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<td>November 5, 2013</td>
<td>L</td>
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<td>December 2, 2013</td>
<td>M</td>
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<tr>
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<td>March 21, 2014</td>
<td>Q</td>
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<td>May 6, 2014</td>
<td>R</td>
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<td>Alan Goetzelmann</td>
<td>February 3, 2015</td>
<td>T</td>
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<tr>
<td>Alan Goetzelmann</td>
<td>February 17, 2015</td>
<td>U</td>
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<td>Alan Goetzelmann</td>
<td>June 21, 2016</td>
<td>X</td>
<td>Update Document, removed software tool, Separate document for diagnostic tool</td>
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1 Overview
This document contains information pertaining to the operation of the Vapor electric door system and diagnostic software.

2 Door emergency release operations
In the case of an emergency, the door gearbox can be disengaged allowing the door to be freely pushed open. The release mechanism may be a pull handle or rotary air dump valve located behind a breakable clear cover. When pulled, the handle will move a release lever on the gearbox that will disengage the internal clutch, allowing the teeter lever to rotate freely.

If the rotary air dump valve is activated, a spring loaded air cylinder will move the release lever on the gearbox that will disengage the internal clutch allowing the teeter lever to rotate freely. A proximity sensor detects that the emergency release mechanism has been activated and sends a signal to the bus.
2.1 Mechanical cable emergency release

- The Vapor electric operator is designed to accommodate dual mechanical cable emergency releases (internal and external). Final interface with the bus will be OEM specific.
- Before exiting the bus, the driver opens the door via the driver’s door controller. The driver turns off the bus run switch and exits through the entrance door. A concealed external pushbutton is mounted behind a panel towards the front of the vehicle (location determined by bus OEM). The external pushbutton command will trigger a bus PLC command to close the door and the electric operator keeps the door closed and locked. Once the door closes, the bus PLC goes to sleep.
- Upon returning to the bus, the doors are still in the closed and locked state. The driver will press the external pushbutton for X seconds (dependent upon bus OEM PLC).
  - If electric power is available on the bus (battery power is still available) a signal is sent to wake up the bus PLC which in return sends a signal to open the door.
  - If electric power is NOT available on the bus the doors cannot be opened electrically, therefore a mechanical cable can be provided that is accessible from the exterior of the vehicle (location determined by bus OEM) to enable the driver to gain entry. The driver can manually open the doors and enter the bus. Once battery power is available and the run switch is on, the driver will move the driver’s door controller to the open position and back to the closed position to initiate the homing sequence. The door will slowly move to the fully closed position. Obstruction detection is active during the homing sequence. Once the door reaches the fully closed (home) position, the door will return to the normal operating state and respond to commands via the driver’s door controller.
  - The door will slowly open or close during the initial cycle of the door. Once the door reaches the fully open or closed position, the door will be in the normal operating state.
2.2 Pneumatic Emergency Release

- An air cylinder can be used as another option to activate the emergency release.
- The emergency release can be activated by a rotary dump valve located near the door or a drivers air dump switch located near the driver.
- The release can also be activated by an electric solenoid valve that will remove air from the cylinder when the bus run switch is turned off.
- Before exiting the bus, the driver turns off the bus run switch and turns the driver’s dump valve to the OFF position exhausting air from the emergency release device which disengages the clutch on the electric operator. The doors enter a neutral state and can be operated manually by hand.
- Upon returning to the bus, the doors are still in a neutral state. The driver turns on the bus run switch and returns the driver’s dump valve to the ON position applying air to the emergency release device. Once adequate air pressure is achieved the emergency release device will initiate the homing sequence by engaging the clutch on the electric operator. The door will slowly move to the fully closed position, regardless of the door’s commanded state. Obstruction detection is active during the homing sequence. Once the door reaches the fully closed (home) position, the door will return to the normal operating state and respond to commands via the driver’s door controller. For example: If the driver’s door controller is in the open position during the homing sequence, the door will move to the full open position after reaching the fully closed (home) position.
2.3 Pneumatic Emergency Release (remote)

- A remote mounted air cylinder can be used as another option to activate the emergency release.
- The emergency release can be activated by a rotary dump valve located near the door or a driver's air dump switch located near the driver.
- The release can also be activated by an electric solenoid valve that will remove air from the cylinder when the bus run switch is turned off.
- Before exiting the bus, the driver turns off the bus run switch and turns the driver’s dump valve to the OFF position exhausting air from the emergency release device which disengages the clutch on the electric operator. The doors enter a neutral state and can be operated manually by hand.
- Upon returning to the bus, the doors are still in a neutral state. The driver turns on the bus run switch and returns the driver’s dump valve to the ON position applying air to the emergency release device. Once adequate air pressure is achieved the emergency release device will initiate the homing sequence by engaging the clutch on the electric operator. The door will slowly move to the fully closed position, regardless of the door’s commanded state. Obstruction detection is active during the homing sequence. Once the door reaches the fully closed (home) position, the door will return to the normal operating state and respond to commands via the driver’s door controller. For example: If the driver’s door controller is in the open position during the homing sequence, the door will move to the full open position after reaching the fully closed (home) position.
2.4 Pneumatic emergency release without dump valve solenoid (entrance door)

- The pneumatic emergency release operates similar to an existing pneumatic emergency release system.
- Before exiting the bus, the driver turns off the bus run switch and turns the driver’s dump valve to the OFF position exhausting air from the emergency release device which disengages the clutch on the electric operator. The doors enter a neutral state and can be operated manually by hand.
- Upon returning to the bus, the doors are still in a neutral state. The driver turns on the bus run switch and returns the driver’s dump valve to the ON position applying air to the emergency release device. Once adequate air pressure is achieved the emergency release device will initiate the homing sequence by engaging the clutch on the electric operator. The door will slowly move to the fully closed position, regardless of the door’s commanded state. Obstruction detection is active during the homing sequence. Once the door reaches the fully closed (home) position, the door will return to the normal operating state and respond to commands via the driver’s door controller. For example: If the driver’s door controller is in the open position during the homing sequence, the door will move to the full open position after reaching the fully closed (home) position.

2.5 Pneumatic emergency release with dump valve solenoid (entrance door)

- The pneumatic emergency release operates similar to an existing pneumatic emergency release system.
- Before exiting the bus, the driver turns off the bus run switch which removes power from the magnetic dump valve solenoid. Air is exhausted from the emergency release device which disengages the clutch on the electric operator. The doors enter a neutral state and can be operated manually by hand.
- Upon returning to the bus, the doors are still in a neutral state. The driver turns on the bus run switch and applies power to the Command State dump valve. Once adequate air pressure is achieved the emergency release device will initiate the homing sequence by engaging the clutch on the electric operator. The door will slowly move to the fully closed position, regardless of the door’s commanded state. Obstruction detection is active during the homing sequence. Once the door reaches the fully closed (home) position, the door will return to the normal operating state and respond to commands via the driver’s door controller. For example: If the driver’s door controller is in the open position during the homing sequence, the door will move to the full open position after reaching the fully closed (home) position.
2.6 Pneumatic emergency release dump valve (exit door)

- The pneumatic emergency release operates similar to an existing pneumatic emergency release system.
- When the emergency release dump valve is activate, the air is exhausted from emergency release air cylinder disengaging the clutch on the electric operator. The doors enter a neutral state and can be operated manually by hand.
- When the emergency release dump valve is reset back to normal position, the emergency release air cylinder will reset.
- Once adequate air pressure is achieved the emergency release device will initiate the homing sequence by engaging the clutch on the electric operator. The door will slowly move to the fully closed position, regardless of the door’s commanded state. Obstruction detection is active during the homing sequence. Once the door reaches the fully closed (home) position, the door will return to the normal operating state and respond to commands via the driver’s door controller. **For example:** If the driver’s door controller is in the open position during the homing sequence, the door will move to the full open position after reaching the fully closed (home) position.

![Normal emergency release state](image1)

![Activated emergency release state](image2)
3  **Quick Setup door linkage adjustment**

The Vapor door controller has a setup button that will assist in the door linkage adjustment. The Yellow button is located next to the Setup LED indicator on the front of the control. Press this button for 5 seconds to start the quick setup mode. The setup LED indicator will be lite when in the quick setup mode.

If the emergency release is engaged, the pressing of the Quick setup button will reengage the door operator.

If the door has an air operated emergency release, reset the emergency release air valve to the normal operating position.

**Warning** the electric door operator, door panels and door linkage will be in motion during this adjustment and caution should be taken to prevent bodily harm.
3.1 Step 1 (home position)
This step is normally performed with the door linkage removed. If the door linkages are connected, remove them before continuing. During the home position location process, the teeter lever may rotate more than 360 degrees when searching for the home position. When the motor stops the teeter is in the home position. Note that the keyway on the teeter shaft is almost vertical or facing towards the inside of the bus.
3.2 Step 2 (door close, adjust linkage)
Press and then release the setup button again and the controller will move the teeter to the fully closed position.
Reconnect and adjust the door linkage until the proper amount of preload has been achieved to provide a tight door seal.
The Setup LED will still be on and the controller still in the Setup mode.

3.3 Step 3 (encoder calibration)
Press and then release the setup button again and the controller will run the encoder calibrate process. The door will open fully and then close at a slow speed allowing the encoder position to be calibrated.
When complete, the Setup Led will turn off allowing normal door operation.
4 Door Obstruction

4.1 Front Door Closing Obstruction
The front doors typically do not have a sensitive edge to detect obstructions when closing. The control can detect an obstruction as the door is closing. It cannot detect an obstruction during the last few inches of the door closing movement. A front door closing obstruction is determined by the control monitoring the front door movement.

If an obstruction is detected during the closing, the door will stop and recyle to the open position. There will be a one second delay once the door has reached the door fully open position. After the delay the controller will then respond to the current door command signal. If the signal indicates a door close command, the door will start to close. If the command is in the door open command, the door will remain in the open position.

4.2 Rear Door Closing Obstruction
The rear doors will typically use sensitive door edge sensors to detect an obstruction while closing. The sensitive edge signals are wired into the electric operator control.

The electric operator will monitor and react to the sensitive edge signal during the entire time that the door is closing until the door is fully closed.

If a sensitive edge is detected during a door closing movement, the door will stop and then recycle open. There will be a one second delay once the door has reached the door fully open position. After the one second delay the controller will then respond to the current door command signal. If the signal indicates a door close command, the door will start to close. If the command is in the door open command, the door will remain in the open position. The electric operator control can also detect a closing obstruction by monitoring the door movement.

4.3 Door Open Obstruction
The door will stop when an obstruction is detected as the door is opening. After a 1 second delay, the door will continue to move in the opening direction. If an obstruction is detected again, the door will stop for one second and then resume opening. After 3 (default setting) attempts to open, the door will stop and enter the fault state. Commanding the door to close will clear the fault and return to normal operation.
5 Electric Door Controller

![Diagram of Electric Door Controller]

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>J1 Voice Annunciator Port</td>
</tr>
<tr>
<td>2</td>
<td>J12 Quadrature Encoder</td>
</tr>
<tr>
<td>3</td>
<td>J5 Bus Interface</td>
</tr>
<tr>
<td>4</td>
<td>J7 J1939 Interface</td>
</tr>
<tr>
<td>5</td>
<td>J9 Baseplate Interface</td>
</tr>
<tr>
<td>6</td>
<td>J11 Motor and Power</td>
</tr>
<tr>
<td>7</td>
<td>J13 USB Port</td>
</tr>
<tr>
<td>8</td>
<td>Setup LED</td>
</tr>
<tr>
<td>9</td>
<td>Maintenance LED</td>
</tr>
<tr>
<td>10</td>
<td>Fault LED</td>
</tr>
<tr>
<td>11</td>
<td>Power LED</td>
</tr>
<tr>
<td>12</td>
<td>Quick Setup Button</td>
</tr>
</tbody>
</table>
6 Controller inputs

The controller has been designed with optically coupled input circuitry. Each input can be configured for an active high or active low signal. The standard configuration is active high.

6.1 Speed interlock/ Door Enable input
This input is used to enable the door controller to allow the door to move. When this signal is low, the motor drive circuit is disabled. For an entrance door, this signal can be connected to a vehicle speed signal, or a signal providing the necessary logic needed to open and close the door. Some properties have requirements to open and close the entrance door while the bus is moving. For an exit door, this input would be connected to a vehicle speed signal to prevent the door from opening while the bus is moving.

6.2 Air dump pressure switch input
This input is wired to a pressure switch that is used to monitor the air pressure supplied to the emergency release cylinder. The state of the pressure switch is used to automatically reengage the mechanical operator.

6.3 Door closed input
This signal comes from the proximity sensor located on the gearbox. It senses a metal bracket attached to the teeter lever. When the sensor detects the bracket, the door is in the closed position.

6.4 Door command input
This input commands the controller to open and close the door. A high signal will command the door to open. The door will close when the signal goes low.

6.5 Emergency release input
This signal comes from a proximity sensor located on the gearbox. This sensor monitors the emergency release mechanism. During normal operation this input is high from the sensor. If the emergency release mechanism is activated this signal will be low.

6.6 Sensitive edge input
This input can be wired to sensitive edge pressure switch. When the pressure switch has sensed an obstruction, this signal to this input goes high. This will stop the doors from closing and then re-open them.

6.7 Power Input
This input powers on and off the controller. A 24 VDC signal will turn on the controller. The signal was added to allow the controller to be powered down when the bus run switch is turned off. This is a low current signal less than 1 Amp. All the high current is supplied on J11 for the motor.
7 Controller outputs
The controller outputs are high side switches rated at 1 Amp. When active these drivers will supply a signal at the vehicle supply voltage. The logic for the bus interface is configurable to the requirements of the OEM.

7.1 Emergency release output
During normal door operation when the emergency release is not activated, this output will be on. When the controller is in the emergency release state, this output will be off.

7.2 Door fully open output
The output will be on when the controller is in the door fully open position.

7.3 Door fully closed output
This output will be on when the controller is in the door fully closed position.

7.4 Door obstruction signal output
This output will pulse on for a short duration when the controller has detected an obstruction. The controller will also monitor the pneumatic sensitive edge pressure wave switch and activate this output signal.

7.5 Emergency release solenoid output
This output is connected to the release reset solenoid. This output is turned on to activate the solenoid to allow the emergency release to reset.

7.6 Motor brake output
This output is connected to the motor brake solenoid. When turned on, the motor brake will disengage to allow the electric operator to move the doors.

8 LED indicators

8.1 Setup LED
The setup LED is active during the Quick Setup door linkage adjustment procedure.

8.2 Maintenance LED
The maintenance LED does not have a function with the current release of firmware. It will momentarily indicate the controller is saving data to the file system.

8.3 Fault LED
The fault LED indicates when the controller has entered a fault state. To exit the fault state, command the door to the close position.

8.4 Power LED
The power LED indicates when the controller is powered.
9  **J1939 J7 connector (door position)**

The controller has the ability to function on a J1939 network. Connector J7 contains the connection points for the J1939 network as well as inputs can be used for door position information. The entrance door is always door 1 and does not require a connector with jumper wires. This allows a single controller part number to be placed in any door position on the bus. If J1939 network is not connected, the jumpers will still provide door position information to the controller.

<table>
<thead>
<tr>
<th>Door Number</th>
<th>Address 1</th>
<th>Address 2</th>
<th>Address 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance door</td>
<td>Door 1</td>
<td>J7-1, J7-12</td>
<td>N.C.</td>
</tr>
<tr>
<td>Middle Door Curb</td>
<td>Door 2</td>
<td>Jumper</td>
<td>N.C.</td>
</tr>
<tr>
<td>Rear Door Curb</td>
<td>Door 3</td>
<td>N.C.</td>
<td>Jumper</td>
</tr>
<tr>
<td>Middle Door Street</td>
<td>Door 4</td>
<td>Jumper</td>
<td>Jumper</td>
</tr>
<tr>
<td>Read Door Street</td>
<td>Door 5</td>
<td>N.C.</td>
<td>N.C.</td>
</tr>
</tbody>
</table>
10 Electric door controller wiring
11 Control Connectors for 51250295-xx

11.1 J1 Voice Annunciator (Vapor)
The plug for this connector is supplied on the Vapor 50740055-xx Voice Annunciator.

11.2 J12 Quadrature Encoder (Vapor)
The plug for this connector is supplied on the Vapor encoder cable 51130459-xx.

11.3 J5 Bus Interface (Grey) (OEM Supplied)
- Deutsch DT06-12SA-CE06 (Grey) (Connector-Plug 12 pin
- Deutsch 0462-201-16141 Solid Socket
- Deutsch W12S-P012 Wedge Lock

11.4 J7 J1939 Interface (Black) (OEM Supplied)
- Deutsch DT06-12SB-CE06 (Black) Connector-Plug 12 pin
- Deutsch 0462-201-16141 Solid Socket
- Deutsch W12S-P012 Wedge Lock

11.5 J9 Baseplate Interface (Green) (Vapor)
- Deutsch DT06-12SC-CE06 (Green) Connector-Plug 12 pin
- Deutsch 0462-201-16141 Solid Socket
- Deutsch W12S-P012 Wedge Lock
The plug for this harness is supplied on the Vapor Baseplate Harness 51250298-xx.

11.6 J11 Power and Motor (Vapor)
The following part numbers are for the connector and pin needed on the harness.
- Housing Receptacle 4 position Minifit Sr. Molex 0428160412
- Socket Terminal 12-10 AWG Minifit Sr. Molex 0428150011
The plug for this connector is supplied on the Vapor Power/Motor Cable 51250296-xx.

11.7 J13 USB Port
This port is for programming and diagnostics.
Use a standard USB 2.0 A/B cable for diagnostic program
11.8 Operator mounted connectors
These part numbers are for the harness side connectors. This is what an OEM would need to build a wire harness for the electric operator.

- Door Fully Closed Proximity sensor connector
- The following part numbers are for the connector and pin needed on the harness.
  - 50120322-08 Receptacle Housing 3 circuit    AMP 172234-1
  - 50120322-11 Pin (20-16 AWG)                AMP 794406-3

- Emergency Release Proximity sensor connector
- The following part numbers are for the connector and pin needed on the harness.
  - 50120322-08 Receptacle Housing 3 circuit    AMP 172234-1
  - 50120322-11 Pin (20-16 AWG)                AMP 794406-3

- Brake connector
- The following part numbers are for the connector and pin needed on the harness.
  - 51130400-11 Receptacle Housing 2 circuit Minifit Jr Molex 0039012025
  - 51130400-15 Socket (24-18 AWG) Minifit Jr Molex 0039000039

- Emergency release solenoid connector
- The following part numbers are for the connector and pin needed on the harness.
  - 51130400-11 Receptacle Housing 2 circuit Minifit Jr Molex 0039012025
  - 51130400-15 Socket (24-18 AWG) Minifit Jr Molex 0039000039

- Motor
- The following part numbers are for the connector and pin needed on the harness.
  - 51130400-07 Receptacle Housing 2 circuit Molex 0019091026
  - 51130400-09 Socket (20-14 AWG) Molex 0002091104

11.9 OEM harness power connector
This part number is for the connector that an OEM would need on the bus side to supply power to a Vapor harness.

- Harness power connector
- Plug 2-position Delphi Metri-Pack 280 Delphi 15300027
- Connecters Female Metri-Pack 280 Delphi 12077413
- Secondary Lock Metri-Pack 280 Delphi 15300014
# 12 Signal Timing

## 12.1 Door Open Sequence

<table>
<thead>
<tr>
<th>Speed Interlock Input</th>
<th>Door Open Sequence</th>
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</thead>
<tbody>
<tr>
<td>≤ 3 MPH</td>
<td>Door Open</td>
</tr>
<tr>
<td>&gt; 3 MPH</td>
<td>Door Closed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Door Command Input</th>
<th>Emergency Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Door Normal</td>
</tr>
<tr>
<td>Close</td>
<td>Door Released</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Door Fully Open Output</th>
<th>Obstruction Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Open</td>
<td>Obstruction</td>
</tr>
<tr>
<td>Not Open</td>
<td>No Obstruction</td>
</tr>
</tbody>
</table>

## 12.2 Door Close Sequence

<table>
<thead>
<tr>
<th>Speed Interlock Input</th>
<th>Door Close Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 3 MPH</td>
<td>Door Open</td>
</tr>
<tr>
<td>&gt; 3 MPH</td>
<td>Door Closed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Door Command Input</th>
<th>Emergency Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Door Normal</td>
</tr>
<tr>
<td>Close</td>
<td>Door Released</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Door Fully Open Output</th>
<th>Door Fully Closed Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Open</td>
<td>Obstruction</td>
</tr>
<tr>
<td>Not Open</td>
<td>No Obstruction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Obstruction Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruction</td>
</tr>
<tr>
<td>No Obstruction</td>
</tr>
</tbody>
</table>
### 12.3 Door Emergency Release Activated

<table>
<thead>
<tr>
<th>Speed Interlock Input</th>
<th>Door Closed Emergency Release Activated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 3 MPH Open</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 MPH Closed</td>
</tr>
<tr>
<td>Door Command Input</td>
<td></td>
</tr>
<tr>
<td>Emergency Input</td>
<td>Door Normal</td>
</tr>
<tr>
<td>Emergency Output</td>
<td>Door Released</td>
</tr>
<tr>
<td>Door Fully Open Output</td>
<td></td>
</tr>
<tr>
<td>Door Fully Closed Output</td>
<td>Door Open Not Open</td>
</tr>
<tr>
<td>Obstruction Output</td>
<td>Obstruction</td>
</tr>
<tr>
<td>Emergency Release</td>
<td>No Obstruction</td>
</tr>
</tbody>
</table>

### 12.4 Door Emergency Release Reset

<table>
<thead>
<tr>
<th>Speed Interlock Input</th>
<th>Door Emergency Release Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 3 MPH Open</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 MPH Closed</td>
</tr>
<tr>
<td>Door Command Input</td>
<td></td>
</tr>
<tr>
<td>Emergency Input</td>
<td>Door Normal</td>
</tr>
<tr>
<td>Emergency Output</td>
<td>Door Released</td>
</tr>
<tr>
<td>Door Fully Open Output</td>
<td>Door Released</td>
</tr>
<tr>
<td>Door Fully Closed Output</td>
<td>Door Closed Not Closed</td>
</tr>
<tr>
<td>Obstruction Output</td>
<td>Obstruction</td>
</tr>
<tr>
<td>Emergency Release</td>
<td>No Obstruction</td>
</tr>
</tbody>
</table>

**Door Controller engages Clutch**  
Door Moves to Closed Position  
Door Fully Closed
### 12.5 Front Door Air Dump Release (Air Dumped From Pneumatic Cylinder)

<table>
<thead>
<tr>
<th>Speed Interlock Input</th>
<th>&lt; 3 MPH</th>
<th>&gt; 3 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Command Input</td>
<td>Open</td>
<td>Close</td>
</tr>
<tr>
<td>Emergency Output</td>
<td>Door Normal</td>
<td>Door Released</td>
</tr>
<tr>
<td>Air Dump PS Input</td>
<td>&lt;50 PSI</td>
<td>&gt;50 PSI</td>
</tr>
<tr>
<td>Door Fully Open Output</td>
<td>Door Open</td>
<td>Not Open</td>
</tr>
<tr>
<td>Door Fully Closed Output</td>
<td>Door Closed</td>
<td>Not Closed</td>
</tr>
<tr>
<td>Obstruction Output</td>
<td>Obstruction</td>
<td>No Obstruction</td>
</tr>
</tbody>
</table>

*Pneumatic air cylinder activate emergency release, disengages clutch*

### 12.6 Front Door Air Dump Reset (Air Reapplied to Pneumatic Cylinder)

<table>
<thead>
<tr>
<th>Speed Interlock Input</th>
<th>&lt; 3 MPH</th>
<th>&gt; 3 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Command Input</td>
<td>Open</td>
<td>Close</td>
</tr>
<tr>
<td>Emergency Output</td>
<td>Door Normal</td>
<td>Door Released</td>
</tr>
<tr>
<td>Air Dump PS Input</td>
<td>&lt;50 PSI</td>
<td>&gt;50 PSI</td>
</tr>
<tr>
<td>Door Fully Open Output</td>
<td>Door Open</td>
<td>Not Open</td>
</tr>
<tr>
<td>Door Fully Closed Output</td>
<td>Door Closed</td>
<td>Not Closed</td>
</tr>
<tr>
<td>Obstruction Output</td>
<td>Obstruction</td>
<td>No Obstruction</td>
</tr>
</tbody>
</table>

*Door disengaged, Door Controller engages Clutch, Door Moves to Closed Position, Door Fully Closed*
### 12.7 Door Close Obstruction

<table>
<thead>
<tr>
<th>Speed Interlock Input</th>
<th>&lt; 3 MPH</th>
<th>&gt; 3 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door Command Input</td>
<td>Oper</td>
<td>Crea</td>
</tr>
<tr>
<td>Sensitive Edge PWS Input</td>
<td>Obstruction</td>
<td>No Obstruction</td>
</tr>
<tr>
<td>Emergency Output</td>
<td>Door Normal</td>
<td>Door Released</td>
</tr>
<tr>
<td>Air Dump PS Input</td>
<td>95 PSI</td>
<td>85 PSI</td>
</tr>
<tr>
<td>Door Fully Open Output</td>
<td>Door Open</td>
<td>Not Open</td>
</tr>
<tr>
<td>Door Fully Closed Output</td>
<td>Door Closed</td>
<td>Not Closed</td>
</tr>
<tr>
<td>Obstruction Output</td>
<td>Obstruction</td>
<td>No Obstruction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Door Fully Open</th>
<th>Door Closing</th>
<th>Door Recedes to Open Position</th>
<th>Door Open 1 Second Wait</th>
<th>Door Closing</th>
<th>Door Fully Closed</th>
</tr>
</thead>
</table>
13 Door power up operation
The control will monitor the door closed sensor at power up to determine the door position. The control also uses an encoder to determine door position but does not retain this information after the power is removed. The door will synchronize the encoder each time the door is in the closed position.
The encoder is tested at power by jogging the motor to confirm that the encoder is functioning.

13.1 Door closed
If the door closed sensor is detected at power-up, the controller will perform a test to determine if the door is closed. When the test has passed the control is placed in the door fully closed state.

13.2 Door not closed
If the door closed sensor is not detected at power-up, the controller will be placed in the door fault state. At this point the control does not know if the door is open or closed. The door open signal is sent to the bus. When a door command signal change from open to close is detected, the door will move slowly to the closed position. When the door stops moving, the position encoder will be synchronized with the door.
14 Emergency Release Logic

14.1 Emergency Release Sensor
This sensor is used to monitor the status of the emergency release clutch in the gearbox. The engagement of the emergency release clutch is confirmed when the target is detected by the emergency release proximity sensor.
When the target is detected, the signal from proximity sensor is 24VDC. The signal wire is connected to pin J9-2 on the base plate connector J9.
When the emergency release has been activated, the target arm rotates away from the proximity sensor. The emergency release proximity sensor signal will be near 0VDC.
The controller will detect the low signal state and then the software will switch to the emergency release state.

14.2 Emergency Release State
When the controller enters the emergency release state, the J5-7 emergency release signal, J5-8 door fully open and J5-9 door fully closed output will change state.
These changes are assuming that the door is fully closed.
- J5-7 emergency release signal is will change from 24VDC to 0VDC
- J5-8 door fully open signal is will change from 0VDC to 24VDC
- J5-9 door fully closed signal is will change from 24VDC to 0VDC
These changes are assuming that the door is fully open.
- J5-7 emergency release signal is will change from 24VDC to 0VDC
- J5-8 door fully open signal, no change 24VDC
- J5-9 door fully closed signal no change 0VDC

In this state the control will be monitoring the J9-5 air pressure switch and J5-3 door command input signals.
There are several ways to command the controller to reset the emergency release clutch, allowing the door to return to normal function.

14.3 Emergency Release Reset Pneumatic
The controller will not attempt to reset the door while the bus is in motion.
In the case of a bus with a pneumatic release air dump valve, the J9-5 air pressure switch is monitor to determine if the air has been restored to the system. When the air is restored, the controller will attempt to reengage the clutch by driving the motor in the forward and reverse directions. The sequence is repeated 5 times, when the clutch resets to the engaged position, the emergency release arm and target will rotate back to the normal position and is detected by the emergency release proximity sensor.
The controller will then proceed to move the door to the closed position. When fully closed, the following signals will change state.
- J5-7 emergency release signal is will change from 0VDC to 24VDC
- J5-8 door fully open signal is will change from 24VDC to 0VDC
- J5-9 door fully closed signal is will change from 0VDC to 24VDC
14.4 Emergency Release Reset Mechanical Release Cable

The controller will not attempt to reset the door while the bus is in motion. In the case of a bus with a mechanical emergency release cable, the J5-3 door command input is monitored to detect a transition from 24VDC to 0VDC. This transition represents the door command signal transition from an open command to a closed command. When the sequence is detected, the controller will attempt to reengage the clutch by driving the motor in the forward and reverse directions. The sequence is repeated 5 times, when the clutch resets to the engaged position, the emergency release arm and target will rotate back to the normal position and is detected by the emergency release proximity sensor.

The controller will then proceed to move the door to the closed position. When fully closed, the following signals will change state:

- J5-7 emergency release signal is will change from 0VDC to 24VDC
- J5-8 door fully open signal is will change from 24VDC to 0VDC
- J5-9 door fully closed signal is will change from 0VDC to 24VDC
15 Controller electrical specifications PN 51220550-xx

Part Number 51220550-xx

Supply Voltage:
- Nominal: 24-28 VDC 30 Amp protected circuit
- Range: 20 to 36VDC

Supply Current:
- Note: J5-12 supplies power to the logic and output drivers (Max 3 Amps)
- Note: J11-1 supplies power to the DC drive motor (Max 20 Amps)
- The J11-1 typical current during the door movement is 2-10 Amps.
- The J11-1 current can reach 20 Amps during a door obstruction event.
- The J11-1 current at end of door cycle is 16 Amps for 500 milliseconds.

Control powered off (J5-12 Logic Power Supply Input Low 0 VDC)
- J5-12 (0 ma)
- J11-1 (5 ma)

Control powered on (J5-12 Logic Power Supply Input High 24 VDC)
- J5-12 (150 mA) Door not moving
- J11-1 (5 mA) Door not moving

Input Signals: All input signals are active high.
- J5-1 Input 1 Speed interlock (from OEM)
  - (Low = 3.5V, High = 7.5V) 1K ohm pull down resistor
- J5-2 Input 2 Spare
  - (Low = 3.5V, High = 7.5V) 1K ohm pull down resistor
- J9-1 Input 3 Door fully closed proximity switch
  - (Low = 3.5V, High = 7.5V) 47K ohm pull down resistor
- J5-3 Input 4 Door Command (from OEM)
  - (Low = 3.5V, High = 7.5V) 1K ohm pull down resistor
- J9-2 Input 5 Emergency release proximity Sensor
  - (Low = 3.5V, High = 7.5V) 47K ohm pull down resistor
- J5-4 Input 6 Spare
  - (Low = 3.5V, High = 7.5V) 47K ohm pull down resistor
- J9-3 Input 7 Sensitive edge switch
  - (Low = 3.5V, High = 7.5V) 47K ohm pull down resistor
- J5-5 Input 8 Spare
  - (Low = 3.5V, High = 7.5V) 47K ohm pull down resistor
- J9-4 Input 9 Door position signal (0=entrance, 1=exit)
  - (Low = 3.5V, High = 7.5V) 47K ohm pull down resistor
- J9-5 Input 10 Air dump pressure switch (entrance)
  - Touch Handle switch (exit)
  - (Low = 3.5V, High = 7.5V) 47K ohm pull down resistor
Output Drivers:
- J5-6, J9-7 Output 1 Spare
  - Source High (1.0 Amp)
- J5-7 Output 2 Emergency release output
  - Source High (1.0 Amp) Sink Low (.55 Amp)
- J5-8 Output 3 Door fully open output
  - Source High (1.0 Amp) Sink Low (.55 Amp)
- J5-9 Output 4 Door fully closed output
  - Source High (1.0 Amp) Sink Low (.55 Amp)
- J9-6 Output 5 Emergency release solenoid
  - Source High (2.9 Amp)
- J5-10 Output 6 Touch Handle output
  - Source High (1.0 Amp)
- J5-11 Output 7 Obstruction detect output
  - Source High (1.0 Amp) Sink Low (.55 Amp)
- J9-8 Output 8 Motor Brake solenoid
  - Source High (2.9 Amp)

Motor Drive:
- Max Current (short-circuit shutdown): 30 A

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