Connectivity Packages for REF 541/543/545, REM 543/545, RET 541/543/545

User's Guide

1. About this manual

1.1. Copyrights

1.2. Trademarks

1.3. General

Connectivity package is a collection of software and information related to a specific protection and control terminal (IED). It provides means for applications and tools to connect and interact with IED.

This manual introduces the installation and uninstallation of the connectivity packages and the main functions of the Connectivity Package Manager. Connectivity Package Manager is a tool that helps the user to associate the right connectivity package versions to different applications and tools. This manual introduces also shortly the content and the usage of the connectivity packages as well as logical node naming principles.

For more information on handling connectivity packages in different applications and tools, refer to Section 1.8. Related documents.

This manual applies to the following connectivity packages:

- REF 541/543/545 Connectivity Package v.1.1 and v. 1.2
- REM 543/545 Connectivity Package v. 1.1
- RET 541/543/545 Connectivity Package v. 1.0

Supported IEDs:

- REF 541, REF 543, REF 545: Release 3.0, 3.5
- REM 543, REM 545: Release 2.5
- RET 541, RET 543, RET 545: Release 3.0

Connectivity packages support IEC 61850, LON and SPA communication protocols for the IEDs mentioned above.

Supported system products and tools:

- Communication Engineering Tool for COM 610
- Communication Engineering Tool for SPA-ZC 40x
- Communication Engineering Tool for MicroSCADA Pro SYS 600 *9.0 or later and COM 500 *4.1 or later
- SCL Importer in MicroSCADA Pro SYS 600 *9.1 or later and COM 500 *4.2 or later

For more information about the supported tools, refer to Chapter 4. Content and usage of connectivity packages.

This user's guide is divided into following sections:

Installation and uninstallation

This chapter describes the installation and the uninstallation of the connectivity packages.

Connectivity Package Manager

This chapter introduces the funtionality of the Connectivity Package Manager and the handling of the connectivity packages.

Content and usage of connectivity packages

This chapter describes the content and usage of connectivity packages in different products.

Logical node naming

In this chapter you find the naming of logical nodes and the LN prefixes for RED500 IEDs.

1.4. Use of symbols

The information symbol points out safety related or other important information. It also point out useful hints to the reader. The corresponding symbol should be interpreted as follows:

Information icon alerts the reader to pertinent facts and conditions.

1.5. 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 CTRL key. Enter and Shift keys are exceptions, for example, press Enter.
- 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: **Menu Name** > **Menu Item** > **Cascaded Menu Item**. For example: select **File** > **Open** > **New Project**.
  - The **Start** menu name always refers to the **Start** menu on the Windows Task Bar.
- The menus that are displayed by right-clicking the mouse button are called shortcut menus.

1.6. Terminology

Term	Description
applications and tools	In this context an application means a product that administer one of the supported tool, for example COM 610. A tool means one of the supported tool that are listed in Section 1.3. General, for example CET.
Communication Engineering Tool	Communication Engineering Tool is a software for configuring and monitoring communication gateways or communication front-ends.
connectivity concept	The connectivity concept separates the IED specific information from applications and tools, it provides means for the user to update the applications and tools easily with the latest versions of the IED specific information.
connectivity package	Software package that provides device specific information about certain protection and control relay (IED), which provides means for applications and tools to connect and interact with the IED. Furthermore, connectivity package will ease and simplify the engineering process.
Connectivity Package Manager	Software that helps user to associate right connectivity package versions to different applications and tools.
Intelligent Electronic Device	In this context, IED is used as a common term for protection and control relays, such as REF 543.
IEC 61850	A communication protocol based on IEC 61850 standard series and a standard for substations modeling.
Substation Configuration description Language (SCL)	XML based description language for configurations of electrical substation IEDs. Defined in the IEC 61850 standard.

1.7. Abbreviations

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

Abbreviation	Description
CAP	Computer Aided Programming system (a tool used to configure, maintain and operate the protection and control IEDs)
CET	Communication Engineering Tool
GUI	Graphical User Interface
IED	Intelligent Electronic Device (protection and control relay)
LN	Logical node according to IEC 61850 standard
LON	A communication protocol developed by Echelon
SCL	Substation Configuration description Language
SPA	ABB proprietary communication protocol used in substation automation

1.8. Related documents

Name of the manual	Document ID
SPA-ZC 400 Ethernet Adapter Installation and Commissioning Manual	1MRS755347
SPA-ZC 402 Ethernet Adapter Installation and Commissioning Manual	1MRS755380
Communication Gateway COM 610 *2.0 User's Guide	1MRS755385
MicroSCADA Pro IEC 61850 Master Protocol (OPC) *1.1 User's Guide	1MRS755321
IEC 61850 standard	IEC 61850-6, -7-3, -7-4

1.9. Document revisions

Version	Date	History
A	15.10.2004	Document created
B	25.05.2005	Support for new IED (RET 541/543/545) Additions: Chapter 4. Content and usage of connectivity packages and Chapter 5. Logical node naming.
C	08.07.2005	Support for REF (Release 3.5)

2. Installation and uninstallation

This chapter describes the installation and the uninstallation of the connectivity packages.

2.1. Installing connectivity packages

One connectivity package requires at least 55 MB of hard disk space, although the installation package size is about 30 MB.

Connectivity packages can be installed into the same environments as system products and tools that utilize the connectivity packages. For more information about the system products and tools manuals, refer to Section 1.8. Related documents.

1. Locate the connectivity package installation program (.msi) from the computer or download it via Internet.
2. Double click the relevant IED connectivity package installation program to start the installation. The installation wizard extracts the installation files to your local computer.
3. After the connectivity package installation program starts, click **Next** to proceed, see Fig. 2.1.-1.

   With the **Back** button you can return to the previous dialog, and with the **Cancel** button exit the installation wizard. This applies to all the dialogs in the installation wizard.

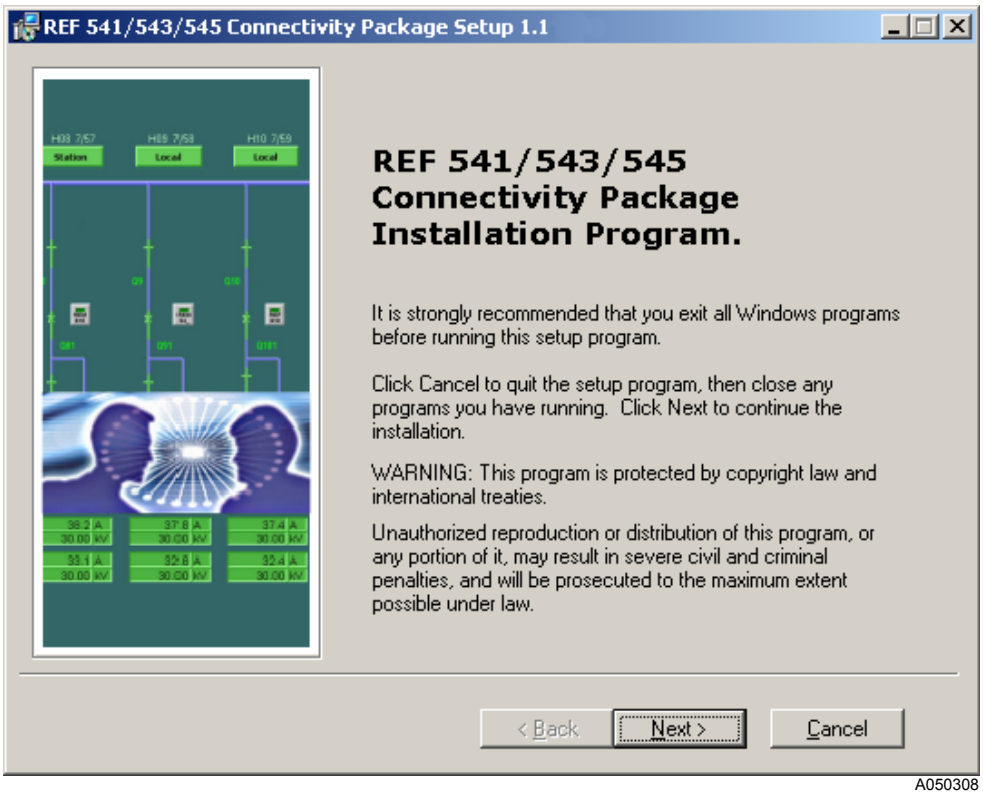

Fig. 2.1.-1 REF 541/543/545 Connectivity Package installation program

4. Follow the instructions of the installation wizard to complete the installation.

2.2. Uninstalling connectivity packages

To uninstall the connectivity packages:

1. Open the Add or Remove Programs dialog from the Windows Control Panel.
2. Select the relevant connectivity package and click **Remove**, see Fig. 2.2.-1.
   You can check that you are uninstalling the right connectivity package by clicking the support information link. A Support Info dialog is displayed to indentify the correct connectivity package version.

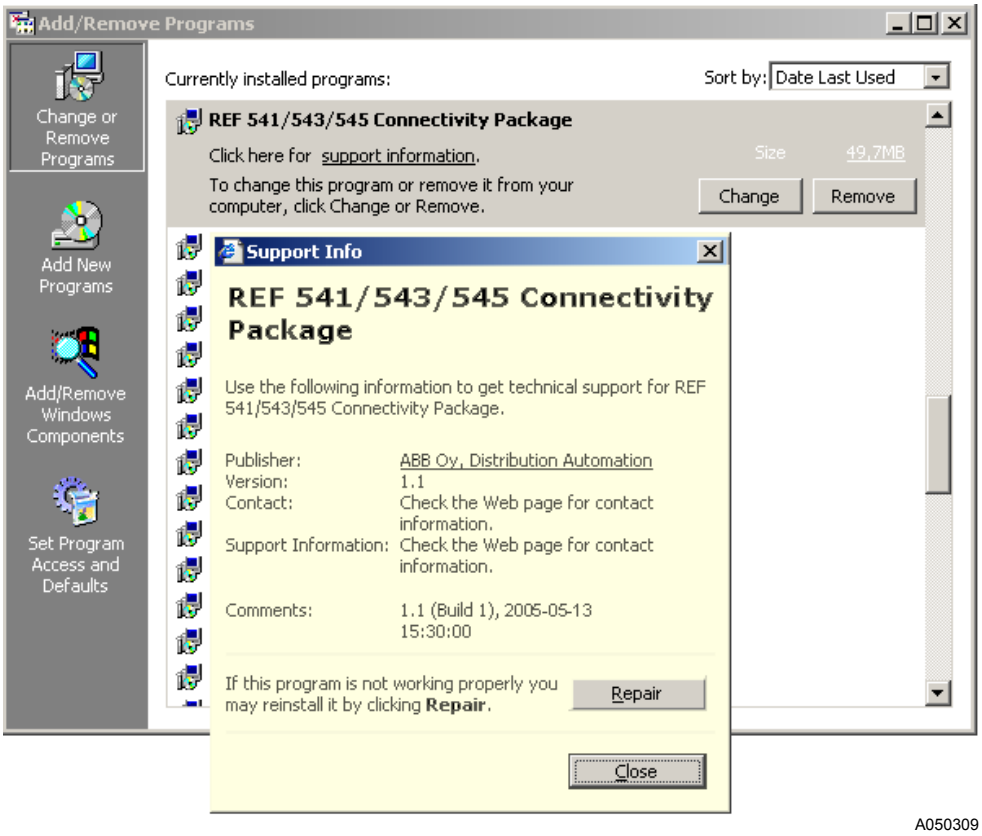

Fig. 2.2.-1 Add or Remove Programs dialog

3. Connectivity Package Manager

The Connectivity Package Manager is a tool that helps you to associate the right connectivity package versions to different applications and tools. Connectivity Package Manager is included in products supporting the connectivity concept. For more information on the supported applications and tools, refer to Section 1.3. General and Section 1.8. Related documents.

A Connectivity Package Manager window shows the installed applications and tools, as well as the installed connectivity package versions in a tree structure, see Fig. 3.-1. The object tree shows all the information on the connectivity packages and the IED configuration tools that are installed on the computer. You can decide which version of the connectivity package associates with the specified application and tool by selecting the corresponding check box.

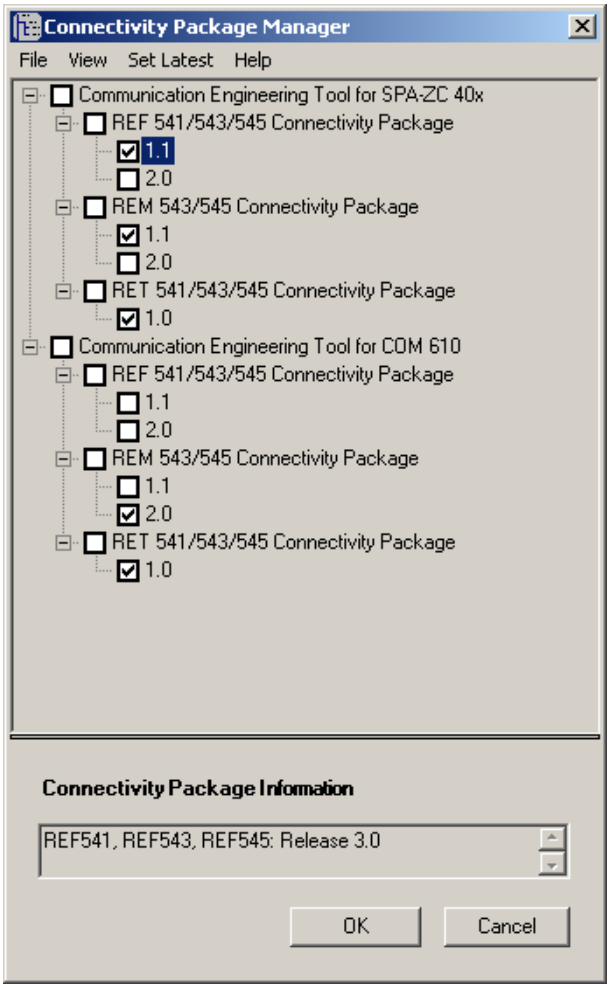

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Fig. 3.-1 Connectivity Package Manager

3.1. Starting Connectivity Package Manager

You can start the Connectivity Package Manager from the shortcut icon on your computer's desktop, see Fig. 3.1.-1, or from the **Tools** menu of the corresponding tool.

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Fig. 3.1.-1 Connectivity Package Manager icon

You can exit the program by selecting **File > Exit**.

3.2. Using Connectivity Package Manager

This section describes the main functions of the Connectivity Package Manager.

3.2.1. Associating connectivity package versions

When the Connectivity Package Manager is started, it shows all the applications and tools supporting connectivity concept, as well as the connectivity packages installed on your computer. You can expand and collapse the Connectivity Package Manager's tree structure to see which connectivity package versions are currently used in the different applications and tools.

You can browse in the object tree with mouse or keyboard's arrow keys. You can expand and collaps the nodes by clicking the ⊞ and ⊟ icons or pressing left and right arrow keys. You can also use the commands from the **View** menu to expand and collaps the nodes.

If the check box beside the version name is selected, the particular version of the connectivity package is used in the application or tool. If you clear all the versions of one connectivity package, the application or tool no longer uses that connectivity package the next time you start it. This will save some processing time during the application or tool startup.

If you have already installed some other connectivity packages, the Connectivity Package Manager detects them and checks if they can be used with the new IEDs. If the installed connectivity packages are from a wrong version extension, the Connectivity Package Manager prevents them to associate with the new IEDs.

To select the latest versions for all the installed connectivity packages select **Set Latest > Set Latest Versions to All**. The program goes through all the installed connectivity packages shown in the object tree and selects the most recent version for all of them, see Fig. 3.2.1.-1.

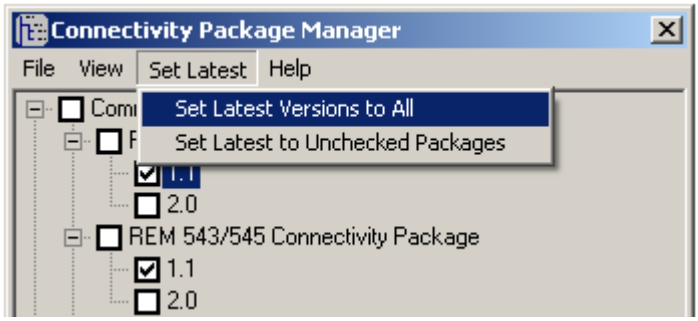

Fig. 3.2.1.-1 Setting latest versions to all nodes

To select the latest version for only those connectivity packages which do not have any version selected, select **Set Latest > Set Latest to Unchecked Packages**. This command leaves the already selected connectivity package versions as they are, see Fig. 3.2.1.-2.

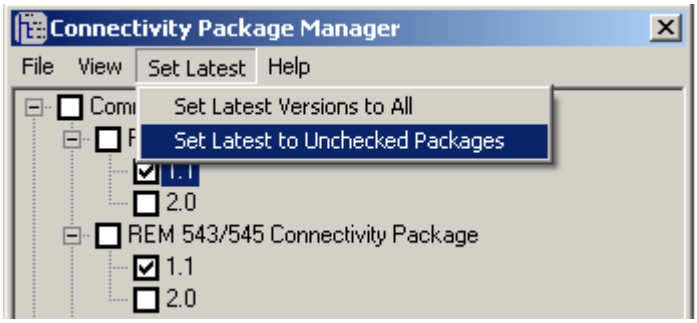

Fig. 3.2.1.-2 Setting latest versions to unactive nodes

If the connectivity package version has information about supported IEDs, this information is shown in the text box under Supported IEDs, see Fig. 3.2.1.-3. With this information you can confirm the right version of the connectivity package.

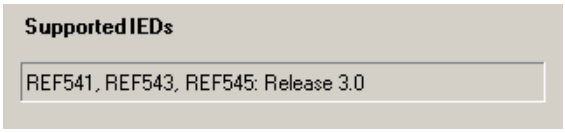

Fig. 3.2.1.-3 Specific IED's supported versions

3.2.2. Adding connectivity packages

Connectivity packages can be installed to the local computer also with the Connectivity Package Manager. You can install connectivity packages from any location you have access to.

To add a new connectivity package:

1. Select **File > Add new package**. The Open dialog displays.

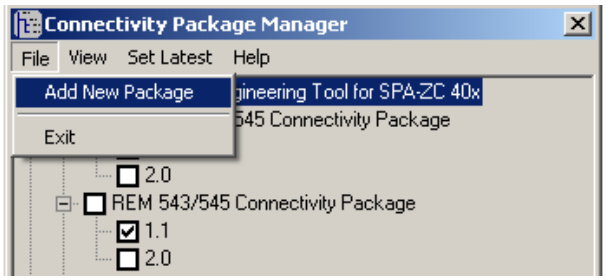

Fig. 3.2.2.-1 Adding new connectivity package

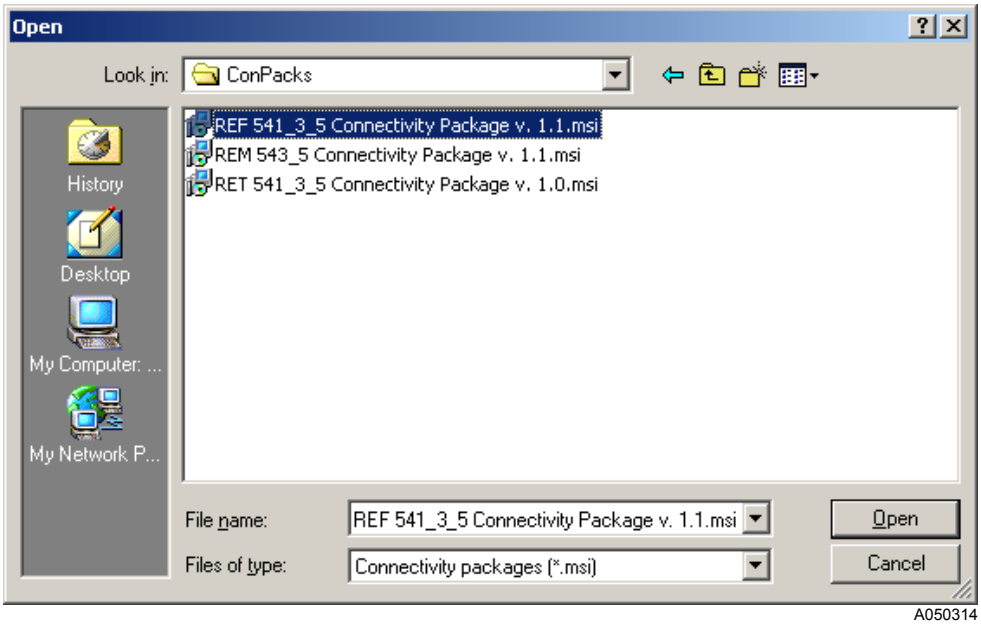

Fig. 3.2.2.-2 Adding connectivity package

2. Select a relevant connectivity package installer file (.msi).
3. Click **Open**.

The installation program starts to install the selected connectivity package to your local computer. For more information about installing connectivity packages, refer to Chapter 2. Installation and uninstallation.

4. Content and usage of connectivity packages

For all the products supporting the connectivity concept, the connectivity packages contain:

- Description of IED functionality and capabilities in SCL format. An IED functionality is mapped from the SPA and LON protocols to IEC 61850 protocol. The description texts in these files can be translated to other languages as well.
- Object types for device integration. These object types define the properties for a device related object, for example the protocols that are supported by IED.
- IED specific visual elements, for example object icons, graphical symbols and pictures in various places.
- Connectivity package related documentation
- IED specific documentation
- Other data and components needed by products using connectivity packages

The following sections describe the usage of connectivity packages in different products. For more information on how to use connectivity packages in applications and tools, refer to documentation related to each product.

Communication Gateway COM 610

You can use the connectivity packages to configure the Communication Gateway COM 610 with CET to communicate and interact with the SPA and LON devices. With the connectivity packages, you can also configure COM 610 by using IEC 61850 protocol to a SPA device that uses SPA-ZC 40x.

Ethernet Adapter SPA-ZC 40x

You can use the connectivity packages to configure SPA-ZC 40x with CET for SPA-ZC 400 and SPA-ZC 402. A combination of SPA-ZC 40x and COM 610 is also supported.

MicroSCADA Pro SYS 600 and COM 500

In the MicroSCADA Pro SYS 600 *9.0 or later and COM 500 *4.1 or later, you can use the connectivity packages to configure the IEC 61850 OPC server. This is usually done by importing the export file that is generated when SPA-ZC 40x is configured. In the MicroSCADA Pro SYS 600 *9.1 or later and COM 500 *4.2 or later, the same export file can be also used to build up the process database.

5. Logical node naming

The connectivity packages contain the descriptions for logical nodes and function blocks of IEDs. When an IED configuration (SCL file or CAP project file) is imported to the connectivity package object, a structure containing definitions of logical nodes is constructed.

When the IED configuration is imported, for example, to the Communication Engineering Tool (CET), you can see the logical devices (LD) and logical nodes (LN). An IED object can include many logical devices, and a logical device can include many logical nodes.

The logical node names are constructed from three different parts: LN prefix, LN class and LN instance number. LN prefix is an ABB specific string with less than five characters (see the table below). The LN class is the name of the logical node class defined in the IEC 61850-7-4 specification, refer to the Section 1.8. Related documents. The LN instance number is the ID number of logical node. In the REF 541/543/545, REM 543/545 and RET 541/543/545 connectivity packages, the LN instance number is the SPA channel number of the corresponding function block.

The figure below shows a designation code for the logical nodes in connectivity packages. In the following example, the logical node name is DEFPTOC41.

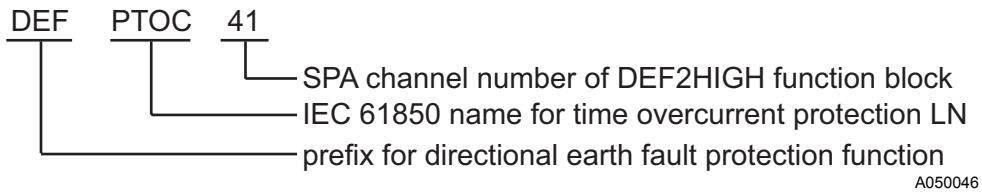

Fig. 5.-1 Logical node naming in connectivity packages

The following table presents the logical node prefixes for RED500 series IEDs.

Table 5.-1 LN prefixes for RED500

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
Protection				
AR5Func	-	RREC	80	Auto-reclosing function
CUB1Cap	CUB	PTOC	117	Unbalance protection for capacitors
CUB1Cap	CUB	RBRF	117	Circuit breaker failure protection of unbalance protection for capacitors
CUB3Cap	CUB	PTOC	52	Three-phase unbalance protection for capacitor banks
CUB3Cap	CUB	RBRF	52	Circuit breaker failure protection of three-phase unbalance protection for capacitor banks
CUB3Low	CUB	PTOC	51	Phase discontinuity protection
CUB3Low	CUB	RBRF	51	Circuit breaker failure protection of phase discontinuity protection
DEF2High	DEF	PTOC	41	Directional earth-fault protection function, high-set stage
DEF2High	DEF	RBRF	41	Circuit breaker failure protection of directional earth-fault protection function, high-set stage
DEF2Inst	DEF	PTOC	42	Directional earth-fault protection function, instantaneous stage
DEF2Inst	DEF	RBRF	42	Circuit breaker failure protection of directional earth-fault protection function, instantaneous stage
DEF2Low	DEF	PTOC	40	Directional earth-fault protection function, low-set stage
DEF2Low	DEF	RBRF	40	Circuit breaker failure protection of directional earth-fault protection function, low-set stage
Diff3	HIZ	PDIF	100	High-impedance based differential protection for generators and motors
Diff3	HIZ	RBRF	100	Circuit breaker failure protection of high-impedance based differential protection for generators and motors
Diff6G	GEN	PDIF	99	Stabilized three-phase differential protection for generators
Diff6G	GEN	RBRF	99	Circuit breaker failure protection of stabilized three-phase differential protection for transformers
DOC6High	DIR	PTOC	36	Three-phase directional overcurrent function, high-set stage
DOC6High	DIR	RBRF	36	Circuit breaker failure protection of three-phase directional overcurrent function, high-set stage

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
DOC6Inst	DIR	PTOC	37	Three-phase directional overcurrent function, instantaneous stage
DOC6Inst	DIR	RBRF	37	Circuit breaker failure protection of three-phase directional overcurrent function, instantaneous stage
DOC6Low	DIR	PTOC	35	Three-phase directional overcurrent function, low-set stage
DOC6Low	DIR	RBRF	35	Circuit breaker failure protection of three-phase directional overcurrent function, low-set stage
FLOC	LCTR	RFLO	58	Fault locator
Freq1St1	T1	PTOF	72	Overfrequency protection stage 1, timer 1
Freq1St1	T1	PTUF	72	Underfrequency protection stage 1, timer 1
Freq1St1_1	T2	PTOF	72	Overfrequency protection stage 1, timer 2
Freq1St1_1	T2	PTUF	72	Underfrequency protection stage 1, timer 2
Freq1St1	-	PFRC	72	Rate of change of frequency protection stage 1
Freq1St2	T1	PTOF	73	Overfrequency protection stage 2, timer 1
Freq1St2	T1	PTUF	73	Underfrequency protection stage 2, timer 1
Freq1St2_1	T2	PTOF	73	Overfrequency protection stage 2, timer 2
Freq1St2_1	T2	PTUF	73	Underfrequency protection stage 2, timer 2
Freq1St2	-	PFRC	73	Rate of change of frequency protection stage 2
Freq1St3	T1	PTOF	74	Overfrequency protection stage 3, timer 1
Freq1St3	T1	PTUF	74	Underfrequency protection stage 3, timer 1
Freq1St3_1	T2	PTOF	74	Overfrequency protection stage 3, timer 2
Freq1St3_1	T2	PTUF	74	Underfrequency protection stage 3, timer 2
Freq1St3	-	PFRC	74	Rate of change of frequency protection stage 3
Freq1St4	T1	PTOF	75	Overfrequency protection stage 4, timer 1
Freq1St4	T1	PTUF	75	Underfrequency protection stage 4, timer 1

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
Freq1St4_1	T2	PTOF	75	Overfrequency protection stage 4, timer 2
Freq1St4_1	T2	PTUF	75	Underfrequency protection stage 4, timer 2
Freq1St4	-	PFRC	75	Rate of change of frequency protection stage 4
Freq1St5	T1	PTOF	76	Overfrequency protection stage 5, timer 1
Freq1St5	T1	PTUF	76	Underfrequency protection stage 5, timer 1
Freq1St5_1	T2	PTOF	76	Overfrequency protection stage 5, timer 2
Freq1St5_1	T2	PTUF	76	Underfrequency protection stage 5, timer 2
Freq1St5	-	PFRC	76	Rate of change of frequency protection stage 5
FuseFail	-	RFUF	118	Fuse failure supervision
Inrush3	INR	PHAR	34	Three-phase transformer inrush and motor start-up current detector
MotStart	-	PMSS	54	Three-phase start-up supervision for motors, starting time supervision
MotStart	-	PMRI	54	Three-phase start-up supervision for motors, restart inhibition
NEF1High	EF	PTOC	39	Non-directional earth-fault protection function, high-set stage
NEF1High	EF	RBRF	39	Circuit breaker failure protection of non-directional earth-fault protection function, high-set stage
NEF1Inst	EF	PTOC	90	Non-directional earth-fault protection function, instantaneous stage
NEF1Inst	EF	RBRF	90	Circuit breaker failure protection of non-directional earth-fault protection function, instantaneous stage
NEF1Low	EF	PTOC	38	Non-directional earth-fault protection function, low-set stage
NEF1Low	EF	RBRF	38	Circuit breaker failure protection of non-directional earth-fault protection function, low-set stage
NOC3High	PH	PTOC	32	Three-phase non-directional overcurrent function, high-set stage
NOC3High	PH	RBRF	32	Circuit breaker failure protection of three-phase non-directional overcurrent function, high-set stage

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
NOC3Inst	PH	PTOC	33	Three-phase non-directional overcurrent protection function, instantaneous stage
NOC3Inst	PH	RBRF	33	Circuit breaker failure protection of three-phase non-directional overcurrent protection function, instantaneous stage
NOC3Low	PH	PTOC	31	Three-phase non-directional overcurrent function, low-set stage
NOC3Low	PH	RBRF	31	Circuit breaker failure protection of three-phase non-directional overcurrent function, low-set stage
NPS3High	NS	PTOC	78	Negative phase sequence protection, high-set stage
NPS3High	NS	RBRF	78	Circuit breaker failure protection of negative phase sequence protection, high-set stage
NPS3Low	NS	PTOC	77	Negative phase sequence protection, low-set stage
NPS3Low	NS	RBRF	77	Circuit breaker failure protection of negative phase sequence protection, low-set stage
NUC3St1	PH	PTUC	88	Three-phase non-directional undercurrent protection, stage 1
NUC3St1	PH	RBRF	88	Circuit breaker failure protection of three-phase non-directional undercurrent protection, stage 1
NUC3St2	PH	PTUC	89	Three-phase non-directional undercurrent protection, stage 2
NUC3St2	PH	RBRF	89	Circuit breaker failure protection of three-phase non-directional undercurrent protection, stage 2
OE1High	-	PVPH	69	Overexcitation protection, high-set stage
OE1High	-	RBRF	69	Circuit breaker failure protection of overexcitation protection, high-set stage
OE1Low	-	PVPH	68	Overexcitation protection, low-set stage
OE1Low	-	RBRF	68	Circuit breaker failure protection of Overexcitation protection, low-set stage
OL3Cap	OLC	PTOC	116	Three-phase overload protection for capacitors
OL3Cap	OLC	PTUC	116	Undercurrent protection for capacitor banks

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
OL3Cap	OLC	RBRF	116	Circuit breaker failure protection of three-phase overload protection for capacitors
OPOW6St1	PH	PDIR	92	Three-phase directional overpower, stage 1
OPOW6St1	PH	PDOP	92	Directional overpower
OPOW6St1	PH	RBRF	92	Breaker failure
OPOW6St2	PH	PDIR	93	Three-phase directional overpower, stage 2
OPOW6St2	PH	PDOP	93	Directional overpower
OPOW6St2	PH	RBRF	93	Breaker failure
OPOW6St3	PH	PDIR	94	Three-phase directional overpower, stage 3
OPOW6St3	PH	PDOP	94	Directional overpower
OPOW6St3	PH	RBRF	94	Breaker failure
OV3High	PH	PTOV	63	Three-phase overvoltage protection, high-set stage
OV3Low	PH	PTOV	62	Three-phase overvoltage protection, low-set stage
PREV3	PRV	PPAM	55	Phase reversal protection
PSV3St1	NS	PTOV	112	Negative phase sequence overvoltage
PSV3St1	PS	PTUV	112	Positive phase sequence undervoltage
PSV3St1_1	PS	PTOV	112	Positive phase sequence overvoltage
PSV3St2	NS	PTOV	113	Negative phase sequence overvoltage
PSV3St2	PS	PTUV	113	Positive phase sequence undervoltage
PSV3St2_1	PS	PTOV	113	Positive phase sequence overvoltage
REF1A	REF	PDIF	102	High-impedance based restricted earth-fault protection
REF1A	REF	RBRF	102	Circuit breaker failure protection of high-impedance based restricted earth-fault protection
ROV1High	RES	PTOV	45	Residual overvoltage protection, high-set stage
ROV1Inst	RES	PTOV	46	Residual overvoltage protection, instantaneous stage
ROV1Low	RES	PTOV	44	Residual overvoltage protection, low-set stage
SCVST1	-	RSYN	70	Synchro-check/voltage check function stage 1

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
SCVST2	-	RSYN	71	Synchro-check/voltage check function stage 2
TOL3Cab	CAB	PTTR	47	Three-phase thermal overload protection for cables
TOL3Dev	DEV	PTTR	48	Three-phase thermal overload protection for devices
UE6High	-	PDIR	67	Three-phase underexcitation protection, high-set stage
UE6High	-	PDUP	67	Directional underpower of three-phase underexcitation protection, high-set stage
UE6High	-	RBRF	67	Circuit breaker failure of three-phase underexcitation protection, high-set stage
UE6Low	UE	PDIS	66	Three-phase underexcitation protection, low-set stage
UI6High	-	PDIS	111	Three-phase underimpedance protection, high-set stage
UI6High	-	RBRF	111	Circuit breaker failure of three-phase underimpedance protection, high-set stage
UI6Low	UI	PDIS	110	Three-phase underimpedance protection, low-set stage
UI6Low	UI	RBRF	110	Circuit breaker failure of three-phase underimpedance protection, low-set stage
UPOW6St1	PH	PDIR	95	Three-phase underpower or reverse power, stage 1
UPOW6St1	PH	PDUP	95	Directional underpower
UPOW6St1	PH	RBRF	95	Circuit breaker failure of three-phase underpower or reverse power, stage 1
UPOW6St2	PH	PDIR	96	Three-phase underpower or reverse power, stage 2
UPOW6St2	PH	PDUP	96	Directional underpower
UPOW6St2	PH	RBRF	96	Circuit breaker failure of three-phase underpower or reverse power, stage 2
UPOW6St3	PH	PDIR	97	Three-phase underpower or reverse power, stage 3
UPOW6St3	PH	PDUP	97	Directional underpower
UPOW6St3	PH	RBRF	97	Circuit breaker failure of three-phase underpower or reverse power, stage 3
UV3High	PH	PTUV	65	Three-phase undervoltage protection, high-set stage

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
UV3Low	PH	PTUV	64	Three-phase undervoltage protection, low-set stage
VOC6High	-	PVOC	107	Voltage controlled/dependent time overcurrent
VOC6High	-	RBRF	107	Circuit breaker failure of voltage controlled/dependant time overcurrent
VOC6Low	PH	PVOC	91	Voltage dependent overcurrent protection, low-set stage (51V)
VOC6Low	PH	RBRF	91	Circuit breaker failure of voltage dependent overcurrent protection, low-set stage
NOC3LowB	PH	PTOC	53	Three-phase non-directional overcurrent function, low-set stage
NOC3LowB	PH	RBRF	53	Circuit breaker failure protection of three-phase non-directional overcurrent function, low-set stage
REF4A	REF	PDIF	101	Stabilized restricted earth-fault protection, high voltage side
REF4A	REF	RBRF	101	Circuit breaker failure protection of stabilized restricted earth-fault protection, high voltage side
REF4B	REF	PDIF	119	Stabilized restricted earth-fault protection, low voltage side
REF4B	REF	RBRF	119	Circuit breaker failure protection of stabilized restricted earth-fault protection, low voltage side
Diff6T	GEN	PDIF	106	Stabilized three-phase differential protection for transformers
Diff6T	GEN	RBRF	106	Circuit breaker failure protection of stabilized three-phase differential protection for transformers
Control				
CO3DC1	DCO3	CILO	139	Three state disconnector 1, interlocking
CO3DC1	DCO3	CSWI	139	Three state disconnector 1, switch control
CO3DC1	DCO3	XSWI	139	Three state disconnector 1, disconnector information
CO3DC1_1	ESW3	CILO	139	Three state disconnector 1, interlocking
CO3DC1_1	ESW3	CSWI	139	Three state disconnector 1, switch control
CO3DC1_1	ESW3	XSWI	139	Three state disconnector 1, disconnector information
CO3DC2	DCO3	CILO	140	Three state disconnector 2, interlocking

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
CO3DC2	DCO3	CSWI	140	Three state disconnector 2, switch control
CO3DC2	DCO3	XSWI	140	Three state disconnector 2, disconnector information
CO3DC2_1	ESW3	CILO	140	Three state disconnector 1, interlocking
CO3DC2_1	ESW3	CSWI	140	Three state disconnector 2, switch control
CO3DC2_1	ESW3	XSWI	140	Three state disconnector 2, disconnector information
COCB1	CB	CILO	120	Circuit breaker 1, interlocking
COCB1	CB	CSWI	120	Circuit breaker 1, switch control
COCB1	CB	XCBR	120	Circuit breaker 1, circuit breaker information
COCB2	CB	CILO	121	Circuit breaker 2, interlocking
COCB2	CB	CSWI	121	Circuit breaker 2, switch control
COCB2	CB	XCBR	121	Circuit breaker 2, circuit breaker information
CODC1	DCO	CILO	122	Disconnector 1, interlocking
CODC1	DCO	CSWI	122	Disconnector 1, switch control
CODC1	DCO	XSWI	122	Disconnector 1, disconnector information
CODC2	DCO	CILO	123	Disconnector 2, interlocking
CODC2	DCO	CSWI	123	Disconnector 2, switch control
CODC2	DCO	XSWI	123	Disconnector 2, disconnector information
CODC3	DCO	CILO	124	Disconnector 3, interlocking
CODC3	DCO	CSWI	124	Disconnector 3, switch control
CODC3	DCO	XSWI	124	Disconnector 3, disconnector information
CODC4	DCO	CILO	125	Disconnector 3, interlocking
CODC4	DCO	CSWI	125	Disconnector 3, switch control
CODC4	DCO	XSWI	125	Disconnector 3, disconnector information
CODC5	DCO	CILO	126	Disconnector 5, interlocking
CODC5	DCO	CSWI	126	Disconnector 5, switch control
CODC5	DCO	XSWI	126	Disconnector 5, disconnector information
COIND1	ESW	CSWI	127	Switch controller
COIND1	ESW	XSWI	127	Object indication 1, non-controllable
COIND2	ESW	CSWI	128	Switch controller
COIND2	ESW	XSWI	128	Object indication 2, non-controllable
COIND3	ESW	CSWI	129	Switch controller

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	IEC 61850 Logical Node Name			Description
	Logical Node Prefix	Logical Node Class	Logical Node Instance (Channel Number)	
COIND3	ESW	XSWI	129	Object indication 3, non-controllable
COIND4	ESW	CSWI	130	Switch controller
COIND4	ESW	XSWI	130	Object indication 4, non-controllable
COIND5	ESW	CSWI	131	Switch controller
COIND5	ESW	XSWI	131	Object indication 5, non-controllable
COIND6	ESW	CSWI	132	Switch controller
COIND6	ESW	XSWI	132	Object indication 6, non-controllable
COIND7	ESW	CSWI	133	Switch controller
COIND7	ESW	XSWI	133	Object indication 7, non-controllable
COIND8	ESW	CSWI	134	Switch controller
COIND8	ESW	XSWI	134	Object indication 8, non-controllable
COPFC	PFC	ARCO	143	Power factor controller
Condition Monitoring				
CMBWEAR1	CBEW	GGIO	187	Circuit breaker electric wear 1
CMBWEAR2	CBEW	GGIO	188	Circuit breaker electric wear 2
CMCU3	SCC	GGIO	181	Supervision function of the energizing current input circuit
CMGAS1	-	SIMG	186	Gas density monitoring
CMGAS3	-	SIMG	194	Gas density monitoring of three poles
CMSHED	CHED	GGIO	189	Scheduled maintenance
CMSPRC1	SPRC	GGIO	190	Spring charging control 1
CMTCS1	TCS	GGIO	191	Trip circuit supervision 1
CMTCS2	TCS	GGIO	192	Trip circuit supervision 2
CMTIME1	T	GGIO	184	Operate time counter 1 for the used operate time (motors)
CMTIME2	T	GGIO	185	Operate time counter 2 for the used operate time (motors)
CMTRAV1	TRT	GGIO	193	Breaker travel time 1 supervision
CMVO3	SVC	GGIO	182	Supervision of the energizing voltage input circuit
Measurement				
MEAI1	GM	GGIO	213	General measurement 1
MEAI2	GM	GGIO	214	General measurement 2
MEAI3	GM	GGIO	215	General measurement 3
MEAI4	GM	GGIO	216	General measurement 4
MEAI5	GM	GGIO	217	General measurement 5
MEAI6	GM	GGIO	218	General measurement 6

Table 5.-1 LN prefixes for RED500 (Continued)

Function Block Name	**IEC 61850 Logical Node Name**			**Description**
	Logical Node Prefix	**Logical Node Class**	**Logical Node Instance (Channel Number)**	
MEAI7	GM	GGIO	219	General measurement 7
MEAI8	GM	GGIO	220	General measurement 8
MECU1A	I	MMXU	201	Current measurement A
MECU1B	I	MMXU	203	Current measurement B
MECU3A	I	MMXU	200	Three-phase current measurement A
MECU3B	I	MMXU	202	Three-phase current measurement B
MEDREC	-	RDRE	225	Transiet disturbance recorder
MEFR1	F	MMXU	208	System frequency measurement
MEPE7	W	MMTR	207	Three-phase energy metering
MEPE7	P	MMXU	207	Three-phase power metering
MEVO1A	U	MMXU	205	Voltage measurement A
MEVO1B	U	MMXU	226	Voltage measurement B
MEVO3A	U	MMXU	204	Three-phase voltage measurement A
MEVO3B	U	MMXU	206	Three-phase voltage measurement B
Power Quality				
PQCU3H	PQ	MHAI	512	Current waveform distortion measurement
PQVO3H	PQ	MHAI	513	Voltage waveform distortion measurement
PQVO3SD	UV	QVVR	514	Short duration voltage variations

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