

## **EZTouch® Protocol Conversion Feature**

#### Application Note & Examples

The EZTouch Editor supports dual protocol PLC Communication. It also supports multi-function operations and expressions that can be used for protocol conversion and/or multi-PLC conditional coding. For example, you can read PLC tags from an Allen Bradley PLC and thru the EZTouch convert the data so a Siemens PLC can also understand the updated values.



If using Ethernet dual protocol then you can communicate with multiple PLCs of the same type that enables pass-through communication between these different PLCs using the EZTouch HMI<sup>®</sup>. For example, you can have a MicroLogix, CompactLogix and ControlLogix all transferring data between each other through the EZTouch<sup>®</sup>. This pass through communication and expressions allow for multi-PLC conditional coding as well.

This document will look at 4 different ways of setting up protocol conversion/pass through communication. Then it will provide an example for each at the end. First to setup dual protocol follow the directions below:

### **Dual Protocol Setup**

- 1. On the Project Information Screen under **Protocol/PLC Model** you can enable **PLC2 / Drive** and then select a second PLC or drive to communicate to.
- 2. Communication setup is like for PLC 1 using the View/Edit PLC Com Setup.

	Step 4: Protocol/PLC Model	
	PLC1 / Drive PLC Manufacturer : Protocol /PLC Model: Ethermet Drivers  Ethermet/IP - Rev H / I	View/Edit PLC Com Setup
Please assign proper ports in	PLC2 / Drive	
Setup->Panel Attributes->Ports te	tab PLC Manufacturer : Protocol /PLC Model: Ethernet Drivers  Siemens ISO TCP/IP - Rev A / b	View/Edit PLC Com Setup



4. Once you have setup both PLC Protocols then in the tag database you can use either PLC 1 or PLC 2 to create new tags. Note: Syntax will be checked for both PLCs that tag makes sense for the object being used and it has the correct format.

Add New Tag Details
Select Tag Type  PLC 1 : Ethernet Drivers Ethernet/IP - Rev H  PLC 2 : Ethernet Drivers Siemens ISO TCP/IP - Rev A  Internal Tag  Expression
Tag Name Tag Datatype SIGNED_INT_16
Address String
# of Characters
Initial Value/Retentive Flag
Initial Value
Retentive
Add New Tag Close Help



### MULTI-FUNCTIONS (Single Instance Conversion)

The multi-function button is a button which you add to the screen. When the button is pressed then multiple functions can be performed on multiple registers. These operations include a move function which can move information from a tag in PLC 1 to a tag in PLC 2 or vice versa. You can also do operations with both PLC 1 and PLC 2 tags together such as adding, dividing, multiplying, etc.

To create this object follow the directions below:

1. In the object menu select Multi-Function.

neral	Operations F	rotecti	ion Visibility/I	Details		
laximu	m number of op	eratior	ns: 20	Number	of operations in this m	nulti-function object 0
Opr#	Destination	-	Source1	Operation	Source2	
	MoveUp		MoveDow	m A	Add/Edit Operation	Delete Operation(s)

- 2. The General tab in the Multi-Function is useful to change the button display characteristics. The operations tab is where you define the operations to be performed like the move function.
- 3. Click the Add/Edit Operation to create the operation to be done. You can also decide on the source tag (can be from PLC 1 or PLC 2). Then finally decide the destination tag (this can also be from PLC 1 or PLC 2).

Add Operation Details			X
Source1			
Tag	Constant	Previous Operation	
Tag PLC1		•	-
Data Format	▼ Value 0	Operation #	•
Operation Source2	(MOVE)	•	
◯ Tag	Constant	O Previous Operation	
Тад			-
Data Format Unsigned D	ecimal 🔻 Value 0	Operation #	-
🔽 Store To Tag			
Destination Tag PL	02	•	
Help	Add New Operatio	Close	

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5. Once all operations are created and the object is added to the screen, pressing this button will evaluate all the operations at once. For Protocol conversion all the move functions will only be evaluated upon pressing of the button.

### GLOBAL MULTI-FUNCTIONS (Continuous Automatic Conversions)

The global multi-functions are operations which are done <u>constantly when a condition happens</u>. Such as when a value changes or even time based. After the condition changes multiple operations can be carried out at the same time. For protocol conversion this means that you could move data from PLC 1 to PLC 2 at set intervals, when the data changes or even based on a discrete tag conditions.

To create this object follow the directions below:

1. In Setup > Global Objects select Multi-Function	۱.
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Iulti-Function			×
General Page Operatio	S		
Label Text			
Event			
Туре	when the source operands cha	nge 🔹	
Tag		•	
Time (1/10th Sec)	10 O Hour	Minutes	
	Seconds	1/10 second	
		OK Can	Help

- 2. In the dialogue box on the General Page define the condition when this will be evaluated. This can be when a register value changes, when a discrete turns on or off, or even on a time base scale.
- 3. In the Operations page you define the operations exactly as with the Multi-Function Button.





4. Click the Add/Edit Operation to create the operation to be done. You can also decide on the source tag (can be from PLC 1 or PLC 2). Then finally decide the destination tag (this can also be from PLC 1 or PLC 2).

Add Operation Details			X
Source1			
Tag	Constant	O Previous Operation	
Tag PLC1			•
Data Format	▼ Value 0	Operation #	-
Operation Source2	(MOVE)	•	
◯ Tag	Constant	O Previous Operation	
Тад			-
Data Format Unsigned De	ecimal 🔻 Value 0	Operation #	-
Store To Tag	2	•	-
Help	Add New Operatio	n Close	

- 5. Once you finish, click on Add New Operation to add the operation. Then you can then define the next operation using the same method.
- 6. Once the operation created when the condition previously defined is true all the operations will be evaluated at once.



## FUNCTION EXPRESSIONS (Multi-PLC Functions)

The function expressions are internal program logic designed to do simple math / logic functions. These functions can be done on multiple tags from 1 PLC or multiple tags from many different PLCs. The expressions are always evaluated and recorded and do not have to be viewed. Expressions can be assigned to be displayed by indicators and can also use internal HMI tags as well.

To create an expression follow the directions below:

1. Go to Setup > Tag Database.

PLC1 Model / Manufacturer. Ethernet Drivers Ethernet/IP - Rev H PLC2 Model / Manufacturer. Ethernet Drivers EZPLC TCP/IP - Rev e Search and Replace in Tag Name Find Replace With					Number of HLC2 Tags Number of FLC2 Tags Number of internel tags Number of Expression tags Totel Tags Highlight Int/Exp Tags			2 0 0 4		
F	ind Next	Replace	Replace.	AIL	EH ⊡H	ghlight ghlight	Unused Tags all tags that failed	l verificati	on	
Та	Tag Name	Data Type	ADD	\$0.	Initial	Re	PLC /Int/Exp	w		_
1	CONTROL LOGIX TAG 1	SIGNED_INT_16	1>Teg				PLC1			
2	CONTROL LOGIX TAG 2	SIGNED_INT_16	2>Tag				PLC1			
3	AVG TAG 1	SIGNED_INT_16	1-R1				PLC2			
4	AVG TAG 2	SIGNED_INT_16	2-R1				PLC2			

2. Click on Add/Edit. In the next dialogue box select Expression. And then put in the expression name in tag name box.

Add New Tag Details
Select Tag Type  PLC 1 : Ethernet Drivers Ethernet/IP - Rev H  PLC 2 : Ethernet Drivers EZPLC TCP/IP - Rev e  Internal Tag  Expression  Define Expression
Tag Name Tag Datatype SIGNED_INT_16
Expression String
# of Characters
Initial Value/Retentive Flag
Initial Value
Retentive
Add New Tag Close Help

3. Now click on Define Expression.



Define Write Expression		×
Double click to embed a tag in the expression	Expression (Press Ctrl+Enter to move to new line)	Double click to embed an operator in the expression
Avg TAG 1 Avg TAG 2 CONTROL LOGX TAG 1 CONTROL LOGX TAG 2		IF-THEN-ELSE-ENDIF           \$ [Hexvalue delimiter]           # [Octaivalue delimiter]           [Iopital Romonsian           [Iopital Romonsian           * [Mixing NOT]           [Iopital Romonsian           * [Positive/Add]           * [Mutipty]           * [Mutipty]           > [Shin Reigh]           < [Less than or equal]
-Write Evaluated Expression \	/alue to :	▼ Add New Tag
ОК	Cancel	Help

- 4. In the Define Write Expression dialogue box you can define the expression:
  - a. Click in the middle column to type in a Constant.
  - b. Double click on a Tag in the list on the left hand column to insert it into an Expression. The tag will appear in the center column.
  - c. Select (double click) an Operator in the right hand column to insert into the Expression.
- 5. Example of an function expression (further examples in example section):

AVG TAG 1 Value = 1 Operator = + [Positive/Add] CONTROL LOGIX TAG 1 Value = 3

Result: 1 + 3 = 4Expression Value = 4

6. This is a very simple example of the complex computations that can be accomplished with Expression tags.

Note: Please be aware that Expression Tags are limited to a maximum of 40 operands per tag. Complex operands may use more memory and may further limit the number of operands per expression. In order to avoid errors when trying to use the tag, avoid using too many operands per expression.



## CONDITIONAL EXPRESSIONS (Multi-PLC Conditions)

The conditional expressions are internal program logic designed to do simple If / Then statements. These expressions are made the same way as Functional expressions, just behave differently. These functions can be done on multiple tags from 1 PLC or multiple tags from many different PLCs. The expressions are always evaluated and recorded and do not have to be viewed. Expressions can be assigned to be displayed by indicators and can also use internal HMI tags as well.

To create an expression follow the directions below:

1. Go to Setup > Tag Database.

PLC 1 Model / Manufacturer. Ethernet Drivers Ethernet/IP - Rev H PLC 2 Model / Manufacturer. Ethernet Drivers EZPLC TCP/IP - Rev e Search and Replace in Tag Name Find Replace With Replace With Replace All					Number of PLC1 togs : Number of PLC2 togs : Number of internal togs : Number of Expression togs : Total Tags : Highlight Int/Exp Tags Highlight Unused Tags				tags tags iltags ntags Tags	2 0 0 4
To 1 2 3 4	Tag Name CONTROL LOGIX TAG 1 CONTROL LOGIX TAG 2 AVG TAG 1 AVG TAG 2	Data Type SIGNED_INT_16 SIGNED_INT_16 SIGNED_INT_16 SIGNED_INT_16	ADD 1>Tag 2>Tag 1-R1 2-R1	<b>\$</b> 0	Initial	Re	PLC/MVExp PLC1 PLC1 PLC2 PLC2	W		
Ad	d/Edit Delete Select Tags	Delete Unu Tags	sed	Verity*	Tags		Help	ОК	Co	ncel

2. Click on Add/Edit. In the next dialogue box select Expression. And then put in the expression name in tag name box.

Add New Tag Details	X
Select Tag Type	
PLC1 : Ethernet Drivers Ethernet/IP - Rev H	
PLC 2 : Ethernet Drivers EZPLC TCP/IP - Rev e	
Expression     Define Expression	
Tag Name	
Tag Datatype SIGNED INT 16	
Expression String	
# of Characters	
Initial Value/Retentive Flag	
Initial Value	
Retentive	
Add New Tag Close Help	

3. Now click on Define Expression.

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- 4. In the Define Write Expression dialogue box you can define the expression:
  - a. Click in the middle column to type in a Constant.
  - b. Double click on a Tag in the list on the left hand column to insert it into an Expression. The tag will appear in the center column.
  - c. Select (double click) an Operator in the right hand column to insert into the Expression.
- 5. Example of an conditional expression (further examples in example section):

The format for the conditional is:

IF <expression> THEN <expression> ELSE <expression> ENDIF

The ELSE and ENDIF are required. All expressions require at least one operand. The conditional can be used as an operand.

For example: IF(AVG TAG 2=5)THEN(CONTROL LOGIX TAG 1 + 10)ELSE(5)ENDIF

7. This is a very simple example of the complex computations that can be accomplished with Expression tags.

Note: Please be aware that Expression Tags are limited to a maximum of 40 operands per tag. Complex operands may use more memory and may further limit the number of operands per expression. In order to avoid errors when trying to use the tag, avoid using too many operands per expression.



## Example #1 – Single Instance Protocol Conversion

This example converts ControlLogix Tags to AVG tags when the multi-function button is pressed. It also adds the ControlLogix tags together and stores it in an Internal tag.

Multi-Function		
General Operations Protection V	isibility/Details	
Label Text		
Language 1 🔶 (	Character Size 6x8 💌	
Label Text MULTI-FUNCTION		
Position	Color	
Top     Determ	l ext	
Bollom	Background	
		🔽 Display Frame
Text	Char Size Colo	л
Language 1 🚔	Tex	Back t Blink ground Blink
Text Convert Data	8x32 🔻	
	ОК	Cancel Help
Multi-Function		
General Operations Protection Vi	sibility/Details	
Maximum number of operations: 20	Number of operations	in this multi-function object 3
Opr# Destination - Sou	rce1 Operation	Source2

	Bootindaon		Sourcer	operation	Sourcez
1	AVG TAG 1	=	CONTROL LOGIX TAG 1	MOVE	
2	AVG TAG 2	=	CONTROL LOGIX TAG 2	MOVE	
3	INTERNAL TAG	=	CONTROL LOGIX TAG 1	ADD	CONTROL LOGIX TAG 2
4					

Pressing this button will now convert the data at this time and also add the ControlLogix tag together and move them into an Internal tag.





### Example #2 – Continuous Automatic Protocol Conversion

This example converts ControlLogix Tags to Siemens tags when the value of the tags changes. It also adds the ControlLogix tags together and stores it in an Internal tag.

Multi-Function		<b>X</b>
General Page Operatio	ns	
Label Text	Convert Data	
Event		
Туре	when the source operands change	▼
Tag		•
Time (1/10th Sec)	10 O Hour O Minutes	
	Seconds (i) 1/10 sec	ond
	ОК	Cancel Help

eneral F	Page Operations					
Maximu	m number of operat	ions	20 Number	ofoperations	in this multi-function object:	3
Opr#	Destination	=	Source1	Operation	Source2	
1	SIEMENS TAG 1	=	CONTROL LOGIX TAG 1	MOVE		
2	SIEMENS TAG 2	=	CONTROL LOGIX TAG 2	MOVE		
3	INTERNAL TAG	=	CONTROL LOGIX TAG 1	ADD	CONTROL LOGIX TAG 2	
		_				
	MoveUp		MoveDown	Add/Edit Oper	Delete Operation	(s)

# EZTouch<sup>®</sup> Protocol Conversion EZTouch<sup>\*</sup>



### Example #3 – Multi-PLC Functions

This example adds the ControlLogix Tags to the Automation Direct tags. The result is always reported in the expression. Also shown is data display to show the result.

Edit Tag Details	Numeric Display
Select Tag Type  PLC 1 : Ethernet Drivers Ethernet/IP - Rev H  PLC 2 : Ethernet Drivers ADC Productivity Ethernet - Rev A  Internal Tag  Expression  Define Expression	General Scaling Visibility/Details  Label Text Language 1 Character Size 6x8 Label Text Multi PLC Addition Result Position O Top Text Text
Tag Name MULTI PLC EXPRESSION Tag Datatype SIGNED_INT_16	Bottom     Background        Background
Expression String CONTROL LOGIX TAG 1+AUTOMATION DIRECT TAG 1 # of Characters	Color Text III Blink Background III Blink Fractional Digits 5 - Fractional Digits 0 -
Initial Value/Herentive Flag Initial Value Retentive Apply Changes Close Help	Use tag for decimal point Decimal point Tag Name
Close Tielp	OK Cancel Help

Define Display Expression					X
Duble click to embed a tag in the expression AUTOMATION DIRECT TAG 1 AUTOMATION DIRECT TAG 2 CONTROL LOGK TAG 2 INTERNAL TAG 2 INTERNAL TAG 2 MULTI PLC CONDITIONS	Expression (Press Ctrl+Enter to move to new li CONTROL LOGIX TAG 1+AU	ne) JTOMATION DIRECT T	AG 1	Double click to embed an ope in the expression IF-THEN-ELSE-ENDIF #{Otal value delimiter} #{Otal value delimiter} ((Let Parenthesis) ] Flight Parenthesis] "{Binkse NOT] [Logical NOT] -{Negative/Subtrac] + {Positive/Add}	erator
				%[Modulus] *[Multiply] /[Divide] *[Shift Right] <[Less than or equal] >[Greater than or equal] >[Greater than or equal] =[Equal to condition] &[Notequal to condition] &[Bitwise AND] [Bitwise XOR]	H
Write Evaluated Expression \	/alue to :	<b>_</b>	Add New Tag		
ОК	Cancel		Help		đ

	Mul	ti PLC	Additi	on Resu	ılt	
			-32768			
_				ĺ	ĺ	



### Example #4 – Multi-PLC Conditions

This example uses both ControlLogix and AVG Tags to control a multi-state indicator button to display multiple different messages based on both tags.

Edit Tag Details	×
Select Tag Type PLC1 : Ethernet PLC2 : Ethernet Internal Tag Expression	t Drivers Ethernet/IP - Rev H t Drivers EZPLC TCP/IP - Rev e Define Expression
Tag Name Tag Datatype	MULTI PLC CONDITIONS SIGNED_INT_16
Expression String	IF(AVG TAG 1=1)THEN(IF(CONTROL LOGIX TAG 1=1)TH
# of Characters	0
│ Initial Value/Ret Initial Value Retentive	entive Flag
Apply Changes	Close Help

Z Define Write Expression		<b>X</b>
Double click to embed a tag in the expression	Expression (Press Ctrl+Enter to move to new line )	Double click to embed an operator in the expression
AVG TAG 1 AVG TAG 2 CONTROLLOGIX TAG 1 CONTROLLOGIX TAG 2 INTERNAL TAG MULTI PLC EXPRESSION	IF(AUG TAG 1=1)THEN (IF(CONTROL LOGIX TAG 1=1)THEN (1)ELSE (IF(CONTROL LOGIX TAG 2=2)THEN (3)ELSE (2)ENDIF)ENDIF)ELSE (0)ENDIF	IF-THEN-ELSE-ENDIF           \$ ['Hax value delimiter]           \$ [Octal value delimiter]           [ Octal value delimiter]           [ Octal value delimiter]           [ Ication of the delimiter]           * [ Multiphy]           [ Ibid the delimiter]           * [ Multiphy]           [ Ibid the delimiter]           * [ Shift Left]           * [ Shift Left]           * [ Greater than or equal]           * [ Greater than or equal]           * [ Bitwise AND]           * [ Bitwise AND]           * [ Bitwise CR]           * [ Bitwise CR]           * [ Logical AND]           * [ Logical OR]           * [ Accumulator]
Write Evaluated Expression	/alue to :	Add New
		Tag
ОК	Cancel	Help

Example results:

- AVG TAG=1 and CONTROL LOGIX TAG=1
  - MULTI PLC CONDITIONS=1 → Message: All tags are 1!
- AVG TAG=1 and CONTROL LOGIX TAG=2 •
  - MULTI PLC CONDITIONS=3 → Message: AVG is 1 and CL is 2!
- AVG TAG=1 and CONTROL LOGIX TAG!= 1 or 2 MULTI PLC CONDITIONS=2 → Message: AVG is 1!
- AVG TAG!=1
  - o MULTI PLC CONDITIONS=0 → Message: Default Message!

ages Visibility/Details					Genera	al Messages Vis	iibility/De	tails					0.55
ot 1 Character Size	6x8 •	9			Dis	iplay messages bas	ed on Mi	ISSAGE N	UMBER.			Maximum number of messages : Current Editing Langauge : Total Number of Messages :	255 1 4
Text Condition Results					Msg	g,# Pr	Char	Text C	BL. Bkg	CBL	. Lan	Msg Text	S
Color					0	NO	6x8		NO	N	) 1	Default Message!	NO
	fert V				1	NO	6x8		NO	N	1	All tags are 1	NO
Top	-				2	NO	6x8		NO	N	1	AVG is 1!	NO
/flom Backgro	una 💌				3	NO	6x8		NO	N	1	AVG is 1 and CL is 2!	NO
MULTIPLE CONDITIONS		- 1	Display Frame										
moeth to contentione			_ company reason										
espage based on	Rite are remove	n hate											
er	(a) Decimal sy	stem 🛞 Oc	al system										
	Selecting Image	Number will o	isplay the										
	images based	on the tag's va	ue.										
ed message action on panel	Justification								ш				,
n anni massana	Vertical						_						
lank message	C Top	Center	Bottom				A	dd/Edit Mes	isage		Delete	Message(s)	
ist displayed message.	Horizostal												
w value)	(Dit of	(B) Contra	Diabi			Set as Defi	oult Mess	age attribut	0.0		Chan	ge attributes to Default attributes	
ghest programmed message	ULet	. Center	Oragin										
											132		
		OK	Cancel	Help								ov	

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