COM600 series 5.0
FDIR Configuration Manual
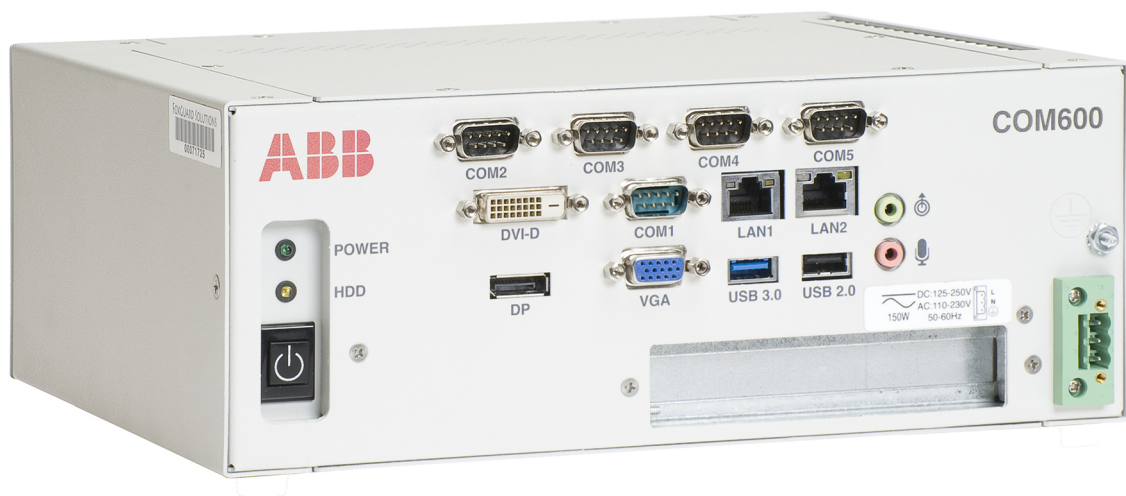
Contents:

1.   About this manual

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This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2004/108/EC) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2006/95/EC). This conformity is the result of tests conducted by ABB in accordance with the product standards EN 50263 and EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series.

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1.5. General information

This manual provides thorough information on FDIR configuration on Station Automation Builder (SAB600) and the central concepts related to it. You find instructions on building FDIR project on SAB600. Information in this configuration manual is intended for application engineers who configure the FDIR project communication structure and use the FDIR configuration tool to set up FDIR.

1.6. Document conventions

The following conventions are used for the presentation of material:
- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the space bar, comma key, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press ESC E C indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click **OK**.
- The names of menus and menu items are boldfaced. For example, the **File** menu.

- • The following convention is used for menu operations: **MenuName > Menu-Item > CascadedMenuItem**. For example: select **File > New > Type**.
  - • The **Start** menu name always refers to the **Start** menu on the Windows taskbar.
- • System prompts/messages and user responses/input are shown in the Courier font. For example, if you enter a value out of range, the following message is displayed:

    `Entered value is not valid. The value must be 0 - 30  .`

- • You can be asked to enter the string MIF349 in a field. The string is shown as follows in the procedure:

    MIF349
- • Variables are shown using lowercase letters:

    sequence name

1.7. Use of symbols

This publication includes warning, caution, and information icons that point out safety-related conditions or other important information. It also includes tip icons to point out useful information to the reader. The corresponding icons should be interpreted as follows.

The electrical warning icon indicates the presence of a hazard which could result in electrical shock.

The warning icon indicates the presence of a hazard which could result in personal injury.

The caution icon indicates important information or warning related to the concept discussed in the text. It may indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.

The information icon alerts the reader to relevant facts and conditions.

The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

1.8.   Terminology

The following is a list of terms associated with COM600 that you should be familiar with. The list contains terms that are unique to ABB or have a usage or definition that is different from standard industry usage.

Term	Description
Device	A physical device that behaves as its own communication node in the network, for example, protection relay.
Event	Change of process data or an OPC internal value. Normally, an event consists of value, quality, and timestamp.
Intelligent Electronic Device	A physical IEC 61850 device that behaves as its own communication node in the IEC 61850 protocol.
OPC	Series of standards specifications aiming at open connectivity in industrial automation and the enterprise systems that support industry.
Property	Named data item.

1.9.   Abbreviations

The following is a list of abbreviations associated with COM600 that you should be familiar with.

Abbreviation	Description
FDIR	Fault detection, fault isolation and load restoration
WebHMI	Web Human Machine Interface
IED	Intelligent Electronic Device
SAB600	Station Automation Builder 600
SLD	Single Line Diagram

1.10.   Related documents

Name of the manual	MRS number
COM600 Logic Processor User's manual	1MRS756738

1.11.   Document revisions

Document version/date	Product revision	History
A/30.6.2011	3.5	Document created

Document version/date	Product revision	History
B/31.5.2012	4.0	Document revised
C/13.3.2015	4.1	Document revised
D/24.5.2017	5.0	Document revised

2.   Introduction

2.1.   General information about the COM600 series

The COM600 product series are versatile Substation Management Units that help realize smart substation and grid automation solutions in industrial and utility distribution networks.

They get deployed together with protection and control IEDs, substation devices such as RTUs, meters and PLCs in dedicated cabinets and switchgear.

The COM600 product is an all-in-one unit that functions as:
*   Communication gateway
*   Web Human Machine Interface (WebHMI)
*   Automation controller
*   Real-time and historical data management unit

The COM600 product series use process information and device data, acquired over Ethernet or serial communication protocol interfaces to execute specific substation functions and applications. Thus, they are critical building blocks to realize substation secondary system solutions and in the process solving diverse customer needs.

2.2.   COM600 product series variants and rationale

To facilitate substation and grid automation solutions in IEC and ANSI market areas, a variant-based system similar to Relion® 615 and 620 series is being followed from COM600 5.0 release.

The main reasons for such an approach are the following:

*   To ensure all COM600 product series features are advantageously used in end-customer projects in the medium voltage substation automation domain.
*   To ensure an optimum feature set to be bundled together to realize specific applications required in IEC and ANSI market areas.
*   To ensure a future-proof product approach.

This release then comprises of two variants, based on the primary intent or application are defined as follows:
*   COM600S IEC – COM600 for substation automation, analysis and data management (for IEC markets)
    *   COM600S IEC is a substation automation, analyzer and data management unit that integrates devices, facilitates operations, manages communication and runs analysis applications pertinent to equipment or operations in utility or industrial distribution substations.
*   COM600F ANSI – COM600 as distribution automation controller (for ANSI markets)

  • COM600F is a dedicated distribution automation controller unit that runs distributed grid and feeder applications for ANSI power networks and inherits all core features of the COM600 series.

2.3.   Overview of FDIR

FDIR on COM600 provides a feeder automation function for radial distribution networks. It gathers data from protection and control IEDs and runs a fault detection, fault isolation and load restoration (FDIR) algorithm on Logic Processor to realize automatic fault restoration.

When a fault happens in the network, FDIR on COM600 detects the location of the fault and issues switch operation commands to isolate faulty sections from the network and to restore the electricity to the healthy sections. It also sends commands to IEDs controlling the switches to return to the normal pre-fault condition when a fault has been cleared.

3.   FDIR configuration

3.1.   Building FDIR project on SAB600

To build an FDIR project on SAB600, you need to configure a proper communication structure, single line diagram and use FDIR Configuration Tool to automatically generate a Logic Processor FDIR project and cross-references.

> **i**   When FDIR is used in COM600, the single line diagram represents only the FDIR network.

The FDIR single line diagram differs from the normal COM600 substation single line diagram. The FDIR single line diagram currently only uses the Circuit Breaker symbol to represent a switch, the Outfeeder symbol to represent load, and Infeeder and Busbar symbols to represent source. Other symbols are not used in the FDIR single line diagram.

3.2.   FDIR communication structure

The IEDs in the network need to be configured in the SAB600 communication structure. For more information on the configuration, refer to the related communication protocol configuration manual. Figure 3.2-1 shows an example of a typical IED configuration.
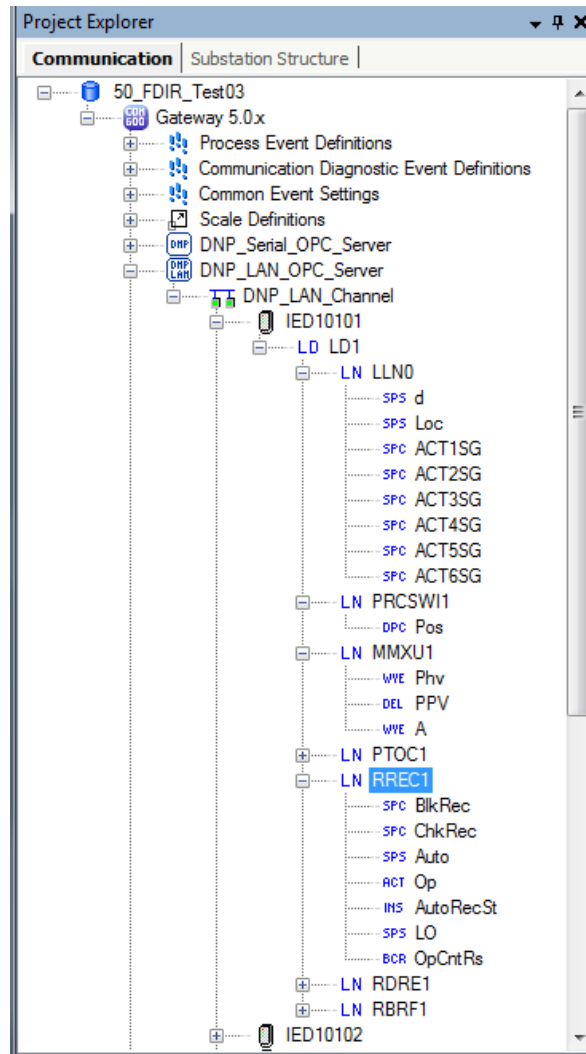
IED_configuration

Figure 3.2-1 IED configuration

To implement FDIR, certain settings must be configured properly to enable the automation restoration logic.

Table 3.2-1 Data objects required for FDIR

Data object	Description	Mandatory/optional
LLN0/Loc	This data object is used to determine if the switch is in **Remote** or **Locale** mode.	Mandatory

Data object	Description	Mandatory/optional
LLN0/Act1SG LLN0/Act2SG LLN0/Act3SG LLN0/Act4SG LLN0/Act5SG LLN0/Act6SG	Used to change setting group on the IED. In the FDIR configuration tool, user can set the load level for different setting groups. During FDIR operation, system will check the new load and change the setting group on the IED.	Optional
CSWI/Pos	Used to read switch status and operate the switch.	Mandatory
MMXU/A	The current measurement through the IED, which is used to calculate the load in the network.	Mandatory
RREC/LO	The lock out signal from the IED. This signal and switch open from CSWI\Pos will contribute a fault condition in FDIR.	Mandatory

3.3.   FDIR single line diagram

Single line diagram should be built to map the actual distribution network. In FDIR three elements are used to describe distribution network: Source, Switch and Load. In FDIR single line diagram, Infeeder or Bus Bar should be used to represent Source, Circuit Breaker to represent Switchers, and Outfeeder to represent Load. There should always be an Outfeeder (Load) connection between any two switches.

All objects of FDIR should be placed below one voltage level. All devices can be placed under one bay to create a simple network. It is recommended to configure a bay for each substation, configure a substation network under each bay and in Voltage Level to configure connections among substations.
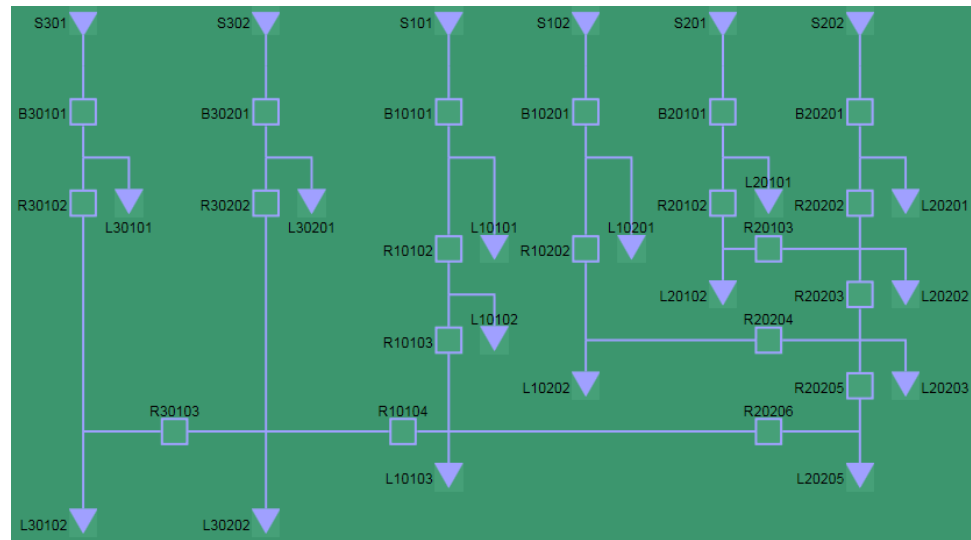
Figure 3.3-1 shows a typical single line diagram with 6 Sources, 15 Loads and 20 Switches in the network.
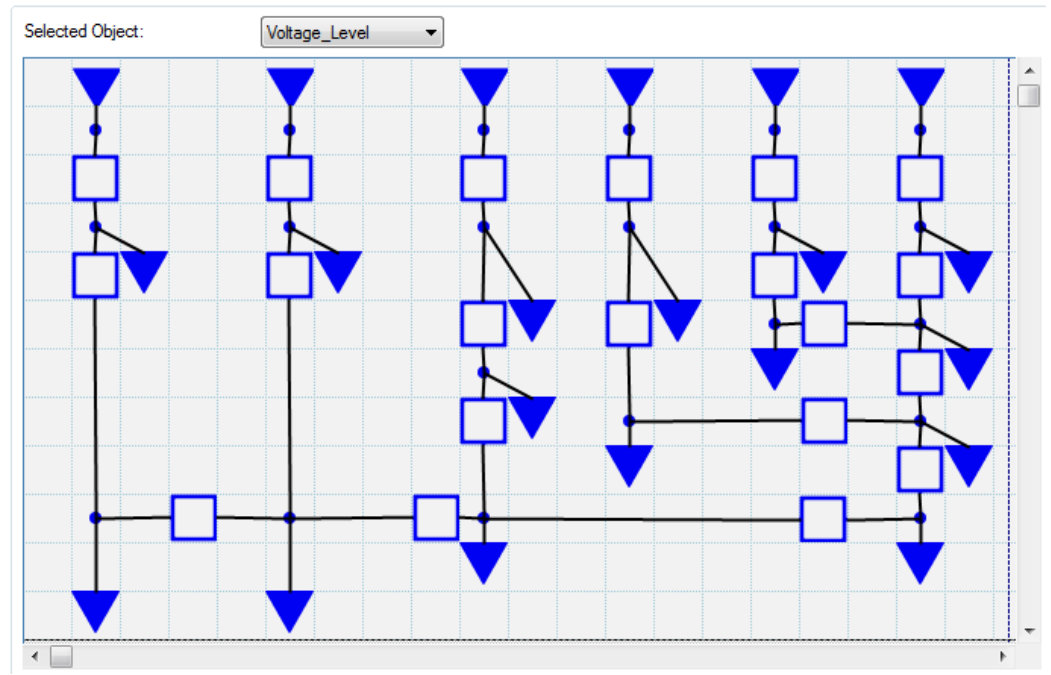
FDIR_SLD

Figure 3.3-1 FDIR Single Line Diagram

The Measurements readings from IEDs are optional. Figure 3.3-2 shows a preview of the FDIR single line diagram.
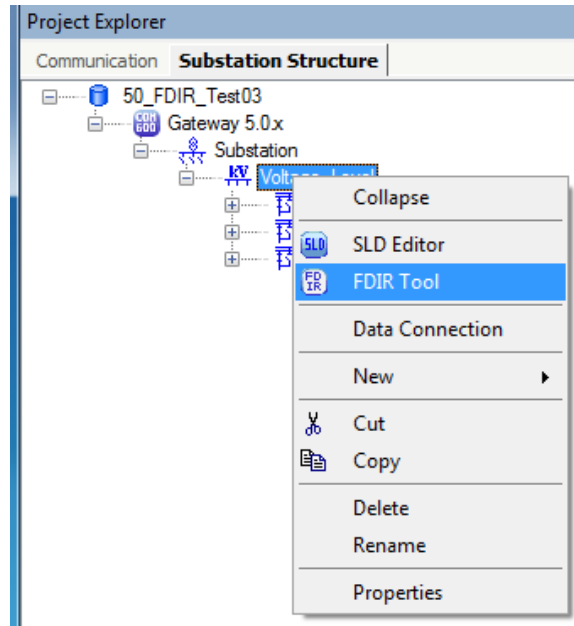

FDIR_SLD_preview

Figure 3.3-2 Preview of FDIR single line diagram

3.4.   FDIR Configuration Tool

3.4.1.   Launching FDIR Configuration Tool

To launch FDIR Configuration Tool:
1.   In the Substation Structure, right-click the **Voltage Level** node in the **Substation Structure**.
2.   Select **FDIR Tool**, see Figure 3.4.1-1.

launch_FDIR_configuration_tool

Figure 3.4.1-1 Launch FDIR Configuration Tool

The FDIR Tool opens.

3.4.2.   FDIR Configuration Tool functions

FDIR Configuration Tool can be used for the following functions:
•   enabling device in the network and specifying capacity limit
•   specifying group setting
•   generating FDIR Logic Processor configuration
•   changing cross references

3.4.3.   Specifying network settings

Figure 3.4.3-1 shows the **Network** setup tab in FDIR Configuration Tool, in which you can enable or disable a device in the network and change the capacity limit of sources and switches.

FDIR Configuration Manual
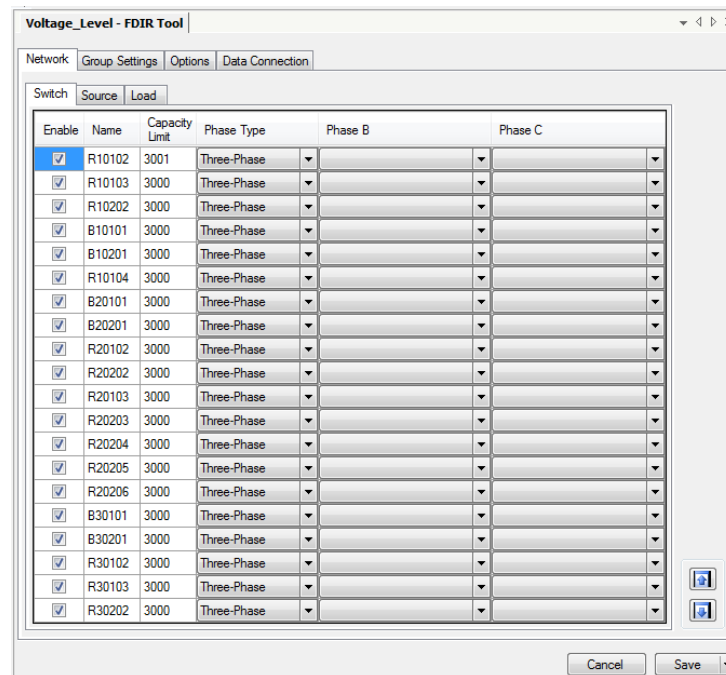
FDIR_network_setup

Figure 3.4.3-1 FDIR Configuration Tool - Network Setup

On the **Switch** tab, you can enable or disable the switch to be included in the FDIR network. You can also change the capacity limit on the switch. FDIR also supports single phase switch in the network. When single phase is selected, you can select the switch for phase B and phase C. Phase B and Phase C switch should be disabled from the FDIR network.

On the **Source** tab, you can enable or disable the source to be included in the FDIR network. Also you can change the capacity limit on the source.

On the **Load** tab, you can enable or disable the load to be included in the FDIR network.

3.4.4. Setting parameters for setting groups

In the **Group Settings** tab, you can set parameters for setting groups, the range to activate the setting group, a data object to read the current setting group number, and a data object to send a command to change the setting group.
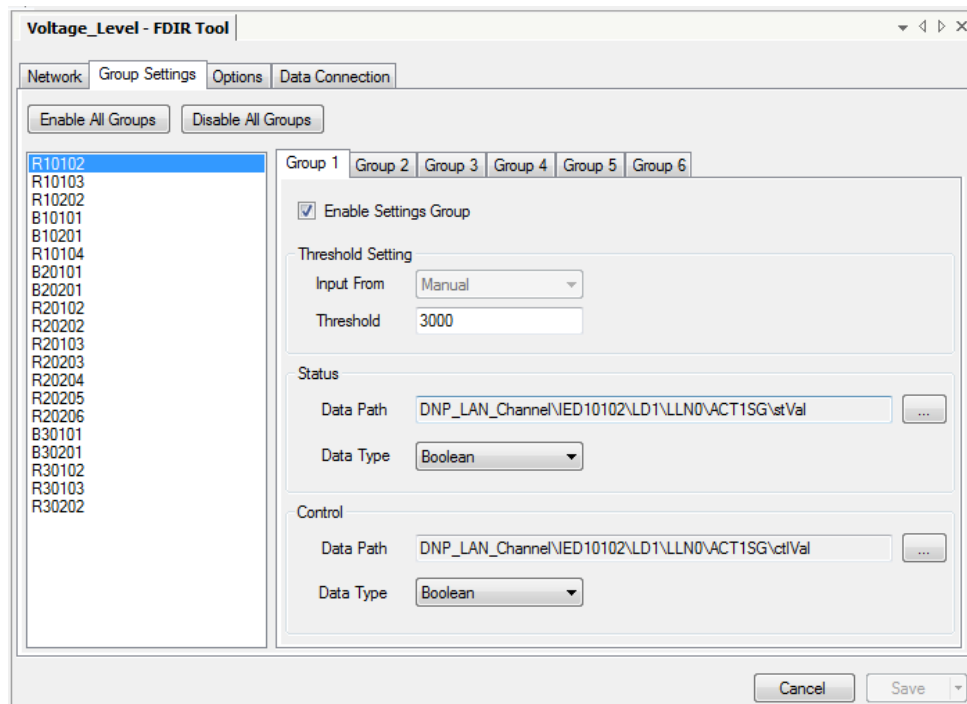
FDIR_setting_groups

Figure 3.4.4-1 Protection Setting Group

3.4.5. Changing cross references

In the **Data Connection** tab, you can view and manually change the cross reference of FDIR variables.

The **Variable** column contains a list of variables used in the FDIR logic. The OPC item contains the mappings for the variables in the OPC servers of the communication structure. The data connection mapping is a table view of the logic processor cross reference, which is generated by the FDIR configuration tool. The FDIR configuration tool uses data connection information in the substation structure to find the corresponding switch data object for the variables. Any change on the data connection table is reflected on the logic processor cross reference.

To change the cross reference:
1. Double-click the row to change its cross reference.
2. The **Select Data Attribute** dialog opens with a list of available data objects to select, see Figure 3.4.5-2.
3. Select appropriate data object in the dialog and click **Apply**.

FDIR Configuration Manual
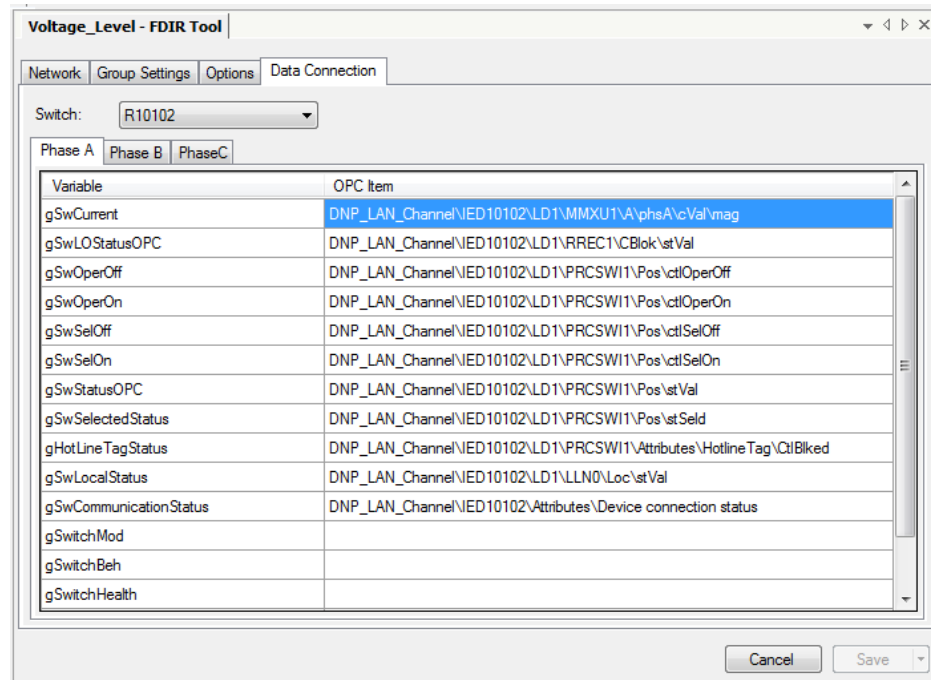
FDIR_data_connection

Figure 3.4.5-1 Data Connection
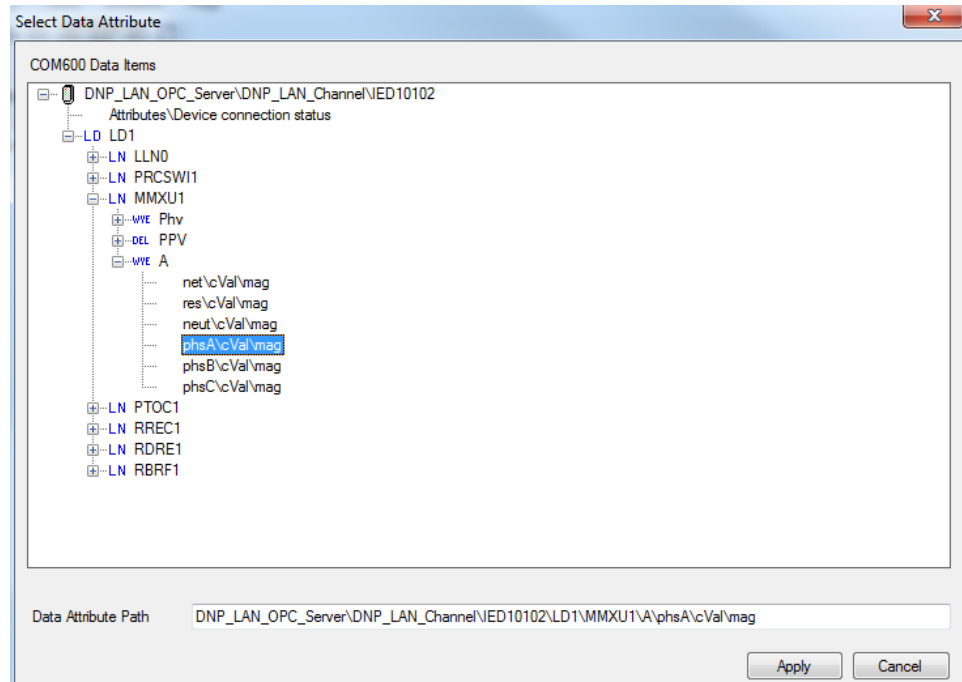
select_cross_reference

Figure 3.4.5-2 Select Cross Reference

3.4.6.   Generating FDIR Logic Processor configuration

Another result of FDIR Configuration Tool is the Logic Processor cross reference. In the communication structure, right-click **Logic Processor** and select **Cross References**. Cross Reference Tool opens between OPC Server data objects and Logic Processor variables automatically generated by FDIR configuration.


logic_processor_cross_reference

Figure 3.4.6-1 Cross Reference

3.4.7.   Options

The **Options** tab shows the options you can select when running the FDIR tool.

If you add your own cross references, clear the **Update Cross References** check box to prevent the changes from being overwritten when you run the tool the next time. If you add your own logic to the FDIR logic project, clear the **Update Logic Processor Project** check box to prevent the changes from being overwritten.
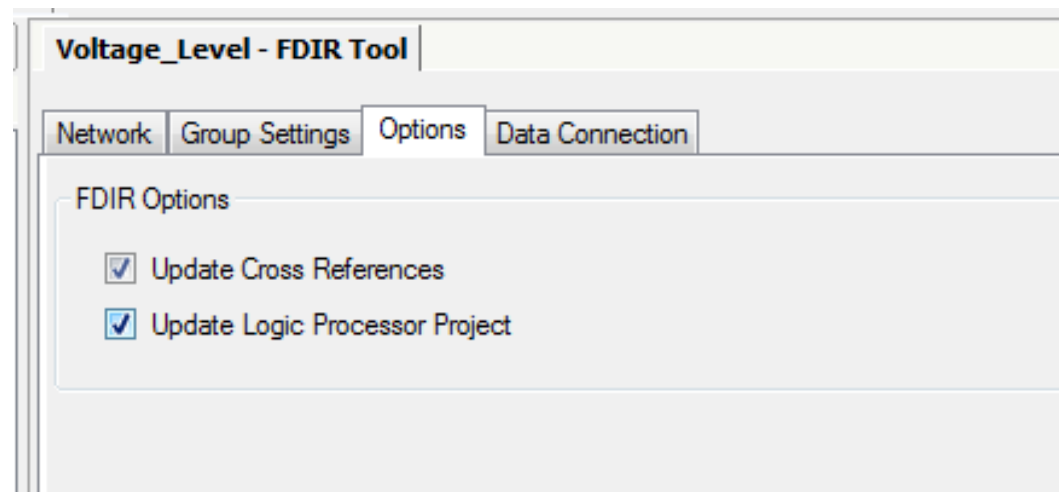
options.png

Figure 3.4.7-1 Options

3.5.   Downloading FDIR configuration

3.5.1.   Downloading FDIR configuration

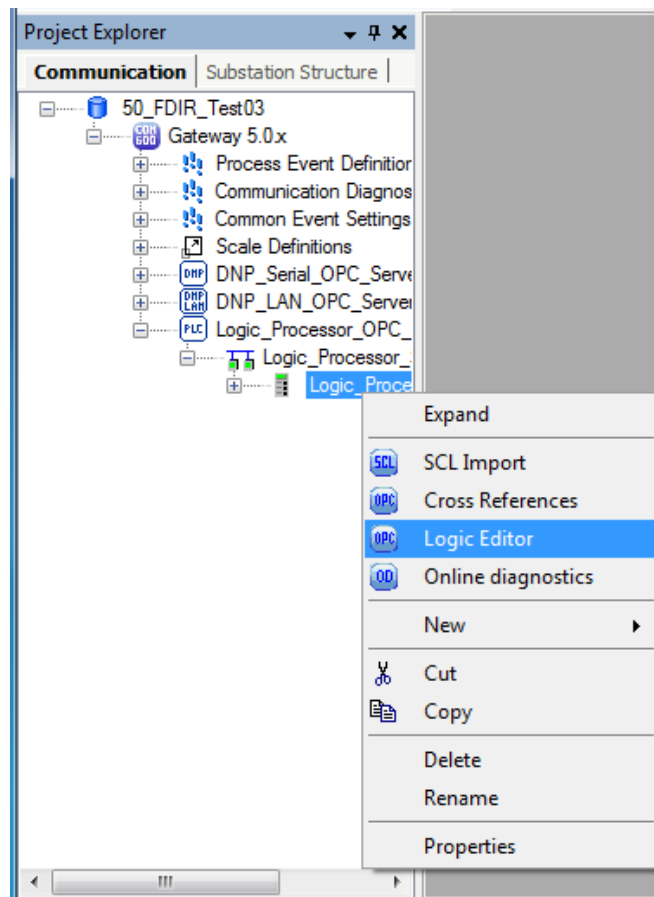The following steps are required for downloading FDIR configuration to COM600:
- 3.5.2, Downloading FDIR Logic Processor Project
- 3.5.3, Downloading FDIR SAB600 configuration

3.5.2.   Downloading FDIR Logic Processor Project

FDIR Configuration Tool will generate the FDIR Logic Processor project automatically.

To download FDIR Logic Processor project:
1. In the communication structure, select **Logic Processor IED**.
2. Right-click the IED and select **Logic Editor** to launch Logic Processor Editor, see Figure 3.5.2-1.

launch_logic_editor

Figure 3.5.2-1 Launch Logic Editor

The FDIR project opens in a separate **Logic Processor Editor** window.

3. In Logic Processor Editor, select **Device** to open the device dialog.
4. In the device dialog, select the default device. For more information, see Logic Processor User Manual.
5. Select **Online\Login** to download the FDIR Logic Processor project.

3.5.3.   Downloading FDIR SAB600 configuration

After you have downloaded the FDIR Logic Processor project, download FDIR SAB600 configuration to COM600 with updated cross references. The FDIR configuration is downloaded in the same way as other SAB600 projects.

To download the FDIR SAB600 configuration:
1. In the communication structure, select **Gateway**.
2. Right-click the **Gateway** object and select **Management**.
3. In the **Management** dialog, select the **Reset** check-box.
4. Click the **Update and reload configuration** button.

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ABB Oy
Medium Voltage Products
P.O. Box 699
FI-65101 VAASA, FINLAND
Tel.   +358 10 22 11
Fax.   +358 10 224 1094

ABB Inc.
Medium Voltage Products
655 Century Point
Lake Mary, FL 32746, USA
Tel: +1 407 732 2000
Fax: +1 407 732 2335

www.abb.com/medium-voltage