

CC-Link IE TSN system construction method using Mitsubishi Electric PLC(RJ71GN11-T2) and Moxa TSN switch(TSN-G5000 Series)



CC-Link Partner Association Mitsubishi Electric Corporation Moxa Inc.

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1. Introduction

In order to interconnect CC-Link IE TSN compliant devices, appropriate configurations must be made for the CC-Link IE TSN system that you want to build on each device. If the configurations of each device are not consistent throughout the TSN system, proper operation cannot be expected.

This document describes the configurations required to interconnect the TSN-G5000 Series which is a TSN compliant switch manufactured by Moxa Inc. (hereafter referred to as "Moxa"), and RJ71GN11-T2 which is a master/local station product manufactured by Mitsubishi Electric Corporation (hereafter referred to as "Mitsubishi"), with Certification class B of CC-Link IE TSN.

This document assumes the following firmware versions:

Table 1-	1 Device	and the	firmware	version	required
	Device	and the	mmware	1013001	requireu

No	Device/Tool	Туре	Manufacturer	Firmware version (*1)
1	TSN-G5000 Series (including TSN-G5008- 2GTXSFP and TSN- G5004) (*2)	Switching HUB	Moxa Inc.	Ver.2.2
2	RJ71GN11-T2	PLC Master/Local Station	Mitsubishi Electric Corporation	Ver.15
3	GX Works 3	Engineering tool	Mitsubishi Electric Corporation	1.085P

(*1) Please check with each manufacturer for the applicable firmware.

(*2) In this document, the TSN-G5008-2GTXSFP is used as an example. Please note that the TSN features and corresponding settings for TSN-G5008-2GTXSFP and TSN-G5004 are identical

2. CC-Link IE TSN

2.1. Overview

CC-Link IE TSN utilizes the time of synchronization in the network to transmit both output and input communication frames simultaneously at a fixed time. By combining this method with the TSN technology used in Ethernet, it can optimize throughout the network.

TSN technology consists of multiple international standards, and the major ones are IEEE802.1AS, which specifies the time synchronization methods, and IEEE802.1Qbv, which specifies a time division method. By combining these standards, it is possible to achieve determinism, which guarantees transmission within a certain period of time, and to mix different communication protocols on the same trunk line. For example, devices can be controlled by real-time cyclic communication by giving higher priority for cyclic communication on the devices and assigning a band priority over information communication. Devices used for monitoring and analyzing such as vision sensors and surveillance cameras that communicate with production sites using UDP and TCP can be connected to a single network with high precision.

2.2. Time synchronization system

In the CC-Link IE TSN network, all stations perform time synchronization using either IEEE1588 or IEEE802.1AS. The time synchronization method of each node and switch must be unified in the network. Please be consistent with either IEEE1588 or IEEE802.1AS.

If you are using IEEE802.1AS, all of the devices in the TSN system (Master, local, remote, switch, etc.) must support IEEE802.1AS and must be configured accordingly.

On the other hand, if you are using IEEE1588, not all devices in the TSN system need to support IEEE1588. It is only necessary to configure IEEE1588 relevant devices.

2.3. Time division system

In the CC-Link IE TSN network, communication is performed by dividing the communication cycle into time slots as a time division method. Up to eight time slots are available, and each time slot can be used for any purpose. The total time allocated to all time slots is the cyclic communication.

When the RJ71GN11-T2 is used as the master station, the communication cycle is divided into 3 time slots, and each time slot is used for the following purposes.

- TSLT0: A band that allows each node to communicate freely. Used for transient communication and IP communication.
- TSLT1: Used for cyclic communication
- TSLT2: Used for communication for time synchronization of IEEE802.1AS and IEEE1588

		Configurations			D 171 CN111 T2 Master Station	
No	Time slot	Cycle Start Offset	Cycle End Offset	Time slot length	Cyclic Communication	example of usage
1	TSLT1	t1	t2	A (= t2 - t1)	т	Cyclic communication
2	TSLT2	t2	t3	B (= t3 - t2)		Time synchronization (IEEE802.1AS, IEEE1588)
3	TSLT3	t3	t4	C (= t4 - t3)		Not used
4	TSLT4	t4	t5	D (= t5 - t4)		Not used
5	TSLT5	t5	t6	E (= t6 - t5)		Not used
6	TSLT6	t6	t7	F (= t7 - t6)		Not used
7	TSLT7	t7	t0	G (= t0 - t7)		Not used
8	TSLT0	tO	t_end	H (= t_end - t0)		Transient communication IP communications (SLMP), etc.

Table 2.3-1 Cyclic communication and time slot configuration items

(*) T = A + B + C + D + E + F + G + H (The cyclic communication is the sum of all time slots.)



Figure 2.3-1 Cyclic communication and time slot configuration items

In the TSN-G5000 series, EtherType can be used to classify and prioritize communication frames. Refer to Table 2.3-2 for details.

No.	Classification	EtherType	Priority/ Queue
1	CC-Link IE TSN frames e.g. cyclic communication frame	0x890F	7
2	Time sychronization frame	0x88F7	6
3	IP frame	0x0800	0

Table 2.3-2 Classification and the appointed priority/queue of communication frames to be used

3. CC-Link IE TSN system configurations

3.1. TSN-G5008-2GTXSFP /RJ71GN11-T2 common configurations

This section describes common configurations for the Moxa TSN-G5008-2GTXSFP and Mitsubishi RJ71GN11-T2. The configurations must be consistent within the same CC-Link IE TSN system. This section describes the time synchronization method only for IEEE802.1AS.

■Time synchronization system

Table 3.1-1 Configuration items for the time synchronization method

Device	Configuration Path	Configuration	Set value
TSN-G5008-2GTXSFP	System > Time > Time Synchronization > General	Time Synchronization	Enabled (default)
		Profile	IEEE 802.1AS-2011
RJ71GN11-T2	"RJ71GN11-T2 Module Parameters" \rightarrow	Authentication Class	Authentication Class B
	"Preferences" \rightarrow "Connection Device Information"	Setting (*)	only(*)

*Authentication class in RJ71GN11-T2 (GX Works3 engineering tool) is same as certification class.

With the above configurations, IEEE802.1AS is selected as the time synchronization method. The TSN-G5008-2GTXSFP and RJ71GN11-T2 must select the same standard.

Communication Cycle

Table 3.1-2 Configuration items for cyclic communication

Device	Configuration Path	Configuration	Set value
TSN-G5008-	Layer 2 Switching > Time-aware Shaper >	Gate Control List	Please change to "User
2GTXSFP	Settings > Edit (Per port)		arbitrary communication
			cyclic (*1) (*2)"
RJ71GN11-T2	"RJ71GN11-T2 Module Parameters" \rightarrow	Cyclic communication	User arbitrary communication
	"Preferences" \rightarrow "Connectivity device information"	interval configuration	cyclic (*1)

(*1) The TSN -G5008-2GTXSFP and RJ71GN11-T2 must have the same communication cycle settings.

(*2) Communication cycle (Cycle Time) in TSN-G5008-2GTXSFP is accumulated automatically from the results of time slot settings.



■Time slot

Table 3.1-3 Configuration for time slots

Device	Configuration Path	Configuration	Set value
TSN-G5008-	Layer 2 Switching > Time-aware Shaper >	Gate Control List/ Interval	Time for each time slot within one
2GTXSFP	Settings > Edit		communication cycle
		Gate Control List/ Queue	Queue assignment for each time
			slot (*)
		Copy configurations to	Specify the port numbers to copy
		ports	the configuration
RJ71GN11-T2	"RJ71GN11-T2 Module Parameters"	System Reservation Time	Timeslot time for time
	\rightarrow "Preferences" \rightarrow "Connectivity device		synchronization
	information"	Cyclic Transmission Time	Timeslot time for cyclic
			communications

(*) For example, as specified in Section 2.3, cyclic communication is assigned to be transmitted only on TSLT1 and therefore the corresponding queue

(queue 7) should be added to this entry.

3.2. The TSN-G5008-2GTXSFP specific configuration items

This section describes what to configure only for the TSN-G5008-2GTXSFP. Mitsubishi's RJ71GN11-T2 has parameters already built in as fixed values for time synchronization, and the TSN-G5008-2GTXSFP must have corresponding parameters. In addition, the TSN-G5008-2GTXSFP must be configured for the device connected to each communication port and for enabling the time division method. Again, the table below describes the configuration only for IEEE802.1AS.

■Time Synchronization Parameters

Device	Configuration Path	Configurations	Set Value (*1) (*2)
TSN-G5008-2GTXSFP	System > Time > Time Synchronization >	Time Synchronization	Enabled
	General	Profile	IEEE 802.1AS-2011
		Priority 1	246
		Priority 2	248
		Accuracy Alert	500
	System > Time > Time Synchronization >	Time Synchronization	Enabled
	Port Settings > ✓ Edit (Per port)	Announce Interval	0 (1 sec.)
		Announce Receipt Timeout	3
		Sync Interval	-3 (0.125 sec.)
		Sync Receipt Timeout	3
		Pdelay-Request Interval	0 (1 sec.)
		Neighbor Propagation Delay Threshold	3000

Table 3.2-1 Configuration items for time synchronization parameters

(*1) Although it is set by default, please set Neighbor Propagation Delay Threshold to 3000.

(*2) When connecting RJ71GN11-T2, set the above value. Enabling only the ports that use for CC-Link IE TSN communications through

System > Time > Time Synchronization > Port Settings > / Edit (Per port) > Time Synchronization

Configuration Items for Time Division Method

Table 3.2-2 Configuration items for time division method

Device	Configuration Path	Configurations	Set value
TSN-G5008-2GTXSFP	Layer 2 Switching > Time-aware Shaper > Settings	Enable slider	Enabled (*)

(*) Turn the **Enable** slider on only for the ports that are designated to use the time division method.

Configuration Items for Classifying Communication Frames

Table 3.2-3 Configuration Items for classifying communication frames from the devices connected

Device	Configuration Path (*)	Configurations	Set Value
TSN-G5008-2GTXSFP	Layer 2 Switching > Priority Management >	Port	Port that needs to apply the
	Ingress > Per-stream Priority >		per-stream priority settings
			(*)
		EtherType	EtherType in order to classify
			the type of the ingress
			frames on the Port
			e.g. 0x890F for cyclic
			communication frame
		Subtype	Option
		VLAN ID	1
		Priority Code Point (PCP)	7 for cyclic communication
			frame
		Copy configurations to	Specify the port numbers to
		ports	copy the configuration

(*) Priority Management allows you to select communication priority process from two types: Port Default Priority and Perstream Priority. Use Per-stream Priority when different types of communication are handled on a single port, such as CC-Link IE TSN. Port Default Priority can also be used if there are no problem handling different communications on the port with the same priority.



Configuration Items for Function to Untag Frames

Table 3.2-4 Configuration items for function to untag frames before sending out to connected devices

Device	Configuration Path	Configurations	Set Value
TSN-G5008-2GTXSFP	Layer 2 Switching > Priority Management >	Egress Untag	Enabled (*)
	Egress > Edit	Copy configurations to	Specify the port numbers to
		ports	copy the configuration

(*) Enabling only the ports that use for CC-Link IE TSN communications.

Configuration Items for VLAN Function

Table 3.2-5 Configuration items for VLAN function

Device	Configuration Path	Configurations	Set Value
TSN-G5008-2GTXSFP	Layer 2 Switching > VLAN > Settings	Mode	Trunk (*)
	> Edit	PVID	1
		Tagged VLAN	1 (*)
		Copy configurations to	Specify the port numbers to
		ports	copy the configuration

(*) Setting only the ports that use for CC-Link IE TSN communications.

4. Configuration example

4.1. Example of system configuration

In this chapter, the way to configure the TSN-G5008-2GTXSFP and RJ71GN11-T2 shown in Figure 4.1-1 will be explained.



Figure 4.1-1 System configuration

The devices that support CC-Link IE TSN are the master station, local station 1, local station 2, and switches. They implement time synchronization using IEEE802.1AS and construct a system of Certification class B by using the time division method using IEEE 802.1Qbv.

In the system of Figure 4.1-1, RJ71GN11-T2 is used as master and local station and TSN-G5008-2GTXSFP is used as the TSN switch. For IP devices, general TCP/IP-based information device such as a PC is used.

All devices shall be connected via 1Gbps Ethernet, with switch port 1 ~ 3 used to connect the CC-Link IE TSN device and port 4 used to connect the IP device.

The communication cycle is 1ms and is divided into three time slots. Assign times as described in Table 4.1-1.

Time slot	Usage	Assigned Time
TSLT1	Cyclic communication	500 [µs]
TSLT2	Time synchronization communication	20 [µs]
	(IEEE802.1AS)	
TSLT0	Transient communication	480 [µs]
	IP communication	

Table 4 4 4	Time a alas	alla antinu fa			
Table 4.1-1	Time slot	anocation to	r example s	vstem com	Iduration

4.2. Configuring the Moxa TSN-G5008-2GTXSFP

This section describes the necessary steps and procedures for configuring the TSN-G5008-2GTXSFP in the system specified in Figure 4.1-1. The time synchronization method and time division method are set through via a web-based GUI (you can also configure these settings via the CLI console using a SSH/telnet connection.) The configuration screens shown in the following sections can be accessed after logging in through a web browser after connecting the TSN-G5008-2GTXSFP to a PC using an Ethernet cable.

Setting Up the Time Synchronization System and Parameters

In the TSN-G5008-2GTXSFP, IEEE802.1AS is the default profile that is enabled globally for all ports. In order to avoid unexpected behavior on the connected devices, it is recommended to make the time synchronization on the ports which do not connect the CC-Link IE TSN device disable by going to **System** > **Time** > **Time** Synchronization > **Port Settings** >

Edit > Time Synchronization (see Figure 4.2-1.)

Time Synchronization	•		Enabled (default)
Announce Interval		Announce F	(4014412)
0 (1 sec.)	-	3	
		2 - 10	times
Sync Interval		Sync Receipt T	imeout
-3 (0.125 sec.)	•	3	
		2 - 10	times
Pdelay-Request Interval			
0 (1 sec.)	•		
Neighbor Propagation Dela 3000	y Thresł	nold	
1 - 10000		ns	

Figure 4.2-1 Enabling/disabling the time synchronization method on a TSN-G5008-2GTXSFP port

ply

Set the time synchronization parameters at **System** > **Time** > **Time Synchronization** > **General** (see Table 3.2-1 for the global parameters) and **System** > **Time** > **Time Synchronization** > **Port Settings** > **Context** (see Figure Table 3.2-1 for per-port parameters), so that they match the RJ71GN11-T2 settings given in Table 3.2-1. (see Figure 4.2-2,4.2-3).

Fime Synchro	onization			
General	Port Settings	Status	Port Status	
Time Synchronization * Enabled	•			
Profile * IEEE 802.1AS-2011		Se	t the corresponding parameters as given in table 3.2-1.	s
Priority 1 * 246	Priority 2 * 248			
0 - 255 Accuracy Alert * 500	0 - 255			
50 - 250000000	ns			
APPLY				

Figure 4.2-2 Setting TSN-G5008-2GTXSFP time synchronization parameters (1/2)

Edit Port 1 Settings

Time Synchronization * Enabled	•			
Announce Interval *	•	Announce Rece	ipt Timeout *	
Sync Interval * -3 (0.125 sec.)	•	2 - 10 Sync Receipt Tin 3	times meout *	
Pdelay-Request Interval * 0 (1 sec.)	*	2 - 10	times	
Neighbor Propagation Dela	ay Thresh	old *	Set the corr as given Change the " Delay Thresh	esponding parameters in table 3.2-1. 'Neighbor Propagation old" value to 3000.
1 - 10000 Copy configurations	s t 🕶	ns		

Figure 4.2-3 Setting TSN-G5008-2GTXSFP time synchronization parameters (2/2)

Setting Up the Communication Cycle Time

The communication cycle (Cycle Time) in TSN-G5008-2GTXSFP is accumulated automatically from the time slot settings. The value can be viewed at Layer 2 Switching > Time-aware Shaper > Settings > Cycle Time.

Q Search for function	Time-av	ware Sh	aper			
Device Summary System	v V	15	Status	These are automatically generated cumulative values of the time slot (interval) settings		
Layer 2 Switching	^	Port	Cycle Time (µs)	Selected Queue Summary		
Priority Management		1	1000	Q7, Q6, Q0		
MAC	č 🔹 🥌	2	1000	Q7, Q6, Q0		
Multicast Time-aware Shaper	Ě	3	1000	Q7, Q6, Q0		
Redundancy	~ ()	4				
Management	× 💿 2	5		-		
Security) 💿	6		-		
		7		-		
		8	-	-		

Figure 4.2-4 TSN-G5008-2GTXSFP communication cycle (1/2)

Edit Port 1 Settings



Figure 4.2-5 TSN-G5008-2GTXSFP communication cycle (2/2)

Setting Up the Time Slot

To set the time slots go to Layer 2 Switching > Time-aware Shaper > Settings > Edit and add new entries for each time slot for settings including Interval [µs] and Queue for the ports. The entries are ordered as Slot 0 (TSLT1), Slot 1 (TSLT2), and Slot 2 (TSLT0); see Table 4.1-1 for details. Since cyclic communication is assigned to be transmitted only on TSLT1 only, the corresponding queue 7 should be added onto the time-slot entry. For TSLT0, where both transient communication and IP communication are expected to be transmitted, the corresponding queue 0 should be added to the time-slot entry. And, for time synchronization communication on TSLT2, add queue 6 to the time-slot entry.



Figure 4.2-6 TSN-G5008-2GTXSFP timeslot configuration

Note that the time slot is set for each port. However, you can use a copy function in the setup page to copy configuration settings to other ports. In the system illustrated in Figure 4.1-1, for example, you can edit the settings on one of the ports from port 1 to 3 and then copy it to the other two ports.

Setting Up the Time Division Method

To activate the time division method on a port, turn on the slider associated with the port at Layer 2 Switching > Time-aware

Shaper > Settings.

Q Search for function	Time-aware Shaper						
Device Summary		Settings		Status			
System	~ ~			Turn o enable	on the slider to the time division method		
Layer 2 Switching	^		Port	Cycle Time (µs)	Selected Queue Summary		
Priority Management		• /	1	1000	Q7, Q6, Q0		
MAC	~	- /	2	1000	Q7, Q6, Q0		
Multicast Time-aware Shaper	~	• /	3	1000	Q7, Q6, Q0		
Retwork Redundancy	~) – <i>i</i>	4				
Kanagement	~		5				
Security	Ý		6				
			7	-	-		
			8		-		

Figure 4.2-7 TSN-G5008-2GTXSFP time division configuration

Setting Up the Function to Classify Communication Frames Received From Connected Devices

In the system configuration example used in this section, port 1 to 3 of the TSN-G5008-2GTXSFP are connected with CC-Link IE TSN devices i.e. RJ71GN11-T2. The corresponding classification and the designated priority/queue of communication frames to be used as indicated in Table 3.2-3 should be configured and applied after adding new rules via Layer 2 Switching > Priority Management > Ingress > Per-stream Priority > so that the time division method can be operated accordingly. Note that only CC-Link IE TSN frames with 0x890F including cyclic communication need to be set in this case. For port 4, since only an IP device is connected, we don't need to configure it.

Q Search for function			4	1	0			
		/	5	1	0			
Device Summary		1	6	1	0			
System	~							
Port	~		7	1	0			
Eayer 2 Switching	^	1	8	1	0			
VLAN								
Priority Management								
MAC	~				Click to	o add a new	rule; one	rule
Multicast	~	Per-stro	eam F	Priority	per por for	t (port I t classifying	the cycli	eded c
Time-aware Shaper		8	J		1	communica	itions	
Retwork Redundancy	~	_		Deat	Ether Trees	Outbrand		Detector Or de Detect (DOD)
G Management	~			Port	EtherType	Subtype	VLAN ID	Priority Code Point (PCP)
	~		/	1	0x890F		1	7
Diagnostics	~		/	2	0x890F		1	7
			/	3	0x890F		1	7
		Max. 80) Each p	ort supports	s a maximum of 10 e	entries.		

Figure 4.2-8 Configuring TSN-G5008-2GTXSFP for classifying communication frames from the devices connected (1/2)



Add a Per-stream Priority Entry



Figure 4.2-9 Configuring TSN-G5008-2GTXSFP for classifying communication frames from the devices connected (2/2)

Setting Up the Function to Untag Frames before Sending Out To Connected Devices

In the system configuration example used in this section, port 1 to 3 of the TSN-G5008-2GTXSFP are connected with CC-Link IE TSN devices i.e. RJ71GN11-T2. Since the port 1 to 3 are used as the Trunk ports, corresponding untag action needs to be conducted when sending out the frames from TSN-G5008-2GTXSFP to the connected CC-Link IE TSN devices. In this system configuration example, such setting needs to be applied on port 1 to port 3 via Layer 2 Switching > Priority Management > Egress > Edit > Enabled. Detail can be seen in below Figure 4.2-10.

Pri	iorit	ty Mai	agement	
	Ing	jress	Egress	
			Q Search	
		Port	Egress Untag	
	1	1	Enabled	
	1	2	Enabled	
	1	3	Enabled	
	1	4	Disabled	
	1	5	Disabled	
	1	6	Disabled	
	1	7	Disabled	
	1	8	Disabled	

Figure 4.2-10 Configuring TSN-G5008-2GTXSFP for untag frames before sending out

Setting Up the VLAN Function

In the system configuration example used in this section, port 1 to 3 of the TSN-G5008-2GTXSFP are connected with CC-Link IE TSN devices i.e. RJ71GN11-T2 where the corresponding classification and the designated priority/queue of communication frames to be used as indicated in Table 3.2-3 are also configured. In order to proceed and transmit those frames properly, the corresponding VLAN mode setting needs to be conducted on port 1 to port 3 via Layer 2 Switching > VLAN > Settings > Edit (port) as indicated in below Figure 4.2-11. The mode should be applied as Trunk mode.

C		CI	lick to applied	set the mode to Trunk and to port 2 and 3 as well.		Q Search
/	Port	Mode	PVID	Untagged VLAN	Тад	agged VLAN
1	1	Trunk	1		1	
/	2	Trunk	1		1	
/	3	Trunk	1		1	
/	4	Access	1	1		
/	5	Access	1	1		
1	6	Access	1	1		
1	7	Access	1	1		
/	8	Access	1	1		

Figure 4.2-11 Configuring corresponding VLAN mode on TSN-G5008-2GTXSFP

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4.3. Configuration of Mitsubishi RJ71GN11-T2

Time synchronization method, communication cycle and time slot configuration are configured by module parameters of the GX Works 3 engineering tool.

RJ71FN11-T2 module parameter explained from below can be accessed by double clicking "RJ71GN11-T2" under "Navigation"-

> "Parameter"-> "Module information" in GX Works3.

Also Authentication Class in the GX Works 3 is same as certification class explained above.

■Time synchronization system

Select "Authentication Class B Only" for "Authentication Class Setting" under "RJ71GN11-T2 Module Parameters" \rightarrow "Basic Settings" \rightarrow "Connection Device Information".

Item		Setting		
Network Configuration Settings				
Network Configuration Settings		<detailed setting=""></detailed>		
😑 Refresh	Refresh Settings			
Refresh	Refresh Settings			
😑 Network	Network Topology			
Networ	Network Topology			
😑 Commun	Communication Period Setting			
🕞 Basic F	- 😑 Basic Period Setting			
Setti	Setting in Units of 1us Not			
Com	munication Period Interval Setting (Do not Set it in Units of 1us)	1000.00 us		
Com	munication Period Interval Setting (Set it in Units of 1us)	1000.00 us		
Syst	em Reservation Time	20.00 us		
Cycl	ic Transmission Time	500.00 us	When using IEEE802.1AS, select	
Tran	sient Transmission Time	480.00 us		
🖳 🗐 Multiple	e Period Setting		"Authentication Class B Only"	
Norn	nal-Speed	×4	· · · · · · · · · · · · · · · · · · ·	
Low-	Speed	×16	2	
😑 Connect	Connection Device Information			
Authentication Class Setting		Authentication Class B Only		
TSN H	TSN HUB Setting			
😑 Slave St	Slave Station Setting			
Disconnection Detection Setting		4 times		

Figure 4.3-1 RJ71GN11-T2 set time synchronization method

Communication cycle

Enter"1000.00 μ s" corresponding to the 1ms cycle used in this system under the configuration of "RJ71GN11-T2 Module Parameters" \rightarrow "Basic Settings" \rightarrow "Communication Period Setting" \rightarrow "Basic Period Setting" \rightarrow "Communication Period Interval Setting (Do not Set it in Units of 1 μ s) ".

	Item	Setting		
	Network Configuration Settings			
	Network Configuration Settings	<detailed setting=""></detailed>		
	😑 Refresh Settings			
	Refresh Settings	<detailed setting=""></detailed>		
	😑 Network Topology			
	Network Topology	Line/Star		
	Communication Period Setting			
	Basic Period Setting			
	Setting in Units of 1us	Not Set		
	Communication Period Interval Setting (Do not Set it in Units of 1us)	1000.00 us		
- 1	Communication Period Interval Setting (Set it in Units of 1us)	1000.00 us	7	
	System Reservation Time	20.00 us		
	Cyclic Transmission Time	500.00 us	Enter communication cycle	
	Transient Transmission Time	480.00 us		
	└──⊖ Multiple Period Setting		used in the system.	
	Normal-Speed	×4	,	
	Low-Speed	×16		
	Connection Device Information			
	Authentication Class Setting	Authentication Class B Only		
	TSN HUB Setting	Not to Use TSN HUB		
	🖃 Slave Station Setting			
	Disconnection Detection Setting	4 times		

Figure 4.3-2 Configuration the RJ71GN11-T2 communication frequency

■Time slot

Enter "System Reservation Time" and "Cyclic Transmission Time" under "RJ71GN11-T2 Module Parameters" \rightarrow "Basic Settings" \rightarrow "Communication Period Setting" \rightarrow "Basic Period Setting". The system reservation time is automatically applied to TSLT2 and the cyclic transmission time is automatically applied to TSLT1. From the communication cycle and the above two settings, the transient transmission time field corresponding to TSLT0 is automatically entered.

Item		Setting		
Network Configuration Settings				
Network Configuration Settings	<detailed setting=""></detailed>			
🖃 Refresh Settings				
Refresh Settings	<detailed setting=""></detailed>			
Network Topology				
Network Topology	Line/Star			
Communication Period Setting				
- 😑 Basic Period Setting				
Setting in Units of 1us	Not Set			
Communication Period Interval Setting (Do not Set it in Units of 1us)	1000.00 us			
Communication Period Interval Setting (Set it in Units of 1us)	1000.00 us			
System Reservation Time	20.00 us			
- Cyclic Transmission Time	500.00 us			_
Transient Transmission Time	480.00 us			
Multiple Period Setting		r	_	
Normal-Speed	×4	System Reservation Time	TSLT2	20.00µs
Low-Speed	×16	Cyclic Transmission Time	TSLT1	500.00µs
Connection Device Information		Transient Transmission Time	TSI TO	480 00us
Authentication Class Setting	Authentication Class B Only		TOETO	100.00µ0
TSN HUB Setting	Not to Use TSN HUB			
Slave Station Setting				
Disconnection Detection Setting	4 times			

Figure 4.3-3 RJ71GN11-T2 timeslot configurations



5. Troubleshooting

5.1. Situation

Incorrect configuration or connections may detect the following symptoms from RJ71GN11-T2.

- Data link not Starting/Slow
- Node detects an error
- Nodes are disconnected
- Time out of sync occurs

5.2. Remedies

5.1 If symptoms appear, check the product documentation and take the following actions:

Items to check	Devices	Response
Wiring	All	Check if only a 1 Gbps station is connected to a 100 Mbps port.
	All	Check if a TSN device is connected to a port that does not have TSN enabled.
	All	Check if there is a loop connection in the system.
Time synchronization	All	Verify that the time synchronization method is enabled.
configurations	All	Check if the time synchronization method is set to the same one in the system.
	TSN-G5008-	Verify that time synchronization is enabled on 1) global and 2) per port -bases. (refer to table 3-2.1)
	2GTXSFP	
	TSN-G5008-	Verify that the time synchronization parameter is set correctly.
	2GTXSFP	
Time division	All	Check if the time division function is enabled (Entire device, per port).
configurations	All	Confirm that the cyclic communication is consistent in the system.
	All	Ensure timeslot times are consistent across systems.
	All	The time slot verifies that the transmission delay of the TSN-G5000 series are taken into account.
	TSN-G5008-	Check if Gate Control List is set correctly including interval and queue on each port.
	2GTXSFP	
	TSN-G5008-	Check if the classification and the designated priority/queue of the communication frames on each
	2GTXSFP	port is set correctly.
	TSN-G5008-	Check if the function to untag communication frames on each port is set correctly.
	2GTXSFP	
Others	All	Check for duplicate IP addresses in the system.
	TSN-G5008-	Check if the VLAN mode on each port is set correctly.
	2GTXSFP	

6. Limitations

• Check the manual of each product for precautions when building the system.

7. Related documents

- From CLPA
- CC-Link IE TSN Specification (BAP-C2011ENG-001)
- CC-Link IE TSN Installation Manual (BAP-C3007ENG-001)
- CC-Link IE TSN White Paper
- From Mitsubishi Electric
- MELSEC iQ-R CC-Link IE TSN User's manual (Startup) [SH-082127ENG]
- MELSEC iQ-R CC-Link IE TSN User's manual (Application) [SH-082129ENG]
- GX Works3 Operating Manual [SH-081215ENG]
- From Moxa
- Moxa_Managed_Switch_TSN-G5000_Series_UM_v2.2 (*)

(*) Please contact Moxa to download the above document.



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