ASTM QC Receiver Interface (v 3.0.0)

The ASTM protocol is a transmission protocol used by many clinical chemistry analysers (Siemens, Stago, Ortho-clinical, Abbott, Beckman …) to exchange data with laboratory information systems.

The receiver interface QCASTM1 is intended to work with such analysers :

- It receives analytical data from one analyser through a serial port.
- It extracts quality control and repeatability data
- It re-sends these data to MultiQC, a QC management software which can be downloaded at www.multiqc.com.

The computer which runs MultiQC can be simultaneously connected to several analysers to process QC data from different sources with the same software application.

QCASTM2 and QCASTM3 are to be used when the same QC computer must receive QC data simultaneously from several ASTM analysers (see section 1.1).

QCASTM1, 2 and 3, version 3.0.0, are compatible with Windows 2000 to Windows 7.

1. Installation

1.1. Installation of interfaces

Download the installation package of MultiQC at www.multiqc.com and install the program. The version of MultiQC must be 6.1.0.0 or later (the number of version is visible in the "About" box : main menu < ? → About>).

Download the QCASTM1 receiver interface at www.multiqc.com/QCConnexion.htm and install the program. To comply with the User Access Control of Windows 7, the program files are installed in the folder :

C:\Program files\MultiQC6\ASTM1

and the data files are installed in a different folder that depends on the version of Windows :

Win XP = *C:\Documents and Settings\All Users\Application Data\MultiQC6\ASTM1*

Vista or Win 7 = *C:\ProgramData\MultiQC6\ASTM1*

> By default, Windows hides the folders C:\Documents and Settings\All Users\Application Data\ and C:\ProgramData. To display these folders in the Windows Explorer you must check the box <*Tool* menu -> *Folder options* -> *View* tab -> *Show hidden files and folders*>.

If you want to connect another ASTM analysers to the same QC computer you must download a second interface named QCASTM2 at www.multiqc.com and proceed likewise. The interfaces ASTM1 and ASTM2 are identical except the GUIDs (global unique identifiers) thanks to which MultiQC can recognize each one.

1.2. Connecting analyser and computer

The three ways to connect an analyser to a QC computer are explained in the document www.multiqc.com/CnxArchitecture.pdf :

- Soft connexion
- Full RS232 serial connexion

- Spy RS232 serial connexion

➢ Soft connexion

You might prefer this "soft" solution if you feel more comfortable installing a port sharing software than handling a screwdriver. The workstation which is already connected to the analyser to process patients results also runs MultiQC and the QC receiver interfaces. This kind of architecture is only feasible if the main software of the workstation respects the normal multitasking philosophy of Windows. The operator must have a direct access to the taskbar of Windows to be able to instantaneously switch between patients and QC softwares.

➢ Full RS232 serial connexion

It is feasible only if a free serial socket is available on the analyser. The connexion to the QC computer is made by a straight or a cross cable according to the type of RS-232 socket of the analyser (DTE or DCE). You must check the box ACK/NACK of the tab Communication of the QC receiver interface because the analyser needs an acknowledgement after each message it sends.

➢ Spy RS232 serial connexion

Most frequently the unique output socket of the analyser is taken by a connection to the LIS. A "spy" connection is then necessary. Two additional derivation wires must be soldered on the female connector of the LIS cable which is plugged into the output male connector of the analyser. Thus messages output by the analyser are received both by the LIS and by the QC computer. In this case, the LIS is in charge to acknowledge received data (refer to the appendix for the cabling plans of the spy connexion).

2. Running the interface

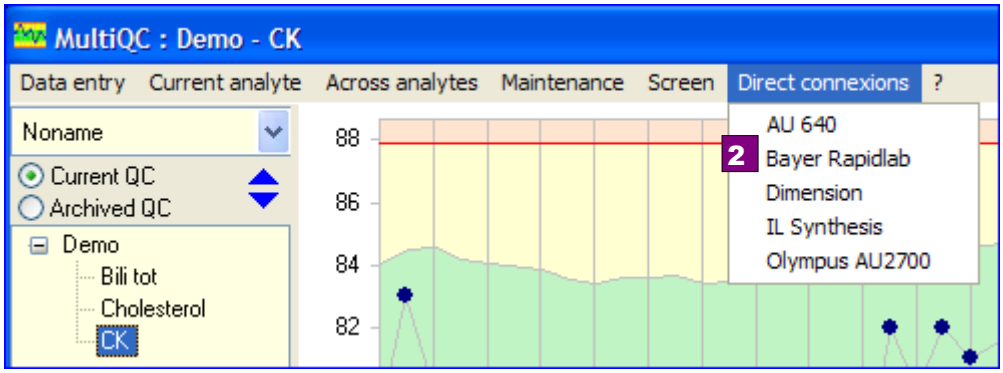
2.1. Starting and stopping QCASTM1

In routine use, QC receiver interfaces are not directly launched or closed. They are under control of MultiQC. Each interface is automatically launched or closed when MultiQC is launched or closed. Any action that would close a normal program (clicking the Windows close box or pressing the keys Alt+F4) only iconizes the QC receiver interface.

After launching MultiQC, you can check that the installed receiver interfaces are running:

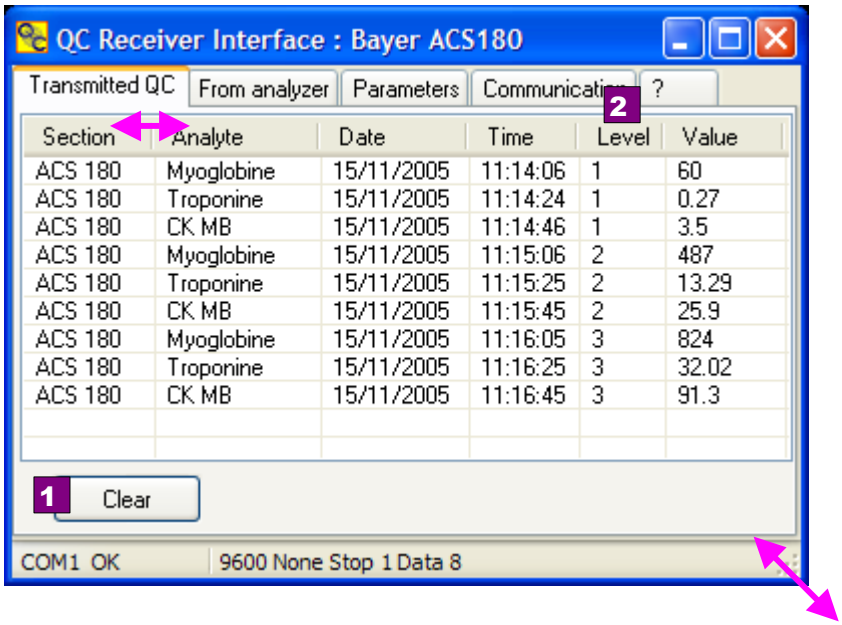
1- They are present in the Windows taskbar as icons

2- New sub-menus are added to the main menu of MultiQC Direct connexions.



In routine work, the QC receiver interface stays iconized in the Windows taskbar. It needs to be restored only on installation for entering communication and analytical parameters or for fixing communication issues.

2.2. Transmitted QC



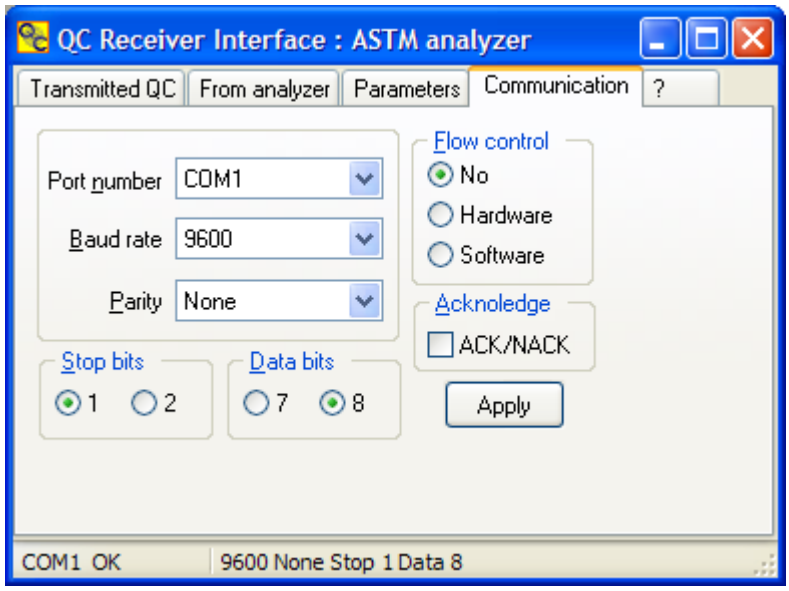
This panel shows the latest 200 decoded analytical results sent to MultiQC.

↔ The width of columns and the size of the window can be adjusted.

1- The button Clear erases all the lines in the list view.

2- The column Level displays either a number (for a QC result) or Rpt for repeatability.

2.3. Setting up the communication parameters



Enter the communication parameters of the serial port connected to the analyser.

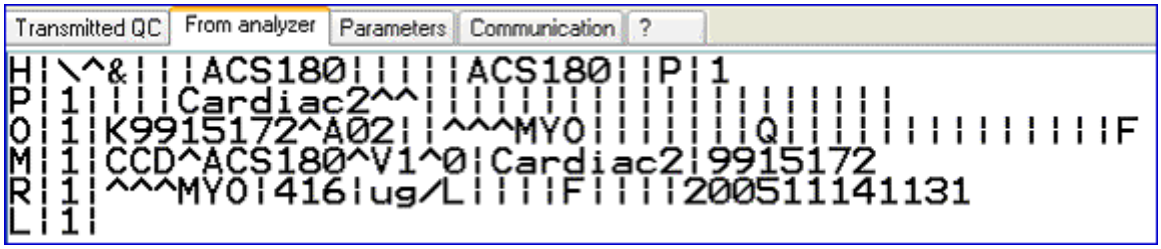
Check the box ACK/NACK if you have installed a full RS232 serial connexion.

Do not forget to click the button Apply after updating parameters.

Look at the status bar to check if the serial connection is OK.

2.4. Understanding the ASTM protocol

First, perform a few QC assays with your analyser to receive ASTM records in the QC receiver interface. The picture below shows an example coming from a Bayer ACS180 :



Each line is a “record”. The letter at the beginning of each record shows the type of the record :

- H = Header record
- P = Patient record
- O = Order record
- M = Extended result record
- R = Result record
- C = Comments record
- L = Trailer record

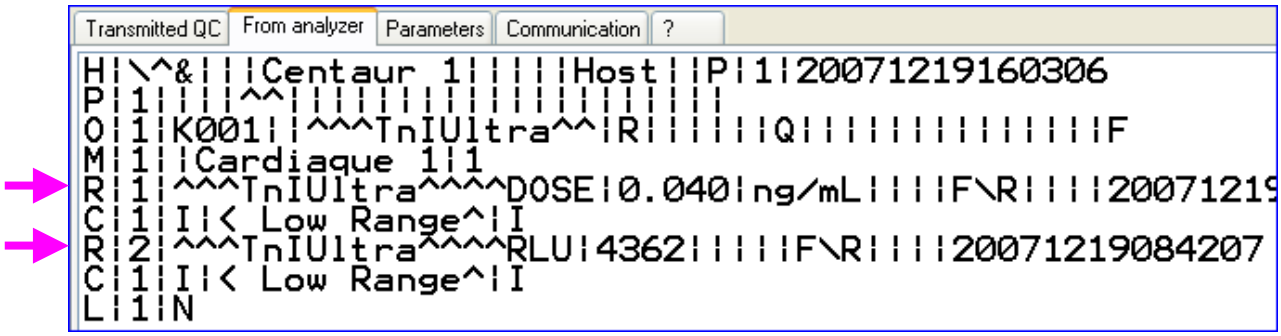
Each record is divided by two different separators :

- | = Field separators
- ^ = Optional component separators which divide the fields into sub-fields named components.

The receiver interface extracts 4 items of information from each transmitted message. Each item is defined by its record, its field number and its component number.

- The identifier of the assayed QC material *Cardiac2* is primarily searched for in the **P** record, field 6, component 1 (= position **P.6.1**) :
  P|1|||||Cardiac2^^|||||||||||||||||||||
- If a matching identifier is not found from the **P** record, the interface searches for another matching identifier *K9915172* in the **O** record, field 3, component 1 (= position **O.3.1**) :
  O|1|K9915172^A02||^^^MYO||||||Q||||||||||||||F
- The name of the test *MYO* is searched for in the **R** record, field 3 (= position **R.3**). All of the components of the field are scanned :
  R|1|^^^MYO|416|ug/L||||F||||200511141131
- The result of the test *416* is searched for in the **R** record, field 4, component 1 (= position **R.4.1**):
  R|1|^^^MYO|416|ug/L||||F||||200511141131
- The date of the test *200511141131* (Year-Month-Day-Hour-Minute) is searched for in the **R** record, field 13, component 1 (= position **R.13.1**) :
  R|1|^^^MYO|416|ug/L||||F||||200511141131

Some analysers output several R records for each assay. The example below shows the case of a Siemens Centaur which simultaneously outputs concentrations and luminescence units.



There are two **R** records

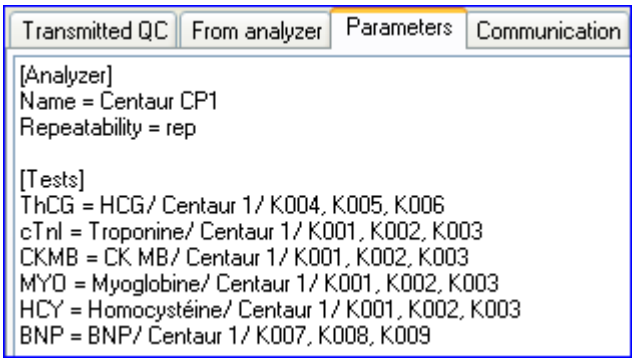
R|1|^^^TniUltra^^^^DOSE|0.040|ng/ml|||F\R.....

R|1|^^^TniUltra^^^^RLU|4362|||||F\R.....

To cope with these double and sometimes triple **R** records, the receiver interface must be set up with two identifiers per analyte, a main one *TniUltra* and a sub-identifier *DOSE*. The program scans all of the components of the **R.3** fields searching for both identifiers.

2.5. Setting the parameters of the QC receiver interface

Select the tab Parameters to edit the "ini" file that saves the working parameters of the interface. This file is made of two sections (between brackets).



➢ Analyser]

- Name = name which is shown in the Windows taskbar and in the additional sub-menu that is created in MultiQC.
- Repeatability = Reserved identifier for automatic transmission of repeatability data (default "rep"). Any series of samples with identifiers beginning by "rep" (not case sensitive) will be recognized by MultiQC (version > 5.2.0.0) as a verification of repeatability. For instance you can identify successive samples by REP REP REP…. , or Rep1 Rep2 Rep3 …

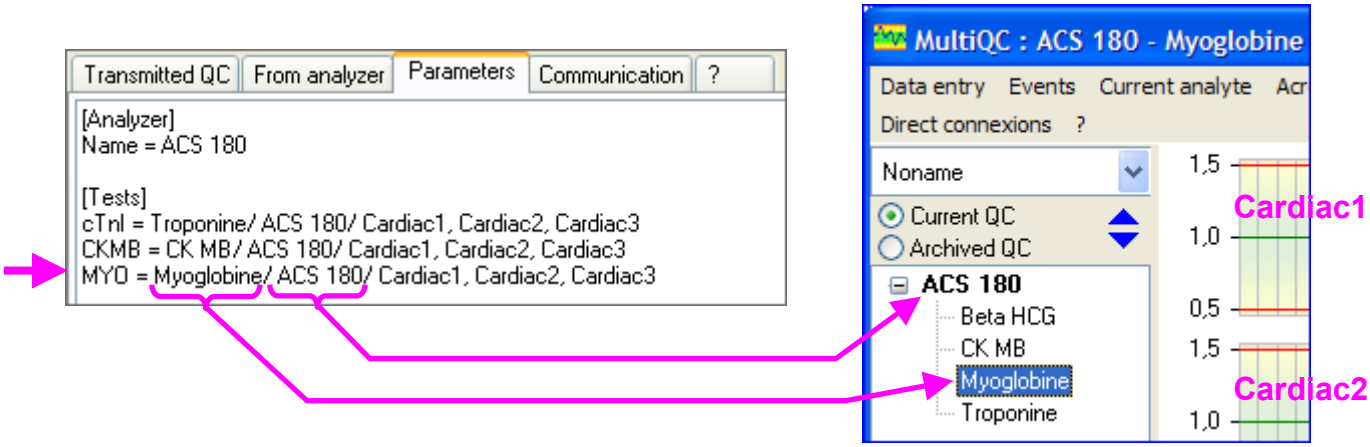
➢ [Tests]

Each line is made of items of information relevant to one test. The general syntax is :

A / B = C / D / List

- **A** : main identifier of the test in the ASTM record at position **R.3**. It is case sensitive. The best way to avoid errors is to copy it from the tab From analyser and paste it to the tab Parameters.
- **B** (optional) : sub-identifier to be used when several R records are output in the same ASTM message.
- **C :** name of the test in MultiQC.
- **D** : name of the section of the tree view of MultiQC where the test is placed.
- **List :** list of the identifiers of the control materials which are read at position **O.3.1** or **P.6.1** according to the brand of the ASTM analyser. Items of the list are comma separated. The first one will become level 1 in MultiQC and so on. The identifiers are not case sensitive. There may be up to 6 items in the list because MultiQC can manage up to six simultaneous control charts.

➢ Example 1



The above *ACS180* analyser has one **R** record per ASTM message. A single identifier is enough to recognize each QC assay :

MYO = Myoglobine/ ACS 180/ Cardiac1, Cardiac2, Cardiac3

A / B **= C / D / List**

A = Myo

B : n/a

C = Myoglobine

D = ACS180

List = Cardiac1, cardiac2, Cardiac3

The test identified by *Myo* in the **R** record will be named *Myoglobine* in MultiQC and placed in the tree view of analytes under *ACS 180.*

If a field **O.3.1** or **P.6.1** contains one reserved identifier of the list *Cardiac1*, *Cardiac2* or *Cardiac3*, then the following **R.4** result is plotted in the top, mid or bottom chart of MultiQC.

Results associated with different identifiers are ignored.

➢ Example 2

The above *Centaur* analyser has two **R** records per ASTM message. So two identifiers are required to retrieve the concentrations of troponine :

TniUltra / DOSE = Troponine / Centaur 1 / K001, K002, K003

A / B = C / D / List

A = TniUltra

B = DOSE

C = Troponine

D = Centaur 1

List = K001, K002, K003

The test identified by *TniUltra + DOSE* in the **R** record will be named *Troponine* in MultiQC and placed in the tree view of analytes under *Centaur 1*

If a field **O.3.1** or **P.6.1** contains one reserved identifier of the list *KOO1, KOO2 or KOO3*, then the following **R.4** result will be plotted in the top, mid or bottom chart of MultiQC.

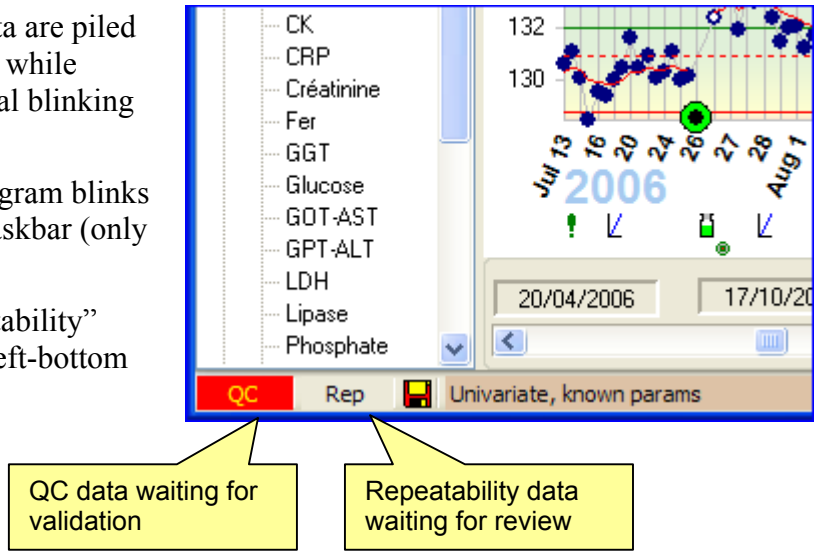
Results associated with different identifiers are ignored.

3. Data processing by MultiQC

3.1. Reception of data by MultiQC

Received QC and repeatability data are piled up by MultiQC in pending queues while waiting for being reviewed. Several blinking warnings are triggered :

- The icon of the interface program blinks blue/orange in the Windows taskbar (only Windows XP).
- A "QC" panel and a "Repeatability" panel blink red/yellow at the left-bottom corner of the main window as soon as data is available.



3.2. Assembling QC vectors

In multi-level QC, materials are sequentially assayed by the analyser. For each analyte it is necessary to lump together the different QC levels in a unique vector. This is made on a time interval basis. QC levels are associated in the same QC vector if the time interval between the assays is less that the limit entered in MultiQC :

- Menu : Configure→Miscellaneous
- Tab : General
- Field : Max time interval between levels (default 5 minutes)

When rebuilding a QC vector with separate QC values, the final time is the time of the earliest QC value.

Do not start validation before all the QC levels have been received

3.3. Validating QC data

Click the yellow/red blinking panel "QC" and proceed as indicated in the user manual of MultiQC. You can also click the main menu of MultiQC <Data entry -> Pending QC> (shortcut F2).

If the name of an analyte is unknown by MultiQC, a new analyte is automatically created with default parameters. Later, you will have to enter the appropriate parameters through the main menu <Maintenance→Analytes>.

3.4. Reviewing repeatability data

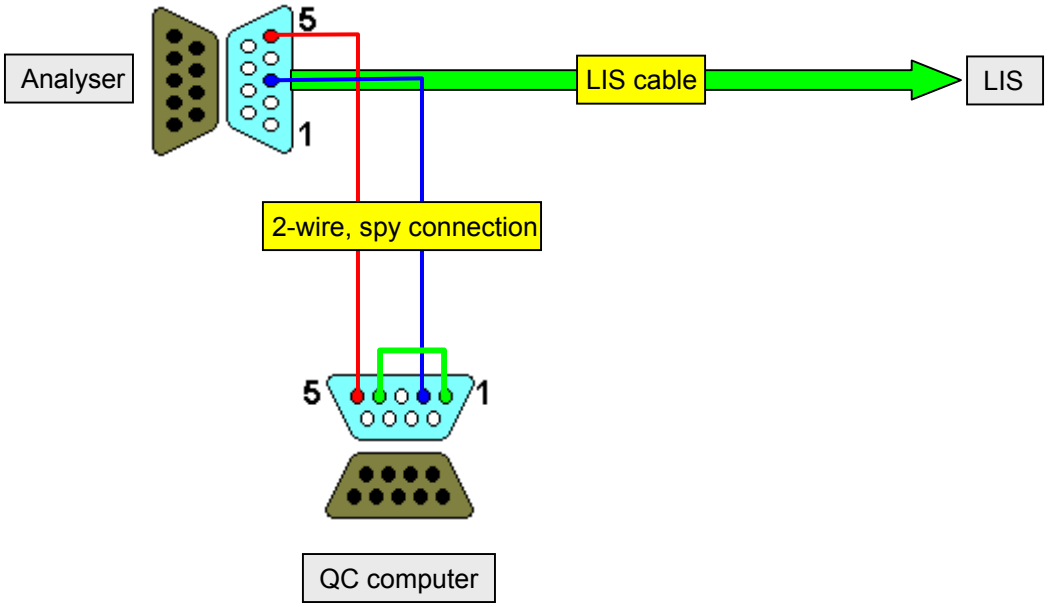
Click the yellow/red blinking panel "Rep" and proceed as indicated in the user manual of MultiQC. Repeatability data for analytes unknown by MultiQC are ignored.

4. Appendix

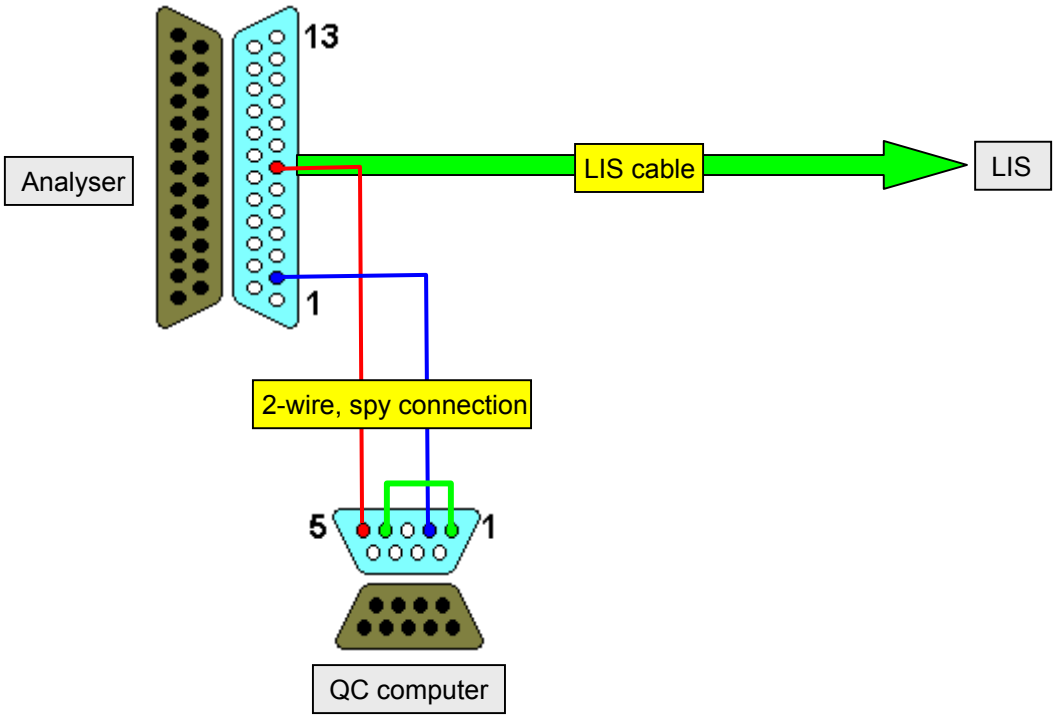
There are two types of RS-232 ports, DTE and DCE type. The signal names and pin numbers are the same, but signal flow is opposite ! Computers are DTE but analysers can be DTE or DCE.

- The pin 2, labelled Rx, is input in DTE and output in DCE.
- The pin 3, labelled Tx, is output in DTE and input in DCE.

DB9 spy connection (DTE analyser) :

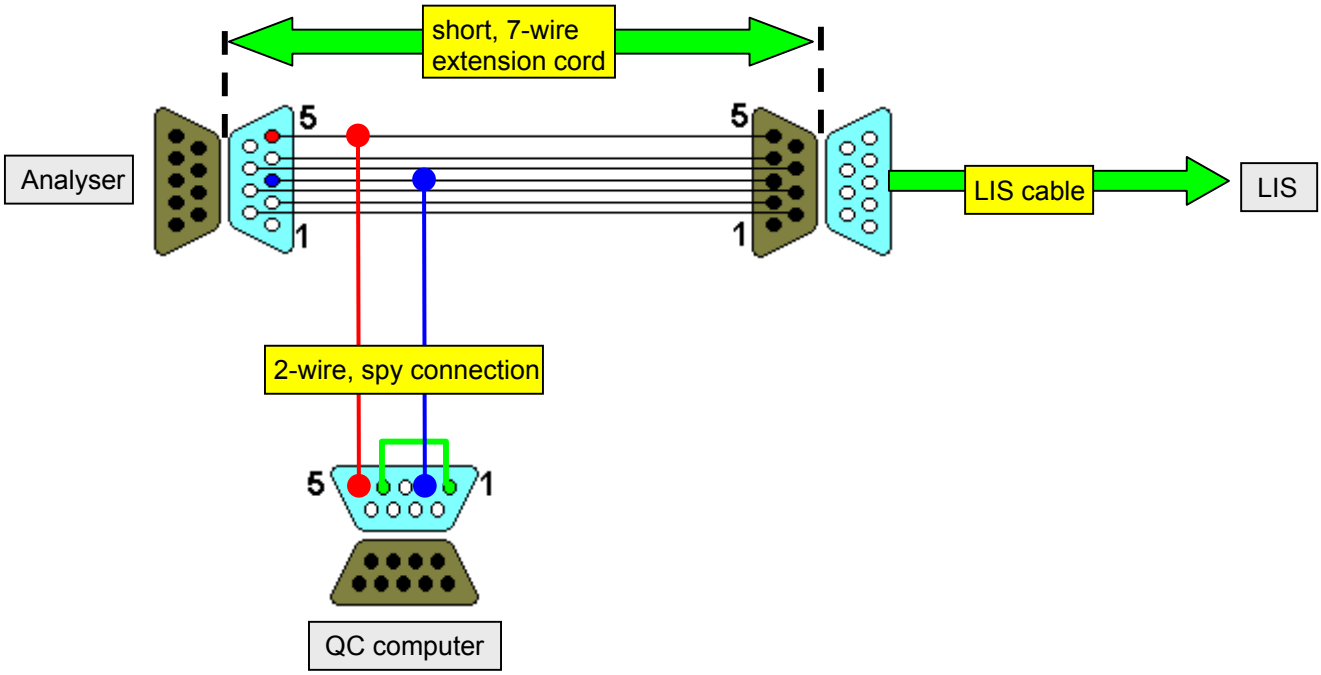


DB25 spy connection (DCE analyser) :



It might be more practical to build a short extension cord (female / male) with the 2-wire derivation soldered on the female connector. Thus the derivation can be easily inserted in or removed from the original LIS cable which does not need to be modified.

DB9 spy extension cord (DTE analyser) :



DB25 spy extension cord (DCE analyser) :