INSTRUCTION MANUAL

COMPONENT TESTER

DB23X

Covering DB232, DB236 and DB233Z

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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.

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, e-mail: service@danbridge.com or sales@danbridge.com
Web address: www.danbridge.com

The DB23X 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 DB23X is a CLR Bridge with a wide measuring range and with measuring of frequencies: 100Hz, 1kHz, 10kHz and 100kHz (optional 120Hz instead of 100Hz). The instrument is capable of testing at one frequency or combining these frequencies in dual frequency testing or using all frequencies in a single measurement cycle.

The instrument is designed for high speed measurements with max. measuring speed of 16 to 28msec from trig to end of measurement for all test frequencies except 100Hz (160-180msec). 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 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) and RS232C interfaces make 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.

DB23X layout

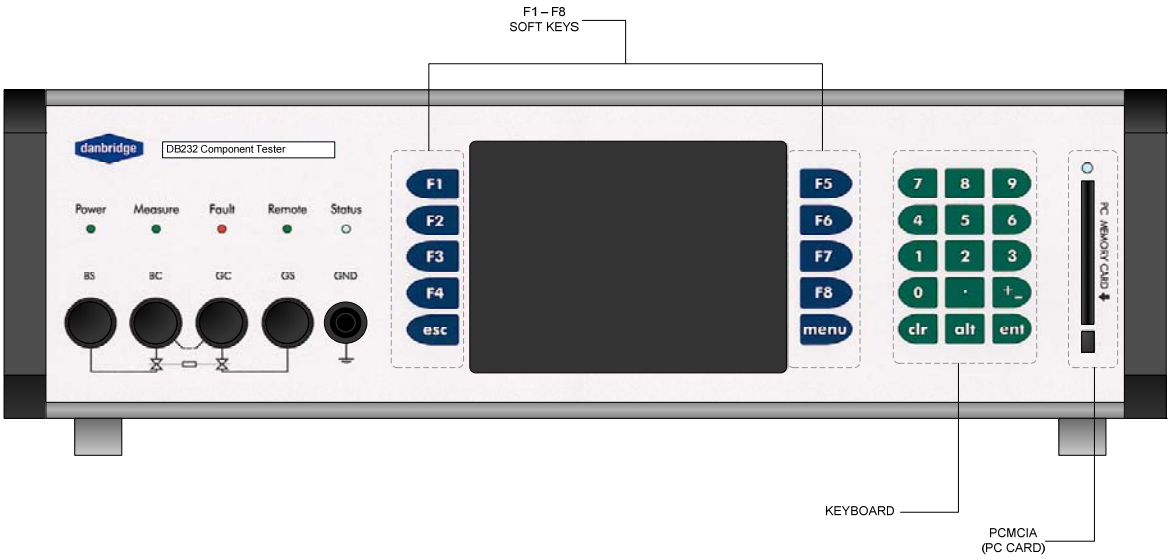


Fig. 1 DB23X Main frame front

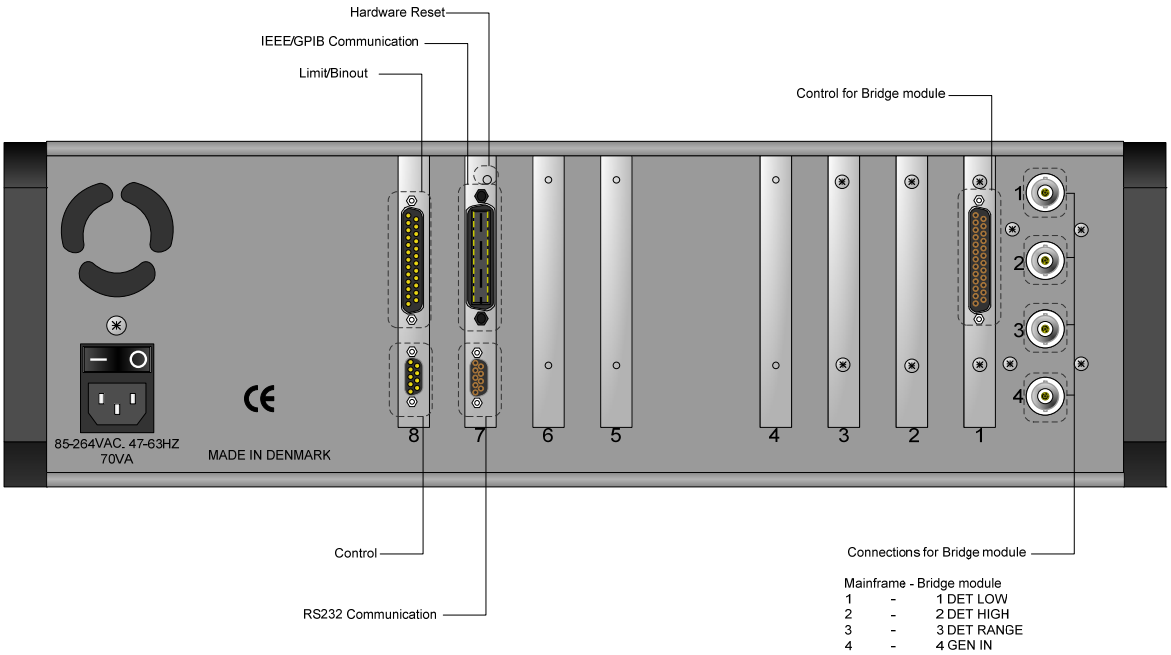


Fig. 2 DB23X Main frame rear

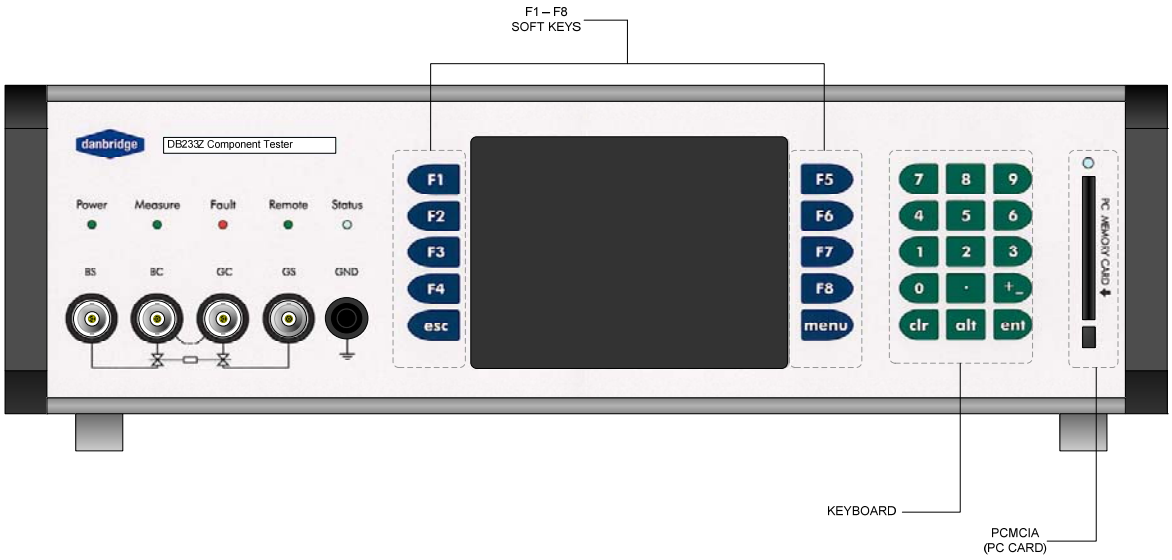


Fig. 3 DB233Z Main frame front

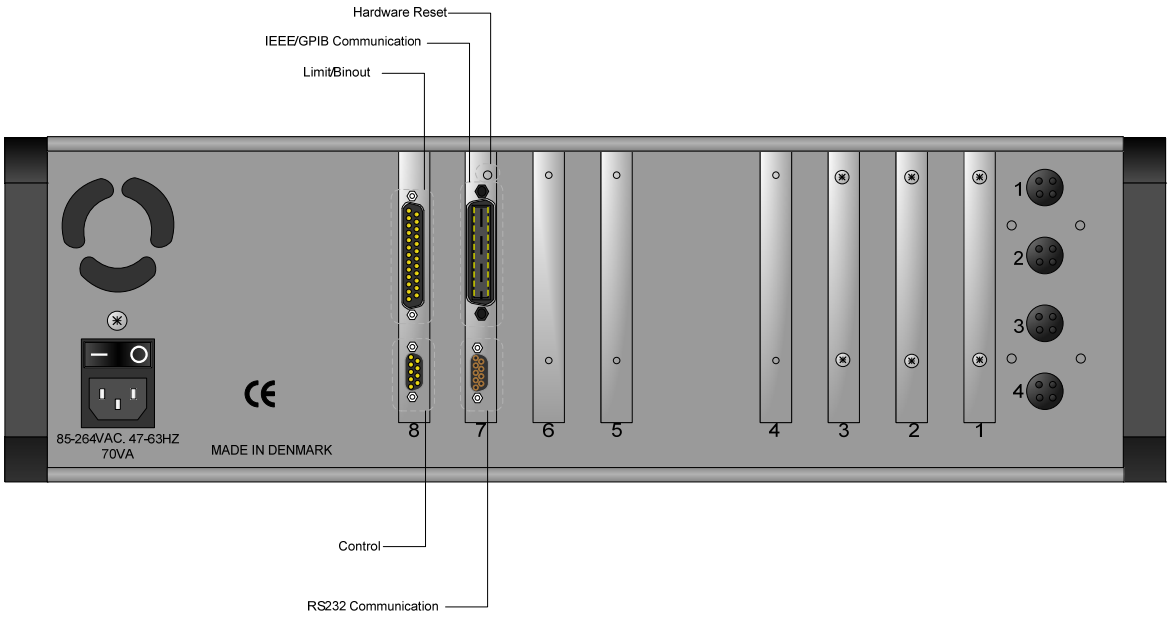


Fig. 4 DB233-Z Main frame rear

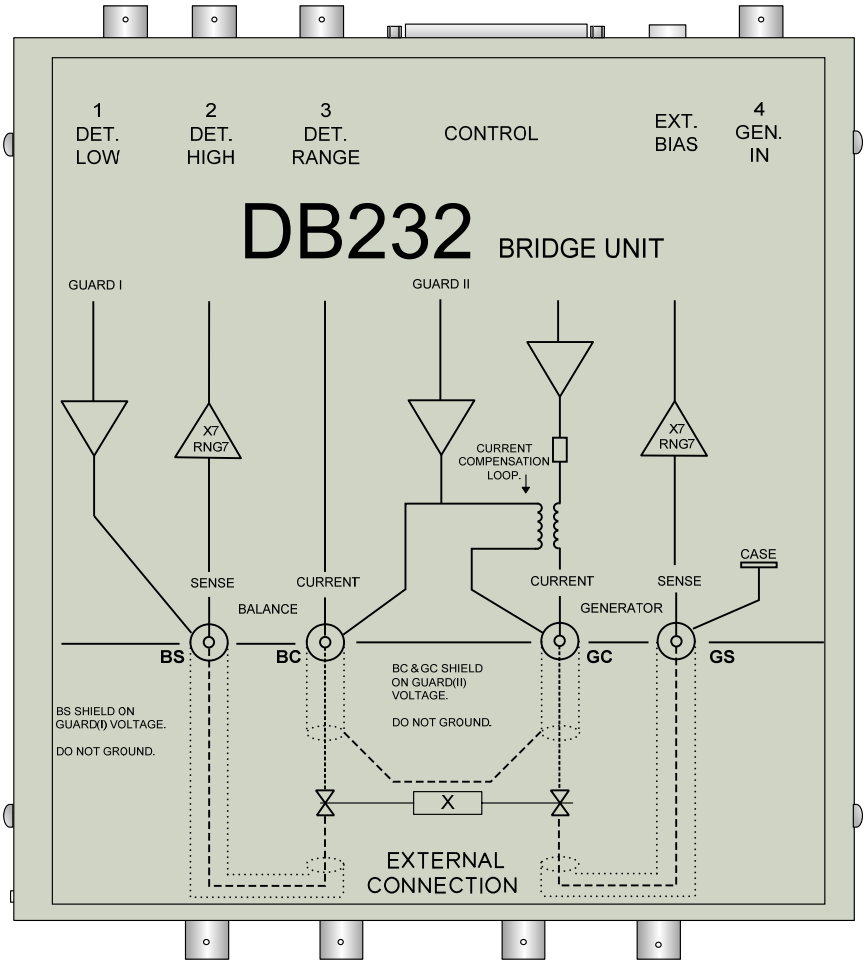


Fig. 5 DB23X Bridge Module top

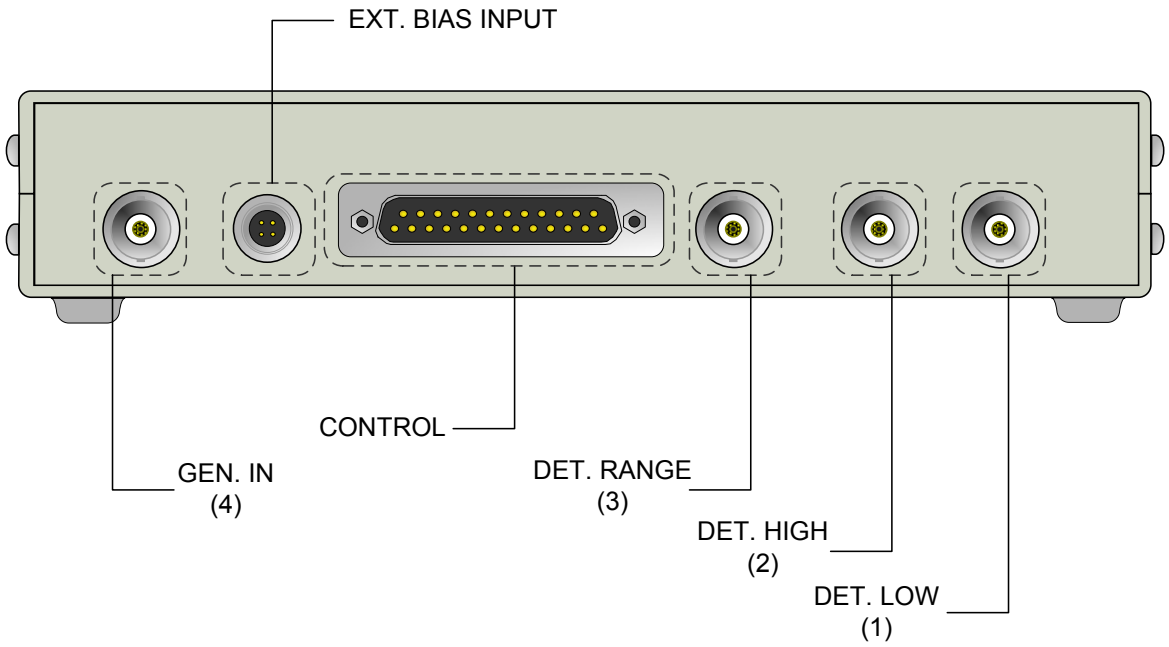


Fig. 6 DB23X Bridge Module rear

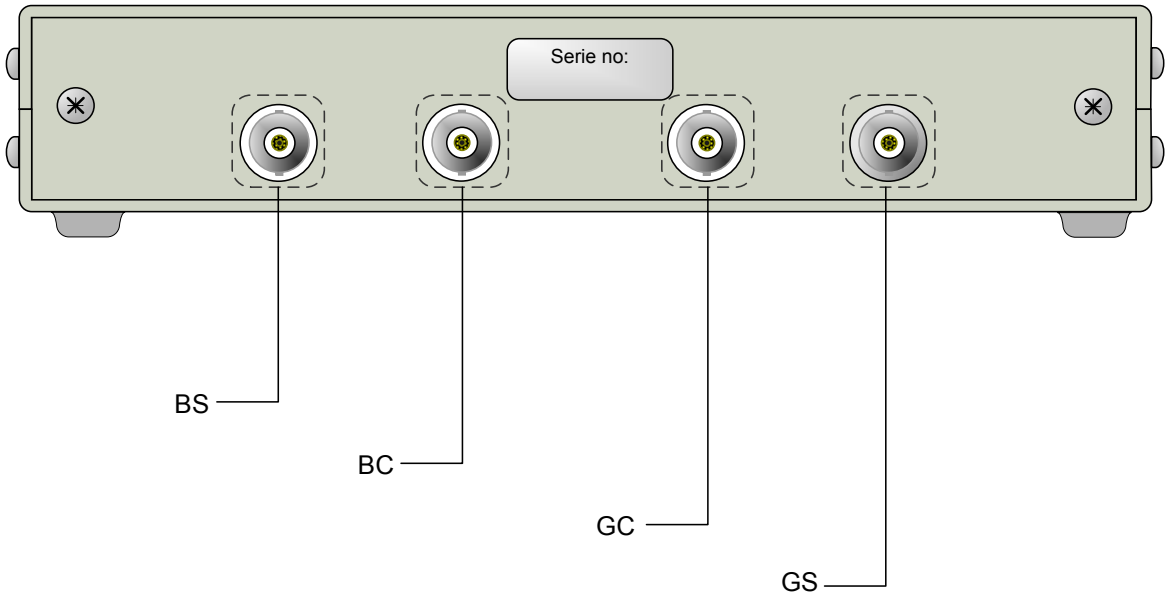


Fig. 7 DB23X Bridge Module front

Specifications

DB232 specifications

Measured Parameters:	C, L, R, Z, (serial or parallel) tan δ, ESR, Rs, Rp, Q, R-X, Z-Θ				
Measuring Frequencies:	100k, 10k, 1k and 100 Hz with multiple frequency facility				
Measuring Voltages:	1 V RMS up to 100μF at 100Hz - 0.1V steps (maximum 1.5 V RMS)				
	1 V RMS up to 10μF at 1kHz - 0.1V steps (maximum 1.5 V RMS)				
	1 V RMS up to 1μF at 10kHz - 0.1V steps (maximum 1.5 V RMS)				
	1 V RMS up to 0.1μF at 100kHz - 0.1V steps (maximum 1.5 V RMS)				
	Above: (linearly decreasing with the impedance)				
Measuring Speed:		100Hz	1kHz	10kHz	100kHz
	From trig to end of measurement*:	180ms	20ms	20ms	20ms
	From trig to data ready*:	190ms	28ms	28ms	28ms
	Additional time per meas. By average	160ms	16ms	16ms	16ms
	* Allowing 3ms contact bouncing or 1 range change				
	Multiple measurements (average):	Sum of each measurement (trig to end of measurement) + 8ms for calculation time			
Measuring Cables:	1m (39.3 inch) RG58 from bridge module to fixture				
Input Protection:	2 Joule up to 1kV or 4μF charged 1000V				
Bias Voltage internal:	Up to ±3.0VDC on generator terminal (0.1V steps) (internally generated)				
Bias Voltage external:	Up to ±48VDC (externally generated)				

Accuracy:

Frq.	100Hz	1kHz	Accuracy ±1 digit Capacitance	Tan δ
	300pF - 3nF	1pF - 39pF	0.5%	± .0010
		40pF - 3,9μF	0.05%*	± .0002
	3nF - 30μF	4μF - 399μF	0.1%	± .0007
	30μF - 300μF		0.1%	± .0010
	300μF - 3mF	400μF - 1mF	1%	± .0020

Frq.	10kHz	100kHz	Capacitance	Tan δ
	0.1pF - 3.9pF	.03pF - .9pF	0.1%	± .0010
	4pF - 3.9μF	1pF - .9μF	0.05%**	± .0002
	4μF - 39μF		0.1%	± .0007
		1nF - 9μF	0.2%	± .0010
	40μF - 400μF	10μF - 40μF	1%	± .0020

*Accuracy ± 0.2pF **Accuracy ± 0.1pF

The above specifications require a stable jig with stray capacitance lower than 30pF

Bin Sorting:	Up to 12 limits for 1st parameter and 4 limits for 2nd parameter by opto-couplers	
Interfaces:	Rear panel:	IEEE 488 (GPIB) and RS232C
	Control:	Measure end, data ready, trig ready, fault and status
	Trig input:	DC, AC and contact closure
	Front panel:	PC card (PCMCIA) for set-ups, save and loading
Environment:	Ambient temperature:	10-30 degrees Celsius
	Warm-up time:	Minimum 30 minutes
	Power:	90-130 and 200-260 V AC, 50-60 Hz,
Calibration interval:	Minimum:	Every 12 months

		Mainframe	Bridge module
Dimensions:	Height:	140mm – 5.5 inch	35mm – 1.4 inch
	Width:	438mm – 17.2 inch	192mm – 7.5 inch
	Depth:	360mm – 14.2 inch	205mm – 8.1 inch
	Weight:	13kg - 29 lb	1kg – 2.3 lb

DB236 specifications

Measured Parameters:	C, L, R, Z, (serial or parallel) tan δ, ESR, Rs, Rp, Q, R-X, Z-Θ
Measuring Frequencies:	100k, 10k, 1k and 100 Hz with multiple frequency facility
Measuring Voltages:	1 V RMS up to 100µF at 100Hz
	1 V RMS up to 10µF at 1kHz
	1 V RMS up to 1µF at 10kHz
	1 V RMS up to 0.1µF at 100kHz
	Above: (linearly decreasing with the impedance) Programmable in 0.1V steps (maximum 1.5V RMS)

Measuring Speed:	100Hz	1kHz	10kHz	100kHz
From trig to end of measurement*:	180ms	20ms	20ms	20ms
From trig to data ready*:	190ms	28ms	28ms	28ms
Additional time per meas. By average	160ms	16ms	16ms	16ms
*) 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 module to fixture (cables supplied by Danbridge)
Input Protection:	2 Joule up to 1kV or 4µF charged 1000V
Bias Voltage internal:	Up to ±3.0VDC on generator terminal, set in 0.1V steps (internally generated)
Bias Voltage external:	Up to ±48VDC (externally generated)

	Frequency	100Hz	1kHz	Accuracy ±1 digit Capacitance	Tan δ
Accuracy:		300pF - 3nF	1pF - 39pF	0.5%	± .0010
		-	40pF - 3.9µF	0.05%*	± .0002
		3nF - 30µF	4µF - 399µF	0.1%	± .0007
		30µF - 300µF	-	0.1%	± .0010
		300µF - 3mF	400µF - 1mF	1%	± .0020
		10kHz	100kHz		
		0.1pF - 3.9pF	.03pF - .9pF	0.1%	± .0010
		4pF - 3.9µF	1pF - .9µF	0.05%**	± .0002
		4µF - 39µF		0.1%	± .0007
		-	1nF - 9µF	0.2%	± .0010
		40µF - 400µF	10µF - 40µF	1%	± .0020

*Accuracy ± 0.2pF
The above specifications require a stable jig with **Accuracy ± 0.1pF capacitance lower than 30pF

Accuracy ESR & Z:

$$ESR = \frac{\tan d}{2 \cdot \pi \cdot f \cdot Cs} \qquad Zc = \frac{1}{2 \cdot \pi \cdot f \cdot C}$$

Bin Sorting:	Up to 12 limits for 1st parameter and 4 limits for 2nd parameter by opto-couplers	
Interfaces:	Rear panel:	IEEE 488 (GPIB) and RS232C
	Control:	Measure end, data ready, trig ready, fault and status
	Trig input:	DC, AC and contact closure
	Front panel:	PC card (PCMCIA) for set-ups, save and loading
Environment:	Ambient temperature:	10-30 degrees Celsius
	Warm-up time:	Minimum 30 minutes
	Power:	90-130 and 200-260 V AC, 50-60 Hz,
Calibration interval:	Minimum:	Every 12 months

Dimensions:	Mainframe	Bridge module
Height:	140mm or 5.5 inch	35mm or 1.4 inch
Width:	438mm or 17.2 inch	192mm or 7.5 inch
Depth:	360mm or 14.2 inch	205mm or 8.1 inch
Weight:	13kg or 29 lb.	1kg or 2.3 lb.

DB233Z specifications

Measured Parameters:	C, L, R, Z, (serial or parallel) tan δ, ESR, Rs, Rp, Q, R-X, Z-Θ
Measuring Frequencies:	100k, 10k, 1k and 100 Hz with multiple frequency facility
Measuring Voltages:	1 V RMS up to 100μF at 100Hz
	1 V RMS up to 10μF at 1kHz
	1 V RMS up to 1μF at 10kHz
	1 V RMS up to 0.1μF at 100kHz
	Above: (linearly decreasing with the impedance) Programmable in 0.1V steps (maximum 1.5V RMS)

Measuring Speed:	100Hz	1kHz	10kHz	100kHz
From trig to end of measurement*:	180ms	20ms	20ms	20ms
From trig to data ready*:	190ms	28ms	28ms	28ms
Additional time per meas. By average	160ms	16ms	16ms	16ms
*) 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 from instrument to fixture (cables supplied by Danbridge)
Input Protection:	2 Joule up to 1kV or 4μF charged 1000V
Bias Voltage internal:	Up to ±3.0VDC on generator terminal, set in 0.1V steps (internally generated)

	Frequency			Accuracy ±1 digit Capacitance	Tan δ
Accuracy:		300pF - 3nF	1pF - 39pF	0.5%	± .0010
		-	40pF - 3,9μF	0.05%*	± .0002
		3nF - 30μF	4μF - 399μF	0.1%	± .0007
		30μF - 300μF	-	0.1%	± .0010
		300μF - 3mF	400μF - 1mF	1%	± .0020
		10kHz	100kHz		
		0.1pF - 3.9pF	.03pF - .9pF	0.1%	± .0010
		4pF - 3.9μF	1pF - .9μF	0.05%**	± .0002
		4μF - 39μF		0.1%	± .0007
		-	1nF - 9μF	0.2%	± .0010
		40μF - 400μF	10μF - 40μF	1%	± .0020

*Accuracy ± 0.2pF **Accuracy ± 0.1pF

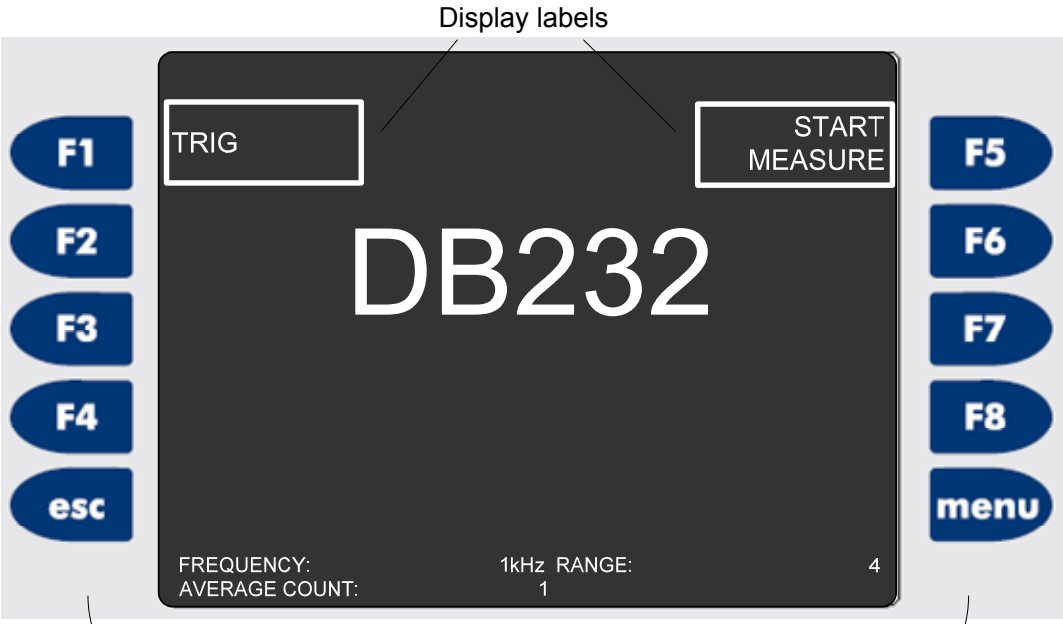
The above specifications require a stable jig with capacitance lower than 30pF

Zener option:	Measuring current: constant + or - 5mA	Accuracy ±10%
	Voltage: Minimum 50V (maximum 56V)	Accuracy ±1% or ± 0.1V
Bin Sorting:	Up to 12 limits for 1st parameter and 4 limits for 2nd parameter by opto-couplers	
Interfaces:	Rear panel:	IEEE 488 (GPIB) and RS232C
	Control:	Measure end, data ready, trig ready, fault and status
	Trig input:	DC, AC and contact closure
	Front panel:	PC card (PCMCIA) for set-ups, save and loading
Environment:	Ambient temperature:	10-30 degrees Celsius
	Warm-up time:	Minimum 30 minutes
	Power:	90-130 and 200-260 V AC, 50-60 Hz,
Calibration interval:	Minimum:	Every 12 months
Dimensions:		Mainframe
	Height:	140mm or 5.5 inch
	Width:	438mm or 17.2 inch
	Depth:	360mm or 14.2 inch
	Weight:	13kg or 29 lb.

Philosophy

This Manual

Please note that in this manual, keys are shown and display labels used are marked in bold text as in this example:



Start display

Soft key(s) around the display

(Text in the display for the actual function) (display label)

All menus and commands it this manual are explained as is if you are in the start display

Displayed Characters and Labels

Several of the soft keys are toggle switches, meaning that they will change every second time they are activated. For instance:

Stop Measure/Start Measure
The instrument is in continuous mode and will measure every ½ sec (approximately).

The next time 

is activated the measurements will stop.

The idea is that next time you will get what is shown in the display label.

Alternatively the situation could be

Start Measure/Stop measure
Meaning that the measuring has been stopped and the instrument is now waiting to be started again by pressing 

once.

Switch-On

Before switching-on please make sure that the mains voltage selector on the rear panel is set to the appropriate voltage and that the correct fuse is placed in the power socket housing: 1,0A slow (T) at 110V AC and 0,5A slow (T) at 230V AC.

Factory Setting

Factory Setting is at 230V AC and 0,5A slow (T)
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 lamp shows a green light, indicating that the power is on.

The DB23X starts with a memory check and the display shows DB23X. The DB23x will then detect whatever a bridge module is connected, read the calibration and store if (or verify with the values already stored in the DB23x). DB23x will display a message after a short time if everything is ok saying whatever it have read (stored on DB23x), verified (if the bridge module have not been changed since last check). In case something is not correct, it might take a little longer and then the DB23x will display whatever it does not see the bridge module (not plugged in – see section concerning Installation of the bridge module) or if some internal communication is malfunctioning.

On older software versions: The first time the instrument is connected to the module and turned on it will read the calibration from the module and display “calibration saved“ whenever it is ready (some 20-30 seconds later). Please wait until this has been displayed before making any measurements.

When the instrument is ready to measure the TRIG menu becomes available in the display.

After the instrument has passed the memory check and the first trig, the DB23X 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	110/230V AC is on (green light) and the main switch on the rear panel is on.
Measure	Is on (green light) as long as the instrument is running a measurement cycle.
Fault	Is on (red light) when an external fault is detected. An external fault could for instance be a wrong component.
Remote	Is on (green) when the instrument is controlled by IEEE or RS232C
Status	Green light means OK and red light means that something is wrong, for instance jig-calibration is not yet done.

Status LED

The Status LED is red as long as there is no Open or Short Jig zeroing stored in the memory. The reason could be that the last jig calibration has been deleted from the menu or 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 lamp is used for software updates, indicating when the new software has been stored into the flash memory (by red/green flashing).

Flashing light in the status lamp after start up indicates that there might be a fault in the microprocessor during the automatic internal test. In case this situation occurs, please contact Danbridge service department.

Installation of bridge module (for DB232 and DB236)

Warning: Do not connect or disconnect the bridge module when the power is switched on. This can destroy the calibration of the module and damage the hardware.

Please connect a suitable 4-terminal Kelvin jig to the instrument before start of measuring with DB23X, for instance the optional JIG32. 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 external bridge module 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.

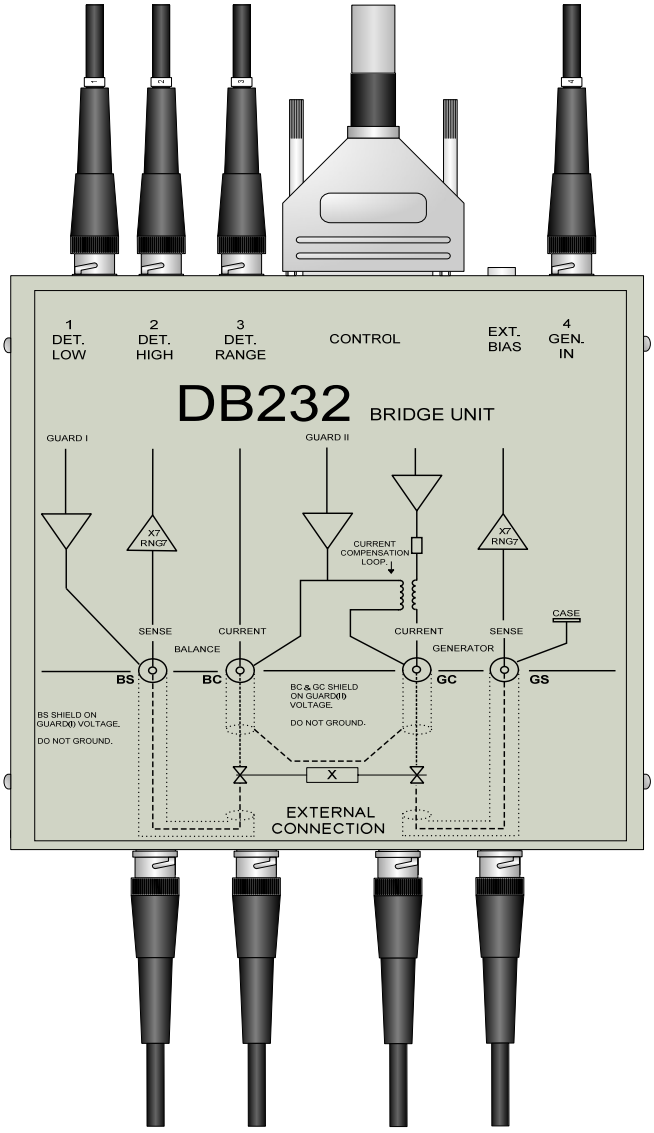


Fig. 8 Cable connections of bridge module

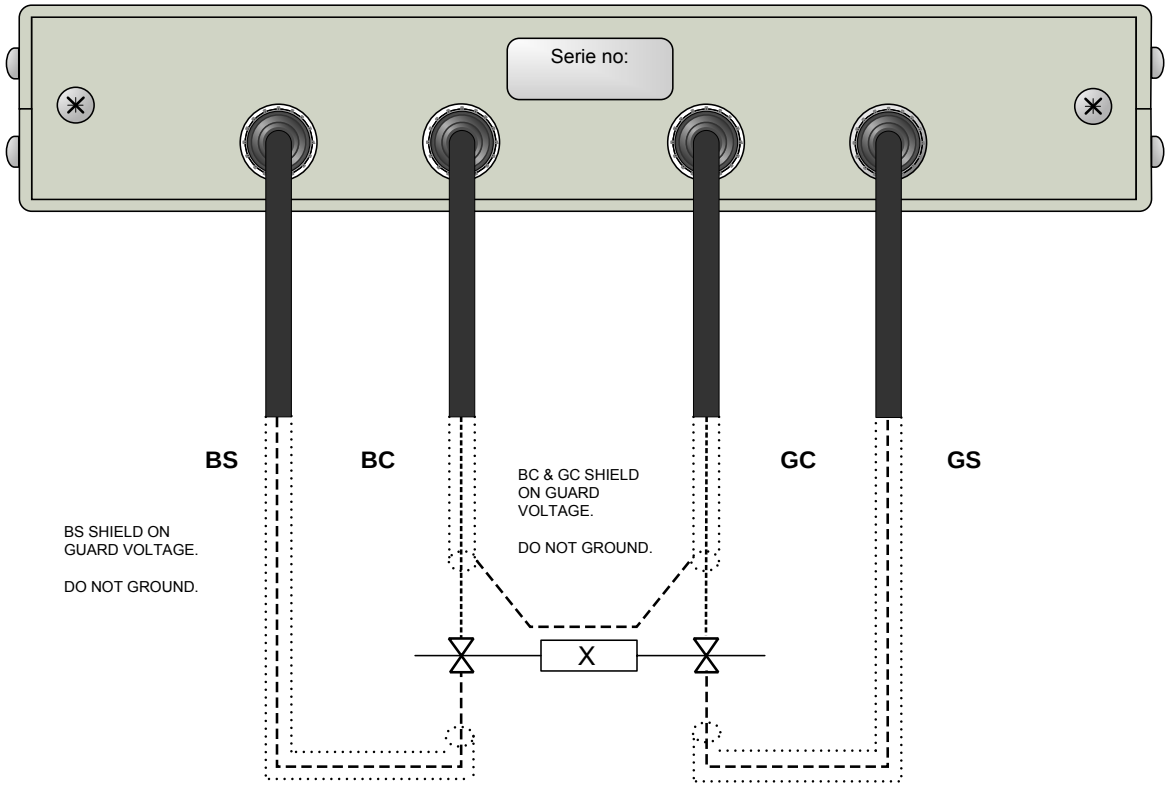


Fig. 9 Bridge module connection

Installation of the DB233Z

Please connect a suitable 4-terminal Kelvin jig to the instrument before start of measuring with DB233, for instance the optional JIG32. 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 external bridge module 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.

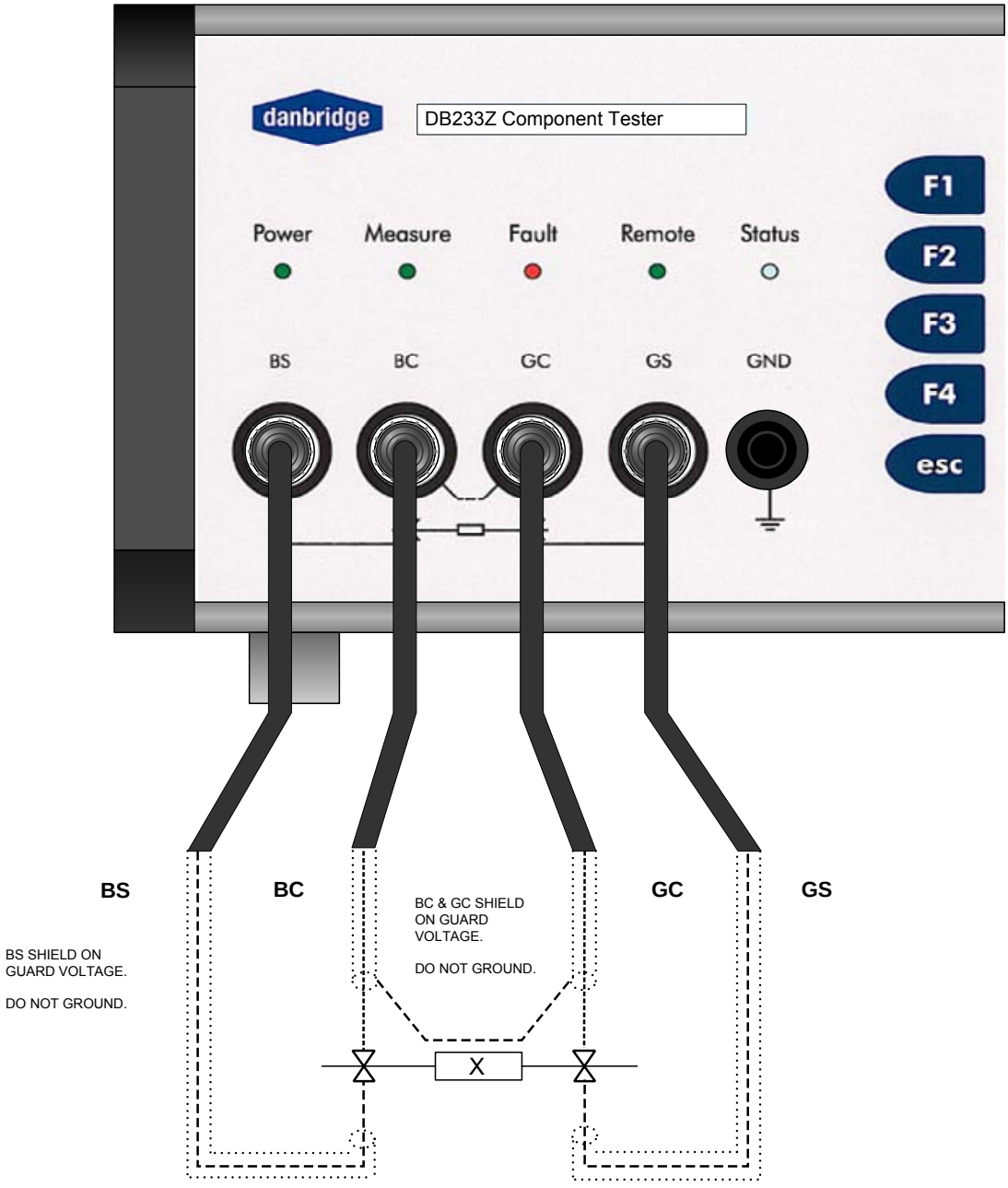


Fig. 10 Cable connections for DB233Z

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 mΩ 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 mΩ is normally considered very well.

The DB23X incorporates an active guard system which is different from other manufacturers. This system is described below. 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.

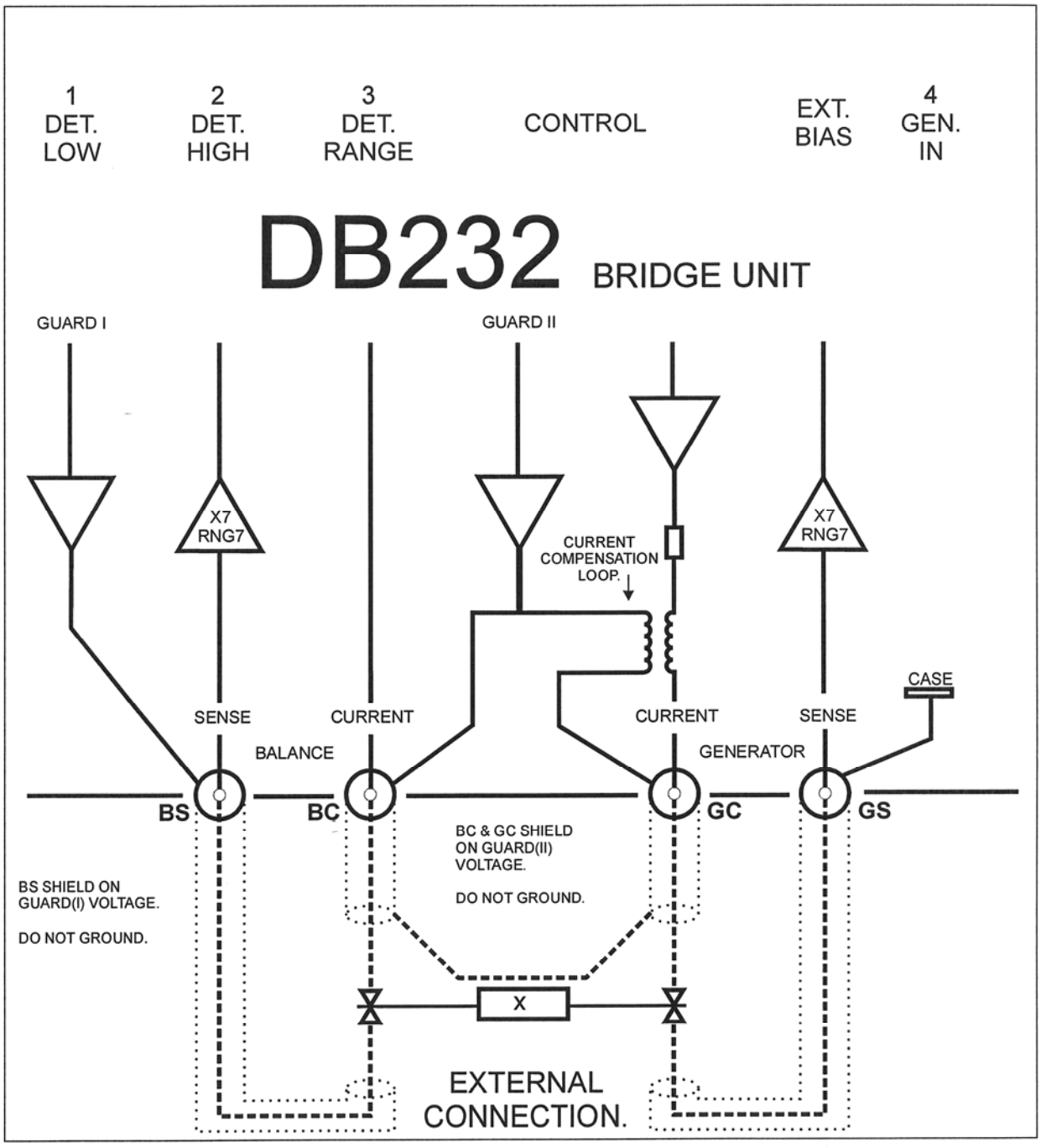
The general cabling from the bridge module or mainframe to the Jig is explained on the top of the module and on the front of the mainframe

BS
BC
GC
GS

Please notice the shield current loop between the BC and GC which must be soldered together. This should be done as close to the measurement jig as possible.
BS and GS shield should not be connected. Keep it the shield protected by the isolation material covering the cable.

Layout of Bridge Module for DB23X

Below follows a more detailed explanation of the bridge measuring system utilised by Danbridge.



Menu

menu

From the start display you can access the menu by this button
From this menu you have access to a range of submenus and commands:

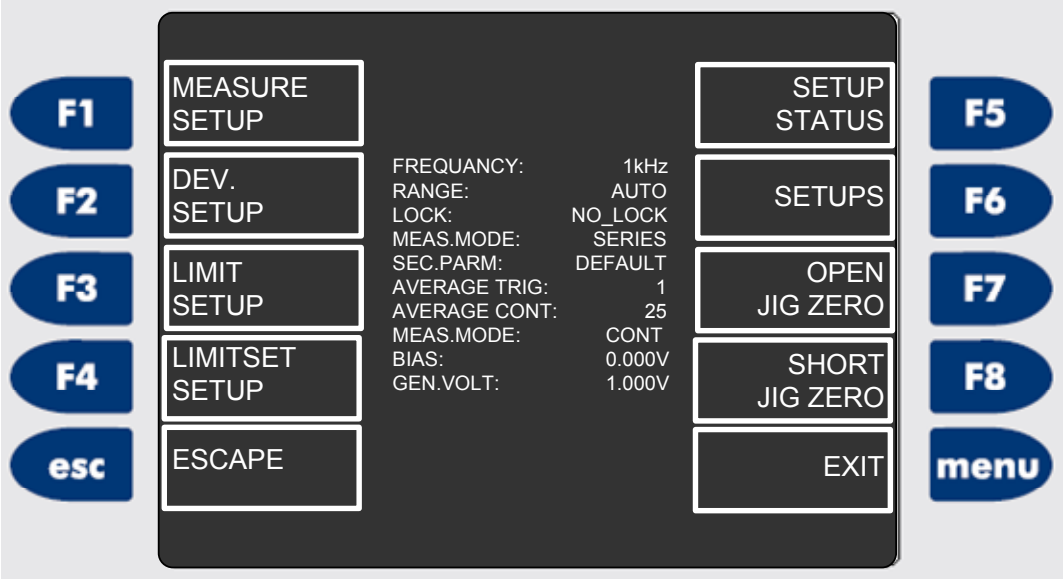


Fig. 11 Menu display

Setup Status

If you want to check the status of the current instrument setup, please press:

Setup status

The status display will inform you how the instrument is setup is done:

Frequency	Limit on/off
Range	LIM 0
Lock	LIM 1
Nominal Deviation	LIM 2
Measurement mode	LIM 3
Second parameter	LIM 4
Average Count	LIM 5
Measuring mode	LIM 6
Contact Check	LIM 7
DBL FRQ Bin	LIM 8
Remote	LIM 9
Data transmission	LIM 10
IEEE address	LIM 11
EOI	Second parameter
TON	SEC LIM 0
	SEC LIM 1
	SEC LIM 2
CT30 Mode	SEC LIM 3

For DB233Z

Frequency	Limit on/off
Range	LIM 0
Lock	LIM 1
Nominel Deviation	LIM 2
Measurement mode	LIM 3
Second parameter	LIM 4
Average Count	LIM 5
Measuring mode	LIM 6
Contact Check	LIM 7
DBL FRQ Bin	LIM 8
Remote	LIM 9
Data transmission	LIM 10
IEEE address	LIM 11
EOI	Second parameter
TON	SEC LIM 0
	SEC LIM 1
	SEC LIM 2
CT30 Mode	SEC LIM 3
	Range lock
	Zener

Jig Calibration

Open Jig Zero compensates for stray impedance's 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 calibrate the instrument by Jig zero the fixture before any measurements are made with the DB23X. Also when the status lamp on the front panel is red, please calibrate as described below.

Remove any components from the fixture and press the following

menu

F7

Open Jig Zero

As shown below, the contacts should be closed and shorted 2 by 2.
It is very important that the contacts are closed as shown below and not open.

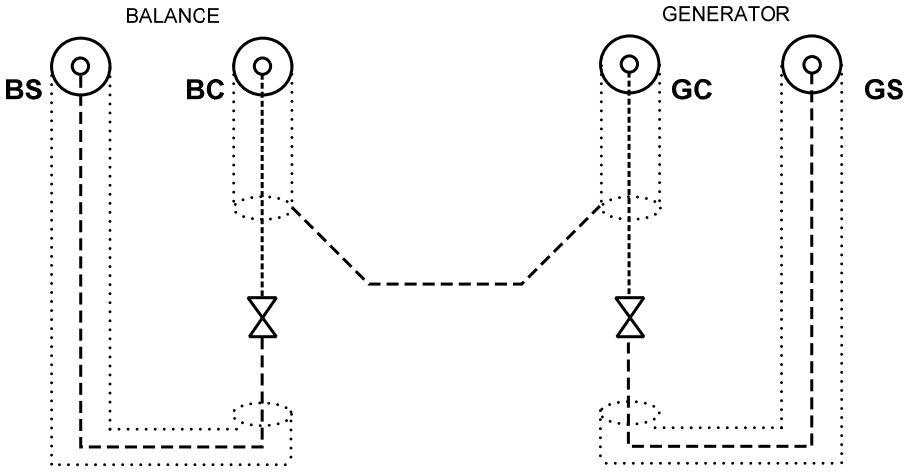


Fig. 12 Open jig zero

During the open jig zeroing, the display will show "***Jig Zero Running***"
When finished the display will show "***Jig Zero Open End"***
The open jig zeroing lasts approximately 12 sec.

During the calibration process, please keep away from the area 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.

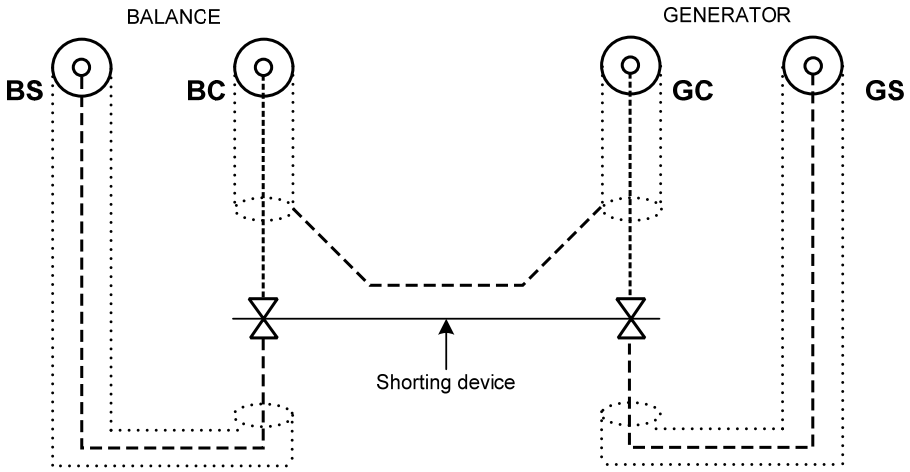


Fig. 13 Short jig zero

Please inset shorting device as shown above and notice that the contacts should be shorted, all 4 together and press

menu *(If not already in menu)*

F8 ***Short Jig Zero***

During the short zeroing, the display will show "***Jig Zero Running***"
When finished the display will show "***Jig Zero Short End"***
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 devices for the SMD Jig as separate devices.

Deleting jig calibration

In order to delete the jig calibration, please use the keyboard and press:

Alt display with several facilities

Reset Menu

Jig Zero Off

This deletes the current jig calibration and the status light turns red, to indicate there is no jig calibration done.

To Measure

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 has been performed)

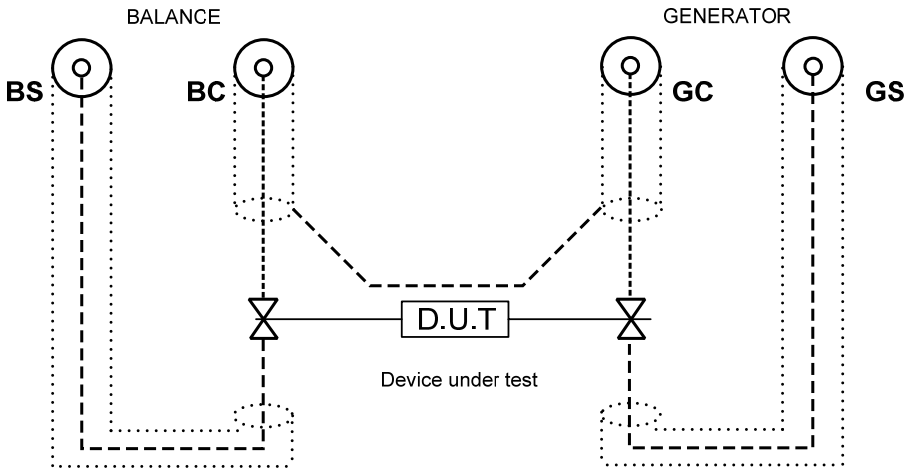


Fig. 14 Component placement when testing

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.

F1

Trig (single trig)

or

F5

Start Measure (continuous)

Trig Delay

The time from Trig to the start of measurement can be programmed from Zero to 99msec. This Trig Delay is used to avoid range changes due to contacts which are not completely stable when the Trig signal arrives.

The Trig Delay is entered by pressing

menu

F1

Measure Setup

F6

Average

F2

Trig Delay

Measuring Speed

Normal mode

	100Hz	1kHz	10kHz	100kHz
From trig to end of measurement:	180ms	20ms	20ms	20ms
From trig to data ready:	190ms	28ms	28ms	28ms
Additional time per meas. by average	160ms	16ms	16ms	16ms
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

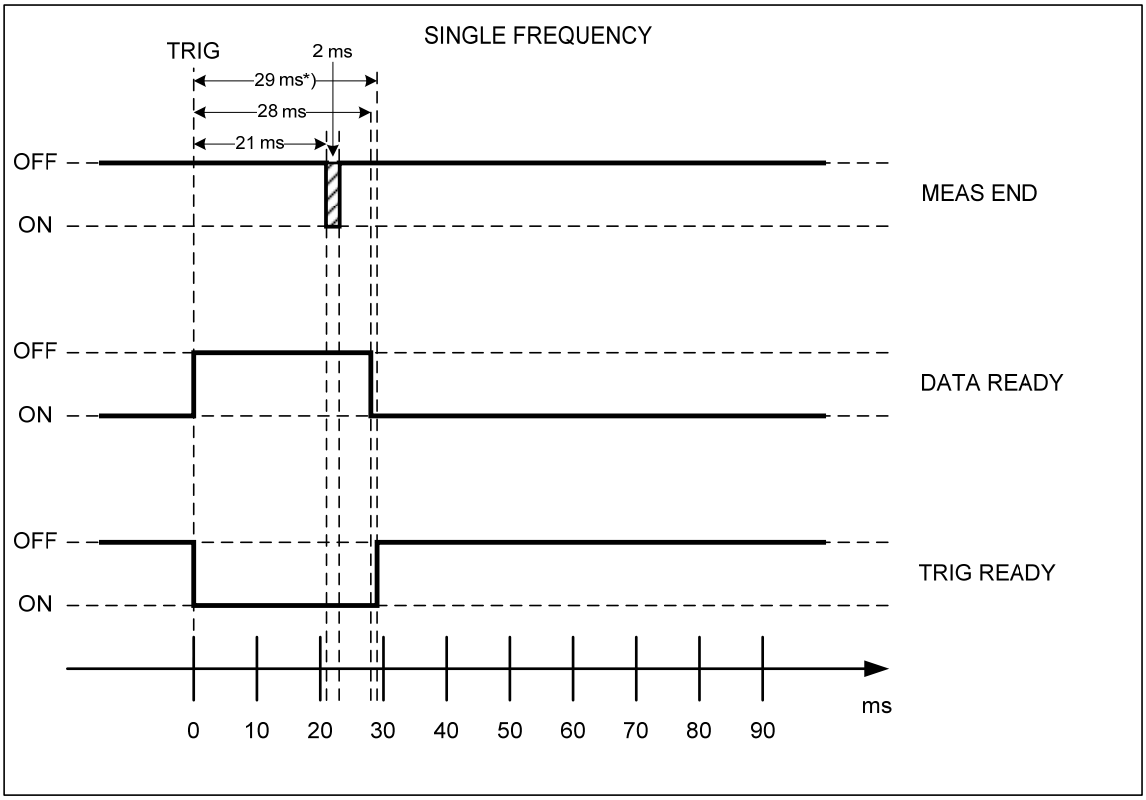


Fig. 15 Timing Diagram Single Frequency

*)Trig ready time: Depending on the remote interface: 29 mSec by IEEE or Datatransmission OFF, 40 mSec by RS232C with 19200 baud.

1kHz + 100kHz Normal Mode

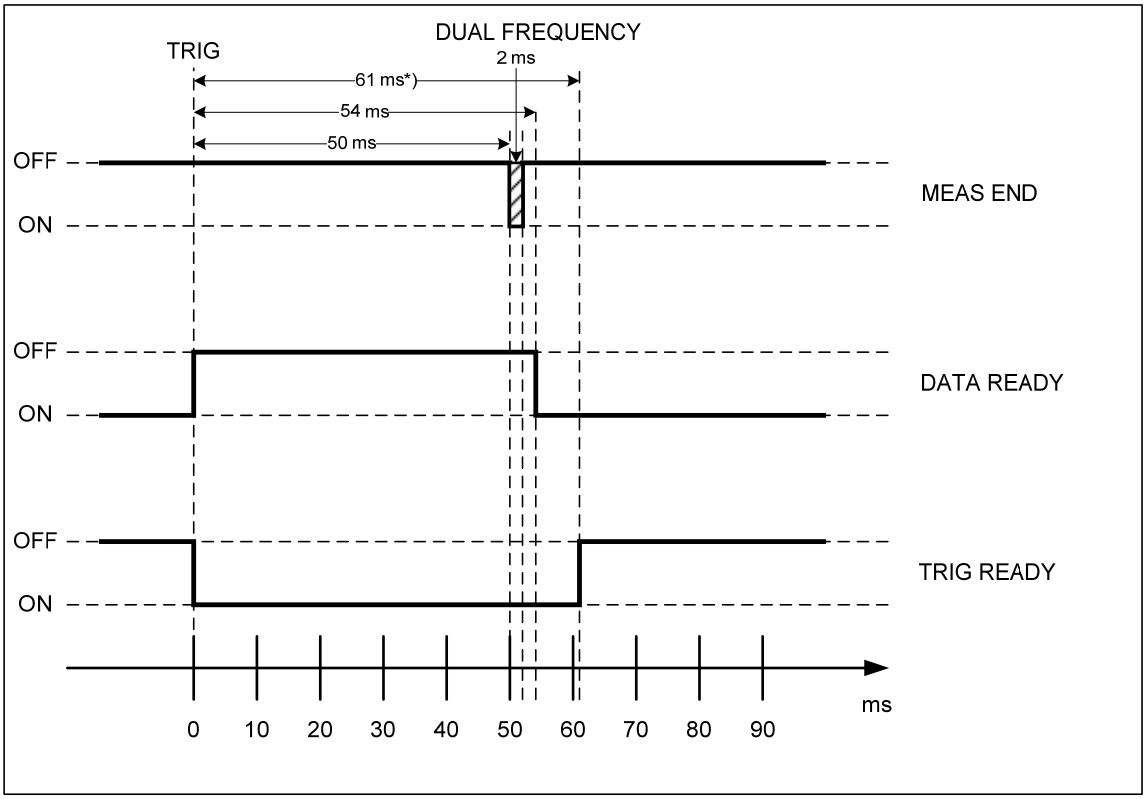


Fig. 16 Timing Diagram Dual Frequency

*)IEEE and Datatransmission OFF

Trig mode (from front panel)

Trig
is used for single trig measurement

Continuous mode

Start Measure

By activating the key the instrument will go into continuous mode and start measuring and the label on the display will show the next possibility:

Stop Measure

When the instrument is in continuous mode, it will measure continuously.
Next time the key is activated the measurements will stop, consequently the display will show the next possibility:

Start Measure

Meaning that the measuring has been stopped and the instrument is now waiting to be started again by pressing either 

or 

The measured results are shown on the display, the upper line shows capacitance and the lower line shows the default loss factor, tan δ

At the bottom of the display, you may see details from the setup:

Frequency :	Shows the actual test frequency
Range:	Shows the actual range selection
Average count:	Shows the actual number of measurements selected before calculation and display of average value.

Please notice that the speed of the updates in the display is determined by the chosen average count. This value can be seen from the bottom of the display. Default setting of average count in continuous mode is 25.

By connecting a component to the 4 terminal fixture the component values may be measured, as described above. The results will appear as shown in Fig. 17 Measure Display

Measure display

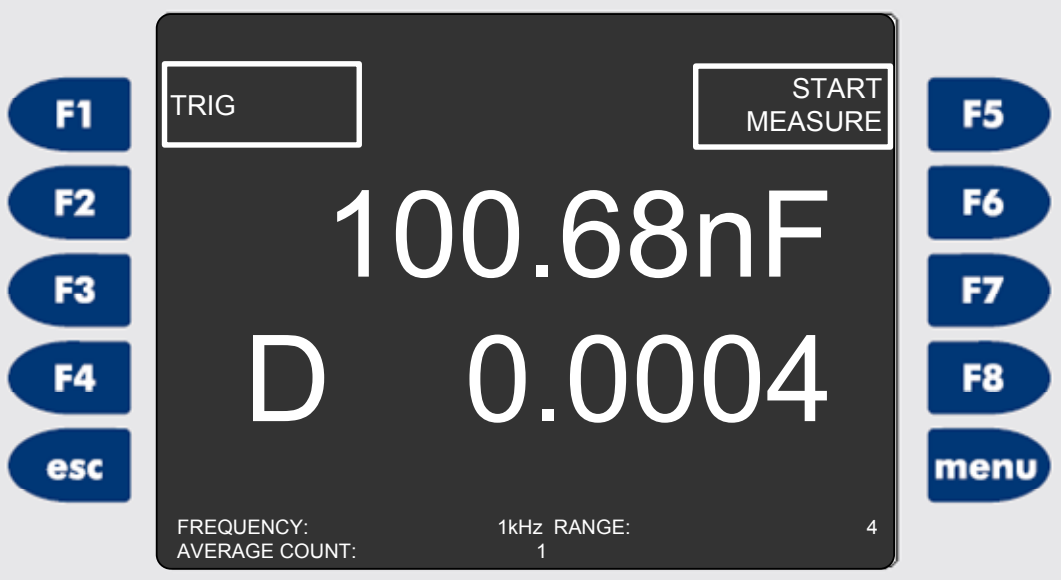


Fig. 17 Measure Display

Frequency Selection

The test frequency can be selected by pressing:

menu
F1

Freq
If you wish to measure only on one single frequency mode, press:

F5

Single freq
If you wish to on two frequencies in a cycle, press:

F6

Double freq
If you wish to measure at three frequencies, press:

F7

Triple freq
If you wish to measure at four frequencies, press:

F8

Quad freq
After choosing the number of frequencies to utilise, the specific frequencies may be chosen from the left side of the display, where the relevant soft keys are available.

100Hz

1kHz

10kHz

100kHz

When programming double frequency mode, the first selected frequency will be the primary frequency and the frequency selected next will become the secondary frequency. This has special importance when sorting into bins on a sorting machine, which is a main purpose of many DB23Xs.

A typical test is 1 kHz/100 kHz

Escape will return you to the main screen.

Exit may step backwards step by step.

Serial / Parallel Selection

You may choose between serial and parallel measuring modes by using:

Measure Setup

Select Serial / Select parallel

The soft key is operating as a toggle switch, shifting between serial mode and parallel mode every second time the key is pressed.

The actual mode is shown in the status display visible by pressing 

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 average count value may be set by the operator. Values between 1 and 100 are accepted.

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

The average count is changed as follows.

Measure Setup

Average + M. Speed

Average on Cont

Average on Trig

Select the required number of average count (1 to 99) by using the numeric keyboard and when finished press 

If you enter a wrong value it can be corrected by using 

Range Selection

Absolute measuring mode

Ranges may be selected manually (fixed range) or automatically (auto range).

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 as the total time for measuring one component is shorted significantly by letting the instrument know the range which should be used.

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.

Deviation measuring mode

When running the instrument in deviation mode, using a nominal value, the DB23X 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.

The instrument has 7 ranges:

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

The ranges may be selected by using soft keys:

Measure Setup

Range

Range up

Range down

Auto Range

Parameter Control

When measuring capacitors or inductors the following keys control the parameters measured:

Measure Setup

Parm set (parameter setting)

Gives you access to select the following second parameters:

Q

D

R

G

Default (will set d with C or Q with L components)

Z - Θ (radian)

Z - Θ (degree)

R – X

Escape will return you to the main screen.

Exit may step backwards step by step.

Selecting Parameter Lock

Lock may be selected by:

Measure Setup

Lock

The following possibilities are then available:

No Lock

R Lock

C Lock

L Lock

LC Lock

CLC Lock (LC Lock + C Lock)

LLC Lock (LC Lock + L Lock)

Escape will return you to the main screen.

Exit may step backwards step by step.

Deviation Measurements

menu
F2

Dev. Setup

F2 ***Deviation Setup***

Will give you access to measure related menus such as:

F1	***Deviation off***	Switch off / on deviation measuring mode (toggle function)
F2	***R deviation***	Select R deviation
F3	***C deviation***	Select C deviation
F4	***L deviation***	Select L deviation
F5	***Percentage***	Select percentage deviation
F6	***Nominal value***	Let you program the nominal value
F7	***Delete Nom val***	Delete nominal value
F8	***Not in use***	

esc ***Escape*** Will let you escape the present settings without storing the settings or let you jump back to the measure display in one step.

menu ***Exit*** Let you step backwards one by one step

The soft keys F1, F2, F3, F4, and F5 will activate the above mentioned functions when pressed.

F6

Nominal value

Type the required nominal value of the component you want to test by using the numeric keyboard and select the item (Ω, F or H).

Then finish by ent
If you need to correct the nominal value while typing, use clr

Limits

The DB23X 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 DB23X, 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 DB23X 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.

Double Frequency Limits

Binning in Dual Frequency Mode

In dual frequency measurements it is possible to redefine the secondary limits so that LIM 0 (SLIM 0) is a GO/NOGO limit for the "PFQ" (primary frequency) second parameter and LIM 1 a GO/NOGO limit for the

"SFQ" second parameter.

The BIN number definition is then:

SLIM 0		SLIM 1	
SBIN 0	SBIN 1	SBIN 2	SBIN 3
GO	NOGO	GO	NOGO
|____PFQ_____|		|____SFQ_____|	

LIM 2 and LIM 3 are ignored in this mode.

NB. When in Dual frequency binning the value of SLIM1 is independent of SLIM0

This "two GO/NOGO limit" mode is selected in dual frequency mode by:

Limit setup

DBL FRQ BIN ON (Toggle switch OFF)

Limit Setup

When a nominal value has been programmed (see deviation) it is possible to let the DB23X run in limit mode sorting out the measured components in 13 bins for the main parameter (C, L, R or Z) and 5 bins for the second parameter.

The limits are easily programmed by pressing:

menu
F3

Limit setup

F3 ***Limit setup*** Will give you access to the limit programming menu:

F1	***Disable limits***	Will switch off any selected bin mode
F2	***Edit limit***	You may edit a selected limit
F3	***Not in use***	
F4	***Delete limit***	You may delete a selected limit
F5	***Previous limit***	You may go backwards to select a limit
F6	***Next limit***	You may go forwards to select a limit
F7	***DBL FRQ ON***	Selects to set the DB23X in dual frequency binning mode.
F8	***Bin out cont on***	Selects continous measurements in manual sorting.

esc ***Escape*** Will let you escape the present settings and let you jump back to the measure display in one step.

menu ***Exit*** Let you step backwards one by one step

First Parameter

LIM 0	Low reject limit
LIM 1	
LIM 2	
LIM 11	High reject limit

Second Parameter

SEC LIM 0	GO
SEC LIM3	NO-GO

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.

menu
F4

Limit set setup

F4 ***Limit set setup*** Will give you access to the limit set save and recall menu:

F1	***Save limit set***	You may save a limit set in position 1 to 5
F2	***Recall limit set***	You may recall a limit set from position 1 to 5
F3	***Delete limit set***	You may delete a selected limit set
F4	***Not in use***	
F5	***Previous limit set***	You may go backwards to select a limit set
F6	***Next limit***	You may go forwards to select a limit set
F7	***Not in use***	
F8	***Not in use***	

esc ***Escape*** Will let you escape the present settings and let you jump back to the measure display in one step.

menu ***Exit*** Let you step backwards one by one step

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

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 DB23X by an input current of 10mA (maximum 30mA forward and maximum 6V reverse). The opto-coupler outputs are rated 25V and 10mA each

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 Setting (internal)

DC Bias may be used for measuring the capacitance in a diode or for measuring the capacitance as a function of the voltage across the capacitance diode. Furthermore the DC Bias may be used for polarising an electrolytic capacitor correctly during the measuring sequence.

Up to ±3.0V DC bias may be superimposed on the measuring signal in 0.1V steps:

Measure setup

Bias setting

Select the required voltage for the bias (±3.0V) by using the numeric keyboard and when finished press

If you need to correct the voltage typed, use 

Bias Voltage external

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

Up to ±48V external DC bias may be supplied via the miniature connector located on the rear of the bridge module.

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

menu
F1
F7
F4

Measure setup

Bias setting

External Bias ON/OFF (toggle switch)

I using the numeric keyboard and when finished press ent

if you need to correct the voltage typed, use clr

Zener measurements (DB23Z)

For testing of Zener diode voltage, positive or negative constant current generators of 5mA max. 56V (sign is referred to the generator terminals) is connected to the measuring terminals, and the resultant DC voltage across the diode is displayed as a signed value.

Zener measurements may also be selected by remote control (see page 55)

menu
F1
F7
F5
F6
F7

Measure setup

Bias + zener

Zener on positive

Zener on negative

Zener off

Generator Voltage Setting

Normally the DB23X 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.

Up to 1.5V RMS can be set in 0.1V steps by:

Measure setup

Gen. Volt + Contact (Generator setting)

Select the required RMS voltage (±1.5V) by using the numeric keyboard and when finished press 

If you need to correct the voltage typed, use 

CONTACT CHECK:

Measure setup

Gen. Volt + Contact

Contact check (on/off)

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.

Bus and I/O setting

The alt menu gives access to several facilities and sub menus:

Alt display with several facilities

Bus I/O setup
Menu with several facilities

IEEE setup
Bus address, EOI & TON setting

RS232 setup
Baud rate, data bits, parity and TON

Cancel data out
Toggle switch for switching data output on/off

Select IEEE / RS232
Toggle switch for selecting IEEE or RS232

CT30 mode on/off
Toggle switch for letting the instrument communicate as the instrument CT30 (emulating CT30).

CT20 mode on/off
Toggle switch for letting the instrument communicate as the instrument CT20 (emulating CT20).

Set fast data out
Reduced output format used under high- speed measurements

Reset the DB23X

The program in the DB23X may be reset in two ways:

1. Software reset from the front panel, using the keyboard by pressing:

Alt display with several facilities

Reset menu

Software Reset

2. 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.

Warning

Please note that software reset will delete all data, Bin settings, Setup, etc.

The RAM memory will be totally cleared by reset

Test Program

In order to go into the test software, please use the keyboard and press:

Alt display with several facilities

Test Program

By pressing the above mentioned keys, you will open the Test Software.

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 loosing the entire basic calibration is quite high. Therefore please note this part of the program is available, but interaction should normally be avoided.

Display Setup

The display is of a LCD type and these types of displays do have a limited display angle.
If you want to change this angle or you prefer to see the display inverse (black on white) you may adjust the display as you like by using the keyboard and pressing:

Alt display with several facilities

Display Setup
By pressing the above mentioned keys you will open the Display Setup display, where you may press:

Dev. Norm Small/Double
The display will, when in deviation mode, either display nominal value with a large (double) or normal (small) font.

Cancel Display

Normal Display
The display will present the measurements in Tan Delta with four decimals.

High Res Display
The display will present the measurements in Tan Delta with five decimals.

Display, Black on White
This soft key is a toggle switch that changes the display to what is stated on the label on the display every second time the key is activated. Consequently the display will change to the opposite by pressing again:

Display, White on Black
Display contrast may change by temperature and may be adjusted by

Display Contrast
Default value is ***C+00*** but this may be adjusted by pressing

Display Contrast +

Display Contrast -

Display Contrast Clear
(Will reset the selected value contrast to default ***C+00***)

Reset from the front panel or by remote control will also set the display value to default ***C+00***

PC Memory Card

The PC Memory Card is used for software updating or saving measurement setups. A complete update requires two PC Cards containing software for the Measurement CPU (MCPU) and for the Control CPU (CCPU).

Insert the PC Card with the new software in the slot starting with the Measurement CPU (MAxx).

Alt display with several facilities.

SOFTWARE RELEASE

SOFTWARE UPDATE

The DB23X will display which CPU will be updated, the yellow Power ON LED above the PC Card will light up shortly and:

for software release CA24 and later versions:

"Warning
Updating Software
Please wait"

will appear on the display.

Soon after the instrument will automatically reset and will appear on the display.

Remove the PC card and the instrument is ready for use.

WARNING! The Mains Supply must not be switched off or the rear panel reset switch must not be activated, after F4 is entered and before DB23X appears in the centre of the display.

Serviceability

With this generation of Danbridge instruments, a major step has been taken in order to improve serviceability on the instruments.

The idea is that exchanging a PCB in the instrument, should be as easy as exchanging a board in a standard PC. The horizontal motherboard is almost without components, except for the connectors for the PCBs. Consequently all the electronic circuits are to be found on the vertical PCBs which are very easy to remove or exchange in case of any malfunction.

For further information, please check our web site: www.danbridge.com where you may find answers to your questions or contact Danbridge.

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

Technical service questions, repair of equipment: service@danbridge.com

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

Or you may contact Danbridge by:

Postal address:

Danbridge Electronics
Herlev Hovedgade 195, 1. tv.
DK-2730 Herlev
Denmark

Phone: +45 4495 5522
Website/URL: www.danbridge.com / www.danbridge.dk

REMOTE CONTROL OF DB23X

Remote interface DB23X

There are two ways to remote control the DB23X either by IEEE 488 (GPIB) or by RS232C.

WARNING: DO NOT CONNECT ANY CABLES BETWEEN THE DB23X AND A CONTROLLER WTHOUT 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. Except the bus settings in the alt 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 bus settings in the alt 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).

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 DB23X. 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 DB23X 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 have 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 DB23X 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 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 DB23X (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 DB23X 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 below.

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-15	F

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

Commands which are on/off commands as, for example, CCHECK the data can be ON/OFF or O/1.
0/1 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**;**
Example: 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 = 0/1 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 me 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 add 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 47.000PFCR
	LF

Commands which 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 DB23X will reply in fixed decimal format.

See fig. Fig. 18 Service Request Register System

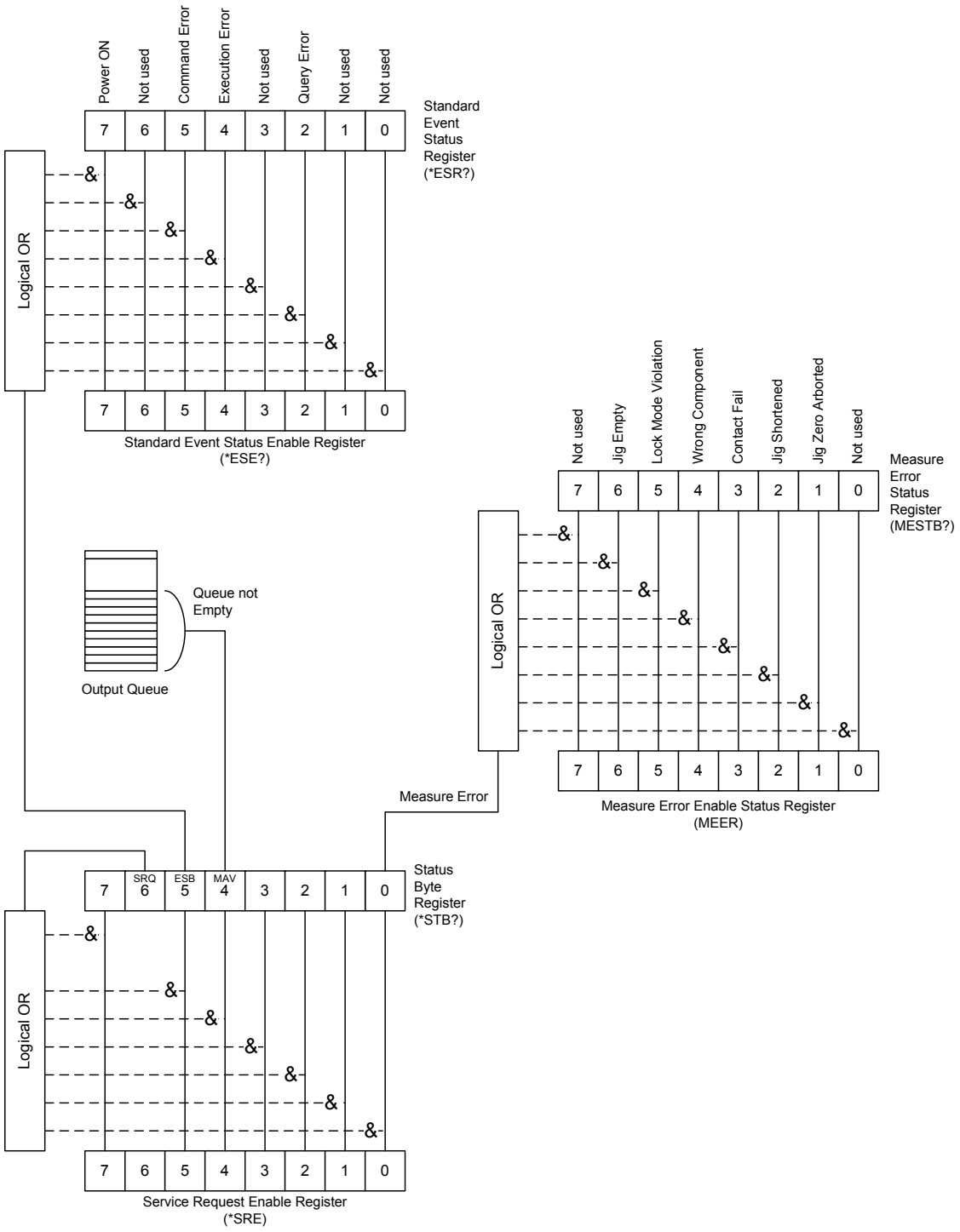


Fig. 18 Service Request Register System

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 DB23X will generate a service request interrupt. The STATUS BYTE REGISTER is cleared by reading.

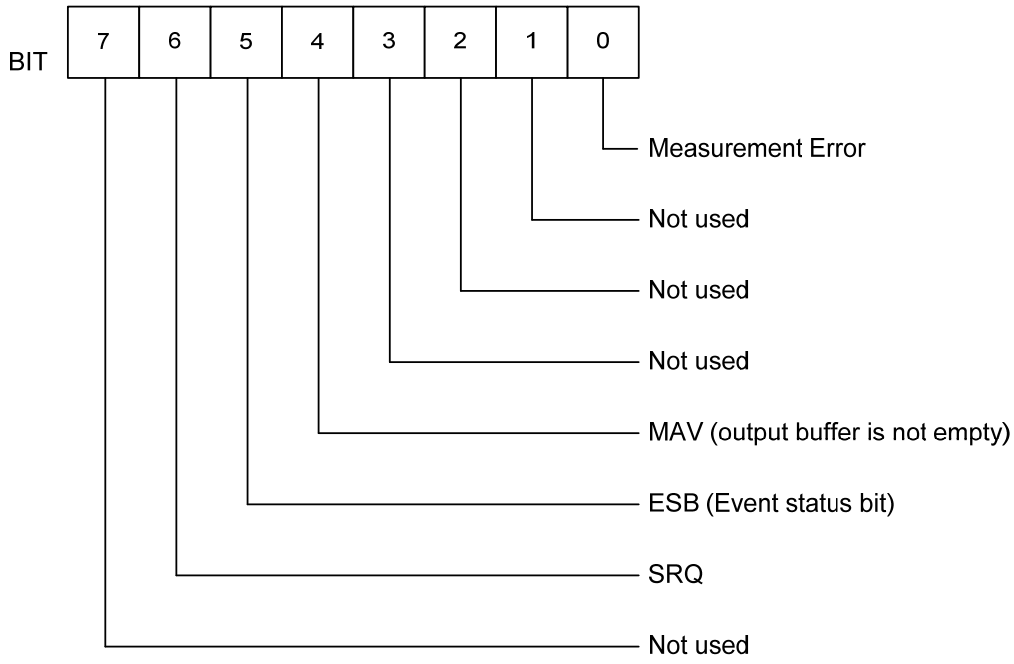


Fig. 19 Status Byte Register

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 DB23X will set the ESB bit in the STATUS BYTE REGISTER.
The STANDARD EVENT STATUS REGISTER is cleared by reading.

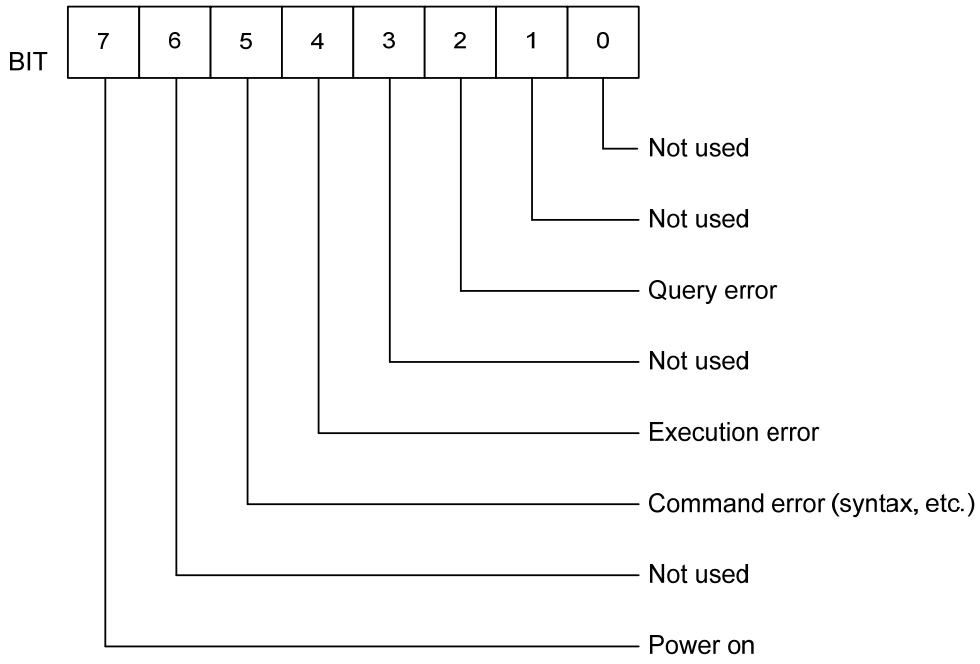


Fig. 20 Standard Event Status Register

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.

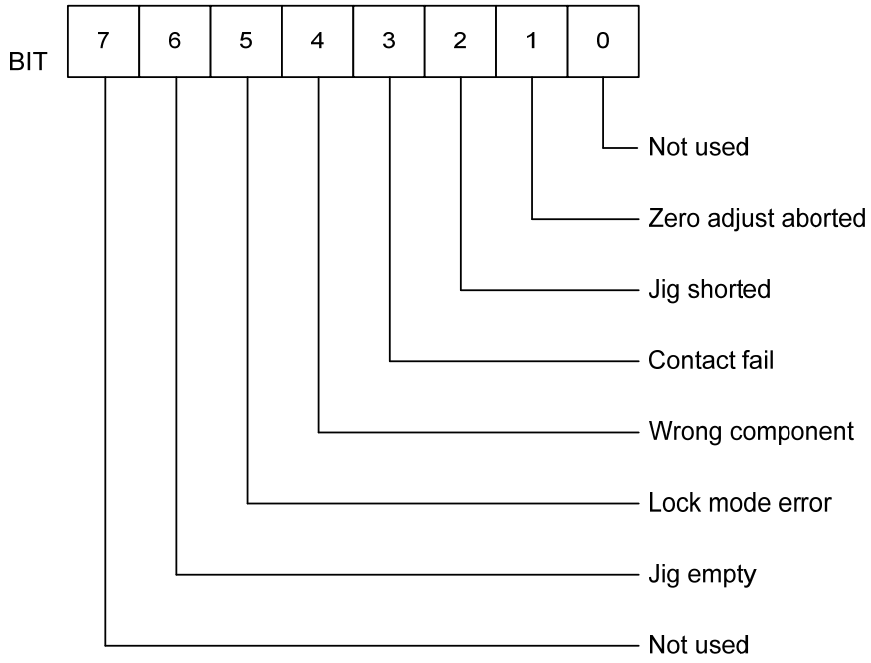


Fig. 21 Measurement Error Status Register

Input commands

IEEE488-2 command

*TRG	Device trigger
*IDN?	Return device identifier. DANBRIDGE, DB23X, 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 O = Contact check off.
CCHECK?	Recall contact check ON/OFF setting.
CLIM	Clear all limits.
COMODE	Enable a special Talker/Listener mode without SRQ. If the instrument is addressed to talker and the output buffer is empty it will delay the IEEE bus until the measurement result is ready, and then respond. ON or 1 = Comode on. OFF or 0 = Comode off.
COMODE?	Recall comode setting.
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.
CONTINOUS	ON = Start continuos 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
DBLFRQBIN	ON / OFF
DATATRANS	Data Transmission ON (or 1) / OFF (or 0) (Introduced in SW version 41)
DATATRANS?	Recall Data Transmission 0 for OFF / 1 for ON (Introduced in SW version 41)
DCBIAS	Enter DC Bias -3.0 to 3.0V).
DCBIAS?	Recall DC bias setting

DEVIATION	Deviation ON/OFF/PCT ON or 1 = Absolute deviation OFF or 0 = deviation on. PCT = Deviation in Percent on.
DEVIATION?	Recall deviation setting.
DISPLAY	Display ON/OFF. ON or 1 = Display on. OFF or O = Display off.
DISPLAY?	Recall display ON/OFF
DDNORMDISP	Double deviation normal display ON/OFF. ON or 1 = Display Small font. OFF or O = Display Double font.
DDNORMDISP?	Recall Double deviation normal display ON/OFF
EXTBIAS	External Bias ON/OFF (only available in instruments with external bridge module)
EXTBIAS?	External DC Bias on / off (only available in instruments with external bridge module)
FREQUENCY	Enter measurement frequency or FRQ1 by multi frequency measurement.
FREQUENCY?	Recall measurement frequency/FRQ1.
FRQDOUBLE	Double frequency measurement ON = Enable Double Frequency measurement. OFF = Disable Double Frequency measurement. Enter FRQ2 (must be set before enable).
FRQDOUBLE?	Recall FRQ2
FRQTRIPLE	Triple frequency measurement ON = Enable Triple Frequency measurement. OFF = Disable Triple Frequency measurement.
FRQTRIPLE?	Enter FRQ3 (must be set before enable).
FRQQUAD	Quadruple frequency measurement ON = Enable Quadruple Frequency measurement. OFF = Disable Quadruple Frequency measurement.
FRQQUAD?	Enter FRQ4 (must be set before enable)
JIGZERO	Jig Compensation ON/OFF OPEN & SHORT. ON or 1 = Set Jig Compensation ON. OFF or O = Set Jig Compensation OFF. OPEN = Start OPEN Compensation. SHORT = Start SHORT Compensation.
JIGZERO?	Recall Jig Compensation ON/OFF.

LIM0	Enter lim0 value. Format: LIMO ch1 ch2, value ch1: A = Absolute B = Relative P = Percent S = Symmetrical % channel limits ch2: C/L/R
Example	LIM0 => 10% LIM0 PCT also gives 10%
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.
LOCAL	Go to local
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.

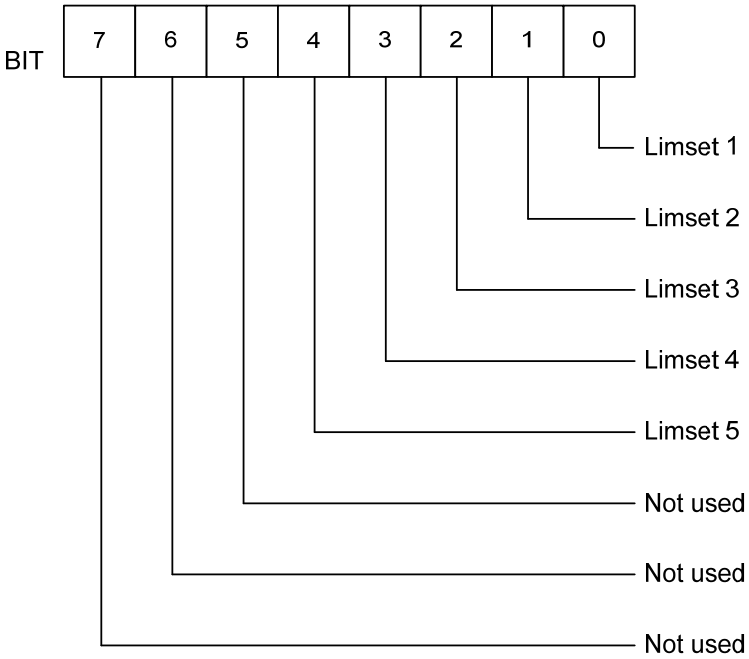


Fig. 22 Primary Limset

0 = FREE
1 = STORED

SECPARM	Select Secondary Parameter by C/L measurement Format: SECPARM Q/D/R/G
SECPARM?	Recall Secondary Parameter Selection
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^{-9}
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.

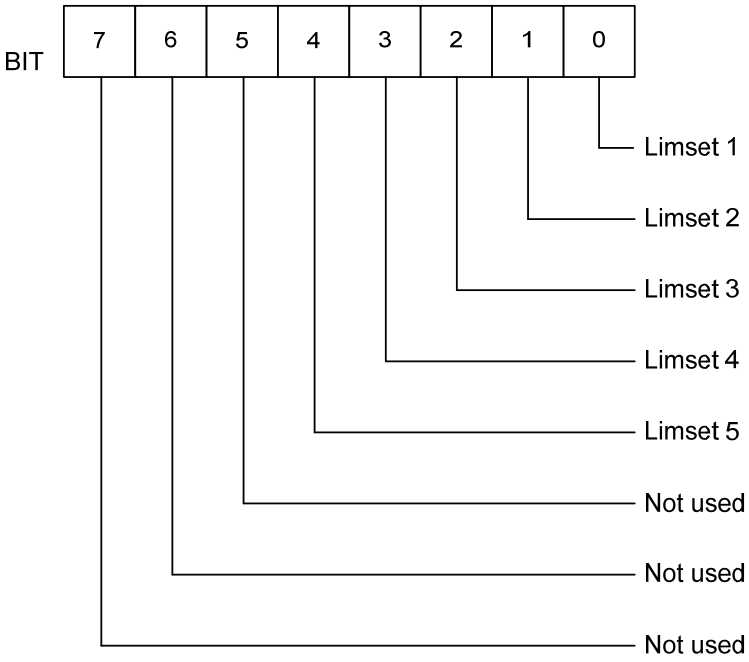


Fig. 23 Secondary Limset

0 = FREE
1 = STORED

TRIG External TRIG ON/OFF.
ON or 1 = Enable external trig.
OFF or 0 = Disable external trig.

TRIG? Recall External trig on/off setting.

DB233Z ONLY:

ZENER Zener measurements ON/OFF.
1 = Zener on positive
2 = Zener on negative
0 = Zener OFF

ZENER? Recall zener setting.

RS232 only

The RS232 can operate with a BAUD RATE of 300 to 19200 baud, 7 or 8 data bits, EVEN - ODD or NO parity and 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.

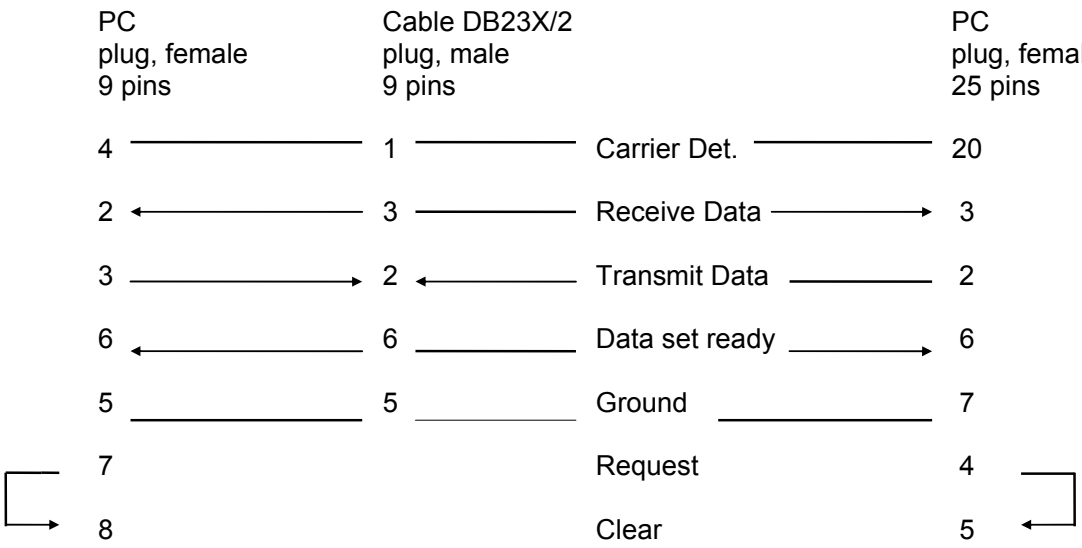
The input and output formats are the same as for IEEE, see this section for details.

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

All output data are terminated with CR LF.

Cable connections

RS232 Cable Connections



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