



## **DF-G2/3 IO-Link Device Parameter Data Add-On Instruction Guide, v2.1**

### **2/7/2019**

This document covers the installation and use of an Add-On Instruction (AOI) for the Logix Designer software package from Rockwell Automation. This AOI handles acyclic IO-Link commands to and from an DF-G2/3. This AOI has four User Defined Tag data types.

**This IO-Link Device Parameter Data AOI is meant to be used alongside a v2.1 Banner IO-Link Master AOI.**

#### **Components**

Banner\_DFG2\_DFG3\_Param\_v2.L5X

#### **UDT's Packaged with the AOI**

Banner\_IOL\_Port\_v2

Banner\_DFG2\_DFG3\_v2

Banner\_DFG2\_DFG3\_RD\_v2

Banner\_DFG2\_DFG3\_WD\_v2

#### **NOTE:**

This Banner IO-Link Device Parameter AOI is useless on its own.

It is intended to be linked to a v2.1 Banner IO-Link Master AOI to function.

#### **Usage**

Add and configure the relevant v2.1 Banner IO-Link Master AOI in your ladder logic program first; then add and configure v2.1 Banner IO-Link Device Parameter Data AOIs as desired, linking them to the Master AOI.

#### **Other AOIs Available Separately**

Banner has AOI files for controlling other Banner IO-Link devices and for a variety of IO-Link Masters. Banner also has AOI files for easily handling Banner device Process Data.

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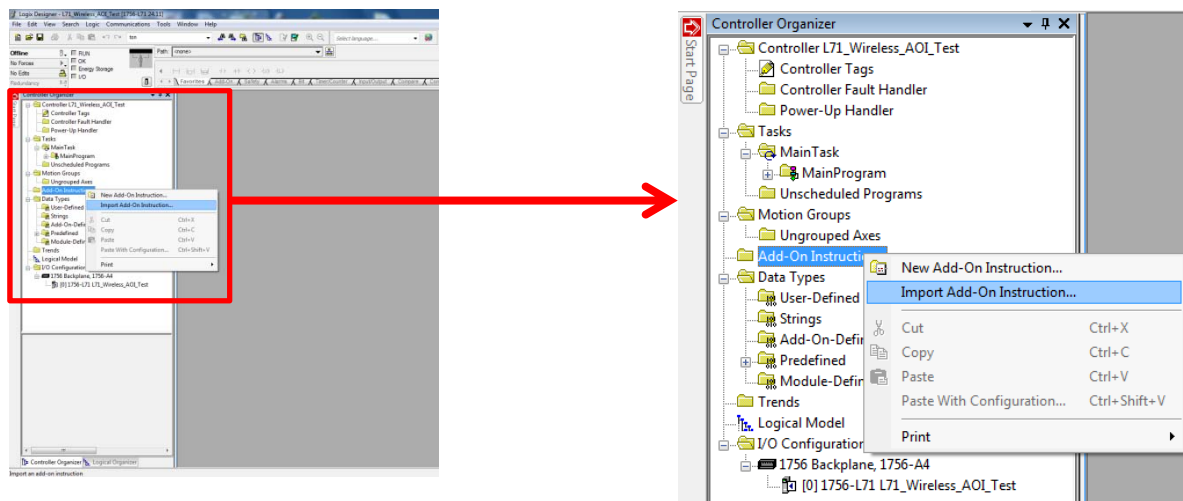
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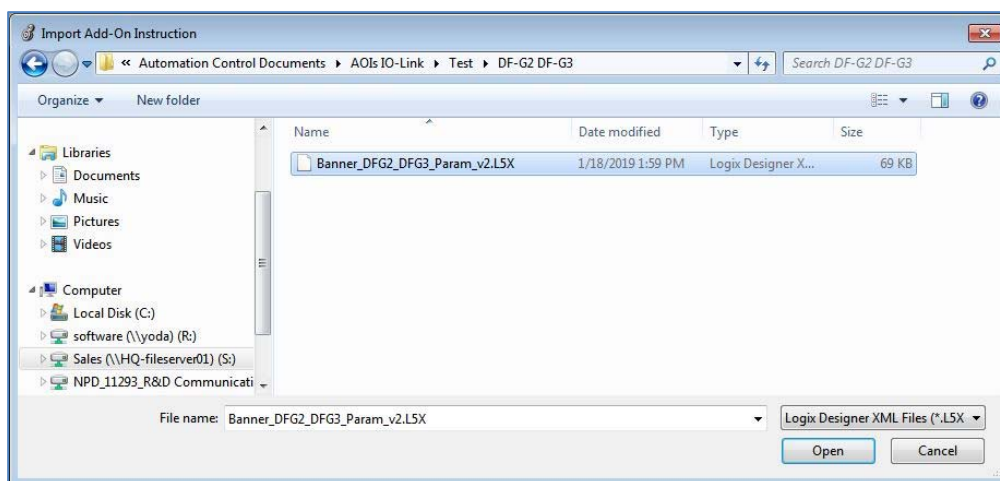
## 1. Installation Process

This section describes how to install the AOI in Logix Designer software.

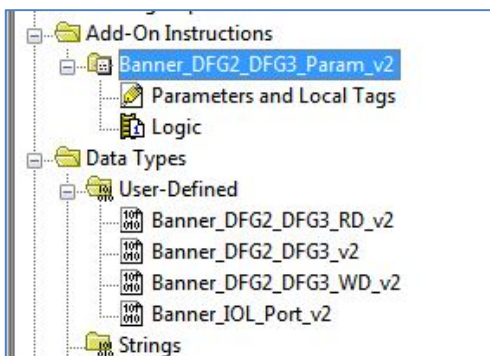
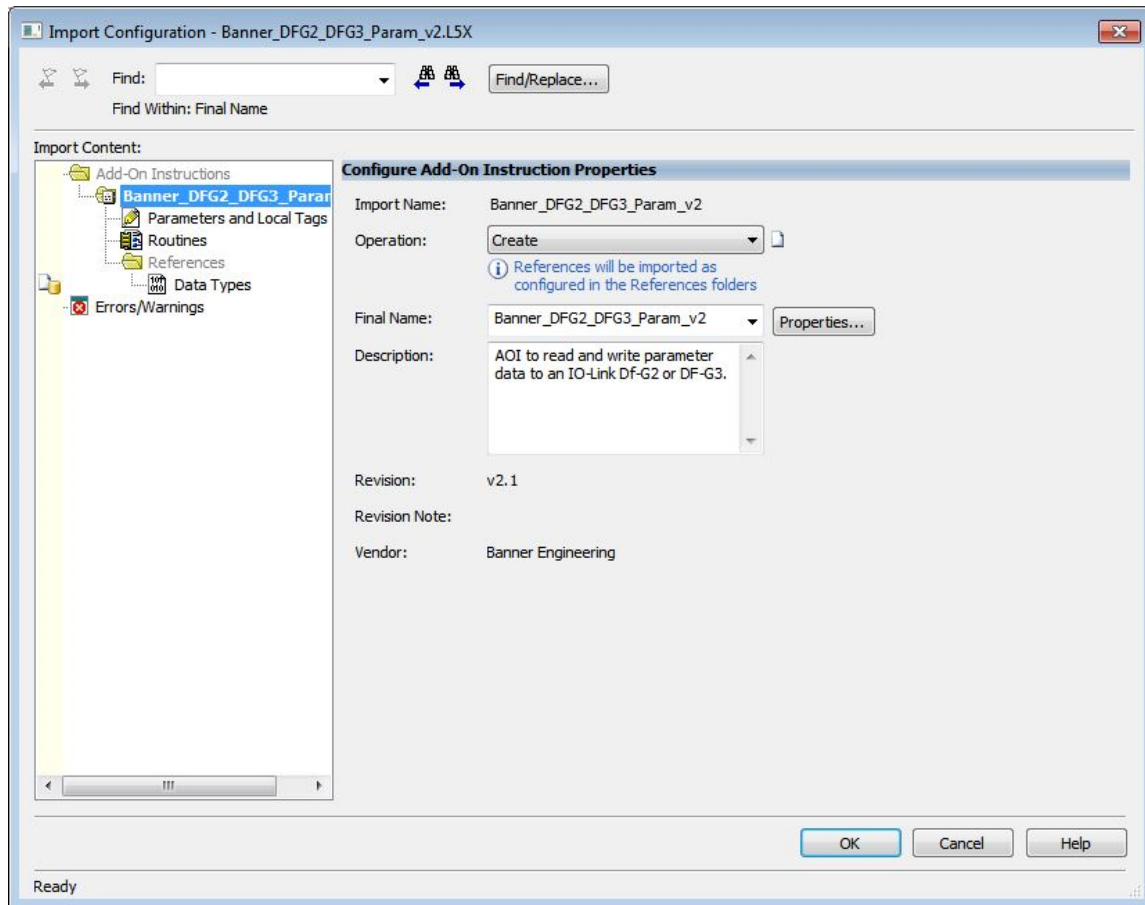
1. Open up a project.
2. In the Controller Organizer window, right-click on the Add-On Instruction folder. Select the Import Add-On Instruction option.



3. Navigate to the correct file location and select the AOI to be installed. In this example the "Banner\_DFG2\_DFG3\_Param\_v2.L5X" file will be selected. Click the Open button.



4. The Import Configuration window will pop up. The default selection will create all of the necessary items for the AOI. Click the OK button to complete the import process.



5. The AOI is added to the Controller Organizer window and should look similar to the picture at left.
6. AOI installation into the Logix Designer software complete.

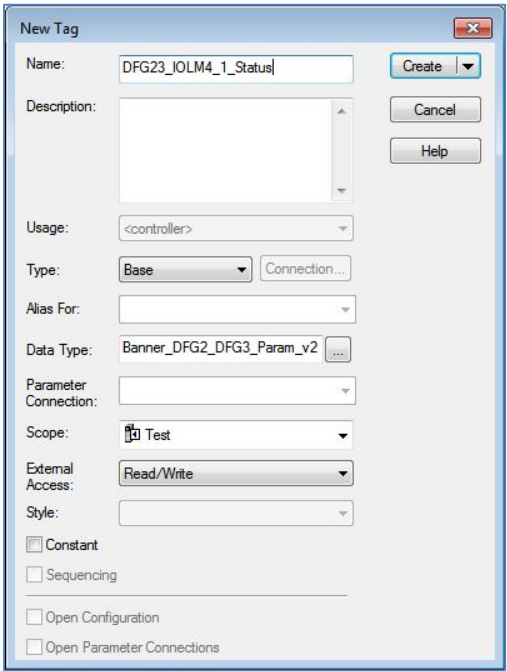
## 2. Configuring the AOI

Make sure to add and configure a Banner IO-Link Master AOI to your program before adding a Banner IO-Link Device AOI.

1. Add the “Banner\_DFG2\_DFG3\_Param\_v2” AOI to your ladder logic program. For each of the question marks shown in the instruction we need to create and link a new tag array. The AOI includes new types of User Defined Tag (UDT): custom arrays of tags meant specifically for this AOI.



2. In the AOI, right-click on the question mark on the line labeled “Banner\_DFG2\_DFG3\_Param\_v2”. Click New Tag. In this example, we’ll use the name “DFG23\_IOLM4\_1\_Status”. The example naming convention accounts for this being a DF-G2/3 device connected to IO-Link Master #4, port #1, in our program. More masters could be named IOLM1, IOLM2, and different sensors could be connected at other port numbers, etc.



The “EnableIn” and “EnableOut” variables are ladder logic rung status bits automatically added to all AOIs.

DFG23_IOLM4_1_Status	{ ... }	{ ... }		Banner_DFG2_DFG3_Param_v2
DFG23_IOLM4_1_Status.EnableIn	1		Decimal	BOOL
DFG23_IOLM4_1_Status.EnableOut	0		Decimal	BOOL
DFG23_IOLM4_1_Status.Port	0		Decimal	DINT

- Now click on the question mark on the line labeled “DFG2\_DFG3”. Click New Tag. In this example, we’ll use the name “DFG23\_IOLM4\_1”. This array of tags includes the port number to which the DF-G2/3 is connected and the Read and Write data blocks, made up of the information from the DF-G2/3 IO-Link Index and Subindex values.

DFG23_IOLM4_1	{...}	{...}		Banner_DFG2_DFG3_v2
DFG23_IOLM4_1.Initial_Global_Read	0		Decimal	BOOL
DFG23_IOLM4_1.Command	0		Decimal	INT
DFG23_IOLM4_1.DFG_Model	0		Decimal	SINT
DFG23_IOLM4_1.Read_Data	{...}	{...}		Banner_DFG2_DFG3_RD_v2
DFG23_IOLM4_1.Write_Data	{...}	{...}		Banner_DFG2_DFG3_WD_v2
DFG23_IOLM4_1.Archive_Data	{...}	{...}		Banner_DFG2_DFG3_WD_v2
DFG23_IOLM4_1.Reset	0		Decimal	BOOL

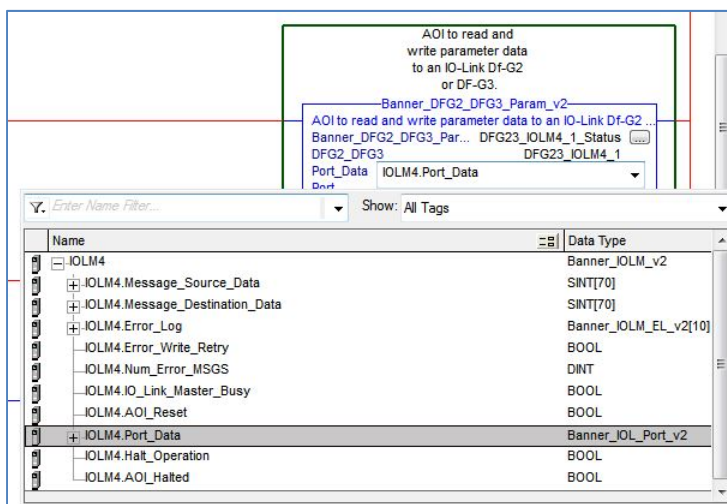
- We need to provide the AOI with the specific DF-G type, either “2” or “3”. Type the value (seen in the DF-G model number) into the “DFG\_Model” variable.

DFG23_IOLM4_1	{...}	{...}		Banner_DFG2_DFG3_v2
DFG23_IOLM4_1.Initial_Global_Read	0		Decimal	BOOL
DFG23_IOLM4_1.Command	0		Decimal	INT
DFG23_IOLM4_1.DFG_Model	3		Decimal	SINT
DFG23_IOLM4_1.Read_Data	{...}	{...}		Banner_DFG2_DFG3_RD_v2
DFG23_IOLM4_1.Write_Data	{...}	{...}		Banner_DFG2_DFG3_WD_v2
DFG23_IOLM4_1.Archive_Data	{...}	{...}		Banner_DFG2_DFG3_WD_v2
DFG23_IOLM4_1.Reset	0		Decimal	BOOL

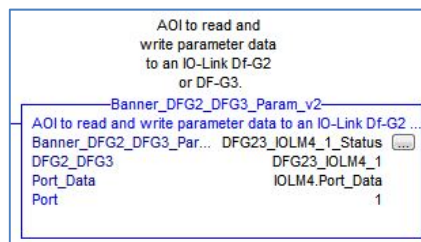
### 3. Linking the Device AOI to the Master AOI

The third tag in the DF-G2/3 AOI is meant to be tied into the IO-Link Master AOI.

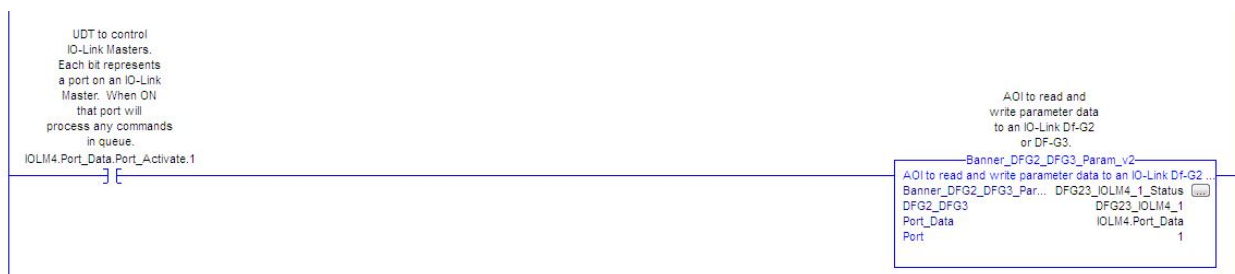
1. For the “Port\_Data” line, choose the relevant IO-Link Master AOI’s “Port\_Data” variable. In this example, we choose “IOLM4.Port\_Data”.



2. For the last line of the DF-G2/3 AOI, “Port\_Number”, type in a number equal to the IO-Link Master port number to which the DF-G2/3 is connected. In this example, the DF-G2/3 is on port 1.



3. The DF-G2/3 AOI is now linked to the IO-Link Master AOI. Add an Examine On instruction to the beginning of the ladder rung and tie it to the IO-Link Master AOI’s “Port\_Activate” bit corresponding to the port number to which the DF-G2/3 is connected. In this example the DF-G2/3 is on port 1 of the IO-Link Master named IOLM4, so the bit “IOLM4.Port\_Data.Port\_Activate.1” is used.



## 4. Using the Paired IO-Link Master and Device Parameter Data AOIs

The goal is to make the Banner device's IO-Link Index and Subindex values appear in PLC tag arrays as if it were an EtherNet/IP-speaking device. Reading from and writing to the Banner IO-Link device becomes as easy as changing tag values in the PLC. All the complicated work of translating from EtherNet/IP to IO-Link is handled automatically, behind the scenes.

When the program is downloaded to the PLC and the PLC goes into run mode, the IO-Link Master AOI performs a global read for each connected Banner device AOI. The Banner device AOI then creates an archive copy of all writeable parameters for that device. This archive is used to determine whether one of the writeable data tags has been changed. If so, the AOI automatically triggers the process of acyclic writing, using correctly-formatted CIP generic message commands.

There are three methods for acyclic reading of Banner device Index and Subindex values.

1. The initial global read, as requested by the IO-Link Master AOI after the PLC program is downloaded and run.
2. Manually toggling the "Port\_Data.Device\_Read" bits performs a one-time read of all values from a given Banner device AOI connected to a specific port on the IO-Link Master. To initiate this one-time read, toggle the bit (0-15) in the "Port\_Data.Device\_Read" variable corresponding to the port number in question. The AOI will read the device parameters from that port once, then turn the bit back to 0 automatically.
3. Manually via the "Command" variable found in every Device Parameter Data AOI. The "Command" register can be used to force one-time read or write actions, as described in Appendix A of any Banner Device Parameter AOI guide.

Acyclic writes to the IO-Link device are handled by simply changing the relevant tag values in the device's "Write\_Data" tag array.



## Appendix A Command Register

The “Command” register can be used to control the connected IO-Link device ‘by hand’. Placing the correct command numbers into this register is how the AOI achieves its automatic control. The write commands are most useful when an IO-Link device has been physically replaced with a new device of the same type—in this situation executing the “41” command will restore all the PLC saved settings to the new unit.

[-] DFG23_IOLM4_1	{ ... }	{ ... }		Banner_DFG2_DFG3_v2
[-] DFG23_IOLM4_1.Initial_Global_Read	0		Decimal	BOOL
[+] DFG23_IOLM4_1.Command	0		Decimal	INT
[+] DFG23_IOLM4_1.DFG_Model	3		Decimal	SINT
[+] DFG23_IOLM4_1.Read_Data	{ ... }	{ ... }		Banner_DFG2_DFG3_RD_v2
[+] DFG23_IOLM4_1.Write_Data	{ ... }	{ ... }		Banner_DFG2_DFG3_WD_v2
[+] DFG23_IOLM4_1.Archive_Data	{ ... }	{ ... }		Banner_DFG2_DFG3_WD_v2
[-] DFG23_IOLM4_1.Reset	0		Decimal	BOOL

The table below shows the command numbers associated with the reading and writing of specific pieces of data. See the DF-G2/3 IODD file or the IO-Link Data Reference Guide for more information of the parameters.

**Table 1: AOI Command Numbers**

DF-G2/3 Parameter (IO-Link Index #)	Read Command	Write Command
Global Read (all)	1	
Global Write (all)		41
Direct Parameters (0)	2	42
Device Access Locks (12)	3	43
Serial Number (21)	4	
Teach-in Channel (58)	5	44
Teach-in Status (59)	6	
BDC1 Setpoints (60)	7	47
BDC1 Configuration (61)	8	48
BDC2 Setpoints (62)	9	49
BDC2 Configuration (63)	10	50
Configuration (64)	11	51
BDC1 Vendor Specific Config (65)	12	52
BDC2 Vendor Specific Config (66)	13	53
BDC1 Status (71)	14	
BDC2 Status (72)	15	

## Appendix B AOI Resets

From time to time, a reset may be needed for an AOI, particularly if one of the read/write processes the AOI undertakes is interrupted. To this end, each Device Parameter Data AOI and IO-Link Master AOI has a reset bit.

Toggling this bit to a “1” causes the AOI to start over and try again.

[-] DFG23_IOLM4_1	{ ... }	{ ... }		Banner_DFG2_DFG3_v2
[-] DFG23_IOLM4_1.Initial_Global_Read	0		Decimal	BOOL
[+] DFG23_IOLM4_1.Command	0		Decimal	INT
[+] DFG23_IOLM4_1.DFG_Model	3		Decimal	SINT
[+] DFG23_IOLM4_1.Read_Data	{ ... }	{ ... }		Banner_DFG2_DFG3_RD_v2
[+] DFG23_IOLM4_1.Write_Data	{ ... }	{ ... }		Banner_DFG2_DFG3_WD_v2
[+] DFG23_IOLM4_1.Archive_Data	{ ... }	{ ... }		Banner_DFG2_DFG3_WD_v2
[+] DFG23_IOLM4_1.Reset	0		Decimal	BOOL

Best practices suggest adding a rung to your ladder logic program that resets all IO-Link Master and Device Parameter AOIs on the first scan. The example below shows one IO-Link Master, called IOLM4, and one connected Q5X having their respective AOIs being reset in this way.

