



Distribution Automation Orion Application Document

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Orion DA-Master Application Note

DA-Master is a software option available on the Orion5 and Orion5r Automation Platforms. Using point-and-click configuration techniques within NovaTech Communications Director (NCD), DA-Master reduces the complexity of setting up DA isolation and restoration schemes.

This note describes a typical, but simplified, Orion DA-Master application where a three-zone radial feeder, with an alternate source, is automated to minimize outage times.

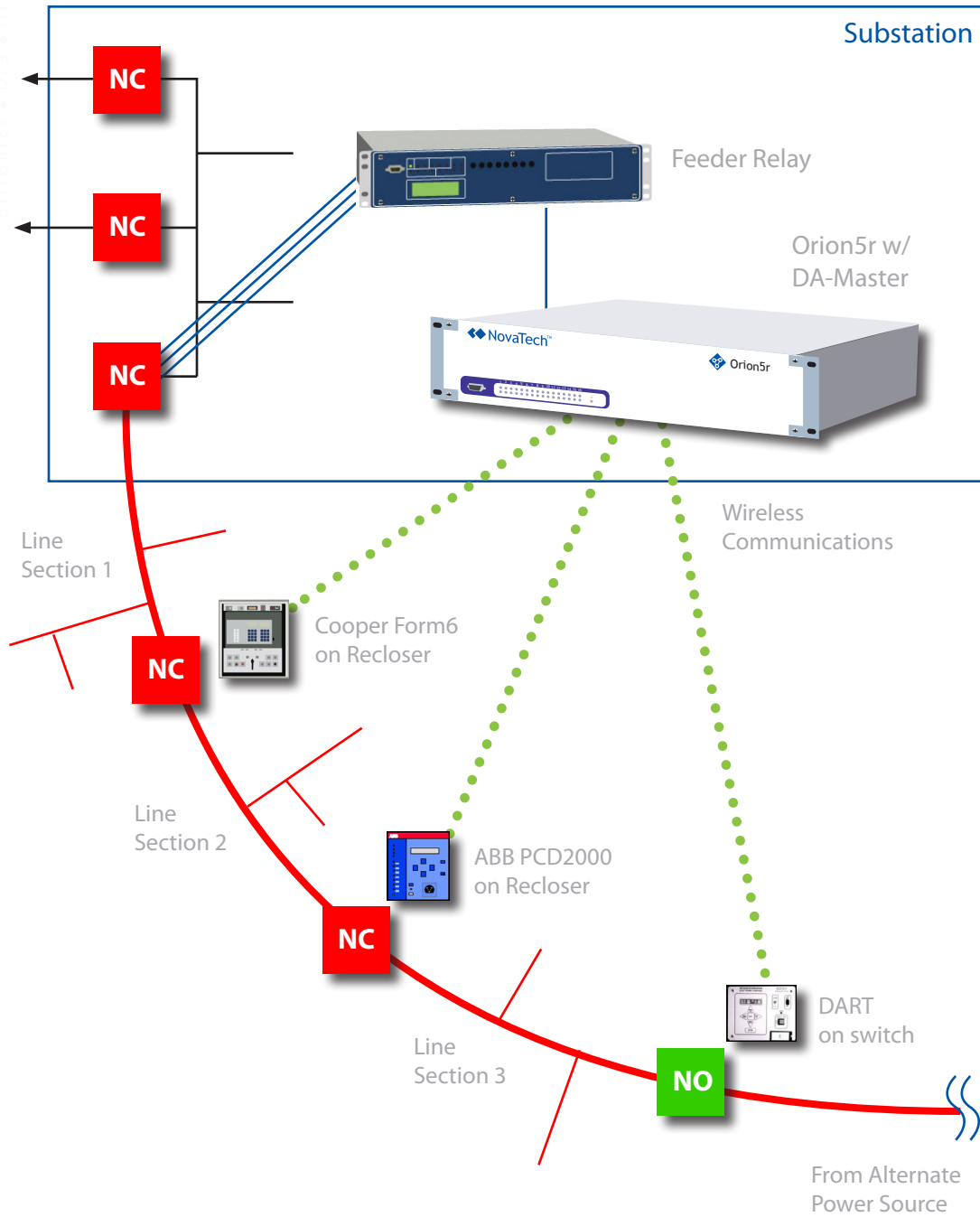
Included in this note:

- 1) Description of DA system components
- 2) Breaking a feeder into Zones
- 3) Step-by-step details of the DA-Master response to four different fault conditions
- 4) NCD Configuration for these schemes

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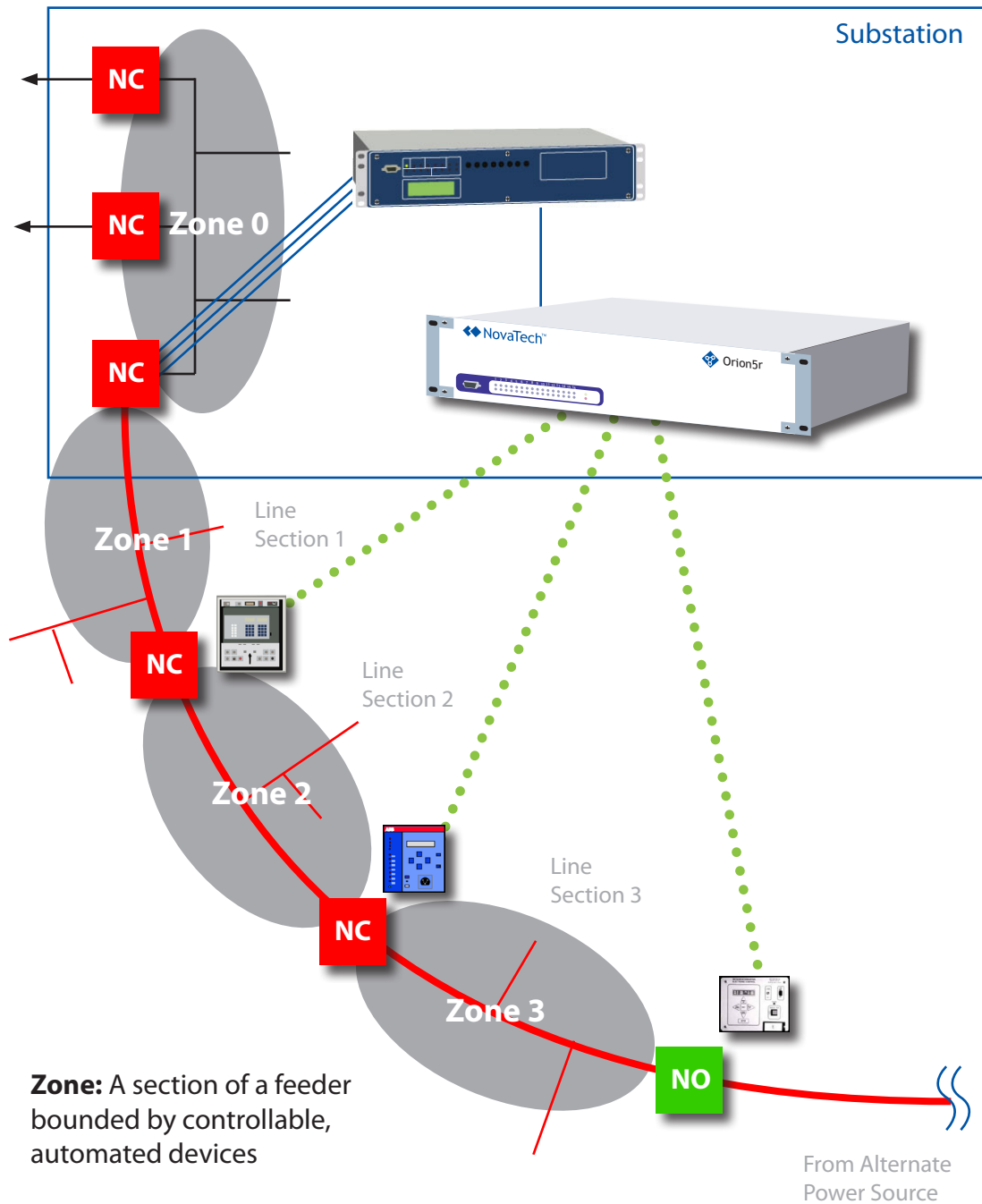


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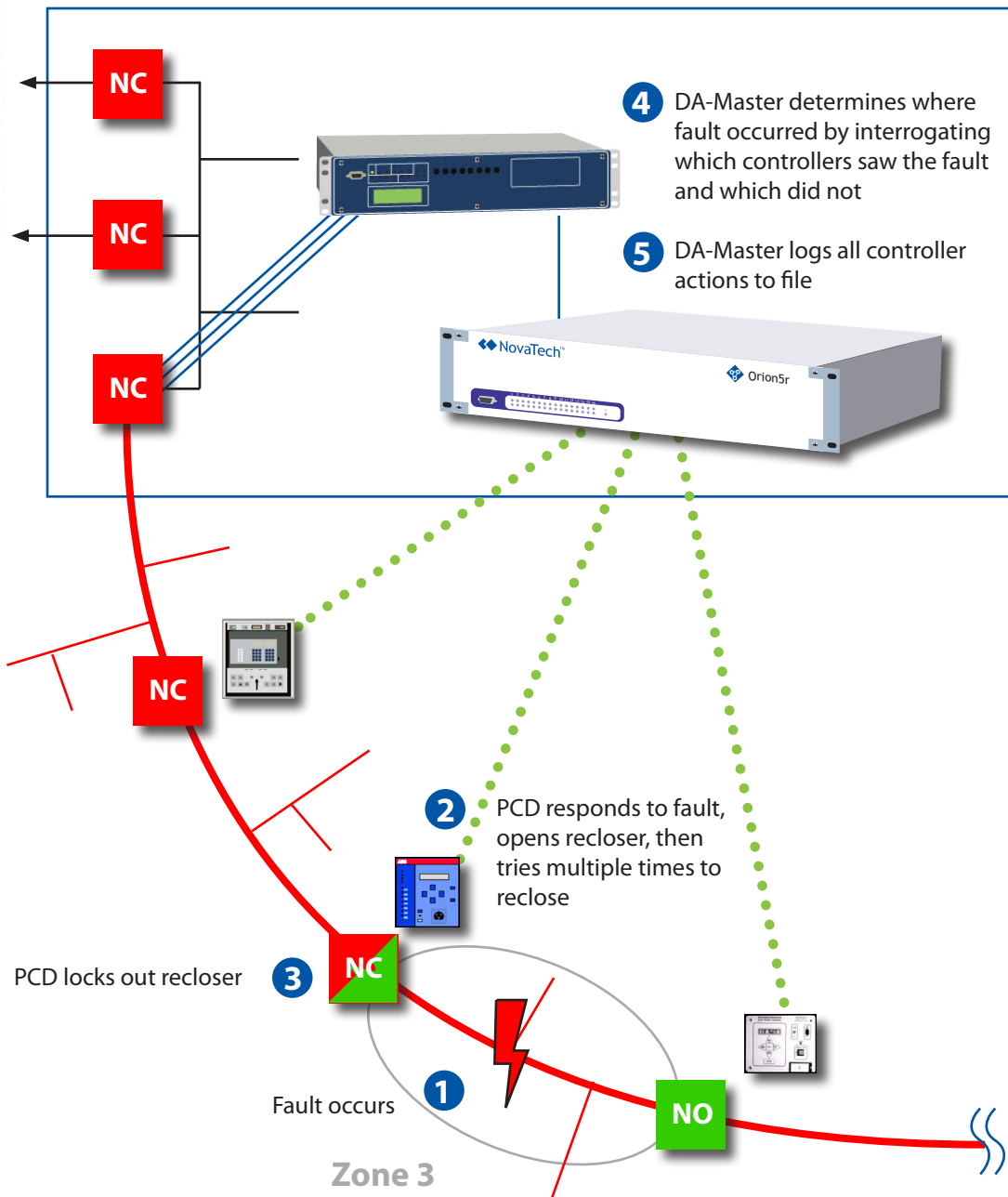




Breaking a Feeder into Zones

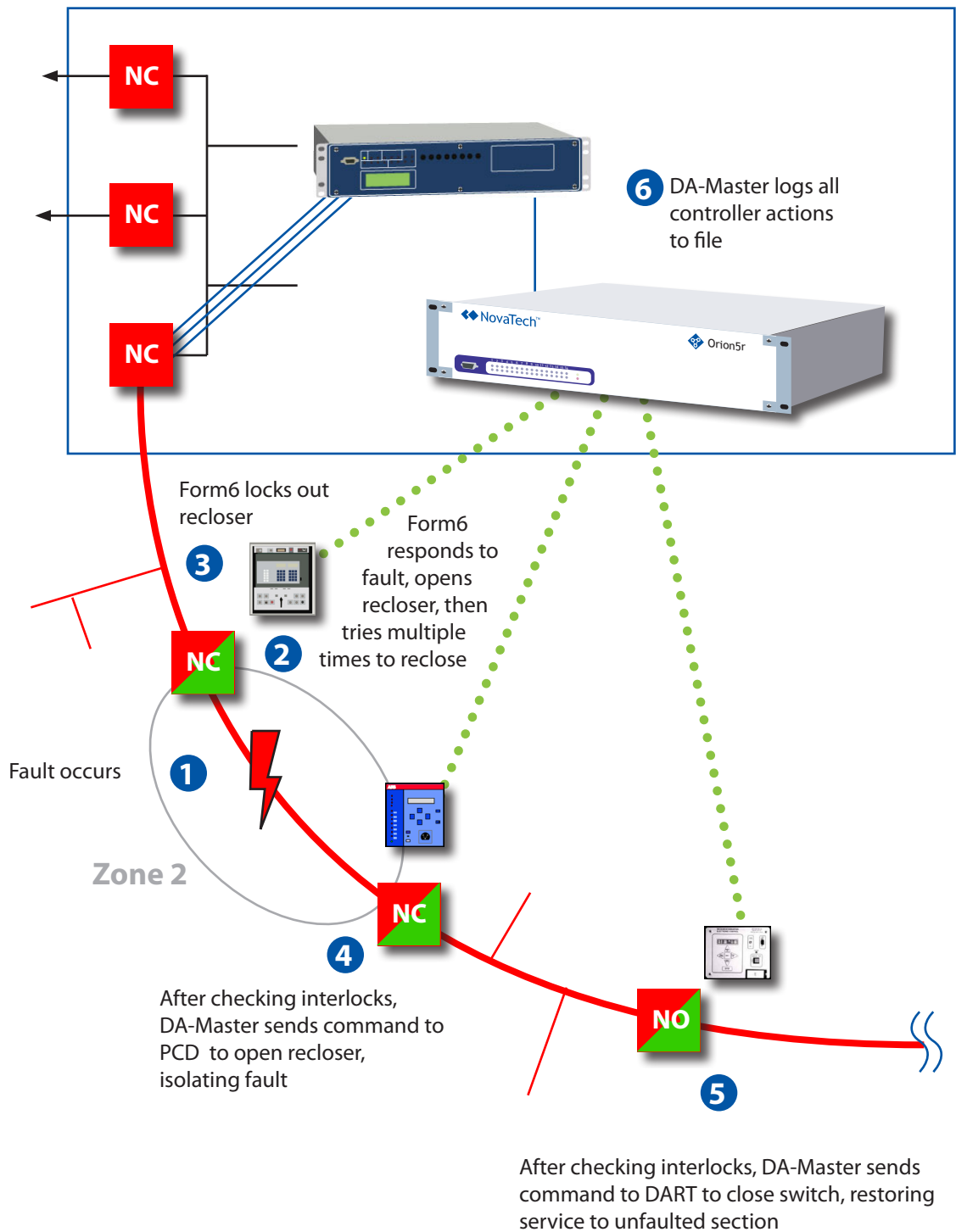


DA-Master Response to Permanent Zone 3 Fault (Automatic)





DA-Master Response to Permanent Zone 2 Fault (Automatic)

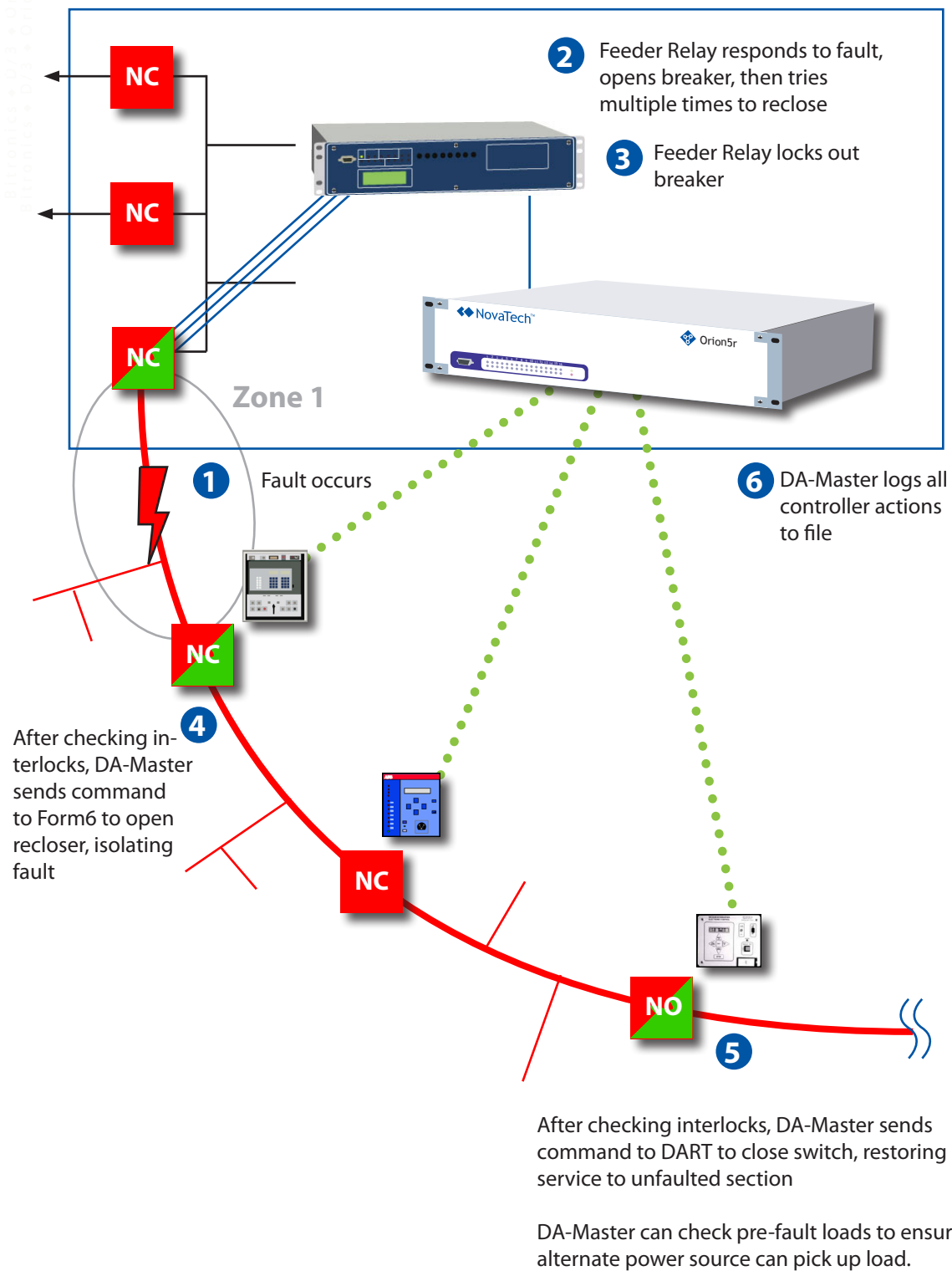


DA-Master can check pre-fault loads to ensure alternate power source can pick up load.



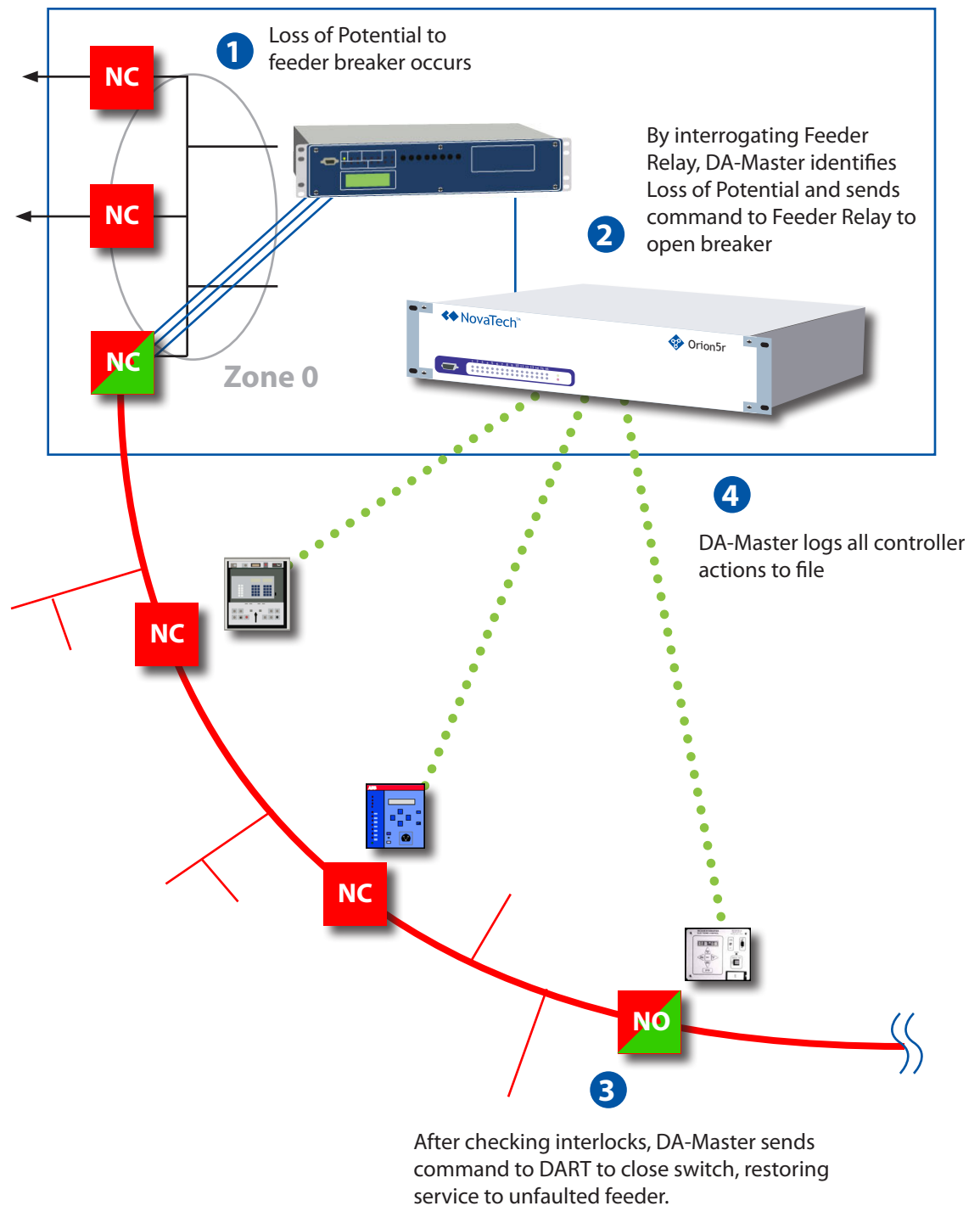
DA-Master Response to Permanent Zone 1 Fault (Automatic)

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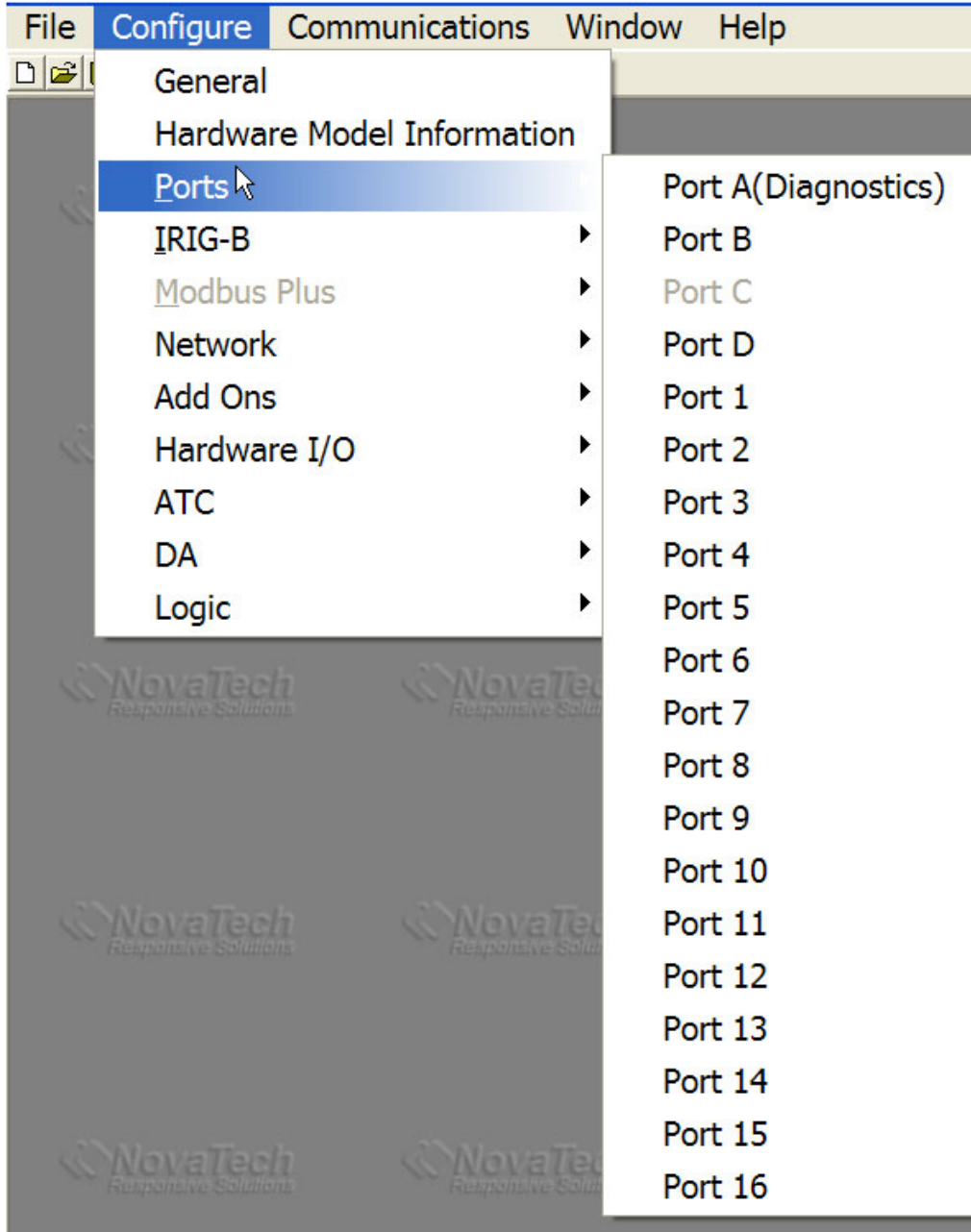
**DA-Master Response to Bus Zone 0 Fault
- Loss of Potential (Automatic)**



DA-Master can check pre-fault loads to ensure alternate power source can pick up load.

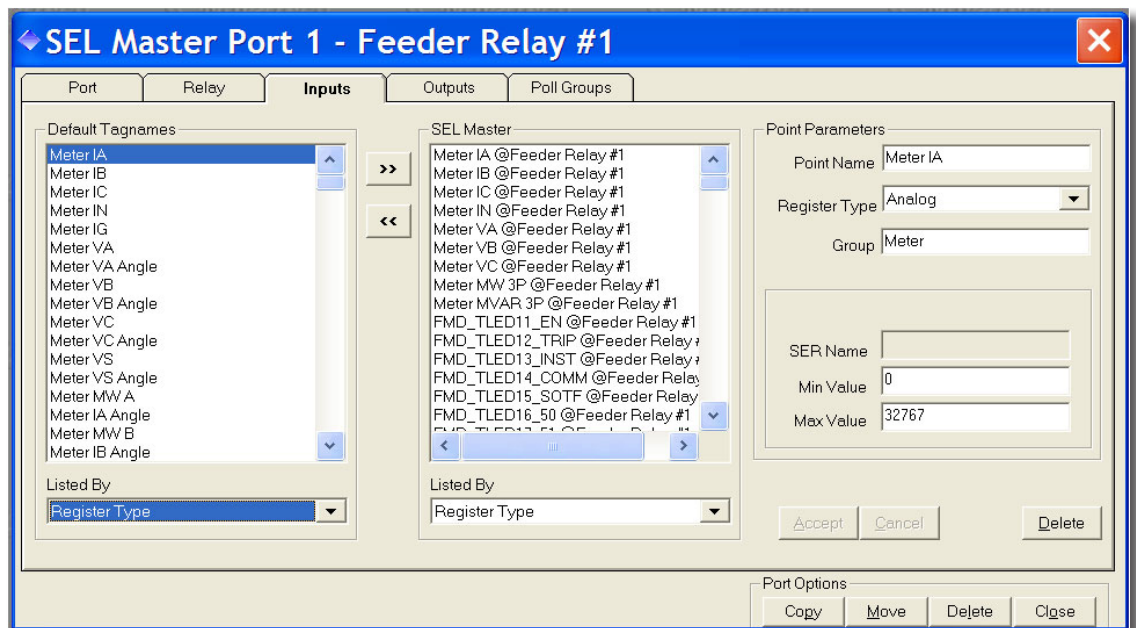
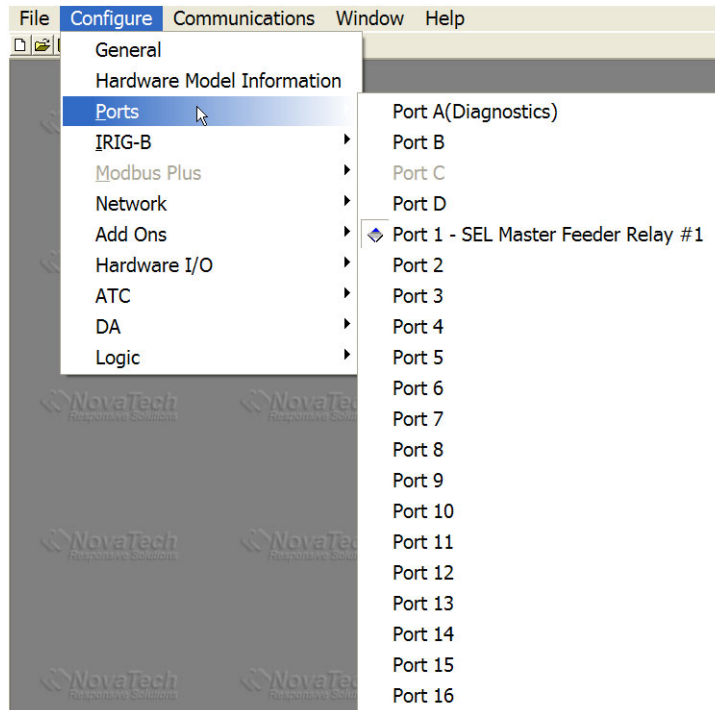


1. Open new NCD configuration.



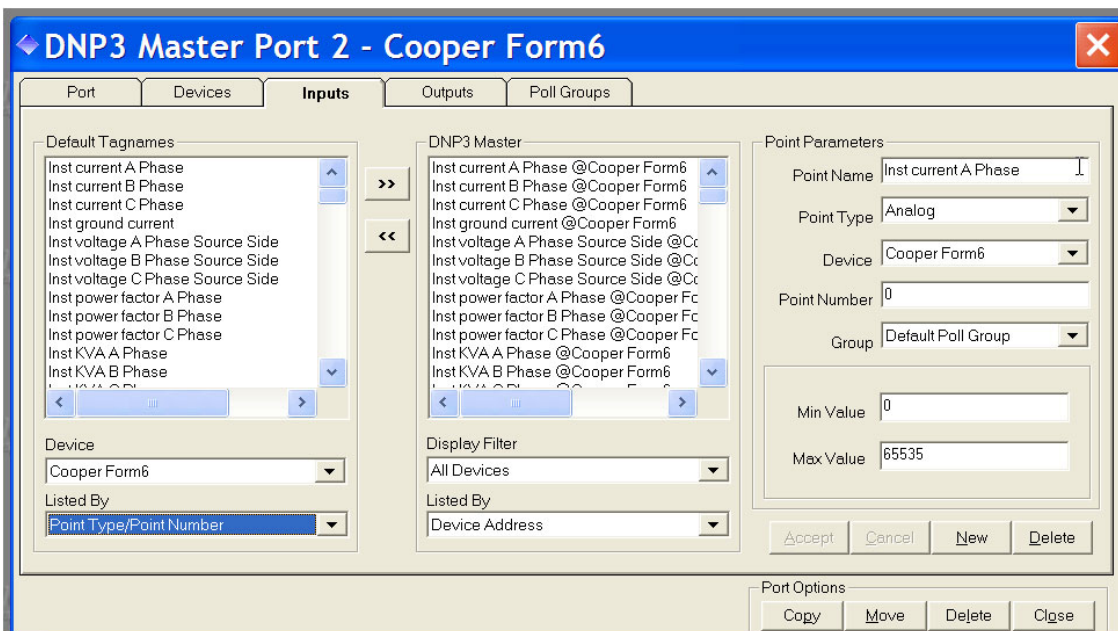
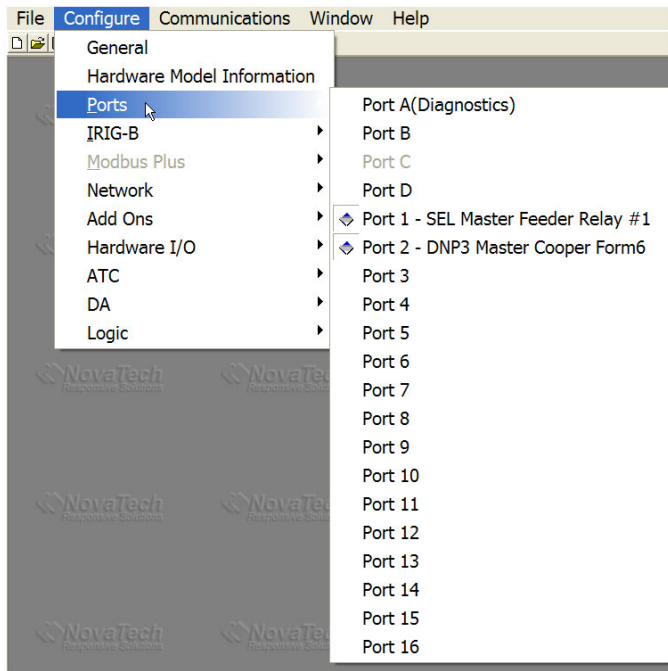


2. Configure points to be read from and written to SEL® Feeder Relay.





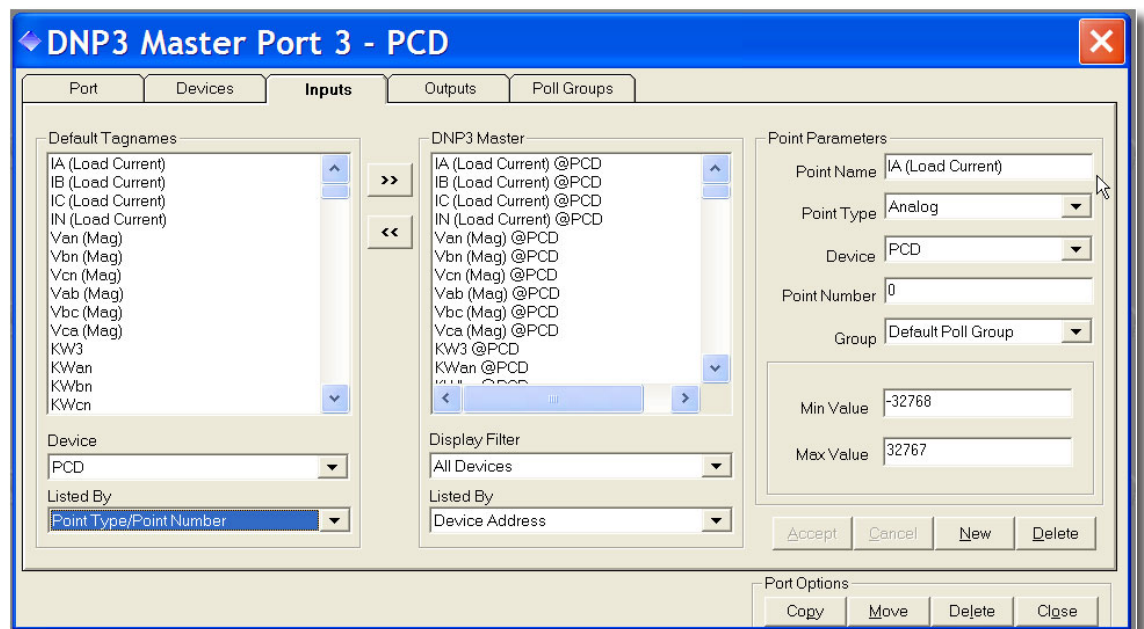
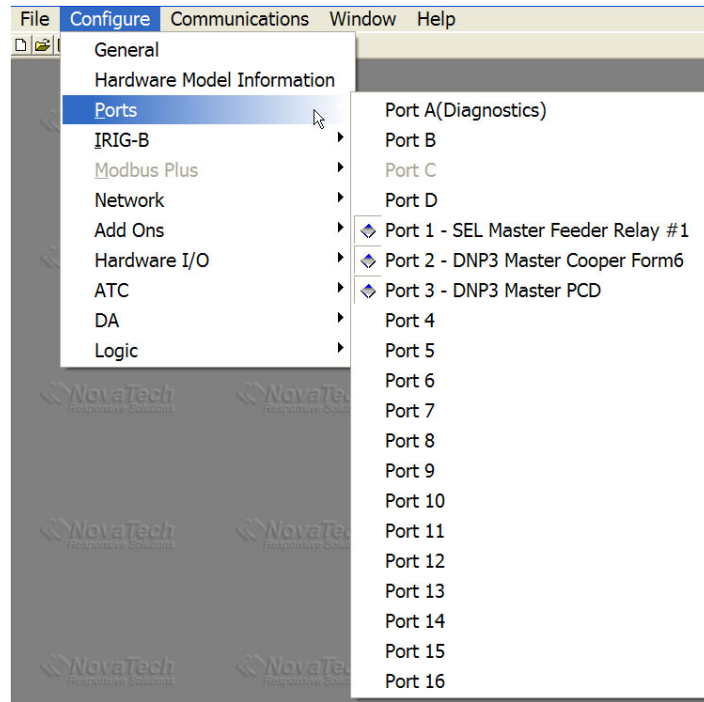
3. Configure points to be read from and written to Cooper Form6.





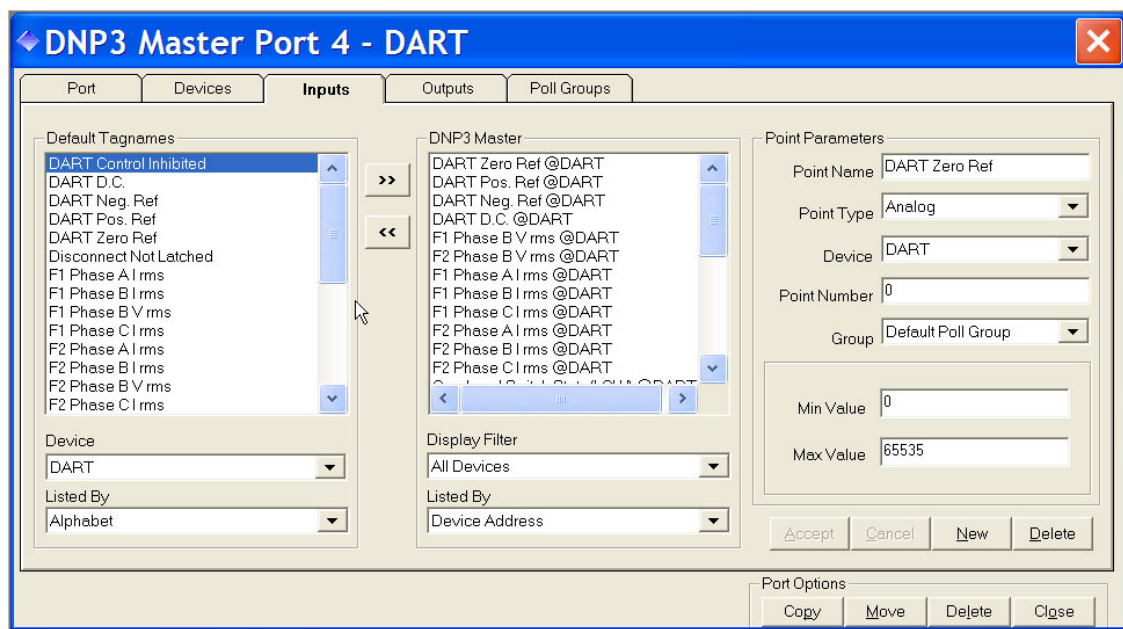
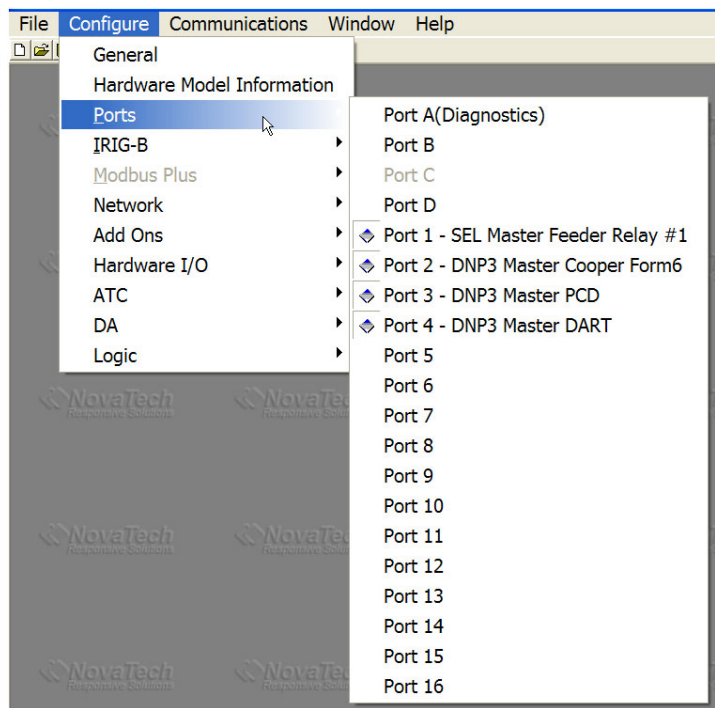
Orion DA-Master Configuration (cont'd)

4. Configure points to be read from and written to PCD.





4. Configure points to be read from and written to DART.





5. Complete configuration of points to be read from and written to IEDs.

The screenshot shows the 'Configure' menu with 'Ports' selected. The 'Ports' submenu lists the following options:

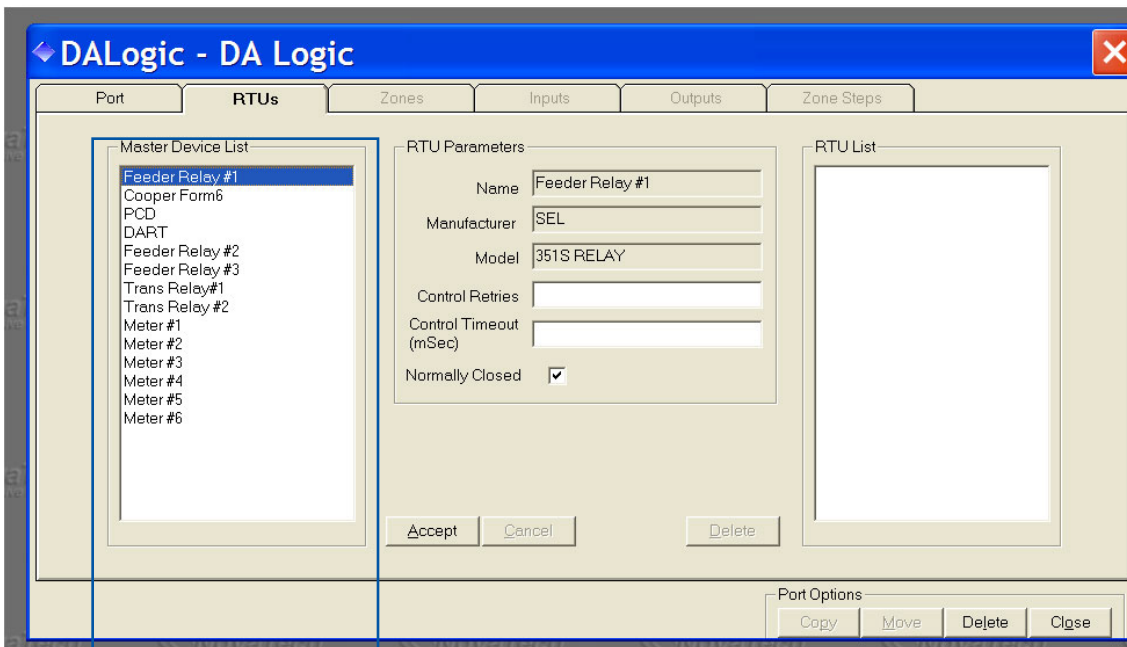
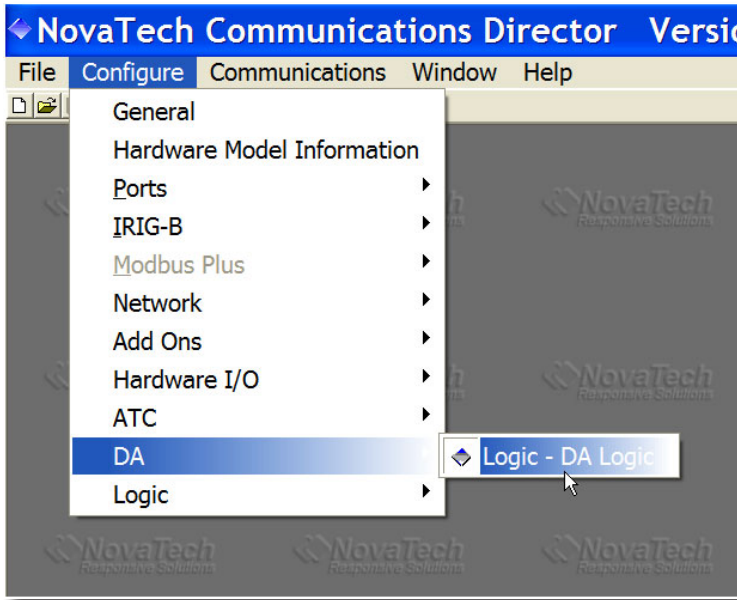
- Port A(Diagnostics)
- Port B
- Port C
- Port D
- Port 1 - SEL Master Feeder Relay #1
- Port 2 - DNP3 Master Cooper Form6
- Port 3 - DNP3 Master PCD
- Port 4 - DNP3 Master DART
- Port 5
- Port 6 - SEL Master Feeder Relay #2
- Port 7 - SEL Master Feeder Relay #3
- Port 8
- Port 9 - DNP3 Master Trans Relay #1
- Port 10 - DNP3 Master Trans Relay #2
- Port 11
- Port 12 - Modbus Master Meters #1 through #4
- Port 13
- Port 14
- Port 15
- Port 16

These are the IEDs that will be used in the DA Scheme

These are the IEDs used in other Orion applications



6. Select DA Configuration



These are all of
the IEDs in this
configuration



6. Select the IEDs to be used in the DA scheme and configure parameters.

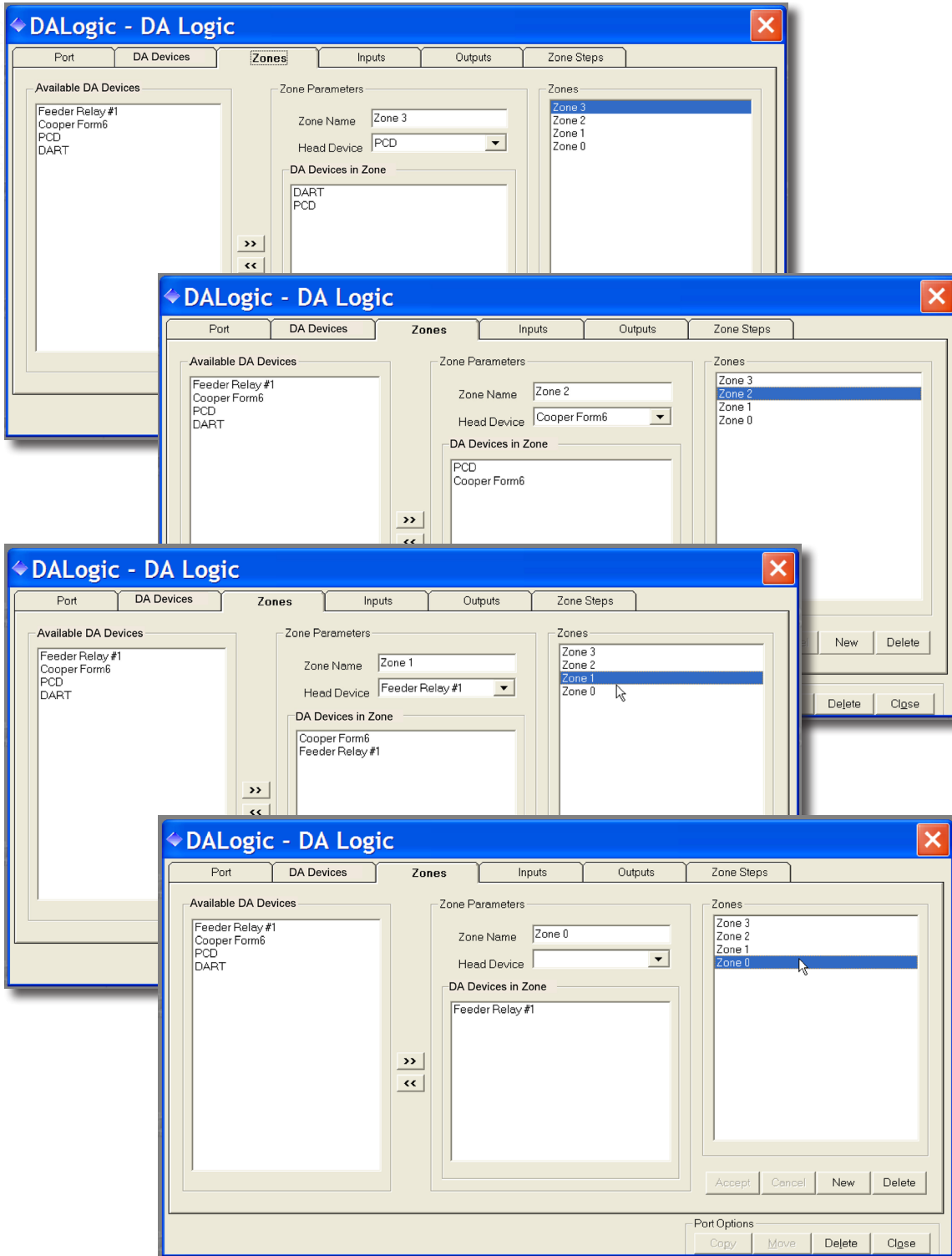
The image shows two overlapping screenshots of the 'DALogic - DA Logic' application window. The top window is in the 'RTUs' tab, showing a list of Master Devices on the left and RTU Parameters for 'Feeder Relay #1' in the center. The bottom window is in the 'DA Devices' tab, showing a list of Master Devices on the left and DA Device Parameters for 'Cooper Form6' in the center. Both windows have a 'Port' tab selected at the top.

7. "Port" tab parameters. Note .log file name

The image shows the 'DALogic - DA Logic' application window with the 'Port' tab selected. The 'Port Name' field contains 'DA Logic'. The 'Port Module' section has 'Use Automatic Settings' checked and 'sDALO' entered. The 'File Parameters' section has 'File Name' set to 'DALogic1.log'. The 'Port Options' section at the bottom has 'Copy', 'Move', 'Delete', and 'Close' buttons.



8. Define IEDs in each zone





Orion DA-Master Configuration (cont'd)

9. Select the "Inputs" needed from the DART for DA-Master logic to operate.

NOTE: Not all IEDs can present all points. As a minimum, DA-Master logic requires:

- Indication of whether fault was seen
- Recloser/Switch position
- Recloser/Switch LO (lock out) for non-tie points
- Loss of potential (voltage) for Bus Zone



10. Select the "Inputs" needed from the PCD for DA-Master logic to operate.

The screenshot shows the 'DALogic - DA Logic' window with the 'Inputs' tab selected. The 'DA Device List' on the left has 'PCD' selected. The 'Tagnames' list in the center shows various inputs with checkboxes. The 'Tagname List' on the right shows a list of tag names. The 'Port Options' at the bottom include 'Copy', 'Move', 'Delete', and 'Close'.

Tagname	Input	Output
Fault A	PATA Phase A Target Alarm @PC	<input type="checkbox"/> N.C.
Fault B	PBTA Phase B Target Alarm @PC	<input type="checkbox"/> N.C.
Fault C	PCTA Phase C Target Alarm @PC	<input type="checkbox"/> N.C.
Fault N	GRD @PCD	<input type="checkbox"/> N.C.
Loss Of Pot.	27B - Phase B Undervoltage @PC	<input type="checkbox"/> N.C.
Shot	79s @PCD	<input type="checkbox"/> N.C.
Reclose LO	79LOA Recloser Lock Out Alarm @P	<input type="checkbox"/> N.C.
Local/Remote	Local Operate Interface @PCD	<input type="checkbox"/> N.C.
Pseudo Loc/Rem		<input type="checkbox"/> N.C.
Auto/Man	Input 1 Input closed @PCD	<input type="checkbox"/> N.C.
Breaker Status	52a Enabled @PCD	<input type="checkbox"/> N.C.
Zone Status		<input type="checkbox"/> N.C.

Tagname List:

- 27 @PCD
- 27-3P Phase Under Voltage Trip @F
- 27A - Phase A Undervoltage @PCD
- 27B - Phase B Undervoltage @PCD
- 27C - Phase C Undervoltage @PCD
- 32NA @PCD
- 32PA @PCD
- 43a @PCD
- 46 @PCD
- 46TC @PCD
- 52A @PCD

Display Filter: All Ports

Listed By: Alphabet

Port Options: Copy, Move, Delete, Close

11. Select the "Inputs" needed from the Cooper Form6 for DA-Master logic to operate.

The screenshot shows the 'DALogic - DA Logic' window with the 'Inputs' tab selected. The 'DA Device List' on the left has 'Cooper Form6' selected. The 'Tagnames' list in the center shows various inputs with checkboxes. The 'Tagname List' on the right shows a list of tag names. The 'Port Options' at the bottom include 'Copy', 'Move', 'Delete', and 'Close'.

Tagname	Input	Output
Fault A	Phase A Fault Target @Cooper Fo	<input type="checkbox"/> N.C.
Fault B	Phase B Fault Target @Cooper Fo	<input type="checkbox"/> N.C.
Fault C	Phase C Fault Target @Cooper Fo	<input type="checkbox"/> N.C.
Fault N	Ground Fault Target @Cooper For	<input type="checkbox"/> N.C.
Loss Of Pot.	Phase B Voltage Present @Coope	<input checked="" type="checkbox"/> N.C.
Shot	Reclose Retry Active @Cooper Fo	<input type="checkbox"/> N.C.
Reclose LO	Control Lockout @Cooper Form6	<input type="checkbox"/> N.C.
Local/Remote	Supervisory Off @Cooper Form6	<input checked="" type="checkbox"/> N.C.
Pseudo Loc/Rem		<input type="checkbox"/> N.C.
Auto/Man	Hot Line Tag Active @Cooper For	<input checked="" type="checkbox"/> N.C.
Breaker Status	Recloser Closed @Cooper Form6	<input type="checkbox"/> N.C.
Zone Status		<input type="checkbox"/> N.C.

Tagname List:

- 27 @PCD
- 27-3P Phase Under Voltage Trip @F
- 27A - Phase A Undervoltage @PCD
- 27B - Phase B Undervoltage @PCD
- 27C - Phase C Undervoltage @PCD
- 32NA @PCD
- 32PA @PCD
- 43a @PCD
- 46 @PCD
- 46TC @PCD
- 52A @PCD

Display Filter: All Ports

Listed By: Alphabet

Port Options: Copy, Move, Delete, Close



Orion DA-Master Configuration (cont'd)

12. Select the "Inputs" needed from the Feeder Relay for DA-Master logic to operate.

DALogic - DA Logic

Port | DA Devices | Zones | **Inputs** | Outputs | Zone Steps

DA Device List: Feeder Relay #1, Cooper Form6, PCD, DART

Tagnames:

Fault A	FMD_TLED22_A @Feeder Relay	<input type="checkbox"/> N.C.
Fault B	FMD_TLED23_B @Feeder Relay	<input type="checkbox"/> N.C.
Fault C	FMD_TLED24_C @Feeder Relay	<input type="checkbox"/> N.C.
Fault N	FMD_TLED26_N @Feeder Relay	<input type="checkbox"/> N.C.
Loss Of Pot	FMD_LOP @Feeder Relay #1	<input type="checkbox"/> N.C.
Shot	FMD_SH3 @Feeder Relay #1	<input type="checkbox"/> N.C.
Redclose LO	FMD_79LO @Feeder Relay #1	<input type="checkbox"/> N.C.
Local/Remote	FMD_SV1 @Feeder Relay #1	<input type="checkbox"/> N.C.
Pseudo Loc/Rem	FMD_SV11 @Feeder Relay #1	<input type="checkbox"/> N.C.
Auto/Man	FMD_SV12 @Feeder Relay #1	<input type="checkbox"/> N.C.
Breaker Status	FMD_52A @Feeder Relay #1	<input type="checkbox"/> N.C.
Zone Status		<input type="checkbox"/> N.C.

Tagname List:

- 27 @PCD
- 27-3P Phase Under Voltage Trip @F
- 27A - Phase A Undervoltage @PCD
- 27B - Phase B Undervoltage @PCD
- 27C - Phase C Undervoltage @PCD
- 32NA @PCD
- 32PA @PCD
- 43a @PCD
- 46 @PCD
- 46TC @PCD
- 501 @PCD

Display Filter: All Ports

Listed By: Alphabet

Accept Cancel

Port Options: Copy Move Delete Close

13. Select the "Outputs" to control the DART.

DALogic - DA Logic

Port | DA Devices | Zones | Inputs | **Outputs** | Zone Steps

DA Device List: Feeder Relay #1, Cooper Form6, PCD, DART

Tagnames:

Auto/Man	
Pseudo Loc/Rem	
Open	Overhead Switch Open/Close @DA
Close	Overhead Switch Open/Close @DA
Settings Group Change	
Force Group	

Tagname List:

- Breaker @Feeder Relay #1
- Breaker @Feeder Relay #2
- Breaker @Feeder Relay #3
- Combined Trip/Close @Cooper Form6
- Overhead Switch Open/Close @DART
- RB1 @Feeder Relay #1
- RB1 @Feeder Relay #2
- RB1 @Feeder Relay #3
- Test23 @PCD
- trip/close @PCD

Display Filter: All Ports

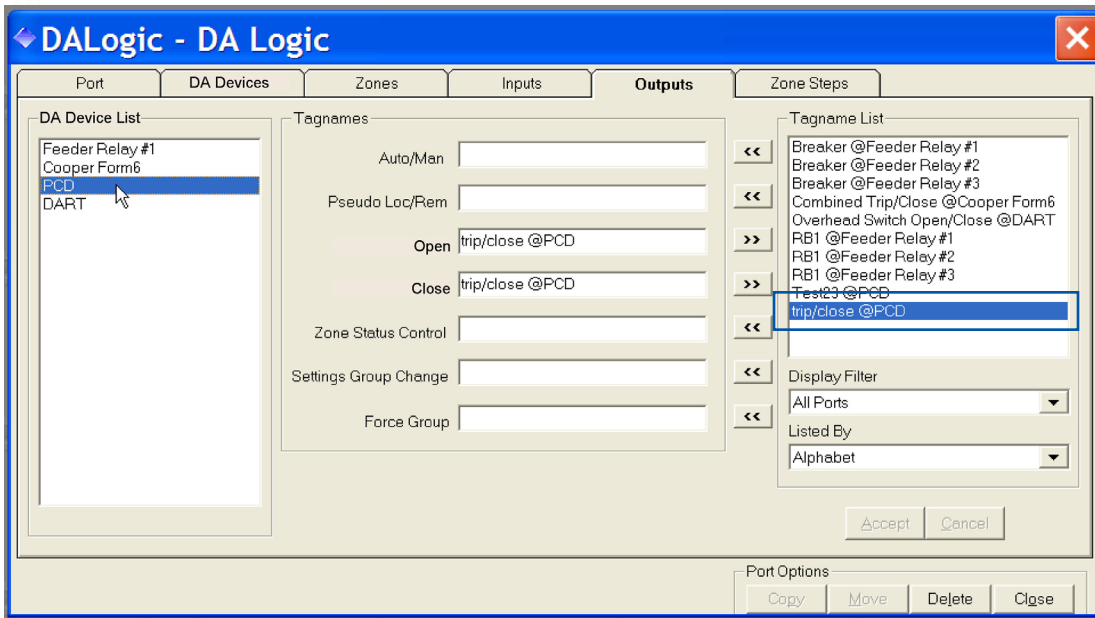
Listed By: Alphabet

Accept Cancel

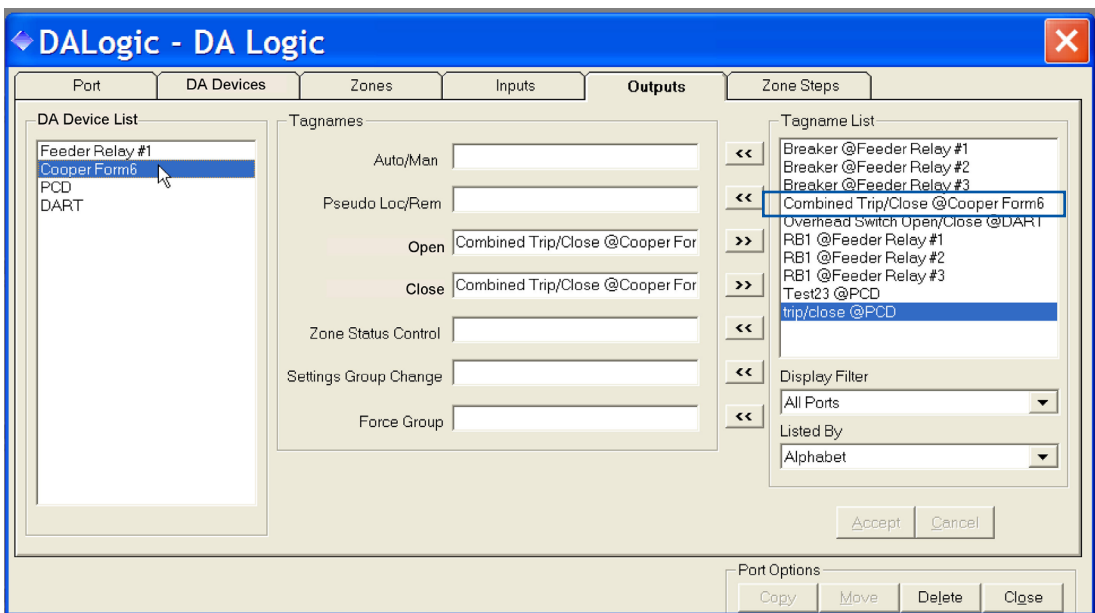
Port Options: Copy Move Delete Close



14. Select the "Outputs" to control the PCD.



15. Select the "Outputs" to control the Cooper Form6.





Orion DA-Master Configuration (cont'd)

16. Select the "Outputs" to control the Feeder Relay.

DALogic - DA Logic

Port | DA Devices | Zones | Inputs | **Outputs** | Zone Steps

DA Device List

- Feeder Relay #1
- Cooper Form6
- PCD
- DART

Tagnames

Auto/Man:

Pseudo Loc/Rem:

Open:

Close:

Zone Status Control:

Settings Group Change:

Force Group:

Tagname List

- Breaker @Feeder Relay #1
- Breaker @Feeder Relay #2
- Breaker @Feeder Relay #3
- Combined Trip/Close @Cooper Form6
- Overhead Switch Open/Close @DART
- RB1 @Feeder Relay #1
- RB1 @Feeder Relay #2
- RB1 @Feeder Relay #3
- Test23 @PCD
- trip/close @PCD**

Display Filter:

Listed By:

Accept Cancel

Port Options

Copy Move Delete Close

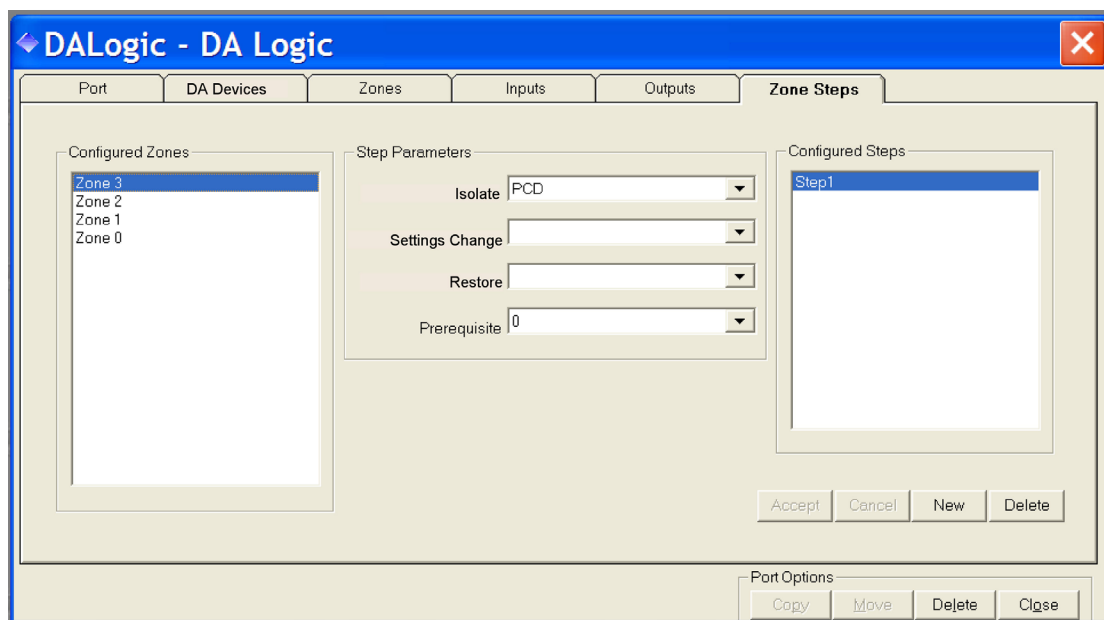
**17.** Define Zone 3 steps:

For **Zone 3**, only one step is required.

Select the PCD as the IED that must isolate the fault from the source. Even though this is an automatic step, it is checked by DA-Master.

NOTE: There is no IED to control to “Restore Unfaulted Section”.

As setting change can optionally be forced on any of the IEDs to accommodate a change in the line characteristics.





Orion DA-Master Configuration (cont'd)

18. Define Zone 2 steps:

For **Zone 2**, two steps are required to isolate and restore service to the unfaulted section.

For **Step 1**, select the Cooper Form6 as the IED that must isolate the fault from the source. Even though this is an automatic step, it is checked by DA-Master.

For **Step 2**, select the PCD as the IED that must isolate the other end of the zone.

Select the DART as the IED that must restore service.

A settings change can optionally be forced on any of the IEDs to accommodate a change in the line characteristics.

The image shows two overlapping screenshots of the 'DA Logic - DA Logic' window. The top window shows the initial state where 'Zone 2' is selected in the 'Configured Zones' list. The 'Step Parameters' section shows 'Isolate' set to 'Cooper Form6', 'Settings Change' is empty, 'Restore' is empty, and 'Prerequisite' is '0'. The 'Configured Steps' list is empty. The bottom window shows the same window after configuration. 'Zone 2' is still selected. The 'Step Parameters' section now shows 'Isolate' set to 'PCD', 'Settings Change' is empty, 'Restore' set to 'DART', and 'Prerequisite' set to '1'. The 'Configured Steps' list now contains 'Step1' and 'Step2'. At the bottom right of the bottom window, there are buttons for 'Accept', 'Cancel', 'New', and 'Delete', and a 'Port Options' section with buttons for 'Copy', 'Move', 'Delete', and 'Close'.



19. Define Zone 1 steps

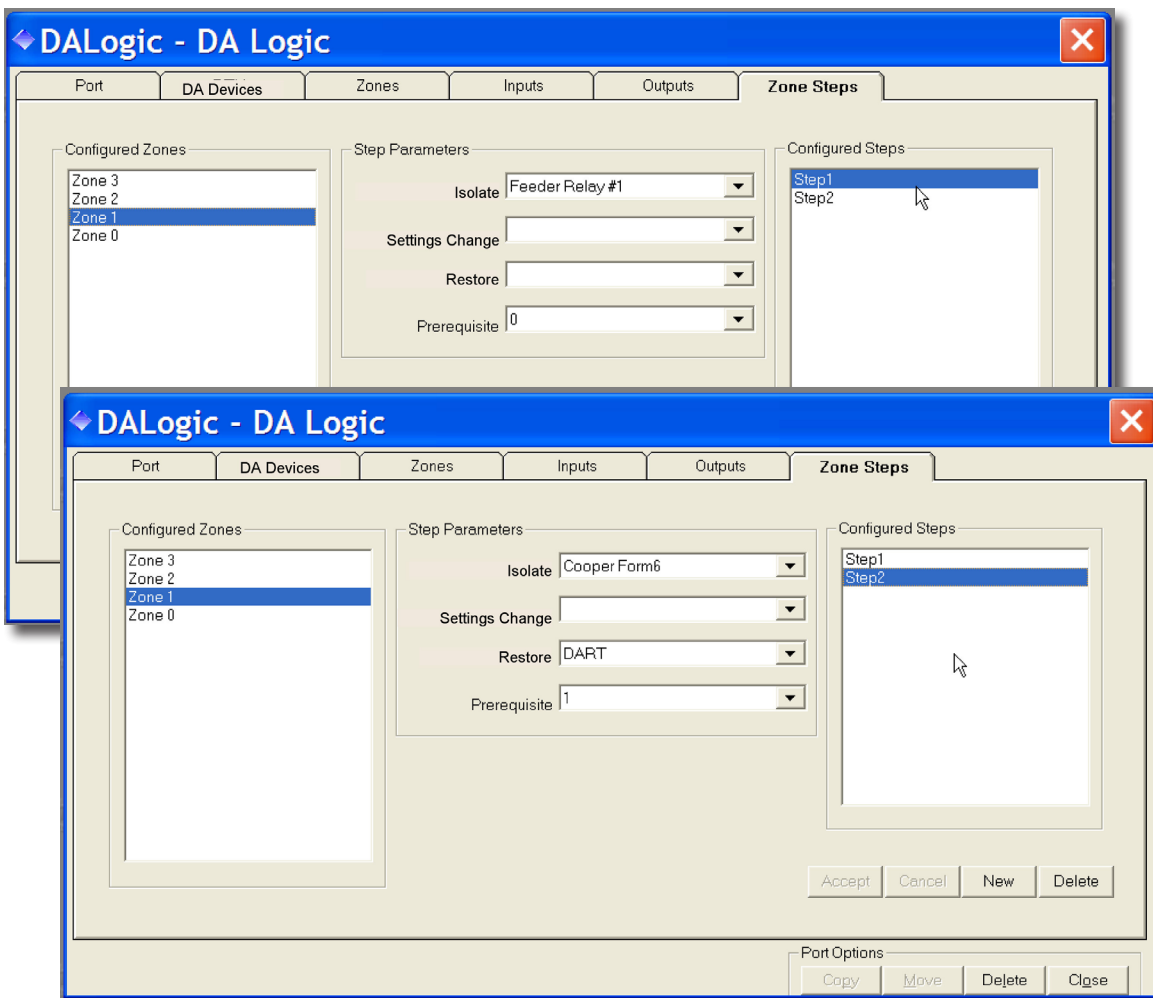
For **Zone 1**, two steps are required to isolate and restore service to the unfaulted section.

For **Step 1**, select the Feeder Relay as the IED that must isolate the fault from the source. Even though this is an automatic step, it is checked by DA-Master.

For **Step 2**, select the Cooper Form6 as the IED that must isolate the other end of the zone.

Select the DART as the IED that must restore service.

A settings change can optionally be forced on any of the IEDs to accommodate a change in the line characteristics.



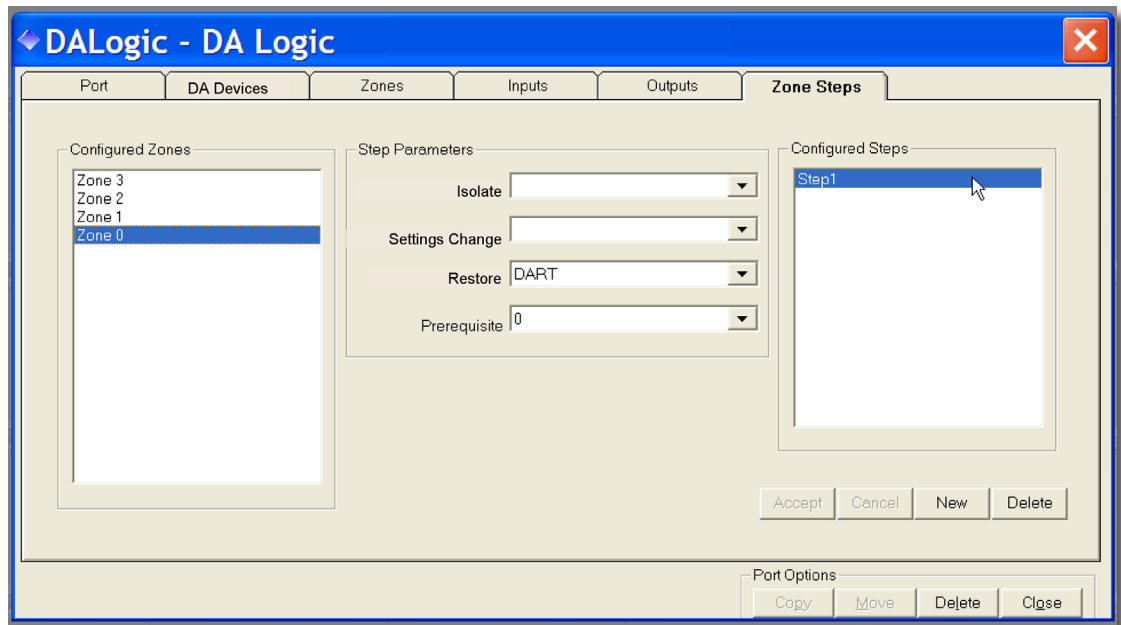


Orion DA-Master Configuration (cont'd)

20. Define Bus Zone Steps

For the **Special Bus Zone**, select the DART as the IED that must restore service to the entire line. In this special zone, DA-Master first commands the substation breaker to open and verifies operation before this step occurs.

A settings change can optionally be forced on any of the IEDs to accommodate a change in the line characteristics.



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