IDENT*Control*
UHF Add-On Instructions for RSLogix 5000 or Studio 5000

ADD-ON INSTRUCTIONS FOR RSLOGIX 5000 AND PEPPERL+FUCHS IDENTCONTROL SPECIFICALLY FOR UHF READ HEADS IUH… 3

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Add-On Instructions for RSLOGIX 5000 and Pepperl+Fuchs IDENTControl specifically for UHF read heads IUH…

Read head compatibility

These special add-on instructions are used to communicate to all IUH-F190… read heads. Here are the read head options and some of the countries they can be used in. If there is a question as to which read head to use please contact your local P+F office for assistance

IUH-F190-V1-FR2 – China, Brazil, Japan
IUH-F192-V1-FR2 – China, Brazil, Japan
IUH-F190-V1-FR2-02 – USA, Canada, Mexico
IUH-F192-V1-FR2-02 – USA, Canada, Mexico
IUH-F190-V1-EU – Europe, India, Singapore, Vietnam
IUH-F190-V1-FR1 – Europe, India, Singapore, Vietnam
IUH-F192-V1-FR1 – Europe, India, Singapore, Vietnam

Controller compatibility

These function blocks make it easy to read, write, filter and parameterize all P+F UHF read heads. They can be used with EtherNet/IP compatible controllers. These function blocks are not compatible with the DeviceNet controller IC-KP-B7-V95. Here are the controller options:

IC-KP-B17-AIDA1 – Four head RFID controller
IC-KP2-2HB17-2V1D – Two head RFID controller
IC-KP2-1HB17-2V1D – One head RFID controller

When to send add-on instruction

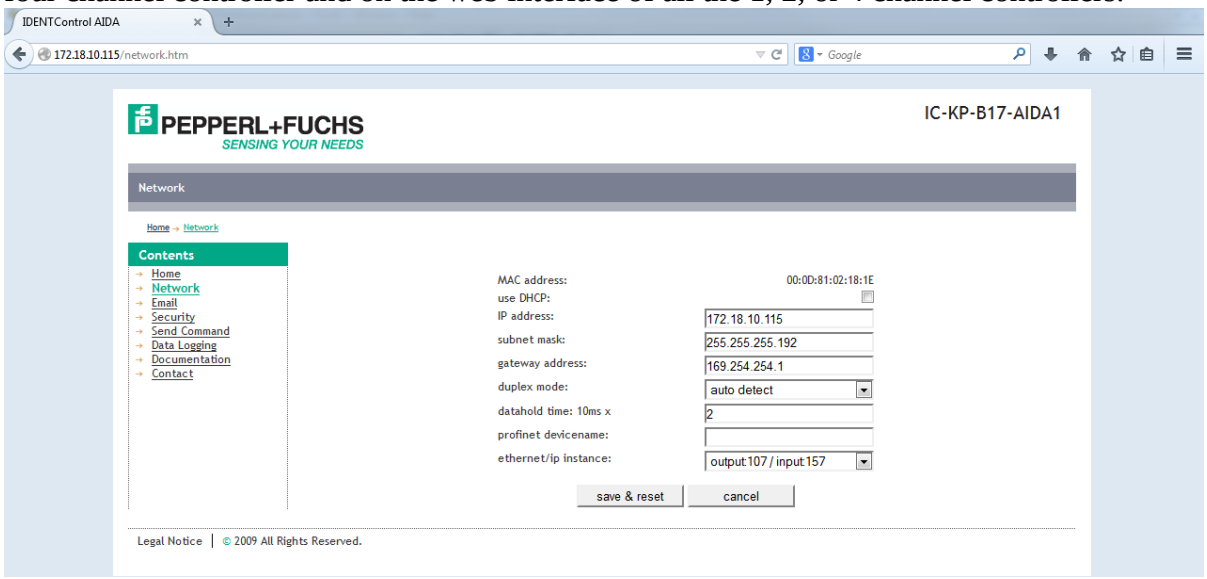
Set tag type
The tag type is automatically set when a read or write parameter command is sent. It is set to 80.

Filtering
The filter string can be setup using the Filter_Set command. When filtering is desired use the filter_Mode instruction. Then read or write as necessary.

Data Retention Time (also called datahold time)

This time must be set properly to avoid both missing data and overloading the internal buffer. A time that is too high could result in slow production and buffer overflows. A time that is too fast can result in missed data. It is suggested that this time be set to 2x(PLC scan time or Ethernet/IP RPI rate) whichever is higher. If an RPI rate of 10ms is being used and this is slower than the scan time then a Data Retention time of 20ms should be set. Because this

timer is in 10ms increments then set the value to 2. This time can be set on the display of the four channel controller and on the web interface of all the 1, 2, or 4 channel controllers.



Protocol Mode requirements

The UHF read heads supports two protocol modes. This mode can be read and set by the PF_UHF_MF_Param_Read_Write add-on instruction or the software RFIDControl. Protocol mode "S" is a compatibility mode Single-Frame protocol that makes the IUH heads read and write tags just like the IPH, ISH, and IQH1 read heads. If you want to use this mode set the protocol mode to "S" and use the standard Add-on Instructions and not the ones for use with the UHF read heads. The protocol mode "M" is the Multi-Frame protocol mode. It is a special protocol for use with UHF heads and reads up to 40 tags in the field at one time. This is the default protocol mode. The read and write add-on instructions in this document are only for this mode. See Table 1 for a protocol mode compatibility chart for all the add-on instructions.

Add-on instruction	Compatible protocol mode
PF_UHF_Filter_Mode	S, M
PF_UHF_Filter_Set	S, M
PF_UHF_MF_1HD_1Time	M
PF_UHF_MF_1HD_Cont	M
PF_UHF_MF_1HD_Cont_OP2	M
PF_UHF_Param_Read_Write	S, M

Table 1: Protocol mode add-on instruction compatibility

Available Add-On instructions

These instructions are broken up into the typically used instructions and the special instructions.

Typically Used Instruction	
PF_UHF_MF_1HD_1Time	Reads or writes one time. Can read the EPC/UII, TID or User data. Can write the EPC/UII or User data. Can

	communicate to up to 40 tags at one time
PF_UHF_MF_1HD_Cont_OP2	Once activated the command runs continuously. Can read EPC/UII, TID and User data. This command also keeps track of all previously read tags. Once read it will not read it again until the tag has been flushed from the PLC buffer
PF_UHF_ParamV2_Read_Write	Reads, writes or resets to default all of the parameters of the UHF read head.
PF_UHF_MF_1HD_Closest	Reads up to 5 tags in the field and uses the RSSI value to return the tag closest to the read head
PF_UHF_MF_Write_Closest	Uses filtering and RSSI value to write to the closest tag.

Special	
PF_UHF_MF_1HD_Cont_OP2	Once activated the command runs continuously. Can read EPC/UII, TID and User data. This command also keeps track of all previously read tags. Once read it will not read it again until the tag has been flushed from the PLC buffer
PF_UHF_ParamV3_Read_Write	Reads, writes or resets to default all of the parameters of the UHF read head.
PF_UHF_Filter_Mode	Activates or deactivates the filter mode so only certain tags within the read range are selected
PF_UHF_Filter_Set	loads the filter that is used as long as the filter mode is activated
PF_UHF_MF_1HD_Cont	Once activated the command runs continuously. Can read EPC/UII, TID and User data.
PF_UHF_MF_Close52	Uses the Closest Add-On to read up to 64bytes of User data off of a tag and return it all at one time.
PF_UHF_Kill	Issues a command to Kill a tag (used by PF_UHF_MF_Read_Then_Kill)(instruction not explained in this document)
PF_UHF_OneParam_RW	Sends a command to read or write any one parameter (used by PF_UHF_MF_Read_Then_Kill)(instruction not explained in this document)
PF_UHF_MF_Read_Then_Kill	Reads closest tag, Sets Password and then Kills one tag

Add-On Instruction Example

This is an example of how an add-on is used. This is a single read example that will read the EPC/UII from the tags in front of the read head as well as user data. There are two tags over the reader in this example but it can read up to 40. Follow the example in figures 1,2, 3, and 4. The data is located in a variable called Tag3.

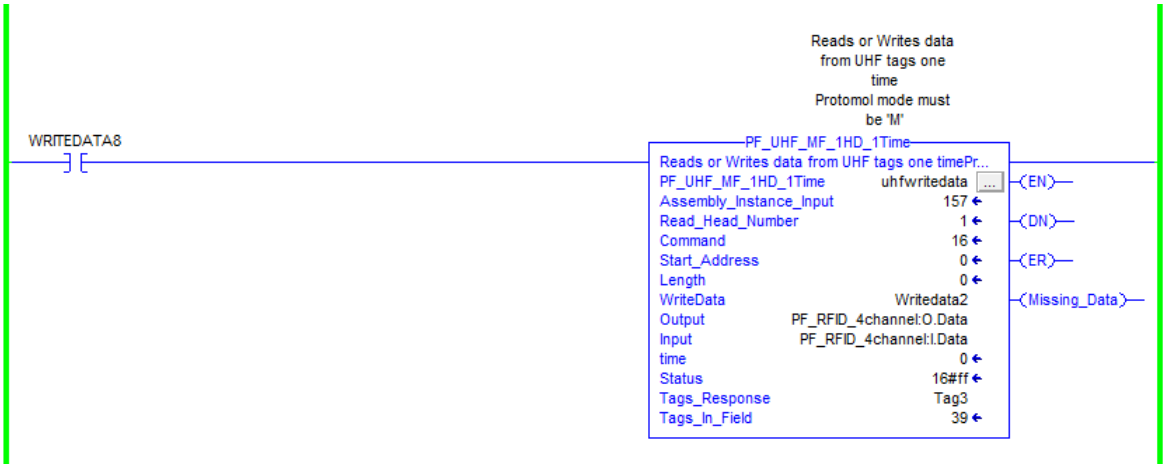


Figure 1: Initial state of add-on instruction, all bits off

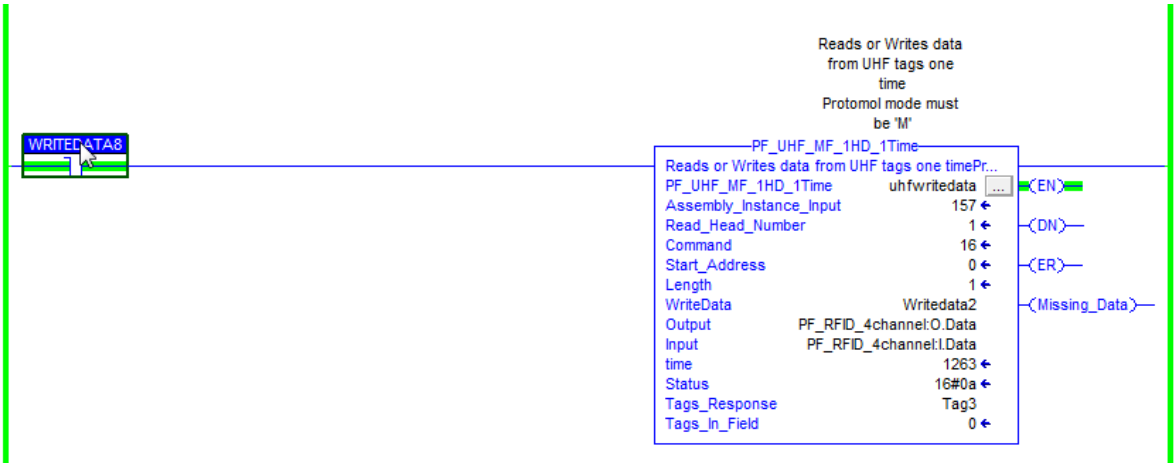


Figure 2: Rung enabled and the EN bit turns on

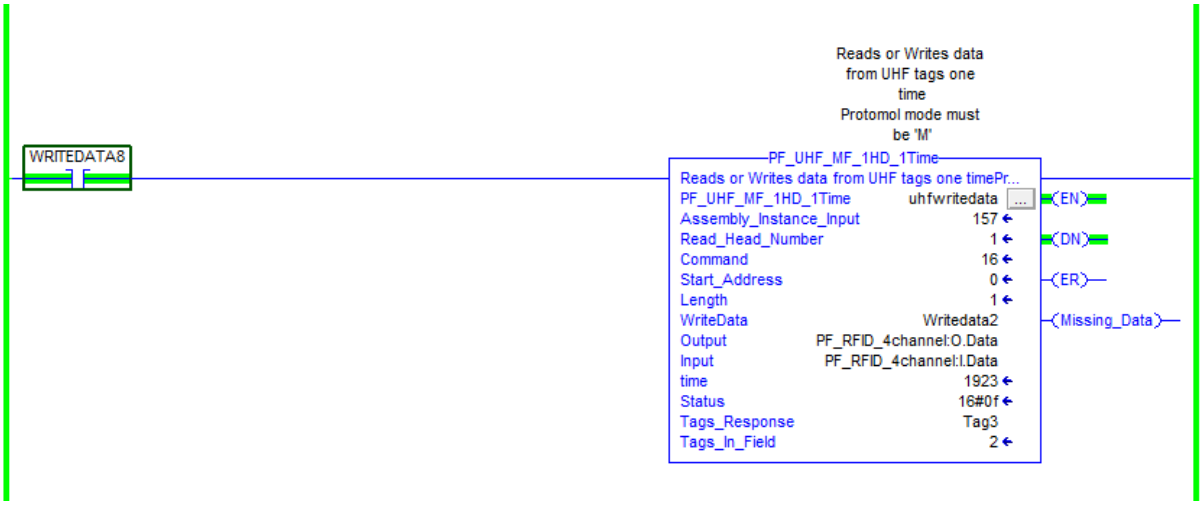


Figure 3: Command done with no errors, DN on, ER off, 2 tags read

Tag3	{...}		USER_Data_PF[40]
Tag3[0]	{...}		USER_Data_PF
Tag3[0].Status	0	Decimal	SINT
Tag3[0].PC	16#0030	Hex	INT
Tag3[0].EPC	'$E2$000$t2$11$00$95$04p$E1$BF'		STRING
Tag3[0].EPC.LEN	12	Decimal	DINT
Tag3[0].EPC.DATA	{...}	ASCII	SINT[82]
Tag3[0].USER	'$00$00$00$00'		STRING
Tag3[0].USER.LEN	4	Decimal	DINT
Tag3[0].USER.DATA	{...}	ASCII	SINT[82]
Tag3[0].Additional_Info	{...}		Additional_Info
Tag3[1]	{...}		USER_Data_PF
Tag3[1].Status	0	Decimal	SINT
Tag3[1].PC	16#0030	Hex	INT
Tag3[1].EPC	'$E2$000$t2$11$00$96$13p$86$r'		STRING
Tag3[1].EPC.LEN	12	Decimal	DINT
Tag3[1].EPC.DATA	{...}	ASCII	SINT[82]
Tag3[1].USER	'$00$00$00$00'		STRING
Tag3[1].USER.LEN	4	Decimal	DINT
Tag3[1].USER.DATA	{...}	ASCII	SINT[82]
Tag3[1].Additional_Info	{...}		Additional_Info

Figure 4: Two tags fill up two array elements 0 and 1. data is PC, 12byte EPC and 4 byte User data

Setup

Before using the Add-On Instructions the Ethernet IDENTControl must be setup. A Generic Ethernet Module is used to map the Input and Output data or an EDS file is used to create an EDS-AOP(Add on Profile). The EDS-AOP is only available in RSLogix 5000 V20 or higher. The Add-On Instruction will use this directly mapped data to issue commands to the ID system. Different Assembly instances are available depending on if you want to map each head individually and/or you want to map all data together. In general a larger Assembly instance means quicker I/O transfer if you want to read or write a lot of data. Also separated mode is faster than mixed mode if you want to talk to multiple read heads simultaneously.

Separated mode means each read head has its own memory map. Commands can be issued simultaneously to all heads. Data mapping is done always for four heads even for a two head controller. This allows for easy expansion of a two head controller to a four head controller with no PLC programming changes required. Use this mode for all two head, IC-KP2-2HB17-2V1D, and four head, IC-KP-B17-AIDA1, controllers.

In **mixed** mode you must toggle between heads yourself. Only one head can have a command issued to it at one time. This mode is typically used for the one head. IC-KP2-1HB17-2V1D, RFID controllers.

Always use Comm. Format Data – DINT. You know when this is correctly set because the Data Size now has a (32-bit) next to it. The Configuration is always 112 and the length for the Configuration is always 0.

Assembly Instance Input	Assembly Instance Output	Length (DINTs)	Can heads be operated separately	Read Data Access	Write Data Access

152	102	8	Mixed	96 bit EPC and 2 DINT user	7 DINT
153	103	15	Mixed	96bit EPC and 9 DINT user	14 DINT
156	106	32	Separate	96 bit EPC and 2 DINT user	7 DINT
157	107	60	Separate	96 bit EPC and 9 DINT user	14 DINT

Table 2: Data mapping options when using protocol mode "M"

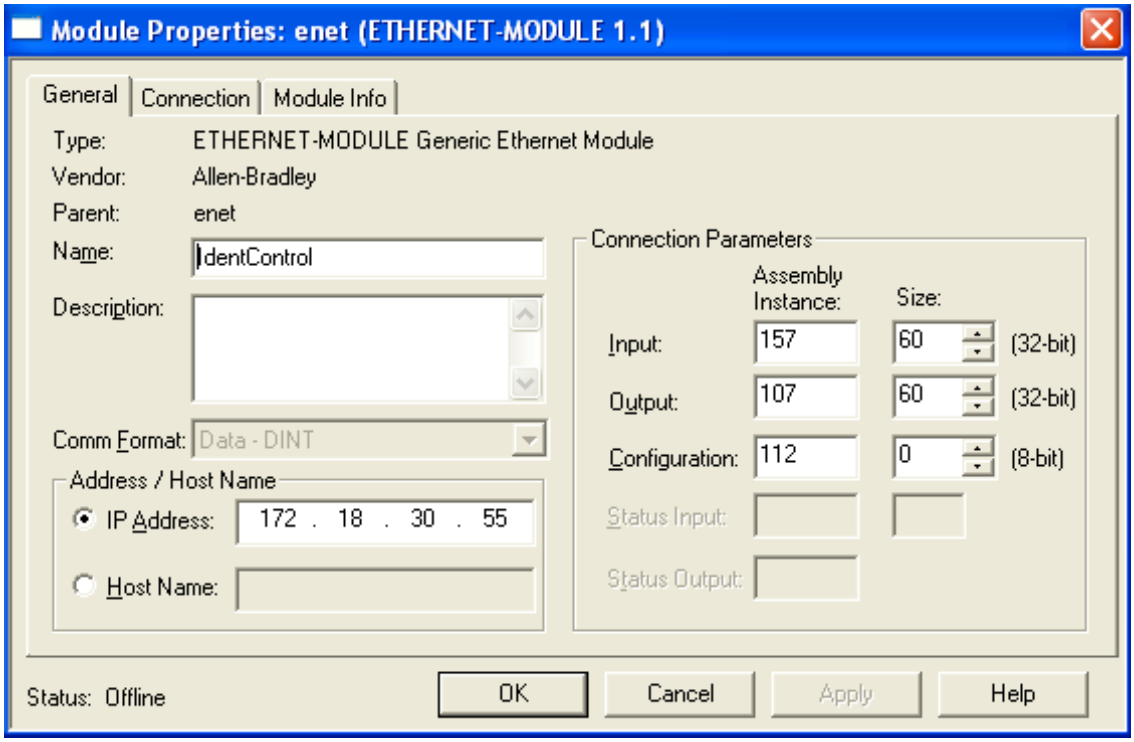


Figure 5: Generic Ethernet module example using Assembly 107/157

Setup using the EDS-AOP

The EDS files for all the controllers can be downloaded from the web site under their model number. The models are IC-KP2-1HB17-2V1D, IC-KP2-2HB17-2V1D and IC-KP-B17-AIDA1. Here is the procedure to install and use the EDS files.

Step 1: Import the EDS file into your project. See Figure 6.

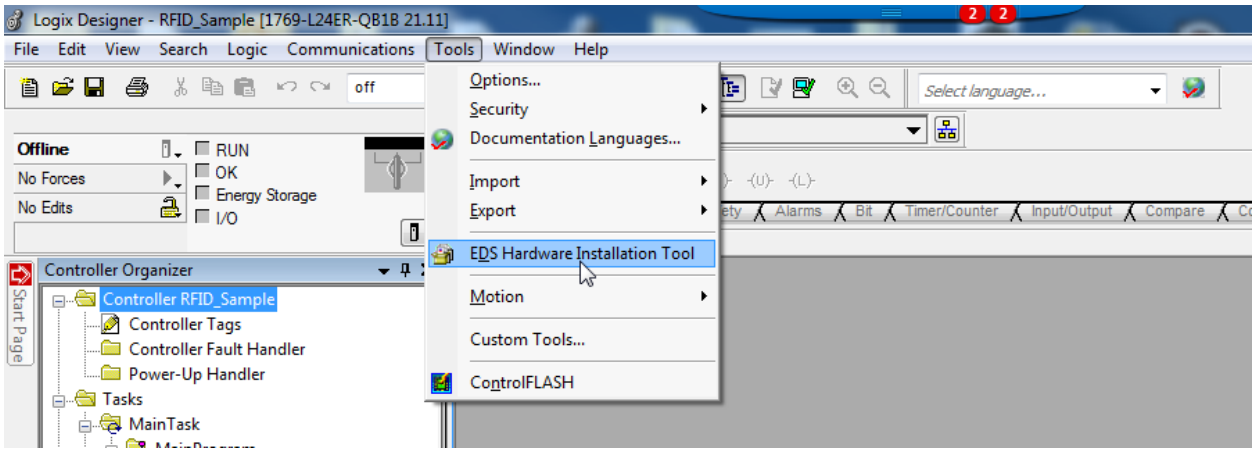


Figure 6: Install EDS file

Step 2: Select your ethernet card or port and add a "New Module". See Figure 7.

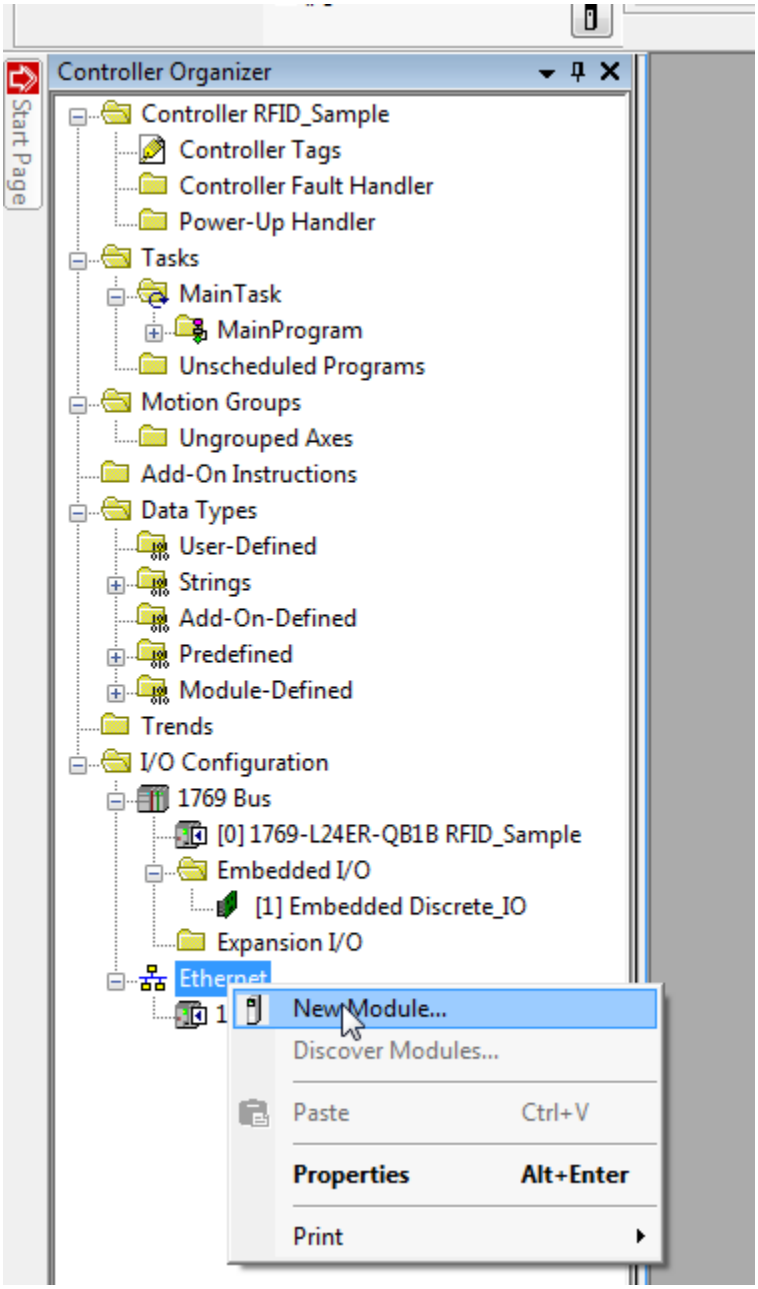


Figure 7: Add new Ethernet controller

Step 3: Select the device/EDS file that you installed. See Figure 8.

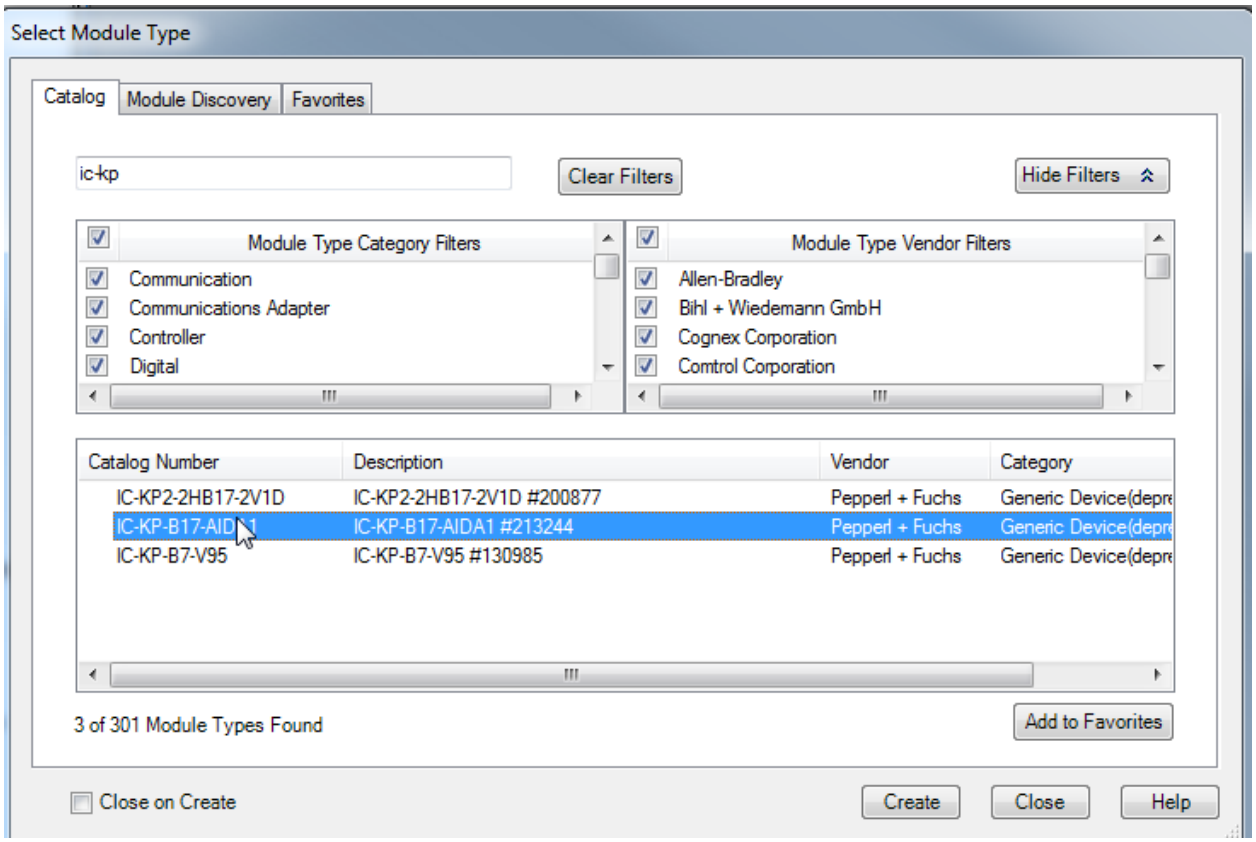


Figure 8: Pick the RFID controller you want to use

Step 4: Create a new name and configure the IP address of your RFID controller then click on “Change”. See Figure 9.

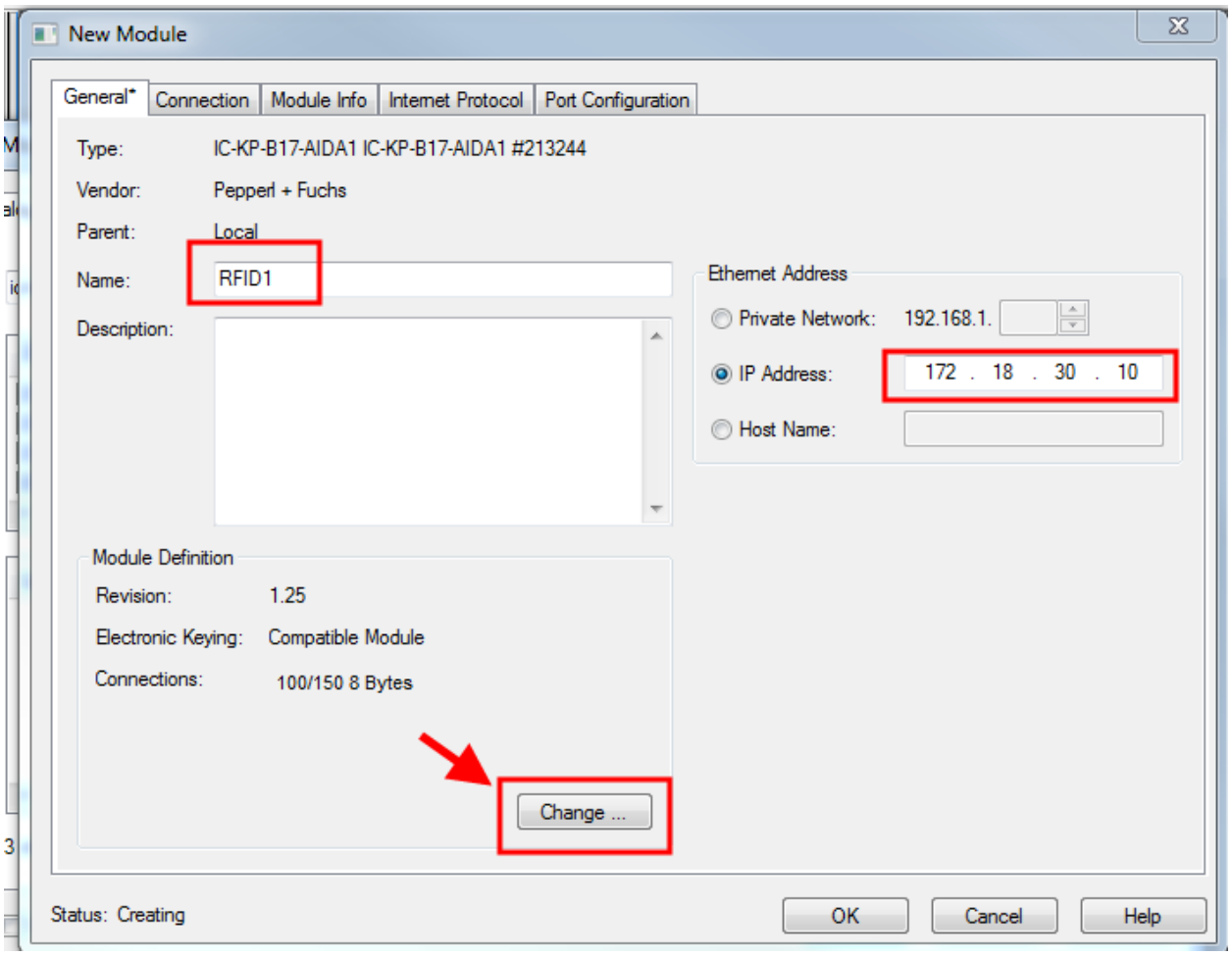


Figure 9: Change the IP address, name and change module definition

Step 5: Select the assembly instance that you want to use from the list. See Figure 10.

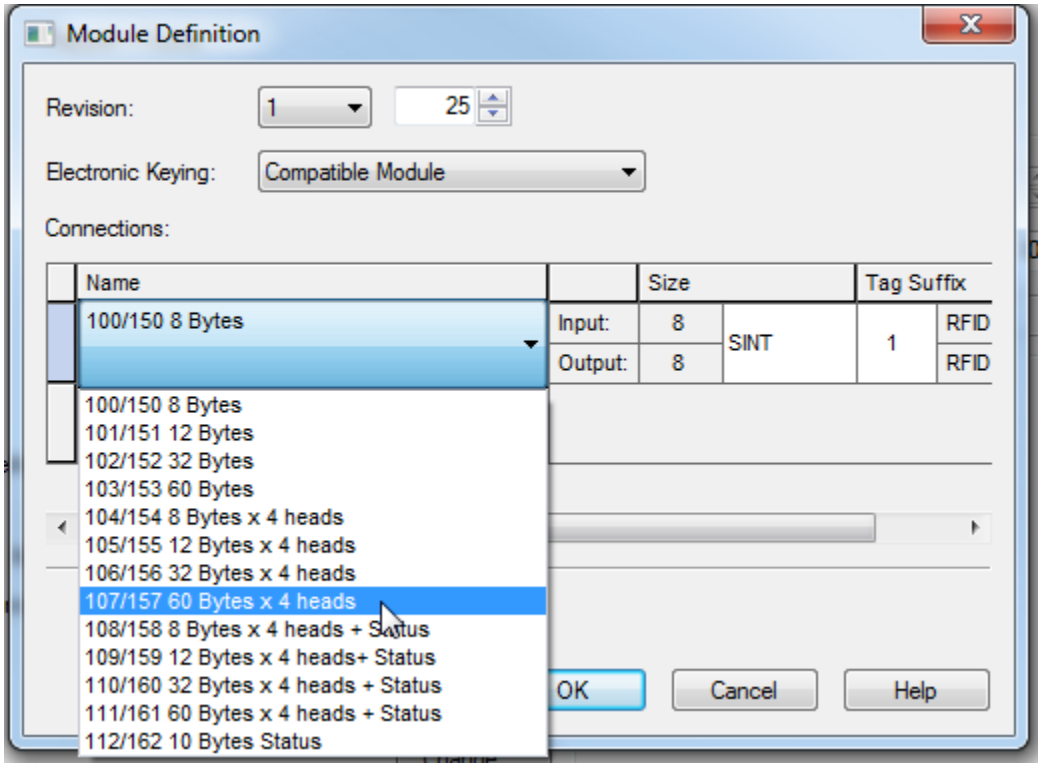


Figure 10: Pick the assembly instance from the list

Step 6: Select "DINT" from the Size list. See Figure 11.

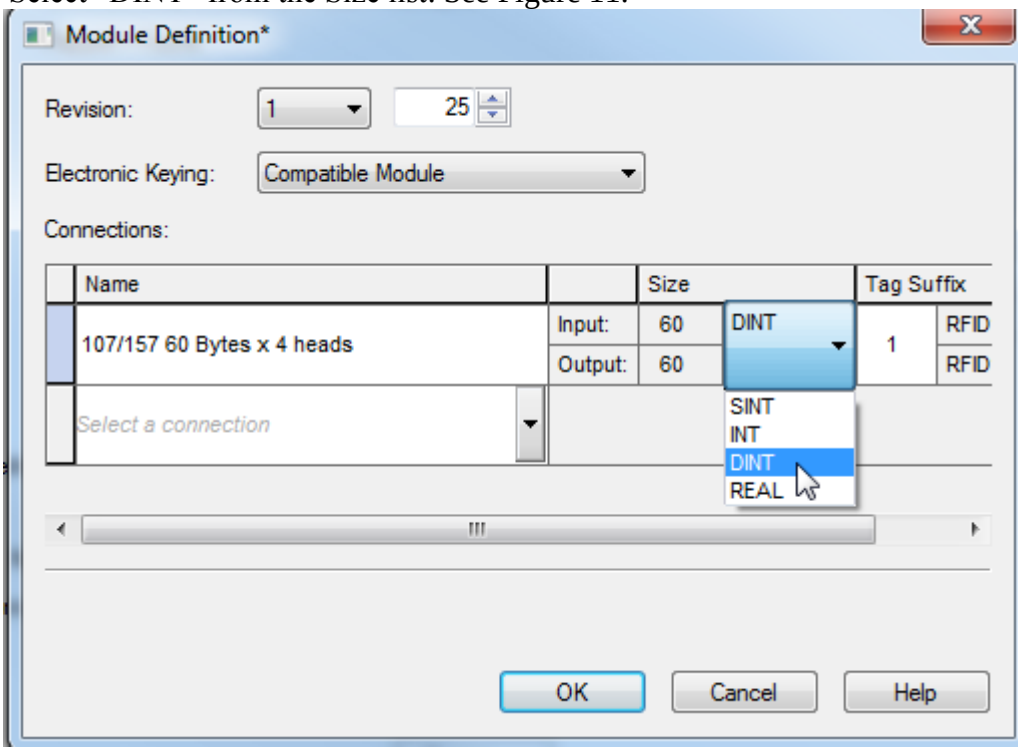


Figure 11: Change the size to DINT

Using the Add-on instructions

One Time Instructions
All of the instructions that end in "1Time" are enabled when the rung condition is made high. The instruction completes when the "DN" bit comes on. If the "DN" bit does not come on the instruction has not completed yet. If the "DN" bit comes on and the "ER" bit is not on then the instruction has completed without error. At this point the instruction can be made low again such that all of the bits DN, EN, ER will turn off. When this happens a new command can be reinitiated by making the rung true again. Also OneShots cannot be used to initiate these instructions. The entire rung must remain true for as long as the command is running.

Continuous Instructions
These instructions are those that end in "Cont". They internally run the enhanced commands. These commands stay running for as long as the controller has power. Even if a read head is disconnected the command restarts when it is reconnected. These instructions run all the time and the rung must remain high continuously. When a tag shows up the Tags_In_Zone counter will increment for each new tag and the tag is placed in the Tags_Response_All buffer. When the tag leaves the zone the counter is decremented and the tag is removed from the buffer. The last tag read is also placed in Tags_Response_Last.

Common Parameters

Certain parameters are common to all Add-on instruction. These parameters are listed here and are not repeated with the explanation of each individual add-on instruction.

Input Parameters
Assembly_Instance_Input – This is exactly the assembly instance that was used to setup your RFID system in the first place. This number must be exactly correct. Go to your I/O configuration of your PLC and then to the generic Ethernet module used for configuring the ID system. See Figures 12 and 13 to see where to get this information.

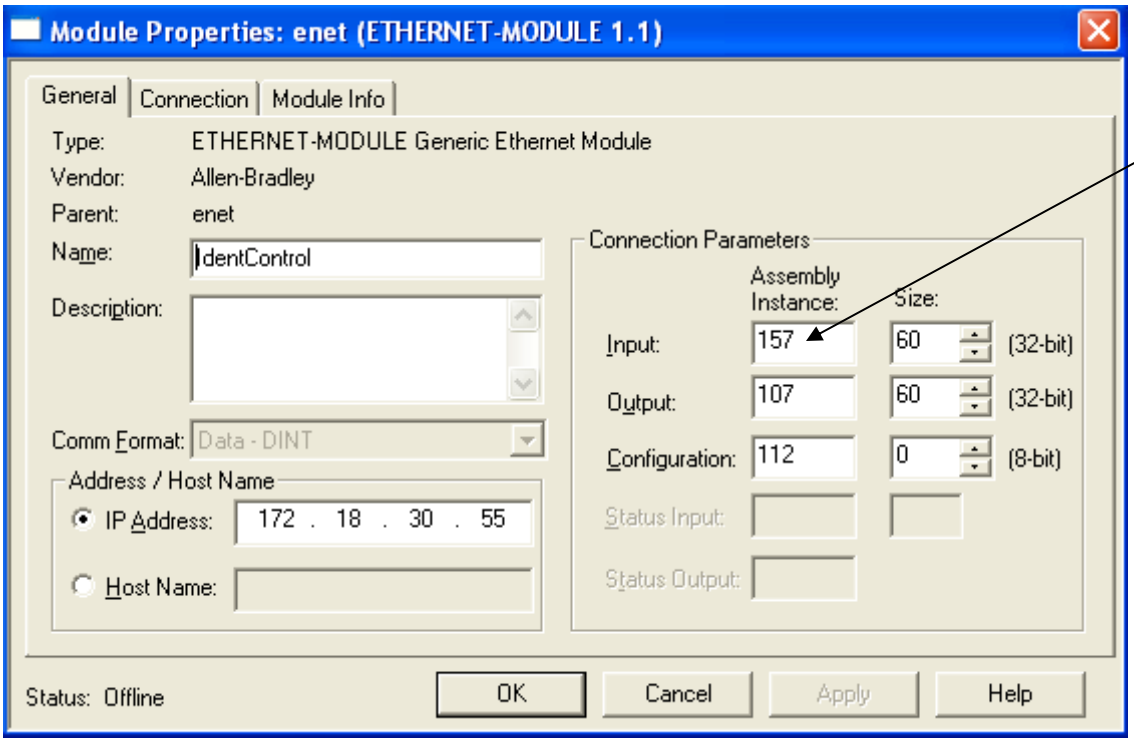


Figure 12: Assembly instance data in generic Ethernet object to place in Assembly instance parameter

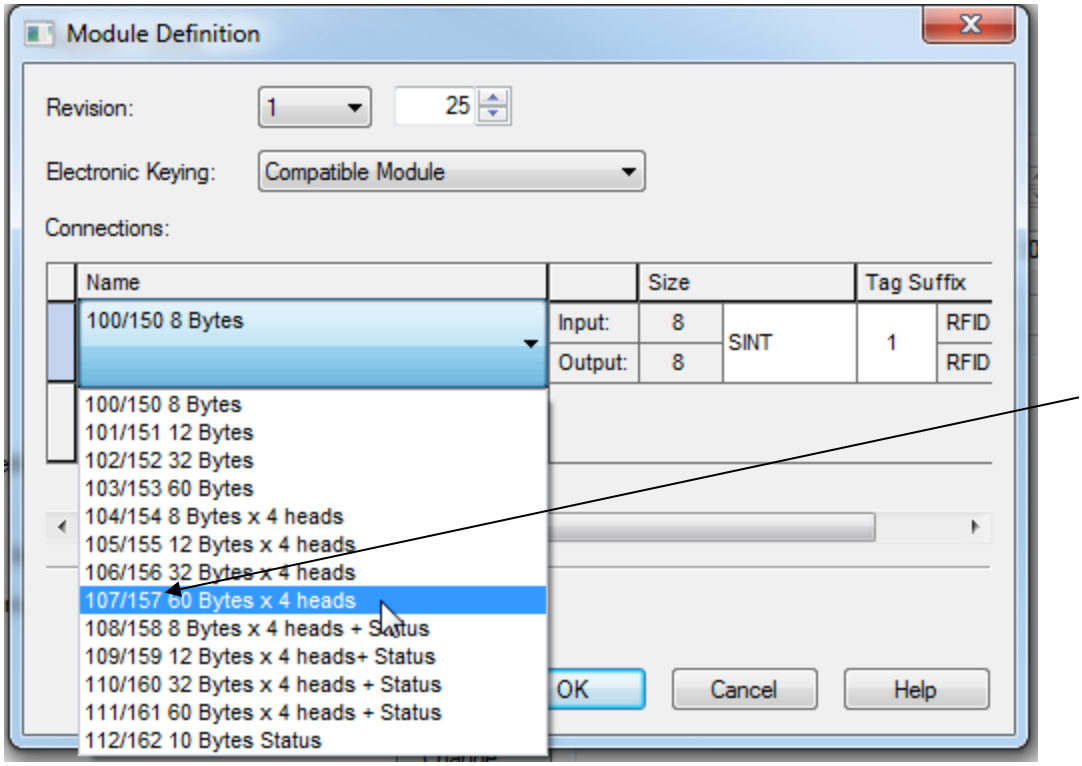


Figure 13: Assembly instance data in EDS-AOP to place in Assembly instance parameter

Read_Head_Number – This is the read head you will be sending the command to. The options are 1, 2, 3 or 4

In/Out Parameters

Output – This is the controller tag associated with the output data for your ID system. It is not the pointer to the first index of the array. It is the entire array itself.

Name	Value	Force Mask	Style	Data Type
asi:C	{...}	{...}		AB:ETHERNET_MODULE:C:0
asi:I	{...}	{...}		AB:ETHERNET_MODULE_INT_148Bytes:I:0
asi:O	{...}	{...}		AB:ETHERNET_MODULE_INT_148Bytes:O:0
IdentControl:C	{...}	{...}		AB:ETHERNET_MODULE:C:0
IdentControl:I	{...}	{...}		AB:ETHERNET_MODULE_DINT_240Bytes:I:0
IdentControl:O	{...}	{...}		AB:ETHERNET_MODULE_DINT_240Bytes:O:0
IdentControl:O.Data	{...}	{...}	Deci...	DINT[60]
Local:2:C	{...}	{...}		AB:1756_IF8H:C:0
Local:2:I	{...}	{...}		AB:1756_IF8H_Analog:I:0
try	-2		Deci...	SINT
try2	511		Deci...	DINT
try3	-256		Deci...	INT

Figure 14: Output data image variable

Input - This is the controller tag associated with the input data for your ID system. It is not the pointer to the first index of the array. It is the entire array itself.

Name	Value	Force Mask	Style	Data Type
asi:C	{...}	{...}		AB:ETHERNET_MODULE:C:0
asi:I	{...}	{...}		AB:ETHERNET_MODULE_INT_148Bytes:I:0
asi:O	{...}	{...}		AB:ETHERNET_MODULE_INT_148Bytes:O:0
IdentControl:C	{...}	{...}		AB:ETHERNET_MODULE:C:0
IdentControl:I	{...}	{...}		AB:ETHERNET_MODULE_DINT_240Bytes:I:0
IdentControl:I.Data	{...}	{...}	Decima	DINT[60]
IdentControl:O	{...}	{...}		AB:ETHERNET_MODULE_DINT_240Bytes:O:0
Local:2:C	{...}	{...}		AB:1756_IF8H:C:0
Local:2:I	{...}	{...}		AB:1756_IF8H_Analog:I:0
try	-2		Decima	SINT
try2	511		Decima	DINT
try3	-256		Decima	INT

Figure 15: Input data image variable

Output Parameters

Status – This byte will give you information about the command at completion. Two additional status messages were defined to give you information about the execution of the Add-On Instruction itself.

FE – Timeout. The command did not complete before the watchdog timer turned out. This status is caused by a missing IDENTControl interface. Check to see if it connected by looking at the connection status. The yellow warning triangle is a good indication of connection failure.

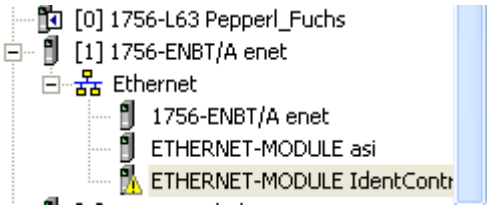


Figure 16: RFID controller missing which causes a timeout

FD – Bad parameters. This is caused by an incorrect assembly instance number, a head number not 1,2,3, or 4 or a read or write data array that is smaller than the amount of data you want to read or write. For example if you want to read 14 DINTs the read_data_array must of size DINT[14] minimum.

Fault/Status messages

Status	Meaning
00h	Command has been executed without error.
FFh	Command is processing.

Fault messages triggered by the identification system

Status	Meaning
01h	Battery of the tag is weak.
02h	Reserved
03h	Reserved
04h	Command is incorrect or incomplete or parameter not in the valid range.
05h	No tag in the detection range.
06h	Hardware error, e.g. error during self-test or read/write head defect.
07h	Internal device error
08h	Reserved
09h	Programmed tag type is not compatible with the connected read/write head.
0Ah	Reserved
0Bh	Reserved
0Ch	Reserved
0Dh	Reserved
0Eh	Reserved
0Fh	Reserved

Figure 17: Read head status messages

EN – When the rung is enabled this bit goes high. If the rung goes off this bit also turns off.
DN – When the command completes this bit is set. The value of the error bit determines if the command was successful or not. If the ER bit is low the command execution was a success. If the ER bit is high the command failed. Check the variable "Tags_In_Field" to

see how many tags were read. DN and no ER just means the command completed without error and not how many tags were read or that tags were read at all.
ER – If this bit is high some sort of error occurred. Check the status for the exact cause of the error.

Read and Write Data

PF_UHF_MF_1HD_1Time

This command will read or write up to 40 tags at one time. The tags are moved to the variable called Tags_Response. If a write command is being used then load the data to be written into the variable WriteData first. Even for a write command the Tags_Response variable is used to show what tags were written to. In the case of the write commands only the EPC/UII data is displayed as a response telling you which tags were written to. See Table 3 for a list of available commands.

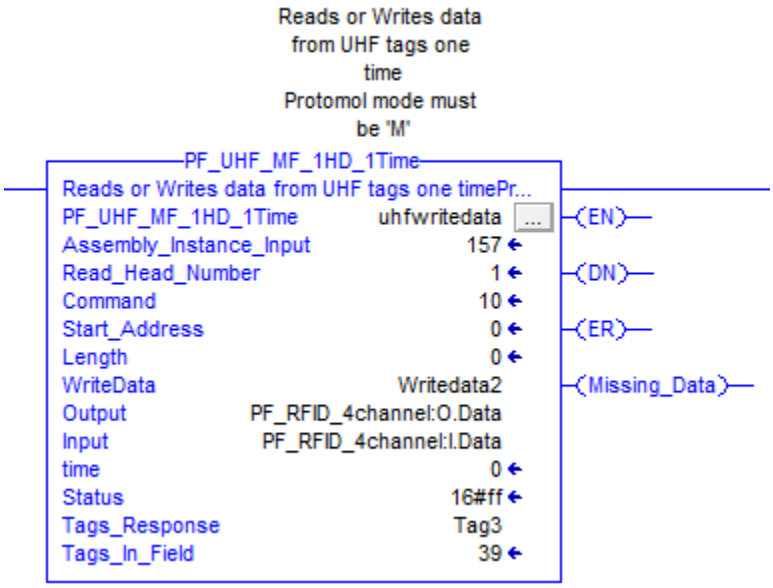


Figure 18: Single Read/write add-on instruction

Command Code	Command	Description
1	SF	Read EPC/UII + TID (DINTs)
16	SR	Read EPC/UII + User data (DINTS)
64	SW	Write User data
10	SS	Read EPC/UII
13	SP	Write EPC/UII
73	#SR	Read EPC/UII +User data (INTs)
74	#SW	Write User data (INTs)

Table 3: Single Read or Write Command Options

Parameters

Input Parameters

Command (DINT) – This is the read or write operation to be performed. See Table 3 for options. The Command number should be entered in decimal.
Start_Address (DINT) – This is the block address that you want to access on the tag. Depending on the command this could be a four byte block address or a two byte block address.

SF, SR, SW, SS, SP	4 byte block address
#SR, #SW	2 byte block address

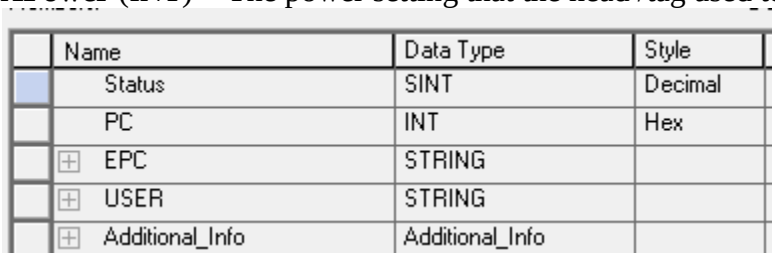
Length (DINT) – This is the amount of blocks that you want to read. The block size is 4 bytes for SF, SR, SW, SS, SP but only two bytes for #SR, #SW

In/Out Parameters

WriteData (SINT[56]) – This is the data that will be written to the tag. If multiple tags are in the field the same data is written to all tags.

Tags_Response (USER_Data_PF[40])- This is the location where all read tags are placed. This is a user defined variable that contains a lot of information for each tag. See Figure 18.

Status (SINT) = Tells if the EPC code is a duplicate or not.
0=unique EPC
A=duplicate EPC (May not be used)
PC (INT) = Protocol control word. See IUH manual for the bit definitions.
EPC (STRING) = EPC/UII code from UHF tag
USER (STRING) = Additional data supplied by the tag. It will vary depending on command used.
SF = TID
SR, #SR = User Data
Additional_Info (Additional_Info) – An optional set of data for a tag that is only available if the IF parameter is set to 1.
InfoTyp (SINT) = 1 (This is the type of data to follow: RSSI,…)
RSSI (SINT) = The RSSI data as returned from the tag
TXChannel (SINT) = Frequency channel that the reader communicated to the tag with
TXPower (INT) = The power setting that the head /tag used to communicate



	Name	Data Type	Style
	Status	SINT	Decimal
	PC	INT	Hex
⊞	EPC	STRING	
⊞	USER	STRING	
⊞	Additional_Info	Additional_Info	

Figure 19: USER_Data_PF user defined variable contains data from UHF tags

Output Parameters

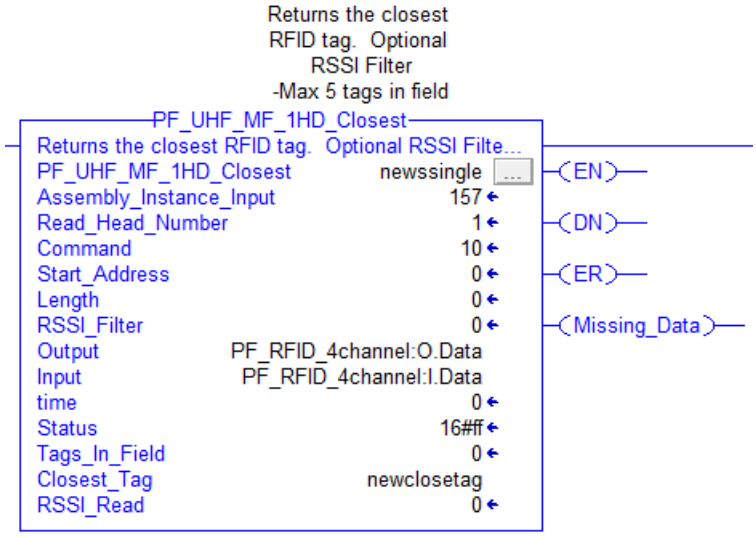
Time (DINT) **–** This is the recorded time is takes for the command to complete. The time stops when the DN bit goes high. If the command goes DN(done) with no ER(error) and you think this time is unusually long check the "Data hold time" This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced to a very low number speeding up your process.

Tags_In_Field (DINT) = The number of tags read or written by the command

Missing_Data (BOOL) = The execution counter is monitored. If the counter ever goes up by more than one then a response was missed by the add-on instruction. Check to make sure the "Data hold time" is long enough. It should be set to greater than 2 x the maximum IO scan time. This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced to a very low number speeding up your process.

PF_UHF_MF_1HD_Closest

In order to use this command the parameter "Additional_Info_IF" must be enabled. See the UHF add-on PF_UHF_ParamVx_Read_Write to set this parameter. It compares the RSSI values of up to 5 read tags. If one tag has a higher RSSI value then all others and the RSSI value is above the RSSI_Filter parameter then this tag is considered the closest tag to the reader.



Parameters

Input Parameters

Command (DINT) –

10 – Read EPC Code only
16 – Read EPC and user data
1 – Read EPC and TID

Start_Address (DINT) – This is the block address that you want to access on the tag. Only used for Command 16 otherwise set to 0.

Length (DINT) – This is the amount of blocks that you want to read. Only used for Command 16 otherwise set to 0.

RSSI_Filter (DINT) – The RSSI threshold that the closest tag must exceed. Often used to ensure the closest tag is the one on the pallet. If a tag is missing and you had no filter then the closest tag could be on another station.

In/Out Parameters

Tags_Response (USER_Data_PF)- This is the location where the closest tag will be placed. This is a user defined variable that contains a lot of information for each tag. See Figure 19.

Status (SINT) = Tells if the EPC code is a duplicate or not.

0=unique EPC

A=duplicate EPC (May not be used)

PC (INT) = Protocol control word. See IUH manual for the bit definitions.

EPC (STRING) = EPC/UII code from UHF tag

USER (STRING) = Additional data supplied by the tag. It will vary depending on command used.

SF = TID

SR, #SR = User Data

Additional_Info (Additional_Info) – An optional set of data for a tag that is only available if the IF parameter is set to 1.

InfoTyp (SINT) = 1 (This is the type of data to follow: RSSI,…)

RSSI (SINT) = The RSSI data as returned from the tag

TXChannel (SINT) = Frequency channel that the reader communicated to the tag with

TXPower (INT) = The power setting that the head /tag used to communicate

Name	Data Type	Style
Status	SINT	Decimal
PC	INT	Hex
EPC	STRING	
USER	STRING	
Additional_Info	Additional_Info	

Figure 20: USER_Data_PF user defined variable contains data from UHF tags

Output Parameters

Time (DINT) **–** This is the recorded time is takes for the command to complete. The time stops when the DN bit goes high. If the command goes DN(done) with no ER(error) and you think this time is unusually long check the "Data hold time" This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced to a very low number speeding up your process.

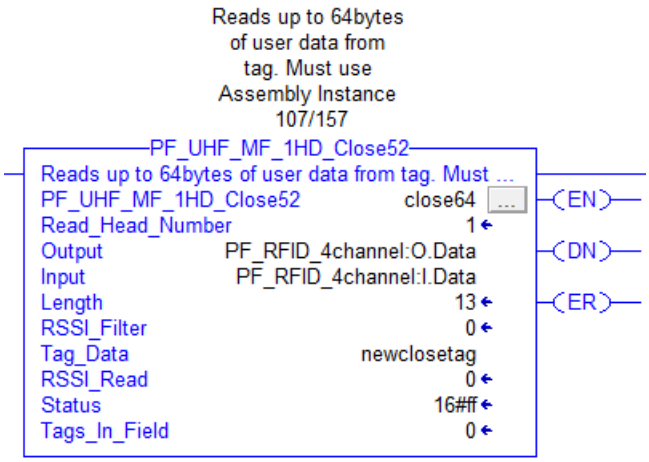
Tags_In_Field (DINT) - The number of tags read by the command. Only one tag is returned but gives the number of tags still in the field.

Missing_Data (BOOL) - The execution counter is monitored. If the counter ever goes up by more than one then a response was missed by the add-on instruction. Check to make sure the "Data hold time" is long enough. It should be set to greater than 2 x the maximum IO scan time. This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced to a very low number speeding up your process.

RSSI_Read (DINT) – The value of the RSSI of the closest tag returned

PF_UHF_MF_1HD_Close52

In order to use this command the parameter "Additional_Info_IF" must be enabled. See the UHF add-on PF_UHF_ParamVx_Read_Write to set this parameter. It compares the RSSI values of up to 5 read tags. If one tag has a higher RSSI value then all others and the RSSI value is above the RSSI_Filter parameter then this tag is considered the closest tag to the reader. This is a special command that does two reads internally. Only use this command if you want to read from 10 to 16 DINTs(40-64bytes) of User data



Parameters

Input Parameters

Length (DINT) – 10-16 4byte blocks possible to read

RSSI_Filter (DINT) – The RSSI threshold that the closest tag must exceed. Often used to ensure the closest tag is the one on the pallet. If a tag is missing and you had no filter then the closest tag could be on another station.

In/Out Parameters

Tags_Response (USER_Data_PF)- This is the location where the closest tag will be placed. This is a user defined variable that contains a lot of information for each tag. See Figure 19.

Status (SINT) = Tells if the EPC code is a duplicate or not.

0=unique EPC

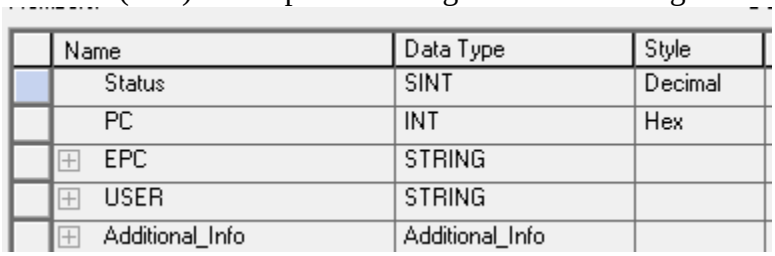
A=duplicate EPC (May not be used)

PC (INT) = Protocol control word. See IUH manual for the bit definitions.
EPC (STRING) = EPC/UII code from UHF tag
USER (STRING) = Additional data supplied by the tag. It will vary depending on command used.

SF = TID
SR, #SR = User Data

Additional_Info (Additional_Info) – An optional set of data for a tag that is only available if the IF parameter is set to 1.

InfoTyp (SINT) = 1 (This is the type of data to follow: RSSI,…)
RSSI (SINT) = The RSSI data as returned from the tag
TXChannel (SINT) = Frequency channel that the reader communicated to the tag with
TXPower (INT) = The power setting that the head /tag used to communicate



Name	Data Type	Style
Status	SINT	Decimal
PC	INT	Hex
EPC	STRING	
USER	STRING	
Additional_Info	Additional_Info	

Figure 21: USER_Data_PF user defined variable contains data from UHF tags

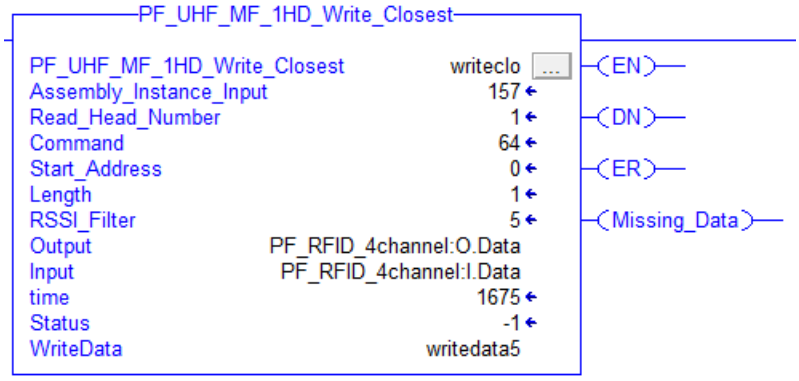
Output Parameters

Tags_In_Field (DINT) - The number of tags read by the command. Only one tag is returned but gives the number of tags still in the field.

RSSI_Read (DINT) – The value of the RSSI of the closest tag returned

PF_UHF_MF_1HD_Write_Closest

In order to use this command the parameter "Additional_Info_IF" must be enabled. See the UHF add-on PF_UHF_ParamVx_Read_Write to set this parameter. It compares the RSSI values of up to 5 read tags. If one tag has a higher RSSI value then all others and the RSSI value is above the RSSI_Filter parameter then this tag is considered the closest tag to the reader. The filtering is enabled and the closest EPC code is used as the filter string. The tag is now written.



Parameters

Input Parameters

Command (DINT) –

64 – Write User (4byte blocks)
13 – Write UII/EPC
74 – Write User (2byte blocks)

Start_Address (DINT) – This is the block address that you want to access on the tag. Only used for Command 16 otherwise set to 0.

Length (DINT) – This is the amount of blocks that you want to read. Only used for Command 16 otherwise set to 0.

RSSI_Filter (DINT) – The RSSI threshold that the closest tag must exceed. Often used to ensure the closest tag is the one on the pallet. If a tag is missing and you had no filter then the closest tag could be on another station.

In/Out Parameters

WriteData (SINT[56]) – The data to be written to the closest tag.

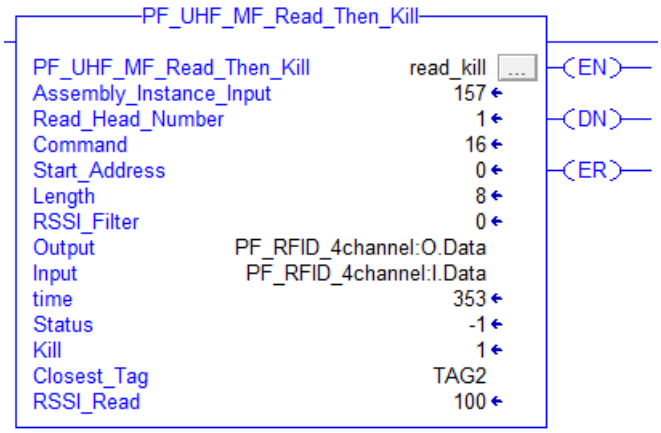
Output Parameters

Tags_In_Field (DINT) - The number of tags read by the command. Only one tag is returned but gives the number of tags still in the field.

RSSI_Read (DINT) – The value of the RSSI of the closest tag returned

PF_UHF_MF_Read_Then_Kill

In order to use this command the parameter "Additional_Info_IF" must be enabled. See the UHF add-on PF_UHF_ParamVx_Read_Write to set this parameter. This command returns the closest tag and then kills it. After the tag is killed it can never be used again. Ths command is often used at the end of the product lines before a tag leaves the facility. It compares the RSSI values of up to 5 read tags. If one tag has a higher RSSI value then all others and the RSSI value is above the RSSI_Filter parameter then this tag is considered the closest tag to the reader.
After closest tag is found a password is written to bank 0 and a kill operation is performed



Parameters

Input Parameters

Command (DINT) –

10 – Read EPC Code only

16 – Read EPC and user data

1 – Read EPC and TID

Start_Address (DINT) – This is the block address that you want to access on the tag. Only used for Command 16 otherwise set to 0.

Length (DINT) – This is the amount of blocks that you want to read. Only used for Command 16 otherwise set to 0.

RSSI_Filter (DINT) – The RSSI threshold that the closest tag must exceed. Often used to ensure the closest tag is the one on the pallet. If a tag is missing and you had no filter then the closest tag could be on another station.

Kill (DINT) – If 0 the command does not perform the kill operation. If one the tag is killed after the closest tag is found.

In/Out Parameters

Tags_Response (USER_Data_PF)- This is the location where the closest tag will be placed. This is a user defined variable that contains a lot of information for each tag. See Figure 19.

Status (SINT) = Tells if the EPC code is a duplicate or not.

0=unique EPC

A=duplicate EPC (May not be used)

PC (INT) = Protocol control word. See IUH manual for the bit definitions.

EPC (STRING) = EPC/UII code from UHF tag

USER (STRING) = Additional data supplied by the tag. It will vary depending on command used.

SF = TID

SR, #SR = User Data

Additional_Info (Additional_Info) – An optional set of data for a tag that is only available if the IF parameter is set to 1.

InfoTyp (SINT) = 1 (This is the type of data to follow: RSSI,…)
RSSI (SINT) = The RSSI data as returned from the tag
TXChannel (SINT) = Frequency channel that the reader communicated to the tag with
TXPower (INT) = The power setting that the head /tag used to communicate

	Name	Data Type	Style
	Status	SINT	Decimal
	PC	INT	Hex
⊞	EPC	STRING	
⊞	USER	STRING	
⊞	Additional_Info	Additional_Info	

Figure 22: USER_Data_PF user defined variable contains data from UHF tags

Output Parameters

Time (DINT) **–** This is the recorded time is takes for the command to complete. The time stops when the DN bit goes high. If the command goes DN(done) with no ER(error) and you think this time is unusually long check the "Data hold time" This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced to a very low number speeding up your process.

RSSI_Read (DINT) – The value of the RSSI of the closest tag returned

Read and Write Data Continuously

PF_UHF_MF_1HD_Cont

This command will read or write up to 40 tags at one time. The tags are loaded into the variable called Tags_Response_All. Additionally the last tag read is loaded into Tags_Response_Last. Once the tags leave the read zone the tags are removed from the variable table. When all tags are gone the variable table will be all zeros. If a write command is being used then load the data to be written into the variable WriteData first. Even for write commands the Tags_Response variable is used to show what tags were written to. In the case of the write commands only the EPC/UII data is displayed as a response. See Table 4 for a list of available commands. The first tag read is placed in Tags_Response_All[0], second in Tags_Response All[1]…and so on. Once a tag leaves the read zone that tag is removed from the table and then all tags below the empty spot are moved up by one.

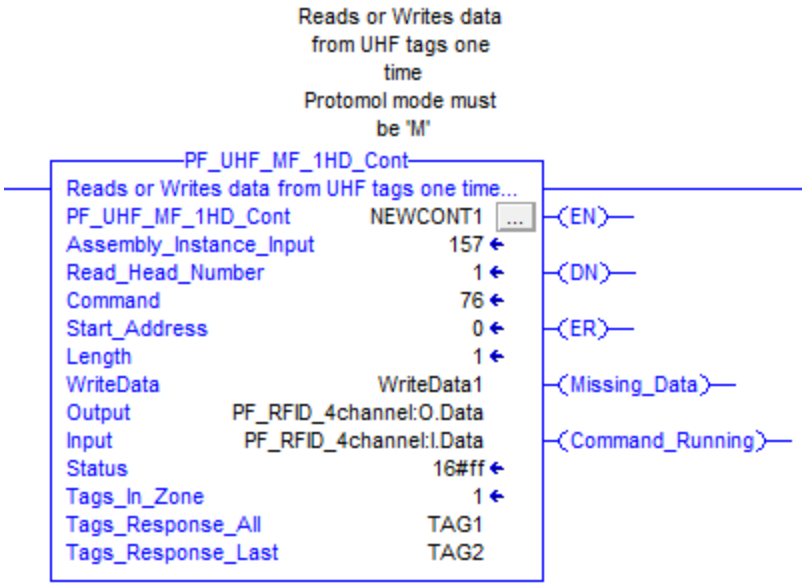


Figure 20: Continuous Read/Write add-on instruction

Command Code	Command	Description
29	EF	Read EPC/UII + TID (DINTs)
25	ER	Read EPC/UII + User data (DINTS)
26	EW	Write User data
113	ES	Read EPC/UII
75	#ER	Read EPC/UII +User data (INTs)
76	#EW	Write User data (INTs)

Table 4: Single Read or Write Command Options

Parameters

Input Parameters

Command (DINT) – This is the read or write operation to be performed. See Table 4 for options. The Command number should be entered in decimal.

Start_Address (DINT) – This is the block address that you want to access on the tag. Depending on the command this could be a four byte block address or a two byte block address.

SF, SR, SW, SS, SP	4 byte block address
#SR, #SW	2 byte block address

Length (DINT) – This is the amount of blocks that you want to read. The block size is 4 bytes for SF, SR, SW, SS, SP but only two bytes for #SR, #SW

In/Out Parameters

WriteData (SINT[56]) – This is the data that will be written to the tag. If multiple tags are in the field the same data is written to all tags.

Tags_Response (USER_Data_PF[40])- This is the location where all read tags are placed. This is a user defined variable that contains a lot of information for each tag. See Figure 20.

Status (SINT) = Tells if the EPC code is a duplicate or not.

0=unique EPC

A=duplicate EPC

PC (INT) = Protocol control word. See IUH manual for the bit definitions

EPC (STRING) = EPC/UII code from UHF tag

USER (STRING) = Addition data supplied by the tag. It will vary depending on command used.

SF = TID

SR, #SR = User Data

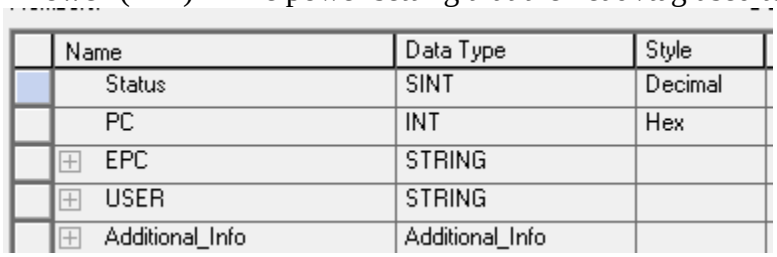
Additional_Info (Additional_Info) – An optional set of data for a tag that is only available if the IF parameter is set to 1.

InfoTyp (SINT) = 1 (This is the type of data to follow RSSI,…)

RSSI (SINT) = The RSSI data as returned from the tag

TXChannel (SINT) = Frequency channel that the reader communicated to the tag with

TXPower (INT) = The power setting that the head /tag used to communicate



	Name	Data Type	Style
	Status	SINT	Decimal
	PC	INT	Hex
⊞	EPC	STRING	
⊞	USER	STRING	
⊞	Additional_Info	Additional_Info	

Figure 20: USER_Data_PF user defined variable contains data from UHF tags

Output Parameters

Time (DINT) **–** This is the recorded time is takes for the command to complete. The time stops when the DN bit goes high. If the command goes DN(done) with no ER(error) and you think this time is unusually long check the "Data hold time" This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced speeding up your process.

Tags_In_Field (DINT) = The number of tags read or written by the command

Missing_Data (BOOL) = The execution counter is monitored. If the counter ever goes up by more than one then a response was missed by the add-on instruction. Check to make sure the "Data hold time" is long enough. It should be set to greater than 2 x the maximum IO scan time. This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced speeding up your process.

Command_Running (BOOL) = On as long as the continuous read command is running

Tags_Response_Last(USER_Data_PF)- This is the last tag read. In some applications this may be the only important tag.

PF_UHF_MF_1HD_Cont_OP2

This command will read or write up to 40 tags at one time. This command keeps a running list of tags and never clears them out. When a new tag is read the list of tags is searched. If the same tag with the same EPC code is found then the data is thrown out. If the tag is new it is placed in Tags_Response_All[last index]. This is the last index in the array. All data from [1] … [lastindex-1] are automatically shifted to [0] …[lastindex-2]. This command is often used on conveyors where one tag is read at a time but the tags may be too close together or bunch up like in a power-and-free conveyor. Once the tag is read it won't be read again until it makes its way all the way around the entire conveyor loop. Make sure the size of the Tags_Response_All[x] array is smaller then the total number of tags used.

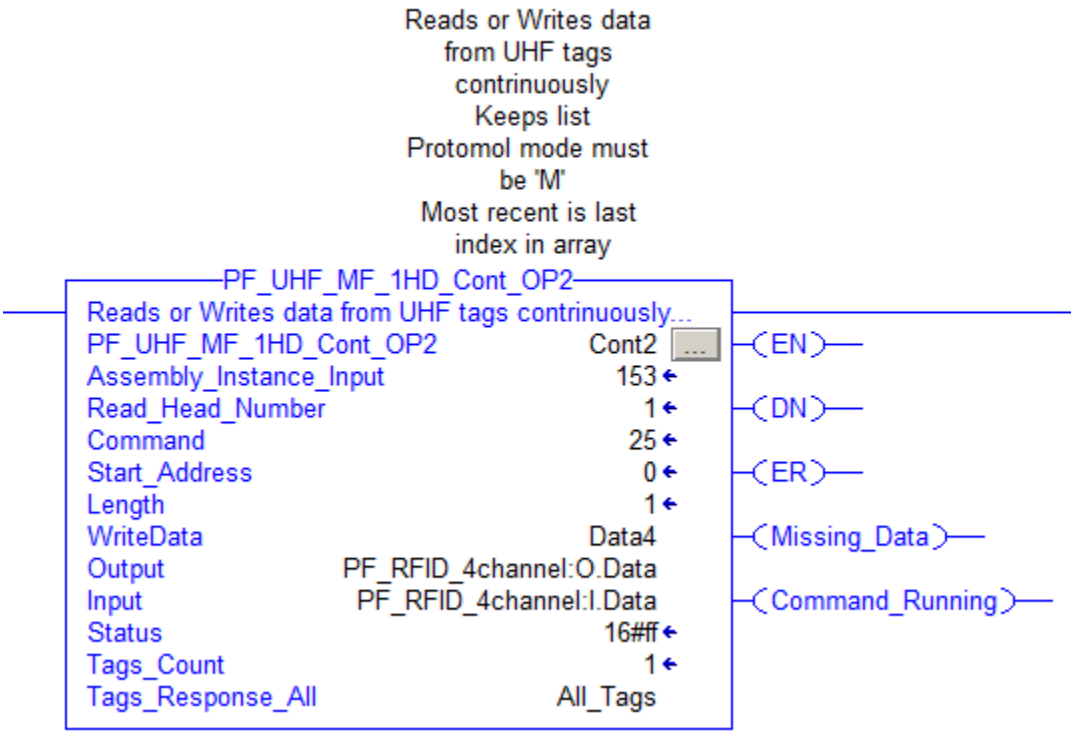


Figure 21: Continuous Read/Write add-on instruction

Command Code	Command	Description
29	EF	Read EPC/UII + TID (DINTs)
25	ER	Read EPC/UII + User data (DINTS)
26	EW	Write User data

113	ES	Read EPC/UII
75	#ER	Read EPC/UII +User data (INTs)
76	#EW	Write User data (INTs)

Table 5: Single Read or Write Command Options

Parameters

Input Parameters

Command (DINT) – This is the read or write operation to be performed. See Table 5 for options. The Command number should be entered in decimal.
Start_Address (DINT) – This is the block address that you want to access on the tag. Depending on the command this could be a four byte block address or a two byte block address.

SF, SR, SW, SS, SP	4 byte block address
#SR, #SW	2 byte block address

Length (DINT) – This is the amount of blocks that you want to read. The block size is 4 bytes for SF, SR, SW, SS, SP but only two bytes for #SR, #SW

In/Out Parameters

WriteData (SINT[56]) – This is the data that will be written to the tag. If multiple tags are in the field the same data is written to all tags.

Tags_Response (USER_Data_PF_V2[1])- This is the location where all read tags are placed. This is a user defined variable that contains a lot of information for each tag. See Figure 21. Make the array length as long as desired but no longer then the maximum number of tags in the system.

Status (SINT) = Tells if the EPC code is a duplicate or not.
0=unique EPC
A=duplicate EPC
PC (INT) = Protocol control word. See IUH manual for the bit definitions
EPC (STRINGPF_30) = EPC/UII code from UHF tag
USER (STRING) = Addition data supplied by the tag. It will vary depending on command used.
SF = TID
SR, #SR = User Data
Additional_Info (Additional_Info) – An optional set of data for a tag that is only available if the IF parameter is set to 1.
InfoTyp (SINT) = 1 (This is the type of data to follow RSSI,…)
RSSI (SINT) = The RSSI data as returned from the tag
TXChannel (SINT) = Frequency channel that the reader communicated to the tag with
TXPower (INT) = The power setting that the head /tag used to communicate

	Name	Data Type	Style
	Status	SINT	Decimal
	PC	INT	Hex
⊞	EPC	STRING	
⊞	USER	STRING	
⊞	Additional_Info	Additional_Info	

Figure 21: USER_Data_PF user defined variable contains data from UHF tags

Output Parameters

Time (DINT) **–** This is the recorded time is takes for the command to complete. The time stops when the DN bit goes high. If the command goes DN(done) with no ER(error) and you think this time is unusually long check the "Data hold time" This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced speeding up your process.

Missing_Data (BOOL) = The execution counter is monitored. If the counter ever goes up by more than one then a response was missed by the add-on instruction. Check to make sure the "Data hold time" is long enough. It should be set to greater than 2 x the maximum IO scan time. This parameter can be found on the display of the controller or on the web page of the controller. This value is 500ms by default and can be reduced speeding up your process.

Command_Running (BOOL) = On as long as the continuous read command is running

Read and Write UHF Parameters

PF_UHF_ParamV2_Read_Write

This instruction reads all of the UHF parameters from the read head. You can then modify them and write them back down. Before executing the command configure the Reset_To_Default bit. Set ON to reset to default or OFF to perform the read or write operation. If the Reset_To _Default is off then the bit Read_Write is used to specify the operation, 0=read parameters and 1=write parameters. We always suggest reading the parameters first, modify them and then write them back down to the read head. The PF_UHF_ParamV2_Read_Write is not a drop in replacement for the original PF_UHF_Param_Read_Write. The functionality is the same but the names and parameter order has changed to match those in the RFIDControl software.

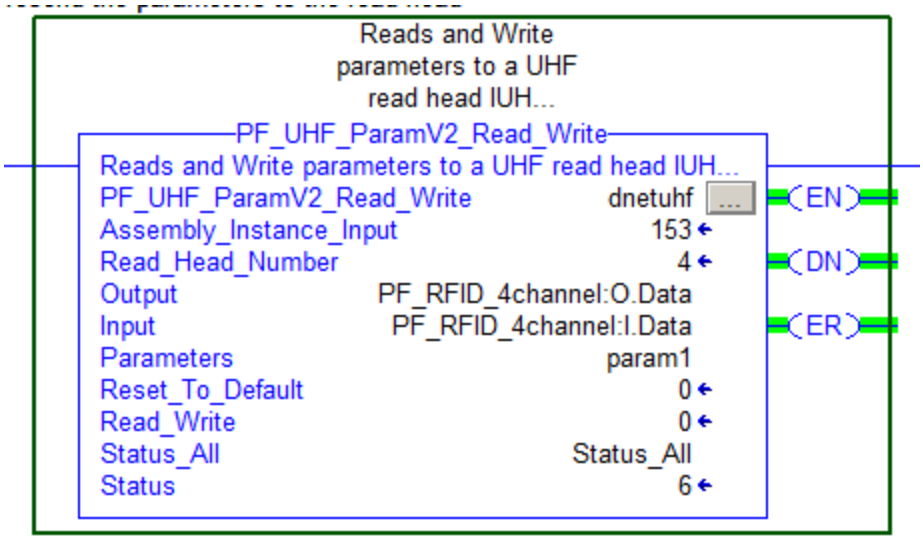


Figure 21: Parameter read/write instruction

Parameters

Input Parameters

Reset_To_Default(DINT) – Turn on to have the read reset all the parameters to default. Additionally all parameters are read in after. This parameter overrides the Read_Write bit.

0= Do not reset the parameters to default

1=Reset all parameters to default

Read_Write(DINT) – Set the instruction to either read in all the parameters or writes all the parameters. Some parameters are read only and are always read.

0=Read Parameters

1=Write Parameters

In/Out Parameters

Parameters(UHF_ParametersV2) – This is the list of parameters. The defaults may differ by read head. See the manual on the read head for additional descriptions on each parameter.

Parameter Name	Data Type	Style	Range	Default (F190-FR2-02)	Read or Write (F190-FR2-02)	Description
.Region_Code_RC	INT	Hex	-	16#82	RD	Country code
.Polarization_AP	SINT	ASCII	'R', 'H','V'	'R'	RD/WR	R=circular, H=horizontal, L=vertical
.Transmit_Power_PT Possible power values are 50, 60, 80, 100, 125, 150, 200, 300,	INT[0]	Dec	50…500	125	RD/WR	Power 1
	INT[1]	Dec	0…500	0	RD/WR	Power 2
	INT[2]	Dec	0…500	0	RD/WR	Power 3

400, 500 mW EIRP for country code 2	INT[3]	Dec	0…500	0	RD/WR	Power 4
	INT[4]	Dec	0…500	0	RD/WR	Power 5
	INT[5]	Dec	0…500	0	RD/WR	Power 6
	INT[6]	Dec	0…500	0	RD/WR	Power 7
	INT[7]	Dec	0…500	0	RD/WR	Power 8
	INT[8]	Dec	0…500	0	RD/WR	Power 9
	INT[9]	Dec	0…500	0	RD/WR	Power 10
.Transmission_Channels_CD	SINT[56]	Dec	-	-	RD	Frequency channels
.Number_Of_Channels_NC	SINT	Dec	depends	4	RD/WR	Frequency channels used
.Number_of_Attempts_TA	SINT	Dec	1…255	2	RD/WR	Read attempts
.Enhanced_Status_5_E5	SINT	Dec	0…252	5	RD/WR	No reads before status 5 appears
.Memory_Bank_MB	SINT	Dec	0,1,2,3	3	RD/WR	Bank to use during SR, SW…
.Protocol_Mode_QV	SINT	ASCII	'S', 'M'	'M'	RD/WR	Single-frame, multi-frame
Additional_Info_IF	SINT	Dec	0,1	0	RD/WR	0=no additional info 1=additional included including RSSI, power,…
.Q_Value_QW	SINT	Dec	0…6	2	RD/WR	2^Q=tags in field
.Cancellation_Criteria_for_search	INT	Dec	1…40,255	255	RD/WR	Reads canceled when this many tags read
.Transmission_Pause_SM	DINT	Dec	0…65535	0	RD/WR	Pauses between cycles
.Filter_Mask_0	STRING	-	-	-	RD	Filter mask 1
.Filter_Mask_1	STRING	-	-	-	RD	Filter mask 2
.Filter_Mask_2	STRING	-	-	-	RD	Filter mask 3
.Measure_Reflection	INT[50]	Dec	0…255	-	RD	To get dBm subtract 100

Figure 22: Parameter options

Status_All(DINT[20]) – Shows the result of each individual read or write parameter command. Is used for debug in case one command doesn't work.

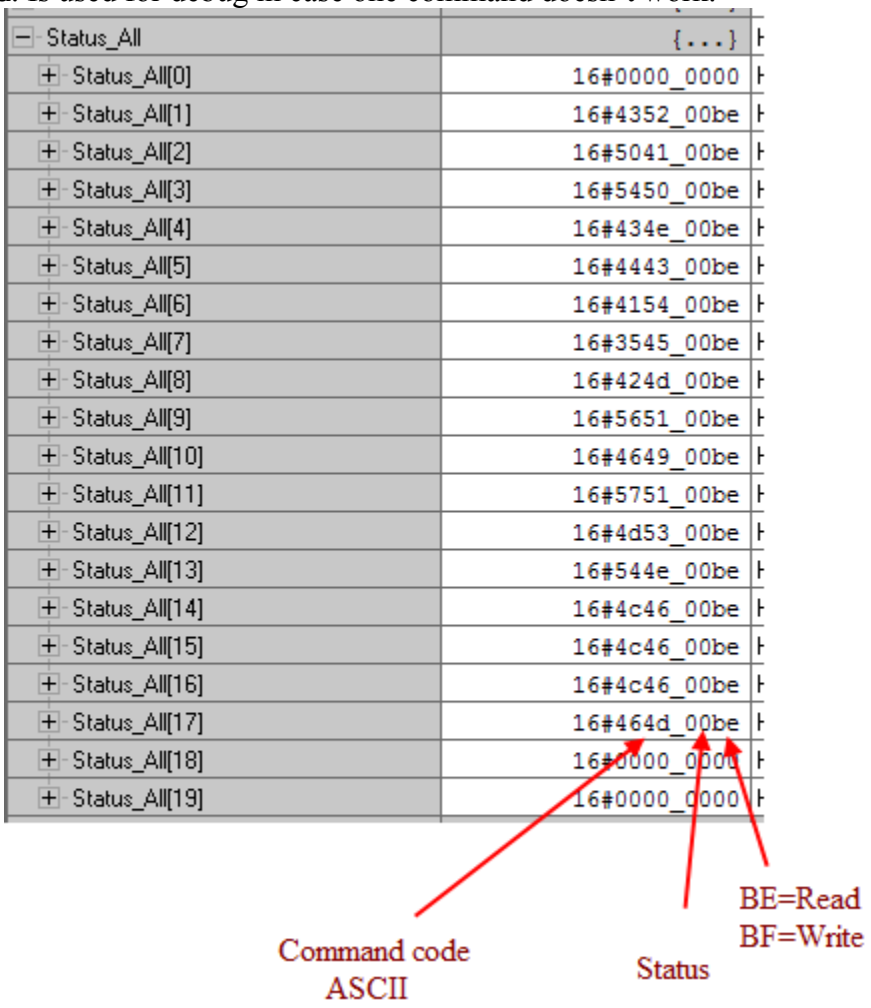


Figure 23: Status indication for each parameter read or written

PF_UHF_ParamV3_Read_Write

This instruction reads all of the UHF parameters from the read head. You can then modify them and write them back down. Before executing the command configure the Reset_To_Default bit. Set ON to reset to default or OFF to perform the read or write operation. If the Reset_To _Default is off then the bit Read_Write is used to specify the operation, 0=read parameters and 1=write parameters. We always suggest reading the parameters first, modify them and then write them back down to the read head. The PF_UHF_ParamV3_Read_Write adds two additional parameters.

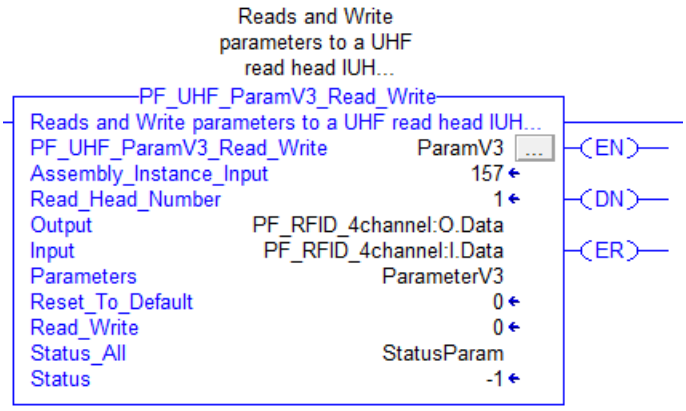


Figure 21: Parameter read/write instruction

Parameters

Input Parameters

Reset_To_Default(DINT) – Turn on to have the read reset all the parameters to default. Additionally all parameters are read in after. This parameter overrides the Read_Write bit.

0= Do not reset the parameters to default

1=Reset all parameters to default

Read_Write(DINT) – Set the instruction to either read in all the parameters or writes all the parameters. Some parameters are read only and are always read.

0=Read Parameters

1=Write Parameters

In/Out Parameters

Parameters(UHF_ParametersV2) – This is the list of parameters. The defaults may differ by read head. See the manual on the read head for additional descriptions on each parameter.

Parameter Name	Data Type	Style	Range	Default (F190-FR2-02)	Read or Write (F190-FR2-02)	Description
.Region_Code_RC	INT	Hex	-	16#82	RD	Country code
.Polarization_AP	SINT	ASCII	'R', 'H','V', 'C'	'R' or 'C'	RD/WR	R=circular, H=horizontal, L=vertical C=combined
.Transmit_Power_PT Possible power values depend on region code and model number	INT[0]	Dec	3…4000	125	RD/WR	Power 1
	INT[1]	Dec	3…4000	0	RD/WR	Power 2
	INT[2]	Dec	3…4000	0	RD/WR	Power 3
	INT[3]	Dec	3…4000	0	RD/WR	Power 4

	INT[4]	Dec	3…4000	0	RD/WR	Power 5
	INT[5]	Dec	3…4000	0	RD/WR	Power 6
	INT[6]	Dec	3…4000	0	RD/WR	Power 7
	INT[7]	Dec	3…4000	0	RD/WR	Power 8
	INT[8]	Dec	3…4000	0	RD/WR	Power 9
	INT[9]	Dec	3…4000	0	RD/WR	Power 10
.Transmission_Channels_CD	SINT[56]	Dec	-	-	RD	Frequency channels
.Number_Of_Channels_NC	SINT	Dec	depends	4	RD/WR	Frequency channels used
.Number_of_Attempts_TA	SINT	Dec	1…255	2	RD/WR	Read attempts
.Enhanced_Status_5_E5	SINT	Dec	0…252	5	RD/WR	No reads before status 5 appears
.Memory_Bank_MB	SINT	Dec	0,1,2,3	3	RD/WR	Bank to use during SR, SW…
.Protocol_Mode_QV	SINT	ASCII	'S', 'M'	'M'	RD/WR	Single-frame, multi-frame
Additional_Info_IF	SINT	Dec	0,1	0	RD/WR	0=no additional info 1=additional included including RSSI, power,…
.Q_Value_QW	SINT	Dec	0…6	2	RD/WR	2^Q=tags in field
.Cancellation_Criteria_for_search	INT	Dec	1…40,255	255	RD/WR	Reads canceled when this many tags read
.Transmission_Pause_SM	DINT	Dec	0…65535	0	RD/WR	Pauses between cycles
.Filter_Mask_0	STRING	-	-	-	RD	Filter mask 1
.Filter_Mask_1	STRING	-	-	-	RD	Filter mask 2
.Filter_Mask_2	STRING	-	-	-	RD	Filter mask 3
.Measure_Reflection	INT[50]	Dec	0…255	-	RD	To get dBm subtract 100
Session	SINT	Dec	0,1,2,3	0	RD/WR	Communication session
Search_Mode	SINT	Dec	0,1,2	0	RD/WR	Search Mode

Figure 22: Parameter options

Status_All(DINT[20]) – Shows the result of each individual read or write parameter command. Is used for debug in case one command doesn't work.

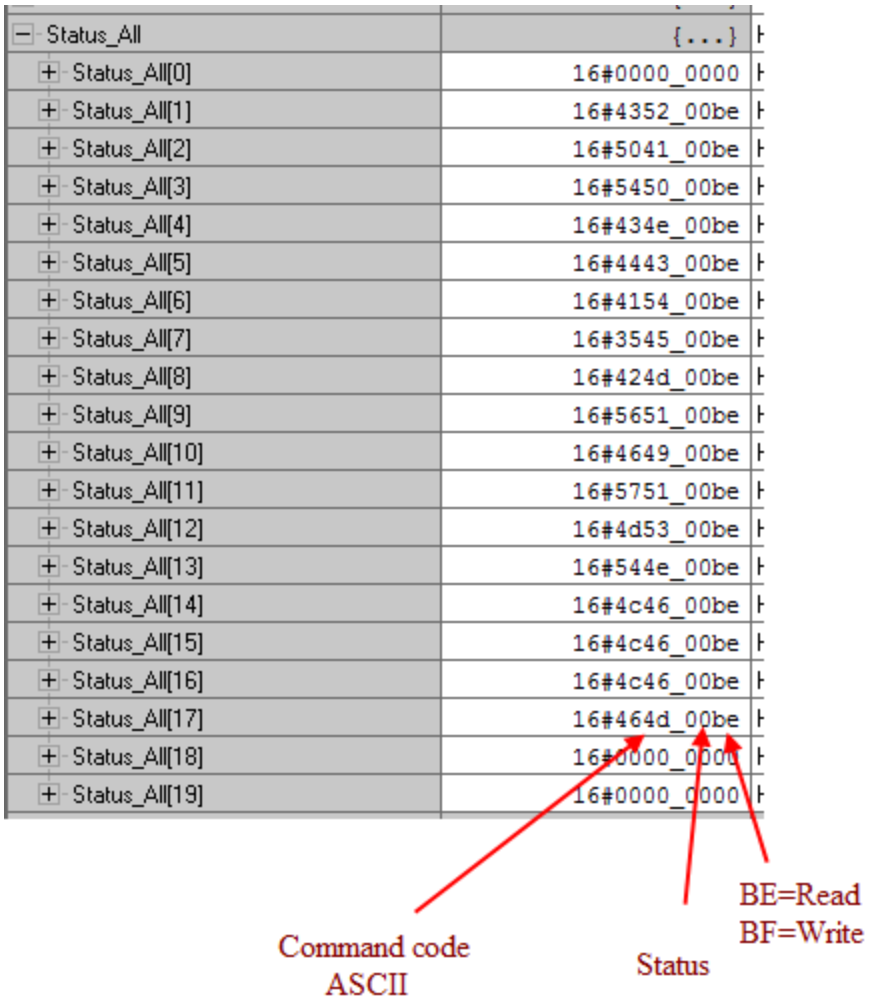


Figure 23: Status indication for each parameter read or written

Filtering

PF_UHF_Filter_Set

This command sets up a filter that will be used when filtering is enabled. This instruction is often used to exclude tags that you don't want to read. If you know all of the tags on the product line begin with a certain number then filter to that number. This will reduce the risk that someone brings in a tag off the street and could disrupt production.

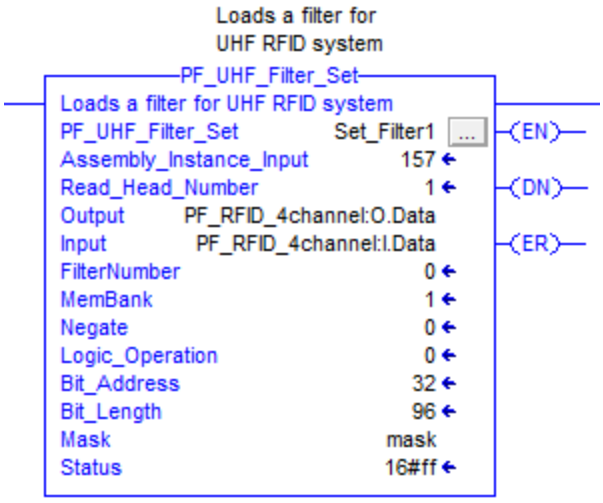


Figure24: Filter Set instruction

Parameters

Input Parameters

FilterNumber(SINT) – This is the filter number that you want to configure. Three filters are possible numbered 0, 1, and 2

MemBank(SINT) – This is the bank that you want to perform the filter on.

1=EPC/UII code
2=TID
3=User Data

Negate(BOOL) – If you want to filter everything that does not meet the filter criteria then make this variable 1

Logic_Operation(BOOL) – The logical operation of all the filters assuming that more than one filter is used. If there is only one filter then this parameter has no meaning.

0=OR link between filters
1=AND link between filters

Bit_Address(INT) – The location in the bank that you want to start filtering. This bit location is the absolute position.

Filtering on EPC
Bit 16=PC (Protocol control word)
Bit 32=Start of EPC/UII

Bit_Length(SINT) – This is the number of bits that you are filtering

In/Out Parameters

Mask(SINT[2]] – The actual mask data

PF_UHF_Filter_Mode

This instruction enables filtering. It uses the filter mask that was set in the "Filter_Set" instruction.

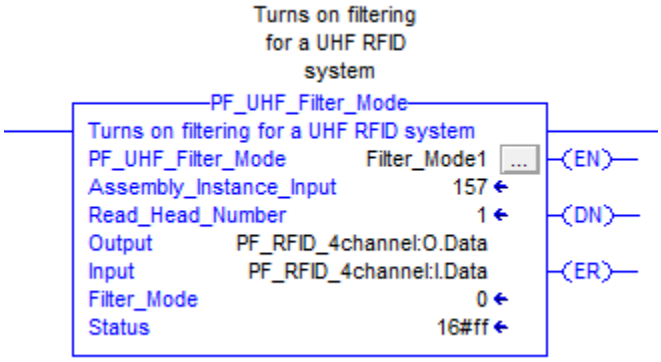


Figure27: Filter instruction to enable filtering

Parameters

Input Parameter

Filter_Mode(SINT) – This parameter will enable or disable the filter mode

0=disables filter mode

1=Activates filter mode 1, Sets the flag bit on all tags that match the filter and then acts on all flagged tags

2=Activates filter mode 2, Sets the flag bit on all tags that do not match the filter and then acts on all tags that are not flagged