

AutomationDirect.com

P-Series CPUs to NITRA Pneumatic Automation Link (PAL)

Integration Walk-Through

Revision: 1.1
3-23-2021

Table of Contents

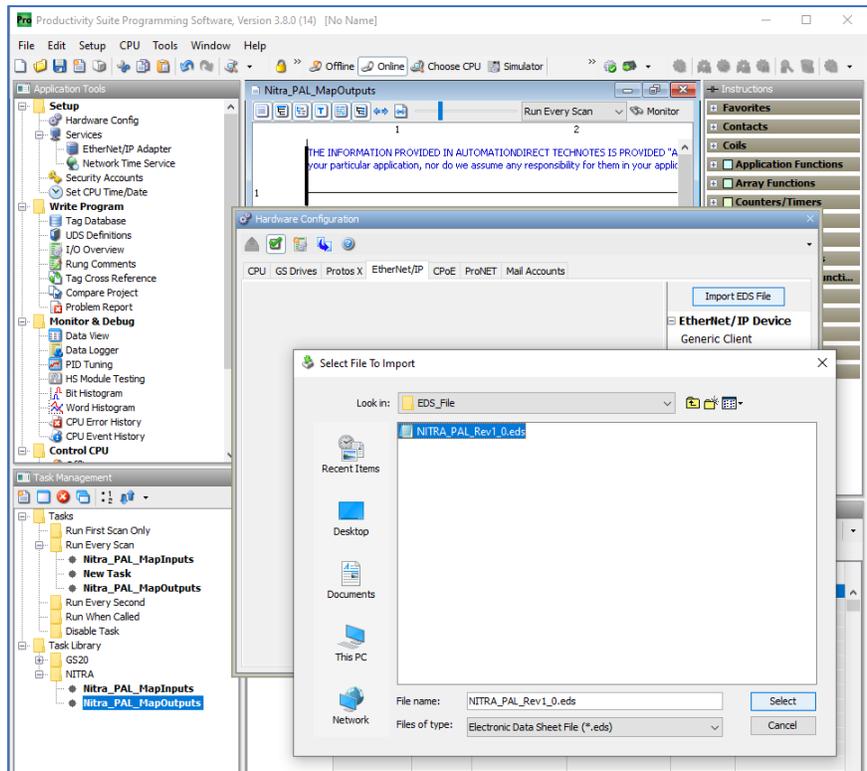
Import EDS File..... 2

Import Task Library 5

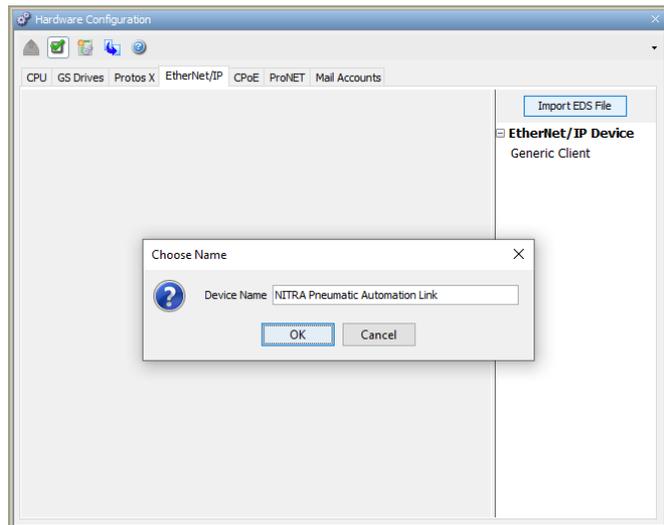
Modifying the Program..... 9

Import EDS File

From the Hardware Configuration, select the EtherNet/IP tab and click the 'Import EDS File' button. Navigate to the directory where the NITRA_PAL_Rev1_0 file has been saved and select the file.

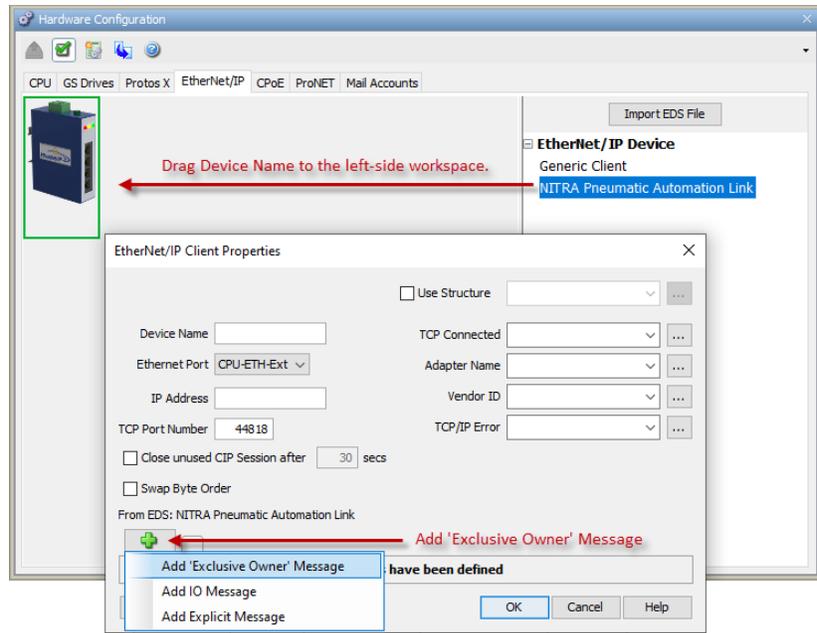


Provide a name for the device. The name 'NITRA Pneumatic Automation Link' has been provided by default.



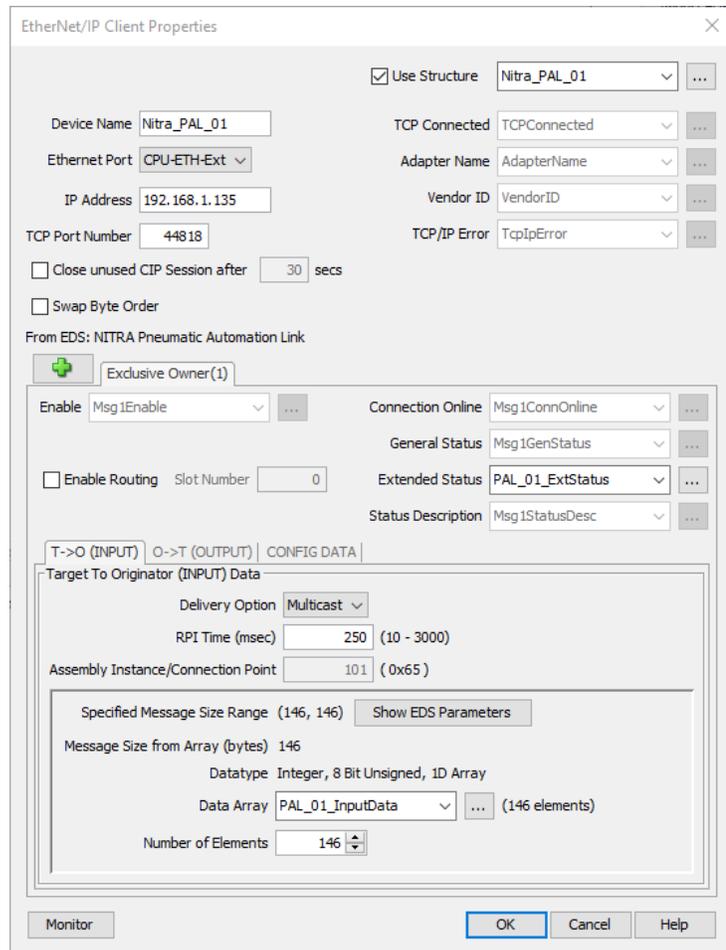
Drag the newly added device from the right-side list to the left-side workspace.

Add the 'Exclusive Owner' Message.



Create an 8 Bit Unsigned 1D Array of 146 elements for use with the IO Messaging Input Data from the Nitra PAL.

Note: a 16-element array for the Extended Status has been created. This is very useful when troubleshooting.



Create an 8 Bit Unsigned 1D Array of 102 elements for use with the IO Messaging Output Data from the Nitra PAL

EtherNet/IP Client Properties

Use Structure Nitra_PAL_01

Device Name: Nitra_PAL_01
Ethernet Port: CPU-ETH-Ext
IP Address: 192.168.1.135
TCP Port Number: 44818

TCP Connected: TCPConnected
Adapter Name: AdapterName
Vendor ID: VendorID
TCP/IP Error: TcpIpError

Close unused CIP Session after 30 secs
 Swap Byte Order

From EDS: NITRA Pneumatic Automation Link

Exclusive Owner(1)

Enable: Msg1Enable
Connection Online: Msg1ConnOnline
General Status: Msg1GenStatus
Extended Status: PAL_01_ExtStatus
Status Description: Msg1StatusDesc

Enable Routing Slot Number: 0

T->O (INPUT) | O->T (OUTPUT) | CONFIG DATA

Originator To Target (OUTPUT) Data

Include Status Header (When checked the message size will be increased by 4 bytes)

RPI Time (msec): 250 (10 - 3000)

Assembly Instance/Connection Point: 100 (0x64)

Specified Message Size Range: (102, 102) Show EDS Parameters

Message Size from Array (bytes): 102

Datatype: Integer, 8 Bit Unsigned, 1D Array

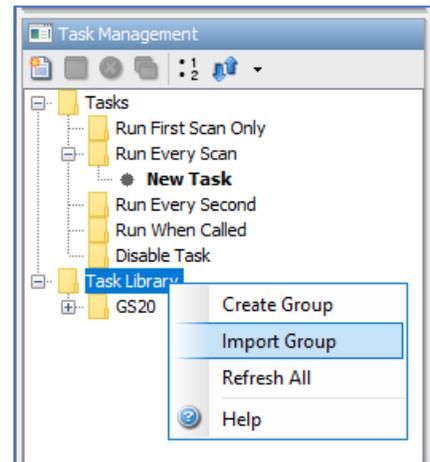
Data Array: PAL_01_OutputData (102 elements)

Number of Elements: 102

Monitor OK Cancel Help

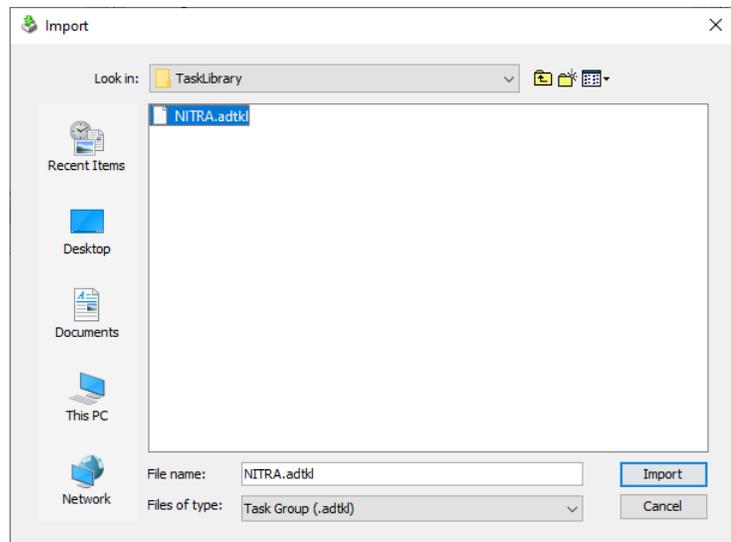
Import Task Library

From the Task Management window in the Productivity Suite, right-click on Task Library and select 'Import Group.'



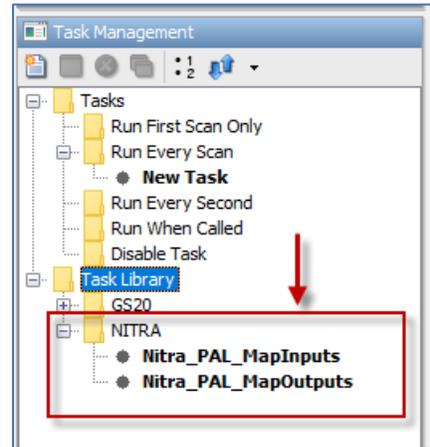
Select the NITRA.adtkl file from the directory user saved directory.

Click 'Import.'

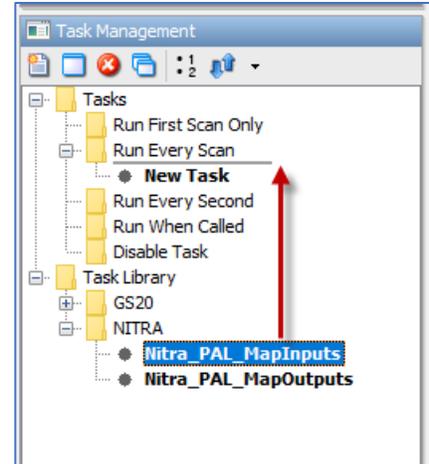


The following two Tasks will be imported:

- Nitra_PAL_MapInputs
- Nitra_PAL_MapOutputs

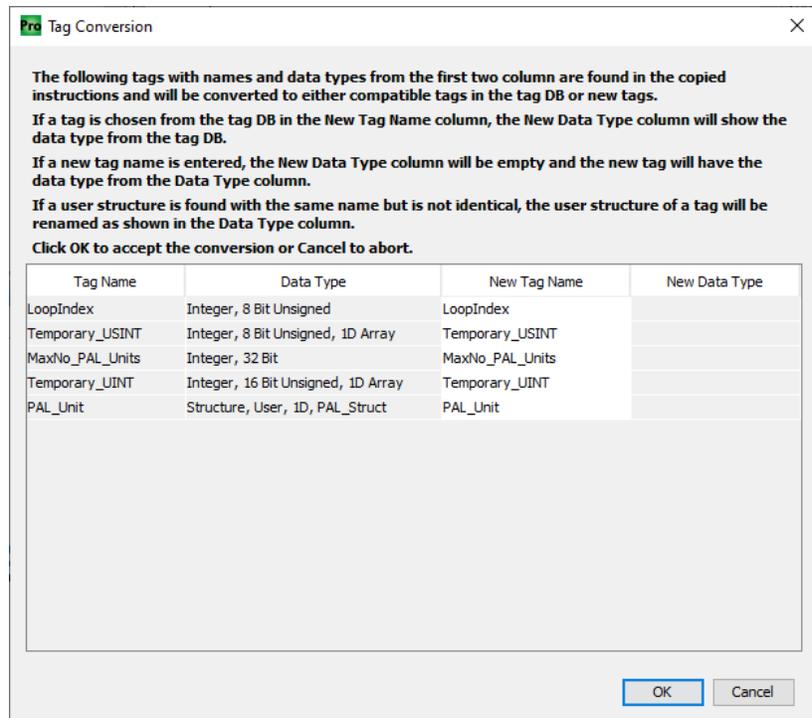


Move the Nitra_PAL_MapInputs Task to the 'Run Every Scan' section, placing it early in the execution order of other tasks.

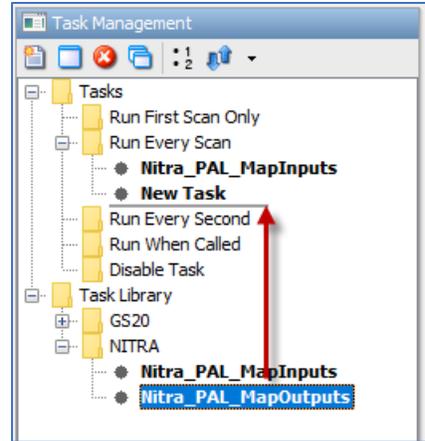


The following tags and User Defined Structure will be imported into the main project.

Click 'OK.'



Move the Nitra_PAL_MapOutputs Task to the 'Run Every Scan' section, placing it later in the execution order of other tasks



The following tags and User Defined Structure will be imported into the main project.
 Note: Most of these tags are the same as the previous import.

Click 'OK.'

Tag Conversion

The following tags with names and data types from the first two column are found in the copied instructions and will be converted to either compatible tags in the tag DB or new tags.

If a tag is chosen from the tag DB in the New Tag Name column, the New Data Type column will show the data type from the tag DB.

If a new tag name is entered, the New Data Type column will be empty and the new tag will have the data type from the Data Type column.

If a user structure is found with the same name but is not identical, the user structure of a tag will be renamed as shown in the Data Type column.

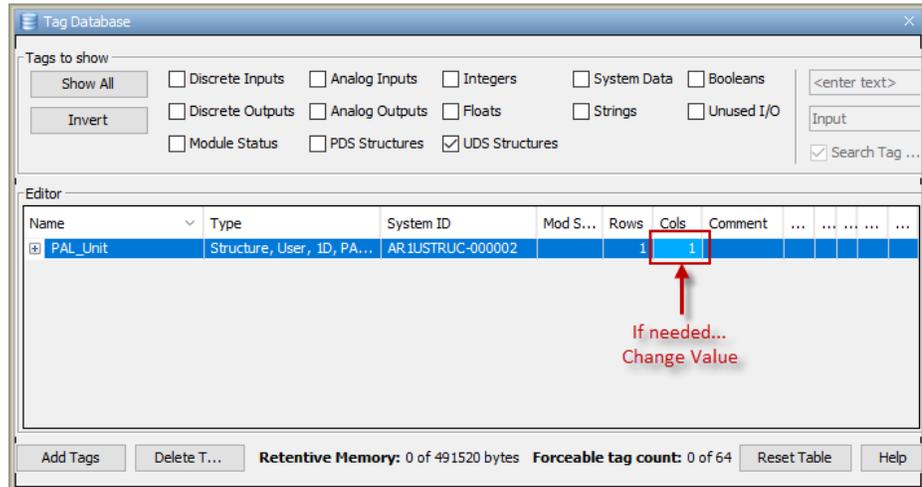
Click OK to accept the conversion or Cancel to abort.

Tag Name	Data Type	New Tag Name	New Data Type
LoopIndex	Integer, 8 Bit Unsigned	LoopIndex	Integer, 8 Bit Unsigned
Temporary_USINT	Integer, 8 Bit Unsigned, 1D ...	Temporary_USINT	Integer, 8 Bit Unsigned, 1D ...
MaxNo_PAL_Units	Integer, 32 Bit	MaxNo_PAL_Units	Integer, 32 Bit
Temporary_UINT	Integer, 16 Bit Unsigned, 1...	Temporary_UINT	Integer, 16 Bit Unsigned, 1...
PAL_Unit	Structure, User, 1D, PAL_S...	PAL_Unit	Structure, User, 1D, PAL_S...
Temporary_BOOL	Boolean, 1D Array	Temporary_BOOL	

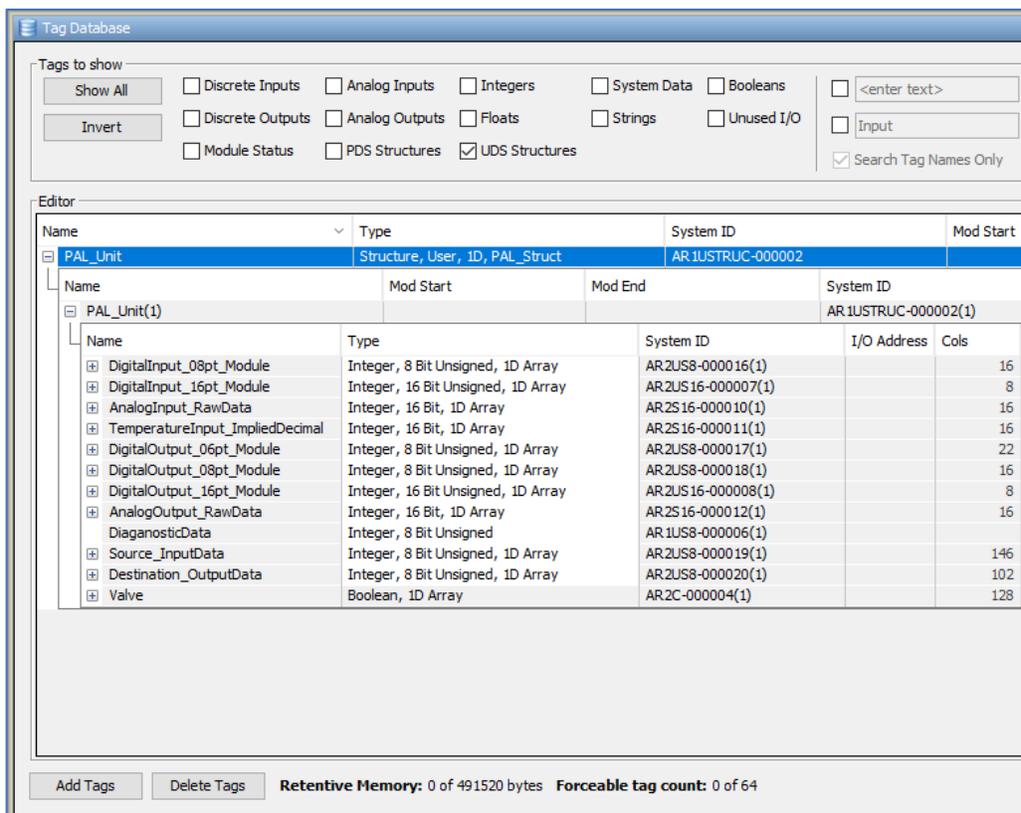
OK Cancel

Modifying the Program

The imported code blocks from the Task Library contain a User Defined Structure (UDS) named 'PAL_Struct' and a single Instance of this UDS (single element 1D array), named 'PAL_Unit(1)' within the Tag Name Database. If your system has a single Pneumatic Automation Link unit, then the default quantity of one is correct. If your system has more than one PAL unit, then the size of the 'PAL_Unit' array will need to be adjusted to accommodate the number of units in the system.



The UDS provides structure members for the maximum quantity of each IO module type, the maximum valve count, a Diagnostic Data element, as well as members for mapping the EtherNet/IP Source Input Data and Destination Output Data.



At the top of the Task: Nitra_PAL_MapInputs, the 146 bytes from the T->O array needs to be copied into the PAL_Unit.Source_InputData array elements. Insert a rung above the FOR/NEXT loop and use the Copy Array (CPA) instruction and the Copy Binary selection to map the data.

The screenshot displays the Productivity Suite Programming Software interface. The main window shows a ladder logic diagram for the task 'Nitra_PAL_MapInputs'. A 'Copy Array (CPA)' dialog box is open, showing the following configuration:

- Source Array: PAL_01_InputData
- Destination Array: PAL_Unit.Source_Input
- Start Row (2D Only): 1
- End Row (2D Only): 1
- Start Column: 1
- End Column: 146
- Overflow: (empty)
- Clear Source: Copy Value: Copy Binary:
- Show Instruction Comment:

A red arrow points to the 'Enable' checkbox in the dialog box. The background shows a ladder logic rung with a 'FOR LOOP' instruction and a 'NOP' instruction. The 'Data View' at the bottom shows a table with columns: Tagname, Value, Edit, Tag Data Type, and View As.

Tagname	Value	Edit	Tag Data Type	View As

Using the Copy Data (CPD) instruction, write the number of Pneumatic Automation Link units (used in the system) to the 'MaxNo_PAL_Units' tag. This tag value dictates the number of loop iterations for mapping the data for one or more units.

The screenshot displays the Productivity Suite Programming Software interface. The main window shows a ladder logic diagram for a task named 'Nitra_PAL_MapInputs'. The diagram includes a 'FOR LOOP' instruction with a 'MaxNo_PAL_Units' tag. A 'COPY DATA' instruction is being configured in a dialog box, with the 'Destination' field set to 'MaxNo_PAL_Units'. The dialog box also shows the 'Source' field set to '1' and the 'Type' set to 'Copy Value'. The 'Copy Data' dialog box has the following fields:

Source	Destination
1	MaxNo_PAL_Units

The 'Copy Data' dialog box also includes the following options:

- Copy Value
- Copy Binary
- Show Instruction Comment

The 'Copy Data' dialog box also has 'OK', 'Cancel', and 'Help' buttons.

The ladder logic diagram shows the following instructions:

- (NOP)
- Enable
- Enable
- *** START LOOP ***
This is a For/Next Loop that is designed to map all of the EtherNet/IP Digital Inputs to the corresponding PAL Units.
- DIAGNOSTIC DATA
- DIAGPT DIGITAL INPUTS
- DIAGPT DIGITAL INPUTS

The 'Data View' window at the bottom shows a table with the following columns:

Tagname	Value	Edit	Tag Data Type	View As

At the bottom of the Task: Nitra_PAL_MapOutputs, the 102 bytes from the O->T array needs to be populated by the PAL_Unit.Destination_OutputData array elements. Insert a rung below the FOR/NEXT loop and use the Copy Array (CPA) instruction and the Copy Binary selection to map the data.

The screenshot displays the Productivity Suite Programming Software interface. The main window shows a ladder logic diagram for the task 'Nitra_PAL_MapOutputs'. The diagram consists of several rungs (1-11) and a 'NEXT' instruction. A 'COPY ARRAY' instruction is highlighted in rung 9, with its properties set to 'Type: Copy Binary'. A red arrow points to the 'Enable' checkbox of this instruction. A 'Copy Array (CPA)' dialog box is open in the foreground, showing the following configuration:

- Source Array: PAL_Unit-Destination_C
- Destination Array: PAL_01_OutputData
- Start Row (2D Only): 1
- Start Column: 1
- End Row (2D Only): 1
- End Column: 102
- Overflow: (empty)
- Clear Source:
- Copy Value:
- Copy Binary:
- Show Instruction Comment:

The status bar at the bottom indicates: User: No Security, Task: Nitra_PAL_MapOutputs, Rung: 9, Column: 11, CPU: Offline, Project File Status: Not Saved, CPU Project Status, Run Time Transfer.

To verify the data mapping, enable the communication between the PLC and the PAL unit using the .Msg1Enable bit. Note: This can be done through ladder or a Data View.

The screenshot displays the Productivity Suite Programming Software interface. The main window shows a ladder logic diagram with 10 rungs. The first rung contains a coil labeled "Nitra_PAL_01.Msg1Enable" with an output of "OUT". A red box highlights this coil, and a red arrow points from it to the Data View window below.

The Data View window shows the following table:

Tagname	Value	Edit
Nitra_PAL_01.AdapterName		
Nitra_PAL_01.Msg1ConnOnline	<input type="checkbox"/>	<input type="checkbox"/>
Nitra_PAL_01.Msg1Enable		
Nitra_PAL_01.Msg1GenStatus	0	0
Nitra_PAL_01.Msg1StatusDesc		
Nitra_PAL_01.TcpIpConnected	<input type="checkbox"/>	<input type="checkbox"/>
Nitra_PAL_01.TcpIpError		
Nitra_PAL_01.VendorID	0	0
PAL_01.ExtStatus		
PAL_01.InputData		
PAL_01.OutputData		