LE590-SG
User's Manual

<2nd>

Table of Contents

1. LE590-SG Overview

LE590-SG provides a powerful and sophisticated virtual front control panel to manage the LE-590TX. Two test ports can be independently configured with parameters to define multiple streams, filters, and capture capabilities. Traffic for various network protocols can be customized, transmitted, and received on each port. Comprehensive statistics provide users an in-depth analysis of the performance of the DUT (Device Under Test).

1.1. Starting LE590-SG

There are two ways to start LE590-SG:

Starting LE590-TAP

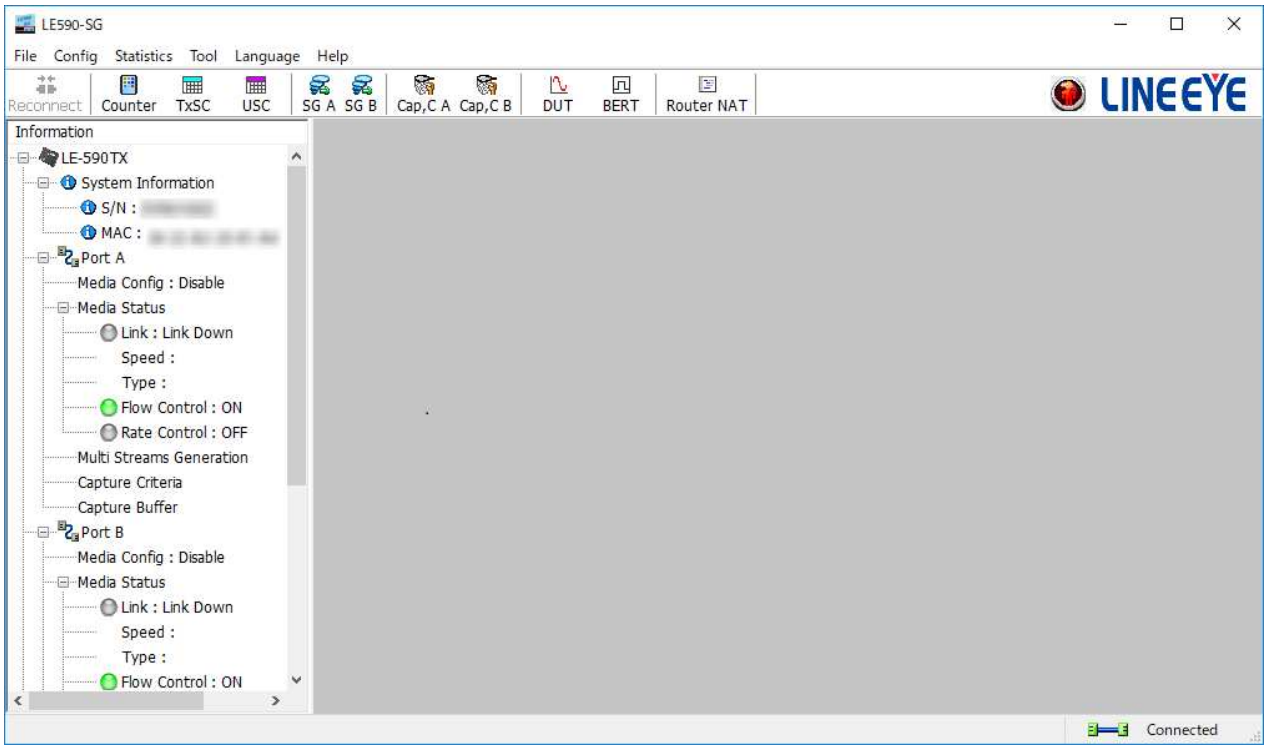
- Click **Start → Programs → LINEEYE → LE-590TX → LE590-SG Vxxxxx → LE590-SG Vxxxxx**.

- Double-click LE590-SG icon located on your PC's desktop.

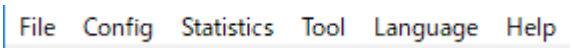
This manual is for LE590-SG v1.1b028 or later.

1.2. Operation Menu

The operation menu is located at top of this utility



1.2.1. Menu Bar



1.2.1.1. File

Menu Choice	Usage
Load	
Load Port A Config	Load port A setting
Load Port B Config	Load port B setting
Save	
Save Port A Config	Save port A settings.
Save Port B Config	Save port B settings.
Exit	Exit and close this utility

1.2.1.2. Config

Menu Choice	Usage
Port A Streame Generation	Configure the settings and contents of port A for the generation of packet streams
Port B Streame Generation	Configure the settings and contents of port B for the generation of packet streams
Port Configuration	Configure each setting of port A / B
Frame gap for USB transferring	Set capture buffer size to transfer to PC with USB.
Option	In this window, you can set if the future warning window will pop up more often by choosing the Often option, or pop up less warning window by choosing Seldom option.

1.2.1.3. Statistics

Menu Choice	Usage
Control Panel	Real-time frame counters and control panel of Port A and Port B. The counters contain frame counts generated and received that can examine the DUT.

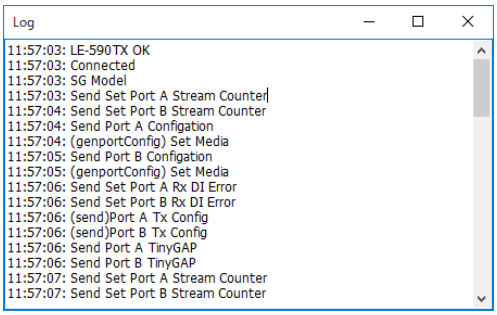
1.2.1.4. Tool

Menu Choice	Usage
DUT OSC Measurement	Performs DUT clock measurement.
BERT Test	Run BERT.

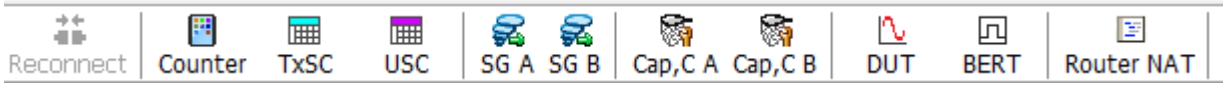
1.2.1.5. Language

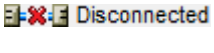
Menu Choice	Usage
Languages	LE590-SG has 3 different languages for its UI available. You can set the UI language to English, Simplified Chinese or Japanese.

1.2.1.6. Help

Menu Choice	Usage
About ...	An “About” window will pop up and show detailed system information. Click the OK button to exit the “About” pop-up window.
System Requirements	A “System Requirements” window will pop up and show the requirements for your PC and the FPGA/Firmware of the module. Click the OK button to exit the “System Requirements” pop-up window.
LINEEYE Web	Open your default web browser and access LINEEYE Website (www.lineeye.com)
Log	See instant log of current running command and result 

1.2.2. Toolbar

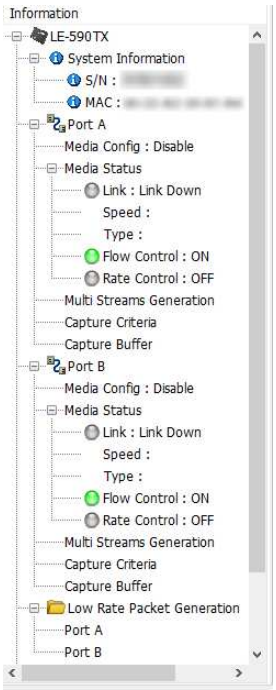


Keys	Usage
Reconnect	If the USB connection between your PC and LE-590TX is down, a “**Disconnected**” icon  will be shown in “**System Connection Status**”. Press **Reconnect** button  to re-establish the connection between your PC and LE-590TX. If the connection has been established successfully, a message window will pop up, and the “**System Connection Status**” will be shown as “**Connected**”  .
Counter	Real-time frame counters and control panel of Port A and Port B. The counters contain frame counts generated and received that can examine the DUT.

Tx SC	Shown the **Tx Streams Counter** window.
USC	Shown on the **Port Universal Streams Counter** window.
SG A	Configure the settings and contents of port A for the generation of packet streams
SG B	Configure the settings and contents of port B for the generation of packet streams
Cap, C A	Configure the criteria to capture the packets from port A.
Cap, C B	Configure the criteria to capture the packets from port B.
DUT	Performs DUT clock measurement.
BERT	Run BERT.
Router NAT	Run router NAT test.

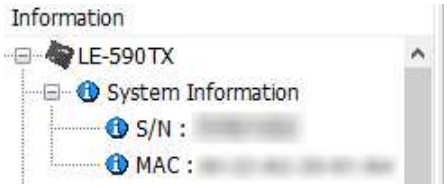
1.2.3. Configuration and Information Zone

For different selections, there are System Information, Configuration and Status of Port A, Port B, Report and Function Configuration in this block.



1.2.3.1. System Information

Click the item below to show the system information

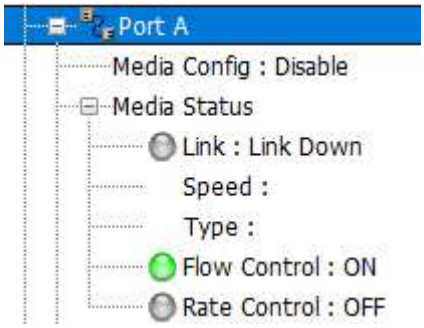


On the right side of the main window, it shows

Model	LE-590TX
S/N	
MAC	
PCB Version	MP03
FPGA Version	v2.2b001 2019/01/04
Firmware Version	v0.9b023
API Version	v1.0b035 2019/01/08

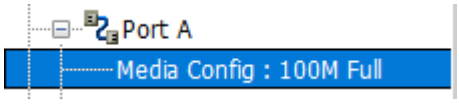
1.2.3.2. Port Status and Configuration

Click the item of ports to show the status or configuration

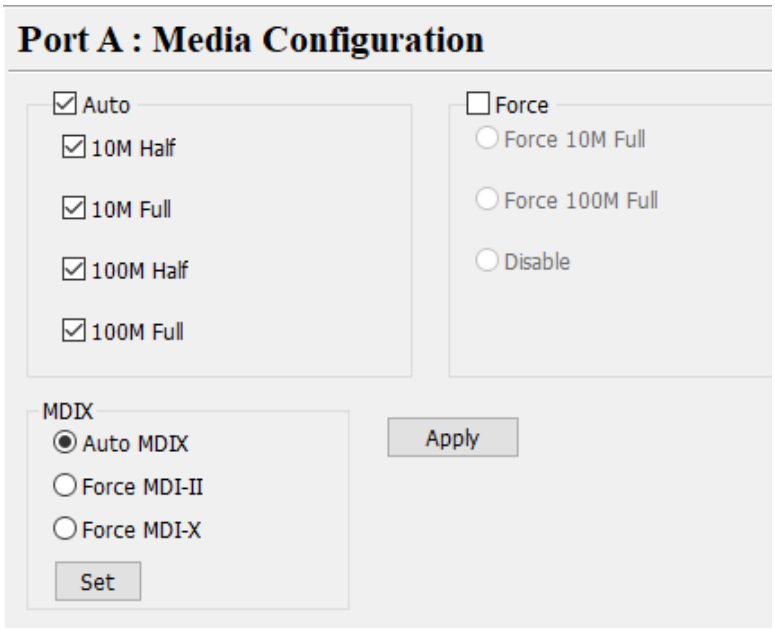


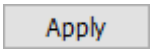
1.2.3.3. Media Config

Click item below to configure the link mode. Port A and port B has the same configuration items



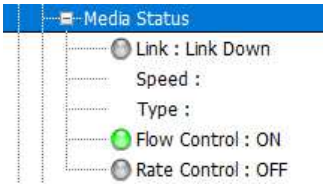
User can view the media link status or force to run specified media link



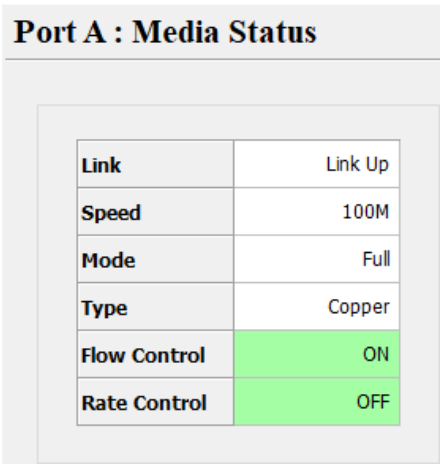
Click  to take effect the configuration on this page.

1.2.3.4. Media Status

Click items below to view the media status at its sub-tree.



This window shows current link and media status

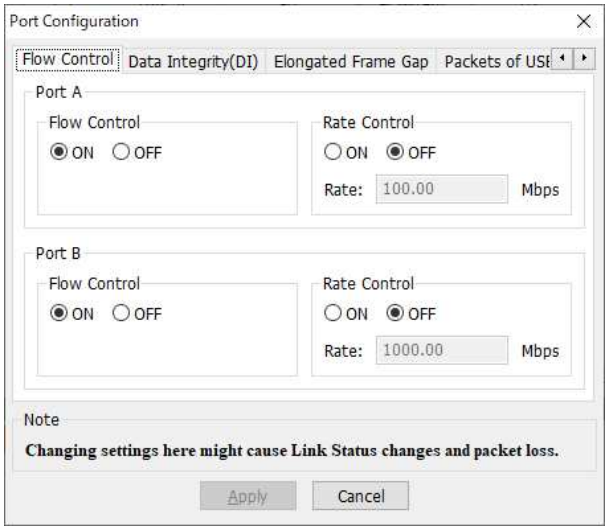


1.2.4. Port Configuration

Other settings related to each A / B port are displayed by selecting “Port Configuration” from “Config” in the menu.

1.2.4.1. Flow Control

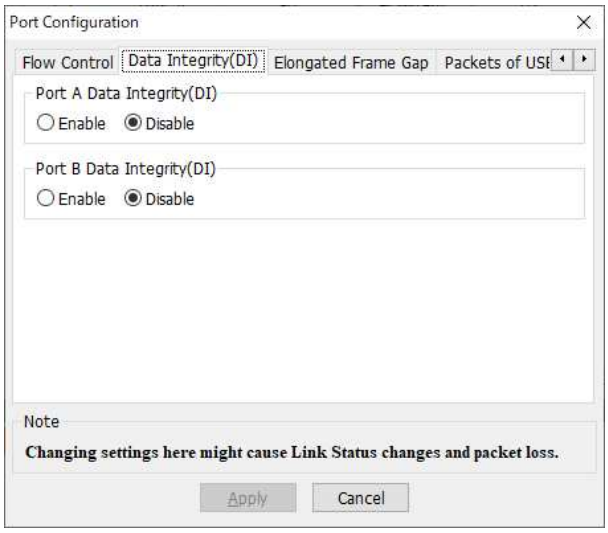
Sets ON/OFF of flow control.
Flow control is a mechanism which keeps the transmission rate of the sender within the receiving range of the receiver, and is used to manage the flow of data / packets between two nodes, especially when the sender can send more than the receiver acceptance capacity.
When flow control is enabled, rate control setting turns to be available and when rate control is enabled you can set the rate.



1.2.4.2. Data Integrity(DI)

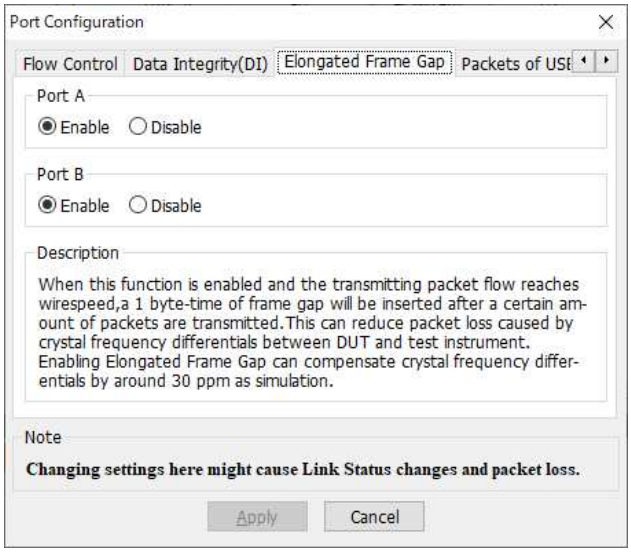
Sets ON/OFF of the check function by second level CRC (advanced data integrity).
The second level CRC is a checksum calculated based on the contents of the frame contents from the offset to the end of the data field.

If the data is corrupted by the DUT and the FCS is affected by the error data, the second level CRC check serves as a checksum. The mismatch between sent and received packets is recorded as a second level CRC check error (DI Error).



1.2.4.3. Elongated Frame Gap

When this function is enabled and packet transmission reaches wire speed, a frame gap of the time for 1 byte is inserted after a certain number of packets are transmitted. As a result, in the simulation of crystal oscillation between the DUT and the test equipment, the difference of crystal oscillation can be corrected by about 30 ppm by enabling the elongated frame gap. Enable this function if the DUT clock is slower than the LE-590TX.

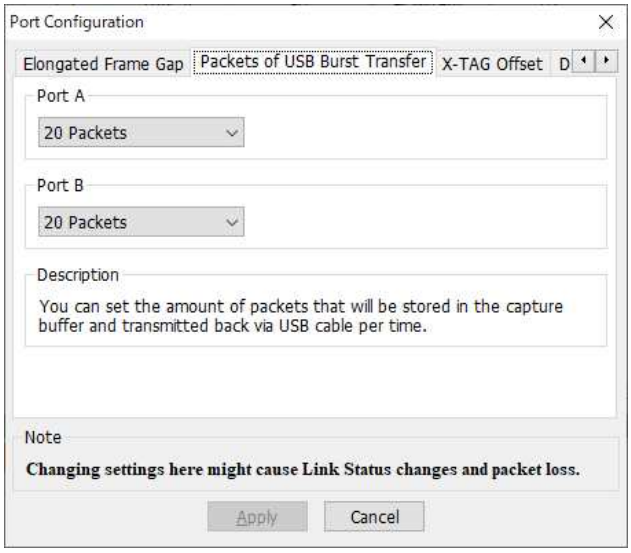


1.2.4.4. Packets of Burst Transfer

Transmits to the PC via USB for each specified number of packets.

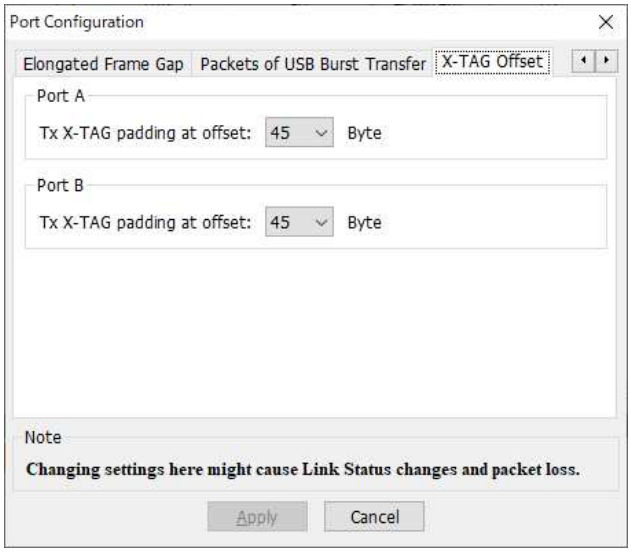
Usually select the default value of 20 Packets.

Lower the value when using older PCs and laptops with lower performance.



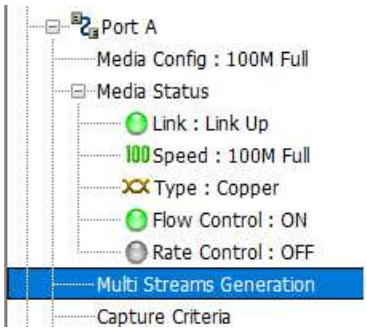
1.2.4.5. X-TAG Offset

Set the insertion position of an X-TAG when using it.

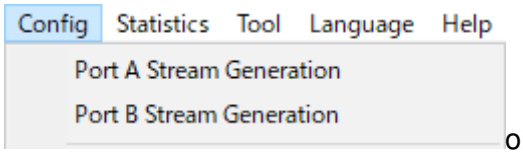


1.3. Multi Streams Generation

Click item below to view the Multi Streams Generation configuration window.

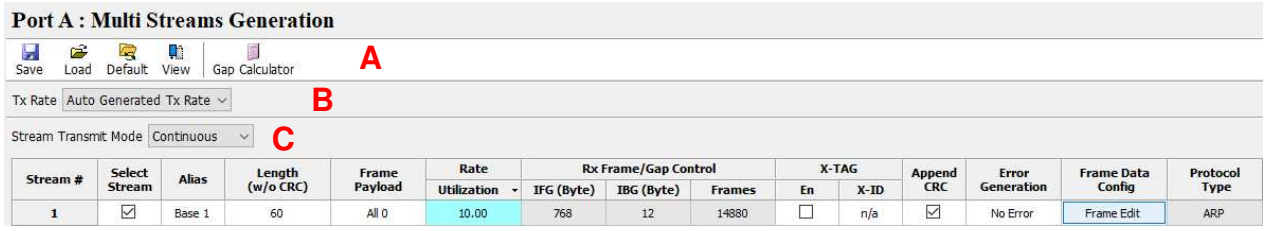


The configuration is the same as selection in operation menu or toolbar as below

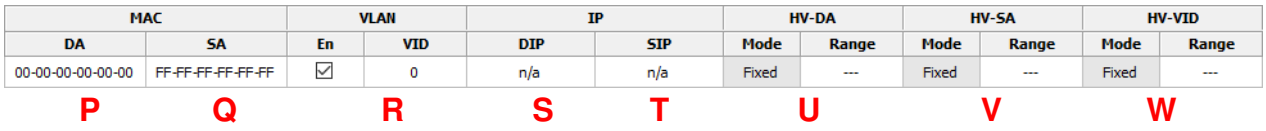
Operation Menu: 

or Toobar: 

System shows the configuration window. User can configure the streams patterns for streams generation. Maximum 64 entries are allowed for this configuration.

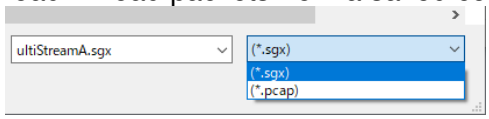


Continued



A: "Save" : Save the configuration of current settings

"Load" : Load packets from a saved configuration (.sgx) or Pcap format (.pcap) file.



"Default" : Restore to the default settings.

"View" : Select the item to be displayed.

"Gap Calcuator" : The gap calculation can be done.

B: Tx Rate : Select the send rate.

"Auto Generated Tx Rate" : Transmit at the rate of the value set for **I**.

"Manual Input Rate" : Transmit at the rate of the value set for **J**.

"Capped Balance Tx Rate" : Transmit evenly with the value entered for "Max Rate (Mbps)".

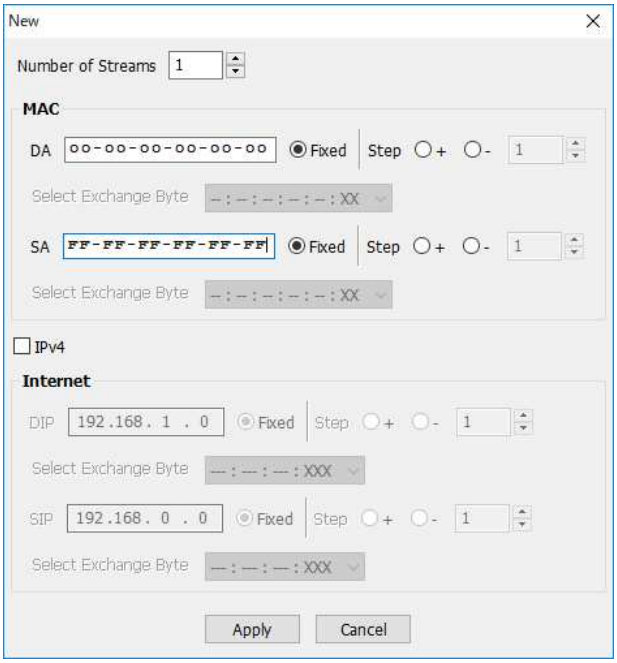
C: "Continuous" : Continuously transmit.

"Packets Limit" : Transmits the number of packets entered in "Packets".

"Time Mode" : Transmission is performed for the period entered in "second(s)".

D: Select # : Show the number of streams.

To add a new stream, right click on the lower number of the stream volume (Stream #) and select "New".

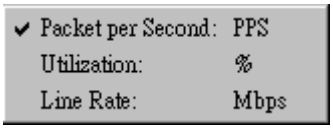


E: Select Stream □: User can tick the □ to active the stream generation of this stream.

F: Alias : Enter the name of the created frame.

G: Length (no CRC): Frame length in bytes without CRC

I: Rate: Select the unit and input the value of the parameter that the packets will be generated.



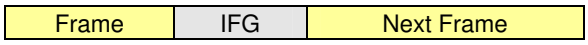
PPS: Packet per second. Volume of packets that will be generated per second.

Utilization: Percentage of Wirespeed transmission

Line Rate: Mbytes per second in transmission

J: CRC TxFrame/GAP Control : Enter IFG, IBG, Frames when Tx Rate is set to "Manual Input Rate".

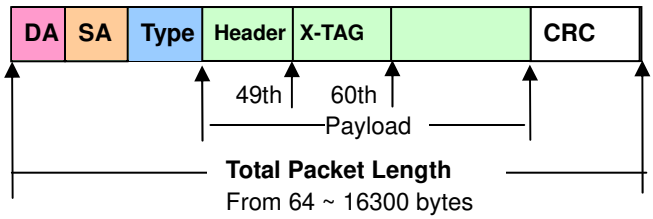
Ethernet devices must allow a minimum idle period between transmissions of Ethernet frames. It is called interframe gap (IFG) as the illustration below



The minimum interframe gap is 96 bits time or 12 byte time. It is the time taken for transmission of 96 bits raw data on the media.

K: X-TAG En □: User can tick the □ to active tag generation of X-TAG. When it is ticked, user can select X-ID. Each X-TAG has an unique ID. If there are more than one product of Xtramus is generating the data stream on the same network, their X-ID should be different

X-TAG that is used as stream tags for providing fundamental information for collecting statistics of multi-stream traffic. Advanced tests like latency, packet loss, and packet sequence miss can be realized by X-TAG.
X-TAG is an Xtramus proprietary 12 bytes embedded tag that is located at 49th~60th bytes of each testing frames that are generated by Rapid-Matrix for multi-stream tests.



L: Append CRC: Add CRC checksum to the end of each frame. CRC checksum is the way to verify the correctness after data transmission. 4 bytes will be added at the end of the frame when CRC checksum is added.
M: Error Generation : Generates an error frame.
N: Frame Data Config: Configure the payload contents in frame. Click the **Frame Editor**

to edit the detailed contents in frame. For the detail of how to use Frame Editor, please refer to 1.11 Frame Editor

O: Protocol Type: System shows the Protocol Type when frame content is configured in

P: DA: Mode: Show or configure current Destination Address Mode. It can be Fixed, Increase, Decrease or Random. If increse or decrese mode is selected, configure range (0~255) is required. The DA will increase or decrease according to the range and repeat again. For the

detail of this function, please refer to 1.11 Frame Editor

Q: SA: Mode: Show or configure Source Address Mode. It can be Fixed, Increase, Decrease or Random. If increse or decrese mode is selected, configure range (0~255) is required. The SA will increase or decrease according to the range and repeat again. For the detail of this function, please refer to 1.11 Frame Editor

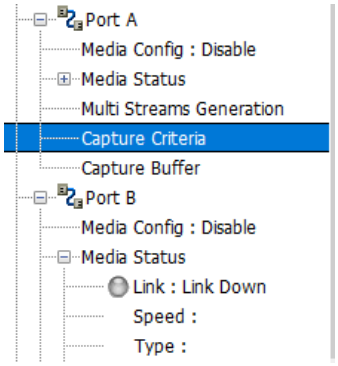
R: VID: Mode: Show or configure VID Mode. It can be Fixed, Increase, Decrease or Random. If increse or decrese mode is selected, configure range (0~4095) is required. The SA will increase or decrease according to the range and repeat again. For the detail of this function, please refer to 1.11 Frame Editor

S: DIP: Show or configure current Destination IPaddress.
T: SIP: Show or configure Source IPaddress.
U: HV-DA : Change the end value (XX) of the Destination MAC address.
V: HV-SA : Change the end value (XX) of the Source MAC address.
W:HV-VID : When VID is checked, VID is changed.

Click Apply to take effect the configuration.

1.4. Capture Criteria

Click item below to view the Capture Criteria configuration window.



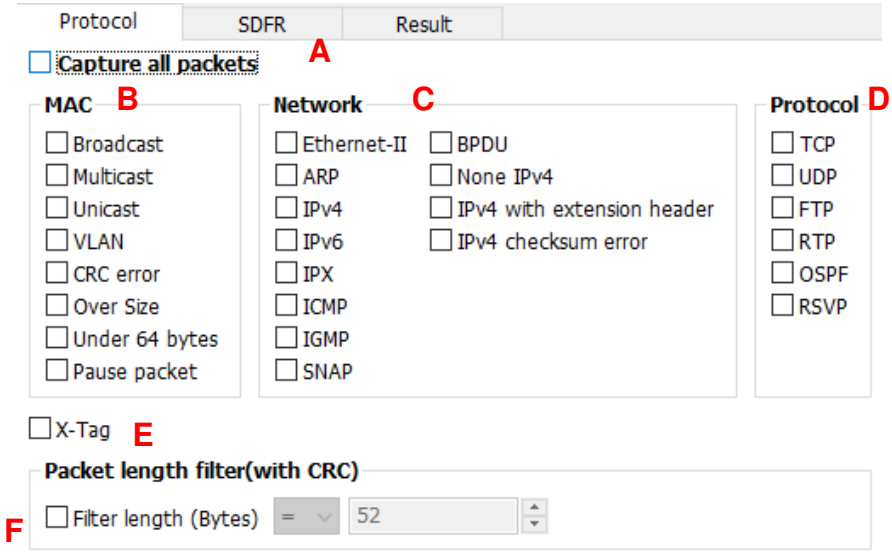
The configuration is the same as selection in operation menu or toolbar as below

Toolbar: Cap,C A Cap,C B

System shows the configuration window. Users can configure the criteria that they want to capture, from protocol or SDFR aspects

◆ Protocol

Different protocols can be combined as unique criteria



A: Capture all packets: All packets are captured and sent to PC by USB port. Be attention that packet loss is possible if the captured traffic is higher than traffic allowed for USB port.

B: MAC: MAC based criteria. Packets with MAC events in the list is captured and sent to PC by USB port

C: Network: Network events criteria. Packets with network events in the list is captured and sent to PC by USB port.

D: Protocol: Protocol Type criteria. Packets with protocol type in the list is captured and sent to PC by USB port.

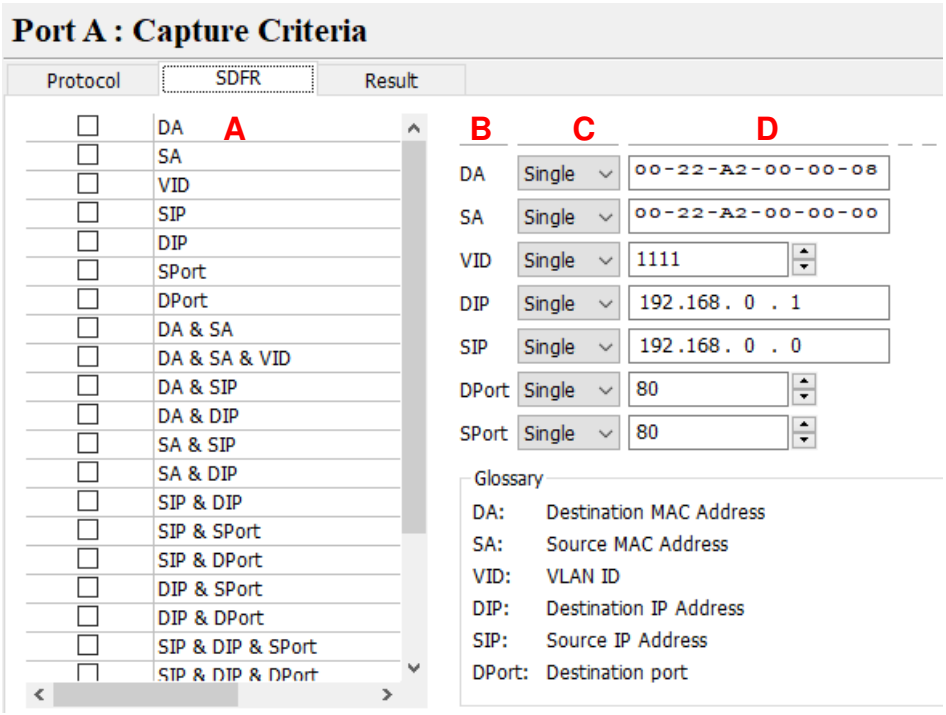
E: X-TAG: X-TAG is an Xtramus proprietary 12 bytes embedded tag. User can capture this kind of packets from product of Xtramus

F: Packet length filter: Capture packet (frame) length in specified range of length

◆ SDFR:

- SDFR (Self-Discover Filtering Rules) is a technique that make capture of Ethernet easy and convenient
- User-friendly interface that the value such as source IP, destination IP and other criteria for capture and filter can be input directly without calculating mask.

- SDFR value for capture or filter includes several network event (such as DA, SA, DIP…), varied length of frame (oversized, undersized) and varied of frame/packet type (CRC error, IP checksum error…).
- Value of SDFR can be a unique value or a range of values between specified values. All packets that fit the value are captured
- Multiple filter condition can be activated easily by just clicking different options
- Displays captured packet in real-time while network is still running.
- Value of SDFR and filter criteria can be changed dynamically during capture procedure.



A: SDFR items: User can tick the items that act as criteria. When user ticks one option, some other options will be gray. It means the option what user tick has covered the range of those options in gray.

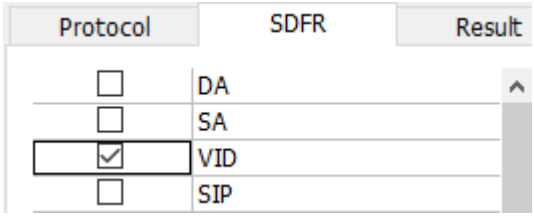
B:Pattern

- DA: Destination MAC address
- SA: Source MAC address
- VID: VLAN ID that follows 802.11Q standard
- DIP: Destination IP address
- SIP: Source IP address
- DPort: Destination port of IP address
- SPort: Source port of IP address

C: Pattern Mode: Select a pattern (Single, Pair, Range) to cover the value of criteria items.

D: Patterns: The unique value or range of values specified as the capture criteria of criteria items.

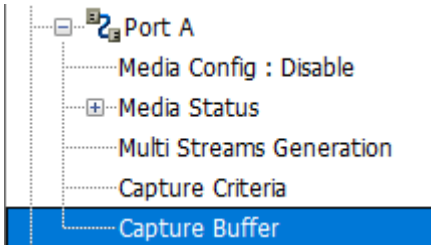
For example, user wants to capture packets with VLAN ID 1 to 10.



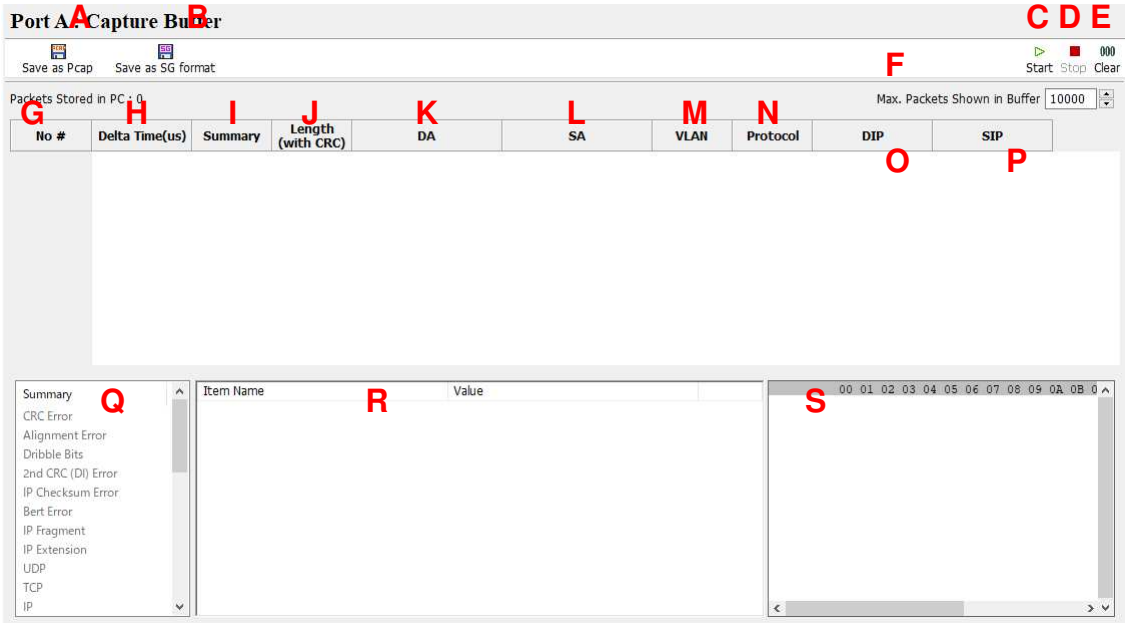
Plus

1.5. Capture Buffer

Click item below to view the Capture Buffer configuration window.



To view the contents of captured packets, user can select the captured packets from Capture Buffer window



A: Save: Save the captured packets to file

B: Tick this option to capture Bert Error packets

C: Start Capture: Starts the capture process.

D: Stop Capture: Stop the capture process

This block lists all captured packets

E: Summary: Summary of network items

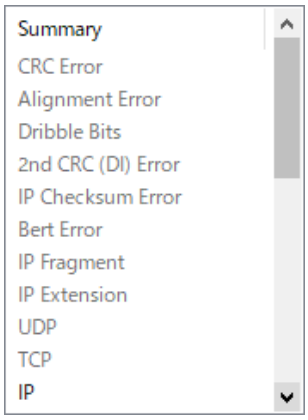
F: Length (add CRC): Packet length that includes CRC

G: DA: Destination MAC Address

H: SA: Source MAC Address

I: Frame Data: Contents of captured frame (packet).

J: Summary: List all summry items of network. When user select a packet, the summary items that fit the packet is labels as black word, otherwise, labels as gray word that it does not fit the packet. For the example below, the selected packet is **IP** packet and it does not has the other property such as CRC Error, Alignment Error.



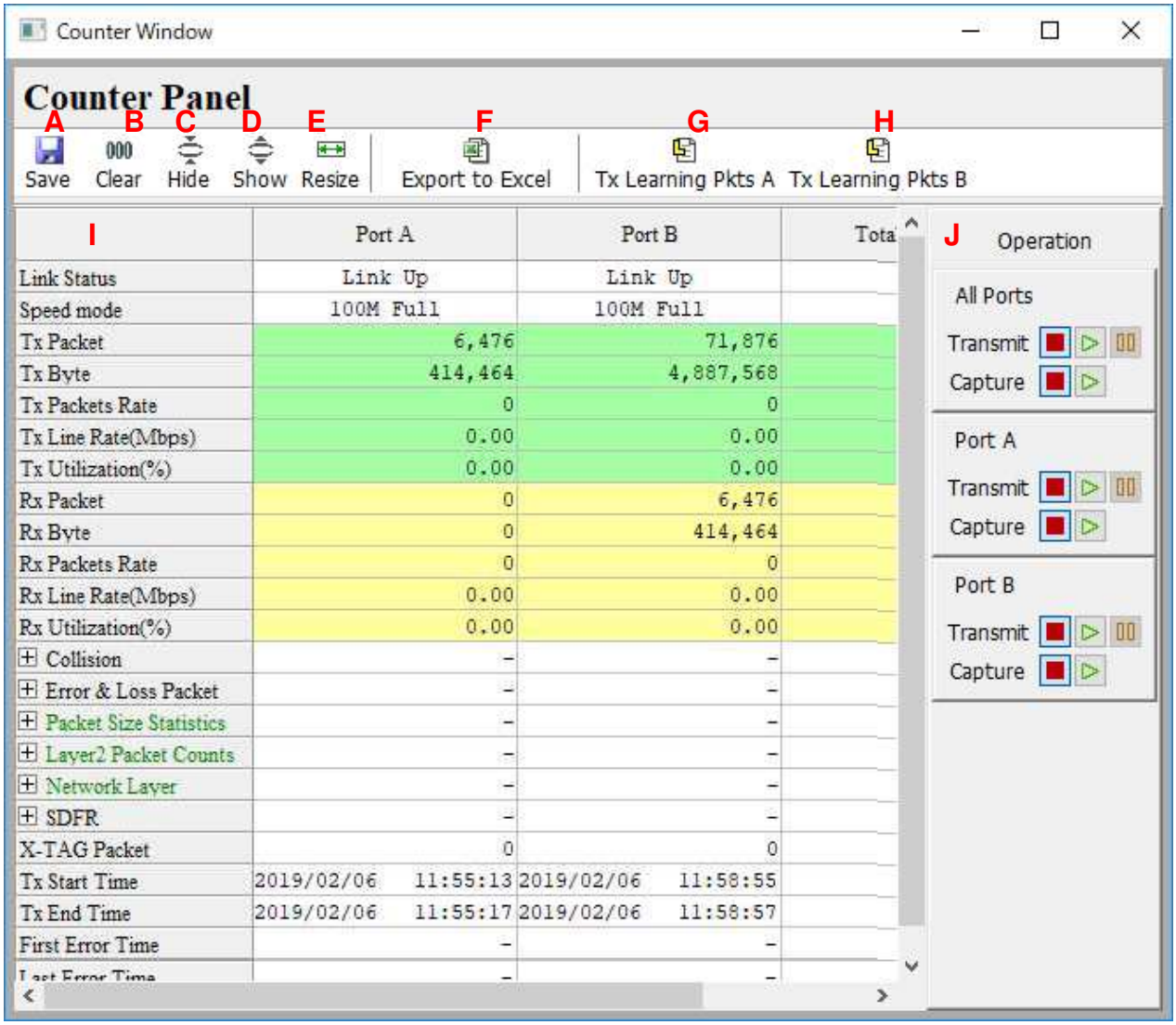
K: Item Name: Frame view of capture packets, such as Ethernet II

1.6. Control Panel

Click the 

button to pop up the Counter window.

Control button of this window can control packet generation and receiving, and also view the result counter



◆ Control buttons

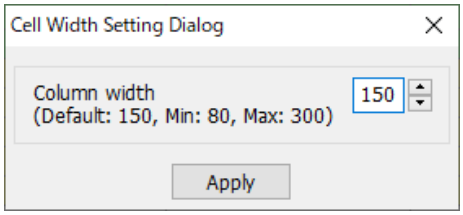
A: Save: Save current result of counters to Excel file

B: Clear: Clear all counters to zero and it is ready for next packet generation

C: Hide: Hide all the data that is zero.

D: Show: Show all the data of this window.

E: Resize: Adjust the width of the cell.



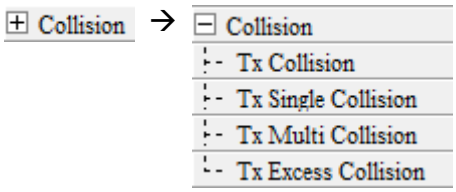
F: Export to Excel:

G: Tx Leaming PKts A: Transmit Learning packets from port A.

H: Tx Leaming PKts B: Transmit Learning packets from port B.

I: Counter: Counters for streams generation

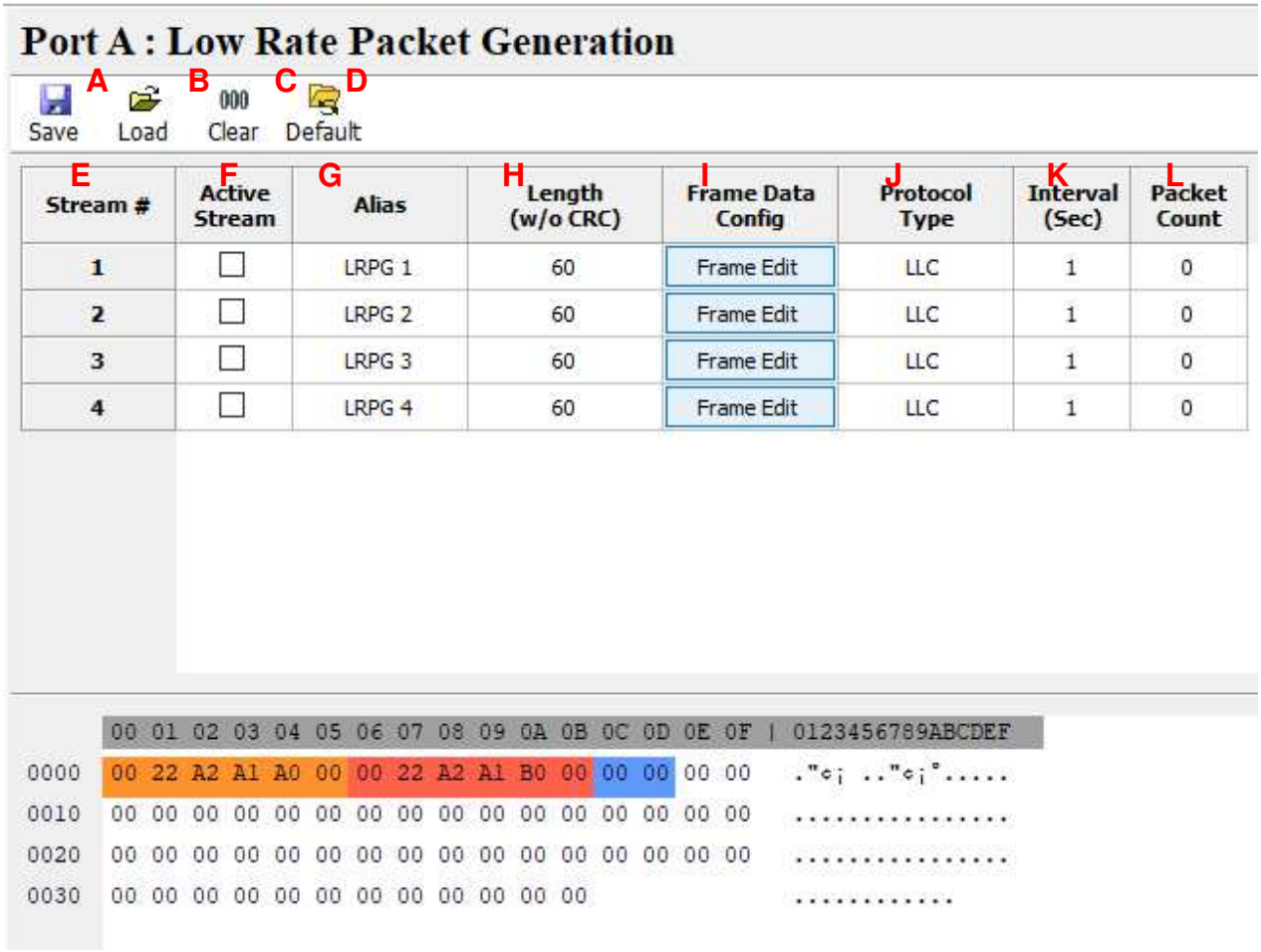
Counter with ⊞ mark is expansible. Please click the ⊞ mark



J: Operation: This option can activate Transmit or Capture of port A, port B or port A + B individually.

Button	Description
	Stop complete procedure of transmitting or capturing.
	Start to transmit or capture procedure
	Pause transmitting or capturing procedure. System still measure the statistics couter, however, the counter value is static for user to watch the status when user click the  button. When user click  again, the counter status resume to real status instantly. Click this button does not affect the real counters values

1.7. Low Rate Packet Generation



A: Save: Save the current settings.

B: load: Load the settings.

C: Clear: Clear the current value to zero

D: Default: Restore to the default settings.

E: Stream #: Show the number of streams.

F: Active Stream: User can tick the □ to active the stream generation of this stream.

G: Length (w/o CRC): Frame length in bytes without CRC

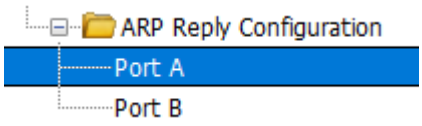
H: Frame Data Config: Configure the payload contents in frame.

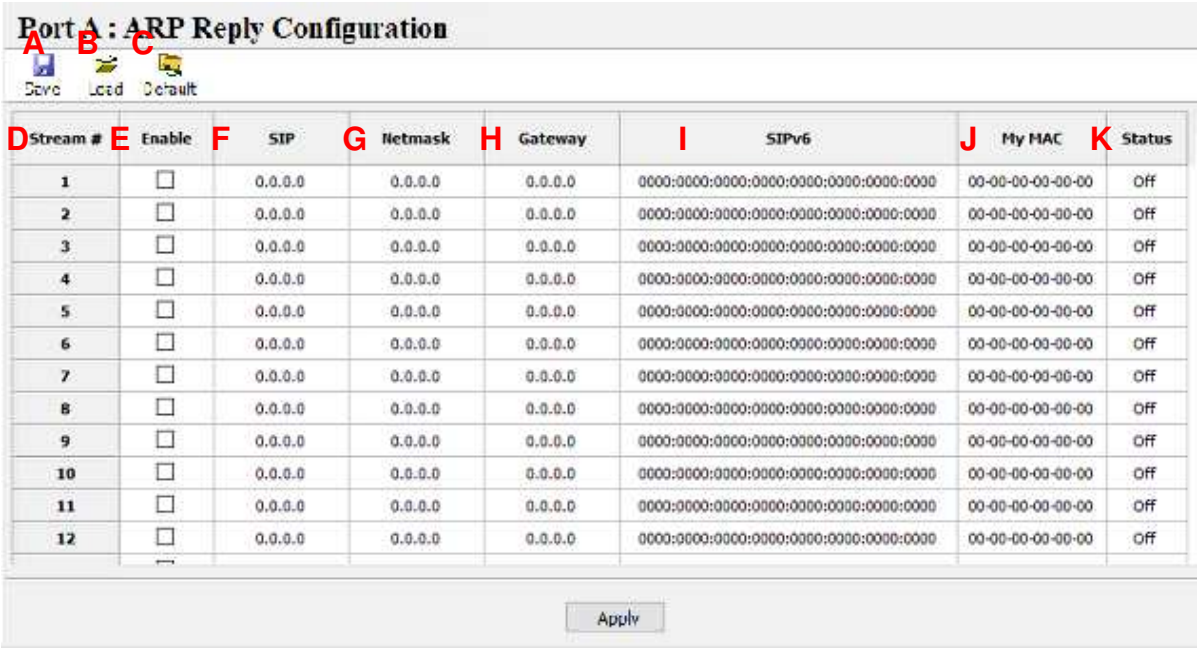
I: Protocol Type: System shows the Protocol Type when frame content is configured in

J: Interval(Sec): Sets the transmission interval.

K: Packet Count: Sets the number of packets to transmission.

1.8. ARP Reply Configuration





A: Save: Save the current settings.

B: load: Load the settings.

C: Default: Restore to the default settings.

D: Stream#: Show the number of streams.

E: Enable: User can tick the □ to active the stream generation of this stream.

F: SIP: Show or configure Source IPaddress.

G: Netmask: Show or configure Netmask.

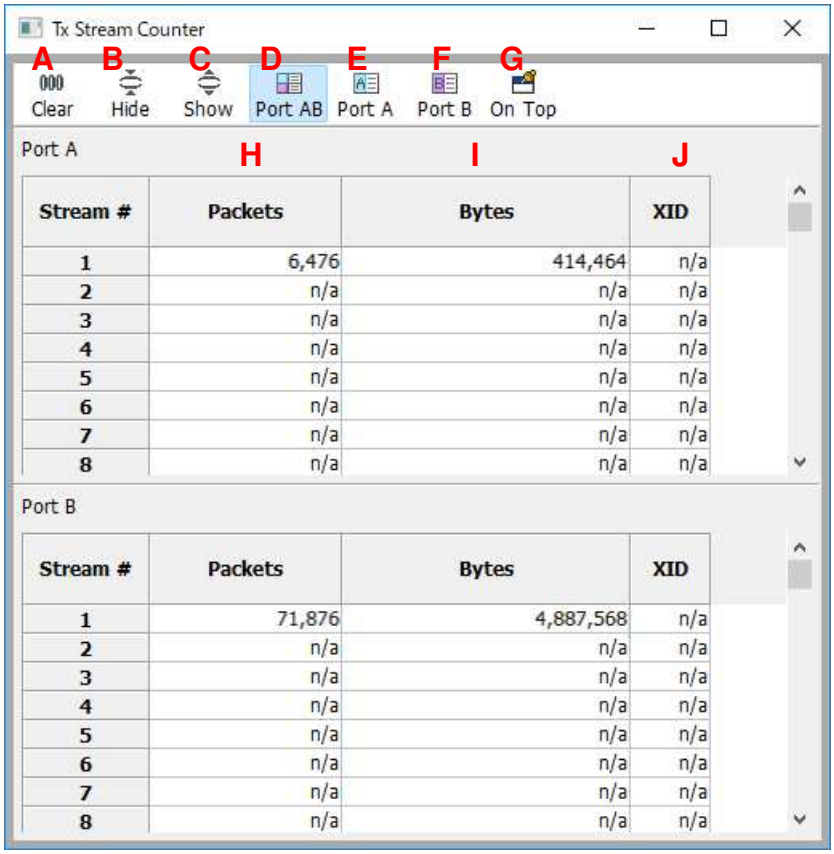
H: Gateway: Show or configure Default Gateway.

I: SIPv6: Show or configure Source IPaddress V6.

J: My MAC: Show or configure MAC Address.

K: Status: Show the transmission status.

1.9. Tx Stream Counter



A: Clear: Clear the current counters value to zero.

B: Hide Zero: Hide counter items that its counter value is zero.

C: Show: Show all the data of this window.

D: Port AB: Lists counters value of port A and port B simultaneously.

E: Port A: Lists counters value of port A only.

F: Port B: Lists counters value of port B only.

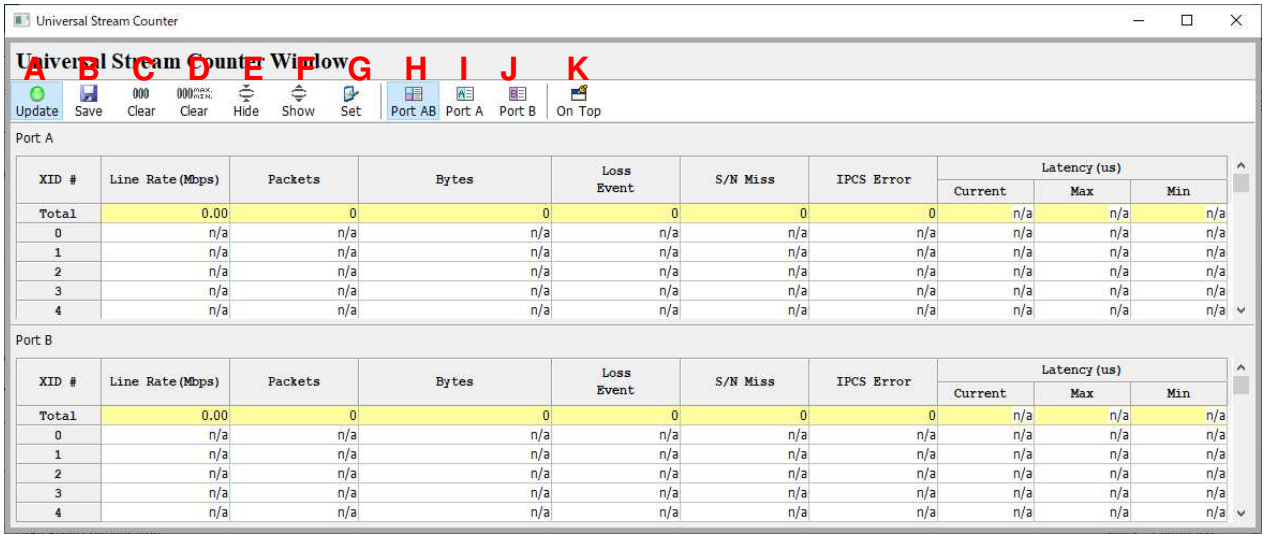
G: On Top: Display the window in front.

H: Packets: Show the number of packets.

I: Bytes: Show the number of bytes in the packets.

J: XID: Show the XID of the packets.

1.10. Universal Stream Counter



A: Update: The Update button allows you to pause or start the counter operation.

B: Save: Save current result of counters to Excel file.

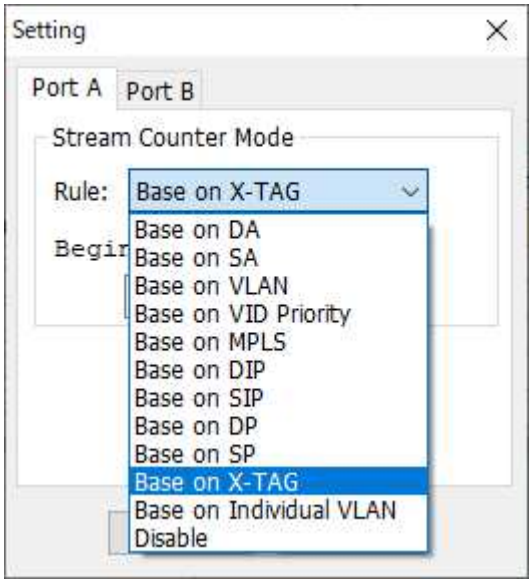
C: Clear: Clear all counters to zero.

D: Clear: Clear Max and Min counters to zero..

E: Hide: Hide all the data that is zero.

F: Show: Lists counters value of port B only.

G: Set: Click the button to pop up the Setting window. In this window, you may modify the Rule (Stream Counter Mode) of USC. The chosen mode will be shown in the side pointed by the red arrow. Click the Apply button to save this setting or Cancel to close this window without saving.



After applying your settings made on the Setting window, the changes will be shown on the Port Universal Streams Counter window.

XID #	Line Rate (Mbps)	Packets	Bytes	Loss Event	S/N Miss	IPCS Error	Latency (us)		
							Current	Max	Min
Total	0.00	368,331	23,573,184	0	0	0	n/a	n/a	n/a
6	0.00	368,331	23,573,184	0	0	0	n/a	0.00	0.00

H: Port AB: Show the PortA & B counter of this window.

I: Port A: Show the PortA counter of this window.

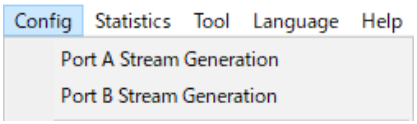
J: Port B: Show the PortB counter of this window.

K: On Top: Display the window in front.

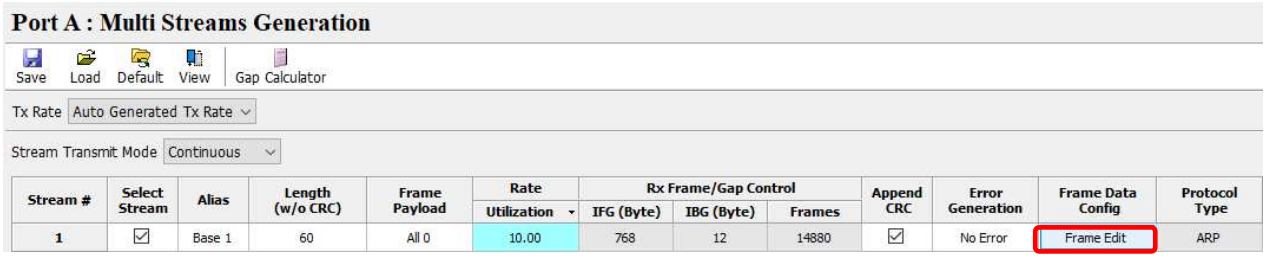
1.11. Frame Editor

To create the pattern and contents of the streams what user want to generate, the utility has Frame Editor function to create what user want.

Click 

button on toolbar or 

on operation menu, system shows

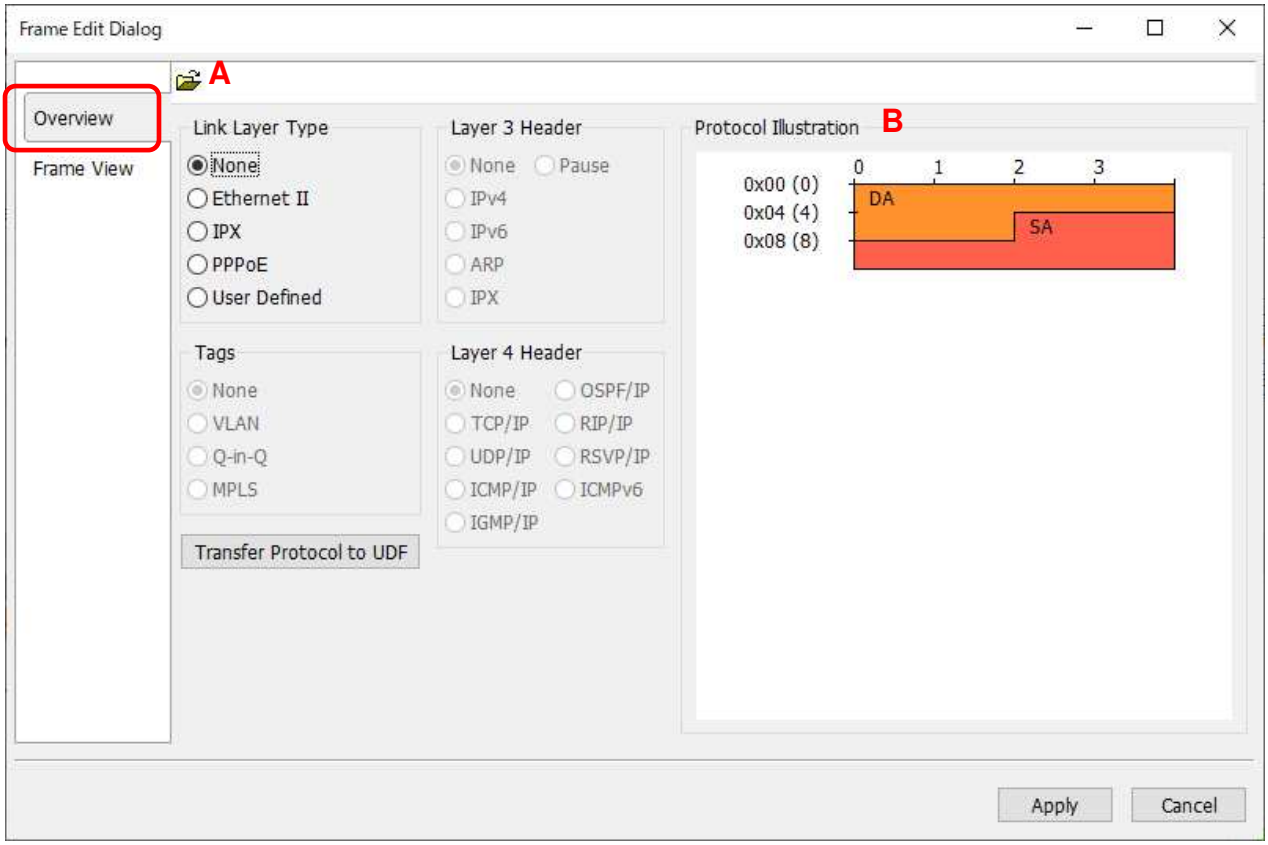


Configure related parameters, then user can click 

to edit the detailed contents in frame.

1.11.1. Overview

This window shows all frame type that is configurable. User can also import user-defined file (*.pcap of Ethereal or Wireshark) for test directly.



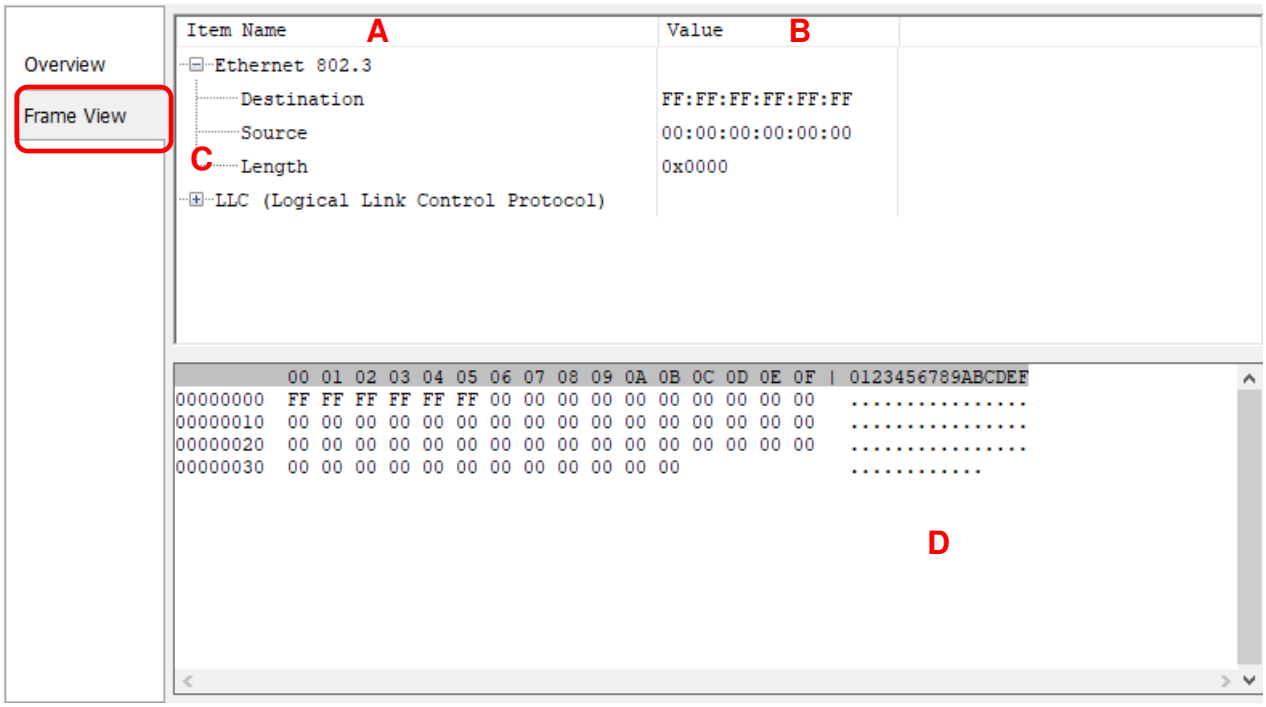
1.11.2. Import

Click the **A**: button and import the file from PC

B: Protocal Illustration: The figure shows the structure of packet/frame that will be generated. The figure is changeable, depending on the configuration of the packet/frame.

1.11.3. Frame View

This Frame View window shows the frame structure of the frame that user want to edit.



A: Item Name: Network protocal type

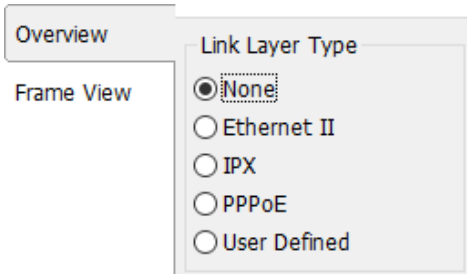
B: Value: the value in the protocal type

C: Click ⊞ can expend the items in protocal type

D: Contents of the edited frame/packet.

1.11.4. Data Link layer

Data Link Layer type of streams generation

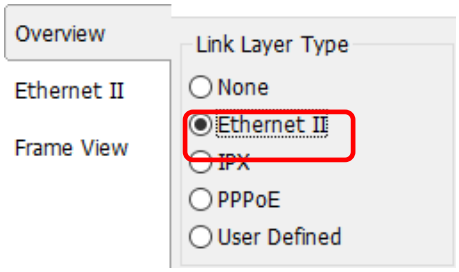


Data Link layer: The Data Link Layer is Layer 2 of the seven-layer OSI model of computer networking. The Data Link Layer protocols respond to service requests from the Network Layer and they perform their function by issuing service requests to the Physical Layer.

Several protocols options can be chosen for the test.

1.11.4.1. Ethernet II

Ethernet II: The most common Ethernet protocol currently used on LAN



User can configure the MAC address of DUT.

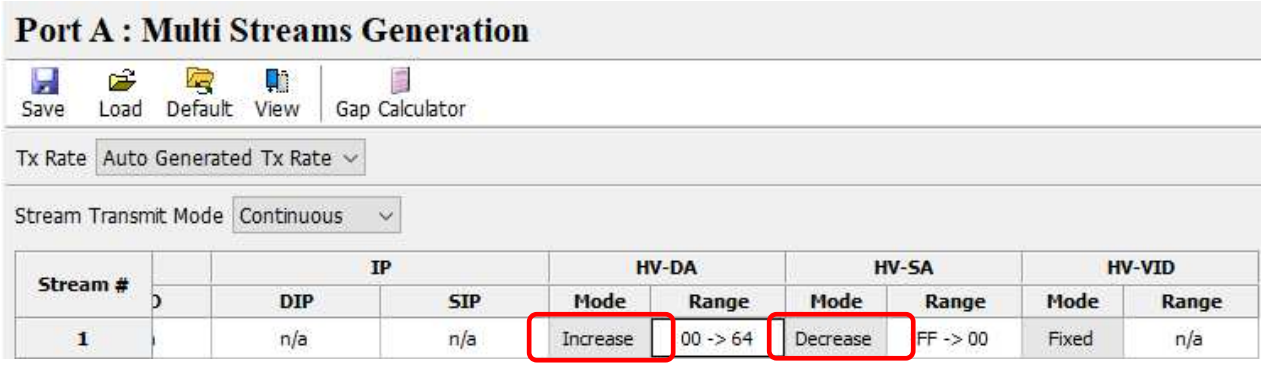
Destination Address (DA): Default: FF:FF:FF:FF:FF:FF, means broadcast frame. To use variation of DA function, this MAC address is the start MAC address

Source Address (SA): Default: 00:00:00:00:00:00, means the MAC address of this device itself. To use variation of SA function, this MAC address is the start MAC address

1.11.4.2. Variation of DA, SA and VID

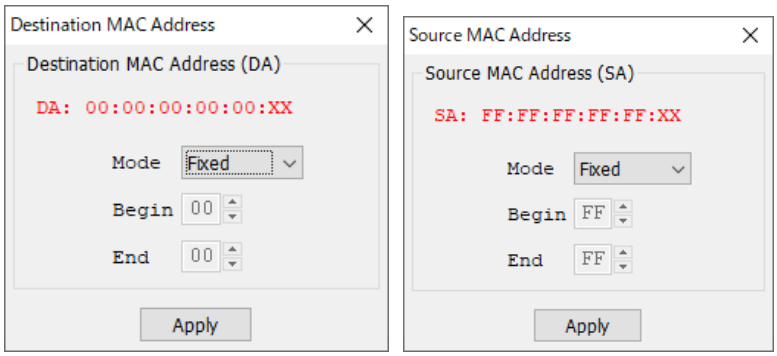
The DA and SA is variable if increase or decrease selection is selected

DA, SA of Default Multi Streams generation is fixed



User can click the selection and change it to increase or decrease and also specify a range of variation as the example below

HV-DA		HV-SA	
Mode	Range	Mode	Range
Increase	00 -> 64	Decrease	FF -> 00

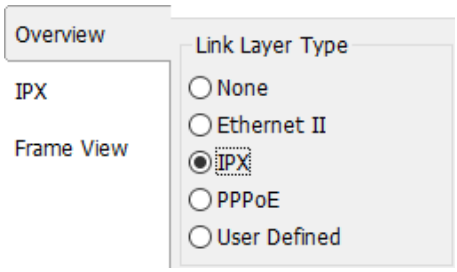


Assume that the DA is 00-00-21-5C-0A-22, Assume that the DA is 00-00-21-5C-0B-22

- When increase mode is selected, the last 2 hexdecimal digits will be 22, 23, 24…till the counts of the range, for example, 100.
- When decrease mode is selected, the last 2 hexdecimal digits will be 22, 21, 20…till the counts of the range, for example, 150.

1.11.4.3. IPX

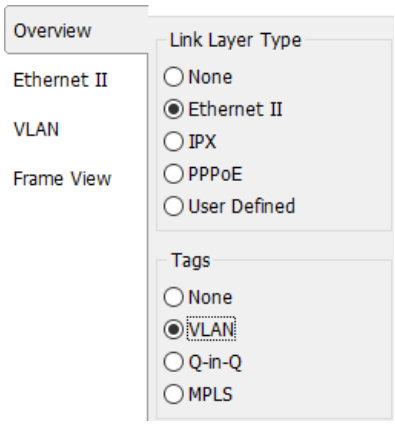
IPX: Internetwork Packet Exchange (IPX) is the OSI-model Network layer protocol in the IPX/SPX protocol stack. The IPX/SPX protocol stack is supported by Novell's NetWare network operating system.



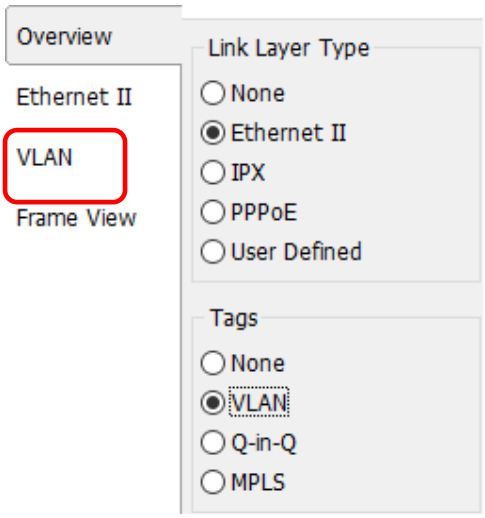
This editor of IPX will added if required.

1.11.5. Tags

When Ethernet II of Data Link Layer is selected, extra tag options is available.
When Ethernet II is selected. Tags option is opened

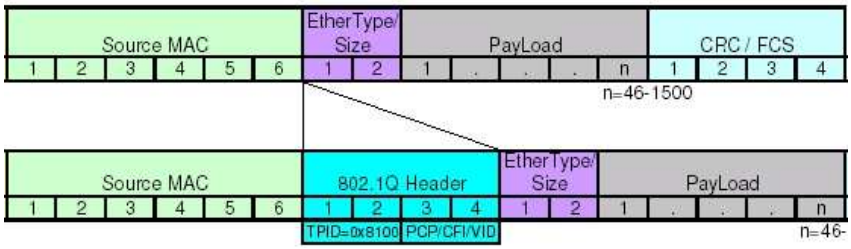


1.11.5.1. VLAN



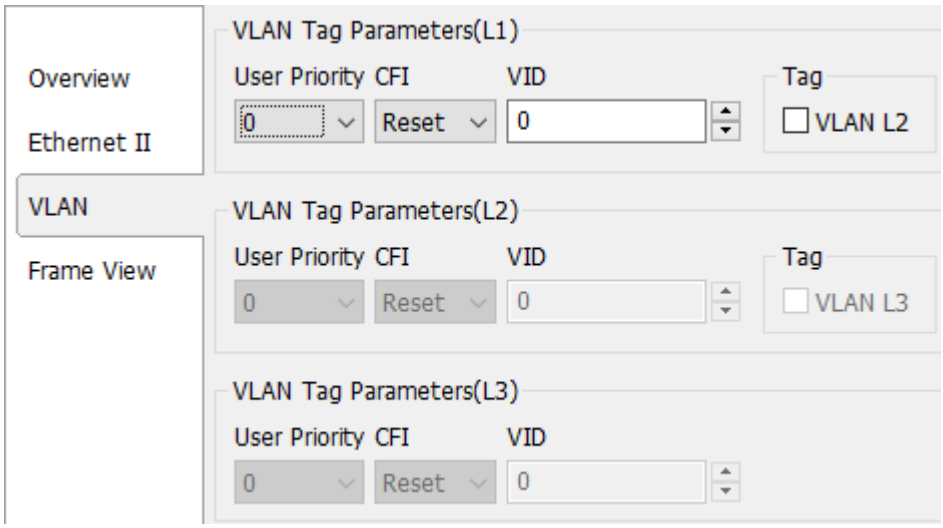
A virtual LAN, commonly known as a VLAN, is a group of hosts with a common set of requirements that communicate as if they were attached to the Broadcast domain, regardless of their physical location.
The protocol most commonly used today in configuring virtual LANs is IEEE 802.1Q.

IEEE 802.1Q adds a 32-bit field between the source MAC address and the EtherType/Length fields of the original frame. The VLAN tag field has the following format:



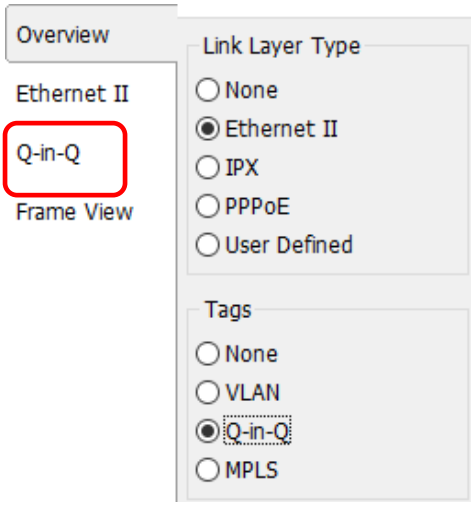
VLAN Tag in Ethernet Frame

To configure the VLAN for streams generation, click the VLAN Tab

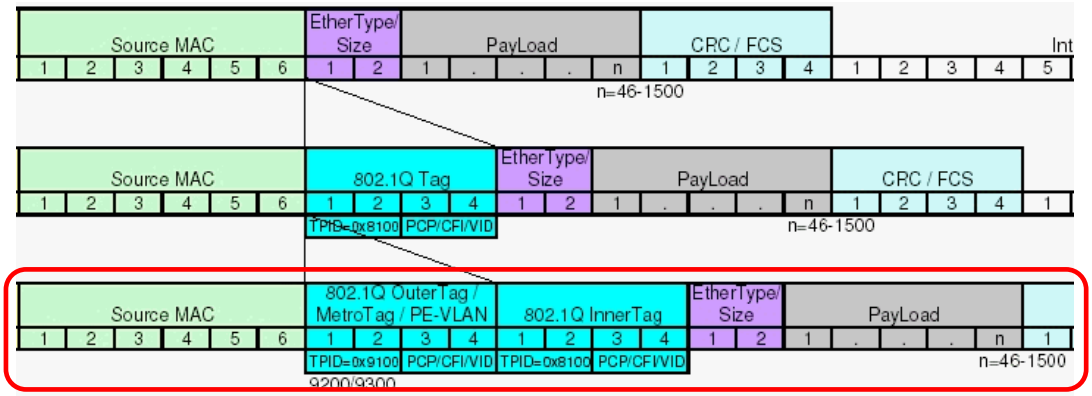


User priority (also called COS, class of service) and VID are most common parameter for the test

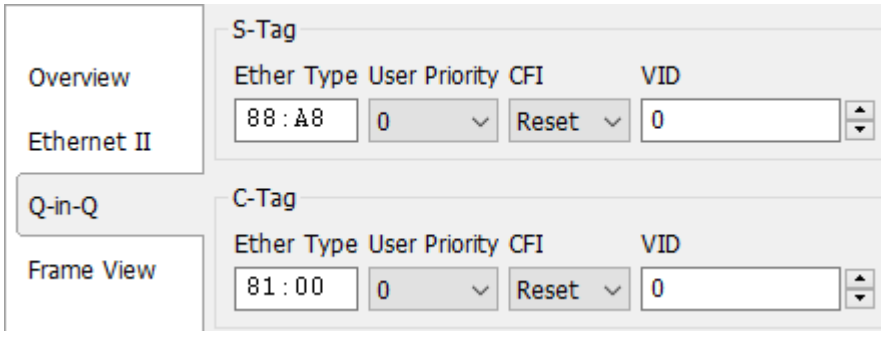
1.11.5.2. Q-in-Q



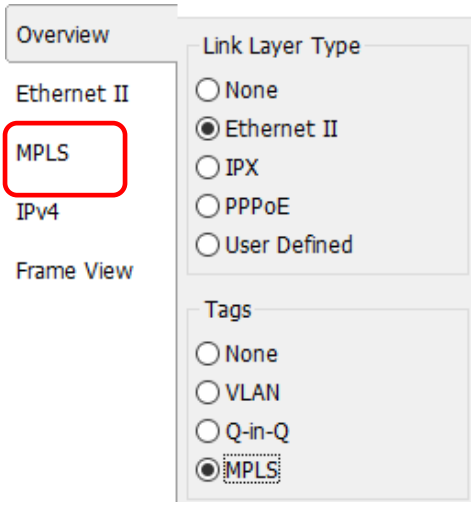
IEEE 802.1ad (Provider Bridges) is an amendment to IEEE standard IEEE 802.1Q-1998 and it is called Q-in-Q or Stacked VLANs



To configure the Q-in-Q for streams generation, click the Q-in-Q Tab



1.11.5.3. MPLS

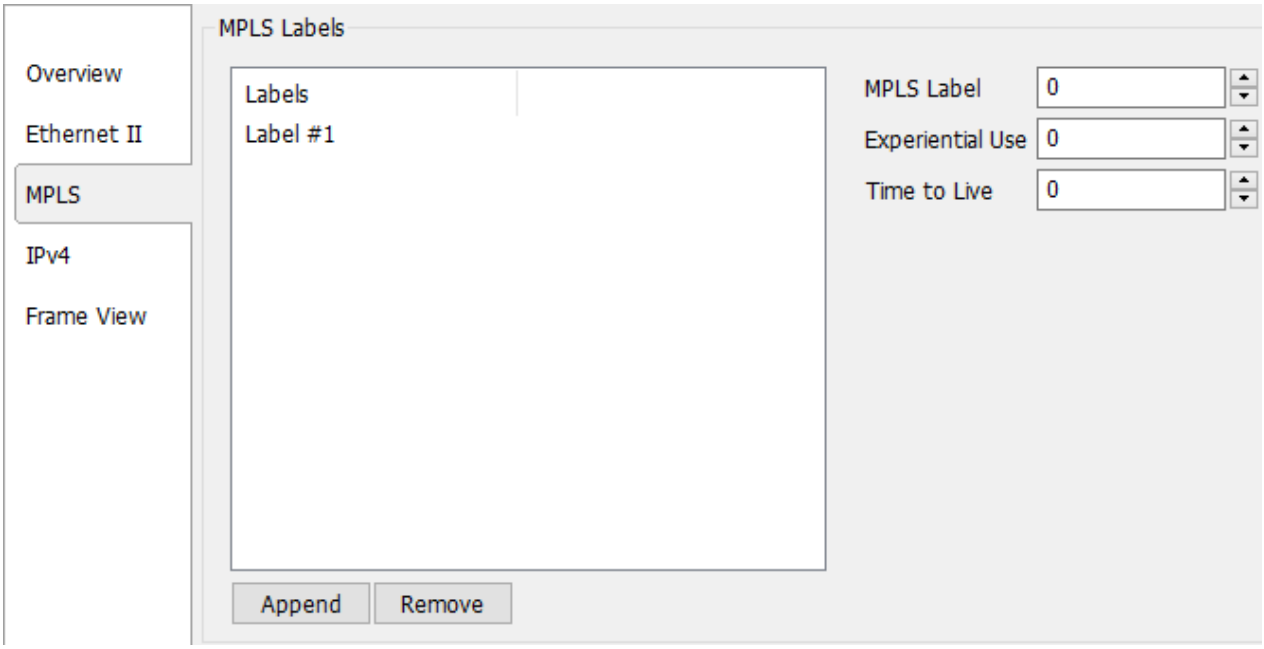


In computer networking and telecommunications, Multiprotocol Label Switching (MPLS) refers to a mechanism that directs and transfers data between Wide Area Networks (WANs) nodes with high performance, regardless of the content of the data. MPLS makes it easy to create "virtual links" between nodes on the network, regardless of the protocol of their encapsulated data.

MPLS works by prefixing packets with an MPLS header, containing one or more 'labels'. This is called a label stack. Each label stack entry contains four fields:

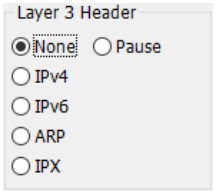
- A 20-bit label value.
- A 3-bit Traffic Class field for QoS (Quality of Service) priority (experimental) and ECN (Explicit Congestion Notification).
- A 1-bit bottom of stack flag. If this is set, it signifies that the current label is the last in the stack.
- An 8-bit TTL (time to live) field.

This can be defined by the configuration of this utility.

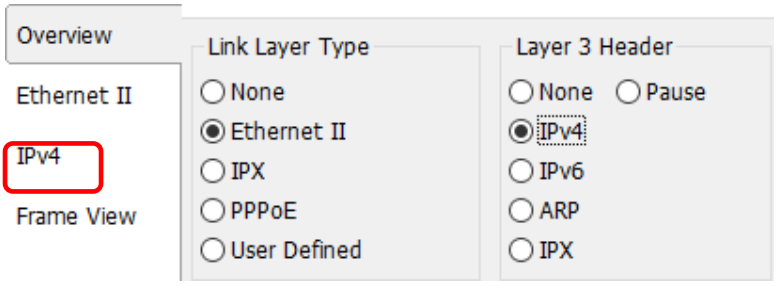


1.11.6. Layer 3 Header

In the payload of frame, layer 3 header as the items below is configurable



1.11.6.1. IPv4

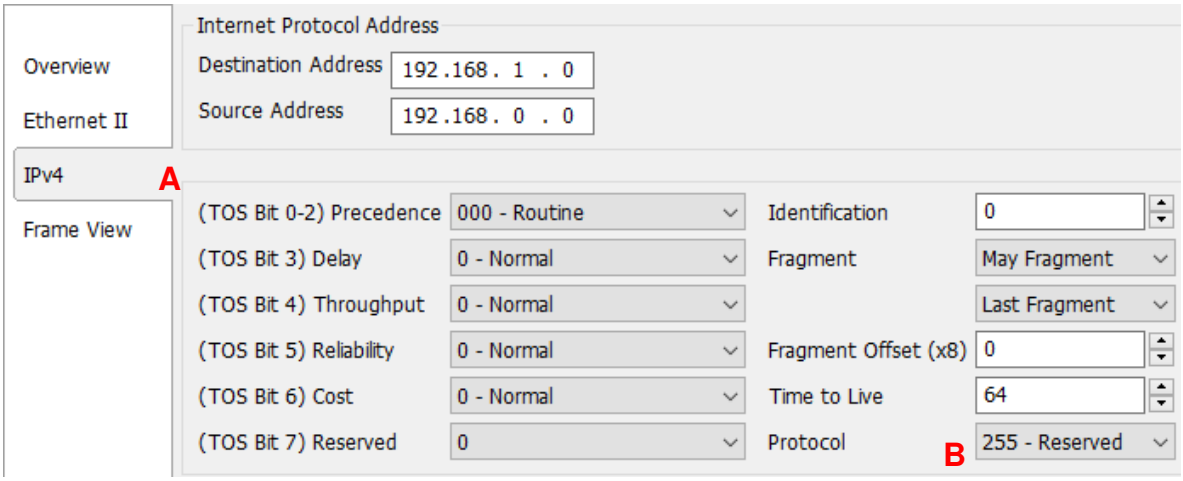


IPv4: Internet Protocol version 4 (IPv4) is the fourth revision in the development of the Internet Protocol (IP) and it is the first version of the protocol to be widely deployed.

The structure of IP header is illustrated below

bit offset	0–3	4–7	8–15	16–18	19–31
0	Version	Header length	Differentiated Services	Total Length	
32	Identification			Flags	Fragment Offset
64	Time to Live		Protocol	Header Checksum	
96	Source Address				
128	Destination Address				
160	Options				
160 or 192+	Data				

The utility has user configurable interface to match the structure of IPv4 header



A: Differentiated Services (DS) was originally defined as the TOS (**Type of Services**) field; this field is now defined by RFC 2474 for Differentiated services (DiffServ) and by RFC 3168 for Explicit Congestion Notification (ECN), matching IPv6.

B: Most common protocols numbers are listed below and the utility has detail configuration of these protocol.

1: Internet Control Message Protocol (ICMP)

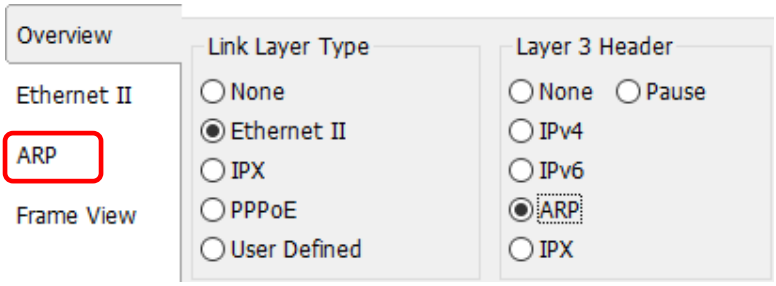
2: Internet Group Management Protocol (IGMP)

6: Transmission Control Protocol (TCP)

17: User Datagram Protocol (UDP)

IPv6: This protocol will be supported later.

1.11.6.2. ARP

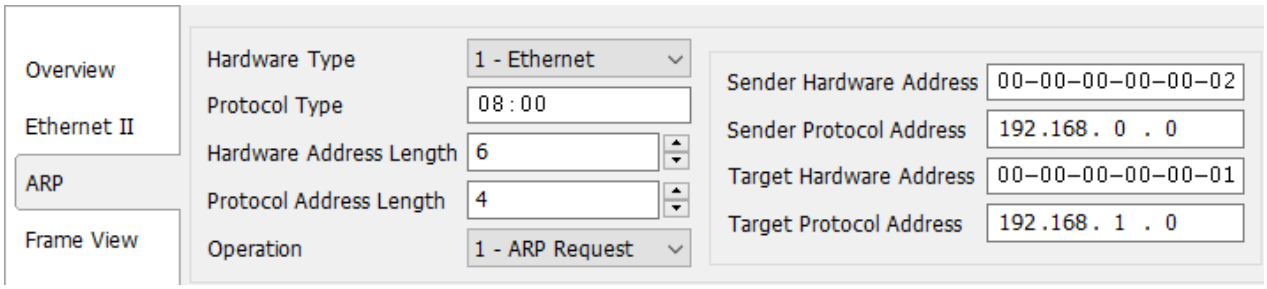


ARP: Address Resolution Protocol (ARP) is the method for finding a host's link layer (hardware) address when only its Internet Layer (IP) or some other Network Layer address is known. ARP is primarily used to translate IP addresses to Ethernet MAC addresses.

The structure of ARP header is illustrated below

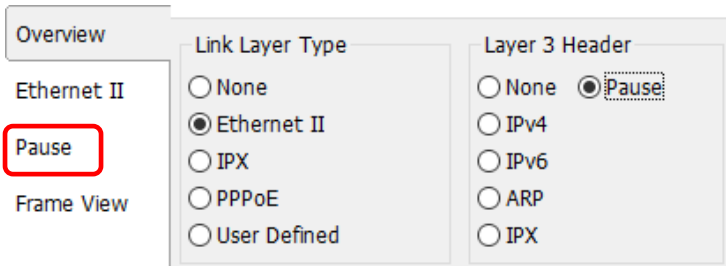
bit offset	0 - 7	8 - 15	16 - 31
0	Hardware type (HTYPE)		Protocol type (PTYPE)
32	Hardware length (HLEN)	Protocol length (PLEN)	Operation (OPER)
64	Sender hardware address (SHA) (first 32 bits)		
96	Sender hardware address (SHA) (last 16 bits)		Sender protocol address (SPA) (first 16 bits)
128	Sender protocol address (SPA) (last 16 bits)		Target hardware address (THA) (first 16 bits)
160	Target hardware address (THA) (last 32 bits)		
192	Target protocol address (TPA)		

The utility has user configurable interface to match the structure of ARP header

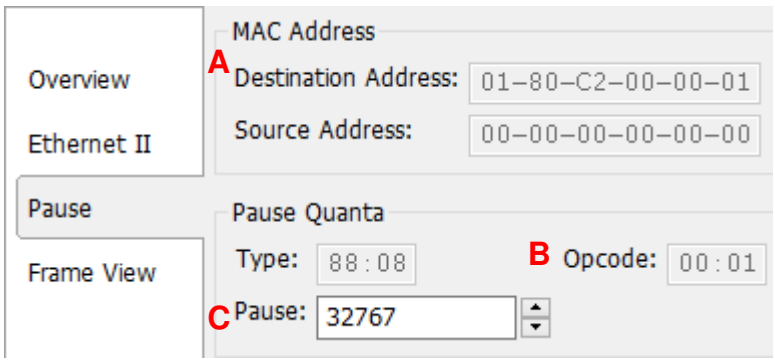


◆**D**: IPX: Reserve function for next version

1.11.6.3. Pause



Pause: PAUSE is a flow control mechanism on full duplex Ethernet link segments defined by IEEE 802.3x and uses MAC Control frames to carry the PAUSE commands.



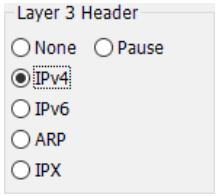
A: Destination Address: 01:80:C2:00:00:01. This particular address has been reserved for use in PAUSE frames.

B: Opcode: The MAC Control opcode for PAUSE is 00:01 (0X0001 in hexadecimal)

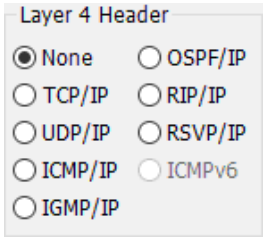
C: A PAUSE frame includes the period of pause time being requested, in the form of two byte unsigned integer (0 through 65535). This number is the requested duration of the pause.

1.11.7. Layer 4 Header

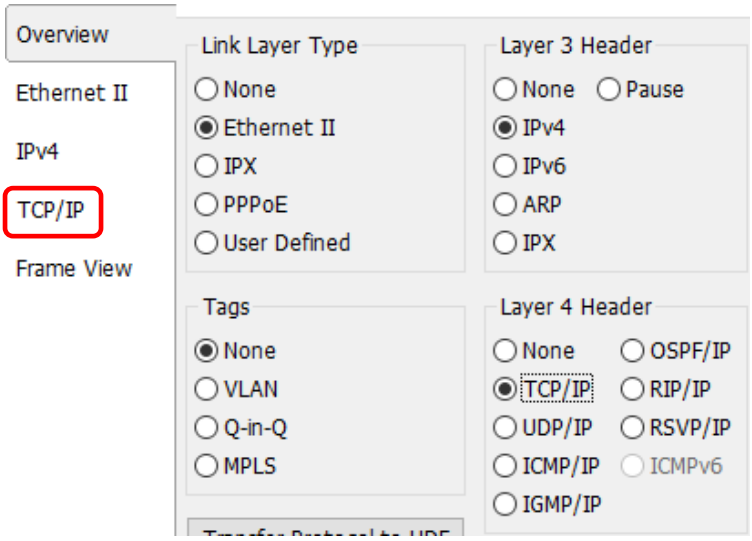
In the payload of frame, if IPv4 is selected



Then Layer 4 header as below is configurable



1.11.7.1. TCP/IP



The Transmission Control Protocol (TCP) is one of the core protocols of the Internet Protocol Suite.

The structure of TCP segment is illustrated below. The TCP header starts after bit 160 of the IP header.

TCP Header

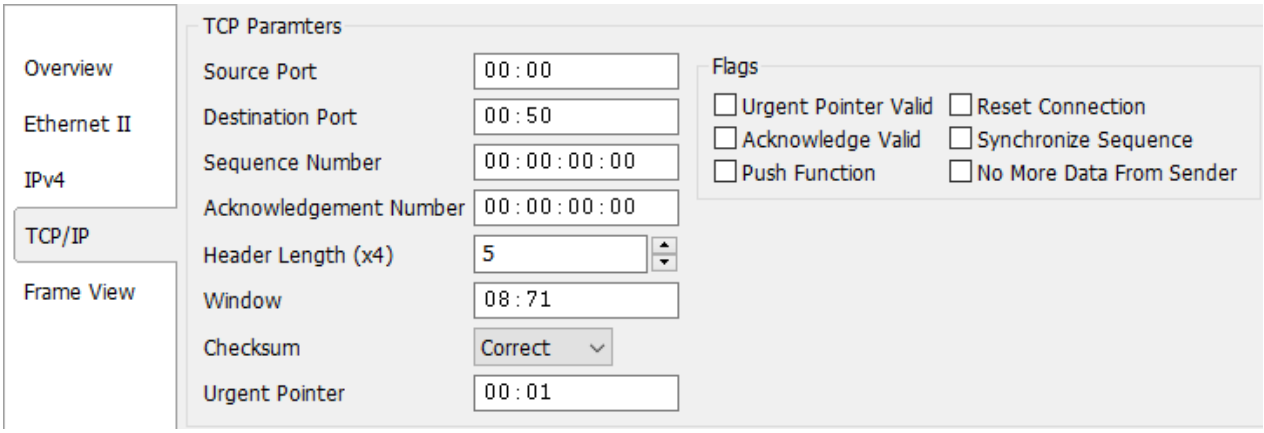
Bit offset	0–3	4–7	8–15	16–31
0	Source port			Destination port
32	Sequence number			
64	Acknowledgment number			
96	Data offset	Reserved	CWR ECE URG ACK PSH RST SYN FIN	Window Size
128	Checksum			Urgent pointer
160	Options (optional)			
160/192+	Data			

Flags (8 bits) (called Control bits) – contains 8 1-bit flags

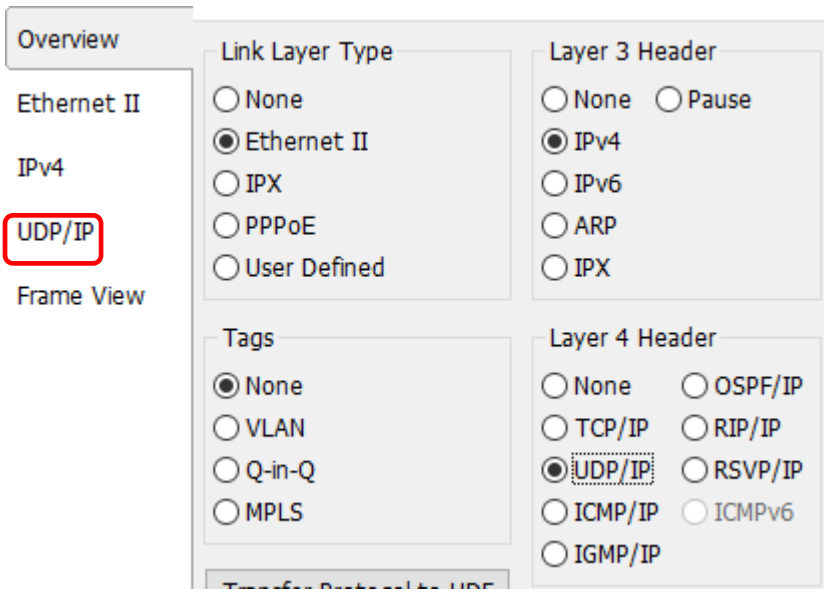
- CWR (1 bit) – Congestion Window Reduced (CWR) flag is set by the sending host to indicate that it received a TCP segment with the ECE flag set (added to header by RFC 3168).
- ECE (ECN-Echo) (1 bit) – indicate that the TCP peer is ECN capable during 3-way handshake (added to header by RFC 3168).
- URG (1 bit) – indicates that the URGent pointer field is significant
- ACK (1 bit) – indicates that the ACKnowledgment field is significant

- PSH (1 bit) – Push function
- RST (1 bit) – Reset the connection
- SYN (1 bit) – Synchronize sequence numbers
- FIN (1 bit) – No more data from sender

The utility has user configurable interface to match the structure of TCP segment



1.11.7.2. UDP/IP



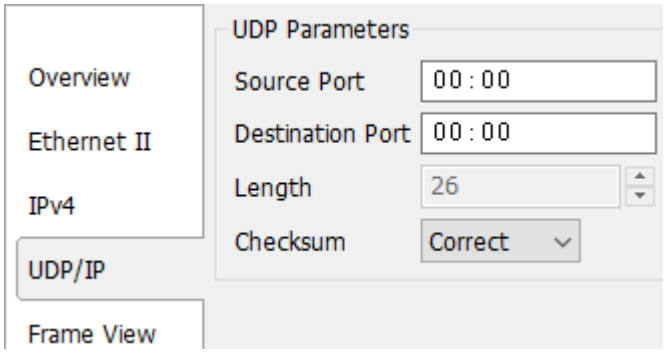
UDP/IP

The User Datagram Protocol (UDP) is one of the core members of the Internet Protocol Suite, the set of network protocols used for the Internet.

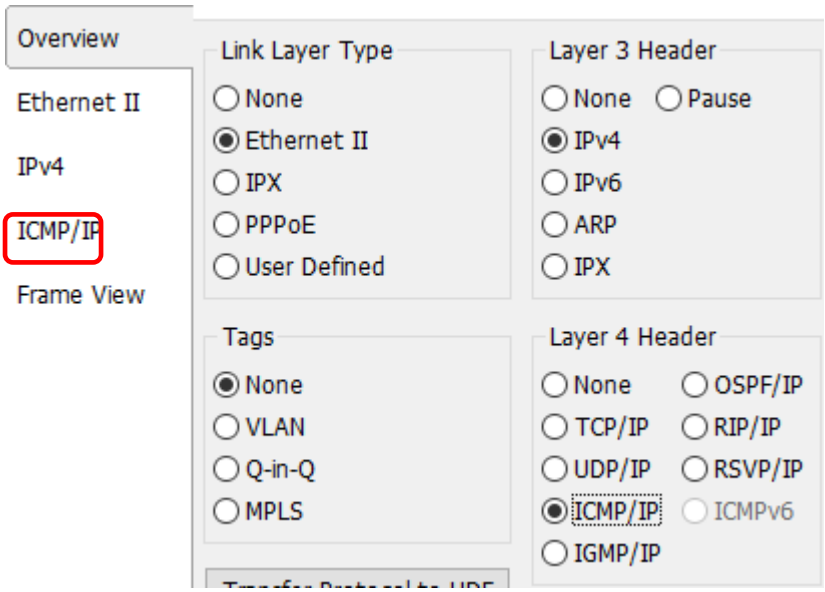
The structure of UDP segment is illustrated below. The UDP segment starts after bit 160 of the IP header

bits	0 - 15	16 - 31
0	Source Port	Destination Port
32	Length	Checksum
64	Data	

The utility has user configurable interface to match the structure of UDP segment



1.11.7.3. ICMP/IP



ICMP/IP

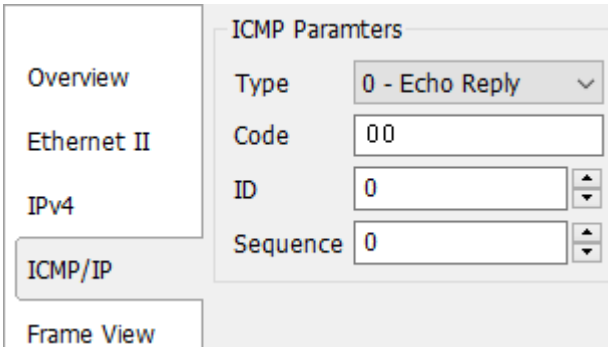
The Internet Control Message Protocol (ICMP) is one of the core protocols of the Internet Protocol Suite.

The structure of ICMP segment is illustrated below

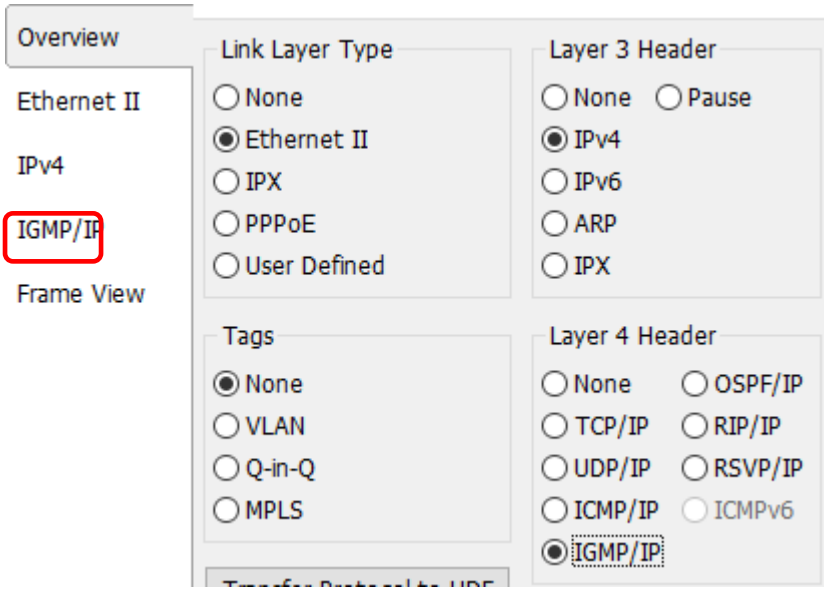
The ICMP header starts after bit 160 of the IP header

Bits	160-167	168-175	176-183	184-191
160	Type	Code	Checksum	
192	ID		Sequence	

The utility has user configurable interface to match the structure of ICMP segment



1.11.7.4. IGMP/IP



IGMP/IP

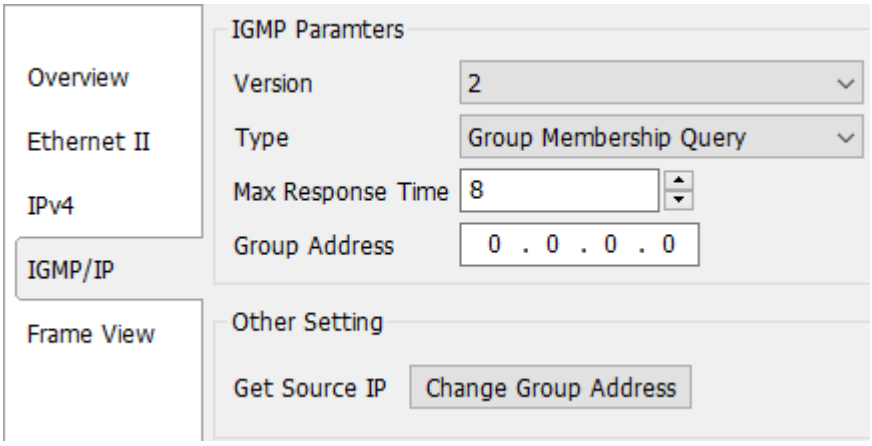
The Internet Group Management Protocol (IGMP) is a communications protocol used to manage the membership of Internet Protocol multicast groups.

The structure of IGMP segment is illustrated below. The IGMP header starts after bit 160 of the IP header

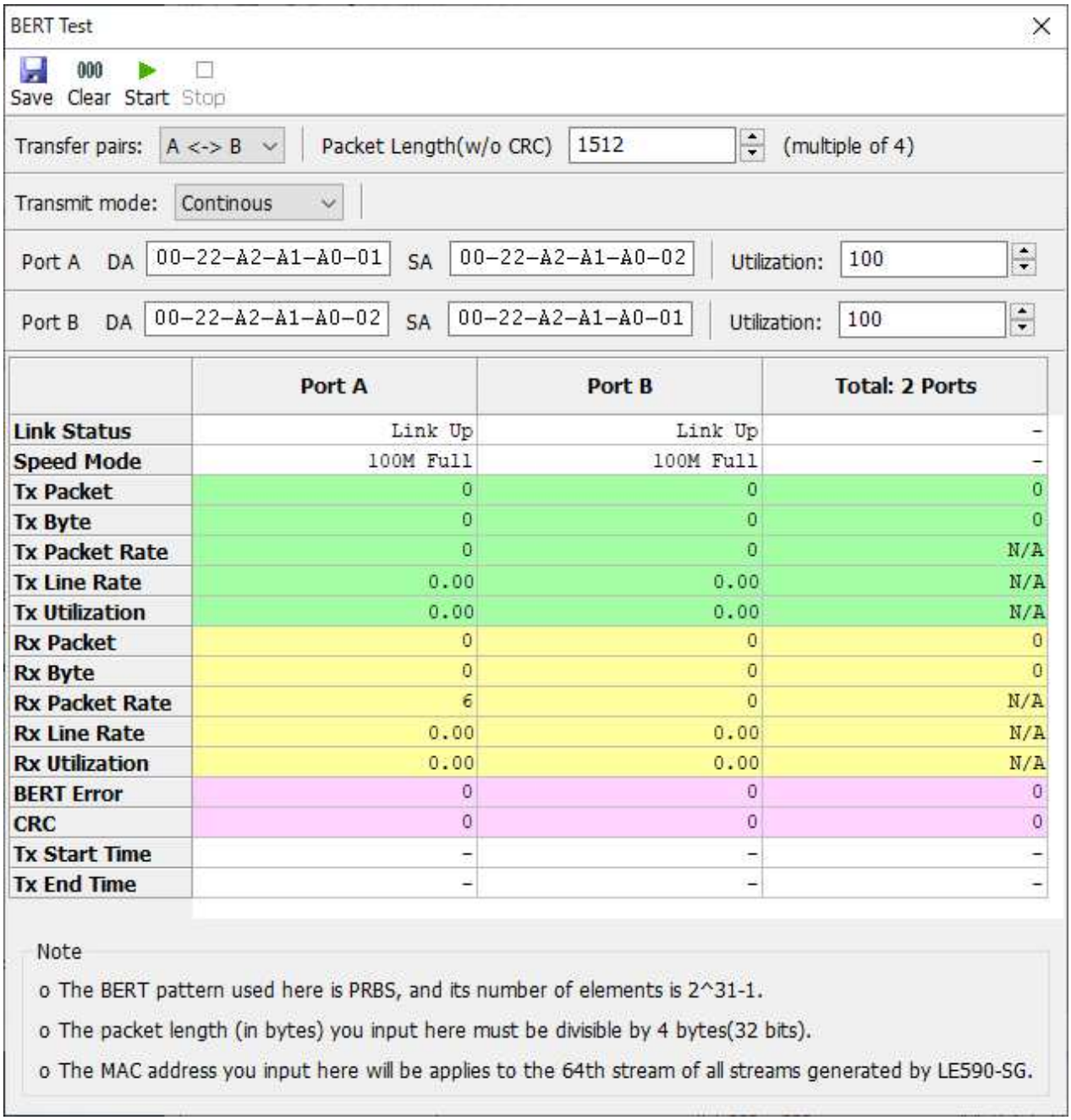
+	Bits 0 - 7	8 - 15	16 - 23	24 - 31
0	Type	Max Resp Time	Checksum	
32	Group Address			

The utility has user configurable interface to match the structure of IGMP segment

There are three versions of IGMP



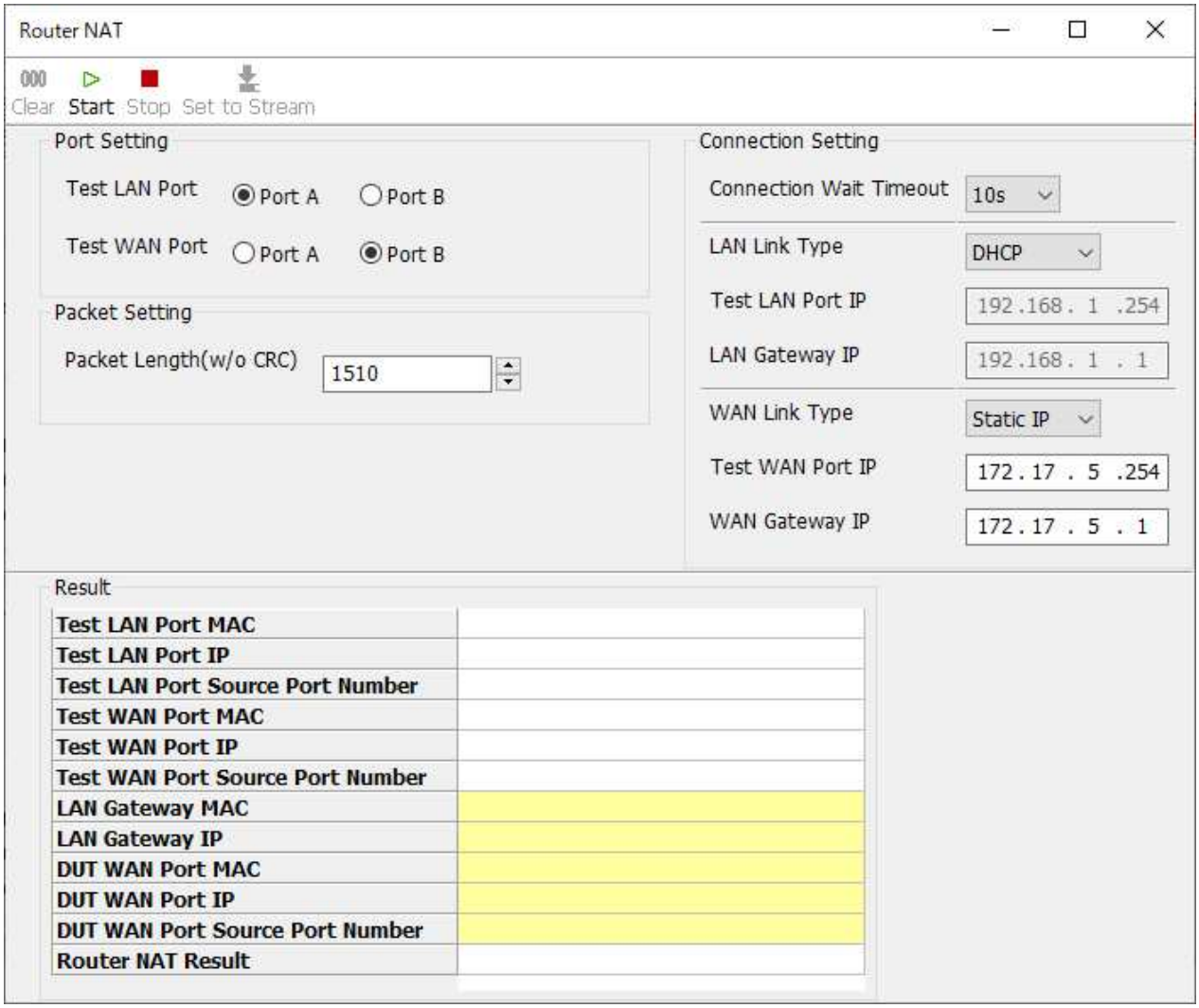
1.12. BERT



	Port A	Port B	Total: 2 Ports
Link Status	Link Up	Link Up	-
Speed Mode	100M Full	100M Full	-
Tx Packet	0	0	0
Tx Byte	0	0	0
Tx Packet Rate	0	0	N/A
Tx Line Rate	0.00	0.00	N/A
Tx Utilization	0.00	0.00	N/A
Rx Packet	0	0	0
Rx Byte	0	0	0
Rx Packet Rate	6	0	N/A
Rx Line Rate	0.00	0.00	N/A
Rx Utilization	0.00	0.00	N/A
BERT Error	0	0	0
CRC	0	0	0
Tx Start Time	-	-	-
Tx End Time	-	-	-

The bit error rate test (BERT) function transmits a pattern from each port, checks the received pattern, and verifies the transmission quality.
While the BERT operates, the contents of the packet to be transmitted are switched to those of the BERT setting.

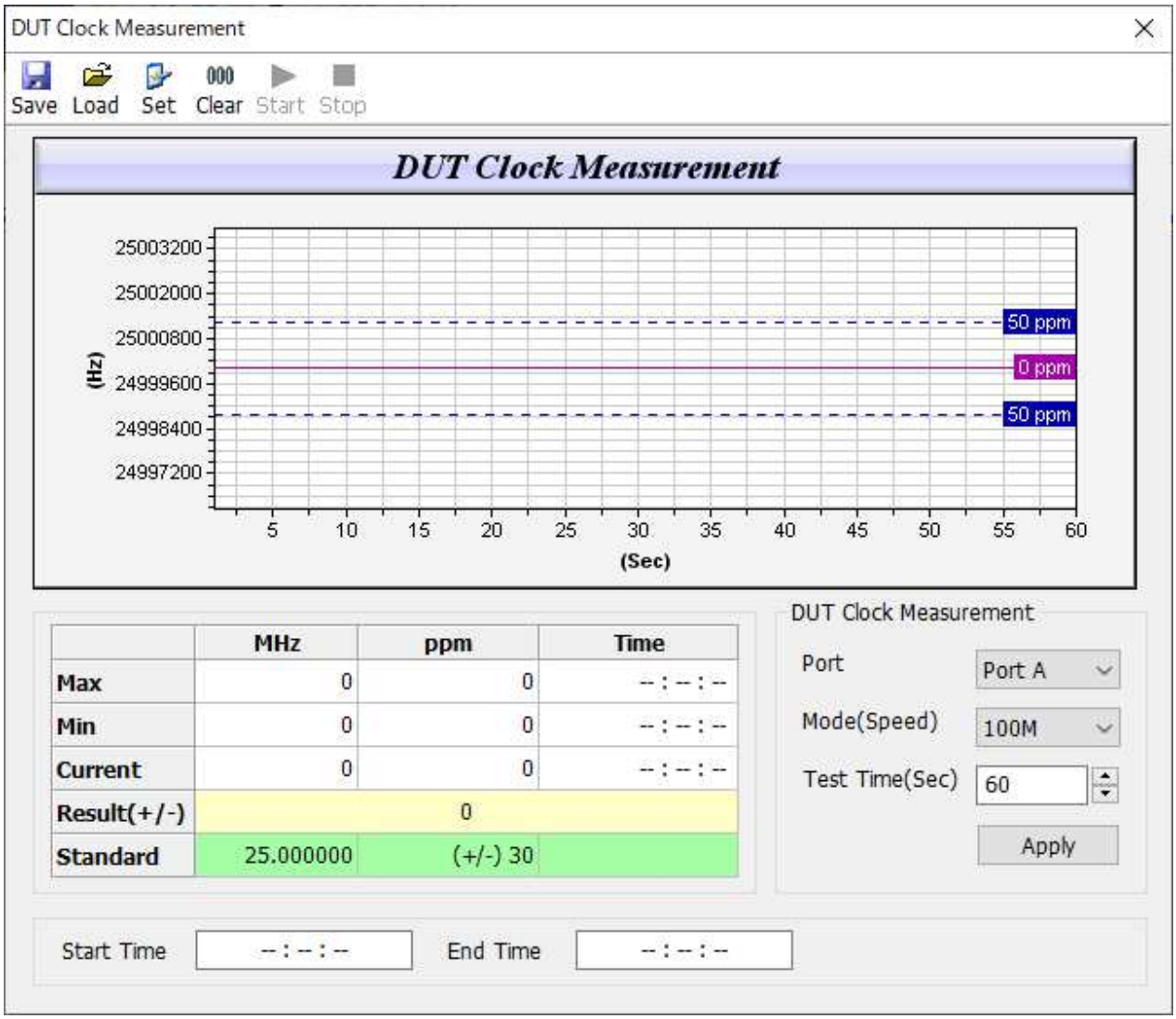
1.13. Router NAT



Validates the address translation (NAT) of the router. While the router NAT is running, the contents of the packet being sent are switched to the router NAT configuration.

1.14. DUT Clock Measurment

With the LE-590TX's high-accuracte (1ppm) temperature compensated oscillator it measures the oscillator frequency of DUT (device under test) and evaluates whether it is faster or slower than the standard speed (ppm scale).

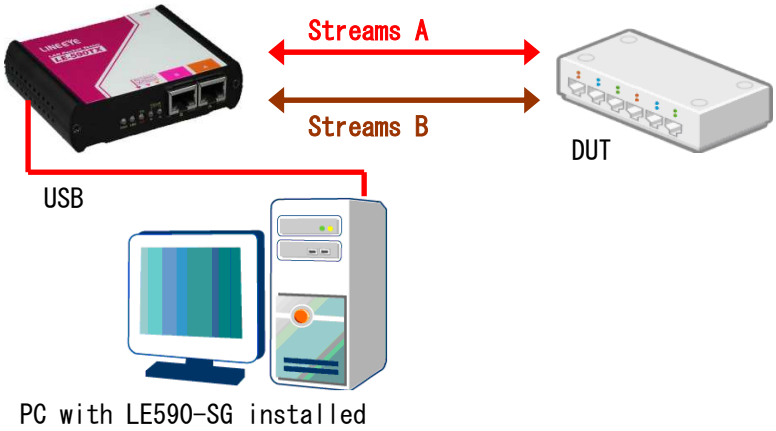


2. Operation of LE-590TX with LE590-SG

To chapter tell you how to use this device to test the DUT

2.1. Hardware connection

To use this device, user can connect it to DUT as the illustration below



Then LE-590TX can generate test stream to DUT and also receive data stream from DUT for analysis

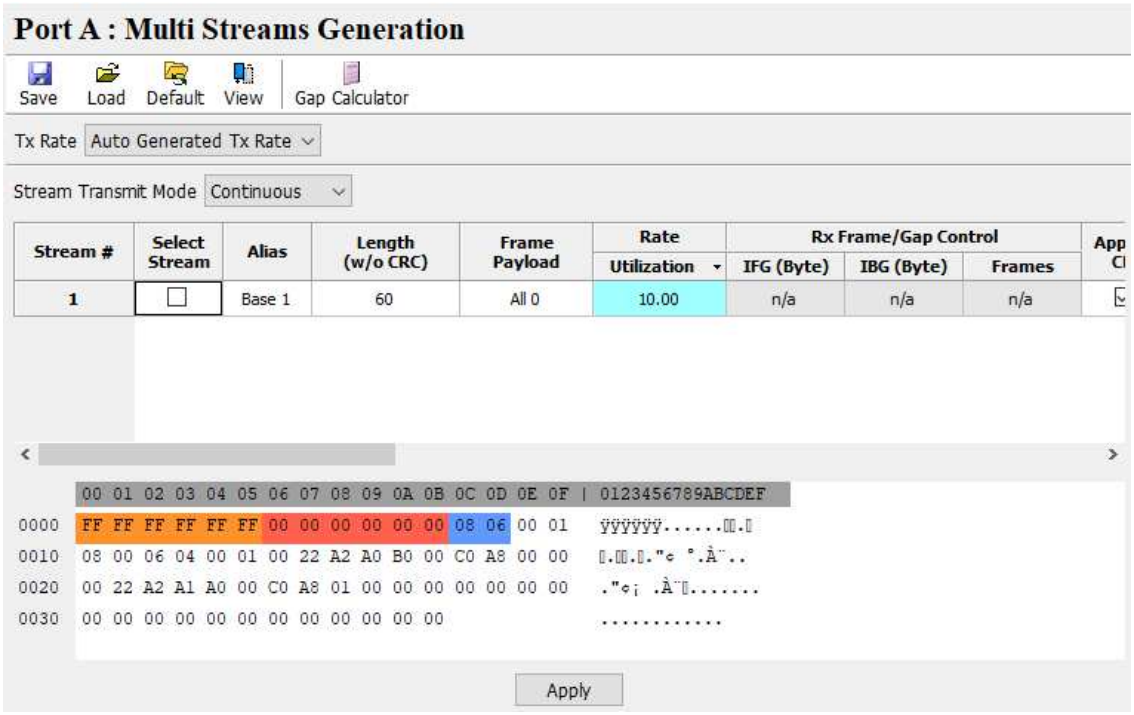
2.2. Operation of LE590-SG

2.2.1. Generate Test Streams to DUT

To generate the test streams, user should configure the pattern and contents of the test streams

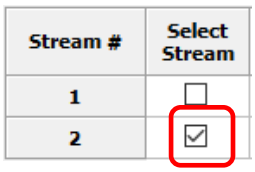
Click 

, System shows

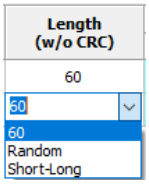


Select the streams volume user want to generate. It can be 1~64

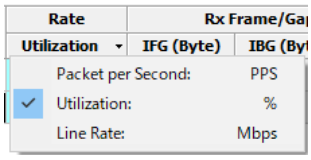
User can create many streams; however, only tick streams that user want to send



Double click value in the grid of length, then user can change the value. Select random or input the length directly.



Select the unit and input the value of the parameter that the packets will be generated.



PPS: Packet per Second. Volume of packets that will be generated per second.

Utilization: Percentage of Wirespeed transmission

Line Rate: Mbytes per second in transmission

Tick to activate X-TAG if user needs

X-TAG	
En	X-ID
☑	6
☐	n/a

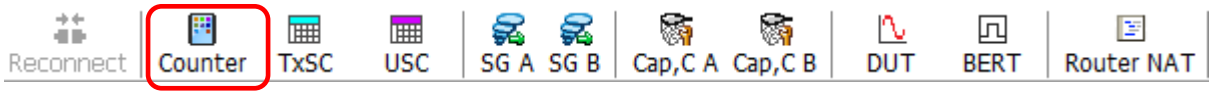
Click Frame Editor to edit the pattern and contents of stream packets. Please refer to 1.11 Frame Editor about how to use frame editor

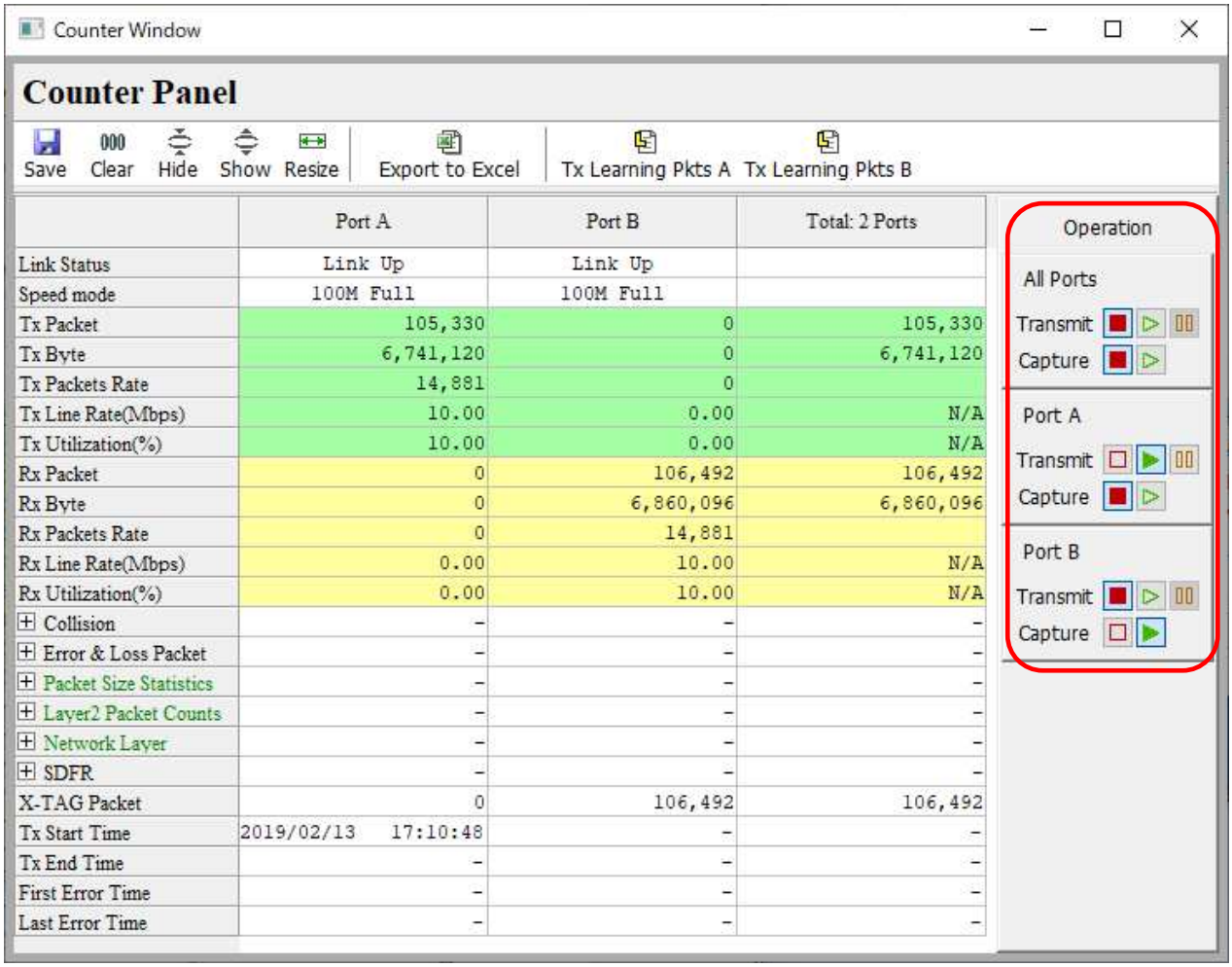
When all procedures are done, the read-only basic information at last few items if shown automatically

Then input count and click Apply to take effect.

2.2.2. Start to generate test streams

When all configurations is done, click Control Panel on Toolbar





Click control button on operation button to control the packet generation

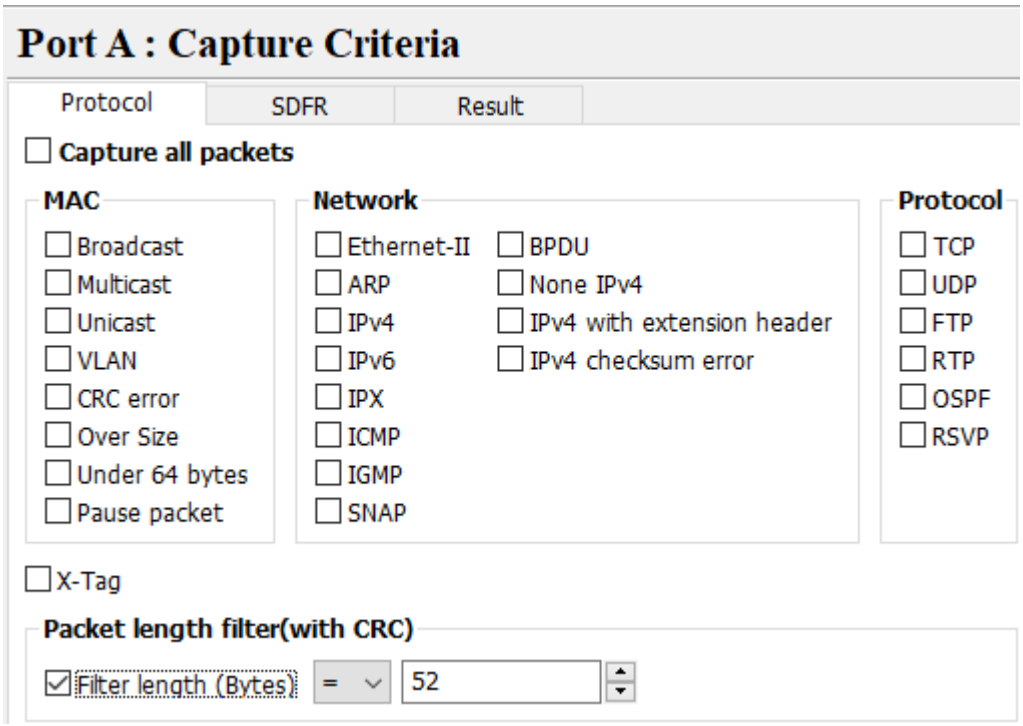
Expend sub-item counter to see more details of counters.

2.2.3. Capture Specified Packets

To capture packets/frames of incoming streams to PC via USB port, configure capture criteria is required.

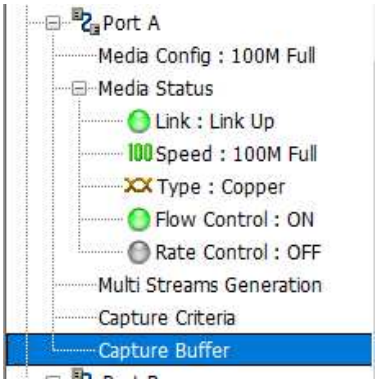
Click 

button on toolbar. The system shows the capture criteria settings

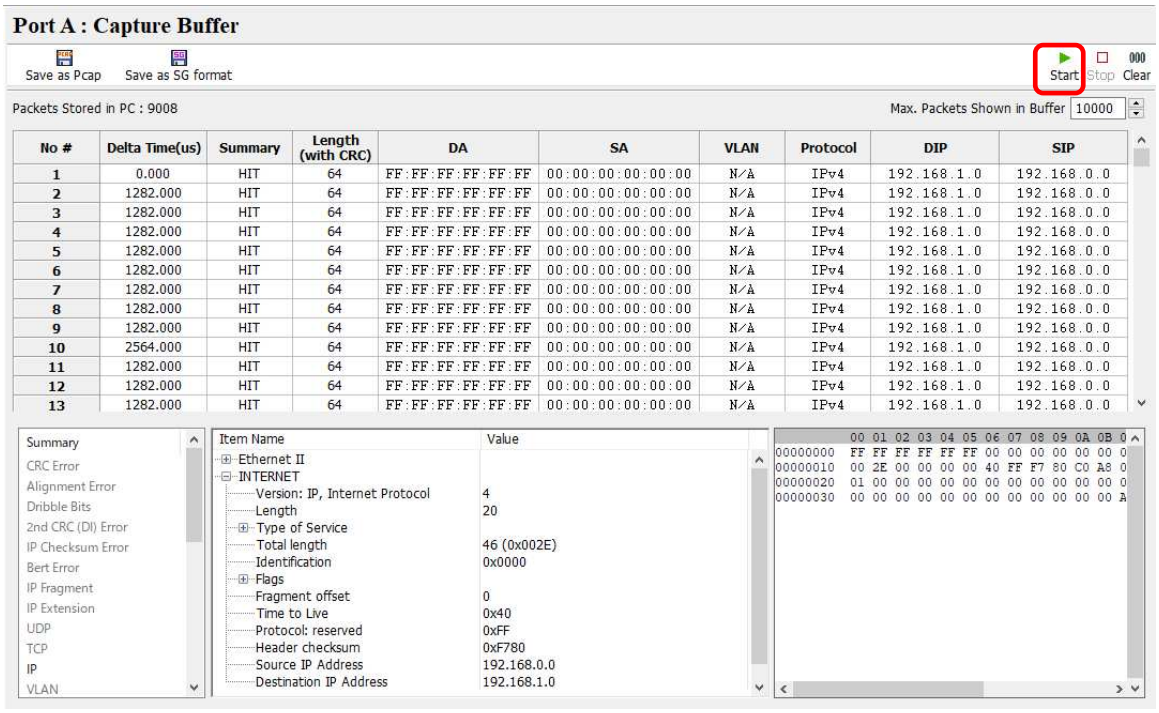


User can configure criteria of Protocol, SDFR according to section エラー! 参照元が見つかりません。エラー! 参照元が見つかりません。

Then Click Capture Buffer of selected port



Start capture from the Capture Buffer window

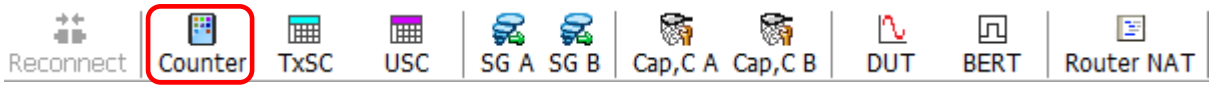


The result of captured frame is shown on Capture Buffer window.

2.2.4. View counter of captured packet and others

User can view the counters of captured packet by SDFR criteria

Click Control Panel on Toolbar



Expand SDFR sub-counter item by clicking "+" of 

, user the see the packet counts that is captured by SDFR criteria

User also can see conters of other events.

SDFR	-	-	-
DA rule hit	0	1,314,639	1,314,639
SA rule hit	0	1,314,639	1,314,639
VID rule hit	0	0	0
SIP Addr. rule hit	0	0	0
DIP Addr. rule hit	0	0	0
DPort rule hit	0	0	0
SPort rule hit	0	0	0

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