

Maintenance Section



RT655 Mk II Regenerative Air Twin Engine Sweeper

From Manufacture
Sequence No. 10/4233

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CHAPTER

P

Page Issue Levels

Description

This chapter lists each page in the Maintenance section, it's issue level and whether it has changed since the previous revision level. Changed pages are indicated by the letter 'C' in the changed column, and new pages by the letter 'N'.

P Chapter - Page Issue Levels

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1 Chapter - Scheduled Maintenance

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1:11	10	C	1:12	08	

2 Chapter - Hydraulic System

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2:1	03		2:2	01	
2:3	05		2:4	03	
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3 Chapter - Electrical System

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3:15	07		3:16	08	
3:17	08		3:18	10	C
3:19	08	C	3:20	09	C
3:21	07	C	3:22	07	C
3:23	09	C	3:24	09	C
3:25	08	C	3:26	08	C
3:27	08	C	3:28	08	C
3:29	08	C	3:30	08	C

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4 Chapter - Water System

Page	Issue	Changed	Page	Issue	Changed
4:1	03		4:2	01	
4:3	01		4:4	01	
4:5	03		4:6	02	C
4:7	10	C	4:8	10	C
4:9	10	C	4:10	05	C
4:11	10	C	4:12	10	C
4:13	09	C	4:14	09	C
4:15	09	C	4:16	08	

5 Chapter - Pneumatic System

Page	Issue	Changed	Page	Issue	Changed
5:1	10	C	5:2	01	
5:3	02		5:4	02	
5:5	10	C	5:6	09	
5:7	09		5:8	10	C
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8 Chapter - Fault Diagnosis

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8:5	01		8:6	01	
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9 Chapter - Service Tools

Page	Issue	Changed	Page	Issue	Changed
9:1	01		9:2	10	C

10 Chapter - Health and Safety

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CHAPTER

1

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.

A flap is provided in the rear valance of the engine mounting tub to give access to the engine when carrying out servicing and for cleaning spilt oil etc. from under the tub floor which could be a fire hazard.

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.

CIRCUIT DIAGRAMS

A chart can be found overleaf to assist in finding the circuit diagram required.

The actual circuit diagrams will be found in the appropriate chapter.

Fluid Finder - Diagram FM0100Z01A
WATER SYSTEM

- WM0101?01 - Main Circuit _____ s - Single Sweep
- _____ d - Dual Sweep
- WM0103z01 - SupaWash Hand Lance & Spray Bar

HYDRAULIC SYSTEM

- HM0101z01 - Reservoir and System Services
- HM0102?01 - Sweep System Circuit _____ s - Single Sweep
- _____ d - Dual Sweep
- HM0108z01 - Secondary Pump Services
- HM0109z01 - Emergency Discharge Pump
- HM0111z01 - Pump Services
- HM0112z01 - Brush Assisted Hood

PNEUMATIC SYSTEM

- PM0101?01 - Main Circuit _____ s - Single Sweep
- _____ d - Dual Sweep
- _____ a - Base System
- _____ b - Option System
- PM0102?01 - Air Blaster _____ s - Single Sweep
- _____ d - Dual Sweep
- PM0104 - Varia Brush _____ s - Single Sweep
- _____ d - Dual Sweep
- PM0105z01 - Mesh Shakers & Rear Wanderhose
- PM0106z01 - Intake Duct Blanking Flap

OPTIONAL EQUIPMENT SHOWN IN ITALIC TEXT




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FLUID FINDER DIAGRAM

CON: 207146	DRAWN BY: RT655	DATE: 15/02/11
NO.:	RT655	REV: 01
FIG. NO.:	FM0100Z01	REV: 01

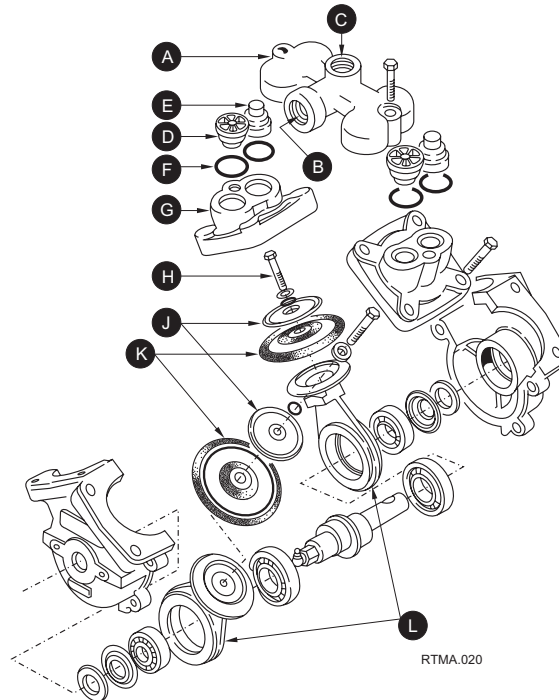
Diagram Index - EM0101Z02B

GENERAL SERVICES	RELAY SOURCES	RELAY OUTPUT	CREATED BY	DATE	RELEASED BY	DATE
EM0101Z02	Diagram Index	Gutter Broom Dual	MOORE	19.05.2011	DAVIS	27.05.2011
EM0102Z02	Electrical Circuit Component Identification	Pick Up Hood Dual/Single	REVISIONS			
EM0103Z02	Electrical Component Identification	Veg Gate/ Indicators	NO. OF CHANGES			
EM0104Z02	System map RT655	Beacons	REVISION			
EM0105Z02	Switch Panel	Supawash	DATE			
EM0106Z02	Relay Box Layout	Rear Wander Hose J Deere 86KW	DRAWN BY			
EM0107Z02	Diode Pack	Rear Wander Hose IVECO 104KW	CHECKED BY			
EM0108Z02	Fuse/Main Relay	John Deere 86 KW Tier 3 Aux Engine	DATE			
EM0109Z02	Program/Discharge Select	John Deere 86 KW Tier 3 Aux Engine	SCALE			
EM0110Z02	Discharge Control	John Deere 86 KW Tier 3 Aux Engine	NTS			
EM0111Z02	Work Lamps & Marker Lights	Iveco 104KW Stage 3A Aux Engine	SHEET			
EM0112Z02	Instrument Panel	Iveco 104KW Stage 3A Aux Engine	1 / 1			
EM0113s02	Gutter Broom Single	Iveco 104KW Stage 3A Aux Engine	BOOK NUMBER			
			EM0101Z02			
			B			
			706942			
			A3			
 <p>Johnston Sweepers Conventional All Rights Reserved © 2011 Johnston Sweepers Limited All Rights Reserved</p>						
EM0119Z02 Rear Wander Hose IVECO 104KW ADDED REVISION NUMBER						
PROJECT: RT 655 CONTROL SYSTEM RESPONSIBLE PARTS: C-D DOCTYPE: ACD RESBK: 01						
TITLE: JOHNSTON RT655 Diagram Index						

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.

- (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.



FLUID FLYWHEEL FILLING PORTS
(VIEWED WITH FAN CASE AND FAN REMOVED FOR CLARITY)

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 175°C (recognised by three equi-spaced indentations round the hexagonal socket). Oil should be replaced after 4,000 hours operation.

FILLING INSTRUCTIONS

Rotate flywheel (A) until its 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 Johnston Fluid Flywheel Oil, Part No. 39673-5 until it reaches the level of the port. 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.

DRAINING INSTRUCTIONS

Place a suitable drain tray under the flywheel housing via the engine tub valance access port. Remove filler plug and turn flywheel through 150° so that port is at lowest position.

THROTTLE SETTINGS

The engine has its own ECU and the speeds are 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** : Remove the fan inlet blanking plate before lowering the body.

ENGINE TYPE	JOHNSTON PART NO.	IDLE SPEED Rev/Min	MAXIMUM FLIGHT SPEED (Off Load) Rev/min
John Deere Turbocharged Electronic - Tier 3 (86kW)	283791-12	750	2000
Iveco Stage 3a HP	283805-24	800 ± 50	2000

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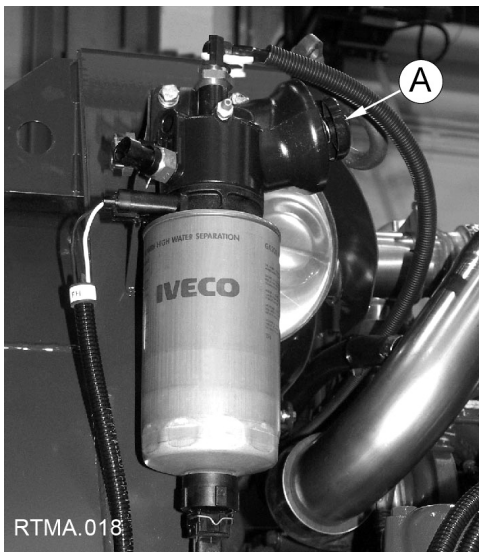
AUXILIARY ENGINE - FUEL SYSTEM

IVECO and John Deere HP 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 on the IVECO and the lift pump on the John Deere.

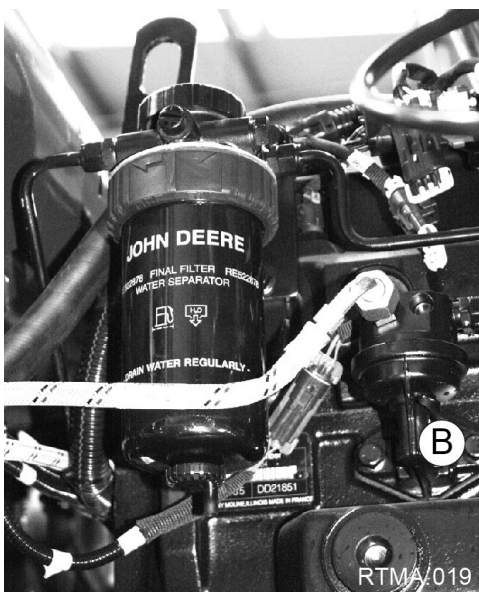
When starting the engine for the first time after bleeding the fuel system, or if the engine has run out of fuel, air pockets in the fuel system may prevent the engine from starting correctly. The procedure for priming the fuel system and removing the air pockets is as follows.

IVECO Engine



1. Locate the fuel priming pump (A) on the fuel prefilter unit located on the fan case housing, as shown.
2. Pump the priming button on the top to the pump/prefilter unit, 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.

John Deere Engine

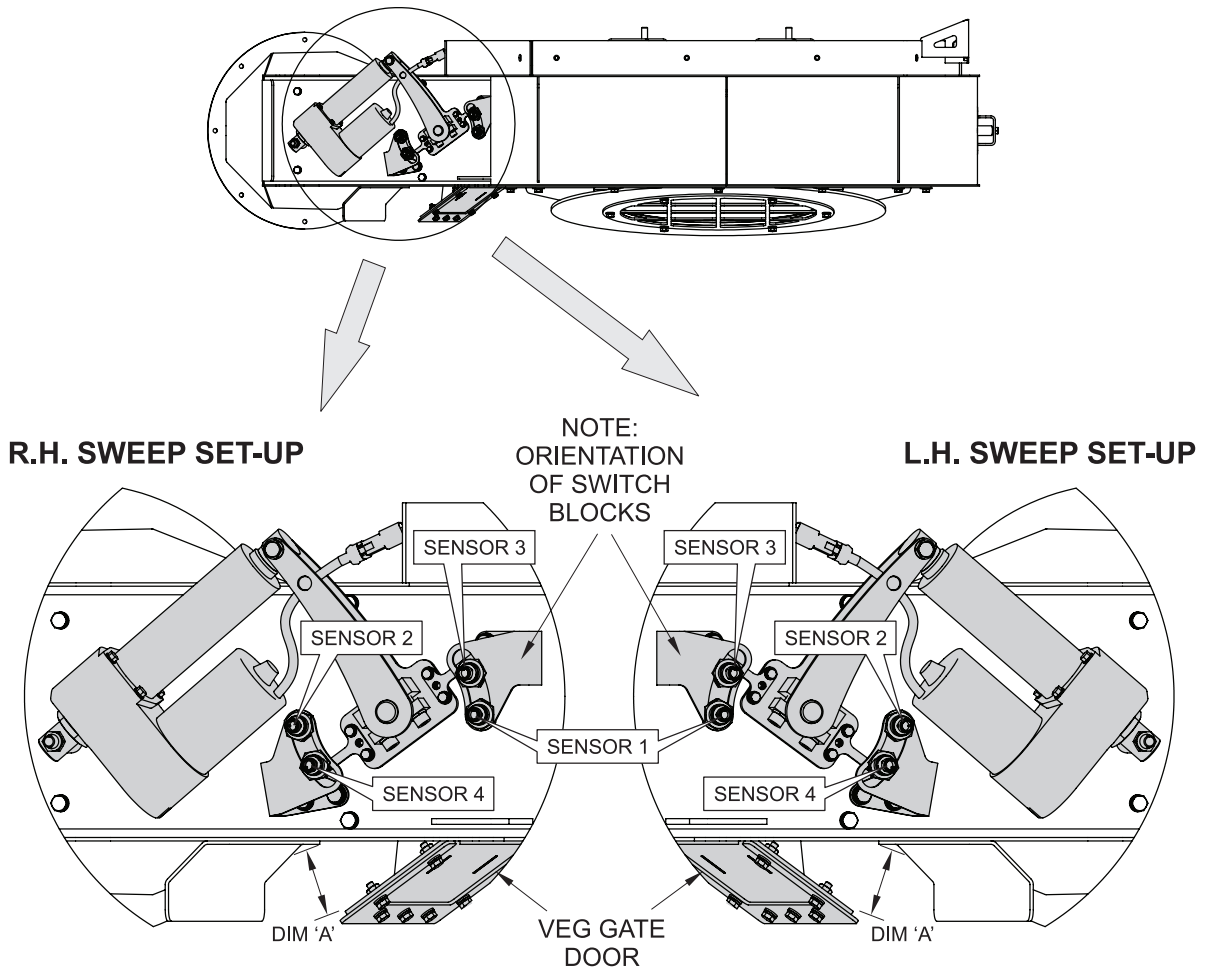


1. Locate the fuel priming pump (B) located on the engine, as shown.
2. Pump the lever on the side of the pump as indicated, until it becomes difficult/stiff to operate (this may take several minutes).
3. Crank the engine until the engine fires. The maximum cranking time should not exceed 15 seconds 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 can be found in RH or LH configuration.

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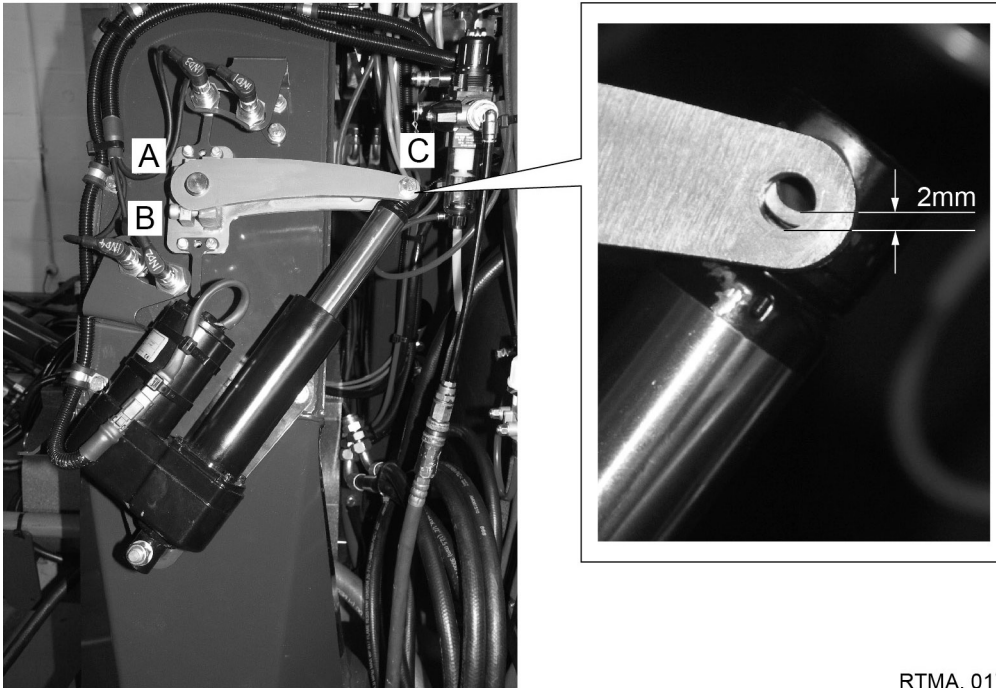


LED ILLUMINATED	SENSOR POSITION	DIMENSION 'A' LIGHT ON	DIMENSION 'A' LIGHT OFF	FUNCTION 'A'
RED	1	CLOSED 0mm	26mm	FULL REGEN
YELLOW	2	25mm	61mm	60% REGEN
BLUE	3	60mm	97mm	30% REGEN
GREEN	4	FULLY OPEN 96mm		VACUUM

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

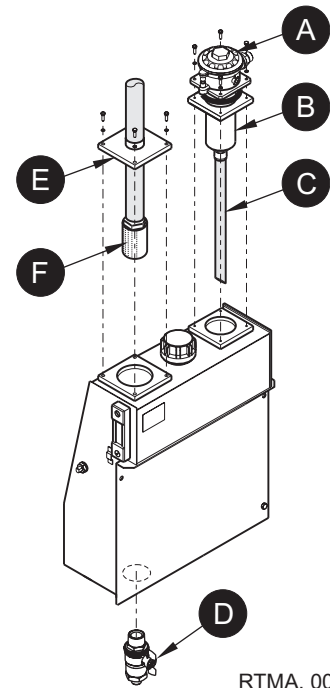
RTMA. 017

- 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.

HYDRAULIC OIL RESERVOIR

RENEWING THE RETURN FILTER

Unscrew cover (A) with a suitable spanner and lift out the cartridge element (B). Refit cartridge and screw on the cover, some force will be required to compress the carriage retaining spring.



RTMA. 003-2

SYSTEM DRAINING

The oil can be changed by removing the return filter (A) and the element and inserting standard gauge equipment for extraction of oil from engine sumps and tanks.

RENEWING THE SUCTION FILTER

The filter is best changed whilst the system is empty to prevent contaminated oil entering the suction port when the filter is removed. The filter is changed as follows.

Release the four retaining screws and remove the suction filter assembly (E). There should be enough slack to remove the filter assembly. The suction filter (F) option can be unscrewed and replaced. After fitting a new filter, replace the cover ensuring the 'O' ring is seated in its groove.

SYSTEM REFILLING

The system capacity dry is 90 litres. Refer to Chapter 6 of the Operator's Guide detailing the correct oil level in the reservoir.

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.

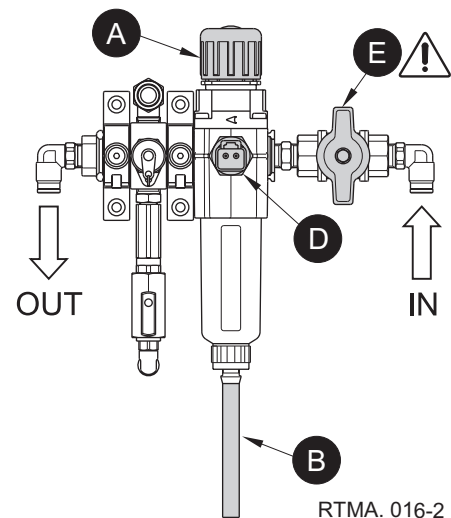
Safety Precautions

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

The air filter unit incorporates a semi automatic drain which automatically dumps accumulated water when the air supply is isolated by the shut off valve (C). It can also be drained by pushing up the drain tube (B) that protrudes from the underside of the systems locker.

The pressure regulator (A) ensures the equipment is not over pressurised. It is factory set and sealed at 7.5 bar (108 psi).

A pressure switch (D) is fitted to illuminate the low air pressure warning lamp on the cab switch panel.



RTMA. 016-2

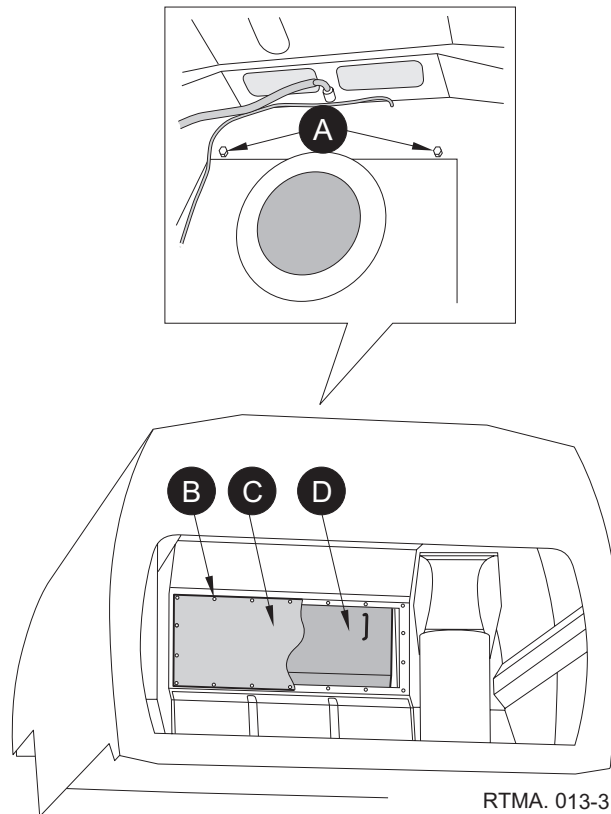
SEPAVAC

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 wide sweep brush slewing cylinder on dual sweep machines and the channel brush lift cylinder. Avoid playing 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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GENERAL DESCRIPTION

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

- 1 Sweep system and load discharge.
- 2 Options system for Supawash etc.

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

CIRCUIT PRESSURES

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

POINT NO.	FUNCTION
T1	Sweep and load discharge
T2	Supawash

SWEEPING SYSTEM

Connect a suitable 250 bar gauge to Test Point T1 (see Valve Identification).

To check the main relief valve 210 bar, it is necessary to run the auxiliary engine at 2000 rpm. Operate the rear door close and adjust RV1 valve to give 210 bar.

Note: Do not run the pressure test for more than 30 seconds.

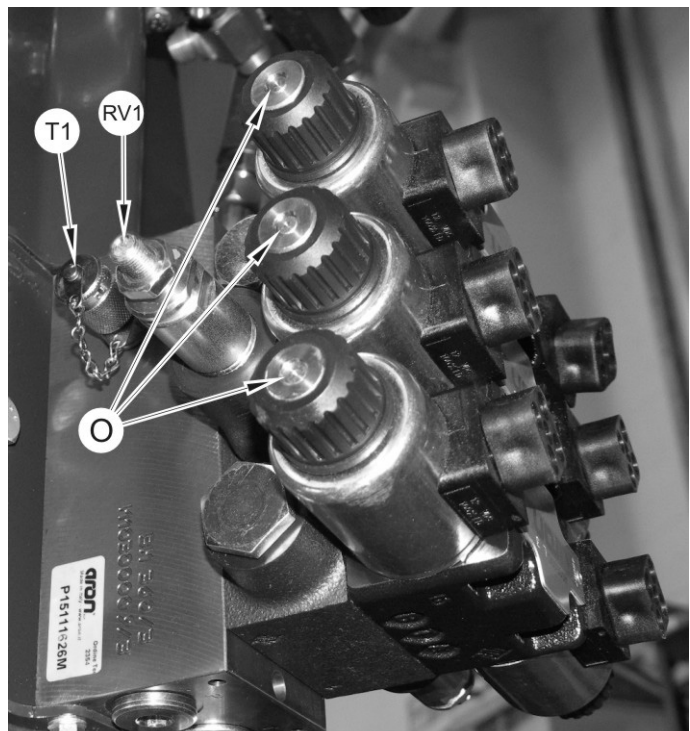
BODY DISCHARGE SYSTEM

Connect a suitable 250 bar gauge to Test Point T1 (see Valve Identification). Operate auxiliary engine at tick over, activate the body discharge system, press the body lower button and read the pressure on T1. This should be 80 bar; adjust the discharge relief valve RV2 to 80 bar if necessary.

Tip cylinder descent is controlled by an over centre valve that is pilot operated to lock out the cylinder in the event of a hose failure.

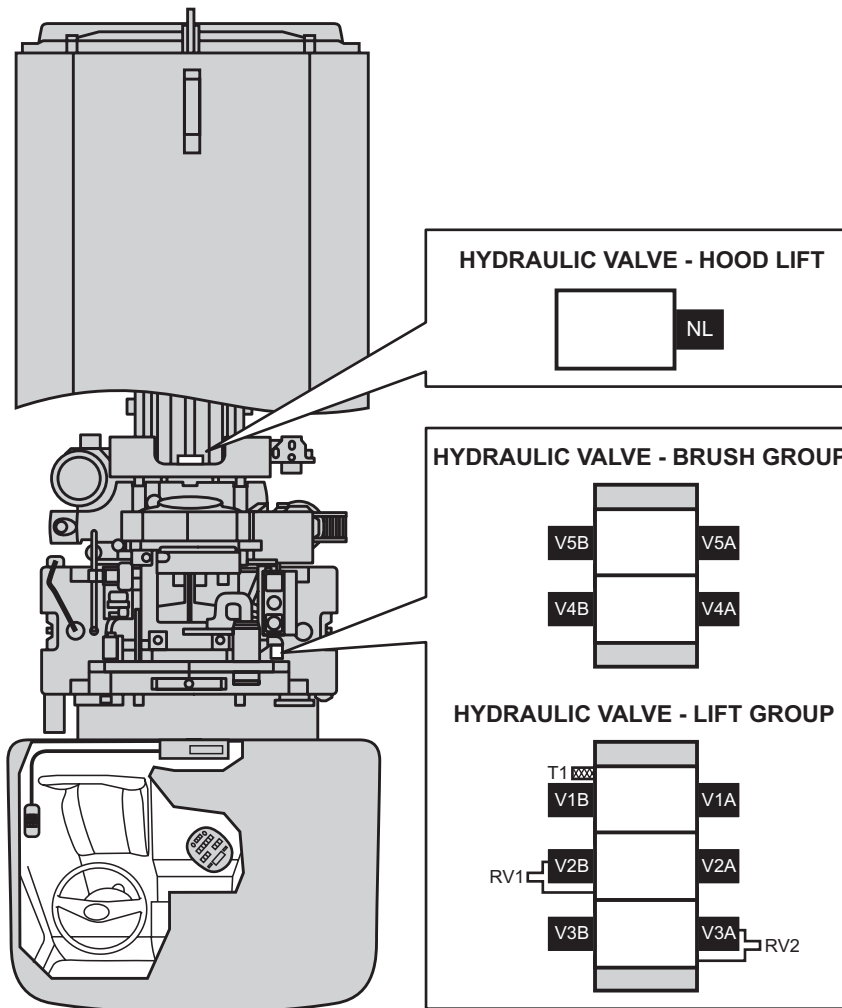
Note: Do not run the pressure test for more than 30 seconds.

The hydraulic valves have a manual override button (O) as shown, that can be pushed to manually operate the hydraulic valve.



RTMA. 014

VALVE IDENTIFICATION



RTMA. 002

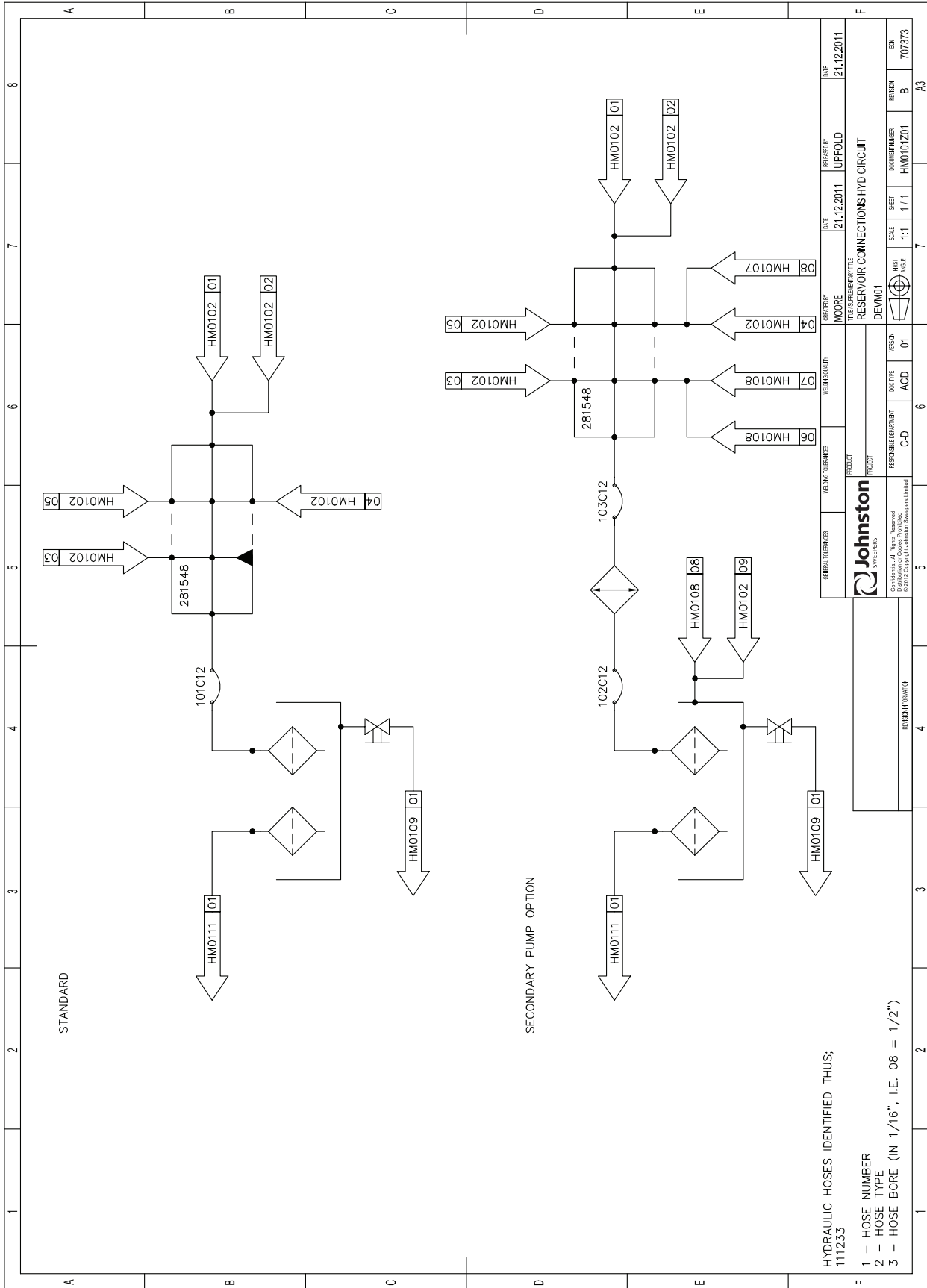
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Modus Operandi

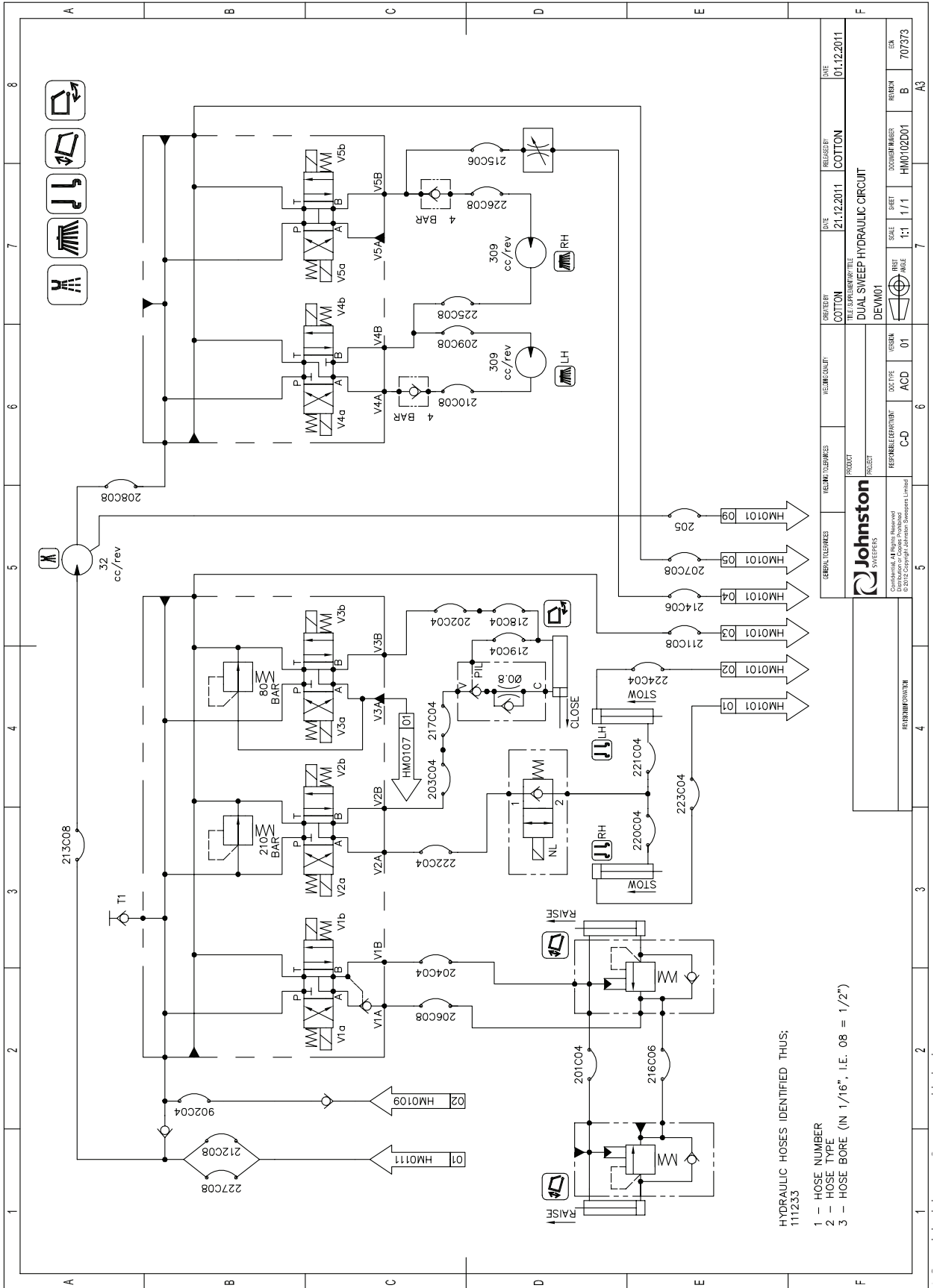
Modus Operandi - Fluid power valve control																			
Function	Hydraulic Valves											VM10							
	V1a	V1b	V2a	V2b	V3a	V3b	V4a	V4b	V5a	V5b	NL	BH	PB	SV1	PV1	PV2	PV3	PV4	
LH Gutter Broom (single mode) - Out position							✓		✓						✓				
LH Gutter Broom (single mode) - In position							✓		✓						✓				
LH Gutter Broom (dual mode) - Out position									✓						✓				
LH Gutter Broom (dual mode) - In position									✓						✓				
LH Gutter Broom - Stow																			
RH Gutter Broom (single mode) - Out position								✓								✓			✓
RH Gutter Broom (single mode) - In position								✓								✓			
RH Gutter Broom (dual mode) - Out position									✓							✓			✓
RH Gutter Broom (dual mode) - In position									✓							✓			
RH Gutter Broom - Stow																			
Pick-Up Head - Lower														✓					
Pick-Up Head - Raise (broom/s active)				✓															
Pick-Up Head - Raise (broom/s inert)				✓						✓									
Hopper - Raise		✓																	
Hopper - Lower	✓									✓									
Rear Door - Open			✓																
Rear Door - Close					✓														
Supawash																			
PowaBoom - Raise																			
PowaBoom - Lower										✓									
Revision 04																			

Reservoir Connections - Diagram HM0101Z01B

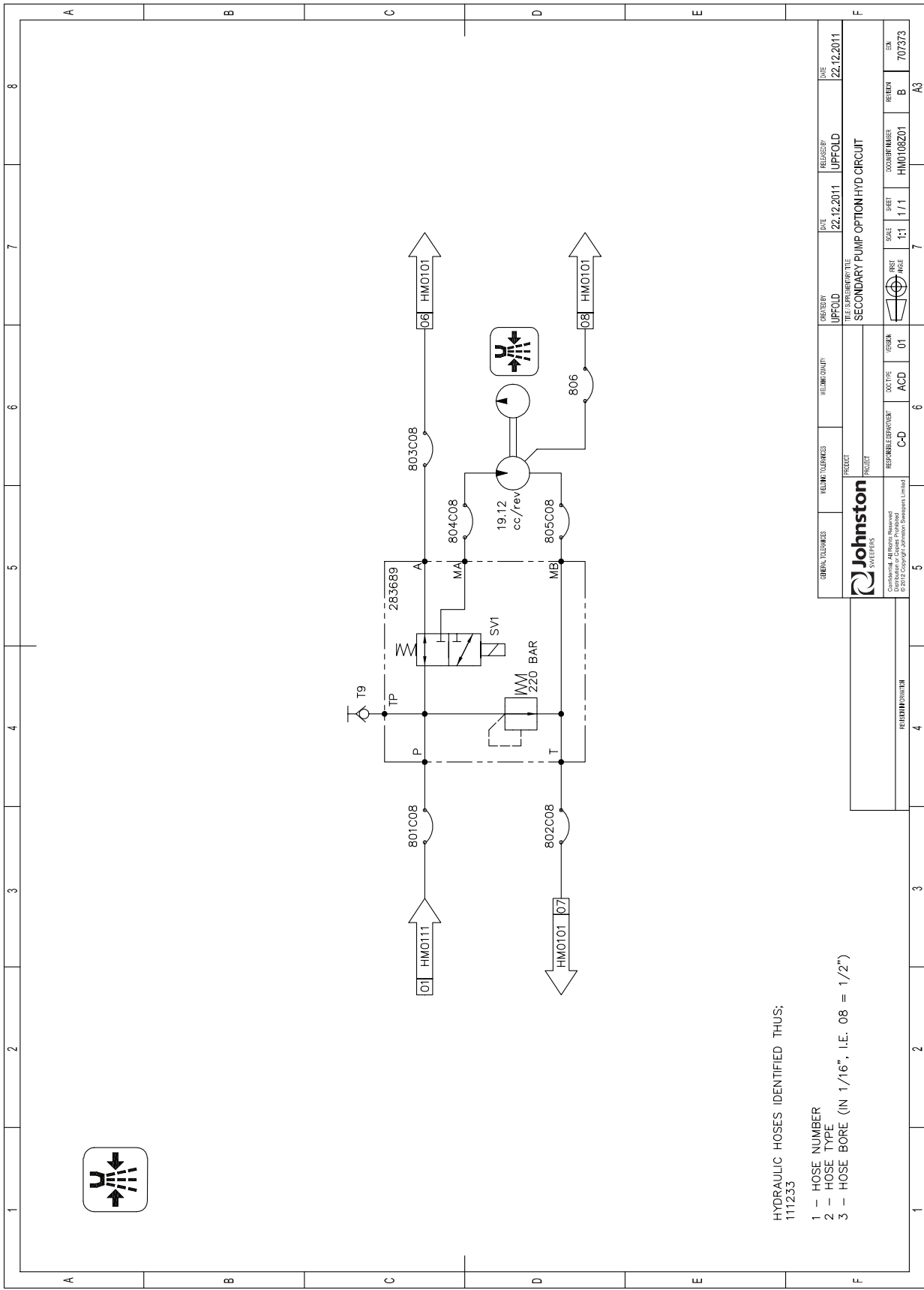


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Dual Sweep - Diagram HM0102D01B

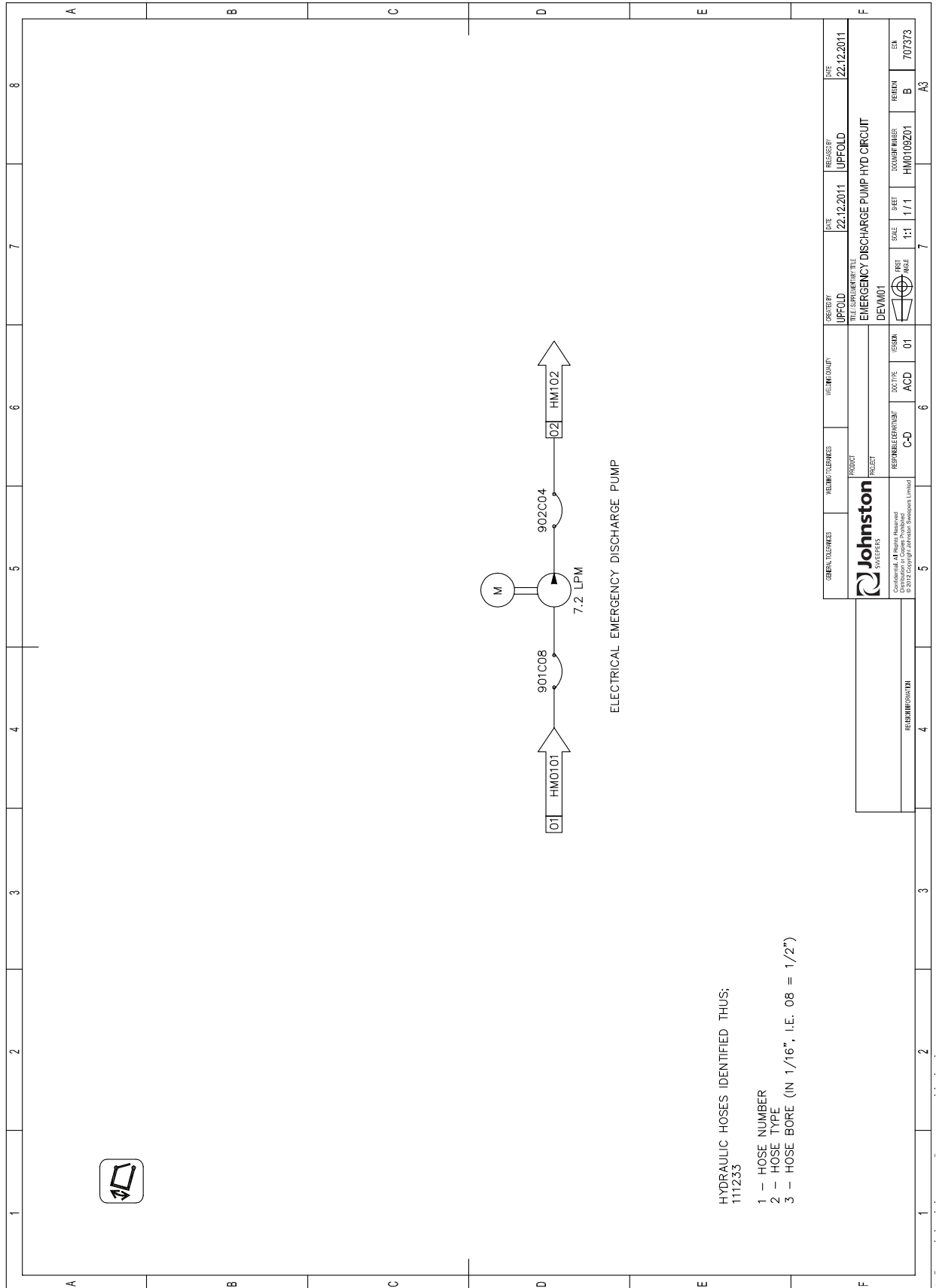


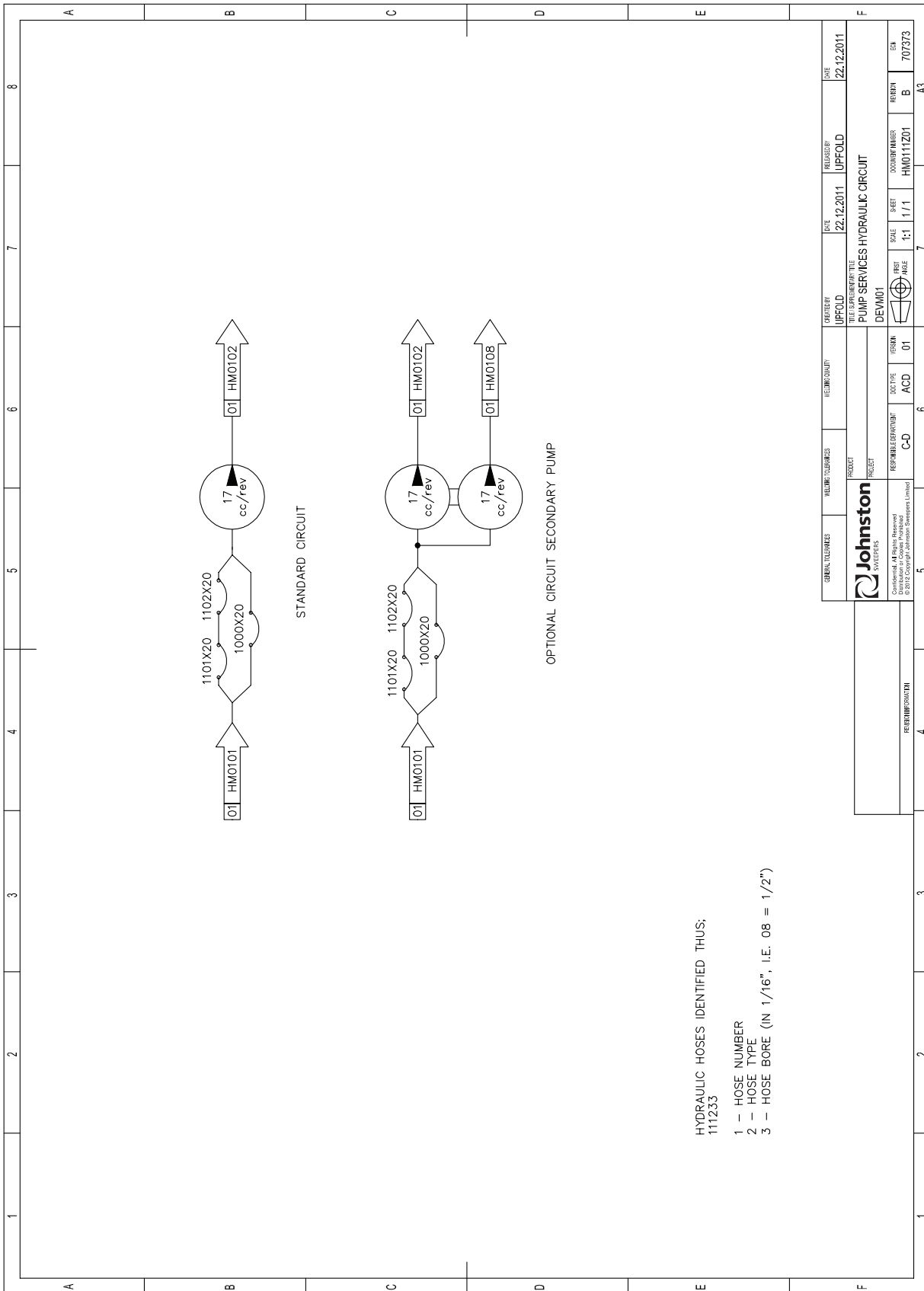
Supawash Pump Diagram - HM0108Z01B



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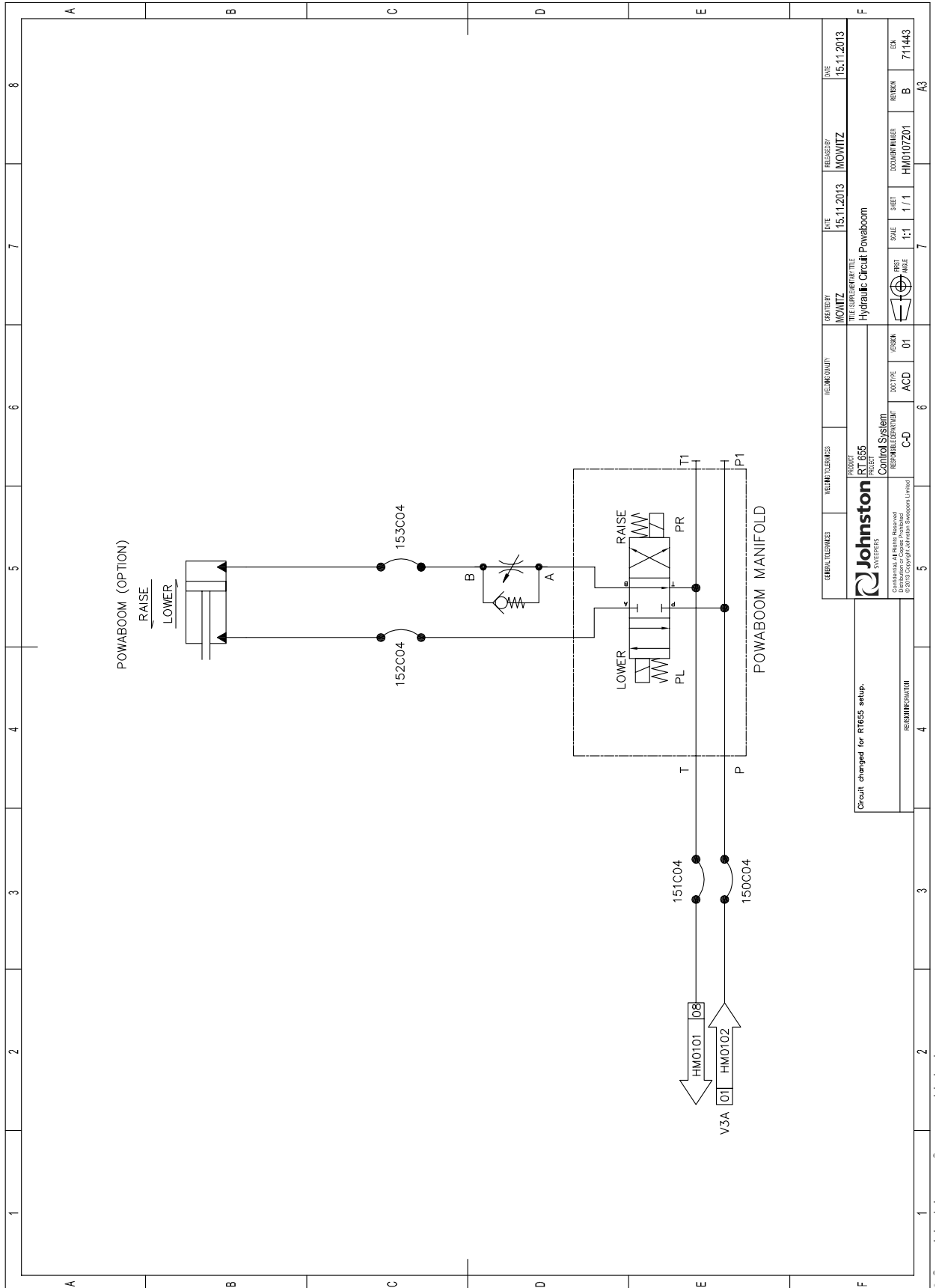
Emergency Discharge Pump Diagram - HM0109Z01B



P.T.O. Pump Diagram - HM011Z01B


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Powaboom (Option) - Diagram HM0107Z01B



GENERAL COMMENTS	REVISIONS	PROJECT	DATE	REVISION	DATE
Circuit changed for RT655 setup.	1	RT 655	15.11.2013	1	15.11.2013
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	3	RESUBMITTED		3	
	4	C-D		4	
	5	ACD		5	
	6	01		6	
	7			7	
	8			8	
	9			9	
	10			10	
	11			11	
	12			12	
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CHAPTER

3

Electrical System**Table of Contents**

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Component Identification	
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Circuit Diagrams	3 : 5

GENERAL DESCRIPTION

The system is integrated with that of the chassis in that it shares its battery and power source. The auxiliary engine is equipped with a second alternator to supplement power generation. The system activates all operational functions of the machine except channel brush speed regulation.

SYSTEM DESCRIPTION

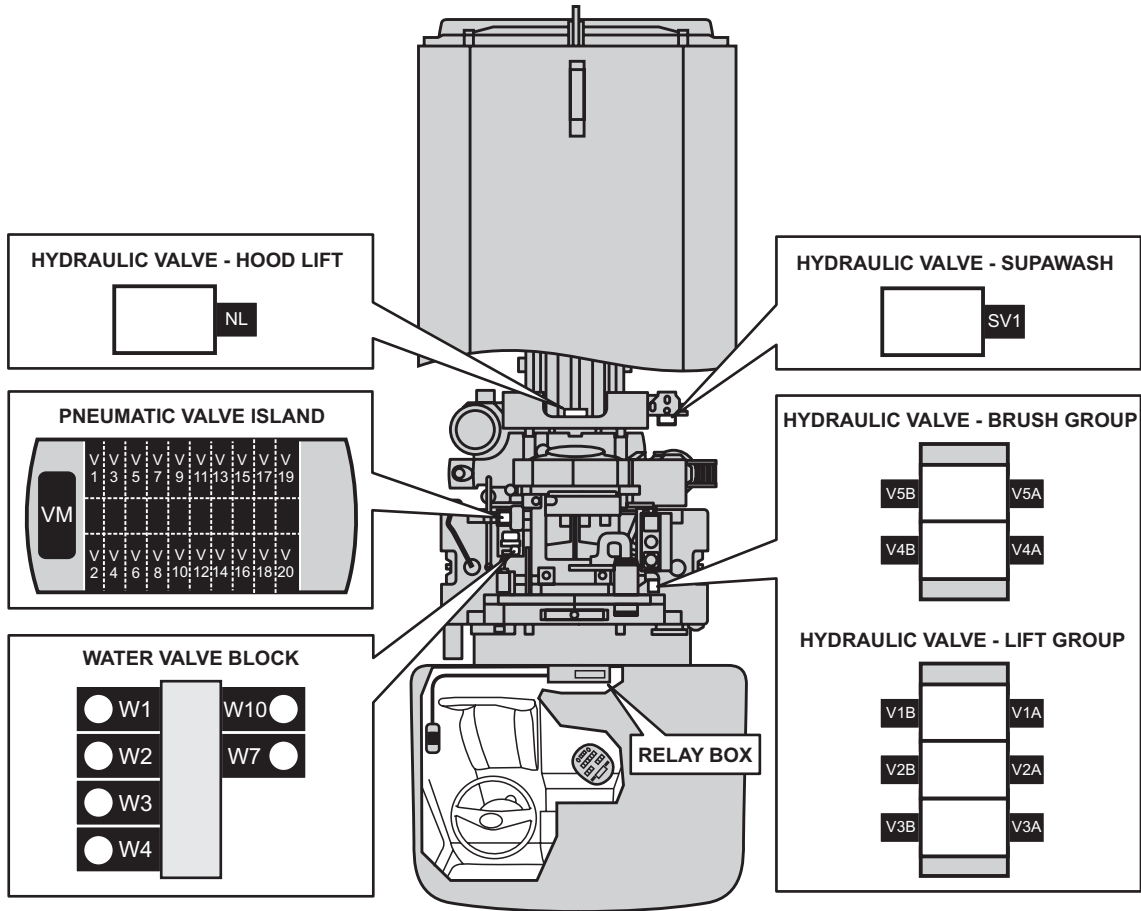
The electrical system circuit diagrams are sub divided into modularised sub circuits and are identified by an eight digit code, i.e. EM0101Z02. The first six digits identify the machine and a particular control feature, the last three digits identify variation and design status of the particular control feature. When the seventh digit is a 'Z', then there is only one design variation, though there could be other variations identified by the eighth and ninth digits.

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

The electrical system is protected by various fuses - See Operators Guide for diagram.

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

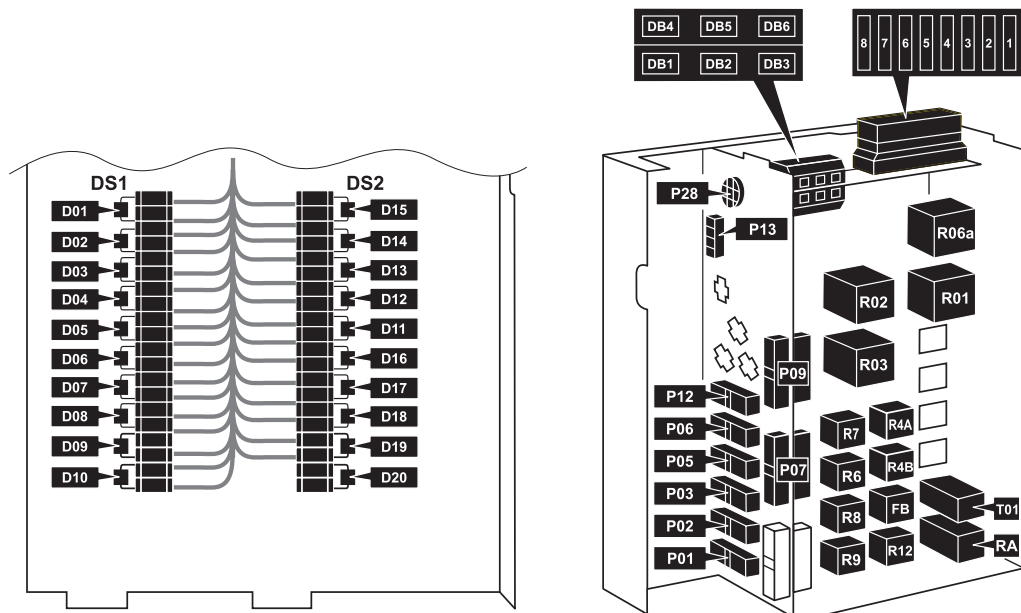
COMPONENT IDENTIFICATION



RTMA. 005

RELAY BOX

Dual sweep box shown

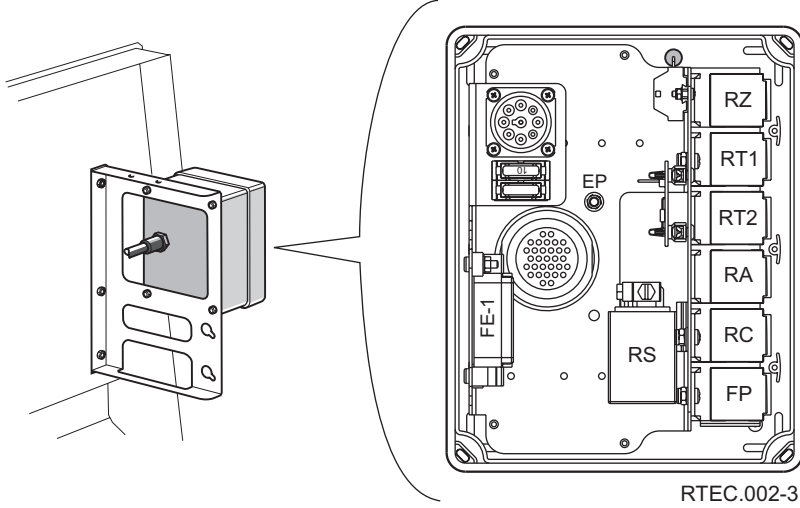


RTMA.006-2

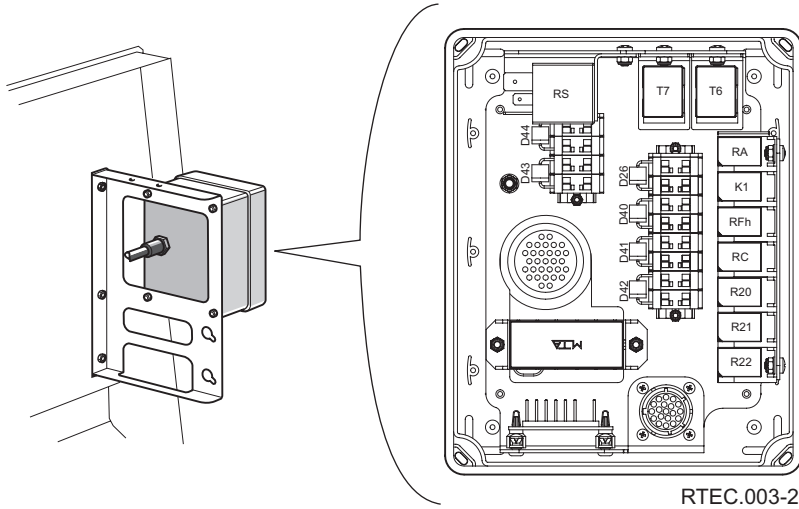
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Powapack Management Box

John Deere 'HP' Tier 3




Iveco Tier HP 3a



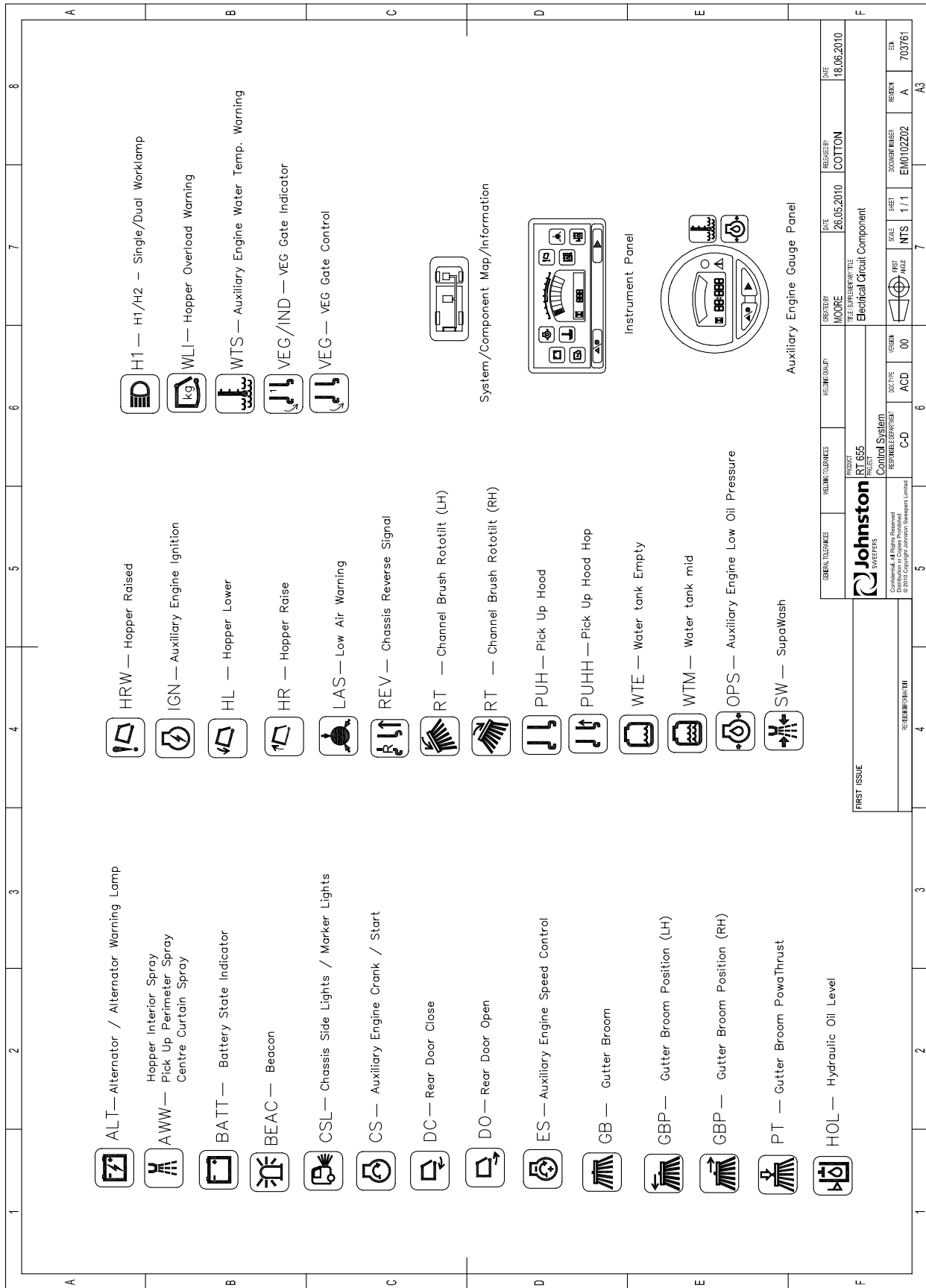
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Index - Diagram EM0101Z02B

1	2	3	4	5	6	7	8
EM0101z02	Diagram Index			EM0113d02	Gutter Broom Dual		
EM0102z02	Electrical Circuit Component Identification			EM0114z02	Pick Up Hood Dual/Single		
EM0103z02	Electrical Component Identification			EM0115z02	Veg Gate/ Indicators		
EM0104z02	System map RT655			EM0116z02	Beacons		
EM0105z02	Switch Panel			EM0117z02	Supawash		
EM0106z02	Relay Box Layout			EM0118z02	Rear Wander Hose J Deere 86KW		
EM0107z02	Diode Pack			EM0119z02	Rear Wander Hose IVECO 104KW		
EM0108z02	Fuse/Main Relay			EM0127z02A	John Deere 86 KW Tier 3 Aux Engine		
EM0109z02	Program/Discharge Select			EM0127z02B	John Deere 86 KW Tier 3 Aux Engine		
EM0110z02	Discharge Control			EM0127z02C	John Deere 86 KW Tier 3 Aux Engine		
EM0111z02	Work Lamps & Marker Lights			EM0128z02A	Iveco 104KW Stage 3A Aux Engine		
EM0112z02	Instrument Panel			EM0128z02B	Iveco 104KW Stage 3A Aux Engine		
EM0113s02	Gutter Broom Single			EM0128z02C	Iveco 104KW Stage 3A Aux Engine		

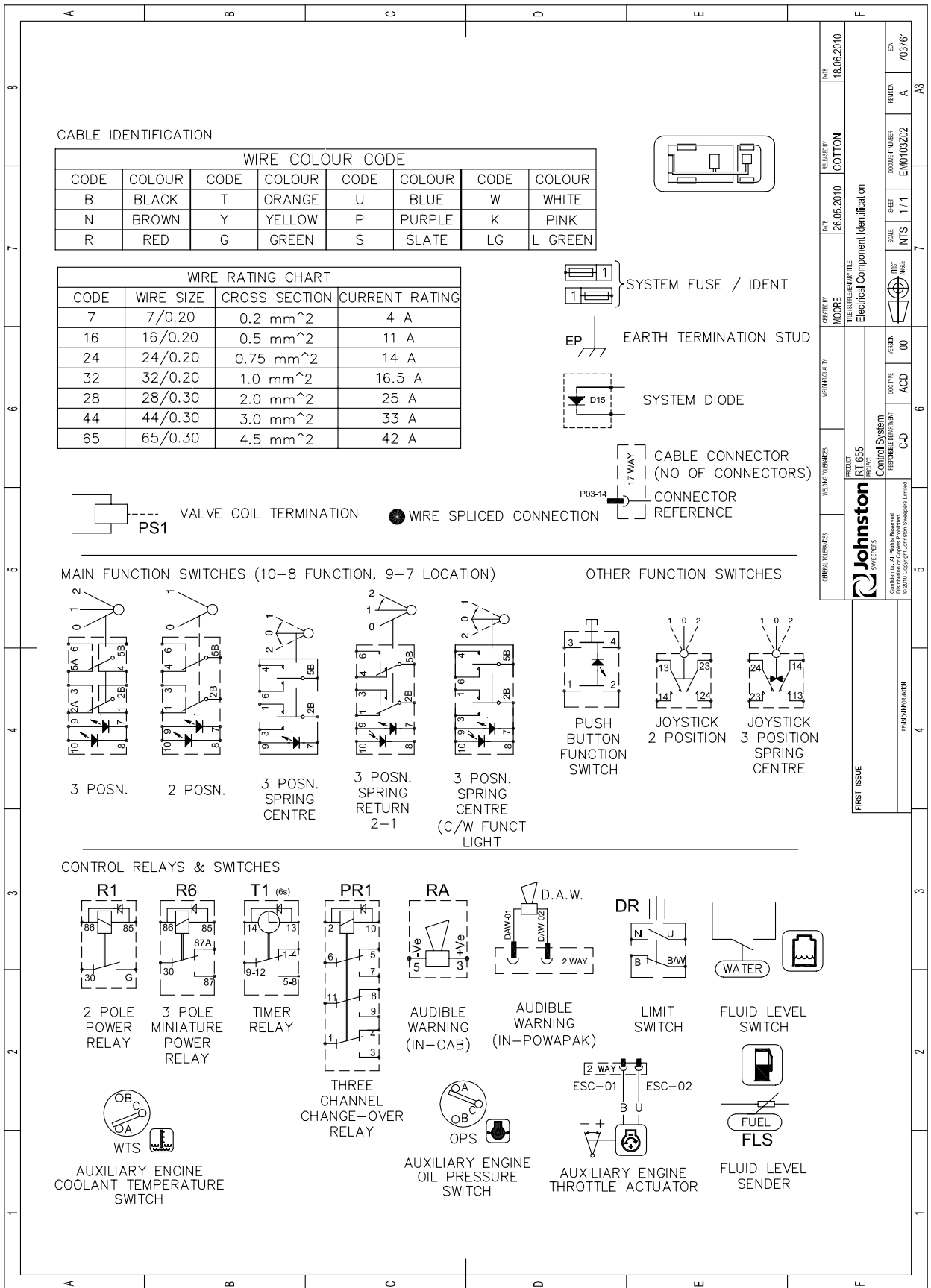
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 <small>Copyrighted. All Rights Reserved by Johnston Sweepers Limited © 2011 Johnston Sweepers Limited</small>			PROJECT RT 655 RT 655 Control System			
EM0119z02 Rear Wander Hose IVECO 104KW ADDED						
REVISION/REVISION	DOC TYPE	ISSUE	DATE	BY	REASON	DATE
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	SCALE	SHEET				
	NTS	1/1				
	REVISION					
	B					
	706942					

Electrical Component Identification - Diagram EM0102Z02A



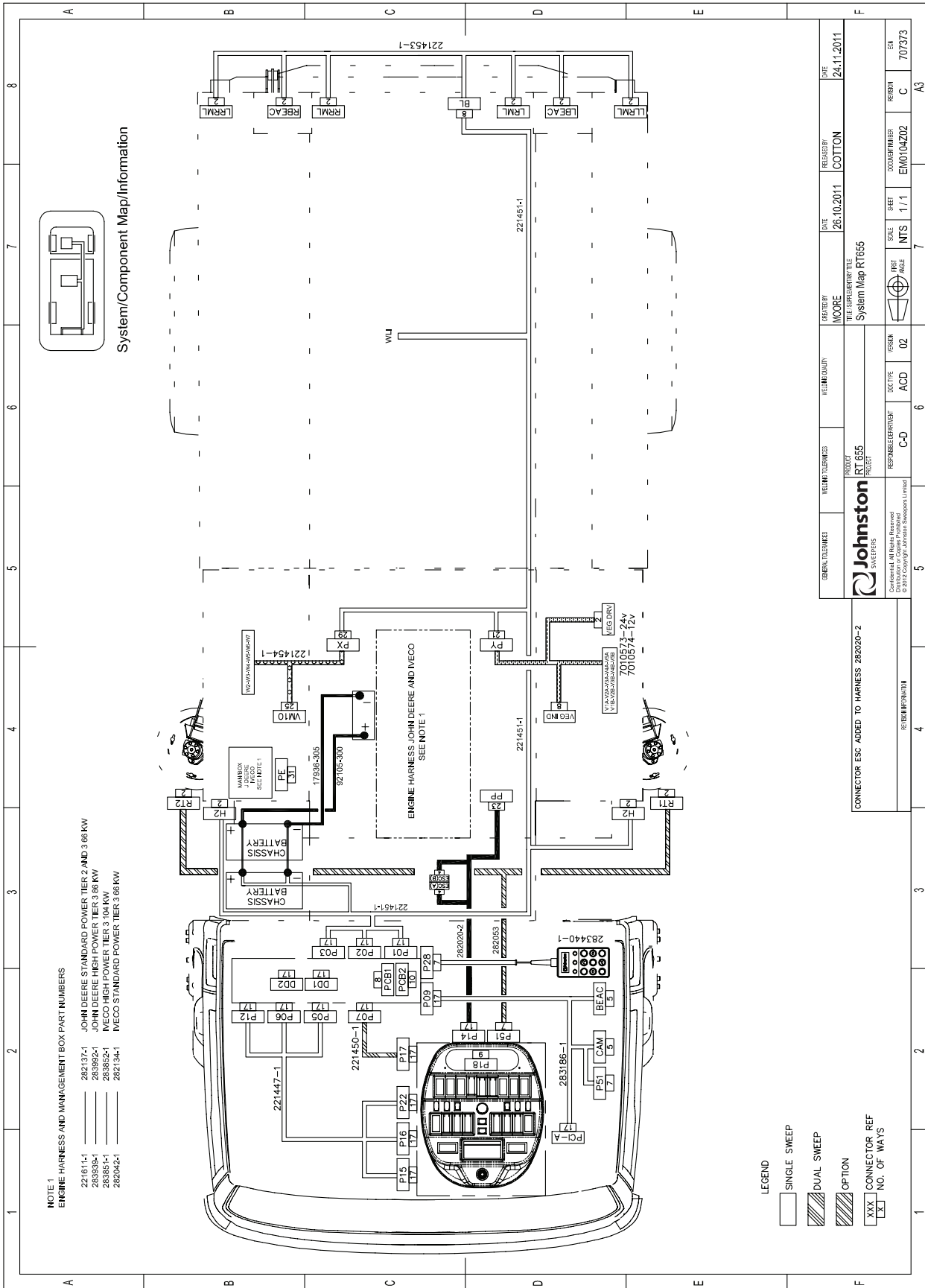
Electrical Component Identification - Diagram EM0103Z02A

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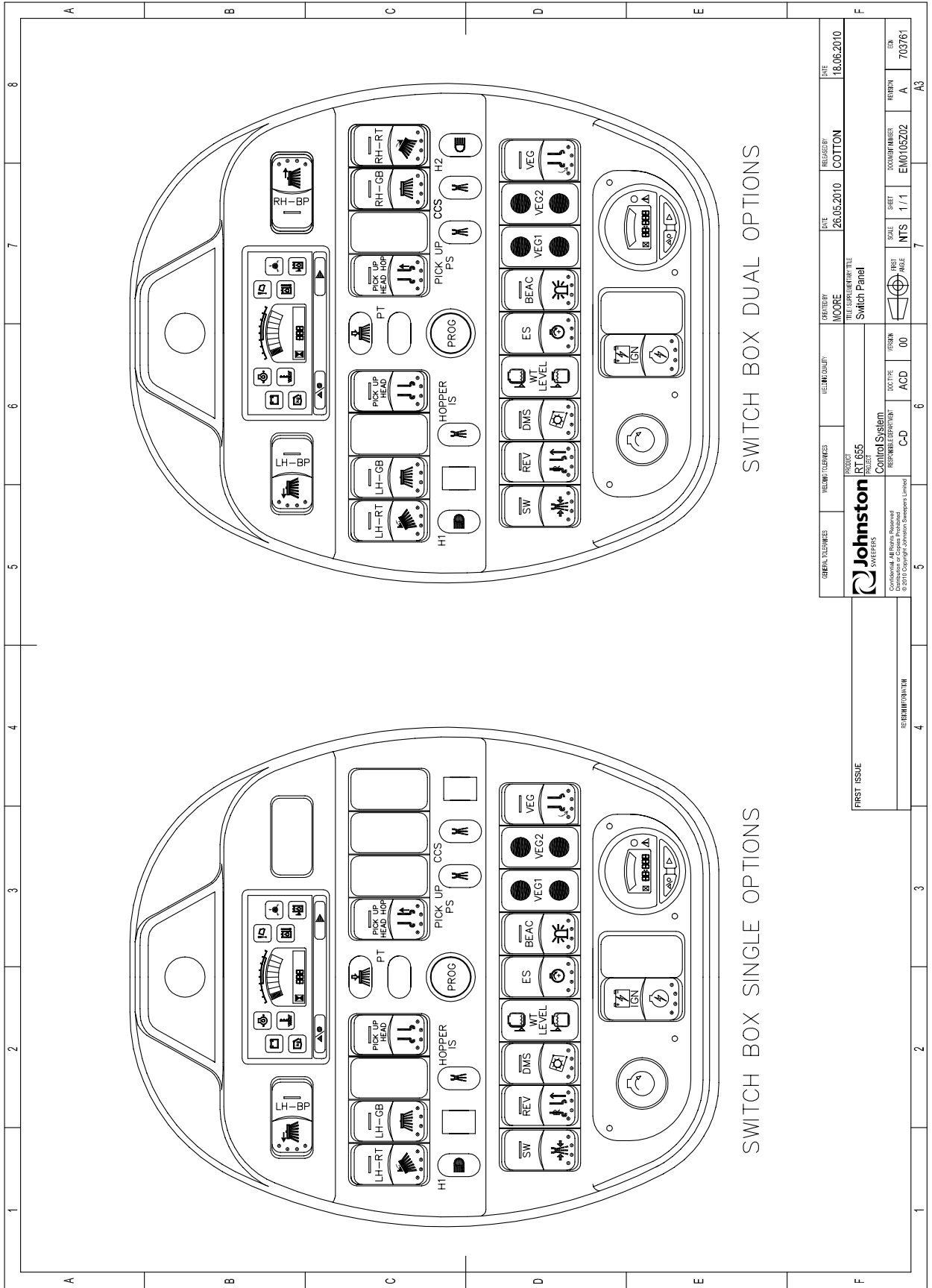
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DATE	26.05.2010
CREATED BY	MOORE
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PROJECT	Control System
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Doc Type	ACD
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Revision	A
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System Map - Diagram EM0104Z02C

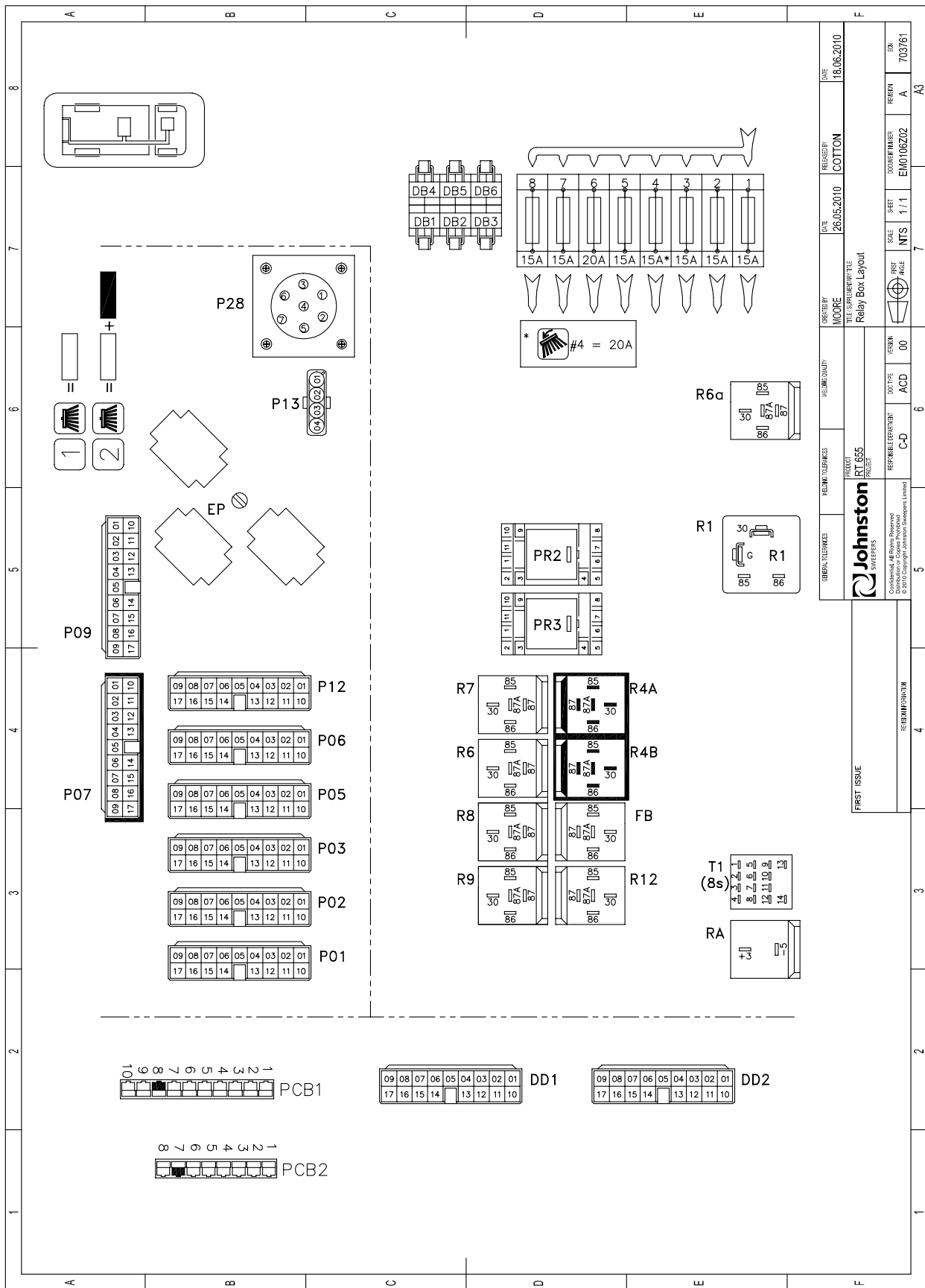


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Switch Panel - Diagram EM0105Z02A



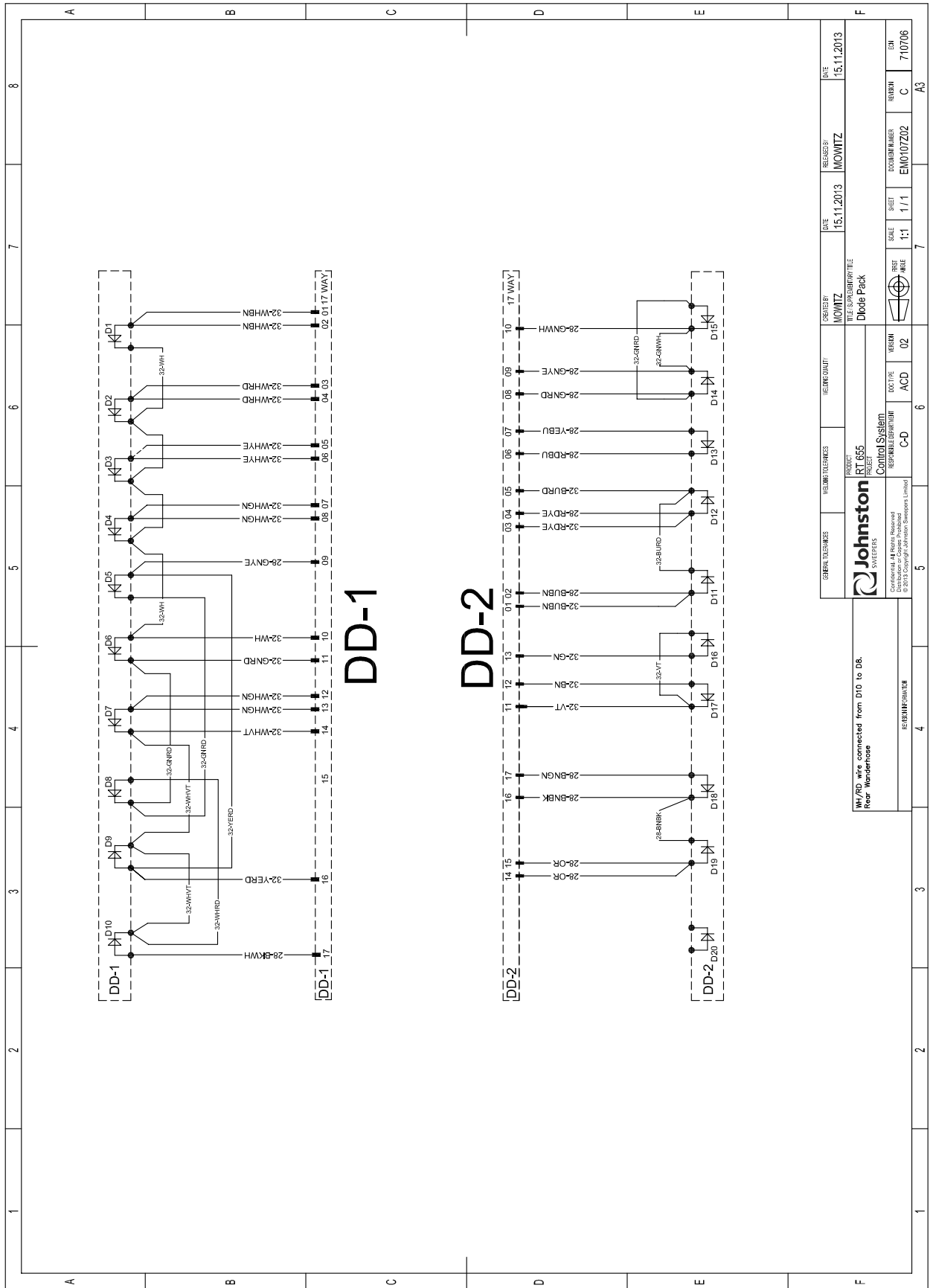
Relay Box Layout - Diagram EM0106Z02A

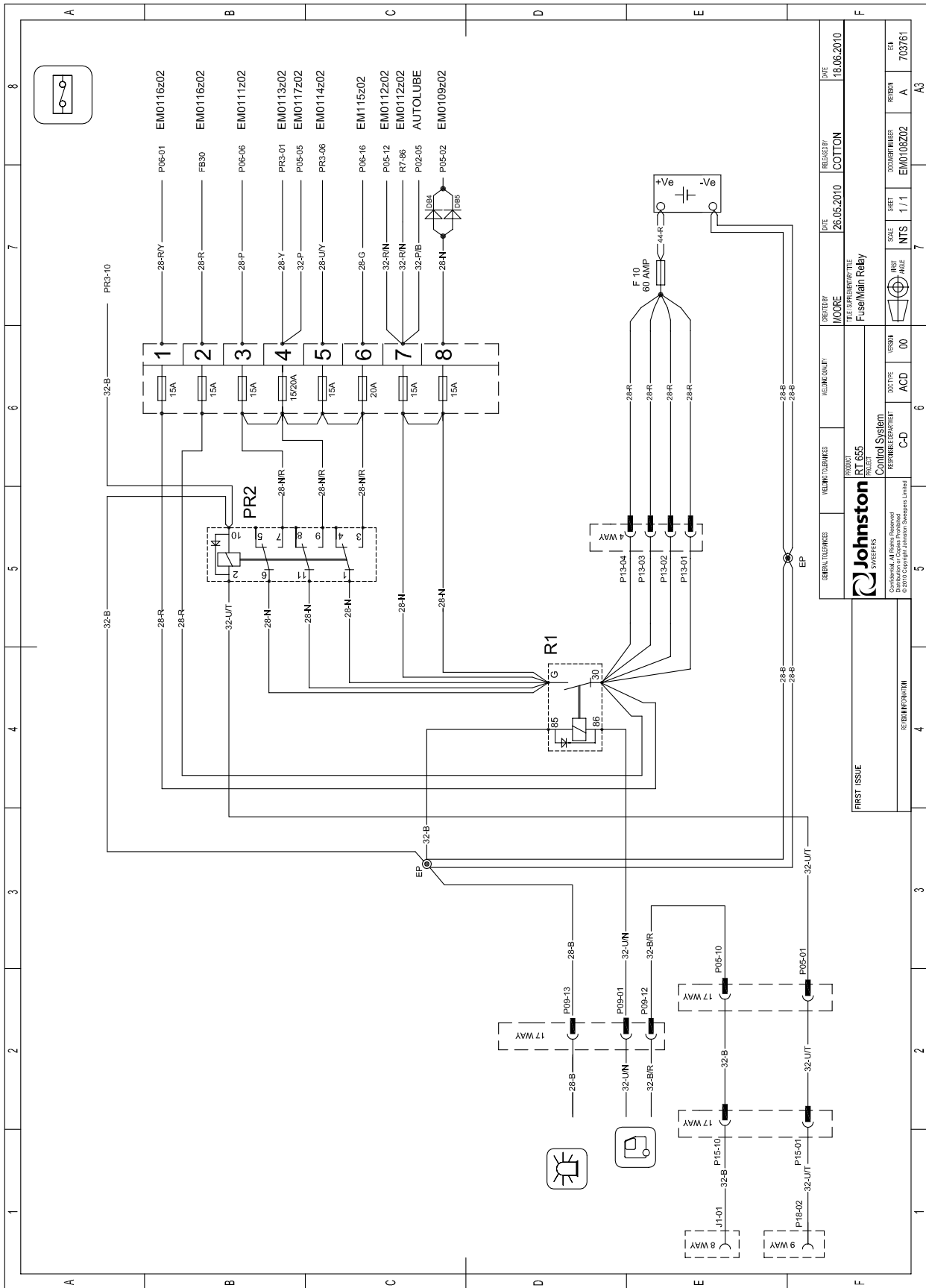


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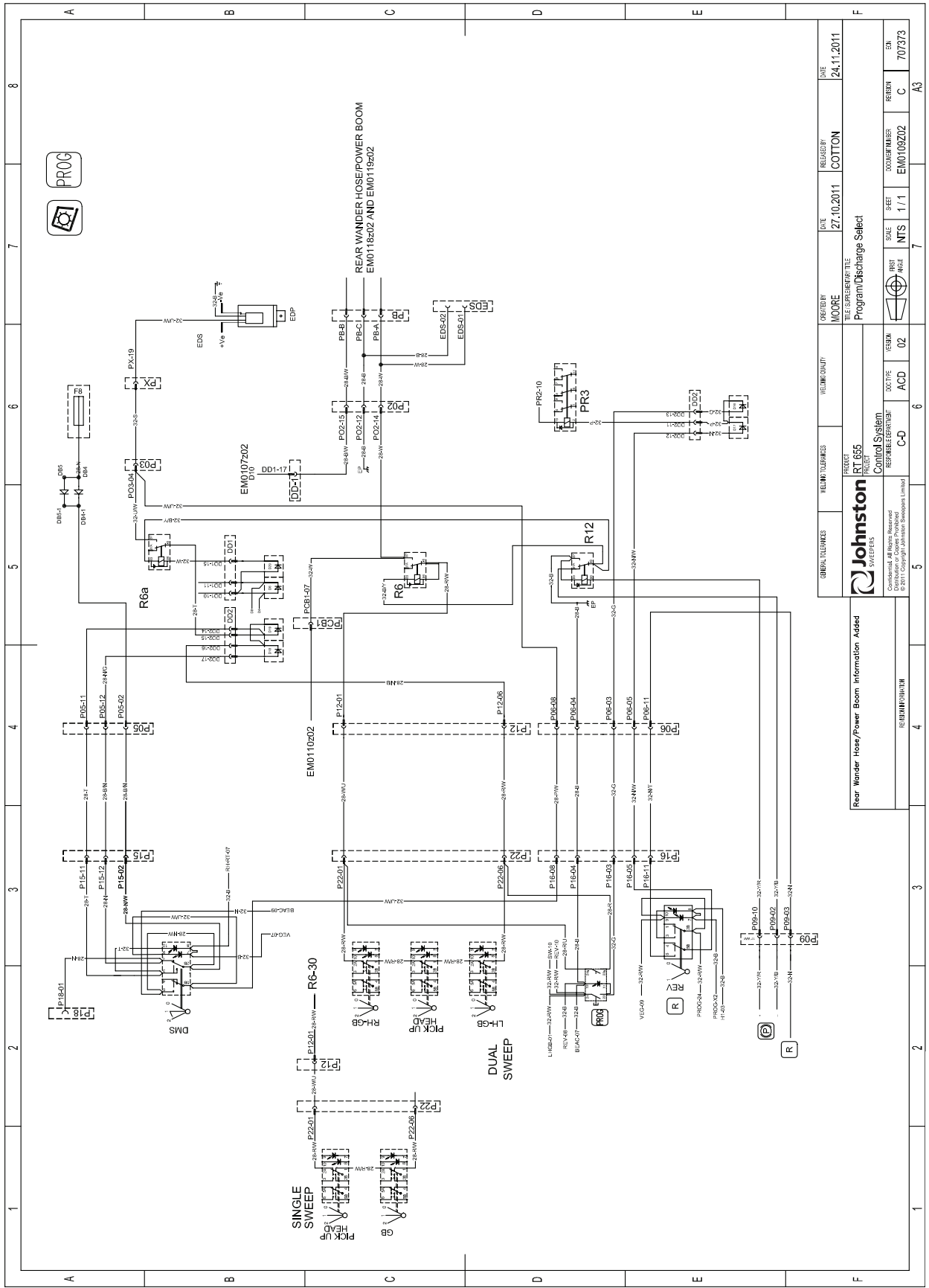
Diode Pack - Diagram EM0107Z02C

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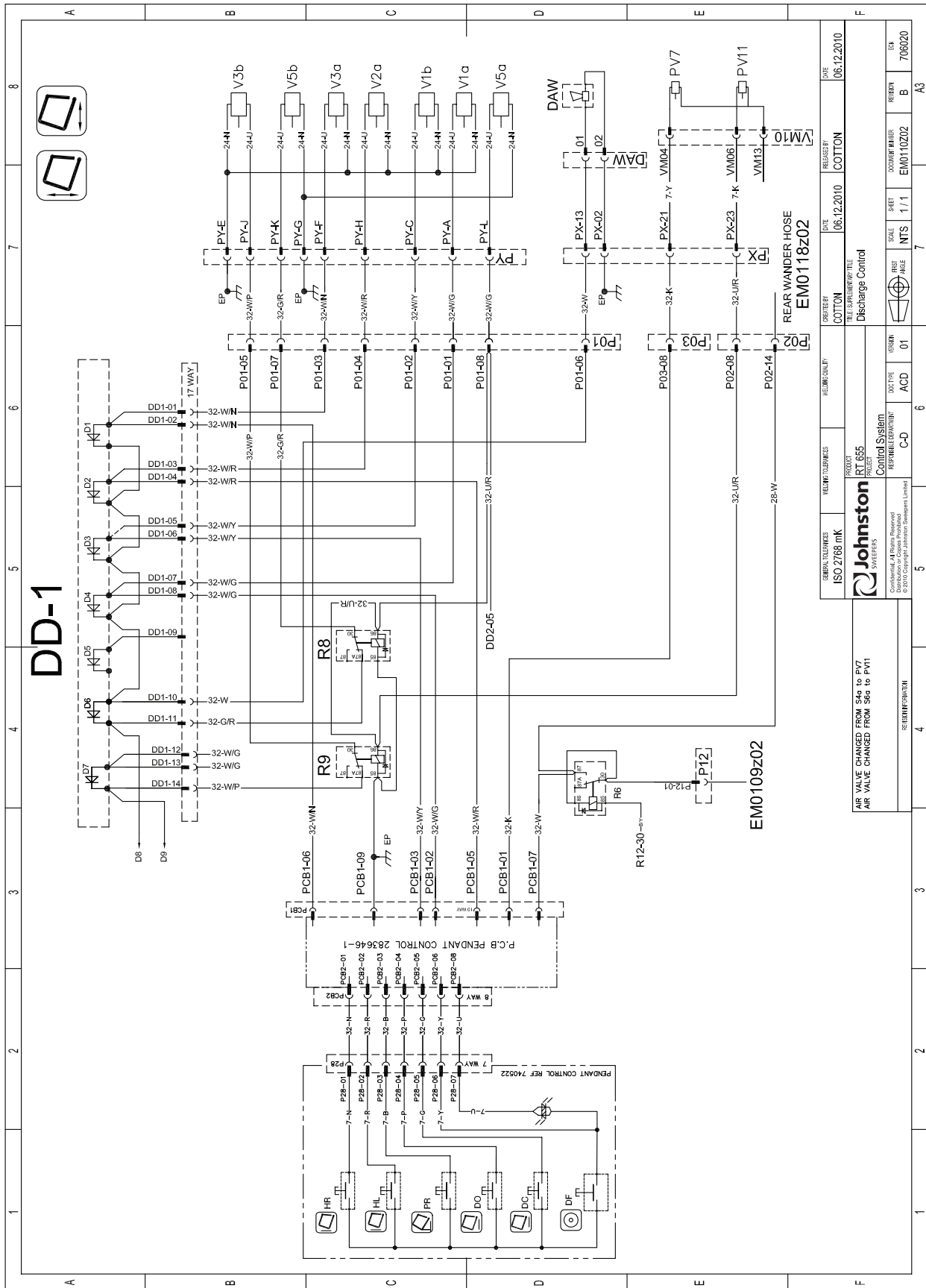


Fuse / Main Relay - Diagram EM0108Z02A


Program / Discharge Select - Diagram EM0109Z02C

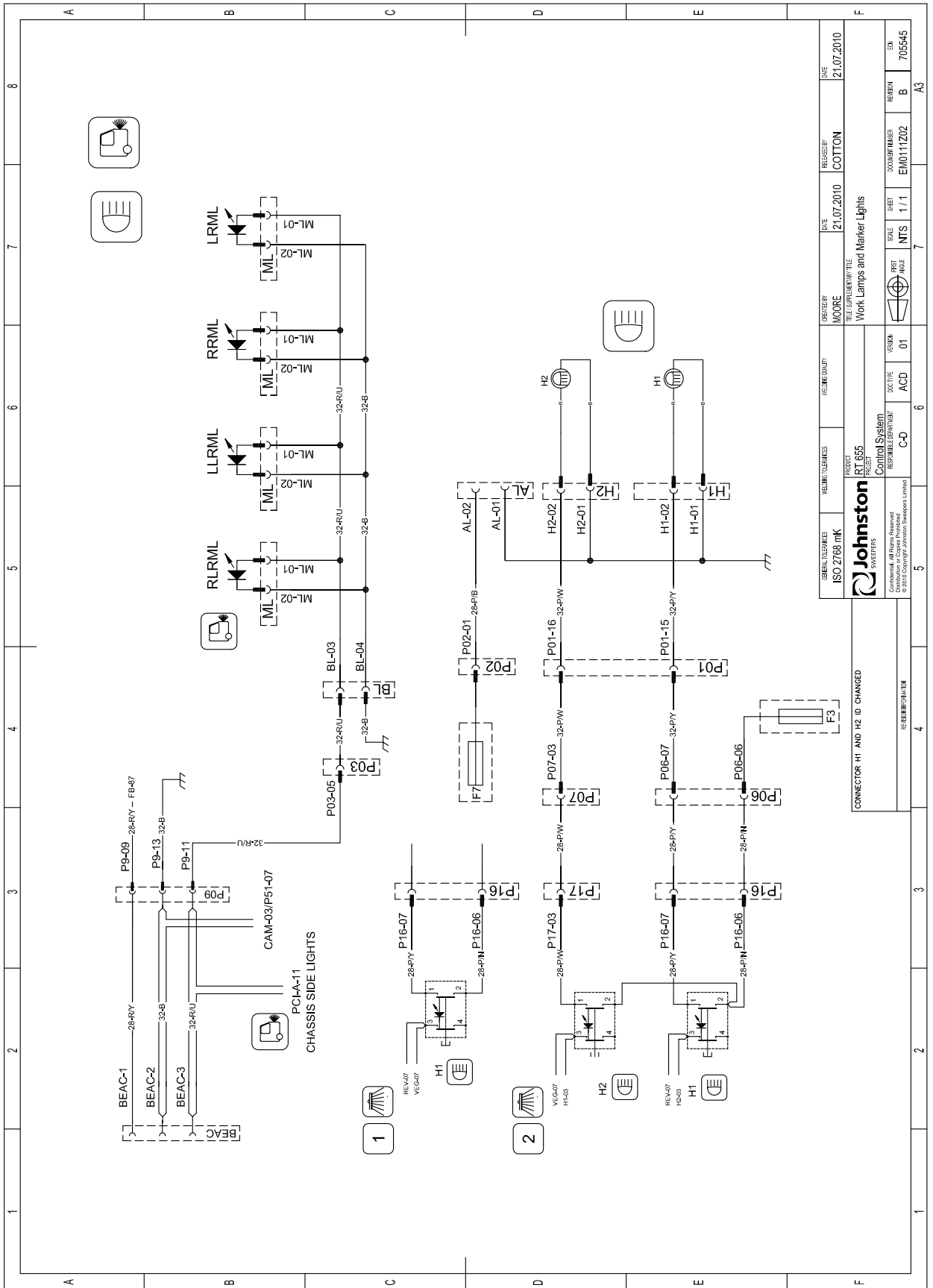


Discharge Control - Diagram EM0110Z02B



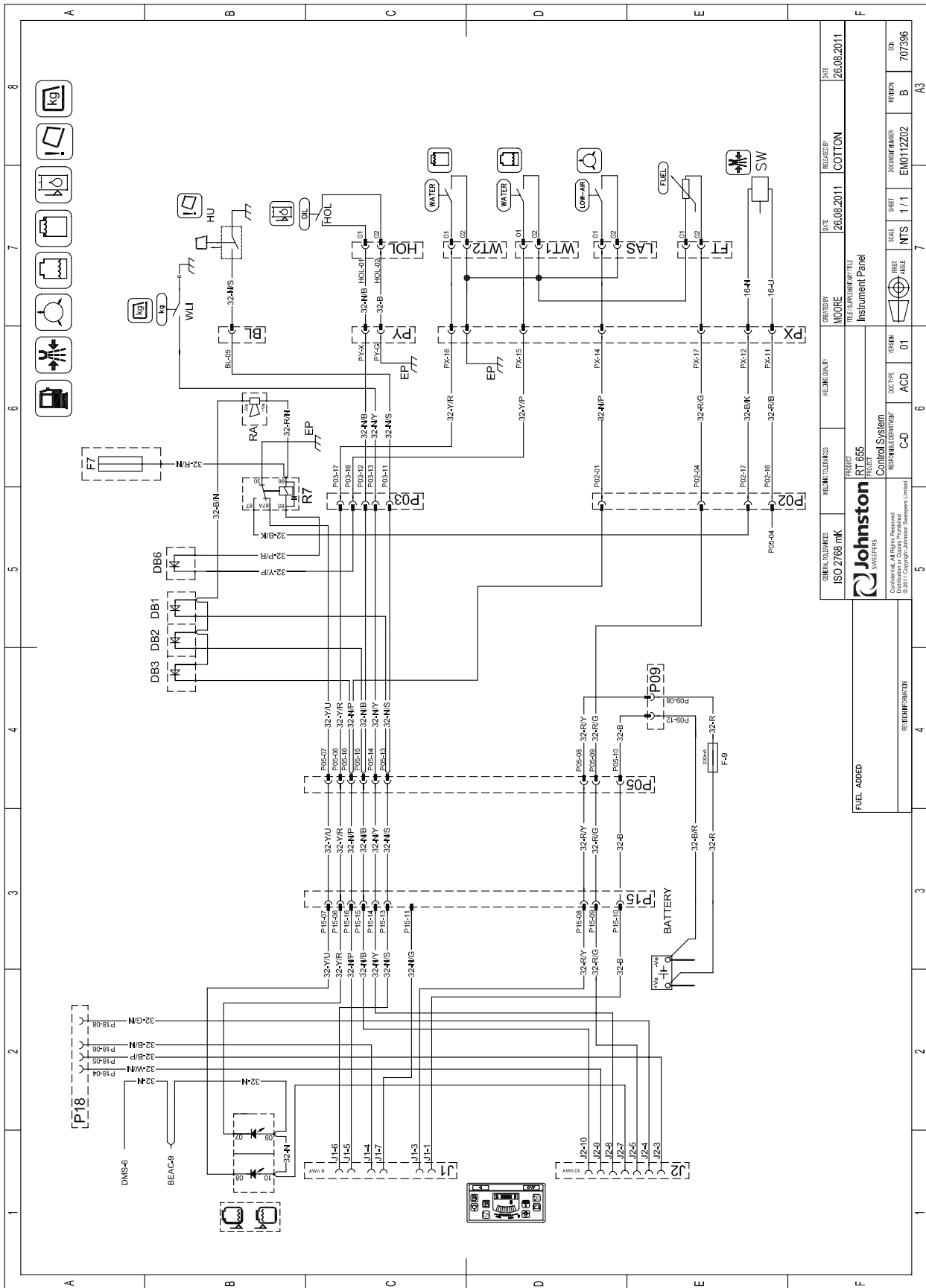
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Work Lamps and Marker Lamps - Diagram EM011Z02B



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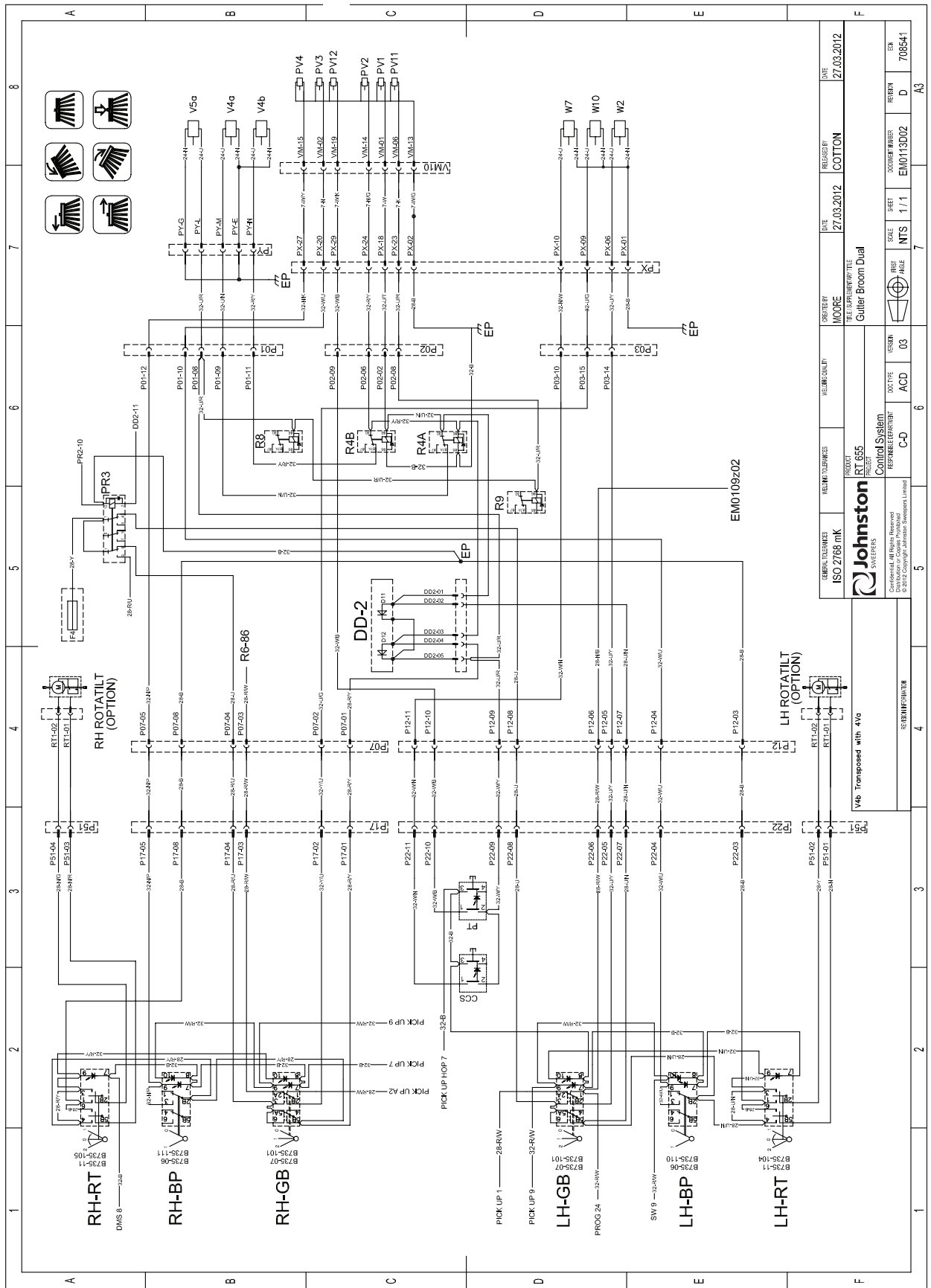
Instrument Panel - Diagram EM0112Z02B



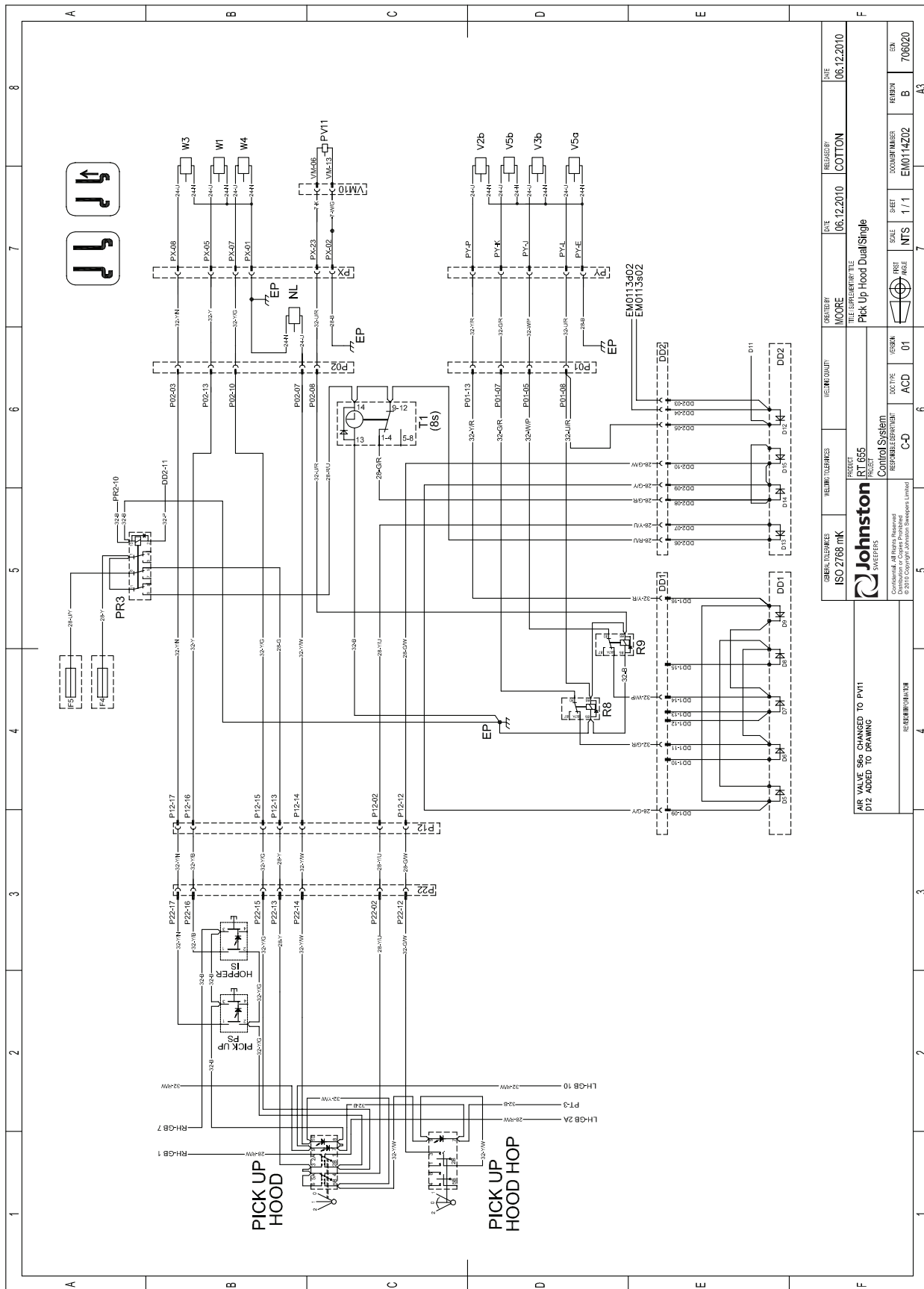
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Dual Gutter Broom - Diagram EM0113D02D

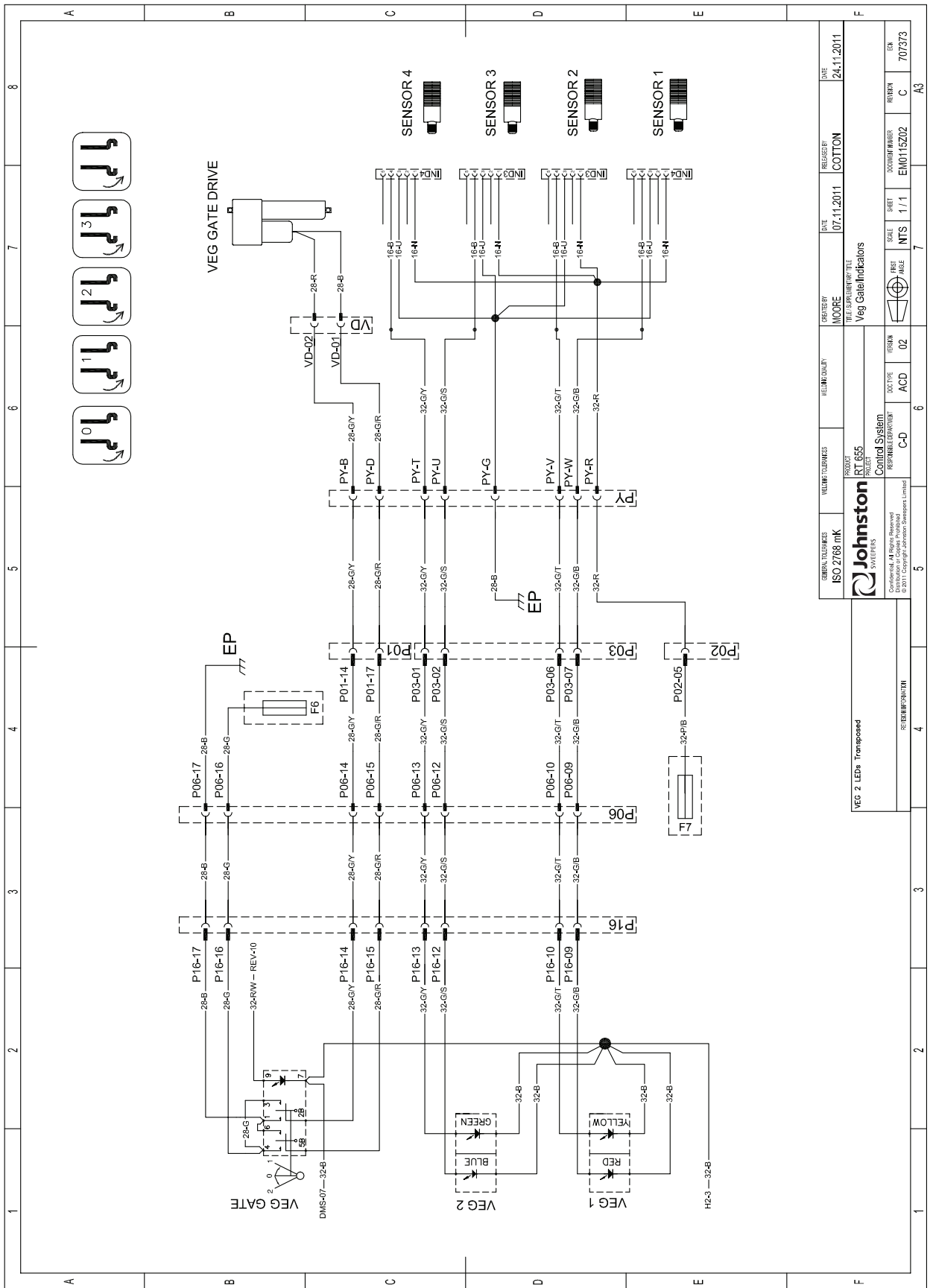


Pick-up Hood Dual - Diagram EM0114Z02B



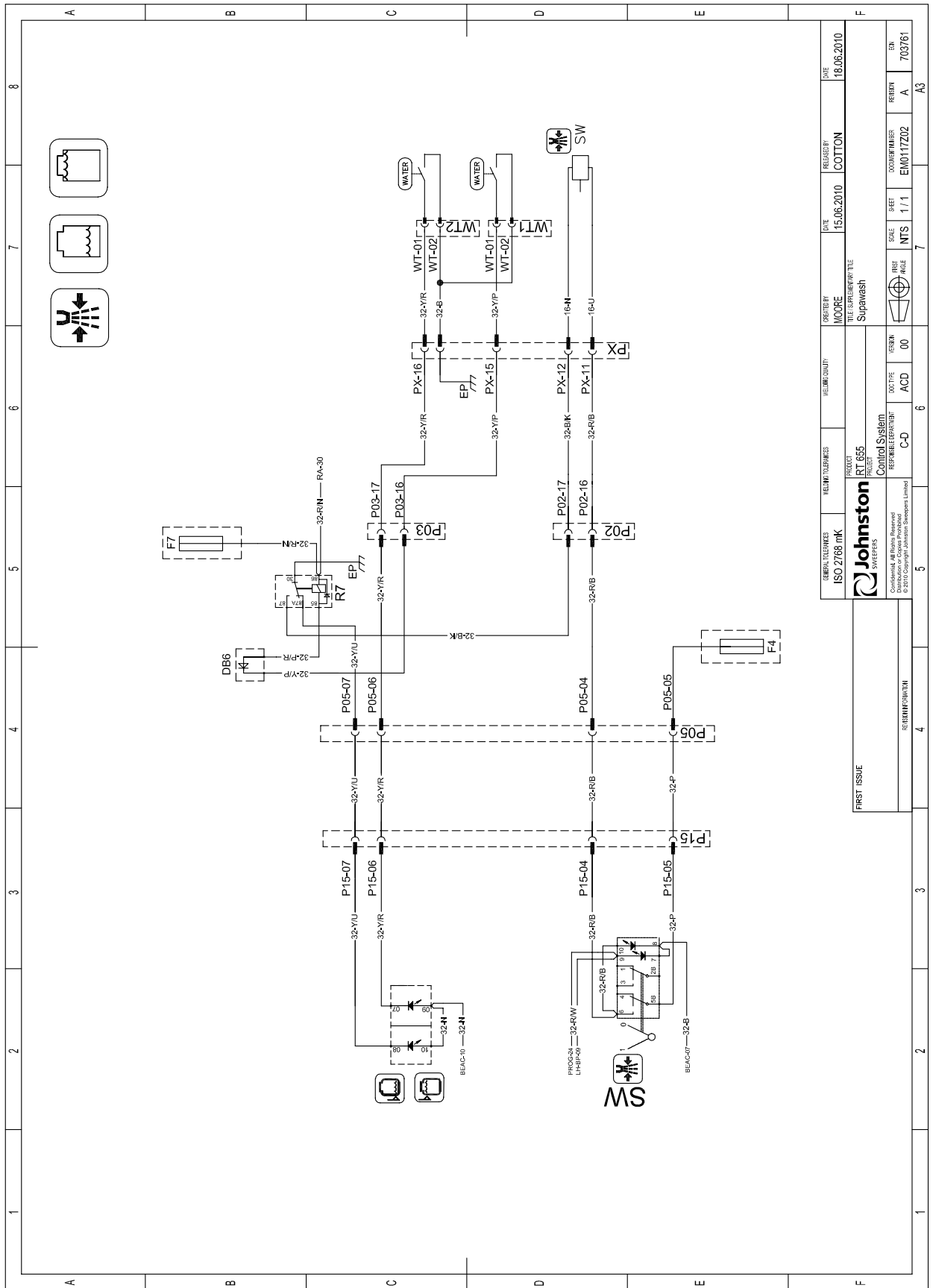
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VEG Gate / Indicators - Diagram EM0115Z02C



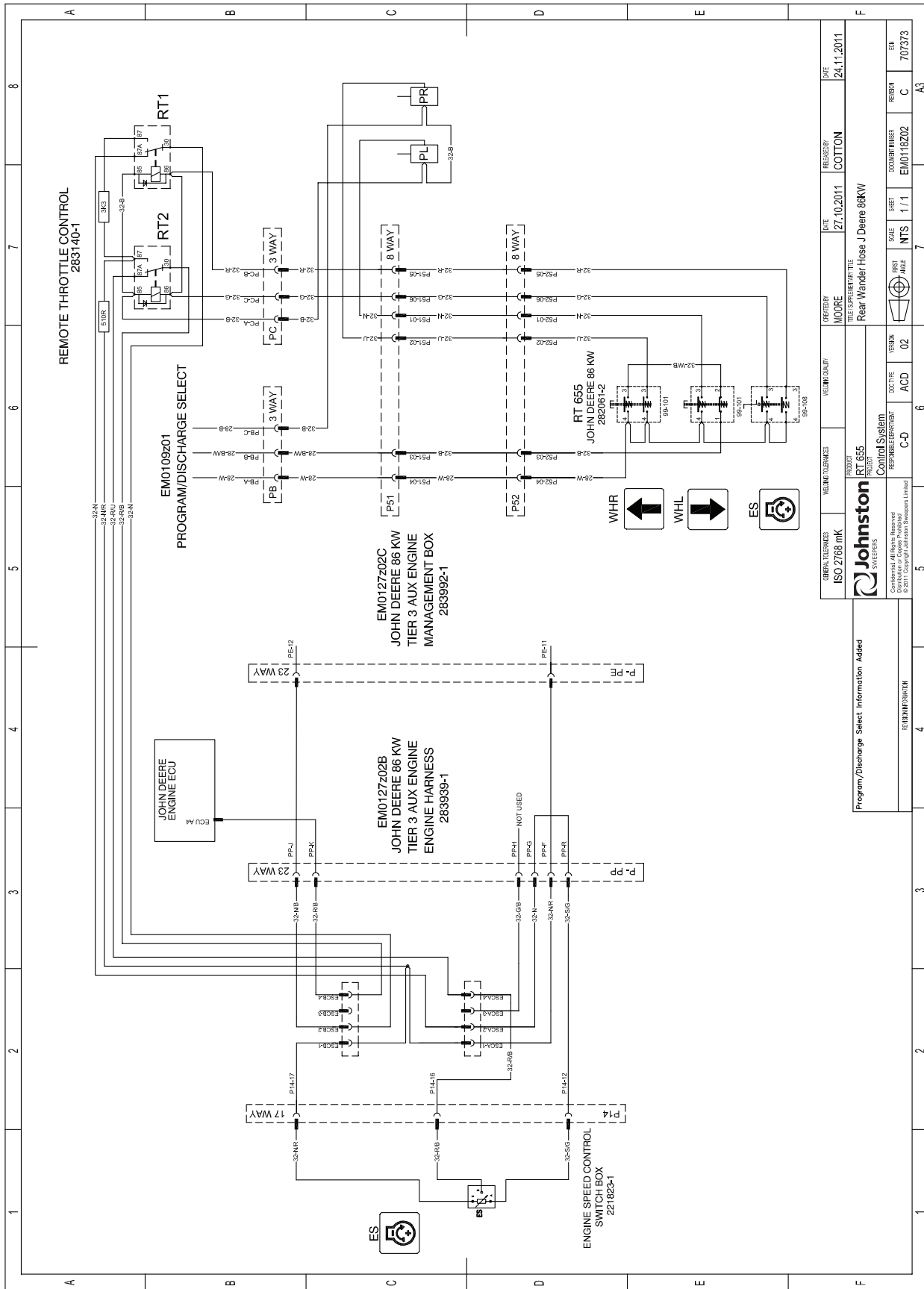
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RESISTOR VALUE		SCALE	1/1	DATE		RELEASED BY		DATE	

Supawash Option - Diagram EM0117Z02A



GENERAL REFERENCES ISO 2768 mK	REVISIONS REV. NO. 1	REVISIONS REV. NO. 2	REVISIONS REV. NO. 3	REVISIONS REV. NO. 4	REVISIONS REV. NO. 5	REVISIONS REV. NO. 6	REVISIONS REV. NO. 7	REVISIONS REV. NO. 8
DATE 15.06.2010	RELEASED BY COTTON	DATE 18.06.2010	DATE 18.06.2010	DATE 18.06.2010	DATE 18.06.2010	DATE 18.06.2010	DATE 18.06.2010	DATE 18.06.2010
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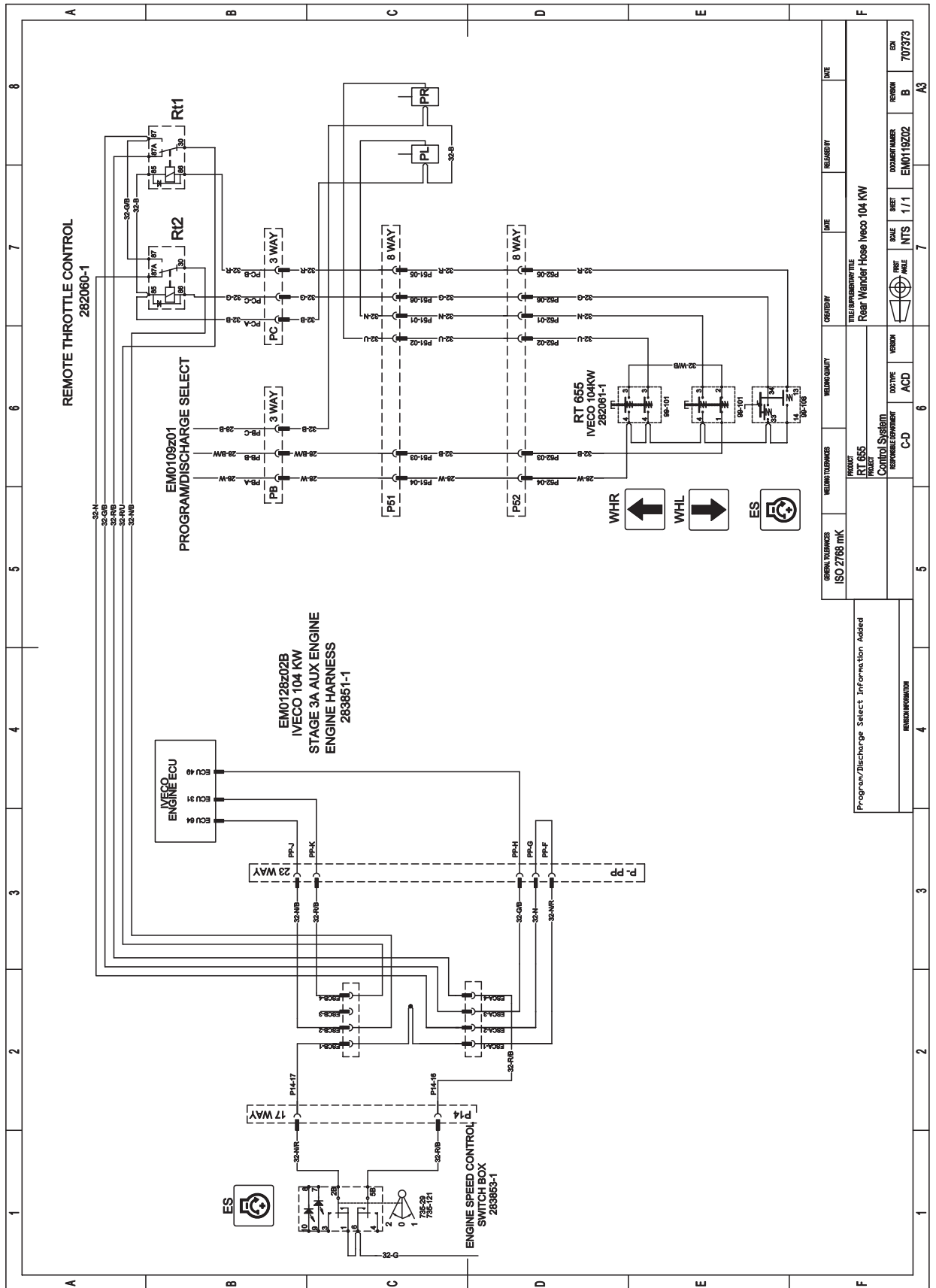
Rear Wander Hose John Deere Engine - Diagram EM0118Z02C



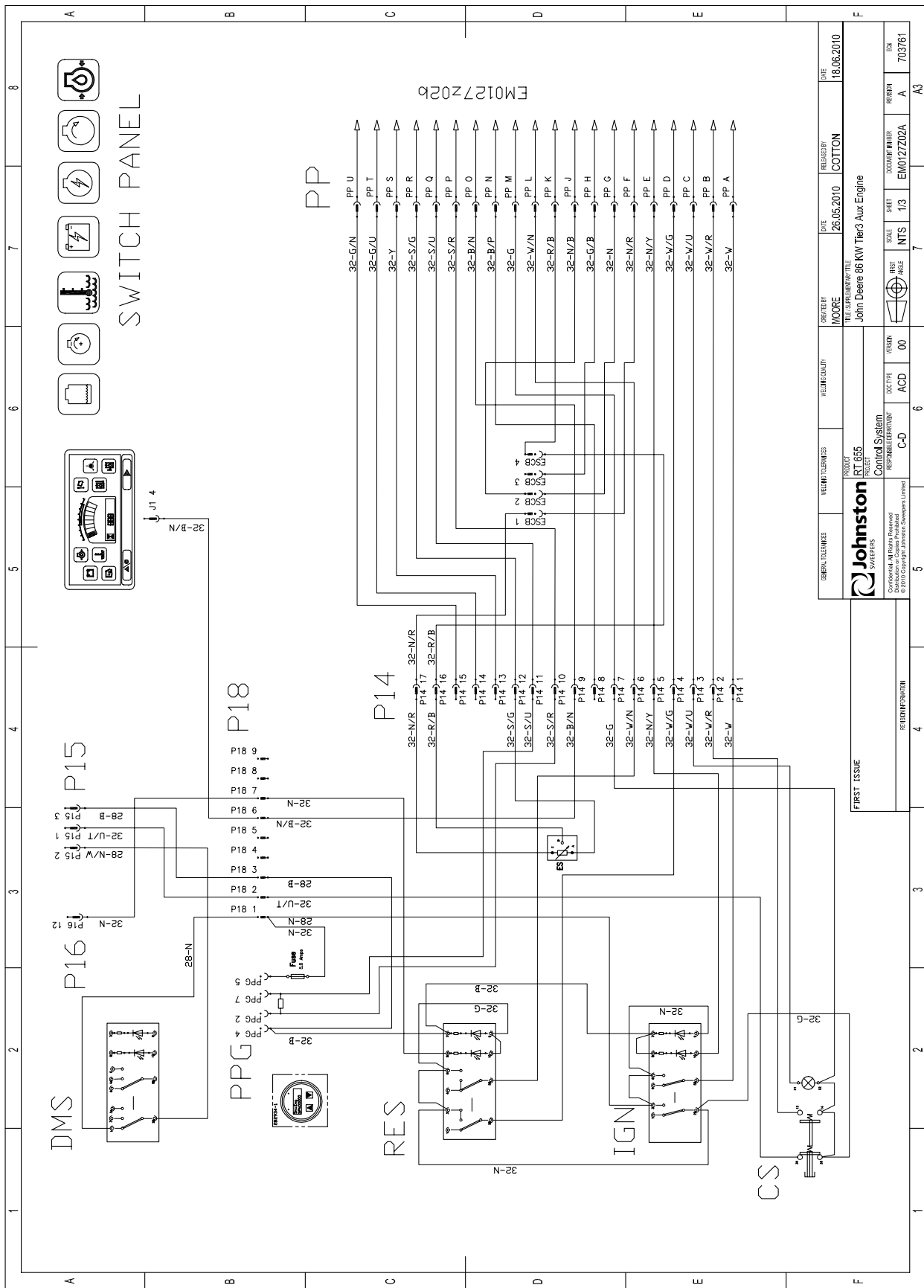
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RESUBMITTER		RESUBMITTER		DATE		DATE		REVISION	A3

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Rear Wander Hose Iveco Engine - Diagram EM0119Z02B



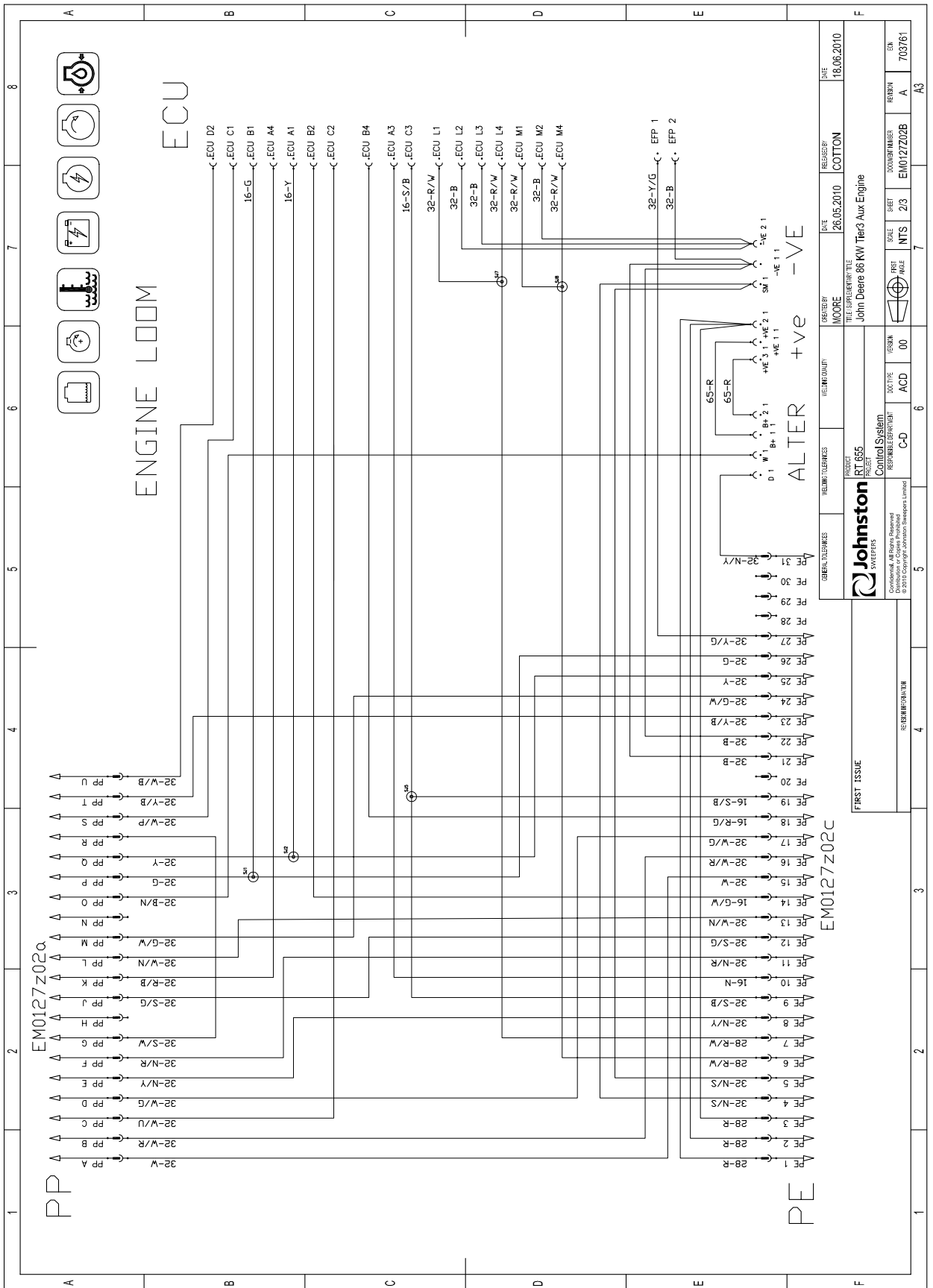
John Deere Tier 3 HP Engine - Diagram EM0127Z02A



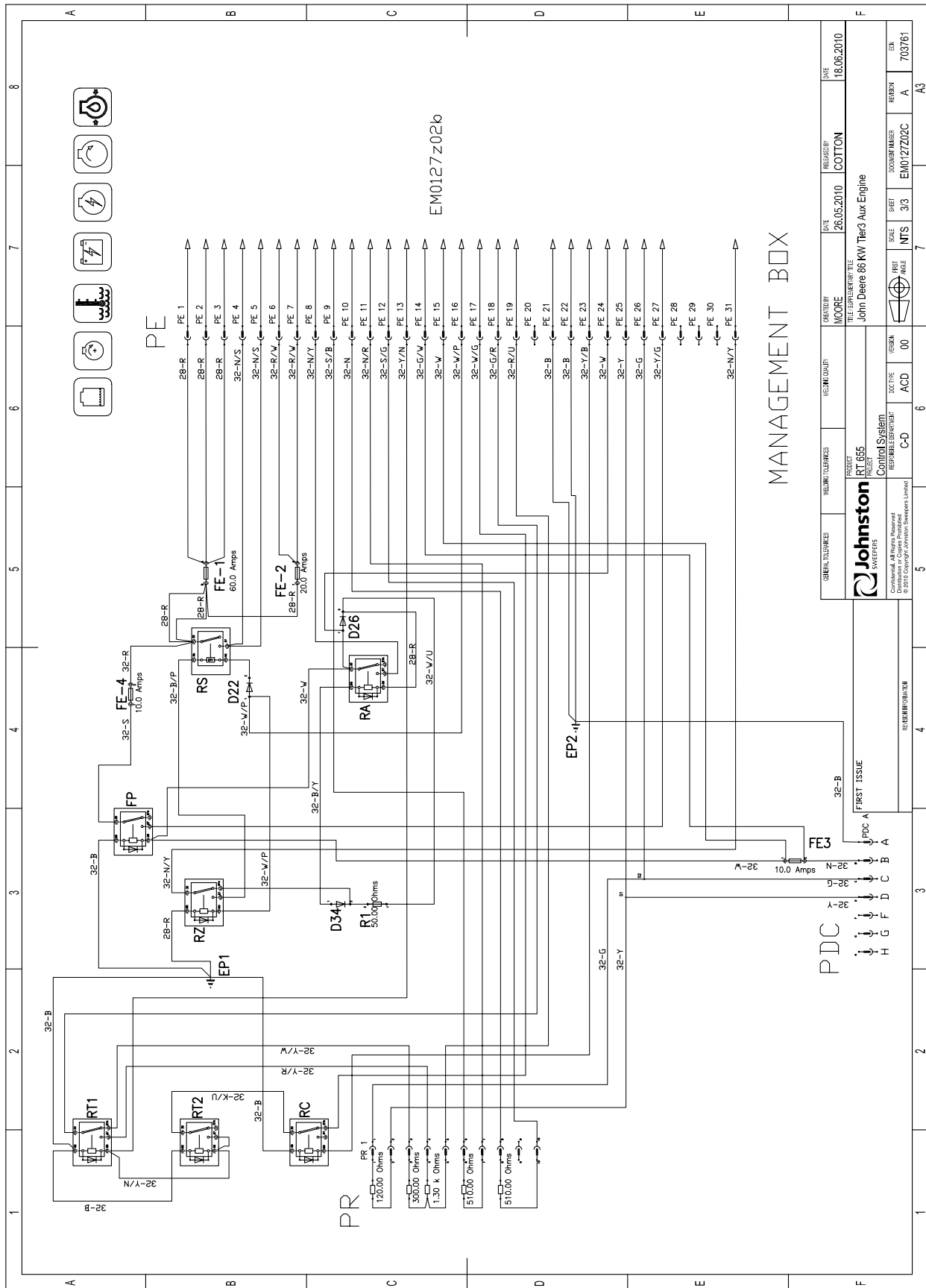
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John Deere Tier 3 HP Engine - Diagram EM0127z02B

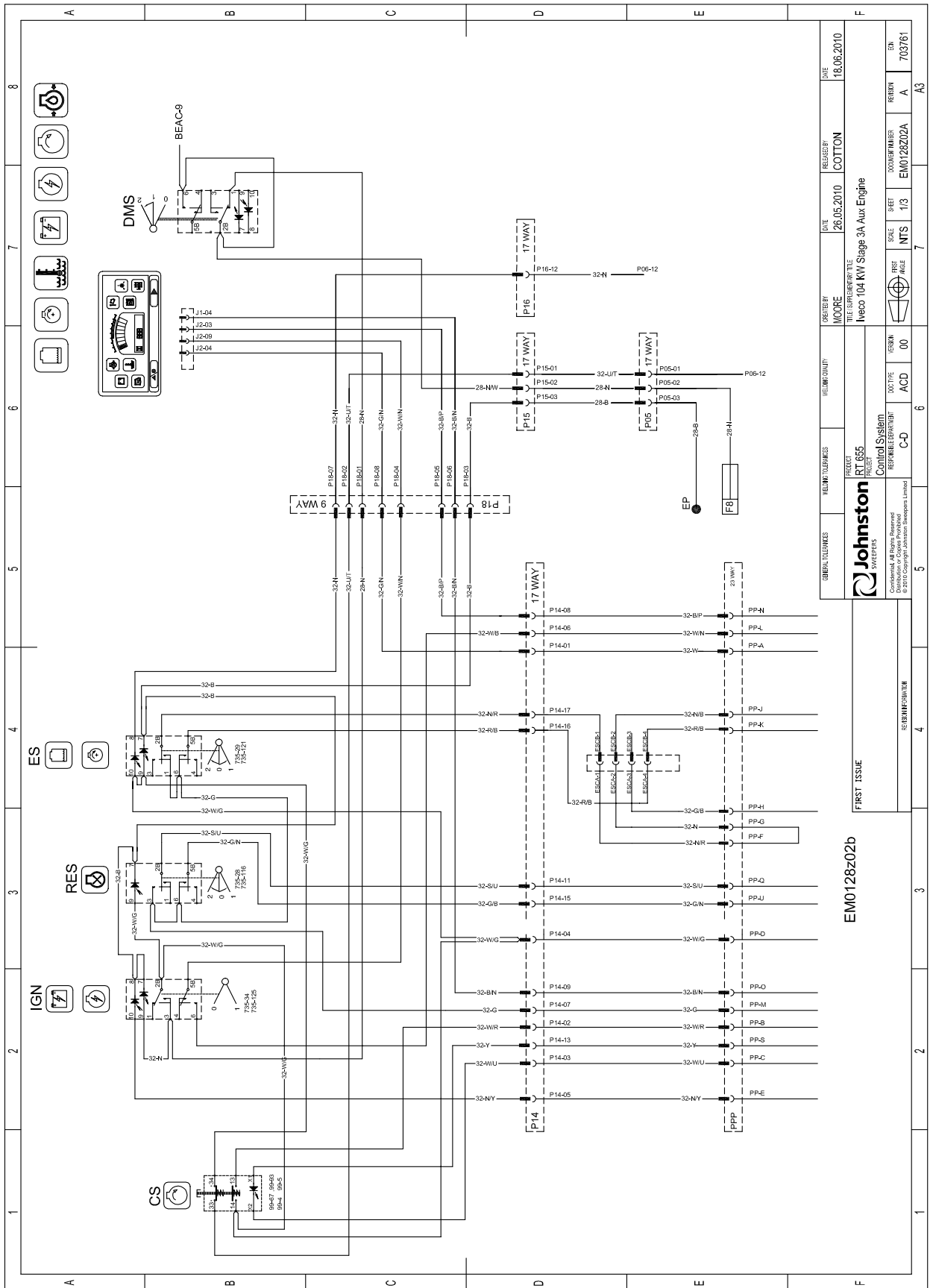


Iveco Stage 3a HP Engine - Diagram EM0127Z02C

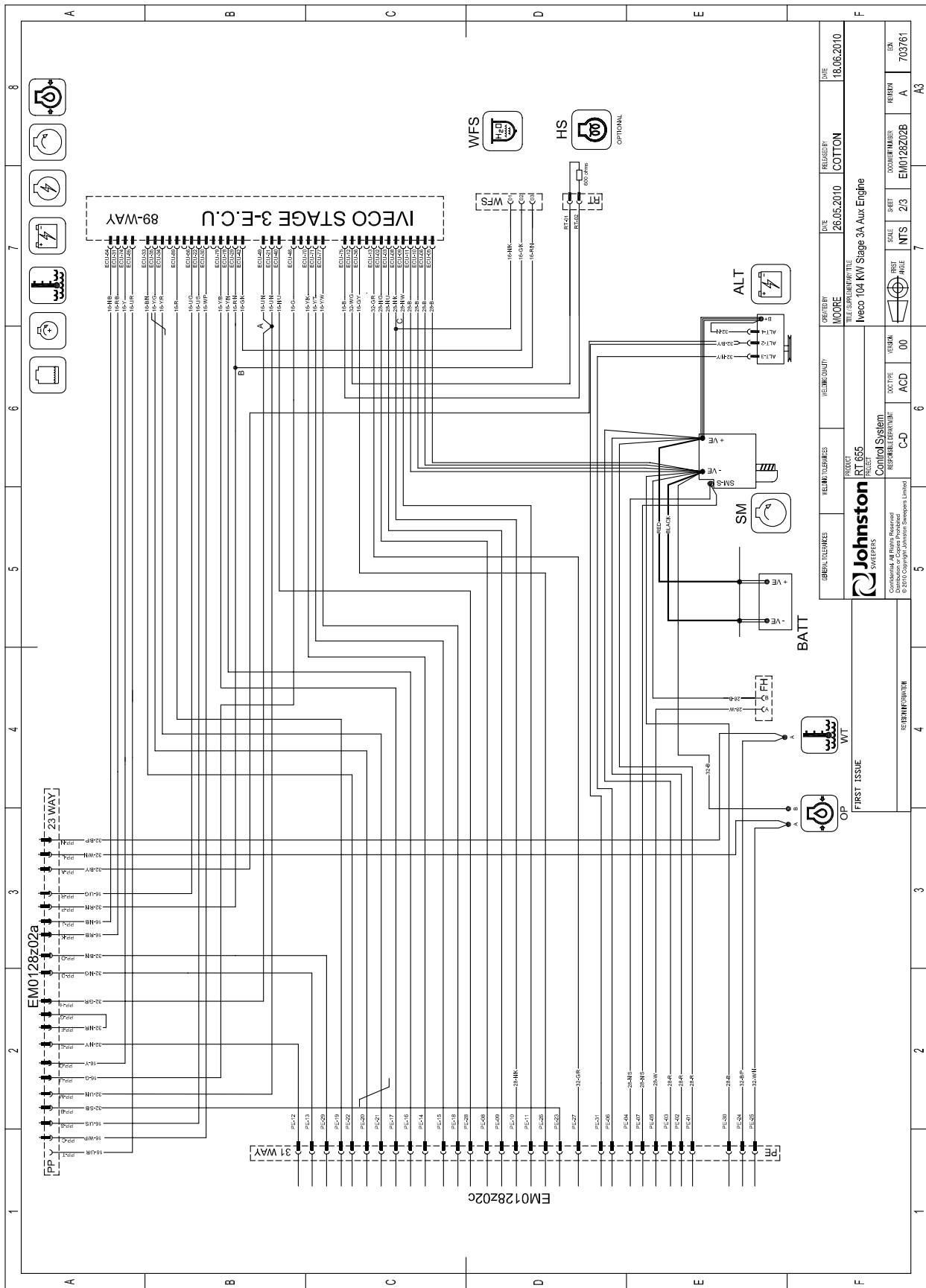


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Iveco Stage 3a HP Engine - Diagram EM0128Z02A

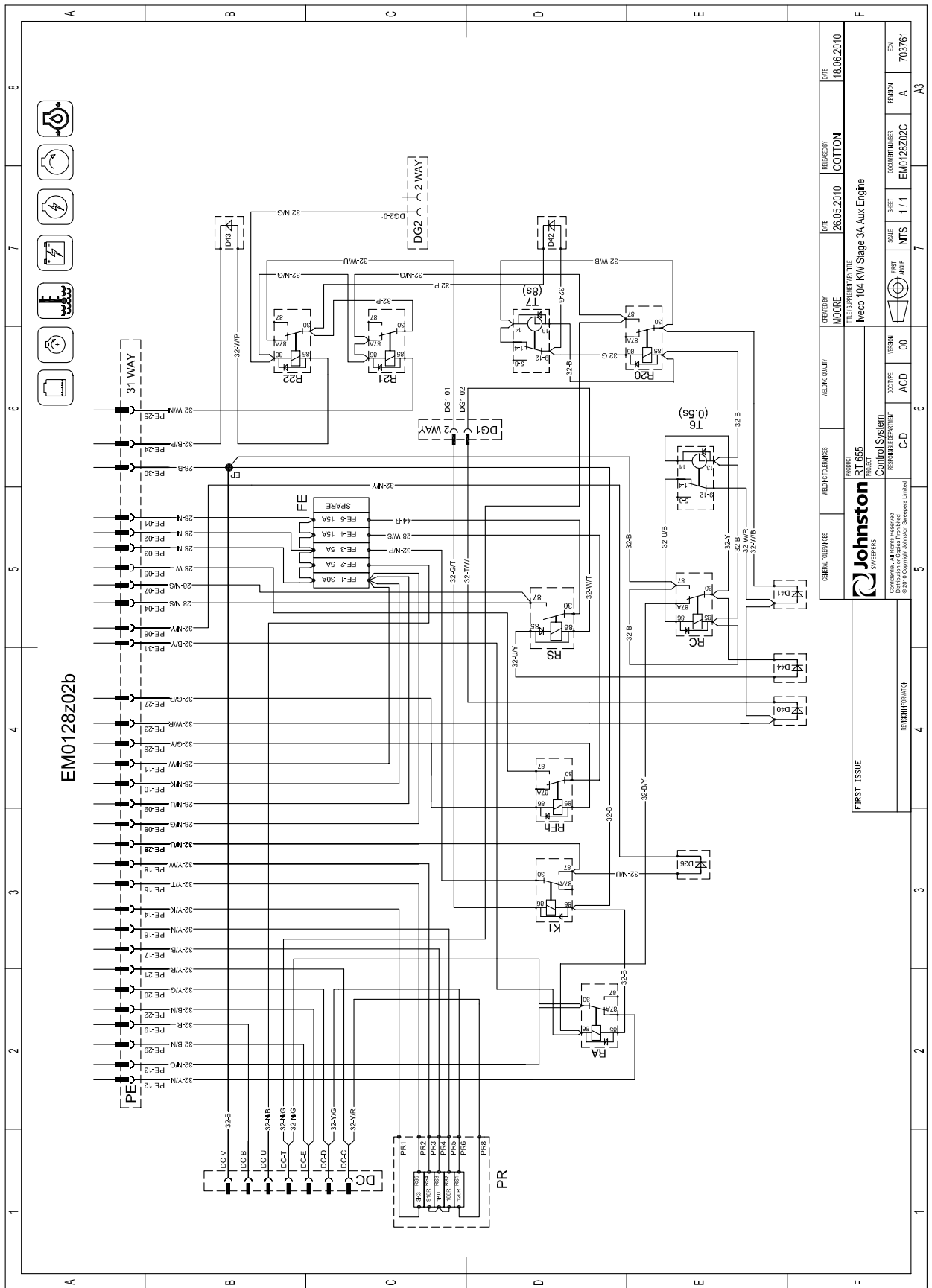


Iveco Stage 3a HP Engine - Diagram EM0128Z02B



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Iveco Stage 3a HP Engine - Diagram EM0128Z02C



CHAPTER

4

Water System

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Water Pump	4 : 3
Relief Valve	4 : 4
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Water Valve Block	4 : 5
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Circuit Diagrams	
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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 right hand side of the Powapak.

Control of the washdown hose and rear wanderhose water injection 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 and nozzle spraybars are optional equipment.

SUPAWASH UNLOADER VALVE

1. Ensure that the hydraulic relief valve has been set as outlined in section 8
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.

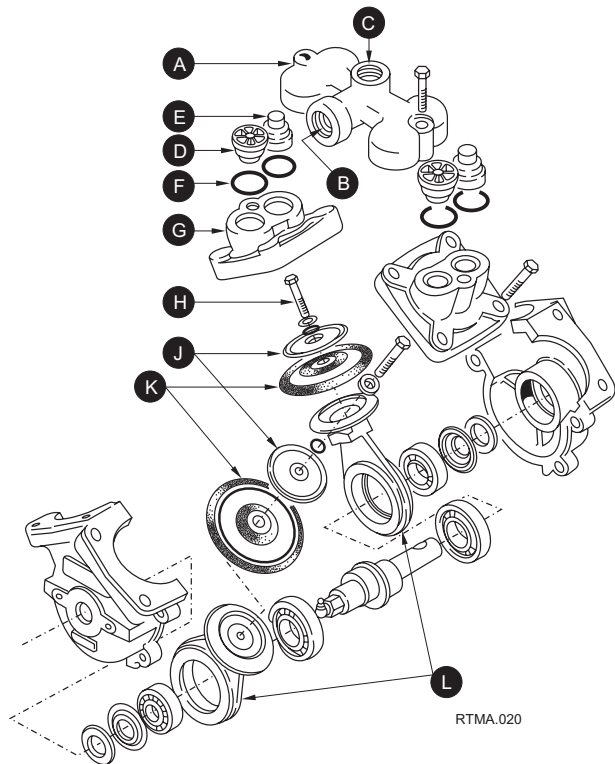
CIRCUIT PRESSURES

Two test points are provided for checking the water pressures.

Test Point No.	Function
T12	Dust Suppression Sweep System
T13	Supawash System

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 undermentioned 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.

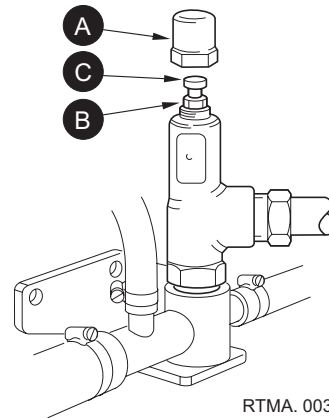
It is important that these instructions are carried out, especially with regard to the fitting of the manifolds, to ensure a satisfactory seal at the valve sealing rings. Unless these instructions are followed, leakage will be experienced at the joint between the manifold and the pump chambers. On dismantling 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.

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.



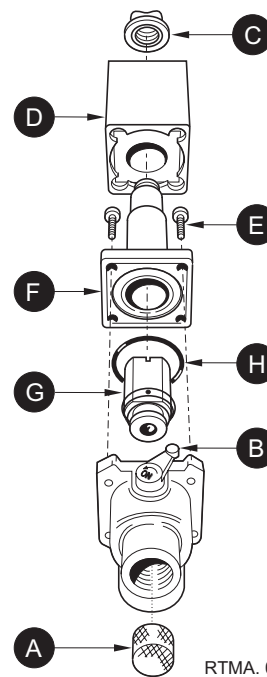
RTMA. 0031

SOLENOID VALVES

Solenoid valves control the water spray jets and are located in the systems locker. Each valve incorporates a filter (A) in its suction port and a manual lift override lever (B). Turning the lever anticlockwise opens the valve; clockwise closes it. This manual lift facility can be used when draining the water system in winter (see Operator's Guide, Chapter 3) and for actuating the valve should it for any reason fail to operate electrically.

The valve is readily dismantled for inspection or cleaning by unscrewing the retaining cap (C) through the coil (D).

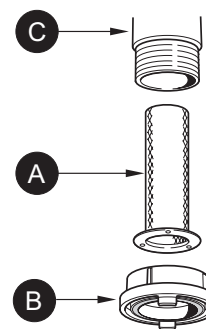
To access the armature, unscrew the four retaining screws (E) and remove the armature cover (F). The armature (G) can be removed. When refitting parts ensure the 'O' ring (H) is in good condition and located correctly.



RTMA. 029

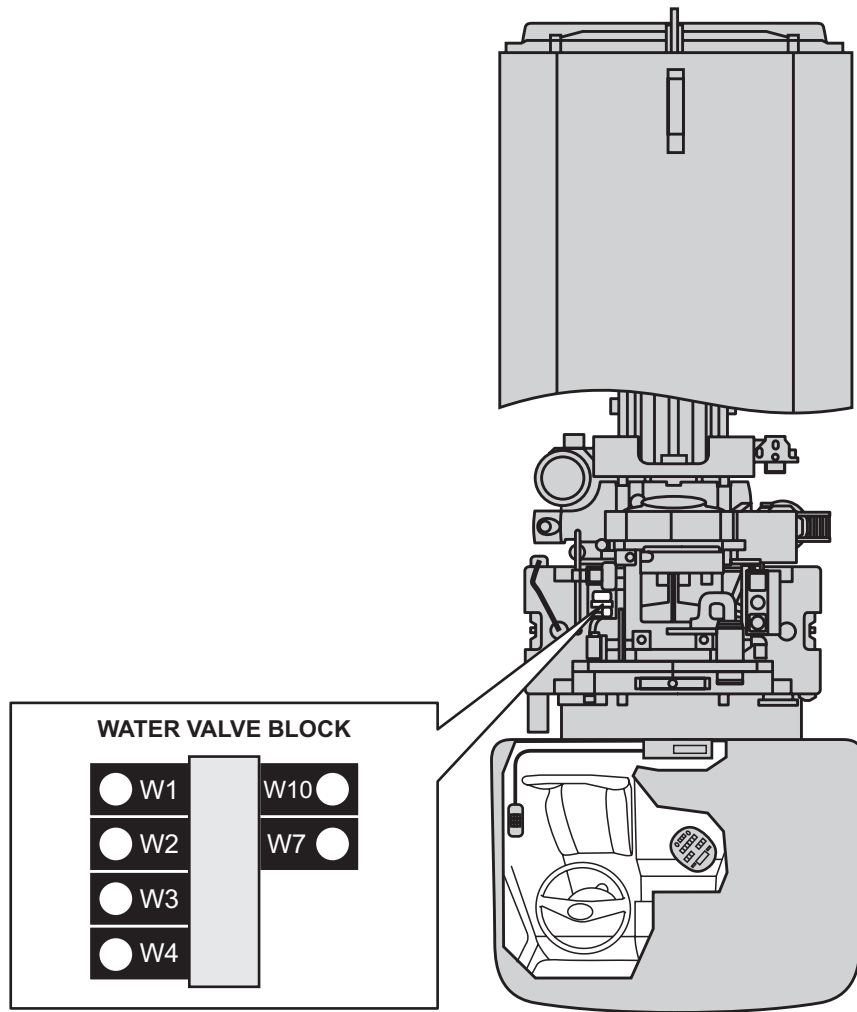
HYDRANT FILTER

Periodically the hydrant filler 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).



RTMA. 030

WATER VALVE BLOCK



RTMA. 002-3

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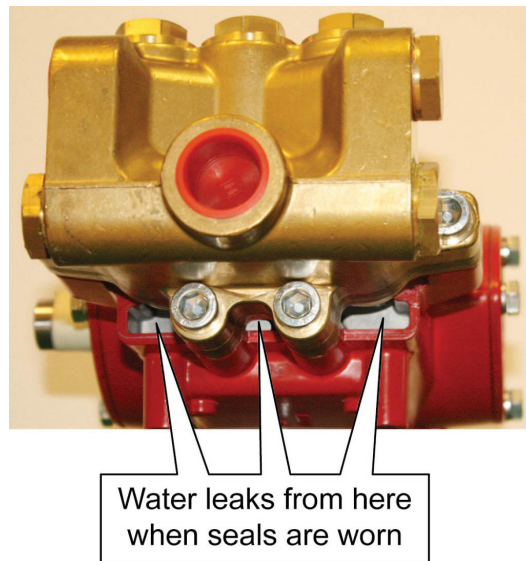
SUPAWASH

Water Pump Repair

Water pumps by their very nature are subject to erosion and wear from the process of pumping water. The life of the pump will depend on the quality of the water being used. The more particles that are in suspension in the water the sooner the seals and valves in the pump will wear and require replacing and are therefore considered as consumable items.

The main components in the pump that will require servicing are the suction and discharge valves and the seals on the plunger pipes.

A pump working correctly will normally not have any water leaks. If the plunger seals wear water will leak from the underside of the pump as shown below.



A drip ever 5 -10 seconds is an indication that the seals need replacing in the very near future. A continuous drip from underneath the pump shows the seals are severely worn and require urgent and prompt replacement. Shown by the arrows in the above picture.









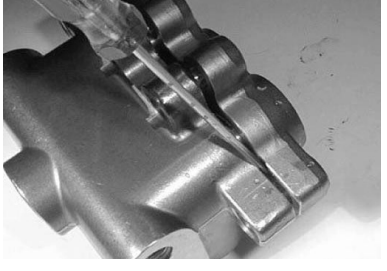
If a steady stream of water leaking from the pump is observed the pump should NOT be used. Should the pump be used in this condition water will be drawn back into the crankcase by the motion of the plungers. This water ingress into the crankcase will cause a catastrophic failure of the pump.

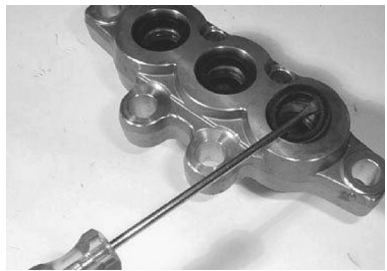








When the suction and discharge valves wear the out put of the pump will be reduced and this will be noticed as reduced output from the spray jets.

**P22/34-100 Johnston Water pump 283701-1
Seal and Valve Maintenance Instructions**

The following shows the overhaul procedure for the valves and plunger seals

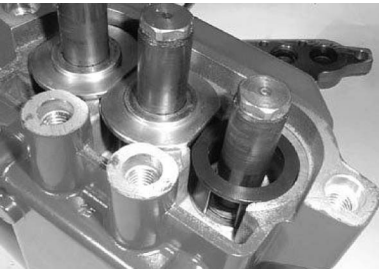
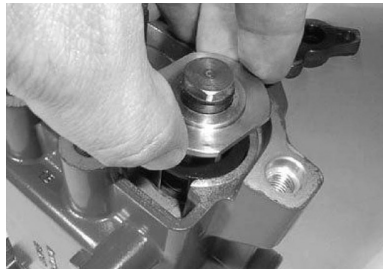
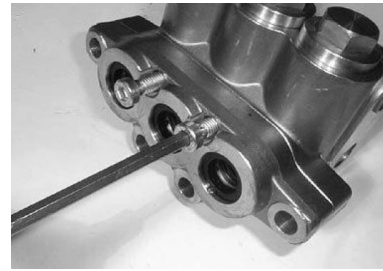



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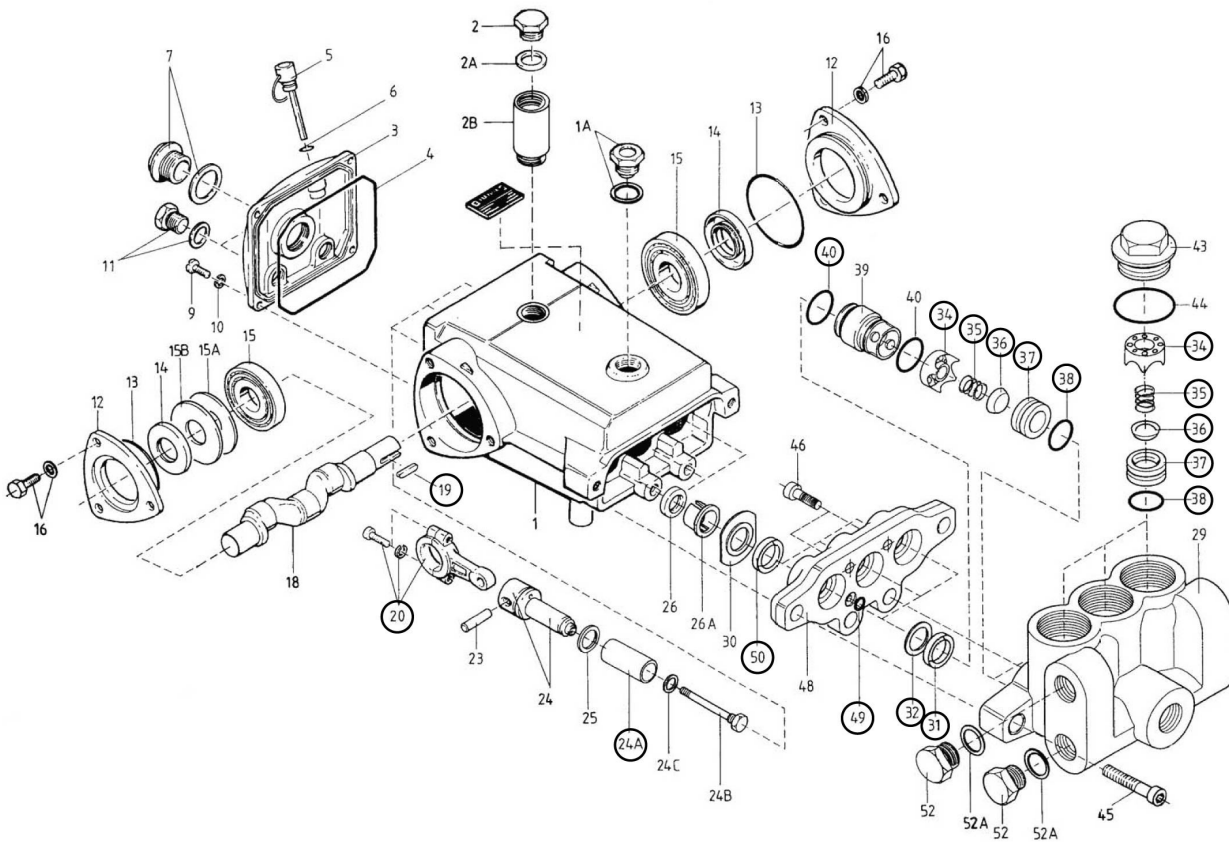
		
<p>1. With a 22mm socket, remove the three discharge valve plugs (43) from the top of the manifold.</p>	<p>2. With a pair of needle nose pliers remove the spring tension cap (34), spring (35) and plate (36)</p>	
		
<p>3. Use a valve extractor tool (99.061) to remove the valve seats (37)</p>	<p>4. Inspect the valve seat (37) and valve seat (36) for signs of wear or cavitation and replace as necessary.</p>	<p>5. Using an 8mm Allen key remove the inner hexagon screws (45)</p>
		
<p>6. With a rubber mallet tap the back of the valve casing (29) and pull the valve casing (29) off the plungers (24a).</p>	<p>7. Using a 6mm Allen key remove the two inner hexagon screws (46).</p>	<p>8. Separate the intermediate casing (48) from the valve casing (29)</p>

		
<p>9. Remove and inspect the low pressure seal (50) and replace if necessary.</p>	<p>10. Turn over intermediate casting (48) Remove and inspect the high pressure seal (31) and the support ring (32) replace if necessary.</p>	<p>11. Remove the seal case (39) from the valve casing (29) and inspect both O Rings (40) for wear.</p>
		
<p>12. Using needle nose pliers, remove the spring tensioning caps (34), valve spring (35), valve plate (36) from the valve casing (29) Using a valve extractor (99.061) to remove the valve seat (37) from the valve casing (29).</p>	<p>13. Inspect the valve seat (37) and valve seat (36) for signs of wear or cavitation and replace as necessary.</p>	<p>14. Install the inlet valve assembly (34 – 38) back into the valve casing. Ensure the “fingers” of the spring tensioning cap (34) DO NOT obstruct the cross bore in the valve casing (29).</p>
		
<p>15. Install the seal case (39) with O Rings (40) into the valve casing (29)</p>	<p>16. Install the support ring (32) and the high pressure seal (31) into the intermediate plate (48)</p>	<p>17. Lubricate the low pressure seal (50) and install into the intermediate casing (48).</p>

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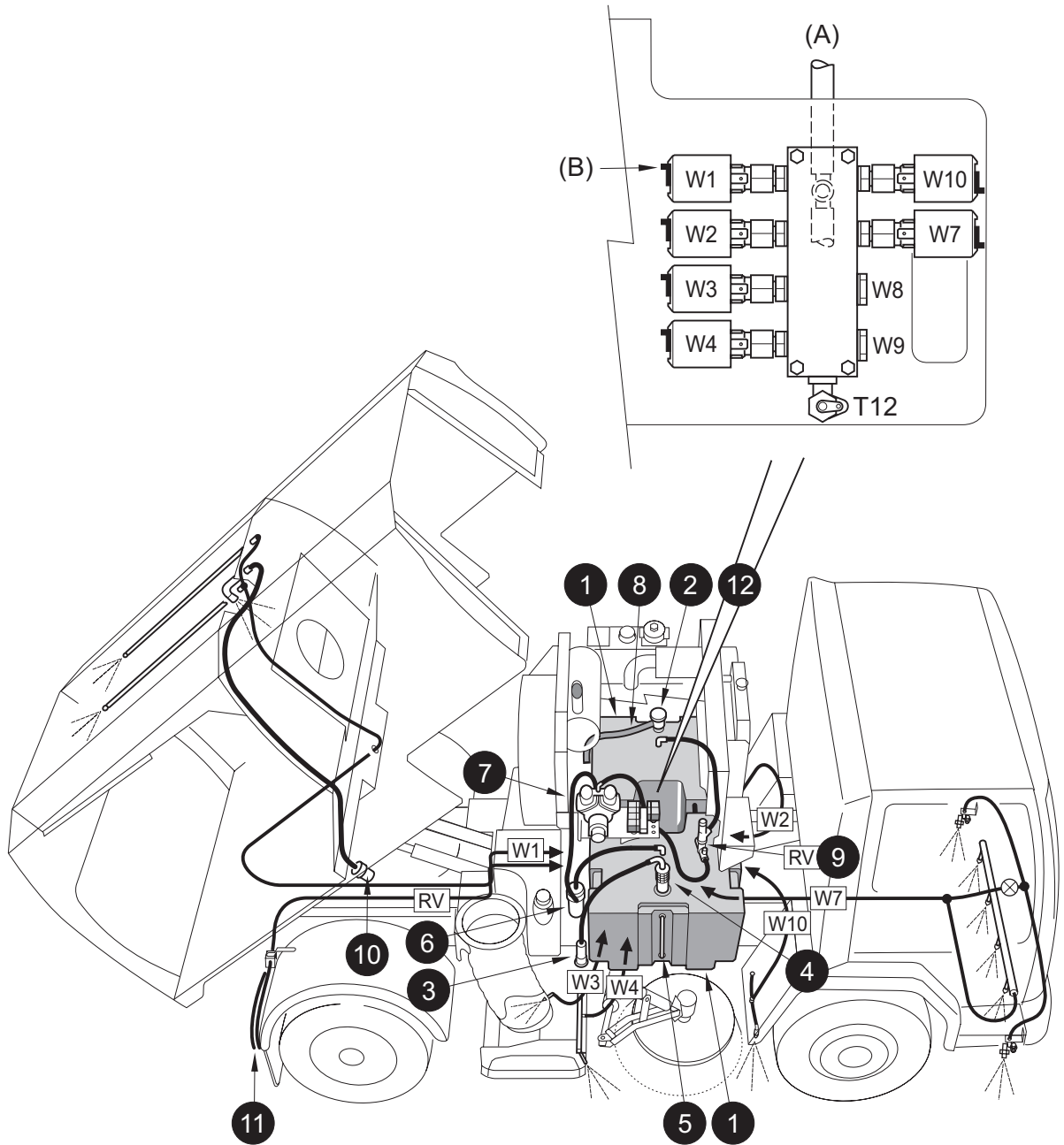
		
<p>18. Replace the three spacer sleeves (26a) over the plunger (24a) with the flanged side toward the valve casing (29)</p>	<p>19. Install the pressure rings (30) over the plungers (24a). Make sure that the small o ring (49) is in place in the intermediate casing (49)</p>	<p>20. Secure the intermediate casing (48) to the valve casing (29) with the inner hexagon screws (46). Torque to 12 NM.</p>
		
<p>21. Place the valve casing (29) over the plungers (24a). Secure with inner hexagon screws (45) Torque evenly to 45 NM</p>	<p>22. Install the high pressure valve assemblies with o rings (34 – 38) Ensuring the fingers of the spring tensioning cap (34) DO NOT obstruct the cross bore in the head (29).</p>	<p>23. Replace the high pressure plugs (43) and torque to 70 NM.</p>

Exploded view of Pump


Item Number	Quantity	Part Number	Description
19	1	283701-13	Woodruff Key
20	3	283701-14	Connecting Rod
24A	3	283701-12	Ceramic Liner
31,32,40,49,50	1 Kit	283701-10	Plunger Seal kit - for 3 plungers
34,35,36,37,38	1 Kit	283701-11	Valve Kit - for the 6 valves

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Piping Diagram



RTMA. 012-2

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Illustration Component Key

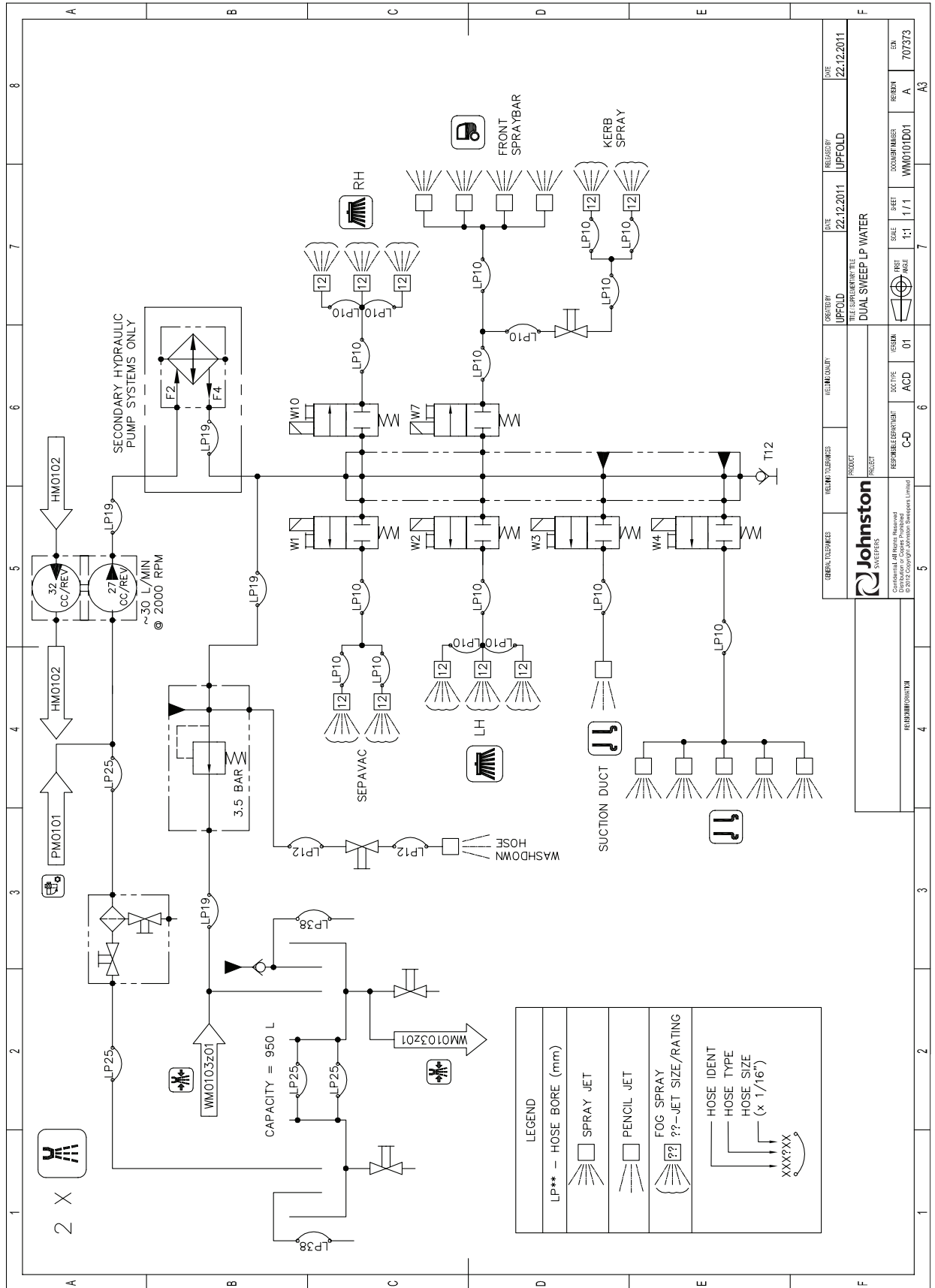
- 1 Water tanks - Drain plug on undersides
- 2 Tank filler port - hosepipe
- 3 Tank filler port - hydrant
- 4 'Type A' anti syphon water break
- 5 Water level sight glass - both tanks
- 6 Suction filter
- 7 Water pump - output 28 l/m
- 8 Tank overflow hose
- 9 Relief valve
- 10 'Sepavac' water flush hydrant connection
- 11 Washdown hose - shown this side for clarity
- 12 Water valve manifold - see table below
 - (A) Supply
 - (B) Manual override levers
 - T12 Water test point

WATER SYSTEM - WATER VALVE STATION UTILISATION

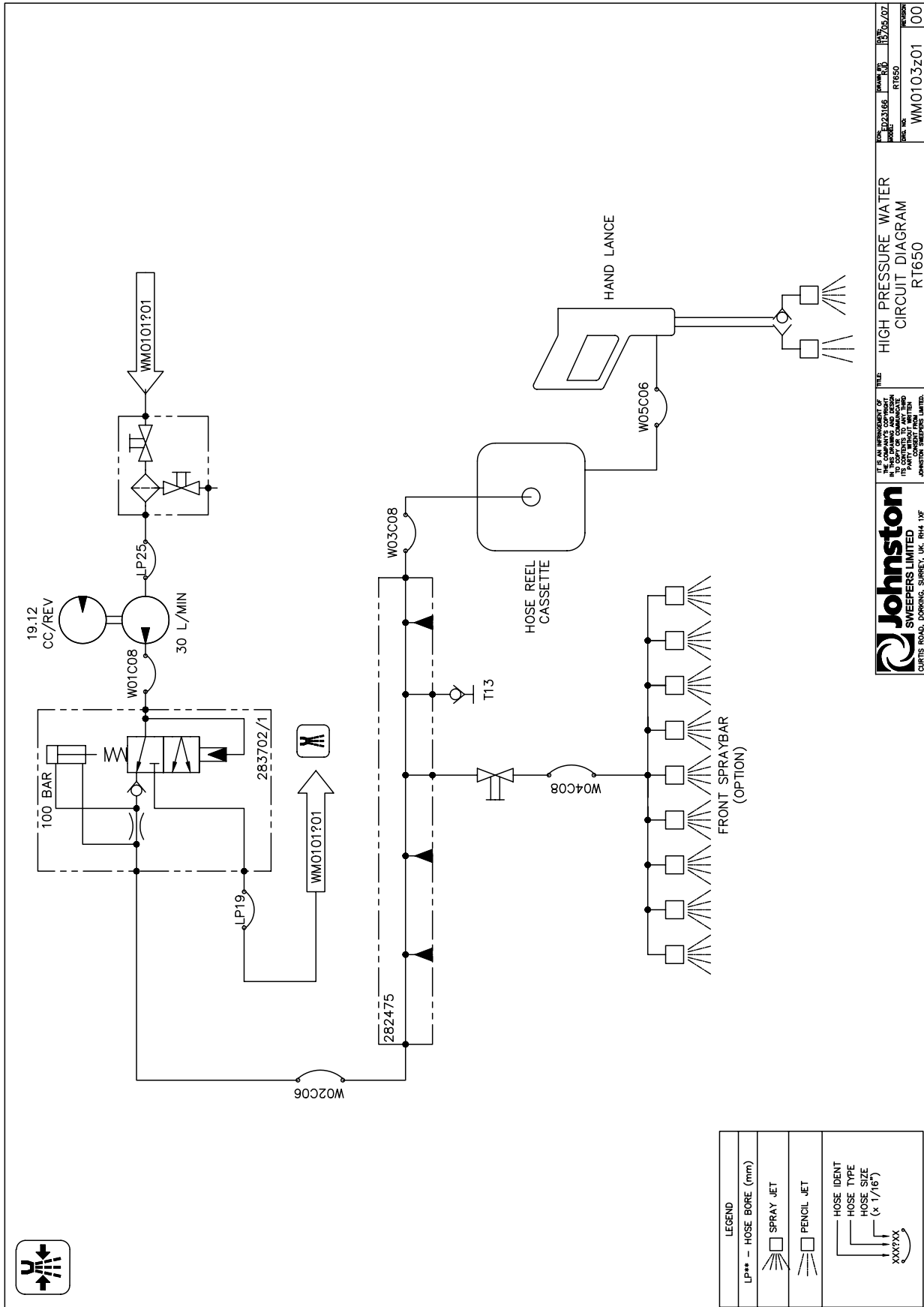
Note: Where the words 'not fitted' appear this means that the valve is not fitted to the mounting station.

	2
VALVE	DUAL
W1	Sepa Vac
W2	LH Gutter broom
W3	Suction duct
W4	Pick-up hood
W10	RH gutter broom
W7	Gutter & Front spraybar
W8	<i>Not fitted</i>
W9	<i>Not fitted</i>

Water System Low Pressure Dual Sweep - Diagram WM0101D01A



Water System High Pressure - Diagram WM0103Z0100



LEGEND	
LP**	HOSE BORE (mm)
	SPRAY JET
	PENCIL JET
HOSE IDENT	
HOSE TYPE	
HOSE SIZE	(x 1/16")
XXX?XX	

Johnston SWEEPERS LIMITED
 CURTIS ROAD, DORKING, SURREY, UK, RH4 1YF

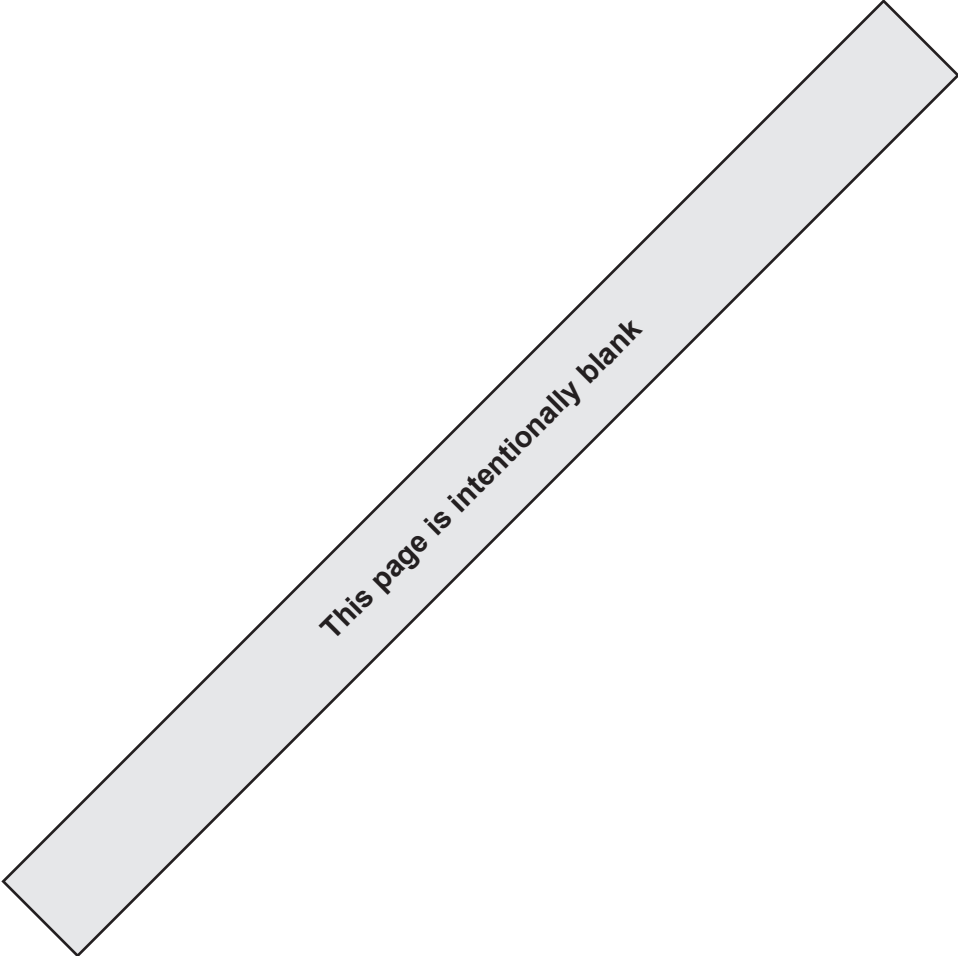
THE ONLY MANUFACTURER OF THE COMPLETE SYSTEMS IN THE WORLD FOR THE SWEEPING AND POLISHING INDUSTRY. JOHNSTON SWEEPERS LIMITED.

TITLE: HIGH PRESSURE WATER CIRCUIT DIAGRAM
 RT6550

REVISED: 15/05/07
 DRAWN BY: J. WOOD
 CHECKED BY: J. WOOD
 PROJECT: RT6550
 SPEC. NO: WM0103Z01
 NUMBER: 00

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CHAPTER

5

Pneumatic System**Table of Contents**

Section	Page
Introduction	
General Description	5 : 2
Circuit Pressures	5 : 2
Pneumatic Pipe Colours	5 : 2
Valve Identification/Location	5 : 3
Component Removal	
Air Filtration and Regulator (FR)	5 : 4
Pneumatic Valve Island	5 : 5
Circuit Diagrams	
Dual Sweep	5 : 6
Dual Sweep	5 : 7
Varia Brush	5 : 8

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/nozzle/hood and intake duct flap.



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 PTP (on piping diagram) is provided in the systems locker to carry out pressure checks, i.e. 8.0 bar (115 PSI).

The pressure in the Powathrust system is preset at 3.5 bar.

The pressure in the Powascrub system (option) is preset at 2 bar.

- 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.

NB : Provided in the systems locker is an air charge point (AC) via an airline push in connector supplied with the sweeper.

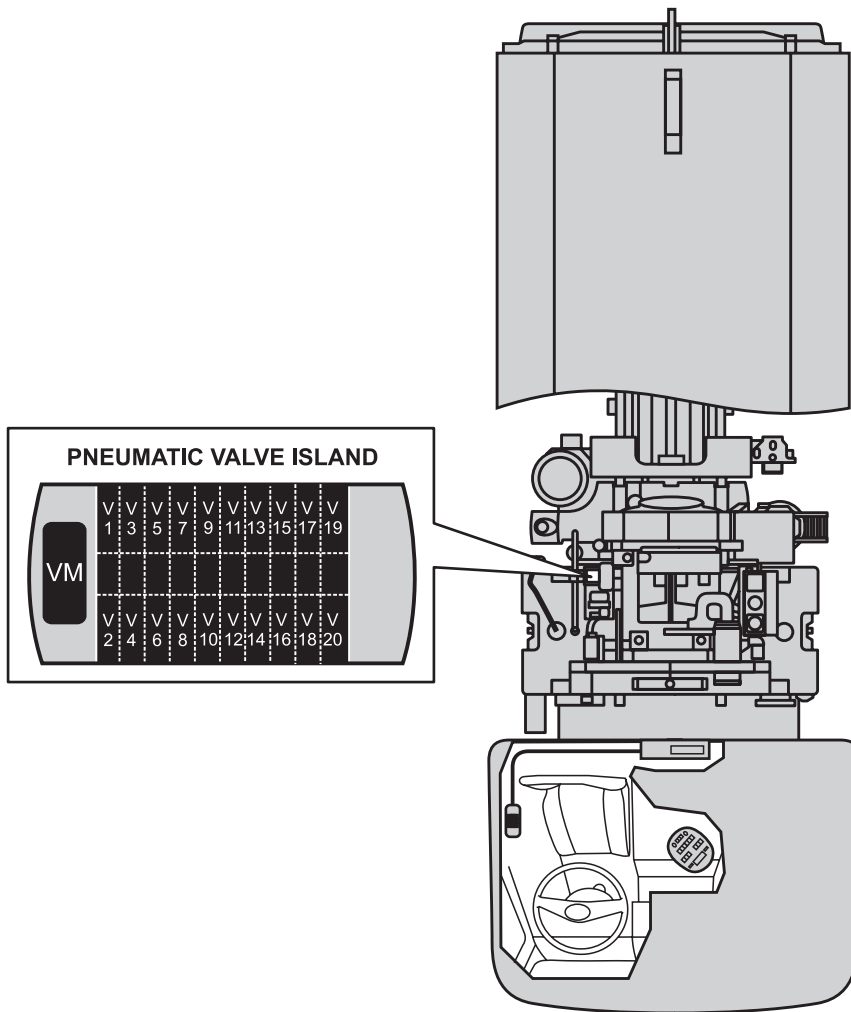
PNEUMATIC PIPE COLOURS

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

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RTMA. 002-2

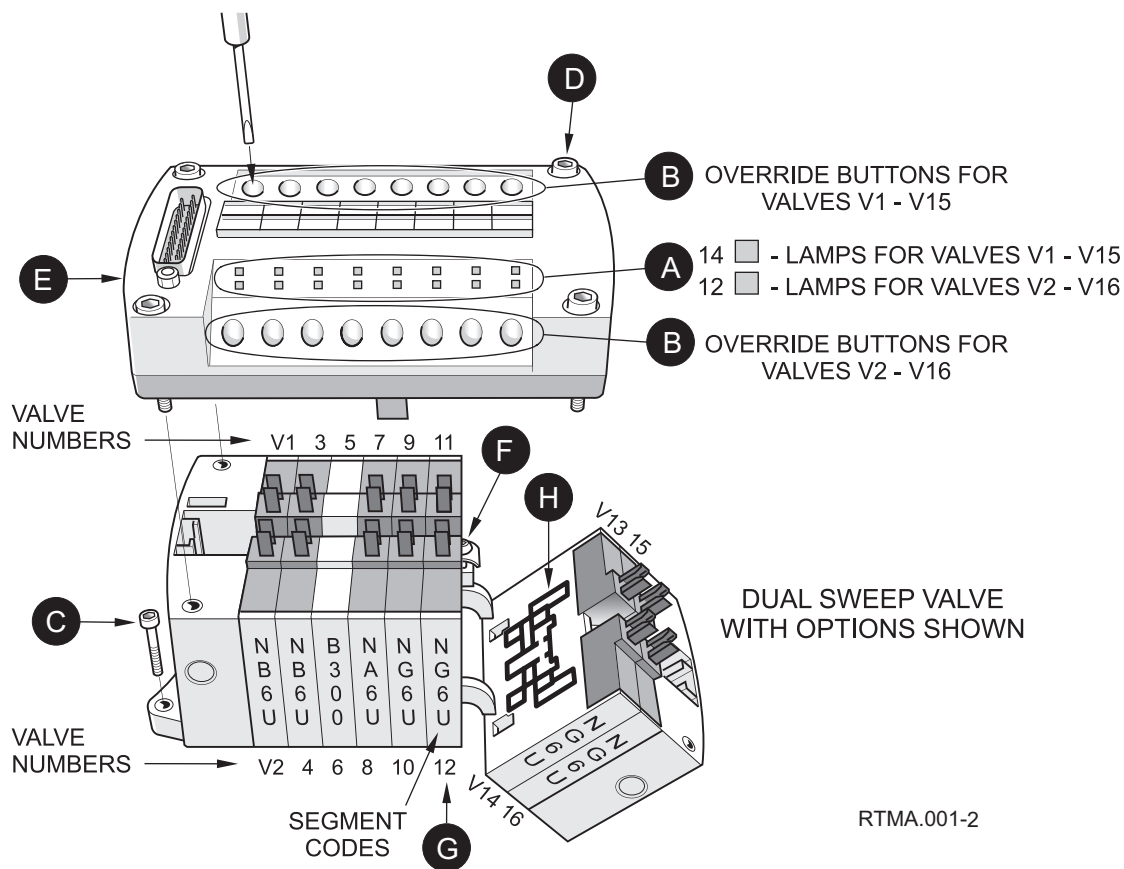
AIR FILTRATION AND REGULATOR (FR)

A filter regulator unit, located in the systems locker on the left 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 remove it from the locker by first draining 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 various valve segments. Each valve segment has an indicator light that illuminates when energised (A) and a manual override button (B) for ports 2 or 4 on each segment



The segments are identified by a code and are not all the same - see following tables.

To replace a valve segment -

- 1) Remove the 4 fixing screws (C).
- 2) Remove the 4 socket head screws (D).
- 3) Remove the valve cover containing the valve operating coils (E).
- 4) Unscrew (F) each side of the segment to be replaced.
- 5) Fold open the segment (G) and replace ensuring the rubber gasket (H) is in position.
- 6) Tighten screws (F).
- 7) Replace top cover (E).
- 8) Replace screws (D).

Pneumatic Valve Island Modus Operandi

Dual Configuration

VM10 Valve	Segment Code + =T (12 V) + =N (24V)	Function	
		Port 4 / LED 14	Port 2 / LED 12
V1 & V2	+B6U	V1 - LH Gutter Broom up / down (NO)	V2 - RH Gutter Broom up / down (NO)
V3 & V4	+B6U	V3 - LH Gutter Broom in / out (NO)	V4 - RH Gutter Broom in / out (NO)
V5 & V6	B000	V5 - Blank	V6 - Blank
V7 & V8	+G6U	V7 - Autoprop Retract / Extend	
V9 & V10	B000	V9 - Blank	V10 - Blank
V11 & V12	+G6U	V11 – Autolok on / off (NC)*	V12 – Powasave / Powathrust (NO)
V13 & V14	+G6U	V13 – Option* (NC)	V14 – Option* (NC)
V15 & V16	+G6U	V15 – Option* (NC)	V16 – Option* (NC)
V17 & V18	+G6U	V17 – Option* (NC)	V18 – Option* (NC)
V19 & V20	+G6U	V19 – Flap : Full Bore (NC)	V20 – Flap : Annulus (NO)
*Option		Revision 03 - dated 01/12/2010	

Indicators

- (J) - Error LED (Red) The LED indicates the status of the CAN physical and indicates errors due to missing CAN messages (SYNC, GUARD or HEARTBEAT).
- (K) - Run LED (Red/Green) This LED indicates the status of the CANopen network state machine.
- (L) - 5v (Green) This LED will only be energised when the Network power is connected to the Network connector, indicating that the logic circuit of the module is powered.
- (M) - 24v (Green) This LED will only be energised when chassis voltage is applied to the valve power terminal of the power supply connector.

Indicator status during powering up and commissioning

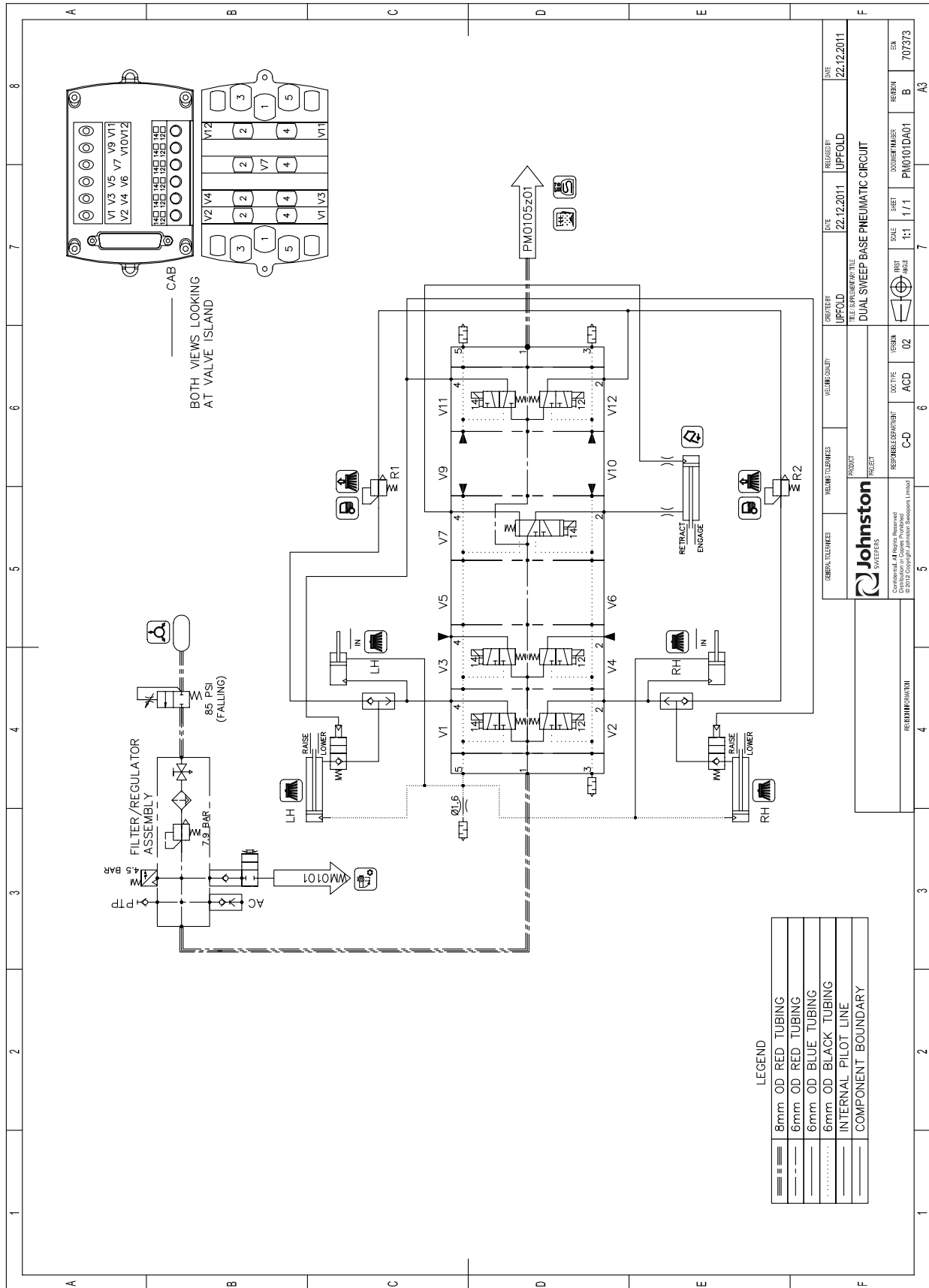
Condition	24v	5v	Error LED	Run LED
Power up	On	On	Single flash	Single flash green/red
Auto baud rate detection active	On	On	Flickering	Flickering green
Changing of address during commissioning	On	On	Flickering	Flickering green
Device in a pre-operation state	On	On	Off	Blinking green
Device in a stopped state	On	On	Off	Single flash green
Device in an operation state	On	On	Off	On green

Indicator status during CAN message errors

Condition	24v	5v	Error LED	Run LED
Too many error frames received	On	On	Single flash	Dependent on device state
Heartbeat event has occurred	On	On	Double flash	Dependent on device state
A sync message has not been received	On	On	Triple flash	Dependent on device state
Bus off	On	On	On	Dependent on device state

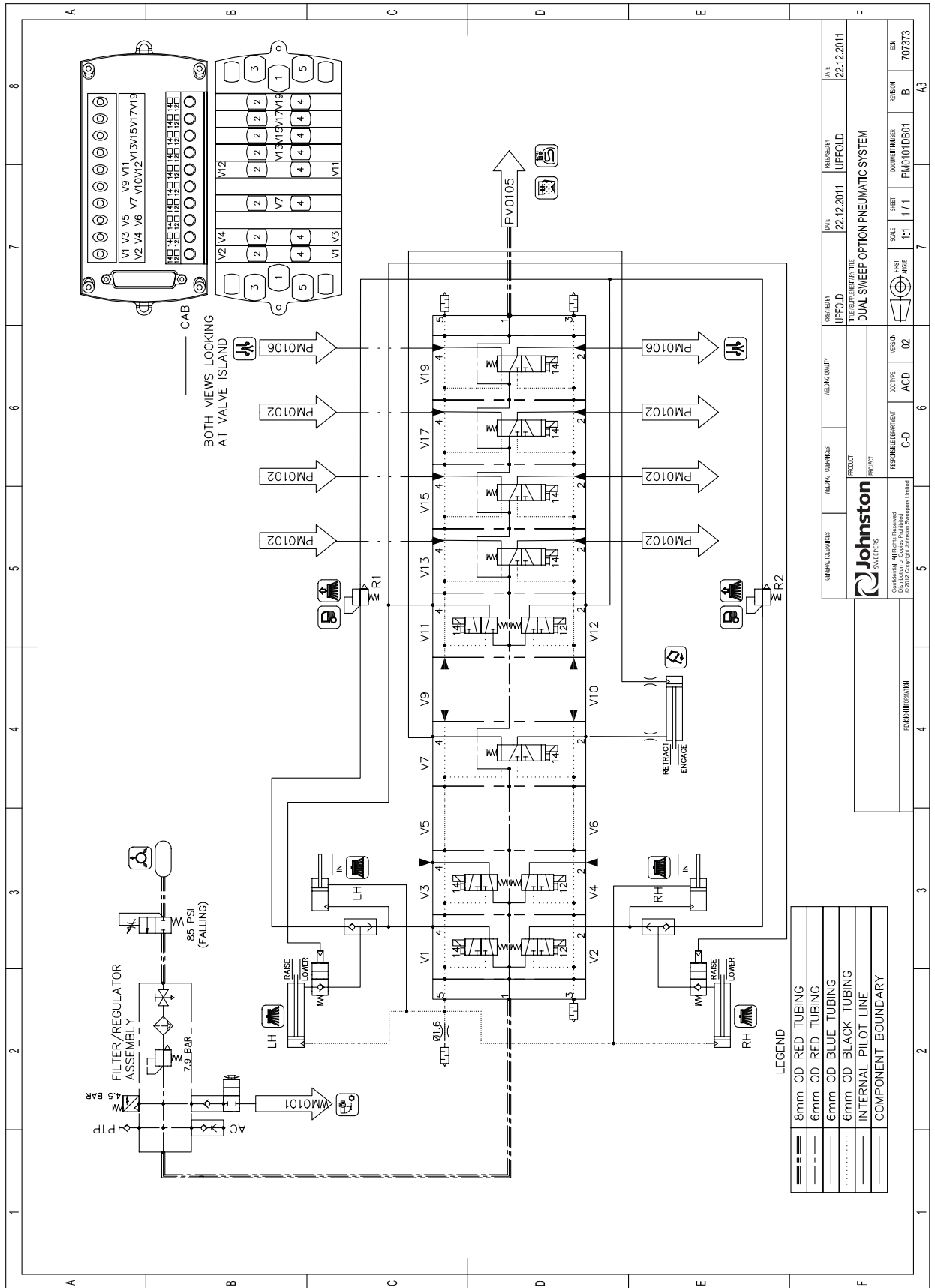
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Dual Sweep - Diagram PM0101DA01B

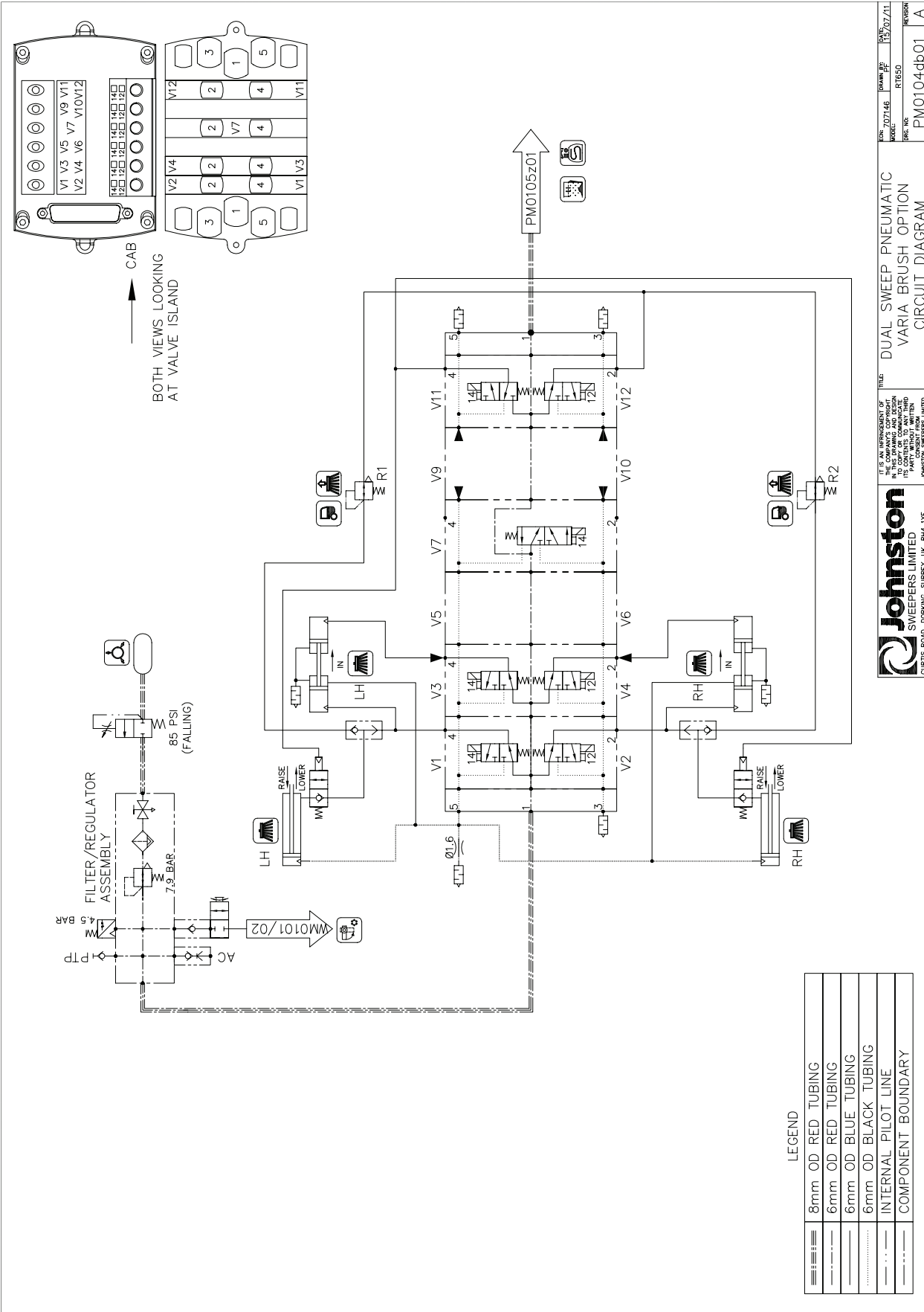


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Dual Sweep with Options - Diagram PM0101DB01B



Dual Sweep Varia Brush Option - Diagram PM0104DB01A



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CHAPTER

6

Wearing Items

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Replacement Instructions	
Fan Impeller	6 : 2
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

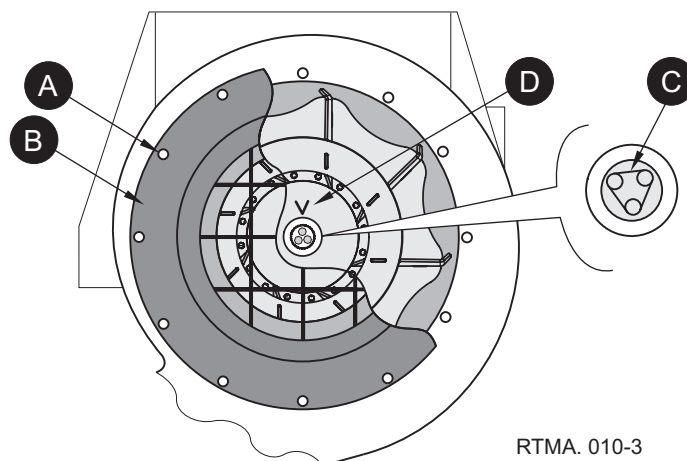


- Ensure the machine is standing on firm, level ground and there are no obstructions above or to the rear before raising the body.
- Ensure the safety prop is engaged at all times when working under the body.
- Ensure operators are fully conversant with the controls and operation.
- Isolate the air in 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 operators guide chapter 6. An inspection port is provided on the side of the fan case for this purpose. The impeller should be replaced as soon as the blade thickness is <3mm or the blades show visible signs of wear or damage.



RTMA. 010-3

REMOVAL

Raise the body and ensure the prop is engaged.

Remove the fan case inlet duct (B) by removing the 12 retaining bolts (A).

Before removing the fan 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.

Flatten the tab washer (C, if fitted) and 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.

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.

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.

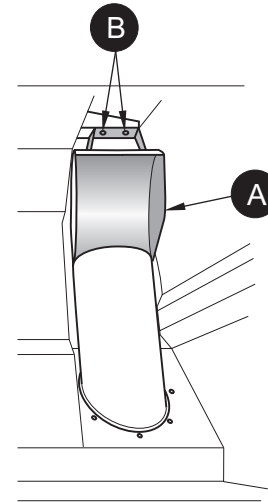
REMOVAL

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

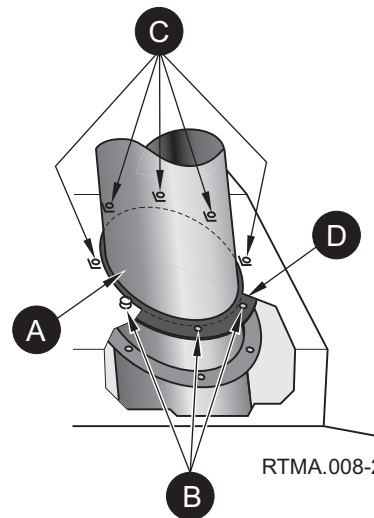
The intake duct (A) is subject to aggressive abrasion. Inspect on a regular basis and replace when worn, before the duct is perforated.

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.

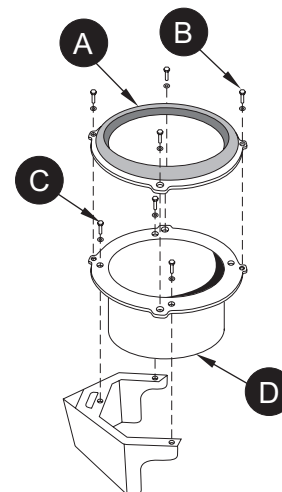


RTMA.008-2

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.004-2

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.

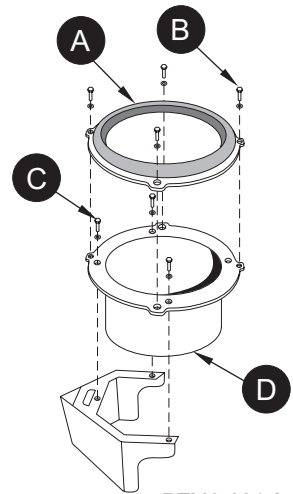
Release the trunking from the intake seat as described above.

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.



RTMA.004-2

CHAPTER

7

Remove and Refit Procedures**Table of Contents**

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Removal and Refitting Instructions	
Water Pump	7 : 2
Gutter Broom	7 : 2
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Lifting or Removal of the Body	7 : 3
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Hydraulic Pump	7 : 4
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Fan Case - Removal	7 : 4
Gearbox - Removal	7 : 5
Fluid Drive Coupling - Removal	7 : 5
Flywheel	7 : 5
Fluid Drive Coupling - Refitting	7 : 6
Gearbox - Refitting	7 : 6
Fan Case - Refitting	7 : 6
Fan Impeller - Refitting	7 : 6
Fan Case Cover	7 : 6
Exhaust Silencer	7 : 6
Fuel Tank	7 : 6
Water Tank	7 : 7
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.

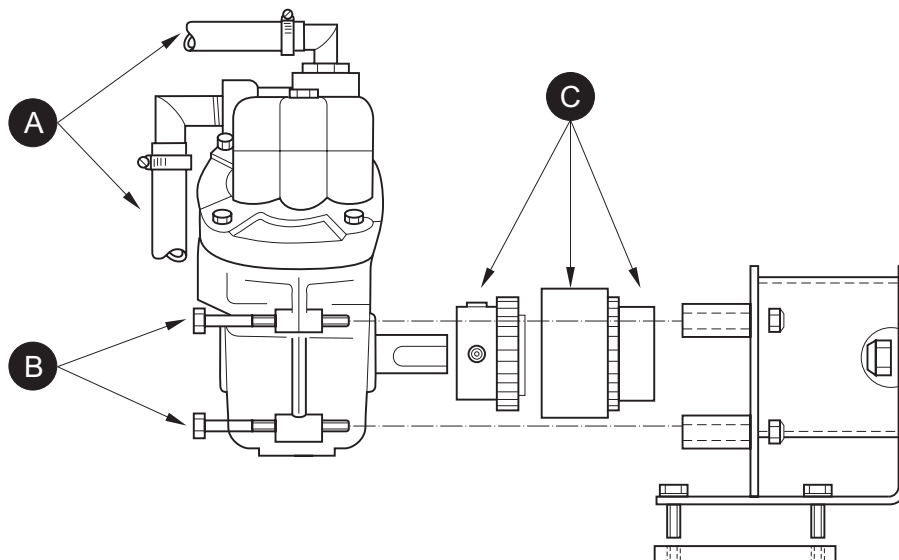
Disconnect the battery negative lead before undertaking any of the following operations on the auxiliary pack.

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

2. GUTTER BROOM MOTOR - Removal and Refitting

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

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.

Refitting

The refit procedure is the reverse of the above. When fitting the M16F and M18 lug bolts, tighten to - M16F 76 Nm (55 lbf/ft) - M18F 85 Nm (63 lbf/ft) and apply Loctite 243 (thread locker).

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 spray bar and 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

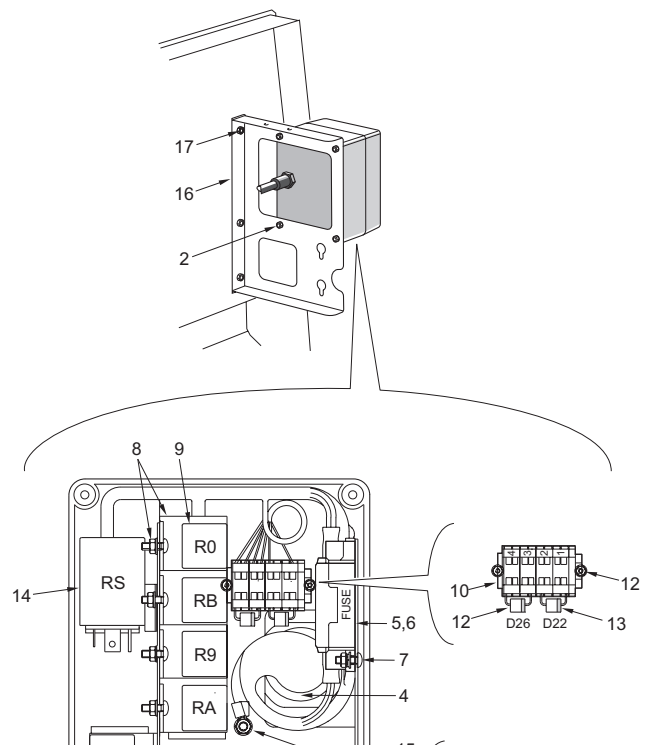
- 1 Refit is a verse of the above procedure.
- 2 When fitting the nozzle trunkings it may assist to jack up the rear axle to increase the clearance to slide the trunkings onto the air ducts.

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 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.

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 five button headed socket screws and remove walkway in front of radiator.
- 4 Unscrew the four mounting screws and withdraw radiator from shroud.
- 5 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 lbf/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.

Flatten the tab washer and 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).

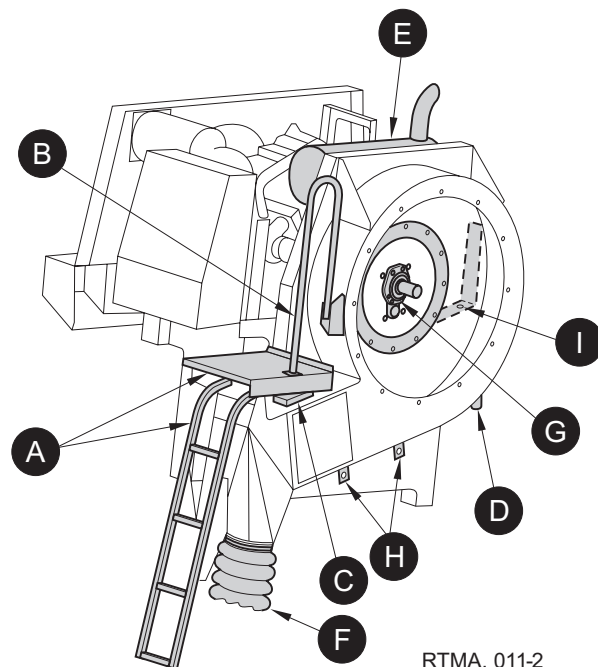
Remove the screws securing the fuel bowl for the auxiliary engine from the right hand side of the fan case (D).

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.



RTMA. 011-2

9. GEARBOX - Removal

- 1 Carry out procedures 7 and 8.
- 2 Drain fluid drive coupling as described in Chapter 6.
- 3 Remove the 6 setscrews securing the gearbox to the bell housing and the 4 bolts holding the 2 cover plates to the flywheel housing.
- 4 Withdraw the gearbox, supporting its weight so as not to damage the input shaft fluid drive coupling.
- 5 On some installations there may be an adaptor ring between gearbox and flywheel housing.

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.

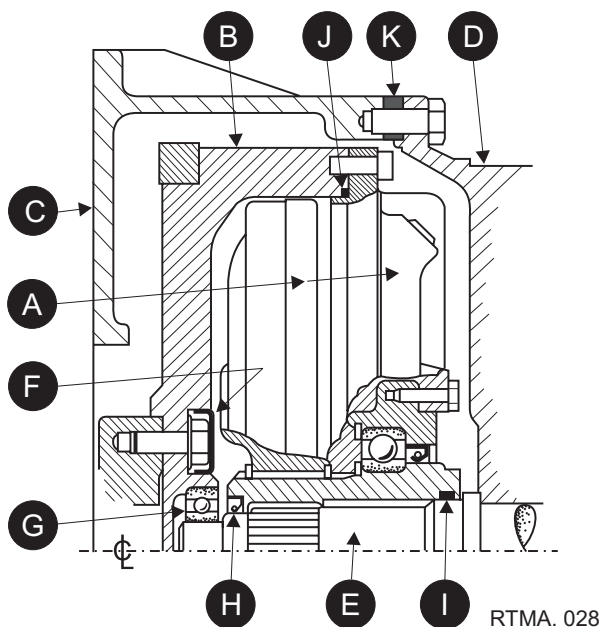


FIGURE 2 - FLUID DRIVE COUPLING AND FLYWHEEL
(Procedures 6 to 9)

- 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.

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.

16. FAN IMPELLER - Refitting

See Chapter 6.

17. FAN CASE COVER - Refitting

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

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.

20. WATER TANK - Removal and Refitting

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.

CHAPTER

8

Fault Diagnosis

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HYDRAULIC SYSTEMS

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

PNEUMATIC SYSTEMS

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

WATER SYSTEMS

FAULT SYMPTOM	POSSIBLE CAUSE
Jet continuously leaking	<ol style="list-style-type: none">1. Grit under armature seating.2. Armature stuck open.3. Manual override on.
No water to wash down hose or jets	<ol style="list-style-type: none">1. Water pump filter blocked.2. Water tank filter blocked.3. Check hydraulic motor is turning.4. Drain tap on filter open.5. Filter isolation valve closed.6. Filter assembled incorrectly7. Pump valves fitted incorrectly after overhaul.
Lack of pressure	<ol style="list-style-type: none">1. Grit under relief valve seating.2. Relief valve spring broken.3. Relief valve stuck open.4. Relief valve worn.

ELECTRICAL SYSTEM

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

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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

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

AUXILIARY ENGINE ELECTRICS AND SHUT DOWN SYSTEM

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

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PICK-UP HOOD

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

CHANNEL BRUSH / GUTTER BROOM

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

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.

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CHAPTER **9**

Service Tools

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The following tools are available through our Spares Network

TOOL NO	ITEM	FUNCTION
283266-1	ESU Unpacking Control Unit	Rear door control (single plug) to enable ESU's to be unpacked
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	Ø5 - Ø6mm
TN 7964	Torque Wrench Extension Spanner	Fits special bolts 62077-1 on WS Brush Compensator Shaft
422-1	Body Eye Bolt	Raising/lifting of body

CHAPTER 10

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.



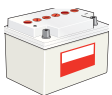
Anti Freeze:

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.

