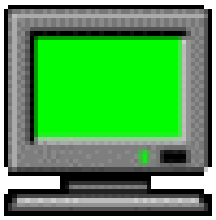
CAPILLARYS / PHORESIS

EXTENDED PROTOCOL
RS-232C & FILE-TRANSFER (NETWORK)



Host 5.X.X
November 2006

INTERFACING PHORESIS TO A HOST COMPUTER

INTRODUCTION

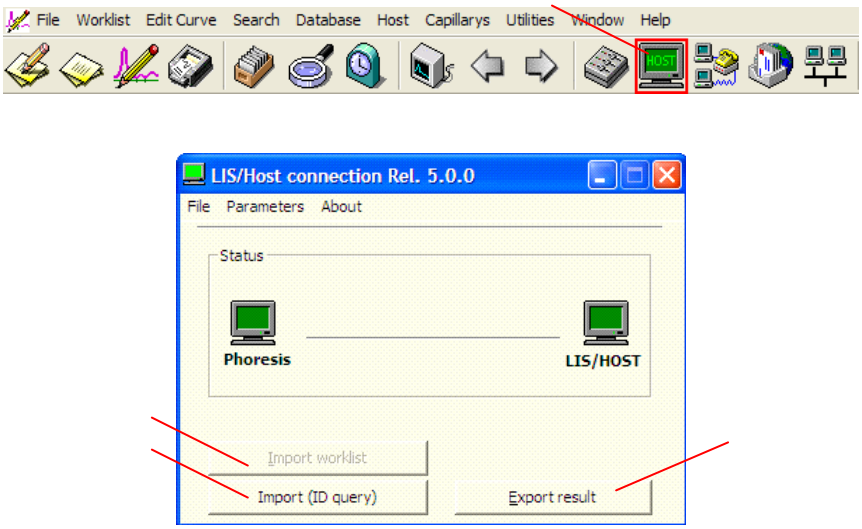
This manual provides all the information to interface a Capillarys system or Phoresis scanner to a host computer or LIS (Laboratory Information System) through a RS232C serial link or via file transfer (network).
It describes the communication protocols and message formats used by Phoresis in receiving and transmitting data.

Contents

RS-232C SERIAL LINK

The RS-232C serial link consists of message exchange between Capillarys/Phoresis and the host computer. Through these messages, it is possible to import either the entire worklist in one time **(Worklist or Total mode)** or patient by patient **(Query or Partial mode)** according to the present patient ID numbers (entered through the keyboard or scanned with the tube barcode reader) in the Phoresis worklist and to export after running the samples the corresponding patient results.

The operator has to click on the Host icon on the main screen, and then select either *Import worklist* or *Import (ID query)* according to the setting to import the patient data or *Export results* to transmit the sample results and thus for the **selected analysis program** and **current date**.



6 types of messages allow the host and Phoresis to communicate together:

MSG1 Worklist request (or Total request)
MSG2 Transfer OK (ACK)
MSG3 Demographic data of a single patient
MSG4 Transfer error (NACK)
MSG5 Result data of a single patient
MSG6 Query request (or Partial request of a single patient by patient ID number)

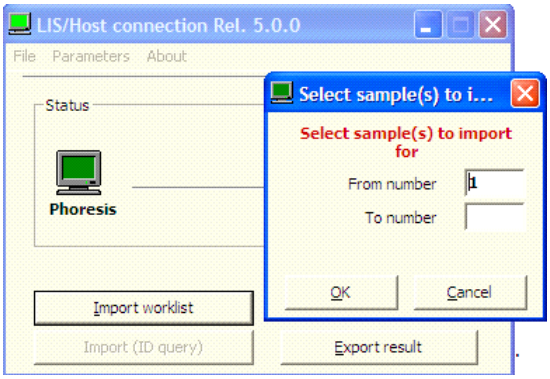
All messages start with a **STX** character (ASCII 02h) and end with an **ETX** character (ASCII 03h).

The last patient to download to Phoresis in Worklist mode after a MSG3 request and the last patient analysis results uploaded (MSG5) to the Host end with **EOT** character (ASCII 04h) instead of ETX in order to indicate to the receiver that there are no more patients to transmit.

IMPORTING A WORKLIST IN WORKLIST MODE FROM THE HOST

The Worklist or Total mode allows the operator to download the patient demography of all the patients or a group of patients by indicating the start and end sample numbers (e.g. 1 to 50 or 51 to 51 when it is an emergency patient) and thus for the **selected analysis program** and **current date**.

The operator has to click on the *Host* icon, select *Import worklist,* enter the start and end sample numbers and confirm with *OK* as shown on the following screen before starting downloading the patient data.



Communication protocol:

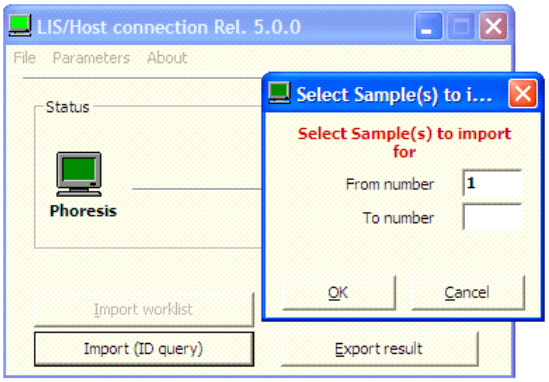
PHORESIS		MSG1				MSG2		MSG2		MSG2
HOST			MSG2	MSG3		MSG3		MSG3		

Notes:

- Phoresis sends a MSG1 to the Host and waits for a MSG2, then waits for the MSG3.
- When Phoresis has received correctly a MSG3 from the Host, it answers with a MSG2 (ACK) and thus for all the patients downloaded. In case of wrong reception, Phoresis answers with the MSG4 (NACK) and consequently the Host retransmits the MSG3 for a max of 3 times then goes to the next patient.
- When the Host does not have anymore samples to download to Phoresis, the last character of MSG3 becomes **EOT** (ASCII 04h) instead of the **ETX** (ASCII 03h) character transmitted after each of the previous samples.
- When the operator does not know the number of samples to download, he has to enter 9999 as the last sample number.
- Every messages have a **fixed length**

IMPORTING A WORKLIST IN QUERY MODE FROM THE HOST (QUERY BY PATIENT ID)

The Query or Partial mode allows the operator to download the patient data of the **selected analysis program** and **current date** after entry of the patient ID numbers first in the worklist.
The patient ID numbers can be entered either from the keyboard or a barcode reader from *Worklist by single sheet* or *Worklist by table* menu. Once the patient ID numbers have been entered, the operator has to click on the *Host* icon, select *Partial request* enter the start and end sample numbers and confirm with *OK* as shown on the following screen before starting downloading the corresponding patient data.



Note:

To enter the patient ID numbers with a barcode reader, select *Worklist by single sheet* and uncheck all the fields except *ID number* from *Options* menu. To verify all the worklist fields once the samples have been downloaded, select *Worklist by table* and *View all*.

Communication protocol:

PHORESIS		MSG6			MSG2
HOST			MSG2	MSG3	

Notes:

- Phoresis sends a MSG6 to the Host and waits for a MSG2, then waits for the MSG3.

- When Phoresis has received correctly a MSG3 from the Host, it answers with a MSG2 (ACK), and thus for all the patients downloaded. In case of wrong reception, Phoresis answers with the MSG4 (NACK) and consequently the Host retransmits the MSG3 for a max of 3 times then goes to the next patient.

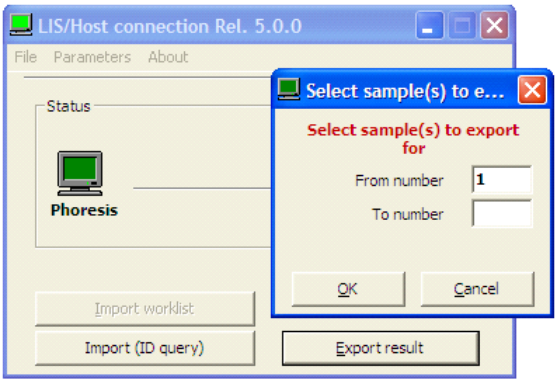
When the Host does not have anymore sample to download to Phoresis, the last character of MSG3 becomes **EOT** (ASCII 04h) instead of the **ETX** (ASCII 03h) character transmitted at the end of each previous samples.

- **The Sample number (position in the Worklist) is not used in Query reception since it is given by Phoresis. The Host should return 0000 for this field, if a different value is transmitted, Phoresis will ignore it.**

EXPORTING THE RESULTS TO THE HOST

This procedure allows the operator to upload the whole patient results of the **selected analysis program** for the **current date** to the Host once the samples have been run and edited.

The operator has to click on the *Host* icon, select *Export results* then Phoresis asks for the start and end sample numbers to export as shown on the following screen:



Communication protocol:

PHORESIS		MSG5		MSG5	
HOST			MSG2		MSG2

Notes:

- Phoresis starts the transmission sending MSG5 (first patient) then waits for MSG2 (ACK) from the Host, then continues with the next MSG5 (next patient) and waits again for MSG2, and thus up to the last sample selected by the operator.
-
- If Host answers a MSG4 (NACK), Phoresis retransmits the previous patient results and waits again for the MSG2 (ACK) for max. 3 times then goes to the next patient results.

When Phoresis does not have anymore samples to transmit to the Host, the last character of MSG5 becomes **EOT** (ASCII 04h) instead of the **ETX** (ASCII 03h) character transmitted at the end of each previous sample.

- Every record as a fixed length

- **MESSAGE 1 DESCRIPTION (MSG1)**

No.	Description	Start	Length	Note
1	STX	1	1	ASCII 02h
2	Analysis program code	2	1	Letter from A to Z , 0 to 9 ***(see APPENDIX 1)***
3	Start sample number	3	4	Aligned right e.g. 0001 (1)
4	End sample number	7	4	Aligned right e.g.0010 (9999 or nothing)
5	ETX	11	1	ASCII 03h
		TOTAL	**11**	**bytes**

MESSAGE 2 DESCRIPTION (MSG2)

No.	Description	Start	Length	Note
1	STX	1	1	ASCII 02h
2	ACK	2	1	ASCII 06h
3	ETX	3	1	ASCII 03h
		TOTAL	**3**	**bytes**

MESSAGE 3 DESCRIPTION (MSG3)

No.	Description	Start	Length	Note
1	STX	1	1	ASCII 02h
2	Analysis program code	2	1	Letter from A to Z , 0 to 9 ***(see APPENDIX 1)***
3	Sample number	3	4	Aligned right e.g. 0001
4	Patient ID number	7	15	Alphanum. charact., aligned left and spaces
5	Patient Name	22	30	Alphanum. charact., aligned left and spaces
6	Date of birth	52	8	DDMMYYYY
7	Sex	60	1	M or F
8	Age in years	61	3	Aligned right e.g. 015
9	Department	64	20	Alphanum. charact., aligned left and spaces
10	Sample date	84	8	DDMMYYYY
11	Concentration (e.g. total protein)	92	5	Not fixed with a decimal separator: “.” (2Eh)
12	Free 1	97	30	Alphanum. charact., aligned left and spaces
13	Free 2	127	30	Alphanum. charact., aligned left and spaces
14	Free 3	157	30	Alphanum. charact., aligned left and spaces
15	Free 4	187	30	Alphanum. charact., aligned left and spaces
16	Free 5	217	30	Alphanum. charact., aligned left and spaces
17	**ETX or EOT**	247	1	ASCII 03h or 04h for the last sample
		TOTAL	**247**	**bytes**

MESSAGE 4 DESCRIPTION (MSG4)

No.	Description	Start	Length	Note
1	STX	1	1	ASCII 02h
2	NACK	2	1	ASCII 15h
3	ETX	3	1	ASCII 03h
		TOTAL	**3**	**bytes**

MESSAGE 5 DESCRIPTION (MSG5)

No.	Description	Start	Length	Note
1	STX	1	1	ASCII 02h
2	Program code	2	1	Letter from A to Z , 0 to 9 *(see **APPENDIX 1**)*
3	Sample number	3	4	Aligned right e.g. 0001
4	Patient ID code	7	15	Alphanum. charact., aligned left and spaces
5	Patient Name	22	30	Alphanum. charact., aligned left and spaces
6	Date of Birth	52	8	DDMMYYYY
7	Sex	60	1	M or F
8	Age in years	61	3	Aligned right e.g. 015
9	Department	64	20	Alphanum. charact., aligned left and spaces
10	Sample date	84	8	Format DDMMYYYY
11	Concentration (e.g. total protein)	92	5	Not fixed with a decimal separator “.” (2Eh)
12	Measurement unit of concentration	97	8	Alphanum. charact., aligned left and spaces
13	Free field 1	105	30	Alphanum. charact., aligned left and spaces
14	Free field 2	135	30	Alphanum. charact., aligned left and spaces
15	Free field 3	165	30	Alphanum. charact., aligned left and spaces
16	Free field 4	195	30	Alphanum. charact., aligned left and spaces
17	Free field 5	225	30	Alphanum. charact., aligned left and spaces
18	Operator ID	255	3	Alphanum. charact. e.g. JON
19	Date of Analysis	258	8	Format DDMMYYYY
20	Number of fractions (max. 10)	266	2	Aligned right e.g. 06
21	Fraction 1 name	268	10	Alphanum. charact., aligned left and spaces
22	Fraction 2 name	278	10	Alphanum. charact., aligned left and spaces
23	Fraction 3 name	288	10	Alphanum. charact., aligned left and spaces
24	Fraction 4 name	298	10	Alphanum. charact., aligned left and spaces
25	Fraction 5 name	308	10	Alphanum. charact., aligned left and spaces
26	Fraction 6 name	318	10	Alphanum. charact., aligned left and spaces
27	Fraction 7 name	328	10	Alphanum. charact., aligned left and spaces
28	Fraction 8 name	338	10	Alphanum. charact., aligned left and spaces
29	Fraction 9 name	348	10	Alphanum. charact., aligned left and spaces
30	Fraction 10 name	358	10	Alphanum. charact., aligned left and spaces
31	Fraction 1 % value	368	5	Not fixed with a decimal separator “.” (2Eh)
32	Fraction 2 % value	373	5	Not fixed with a decimal separator “.” (2Eh)
33	Fraction 3 % value	378	5	Not fixed with a decimal separator “.” (2Eh)
34	Fraction 4 % value	383	5	Not fixed with a decimal separator “.” (2Eh)
35	Fraction 5 % value	388	5	Not fixed with a decimal separator “.” (2Eh)
36	Fraction 6 % value	393	5	Not fixed with a decimal separator “.” (2Eh)
37	Fraction 7 % value	398	5	Not fixed with a decimal separator “.” (2Eh)
38	Fraction 8 % value	403	5	Not fixed with a decimal separator “.” (2Eh)
39	Fraction 9 % value	408	5	Not fixed with a decimal separator “.” (2Eh)
40	Fraction 10 % value	413	5	Not fixed with a decimal separator “.” (2Eh)
41	Fraction 1 conc. value	418	5	Not fixed with a decimal separator “.” (2Eh)
42	Fraction 2 conc. value	423	5	Not fixed with a decimal separator “.” (2Eh)
43	Fraction 3 conc. value	428	5	Not fixed with a decimal separator “.” (2Eh)
44	Fraction 4 conc. value	433	5	Not fixed with a decimal separator “.” (2Eh)
45	Fraction 5 conc. value	438	5	Not fixed with a decimal separator “.” (2Eh)
46	Fraction 6 conc. value	443	5	Not fixed with a decimal separator “.” (2Eh)
47	Fraction 7 conc. value	448	5	Not fixed with a decimal separator “.” (2Eh)
48	Fraction 8 conc. value	453	5	Not fixed with a decimal separator “.” (2Eh)

49	Fraction 9 conc. value	458	5	Not fixed with a decimal separator "." (2Eh)
50	Fraction 10 conc. value	463	5	Not fixed with a decimal separator "." (2Eh)
51	Peak 1 name	468	10	Alphanum. charact., aligned left and spaces
52	Peak 2 name	478	10	Alphanum. charact., aligned left and spaces
53	Peak 3 name	488	10	Alphanum. charact., aligned left and spaces
54	Peak 4 name	498	10	Alphanum. charact., aligned left and spaces
55	Peak 1 % value	508	5	Not fixed with a decimal separator "." (2Eh)
56	Peak 2 % value	513	5	Not fixed with a decimal separator "." (2Eh)
57	Peak 3 % value	518	5	Not fixed with a decimal separator "." (2Eh)
58	Peak 4 % value	523	5	Not fixed with a decimal separator "." (2Eh)
59	Peak 1 conc. value	528	5	Not fixed with a decimal separator "." (2Eh)
60	Peak 2 conc. value	533	5	Not fixed with a decimal separator "." (2Eh)
61	Peak 3 conc. value	538	5	Not fixed with a decimal separator "." (2Eh)
62	Peak 4 conc. value	543	5	Not fixed with a decimal separator "." (2Eh)
63	Pathological Flag	548	1	0 = Normal , 1 = Pathological
64	Ratio 1 (e.g. A/G for the proteins)	549	5	Not fixed with a decimal separator "." (2Eh)
65	Ratio 2	554	5	Not fixed with a decimal separator "." (2Eh)
66	Comment	559	230	Alphanum. charact., aligned left and spaces
67	Reference pattern flag	789	1	0 = Normal pattern , 1 = Reference pattern
68	QC sample flag	790	1	0 = Normal sample , 1 = QC sample
69 **82** **124**	Optional fields	--	--	Curve Programmable fields + the attached card comment Extended comment
69/82/124/125	ETX or EOT	791/XXX	1	ASCII 03h or 04h for the last sample

TOTAL Variable 791 bytes without optional fields
GLOBAL/POSITION: 790 + 1 = 791 bytes/Line

MESSAGE 6 DESCRIPTION (MSG6)

No.	Description	Start	Length	Note
1	STX	1	1	ASCII 02h
2	Program Code	2	1	Letter from A to Z , 0 to 9 *(see APPENDIX 1)*
3	Patient ID number	3	15	Alphanumeric. character., aligned left and spaces
4	ETX	18	1	ASCII 03h

TOTAL 18 bytes

Optional fields for the curve

69	Number of dots of the curve	791	4	Aligned right e.g. 0300
70	Curve scale flag	795	1	A = Automatic scale, M = Manual scale
71	Curve scale factor	796	4	Aligned right with zero (from 0100 to 1000)
72	Start Peak 1 Coord. (peak position)	800	4	Aligned right e.g. 0127
73	End Peak 1 Coord. (peak position)	804	4	Aligned right e.g. 0127
74	Start Peak 2 Coord. (peak position)	808	4	Aligned right e.g. 0127
75	End Peak 2 Coord. (peak position)	812	4	Aligned right e.g. 0127
76	Start Peak 3 Coord. (peak position)	816	4	Aligned right e.g. 0127
77	End Peak 3 Coord. (peak position)	820	4	Aligned right e.g. 0127
78	Start Peak 4 Coord. (peak position)	824	4	Aligned right e.g. 0127
79	End Peak 4 Coord. (peak position)	828	4	Aligned right e.g. 0127

80	Curve dots	832	Max4800	XYYY format, see after
81	Separator "|" (pipe)	2032	1	ASCII 7Ch

TOTAL Variable 1242 bytes for a curve made of 300 dots.
The length of the curve optional fields depends of the number of dots of the curve:

- Number of dots (No. 69)
  Max. 1200 dots.

- Curve scale flag (No. 70)

"**A**" = Automatic, the scale is determined by the max. (Y) Amplitude value of the curve (curve full scale).
"**M**" = Manual, the scale is multiplied by a percentage factor of the max. value.

- Curve scale factor (No. 71)
  A number from 100% to 1000% to redraw the curve with the new manual scale.

- Start/End Peak coord. (No. 72-79) peak position
  4 couples of coordinate values indicating the start and end positions of the 4 peaks (monoclonal peaks) on the curve.

- Curve dots (No. 80)
  A set of dots for the curve coded under the following format: **XYYY**

X representing the type of dot:
0 = ASCII (30h) Normal dot
8 = ASCII (38h) Dot corresponding to a minimum separator.
4 = ASCII (34h) Dot corresponding to a manually deleted minimum separator.
C = ASCII (43h) Dot corresponding to a manually inserted minimum separator.
1 = ASCII (31h) Dot corresponding to a deleted fraction.
5 = ASCII (35h) Dot corresponding to a deleted fraction and deleted minimum separator.
YYY (hexadecimal value) indicating the Y amplitude of the dot (right aligned, min. = 000, max. = FFF).

- Separator character (No. 81)
  "|" **pipe** char. (ASCII 7Ch) to indicate to the host the last dot of the curve.

- The curve consists today of 300 dots, so it means that it has a total length of 1200 characters, and the whole optional fields for the curve has a total length of 1242 bytes. In the future, the number of dots of the curve could be increased from 300 up to 1200 dots (4800 characters).

Additional field transmission: 40 programmable fields + the attached card comment

No.	Description	Start	Length	Note
82	** (2 Characters 2Ah)	791	2	Indicates the additional field transmission
83	Programmable field #1	793	15	Alphanum. charact.
84	Programmable field #2	808	15	Alphanum. charact.
85	Programmable field #3	823	15	Alphanum. charact.
86	Programmable field #4	838	15	Alphanum. charact.
87	Programmable field #5	853	15	Alphanum. charact.
88	Programmable field #6	868	15	Alphanum. charact.
89	Programmable field #7	883	15	Alphanum. charact.
90	Programmable field #8	898	15	Alphanum. charact.
--	---------	----	---	---
120	Programmable field #38	1348	15	Alphanum. charact.
121	Programmable field #39	1363	15	Alphanum. charact.
122	Programmable field #40	1378	15	Alphanum. charact.
123	Attached card comment	1393	256	Alphanum. charact.
		TOTAL	**858**	**bytes**

The content configuration of the 40 programmable fields can be done only by modification of the host.ini file (into the Host folder).

Host.ini file example to transmit the additional Capillarys data

[PROTOCOLLO]
MODO=RS232
TIPO=Phoresis Extended
LETTERA=S
RX_MODE=WORKLIST
REALTIME=0
RECALL_MODE=1

[PHORESIS]
CURVA=0
COMMENTO_ESTESO=0
OPTIONAL_FIELDS=0
CRC_CHECK=0
IMAGE_IF=0
AUTOSEQUENCE=0
NUMERIC_ID=0
FILE_CARD=0
FORCE_SEQUENCE=0

OPZ_FIELD1=DO_MAX
OPZ_FIELD2=NR_CAPILLARY
OPZ_FIELD3=RACK_NR
OPZ_FIELD4=ANALYSIS_TIME
OPZ_FIELD5=MIGRATION_TIME
OPZ_FIELD6=DELAY_TIME
...
...

The additional instructions to transmit the programmable fields (corresponding to Capillarys here) are in bold characters.

Optional field for the extended comment

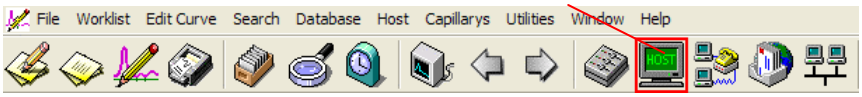
124	Extended comment	--	max3000	Alphanum. charact. With max 3000 charact.

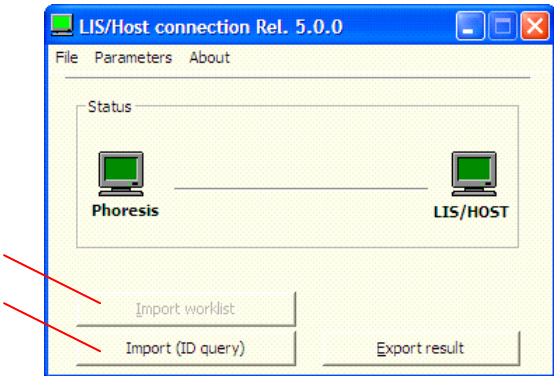
This optional field has a variable length from 0 to 3000 characters. All CR+LF (ASCII 0Dh+0Ah) entered in the extended comment will be converted in RS characters (ASCII 1Eh).

FILE-TRANSFER (NETWORK)

The connection via File Transfer happens through read/write of files in a folder shared in network between Phoresis and the Host.
Two files, of configurable path and name, one containing the Worklist data and the other one, the result data are in ASCII format with a structure of record, will be read therefore from a common text editor.

This file containing the patient demography of all the samples to scan is generated by the Host.
The record has a fixed length.
The operator has 2 options to download the worklist of the **selected analysis program** for the **current date**: Worklist (Total) mode or Query (Partial) mode

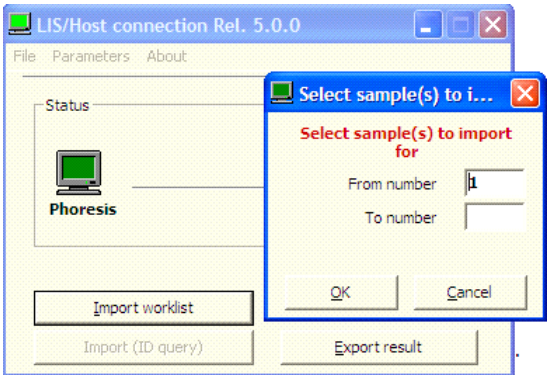




IMPORTING THE WORKLIST IN WORKLIST (TOTAL) MODE FROM THE HOST

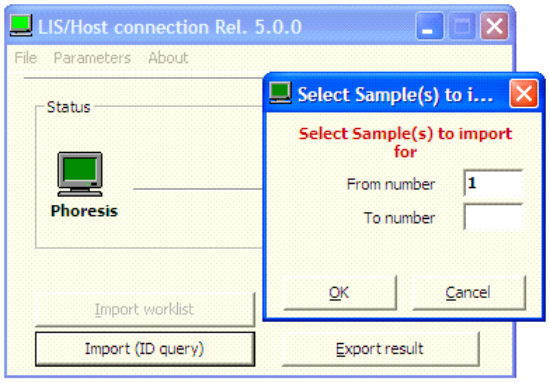
The Worklist or Total mode allows the operator to download the patient demography of all the patients or a group of patients to run on the system by indicating the start and end sample numbers (e.g. 1 to 50 or 51 to 51 when it is an emergency patient) and thus for the **selected analysis program** and **current date**.

The operator has to click on the *Host* icon, select *Import worklist,* enter the start and end sample numbers and confirm with *OK* as shown on the following screen before starting downloading the patient data.



IMPORTING THE WORKLIST BY QUERY (PARTIAL) MODE

The Query or Partial mode allows the operator to download the patient data after entry of the patient ID numbers first in the Worklist. The patient ID numbers can be entered either from the keyboard or a barcode reader from *Worklist by single sheet* or *Worklist by table* menu.
Once the patient ID numbers have been entered, the operator has to click on the *Host* icon, select *Import (ID query)*, enter the start and end sample numbers and confirm with *OK* as shown on the following screen before important the corresponding patient data.



Note:
To enter the patient ID numbers with a barcode reader, select *Worklist by single sheet* and uncheck all the fields except *ID number* from *Options* menu.
To verify all the worklist fields once the samples have been downloaded, select *Worklist by table* and *View all*.

RECORD DESCRIPTION

No.	Description	Start	Length	Note
1	Analysis program code	1	1	Letter from A to Z , 0 to 9 *(see APPENDIX 1)*
2	Sample number	2	4	Aligned right e.g. 0001
3	Patient ID number	6	15	Alphanum. charact. aligned left and spaces
4	Patient Name	21	30	Alphanum. charact. aligned left and spaces
5	Date of birth	51	8	DDMMYYYY
6	Sex	59	1	M or F
7	Age in years	60	3	Aligned right e.g.. 015
8	Department	63	20	Alphanum. charact. aligned left and spaces
9	Sample date	83	8	DDMMYYYY
10	Concentration (e.g. total protein)	91	5	Not fixed a decimal separator "." (2Eh)
11	Free 1	96	30	Alphanum. charact. aligned left and spaces
12	Free 2	126	30	Alphanum. charact. aligned left and spaces
13	Free 3	156	30	Alphanum. charact. aligned left and spaces
14	Free 4	186	30	Alphanum. charact. aligned left and spaces
15	Free 5	216	30	Alphanum. charact. aligned left and spaces
16	CR+LF	246	2	ASCII 0Dh + 0Ah
		TOTAL	**247**	**bytes**

Example of protein worklist with 4 samples (analysis program code: S)

S00019111111111 PATIENT 1 NAME 01011950M050DEPARTMENT 28012000078.5FREE FIELD 1
FREE FIELD 2 FREE FIELD 3 FREE FIELD 4 FREE FIELD 5
S00029222222222 PATIENT 2 NAME 01011960F040DEPARTMENT 28012000078.5FREE FIELD 1
FREE FIELD 2 FREE FIELD 3 FREE FIELD 4 FREE FIELD 5
S00039333333333 PATIENT 3 NAME 01011970F030DEPARTMENT 28012000078.5FREE FIELD 1
FREE FIELD 2 FREE FIELD 3 FREE FIELD 4 FREE FIELD 5

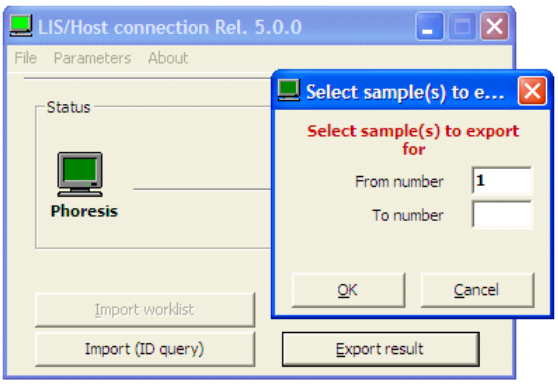
S00049444444444 PATIENT 4 NAME 01011980M020DEPARTMENT 28012000078.5FREE FIELD 1
FREE FIELD 2 FREE FIELD 3 FREE FIELD 4 FREE FIELD 5

EXPORTING THE RESULTS TO THE HOST (RESULT FILE FROM PHORESIS)

This file is generated by Phoresis after selection of the patients to export by the operator.
It contains all the numerical results and demographic patient data.
It consists of a sequential ASCII record with a fixed length when the optional fields are not selected or a variable length when they are selected.

The procedure allows the operator to upload the whole patient results of the **selected analysis program** for the **current date** to the Host once the samples have been run and edited.

The operator has to click on the *Host* icon, select *Export results*, enter the start and end sample numbers to upload and confirm with OK as shown on the following screen:



RECORD DESCRIPTION

No.	Description	Start	Length	Note
1	Program code	1	1	Letter from A to Z , 0 to 9 *(see APPENDIX 1)*
2	Sample number	2	4	Aligned right e.g. 0001
3	Patient ID number	6	15	Alphanum. charact. aligned left and spaces
4	Patient Name	21	30	Alphanum. charact. aligned left and spaces
5	Date of Birth	51	8	Format DDMMYYYY
6	Sex	59	1	M or F
7	Age in years	60	3	Aligned right e.g. 015
8	Department	63	20	Alphanum. charact. aligned left and spaces
9	Sample date	83	8	Format DDMMYYYY
10	Concentration (e.g. total protein)	91	5	Not fixed decimal separator "." (2Eh)
11	Measurement unit of concentration	96	8	Alphanum. charact. aligned left and spaces
12	Free field 1	104	30	Alphanum. charact. aligned left and spaces
13	Free field 2	134	30	Alphanum. charact. aligned left and spaces
14	Free field 3	164	30	Alphanum. charact. aligned left and spaces
15	Free field 4	194	30	Alphanum. charact. aligned left and spaces
16	Free field 5	224	30	Alphanum. charact. aligned left and spaces
17	Operator ID	254	3	Alphanum. character e.g. JON
18	Date of Analysis	257	8	DDMMYYYY
19	Number of fractions (max.10)	265	2	Aligned right with e.g. 06
10	Fraction 1 name	267	10	Alphanum. charact. aligned left and spaces
21	Fraction 2 name	277	10	Alphanum. charact. aligned left and spaces
22	Fraction 3 name	287	10	Alphanum. charact. aligned left and spaces
23	Fraction 4 name	297	10	Alphanum. charact. aligned left and spaces
24	Fraction 5 name	307	10	Alphanum. charact. aligned left and spaces
25	Fraction 6 name	317	10	Alphanum. charact. aligned left and spaces
26	Fraction 7 name	327	10	Alphanum. charact. aligned left and spaces
27	Fraction 8 name	337	10	Alphanum. charact. aligned left and spaces
28	Fraction 9 name	347	10	Alphanum. charact. aligned left and spaces
29	Fraction 10 name	357	10	Alphanum. charact. aligned left and spaces
30	Fraction 1 % value	367	5	Not fixed with a decimal separator "." (2Eh)
31	Fraction 2 % value	372	5	Not fixed with a decimal separator "." (2Eh)
32	Fraction 3 % value	377	5	Not fixed with a decimal separator "." (2Eh)
33	Fraction 4 % value	382	5	Not fixed with a decimal separator "." (2Eh)

34	Fraction 5 % value	387	5	Not fixed with a decimal separator "." (2Eh)
35	Fraction 6 % value	392	5	Not fixed with a decimal separator "." (2Eh)
36	Fraction 7 % value	397	5	Not fixed with a decimal separator "." (2Eh)
37	Fraction 8 % value	402	5	Not fixed with a decimal separator "." (2Eh)
38	Fraction 9 % value	407	5	Not fixed with a decimal separator "." (2Eh)
39	Fraction 10 % value	412	5	Not fixed with a decimal separator "." (2Eh)
40	Fraction 1 conc. value	417	5	Not fixed with a decimal separator "." (2Eh)
41	Fraction 2 conc. value	422	5	Not fixed with a decimal separator "." (2Eh)
42	Fraction 3 conc. value	427	5	Not fixed with a decimal separator "." (2Eh)
43	Fraction 4 conc. value	432	5	Not fixed with a decimal separator "." (2Eh)
44	Fraction 5 conc. value	437	5	Not fixed with a decimal separator "." (2Eh)
45	Fraction 6 conc. value	442	5	Not fixed with a decimal separator "." (2Eh)
46	Fraction 7 conc. value	447	5	Not fixed with a decimal separator "." (2Eh)
47	Fraction 8 conc. value	452	5	Not fixed with a decimal separator "." (2Eh)
48	Fraction 9 conc. value	457	5	Not fixed with a decimal separator "." (2Eh)
49	Fraction 10 con. value	462	5	Not fixed with a decimal separator "." (2Eh)
50	Area 1 name	467	10	Alphanum. charact. aligned left and spaces
51	Area 2 name	477	10	Alphanum. charact. aligned left and spaces
52	Area 3 name	487	10	Alphanum. charact. aligned left and spaces
53	Area 4 name	497	10	Alphanum. charact. aligned left and spaces
54	Area 1 value %	507	5	Not fixed with a decimal separator "." (2Eh)
55	Area 2 value %	512	5	Not fixed with a decimal separator "." (2Eh)
56	Area 3 value %	517	5	Not fixed with a decimal separator "." (2Eh)
57	Area 4 value %	522	5	Not fixed with a decimal separator "." (2Eh)
58	Area 1 conc. value	527	5	Not fixed with a decimal separator "." (2Eh)
59	Area 2 conc. value	532	5	Not fixed with a decimal separator "." (2Eh)
60	Area 3 conc. value	537	5	Not fixed with a decimal separator "." (2Eh)
61	Area 4 conc. value	542	5	Not fixed with a decimal separator "." (2Eh)
62	Pathological Flag	547	1	0 = Normal , 1 = Pathological
63	Ratio 1(e.g. A/G for the proteins)	548	5	Not fixed with a decimal separator "." (2Eh)
64	Ratio 2	553	5	Not fixed with a decimal separator "." (2Eh)
65	Comment	558	230	Alphanum. charact. aligned left and spaces
66	Reference pattern flag	788	1	0 = Normal pattern , 1 = reference pattern
67	QC sample flag	789	1	0 = Normal sample , 1 = QC sample
68 **81** **123**	**Optional fields**	---	---	Curve Programmable fields + the attached card comment Extended comment
68/81/123/124	CR + LF	790/XXX	2	ASCII 0Dh or 0Ah

TOTAL Variable 791 bytes without optional fields
GLOBAL/POSITION: 789+2 = 791 bytes/Line

Optional fields for the curve

68	Number of dots of the curve	790	4	Aligned right e.g. 0300
69	Curve scale flag	794	1	A = Automatic scale, M = Manual scale
70	Curve scale factor	795	4	Aligned right with zero (from 0100 to 1000)
71	Start peak 1 Coord. (peak position)	799	4	Aligned right e.g. 0127
72	End peak 1 Coord. (peak position)	803	4	Aligned right e.g. 0127
73	Start peak 2 Coord. (peak position)	807	4	Aligned right e.g. 0127
74	End peak 2 Coord. (peak position)	811	4	Aligned right e.g. 0127
75	Start peak 3 Coord. (peak position)	815	4	Aligned right e.g. 0127
76	End peak 3 Coord. (peak position).	819	4	Aligned right e.g. 0127
77	Start peak 4 Coord. (peak position)	823	4	Aligned right e.g. 0127
78	End peak 4 Coord. (peak position)	827	4	Aligned right e.g. 0127
79	Curve dots	831	max4800	See hereafter
80	Separator "|" (pipe)	2031	1	ASCII 7Ch

TOTAL Variable 1242 bytes for a curve made of 300 dots.
The length of the curve optional fields depends of the number of dots of the curve:

- Number of dots (No. 68)
  Max. 1200 dots.

- Curve scale Flag (No. 69)

"**A**" = Automatic, the scale is determined by the max. (Y) Amplitude value of the curve (curve full scale).
"**M**" = Manual, the scale is multiplied by a percentage factor of the max. value.

- Curve scale factor (No. 70)
  A number from 100% to 1000% to recalculate and redraw the curve with the new manual scale.

- Start/End Peak coord. (No. 71-78) peak position
  4 couples of coordinate values indicating the start and end positions of the 4 peaks (monoclonal peaks) on the curve.

- Curve dots (No. 79)

  A set of dots for the curve coded under the following format: **XYYY**.
  X representing the type of dot:

0 = ASCII (30h) Normal dot
8 = ASCII (38h) Dot corresponding to a minimum separator.
4 = ASCII (34h) Dot corresponding to a manually deleted minimum separator.
C = ASCII (43h) Dot corresponding to a manually inserted minimum separator.
1 = ASCII (31h) Dot corresponding to a deleted fraction.
5 = ASCII (35h) Dot corresponding to a deleted fraction and deleted minimum separator.

  YYY (hexadecimal value) indicating the Y amplitude of the dot (right aligned, min. =000, max. =FFF).

- Separator character (No. 80)
  "|" pipe char. (ASCII 7Ch) to indicate to the host the last dot of the curve.

- The curve consists today of 300 dots, so it means that it has a total length of 1200 characters, and the whole optional fields for the curve has a total length of 1242 bytes. In the future, the number of dots of the curve could be increased from 300 up to 1200 dots (4800 characters).

Additional field transmission: 40 programmable fields + the attached card comment

No.	Description	Start	Length	Note
81	** (2 Characters 2Ah)	790	2	Indicates the additional field transmission
82	Programmable field #1	792	15	Alphanum. charact.
83	Programmable field #2	807	15	Alphanum. charact.
84	Programmable field #3	822	15	Alphanum. charact.
85	Programmable field #4	837	15	Alphanum. charact.
86	Programmable field #5	852	15	Alphanum. charact.
87	Programmable field #6	867	15	Alphanum. charact.
88	Programmable field #7	882	15	Alphanum. charact.
99	Programmable field #8	897	15	Alphanum. charact.
--	---------	----	---	---
119	Programmable field #38	1347	15	Alphanum. charact.
120	Programmable field #39	1362	15	Alphanum. charact.
121	Programmable field #40	1377	15	Alphanum. charact.
122	Attached card comment	1392	256	Alphanum. charact.
		TOTAL	**858**	**bytes**

The content configuration of the 40 programmable fields can be done only by modification of the host.ini file (into the Host folder).

Host.ini file example to transmit the additional Capillarys data

```
[PROTOCOLLO]
MODO=RS232
```

TIPO=Phoresis Extended
LETTERA=S
RX_MODE=WORKLIST
REALTIME=0
RECALL_MODE=1

[PHORESIS]
CURVA=0
COMMENTO_ESTESO=0
OPTIONAL_FIELDS=0
CRC_CHECK=0
IMAGE_IF=0
AUTOSEQUENCE=0
NUMERIC_ID=0
FILE_CARD=0
FORCE_SEQUENCE=0

OPZ_FIELD1=DO_MAX
OPZ_FIELD2=NR_CAPILLARY
OPZ_FIELD3=RACK_NR
OPZ_FIELD4=ANALYSIS_TIME
OPZ_FIELD5=MIGRATION_TIME
OPZ_FIELD6=DELAY_TIME

The additional instructions to transmit the programmable fields (Corresponding to Capillarys here) are in bold characters.

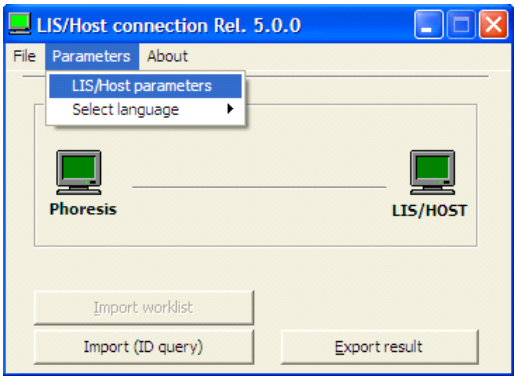
Optional field for the extended comment

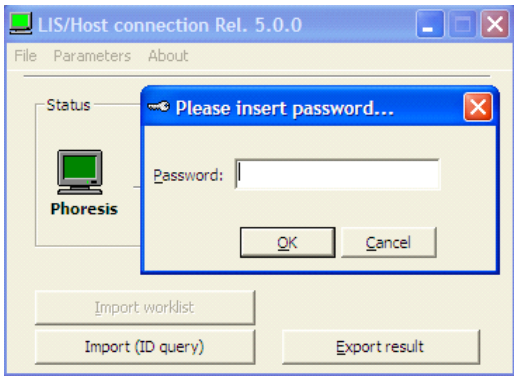
123	Extended comment	--	max3000	Alphanum. charact. With max 3000 charact.

This field has a variable length from 0 to 3000 characters. All CR+LF (ASCII 0Dh+0Ah) entered in the extended comment will be converted in RS character (ASCII 1Eh)

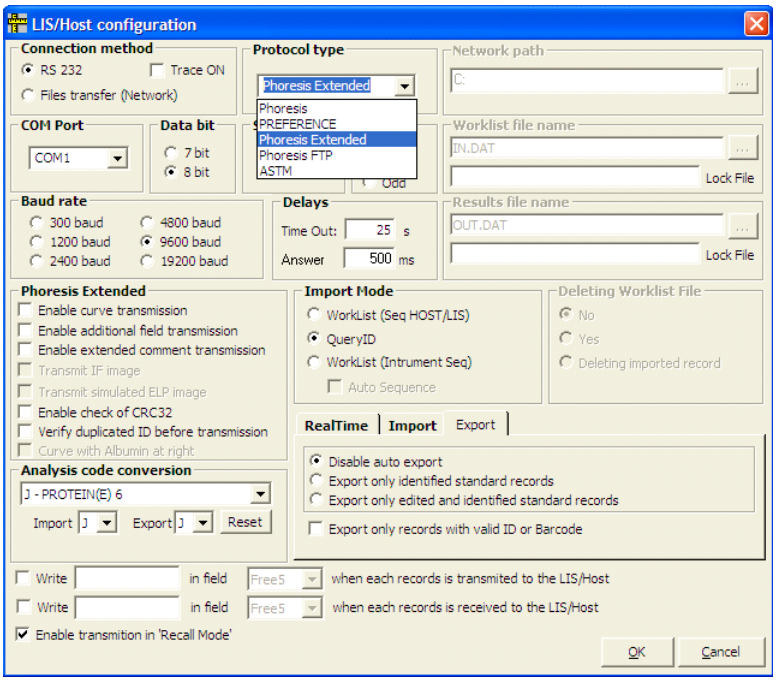
SETTING THE PARAMETERS

From the main menu, click on *Host* icon, select successively *Parameters* and *Host parameters*,





Enter the password **4644** or **free** then the system displays the following screen:



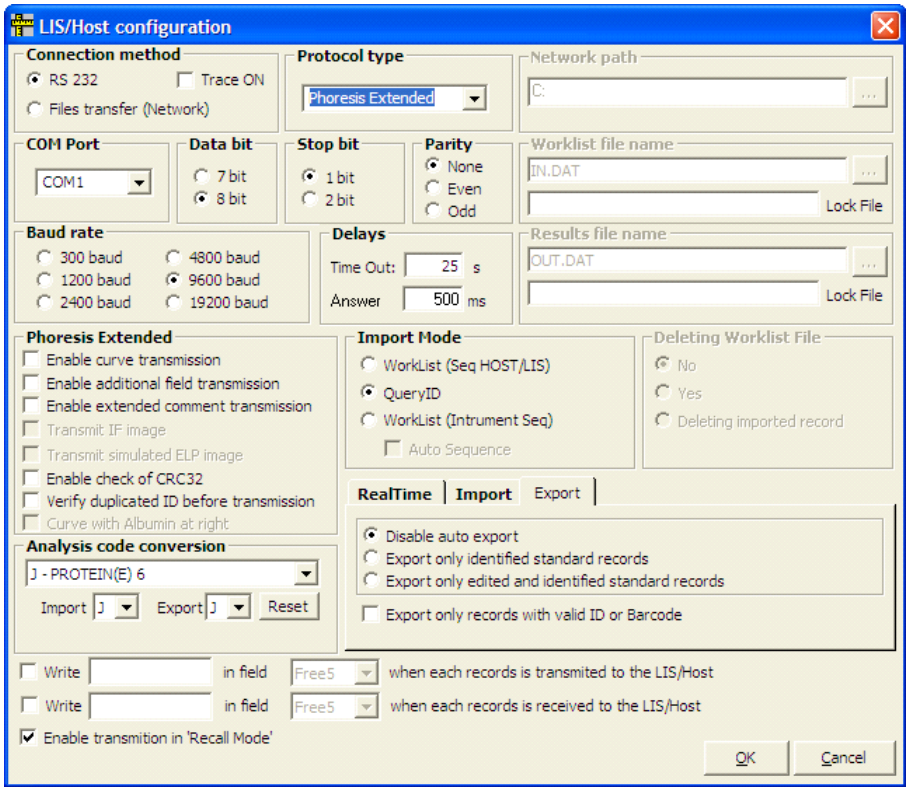
- **Check *File-transfer (Network)***, select the network path, enter the Worklist and result file names, confirm with *OK*, and then restart Phoresis for the changes to be effective.

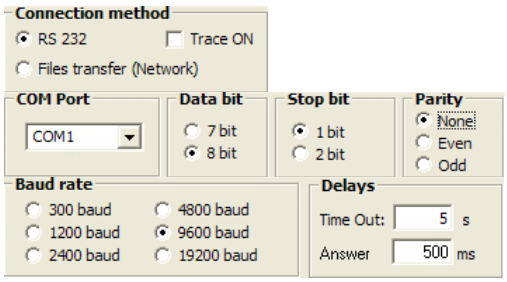
Or

- **Check *RS232***, select the COM port, set the baud rate, data bit, parity, stop bit and delays, confirm with *OK* then restart Phoresis for the changes to be effective.

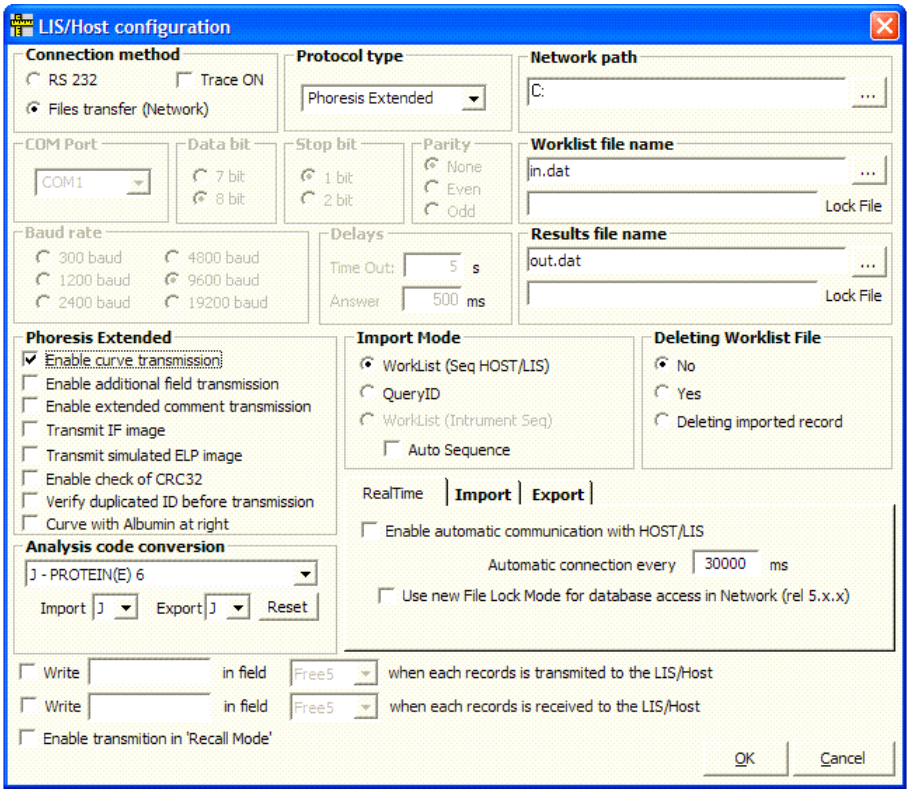
Note:
When clicking in the *Protocol type* window, the system proposes 4 more possibilities: *Preference, Phoresis*, Phoresis FTP and ASTM.
The Preference and the Phoresis protocols are not described in this manual because they do not give the possibility to use all the capabilities of Phoresis such as the capability to use the date of birth, the laboratory code, the sample collection date, the 5 additional free fields and the operator ID for the Worklist and the capability to transmit the monoclonal peaks and the extended comment to the host.
The Phoresis FTP and ASTM protocols are not described.

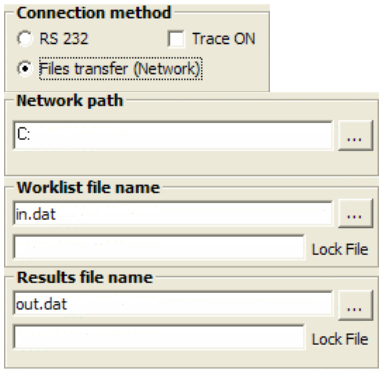
Phoresis Extended protocol type using the RS232 method.

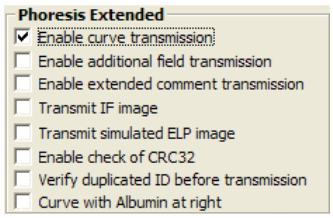




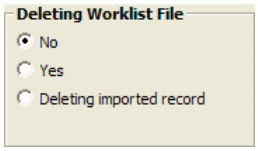
Phoresis Extended Protocol type using the Files transfer method (Network)

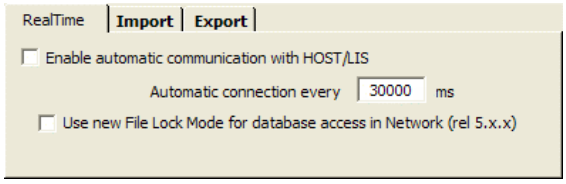


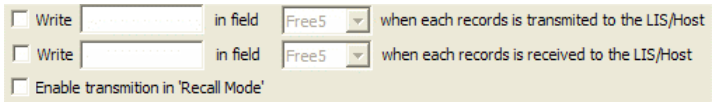




SETTING THE OPTION







APPENDIX 1

Analysis program codes

Code	Analysis program name
A	-----
B	-----
C	B1B2
D	B1B2 +
E	PROTEIN(E) 5
F	IMMUNOTYPING 6
G	-----
H	HYDRAGEL LDL/HDL CHOL Direct
I	HYDRAGEL ISO-LDH
J	PROTEIN(E) 6
K	HR
L	HYDRAGEL LIPO + Lp(a)
M	HYDRAGEL ISO-PAL
N	CDT
O	HYDRAGEL CSF
P	HYDRAGEL PROTEINURIE
Q	HYDRAGEL ISO-CK
R	HYDRAGEL HR1
S	HYDRAGEL PROTEIN(E)
T	HYDRAGEL HEMOGLOBIN(E)
U	HYDRAGEL HR2
V	HEMOGLOBIN(E)
W	HYDRAGEL URINE PROFIL(E)
X	Test Pattern
Y	PROTEIN(E) TOTAL
Z	HYDRAGEL IF/BENCE JONCES
0	URINE
1	HYDRAGEL CSF ISOFOCUSING
2	NEONATAL Hb
3	IMMONUTYPING URINE
4	HYDRAGEL LIPOPROTEIN(E)
5	-----
6	-----
7	-----
8	-----
9	-----

APPENDIX 2

Connector pin assignment

The output is compatible V 24 and RS 232C from one asymmetric 9 pin male connector (db9 connector or COM port) located at the back of the PC.

Pin No.	Signal	Direction	Description
1	DCD	in	Data Carrier Detect
2	RXD	in	Received Data
3	TXD	out	Transmitted Data
4	DTR	out	Data Terminal Ready
5	GND	-	Ground
6	DSR	in	Data Set Ready
7	RTS	out	Request To Send
8	CTS	in	Clear To Send
9	RI		Ring Indicator

Note:

In normal condition, only pins RX, TX and GND are connected.

APPENDIX 3

CRC CALCULATION (in C language)

The CRC is calculated from the following table_CRC_16 which is a table of 256 uint (unsigned integer)

Input data: Number of bytes to calculate
Buffer of date where the calculation is made
Output: CRC obtained for the complete buffer
The STX and ETX are not used for the calculation of the CRC
The CRC is a uint (unsigned integer) transmitted with 5 characters (completed with 0 when necessary)
The CRC is calculated on 16 bits

```
uint CalculateCRC16(uint NbBytes,char* Buffer) {
uint Loop,CRC;
uint Table_CRC_16[ 256 ] =

{
0x0000, 0xC1C0, 0x81C1, 0x4001, 0x01C3, 0xC003, 0x8002, 0x41C2,
0x01C6, 0xC006, 0x8007, 0x41C7, 0x0005, 0xC1C5, 0x81C4, 0x4004,
0x01CC, 0xC00C, 0x800D, 0x41CD, 0x000F, 0xC1CF, 0x81CE, 0x400E,
0x000A, 0xC1CA, 0x81CB, 0x400B, 0x01C9, 0xC009, 0x8008, 0x41C8,
0x01D8, 0xC018, 0x8019, 0x41D9, 0x001B, 0xC1DB, 0x81DA, 0x401A,
0x001E, 0xC1DE, 0x81DF, 0x401F, 0x01DD, 0xC01D, 0x801C, 0x41DC,
0x0014, 0xC1D4, 0x81D5, 0x4015, 0x01D7, 0xC017, 0x8016, 0x41D6,
0x01D2, 0xC012, 0x8013, 0x41D3, 0x0011, 0xC1D1, 0x81D0, 0x4010,
0x01F0, 0xC030, 0x8031, 0x41F1, 0x0033, 0xC1F3, 0x81F2, 0x4032,
0x0036, 0xC1F6, 0x81F7, 0x4037, 0x01F5, 0xC035, 0x8034, 0x41F4,
0x003C, 0xC1FC, 0x81FD, 0x403D, 0x01FF, 0xC03F, 0x803E, 0x41FE,
0x01FA, 0xC03A, 0x803B, 0x41FB, 0x0039, 0xC1F9, 0x81F8, 0x4038,
0x0028, 0xC1E8, 0x81E9, 0x4029, 0x01EB, 0xC02B, 0x802A, 0x41EA,
0x01EE, 0xC02E, 0x802F, 0x41EF, 0x002D, 0xC1ED, 0x81EC, 0x402C,
0x01E4, 0xC024, 0x8025, 0x41E5, 0x0027, 0xC1E7, 0x81E6, 0x4026,
0x0022, 0xC1E2, 0x81E3, 0x4023, 0x01E1, 0xC021, 0x8020, 0x41E0,
0x01A0, 0xC060, 0x8061, 0x41A1, 0x0063, 0xC1A3, 0x81A2, 0x4062,
0x0066, 0xC1A6, 0x81A7, 0x4067, 0x01A5, 0xC065, 0x8064, 0x41A4,
0x006C, 0xC1AC, 0x81AD, 0x406D, 0x01AF, 0xC06F, 0x806E, 0x41AE,
0x01AA, 0xC06A, 0x806B, 0x41AB, 0x0069, 0xC1A9, 0x81A8, 0x4068,
0x0078, 0xC1B8, 0x81B9, 0x4079, 0x01BB, 0xC07B, 0x807A, 0x41BA,
0x01BE, 0xC07E, 0x807F, 0x41BF, 0x007D, 0xC1BD, 0x81BC, 0x407C,
0x01B4, 0xC074, 0x8075, 0x41B5, 0x0077, 0xC1B7, 0x81B6, 0x4076,
0x0072, 0xC1B2, 0x81B3, 0x4073, 0x01B1, 0xC071, 0x8070, 0x41B0,
0x0050, 0xC190, 0x8191, 0x4051, 0x0193, 0xC053, 0x8052, 0x4192,
0x0196, 0xC056, 0x8057, 0x4197, 0x0055, 0xC195, 0x8194, 0x4054,
0x019C, 0xC05C, 0x805D, 0x419D, 0x005F, 0xC19F, 0x819E, 0x405E,
0x005A, 0xC19A, 0x819B, 0x405B, 0x0199, 0xC059, 0x8058, 0x4198,
0x0188, 0xC048, 0x8049, 0x4189, 0x004B, 0xC18B, 0x818A, 0x404A,
0x004E, 0xC18E, 0x818F, 0x404F, 0x018D, 0xC04D, 0x804C, 0x418C,
0x0044, 0xC184, 0x8185, 0x4045, 0x0187, 0xC047, 0x8046, 0x4186,
0x0182, 0xC042, 0x8043, 0x4183, 0x0041, 0xC181, 0x8180, 0x4040,
};

CRC=0;
for (Loop=0;Loop<NbBytes;Loop++)
CRC=( ( CRC << 8 ) ^ Table_CRC_16[ (CRC >> 8 ) ^ Buffer[Loop] ] ); return(CRC);
}
```