Specification

TCP/IP Interface between LAP Pro-Soft and client software

History

Revision	Date	Change sections	Responsible
1.0	05.04.2006	Initial issue	H. Grimm; H. Völz
1.1	27.04.2006	Error messages; Calib_Result	H. Völz
1.2	06.06.2006	Data type in result of Auto.calib.	H. Grimm
1.3	29.09.2006	Definition of additional telegrams	H. Grimm
1.4	21.05.2007	New tele.: Next/previous contour	H. Völz

Table of Contents

1 OVERVIEW

This document describes the exchange of information between client software and LAP Pro-Soft.

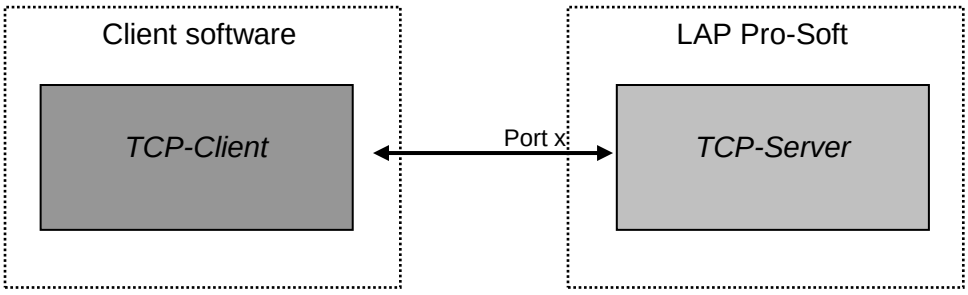
2 GENERAL DEFINITIONS

2.1 Hardware requirements

The communication partners are connected to a Local Area Network (LAN) Ethernet bus system. Network protocol conforms to the IEEE802.3 standard for the physical and data-link layer of the OSI model.

2.2 Software requirements

Each message is one transmission block and will be not subdivided.
For both directions (Sending, Receiving) the same port is used.
Example:



After program start-up, the TCP/IP-Server will listen for a connection at the specified port.
The TCP/IP-Client will establish the connection by connecting to the specified port at the TCP/IP-Server.

2.3 Communication Parameters

Computer Name	Host Name	IP Address	Ports
Client Computer	To be defined by client	To be defined by client	undefined
LAP Pro-Soft Computer	To be defined by LAP	To be defined by client	8000 (Server)

2.4 Byte Order

Intel's byte order is used: Little-Endian (The most significant byte is on the right end of a word).

2.5 Correctness of message contents

In general the sender of a message is responsible for the correctness of sent data and the receiver may rely on the message contents, i.e. it is generally not the task of the receiver to check plausibility of received data.

2.6 Data Types

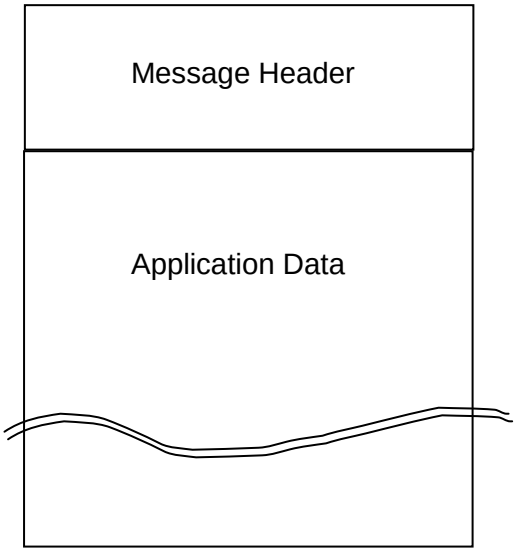
Following Data Types can be used in the telegrams:

Data types	**Abbreviation**	**Size**	**Value range**
Char	C1	1 byte	-128 to 127
Short int	INT2	2 bytes	-32768 to 32767
Unsigned short int	UINT2	2 bytes	0 to 65535
Int / long int	INT4	4 bytes	-2 Giga to 2 Giga-1
Unsigned long int	UINT4	4 bytes	0 to 4 Giga
Float	FLT4	4 bytes	1.1*10**38 to 3.4*10**38
The following abbreviation is used for strings (arrays of characters):			
Char[x]	Cx	x bytes	

3 MESSAGE STRUCTURES

3.1 General Structure

Each message contains a header of constant length and application data of varying length depending on the message id.



3.2 Method of specifying message contents

Message contents are specified field by field. Each field specification includes:

- **No.**,
  Sequential number of the field for documentation and reference purposes only.
- **Field Name**,
  identifies the field. Is typically unique within the message. May not be unique if the message contains arrays of data structures.
- **Field Description**,
  explains nature or usage of the field
- **Type** *(Field Type)*,
  defines the data type and length of the field as defined above.
- **Unit**,
  Description of unit, like mm, kg, °C etc.
- **Val./Rem.** *(Values or Remarks)*,
  optional description of the possible/allowed/expected value range of the field, such as **Y**es/**N**o for enumerated values, or some comments.

3.3 Message Header

All telegrams begin with an uniformed application message header.

No	Field Name	Field Description	Type	Unit	Val./Rem.
1.	Message_Length	Message length, whole length of the message incl. header	UINT2	Bytes	
2.	Source	ID of sender	UINT2		0x0001 for LAP 0x0002 for client
3.	Destination	ID of receiver	UINT2		0x0001 for LAP 0x0002 for client
4.	Message_ID	ID of message	UINT2		

4 LIST OF MESSAGES

Message ID	Message Name	Sender	Receiver
0x0010	Automatic calibration	client	LAP
0x0011	Switch Calibration	client	LAP
0x0012	Switch Calibration Acknowledge	client	LAP
0x0020	Start projection	client	LAP
0x0021	Start and adjust projection	client	LAP
0x0022	Show next contour	client	LAP
0x0023	Show previous contour	client	LAP
0x0030	Stop projection	client	LAP
0x0040	Get Shift- / Rotation Info	client	LAP
0x0110	Result of “Automatic calibration”	LAP	client
0x0111	Result of “ Switch Calibration“	LAP	client
0x0112	Result of “ Switch Calibration Acknowledge“	LAP	client
0x0120	Result of “Start projection”	LAP	client
0x0121	Result of “ Start and adjust projection”	LAP	client
0x0122	Result of “Show next contour“	LAP	client
0x0123	Result of “Show previous contour“	LAP	client
0x0130	Result of “Stop projection”	LAP	client
0x0140	Result of “ Get Shift- / Rotation Info“	LAP	client

5 APPLICATION DATA OF MESSAGES

5.1 Automatic calibration

Msg.-ID:	0x0010
Direction:	client -> LAP
Length:	variable
Function:	Contains path and name of a calibration file and activates an automatic calibration.

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	CalibPath	Path and name of calibration file	Char[n]	

5.2 Result of "Automatic calibration"

Msg.-ID:	0x0110
Direction:	LAP -> client
Length:	variable
Function:	Contains the result(s) of the calibration

No	Field name	Type	Field description	Unit / Remarks
1	Header		Telegram header	
2	Result	Int2	Status of the whole calibration	0: successful 1: faulty 2: file not found 3: file not readable 4: manual calibration required
3	ProjCount	Int2	Number of calibrated projectors	
4	ProjName_1	Char[32]	Name of first projector	
5	ProjAddr_1	Int2	Address of first projector	
6	ProjRes_1	Int2	Status of the calibration of first projector	0: successful 1: calibration result exceeds limit 2: at least one target not found
7	ProjRMS_1	Int4	Root mean square of first projector	Root Mean Square [1/100mm]
8	TgtCount_1	Int2	Number of targets for first projector	
9	TgtNumber_1_1	Int2	Number of first target of first projector	
10	TgtRes_1_1	Int2	Status of the target	0: Target found 1: Target not found
11	TgtDev_1_1	Int4	Deviation of the first target	[1/100 mm]
12	TgtNumber_1_2	Int2	Number of second target of first projector	
13	TgtRes_1_2			
...	...	...	...	
	TgtDev_1_n	Int4	Deviation of the n-th target of first projector	
	ProjName_2	Char[32]	Name of projector 2	
...	...	...	...	
	TgtDev_m_n	Int4	Deviation of the n-th target of m-th projector	

5.3 Switch Calibration

Msg.-ID:	0x0011
Direction:	client -> LAP
Length:	variable
Function:	Changes the active calibration data, four modes possible.

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Mode	Automatic calibration No calibration Position check of target film Position check of target hole	Int2	1 2 3 4
3	CalibPath	Path and name of calibration file	Char[n]	

5.4 Result of „Switch Calibration“

Msg.-ID:	0x0111
Direction:	LAP -> client
Length:	variable
Function:	Contains the result(s) of “Switch Calibration”. In case of switch mode 2, 3 and 4 the telegram will end behind the field “ProjCount” with ProjCount = 0

No	Field name	Type	Field description	Unit / Remarks
1	Header		Telegram header	
2	Result	Int2	Status of the whole calibration	0: successful 1: faulty 2: file not found 3: file not readable 4: manual calibration required
3	ProjCount	Int2	Number of calibrated projectors	
4	ProjName_1	Char[32]	Name of first projector	
5	ProjAddr_1	Int2	Address of first projector	
6	ProjRes_1	Int2	Status of the calibration of first projector	0: successful 1: calibration result exceeds limit 2: at least one target not found
7	ProjRMS_1	Int4	Root mean square of first projector	Root Mean Square [1/100mm]
8	TgtCount_1	Int2	Number of targets for first projector	
9	TgtNumber_1_1	Int2	Number of first target of first projector	
10	TgtRes_1_1	Int2	Status of the target	0: Target found 1: Target not found
11	TgtDev_1_1	Int4	Deviation of the first target	[1/100 mm]
12	TgtNumber_1_2	Int2	Number of second target of first projector	
13	TgtRes_1_2			
...	...	...	...	
	TgtDev_1_n	Int4	Deviation of the n-th target of first projector	
	ProjName_2	Char[32]	Name of projector 2	
...	...	...	...	
	TgtDev_m_n	Int4	Deviation of the n-th target of m-th projector	

5.5 Switch Calibration Acknowledge

Msg.-ID:	0x0012
Direction:	client -> LAP
Length:	10
Function:	Contains the result of target position check (switch calibration mode 3 & 4).

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Status	Status of position check	Int2	0: check Ok 1: check refused

5.6 Result of „Switch Calibration Acknowledge“

Msg.-ID:	0x0112
Direction:	LAP -> client
Length:	10 Byte
Function:	Result of “ Switch Calibration Acknowledge“

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Result	Int2		0: successful 1: faulty

5.7 Start Projection

Msg.-ID:	0x0020
Direction:	client -> LAP
Length:	variable
Function:	Contains path and name of a projection file and starts the projection

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	ProjPath	Path and name of a projection file	Char[n]	

5.8 Result of "Start Projection"

Msg.-ID:	0x0120
Direction:	LAP -> client
Length:	10 Byte
Function:	Result of reading projection file and starting projection

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Result	Int2		0: successful 1: file not found 2: file not readable 3: system not calibrated 4: projection out of range

5.9 Start and adjust projection

Msg.-ID:	0x0021
Direction:	client -> LAP
Length:	variable
Function:	Contains path and name of a projection file, height of the object, shift vector, rotation angle, centre of rotation and starts the projection.

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Height	Height of object / shift in z-Coo.	Int4	[1/100 mm]
3	Shift_x	Shift vector x-Coo.	Int4	[1/100 mm]
4	Shift_y	Shift vector y-Coo.	Int4	[1/100 mm]
5	RotAngle	Rotation angle (clockwise)	Int4	[1/100 deg]
6	RotCentre_x	Rotation centre x-Coo.	Int4	[1/100 mm]
7	RotCentre_y	Rotation centre y-Coo.	Int4	[1/100 mm]
8	ProjPath	Path and name of projection file	Char[n]	

5.10 Result of „Start and adjust projection”

Msg.-ID:	0x0121
Direction:	LAP -> client
Length:	10 Byte
Function:	Result of reading projection file, shift/rotation operation and starting projection

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Result	Int2		0: successful 1: file not found 2: file not readable 3: system not calibrated 4: projection out of range

5.11 Show next contour

Msg.-ID:	0x0022
Direction:	client -> LAP
Length:	8 Bytes
Function:	Request for projection the next contour

No	Field name	Field description	Type	Unit
1	Header	Telegram header		

5.12 Result of „Show next contour“

Msg.-ID:	0x0122
Direction:	LAP -> client
Length:	10 bytes
Function:	Returns the result of showing the next contour

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Result	Result of the operation	Int2	0: success 1: end of list 2: no open file 3: no valid calibration 4: projection out of range

5.13 Show previous contour

Msg.-ID:	0x0023
Direction:	client -> LAP
Length:	8 Bytes
Function:	Request for projection the previous contour

No	Field name	Field description	Type	Unit
1	Header	Telegram header		

5.14 Result of „Show previous contour“

Msg.-ID:	0x0123
Direction:	LAP -> client
Length:	10 bytes
Function:	Returns the result of showing the previous contour

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Result	Result of the operation	Int2	0: success 1: end of list 2: no open file 3: no valid calibration 4: projection out of range

5.15 Stop Projection

Msg.-ID:	0x0030
Direction:	client -> LAP
Length:	8 Byte
Function:	Stops the current projection and turns off the lasers

No	Field name	Field description	Type	Unit
1	Header	Telegram header		

5.16 Result of "Stop Projection"

Msg.-ID:	0x0130
Direction:	LAP -> client
Length:	10 Byte
Function:	Result of terminating the projection

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Result	Int2		0: successful 1: faulty

5.17 Get Shift- / Rotation Info

Msg.-ID:	0x0040
Direction:	client -> LAP
Length:	8 Bytes
Function:	Request for shift and rotation information

No	Field name	Field description	Type	Unit
1	Header	Telegram header		

5.18 Result of „Get Shift- / Rotation Info“

Msg.-ID:	0x0140
Direction:	LAP -> client
Length:	28 bytes
Function:	Returns shift and rotation information for movement of last object

No	Field name	Field description	Type	Unit
1	Header	Telegram header		
2	Shift_x	Shift vector x-Coo.	Int4	[1/100 mm]
3	Shift_y	Shift vector y-Coo.	Int4	[1/100 mm]
4	RotAngle	Rotation angle (clockwise)	Int4	[1/100 deg]
5	RotCentre_x	Rotation centre x-Coo.	Int4	[1/100 mm]
6	RotCentre_y	Rotation centre y-Coo.	Int4	[1/100 mm]