
Automatic Duplex System Summary



**Automatic Duplex
Pneumatic or Electric Logic Controller Features
150 Psig Rated Filter Unit**

Rosedale Products, Inc.

3730 West Liberty Rd. • Ann Arbor, Michigan 48103 • 734-665-8201

NOTICE:

This document is for internal use only. The information contained in this binder is intended for use with the above referenced project only. To the best of our ability, the information is accurate and current.

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General Description:

Introduction:

Rosedale Products produces a basic two-filter unit with an pneumatic or electric control system that automatically switches from one filter to the other when the pressure drop across the on-line filter gets too high. When a filter is off line, it is isolated from the fluid, and can be worked on to replace bags or perform other maintenance.

Thus the unit provides continuous service as long as maintenance personnel service each filter as soon as it comes off line, and get it ready to go back on line when the other filter pressure drop gets too high.

The system provides a differential pressure switch connected into the fluid inlet and outlet lines to monitor the pressure drop. The system puts one filter on line until it shows the highest permissible pressure drop, then switches the flow over to the second filter and isolates the first filter from the fluid.

Each time the pressure drop sensor calls for a switchover, it also sends an electric alarm ("explosion proof" on the pneumatic controller) signal to the customer's remote annunciator system, warning that one of the filters has gotten dirty and needs maintenance. These remote warning signals stay on until an operator comes to the site and manually resets the controls. This turns the warning signal off.

Description of the Fluid Circuits:

Each filter has a 2-way fluid inlet valve and a 2-way fluid outlet valve. These valves are called "transfer valves". They are Bray butterfly valves actuated by Bray pneumatic actuators. These actuators are double air operated no spring actuators which have to be driven in both directions by air pressure. Electric actuators are available with the electric controller only.

It is a characteristic of this combination of hardware that the butterfly is always balanced to pressure reactions, and it takes a certain amount of torque to turn the butterfly shaft. The operator also has built-in friction and resistance to movement. So air pressure is needed to move the butterfly in either direction. The hardware combination is therefore analogous to a double air pilot operated 2-way liquid valve, detented in both positions.

The system also provides a smaller Bray butterfly valve, also provided with a smaller Bray actuator, but this actuator is fitted with a return spring, and only has one air connection. The combination is air operated to open, spring return to close. The total combination therefore is a single pilot spring return normally closed 2-way liquid valve. This valve is called a "cross-connect valve".

The incoming liquid enters the branch outlet of a large pipe tee. From the run ports of this tee the liquid goes through the two filter inlet valves, then into the inlet ports of the filters.

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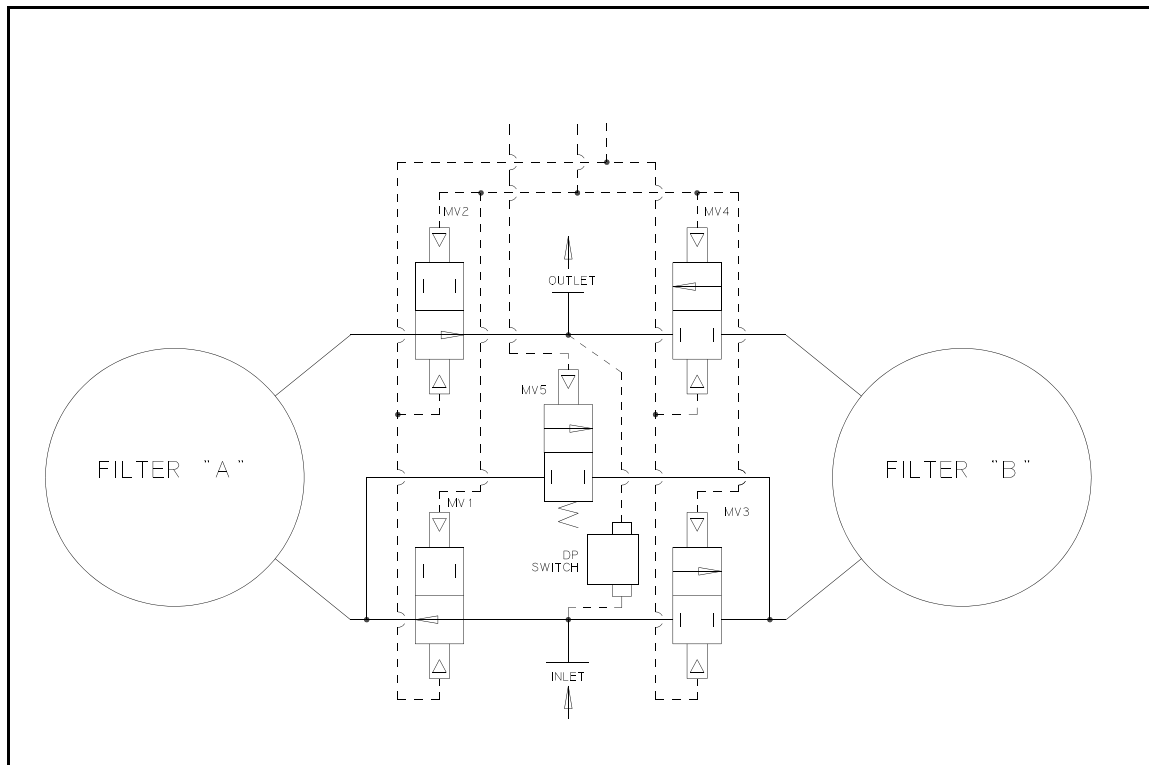
The outlet ports of the filters connect to the (2) outlet valves, which in turn connect to the run ports of an outlet tee. The branch outlet port of this tee is the main outlet port of the system.

A smaller liquid line taps into each filter inlet line between the inlet valve and the filter inlet port. The cross-connect valve is mounted in this cross-over line.

How the Fluid Circuits Work:

To direct fluid through Filter A, the controls open inlet valve MV1 and outlet valve MV2, and close inlet valve MV3 and outlet valve MV4. The cross-connect valve MV5 is also closed. Liquid flows through Filter A, while Filter B is isolated from the fluid.

To direct fluid through Filter B, the controls close inlet valve MV1 and outlet valve MV2, and open inlet valve MV3 and outlet valve MV4. The cross-connect valve MV5 is also closed. Liquid flows through Filter B, while Filter A is isolated from the fluid.



The purpose of the cross-over valve is to bring the off-line filter up to liquid line pressure before

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opening the off-line filter's liquid valves. This prevents liquid hammer and hydraulic shock to the filter bags.

Note that the inlet valve and the outlet valve for each filter always open together and close together. It is important also to note that when the Filter A liquid valves are open, the Filter B liquid valves are closed and vice versa. Thus, one filter or the other is always on line passing liquid.

The cross-connect valve is only opened during the pressure equalization period at the beginning of a Switchover.

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Typical Switchover Sequence:

Assume for this explanation that the system has been actuated and reset, Filter B is on line, and the system is about to switch over to Filter A.

1. The pressure drop sensor senses that the pressure drop is too high, tells the controls "Pressure drop is too high".
2. Cross-connect valve opens, admits liquid under pressure from the Filter B inlet pipe to the inlet port of Filter A. Since filter A liquid valves are closed, Filter A quickly builds up to the liquid line pressure. Start cross-connect timer. Stop reading pressure drop sensor.
3. When enough time has elapsed the timer times out. Simultaneously, controls command Filter B liquid valves to close, and Filter A liquid valves to open. Controls also command cross-connect valve to close.
4. As the Filter B liquid valves start to close, the Filter A liquid valves start to open, and the opening of the Filter A valves proceeds at about the same rate as the closing of the Filter B valves. Thus, there is no interruption of liquid flow during the switch over from Filter B to Filter A.
5. Eventually the Filter B liquid valves get fully closed, and the Filter A liquid valves get fully open. The switch over is complete. Filter A is on line.
6. The controls start reading the condition of the pressure drop sensor again.

Manual Controls and Indicators (for Pneumatic Controller):

CONTROL POWER

OFF-ON 2-position selector. Left position OFF. Right position ON. Turns the control power to the logic off and on.

CONTROL POWER ON Visual indicator. Normally off/black. Turns on/green when control power is on.

SWITCH TO FILTER A Flush black spring return button. Active only when Filter B is on line. When depressed momentarily when Filter B is on line, causes the system to perform a Switchover to put Filter A on line.

SWITCH TO FILTER B Flush black spring return button. Active only when Filter A is on line. When depressed momentarily when Filter A is on line, causes the system to perform a Switchover to put Filter B on line.

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FILTER A ON LINE	Visual indicator. Normally off/black. Turns on/green when controls command the power valves to open the Filter A liquid valves.
FILTER B ON LINE	Visual indicator. Normally off/black. Turns on/green when controls command the power valves to open the Filter B liquid valves.
FILTER A DIRTY	Visual indicator. Normally off/black. Turns on/red when filter A is on line and the pressure drop sensor senses that the pressure drop is too high.
FILTER B DIRTY	Visual indicator. Normally off/black. Turns on/red when Filter B is on line and the pressure drop sensor senses that the pressure drop is too high.
CANCEL ALARMS	Flush black spring return button. When depressed momentarily when either set of alarms is ON, cancels the alarms and enables the AUTO SWITCHOVER circuit.
AUTO SWITCHOVER OFF / ARMED	2-position selector. Left position OFF. disables auto shift. Right position ARMED enables the auto Switchover feature and places Switchover under control of the pressure drop sensor.
AUTO SWITCHOVER ARMED	Visual indicator. Normally off/black. Turns on/green when auto Switchover feature is enabled. Switchover will take place when pressure drop sensor senses that the pressure drop is too high.
CROSS-CONNECT VALVE OPEN	Visual indicator. Normally off/black. Turns on/red when the controls tell valve P3 to open the cross-connection valve. Turns black when the controls tell valve P3 to close the cross-connection valve.

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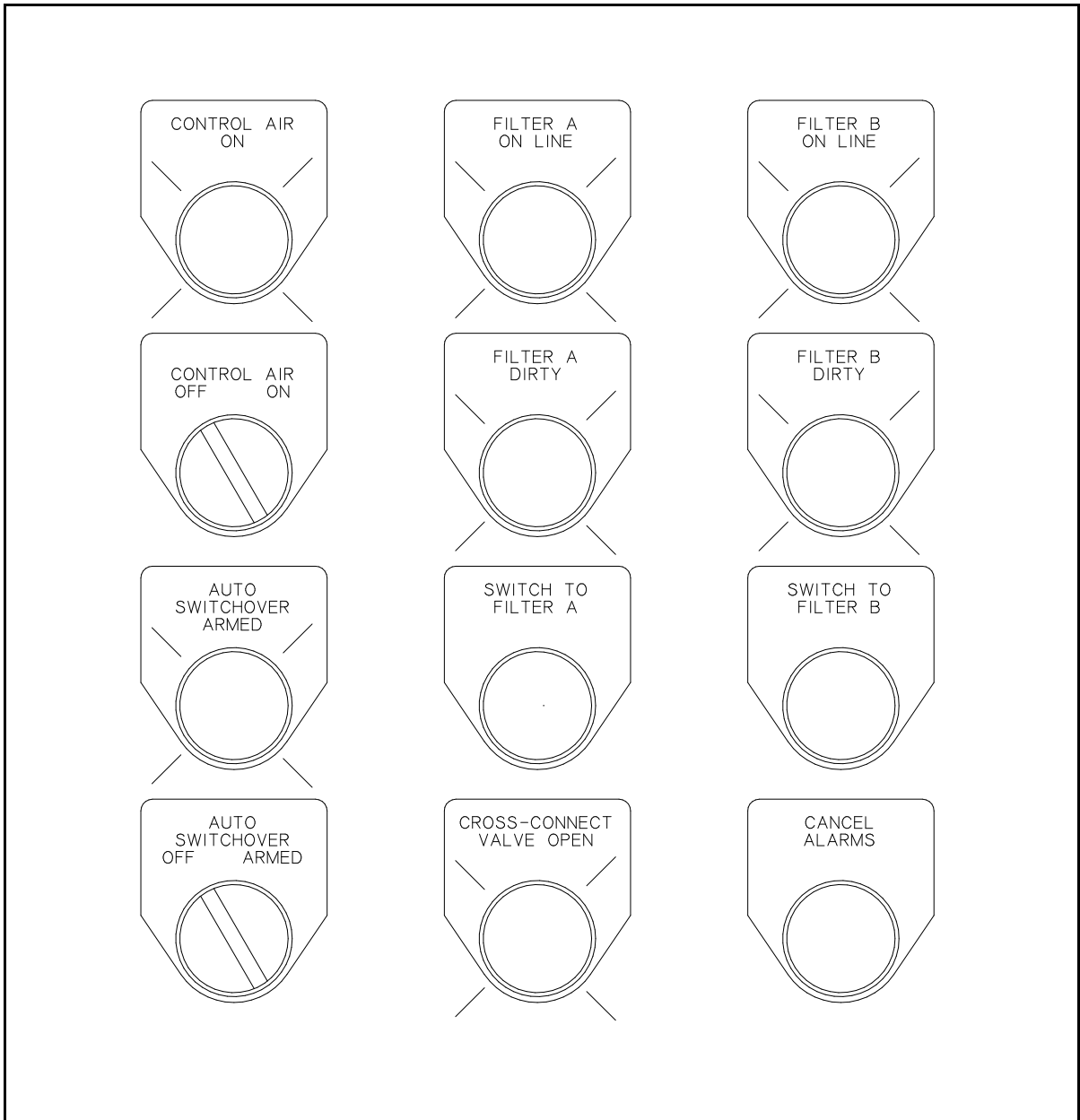
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PNEUMATIC CONTROL PANEL LAYOUT

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Manual Controls and Indicators (Electrical Controller):

MAIN POWER

PULL ON/PUSH OFF Visual indicator. Palm button. Illuminates red when pulled for main power ON. Turns the main power OFF when pushed.

START FILTER A Push button. Activates Filter A on line.

START FILTER B Push button. Activates Filter B on line.

FILTER A ONLINE Visual indicator. Illuminates green when controls command the power valves to open the Filter A liquid valves.

FILTER B ONLINE Visual indicator. Illuminates green when controls command the power valves to open the Filter B liquid valves.

FILTER A DIRTY Visual indicator. Illuminates red when filter A is on line and the pressure drop sensor senses that the pressure drop is too high.

FILTER B DIRTY Visual indicator. Illuminates red when Filter B is on line and the pressure drop sensor senses that the pressure drop is too high.

CANCEL ALARMS /DISARM SWITCHOVER

Push button. When depressed momentarily, cancels the SWITCHOVER ARMED feature, when depressed for 5 seconds or more cancels the FILTER DIRTY ALARM.

ARM SWITCHOVER

Push button. When depressed momentarily enables the auto switchover feature and places switchover under control of the pressure drop sensor. When depressed for 5 seconds or more causes system to perform a standard switchover.

SWITCHOVER ARMED

Visual indicator. Illuminates blue when switchover feature is enabled. Off when switchover has been executed.

CROSSCONNECT VALVE OPEN

Visual indicator. Illuminates amber when crossconnect valve open for liquid.

PUSH TO TEST LIGHTS

Push button. Illuminates pilot lights for visual testing.

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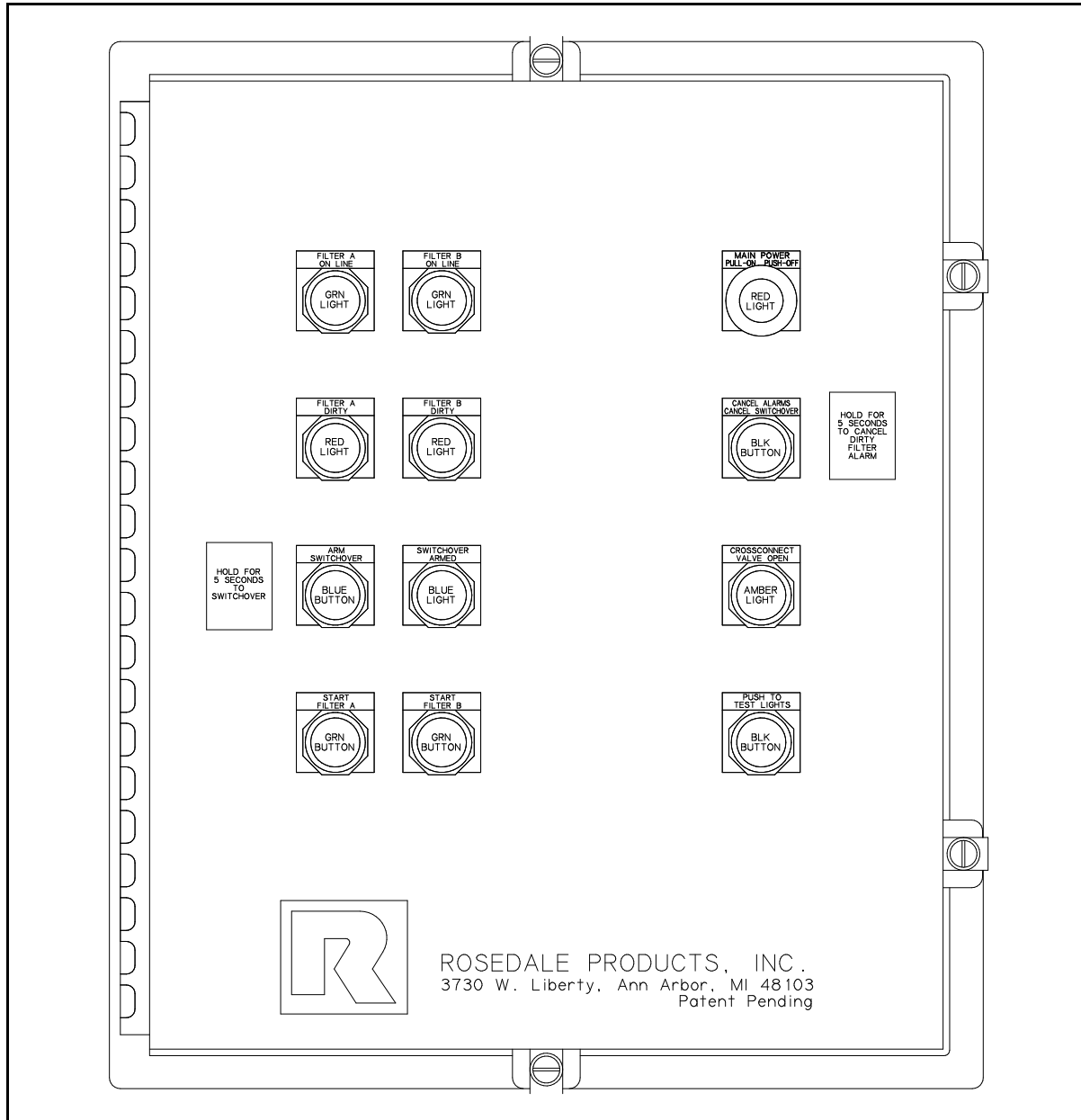
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ELECTRICAL CONTROL PANEL LAYOUT

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How the System Works:

The purpose of this system is to provide continuous filtration, in spite of the filters getting clogged and needing cleaning or changing bags. The general idea is that one of the two filters will be on line at all times, allowing maintenance to change bags or perform service on one filter while the other filter is doing the filtering.

General Arrangement:

Enclosure:

The system will be housed in a NEMA 4 OR 12 enclosure or as specified.

All openings in this enclosure will be in the bottom face of the enclosure, except for the manual controls and indicators mounted in the door. These will all be oil-tight to JIC standards.

Includes the following:

1. (2) Housings of Carbon Steel, 304 or 316 Stainless Steel.
2. (2) Pipe Tees of specified size.
3. (4) Bray Butterfly valves w/actuators-**Transfer Valves**.
4. (1) Bray Butterfly valve w/actuator-**Cross-Connect Valve**.
5. (2) Automatic Air Vents, Stainless Steel (1 each housing)
6. Numatics Air Control Valves for Transfer and Cross-Connect Valve Actuator Operation.
7. Allen Bradley Differential Pressure Switch.
8. (1) Junction Box w/Terminal Strip with the following features (electric control only).
 - a. Visual Indicator (function determined by customer).
 - b. Push Button to "Reset"
 - c. Terminal Strip for Remote Controller.
 - d. NEMA 12 Enclosure, NEMA 4 or better option available.

OR

9. (1) Electric or Pneumatic Control Panel with following features:
 - a. Main power on/off push button.
 - b. Push Buttons to switch Operating Filter A/B.
 - c. Visual Indicators for "Filter A/B Online", "Filter A/B Dirty", "Switchover Armed", "Cross-Connect Valve Open".
 - d. Arm Switchover push button.
 - e. Push Button to Cancel Alarms/Cancel Switchover.
 - f. NEMA 12 Enclosure, NEMA 4 or better option available.
 - g. Logic designed to prevent Switchover to "Dirty Filter".
 - h. Alarm Circuit Connections provided.