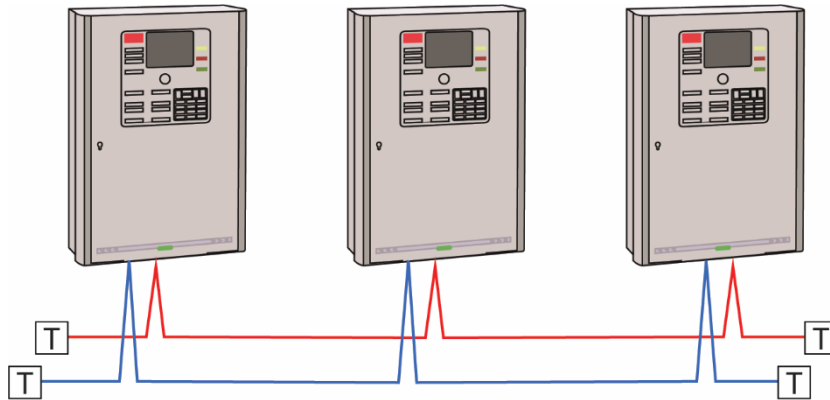


# PANASONIC FIRE ALARM SOLUTIONS TECHNICAL DESCRIPTION TLON



NETWORK USED FOR FIRE ALARM SYSTEM EBL512 G3

## DOCUMENT INFORMATION

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## 1. INTRODUCTION

## 1 INTRODUCTION

This document describes the TLON network.

TLON was used for the older system EBL512 as well, however the focus of this document is to describe the network design of an EBL512 G3 system.

This document is intended to be used by planning engineers as well as service / commissioning engineers. It is not a complete description of the TLON network. The TLON Technical description should be read in conjunction with the Technical description TLON Manager kit, 5095, MEW01983.

The engineer should also have basic knowledge of the fire alarm system.

The document includes information about TLON communication, network design, recommended products, maintenance and troubleshooting.

## 2 ABBREVIATIONS AND EXPLANATIONS

Autonomous control units	A control unit which maintain full functionality autonomous and independently from other control units in the system.	
Channel	A physical structure of the network. Routers may subdivide the network into several channels. It can be useful for long distance network, longer than the max. length for one channel or for extra security reasons.	
c.i.e	Control and indicating equipment	= control unit
CRC	Cyclic Redundancy Check	
LonWorks	A technology platform for implementing control network systems. (Registered trademark of Echelon Corporation)	
Nodes	EBL512 G3 / EBL512 control units	
Repeater	A repeater is a physical amplifier without any data processing function. A repeater will forward all data without any buffering. The repeater may increase the collision rate. For this reason Repeaters shall only be used in a very restricted manner in a TLON Network. Note, do not mix up Repeaters with Router in repeater mode as described below.	
Router / Router in repeater mode	A router is able to forward all valid data based on its destination address. It is also possible configure a router in repeater mode. In this mode all valid data will be forwarded. It is recommendable to use routers in repeater mode because in a TLON Network all EBL512 G3 units share the same data, thus all messages are sent to all units in the TLON Network.	
TP/FT-10	Twisted pair cable topology.	

3. GENERAL DESCRIPTION

### 3 GENERAL DESCRIPTION

TLON is a local network that connects a system of two or more EBL512 G3 control units. Up to 30 control units can be connected in a TLON network.

In a TLON network it is possible using components from third part manufacturers e.g. routers.

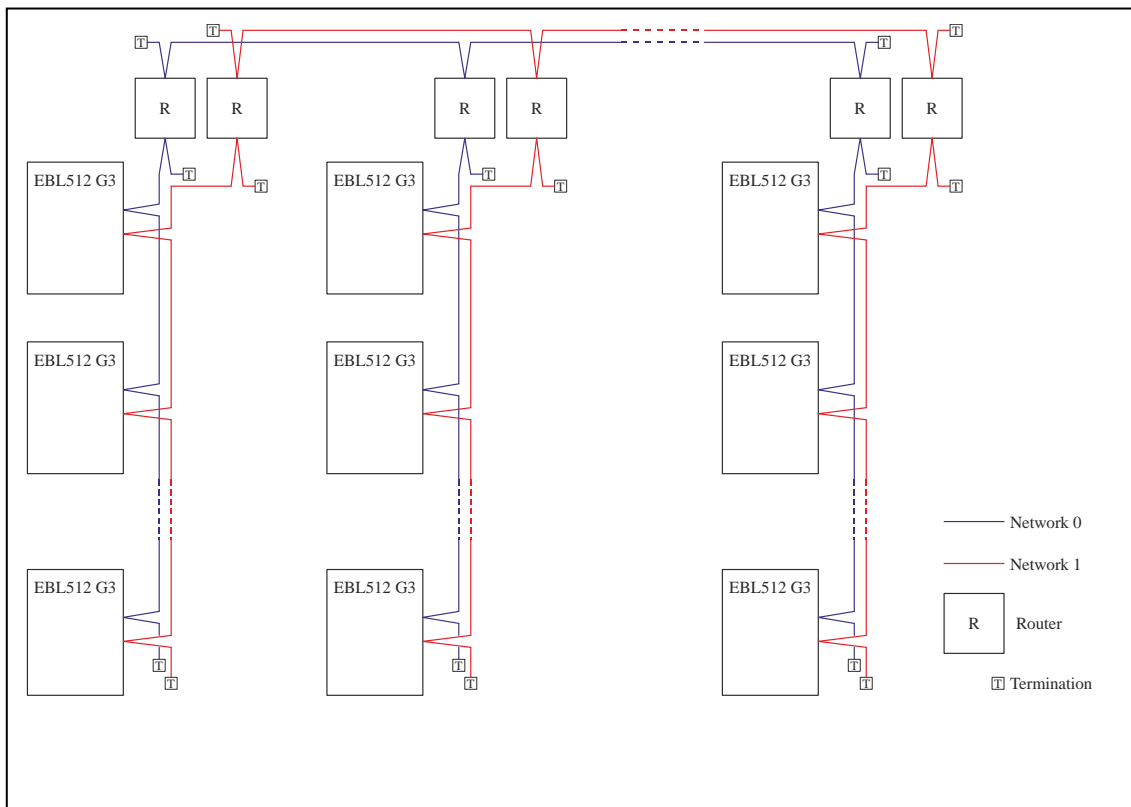
**NOTE!** Panasonic Fire & Security cannot take responsibility for third part products. However all recommended products in this document have been tested in systems with maximum number of EBL512 G3 control units.

TLON Manager 2.0 is the software with which a TLON project is created and installed into the networks units. It is also used for maintenance of the TLON Network.

For connection to the TLON Network a USB Network interface is used.

TLON Networks are used for fire alarm systems EBL512 G3 and EBL512. Each c.i.e. in the network has to have at least one TLON connection board 5095.

Example of a TLON network



### 3. GENERAL DESCRIPTION

#### 3.1 GENERAL DESCRIPTION OF EBL512 G3

EBL512 G3 is an intelligent, analog and addressable Control and Indicating Equipment.

EBL512 G3 can be used as a stand-alone c.i.e. or connected to a TLON Network, i.e. a "system" with up to 30 control units. Each c.i.e. has access to all information.

There are two different types:

- EBL512 G3 type 5000 is with front and display and with or without printer.
- EBL512 G3 type 5001 is without front, display, printer or door. (A "grey box").  
Type 5001 cannot be used stand-alone, it must be connected via the TLON Network to a system where at least one of the control units is of type 5000.



EBL512 G3 Control Unit 5000



EBL512 G3 Control Unit 5001

### 3. GENERAL DESCRIPTION

#### 3.2 TLON CONNECTION BOARD 5090

The TLON connection board 5090 is a transformer coupled interface (FTT-10), which supports the LonWorks TP/FT-10 topology, between the control unit and the TLON Network.

On the EBL512 G3 control unit (5000 / 5001) main board, there are spaces and connectors for two TLON connection boards 5090. In a stand-alone control unit there are no TLON connection board mounted. The number of a standalone control unit is automatically 0.

When the control unit is connected to a system via the TLON Network there may be one or two 5090 boards mounted, one if single TLON Network is used, and two if redundant TLON Network is used. For more information see section [3.4.1 SINGLE TLON NETWORK](#) and [3.4.2 REDUNDANT TLON NETWORK](#).



5090 backside  
The unique Neuron ID number is printed on the label.



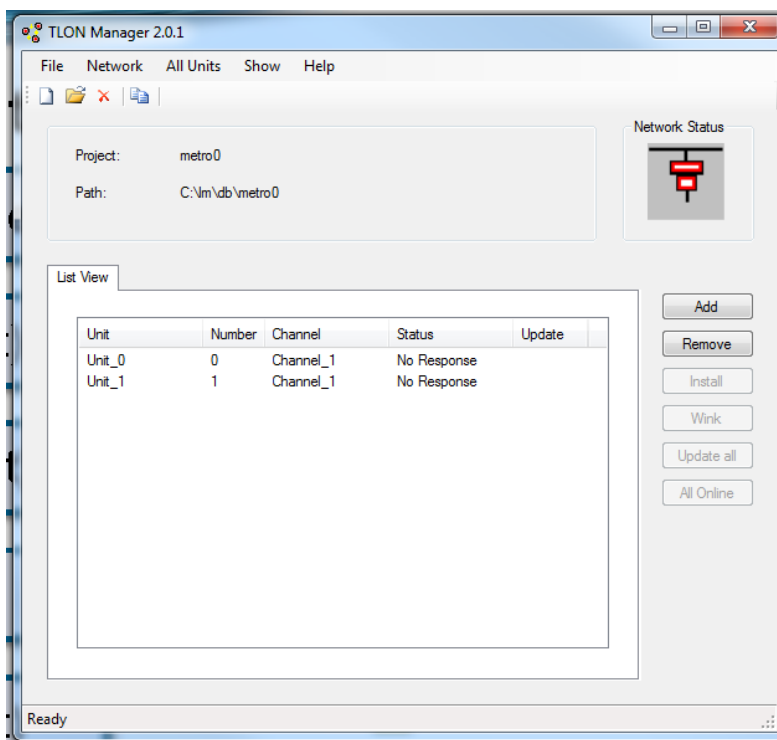
5090 component side



### 3. GENERAL DESCRIPTION

#### 3.3 TLON MANAGER

Since control units share the same communication media, physically attaching control units to TLON is not enough for them to communicate. Control units in a data network needs to be given network configuration information, such as network addresses, to enable them to understand with whom they should share data. With TLON, this network configuration information is defined and loaded by the network installation tool TLON Manager. Besides this, TLON Manager downloads the control unit number to each unit connected to TLON. With the TLON Manager the user just defines the network, there is no need to know the specific network addresses or the bindings between the control units, TLON Manager generates this information automatically. TLON Manager also has functions for diagnostics to detect failures at a network level. More information about TLON Manager is to be find in Technical description TLON Manager kit MEW01983.



### 3. GENERAL DESCRIPTION

## 3.4 THE TLON NETWORK

### 3.4.1 SINGLE TLON NETWORK

In this case all communication occurs on a single TLON Network, called Network 0. In case of a network fault (i.e. open circuit or short circuit) the control units in the system can't share information any longer. This may adversely affect the function of the system and violates the EN 54-2 standard unless all units in the system are autonomous control units, i.e.:

- All control units shall be of type 5000, i.e. including front panel.
- The alarm points and their "belonging" outputs shall be connected to the same control unit.
- If fire alarm routing equipment ("Fire brigade tx" output) shall be used, each control unit in the system shall be able to activate a fire alarm routing equipment independent of the other control units.

In all other cases and for highest security, a redundant TLON Network shall be used.

### 3.4.2 REDUNDANT TLON NETWORK

Normally the communication occurs on Network 0. In case of a network fault on Network 0 (i.e. open circuit or short circuit) is detected, the control units in the system start using Network 1.

**NOTE!** Network 1 always is supervised to detect network faults even when the communication occurs on Network 0.

### 3. GENERAL DESCRIPTION

#### 3.4.3 EBL512 G3 NETWORK REDUNDANT NETWORK

For safety reasons the EBL512 G3 units have the possibility to use two TLON connection boards in order to get two parallel TLON Networks, a so called redundant network.

In a redundant network two projects have to be created and installed. The projects have to be identical but with different project names. One has to be installed for network no. 0 and one installed for network no. 1.

Normally, TLON Network no. 0 is used for communication and TLON Network no. 1 will be used for communication only in case of a fault condition (cut-off or short circuit) on TLON Network no. 0. If a redundant network is used there is no need for routers if not a cable length longer than the normal cable length for one channel, is required (see type B below).

#### 3.4.4 CHANNELS

A channel has to be configured with the TLON Manager tool.

Two or more nodes are physically connected to each other via a network cable. In the LonWorks vocabulary this is called a channel (compare with a COM loop and connected loop units).

In EBL512 G3 one board per TLON Network.

In a network type **A** there is only one channel. No channel has been added, channel 1 is default.

In a network type **B** there is one channel on each side of the router.

In a network type **C** there is one channel for each router and one channel for the backbone net between the routers. Required number of channels has to be added.

#### 3.4.5 ROUTERS

A router has to be configured with the TLON Manager tool.

After the channels have been added, the routers have to be added to the project if it is a type **B** or **C** network. Use channel\_2 for the backbone net.

For more information see section [4.5 ROUTERS](#) or chapter "Add a Router" in the Technical description TLON Manager kit MEW01983.

#### 3.4.6 EBL512 G3

After the channels and routers have been added, the units have to be added to the project.

## 4. NETWORK DESIGN

# 4 NETWORK DESIGN

## 4.1 GENERAL RULES

When planning the installation of a fire alarm system, great carefulness must be taken, especially for the network design. Mistakes, e.g. using wrong type of cables or too long cables, may lead to problems which often are time consuming and expensive to solve afterwards.

The most important rules are:

- The cable shall be of recommended type and the maximum length shall not be exceeded.
- A correct wiring of a TLON network. See section 4.3.
- Separate TLON communication wires from high voltage power cables. Follow the national regulations for fire alarm installations with regard to cable placement.
- If routers are used keep in mind that these are vital components in the fire alarm system and shall be powered with an EN 54-4 approved power supply. See section 4.4.

## 4.2 NETWORK CABLE LENGTH AND CABLE SELECTION

The cable type used for TLON shall be Belden 7703 NH 1 pair 22 AWG or equivalent.

The cable length is  $\leq 900$  meter.

Belden 7703 NH is a twisted pair and shielded cable, suitable for data transmission.

The shield shall be grounded in each control unit and each router if used.

Note that cables usually used for the COM-loop, e.g. ELQYB 2 x 1 or similar, shall not be used for TLON.

## 4. NETWORK DESIGN

**4.3 PATHWAYS FOR TLON**

Type	Used for
TP/FT-10	<ul style="list-style-type: none"><li>• Twisted pair cable</li><li>• Routers, A-side TP/FT-10 B-side TP/FT-10</li><li>• The only pathway needed if only twisted pair cable is used.</li></ul>
FO-10	<ul style="list-style-type: none"><li>• Opto fiber</li></ul>

## 4. NETWORK DESIGN

### 4.4 THE DOUBLY TERMINATED BUS TOPOLOGY

The transceivers used in a TLON network are the FTT-10A twisted pair transceivers. The FTT-10A transceiver is transformer isolated and operates at a data rate of 78 kbps, they support the TP/FT-10 topology.

It is strongly recommended to wire the TLON network in the doubly terminated bus topology fashion show in the figure below.

Two terminations are required one at each end of the bus.

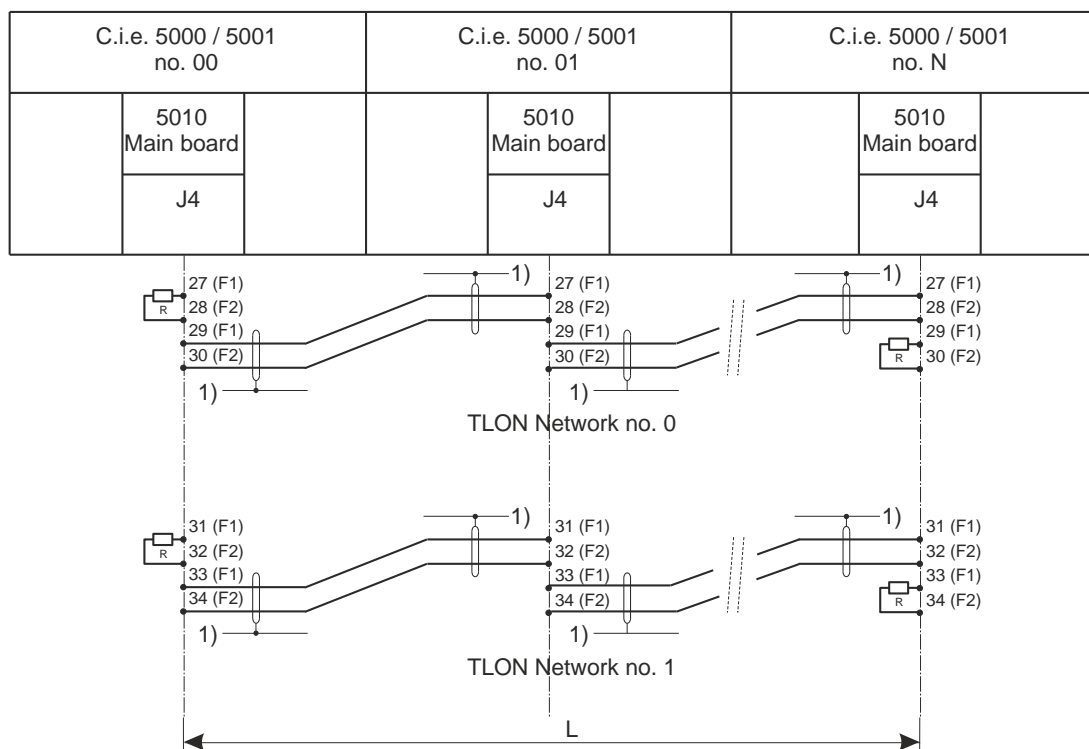
The termination is a resistor,  $R = 105\Omega \pm 1\%$  1/8W, enclosed with 5090 delivery.

The EBL512 G3 control unit supports that both incoming and outgoing wires are connected in the control unit. In that way the control units are strung together in a daisy-chain fashion.

#### The doubly terminated bus topology

R = Termination resistor  $105\Omega \pm 1\%$  1/8W.

L = Cable length = 900 meter. The cable shall be Belden 7703 NH 1 pair 22 AWG or equivalent.



1) Screen shall be connected to the earth point of the control unit.

It is true that the TP/FT-10 support free topology, e.g. one control unit in the center and the others connected in a star. This may be used if absolutely necessary during special circumstances. Note that in this case the maximum total wire length, for the prescribed cable type, is reduced to 500 meter.

Furthermore only one termination resistor shall be used in the center of the net  $R = 52,3\Omega \pm 1\%$  1/8W.

## 4. NETWORK DESIGN

### 4.5 ROUTERS

In a TLON network it is possible to use routers.

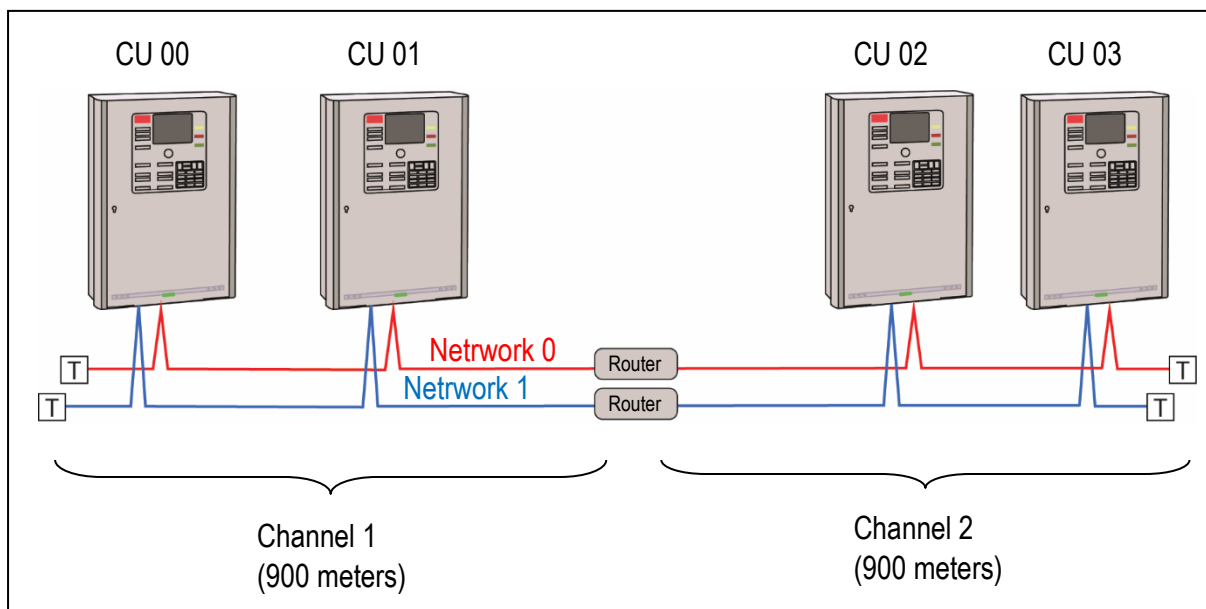
A router adds a channel to the TLON network, which extends the maximum cable length. It is possible to add multiple routers depending on the distance needed.

With a router it is possible to interface different communication media to TLON, e.g. fiber optic cable.

Since the channels connected to a router are isolated, a failure on one channel does not affect the other channel. E.g. if a single TLON network only consists of one channel and a short circuit occurs, this will affect every control unit in the network. The control units will still work stand-alone but no communication will occur between them. Fault messages will be generated in all control units. Instead, if there are more than one channel, the short circuit will only effect the communication between the control units in the actual channel. The communication between control units in other channels are not affected. Naturally fault messages will be generated in every control unit.

If there are more than one channel in the TLON network it may be easier to locate and service faults on the network for example disturbances and so on. If routers are used, only messages with a valid CRC code will be forward between the channels.

A router is able to forward all valid data based on its destination address and can use one of following routing algorithms: configured router, learning router and bridge. However it is also possible configure a router in repeater mode. In this mode all valid data (i.e. data packages with correct CRC codes) will be forwarded. It is recommended to use routers in repeater mode because in a TLON Network all EBL512 G3 units share the same data, thus all messages are sent to all units.



## 4. NETWORK DESIGN

### 4.6 REPEATERS

The repeater increases the maximum cable length. A repeater is a physical amplifier without any data processing function. It physically amplifies the channel and assures that the required signal level is kept throughout the extension. A repeater will transparently forward all data packets without any buffering.

The repeater will impose an extra delay on the channel that could conflict with the media access timing used by the LonTalk protocol. The extra delay results in a higher probability for packet collisions, especially for a busy channel. Check the delay time for the repeater in the product documentation.

A router described in the previous chapter does not increase the collision rate. Because of this, routers shall always be the first choice in a TLON Network.

A repeater does not have to be configured in the network with TLON manager.

**NOTE!** The repeater may increase the collision rate. For this reason Repeaters shall be avoided in a TLON Network, especially in large networks. However they may be used in a restricted manner:

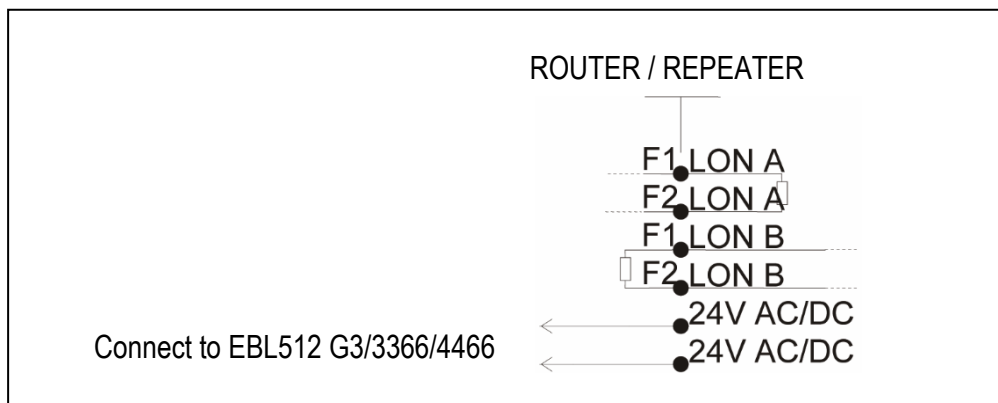
**NOTE!** No more than one repeater shall be in the path between two control units in the TLON network.



#### 4. NETWORK DESIGN

### 4.7 TO POWER THE ROUTER/REPEATER

Since the routers/repeaters are vital components in the TLON network a battery backed up and monitored power source shall be used, for example the 24V output of the EBL512 G3 control units or the external power supply 3366/4466.



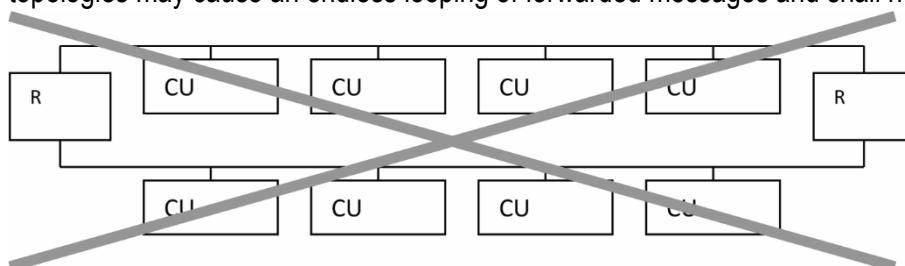
### 4.8 TERMINATION

Often the router/repeater is placed in the end of the bus. In this case the termination resistor ( $R = 105\Omega \pm 1\% \ 1/8W$ ) shall be placed as shown in the illustration above.

**NOTE!** In some cases the termination resistor is built in and selectable by a dip switch, see the manual of the router/repeater.

### 4.9 THE TWO CHANNELS NETWORK

A TLON network that consists of two channels is achieved with one router. The router connect the two channels. Multiple routers connecting same two channels is called looping topologies. Looping topologies may cause an endless looping of forwarded messages and shall not be used.

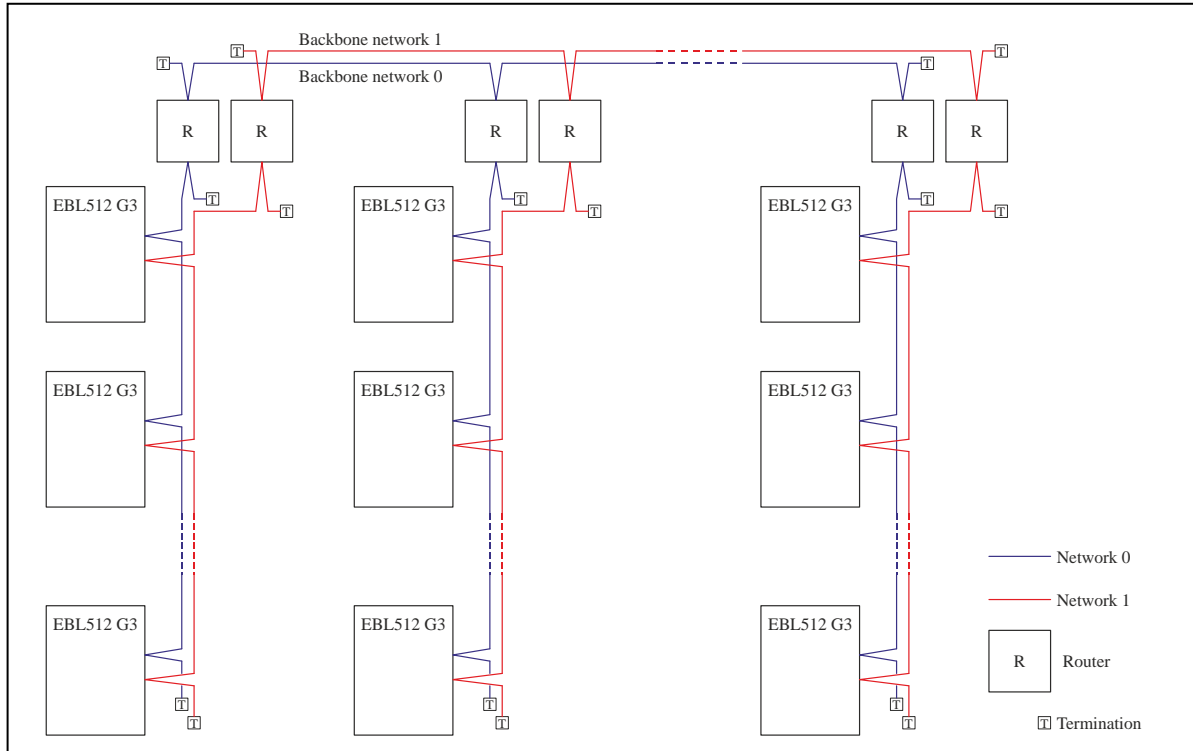


4. NETWORK DESIGN

**4.10 THE BACKBONE ARCHITECTURE**

If a TLON network consists of more than two channels, it may be convenient using the so-called backbone architecture. Since a short circuit on the backbone will affect the communications between all channels extra carefulness shall be taken with regard to cable placement of the backbone.

A backbone net may preferably consist of a fiber optic channel.



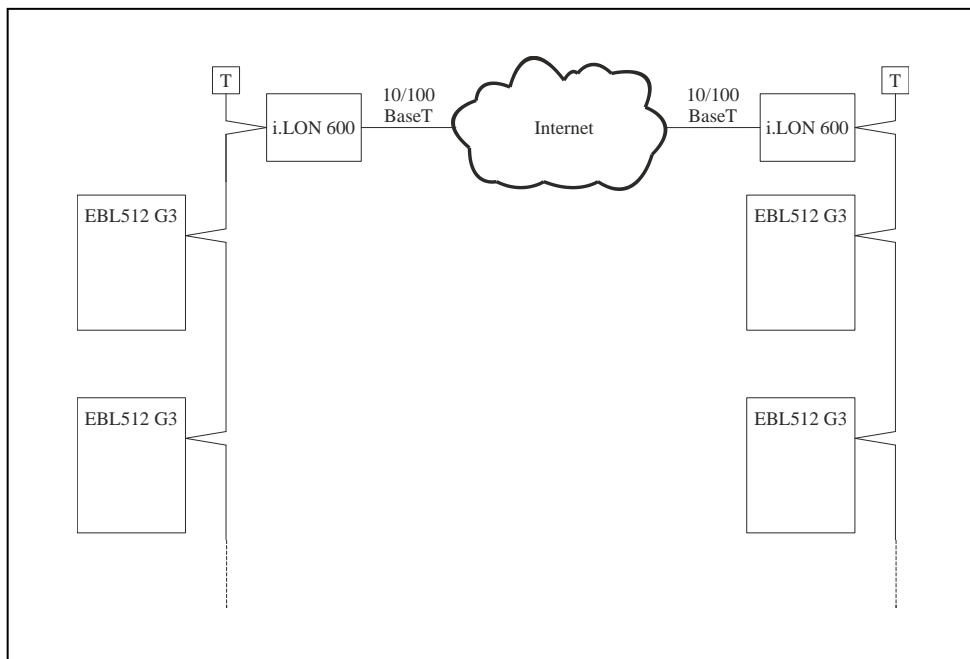
## 4. NETWORK DESIGN

### 4.11 TLON via TCP/IP

With a LonWorks IP server (for example i.LON 700 or later versions) it is possible using internet (or any IP-based LAN or WAN) as a pathway for TLON.

The transition from TP/FT-10 to IP-network opens the opportunity to use the large range of infrastructure products e.g. fiber optic converters.

**NOTE!** Since most national regulations for fire alarm installations request dedicated network wiring, great carefulness must be taken when choosing an IP-network as a pathway for TLON and shall be used for autonomous control units only. Panasonic fire & Security Europe AB cannot take responsibility for IP-based communication since it is dependent on the infrastructure of the IP-network.



## 4. NETWORK DESIGN

### 4.12 FIBER OPTIC NETWORK

#### 4.12.1 THE FIBER OPTIC ROUTER FOR LONWORKS TP/FT-10

With a Fiber Optic to TP/FT-10 router it is possible to connect an TP/FT-10 channel to a fiber optic channel.

In this case EBL512 G3 control units are connected to twisted pair (TP/FT-10) channels. With a Fiber Optic to TP/FT-10 router the TP/FT-10 channel is connected to the fiber optic channel. The topology is the same as in the section 4.9; in this case, the fiber optic channel is the backbone net. If many Fiber Optic to TP/FT-10 router are used, the optical fiber are stringed together via the routers in a daisy-chain fashion.

Refer to the manual of the Fiber Optic to TP/FT-10 router about supported optical fiber types, connectors, maximum length, termination of the optical fiber, and so on.

#### 4.12.2 THE FIBER OPTIC REPEATER FOR LONWORKS TP/FT-10

**NOTE!** A fiber optic repeater has the same disadvantages as repeaters in general.

See section 4.6 REPEATERS. For this reason fiber optic repeaters shall only be used in a restricted manner in a TLON Network.

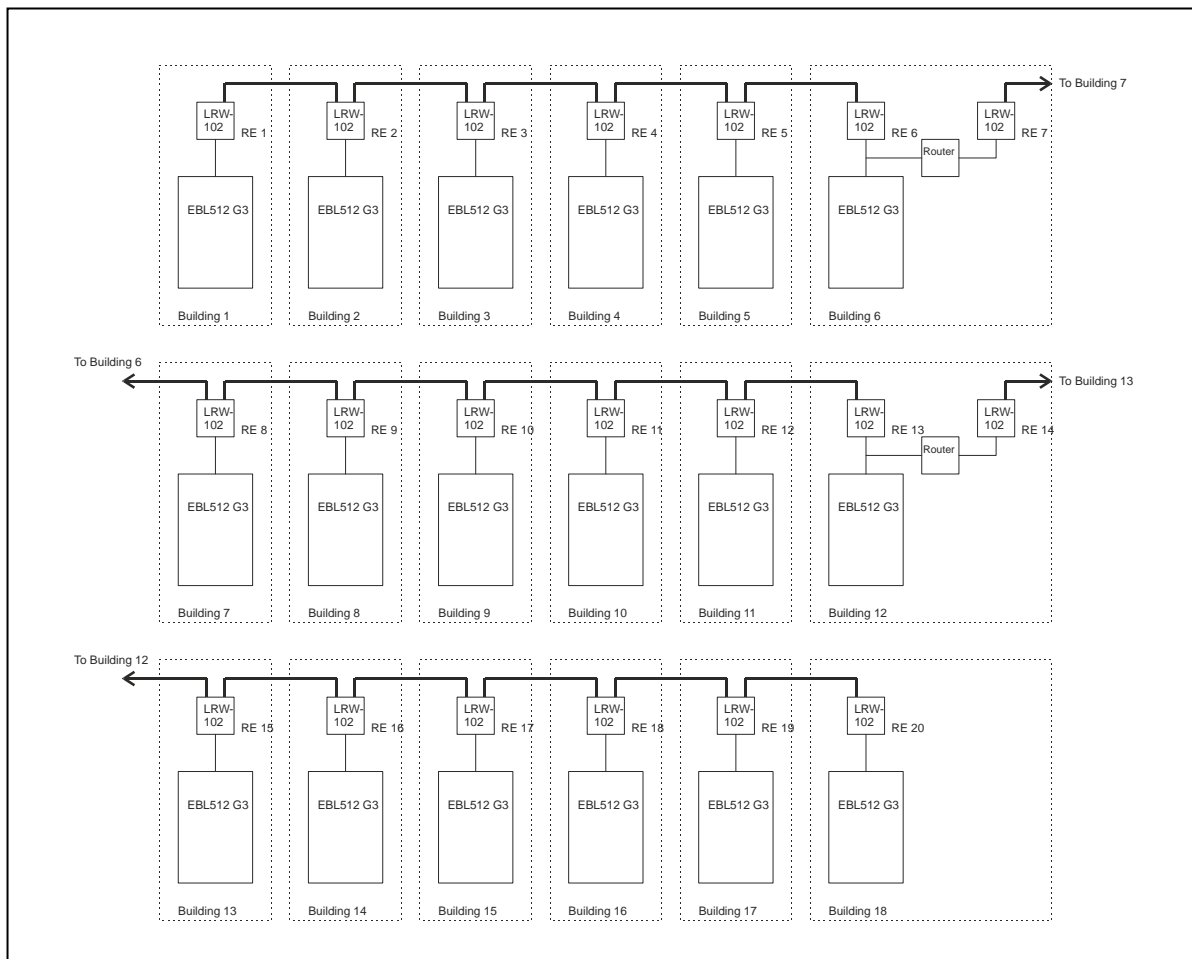
When two or more fiber optic repeaters are connected together they form a physical repeater link.

- The maximum number of EBL512 G3 control units in a system which use optic repeaters is limited to 18 CIEs.
- The maximum number of optic repeaters connected together in a physical repeater link is limited to 8.
- The delay the physical repeater link causes shall not exceed 20  $\mu$ s. The delay depends on the number of optical repeaters in the link and the total length of the fiber optic cable. Typically 1000 m fiber optic cable cause approximately 4,9  $\mu$ s delay and each optic repeater approximately 2  $\mu$ s (see next page).

Several physical repeater links can be connected together via routers (see next page).

## 4. NETWORK DESIGN

### 4.12.3 CONNECTION OF CIE IN DIFFERENT BUILDINGS VIA LRW-102



The illustration above shows an EBL512 G3 system with 18 CIEs. Note that this is the maximum number of CIEs in a system which use optic repeaters. In this example there is only one CIE connected to each optic repeater, of course it is possible connect several CIEs to each optic repeater as long as the number of CIEs in the system does not exceed 18.

The figure also shows three physical repeater links, i.e. RE 1 – RE 6, RE 7 – RE 13 and RE 14 – RE 20. The three physical repeater links are connected together via the routers in building 6 and 12. The number of repeaters in each physical repeater link is 6, 7 and 7. Note that the maximum number of optic repeaters connected together in a physical repeater link is limited to 8.

#### LENGTH OF THE FIBER OPTIC CABLE

Typically 1000 m fiber optic cable cause approximately 4.9  $\mu$ s delay and each optic repeater approximately 2.0  $\mu$ s. The delay the physical repeater link causes shall not exceed **20  $\mu$ s**, i.e:

$L \times 4.9 + N \times 2.0 \leq 20$ ; where L is length in km and N is the number of optical repeaters in the link. The example above this gives us the following maximum lengths :

- 1,6 km between RE 1 and RE 6.
- 1,2 km between RE 7 and RE 13.
- 1,2 km between RE 14 and RE 20.

## 5. RECOMMENDED PRODUCTS

# 5 RECOMMENDED PRODUCTS

For correct installation in the TLON-network, refer to the manual of each of the products below.

## 5.1 ROUTER

Loytech, LS33CB, L-Switch CEA-709 Router 2 x TP/FT-10.

A-Side TP/FT-10

B-Side TP/FT-10

12- 35 VDC

See section [4.5 ROUTERS](#)

## 5.2 LonWorks/IP SERVER

Echelon, i.LON 700, or later versions, LonWorks/IP Server.

Connects a TP/FT-10 to a IP-network.

24V AC/DC

See section [4.12.1 THE FIBER OPTIC ROUTER FOR LONWORKS TP/FT-10](#)

## 5.3 FIBER OPTIC REPEATER

Westermo, LRW-102, or later versions, Fiber optic repeater for TP/FT-10

Connects a TP/FT-10 channel to a LonWorks fiber optic channel.

Available with 1310nm Multi Mode or 1310nm Single Mode

12 – 48 VDC

**NOTE!** Shall be used in a restricted manner.

See section [4.12.2 THE FIBER OPTIC REPEATER FOR LONWORKS TP/FT-10](#)

## 6. MAINTENANCE

# 6 MAINTENANCE

## 6.1 REPLACE PCB

Some TLON information is saved in the TLON connection board memory and some in the EBL512 G3/ EBL512 Main board memory.

### 6.1.1 MAIN BOARD

- If only the Main board is replaced: Perform an **Update** for the unit. (Select the unit, right press and select "Update" in the pop-up menu.) Perform the following steps:

- a) Download S/W if necessary
- b) Update 'No of alarm points' if necessary (with special password).
- c) If the control unit is part of a network, perform 'Update' in TLONManager (in TLONManager 1.2 also 'Save').
- d) Download SSD
- e) Perform calibration of outputs
- f) Change access codes (if necessary - only valid for software version < 2.0.0)
- g) Perform a safe shut down and restart the control unit

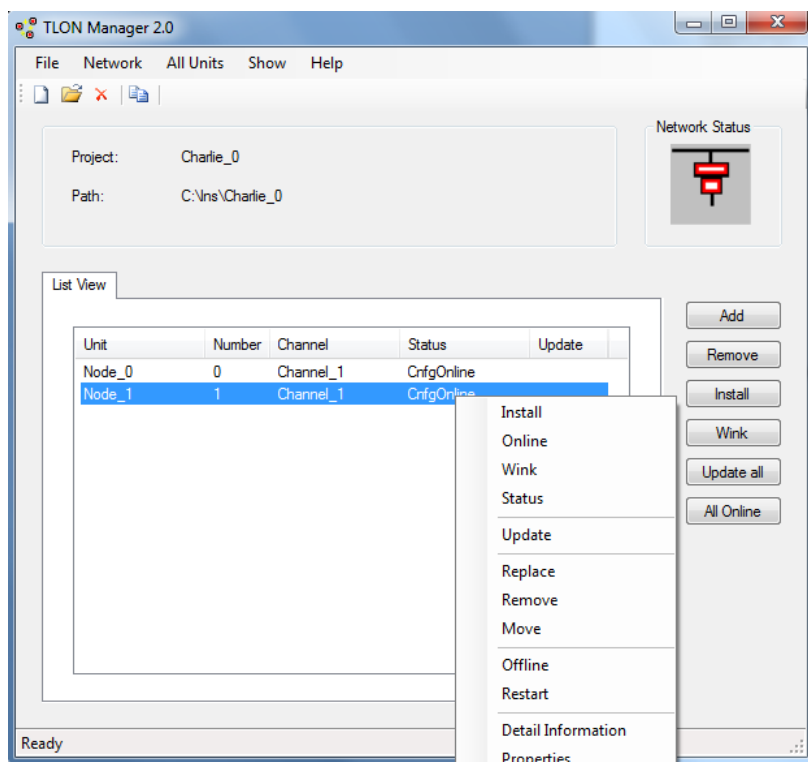
### 6.1.2 TLON CONNECTION BOARD

- If the TLON connection board is replaced: Perform a **Replace** in TLON manager for the correct control unit. Then restart the control unit where the TLON board was replaced.

## 6. MAINTENANCE

### 6.2 TLON MANAGER FUNCTIONS

There are a number of functions that are useful for network maintenance and troubleshooting. The most common are described below. For more information see Technical description TLON Manager kit 5095, MEW01983.



#### 6.2.1 INSTALL

The unit will be installed in the network.

#### 6.2.2 ONLINE

The selected unit can be set Online if the status is CnfgBypass (Offline).

#### 6.2.3 WINK

With "Wink" you can check that the EBL512 G3 unit corresponds to the selected unit in TLON Manager 2.0. A not connected node, not installed, etc. cannot receive a wink message.

There are two ways to send a wink message:

- Select the unit and click the right mouse button to get a pop-up menu. Select "Wink".
- Select the unit and press **Wink**.

##### **EBL512 G3, Network no. 0**

In the selected node the wink message turns on the buzzer and the front LED "Test mode" for approximately 0.4 second.

##### **EBL512 G3, Network no. 1**

In the selected node the wink message turns on the buzzer and the front LED "Test mode" for approximately 2 second.



## 6. MAINTENANCE

### 6.2.4 STATUS

Status for the selected node will be updated, for example, no changes no change of the status.

### 6.2.5 UPDATE

Normally you update a unit (i.e. the network configuration data is downloaded to the physical unit) after it has been installed.

Update can also be used when you suspect that the configuration data in a unit is incorrect.

When a Main board is replaced in an EBL512 G3 unit, the unit has to be updated.

Select the unit and click the right mouse button to get a pop-up menu. Select "Update".

After "Update" the information is:

OK(0) = Update OK (0 unsuccessful attempts)

OK(1) = Update OK (after 1 unsuccessful attempt)

OK(2) = Update OK (after 2 unsuccessful attempts)

NG = Update not good

### 6.2.6 UPDATE ALL

All the units in the Network can be updated (see above) with only one command. Press **Update all**, see also chapter [6.1 REPLACE PCB](#).

### 6.2.7 REPLACE

When a TLON connection board is replaced in an EBL512 G3 unit, select the unit and press **Replace**.

### 6.2.8 MOVE

A node can be moved from one channel to another. In the dialog box that opens, specify the "New location" (Channel) and press **OK**.

**NOTE!** The channels have to be added before.

### 6.2.9 OFFLINE

The selected unit can be set Offline (CnfgBypass) if the status is (Online).

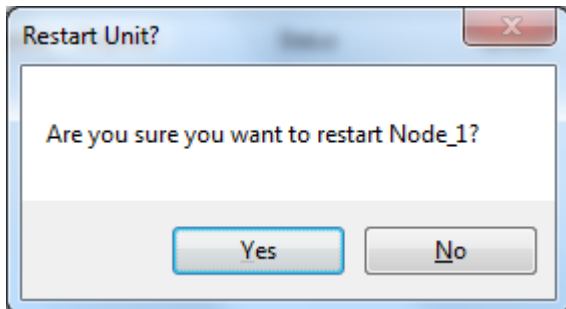
## 6. MAINTENANCE

### 6.2.10 RESTART

You can restart a unit in the network with the restart command. In a TLON Network this command works only with EBL512 G3 units.

Select the unit and click the right mouse button to get a pop-up menu.

Choose **Restart** and the following dialog box displays:

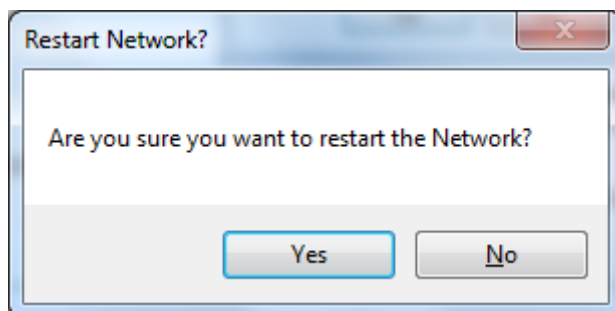


Press **Yes** to restart the unit.

### 6.2.11 RESTART ALL UNITS

You can restart all the units in a TLON Network.

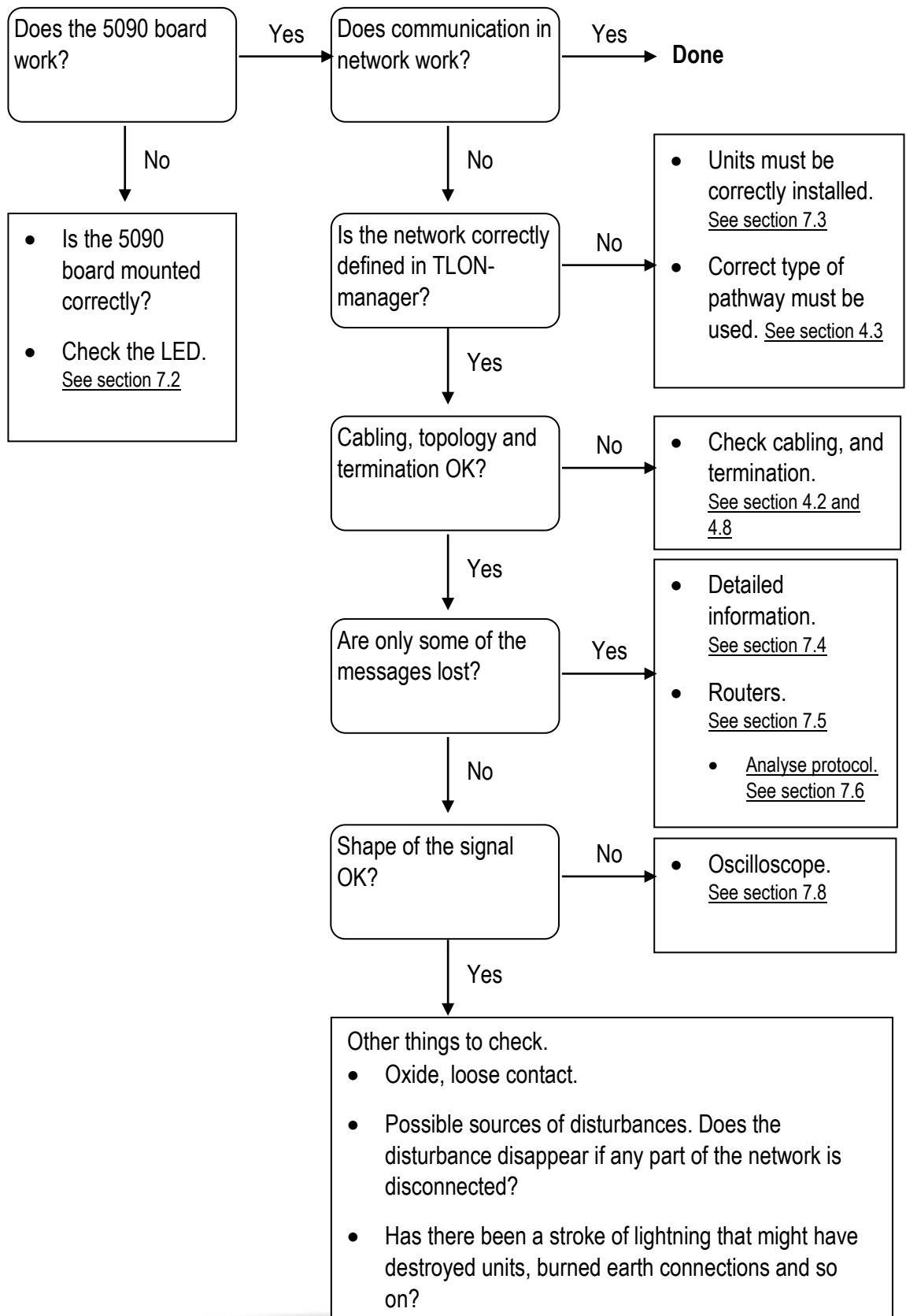
In the menu **All units** choose **Restart** and the following dialog box displays:



Press **Yes** to restart the units.

## 7 TROUBLESHOOTING

### 7.1 TROUBLESHOOTING FLOW CHART



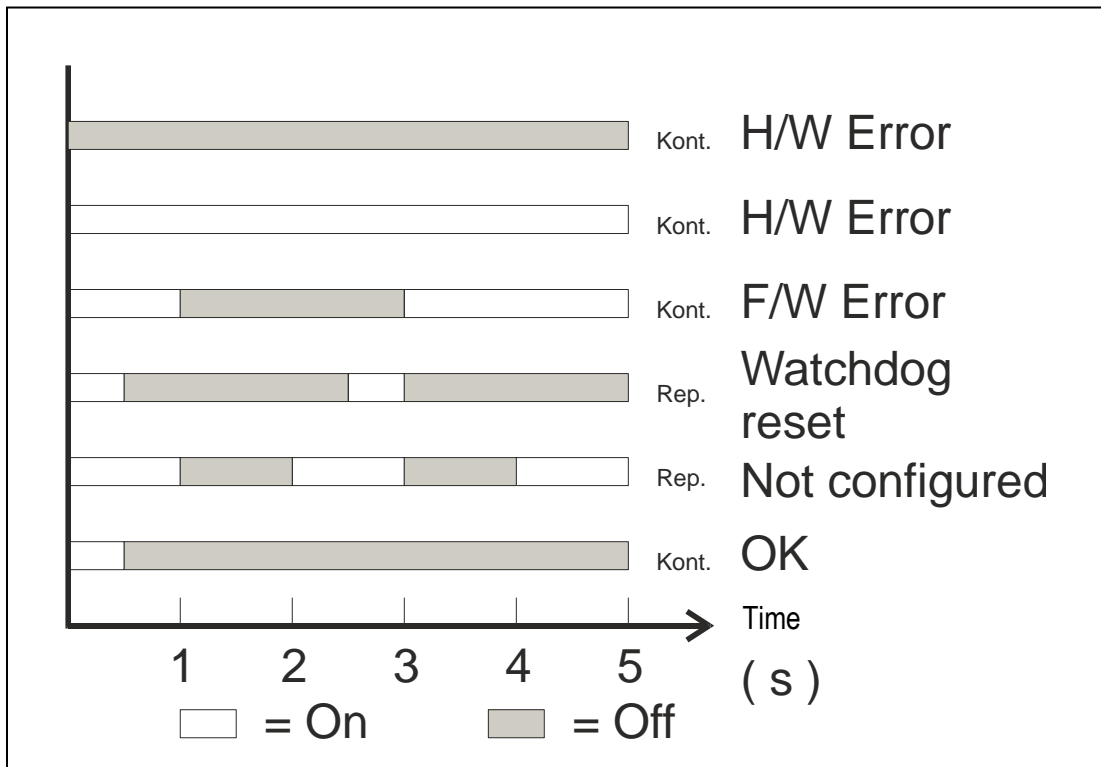
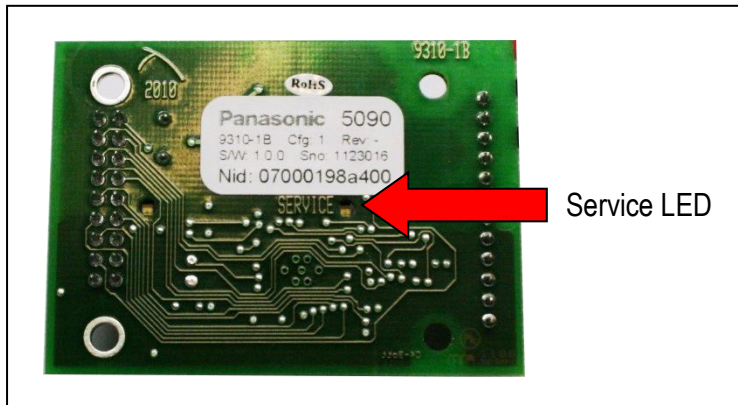
7. TROUBLESHOOTING

**7.2 5090 BOARD SERVICE LED**

If the LED indicates hardware error (H/W) or software error (S/W), change the 5090 board.

If the LED indicates “watchdog reset”, make sure that the 5090 board has contact with the c.i.e. mother board.

If the LED indicates “Not configured”, update and save.



## 7. TROUBLESHOOTING

## 7.3 C.I.E. CORRECT INSTALLED?

## 7.3.1 TYPE OF FAULT

FAULT: CU xx has no contact with control unit xx, network x

The fault has appeared and is not corrected. The control units might be incorrectly installed. Or there might be a cable brake or a short cut on a cable.

FAULT: CU xx has no contact with control unit xx, network x / Serviced

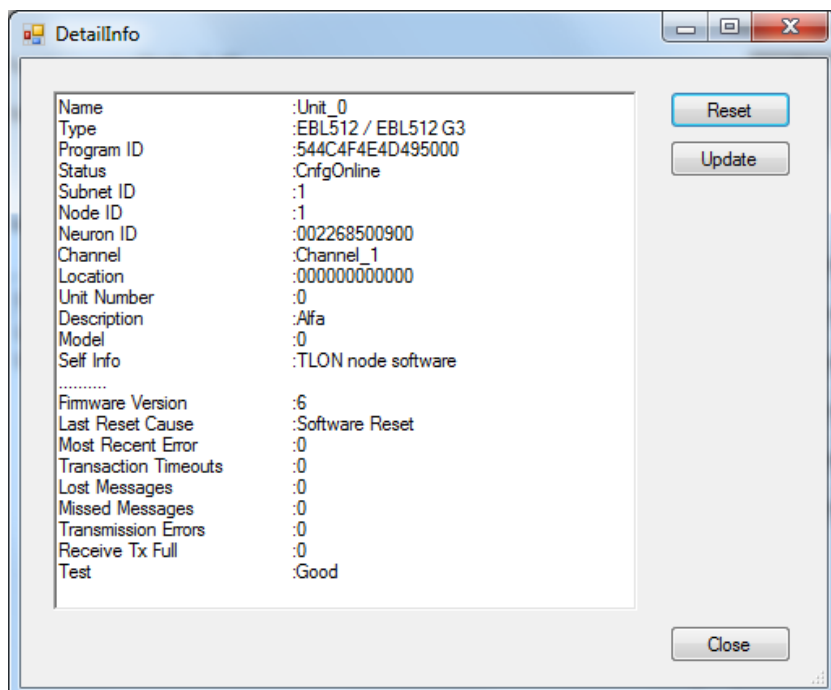
The fault has appeared and is automatically serviced.

Probably the control units are correctly installed. There might be a loose contact, or an unexpected restart or other disturbance has occurred.

## 7.3.2 CHECK IN TLON MANAGER - DETAIL INFORMATION

Is it possible to get contact with the c.i.e. in TLON Manager?

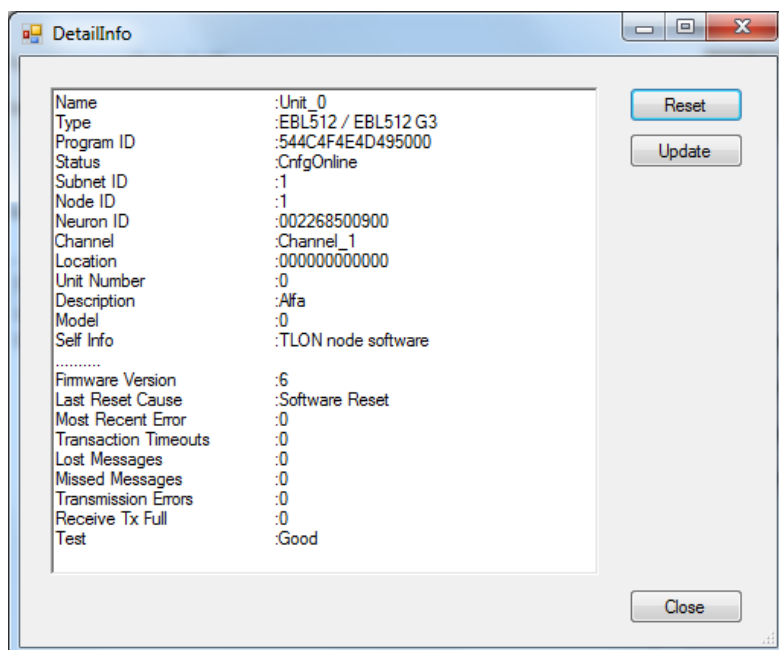
- Check detail information
- Wink
- Is the c.i.e. status "ConfigOnline"?



## 7. TROUBLESHOOTING

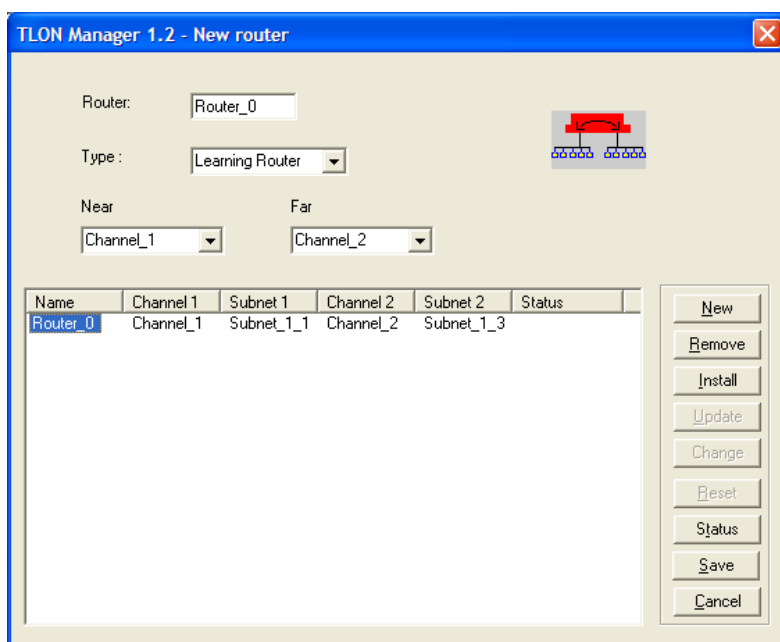
### 7.4 TLON MANAGER – DETAIL INFORMATION

- “Transmission Errors” must not increase during a 10-minutes interval.  
Press Reset and check after 10 minutes.  
New errors within this time is an indication of communication problems / disturbances.



### 7.5 ROUTERS

- Check that the status is “ConfigOnline”. If necessary, Update and Save.  
or
- Restart the router.



## 7. TROUBLESHOOTING

## 7.6 LonScanner – PROTOCOL ANALYZER

The Protocol Analyzer is a PC based tool for listening, saving, and showing messages in the TLON network.

By moving the tool to different points in the network, it's possible to detect where in the network the messages gets lost.

It is also possible to obtain statistics e.g. on the percentage of all messages that have been incorrect.

Num	Time	Attr	Type	Source	Destination	Data
0	01-21T13:16:57.765000		Unacknowledged	S/N:001/004	Group:0	NVI_0 = 0x 02 00 42
1	01-21T13:16:57.953248		Unacknowledged	S/N:001/005	Group:0	NVI_6 = 0x 01 00 82
2	01-21T13:17:06.936998		Unacknowledged	S/N:001/004	Group:0	NVI_0 = 0x 02 00 43
3	01-21T13:17:07.126759		Unacknowledged	S/N:001/005	Group:0	NVI_6 = 0x 01 00 83
4	01-21T13:17:16.109593		Unacknowledged	S/N:001/004	Group:0	NVI_0 = 0x 02 00 44
5	01-21T13:17:16.299298		Unacknowledged	S/N:001/005	Group:0	NVI_6 = 0x 01 00 84
6	01-21T13:17:25.246373		Unacknowledged	S/N:001/005	Group:0	NVI_6 = 0x 01 00 85
7	01-21T13:17:25.280419		Unacknowledged	S/N:001/004	Group:0	NVI_0 = 0x 02 00 45
8	01-21T13:17:34.418959		Unacknowledged	S/N:001/005	Group:0	NVI_6 = 0x 01 00 86
9	01-21T13:17:34.452891		Unacknowledged	S/N:001/004	Group:0	NVI_0 = 0x 02 00 46

In the example above, the measurement is made in a network with two control units with numbers 01 and 02, respectively.

The log shows how the control units send out a timed message every 10 seconds. First byte in "Data" indicates the control unit number. (Loss of three consecutive messages of this type gives rise to the error "Control unit 01 has no contact with control unit 02".) In the tool, you can see when over time messages are lost, or by moving the tool to different points in the network, it's possible to detect where in the network the messages gets lost.

## 7. TROUBLESHOOTING

### 7.7 STATISTICS

- Check that “Error rate” < 1% (approximate value).

The screenshot displays the Echelon LonScanner Protocol Analyzer interface for LON3 (USBLTA). The main window shows a tree view of statistics:

Name	Property
Update Time	13:19:40.073
<b>Snapshot Statistics</b>	
<b>Rate</b>	
<b>Maximum</b>	
Max Bandwidth Utilization	35.20%
Max Error Rate	2.22%
Max Average Packet Size	40.49 bytes
Max Packets Per Sec	48.07
Max Priority Packets Per Sec	0
Max Non-Priority Packets Per Sec	48.07
Max Filtered Packets Per Sec	0
Max Error Packets Per Sec	0.50
<b>Cumulative Statistics</b>	
Elapsed Time	00:11:17.258
<b>Average</b>	
Bandwidth Utilization	< 1%
Error Rate	0.10%
Average Packet Size	30.38 bytes
Packets Per Sec	1.53
Priority Packets Per Sec	0
Non-Priority Packets Per Sec	1.53
Filtered Packets Per Sec	0
Error Packets Per Sec	0.00
<b>Total</b>	
Total Packets	1,034
Total Priority Packets	0
Total Non-Priority Packets	1,033
Total Filtered Packets	0
Total Error Packets	1

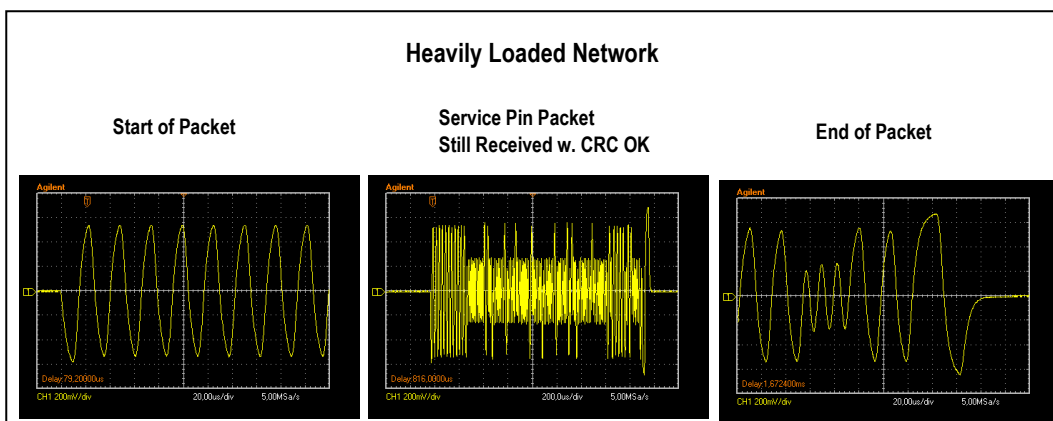
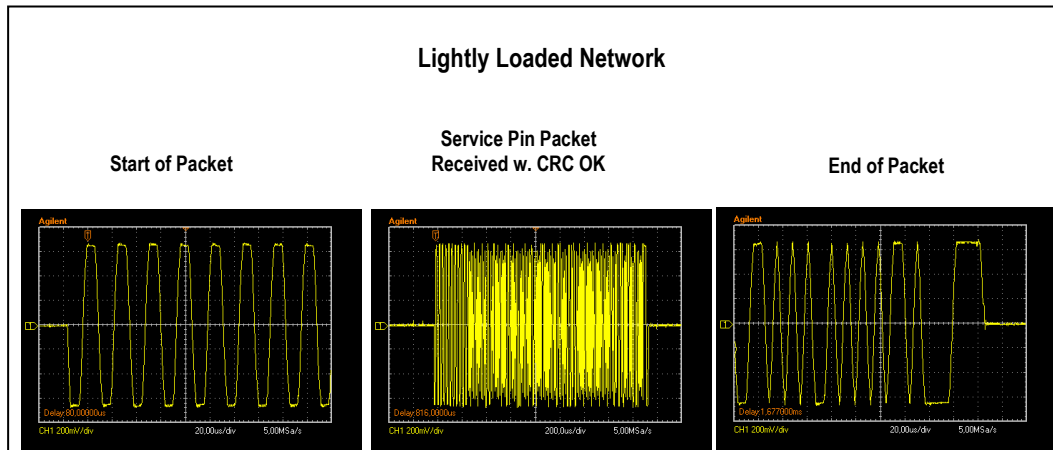
At the bottom of the window, the status bar shows: Connection active, Packets: 1034, Filtered: 0, Log: OFF, and NI Sharing: Enabled.



## 7. TROUBLESHOOTING

## 7.8 OSCILLOSCOPE

Through an oscilloscope, it is possible to analyze the TLON signals appearance at different points of the network. The oscilloscope probe connects to the TLON signals at the point where you want to measure. Note, in order not to introduce and imbalance the signal, the oscilloscope must not be connected to ground (alternatively, a differential probe must be).



- Check that the shape of the waves looks correct, like the upper illustration.
- A wave shape like the lower illustration can indicate too long cables, which means too high capacitive load or line resistance.
- Disturbances can be found with oscilloscope.

7. TROUBLESHOOTING

7.9 WRONG INFORMATION / SYNCHRONIZATION

7.9.1 AUTOMATIC SYNCHRONIZATION

An automatic synchronization is performed when a control unit restarts or when a control unit has lost contact with the others, and then gets contact again

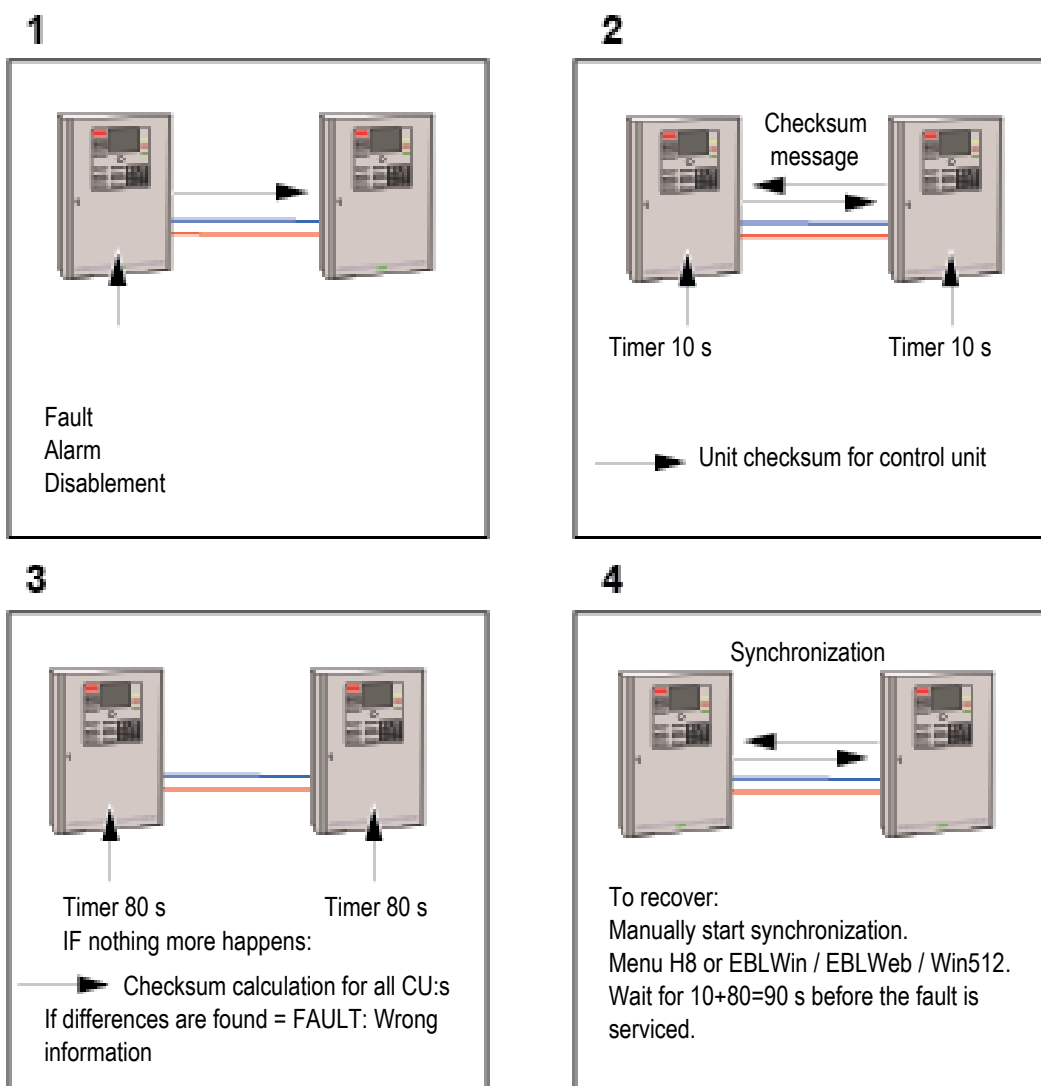
An automatic synchronization is performed when communication changes from one TLON network to the other. (For example from network 0 to backup network 1).

The checksums from different control units can be seen in the message log window in EBLWin / Win512.

In Win512 they are called "UnitChecksum" and the last four bytes of the messages should always be the same. If they are not, a Wrong information fault will be generated as soon as the system has been stable for 80s.

In EBLWin the messages are called 'Pool checksum

7.9.2 MANUAL SYNCHRONIZATION



**NOTE!** The control unit specified in the fault message is the control unit that detected the fault.