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Configuring PTP in Hirschmann Switches for use with Kinetix 5700 Drives

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PTP (Precision Time Protocol) is a procedure described in the IEEE 1588-2008 standard that enables the clocks in the network to be synchronized to a degree of precision of just a few 100 ns. Kinetix5700 drives must be time synchronized with the PLC to ensure commanded position and velocity matches actual position and velocity at a given time. PTP (also called CIP sync) communication is used to do achieve this time synchronization.

This guide is for Hirschmann switches using the HiOS platform such as the OS20/30, RPS, RPSE, etc.

Switches using the Classic OS platform are mostly limited to PTP simple mode which allows the switch to set its internal time using PTP traffic from a master close (such as a PLC), however the switch is unable to forward PTP traffic making it impossible to establish a synchronization between the PLC and Kinetix5700. This applies to RS20/30 switches

PTP Configuration in Hirschmann Switch

This guide will provide the steps to configure 2 ports to be PTP enabled. As a prerequisite this guide will assume the switch has been configured with an IP address and the user has HiView.

Also note that PTP requires all devices to be communicating in full duplex. This can achieved by ensuring that all devices and switch ports are set to auto negotiate or by individually setting all devices and switch ports to full duplex manually. If there is a duplex mismatch, for example the switch port is set to auto negotiate and the Kinetix drive is set to 100/Full, the switch will default to half duplex which will prevent PTP synchronization.

Step 1: Connect to the switch on Port 3 and open the web interface using HiView.

Step 2: Browse the main menu to Time -> PTP -> Global. Set Operation IEEE 1588/PTP to On and set PTP mode to v2-boundary-clock. When complete press the write button at the bottom of the page.

ا چ	2 2 300 1	PTP Global
Filter	Time Out [Operation IEEE1588/PTP
	Port	⊙ On ⊖ Off
	Restart	Configuration IEEE1589.
\bigtriangledown	Time	PTP mode v2-boundary-clock V
	Basic Settings	Sync lower bound [ns] 30
Ļ	- SNTP	Sync upper bound [ns] 5000
	РТР	PTP management
	Global	Status
	Boundary Clock	Is synchronized
	Transparent Clock	Max. offset absolute [ns] 0
\bigcirc	Device Security	PTP time Mar 23, 2020, 8:51:50 PM
€ [®] ,	Network Security	
\$≪	Switching	
$(\mathbf{x} \mathbf{x} \mathbf{y} \mathbf{x} \mathbf{x} \mathbf{y} \mathbf{x} \mathbf{y} \mathbf{x} \mathbf{x} \mathbf{y} \mathbf{x} \mathbf{x} \mathbf{x} \mathbf{x} \mathbf{x} \mathbf{x} \mathbf{x} x$	Routing	
₩.	Diagnostics	
$ \mathbf{\bullet} $	Advanced	🔁 🕹 🕹 🕹 🕹
?	Help -	

Step 3: Configure PTP port settings. Select the checkbox for PTP enable for each port that requires PTP – this includes the PLC and all Kinetix5700 drives. In the event that the PLC and Kinetix5700 drives are connected to different switches, the ports connecting the switches to each other must also be enabled. The network protocol for all enabled ports needs to be set to UDP/IPv4.

١	299 D	PTP Boundary Clock Port										
Filter.			Port	PTP enable	PTP status	Sync interval	Delay mechanism	P2P delay	P2P delay interval [s]	Network protocol	Announce interval [s]	Aı tir
	Port *		1/1	8	initializing	1	e2e	0	1	IEEE 802.3	2	3
	Restart		1/2	V	initializing	1	e2e	0	1	IEEE 802.3	2	3
P	- Time		1/3	ſ.	initializing	1	e2e	0	1	IEEE 802.3	2	3
			1/4		initializing	1	e2e	0	1	UDP/IPv4	2	3
	Basic Settings		1/5	V	initializing	1	e2e	0	1	IEEE 802.3	2	3
	- SNTP		1/6		initializing	1	e2e	0	1 🤇	UDP/IPv4	2	3
	L _{РТР}		1/7	1	initializing	1	e2e	0	1	IEEE 802.3	2	3
	Global		1/8	V	initializing	1	e2e	0	1	IEEE 802.3	2	3
			1/9	8	initializing	1	e2e	0	1	IEEE 802.3	2	3
	Boundary Clock		1/10	V	initializing	1	e2e	0	1	IEEE 802.3	2	3
	Giobai		1/11	1	initializing	1	e2e	0	1	IEEE 802.3	2	3
	Port											
	L Transparent Clock											
Ū	Device Security											
₽ <mark>,</mark>	Network Security											
Switching		4										
	Routing							٢				
¥) Help											

PLC Configuration

Step 1: Go to Controller Properties -> Date/Time. Select the "Enable Time Synchronization" check box to enable PTP. Then go advanced options and change the Priority 1 and Priority 2 values to 127. Changing the priority value will ensure that the PLC is the time master

Project General	Redundancy Major Faults	Nonvolatile Mem Minor Faults	ory Men Date/Time*	iory Se Advance	CIP Sync Time Synchronization: Disable	d		
The Date a Use these	and Time displayed here fields to configure Time Set Date. Time and	is Controller local time attributes of the Contro Zone from Workstatic	e, not workstation I oller.	ocal time.	Grandmaster Clock		Local Clock Synchronization Status:	
ate and Time	:		Change Da	te and Time •		Î	Offset from Master: Backplane State:	ns (Port 1)
ime Zone:	Adjust for Dayligh	t Saving (+00:00) ፍ	~ ~		Identity:		Identity:	
DankEER. If time synchronization DankEER. If time synchronization is disabled online, active axes in any controllore in his chasts. or any other synchronized device, may experience unexpected motion. Statly controllers may fault in on ther time master synchronized devices. D Is the synchronized time save DankEER. If time synchronized time save in any controller in his chasts. or any other synchronized device, may experience unexpected motion. Statly controllers may fault in on ther time master exists in the local chasts.			Class: Accuracy:		Class: Accuracy:			
			Variance: Source:		Variance: Source:			
			Priority 1:		Priority 1: 127	(Master Override)		
) Duplicate C) CST Master) NoCST ma	31 master detected rship disabled ister	isabled		Advanced			-jong 2.	(The bleaker)

Time Synchronization Verification

In the PLC controller properties verify that the PLC is the system time master

🖞 Controller Properties - WAHLAx	
Safety Nonvolatile Memory Memory Security Alarm L General Major Faults Minor Faults Date/Time Advanced SFC Execution Image: SFC Execution (i) The Date and Time displayed here is Controller local time, not workstation local time. Use these fields to configure Time attributes of the Controller. Set Date, Time and Zone from Workstation Change Date and Time	og CIF Project UT Gra
 ✓ Adjust for Daylight Saving (+01:00) ◆ Time Synchronize ✓ Enable Time Synchronization Is the system time master Is a synchronized unite slave Duplicate CST master detected CST Mastership disabled No CST master Adjust for Daylight Saving (+01:00) ◆ 	
OK Cancel Apply	Help

Connect to the switch and browse to Time->PTP->Global. Verify that the status "Is Synchronized" is active.

		- E 2
6 ESW1 - 10.138.1.2 - Global × +		
← → C ☆ ▲ Not secure 10.1	38.1.2/#ptpglobal	🖈 🛛 🖬 🐟 🛛 🎯 Paused) 🔅
Apps ADP WorkForceNow S National	Westher 🥐 FastMall 📓 Yahoo Nall 🍹 PhonePower.com 😵 German Emigrants to 💽 ACT/SAT Text Pep 💽 SAP Concur - Expens. 📓 OLDEIS radio stream 🗞 Overview Deshboard. 📧 Endustrial Networking.	Other bookmarks
Navigation 4		
2 2 (3) P 286 (1)		(h) HIRSCHMANN
	1 PTP Global	0
Filter 👻 🔽	Operation IEEE1588/PTP	
Basic Settings	© On ⊖ Off	
System	Configuration IEEE1588/PTP	
Network	PTP mode v2-boundary-clock v	
Software	Sync lower bound [ns] 30	
	Concerns based ford	
Load/Save	Cyric upper bound (ref) 5000	
External Memory	PTP management	
Port	Status	
Power over Ethernet	Is synchronized	
Restart	Max: offset absolute [ns] 0	
🥱 Time	PTP lime Mar 23, 2020, 8:24:27 PM	
Basic Settings		
Lam		
Global		
Boundary Clock		
Global		
Port		
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Next browse to Time->PTP->Boundary Clock->Global. Here you should be able to see the Priority 1 and 2 values under Grandmaster match the 127 set in the PLC Date/Time settings. The Grandmaster Identity should be the MAC address of the PLC EN2T card with "ff fe"

added between bytes 3 and 4. Also, you should be able to see the Offset to master and Delay to master values – these will update each time the page is refreshed.

	PTP Boundary Clock	Global									
Filter 👻 🗙	Phoney 2	128									
Basic Settings	Status IEEE1588/PTP	Status IEEE1588/PTPv2 BC									
🕝 Time	Two step	1. State of the st	Offset to ma:	ster [ns] 57							
Basic Settings	Steps removed	1	Delay to mas	ster [ns] 10							
	Grandmaster	<u> </u>									
L _{PTP}	Priority 1	127	Clock varian	ce 25120							
Global	Clock class	248	Priority 2	127							
Boundary Clock	Clock accuracy	within 10s		\sim							
Global	Local time properties										
Port	Time source	ptp 👻	UTC offset valid)	Frequency traceable						
Transparent Clock	UTC offset [s]	37	Time traceable		PTP timescale	ſ.					
Device Security	Identities										
Network Security	Clock identity	ec 74 ba ff fe 1b 00 74									
Switching	Parent port identity	ec e5 55 ff fe e0 05 ec 00 05									
(→↓) Routing	Grandmaster identit	ec e5 55 ff fe e0 05 ec									

Finally browse to Time->PTP->Boundary Clock->Port. This screenshot shows an install where the PLC is connected to port 6 and the drive(s) are connected to port 4. The PTP status for the PLC port will be shown as "slave" as the switch is a PTP slave to the PLC. The drive(s) will be shown as "master" as the switch relays the PTP traffic from the PLC, becoming the master to the drive(s).

Navigation 4											
296 1											
Filter		PTP Boundary Clock Port									
		Port	PTP enable	PTP status	Sync interval	Delay mechanism	P2P delay	P2P delay interval [s]	Network protocol	An int	
Basic Settings		1/1		initializing	1	e2e	0	1	IEEE 802.3	2	
🕝 Time		1/2		initializing	1	e2e	0	1	IEEE 802.3	2	
Basic Settings		1/3		initializing	1	e2e	0	1	IEEE 802.3	2	
		1/4	I	master	1	e2e	0	1	UDP/IPv4	2	
		1/5		initializing	1	e2e	0	1	IEEE 802.3	2	
Бартр		1/6	I	slave	1	e2e	0	1	UDP/IPv4	2	
Global		1/7		initializing	1	e2e	0	1	IEEE 802.3	2	
Boundary Clock		1/8		initializing	1	e2e	0	1	IEEE 802.3	2	
		1/9		initializing	1	e2e	0	1	IEEE 802.3	2	
Global		1/10		initializing	1	e2e	0	1	IEEE 802.3	2	
Port		1/11		initializing	1	e2e	0	1	IEEE 802.3	2	
Transparent Clock											
Device Security											