Trio Motion Technology Ltd., Shannon Way, Tewkesbury, Gloucestershire, GL20 8ND United Kingdom Tel: +44 (0)1684-292333 Trio Motion Technology LLC., 187 Northpointe Blvd, Suite 105 Freeport, PA 16229, USA Tel: +1 724 472 4100 Trio Motion Technology (Shanghai) Co. Ltd., A1104 Yunding International Commercial Plaza, 800 Chengshan Rd, Pudong New Area, Shanghai, CHINA CHINA Tel: +86 21 587 976 59 Trio Motion Technology, Teerth Business Center, 3rd Floor, Unit No. 7, Block EL - 15, MIDC, Bhosari, Pimpri-Chinchwad, Pune, 411026, INDIA Tel: +91 827 506 5446





1. Introduction

This application notes describes the supported functions in Profinet that is part of TrioBasic command.

Profinet support is part of firmware 2.0319 release.

This application note is written using the following controllers: TRIO F6Nano and SIEMENS CPU 1211C AC/DC/Rly.

2. Requirements

The functionalities described in this Application Notes are part of 2.0319 firmware release and therefore a minimum of firmware version 2.0319 is required.

3. TrioBasic Commands

3.1. PROFINET - Function 0

This function is to define or display module mapping of TRIO controller. To display configured module mapping, use the first 2 parameters only as in Example 1. To reset the entire module map, use the first 3 parameters as in Example 2.

3.1.1. Syntax

PROFINET(0, slot [, pn_api, pn_slot, pn_subslot, datasource [, index, type, count, direction [,endian]]])

3.1.2. Parameters

Name	Description
slot	Module slot number (default: -1)
pn_api	Application Process Identifier (default: 0)
pn_slot	User slots (163). Note: slot 0 is the interface
pn_subslot	Sub slot (17)



datasource	-1: delete mapping				
	0: VR				
	1: TABLE				
index	Start position (i.e., the base address) in data source				
type	Size and type of the data sent across the bus				
	1: signed 8-bit-integer				
	2: signed 16-bit-integer				
	3: signed 32-bit-integer				
count	Number of datatypes mapped				
direction	Direction of data movements from master point of view (in this example, SIEMENS PLC)				
	0: input (sent by TRIO controller)				
	1: output				
endian	0: default				
	1: swap				

3.1.3. Return Value

-1: OK

0: error

3.1.4. Examples

3.1.4.1. Example 1 - display configured module mapping

>>?profinet(0,-1)
0 1 (1) : 1 0 10 2 1 0 1
0 2 (1) : 1 0 11 2 1 1 1
-1

3.1.4.2. Example 2 - reset entire module mapping

```
>>profinet(0,-1,-1)
>>?profinet(0,-1)
-1
```

3.1.4.3. Example 3 - configure full module mapping

```
>>'Module mapping configuration - Sending to SIEMENS PLC
>>'function = 0
>>'slot = -1
>>'pn_api = 0
>>'pn_slot = 1
>>'datasource = 0
>>'index_send = 10
>>'datatype = 2
>>'count = 1
>>'direction = 0
>>'endian = 1
>>profinet(0,-1,0,1,1,0,10,2,1,0,1)
```



```
>>?profinet(0,-1)
0 1 (1) : 0 0 10 2 1 0 1
-1
>>'Module mapping configuration - Receiving from SIEMENS PLC
>>'pn_slot = 2
>>'direction = 1
>>'index = 11
>>profinet(0,-1,0,2,1,0,11,2,1,1,1)
>>?profinet(0,-1)
0 1 (1) : 0 0 10 2 1 0 1
0 2 (1) : 0 0 11 2 1 1 1
-1
```



3.2. PROFINET - Function 1

This function starts the Profinet protocol.

3.2.1. Syntax

PROFINET(1, slot)

3.2.2. Parameters

Name	Description			
slot	Module slot number (default: -1)			
	Note:			
	• For TRIO Controller to be visible under Profinet network, run function 1 in an autorun program that gets executed on every power cycle. See 4.2.1 sample program.			

3.2.3. Return Value

No return value

3.2.4. Examples

3.2.4.1. Example 1

>>profinet(1,-1)



3.3. PROFINET - Function 2

This function stops the running Profinet protocol.

3.3.1. Syntax

PROFINET(2, slot)

3.3.2. Parameters

Name	Description
slot	Module slot number (default: -1)

3.3.3. Return Value

No return value

3.3.4. Examples

3.3.4.1. Example 1

>>profinet(2,-1)



3.4. PROFINET - Function 5

This function defines which messages generated by the Profinet stack are written out to the command line.

3.4.1. Syntax

PROFINET(5, slot, level)

3.4.2. Parameters

Name	Description
slot	Module slot number (default: -1)
level	Type of messages to be printed out on command line
	0x00: none
	0x01: errors
	0x02: warning
	0x04: info
	0x08: debug

3.4.3. Return Value

No return value

3.4.4. Examples

3.4.4.1. Example 1 - print out all information on command line >>profinet(5,-1, \$f)

3.4.4.2. Example 2 - print out errors only on command line >>profinet(5,-1, 1)



3.5. PROFINET - Function 8

This function sets TRIO Controller's Profinet name.

3.5.1. Syntax

PROFINET(8, device_name)

3.5.2. Parameters

Name	Description			
device_name	Configured Profinet device name			
	Note:			
	 underscore and space are not allowed 			
	• execute this function in an autorun program that gets executed on every power cycle. See 4.2.1 sample program.			

3.5.3. Return Value

No return value

3.5.4. Examples

3.5.4.1. Example 1 - set ProfiNET device name

>>profinet(8,"trio-192-168-0-240")

3.6. AUTO_PROFINET

Controls the action of the system software on power up. If present, the ProfiNET network is initialised automatically on power up or soft reset (EX). If this is not required, then setting AUTO_ETHERCAT to OFF will prevent the ProfiNET from being set up and it is then up to the programmer to start the ProfiNET network from a BASIC program.

ProfiNET name of the controller will be assigned the default name, i.e.: *trio-<controller name>-<5 digit serial number>*. For example, *trio-f6nano-00260*.

This command should not be used in a TrioBASIC program. You must use it in the special MC_CONFIG script which runs automatically on power up. This parameter is NOT stored in FLASH.

3.6.1. Syntax

AUTO_PROFINET=value

3.6.2. Values

Value	Description
0	ProfiNET network does not initialise on power up
1	ProfiNET network starts on power up

3.6.3. Examples

3.6.3.1. Example 1 - set ProfiNET network to start on power up

```
'MC_CONFIG script file
AUTO PROFINET = ON
```



3.6.3.2. Example 2 - prevent ProfiNET network to start on power up

'MC_CONFIG script file
AUTO_PROFINET = OFF



4. Sample Application

4.1. IP Addresses

Set the TRIO controller and SIEMENS PLC on the same subnet addresses. In this example, Trio controller is set to 192.168.0.240 with subnet mask 255.255.255.0 and SIEMENS PLC to 192.168.0.238 with subnet mask 255.255.255.0.



4.2. Motion Perfect Sample Program

4.2.1. START.BAS (autorun)

```
' Rename to specified in 2nd argument
' Default name: trio-<controller name>-<5 digit serial number>.
' For example, trio-f6nano-00260.
' Underscore and space are not accepted.
'PROFINET(8,"tom-cruise-maverick")
PROFINET(8,"trio-192-168-0-240")
' Start Profinet so it's detectable by SIEMENS PLC
PROFINET(1,-1)
WA(5000)
```

PRINT "Profinet started after power up in START_PN"

4.2.2. MAIN.BAS

ON BASICERROR GOTO errorhandling

```
func = 0' = 0 define or display mapping; 1 = start; 2 = stop
slot_= -1 ' Only -1
pn_api = 0 ' Only 0
pn slot = 1
pn subslot = 1
datasource = 0 ' -1 = delete; 0 = VR; 1 = TABLE
index send = 10 ' VR/TABLE index to send to master
index receive = 11 ' VR/TABLE index to receive from master
datatype = 2 ' 2 = signed 16bit integer
count = 1 ' total data
direction = 0 ' 0 = input (to master); 1 = output (to master)
endian = 1 ' 0 = default; 1 = swap
index_missedheartbeat = 0
index interval = 1
index totaltransfer = 2
index missedpercentage = 3
index transmissionstarted = 4
' Send to SIEMENS (master)
PROFINET(func,slot_,pn_api,pn_slot,pn_subslot,datasource,index_send,datatype,count,
direction, endian)
WA(1000)
' Receive from SIEMENS (master)
pn slot = 2
direction = 1 ' 0 = input (to master); 1 = output (to master)
PROFINET(func,slot_,pn_api,pn_slot,pn_subslot,datasource,index_receive,datatype,cou
nt,direction,endian)
WA(1000)
' Reset values
VR(index send) = 0
VR(index receive) = 0
VR(index totaltransfer) = 0
```

```
VR(index_missedheartbeat) = 0
```



```
VR(index missedpercentage) = 0
VR(index transmissionstarted) = 0
' Stop PROFINET
func = 2
PROFINET(func,slot )
WA(5000) ' 5 sec delay
' Start PROFINET
func = 1
PROFINET(func,slot_)
WA(5000) ' 5 sec delay
' Program
WHILE TRUE
    VR(index_transmissionstarted)=1 ' Indicator that program starts transmitting
    IF(VR(index_totaltransfer) <> 0) THEN
        VR(index missedpercentage) = VR(index missedheartbeat)/
VR(index totaltransfer)*100
    ENDIF
    VR(index send) = VR(index send) + 1
   VR(index totaltransfer) = VR(index totaltransfer) + 1
   WA(VR(index_interval))
    ' Detect missed heartbeat
    IF (VR(index send) <> VR(index receive)) THEN VR(index missedheartbeat) =
VR(index missedheartbeat) + 1
    ' Reset heartbeat
    IF VR(index_send) > 100 THEN VR(index_send) = 0
WEND
errorhandling:
IF RUN ERROR=31 THEN
   VR(index transmissionstarted)=0
    ' Stop PROFINET
    func = 2
    PROFINET(func,slot_)
    PRINT "total transfers: ";STR(VR(index totaltransfer),0)
    PRINT "total missed: ";STR(VR(index_missedheartbeat),0);" (";_
        STR((VR(index missedheartbeat)/VR(index totaltransfer)*100),2);"%";")"
ELSE
    PRINT "RUN_ERROR = ";STR(RUN_ERROR,0)
ENDIF
```



4.3. TIA Portal Sample Program

Any P824 application which uses either one servo axis (+/-10V output and encoder input) or 2 servo axes cannot use the MC404-Z as an alternative.

4.3.1. TRIO GSDML Installation

To allow TRIO controllers to appear in TIA Portal hardware catalogue, install the GSDML for Trio controllers as shown below.



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			r		
	Save log Install addi	tional files	L	Close	

4.3.2. Adding TRIO Controller into Project

Follow the steps below to add TRIO controller into your TIA Portal project.



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4.3.3. Creating Network Interface between TRIO Controller and SIEMENS PLC

4.3.4. TRIO Module Setup

Once Trio GSDML is installed, you should be able to drag and drop the available IO modules into the configuration.

In this example, we will only use 1 word input and 1 word output.



trio_profinet_test4 > trio-mc-prt-1-port [RT]	. # = ×	Hardware catalog 👘 🕮 🕨
🖉 Topology view 🛛 🚵 Network view 🛛 🕅 Device	e view	Options
🚁 trio-mc-prt-1-port [RT] 🔍 🖽 📰 🖉 🛎 🔛 Device overview		Filter remained
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× 0 20	~	Input 2 word
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		Uutput 4 word
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No 'properties' available.	H	Information
No 'properties' can be shown at the moment. There is either no object selected or the selected object does not have any displayable properties.		Device:
		DP-NORM
		=
		Input I word
		And the second sec
		Arucie no.:
		Version:
		Description:
		Input 1 word
		×

4.3.5. TRIO Module Ethernet Properties

Trio controller has a default Profinet name in the following format: *trio-<controller name>-<5 digit serial number>*. For example, trio-f6nano-00260. <u>Note</u>: profinet name needs to be identical with function 8 defined in an autorun program in Motion Perfect project. See 4.2.1 sample program.

trio-mc-prt-1-port [RT]				Ripperties	🗓 Info 🚺 📱 Diagnostics	
General IO tags Sys	stem constants	Texts				
 General Catalog information 	Ethernet addres	ses				
 PROFINET interface [X1] 	Interface net	worked with				
General						
Ethernet addresses		Subn	et: PN/IE_1			-
 Advanced options 			Add new subnet			
 Real time settings 	10 1					
IO cycle	IP protocol					
Port 1 [X1 P1]			Set IP address in the project			
Hardware identifier			IP address: 192 168 0 240			
Identification & Maintenance			Subact markly 255, 255, 255, 0			
Hardware identifier			Sublet mask: 255.255.255.0			
	-		use router			
	•		Router address: 0 . 0 . 0 . 0			
			IP address is set directly at the device			
	PROFINET		Unticked			
			G nerate PROFINET device name automatically			
	PROFIN	IET device nam	e: trio-192-168-0-240			
		Converted nam	e: trio-192-168-0-240			
		Device numb	er: 1			-

Assign Update Time and Accepted Update Cycles without IO data to be 16 and 3 respectively.



	MOTION TECHNOL
🔐 trio-mc-prt-1-port [RT] 💌 🔛 🍊 🖽 🛄 🔍 ±	
BO MARY MAY	
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trio-mc-prt-1-port [RT]	😢 Diagnostics 🛛 🗖 🗖 🤜 🤜
General IO tags System constants Texts	
General Second and a second and as second and a	<u>^</u>
PROFINET interface [X1] Update time Update time	
Calculate update time automatically	
Set update time manually	
Update time: 16.000	ms 💌 📃
Adapt update time when send clock changes	
Watchdog time	
Accepted update cycles without IO data: 3	•



4.3.6. Main [OB1]





4.3.7. Trio_db [DB1]

1

	trio_db									
		Name	Data type	Start value	Retain	Accessible f	Writa	Visible in	Setpoint	Comment
1		🔻 Static								
2		byte1_read	Byte 🔳	16#0						
З		byte1_write	Byte	16#0						
4		byte2_read	Byte	16#0						
5		byte2_write	Byte	16#0						
6		a int1_read	LReal	0.0						
7		a int1_write	LReal	0.0						
8		retVal_read	Int	0						
9		retVal_write	Int	0			~			