

Base de Conhecimento > Basics > Configuring PTP in Hirschmann Switches for use with Kinetix 5700 Drives

Configuring PTP in Hirschmann Switches for use with Kinetix 5700 Drives

John M - 2020-05-27 - Basics

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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 5 300 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
\sim		PTP time Mar 23, 2020, 8:51:50 PM
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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.

299 🕄 🏹 🍞	PTP Bo	undary Clock Port								
iter 💌	X 🗆 Port	PTP enable	PTP status	Sync interval	Delay mechanism	P2P delay	P2P delay interval [s]	Network protocol	Announce interval [s]	
Port	▲ □ 1/1	Ś	initializing	1	e2e	0	1	IEEE 802.3	2	
Restart	1/2	Ś	initializing	1	e2e	0	1	IEEE 802.3	2	
- Time	1/3	ĭ.	initializing	1	e2e	0	1	IEEE 802.3	2	
	1/4		initializing	1	e2e	0	1	UDP/IPv4	2	
Basic Settings	1/5	S	initializing	1	e2e	0	1	IEEE 802.3	2	
SNTP	1/6		initializing	1	e2e	0	1 🤇	UDP/IPv4	2	
L _{PTP}	1/7	8	initializing	1	e2e	0	1	IEEE 802.3	2	
Global	1/8	Ś	initializing	1	e2e	0	1	IEEE 802.3	2	
	1/9	Ś	initializing	1	e2e	0	1	IEEE 802.3	2	
Boundary Clock	1/10	1 and	initializing	1	e2e	0	1	IEEE 802.3	2	
Global	1/11	9	initializing	1	e2e	0	1	IEEE 802.3	2	
Port										
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A A Network Security										
Switching	4									
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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 I) The Date a Use these f		Nonvolatile Mem Minor Faults is Controller local time attributes of the Contr Zone from Workstatic	Date/Time*	Advance	CIP Sync Time Synchronization: Disabled UTC System Time: Grandmaster Clock Description:	*	Local Clock Synchronization Statur: Offset from Master:	ns
Date and Time: Time Zone:			Change Date and	Time •		-	Backplane State:	(Port 1)
) is the system) is a synchro	e Synchronization n time master nized time slave ST master detected ship disabled	DANG disable control synchr unexpi	ER. If time synchronization do online, active axes in a lerin this chassis, or any c onized device, may exper cated motion. Safety cont no other time moster exist hassis.	ny other ience trollers ma s in the	l Identity: Class: Accuracy: Valence: Priority 1: Priority 2:		Identity: Class: Accuracy: Variance: Source: Priority 1: Pfiority 2: 0K Cancel	(Master Override) (Tie Breaker) Apply Help

Time Synchronization Verification

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

Safety	perties - WAHLAx Nonvolatile Me Major Faults Mino	mory r Faults	Memory Date/Time	Sec Advanced	urity SFC Execu	Alarm Log tion Projec	ct
	d Time displayed here is Ids to configure Time attr Set Date, Time and Zo	ibutes of the	Controller.	station local time.			
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Connect to the switch and browse to Time->PTP->Global. Verify that the status "Is Synchronized" is active.

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Navigation 4					(Jan		
S & A P 286 (1					(h	HIRSCH	IMANN
Filter 🗙	PTP Global						
	Operation IEEE1588/F O On O Off	PTP					
Basic Settings							
System	Configuration IEEE15						
Network	PTP mode	v2-boundary-clock *					
Software	Sync lower bound [ns]	30					
Load/Save	Sync upper bound [ns]	5000					
External Memory	PTP management	0					
Port	Status						
Power over Ethernet	Is synchronized	\supset					
Restart	Max. offset absolute [ns]	0					
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Basic Settings	-						
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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.

Filter	PTP Boundary Clock	c Global 128								
Basic Settings	Status IEEE1588/PTF	Status IEEE1588/PTPv2 BC								
🔗 Time	Two step		Offset to master [ns] 57							
Basic Settings	Steps removed	1	Delay to master [ns] 10							
	Grandmaster									
L _{PTP}	Priority 1	127	Clock variance 25120)						
Global	Clock class	248	Priority 2 127							
Boundary Clock	Clock accuracy	within 10s								
Global	Local time properties	s								
Port	Time source	ptp 👻	UTC offset valid	Frequency traceable						
Transparent Clock	UTC offset [s]	37	Time traceable	PTP timescale						
Device Security	Identities									
Retwork 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								
		666333116699366								

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).

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ər 💌		Port	PTP enable	PTP status	Sync interval	Delay mechanism	P2P delay	P2P delay interval [s]	Network protocol	
Basic Settings		1/1	0	initializing	1	e2e	0	1	IEEE 802.3	
Time		1/2		initializing	1	e2e	0	1	IEEE 802.3	
Basic Settings		1/3		initializing	1	e2e	0	1	IEEE 802.3	
		1/4	☑ 🤇	master	1	e2e	0	1	UDP/IPv4	
		1/5		initializing	1	e2e	0	1	IEEE 802.3	
L _{PTP}		1/6		slave	1	e2e	0	1	UDP/IPv4	
Global		1/7		initializing	1	e2e	0	1	IEEE 802.3	
Boundary Clock		1/8		initializing	1	e2e	0	1	IEEE 802.3	
		1/9		initializing	1	e2e	0	1	IEEE 802.3	
Global		1/10		initializing	1	e2e	0	1	IEEE 802.3	
Port		1/11		initializing	1	e2e	0	1	IEEE 802.3	