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Preface

The main enhancements made to the NETDIAG V6 software compared to NETDIAG V5 software are described below.

Enhanced DIAGNOSTICS function :

- integration in the NET PACK software package which also includes PL7 NET,
- support for TSX Micro and TSX Premium stations,
- support for FIPWAY TSX FPP 20, TSX FPM 100 modules.

The main enhancements made to the NETDIAG V6 software compared to NETDIAG V42 software are described below.

Enhanced DIAGNOSTICS function :

- Support for the status of the FIPWAY LED on PLCs with a built-in FIPWAY interface,
- Support for FIPWAY and ETHWAY networks,
- Support for TSX 17, TSX V5, PMX V5, FTX 417 and NUM 1040 stations,
- Ability to run the SYSDIAG option for detailed station diagnostics.

Enhanced TRACE function :

- Support for FIPWAY networks,
- Display support increased from 32 to 128 bytes.

Enhanced ANALYZER function :

- Support for FIPWAY networks,
- Display of specific FIPWAY network errors.

Enhanced PERFORMANCE function :

- Support for FIPWAY networks,
- Measurement of the network load factor,
- Station-by-station application data rate analysis,
- Response time measurement over a communication path,
- Displays the time when minimum and maximum measurements were taken.

This manual also includes reminders on token bus operation (MAPWAY). For further information, refer to section 7.

1.1 Program Presentation

1.1-1 General

The design and setup of distributed automation applications often requires the use of different communication protocols running on different PLC or computer systems. Experience with distributed automation systems shows that a dedicated test and setup tool can be required.

For Telemecanique networks (MAPWAY, FIPWAY, TELWAY, ETHWAY, or 802.3), a network observation and diagnostics tool is available. It also supports diagnostics on communication exchanges between distributed applications making use of the various devices connected to the network.

These functions can be required during all of the phases of the operational life of a network:

- Design,
- Setup,
- Operation,
- Maintenance.

During all of these phases, the user requires a tool that supports reading and writing of data to and from network devices for diagnostics purposes.

This tool is the NETDIAG program developed by Telemecanique and designed to run on FTX 507 or 417 terminals or IBM PC-PS/2 or compatible microcomputers. It runs under OS/2 in the X-TEL Software Workshop environment.

NETDIAG supports four different functions:

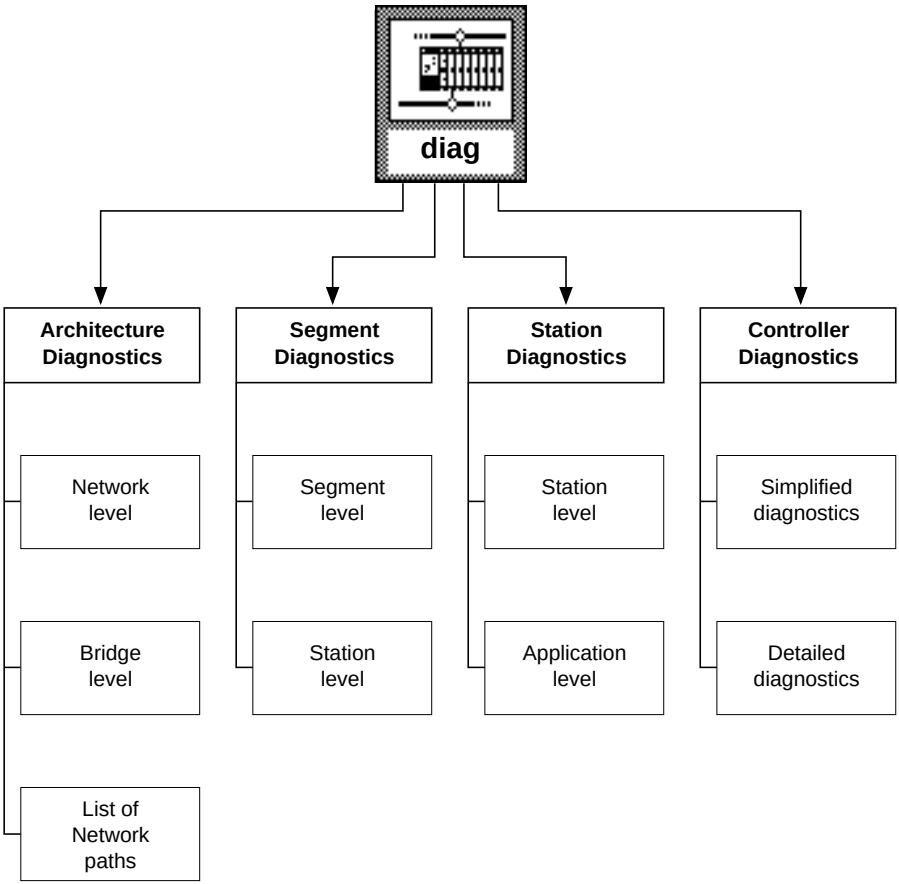
- DIAGNOSTICS to access network diagnostics,
- TRACE to display network exchanges,
- ANALYZER to analyze network operation,
- PERFORMANCE to analyze network performance.

1.1-2 DIAGNOSTICS Function

This function checks the status of the network architecture and informs the user of any errors detected.

Diagnostics are performed on:

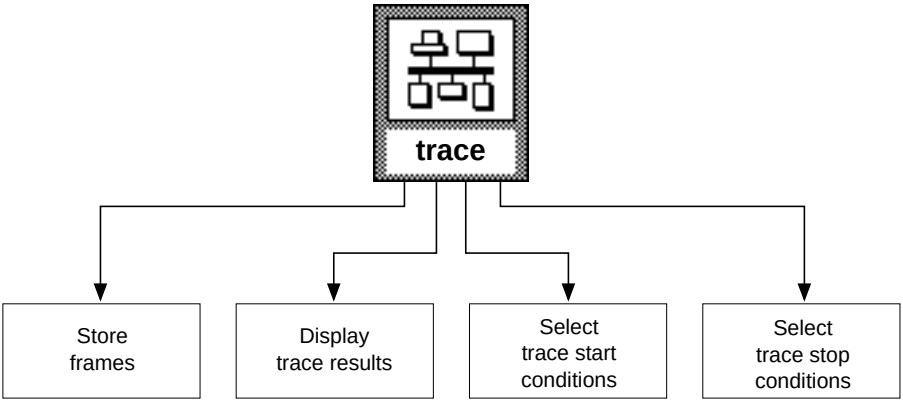
- The complete network architecture,
- Network segments,
- Stations,
- Network interfaces (controllers).



1.1-3 TRACE Function

This function analyzes network operation at application level. It stores and displays:

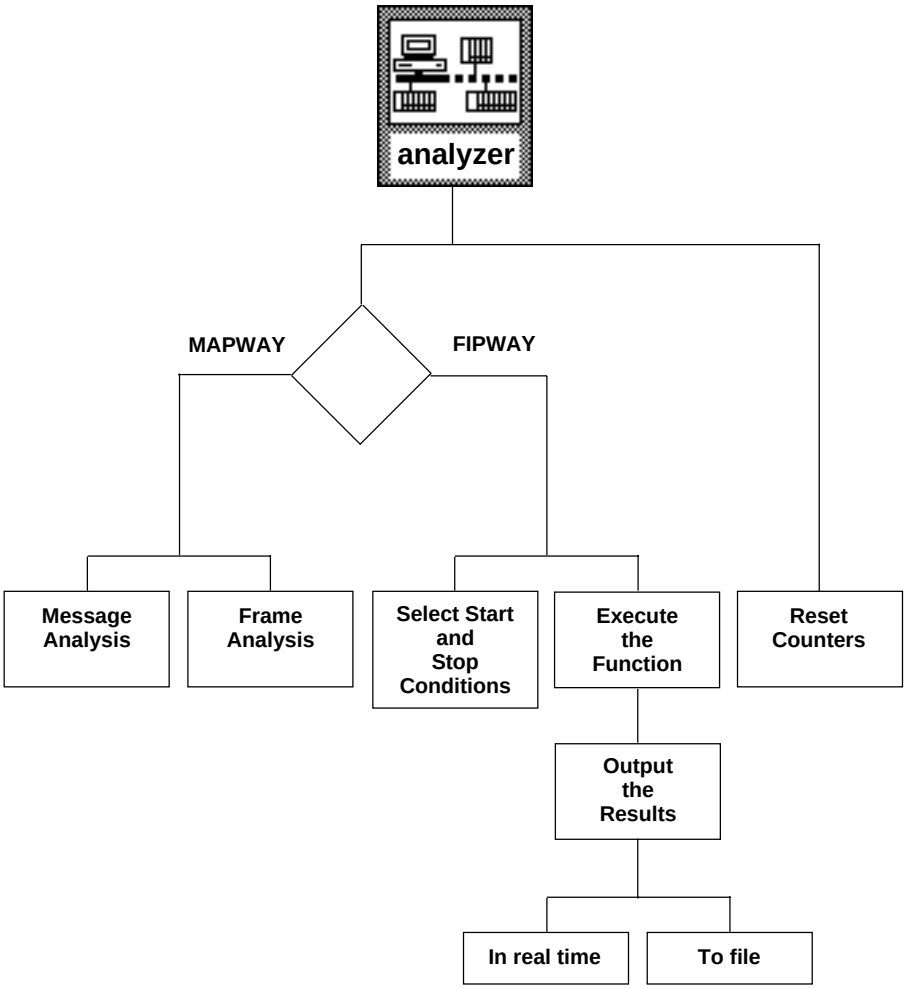
- All network application messages,
- Messages sent by a station,
- Messages received by a station,
- Messages sent and received by a station,
- Messages between two previously defined stations.



1.1-4 ANALYZER Function

This function analyzes network operation at physical layer (LLC and MAC) level. It stores and displays:

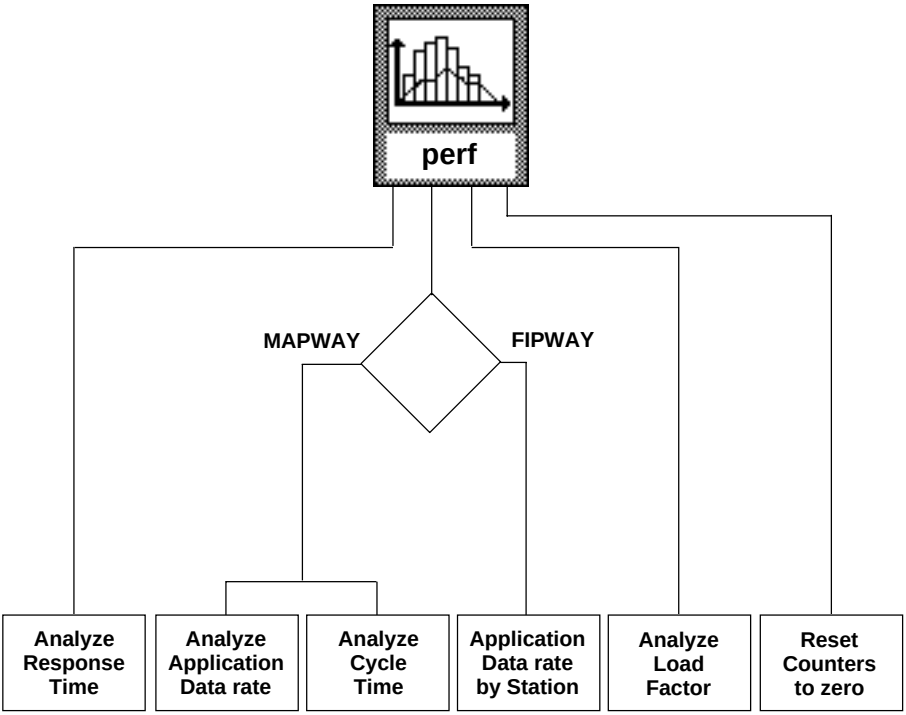
- Data frames,
- Application messages,
- Control frames.



1.1-5 PERFORMANCE Function

This function analyzes network performance levels. It stores and outputs :

- Network cycle time (for MAPWAY networks only),
- Network load factor,
- Application data rate,
- Response time for a selected communication path.



2.1 Hardware Description

In order to use the PL7-NET program you need a machine based on a 386 microprocessor as a minimum equipped with :

- The OS/2 operating system version 2.1, 2.11, 3.0, Blue or Red WARP or WARP Connect.
- The X-TEL Software Workshop, ref. TXT L BASE V6.
- A TSX MAP PC7 42 network interface board to support the use of Trace and Analyzer functions and some modes of the Performance function used with MAPWAY networks,
- A TSX FPC 10M (for FTX 507) or a TSX FPC 20M (for FTX 417) network interface board to support the use of Trace and Analyzer functions and some modes of the Performance function used with FIPWAY networks,
- A TSX ETH PC10 network interface board to support the use of the Diagnostics function and some modes of the Performance function used with ETHWAY or 802.3 networks.

This implies having at least 12 Mb of RAM and a 240 Mb hard disk available to the system.

The NETDIAG program forms part of the NET PACK software package which comprises:

- Two 3 1/2" program diskettes,
- A software key module,
- This manual, ref. TXT DM NTD V6E.
- The documentation associated with PL7 NET, ref. TXT DM PL7 V6E.

2.2 Software Installation

2.2-1 Fitting the Software Key Module

Fit the software key module into the empty location in the software key module holder.

Ensure that the microcomputer is powered-down before inserting the software key module.

Note

The software key module contains the right of use required to run the NETDIAG program. The Key Manager tool, supplied with the X-TEL Software Workshop, lets the user transfer this right of use to the working key module, freeing a software key module holder slot. For further information on the use of the Key Manager, refer to the X-TEL Software Workshop documentation.

2.2-2 Initial Preparations

Before installing the NETPACK program on the hard disk, it is recommended that the user:

- Carefully read the licence and warranty certificates that detail the warranty restrictions that apply to copying and installing the program.
- Make copies of the installation diskettes in order to avoid their becoming damaged. Only work with the copy disks.

Important

The NETPACK program diskettes are supplied write protected. Do not change the position of the write protect tab on the diskettes.

2.2-3 Installation Procedure

The installation procedure for software packages is the same regardless of the type of package.

However, the NET PACK software package must be installed on a terminal where X-TEL V6 is already installed.

To install the NET PACK software package, the terminal must be running under OS/2, preferably with all applications closed.

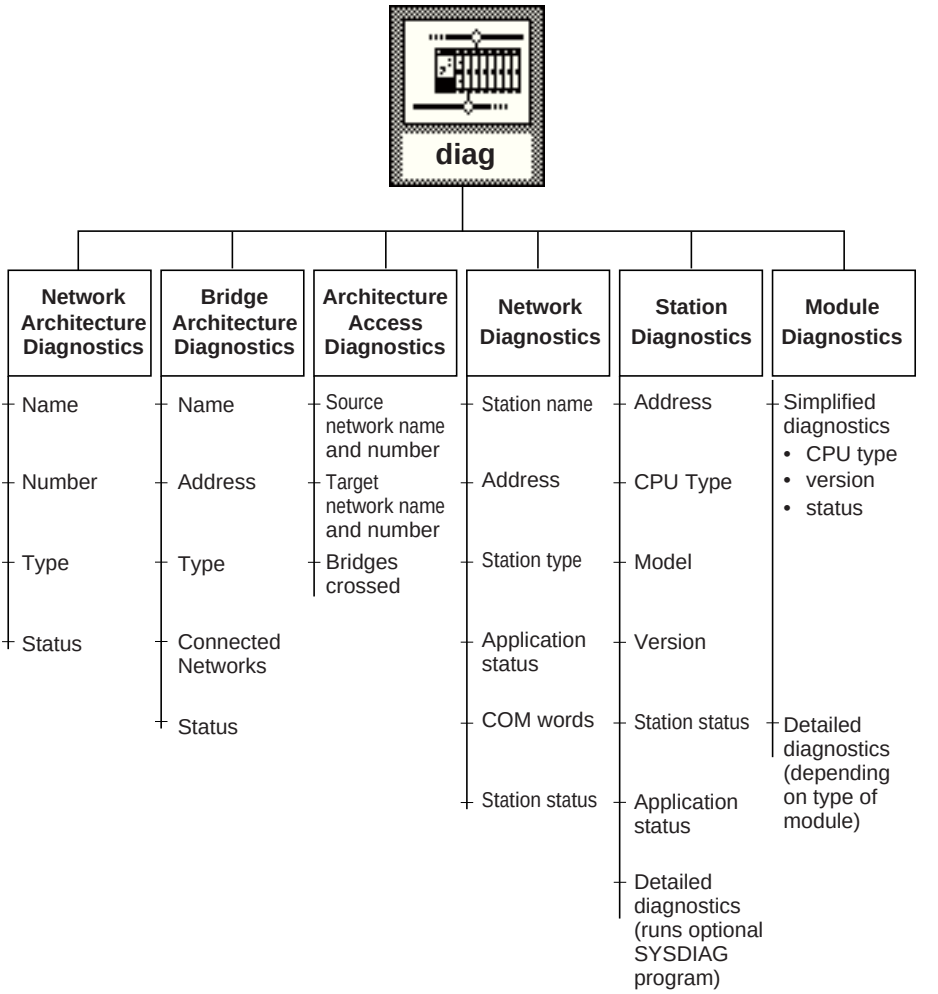
The installation procedure for V6 software packages is detailed in the "V6 software Installation" manual.

3.1 General

3.1-1 Summary

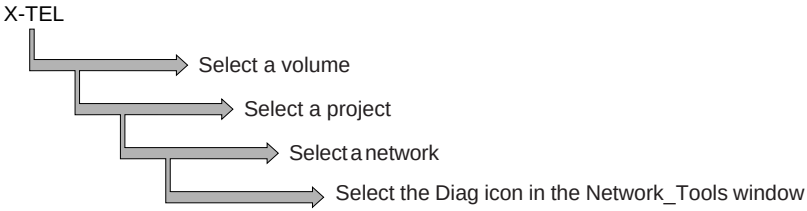
NETDIAG provides a range of diagnostics from network architecture level down to individual interface module level. Diagnostics can be run on MAPWAY, TELWAY, FIPWAY, ETHWAY or 802.3 networks and cover:

- The complete network architecture,
- A single network (or segment) in the network architecture,
- A station on the network,
- A module in a station.



3.1-2 Accessing the DIAGNOSTICS Function

The DIAGNOSTICS function is accessed from the network tools available for a network in the X-TEL Software Workshop :

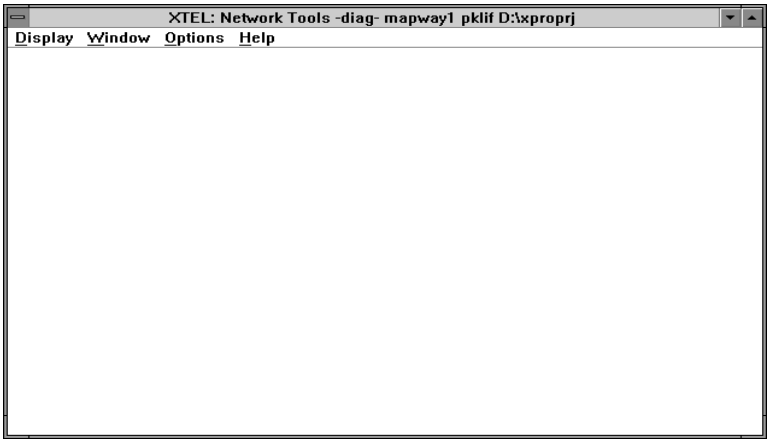


All of the diagnostics functions (except detailed diagnostics for a MAPWAY network) can be accessed from any network or PLC in the network architecture. This requires that the terminal used be connected to :

- The programming port of a PLC, or
- A MAPWAY network via a TSX MAP PC7 42 network card,
- A FIPWAY network via network cards TSX FPC 10 (for an FTX 507 terminal) or TSX FPC 20 (for an FTX 417-20 terminal) or TSX FPP 20 (for an FTX 417-40 terminal),
- An ETHWAY or 802.3 network via a TSX ETH PC 10 network card.

3.1-3 Primary Window

The DIAGNOSTICS function is accessed from the Network Tools window by double clicking on the Diag icon with the mouse. Four main choices are :



- **Display**
  - **New :** Lets the user select diagnostics. Click on the selected diagnostic and NETDIAG will open the appropriate diagnostics window.
  - **Close :** Closes one or all of the open windows.
  - **Print screen :** Generates a file that comprises the displayed screen.
  - **About... :** Provides information about the NETDIAG program,
  - **Exit F3 :** Lets the user exit the diagnostics function and return to the network window.

- **Window**
  - **Tile** : Tiles the open diagnostics windows.
  - **Cascade** : Cascades the open diagnostics windows.
  - **Window name** : Brings the selected window to the front.

- **Options**
  - **Architecture period** : Lets the user change the refresh frequency (in seconds) of the monitoring task. The monitoring task updates the status of the network architecture connected to the terminal.
  - **Module diagnostics period** : Lets the user change the task run period (in seconds) of network interface diagnostics (simple or detailed).
  - **Alarm :** This option lets the user enable or disable the alarm function supported by the diagnostics. When an error occurs in a diagnostics window, an audible alarm sounds and the window starts to blink. If the selection box next to Alarm has an X in it, then the Alarm option is selected. If the box is blank, the alarm option is disabled. To change the Alarm option selection, simply click on the selection box with the mouse.
  - **Reset counters :** This option lets the user, after confirming the action, reset to the counters of the communication interface installed in the selected station. The counters reset by this action are those displayed by the simplified interface diagnostics (refer to section 3.5-1).

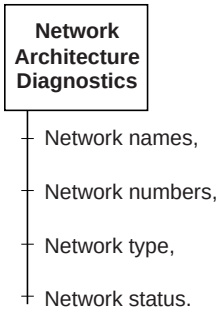
- **Help**
  - Displays the help screens available for the Diagnostics function.

3.2 Architecture Diagnostics

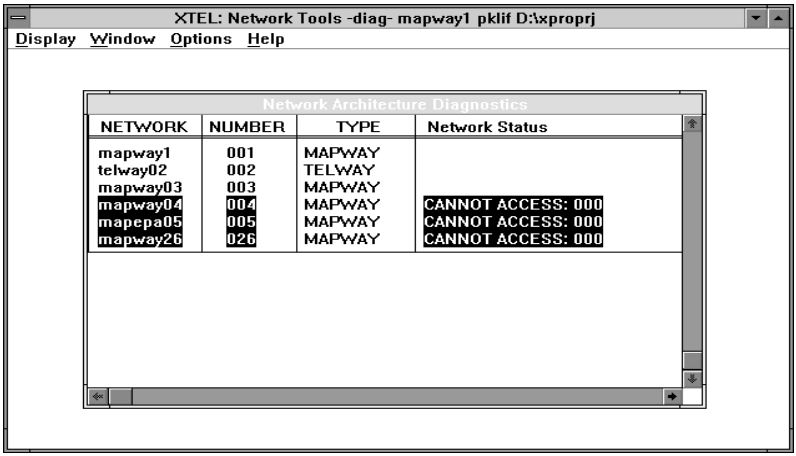
3.2-1 Network Architecture Diagnostics

This function displays the name, number, type and status of the networks present in the network architecture. When an error is detected, the window blinks to indicate an alarm.

Menu levels



Screen example



Network

A string of 1 to 8 alphanumeric characters that display the network name. If the network was not configured with PL7-NET, this column is blank.

Number

Displays the network number. This number can take a value between 1 and 127.

Type

Displays the type of network (ETHWAY, MAPWAY, FIPWAY, TELWAY or 802.3). If the network type is not known, this column is blank.

Network Status

This column displays any errors detected on the network. If no errors are found, the column is blank.

NOT CONFIGURED

Probable cause	Corrective action
Network present in the architecture but not configured.	Configure the network using X-TEL tools.

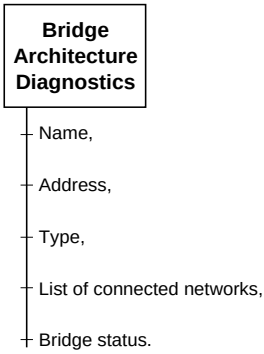
CANNOT ACCESS XXX An error was found in the station network module. XXX indicates the error code.

XXX	Probable cause	Corrective action
000	Network configured but not present in the architecture.	Check the bridges (PLC and network modules) enabling access to the network.
200	Module error (fault).	Check the network module in the bridge enabling access to the network.
201	Network does not respond to the identification request.	As above.
202	Identification request rejected.	As above.
204	Network does not respond to the read stations request.	As above.
205	Read station request rejected.	As above.
206	Network does not respond to the read configuration request.	As above.
207	Read configuration request rejected.	As above.
214	Network does not respond to the status request.	As above.
215	Status request rejected.	As above.

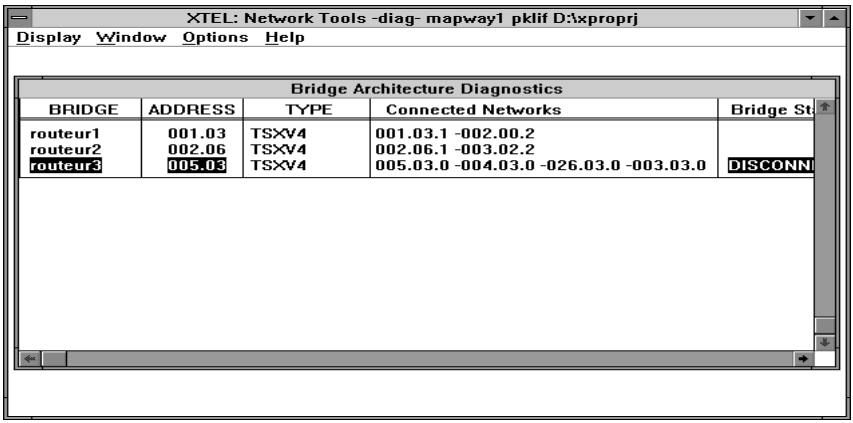
3.2-2 Bridge Architecture Diagnostics

This action displays the various parameters of the bridges in the network architecture. When an error occurs on one of the bridges, the window blinks to display the alarm.

Menu levels



Screen example



Bridge

A string of 1 to 8 alphanumeric characters that display the network name. If the bridge was not configured with PL7-NET, this column is blank.

Address

The primary bridge address. It corresponds to the address (network and station) of the MAPWAY module used for routing, that is located closest to the PLC processor. The address is displayed as NNN.SS where :

- NNN = Network number (1 to 127),
- SS = Station number (0 to 63).

Type

Displays the type of bridge.

- TSXV4 or PMXV4 = Telemecanique TSX or PMX Series 7 Model 40 PLC,
- TSXV5 or PMXV5 = Telemecanique TSX or PMX Series 7 Model 40 V5 PLC.

Connected Networks

Displays a list of all networks connected to the bridge. The address is displayed as NNN.SS.M where :

- NNN = Network number (1 to 127),
- SS = Station number (0 to 63),
- M = Module number in the rack (0 to 7).

Bridge Status

This column displays any errors detected on the bridge. If no errors are detected, the column is blank.

NOT CONFIGURED

Probable cause	Corrective action
The network is present in the architecture but is not configured.	Configure the network using the PL7-NET program.

DISCONNECTED

Probable cause	Corrective action
The bridge is configured but is not present in the network architecture.	Check the routing information with PL7-NET. If the routing information is correct, check the operation of bridges between the X-TEL station and the disconnected bridge.

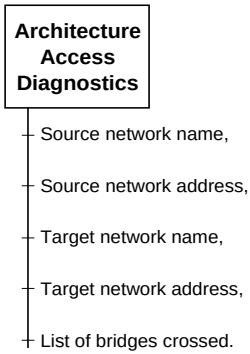
INCOHERENT NETWORKS

Probable cause	Corrective action
The networks that can be accessed by the bridge do not correspond to the configuration physically defined by PL7-NET.	Check correct bridge configuration with PL7-NET or physically connect the networks planned for the affected bridge.

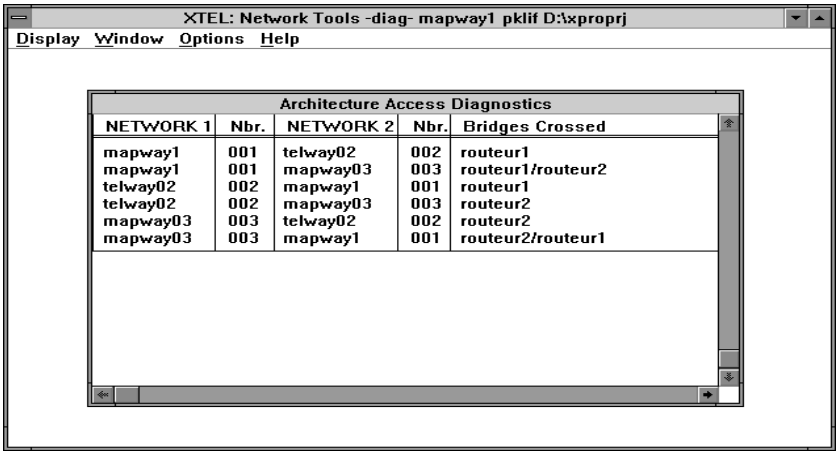
3.2-3 Architecture Access Diagnostics

This function displays the access paths between all of the networks in a network architecture. The access paths are displayed as a list of bridges to cross to move from the source network to the target network.

Menu levels



Screen example



Network 1

A string of 1 to 8 alphanumeric characters that displays the name of the source network. If the source network was not configured with PL7-NET, this column is blank.

Nbr.

Displays the number of the source network. This number takes a value between 1 and 127.

Network 2

A string of 1 to 8 alphanumeric characters that displays the name of the target network. If the target network was not configured with PL7-NET, this column is blank.

Nbr.

Displays the number of the target network. This number takes a value between 1 and 127.

Bridges Crossed

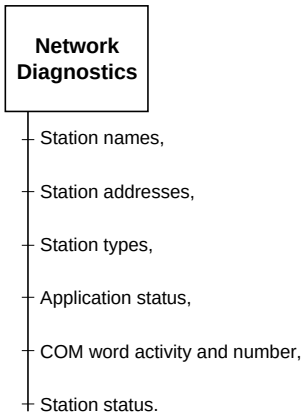
Lists all of the bridges crossed. The bridges are identified either by :

- Their names if they were configured with PL7-NET,
- Their primary address if they were not configured with PL7-NET. The primary address (network and station) is the address of the routing module that is located closest to the PLC processor module in the rack. This address is displayed as NNN.SS, where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).

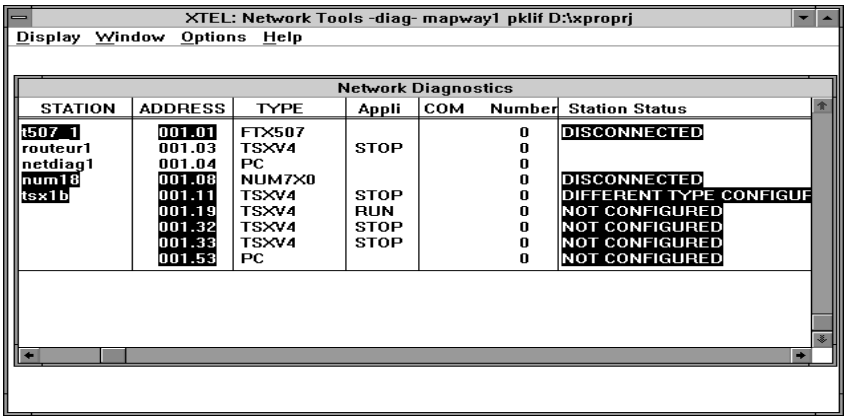
3.3 Network Diagnostics

This function displays all of the characteristics of a network previously selected in X-TEL. This information is designed to help the user in troubleshooting the network or a specific network application, e.g. a station with an incorrect COM word configuration. When an error occurs at one of the network stations, this window blinks to draw attention to the alarm.

Menu levels



Screen example



Station
A string of 1 to 8 alphanumeric characters that display the station name. If the station was not configured by PL7-NET, this column is blank.

Address
Displays the station address. It is displayed as NNN.SS where :
- NNN= Network number (1 to 127),
- SS = Station number (0 to 63).

Type
Displays the station type. It takes one of the values listed below :
- **TSX17** : TSX 17-20 PL7-2 Micro-PLC,
- **TSX27-47** : TSX 47-10 PL7-2, TSX 47-20 PL7-2 PLCs,
- **TSXV3** : TSX 47-30, TSX 47-31, TSX 67-20, TSX 67-21, TSX 67-30, TSX 87-10, TSX 87-20, TSX 87-30, TSX 87-31 PLCs,
- **TSXV4** : TSX 47-40, TSX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **PMXV4** : PMX 47-40, PMX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **TSXV5** : TSX 47-40, TSX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **PMXV5** : PMX 47-40, PMX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **TSX Micro** : TSX 37-10, TSX 37-21, TSX 37-22 PLCs,
- **TSX Premium** : TSX 57-10, TSX 57-20 PLCs,
- **CCX7** : CCX57/77 supervision system,
- **PC** : IBM PC-PS/2 or compatible microcomputer,
- **FTX417** : FTX 417 laptop terminal,
- **FTX507** : FTX 507 programming terminal,
- **NUM7x0** : NUM 750 or NUM 760 numerical controller,
- **NUM1040** : NUM 1040 numerical controller,
- **NUM1060** : NUM 1060 numerical controller,
- **VAX** : VAX minicomputer.

Appli
Displays the status of the application in the Telemecanique PLCs. It takes one of the values listed below :
- RUN,
- STOP.

Prec
Displays the following information for a station connected to the network :
- FIPWAY, status of the bus arbitrator (active, standby or disabled),
- TELWAY, if the station is an NSA (able to distribute the network number).

COM Number
Displays the activity and the number either of COM words or of words from the shared table :
- Blank : Station inactive for COM words,
- RX : Station active in reception only (COM words),
- RX/TX : Station active in transmission and reception,
- TAB.PART. : Station managing the SHARED TABLE service,
- Number : Displays the size of the station COM words or of the shared table.

Station Status
Displays station errors. If no errors occur, this column remains blank.

NOT CONFIGURED

Probable cause	Corrective action
The station is present in the architecture but is not configured.	Configure the station using X-TEL tools.

DIFFERENT TYPE CONFIGURED

Probable cause	Corrective action
The station present on the network is different from the type configured.	Update the type of station using the X-TEL Software Workshop.

DISCONNECTED

Probable cause	Corrective action
The station is disconnected from the network.	Check station status (powered-up, on-line, module failure, etc).

CANNOT ACCESS NETWORK

Probable cause	Corrective action
The network to which the station is connected cannot be accessed.	Troubleshooting using the "Network Architecture Diagnostics" function.

CANNOT ACCESS MODULE XXX An error occurred in the station interface module. XXX displays the error code.

XXX	Probable cause	Corrective action
201	Station does not respond to the identification request.	Check the station interface.
202	Identification request rejected.	As above.
206	Module does not respond to the read configuration request.	As above.
207	Read configuration request rejected.	As above.
219	Module does not respond to the read structure element request.	As above.
220	Read structure element request rejected.	As above.
221	Read Status BA element incorrect.	As above.
222	Status LED element request is incorrect.	As above.

CANNOT ACCESS CPU XXX An error occurred in the CPU. XXX displays the error code.

XXX	Probable cause	Corrective action
104	Invalid bridge number in the configuration.	Check the routing information with PL7-NET.
105	Invalid number of interfaces in the configuration.	As above.
106	Invalid network number in the configuration.	As above.
107	Invalid station number in the configuration.	As above.
109	Type of station different from the type of station configured.	Update the type of station using the X-TEL Software Workshop.
203	CPU does not respond to the identification request.	Check station status.
208	CPU does not respond to the application extension request.	As above.
209	Application extension request rejected.	As above.
216	CPU does not respond to the reservation request.	As above.
217	Reservation request rejected	As above.
218	Identification request rejected.	As above.

I/O ERROR

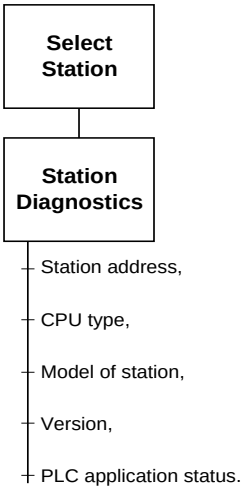
Probable cause	Corrective action
The station has I/O errors.	Run detailed station diagnostics to determine the cause.

3.4 Station Diagnostics

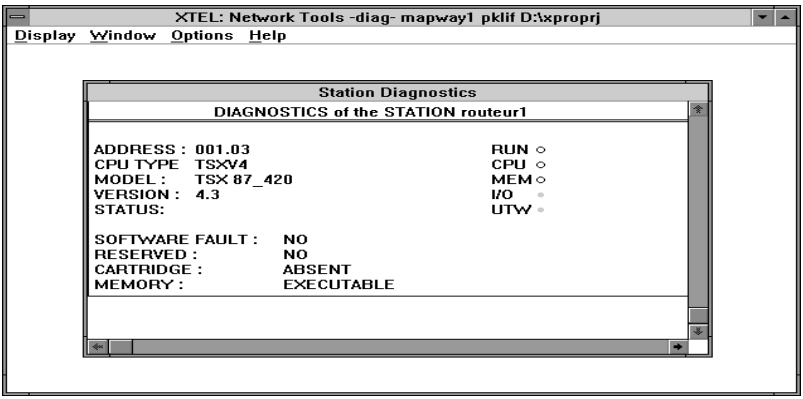
3.4-1 Performing Diagnostics on a Station

This function displays all of the characteristics of a selected station and of its application. When an error occurs on this station, the screen blinks to attract the user's attention to the alarm.

Menu levels



Screen example



Address

Displays the station address. It is displayed as NNN.SS where :

- NNN= Network number (1 to 127),
- SS = Station number (0 to 63).

CPU type

Displays the station type. It takes one of the values listed below :

- **TSX17** : TSX 17-20 PL7-2 Micro-PLC,
- **TSX27-47** : TSX 47-10 PL7-2, TSX 47-20 PL7-2 PLCs,
- **TSXV3** : TSX 47-30, TSX 47-31, TSX 67-20, TSX 67-21, TSX 67-30, TSX 87-10, TSX 87-20, TSX 87-30, TSX 87-31 PLCs,
- **TSXV4** : TSX 47-40, TSX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **PMXV4** : PMX 47-40, PMX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **TSXV5** : TSX 47-40, TSX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **PMXV5** : PMX 47-40, PMX 67-40, TSX 87-40, TSX 107-40 PLCs,
- **TSXV5X** : TSX Micro, TSX Premium PLCs,
- **TSX Micro** : TSX 37-10, TSX 37-21, TSX 37-22 PLCs,
- **TSX Premium** : TSX 57-10, TSX 57-20 PLCs,
- **CCX7** : CCX57/77 supervision system,
- **PC** : IBM PC-PS/2 or compatible microcomputer,
- **FTX417** : FTX 417 laptop terminal,
- **FTX507** : FTX 507 programming terminal,
- **NUM7x0** : NUM 750 or NUM 760 numerical controller,
- **NUM1040** : NUM 1040 numerical controller,
- **NUM1060** : NUM 1060 numerical controller,
- **VAX** : VAX minicomputer.

Model

Displays the PLC model configured for the station.

Version

Displays the version number only for PLCs.

Status

Displays station errors. If no errors are present, this column is blank.

NOT CONFIGURED

Probable cause	Corrective action
Station present but not configured.	Configure the station using the X-TEL programming terminal.

INVALID CONFIGURED TYPE

Probable cause	Corrective action
The station present on the network is different from the type configured.	Update the type of station using the X-TEL programming terminal.

DISCONNECTED

Probable cause	Corrective action
Station disconnected from the network.	Check station status (powered-up, connected to the network, module failure, etc.).

CANNOT ACCESS NETWORK

Probable cause	Corrective action
The network to which the station is connected cannot be accessed.	Troubleshoot using "Network Architecture Diagnostics" function.

CANNOT ACCESS MODULE XXX An error occurred in the station interface module. XXX displays the error code.

XXX	Probable cause	Corrective action
201	Station does not respond to the identification request.	Check the station interface module.
202	Identification request rejected.	As above.
206	Module does not respond to the read configuration request.	As above.
207	Read configuration request rejected.	As above.
219	Module does not respond to the read structure element request.	As above.
220	Read structure element request rejected.	As above.
221	Read Status BA element incorrect.	As above.
222	Status LED element request is incorrect.	As above.

CANNOT ACCESS CPU XXX An error occurred in the CPU. XXX displays the error code.

XXX	Probable cause	Corrective action
104	Invalid bridge number in the configuration.	Check the routing information with PL7-NET.
105	Invalid number of interfaces.	As above
106	Invalid network number.	As above.
107	Invalid station number.	As above.
109	Type of station different from the type of station configured.	Update the type of station using the X-TEL programming terminal.
203	CPU does not respond to the identification request.	Check station status.
208	CPU does not respond to the application extension request.	As above.

CANNOT ACCESS CPU XXX (Continued)

XXX	Probable cause	Corrective action
209	Application extension request rejected.	Check station status.
216	CPU does not respond to the reservation request.	As above.
217	Reservation request rejected	As above.
218	Identification request rejected.	As above.

Software fault

Indicates a software error in the PLC application program.

- YES : A software error occurred,

Probable cause	Corrective action
Illegal operation, that cannot be executed (eg. dividing by 0) in the application program.	Modify the application program.

- NO : No errors.

RESERVED

Displays whether or not the PLC is reserved.

CARTRIDGE

When PLCs are used, indicates whether or not the memory cartridge is present in the processor module.

MEMORY

Indicates presence (executable) or absence (not executable) of the application program stored in the internal memory of the PLC (ON BOARD RAM).

PREC

Displays the following information for a station connected to the network :
- FIPWAY, status of the bus arbitrator (active, standby or disabled),
- TELWAY, if the station is an NSA (able to distribute the network number).

RUN

Corresponds to the RUN LED on the PLC :
- Full circle : LED lit (PLC running),
- Hollow circle : LED extinguished (PLC stopped).

CPU

Corresponds to the CPU LED on the PLC :

- Full circle : LED lit,

Probable cause	Corrective action
Processor module failure.	Replace the processor module.

- Hollow circle : LED extinguished (PLC running).

MEM

Corresponds to the MEM LED on the PLC :

- Full circle : LED lit.

Probable cause	Corrective action
New configuration being loaded.	Wait until loading is complete.
Task period overrun.	Make the appropriate corrections to the program.
Memory contents corrupted.	**RAM memory cartridges :** Initialize the memory cartridges and reload the program. **EPROM memory cartridges :** Erase the memory cartridges by exposure to U.V. light and reload the program.
Faulty back-up battery in a RAM cartridge (when first powered-up, be sure to let the batteries charge fully by leaving the cartridges under power for at least 10 hours).	Initialize the memory cartridges. Remove the memory cartridges, and insert them again one by one until an error occurs. Replace the faulty memory cartridge and reload the program.

- Hollow circle : LED extinguished (correct operation).

I/O

Corresponds to the I/O LED on the PLC :

- Full circle : LED lit.

Probable cause	Corrective action
Terminal block disconnected.	Check each terminal block.
Configuration error.	Correct the I/O configuration.
I/O module failure(s).	Replace faulty module(s).

- Hollow circle : LED extinguished (correct operation).

BAT

Corresponds to the BAT LED on a TSX 17-20 Micro-PLC :

- Full circle : LED lit.

Probable cause	Corrective action
Battery discharged.	Replace the battery.

- Hollow circle : LED extinguished (correct operation).

UTW

Corresponds to the UTW LED on the PLC. This LED is only provided on PLCs that have a built-in UNI-TELWAY interface :

- Full circle : LED lit.

Probable cause	Corrective action
Terminal block parity error.	Check address coding.
UNI-TELWAY device alone on the network.	Check the other connected devices.
Module EPROM or RAM error during self-tests.	Replace the PLC processor.

- Hollow circle : LED extinguished (correct operation).

FIP

Corresponds to the FIP LED on the PLC. This LED is only provided on PLCs that have a built-in FIPWAY interface :

- Full circle : LED lit.

Probable cause	Corrective action
Built-in FIP interface failure.	Replace the PLC processor.

- Hollow/Full circle : LED blinking.

Probable cause	Corrective action
Terminal block disconnected.	Check the network terminal block.
Connection point number coded in the terminal block already used by another device.	Check the address coding.
Configuration problem with the station or a device connected to the FIP link.	Check the application configuration using XTEL-CONF.
No activity on the network, transmission error.	Stop the PLC and restart it.

- Hollow circle : LED extinguished (correct operation).

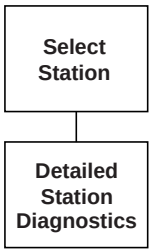
3.4-2 Detailed Station Diagnostics

This function lets the user launch SYSDIAG (TXT L SYD VxE option) when in-depth station diagnostics are required (e.g. for I/O problems).

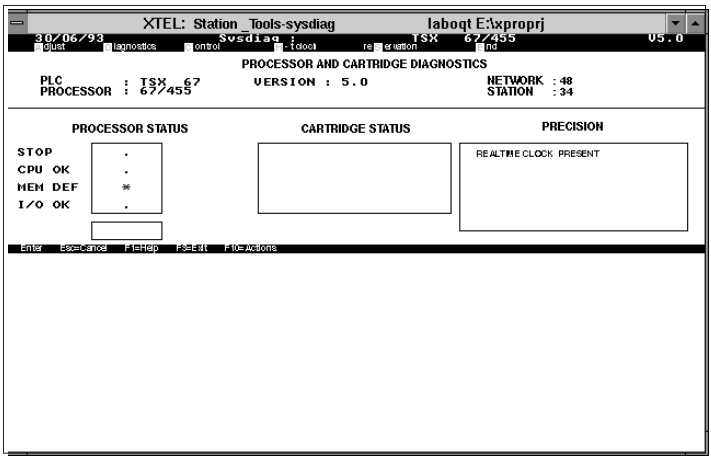
Comment

The detailed diagnostics function is not always available. It is not offered in the diagnostics of ETHWAY networks or TSX Micro and TSX Premium stations.

Diagram



Screen example



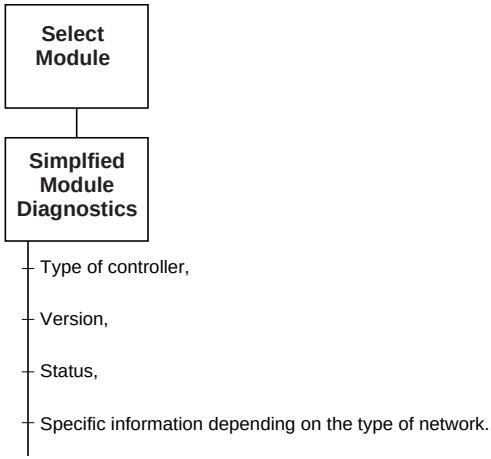
Once the station is selected, NETDIAG starts the SYSDIAG option. SYSDIAG is displayed in the foreground, but NETDIAG remains active. If the SYSDIAG option is not available, a corresponding message is displayed.

3.5 Interface Diagnostics

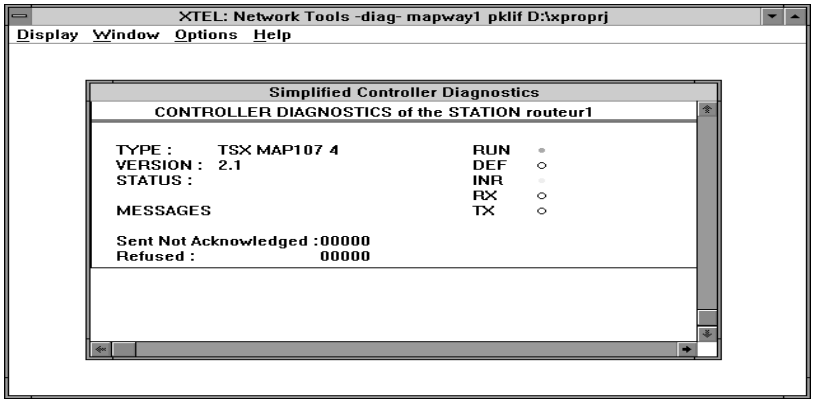
3.5-1 Simplified Diagnostics

This function provides an overview of the characteristics of the selected network interface (module) and displays its status. When an error is detected by this interface, the window blinks to attract the user's attention to the alarm.

Menu levels



Screen example



Type

Displays the type of network interface used, such as the examples shown below :

- TSX MAP107 4 : MAPWAY interface module for PLCs,
- TSX MAPPC7 42 : MAPWAY interface board for IBM PCs or compatibles,
- TSX MAPVAX7 : MAPWAY interface for VAX,
- TSX FPC 10 : FIPWAY interface board for FTX 507 or IBM PC or compatibles,
- TSX FPC 20 : FIPWAY interface board for FTX 417,
- TSX FPP 20 : FIPWAY interface board for TSX Micro, TSX Premium and FTX 417-40
- TSX FPM 100 : FIPWAY interface board for PLC,
- TSX FIP UC : FIPWAY interface built-into the PLC processor,
- TSX FPG 10 : FIPWAY interface for TSX 17-20 Micro-PLCs,
- TSX ETH 107 : ETHWAY interface modules for PLCs,
- TSX ETH PC10 : ETHWAY interface for FTX 507 or IBM PCs or compatibles.
- TSX ETH 200 : Ethernet MMS interface for PLC.

Version

Displays software version number of the network interface.

Status

Displays the status of the network interface. This field is blank if no errors are detected

DOWNGRADED only applies to TELWAY network interface modules,

Probable cause	Corrective action
Conflict with the selected network number between at least two TELWAY network modules.	Correct the network configuration description with PL7-NET.

T. BLOCK ERROR only applies to MAPWAY interfaces,

Probable cause	Corrective action
The module terminal block is disconnected.	Reconnect the terminal block.

PERMANENT ERROR only applies to MAPWAY interfaces,

Probable cause	Corrective action
Network interface no longer operational.	Replace the network interface.

ERROR XXX A processor error occurred. XXX represents the error code:

XXX	Probable cause	Corrective action
102	Unknown type of network assigned to the interface.	Check the type of network connected to affected interface.
203	Interface does not respond to the identification request.	Check interface status.
206	Interface does not respond to the read configuration request.	As above.
207	Read configuration request rejected.	As above.
210	Interface does not respond to the reset counters request.	As above.
211	Reset counters request rejected.	As above.
212	Interface does not respond to the read counters request.	As above.
213	Read counters request rejected.	As above.
214	Interface does not respond to the status request.	As above.
215	Status request rejected.	As above.
218	Identification request rejected.	As above.
219	Interface does not respond to the read structure element request.	As above.
220	Read structure element request rejected.	As above.
221	Read Status BA element is incorrect.	As above.
222	Read Status LED element is incorrect.	As above.

MAPWAY module LEDs

RUN

Corresponds to the module RUN LED :
- Full circle : LED lit (module running (Run)),
- Hollow circle : LED extinguished (module stopped (Stop)).

DEF

Corresponds to the DEF (fault) LED on a MAPWAY module :
- Full circle : LED lit,

Probable cause	Corrective action
One of the module self-tests ended on error.	The error code is displayed by the module LEDs. Refer to the module documentation.
Permanent module error.	Replace the module.
Terminal block disconnected.	Connect the terminal block.

- Hollow circle : LED extinguished (normal operation).

INR

Corresponds to the INR (In ring) LED on a MAPWAY module :
- Full circle : LED lit (normal operation),
- Hollow circle : The module is no longer part of the logical ring,

Probable cause	Corrective action
Station alone on the network.	No corrective action. The module is operating normally.
All other stations on the network are inactive.	As above.
Module excluded from the stations passing the token.	Replace the module.

RX

Corresponds to the RX (reception) LED on a MAPWAY module :
- Full circle : LED lit (module receiving data),
- Hollow circle : LED extinguished (module not receiving data).

TX

Corresponds to the TX (transmission) LED on a MAPWAY module :
- Full circle : LED lit (module sending data),
- Hollow circle : LED extinguished (module not sending data).

TELWAY module LEDs

RUN

Corresponds to the RUN LED on a TELWAY module :
- Full circle : LED lit (module running (Run)),
- Hollow circle : LED extinguished (module stopped (Stop)).

ADR

Corresponds to the ADR LED on a TELWAY module :
- Full circle : LED lit (module addressing error),
- Hollow circle : LED extinguished (normal operation).

NET

Corresponds to the NET LED on the front panel of a TELWAY module :
- Full circle : LED lit (module failure or disconnection from the network),
- Hollow circle : LED extinguished (normal operation).

ETHWAY or 802.3 module LEDs

RUN

Corresponds to the RUN LED on a module :
- Full circle : LED lit (module running (Run)),
- Hollow circle : LED extinguished (module stopped (Stop)).

DEF

Corresponds to the DEF (fault) LED on a module :
- Full circle : LED lit,

Probable cause	Corrective action
One of the module self-tests ended with an error.	The error code is displayed by the module LED display. Refer to the documentation.
Permanent module failure.	Replace the module.
Terminal block disconnected.	Refit the terminal block.

- Hollow circle : LED extinguished (normal operation).

RX

Corresponds to the RX (receive) LED on the module :
- Full circle : LED lit (module receiving data),
- Hollow circle : LED extinguished (module not receiving data).

TX

Corresponds to the TX (transmit) LED on the module :
- Full circle : LED lit (module transmitting data),
- Hollow circle : LED extinguished (module not transmitting data).

FIPWAY interface LEDs

The LEDs that are specific to the FIP interface built-into the PLC module (RUN, CPU, MEM, I/O and FIP) are described in section 3.4-1, Station Diagnostics. The LEDs on other FIP interfaces are described below **:**

RUN

Corresponds to the RUN LED on the interface **:**

- Full circle : LED lit (interface running (Run)),
- Hollow circle : LED extinguished (interface stopped (Stop).

DEF

Corresponds to the DEF LED on the interface **:**

- Full circle : LED lit.

Probable cause	Corrective action
Serious failure.	Replace the FIP interface.

- Hollow/Full circle : LED blinking.

Probable cause	Corrective action
Terminal block disconnected.	Check the network terminal block.
The connection point coded in the terminal block is already used by another device.	Check the address coding.
Configuration problem with the station or other devices connected to the FIP link.	Check the application configuration.
No activity on the network, transmission error.	Stop and restart the PLC.

- Hollow circle : LED extinguished (normal operation).

COM

Corresponds to the COM LED on the interface **:**

- Full circle : LED lit (interface sending and receiving data),
- Hollow circle : LED extinguished (interface is not sending or receiving data).

Messages (for MAPWAY, FIPWAY, ETHWAY or 802.3 networks) :

- *sent not acknowledged* : Number of messages sent by the interface to a remote station and not acknowledged by the target station.
- *refused* : Number of messages sent by the interface to a remote station and refused by the target station.

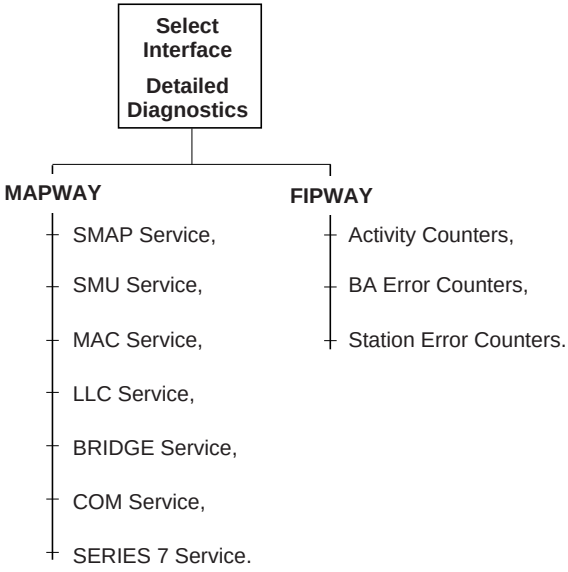
Messages (for TELWAY networks) :

- *local received* : Number of point-to-point messages received by the module.
- *broadcast received* : Number of broadcast messages received by the module (usually COM words).
- *overwrite characters received* : Number of messages received with lost characters.
- *reception frame error* : Number of messages received with a frame error.
- *reception parity error* : Number of messages received with a parity error.
- *inter network received* : Number of point-to-point messages received by the module on the line and destined for another station.
- *sent* : Number of point-to-point messages sent by the module.
- *point-to-point lost* : Number of point-to-point messages received by the module but not processed (module overloaded).
- *BCC line error* : Number of messages received from the network with a bad check character.
- *BCC bus error* : Number of messages received from the PLC bus with a bad check character.

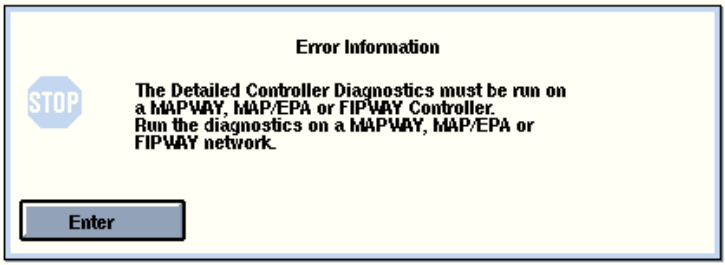
3.5-2 Detailed Diagnostics (General)

This function lets the user access the various services supported by a FIPWAY or MAPWAY interface. The results obtained can only be interpreted by specially trained personnel fully experienced with FIPWAY and MAPWAY network operation (e.g. development or systems support engineers).

Menu levels

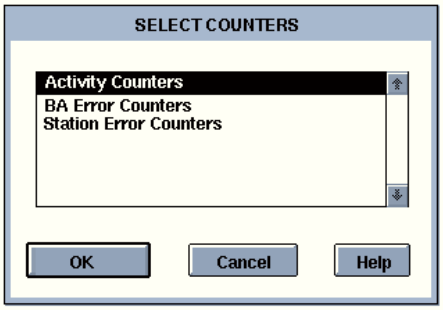


If this function is run on another type of network, the following message is displayed :



3.5-3 Detailed Diagnostics (FIPWAY Network)

Selecting this function on a FIPWAY network displays the "Select Counters" screen shown below :



Activity counters :

This counter displays the :

- **Number of ID_DAT frames received** : Number of FIPWAY variables used by the station (network management variables and variables used by the COM word service).
- **Number of ID_DAT frames sent** : Number of FIPWAY variables produced by the station (network management variables and variables used by the COM word service).
- **Number of high-priority aperiodic requests** : Number of exchanges of aperiodic variables between the local station and a remote station, using high-priority (highest priority).
- **Number of normal-priority aperiodic requests** : Number of exchanges of aperiodic variables between the local station and a remote station, using normal-priority (lowest priority).
- **Number of messages sent and acknowledged** : Number of messages sent by the station with data link level acknowledgment (Datagrams and Telegrams).
- **Number of messages sent and not acknowledged** : Number of messages sent by the station without data link level acknowledgment (broadcast Datagrams).

BA function error counters :

This counter displays the :

- **Number of BA Overrun Errors** : This error is caused by a BA station memory access conflict.
- **Number of Collision Errors** : This error corresponds to activity on the network during theoretically silent periods. After a transmission and until a response is received from the BA, nothing should transit on the network. If the BA detects any activity, it generates a collision error. This occurs for example when more than one BA station is active simultaneously on the network.
- **Number of Silence Errors** : The BA detected no activity on the network for more than a standard time for FIP.
- **Number of refused high-priority aperiodic requests** : This error corresponds to saturation of the queue of high-priority aperiodic variable exchange requests : The BA is temporarily unable to store and satisfy the request.
- **Number of refused normal-priority aperiodic requests** : This error corresponds to saturation of the queue of normal-priority aperiodic variable exchange requests : The BA is temporarily unable to store and satisfy the request.
- **Number of refused message requests** : This error corresponds to saturation of the queue of messages. The BA is temporarily unable to store and satisfy the request.
- **BA Time-Out on aperiodic exchanges** : The time-out is exceeded for messages or aperiodic variables during an elementary cycle within the network macro-cycle.

Station function error counters :

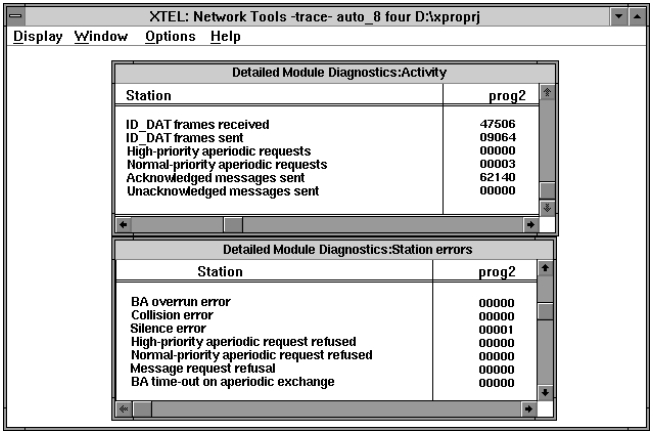
This counter displays the :

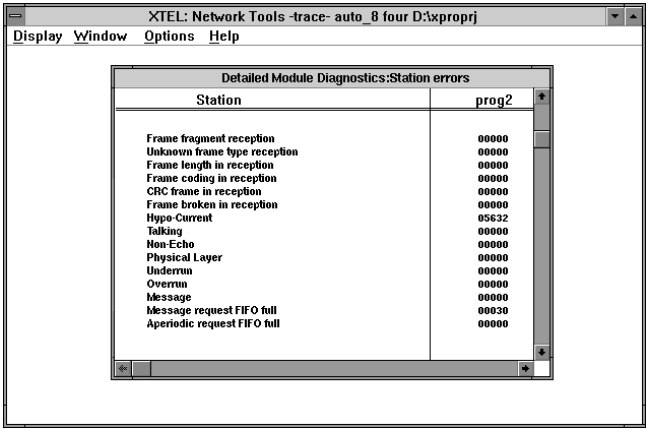
- **Number of frame fragment reception errors** : A frame fragment is identified when the end frame delimiter sequence of symbols is recognized by the system when it is ready to receive a frame and expecting to recognize a start of frame delimiter.
- **Number of unknown frame type reception errors** : Within a frame, the first byte identifies the type of the data link frame. A number of frame types are defined in the data link protocol of the UTE/C46_603 standard. The presence of any other code in a frame corresponds to an unknown frame type error.
- **Number of frame length reception errors** : A FIP frame body cannot exceed 256 bytes.
- **Number of frame coding reception errors** : Indicates reception of certain symbols which can only be part of the start and end of frame delimiter sequences in the body of a frame.
- **Number of frame CRC reception errors** : A CRC error is detected when a difference occurs between the CRC calculated and the CRC contained in the frame received.
- **Number of pierced frame reception errors** : In normal operation, a silence will only occur after an end of frame delimiter has been found. If a silence symbol occurs in the body of a frame, i.e. after identification of a start of frame delimiter and before identification of an end of frame delimiter, a broken frame error is declared.
- **Number of hypo-current errors** : The hypo-current error corresponds to a context in which the transmission line system, when used, produces a current level that is less than the minimum operating current defined. The minimum current level is defined in NFC46-602. This error may be caused by an open line.
- **Number of chatter errors** : The chatter error corresponds to a context where the transmission line system has control of the line for longer than the maximum operating time defined. There are a number of reasons for this error, such as a deterioration of the modulator or a faulty data link layer.
- **Number of non-echo errors** : The non-echo error corresponds to a context where the transmission line system is transmitting using a transmission current level within the defined operating range while simultaneously there is no detection of the presence of the signal on the same channel.
- **Number of physical layer errors** : This error corresponds to a prolonged absence of transitions at physical symbol level.
- **Number of underrun errors** : This error corresponds to the incapacity of the station to respect the transmission speed on the network.
- **Number of overrun errors** : Corresponds to a loss of MAC symbols in reception, linked to reaction time of the received being too slow.
- **Number of message errors** : Number of messages with a negative acknowledgment or none at all.

Station function error counters (continued) :

- **Number of message request FIFO full errors or Number of aperiodic request FIFO full errors** : The messages exchanged between a source entity and a target entity are stored by the receivers in a queue and made available locally to the higher layers. When these messages are not processed fast enough, the queue can overflow.

Screen examples



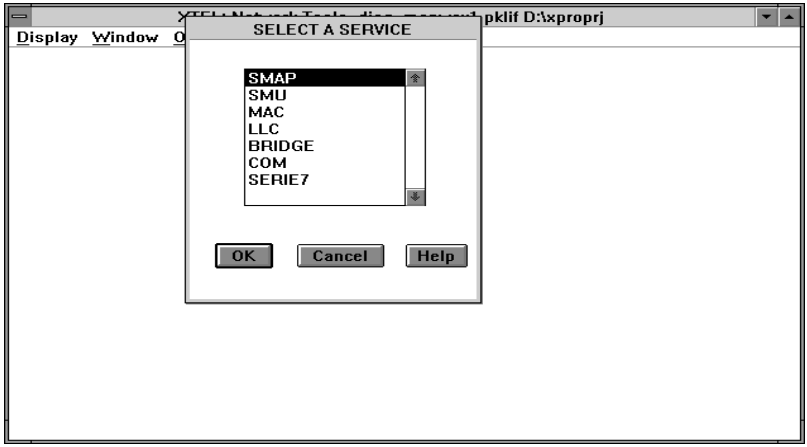


3.5-4 Detailed Diagnostics (MAPWAY Network)

The Detailed Diagnostics function requires terminal connection to the MAPWAY network. Always ensure that :

- The terminal is physically connected to the selected network,
- The software selection of the network is made (in the Networks window) before running the function.

Running this function on a MAPWAY network displays the "Select a Service" screen shown below :



SMAP Service

- **Service version** : Displays the software version level of the SMAP service.
- **Station** : Displays the name of the station where the interface is located. If the station is not configured, the station address is displayed as NNN.SS where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).
- **Error Count** : Number of internal errors detected by the SMAP service.
- **Error Context** : Displays the context of the last error found over two bytes :
  - Byte 1 = State identifier,
  - Byte 2 = Event identifier.
- **System Time** : Displays interface running time since the last power break (in the form HH:MM:SS).
- **Discard SPDU Count**: Displays the number of negative confirms to "L_DATA" or "L_DATA_ACK".

SMU Service

In the rest of this section, a synchronous frame is a frame linked to the master task message system and an asynchronous frame is a frame linked to a bridge and processed as a background task.

- **Service version** : Displays the software version number of the SMU service.
- **Station** : Displays the name of the station where the interface is located. If the station is not configured, the station address is displayed as NNN.SS where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).
- **sdBccError** : Number of synchronous frames received with a checksum error.
- **sdLengthError** : Number of synchronous frames received with a frame length error.
- **sdFormatError** : Number of synchronous frames received with a buffer size error.
- **sdNoReadRessource** : Number of synchronous frames received when no read resource was available.
- **siBccError** : Number of asynchronous frames received with a checksum error.
- **siLengthError** : Number of asynchronous frames received with a frame length error.
- **siFormatError** : Number of asynchronous frames received with a buffer size error.
- **siNoReadRessource** : Number of asynchronous frames received when no read resource was available.
- **tlgmBccError** : Number of telegrams received with a checksum error.
- **tlgmLengthError** : Number of telegrams received with a frame length error.
- **tlgmFormatError** : Number of telegrams received with a buffer size error.
- **tlgmNoReadRessource** : Number of telegrams received when no read resource was available.
- **cwNoReadRessource** : Number of COM word frames received when no read resource was available.

MAC Service

- **Service version** : Displays the software version number of the MAC service.
- **Station** : Displays the name of the station where the interface is located. If the station is not configured, the station address is displayed as NNN.SS where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).
- **MAC address** : Displays the MAC address over 6 bytes :
  - byte 1 = 00 |
  - byte 2 = 80 > Telemecanique identifier,
  - byte 3 = F4 |
  - byte 4 = 00 MAPWAY identifier,
  - byte 5 = NN Network number,
  - byte 6 = SS Station number.
- **Unexpected frame** : Number of unexpected frames at MAC level.
- **Claim Token** : Number of times the station started a "claim token" phase.
- **Non Silence** : Number of noise periods when no "Start Delimiter" was detected.
- **FCS Errors** : Number of frames received without physical errors but with a bad parity check.
- **Ebit Error** : Number of frames received with bit 8 set in the "End delimiter".
- **Last Token Rotation Time** : Time elapsed since the last token passing (time unit is 1.000.000 time byte).

LLC Service

- **Service version** : Displays the software version number of the LLC service.
- **Station** : Displays the name of the station where the interface is located. If the station is not configured, the station address is displayed as NNN.SS where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).
- **Maximum Number of Retries** : Maximum number of message transmission retries if no acknowledgment is received.
- **No More Rdb S7** : Number of frames the LLC service was not able to send to the Series 7 service due to a lack of resources between these two services.
- **No More Rdb Com** : Number of frames the COM service was not able to send to the Series 7 service due to a lack of resources between these two services.
- **Rwr Time out** : Number of RWR type messages (request with response) unacknowledged at MAC level.
- **Unexpected Rsp** : Number of MAC level acknowledgments received that do not correspond to messages sent.

BRIDGE Service

- **Service version** : Displays the software version number of the BRIDGE service.
- **Station** : Displays the name of the station where the interface is located. If the station is not configured, the station address is displayed as NNN.SS where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).
- **Error Count** : Number of internal errors detected by the BRIDGE service.
- **Error Context** : Displays the context of the last error detected over two bytes :
  - byte 1 = Status identifier,
  - byte 2 = Event identifier.
- **Tx Count** : Number of frames sent by the BRIDGE service.
- **Rx Count** : Number of frames received by the BRIDGE service.
- **Refused Count** : Number of negative frame transmission confirms (to LLC or SMU).
- **Oversized Frame** : Number of frames lost because they were oversized.
- **No Resource** : Number of times the service lacked resources.
- **Activity** : Indicates Bridge activity.
- **Frame Size** : Displays the size of a BRIDGE frame (288 bytes).

COM Service

- **Service version** : Displays the software version number of the COM service.
- **Station** : Displays the name of the station where the interface is located. If the station is not configured, the station address is displayed as NNN.SS where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).
- **Error Count** : Number of internal errors detected by the COM service.
- **Error Context** : Displays the context of the last error detected over two bytes :
  - byte 1 = Status identifier,
  - byte 2 = Event identifier.
- **Tx Count** : Number of frames sent by the COM service.
- **Rx Count** : Number of frames received by the COM service.
- **Error Size** : Number of COM word size errors.
- **Com Size** : COM word size.
- **Com activity** : COM word activity,
  - 0 = Station inactive,
  - 1 = Station active in transmission and reception,
  - 2 = Station active in reception only.

SERIES 7 Service

- **Service version** : Displays the software version number of the SERIES 7 service.
- **Station** : Displays the name of the station where the interface is located. If the station is not configured, the station address is displayed as NNN.SS where :
  - NNN = Network number (1 to 127),
  - SS = Station number (0 to 63).
- **Error Count** : Number of internal errors detected by the SERIES 7 service.
- **Error Context** : Displays the context of the last error detected over two bytes :
  - byte 1 = Status identifier,
  - byte 2 = Event identifier.
- **Tx Count** : Number of frames sent by the SERIES 7 service.
- **Rx Count** : Number of frames received by the SERIES 7 service.
- **Refused Count** : Number of negative frame transmission confirms (to LLC or SMU). This counter is incremented each time a refused datagram transits the SERIES 7 service.
- **Tx not Acked** : Number of Uni-TE messages not acknowledged.
- **No Resource** : Number of times the service lacked resources.

4.1 General

4.1-1 Features

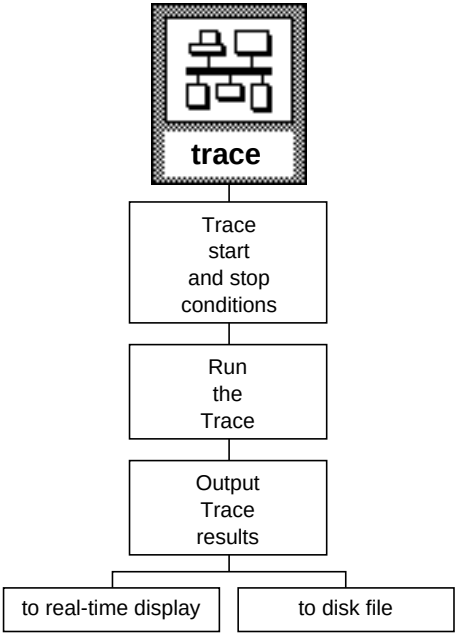
The TRACE function will store application level messages based on selected criteria for FIPWAY or MAPWAY networks, including:

- A source address,
- A target address,
- Function run conditions,
  - Immediate operation,
  - From a start time,
- Function stop conditions,
  - Number of frames to store,
  - Until a stop time,

Results are displayed in:

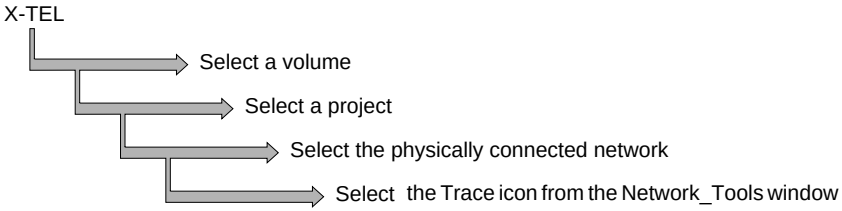
- Real time,
- A file.

4.1-2 Diagram



4.1-3 Accessing the TRACE Function

The TRACE function is accessed from the network tools available for network management in the X-TEL Software Workshop:



Important:

The Trace function requires a terminal connected to a FIPWAY or MAPWAY network.

A FIPWAY network requires either a TSX FPC 10 (for FTX 507 or IBM PC or compatible terminals) or a TSX FPC 20 (for FTX 417 terminals) network card to be installed.

A MAPWAY network requires a TSX MAPPC 742 network card to be installed in the FTX 507 terminal or the IBM or compatible PC .

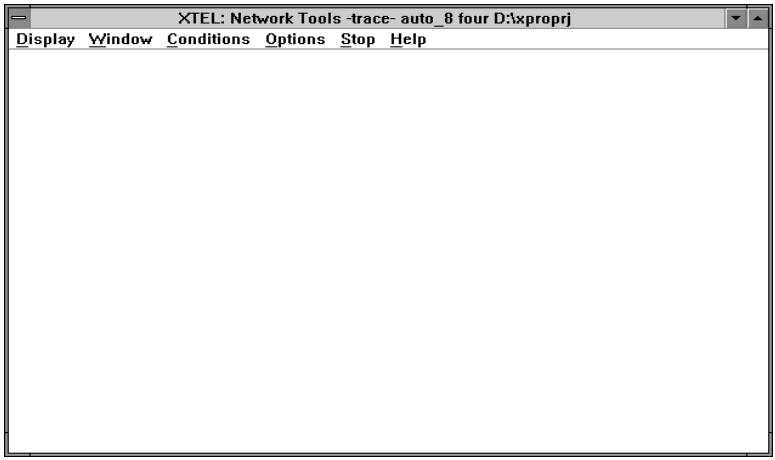
Before running TRACE, the following conditions must be met:

- The terminal must be physically connected to the network selected for trace functions,
- The correct network must also be selected at program level (in the network window) before the function is run.

The TRACE function takes over the system while it is running. No other X-TEL tools can use the network interface while TRACE is running.

4.1-4 Primary Window

The TRACE function is accessed from the Network Tools window by double clicking with the mouse on the Trace icon. The primary window lets the user select six pulldown menus:

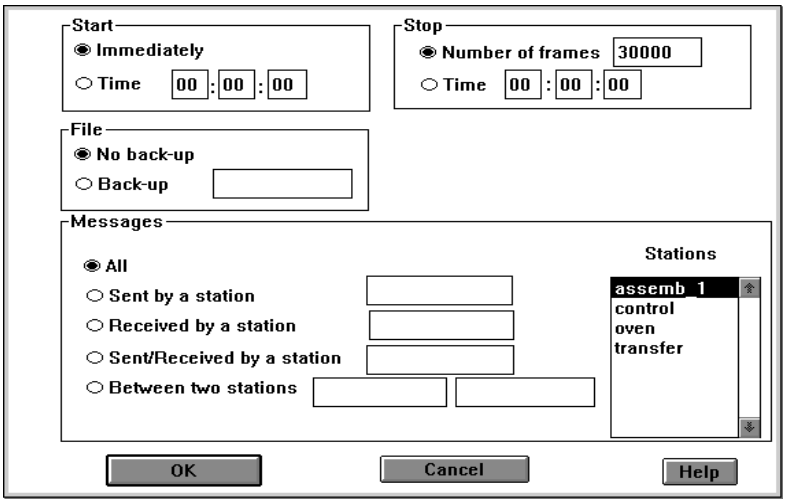


- **Display**
  - **New:** Lets the user access the TRACE function or a file containing a stored trace.
  - **Close:** Closes one or all open windows.
  - **Print Screen:** Generates a file that contains the contents of the currently displayed screen.
  - **About ...:** Provides the user with information about the TRACE function,
  - **Exit F3:** Lets the user exit the TRACE function and return to the Networks window.
- **Window**
  - **Tile:** Tiles the open windows.
  - **Cascade:** Cascades the open windows.
  - **Window Name:** Brings the selected window to the foreground.
- **Conditions**
  Lets the user select trace start and stop conditions, the type of message trace and the number of messages to trace.
- **Options**
  - **Read Period:** Lets the user enter the trace screen refresh rate (in seconds).
- **Stop**
  - **Stop file save:** Stops the trace when it is stored to a file.
- **Help**
  - Displays TRACE function help screens.

4.2 Using the TRACE Function

4.2-1 Selecting Start and Stop Conditions

The trace start and stop conditions are selected from the Conditions menu, accessed from the primary window:



A screen is displayed that lets the user make the following selections:

- Start trace,
  - Immediately,
  - At a set time.
- Stop trace,
  - After a set number of frames are received,
  - At a set time.
- Type of trace:
  - Realtime display (No backup),
  - Save to file (Backup),
- Messages to trace:
  - All messages,
  - All messages sent by a station,
  - All messages received by a station,
  - All messages sent and received by a station,
  - All messages between two stations.

The screen also displays a list of stations connected to the network.

Start

Lets the user select when to start the trace.

Immediately:
The trace starts when the function is run,

Date, Time:
Trace starts at the programmed time and date. The date is entered in the format DD/MM/YY, the time in the format HH:MM:SS.

Stop

Lets the user select when to stop the trace.

Number of frames:
The trace is stopped when the preset number of frames is reached.

Date, Time:
Trace stops at the programmed time and date. The date is entered in the format DD/MM/YY, the time in the format HH:MM:SS.

File

Lets the user select the type of trace output.

No back-up:
The trace is displayed on-screen in real time.

Back-up:
The trace is stored in a file. The filename must be specified (up to 8 alphanumeric characters).

Messages

Lets the user select the messages to trace (except for COM word exchanges). The stations selected must be connected to the network. Station names, displayed for the user's information in the Stations window, must be typed in the corresponding field.
A station is selected by placing the cursor in the corresponding field and clicking in the selected station name.

All:
Traces all network messages.

Sent by a station:
Traces all messages sent by the selected station.

Received by a station:
Traces all messages received by the selected station.

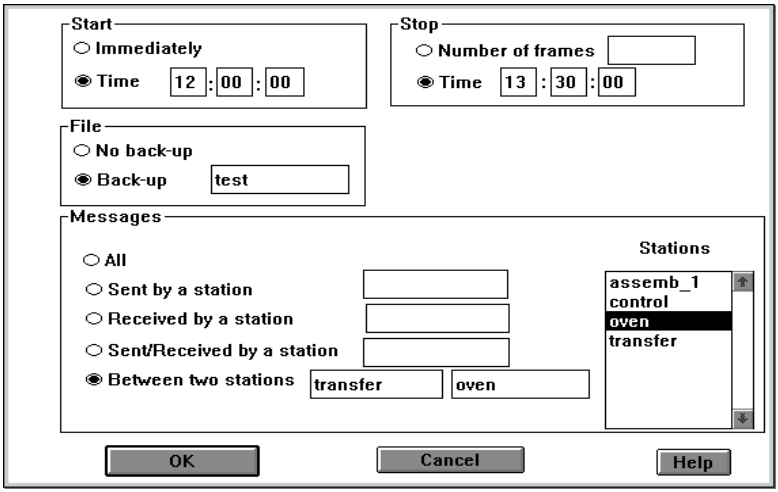
Sent/Received by a station:
Traces all messages sent and received by the selected station.

Between two stations:
Traces all messages between two selected stations.

Example:

Trace to the Test file, all messages exchanged between the transfer and oven stations between 12:00 and 13:30.

When all the data has been entered, the screen looks like this:

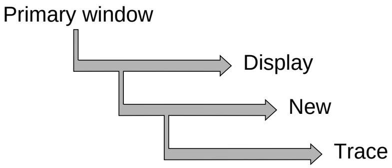


OK Validates all selections made and returns the user to the primary window.

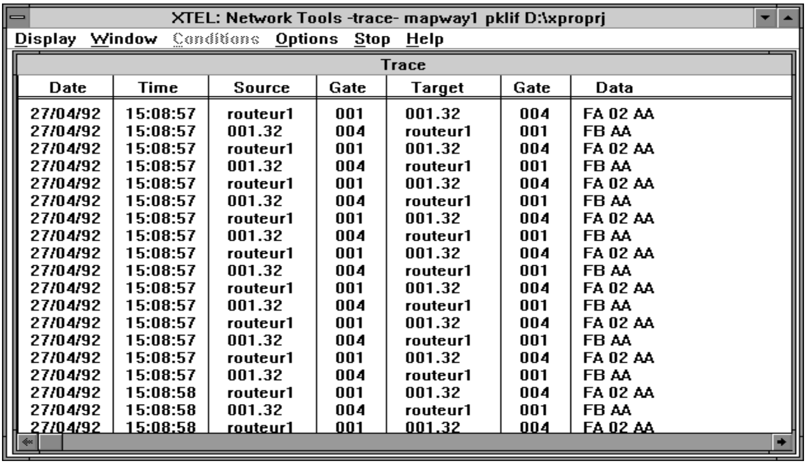
Cancel Cancels all selections made and returns the user to the primary window.

4.2-2 Running the TRACE function in Real Time

To run the TRACE function in real time, the user must first select "No back-up", in the start and stop conditions.
The TRACE function is run from the primary window with the following selections:



The messages exchanged on the network that match the selection criteria specified by the user will be displayed on-screen in real time (up to 6 messages per second).


XTEL: Network Tools -trace- mapway1 pklif D:\xproprj

Display Window Conditions Options Stop Help

Trace

Date	Time	Source	Gate	Target	Gate	Data
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:57	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:57	001.32	004	routeur1	001	FB AA
27/04/92	15:08:58	routeur1	001	001.32	004	FA 02 AA
27/04/92	15:08:58	001.32	004	routeur1	001	FB AA
27/04/92	15:08:58	routeur1	001	001.32	004	FA 02 AA

Date:

Displays the date of message reception.

Time:

Displays the time of message reception.

Source:

Identifies the station that sent the message. The source station is identified either by:
- Its name when if it was configured in the X-TEL Software Workshop,
- Its address, as NNN.SS where:
  - NNN is the network number,
  - SS is the station number.

Gate:

Displays the message source gate. The gate number takes a value between 0 and 255.

Example: For a TSX Series 7 PLC, the gate number can take one of the values listed below:

- **0** : System gate,
- **1,2,3** : Programming port,
- **16 to 79** : Text block TXT0 to TXT63,
- **80 to 255** : Reserved for Monitor 77.

Target:

Identifies the station to which the message is being sent. The target station is identified either by:
- Its name if it was configured in the X-TEL Software Workshop,
- Its address, as NNN.SS where:
  - NNN is the network number,
  - SS is the station number.

Gate:

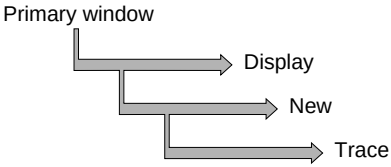
Displays the message target gate. The gate number takes a value between 0 and 255.

Data:

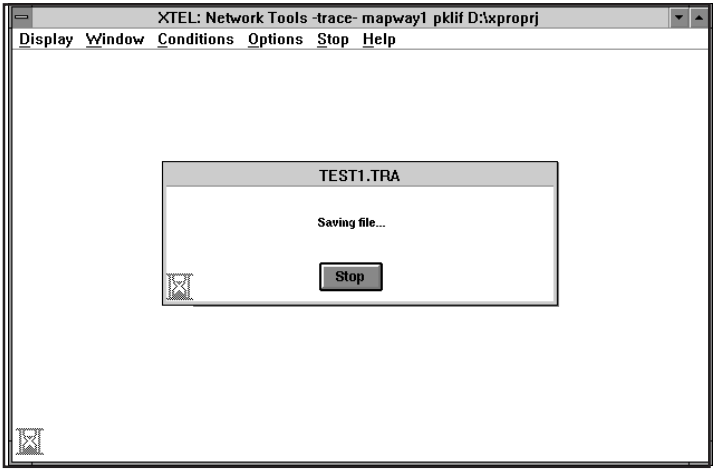
Corresponds to the message data. Only the first 128 bytes of the message are displayed.

4.2-3 Running the TRACE function on a File

To output the TRACE function results to a file, the user must first select "Back-up" in the File heading and enter a filename when the function start and stop conditions are selected.
The TRACE function is started (after user confirmation) from the primary window after making the following selections:



While messages which match the user defined selection criteria are being stored (up to 60 messages per second for MAPWAY and without limit for FIPWAY), the screen displays the following :



The trace is stopped:
- When the buffers are full (4500 messages),
- When the stop conditions are met,
- At the user's request, by selecting Stop and then selecting "Stop file save".

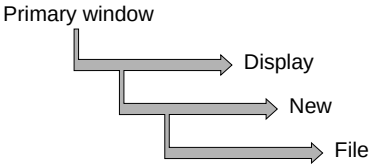
Note:

TRACE files are saved under the selected filename with the .TRA extension at the following location:

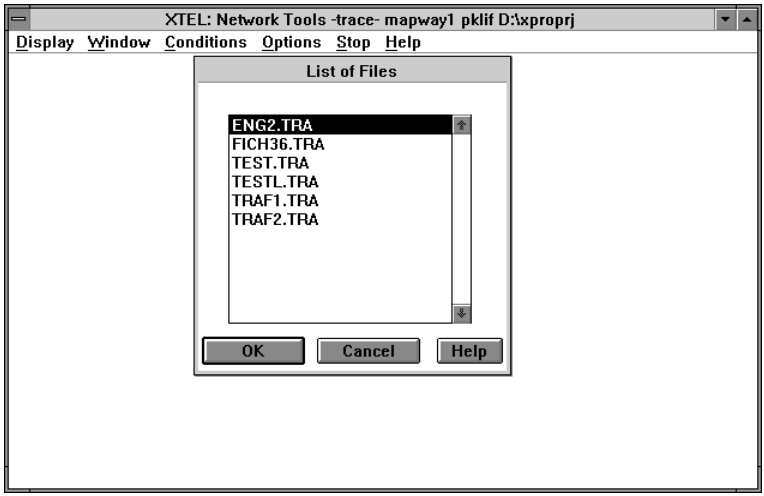
Current logical drive:\XPROPRJ\Project_Name\Network_Name\trace*.tra

4.2-4 Displaying a Trace File

A previously stored trace file can be accessed from the primary window by making the following selections:



The List of Files screen will be displayed, showing the trace files that are available:



After selecting the file to display:

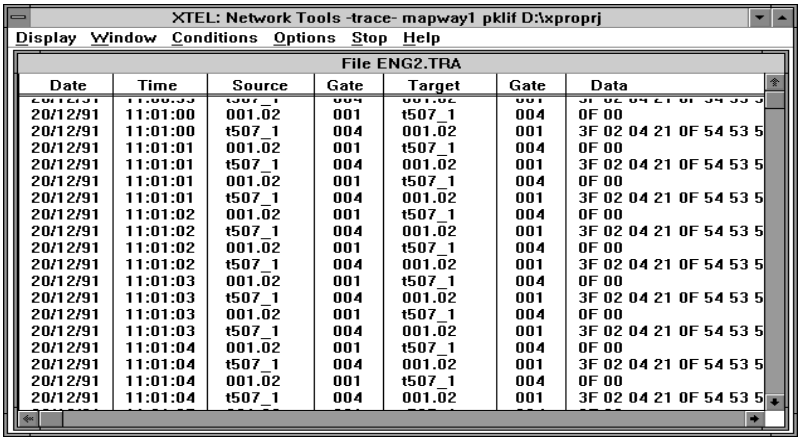
OK Displays the trace file.

Cancel Cancels the read trace file request and returns the user to the primary window.

The data obtained from a stored trace file is the same as when a realtime trace is run.

Example:

Read the ENG2 trace file:



Date	Time	Source	Gate	Target	Gate	Data
20/12/91	11:01:00	001.02	001	t507_1	004	0F 00
20/12/91	11:01:00	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:01	001.02	001	t507_1	004	0F 00
20/12/91	11:01:01	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:01	001.02	001	t507_1	004	0F 00
20/12/91	11:01:01	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:02	001.02	001	t507_1	004	0F 00
20/12/91	11:01:02	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:02	001.02	001	t507_1	004	0F 00
20/12/91	11:01:02	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:03	001.02	001	t507_1	004	0F 00
20/12/91	11:01:03	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:03	001.02	001	t507_1	004	0F 00
20/12/91	11:01:03	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:04	001.02	001	t507_1	004	0F 00
20/12/91	11:01:04	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5
20/12/91	11:01:04	001.02	001	t507_1	004	0F 00
20/12/91	11:01:04	t507_1	004	001.02	001	3F 02 04 21 0F 54 53 5

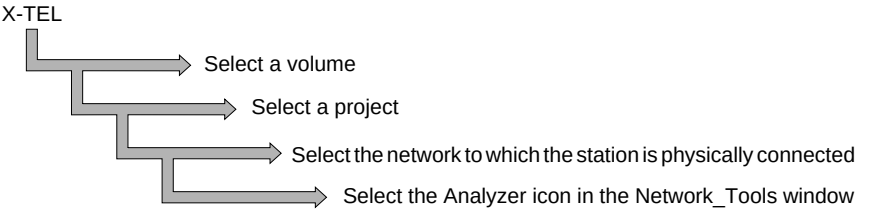
5.1 General

5.1-1 Accessing the ANALYZER Function

The ANALYZER function is used to quickly find any problems which may occur at the physical level when installing a FIPWAY or a MAPWAY network.

The information provided by this function depends on the type of network that the function is run on and is described in detail in the following sections.

The ANALYZER function is accessed from the network tools available for network management in the X-TEL Software Workshop:



Important:

The ANALYZER function requires a terminal connected to a FIPWAY or MAPWAY network.

A FIPWAY network requires the installation of network cards, TSX FPC 10 (for FTX 507 or IBM PC or compatible terminals) or TSX FPC 20 (for FTX 417 terminals) .

A MAPWAY network requires the installation of a TSX MAPPC 742 network card in the FTX 507 terminal or the IBM or compatible PC.

Before running the ANALYZER function, the following conditions must be met:

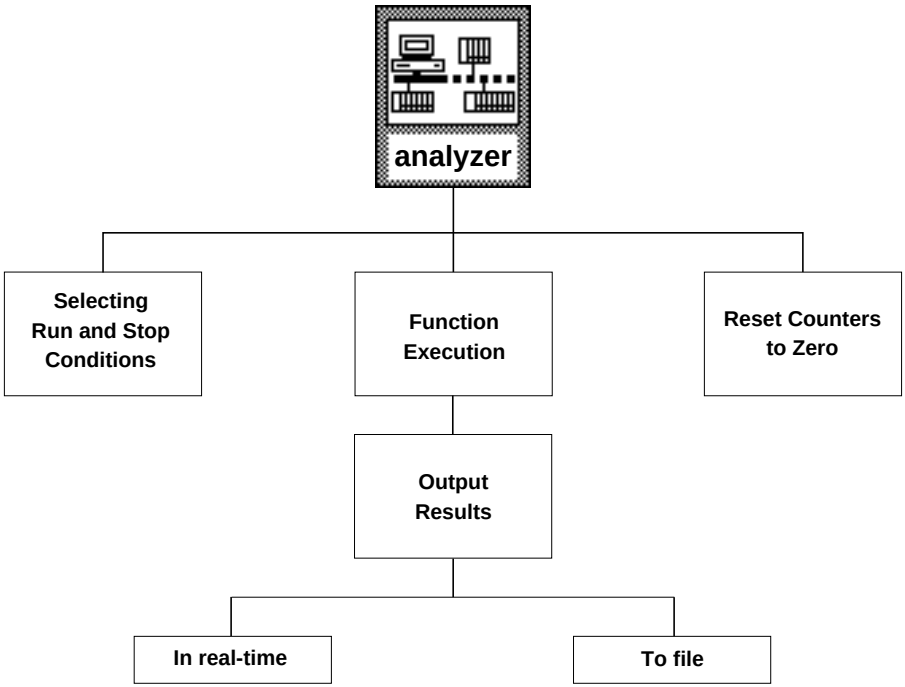
- The terminal must be physically connected to the network selected for analysis,
- The correct network must also be selected at program level (in the network window) before the function is run.

The ANALYZER function takes over the system while it is running. No other X-TEL tools can use the network interface while ANALYZER is running.

5.2 Running the Analyzer on a FIPWAY Network

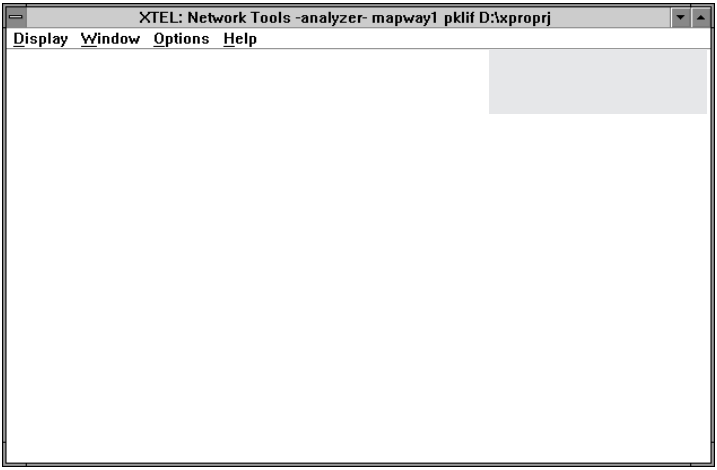
5.2-1 Diagram

When it is run on a FIPWAY network, the ANALYZER function allows analysis of some of the station error counters and warns the user if any problems are found on the network.



5.2-2 Primary Window

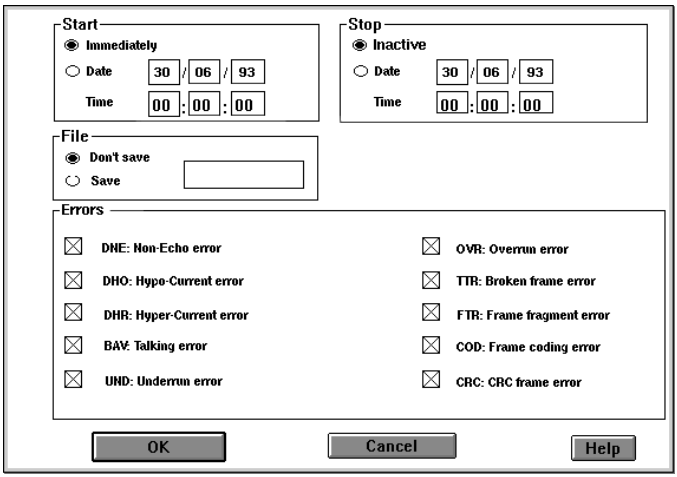
The ANALYZER function is accessed from the Network Tools window by double clicking with the mouse on the Analyzer icon. The primary window lets the user select five pulldown menus (Display, Window, Conditions, Options and Help):



- **Display**
  - **New:** Lets the user access the ANALYZER function or a file containing a stored analysis.
  - **Close:** Closes one or all open windows.
  - **Print Screen:** Generates a file that contains the contents of the currently displayed screen.
  - **About ...:** Provides the user with information about the ANALYZER function,
  - **Exit F3:** Lets the user exit the ANALYZER function and return to the Networks window.
- **Window**
  - **Tile:** Tiles the open windows.
  - **Cascade:** Cascades the open windows.
- **Conditions**
  Lets the user select the conditions that apply to starting and stopping the function and the types of error to analyze.
- **Options**
  - **Read period:** Lets the user enter the screen refresh rate (in seconds).
- **Help**
  - Displays ANALYZER function help screens.

5.2-3 Selecting Start and Stop Conditions

The user can access the selection of start and stop conditions from the primary window by clicking on "Conditions" :



This screen lets the user enter all of the conditions that apply to the analysis:

- Start analysis,
  - immediately,
  - At the programmed time and date.
- Stop analysis,
  - At the programmed time and date.
- Type of analysis :
  - Display the trace on-screen in real time (no save),
  - Save the trace to a disk file (save),
- The errors to take into account during the analysis:

Start

This item lets the user select when the analysis starts.

- **Immediate:**
Analysis starts as soon as the function is selected,

- **Date, Time:**
Analysis starts at the programmed time and date. The date is entered in the format DD/MM/YY, the time in the format HH:MM:SS.

Stop

This item lets the user select when the analysis stops.

- **Inactive:**
There is no stop condition.

- **Date, Time:**
Analysis stops at the programmed time and date. The date is entered in the format DD/MM/YY, the time in the format HH:MM:SS.

File

This item lets the user select the type of analysis output.

- **No save to file:**
The analysis is displayed in real time on-screen.

- **Save to file:**
The analysis is saved to a file. The name of this file must be specified and cannot exceed 8 alphanumeric characters.

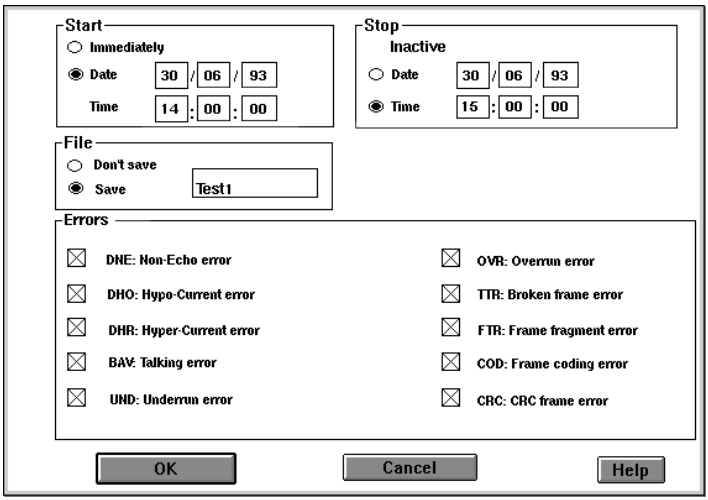
Errors

This item lets the user select the errors to analyze. Selecting these boxes identifies the errors to take into account. If the error counter for a selected type of error changes, the user will be informed of it during the analysis.

Example

Analyze all errors that occur between 14:00 and 15:00 in file TEST1.

Once the appropriate entries are made, the following screen is displayed :



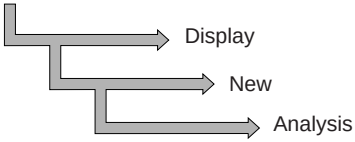
OK Confirms the entries made and returns the user to the primary window,

Cancel Cancels the entries made and returns the user to the primary window.

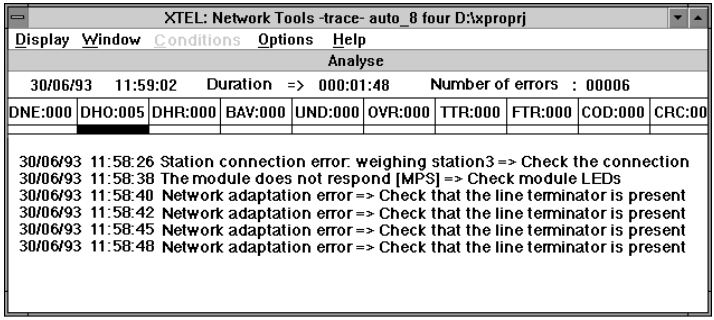
5.2-4 Running the ANALYZER function in Real Time

To run the ANALIZER function in real time, first select "No save to file", when selecting the start and stop conditions. The ANALIZER function is run from the primary window by selecting:

Primary Window



This function first checks for activity on the bus in order to analyze the counters. If a physical problem is encountered on the bus, the function will display the counter(s) causing the network problem in real time and a message to prompt the user to correct the problem.



Across the top of the screen two lines are displayed:

- The first displays the date, time, elapsed time since the start of the analysis and the number of errors detected,
- The second displays for each type of error, the number of errors found. If at least one error was found, the rectangle under the corresponding counter will be displayed in reverse video.

For each error detected, the window displays a line containing:

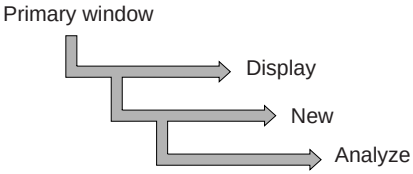
- Date of occurrence,
- Time of occurrence,
- Value of the counter where the error occurred,
- Cause of the error,
- Corrective action required to correct the error.

The counters which can be used to analyze the network status are listed below:

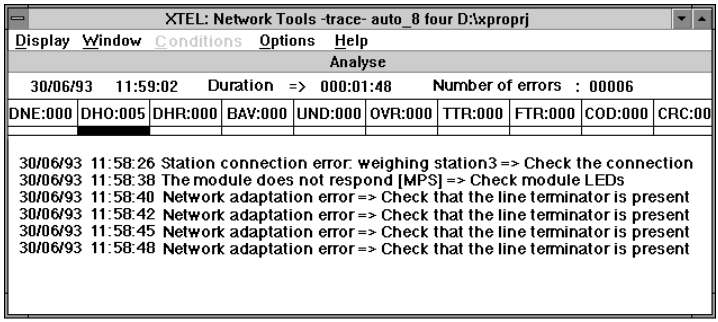
Counter	Probable cause	Corrective action
Non-echo (DNE)	Internal device error (line interface)	If the line interface is in the connection cable, replace it, or replace the network interface.
Hypo-current (DHO)	Connection problem on station i (station incorrectly or not connected)	Check the connection point.
	If the DHO changes for a number of stations, there is a bus termination error (bus cut or badly terminated)	Check for the presence of TSX FP ACC7 terminators or bus continuity.
Hyper-current (DHR)	Internal device error (line interface)	If the line interface is in the connection cable, replace it, or replace the network interface.
	If the DHR changes for a number of stations, there is a bus termination error (bus badly terminated).	Check that only one terminator (TSX FP ACC7) is present.
Chatter Underrun Overrun	Internal device error (line interface)	If the line interface is in the connection cable, replace it, or replace the network interface.
Pierced frame Frame fragment	External device error	Check polarity and connections.
CRC frame	Severe network interference	Find the external cause of interference (machines, power cables, etc.).

5.2-5 Runningthe ANALYZER Function on a File

To save the ANALYZER function results to file, first select "Save to file", when selecting the start and stop conditions. The ANALYZER function is run from the primary window by selecting:



The network analysis is performed on the selected file and the error information is displayed on-screen in real time.



The analysis is stopped:

- When the stop condition is met,
- When the user closes the window.

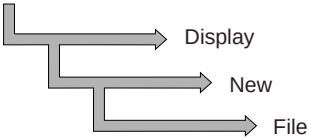
Note:

> Files generated by the ANALYZER function are saved under the selected name with .ANA extension in:
>
> Current logical drive:\XPROPRJ\Project_Name\Network_Name\Analyzer*.ANA

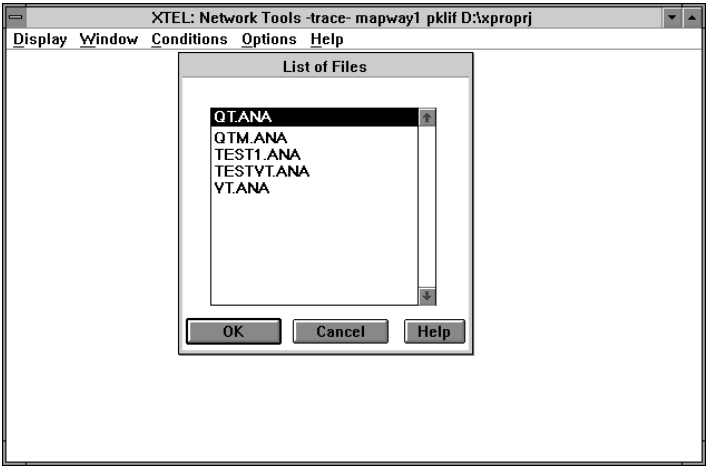
5.2-6 Displaying an ANALYZER File

A previously stored analysis file is displayed from the primary window by selecting:

Primary window



The screen will then display a list of analysis files available:



After selecting the file to display, select:

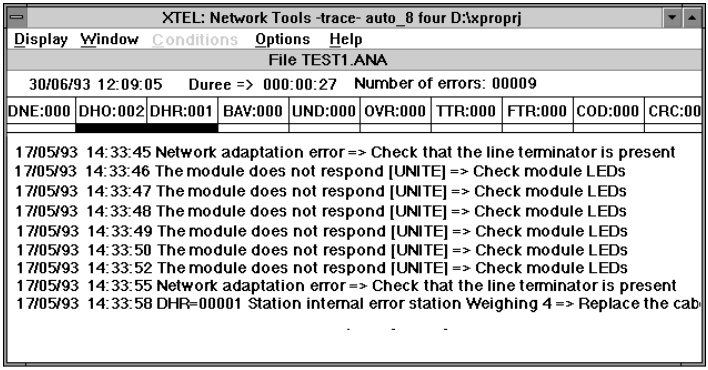
OK To display the file.

Cancel To cancel the action and return to the primary window.

The information in the file is the same as when the function is run in real time.

Example:

Reading the trace file TEST1:

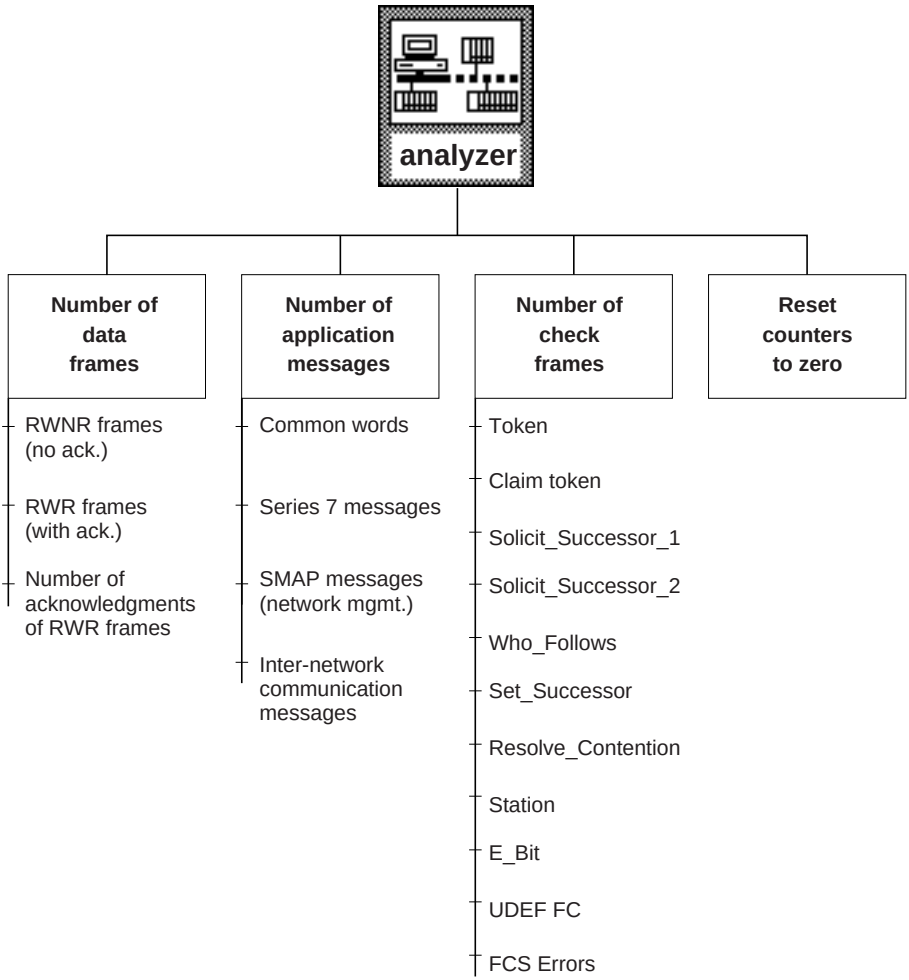


5.3 Analyzer Functions on a MAPWAY Network

5.3-1 Diagram

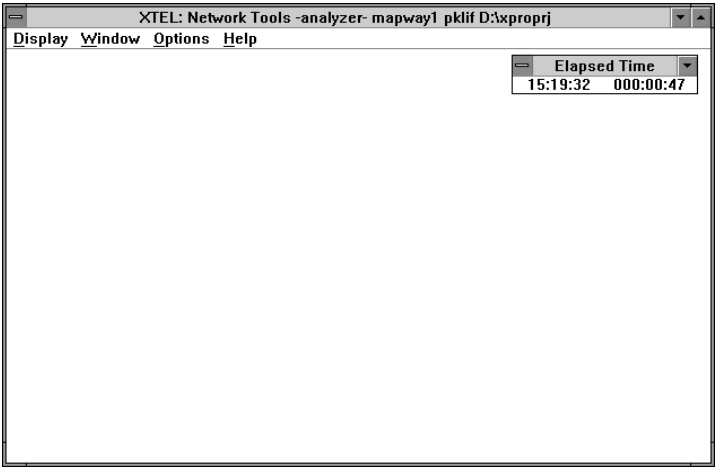
The ANALYZER function provides assistance to the user when installing a MAPWAY network. It lets the user quickly identify problems at physical level by displaying detailed information on LLC (Logical Link Control) and MAC (Medium Access Control) levels:

- Number of check frames,
- Number of data frames,
- Application messages.



5.3-2 Primary Window

The ANALYZER function is accessed from the Network_Tools window by double clicking with the mouse on the "analyzer" icon. The primary window lets the user select four pulldown menus:

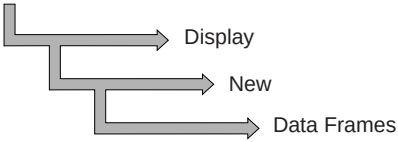


- **Display**
  - **New:** Lets the user access the Analyzer function. Selecting the type of analysis to perform will instruct NETDIAG to open the appropriate window.
  - **Close:** Closes one or all open windows.
  - **Print Screen:** Generates a file that contains the contents of the currently displayed screen.
  - **About ...:** Provides the user with information about the ANALYZER function,
  - **Exit F3:** Lets the user exit the ANALYZER function and return to the Networks window.
- **Window**
  - **Tile:** Tiles the open windows.
  - **Cascade:** Cascades the open windows.
- **Options**
  - **Reset counters:** Once confirmed by the user, this action resets the counters and the elapsed time.
- **Help**
  - Displays ANALYZER function help screens.

5.3-3 Data Frame Analysis

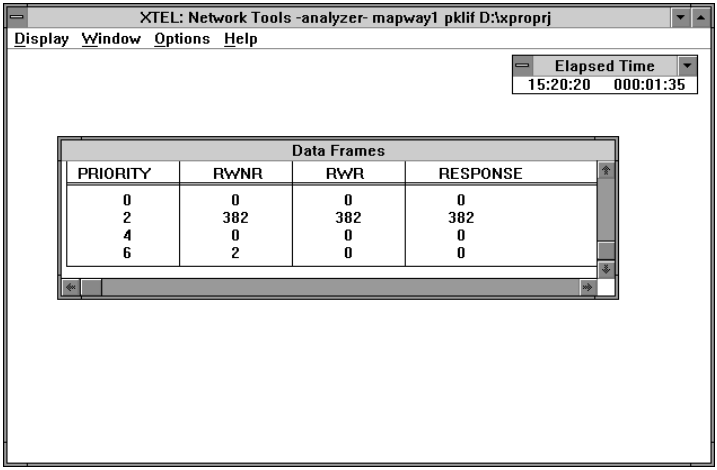
This function is accessed from the primary window by selecting:

Primary Window



This screen displays the number of data frames present at MAC level and their priority.

Screen example



PRIORITY

Displays the priority level of the data frames and the MMS frames on the network. The following information is displayed for Telemecanique devices:

- Priority 0: Service messages (lowest priority level),
- Priority 2: UNI-TE service and application to application messages,
- Priority 4: Common words (COM words),
- Priority 6: Telegrams (highest priority level).

RWNR

Displays the number of unacknowledged frames present on the network. These are usually inter-network exchange frames or frames sent in broadcast mode (COM words).

RWR

Displays the number of acknowledged point-to-point frames present on the network. These are frames common to a single network.

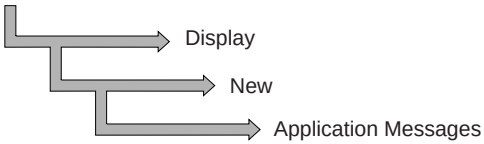
RESPONSE

Corresponds to the numbers of acknowledgments for RWR frames.

5.3-4 Application Message Analysis

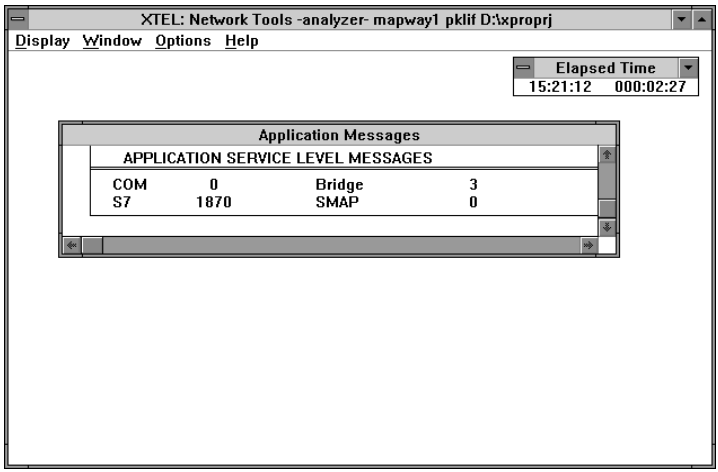
This function is accessed from the primary window by selecting:

Primary Window



The screen displays the number of application messages per service.

Screen example



COM

Displays the number of COM word frames present on the network. This service comprises a database distributed between stations on the same network. Depending on their configuration, the stations can gain access to a common memory field of 256 words of 16 bits, reserved for exchanges between PLCs.

S7

Displays the number of Series 7 service frames present on the network. This service corresponds to the protocol supported by Telemecanique devices.

BRIDGE

Displays the number of BRIDGE service frames present on the network. This service manages communication between networks.

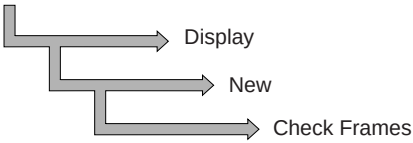
SMAP

Displays the number of SMAP service frames present on the network. This service manages all network functions distributed to the various network devices.

5.3-5 Check Frame Analysis

This function is accessed from the primary window by selecting:

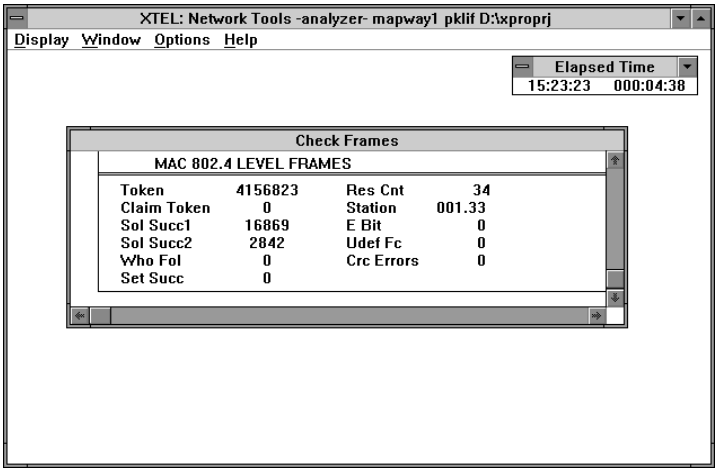
Primary Window



Analysis of the check frames lets the user quickly identify problems at physical level during network set-up or maintenance phases.

> For best results when interpreting the information displayed on screen, refer to Section 7 of this manual for reminders on token bus operation, MAPWAY frame format and the main parameter values and causes of problems encountered.

Screen example



All of the values displayed in this screen are counted since the counters were last reset. To reset the counters, select Option, then Reset Counters.

The time elapsed since the counters were last reset is displayed in the Elapsed Time window.

Token

Displays the number of token frames that have transited on the network. This measurement is not very precise, the indicated value being at best 20% less that the true number.

Claim Token

Displays the number of Claim Token frames that have transited the network.

Sol Succ1

Displays the number of Solicit_Successor_1 frames that have transited the network.

Sol Succ2

Displays the number of Solicit_Successor_2 frames that have transited the network.

Who Fol

Displays the number of Who_Follows frames that have transited the network.

Set Succ

Displays the number of Set_Successor frames that have transited the network.

Res Cnt

Displays the number of Resolve_Contention frames that have transited the network.

Station

Displays the address of the last station that sent a Resolve_Contention frame:

- If the station is a Telemecanique device, this address is displayed as NNN.SS where:
  - NNN = Network number (0 to 127),
  - SS = Station number (0 to 63).
- If the station is an other vendor's device, the MAC address of the station encoded in six bytes is displayed.

E Bit

Displays the number of frames received with the E_Bit data set to 1.

Udef Fc

Displays the number of frames received with an invalid Frame Control.

Crc Errors

Displays the number of frames received with a checksum error.

For more information on these parameters, refer to Section 7.

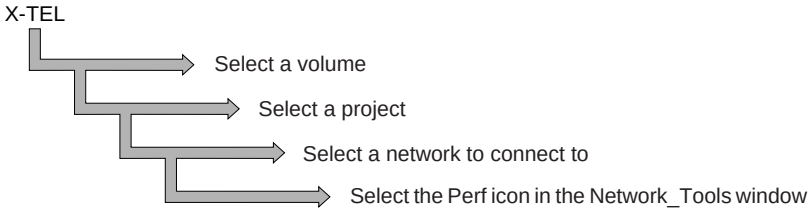
6.1 General

6.1-1 Accessing the PERFORMANCE Function

The PERFORMANCE function provides the user with information necessary to analyze the performance of a FIPWAY or MAPWAY network (it also lets the user measure the response time of a TELWAY, ETHWAY or 802.3 network).

The information provided by this function depends on the type of network on which the function is run and will be described in the following sections.

The PERFORMANCE function is accessed from the network tools available for network mangement in the X-TEL Software Workshop:



Important

As a rule, the PERFORMANCE function requires connection of the station to a FIPWAY, MAPWAY, ETHWAY or 802.3 network.

When using a FIPWAY network, the terminal must be fitted with a TSX FPC 10 (for an FTX 507 or IBM PC or compatible) network module or a TSX FPC 20 (for an FTX 417) network card..

When using a MAPWAY network, the terminal must be fitted with a TSX MAPPC 742 network card (for an FTX 517 IBM PC or compatible).

When using an ETHWAY or 802.3 network, the terminal must be fitted with a TSX ETH PC10 bus module (for an FTX 507 or an IBM PC or compatible).

Before attempting to use the PERFORMANCE function, the user must:

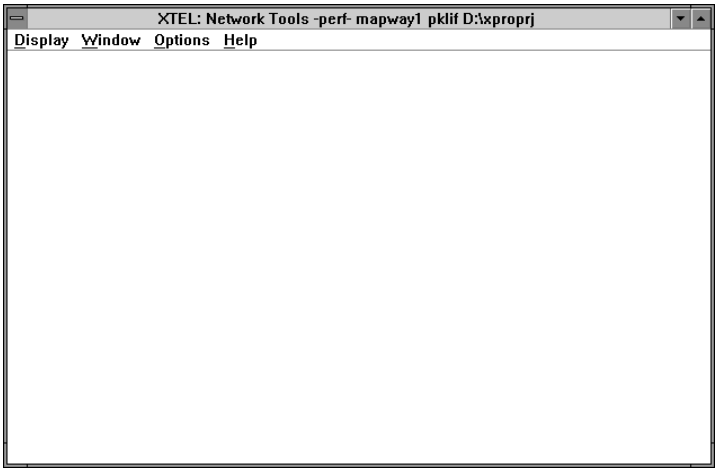
- Ensure that the terminal is physically connected to the appropriate network,
- Make the software selection of the appropriate network (from the Networks window) before running the function.

The traffic analysis functions run in exclusive mode. While one of these functions is running, the user cannot run network cycle time or response time measurements.

It is possible to perform response time measurements on a FIPWAY or MAPWAY network or on a FIPIO fieldbus when NETDIAG is connected to the network via the programming port of a PLC or via a Bridge station.

6.1-2 Primary Window

The PERFORMANCE function is accessed from the Network_Tools window by double clicking with the mouse on the Perf icon. The primary window, common to both FIPWAY and MAPWAY networks lets the user select four pulldown menus:



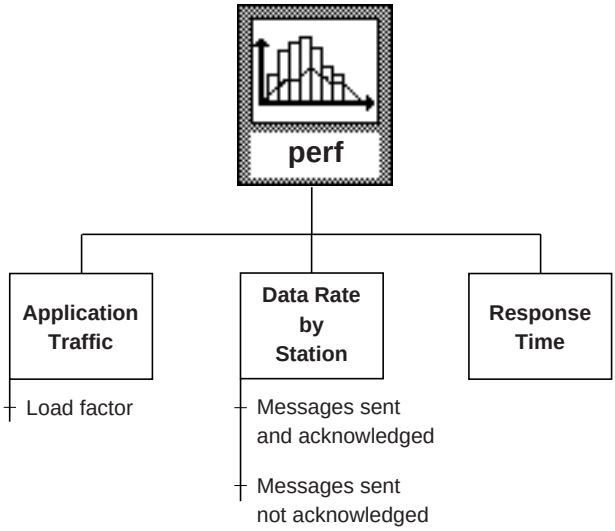
- **Display**
  - **New:** Lets the user select the type of performance. When the user clicks on the selected type, NETDIAG opens its window,
  - **Close:** Closes one or all open windows,
  - **Print Screen:** Generates a file that contains the contents of the currently displayed screen,
  - **About ...:** Provides the user with information about the PERFORMANCE function,
  - **Exit F3:** Lets the user exit the PERFORMANCE function and return to the Networks window.
- **Window**
  - **Tile:** Tiles the open windows,
  - **Cascade:** Cascades the open windows.
- **Options**
  - **Reset Measurements:** Once confirmed, this action resets all of the measurement values and reinitializes the elapsed time counter. Reset applies to all active windows.
- **Help**
  - Displays PERFORMANCE function help screens.

6.2 FIPWAY Network Performance Levels

6.2-1 Diagram

The PERFORMANCE function, when run on a FIPWAY network, provides the user with an analysis of network performance. It saves and displays information on:

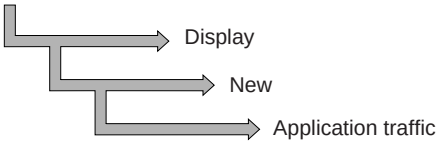
- Application traffic,
- Application data rate by station,
- Response time on a communication path.



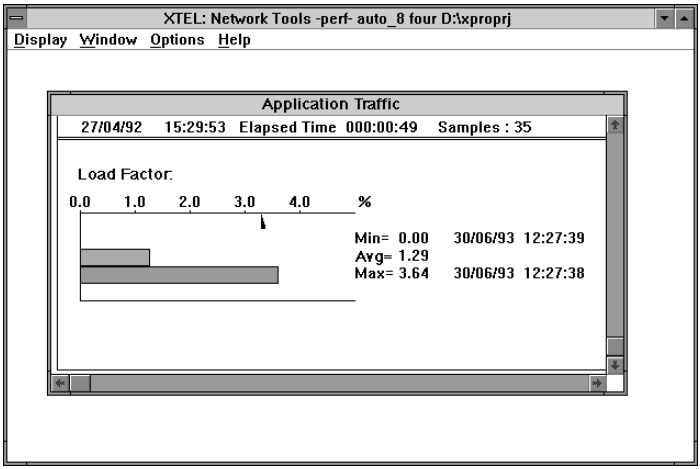
6.2-2 Application Traffic Analysis

This function gives the FIPWAY network load factor (UNI-TE message system, telegrams and COM words). It is run from the primary window when the following selections are made:

Primary window



Screen example



The following information is displayed across the top of the screen: Date, Time, Elapsed time since the start of measurements and the number of measurements performed.

The load factor is expressed as a percentage. It is displayed as a bargraph:

- The immediate value at a given time is shown by the cursor under the scale,
- The minimum value is the smallest measurement value recorded,
- The average value is the average of all of the measurement values recorded,
- The maximum value is the largest measurement value recorded.

The date and time when extreme measurement values (min. and max.) were recorded, are also displayed.

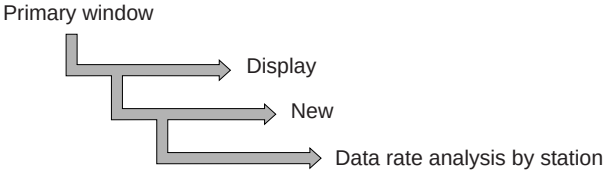
6.2-3 Data Rate Analysis by Station

This function displays the application traffic for each station as:

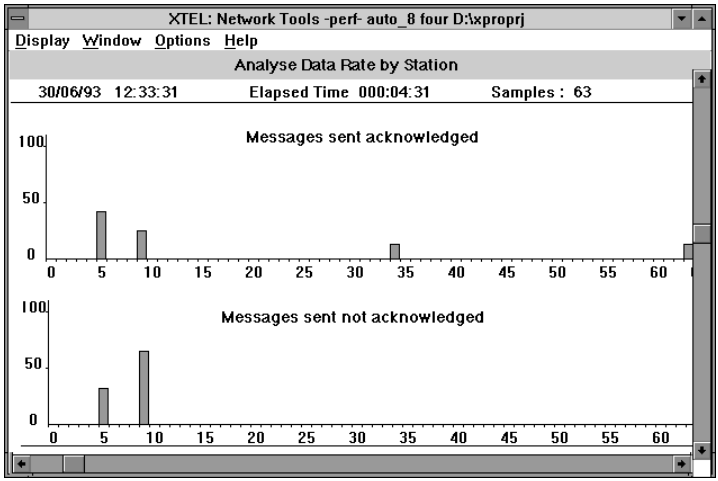
- A data rate of acknowledged messages, sent by each connected station,
- A data rate of unacknowledged messages, sent by each connected station,

Data rates are expressed as a percentage of total data rate.

The analysis function is run from the primary window when the following selections are made:



Screen example



The following information is displayed across the top of the screen: Date, Time, Elapsed time since the start of measurements and the number of measurements performed.

Important:

> The information provided by this function is only significant with high levels of network traffic, as the function itself generates traffic on the network.

6.2-4 Response Time Measurement

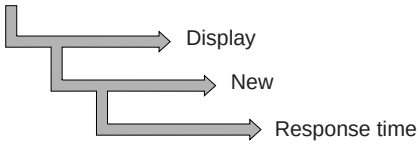
This function measures the response time of a device connected to a FIPWAY network or a FIPIO fieldbus. The response time of any connected device can be measured as long as the device supports the MIIRROR request, e.g.:

- A network interface,
- The processor of any device in the network architecture,
- etc.

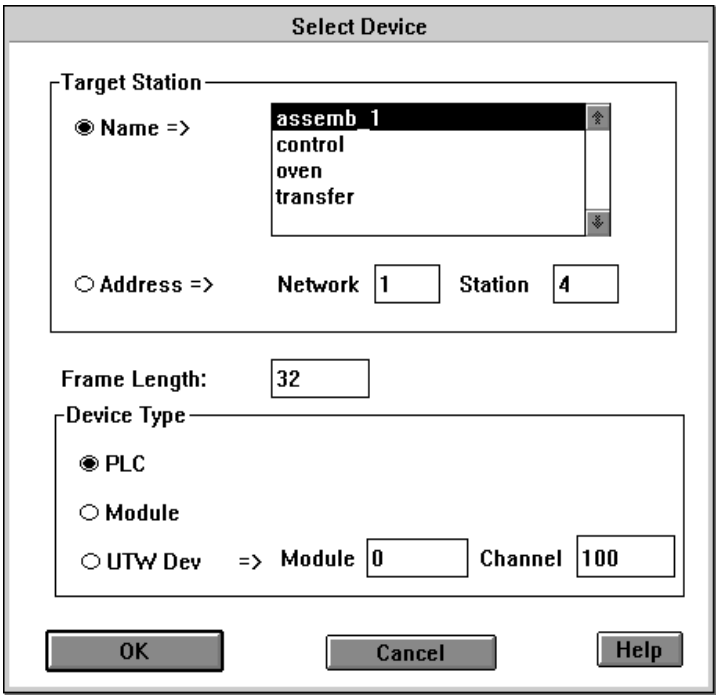
NETDIAG sends a MIIRROR request to the selected device while at the same time setting a timer to measure the time elapsed until a response to the request is received.

This function accessed from the primary window by making the following selections:

Primary window



A dialog box is displayed so that the user can select a device.



This selection requires entering three parameters:

Target Station

There are two ways to select the target station:

- Use the mouse to click on the selected station (only stations in the X-TEL project connected to the currently selected network are displayed for selection),
- Enter the address of the station (network number and station number). Any station in the network architecturecan be accessed in this way.

Frame Length

This item lets the user set the communication frame length (from 1 to 128 bytes).

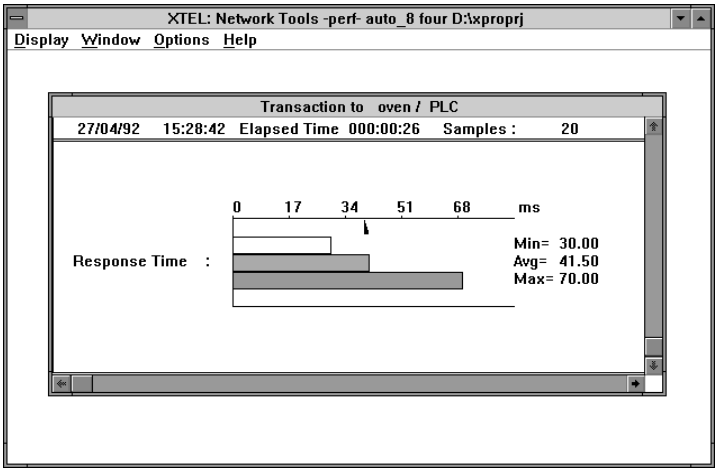
Device Type

There are four possible types of device:

- PLC designates the processor of a Telemecanique device,
- Module designates a network interface module,
- UTW Dev designates a UNI-TELWAY device. In this case, the user must also enter the address of the device:
  - Module, is the address of the Master interface on the UNI-TELWAY bus (0 to 77 for a TSX SCM UNI-TELWAY module or 255 for a built-in SCI interface),
  - Channel is the channel number assigned to the station (from 100 to 252),
- FIPIO Dev designates a device connected to FIPIO (connection point 0 to 63).

Selecting OK confirms the selections made and runs the function.

Screen example



The following information is displayed across the top of the screen: Date, Time , Elapsed time since the start of measurements and the number of measurements performed.

Response time

The response time is expressed in milliseconds (minimum value 10 ms). It is displayed as a bargraph:

- The immediate value at a given time is shown by the cursor under the scale,
- The minimum value is the smallest measurement value recorded,
- The average value is the average of all of the measurement values recorded,
- The maximum value is the largest measurement value recorded.

The response time depends on the:

- Workload of the microcomputer running the NETDIAG program,
- Workload of the network and any bridges used,
- Workload and type of exchange target device.

The time and date when extreme (min. and max.) measurements were recorded are also displayed.

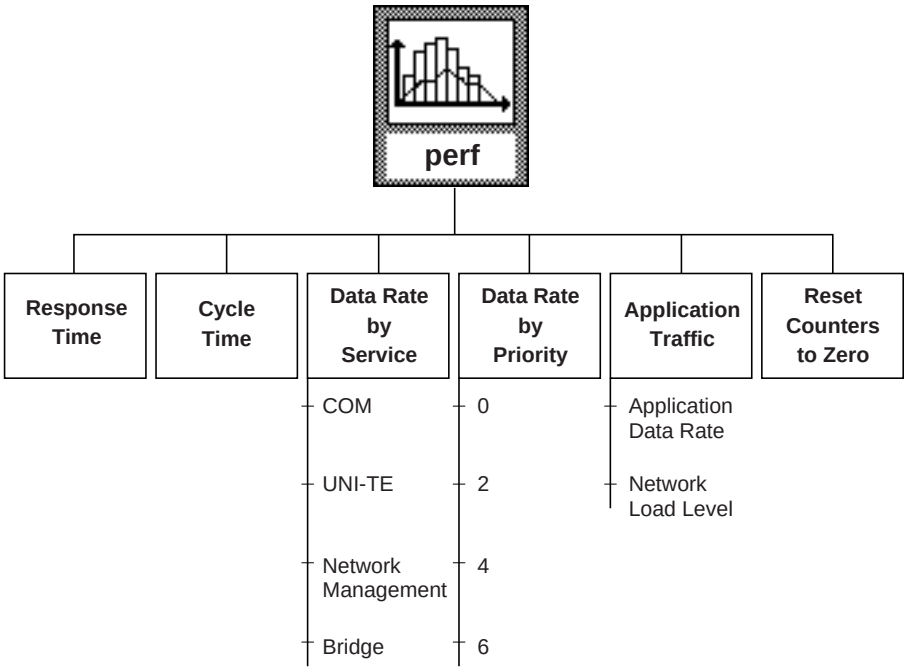
6.3 MAPWAY Network Performance Levels

6.3-1 Diagram

The PERFORMANCE function when run on a MAPWAY network, provides the user with information necessary to analyze the performance of the selected network:

- Time measurement for a communication path,
- Network cycle time,
- Traffic analysis by type of service,
- Traffic analysis by priority level,
- Application data rate analysis.

From these elements, the user can determine the effect of adding or deleting a station on the network. A simple analysis of network traffic will let the user find errors in the application user programs (programming, operation sequencing, etc.).

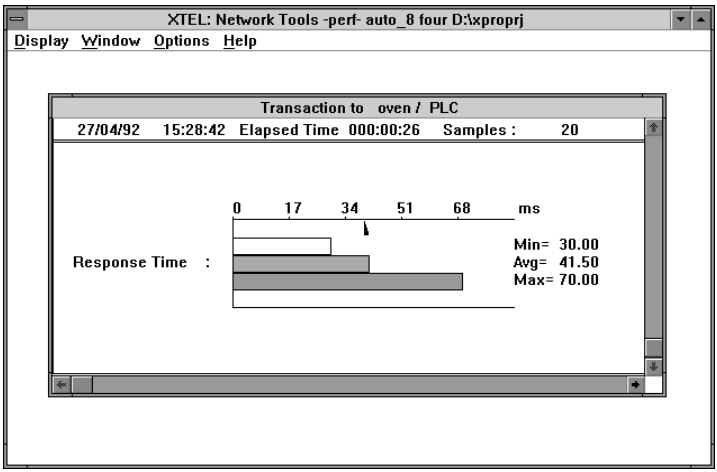


6.3-2 Response Time Measurement

This function measures the response time of a device connected to a MAPWAY network in the same way as described previously for a FIPWAY network. The entry procedure is also the same (device selection, etc.).

For more information on using this function and interpreting the results, refer to section 6.2-4.

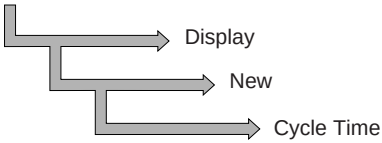
Screen example



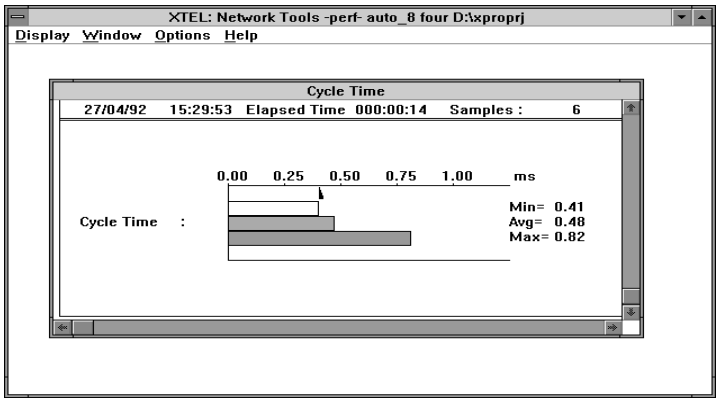
6.3-3 Network Cycle Time Measurement

This function measures the network cycle time, i.e. the time required by the token to travel along the full length of the virtual ring. This function accessed from the primary window by selecting:

Primary Window



Screen example



The following information is displayed across the top of the screen: Date, Time, Elapsed time since the start of measurements and the number of measurements performed.

Cycle time

The cycle time is expressed in milliseconds. It is displayed as a bargraph:

- The immediate value at a given time is shown by the cursor under the scale,
- The minimum value is the smallest measurement value recorded,
- The average value is the average of all of the measurement values recorded,
- The maximum value is the largest measurement value recorded.

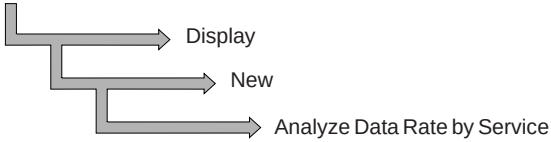
The time and date when the extreme measurement values (min. and max.) where recorded is also displayed. The cycle time depends on the:

- Number of stations connected to the network and the number of messages sent by each station on the network while it has the token,
- Length of the messages,
- Parameters assigned to the MAC network layer.

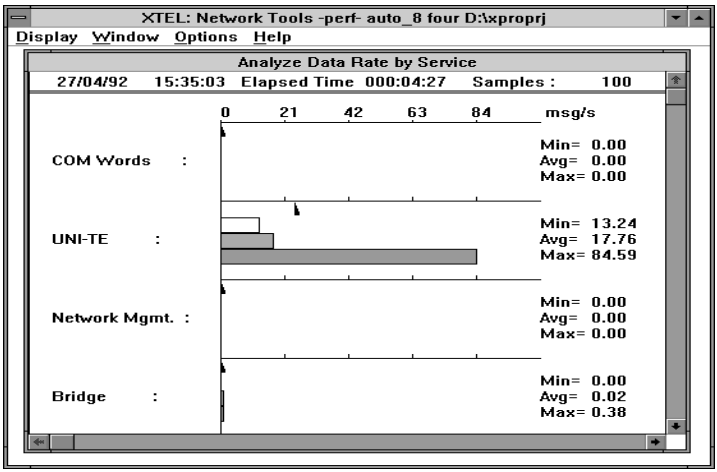
6.3-4 Data Rate Analysis by Service

This function displays the network data rate for each service (COM, UNI-TE, SMAP (network management) and Bridge service). This function is accessed from the primary window by selecting:

Primary Window



Screen example



The following information is displayed across the top of the screen: Date, Time, Elapsed time since the start of measurements and the number of measurements performed.

Data rate analysis

The data rate for each service is expressed in milliseconds. It is displayed as a bargraph:

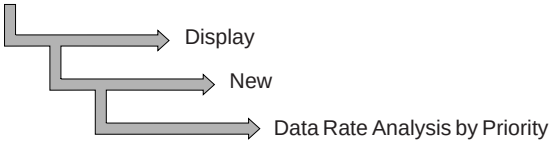
- The immediate value at a given time is shown by the cursor under the scale,
- The minimum value is the smallest measurement value recorded,
- The average value is the average of all of the measurement values recorded,
- The maximum value is the largest measurement value recorded.

The time and date when extreme (min. and max.) measurements were recorded are also displayed.

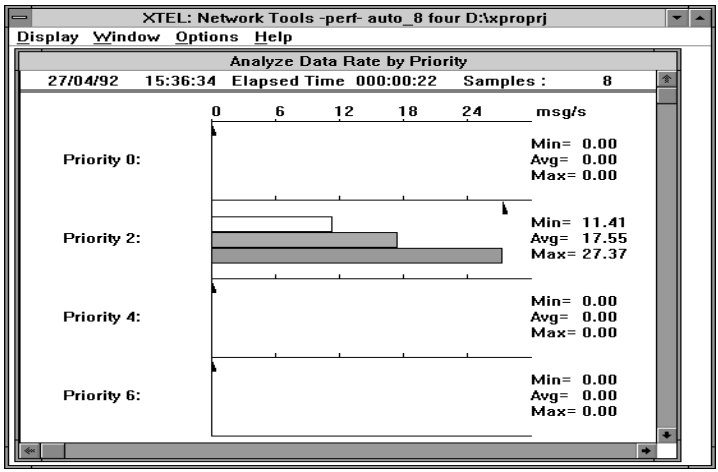
6.3-5 Data Rate Analysis by Priority Level

This function displays the network data rate for each priority level. Priority 0 corresponds to service messages, priority 2 to UNI-TE service and application-to-application messages, priority 4 to COM words and priority 6 to telegrams. This function is accessed from the primary window by selecting:

Primary Window



Screen example



The following information is displayed across the top of the screen: Date, Time, Elapsed time since the start of measurements and the number of measurements performed.

Data rate analysis

The data rate by priority is expressed in messages per second. It is displayed as a bargraph:

- The immediate value at a given time is shown by the cursor under the scale,
- The minimum value is the smallest measurement value recorded,
- The average value is the average of all of the measurement values recorded,
- The maximum value is the largest measurement value recorded.

The time and date when extreme (min. and max.) measurements were recorded are also displayed.

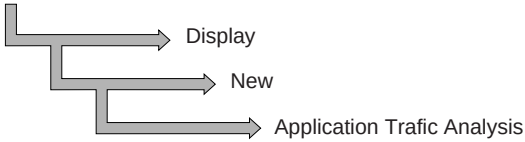
6.3-6 Application Traffic Analysis

This function displays network traffic as:

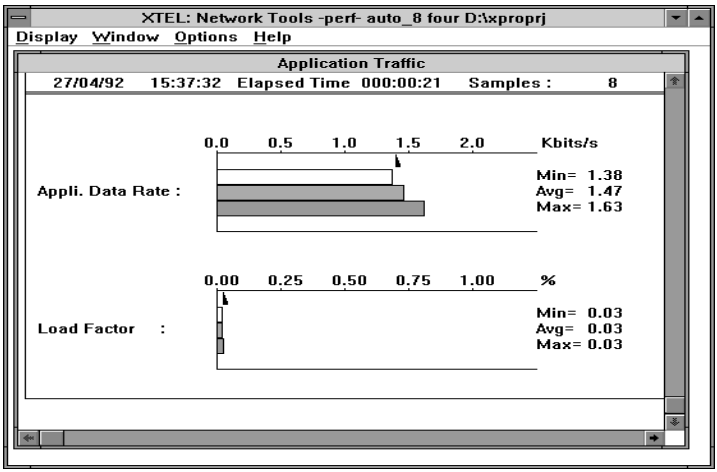
- Application data rate in Kbit/s,
- Network load factor as a percentage.

This function is accessed from the primary window by selecting:

Primary Window



Screen example



The following information is displayed across the top of the screen: Date, Time, Elapsed time since the start of measurements and the number of measurements performed.

Network load factor and traffic analysis

The application data rate only includes bytes contained in the application data fields of the frames on the network.

Network traffic is expressed in Kbit/s. It is displayed as a bargraph:

- The immediate value at a given time is shown by the cursor under the scale,
- The minimum value is the smallest measurement value recorded,
- The average value is the average of all of the measurement values recorded,
- The maximum value is the largest measurement value recorded.

The network load factor expressed as a percentage, depends on the previously calculated analysis of network traffic and on the transmission capacity of the network medium. It is displayed as a bargraph:

- The immediate value at a given time is shown by the cursor under the scale,
- The minimum value is the smallest measurement value recorded,
- The average value is the average of all of the measurement values recorded,
- The maximum value is the largest measurement value recorded.

As a rule, the MAPWAY network load factor should normally be less than 50%.

In both cases, the time and date when extreme (min. and max.) measurements were recorded are also displayed.

6.4 Performance Levels of TELWAY, ETHWAY or 802.3 Networks

The PERFORMANCE function performs response time measurements on TELWAY, ETHWAY or 802.3 networks.

Measurements are performed in the same way as on a FIPWAY network. The data entry procedure is also identical (selecting a device, etc.).

For more information on running this function and on interpreting results, refer to section 6.2-4.

Screen example

7.1 Token Bus Principles

7.1-1 General

A device is identified by a single MAC address encoded in six bytes. For a Telemecanique MAPWAY device, this address is: 00 80 F4 00 NN SS where NN is the network number and SS the station number.

The network number takes the following values:

- 0 in single segment architectures,
- 1 to 127 in multiple segment architectures or in single segment architectures where later expansion is planned.

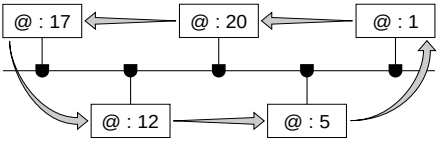
The station number is the device address on the network.

The token bus used by MAPWAY and defined to IEEE 802.4 standards operates as a logical ring where each station only knows two other stations:

- One with an address immediately preceding it,
- One with an address immediately following it.

The token is passed down to the next station with a lower address.

Example



When station 17 has the token (i.e. the right to send), it sends any message(s) that it has to transmit over the network.
Once transmission is complete, station 17 passes the token to station 12, the next station on the network.
Once station 12 has the token, it in turn sends any messages it has to transmit, then passes the token to the next station on the network, in this case station 5. This procedure is repeated until station 20 passes the token to station 17, starting a new cycle.

A station which receives the token when it has no messages to send will immediately pass the token to the next station.

Deterministic networks

Only one station at a time can transmit on a token bus. To ensure maximum MAPWAY network access time, a station must relinquish the token after approx. 800 µs, whether or not it has been able to send all of its messages. Any messages that are not sent will be lost, they will be sent when the station receives the token on the next network cycle.

To ensure that urgent messages are sent first, MAPWAY follows IEEE 802.4 standards and supports four priority levels depending on the type of message:

Priority 6	Telegrams,
Priority 4	COM words,
Priority 2	Messages with a confirm (UNI-TE service and application-to-application messages),
Priority 0	Service messages

MMS messages are sent with various priority levels, depending on the supplier of the device.

This enables a limit to be determined below which it is possible to ensure that a station can send any messages that are critical for the application. This level applies regardless of the network load factor at a given time.

Message acknowledgment

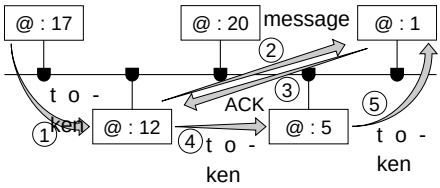
On a MAPWAY network, point-to-point messages are acknowledged (LLC class 3). Acknowledgment is an additional factor in ensuring communication reliability on the network. A source device is immediately advised of any message loss, enabling it to repeat transmission.

The acknowledgment is automatically controlled by the network interfaces and is performed before the sender station passes the token.

In the example below, the successive steps are:

① Token passed to 12,
② Message sent to 1,
③ Acknowledgements 12,
④ Token passed to 5,
⑤ Token passed to 1,

And so on...



Broadcast messages (service messages, COM words) cannot be acknowledged as they have multiple destination stations.

7.2 Accessing the Token Bus

7.2-1 Initializing the Logical Ring

The logical ring is initialized when the token is lost. Initialization determines the station that is the first to have the token:

- at each power-up
- if a station fails while it has the token

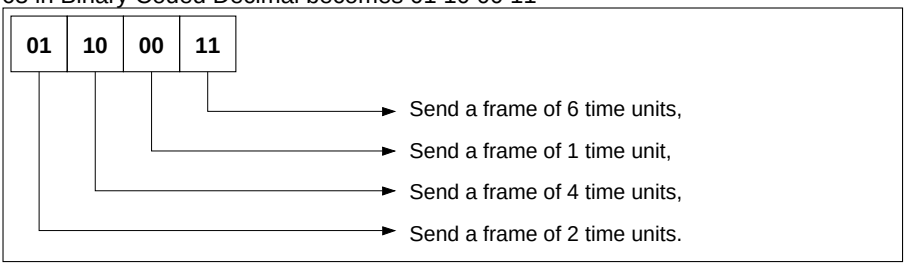
The determination algorithm ensures that the station with the highest address gets the token.

Principle

On initialization of the logical ring, each station sends "Claim_Token" frames which are proportional in length to their address on the network.

Example: Station with address 63

63 in Binary Coded Decimal becomes 01 10 00 11

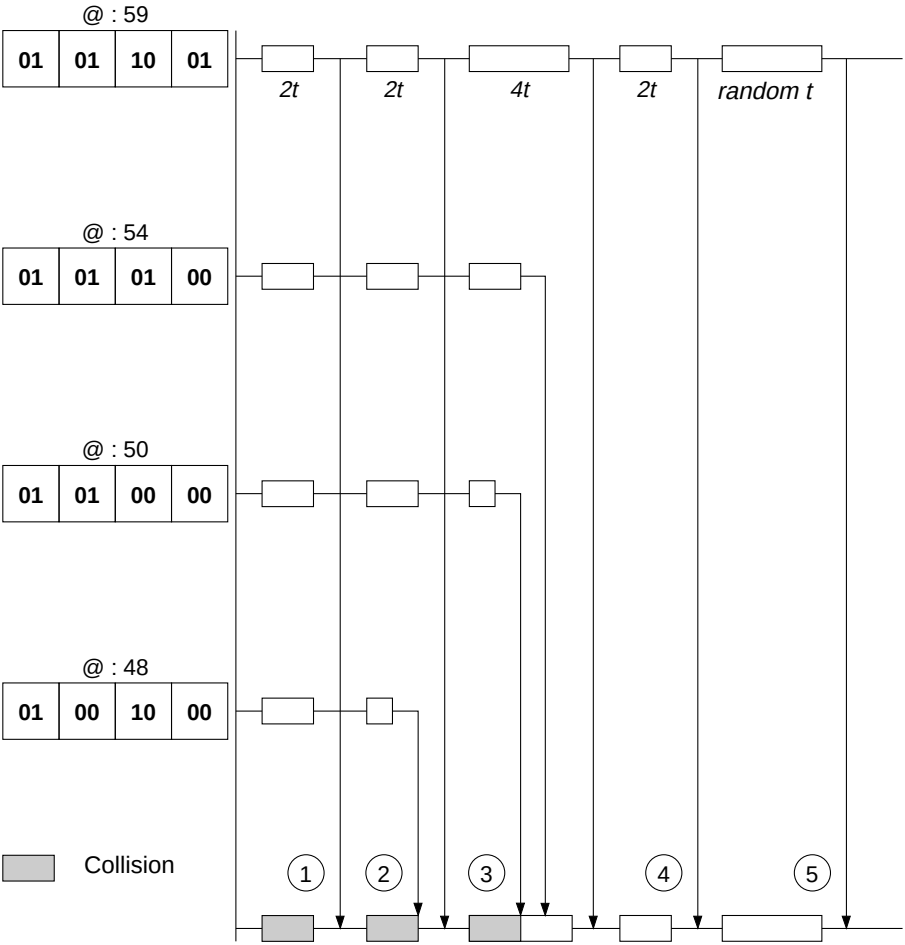


Each station starts by sending the address frame, starting with the MSB (2 time units in the above example) then listens on the line to determine if another station is sending. If another transmission is in progress the station gives up its claim.

When the station no longer detects any transmission on the bus, it sends the next address frame (in the order MSB, LSB). Once again it waits to determine if another station is sending on the bus. Depending on the result, it will continue by sending the next frame or give up its claim.

This procedure is continued until a station (the one with the highest address) is the only one left on the network. When this is the case, the station sends a claim token frame. The length of the claim token frame is determined by two random bits, to avoid a conflict if an addressing error occurred and two different stations were assigned the same address on the network. This station claims the token and the logical ring is initialized.

Example with four stations on the network



① No station is sending on the network, so all stations will send another "Claim_Token" frame,

② The station with address 48 gives up its claim as it detects that other stations are still sending after it has finished its own transmission,

③ The stations with addresses 50 and 54 give up their claims,

④ The station with address 59 is the only station on the network that is still sending so it is free to send the randomly generated Claim_Token,

⑤ The logical ring is initialized. The station with address 59 can send the token.

7.2-2 Passing the Token/Deleting a Station

A station only knows the address of the stations which precede and follow it.

During normal operation, the token is passed from one station to another, in descending address order. Once the token has been passed, the source station awaits acknowledgment from the next station, indicating that the token has been received.

A source station can fail to receive a valid acknowledgment frame for a number of reasons, e.g. noise on the line, station failure or a station absent from the logical ring. The sender continues to listen on the line for four times the “Slot Time”. Any source station must listen to the line for the duration of the slot time (410 µs maximum on a MAPWAY network) and wait for an acknowledgment.

Once the slot time has elapsed, and if the sender has still not received a valid acknowledgment frame, it again sends the token to the destination station.

If once again nothing happens, the destination station is considered to have failed and is no longer a part of the logical ring.

The station that still has the token will then seek to determine the address of the station after the one that has just failed. To do so it sends a “Who_Follows” frame. The correct station will then send back a “Set_Successor” frame that gives its address. The token is then sent to it and network operation can continue normally.

If the source station receives no response to a “Who_Follows” frame, it will try again.

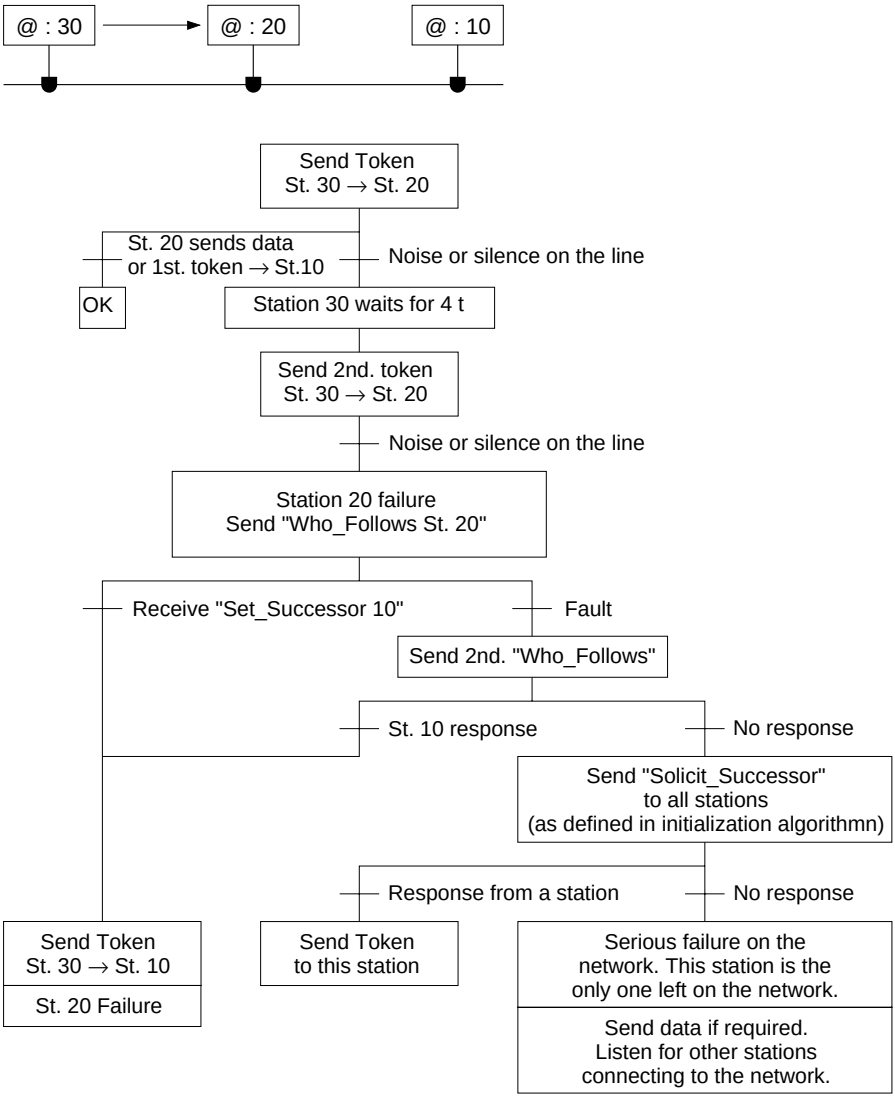
If there is still no response after a retry, the source station will send a “Solicit_Successor_2” frame to all stations on the network. This procedure determines whether another station is available to receive the token. If no response is received, a serious network failure has occurred. The station that is the only one left in the logical ring will listen to the line and determine if any other stations connect to the network.

A detailed example is described overleaf.

Note:

Details of the coding of the "Who_Follows", "Solicit_Successor" and "Set_Successor" frames are given in the Appendix, section 7.3.

Example showing token passing between stations 30, 20 and 10. Station 20 has failed or disconnected



7.2-3 Adding a Station

Each station which is part of the logical ring must check if any new stations have connected to the ring. Every station periodically sends a “Solicit_Successor” frame while it has the token. This frame enables connection of any new station with an address value between those of the source and the next station to connect to the logical ring (the station with the lowest address sends a “Solicit_Successor_2” frame while other stations send a “Solicit_Successor_1” frame).

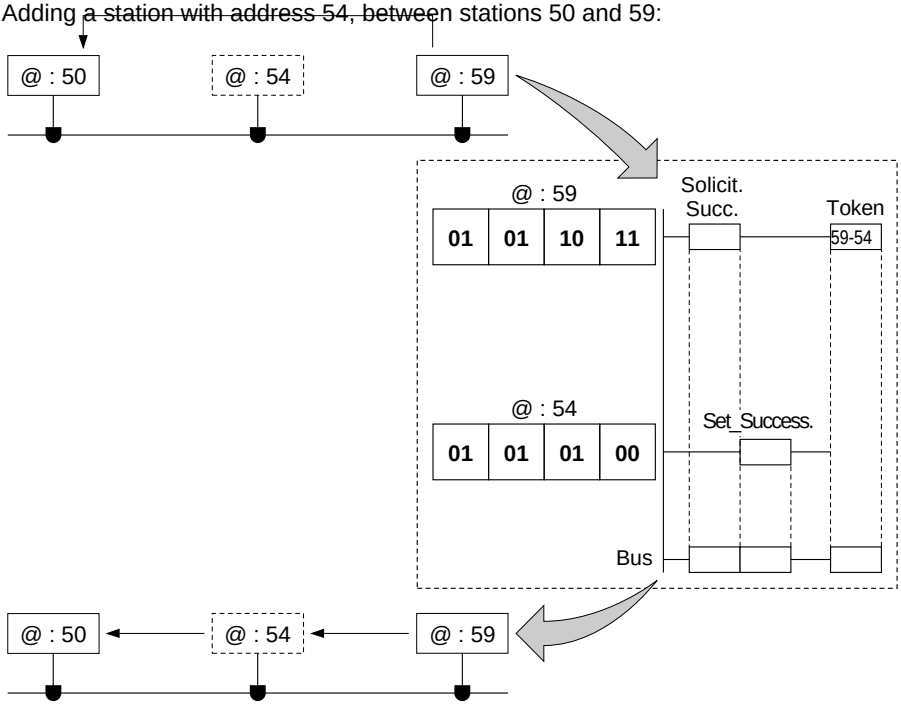
If no station responds to this frame, then there is no station ready to connect to the logical ring.

If a station wants to connect, it sends its address to the source of the “Solicit_Successor” frame, using a “Set_Successor” frame. The new station will now be recognized by the station that precedes it in the logical ring.

If multiple “Set_Successor” frames are received by the station, several stations wish to connect between two stations with successive addresses. It sends a “Resolve_Contention” frame in order to determine which stations want to connect and inserts them into the logical ring.

Example

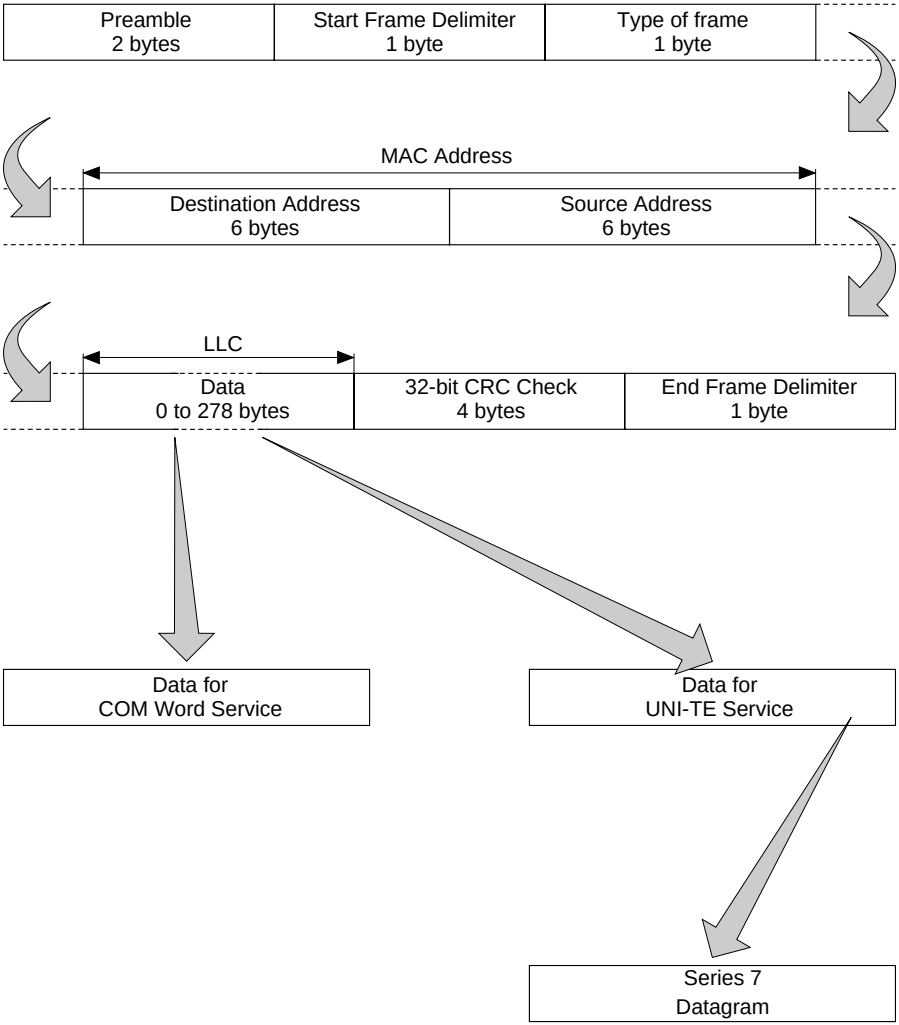
Adding a station with address 54, between stations 50 and 59:



7.3 Detailed MAPWAY Frame Coding

7.3-1 MAPWAY Frame

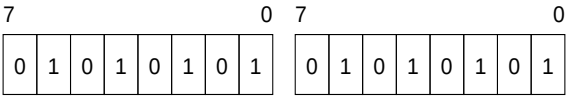
The general format of a MAPWAY frame is described below:



7.3-2 Preamble, Start and Type of Frame

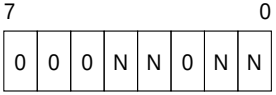
Preamble:

The preamble comprises two bytes. It establishes the synchronization bit and locates the first start frame delimiter bit:



Start frame delimiter:

The start frame delimiter comprises one byte:

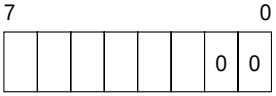


0 = MAC symbol zero
1 = MAC symbol one
N = MAC symbol NOT DATA

Type of frame:

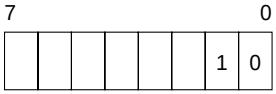
There are two types of frame:

- Medium Access Control (MAC) frame:



0	0	0	0	0	0	: Claim_Token,
1	0	0	0	0	0	: Solicit_Successor_1,
0	1	0	0	0	0	: Solicit_Successor_2,
1	1	0	0	0	0	: Who_Follows,
0	0	1	0	0	0	: Resolve_Contention,
0	0	0	1	0	0	: Token,
0	0	1	1	0	0	: Set_Successor.

- Logical Link Control (LLC) frame:

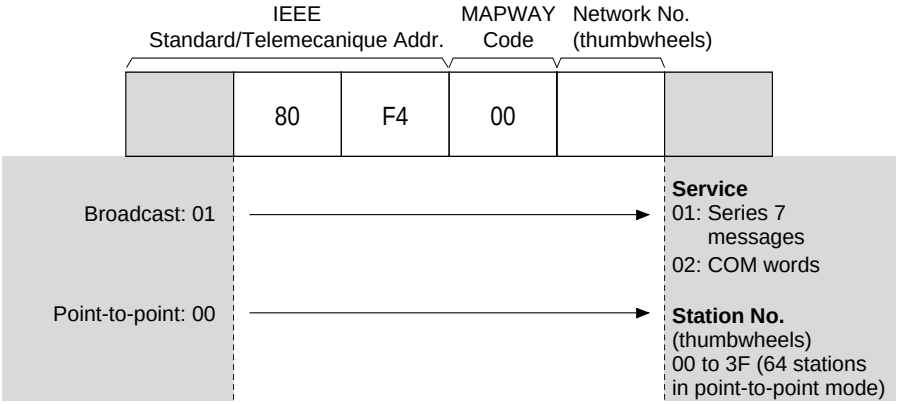


	(**)	(*)	
		0 0 0	R/W don't acknowledge (LLC1)
		1 0 0	R/W and acknowledge (LLC3)
		0 1 0	Confirm
Priority 6 (Telegrams)	0 1 1		
Priority 4 (COM Words)	0 0 1		
Priority 2 (Mess. System)	0 1 0		
Priority 0 (Service Messages)	0 0 0		

(*) MAC message,
(**) Priority.

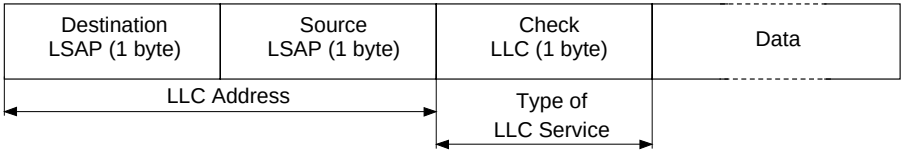
7.3-3 MAC Address

This address is the source and destination address of an exchange. Each address is coded in 6 bytes.



7.3-4 LLC Data

The data comprises the following elements:



LLC.LSAP Address

For Telemecanique, the source and the destination stations are the same type and take the values:

- H'24' = UNI-TE and application-to-application communication,
- H'28' = COM word service.

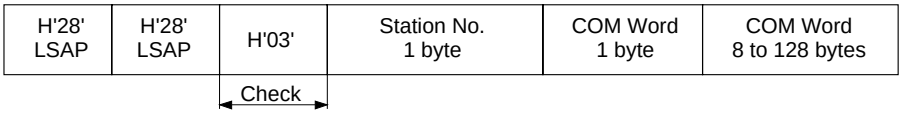
LLC Check

- H'67' = AC0 Read/Write and acknowledge,
- H'E7' = AC1 Read/Write and acknowledge,
- H'03' = Read/Write don't acknowledge,
- H'E3' = Test.

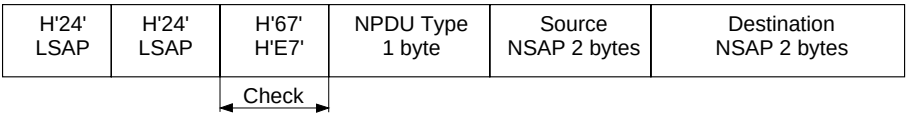
Data

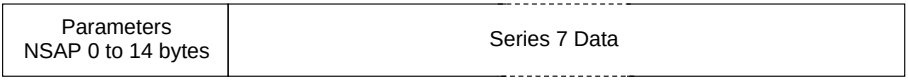
Specific Telemecanique data for the COM word service or UNI-TE service.

- **COM word service data**

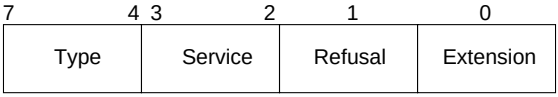


- **UNI-TE service data**



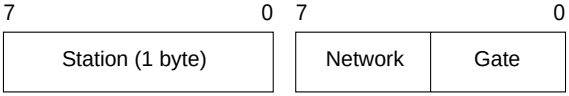


- **NPDU Type**



Type : 0 to 15 (15 = Series 7 Datagram),
Service : 0 to 3 (0 = Standard Datagram),
Refusal bit : 0/1 (1 = Message Refused),
Extension bit : 0/1 (1 = Extended Addressing).

- **NSAP addresses (Station/Network/Gate) - Three level addressing**



Station : 0 to 63,
Network : 0 to 15,
Gate : 0 = Processor system,
: 1-2-3 = Terminal,
: 4 = Network,
: 5 = I/O bus for interface,
: 8 = FIPIO specific addressing,
: 10 = TER type text block,
: 16 to 80 = CPL, TXT, SYS type text blocks.

• **Parameters (five level addressing)**

The use of these parameters is optional (they are only used when the NPDU type extension bit equals 1).

Code	D	Length	Parameter Field

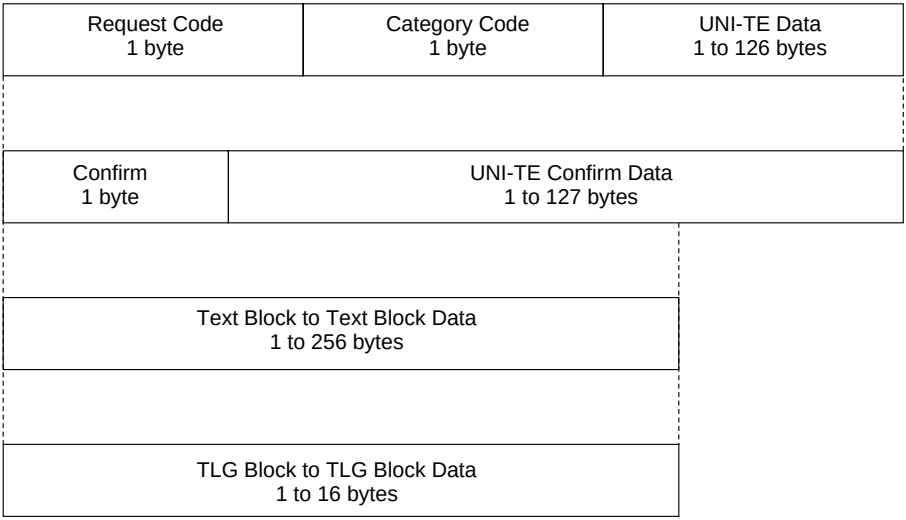
Code : 0 : Sender gate TXTi (16 to 255),
1 : Destination gate TXTi (16 to 255),
2 : Sender network (16 to 255),
3 : Destination network (16 to 255),
4 : Module and channel (Module 0 to 255),
of the sender interface (Channel 0 to 255),
5 : Module and channel of (module 0 to 255),
the destination interface (Channel 0 to 255),
6/15 : Reserved.

D = 1 if it is the last parameter sent.

Length = Parameter field length in bytes.

Parameter field = Data assigned to the code.

• **Series 7 data**

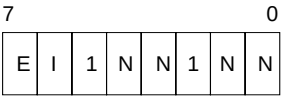


7.3-5 CRC 32 Check and End of Frame

CRC 32 Check

32-bit Cyclic Redundancy Check. These four check bytes are used to check that the exchange was performed correctly. This check code is calculated by the sender station, then sent at the end of the data string. The destination station recalculates the code and compares it with the code sent. If any inconsistency is found, the message is refused by the destination station.

End of frame



E = Error bit (1 = error),
I = Intermediate bit (1 = transmission in progress),
(0 = end of transmission).

7.4 Interpreting Analyzer Function Data

To get the most out of the informations provided by the ANALYZER function, the user should refer to this section for a brief description of each parameter displayed along with their normal values and the most frequently encountered causes of errors.

Important

All of the nominal values given here apply to MAPWAY modules. For MAP/EPA networks, values specific to the selected configuration should be used for calculations.

Token

The token is a special frame which enables stations on the network pass on the right to communicate on the network.

Depending on the messages to be sent on the network, a station can retain the token for:

- At least 44 µs if it has no message to send,
- No more than 819 µs.

The number of token frames exchanged per hour on the network depends on the time that the token is held, and is calculated using the following formula:

$$\text{Number of tokens / hour} = \frac{3600}{\text{Average token hold time (in seconds)}}$$

Examples:

- Maximum number of tokens per hour: $81.8\ 10^6$
- Minimum number of tokens per hour: $4.4\ 10^6$

Typically, the maximum number of tokens per hour is approximately 50 to 60 10^6. (Reminder: The value indicated by the token counter in the ANALYZER function is at least 20% less than the true value).

Claim_Token

This frame travels on the network when the logical ring is initialized or when the token is lost. The main causes of an increase in the number of "Claim_Token" frames on the network are:

- Incorrect network wiring (loose station connection, disconnected cable, etc.),
- High levels of interference caused by an outside source,
- Incorrect network grounding.

Solicit_Successor_1 and Solicit_Successor_2

In normal operation, these frames are periodically generated by each station to check if there are newly connected stations to add to the logical ring. On a MAPWAY network, a station must send Solicit_Successor 1 and 2 frames every 255 token frames. The number of Solicit_Successor_2 frames is a sub-multiple of the number of Solicit_Successor_1 frames, depending on the number of stations.

The following equations determine transmission of these frames:

$$\text{Number of Solicit\_Successor 1 and 2} = \frac{\text{Number of Tokens}}{255}$$

$$\text{Number of Solicit\_Successor\_2 frames} = \frac{\text{Number of Solicit\_Successor 1 \& 2}}{\text{Number of Stations}}$$

Example:

For 10^6 tokens, there will be 3921 Solicit_Successor frames which for a 16 station network will be divided into:

- 3676 Solicit_Successor_1 frames,
- 0245 Solicit_Successor_2 frames.

Who_Follows

This frame is sent by the station holding the token when it can no longer send it the next station (the destination station does not react to transmission of the token). It is used by the sender station to determine the address of the station located immediately after the failed station so that normal network operation can be resumed and the token sent.

Transmission of Who_Follows frames is normal if the station that should receive the token is powered-down. If not, the main causes of transmission problems are:

- Module failure,
- A station "blinded" by noise (due to connection or grounding problems).

Set_Successor

The Set_Successor frame is the response by a station to the Solicit_Successor_1, Solicit_Successor_2 or Who_Follows frames sent when attempting to insert a new station on the network.

Resolve_Contention

In normal operation, this frame is sent by a station when it sends a Solicit_Successor_1 or Solicit_Successor_2 frame and several stations send Set_Successor frames at the same time. This causes a collision on the network. This frame determines which stations want access to the network and allows their insertion into the logical ring.

Once normal network operation is achieved and no new stations are added, nor any stations connected stations removed from the network, an ideal situation will be no Resolve_Contention frames.

All of the network components (hardware, software, protocols, wiring system), are designed for industrial operating environments and are therefore protected against most electro-magnetic interference. When unexpected or exceptional events occur (such as a start-up causing a high level of interference, or a number of stations starting-up simultaneously), transmission of Resolve_Contention frames may occur. The protocol will handle normal contention due to collisions.

The acceptable number of Resolve_Contention frames depends on the number of tokens on the network at a given time.

Two measurement periods are required:

- During a period of severe network interference. In this case, the acceptable number of Resolve_Contention frames is 50 to 60 over a one hour period,
- Over a period of ten hours. In this case, the acceptable number of Resolve_Contention frames must remain below approximately 150 / 200.

Repeated transmission of Resolve_Contention frames by a station indicates severe interference affecting this station. Perform checks on the following:

- Environment (interference from external sources),
- Wiring (incorrectly fitted connector, disconnected cable, etc.),
- Station network interface,
- Correct grounding of the network. This is especially important.

Station (reminder)

Indicates the address of the last station that sent a Resolve_Contention frame:

- If the station is a Telemecanique device, this address is expressed as NNN.SS where:
  - NNN is the network address (1 to 127),
  - SS is the station number (0 to 63).
- If the station is a device from another vendor, the MAC address of the station is shown encoded in six bytes.

E_Bit

When a translator (on a Broadband network) or a repeater receives an incorrect data frame (i.e. with CRC errors), it modifies the frame received by setting the E_Bit parameter to 1. If a station receives a frame with the E_Bit parameter at 1, it increments its E_Bit counter.

Udef_fc

This information is present when a station does not recognize a frame received. The main causes of this error are:

- High levels of interference on the network,
- Faulty sender network interface.

CRC Errors

This information is present when a station receives a frame with a bad checksum. This is usually caused by high levels of interference on the network.