

INSTRUCTION MANUAL

COMPONENT TESTER

DB210



Rev. December 2009
Valid from software revision CA13 and upwards

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Introduction

Safety Precautions

This instrument is designed and manufactured in accordance with the European rules for electrical safety and the instrument fulfils the rules for electrical and magnetic interference, emission and radiation.

Please note the following elementary safety precautions should always be taken into consideration.

- **Do not remove the cover before the instrument has been switched off and the mains cable has been removed.**
- **If the cover has been removed, please take all necessary precautions against anti-static discharge by grounding yourself sufficiently before touching any circuits or components.**
- **Please note that capacitors in the power supply of the instrument may be charged even when the power has been switched off.**

The main power cords of the DB210 should be connected to an outlet with a proper ground terminal (3-way plug).

Finally we emphasise that this instrument is designed for high precision measurements and will only live up to our specifications when installed and used properly and in accordance with the manufacturer's instructions.

This Instrument

Thank you for purchasing Danbridge test equipment. By showing us this confidence, we will do our utmost in order to support you and help you to get your Danbridge instrument running and working in good calibrated condition.

For questions or comments you are always welcome to contact Danbridge by phone: +45 4495 5522, fax: +45 4495 4504.

E-mail: service@danbridge.com or sales@danbridge.com

Web address: www.danbridge.com

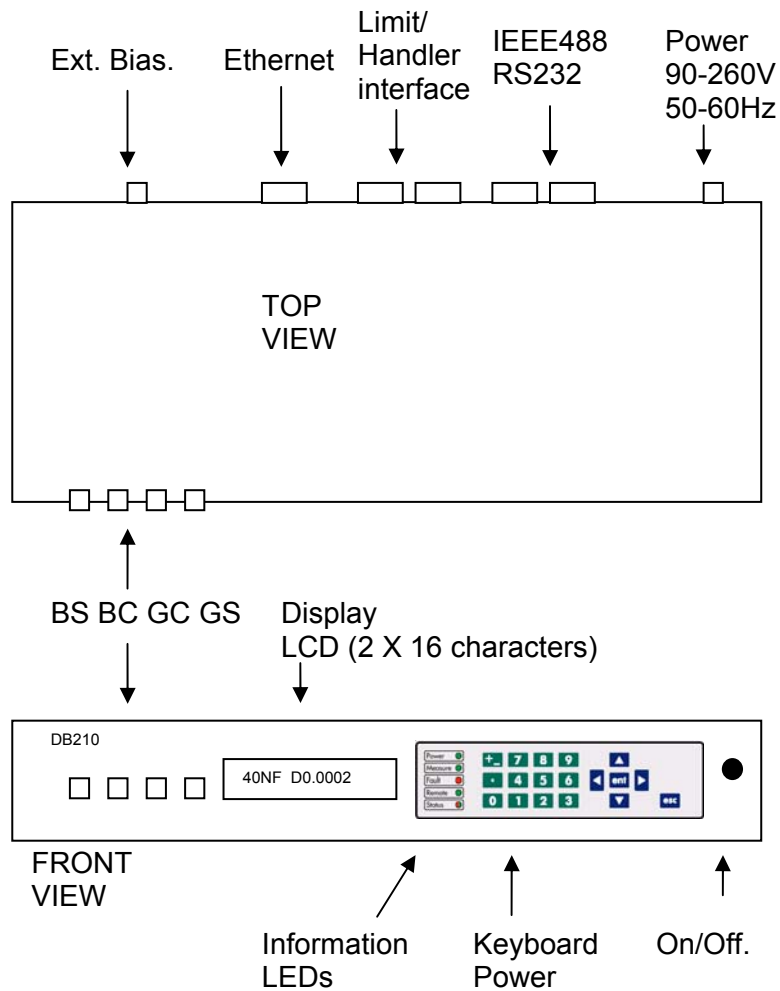
The DB210 is an advanced CLR Bridge, designed for high speed and high precision measurements. The instrument is equipped with numerous advanced features and is easy to use due to the logical user interface.

The DB210 is a CLR Bridge with a wide measuring range and with measuring of frequencies: 100Hz, 120Hz, 1kHz, 10kHz and 100kHz. The instrument in standard version is capable of testing at one frequency; dual trig versions can measure two frequencies in normal (DB210) mode.

The instrument is designed for high speed measurements with maximum measuring speed of 40 ms from single trig to end of measurement for all test frequencies except 100Hz/120Hz (180 ms). The speed depends on the test frequency. This high speed and high accuracy makes the instrument very suitable for applications where automatic testing and automatic sorting is required. The instrument has, as standard, built-in Ethernet (LAN), IEEE (GPIB), RS232C and handler interfaces and the instrument is therefore well suited to work in automatic sorting machines. Moreover, the ability to average the values of a (programmable) number of measurements makes it a very accurate bench-top instrument.

The standard fitted IEEE 488 (GPIB), RS232C and Ethernet (web and telnet) interfaces makes it easy to control the instrument from a PC and to collect data during measurements for further evaluation on the PC. By exporting the measured data to a standard spreadsheet all kinds of statistical information may be investigated.

DB210 layout



Specifications











Measured Parameters	C, L, R, (serial or parallel) tan δ, ESR, Rs, Rp, L/Q					
Measuring Frequencies	100kHz, 10kHz, 1kHz, 100Hz and 120Hz selectable from the keyboard or by data-link					
Measuring Voltage	1 V RMS down to 40 Ohm					
	0,3 V RMS from 40 Ohm to 4 Ohm					
	Linear reduction at lower impedance values					
Measuring Speed		100Hz	120Hz	1kHz	10kHz	100kHz
	From trig to end of measurement*	180ms	180ms	38ms	38ms	38ms
	From trig to data ready*	190ms	190ms	40ms	40ms	40ms
	Add. time per meas. by average	160ms	160ms	34ms	34ms	34ms
	*) Allowing 3ms contact bouncing or 1 range change Multiple measurements (average): The sum of each measurement (from trig to end of measurement) + 8ms for calculation time					
Measuring Cables	1m (39.3 inch) from bridge to fixture (Cables supplied by Danbridge)					
Input Protection	2 Joule up to 1kV or 4μF charged 1000V					
Bias Voltage External	Up to ±48V DC					
Capacitance	Frequency		Accuracy ± 1 digit @ average ≥2			
	100-120Hz	1kHz	Capacitance	Tan δ		
	100pF - 300μF	1pF – 99pF	0.5 pF	± .0010		
		100pF – 389pF	0.1%	± .0005		
		390pF – 3μF	0.05%	± .0005		
		3uF – 30μF	0.1%	± .0010		
	3mF C: (C measured / 0.3mF) x 0.1%		Tan δ: (C measured / 0.3mF) x 0.005			
	10kHz	100kHz				
	39pF – 3μF	39pF – 0.3μF	0.05%	± .0005		
ESR	$ESR = \frac{\tan \delta}{2 \cdot \pi \cdot f \cdot Cs}$					
Bin sorting	Up to 12 limits for 1 st parameter and 4 limit for 2 nd parameter by opto-couplers					
Keyboard & Display	For manual settings, etc.					
Interfaces	Control	<i>Measure end, data ready, trig ready, fault and status</i>				
	Rear panel	<i>IEEE 488 (GPIB), RS232C and Ethernet connector</i>				
	Trig input	<i>DC, AC and contact closure</i>				
Environment	Ambient temp.	<i>10-30 degrees Celsius</i>				
	Warm-up time	<i>Minimum 30 minutes</i>				
	Power	<i>90-130 and 200-260 V AC, 50-60 Hz, 220mA @110V, 110mA @220V</i>				
Calibration Interval	Minimum <i>Every 12 months</i>					
Dimensions		Mainframe	Export Packing Europe	Export Packing Overseas		
	Height	44mm / 1.76 inch	300mm	320mm		
	Width	435mm / 17.4 inch	510mm	520mm		
	Depth	280mm / 11.2 inch	560mm	550mm		
	Weight	5kg	11kg	13kg		

Philosophy

This Manual

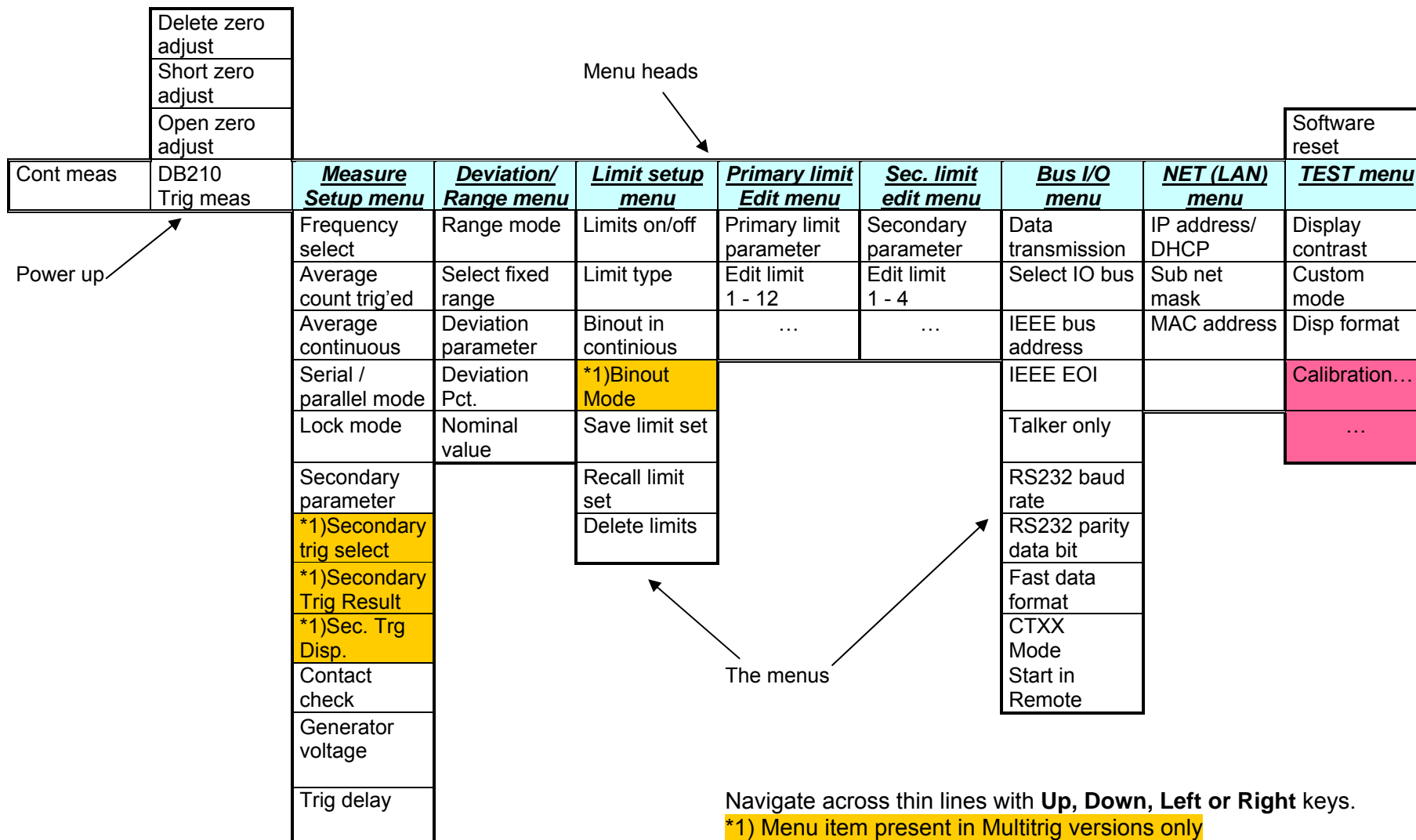
Please note that in this manual, keys used are marked **bold** and display text is marked with *Italics*.

The keys are named

Key	Key name	Description
	Sign	Changes sign when editing numbers.
	Dot	Decimal separator. IP address separator.
 — 	Number	Enters numbers.
	Up	Move up in menus. Change exponent up in edit.
	Left	Move left in menu heads. Toggle menu items. Decrease menu values. Delete while editing values.
	Right	Move right in menu heads. Toggle menu items. Increase menu values.
	Down	Move down in menus. Change exponent down in edit.
	Enter	Trigger in measure menu. Starts/end edit of numbers
	Escape	Return to triggered measurement menu. Escapes from edit without change.



Menu structure



The menu is navigated using arrow keys <right>, <left>, <up> and <down>. There are some differences in the normal version and the Multi trigger version of the DB210.

For example in order to change the item “Contact check”

Normal version:

From the trig measure menu, the contact check menu is reached by pressing:
<right> and **<down>** 7 times.

Multitrig version:

From the trig measure menu, the contact check menu is reached by pressing:
<right> and **<down>** 9 times.

When an item is displayed it can be changed depending on type, by either pressing Ent (Enter) or using arrow keys left or right.

Warning: The menus concerning calibration should NEVER, under normal condition be used. They are used for calibration of the device, improper usage can lead to miscalibration of the device, thus requiring a full recalibration and calibration certificate.

Switch-On

90 to 240 volts AC (50 or 60Hz) can supply the DB210. Note that power cords of the DB210 should be connected to an outlet with a proper ground terminal (3-way plug).

Factory Setting

Connect the power cable to a mains outlet with a good ground connection and switch on by the mains switch on the rear panel. The built-in control LED shows a green light, indicating that the power is on.

The DB210 starts with a memory check and the display shows DB210. When the instrument is ready to measure the TRIG menu becomes available in the display. It is possible to make a single trig at <Enter> and continuous trig if <Left> is pressed.

After the instrument has passed the memory check, the DB210 will continue as prior to the power switch off.

Warm Up Time

If possible, the instrument should be switched on for at least 30 minutes before measuring. Only then is the maximum accuracy of the instrument reached.

LEDs on the front panel

Power:	Green light indicates that 90-260V AC power is connected and the main switch is turned on at the front panel.
Measure:	On (green light) as long as the instrument is running a measurement cycle.
Fault:	On (red light) when an external fault is detected. An external fault could for instance be a wrong component. Flashing light in the Fault LED after start up indicates that there might be a fault in connection with the microprocessor during the automatic internal test. In case this situation occurs, please contact Danbridge support department.
Remote:	Lights green when Ethernet (Telnet), IEEE or RS232C controls the instrument
Status:	The Status LED is red as long as there is no Short or Open Jig zeroing stored in the memory. The reason could be that no jig zeroing has been performed since the latest software reset (or the last software update).

The Status LED is green when a successful Jig zeroing has been performed and the instrument is ready for measurements. Furthermore the status LED is used for software updates, indicating when the new software has been stored into the flash memory (by red/green flashing) followed by automatic reset.

Installation

Please connect a suitable 4-terminal Kelvin jig to the instrument before start of measuring with DB210, for instance the optional JIG10. The fixture should be connected by means of 4 shielded cables with low parasitic loading, for instance cables like RG58U.

The test cables between the DB210 and the fixture should never exceed 100cm. When using cables longer than 30cm we recommend you to use the twisted cables supplied by Danbridge. These cables will prevent unstable measurements and noise pick-up.

The cables should be connected as shown below.

Please note that the contacts in the fixture should always be of a high quality in order to measure loss factor correctly. Even a few $m\Omega$ in variation during a measurement or as variation from the measurement may harm the loss factor measurement when measuring large capacitors at high frequencies. A total contact resistance of 10 $m\Omega$ is normally considered very good.

The DB210 incorporates an active guard system that is different from other manufacturers. This system is described on the following page. As a direct consequence the shields of the measuring cables must not be grounded. Other manufacturers of LCR meters also use active guard systems, not totally different from Danbridge but still incompatible with Danbridge bridges.

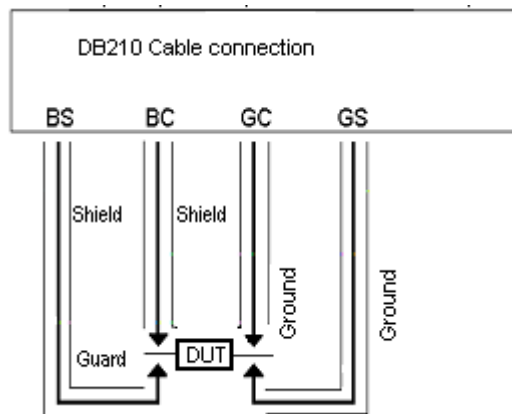
Warning: Do not ground the shields of the measuring cables like other manufacturers of LCR meters advice. The Active Guard system utilised by Danbridge is special and specifically designed for accurate and high speed testing of capacitors.

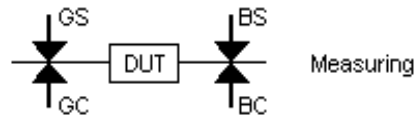
The general cabling from the bridge unit to the Jig is explained below.

BS
BC
GC
GS

Please notice that the BC and BS shields carry an active guard. Only one should be used to avoid a loop.

GC and GS shield should not be connected. Keep the shield protected by the isolation material covering the cable.





Jig Calibration

Open Jig Zero compensates for stray impedances across the jig terminals (i.e. in parallel with the actual component) and for stray capacitance from the BS-BC terminals to ground. This is very important when measuring large impedance's such as small capacitors and large resistance values.

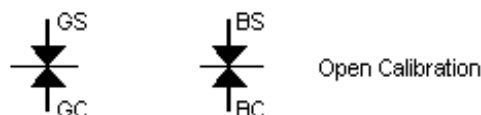
Short jig Zero compensates for the following: Self-inductance in the measuring cables and for errors due to the influence of the magnetic fields from large currents in the BC and GC cables. This is very important when measuring small impedance's by higher frequencies i.e. large capacitors measured at 100 kHz.

Open Jig Zero

It is necessary to adjust the instrument to its fixture by making a Jig zero before any measurements are made with the DB210. The status LED on the front panel indicates whatever a Jig zero has been made. If it is red, please adjust the instrument to its attached fixture as described below.

Press **<UP>**, remove any components from the fixture, press **<ENT>** for open jig zero. As shown below, the contacts should be closed and shorted two by two. It is very important that the contacts are closed as shown below and not open.

Four Terminal Kelvin contacts, open jig zero

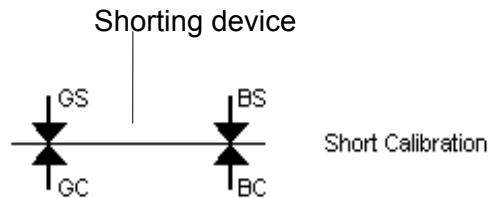


During the open jig zeroing, the words "**Jig Zero Running**" are displayed. When finished "**Jig Zero Open End**" are seen. The open jig zeroing last approximately 12 sec.

During the calibration process, please keep away from the neighbourhood of the fixture as influence from the operator may harm the calibration.

Short Jig Zero

Then insert a shorting device and short all 4 terminals in the fixture. The shorting device should be made of material as close as possible to the ideal short. We recommend gold plated copper plate or something similar to the connectors on the DUT that should be measured.



Press **<UP>** twice and insert a shorting device. Then press **<ENT>** for short jig zero, as shown above and notice that the contacts should be shorted all 4 together.

During the short zeroing, the words "**Jig Zero Running**" are displayed. When finished "**Jig Zero Short End**" are seen. The short jig zeroing process takes approximately 2sec.

SMD fixture

When using the SMD component fixture it is also essential to perform the Jig calibration process. The operation is technically the same as described above. Due to the nature of the SMD fixture the jig calibration devices are different than on the Jig32 for axial and radial components.

When the SMD fixture is delivered from factory, 1 short device and a few open devices (normally three) are enclosed.

The short device is a solid golden plated copper piece. This device is used for the short jig calibration, where all four terminals are shorted as described above.

The open jig device is an component providing short contact between the two of the terminals in a pair. The process is the same as described above.

The open jig calibration devices are delivered in different sizes to adjust for components of different sizes. When it is decided which one of the delivered open jig calibration devices is used, one should select the one that in size resembles the actual device that should be measured the most.

It is possible to order open and short circuit devices for the SMD Jig as separate devices.

Measure Setup

Start Measuring

When the instrument has been switched on and a sufficient 4-terminal Kelvin fixture has been connected, you may insert a component for testing.
(Please make sure that an open/short calibration have been performed)

If you, for instance, use a capacitor and have made sure that the capacitor is sufficiently connected to the 4-terminal fixture, you may press **<ENT>** for trig or **<LEFT>** for continuous measurements.

Trig Delay

The time from Trig to the start of measurement can be programmed from Zero to 9999msec. This Trig Delay is used to avoid range changes due to contacts that are not completely stable when the Trig signal arrives.

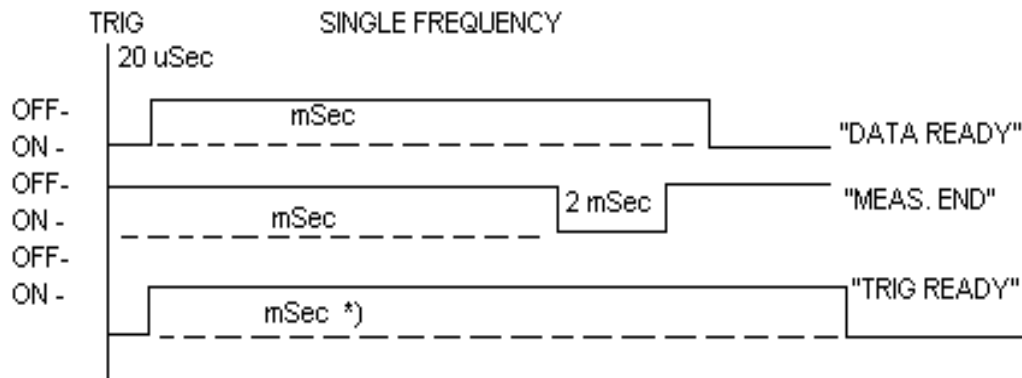
To enter the Trig Delay, see the menu map on page 10

Measuring Speed

Normal mode

	100Hz	1kHz	10kHz	100kHz
From trig to end of measurement:	180ms	38ms	38ms	38ms
From trig to data ready:	190ms	40ms	40ms	40ms
Additional time per meas. by average	160ms	34ms	34ms	34ms
Allowing 3ms contact bouncing or 1 range change				
Multiple measurements (average):	The sum of each measurement (from trig to end of measurement) + 8ms for calculation time			

The Timing Diagram in TRIG Mode % Deviation + limit on C and D 1 kHz



*)Trig ready time: Depending on the remote interface: 40 mSec by IEEE or Data transmission OFF, 51 mSec by RS232C with 19200 baud.

Trig mode (from front panel)

To trig the DB210 and make a measurement, press **<ent>** in the trig meas menu. The trig meas menu is reached on power up or by the **<esc>** key. The display will go blank while measuring.

Continuous mode

By pressing the **<left>** key in trig meas menu the instrument enters continuous mode/menu.

When the instrument is in continuous mode, it will measure continuously. Please notice that the speed of the updates in the display is determined by the chosen average count. Default setting of average count in continuous mode is 25. To leave continuous mode/menu press **<esc>**, **<trig>** or **<right>**.

The measured results are shown on the display, the upper line shows capacitance and the lower line shows the default loss factor, $\tan \delta$.

By connecting a component to the 4 terminal fixture the component values may be measured, as described above. The results will appear as shown below

Measure display

Primary and secondary parameter are displayed to the left, Range, range mode(A:auto, R:fixed, D:deviation L:locked) and frequency are displayed to the left.

1.4500nF	A2
D 0.0003	F 1k

When limits are used binning information is displayed to the left.

1.4500nF	B2
D 0.0003	B1

Using Dual/multi frequency on a dual/multi trigger DB210 display output depends on settings.
Example:

Sec.Trig Display = Normal

T1:	1.4500nF	A2
T2:	1.4500nF	A2

Sec.Trig Display = Bin, Binout mode = normal

T1:	1.4500nF	0
T2:	1.4500nF	0

Sec.Trig Display = Bin, Binout mode = Double Freq, Some Limits entered

T1:	1.4500nF	00
T2:	1.4500nF	02

00 and 02 here are actually 4 different numbers, first is the Bin (0) and then the SBIN (0 and 2) for frequency 1 and then for frequency 2.

Measure menu

The Measure menu is used to change the basic measurement parameters, such as frequency, average count, serial/parallel mode, lock, secondary parameter, Secondary trig frequency, contact check, generator voltage and trig delay.

Frequency Selection

In the menu, use **<left>** or **<right>** can be used to decrease or increase frequency.

Possible selections are:
100Hz, 120Hz, 1kHz, 10kHz or 100kHz.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Average Count

When measuring in continuous mode the default average is set by the internal software to 25 in order to ensure a stable and easy to read measurement. Alternatively, the operator may set the average count. Values between 1 and 100 are accepted.

By using from 2 and up to 100 as average count, electrical noise and hum may be minimised. We advice you to keep as high an average count as possible, in order to reduce influence from external electrical noise. A too high value can be inconvenient in many applications, thus an acceptable value should be chosen as a trade off between stability and measuring time.

Average count Selection (trig)

In the menu, use **<left>** or **<right>** to decrease or increase average count for triggered measurements.
Or use **<number>** to enter a new average count, use **<ent>** end the editing.
Or use **<ent>** edit an existing average count, use **<ent>** end the editing.

Possible selections are:
Any number from 1 to 100.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Average count Selection (continuous)

In the menu, use **<left>** or **<right>** to decrease or increase average count for triggered measurements.
Or use **<number>** to enter a new average count, use **<ent>** end the editing.
Or use **<ent>** edit an existing average count, use **<ent>** end the editing.

Possible selections are:
Any number from 1 to 100.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Serial / Parallel Selection

In the menu, use **<left>** or **<right>** to choose between serial and parallel measure modes.

Possible selections are:
Serial or parallel.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Selecting primary parameter lock

In the menu, use **<left>** or **<right>** to choose between the different lock modes.

Possible selections are:
No Lock, R Lock, C Lock, L Lock, LC Lock, CLC Lock (C Lock + LC Lock) or LLC Lock (L Lock + LC Lock).

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Selecting secondary parameter

In the menu, use **<left>** or **<right>** to choose between the secondary parameters.

Possible selections are:
Q, D, R, G, Default (will set d with C or Q with L components), Z - Θ (radian), Z - Θ (degree) or R - X.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Secondary trig (preliminary)

If Secondary trig is not OFF, it is operating that way that one measurement is made using the default frequency, then frequency is changed to the chosen frequency in this menu point, then after settling time (Depending on frequency), a new trig is performed. After the second trig, frequency is set back to the default frequency, ready for another trig. Secondary Trig does NOT display in the web interface.

In the menu, use **<left>** or **<right>** to select OFF or frequency (DB210 mode only).

Possible selections are:
Off, 100Hz, 1KHz, 10KHz, 100KHz, 120Hz

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Secondary trig result (Multitrig DB210 version only, preliminary)

If Secondary trig is on; Secondary trig result selects whatever to display either the primary result or the secondary result in double trig mode. See Primary parameter lock and secondary parameter for more information.

In the menu, use **<left>** or **<right>** to select Primary or Secondary.

Possible selections are:

0, 1. 0=Primary result, 1=Secondary result

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Sec. Trg Disp. (Multitrig DB210 version only, preliminary)

When measuring using two frequencies using binning on the rear, it is possible to select whatever Range or Bin information is to be displayed on the LCD when measuring.

In the menu, use **<left>** or **<right>** to select Normal or Bin.

Possible selections are:

Normal, Bin. Where Normal (range etc.), 1=Bin (Binning info)

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Contact check

The Contact Check function will test after each measurement in order to check if there are connections between the BC terminal to the BS terminal and between the GC terminal to the CS terminal. In other words to check if one of the 4 measure cables is broken or if one of the fixture contacts fail.

In the menu, use **<left>** or **<right>** to select contact check on or off.

Possible selections are:

On or Off

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Generator Voltage Setting

Normally the DB210 will measure with 1 VMS, if possible (built-in limitation of the measure current). However, some components will change impedance as a function of the voltage, therefore it might be a good idea to change the measuring voltage

In the menu, use **<left>** or **<right>** to decrease or increase generator voltage in 0.1V steps.

Or use **<number>** to enter a new generator voltage, use **<ent>** end the editing.

Or use **<ent>** edit an existing generator voltage, use **<ent>** end the editing.

Possible selections are:

From 0V up to 1,5V RMS can be set in steps of 0.1V.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Trig delay Setting

In the menu, use **<left>** or **<right>** to decrease or increase the trig delay.

Or use **<number>** to enter a new trig delay, use **<ent>** end the editing.

Or use **<ent>** edit an existing trig delay, use **<ent>** end the editing.

Possible selections are:

Any value from 0 to 9999 ms.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Range selection

Absolute measuring mode

Ranges may be selected manually (fixed range), automatically (auto range) or calculated from a nominal value (range lock).

When running the instrument in Trig mode, measuring absolute values, for instance on an automatic sorting machine, it is advisable to use the fixed range or range lock as the total time for measuring one component is shortened significantly by letting the instrument know the range, which should be used. With range lock 3 range shifts are allowed before measure abort.

Using auto range, the instrument needs to seek for the correct range and by this adding extra time to the measuring cycle. Therefore, auto range will normally be used only in continuous mode.

The DB210 has 7 ranges:

Range 1:	X > DUT >	390k Ω
Range 2:	390k Ω > DUT >	39k Ω
Range 3:	39k Ω > DUT >	3,9k Ω
Range 4:	3,9k Ω > DUT >	390 Ω
Range 5:	390 Ω > DUT >	39 Ω
Range 6:	39 Ω > DUT >	10 Ω
Range 7:	10 Ω > DUT	

Deviation measuring mode

When running the instrument in deviation mode, using a nominal value, the DB210 will always start in the correct range in accordance with the nominal value and the chosen test frequency or frequencies.

3 range shifts are allowed before measure abort.

Selecting range mode

In the menu, use **<left>** or **<right>** to choose between the different range modes.

Possible selections are:
Fixed range, Auto range, Range lock or Deviation.

Prerequisites:
Range lock and Deviation requires a nominal value to be entered before activation.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Selecting fixed range

In the menu, use **<left>** or **<right>** to decrease or increase range.

Possible selections are:

Range 1 to range 7.

Prerequisites:

The fixed range mode must be selected before changing the actual range.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Deviation parameter

In the menu, use **<left>** or **<right>** to select the parameter for nominal value.

Possible selections are:

R (Ohm), C (Farad) or L (Henry).

Side effects:

Deletes nominal value and turns deviation off.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Deviation percent

In the menu, use **<left>** or **<right>** to select deviation as percent on or off.

Possible selections are:

On or Off.

Side effects:

Turn limits off.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Nominal value

In the menu, press Ent. to enter the nominal value. Use **<number>** to enter a new nominal value, use **<ent>** end the editing.

Or use **<ent>** edit an existing nominal value, use **<ent>** end the editing.

While editing use **<left>** to correct wrong entered numbers and use **<up>** or **<down>** to select the decade prefix (G,M,K, ,m,u,n,p).

Possible selections are:

Farad 1pF – 0.1F.

Ohm 1mohm – 1Gohm.

Henry 1mH – 10H.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Limits

The DB210 can sort components into 13 bins (BIN0 to BIN12) on the first parameter (C, L, R or Z) and into 5 bins (BIN0 to BIN4) on the second parameter (Q, D, R or G) for C and L components.

There are two types of primary limits available in the DB210, Absolute limits and Deviation limits.

Primary limits must always start with LIM0, if LIM0 is deleted all primary limits in the Limit set are deleted.

Absolute limits:

Enter the values of the limits, starting with Lim0 by Edit LIM0, select ABSOLUTE LIMITS, select the component art C, L or R and enter the values. The limits must be increasing in values, otherwise they are ignored.

LIM0: 10.000 nF, LIM1: 11.000 nF, LIM4: 14.000 nF will sort capacitors with $C < 10.000$ nF in BIN 0 (Low Reject), 10.000 nF $< C < 11.000$ nF in BIN1, 11.000 nF $< C < 14.000$ nF in BIN4 and $C > 14.000$ nF in BIN12 (High reject).

Deviation limits:

When a nominal value has been programmed and Deviation mode activated (see deviation) it is possible to let the DB210 run in Limit mode with limits relative to the nominal value either in absolute deviation or in percentage deviation.

Edit LIM0, select REL LIMITS and then the component art (for absolute deviation) or PERCENT. Again the limits must be increasing in values otherwise they are ignored.

LIM0: -1.0 nF, LIM1: 1.0 nF with a nominal value of 10.000 nF will sort capacitors with $C < 9.000$ nF in BIN0 (Low Reject), 9.000 nF $< C < 11.000$ nF in BIN1 and $C > 11.000$ nF in BIN12 (High Reject).

LIM0: -10% and LIM1 10% with a 10.000 nF will sort in the same bins as above.

Secondary limits:

Secondary limits must always start with SECLIM0 and if SECLIM0 is deleted all secondary limits in the Limit set are deleted. Secondary limits are entered in the same manner as Absolute limits:

Edit SECLIM0, select the second parameter Q, D, R or G and enter the values. The secondary limits must also be increasing in values.

SECLIM0: D = 0.0010, SECLIM1: 0.0020 will sort according to the tan D value of the component with $\tan D < 0.0010$ in BIN0, $0.0010 < \tan D < 0.0020$ in BIN1 and $\tan D > 0.0020$ in BIN4.

Binning in secondary trig mode (Double trig):

In dual frequency measurements it is possible to redefine the secondary limits so that LIM 1 (SLIM 1) is a GO/NOGO limit for the "PFQ" (primary frequency) second parameter and LIM 2 a GO/NOGO limit for the "SFQ" second parameter. This feature can be selected in the menu Binout Mode, and is only active in the normal DB210 mode.

The BIN number definition is then:

SLIM 1		SLIM 2	
SBIN 0	SBIN 1	SBIN 2	SBIN 3
GO	NOGO	GO	NOGO
____PFQ____		____SFQ____	

LIM 3 and LIM 4 are ignored in this mode.

For dual trig versions of DB210, using dual trig mode, bins are shorted in a way that each bit only takes one letter or digit. Numbers higher than 9 is displayed as letters (A = 10, B = 11, C = 12). This is due to limited space in the display.

Limit Setup

When the DB210 run in limit mode it sorts out the measured components in 13 bins for the main parameter (C, L, R or Z) and 5 bins for the second parameter.

Limit on off

In the menu, use **<left>** or **<right>** to select limits on or off.

Possible selections are:
On or Off.

Prerequisites:
Limits must have been entered and not conflict with measurement setup.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Limit type

From the trig measure menu, the limit type menu is reached by pressing:
<right> 3 times and **<down>** 2 times.

Now use **<left>** or **<right>** to select the limit type.

Possible selections are:
Absolute, Relative or Channel.

Side effects:
Turn limits off.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Binout in continuous

In the menu, use **<left>** or **<right>** to select binout in continuous mode on or off.

Possible selections are:
On or Off.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Binout mode

In the menu, use **<left>** or **<right>** to select binout mode.

Possible selections are:
Normal or Double freq (Second has only influence in connection with secondary trig in DB210). See Binning in secondary trig mode for further information.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Limit set setup

When a set of limits has been programmed, you may save the limit set in one of 5 positions for later retrieval.

This function will save much time for you during your daily routine as one limit set may be recalled and re-used so instead of creating new limits all the time you may load a limit set in few seconds

Limit set save

In the menu, use **<left>** or **<right>** to select Limit set to save to and **<ent>** to do the actual saving.

Possible selections are:
1 - 5.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Limit set recall

In the menu, use **<left>** or **<right>** to select Limit set to recall to and **<ent>** to do the actual recalling.

Possible selections are:
1 - 5.

Prerequisites:
The limit set must have been saved earlier.
Side effects:
Current limits are lost.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Delete limits

In the menu, use **<ent>** to delete the current limits.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Primary limit edit

Primary limit parameter

In the menu, use **<left>** or **<right>** to select primary Limit parameter.

Possible selections are:
L, C, R or %.

Side effects:
After limits have been entered, the parameter menu will not be shown. Delete limits first.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Primary limits 1 - 12

In the menu, use **<left>** or **<right>** to select action: Edit-, Insert- or Delete limit and then **<ent>** to execute the action.

Use **<down>** to get to next limit.

Use **<number>** to enter a new limit value, use **<ent>** end the editing.

Or use **<ent>** edit an existing limit value, use **<ent>** end the editing.

While editing use **<left>** to correct wrong entered numbers and use **<up>** or **<down>** to select the decade prefix (G,M,K, ,m,u,n,p).

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Secondary limit edit

Secondary limit parameter

In the menu, use **<left>** or **<right>** to select secondary Limit parameter.

Possible selections are:
Q, D, R, G.

Side effects:

After limits have been entered, the parameter menu will not shown. Delete limits first.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Secondary limits 1 - 4

In the menu, use **<left>** or **<right>** to select action Edit-, Insert- or Delete limit and then **<ent>** to execute the action.

Use **<down>** to get to next limit.

use **<number>** to enter a new limit value, use **<ent>** end the editing.

Or use **<ent>** edit an existing limit value, use **<ent>** end the editing.

While editing use **<left>** to correct wrong entered numbers and use **<up>** or **<down>** to select the decade prefix (G,M,K, ,m,u,n,p).

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Limit and Control I/O on the Rear Panel (slot 8)

Limit Out

PIN	Description	I/O
1	Bin 0 First parameter low reject	0
2	Bin 2 First parameter	0
3	Bin 4 First parameter	0
4	Bin 6 First parameter	0
5	Bin 8 First parameter	0
6	Bin 10 First parameter	0
7	Bin 12 First parameter high reject	0
8	Sbin 1 Second parameter (PFQ NOGO)	0
9	Sbin 3 Second parameter (SFQ NOGO)	0
10	Wrong component	0
11	Common GND (Emitter)	0
12	Trig input anode	1
13	Protective ground (shield)	
14	Bin 1 First parameter	0
15	Bin 3 First parameter	0
16	Bin 5 First parameter	0
17	Bin 7 First parameter	0
18	Bin 9 First parameter	0
19	Bin 11 First parameter	0
20	Sbin 0 Second parameter (PFQ GO)	0
21	Sbin 2 Second parameter (SFQ GO)	0
22	Sbin 4 Second parameter	0
23	Measurement abort	0
24	Trig input cathode	1
25	NC	

The opto-coupler Trig input triggers the DB232 by an input current of 10mA (maximum 30mA forward and maximum 6V reverse). The opto-coupler outputs are rated 25V and 10mA each

Control IO

PIN	Description	I/O
1	Trig ready	0
2	Data ready	0
3	Common GND (Emitter)	0
4	Trig input anode	1
5	Protective ground (shield)	
6	Measure end	0
7	Measurement abort	0
8	Wrong component	0
9	Trig input cathode	1

Special functions

Bias Voltage external

External DC Bias may be used for capacitors or reversed polarised diodes.

Up to $\pm 3\text{V}$ external DC bias may be supplied via the BNC connector located on the rear of the mainframe.

The external power supply must be a floating DC supply with a 120mA current limit

Bus and I/O setting

Data transmission

In the menu, use **<left>** or **<right>** to select data transmission on or off.

Possible selections are:
On or Off.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Select I/O bus

In the menu, use **<left>** or **<right>** to select communication bus for remote control.

Possible selections are:
RS232, IEEE (IEEE488) or Telnet.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

IEEE bus address

In the menu, use **<left>** or **<right>** to decrease or increase the IEEE bus address.
Or use **<number>** to enter a IEEE bus address, use **<ent>** end the editing.
Or use **<ent>** edit an existing IEEE bus address, use **<ent>** end the editing.

Possible selections are:
Any number from 0 to 31.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Talker only

In the menu, use **<left>** or **<right>** to select talker only on or off.

Possible selections are:
On or Off.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

RS232 baud rate

In the menu, use **<left>** or **<right>** to select baud rate.

Possible selections are:
300, 600, 1200, 2400, 4800, 9600 or 19200 bps. Furthermore 57600 bps is available, but is reserved for special case and future use.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

RS232 bit and parity

In the menu, use **<left>** or **<right>** to select bit and parity.

Possible selections are:
8 NO, 8 EVEN, 8 ODD, 7 EVEN or 7 ODD.

There is always 1 stop bit.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Fast data format

Reduced output format used under high- speed measurements

In the menu, use **<left>** or **<right>** to fast data format on or off.

Possible selections are:
On or Off.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

CTXX mode

Used to let the instrument communicate (emulate) as the instruments CT10, CT20 or CT30 with their respective command sets.

In the menu, use **<left>** or **<right>** to select CTXX mode.

Possible selections are:
OFF, CT10, CT20 or CT30.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Start in remote

In the menu, use **<left>** or **<right>** to start in remote on or off.

Possible selections are:
On or Off.

<esc> returns you immediately to the trig measure menu.
<up>, **<down>** navigate to other menus.

Note: when in remote state a LOCAL command (or *L depending on whatever CT10/20/30 is emulated) should normally be issued from the remote interface. However, if the device is, by accident, ended up in the Remote state and a local command cannot be issued from the selected interface, it is possible to enter a sequence of numbers (or password) from the front panel.

In order to unlock the device from the remote state (and it is impossible to enter LOCAL or *L commands depending on the state the DB210 is in):
Press **<ent>** (or similar) to clear password sequence counter.
Press the following keys: 7410961
Hereafter changes in the menu can be done.

Network menu

IP address

In the menu, Use **<number>** to enter a IP address, use **<ent>** end the editing.
Or use **<ent>** edit an existing IP address, use **<ent>** end the editing.

Possible selections are:

A valid IP address in the format: XXX.YYY.ZZZ.QQQ

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Sub net mask

In the menu, Use **<number>** to enter a sub net mask, use **<ent>** end the editing.
Or use **<ent>** edit an existing sub net mask, use **<ent>** end the editing.

Possible selections are:

A valid sub net mask address.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Test menu

Display contrast

In the menu, use **<left>** or **<right>** to decrease or increase the display contrast.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Software reset

The software reset will restore all measurement parameters to the default setting.

In the menu, use **<ent>** to effectuate the reset.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Custom mode

The software has special custom designed modes in which the DB210 can run, under normal circumstances this mode should always be set to **OFF**. These modes are used for tailoring the software, and will only have relevance if the software is somewhat modified in a way which does not have influence on all users.

In the menu, use **<left>** or **<right>** to alter the setting.

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

Calibration

**DO NOT use the calibration menus, contact Danbridge first.
Calibration could be lost.**

In the menu:

<esc> returns you immediately to the trig measure menu.

<up>, **<down>** navigate to other menus.

This Test Software is intended for calibration of the instrument.

Warning

It is not advisable to go into this part of the program as the risk of losing the entire basic calibration is quite high. Therefore please note this part of the program is available, but interaction should normally be avoided.

Hardware reset

Hardware reset from the rear panel, by pressing the reset switch placed just above the IEEE socket. Locate the hole in the rear panel and use a pencil or similar to activate the hardware reset key.

When using the hardware reset, the instrument must be switched on.

Software update

It is possible to update the software of the DB210 with a terminal program and a RS232 cable. Software updates are only available via direct contact with Danbridge.

Serviceability

The DB210 is designed to be a compact and yet versatile CLR-meter, with high accuracy, 1 unit rack mount for machine use and web interface for large display use in a laboratory.

For further information, please check our web site: www.danbridge.com.

Should you need technical assistance when using a Danbridge instrument please do not hesitate to contact us by email:

Technical support: support@danbridge.com (technical questions, etc.)

Technical service: service@danbridge.com (eventual repair of equipment)

Inquires for accessories, spares, etc. sales@danbridge.com

Or you may contact Danbridge by:

Postal address:

Danbridge A/S
Lykkegaardsvej 15
DK-4000 Roskilde
Denmark

Phone: +45 4495 5522
Fax: +45 4495 4504
URL: www.danbridge.com

REMOTE CONTROL

Remote interface

There are three ways to remote control the DB210 either by Ethernet (Telnet or to some extent WEB), IEEE 488 (GPIB) or by RS232C.

WARNING: DO NOT CONNECT ANY CABLES BETWEEN THE DB210 AND A CONTROLLER WITHOUT FIRST REMOVING THE LINE CABLES, OR ELSE DAMAGE CAN BE CAUSED TO THE I/O DRIVERS.
--

IEEE 488 or GPIB

All functions available on the keyboard are also available on the IEEE / GPIB interface as well as the RS232C and Telnet. Except the custom mode and also and bus settings in the bus menu, it is necessary to select IEEE (GPIB) and address before it is possible to communicate with the instrument.

RS232C

All functions available via the keyboard are also available on the RS232C interface. Except the custom mode and also bus settings in the bus menu, it is necessary to select RS232C and serial setup before it is possible to communicate with the instrument.

From the RS232 it is possible to control the instrument with the same device dependent commands as described in the IEEE section. the list below shows the extra commands to be used with RS232.

All input data must be terminated with an LF (line feed), CR is optional.

All output data are terminated with CR LF (carriage return line feed).

Telnet

The same commands can be used via telnet as IEEE and RS232.

A telnet connection can be made with HyperTerminal that comes with Microsoft windows 2000 and XP, with win98 or linux/unix you can use the command line tool Telnet. The DB210 port for telnet is the standard (port 23).

IEEE

The IEEE interface is designed according to the IEEE488-1 and IEEE488-2 standards.

The list below shows the sub-set of the IEEE standard used by the DB232. See appendix C IEEE std. 488-1978 for more detailed explanations.

Identification	Function (description of capabilities)
SH1	Source Handshake
AH1	Acceptor Handshake
T5	Talker (basic talker, serial poll, talker only mode, unaddressed to talk if addressed to listen).
L4	Listener (basic listener, unaddressed to listen if addressed to talk).
SR1	Service request.
RL2	Remote/Local
DC1	Device Clear
DT1	Device Trigger

To enter setup of BUS ADDRESS, TON MODE and EOI on/off see manual operation section.

The first time the DB210 is addressed and the REN line is on, it will go into remote, and the remote LED on the front panel will light up.

When it is in remote, all keyboard functions are disabled, except the MENU key, which is redefined as a toggle switch between the status setup display, and the measure display.

I/O handling

All I/O handling is made by the input and output buffers, each buffer has a maximum capacity of 255 characters.

Input buffer

Commands are entered into the input buffers and executed from there. It is therefore possible to program the DB210 quickly because no command interpreting is done in the bus handler routine.

If the maximum of 255 characters is exceeded, all inputs will be lost and a command error occurs.

The bus command 'GET' (group execute trigger) is executed immediately, if the input buffer is empty, otherwise it is put into the buffer queue and executed later.

Output buffer

When there is an output from the DB210 (measurement result or query) it is placed into the output buffer, the MAV bit in the STATUS BYTE REGISTER is set and a service request will occur if enabled. Because of the queue system it is possible to make triggering and read results out of synchronisation.

Therefore be careful that no result is missed, because after that the readout will always be one or more results behind. If the output buffer overflows all data stored in the output buffer will be lost, and only a part of the expected output will be transmitted.

If the DB210 is addressed as talker and the output queue is empty it will respond with an '?'.

To clear the input and the output buffer the 'DCL' (device clear) is used.

Input format

To enter a command you must use a minimum of four characters. The command must be followed by either a '?' for a question, or a SPACE followed by data.

Example: MEASVOLT?
 MEASVOLT XXX
 MEAS XXX
 MEASV XXX

NOTE: All characters must be in uppercase.

Input data may use fixed or floating format signed or unsigned.

example: 1V
 +1.0E+00
 10E-01
 0.001K
 .000001MA

The exponent can be replaced with a mnemonic i.e. 1E+00 or 1K according to the table on the next page.

Definition	Mnemonic
1E+18	EX
1E+15	PE
1E+12	T
1E+9	G
1E+6	MA
1E+3	K
1E-3	M
1E-6	U
1E-9	N
1E-12	P
1E-16	F

Using end suffixes such as V, OHM or S is optional.

Commands that are on/off commands as, for example, CCHECK the data can be ON/OFF or O/1.

O/1 can be set as fixed or floating.

It is possible to put more than one command into a command string, the command then has to be separated by a :

f.ex: RANGE A;AVERAGE 20;CCHECK

All commands / strings are terminated with and/or EOI.

If a large number of setup commands are used, it is possible to generate an input buffer overflow. A way of preventing this is always to use the short version of the commands (only the first four characters in the command name), not sending leading zeroes in the data. Use = O/1 instead of ON/OFF and so on.

Output format

MEASUREMENT RESULT:

```

CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8 CH9 CH10 CH11
F      1  0  0  K  H  Z      C

CH12 CH13 CH14 CH15 CH16 CH17 CH18 CH19 CH20 CH21 CH22
X  .      X   X   X   X   P   F      ,

CH23 CH24 CH25 CH26 CH27 CH28 CH29 CH30 CH31 CH32
D      0      .  X   X   X   X   X   ;

CH33 CH34 CH35 CH36 CH37 CH38 CH39 CH40 CH41 CH42 CH43
B   I   N   X   X   ,   B   I   N   X   CR

CH44

LF

```

Programming examples

Capacitance measurements with a nominal value of 1uF measured as series capacitance and loss factor (D) and percentage deviation. Set the Measuring Mode and store the nominal value plus the following limits:

-10+%, -2,5%, 0%, +2,5%, +10% and +85%

Program code	Notes
MESMODES S	Series Mode
SECPARM D	Loss factor
NOMVAL C, 1UF	Nominal value stored
DEVIATION PCT	Percentage deviation
LIM0 PC, -10PCT	Limit 0 stored
LIM1 PC, -2.5	Limit 1 stored (PCT may be omitted)
LIM2 PC, 0	Limit 2 stored
LIM3 PC, 2.5	Limit 3 stored
LIM4 PC, 10	Limit 4 stored
LIM5 PC, 85	Limit 5 stored
LIMIT ON	activate stored limits

The same as above but adds two secondary limits on loss factor: 0.0002 and 0.0010

Program code	Notes
SLIM0 SDC, 0.0002	Secondary limit 0 stored
SLIM1 SDC, 10E-4	Secondary limit 1 stored (10E-4 alternative to 0.0010)
LIMIT 1	activate stored limits (1 alternative to ON)

OTHER DATA:

Recall of the setting information. By a question command the respond data output format is the command name followed by the data and terminated with CR LF + EOI (if requested).

For instance:

COMMAND	RESPOND
RANGE?	RANGE X CR LF
MEASVOLT?	MEASVOLTX.XX CR LF
AVERAGE?	AVERAGE XX CR LF
NOMVAL?	NOMVAL 47.000PF CR LF

Commands that are on/off commands will reply with 0 for OFF or 1 for On.

Service request

The service request system is made according to the IEEE488-2 standard. Each of the below described status registers has an enable register. Decimal data is used to set the enable register in fixed or floating format. By recall of enable or status registers, the DB232 will reply in fixed decimal format. See fig. 6.1.

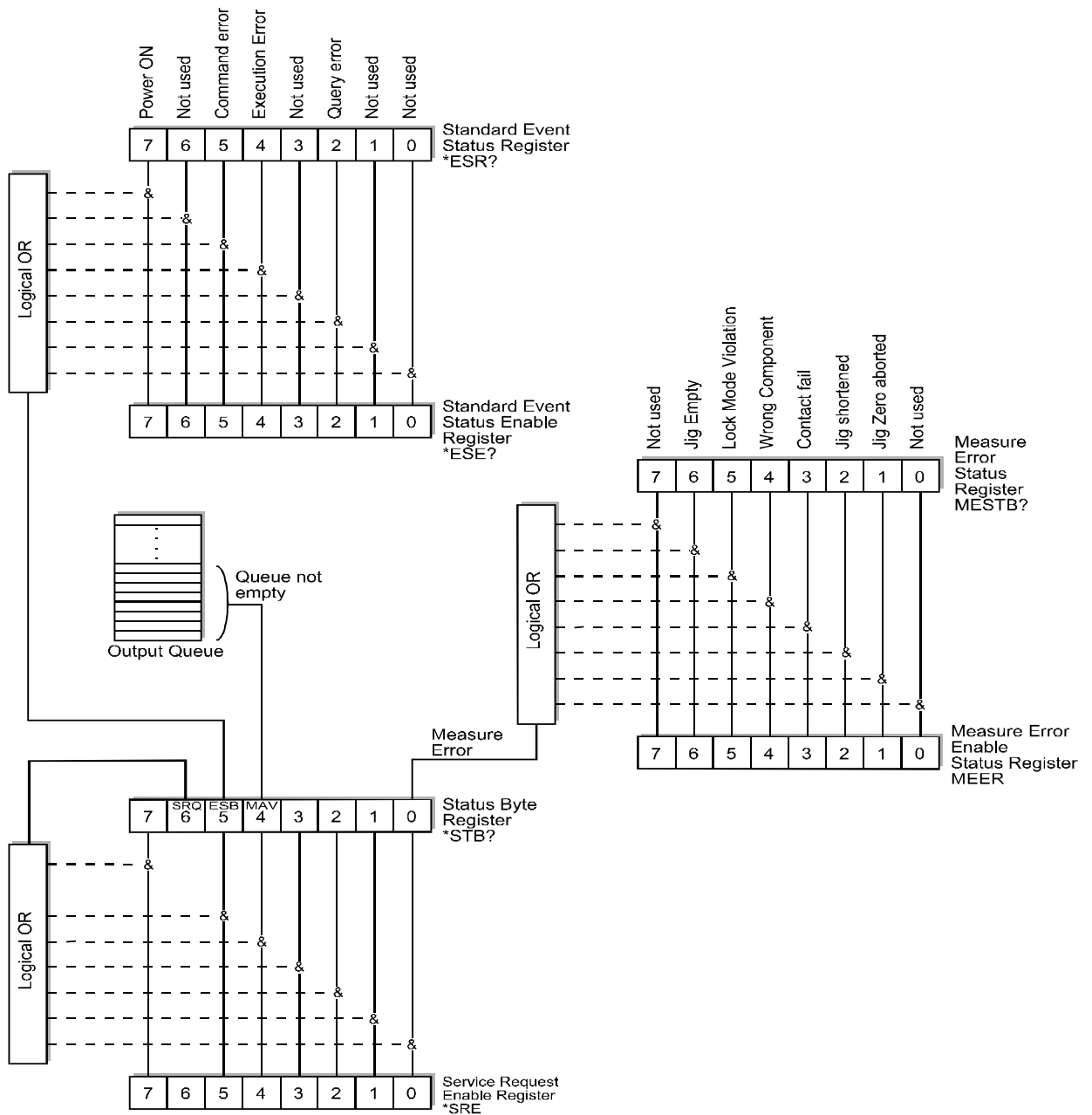
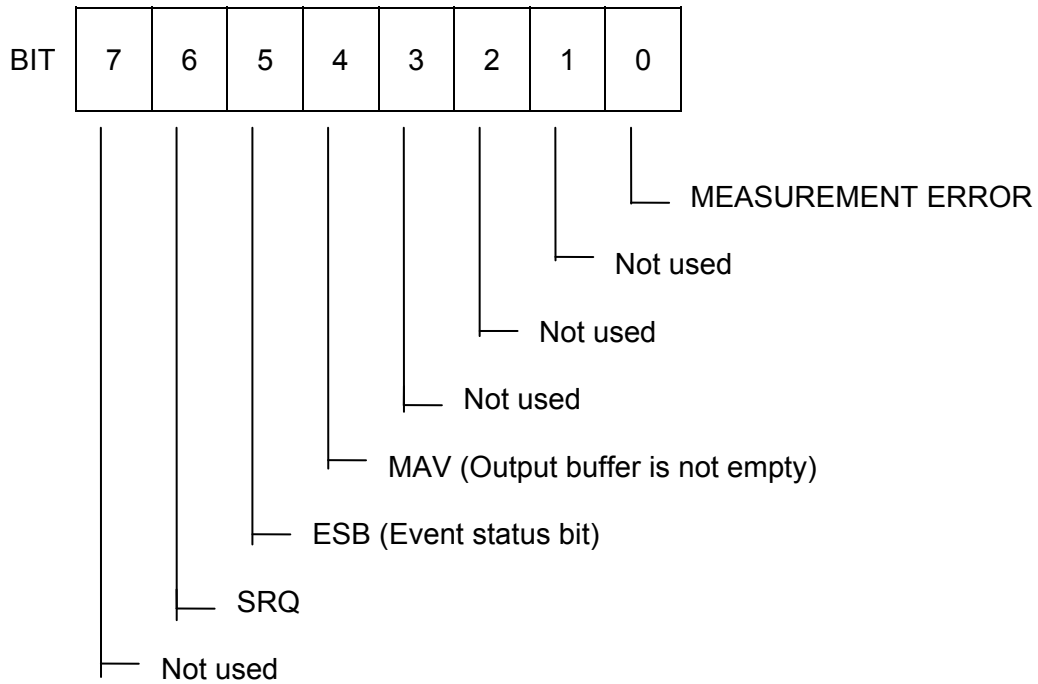


Fig. 6.1. Service Request register system

STATUS BYTE REGISTER (SPOLL).

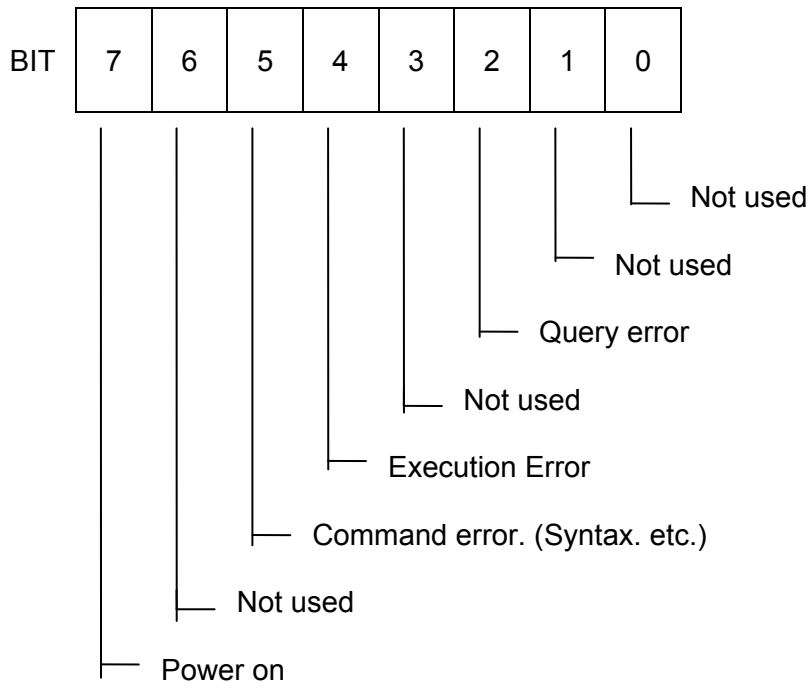
The enable register to the STATUS BYTE REGISTER is set with the command *SRE. If an event bit is true in the status byte register, and the similar bit in the mask register is true, the DB232 will generate a service request interrupt. The STATUS BYTE REGISTER is cleared by reading.



STANDARD EVENT STATUS REGISTER

The enable register to the STANDARD EVENT STATUS REGISTER is set with the command *ESE. If an event bit is true in the status byte register, and the similar bit in the mask register is true, the DB232 will set the ESB bit in the STATUS BYTE REGISTER.

The STANDARD EVENT STATUS REGISTER is cleared by reading.

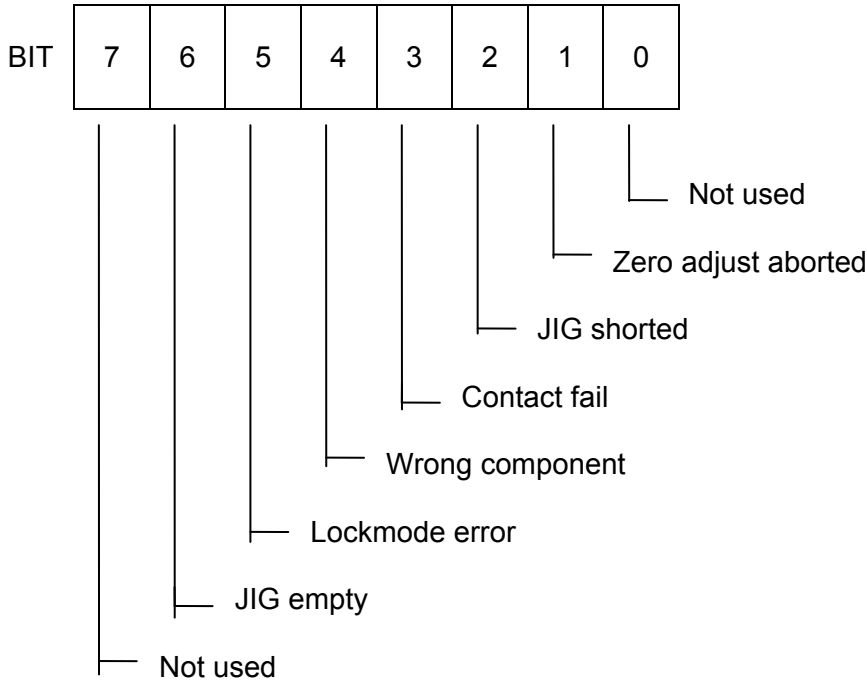




MEASUREMENT ERROR STATUS REGISTER.

The enable register to the MEASUREMENT ERROR STATUS REGISTER is set with the command MEER. If an event bit is true in the status byte register, and the similar bit in the mask register is true, it will set the MEASUREMENT ERROR bit in the STATUS BYTE REGISTER.

The MEASUREMENT ERROR STATUS REGISTER is cleared by reading.



Input commands

IEEE488-2 command

- *TRG Device trigger
- *IDN? Return device identifier.
DANBRIDGE, DB232, 0, XXX
XXX = Software version
- *CLS Clear all event registers.
- *STB? Read STATUS BYTE REGISTER (SPOLL).
- *SRE Set SERVICE REQUEST ENABLE REGISTER (mask for SPOLL reg.).
- *SRE? Recall SERVICE REQUEST ENABLE REGISTER Setting.
- *ESE Set STANDARD EVENT STATUS ENABLE REGISTER.

*ESE?	Recall STANDARD EVENT STATUS ENABLE REGISTER
*ESR	Read STANDARD EVENT STATUS REGISTER.
*RST	Total reset. (WAIT. 10 SEC).
*PSC	Clear all enable registers on power on. 0 = No change on power on. 1 = Clear on power on.
*PSC?	Recall *PSC setting

Device dependent input commands

AVERAGE	Set average count.
AVERAGE?	Recall average count.
CCHECK	Set contact check ON/OFF ON or 1 = Contact check on. OFF or 0 = Contact check off.
CCHECK?	Recall contact check ON/OFF setting.
CLIM	Clear all limits.
COMPLOCK	Component Lock mode LC = Lock on L/C as primary parameter. R = Lock on R as primary parameter. C = Lock on C (Reject R and L results). L = Lock on L (Reject R and L results). OFF or = Component Lock mode off.
COMPLOCK?	Recall Component Lock mode setting.
CONTINUOUS	ON = Start continuous measurements.
CT30MODE	ON = Change to CT30 I/O format OFF = Change to IEEE 488.2 format
CT20MODE	ON = Change to CT20 I/O format OFF = Change to IEEE 488.2 format
CT10MODE	ON = Change to CT10 I/O format OFF = Change to IEEE 488.2 format
DATATRANS	Data Transmission ON (or 1) / OFF (or 0) (Introduced in SW version 8)
DATATRANS?	Recall Data Transmission 0 for OFF / 1 for ON (Introduced in SW version 8)

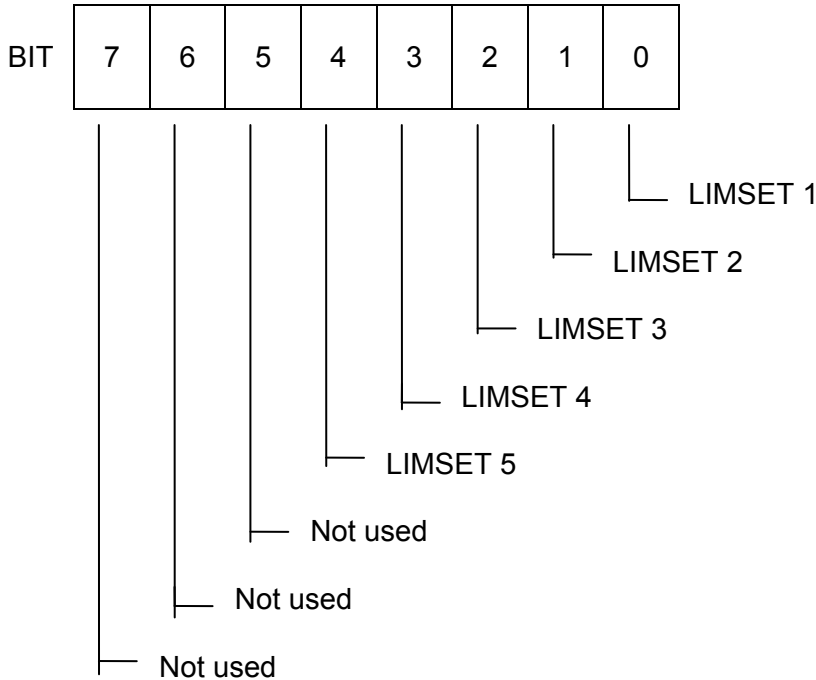
DBLFRQBIN	ON = Change to Normal binout mode OFF = Change to binout mode to Double frequency Mode
DBLFRQBIN?	Recall Binout mode setting
DEVIATION	Deviation ON/OFF/PCT ON or 1 = Absolute deviation OFF or 0 = deviation off. PCT = Deviation in Percent on.
DEVIATION?	Recall deviation setting.
DISPLAY	Display ON/OFF. ON or 1 = Display on. OFF or 0 = Display off.
DISPLAY?	Recall display ON/OFF
FREQUENCY	Enter measurement frequency
FREQUENCY?	Recall measurement frequency.
JIGZERO	Jig Compensation ON/OFF OPEN & SHORT. ON or 1 = Set Jig Compensation ON. OFF or 0 = Set Jig Compensation OFF. OPEN = Start OPEN Compensation. SHORT = Start SHORT Compensation.
JIGZERO?	Recall Jig Compensation ON/OFF.
LIM0	Enter lim0 value. Format: LIM0 ch1 ch2, value ch1: A = Absolute B = Relative P = Percent S = Symmetrical % channel limits ch2: C/L/R
LIM0?	Recall lim0 value.
LIM1	Enter lim1 value Format: See LIM0
LIM1?	Recall lim1 value.
LIM2	Enter lim2 value. Format: See LIM0
LIM2?	Recall lim2 value.

LIM3	Enter lim3 value. Format: See LIM0
LIM3?	Recall lim3 value.
LIM4	Enter lim4 value. Format: See LIM0
LIM4?	Recall lim4 value.
LIM5	Enter lim5 value. Format: See LIM0
LIM5?	Recall lim5 value.
LIM6	Enter lim6 value. Format: See LIM0
LIM6?	Recall lim6 value.
LIM7	Enter lim7 value. Format: See LIM0
LIM7?	Recall lim7 value.
LIM8	Enter lim8 value. Format: See LIM0
LIM8?	Recall lim8 value.
LIM9	Enter lim9 value. Format: See LIM0
LIM9?	Recall lim8 value.
LIMA	Enter limA value. Format: See LIM0
LIMA?	Recall limA value.
LIMB	Enter limB value. Format: See LIM0
LIMB?	Recall limB value.
LIMIT	Set limit ON/OFF. ON or 1 = Limit on. OFF or 0 = Limit off.

LIMIT?	Recall limit ON/OFF information.
LINE	Unit comment line maximum 30 characters.
LINE?	The line is displayed at startup instead of 'DB210' Recall comment line.
LOCAL	Goto local mode. Local mode is the mode in which it is possible to control the DB210 from the DB210 panel.
MEASVOLT	Generator Voltage setting 0.1 to 1.5 Vrms in 0.1 V step.
MEASVOLT?	Recall Generator Voltage setting.
MESMODE	Measurement Mode: A = Auto Selection P = Parallel S = Series.
MESMODE?	Recall Measurement Mode.
MESTB?	Read MEASUREMENT ERROR STATUS REGISTER.
MEER	Set MEASUREMENT ERROR ENABLE STATUS REGISTER.
MEER?	Recall MEASUREMENT ERROR ENABLE STATUS REGISTER SETTING.
NOMVAL	Enter Nominal Value Format: NOMVAL C/L/R, value Delete Nominal Value Format NOMVAL OFF
NOMVAL?	Recall Nominal Value
PARM	Set primary parameter. A: Auto Selection of R,C & L ZTD: Z - ϕ (degrees) ZTR: Z - ϕ (radians) RX: R - X
PARM?	Recall primary parameter setting.
RANGE	Range setting information. 1 = Range 1 2 = Range 2 3 = Range 3 0 or A = Auto range
RANGE?	Recall range setting information.



- RANLOCK** Range lock setting
ON or 1 = Enable Rangelock (NOMVAL must exist)
OFF or 0 = Disable Rangelock
- RANLOCK?** Recall Range Lock setting information
- RLIMSET** Recall stored limset.
1 = recall limset 1.
2 = recall limset 2.
3 = recall limset 3.
4 = recall limset 4.
5 = recall limset 5.
- RLIMSET?** Recall which limset are stored.

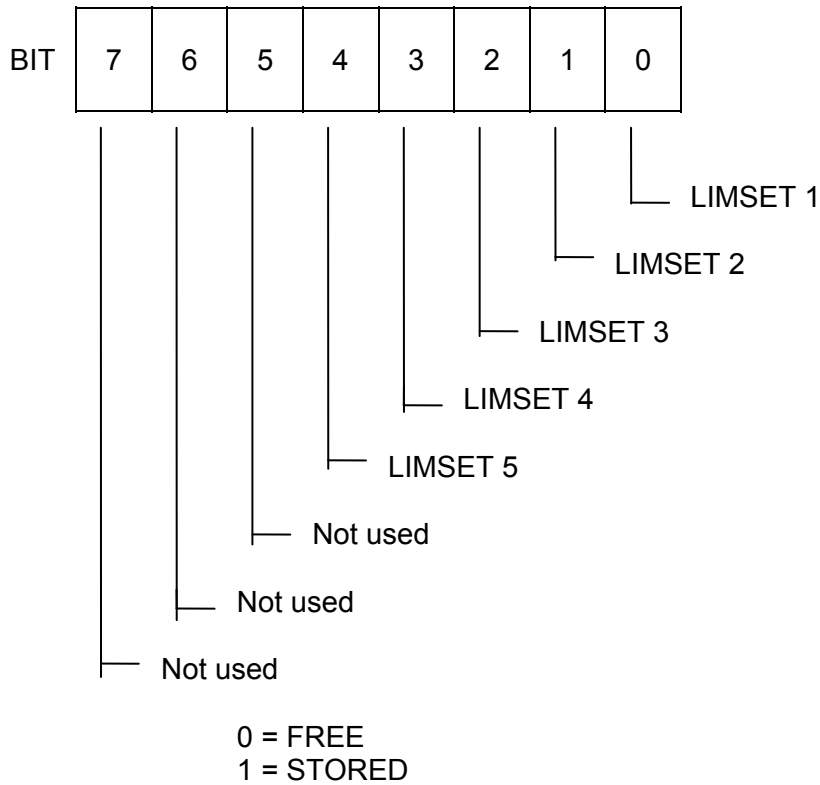


0 = FREE
1 = STORED

- SECFREQUENCY** Enter measurement frequency for secondary trig, or set secondary trig OFF (Valid in Multitrig versions only).
- SECFREQUENCY?** Recall measurement frequency or status for secondary trig (Valid in Multitrig versions only).
- STRESULT** Select type of secondary trig is to be displayed, Primary or Secondary parameter. (Valid in multitrig versions only)
Format STRESULT 0/1
0=Primary, 1=Secondary parameter

STRESULT?	Recall measurement frequency or status for secondary trig (Valid in Multitrig versions only).
STDISPLAY	Select mode of display (range/bin information) to display during double trig range/bin info. (Valid in multitrig versions only) Format STDISPLAY N/B N=Normal (Range etc.) , N=Bin info
STDISPLAY?	Recall display mode (Valid in Multitrig versions only).
SECPARM	Select Secondary Parameter by C/L measurement Format: SECPARM Q/D/R/G
SECPARM?	Recall Secondary Parameter Selection
SENR?	Recall unit serial number. Format: xxxxxx
SLIM0	Enter Secondary Lim0 value. Format: SLIM0 ch1ch2ch3, value ch1: S = Series Mode P = Parallel Mode ch2: Q/D/R/G ch3: C/L (no Secondary limits on R).
Example	"SLIM0 SDC, 0.0001" S limit on D on 1 x 10
SLIM0?	Recall SLIM0 value.
SLIM1	Enter Secondary Lim1 value Format: See SLIM0
SLIM1?	Recall SLIM1 value.
SLIM2	Enter Secondary Lim2 value Format: See SLIM0
SLIM2?	Recall SLIM2 value.
SLIM3	Enter Secondary Lim3 value Format: See SLIM0 value
SLIM3?	Recall SLIM3 value.
SLIMSET	Save limset. 1 = save current limset as limset 1. 2 = save current limset as limset 2. 3 = save current limset as limset 3. 4 = save current limset as limset 4. 5 = save current limset as limset 5.
SLIMSET?	Recall which limset are stored.

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- SUBINFO?** Additional information about the DB210. Can be used to supplement the *IDN? command. Returns a string as described:
 ["M"/"S"] ["4M"/"DL"]
 M or S= Multitrig or single trig device
 4M or DL = 4M cable type or Default Length
- TRIG** External TRIG ON/OFF.
 ON or 1 = Enable external trig.
 OFF or 0 = Disable external trig.
- TRIG?** Recall External trig on/off setting.

RS232 only

The RS232 can operate with a BAUD RATE of 300 to 19200 baud using 7 or 8 data bits, EVEN - ODD or NO parity and, if required, in talker only mode. To enter this setup see manual operation section for details.

From the RS232 it is possible to control the instrument with the same device dependent commands as described in the IEEE section. The list below shows the extra commands to be used with RS232.

@DCL Device clear.
Clear input buffer & output buffer.

DONE Send DONE for command done.
ON or 1 = Done on.
OFF or O = Done off.
When this mode is used, the instrument will always reply with an answer when a command is executed.

Example:

Command	Answer
*TRG	Measure result
RANGE 1	DONE
RANGE?	RANGE X
JIGZ OPEN	DONE
RAN"GE	SYNTAX ERROR

DONE? Recall done on/off setting.

RSERROR Set error message on/off.
ON or 1 = error on.
OFF or O = error off.

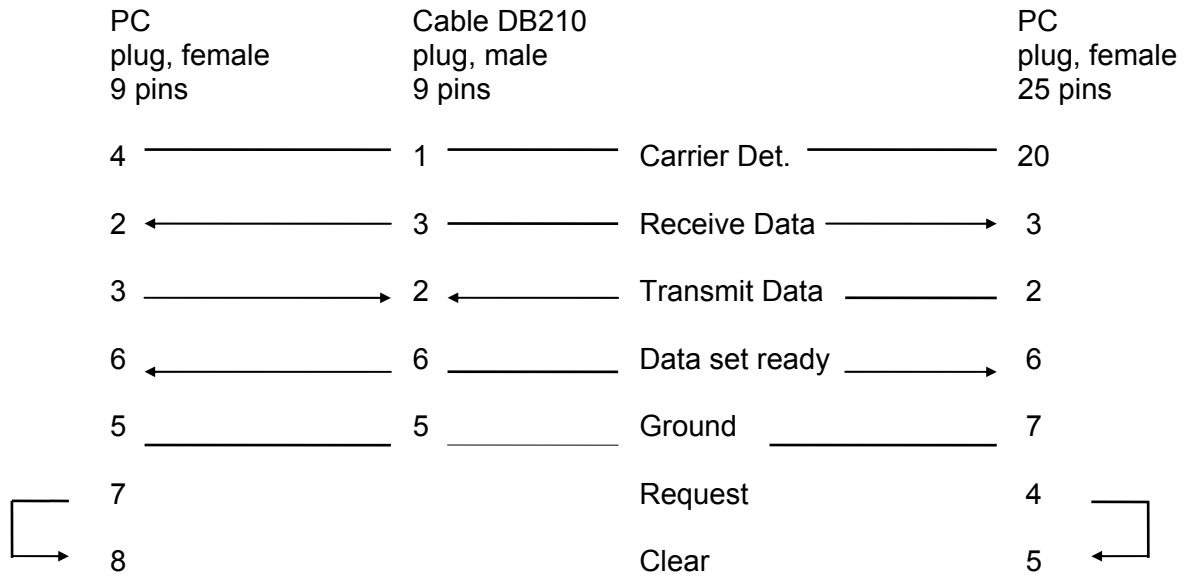
The input and output formats are the same as for IEEE, see this section for details.

All input data must be terminated with an LF (line feed).

All output data are terminated with CR LF.

Cable connections

RS232 Cable Connections



Above shows show the required wiring between DB210 and a PC using with either 9 pin female or 25 Female RS232C connector.

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