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Category

Signalling

Title

Electro-Pneumatic Points – Style S Control Valve

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About This Standard

This manual describes the operation of and maintenance requirements for Westinghouse Style S electro-pneumatic points control valve.

The valve is used to control the movement of air operated points fitted with claw lock systems or with conventional EP systems with separate facing point lock. It can also be used for the movement of derails operated by air motors.

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1. Introduction

The Style S electro-pneumatic control valve, assemble by Westinghouse Signals Australia, is used to control the operation of pneumatic points motors and, where required, facing points locks. It may be used in any interlocking with pneumatic points, although if it is used to replace older types of control valve, circuit alterations will be required.

Principles of operation of the Style S valve are similar to the Style 'C', 'D', and 'E' valves currently in use of EP points at Sydney, Strathfield, Hornsby and Newcastle. There are however significant differences in the construction and method of operation of the valve. These differences are: -

- ☐ The plunger lock control valve is included in the same case as the point control valve.
- ☐ Air supply is maintained to the points cylinder at all times.
- ☐ ISO (International Standards Organisation) standard valves are used without any special manifold(s). Connection between valves is by nylon air line and associated fittings.
- ☐ Main valve position is not detected.
- ☐ Provision is made for emergency power operation by push-button.
- ☐ Emergency manual operation is provided on the main valve (or cut-off, normal and reverse valves) and plunger lock valves.

There are two versions of the Style S valve. The first, produced prior to 1998, used Parker-Hannifin valves and fittings, while valves produced from early 1998 have used Norgren valves and fittings. Operation by both types is identical except for emergency manual operation.



Figure 1.1 - Style S master unit



Figure 1.2 - Style S slave unit



Figure 1.3 - Style S master valve with EOL switch and push-buttons

2. Construction

The Style S valve can be configured in four ways:

- ☐ A master unit with EOL (emergency operation lock) switch, normal and reverse emergency pushbuttons and plunger lock valve.
- ☐ A master unit with EOL switch, normal and reverse emergency pushbuttons without plunger lock valve (used with claw locks).
- ☐ A slave unit with plunger lock valve.
- ☐ A slave unit without plunger lock valve.

For a single end set of points, a master unit must always be used.

For a crossover or where two or more ends of points are controlled from the one lever, one master unit plus as many slave units as necessary are used.

For emergency power operation, the master unit controls all ends of points with the one lever number.

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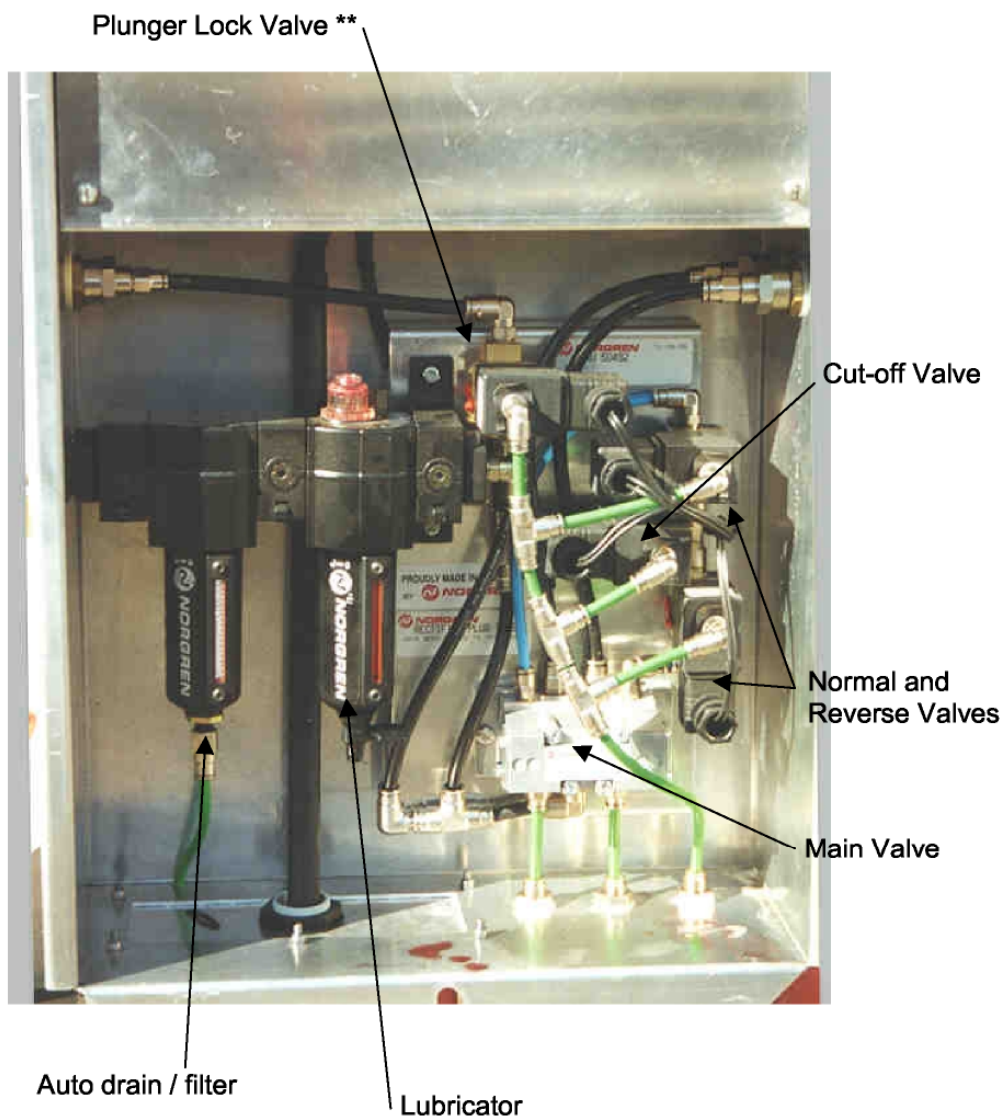
For emergency manual operation, the valve at each set of points must be operated.

The control valves consist of:

- ☐ A spring return two position solenoid valve controlling air supply to the plunger lock. (where fitted)
- ☐ A two position spool valve, operated by pilot air from normal and reverse solenoid pilot valves, controlling air supply to the points cylinder.
- ☐ A solenoid operated cut-off valve controlling air supply to the normal and reverse pilot valves.
- ☐ An auto drain/filter and lubricator assembly.

All components are housed in an aluminium enclosure coupled with nylon air line. Air in, normal air out, reverse air out and plunger lock air out connections are provided together with outlets for exhaust air and filter drain.

Diagrams of valve operation are shown in figures 5.2, 5.3 and 5.4 and the valve pneumatic circuit is shown in figure 5.1. A wiring diagram is given in figure 5.5.



** Not fitted (or if fitted, not connected) when used with claw locks

Figure 2.1 - Style S valve components

2.1 General specifications

Case material.....	Aluminium
Case width	410 mm
Height.....	640 mm
Depth	160 mm
Main Valve	ISO four way two position air operated spool with ISO solenoid two position pilot normal and reverse valves Nominal voltage 110 V \pm 1-% 50 Hz 100% duty cycle
Cut-off Valve	ISO three way solenoid Nominal voltage 110 V \pm 10% 50 Hz 100% duty cycle
Plunger Lock Valve	ISO spring return three way air operated spool with ISO solenoid two position pilot. Nominal voltage 110 V \pm 10% 50 Hz 100% duty cycle
Minimum Air Pressure.....	280 kPa
Maximum Air Pressure.....	840 kPa
Air Line.....	Nylon 6 mm and 8 mm
EOL Key Switch*.....	Fortress Security Key switch, 4(four) independent contacts made with key in, no contacts made with key out
Normal/Reverse Pushbuttons*	1 contact made normal (button out) 1 contact made reverse (button in)

* *Master unit only*

2.2 Operation

The schematic diagram, figure 5.1, shows the pneumatic circuit.

Air passes through the filter and lubricator to inlets of the plunger lock valve, the cut-off valve and the main valve.

With the points laying normal and locked, the plunger lock and cut-off valves are de-energised (closed) and the plunger lock cylinder is open to atmosphere.

Air is applied to the normal side of the points cylinder through the main valve.

To operate the points to reverse, power is applied to the plunger lock valve, the reverse valve and to the cut-off valve. The plunger lock valve opens to inlet air and closes the cylinder exhaust. When the plunger lock has cleared the notch and made the plunger lock reverse contacts, power is applied to the cut-off valve. Air is admitted to the reverse valve via the cut-off valve and in turn is admitted to the main valve to drive the spool to the reverse position. The movement of the spool opens the normal side of the points cylinder to atmosphere and applies air to the reverse side of the cylinder. When points movement has been completed and detection made all valves are de-energised. The plunger lock cylinder is opened to atmosphere and the plunger lock returns to the locked (normal) position. Air continues to be applied to the reverse side of the points cylinder.

3. Maintenance

Maintenance is carried out at the intervals specified in the baseline Signalling Technical Maintenance Plan or in the Tailored Signalling Technical Maintenance Plan for the particular location.

The filter/auto drain is to be examined and cleaned or replaced as necessary. The oil level in the lubricator is to be replenished and lubricator adjustment and operation checked. The lubricator must deliver at least 1 drop of oil but not more than two drops of oil per operation of the points. The unit is to be checked for air leaks.

If lubrication is not provided, premature valve failure can be expected. Excessive oil will lead to premature air hose failure.

No attempt should be made to carry out any internal repairs to the main, normal, reverse, plunger lock or cut off valves on site. Any defective valve should be replaced and returned to a depot or workshop for repair.

All valves can be removed by unplugging air lines and wiring and removing the screws securing the valve to the case. Air lines and fittings should be replaced if leaking since repair is unlikely to be effective.

WARNING

When insulation testing, isolate all solenoid valve coils by disconnecting the connection plug on each valve.

Master Unit Only

Check the operation of the EOL switch and the normal and reverse push buttons. Ensure that the EOL key cannot be removed with the EOL switch contacts made.

3.1 Lubricants

The lubricator must be filled with lubricating oils suitable for pneumatic systems. Examples are:-

Mobil DTE light
Shell Tellus 22
Castrol Hyspin VG32
Ampol Tecoma 32
Caltex Rando HD46
BP HLP 32

Filling intervals will be determined by the number of turnout operations per day and may vary widely between different turnouts. Turnouts with a very high usage rate may require a special service schedule solely for lubricant replenishment.

3.2 Fault Finding

WARNING

Before testing the operation of any valve or replacing any valve within the Style S unit ensure that:

either

The signals protecting all ends of points associated with the Style S unit have been placed at stop

or

The points end controlled by the particular Style S unit has been disconnected from the air supply and clipped and locked.

If the Style S unit is suspected of causing a points failure proceed as shown on the fault finding chart, figure 3.1.

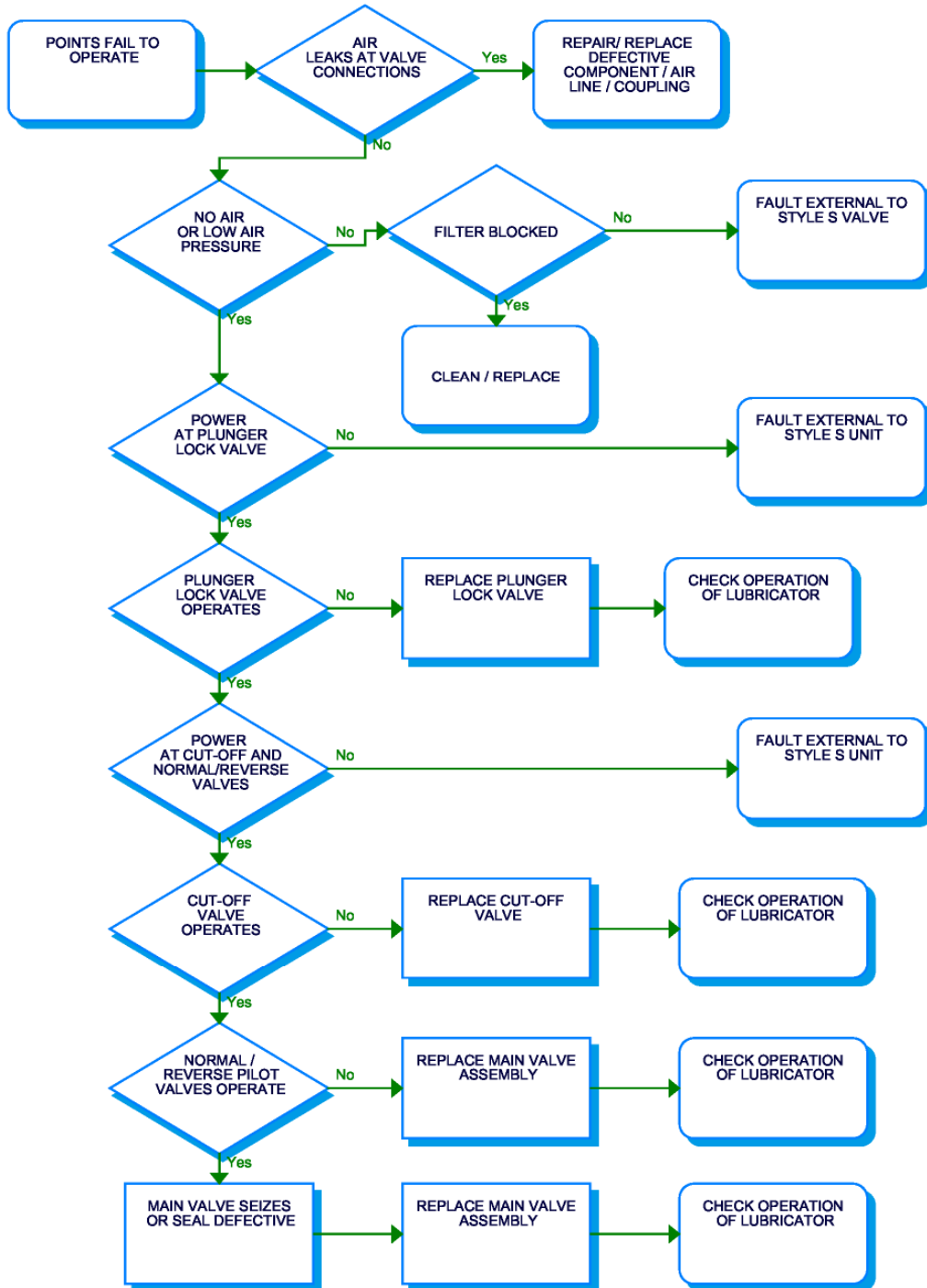


Figure 3.1 – Fault finding chart

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4. Emergency Operation

4.1 Emergency Operation – Power

WARNING

The one Style S master unit contains the EOL for all ends of points with the lever number corresponding to that EOL.

Operation of the EOL switch and push-buttons in the master unit will throw all ends of points.

The EOL must not be operated until it is certain that there are no trains approaching or on any ends of points operated by the master unit.

An Emergency Operation Lock, with a similar purpose to the ESML on an electric switch machine, is provided on the Style S valve. There is however a significant difference as the EOL on the Style S valve provides for emergency power operation of the points by key and pushbutton as opposed to manual operation by hand crank or hand lever on the electric switch machine.

The EOL consists of a 'Fortress Security' key switch, key captive in the normal position, located in a locked box (EOL box) in the vicinity of the points. A matching key switch together with a normal and a reverse push-button are located in the Style S Master Unit case.

To operate the EOL;

- ☐ Turn the key to remove it from the switch in the EOL box. This will open circuit the points detection.
- ☐ Take the key to the Style S master unit, insert it into the key switch and turn (the key is then captive in this switch). This powers the plunger lock valve and the cut-off valve and enables the normal and reverse pushbuttons.
- ☐ Throw the points by pushing the normal or reverse pushbuttons as required.

Note that the facing point lock will be engaged during this procedure but the FPL plunger will not be locked while the EOL key is in the Style S master unit.

4.2 Emergency Operation – Manual

WARNING

Before any attempt is made to blow the points by manual operation of the valves within the Style S unit, the maintainer must ensure that the signal(s) protecting the points have been placed at, and are maintained at, stop in accordance with the safeworking unit procedures.

In addition, no attempt is to be made to blow the points until the maintainer is satisfied that any train approaching the points has come to a stand.

Manual emergency operation should only be used

- ☐ When electrical power is not available and correction of the fault will take longer than traffic requirements permit.
- ☐ When a valve is defective and a replacement is not readily available or replacement will take longer than traffic permits.

For Style S units with Parker Hannifin valves

The plunger lock and main valves are provided with pins at the ends of the valve body which will open the plunger lock valve and move the main valve spool to the reverse or normal position. The pins are not readily accessible and cannot be accidentally operated.

To throw the points depress the pin on the end of the plunger lock valve and hold in. After about 3 to 5 seconds depress the pin on either the normal or reverse end of the main valve to throw the points. Release both pins.

Note that the normal pin will be on the *same* end of the main valve as the normal solenoid valve; the reverse pin will be on the *same* end of the main valve as the reverse solenoid valve.

For Style S units with Norgren valves

The Norgren main valve has no manual operation facility.

The plunger lock, cut-off, normal and reverse valves are fitted with a switch on the side of each valve as shown in figure 4.1.

To manually blow the points for normal to reverse:

1. Operate the switch on the cut-off valve

2. Operate the switch on the plunger lock valve (where fitted) then operated the switch on the reverse valve.

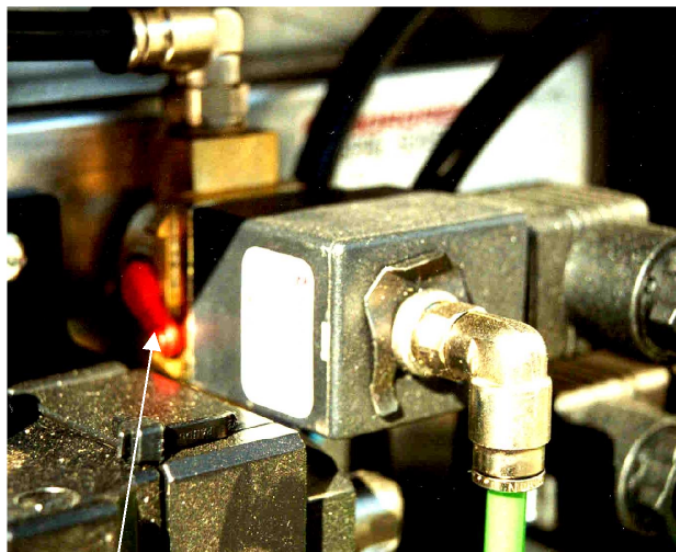
To blow from reverse to normal, proceed as described except operate the switch on the normal valve instead of the reverse valve.

WARNING

Ensure that all manual switches are returned to the power position before the Style S unit is returned to service.



Manual Switch



Manual Switch

Figure 4.1 – Norgren valves manual operating switch

5. Pneumatic and electrical diagrams

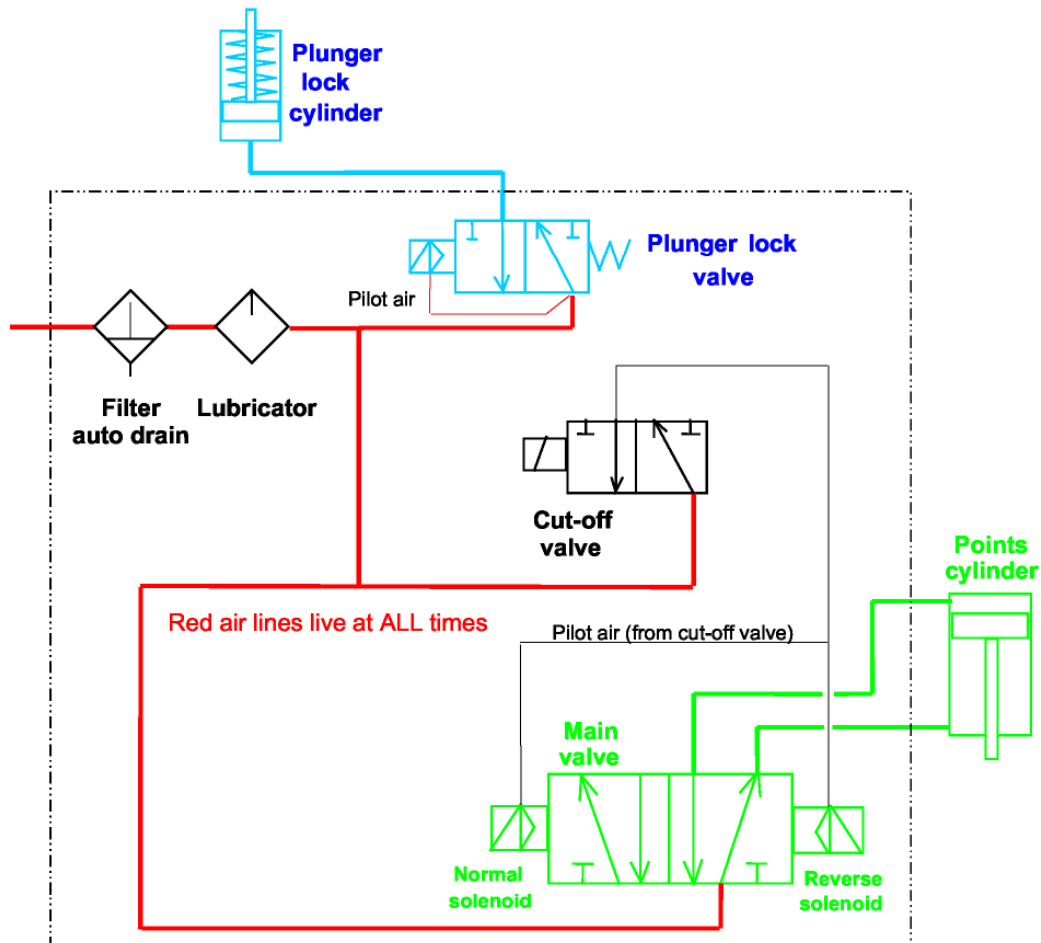


Figure 5.1

Style S valve - Pneumatic Circuit (Valve and points motor in the normal position)

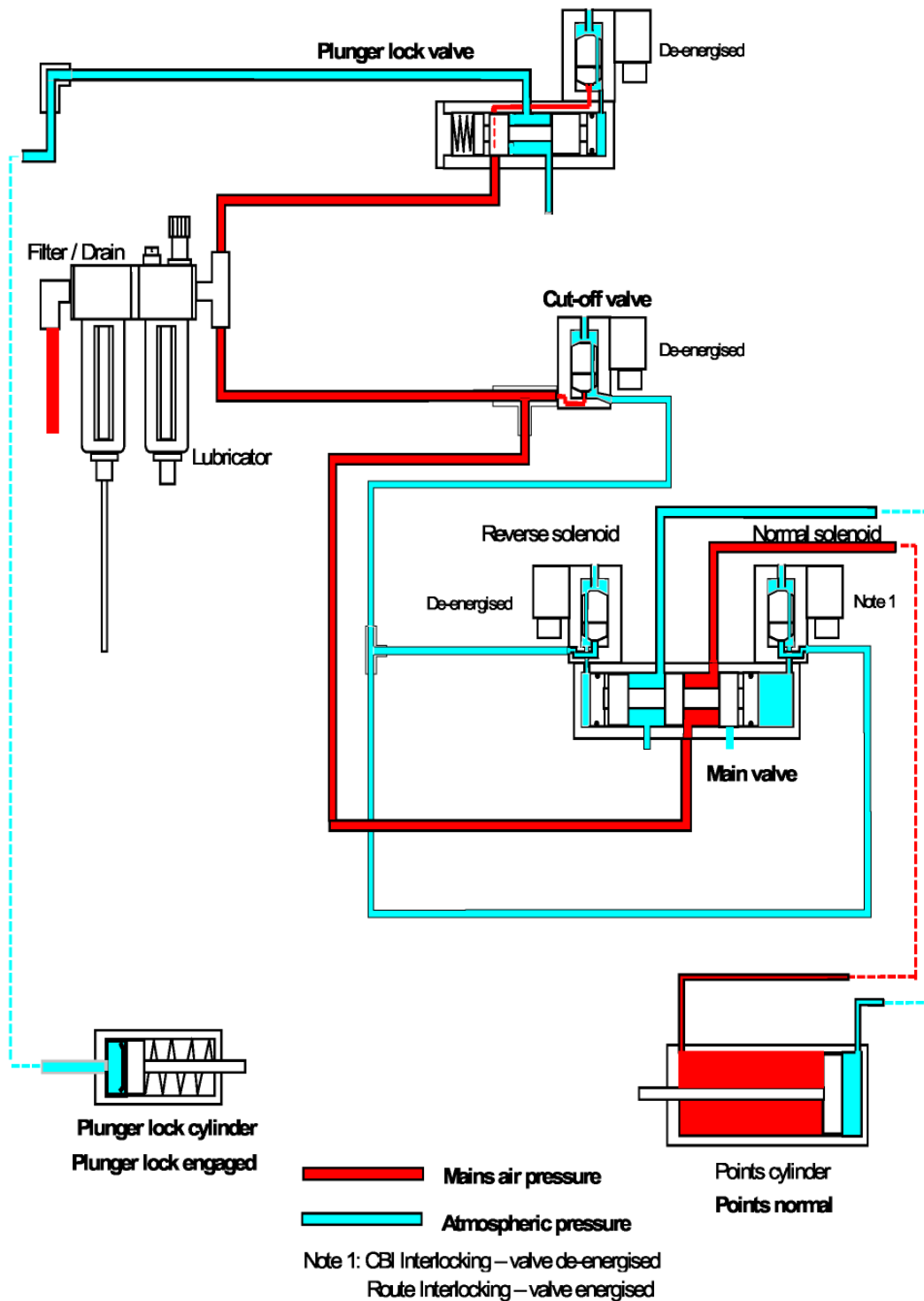


Figure 5.2 - Air flow diagram – points normal

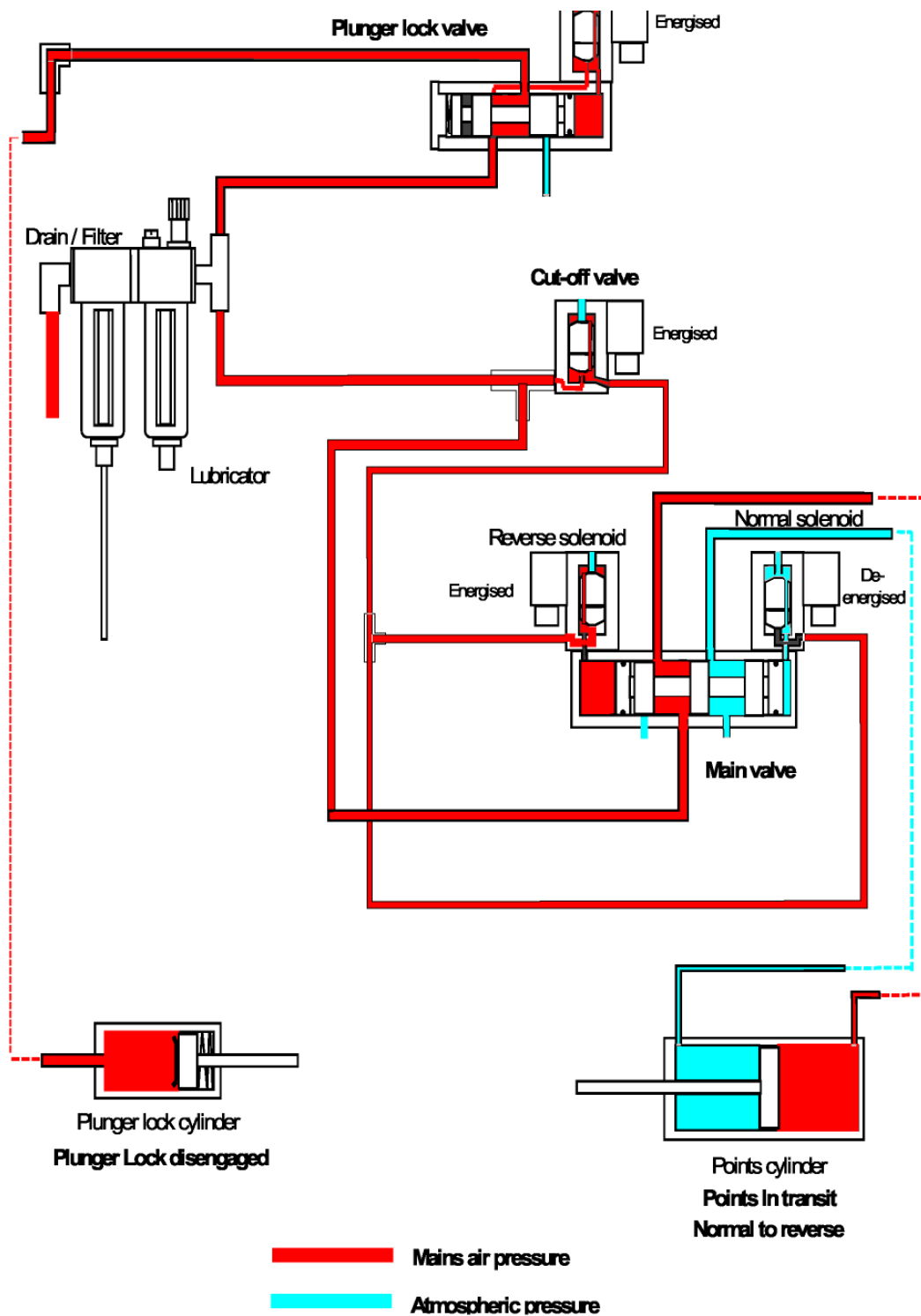


Figure 5.3 - Air flow diagram - Points in transit – Normal to Reverse

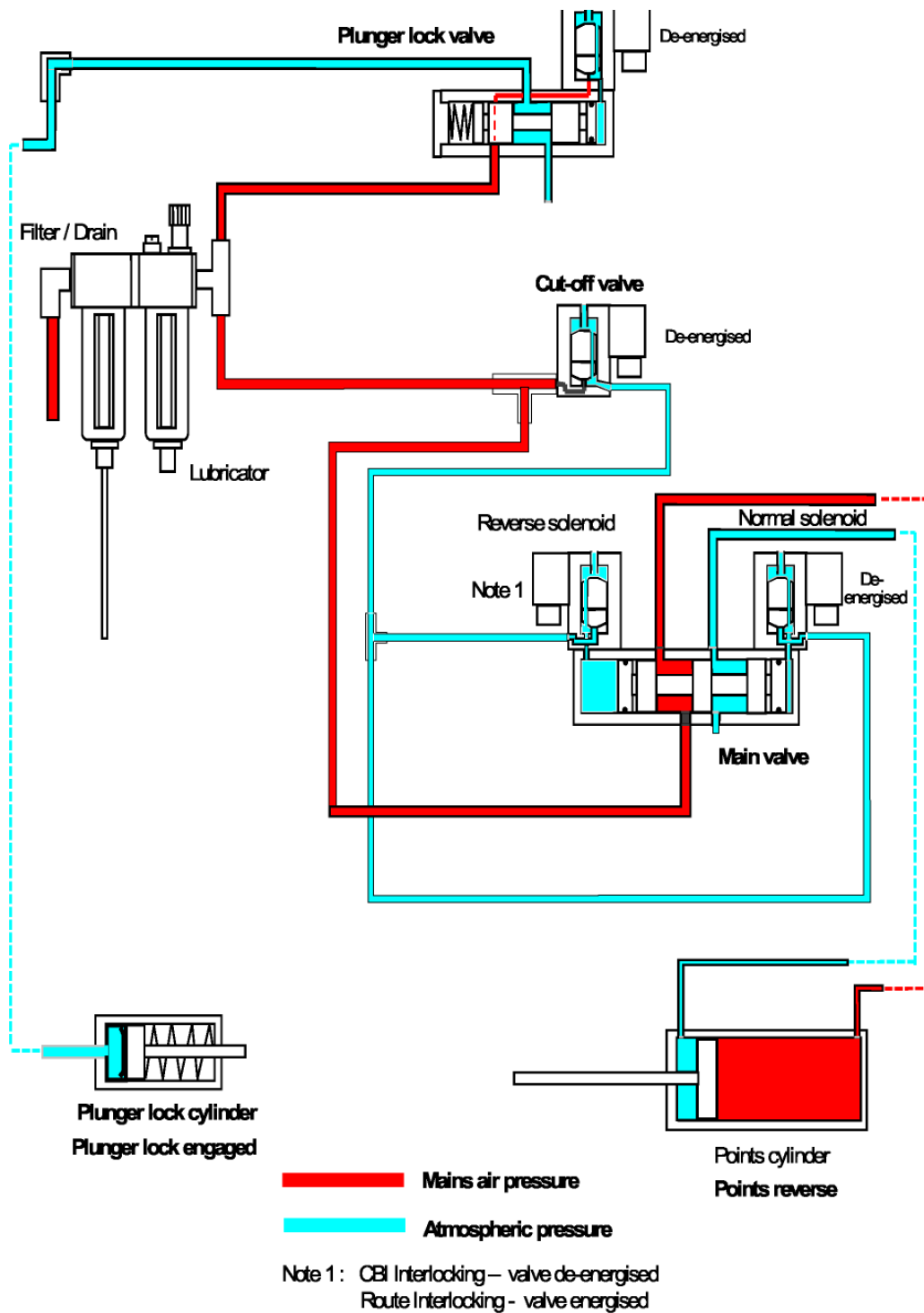
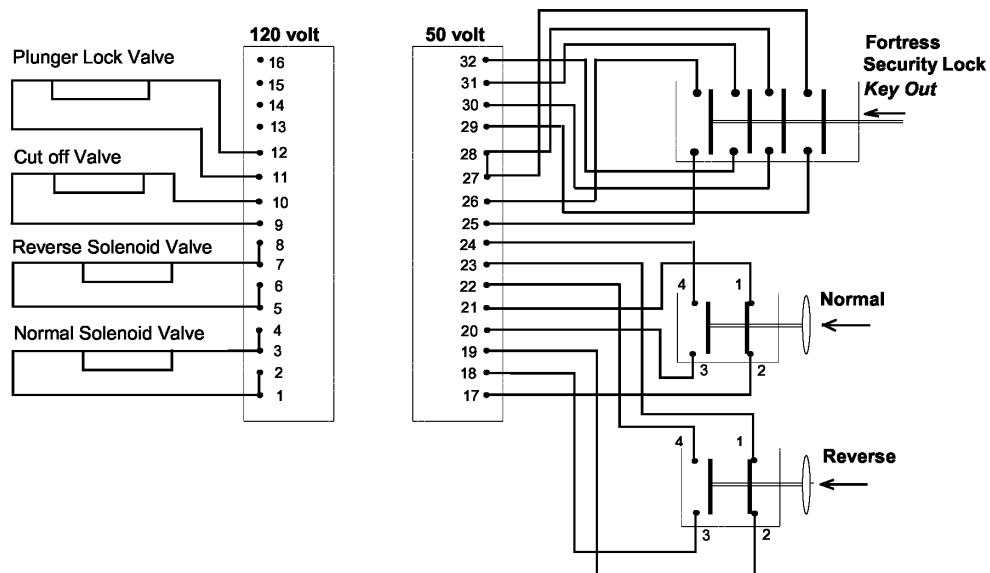
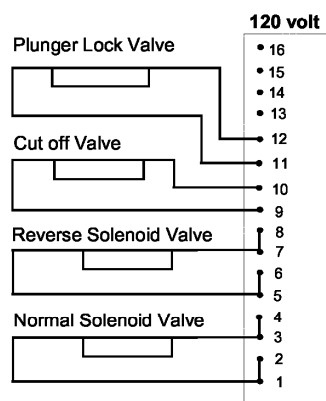


Figure 5.4 - Air flow diagram - Points Reverse



Master Unit



Slave Unit

Figure 5.5 – Master unit and slave unit electrical circuits

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