INSTRUCTION MANUAL

DB62X Megohmmeter

Covers DB620, DB621, DB622, DB623 and DB625

List of contents

Introduction

The operation of the DB62X takes place through softkey driven menus on the LCD display. The display has the optimal viewing angle from +20 deg. to -35 deg. The display contrast is adjustable, please see page 37 for instructions.

The memory of the instrument is Lithium battery powered RAM with a lifetime of minimum five years.

This manual covers DB620, DB621, DB622, DB623 and DB625, the actual differences will be explained where appropriate.

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: The red push button marked **H.T. break** has two functions: Whenever pressed, the High Voltage is switched off and set in discharge mode. Opposite to the other buttons on the keyboard, this function always works, also when the DB62X is under remote control. When the red lamp is on, the voltage measured over the device under test is more than 10 Volt, and in case of a large capacitor the lamp may stay on for a while after the High Voltage has been switched off.

On the rear panel is a socket for a DC plug. A shortened plug should be inserted to activate the HT output. The plug can also be wired to an external switch, for instance in a cage, to ensure that it is closed before the HT can be applied.

WARNING!

DO NOT - UNDER ANY CIRCUMSTANCES - TOUCH THE DEVICE UNDER TEST WHEN THE RED H.T. BREAK LAMP IS ON.

- 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.

Installation

Check that the mains voltage selector has been set to the actual supply voltage. The selector switch is located on the rear panel above the mains voltage inlet.

Make sure that there is a ground connection in the mains outlet.

Connect the megohmmeter to a two-terminal test fixture by means of two coaxial cables (for example Suhner low noise cable type G03130HT04) with special HT-BNC connectors (for DB625 use SHT- or EHT-BNC connectors). See Fig. 1.

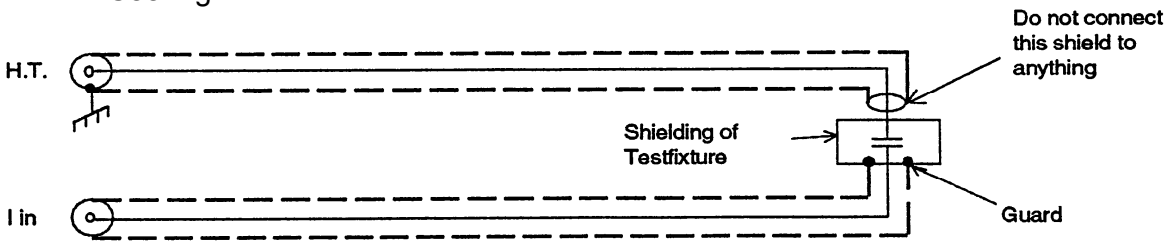
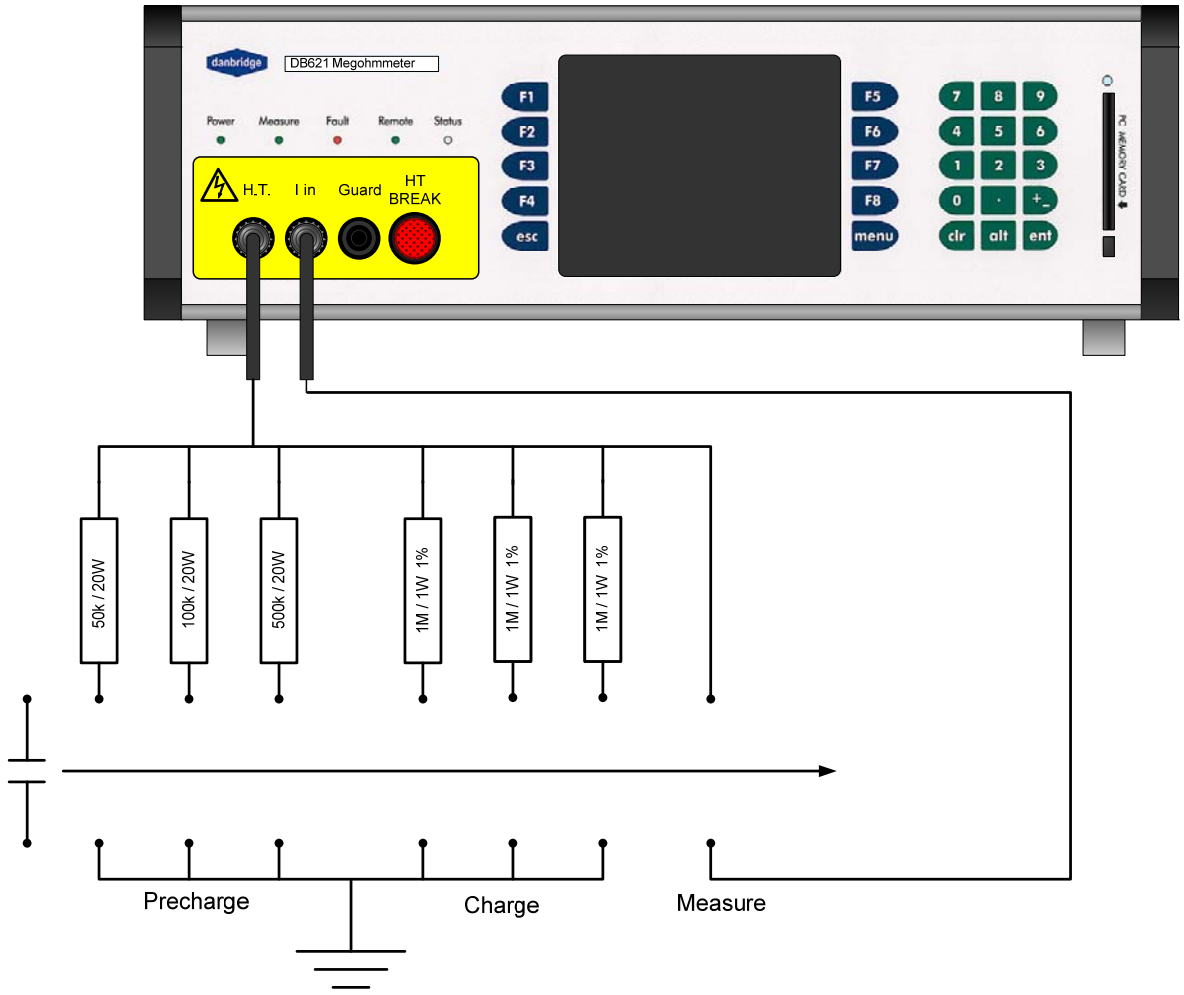


Fig. 1: Connecting DB62X.

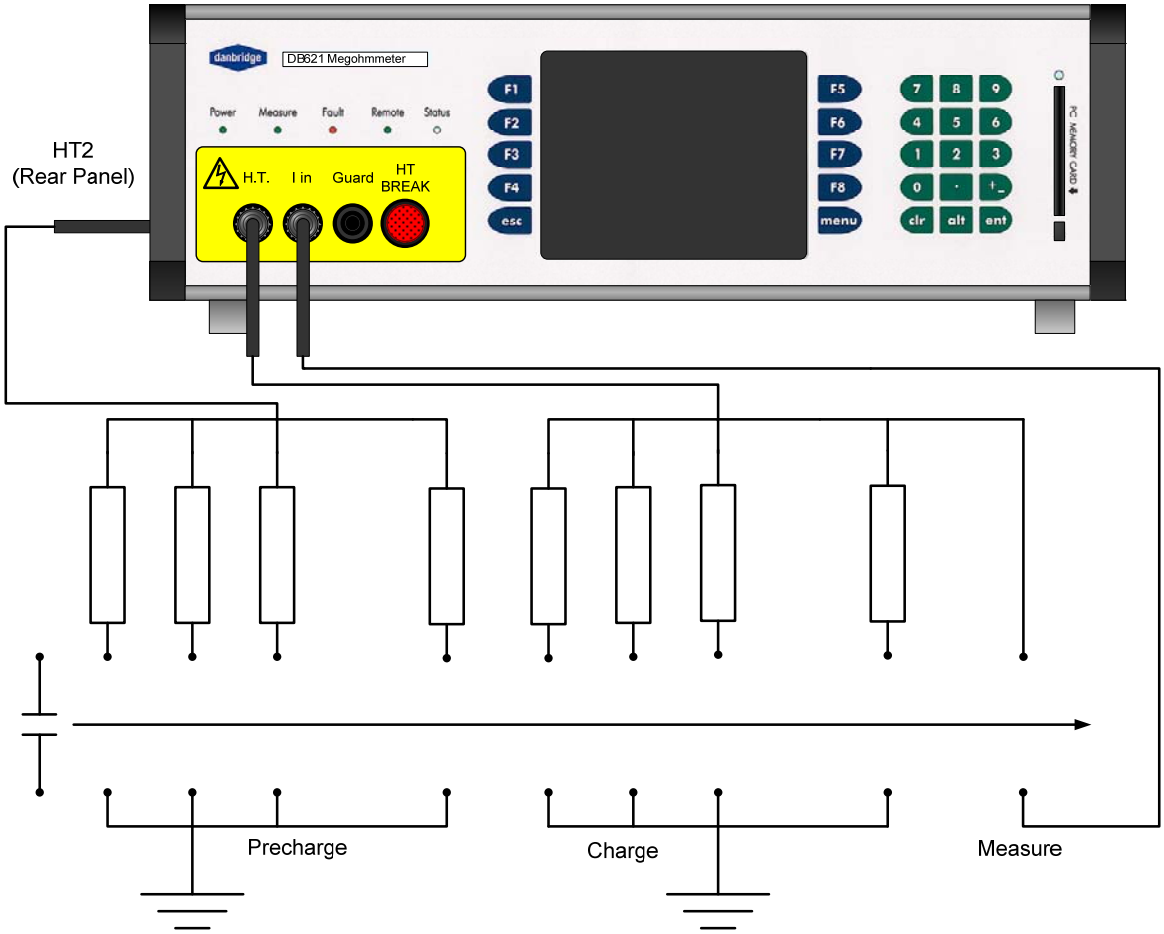
WARNING:
DB620, 621 AND 623 SUPPLY UP TO 1000 VOLT (80 mA) ON THE TEST FIXTURE!
DB622 SUPPLY UP TO 500 VOLT (160 mA) ON THE TEST FIXTURE!
DB625 SUPPLY UP TO 5000 VOLT (45 mA) ON THE TEST FIXTURE!

Example of an automatic testing application

Single supply:



Dual supply:


HT2
(Rear Panel)
DB621 Megohmmeter
Power
Measure
Fault
Remote
Status
H.T.
I in
Guard
HT
BREAK
F1
F2
F3
F4
esc
F5
F6
F7
F8
menu
clr
alt
ent
Precharge
Charge
Measure

Contact information

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.

Or general and contact information please visit our web site:

www.danbridge.com

This Instrument

The DB620 series is advanced Megohmmeters, designed for high speed and high precision measurements. The instruments are equipped with numerous advanced features and are easy to use due to the logical user interface.

The DB620 series Megohmmeters provide a wide measuring range and with measuring voltages from 10V DC to 5000V DC.

Model	Voltage (VDC)	Maximum supply current (mA)	note
DB620	10 – 1000	80	With HT on GND.
DB621	10 – 1000	80	-
DB622	2 x 10 – 500	2 x 160	Dual Supply
DB623	2 x 10 – 1000	2 x 80	Dual Supply
DB625 2kV	50 – 2000	45	-
DB625 5kV	50 – 5000	18	-

The instruments are designed for high speed measurements with max. measuring speed of 44msec from trig to end of measurement. This high speed and high accuracy makes the instrument very suitable for applications where automatic testing and automatic sorting is required. The instruments have, 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 interface makes it easy to control the instruments 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.

DB62X Layout

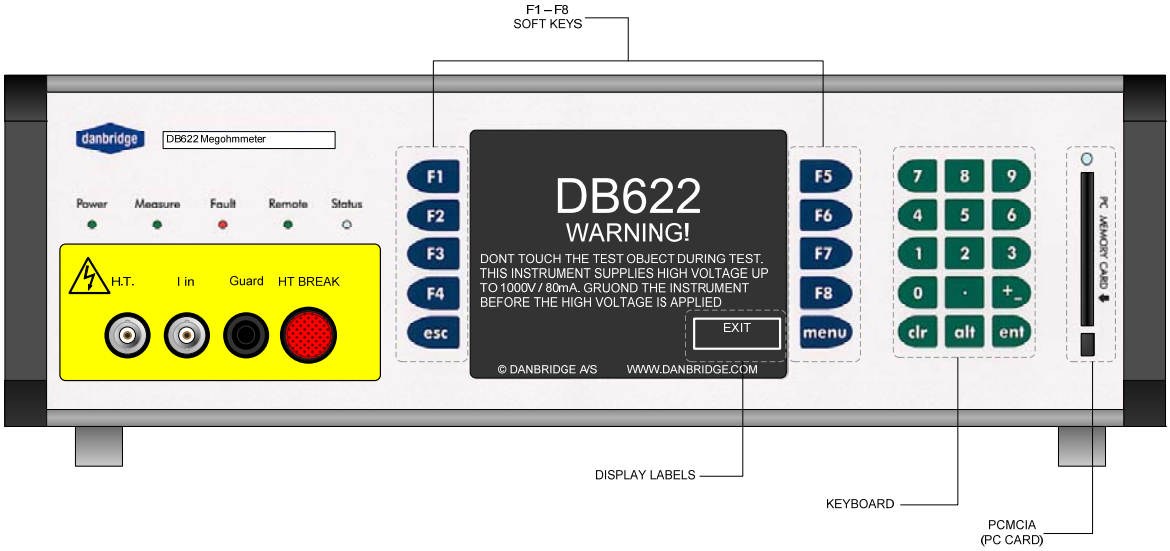


Fig. 2: DB62X Front panel

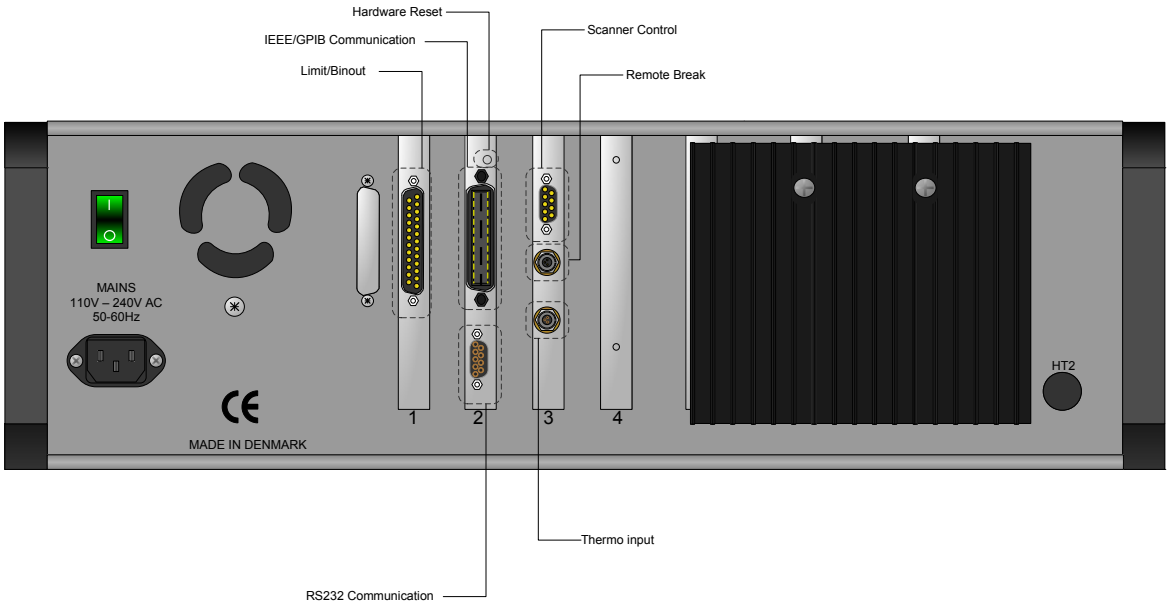


Fig. 3: DB620, 621 and 625 Rear panel

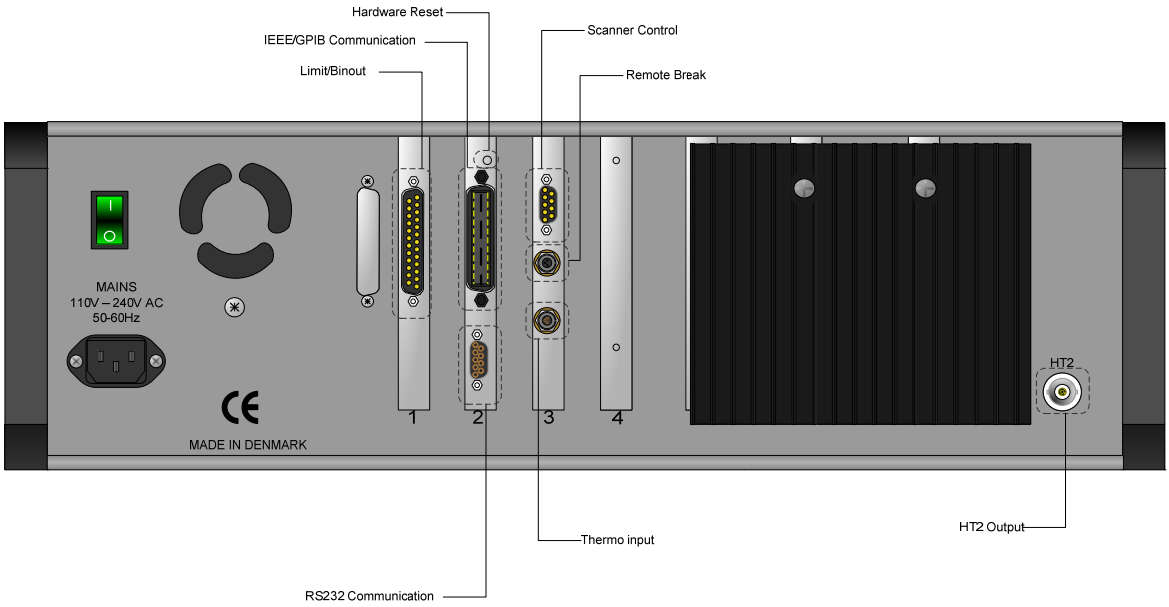
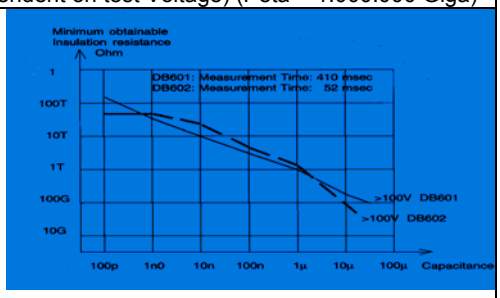


Fig. 4: DB622 and 623 Rear Panel

Specifications:

RESISTANCE MEASUREMENTS:	
Range:	10 kOhm to 1 POhm (dependent on test Voltage) (Peta = 1.000.000 Giga)
Accuracy:	Rx< 20 GOhm x Vtest: ± 2% of value Rx> 20 GOHM x Vtest: ± Vtest/1pA in Ohm max reading Vtest/0.1pA 
DC CURRENT MEASUREMENTS:	
Range:	1 pA to 1 mA
Accuracy:	±2% of value ±1pA
DISPLAY READING	
Direct reading:	Current or Amperes, 3,5 digits
Bar Graph:	8 ranges with 2 decades per graph with fixed- or auto-scaling
x – y Graph:	Current or resistance scale versus time scale
INPUT RESISTANCE:	10 kOhm for I-test> 10nA / 1 MOhm for I-test< 10nA
Discharge Resistance:	10kOhm
TEST VOLTAGE	
Range:	10 V to 1kV in 1 V steps
Accuracy:	±2% of value or ±1 Volt in un-calibrated mode
Stability: ±10ppm @ 10% change in line voltage	±10 ppm / degree C
Source Resistance:	100 Ohm
Max currents:	Measurement: 2 mA Charging: 25/80 mA (pass word protected)
Switching:	Manually ON/OFF from front panel or controlled by a built-in timer, or by remote
TIMING:	Programmable Fast Charging: 0 to 100000 msec (charge resistance 200 Ohm)
Programmable Measurement delay:	0 to 100000 msec
Discharge Time:	t = 0.1 x Cx (in µF) with V test decreasing to 1 % of test level
MEASURING SPEED:	
Trig Mode:	One Measurement: <52 msec (excl. charging) Average up to n = 100measurements: <52 + (N-1) x 40 msec (excl. charging)
Continuous Mode:	Direct Reading: 90 to 4000 msec depending on average Bar Graph: Display update every 52 msec
STANDARD FITTED INTERFACES:	
LIMITS:	5 built-in programmable limits on resistance or current
IEEE 488: (IEEE 488-1 and 2)	"Talker Only" and Talker/Listener" Modes. True sub-set of Standard protocol
RS232C:	Baud rate up to 19200 Baud. Full two-way control/output
Control I/O:	Optocoupler input / output 25 V/10mA. Trig, Measure END Signal, Trig Ready Signal, Data Ready Signal, Fault Signal, Limit Outputs
Ambient Temperature:	10 to 40 degrees Celsius
Power:	90 – 260 V AC 50 – 60 Hz
DIMENSIONS:	
Height:	140 mm/ 5.5 inch
Width:	438 mm/ 17.2 inch
Depth:	360 mm/ 14.2 inch
Weight:	13 kg/ 30 lbs.

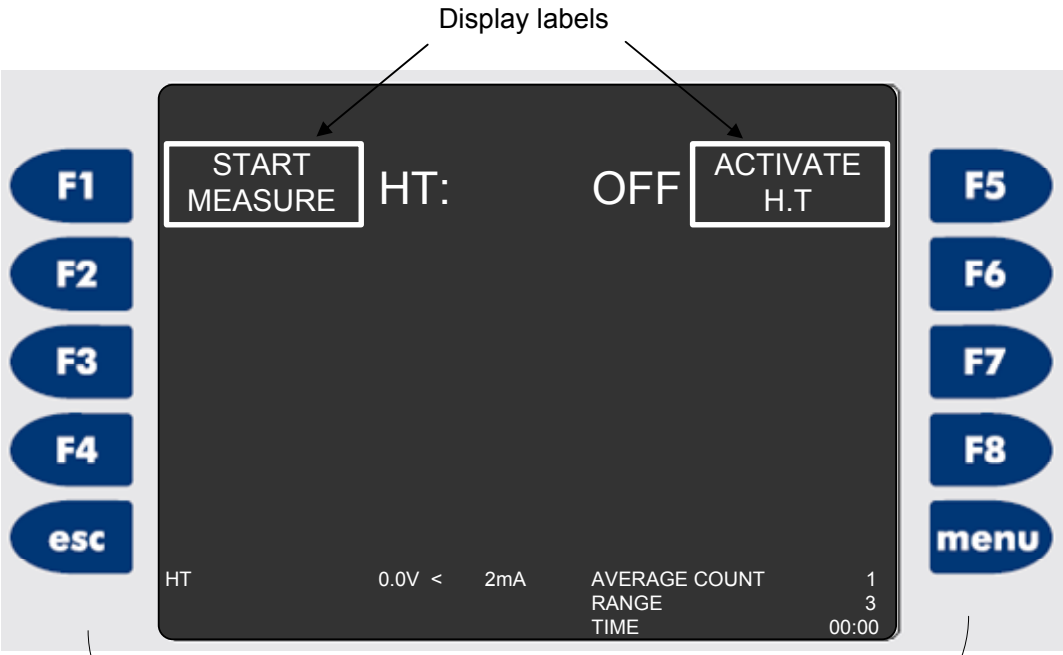
ACCESSORIES SUPPLIED:	Line power connector, Two 1.5 m coax cables with H.T. BNC connectors Brackets for 19" rack-mounting, Manual in English	
Options:	Item number	
Higher measure current and / or charge		
Fixture for axial and radial components:		
Fixture for SMD components requires Jig 600		
Test probe with trig contact:		
© April 2007, Danbridge A/S	ALL SPECIFICATIONS SUBJECT TO CHANGES WITHOUT PRIOR NOTICE	

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 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:			Packing
	Height:	140mm or 5.5 inch	
	Width:	438mm or 17.2 inch	
	Depth:	360mm or 14.2 inch	
	Weight:	Total 13kg or 30 lb.	Total 19kg or 43 lb.

Philosophy

This Manual

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



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

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 (depending of average count). 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

Please note that this equipment has a built-in switch mode power-supply operating from 90V AC to 260V AC 45-66Hz.

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 power control lamp shows a green light, indicating that the power is on.

The DB62X starts with a memory check and the display shows DB62X. After

EXIT menu

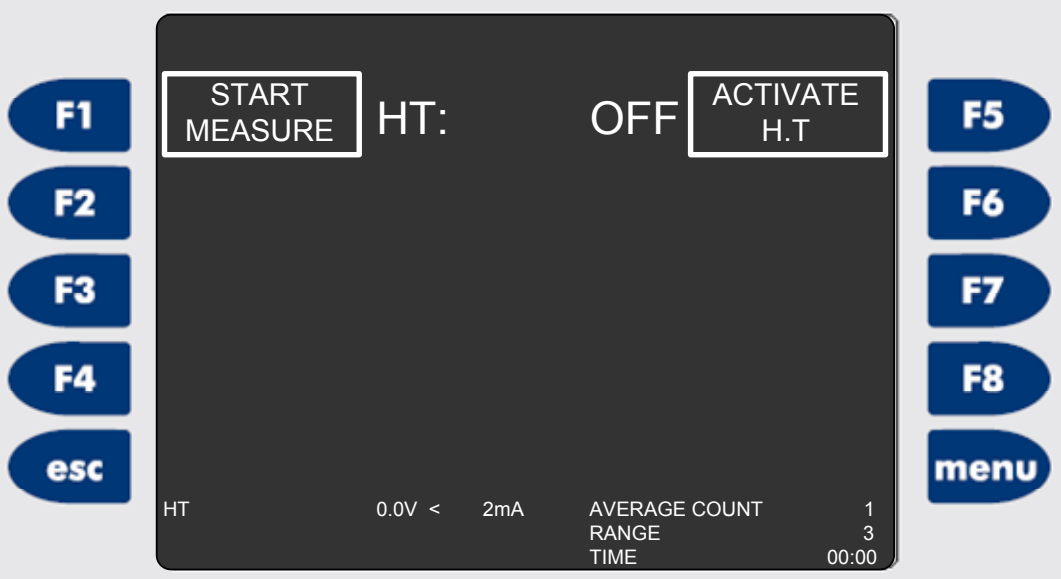


Fig. 5: Start Up Picture

The start-up picture will change and the instrument will be ready to measure.

The TRIG menu becomes available in the display. It is possible to make a single trig at F1 and activate the HT. (High Voltage) by F5.

Alternatively the instrument could be in continuous mode (remembered from last switch on) and the instrument will start measuring by activating F1

After the instrument has passed the memory check and the first F1, the DB62X 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.

Manual Operation

If the message "BREAK HAS BEEN ACTIVATED" appears on the screen when activating the HT for the first time, the cause may be that the short circuited DC connector in Remote brake on the rear panel is missing.

To start, switch on the mains power and press <MENU> to clear the safety warning and the DB62X shows the measurement display.

A short form operating instruction can be found in Section 5.

The operating menu in normal mode has two facilities: <ACTIVATE/CANCEL HT> and <START MEASURE> for repeated measurements or <TRIG> for the execution of one single measurement as defined in the menus: Each result can, as an example, be the average value of up to 100 single 40 msec measurements with internal High Voltage and resistance reading of the result.

The bottom lines in the measurement display show the number of averages, the actual RANGE and input impedance in use, the time elapsed since the HT was switched on and the actual voltage measured on the device under test (not necessarily equal to the generated High Voltage, when charging of capacitors, the output shorted etc.). If the High Voltage is not within 2% of the set voltage, the fault LED will light.

Menu

From the start display you may continue by selecting menu

When pressing menu you have access to a range of submenus and commands:

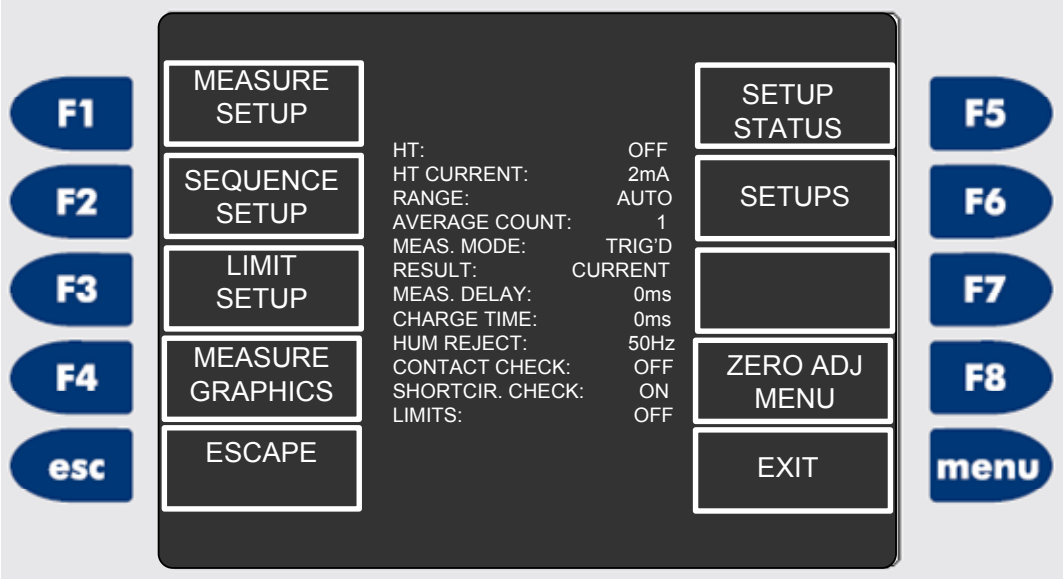


Fig. 6: DB62X Menu

Setup Status

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

menu
F5

Setup status

The status display will inform you how the instrument is setup is done (depending on mode):

HT:		LIMITS:	OFF
HT. CURRENT:	2mA	LIM 0:	
DISCHARGE:	ON	LIM 1:	
MEAS. DELAY:	0ms	LIM 2:	
CHARGE TIME:	0ms	LIM 3:	
RANGE:	AUTO	LIM 4:	
AVERAGE COUNT:	1		
MEAS. MODE:	TRIG'D		
RESULT:	CURRENT		
HUM REJECT:	50Hz		
CONTACT CHECK:	OFF		
SHORTCIR. CHECK:	OFF		
CONT BIN OUT:	ON		
REMOTE:	RS232		
DATA TRANS:	ON		
BAUD RATE:	9600		
DATA BITS:	7		
TON:	OFF		
PARITY:			
NO			

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 current overload or incorrect voltage.
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 zero-adjustment has not yet been done.

Status LED

The Status LED is red as long as there is no zero adjustment stored in the memory. The reason could be that no zeroing has been performed since the latest software reset (or the last software update).
The Status LED is green when a successful zero adjustment 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 support department.

To Measure

Setup

Please connect a suitable 2-terminal jig to the instrument before start of measuring with DB62X, for instance the optional JIG600. The fixture should be connected by means of 2 shielded cables like RG58U or the cables delivered with the instrument.

Warning: Do not ground the shields of the measuring cables

WARNING!

DO NOT - UNDER ANY CIRCUMSTANCES - TOUCH THE DEVICE UNDER TEST WHEN THE RED H.T. BREAK LAMP IS ON.

Zero Adjust

It is necessary to zero adjust the Current Input Amplifier in the instrument before any measurements are made with the instrument. The zero adjust may also be used to zero the leakage in the jig when the HT is on.

When the status LED on the front panel is red, please make zero adjust as described below.

Press menu, remove any components from the fixture, press F8 for zero adjust menu.

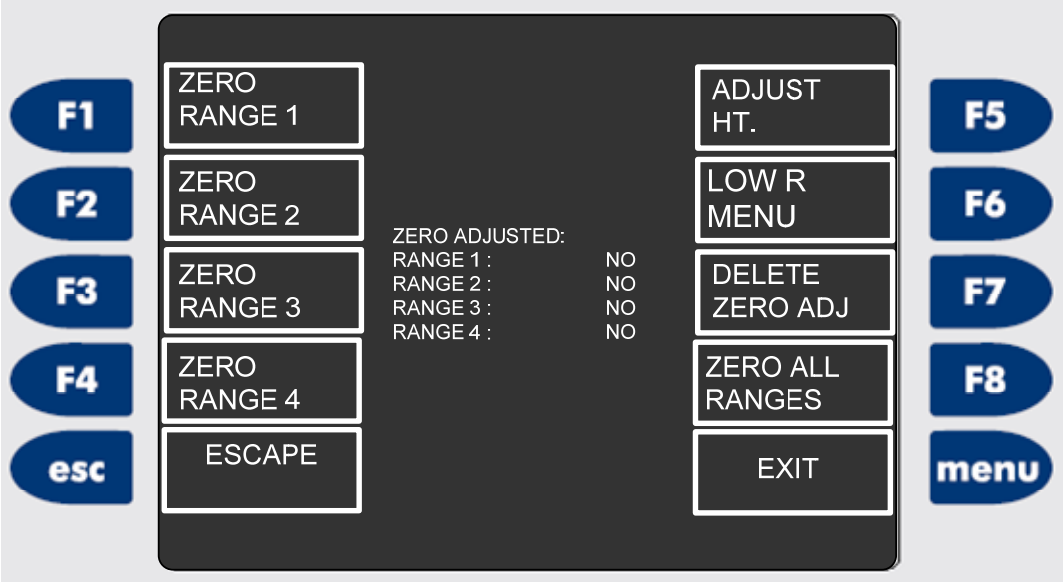


Fig. 7: Zero Adjust

Zero All Ranges

During the zero adjust, the words “ZERO ADJ. RUNNING” are shown. When finished “ZERO ADJ. END” are seen.

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

When zero adjusting the input is extremely sensitive and should be protected against moving of the air and electrostatic charged bodies.

are used for zeroing the individual ranges.

When all ranges are zeroed, the status LED will change from red to green.

HT Adjust

HT Adjust is used in models with two HT Supplies to ensure proper voltage tracing between the the two supplies when set to the same voltage.

ADJUST HT.

Please note that HT need to be activated (Red Light in HT BREAK Lamp) before adjusting the HT voltage.

Low Resistance Compensation

Available on DB620, DB621, DB622 and DB623 with software versions CA32+ and MA23+.

For the megohmmeters low resistances are in the internal 10kohm to 1Mohm. Since the maximum measurable current is 1mA and the lowest output voltage is 10V (or 50V depending on DB62x model) the lowest measurable resistance is 10kohm. When measuring currents above 10nA, the current measurement input has an impedance is 10kohm ±5% (±500ohm). Furthermore, there is a protective resistance of 100 ohm in the input and an output resistance of the HV Supply of approximately 22 ohm. In order to compensate for this a routine called Low Resistance Compensation is present.

Low Resistance Compensation is to be used after a normal Zero Adjust.

Press 

remove any components from the fixture, press 

, and then for Low Resistance Menu, press

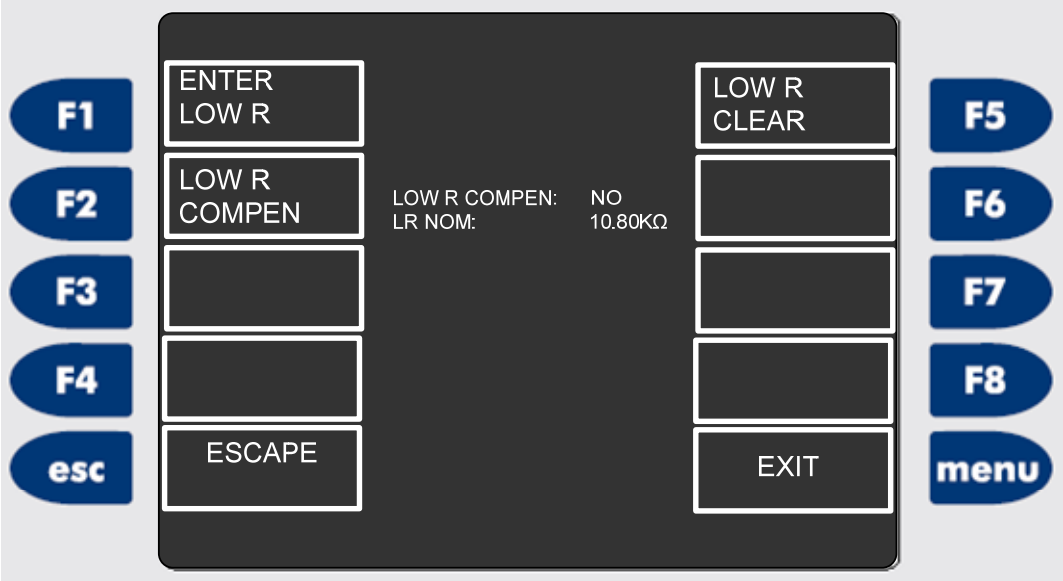


Fig. 8: Low Resistance Compensation Menu (may vary)

Put a calibration resistor with a known value between 10.8k and 13.2kohm calibrated with an uncertainty better than 0.1% in the fixture. Enter its nominal value (F1). Then start the Low Resistance Compensation by pressing F2… It will write LR COMP ENDED, and when done it will write LR COMP ENDED.

The function LOW R CLEAR, is present if the Low Resistance Compensation is to be cleared.

Measure Setup

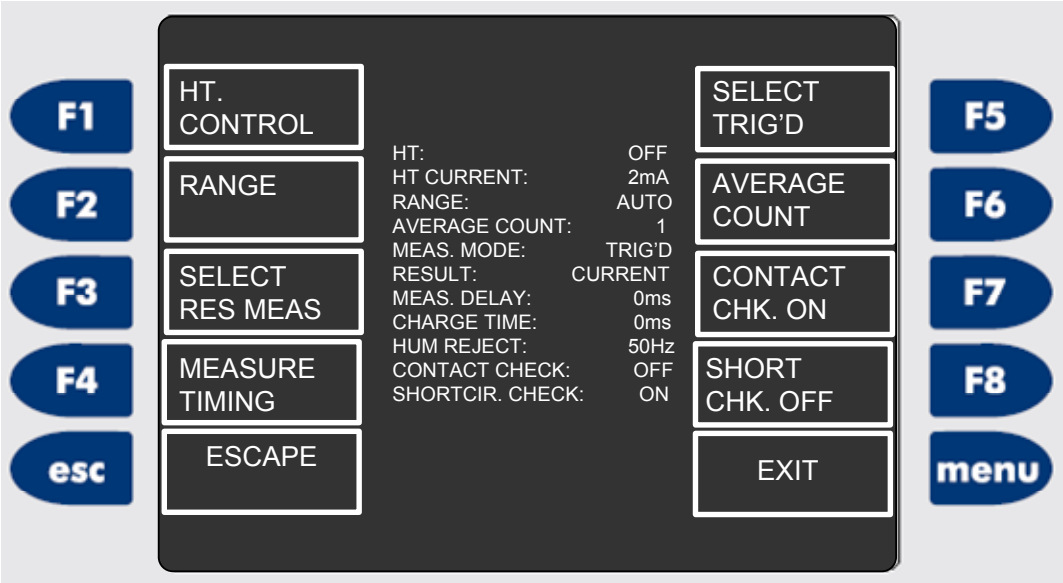


Fig. 9: Measure Setup Menu (may vary)

High Voltage Control

The high voltage setup is done as mentioned below:

Measure setup

HT. Control

The High Voltage tension can be defined from 10 Volt to 1000 Volt in 1 Volt steps.

After each measurement, the instrument can automatically discharge the device under test through a 10 kOhm resistor via a solid state switch.

Normally the current capability of the DB62X is limited to 2 mA. In case a larger current is needed, 25 mA charge mode or 80mA mode can be enabled. For safety reasons, the DB62X asks for a password to enable the charge modes. The password is factory set to 1234 for the 25mA and 4321 for the 80mA mode.

Megohmmeter	Current limit 0	Current limit 1	Current limit 2	Voltage range
DB620	2mA	25mA	80mA	10-1000V
DB621	2mA	25mA	80mA	10-1000V
DB622	2x 2mA	2x 25mA	2x 160mA	2x 10-500V
DB623	2x 2mA	2x 25mA	2x 80mA	2x 10-1000V

DB625 – 5KV	2mA	5mA	18mA	50-5000V
DB625 – 2KV	2mA	12mA	45mA	50-2000V

The instruments can also be used as a current meter with an external High Voltage supply.

The HT adjust routine is used to obtain the best accuracy of the HT voltage. To use this facility, first switch on the HT (in the measurement menu). Let it stabilise for approximately 5 minutes before adjustment.

HT. VOLTAGE Select the HT voltage and press ***ent***

HT2. VOLTAGE Select the HT2 voltage and press ***ent*** Dual supply only.

SELECT HT. EXTRN / SELECT HT. INTRN
Switch between internal and external High voltage supply.

HT ON GND. Selects HT on ground (DB620 only).

DISCHARGE OFF / DISCHARGE ON

MAXIMUM CURRENT

HT. CUR < 2mA Select maximum 2 mA output current (limit 0).

HT. CUR < 25mA Select maximum 25 mA output current (limit 1).

HT. CUR < 80mA Select maximum 80 mA output current (limit 2).

CHANGE PASSWORD

- ***HT2. CUR*** Select current limit for HT2. Dual supply only.

ESCAPE returns you immediately to the measure display.

menu **EXIT** may step backwards step by step.

The DB620 can connect the HT. output to ground. When *HT ON GND* is selected the current input terminal will move negative with respect to ground according to the HT. setting when HT. is activated.
This feature is useful by testing insulation resistance in cables. The HT. output is connected to the cable shield and the current input to the inner cores. The ground connection of the shield provides noise reduction and make the testing of long cables more safe.

WARNING:
When HT ON GND is active the guard terminal will follow the input terminal potential with respect to GND.

Range Setting

menu
F1
F2

MEASURE SETUP

RANGE

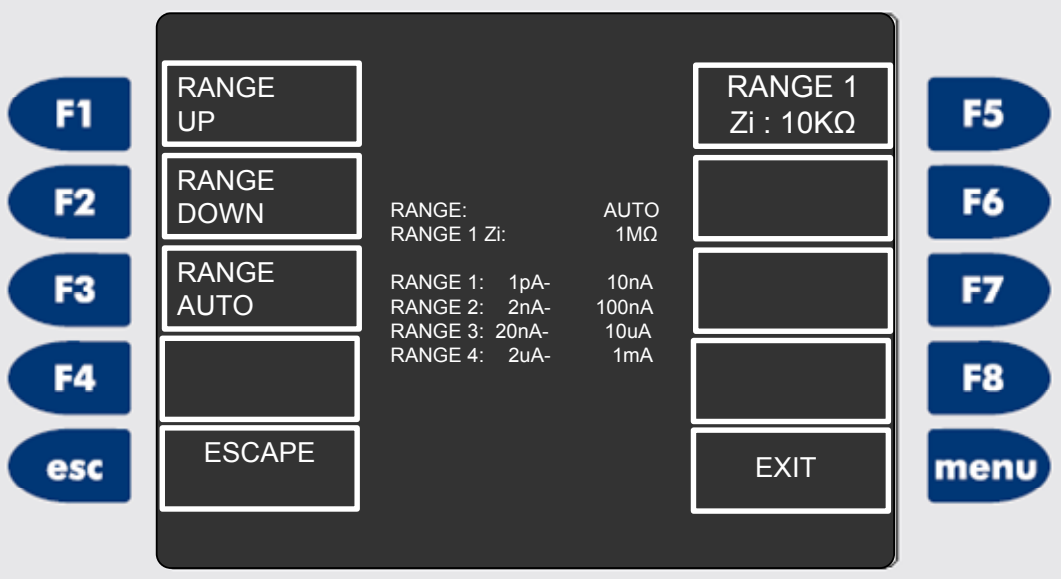


Fig. 10: Range menu

The instrument can work in either fixed range or be autoranging as selected in the RANGE menu. The range setting is depending of the input current:

RANGE 1: 1 pA to 10 nA
RANGE 2: 2 nA to 100 nA
RANGE 3: 20 nA to 10 µA
RANGE 4: 2 µA to 1 mA

In range 1, it is possible to choose between an input impedance of 10 kOhm or 1 MOhm.

When changed to AUTO RANGE the input impedance of range 1 will be the same as chosen earlier for fixed range.

NOTE 1: When measuring a capacitor, the noise in the measurements is partly caused by the AC noise from the HT supply. Therefore the noise in range 1 is much lower with an input impedance of 1 M Ohm than 10 k Ohm. The reason is that the noise gain is 100 times lower.

NOTE 2: When the instrument runs in TRIG-mode the range is always fixed. If the DB62X has been set to autoranging and then is TRIG'D, it will choose a random range, which may be wrong.

RANGE UP	Step to the next higher range
RANGE DOWN	Step to the next lower range
RANGE AUTO	Select auto range
RANGE 1 Zi: 10KΩ / 1MΩ	Change input impedance in range 1

ESCAPE	returns you immediately to the measure display.
EXIT	may step backwards step by step.

Select measuring mode (current / resistance)

menu
F1
F3

MEASURE SETUP

SELECT CUR / RES MEAS

Select current measuring mode or resistance measuring mode.

Select measure timing

menu
F1
F4

MEASURE SETUP

MEASURE TIMING

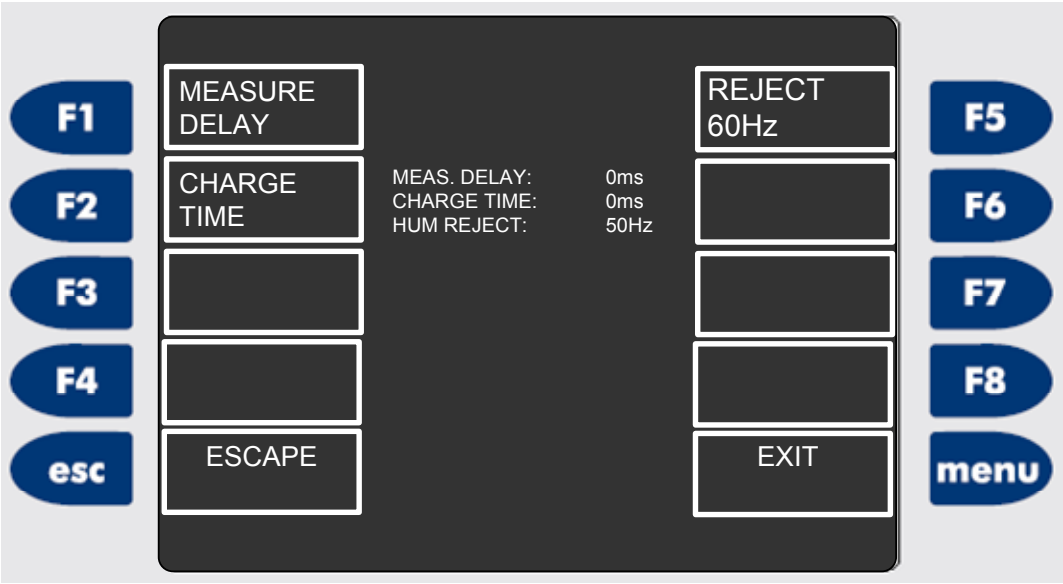


Fig. 11: Measure Timing

In order to suppress the influence of hum, each measurement is integrated over one period of the mains supply frequency. With the REJECT 50/60 Hz button the integration time will be changed to 20 msec or 16 2/3 msec.

The fastest possible time for a measurement result is 52 msec, which the instrument uses in the following way: 20 msec is used to stabilise the input amplifier and measure the HT voltage, 20 msec is integration time to measure the current and 12 msec is used for internal housekeeping. In case of a 60 Hz line frequency, the 20 msec integration time is reduced to 16.7 msec, reducing the fastest measurement to be 48.7 msec.

The minimum time with stable contacting is the above mentioned 20 msec HT voltage measuring time plus the integration time, i.e. total 40 msec in 50 Hz reject mode and 36.7 msec in 60 Hz reject mode.

With the MEASURE DELAY the user can program a delay from TRIG to measurement start. The measure delay can be set from 0 msec to 100 sec.

If the CHARGE TIME is set, the input amplifier will be shorted with a 100 Ohm resistor for the programmed period of time, up to max 100 sec.

When both are selected, the charge time will take place before the measure delay after a TRIG.

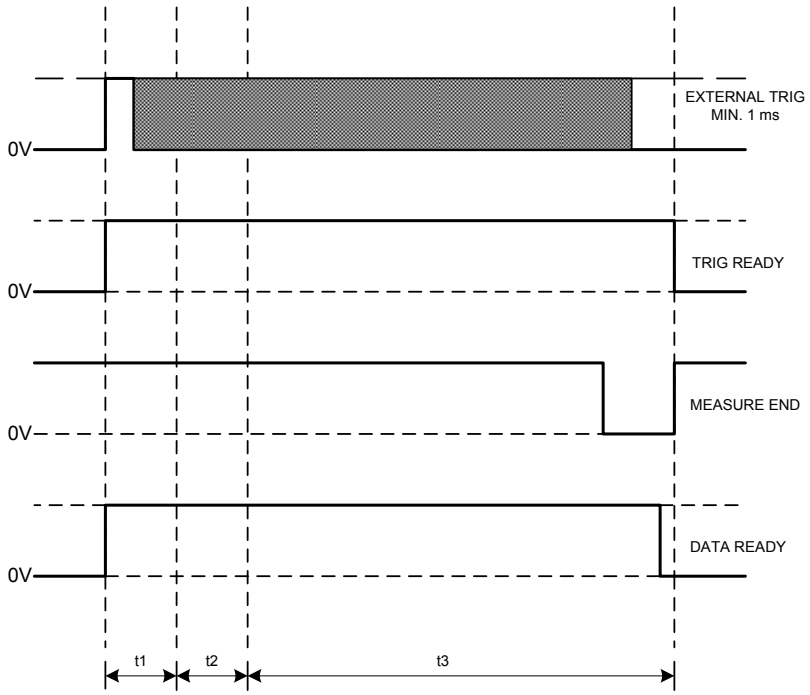


Fig. 12: Measure timing

t1: Programmable Charge Time 0-100000ms
t2: Programmable Measure Delay 0-100000ms
t3: Measure time
- ***for Average= 052ms***
- ***for Average >0 52ms + (Average- 1) 40ms***

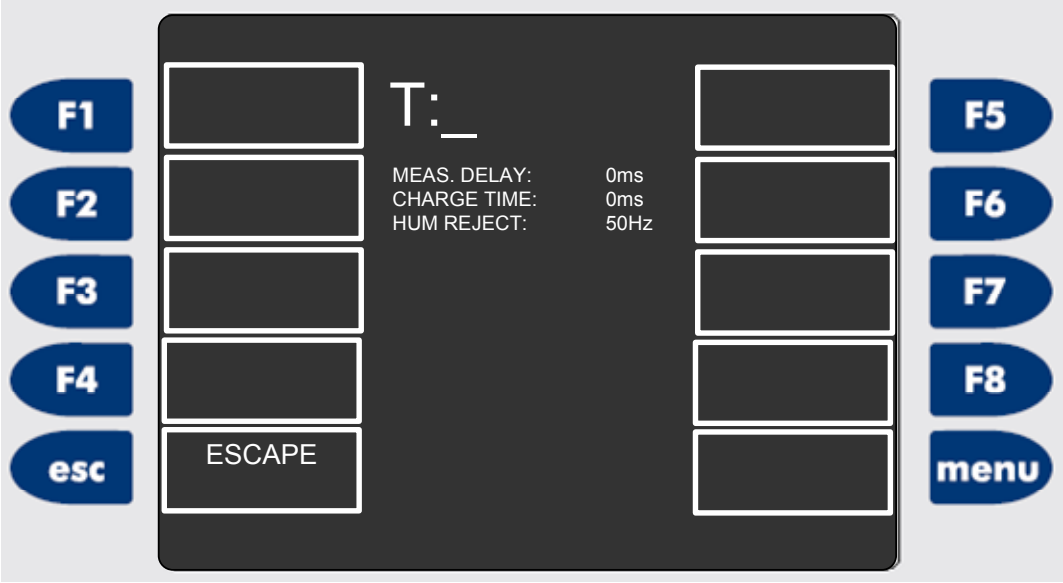


Fig. 13: Trig Delay

F1 ***MEASURE DELAY***

Input the delay time in msec by using the numeric keyboard and when finished press ent and you will return to the menu.

If you need to correct the average count number selected, use clr

F2 ***CHARGE TIME***

Input the delay time in msec by using the numeric keyboard and when finished press ent and you will return to the menu.

If you need to correct the average count number selected, use clr

esc **ESCAPE** returns you immediately to the measure display.

Select continuous mode / trig mode

MEASURE SETUP

SELECT CONT / TRIG´D — Select either continuous or trig mode

ESCAPE — returns you immediately to the measure display.

EXIT — may step backwards step by step.

Select average count

menu
F1
F6

MEASURE SETUP

AVERAGE COUNT

Select the required number of average count (1 to 99) by using the numeric keyboard and when finished press ent and you will return to the main menu.

If you need to correct the average count number selected, use clr

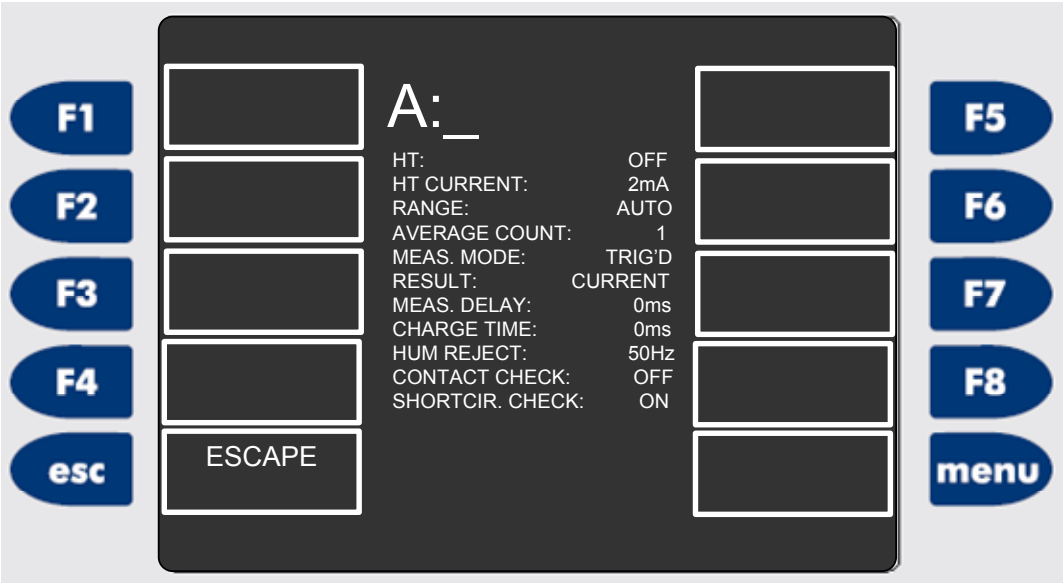


Fig. 14: Average count

esc **ESCAPE** returns you immediately to the measure display.

Select contact check

The CONTACT CHECK is used to check if there is contact to the test object. The contact check is only working with insulation test on capacitive objects. With 1,5 m long measuring cable a capacitance >25 pF can be detected in range 1, 200 pF in range 2, 3 and 4.
When no contact is detected, the display will show NO CONTACT and if limits are active the rear panel control will reject (BIN5 If the measurement is current and BIN0 if the measurement is resistance).

MEASURE SETUP	
CONTACT CHK. ON / OFF	Select contact check on/off
ESCAPE	Returns you immediately to the measure display.
EXIT	May step backwards step by step.

Select Sequence setup

For more about sequences, see Appendix A – Sequences.

Four factory defined sequences are available: 20 SEC, 60 SEC, MES TO GO 20 SEC and MES TO GO 60 SEC.

In the first two preprogrammed sequences, when a sequence is chosen, continuous measurements as defined in the measurement setup are performed until the time 20 sec or 60 sec has elapsed. The measurements are then stopped, and the device under test is discharged automatically. The "Measure to GO" sequences stops measurement and discharges as soon as the lowest active limit is reached. If it is not reached within 20 or 60 seconds the measurements stops like the normal 20 and 60 sec sequences.

SEQUENCE SETUP

ACTIVATE / CANCEL SEQUENCE

VIEW / EDIT SEQUENCE

SELECT SEQUENCE

CLEAR SEQUENCE

PREV SEQUENCE Previous sequence

NEXT SEQUENCE Next sequence

COPY SEQUENCE

PASTE SEQUENCE

Apart from this, five user defined sequences with each 20 steps can be stored at a time.

To program a sequence, press EDIT SEQUENCE. Then choose a step number to edit with EDIT STEP. Each step may consist of one of the following options:

1. Charge , i.e. the input amplifier is shorted with a 100 Ohm resistor.
2. Charge normal, i.e. charge through the input impedance, 10 kOhm or 1 MOhm.
3. Make a measurement.
4. Discharge.

Note: When choosing Measure, and no limit testing is wished, choose LIM SET 0. If a limit shall be used, an appropriate limit must be stored as a limit set (see section 2.4). No time can be specified when measuring, the duration is calculated from the average count.

The editor has automatic repeat functions: if a step is blank, and the previous step has been programmed, each parameter is copied from the previous step with the <ent> key. In case a step has already been programmed, each step is left unchanged, by pressing the <ent> key.

To end the sequence editing, press MENU.

The X-Y graph display cannot be used when using sequences.

Limit setup

For more about Limits, see Appendix B – Limits and BIN OUT.

In the LIMIT SETUP menu, five limits at a time can be defined for sorting purposes. The BIN number into which the component shall be dropped is displayed in the measurement display together with the measurement result. Also the optocoupler outputs are set, for use on automatic sorting machines.

A total of five limit sets can be stored SAVE LIMSET and recalled RECALL LIMSET in the instrument.

When pressing the EDIT LIMIT key, a choice between resistance or current limits is given. Resistance limits does not work when the results are displayed in current and vice versa. When choosing current limits, the limits might be positive or negative current value.

To access Limit setup press

LIMIT SETUP

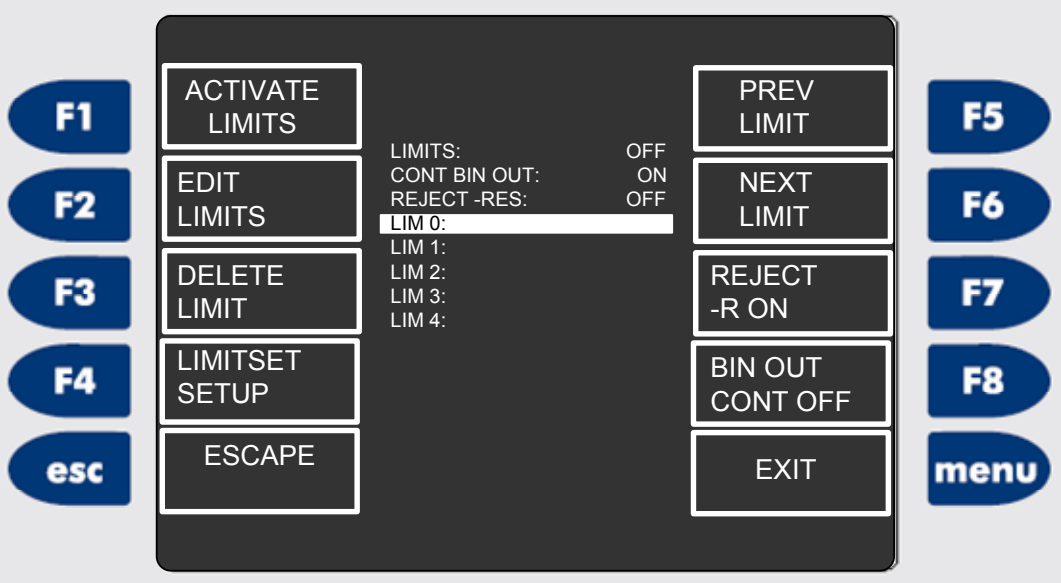


Fig. 15: Limit Setup

F1	***ACTIVATE / CANCEL LIMITS***	
F2	***EDIT LIMIT***	
F3	***DELETE LIMIT***	
F4	***LIMITSET SETUP***	
F5	***PREV LIMIT***	Previous limit
F6	***NEXT LIMIT***	Next limit
F7	***REJECT -R ON/OFF***	Reject on negative resistance on / off
F8	***BIN OUT CONT ON/OFF***	Bin output in Continuous mode on /off
esc	**ESCAPE**	returns you immediately to the measure display.
menu	**EXIT**	may step backwards step

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
F3 ***LIMIT SETUP***
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

Measure Graphics

menu
F4
F2

MEASURE GRAPHICS

NORMAL TEXT Display measuring result in text Mode.

The results can be displayed as a bar graph simulating an analog meter. The bar graph can use autoscaling or 8 fixed scales with two decades each.

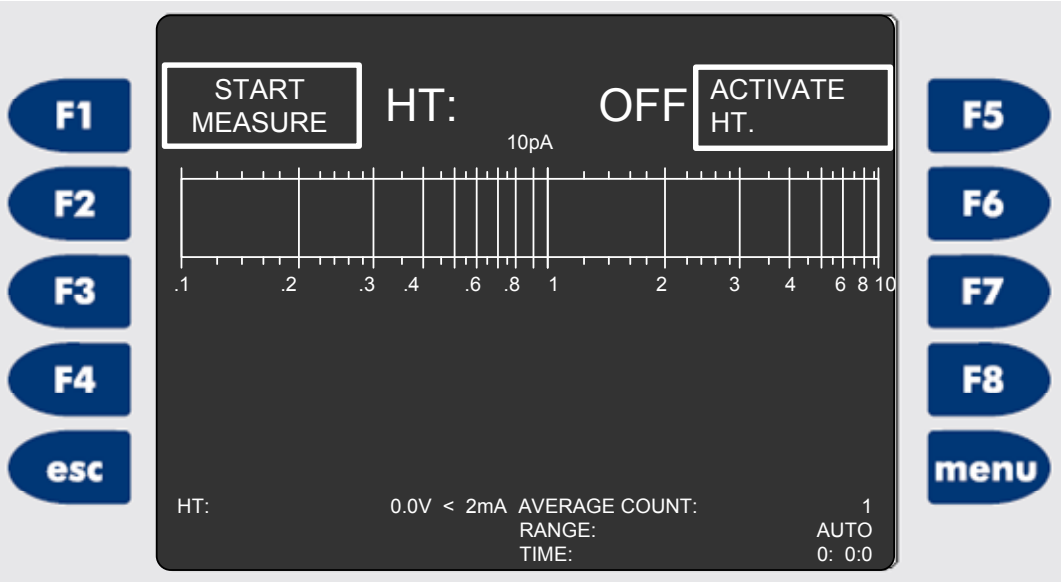


Fig. 16: Bar graph

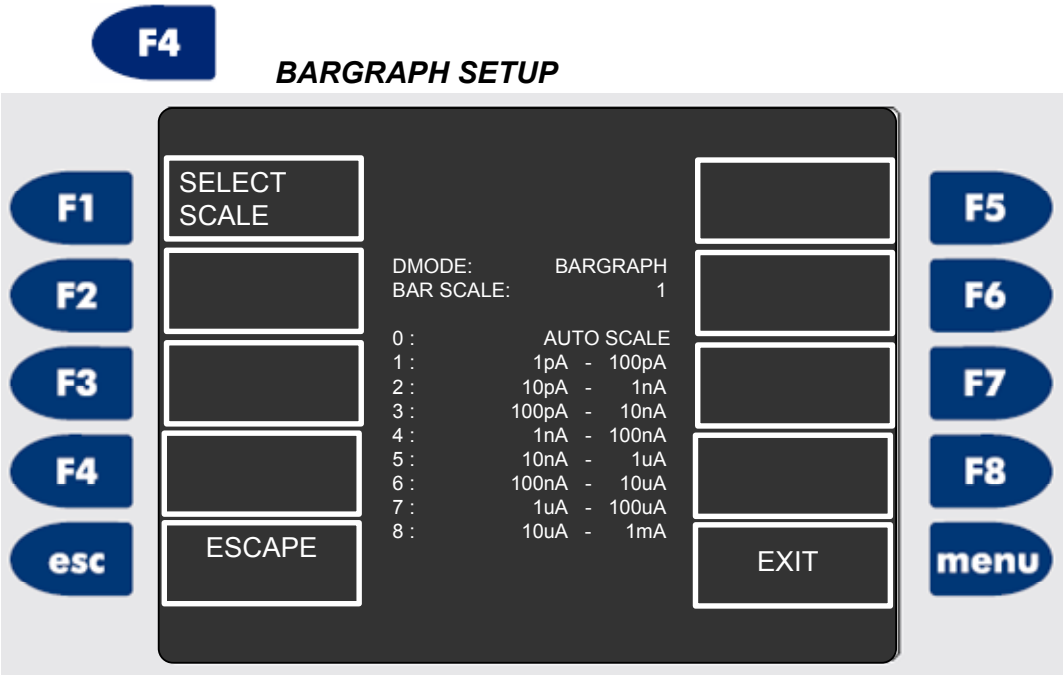


Fig. 17: Bar Graph Setup

X-Y GRAPH

The display can also show the leakage current or insulation resistance as a function of time as an X-Y graph. The X-scale, i.e. the time period for which the measurements shall be shown, can be programmed with <SET TIME> from 1 sec to 3600 sec. The Y-scale is fixed and logarithmic from 1 MOhm to 1 POhm when resistance reading is chosen, and can be set to one out of nine linear scales from 10 pA to 1 mA for current reading.

When returning to the measurement display of the X-Y graph, the softkey P1 is labelled <START GRAPH> and P5 <STOP GRAPH>. When the measurements are started, these labels are no longer shown, but the function is still effective: P1: <START GRAPH> and P5: <STOP GRAPH>.

The X-Y graph cannot be used when using sequences, see section 2.6.

NOTE: A spike in the X-Y graph might be seen when the input impedance is changed. This is caused by the change in the voltage division between the insulation resistance and the input resistance, and is therefore a physical phenomenon that cannot be avoided.

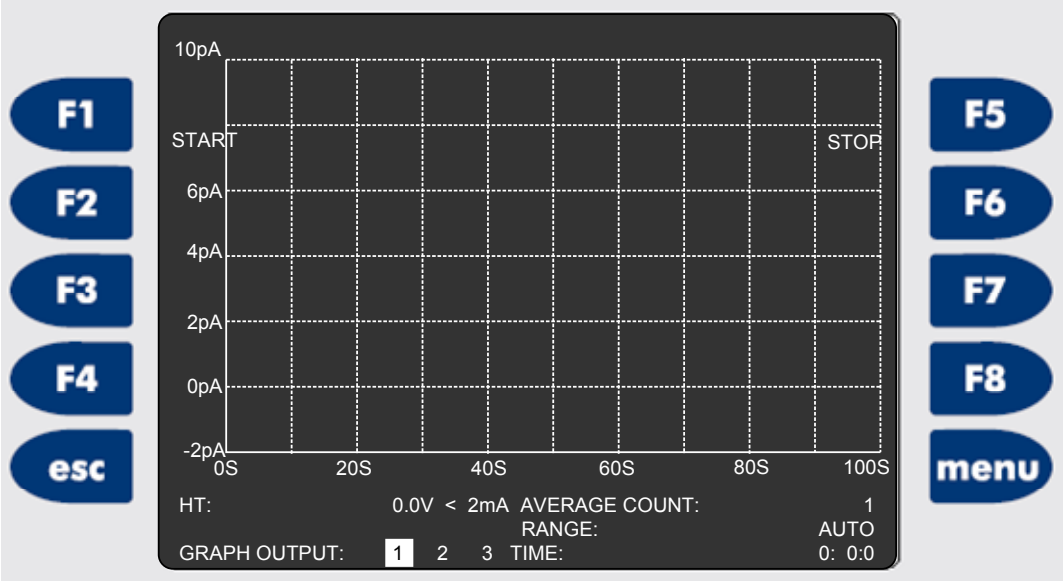


Fig. 18: XY Graph

XY GRAPH SETUP

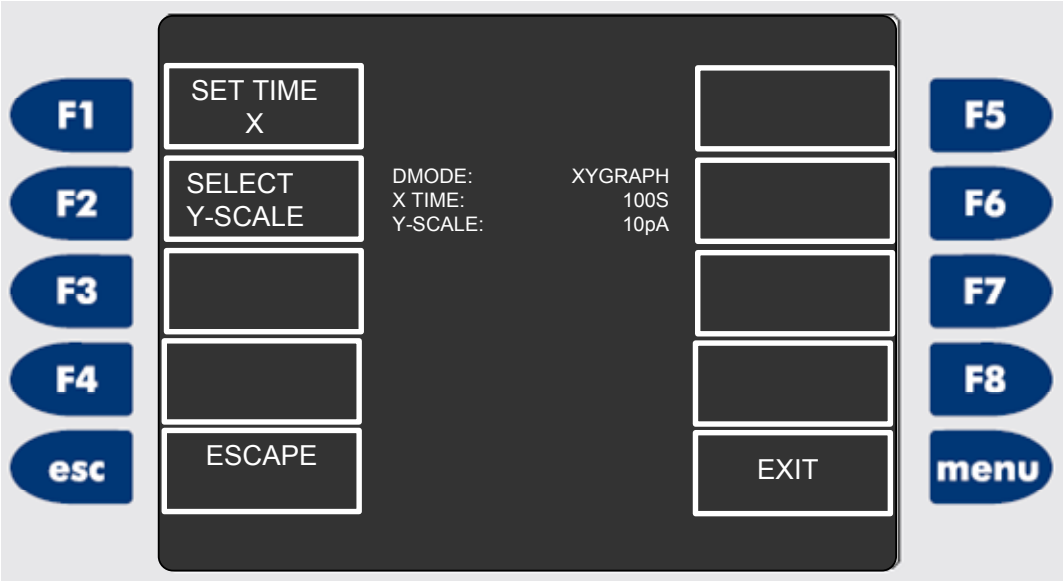


Fig. 19: XY Graph Setup

Setups

menu
F6

SETUPS

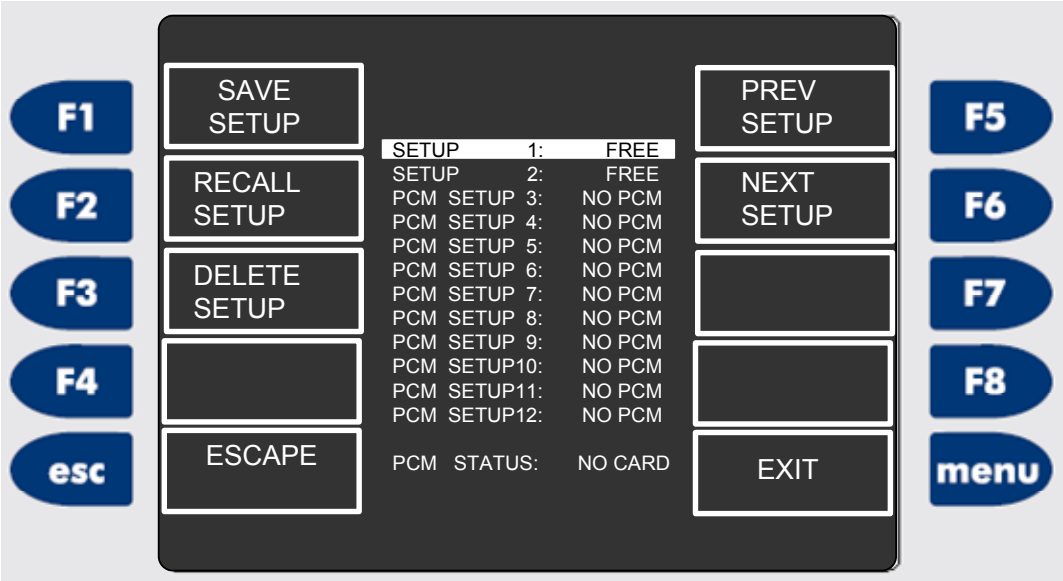


Fig. 20: Setups

F1 ***SAVE SETUP***

F2 ***RECALL SETUP***

F3 ***DELETE SETUP***

F5 ***PREV SETUP*** Previous setup

F6 ***NEXT SETUP*** Next setup

esc **ESCAPE** returns you immediately to the measure display.

menu **EXIT** may step backwards step by step.

Measuring Speed

From trig to end of measurement:	48msec + (Average -1) * 40msec
From trig to data ready:	52msec (Average =1)
Additional time per meas. by average	40msec (33msec for 60Hz rejection)
Multiple measurements (average):	The sum of each measurement (from trig to end of measurement) + 4ms for calculation time

Range Selection

When running the instrument in Trig mode, for instance on an automatic sorting machine, a fixed range should be selected.

When using auto range and continuous mode, the instrument seeks for the correct range, by evaluating each measurement for over- or under flow conditions and from this it selects the range for the next measurement.

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

	Standard Version			Zin Detect Version	
PIN	Description	I/O	I/O	Description	PIN
1	Protective Ground (Shield)			Protective Ground (Shield)	1
2	Trig Input Anode	I	I	Trig Input Anode	2
3	Poll for HT Break Anode	I	O	Zin Detect Collector	3
4	Trig Ready Emitter	O	I	Poll for HT Break Cathode	4
5	Measurement End Emitter	O	O	Measurement End Emitter	5
6	Data Ready Emitter	O	O	Data Ready Emitter	6
7	Fault Emitter	O	O	Fault Emitter	7
8	Bin 5 Emitter	O	O	Bin 5 Emitter	8
9	Bin 4 Emitter	O	O	Bin 4 Emitter	9
10	Bin 3 Emitter	O	O	Bin 3 Emitter	10
11	Bin 2 Emitter	O	O	Bin 2 Emitter	11
12	Bin 1 Emitter	O	O	Bin 1 Emitter	12
13	Bin 0 Emitter	O	O	Bin 0 Emitter	13
14	Trig Input Cathode	I	I	Trig Input Cathode	14
15	Poll for HT Break Cathode	I	O	Zin Detect Emitter	15
16	Trig ready Collector	O	I	Poll for HT Break Anode	16
17	Measurement End Collector	O	O	Measurement End Collector	17
18	Data Ready Collector	O	O	Data Ready Collector	18
19	Fault Collector	O	O	Fault Collector	19
20	Bin 5 Collector	O	O	Bin 5 Collector	20
21	Bin 4 Collector	O	O	Bin 4 Collector	21
22	Bin 3 Collector	O	O	Bin 3 Collector	22
23	Bin 2 Collector	O	O	Bin 2 Collector	23
24	Bin 1 Collector	O	O	Bin 1 Collector	24
25	Bin 0 Collector	O	O	Bin 0 Collector	25

The opto-coupler Trig input triggers the DB62X by an input current of 10mA (maximum 30mA forward and maximum 6V reverse). The opto-coupler outputs are rated 25V and 10mA each.

You can find additional information in Appendix B – Limits and BIN OUT.

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

Reset the DB62X

The program in the DB62X 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. From the rear panel, by pressing the hardware reset key 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:

Cancel Display

The display will return when pressing the ***menu*** key.

Display, Black on White

This soft key is a toggle switch which will change 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. 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.

Alt display with several facilities.

SOFTWARE RELEASE

SOFTWARE UPDATE

The DB62X will display which CPU will be updated, the yellow Power ON LED above the PC Card will light up shortly and

"Warning !
updating software
please wait"

will appear on the display.

The DB62X is ready for use as soon as it has reset it self or for an update of the other CPU.

WARNING! The Mains Supply must not be switch off in the time slot from the F4 is entered until the Status LED blinks.

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.

Remote control interface

There are two ways to remote control the DB62X either by IEEE 488 (GPIB) or by RS232C.

WARNING: DO NOT CONNECT ANY CABLES BETWEEN THE DB62X 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.

Some of the commands are not yet implemented.

RS232C

All functions available via the keyboard are also available on theRS232C 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).

Some of the commands are not yet implemented.

IEEE

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

The list below shows the sub-set of the IEEE standard used by the DB62X. 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 DB62X 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. The input buffer has a maximum capacity of 255 characters, the output buffer have 4096 characters.

Input buffer

Commands are entered into the input buffers and executed from there. It is therefore possible to program the DB62X 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 DB62X (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 DB62X 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: HTVOLT?
HTVOLT XXX
HTVO XXX
HTVOL 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-16	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 :
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 = 0/1 instead off ON/OFF and so on.

Output format

MEASUREMENT RESULT:

CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8 CH9 CH10 CH11
I/R +/- X . X X X E +/- X X

CH12 CH13 CH14 CH15
, (BIN NR) CR LF

Query commands 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).
f.ex:

COMMAND	RESPOND
RANGE?	RANGE X CR LF
HTVOLT?	HTVOLTX.XX CR LF
AVERAGE?	AVERAGE XX CR LF
CHTIME?	CHTIME XXXE-XX CR 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 DB62X will reply in fixed decimal format. See Fig. 21.

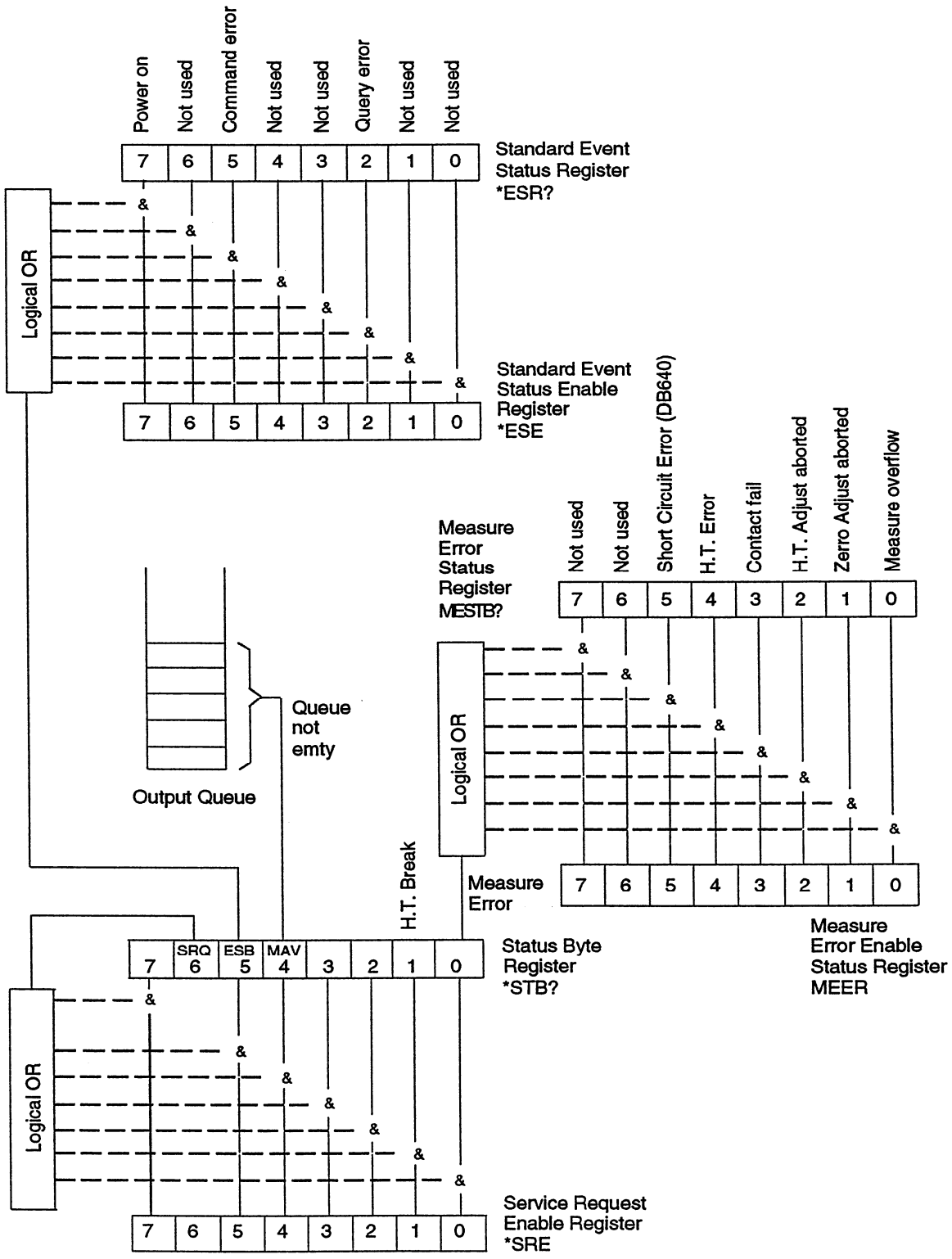
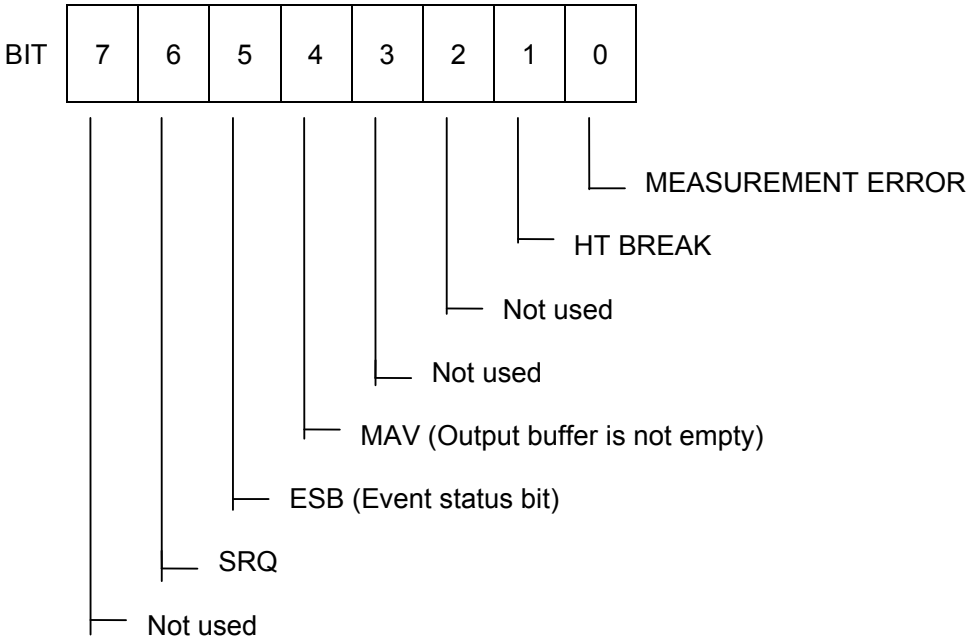


Fig. 21: Service Request register system

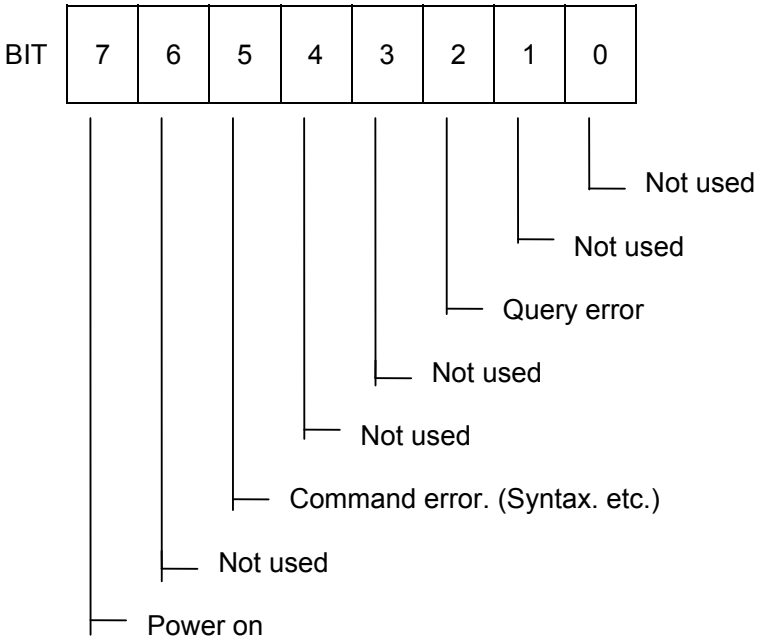
Status Byte Register (SPOLL).

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 DB62X will generate a service request interrupt. The STATUS BYTE REGISTER is cleared by reading.



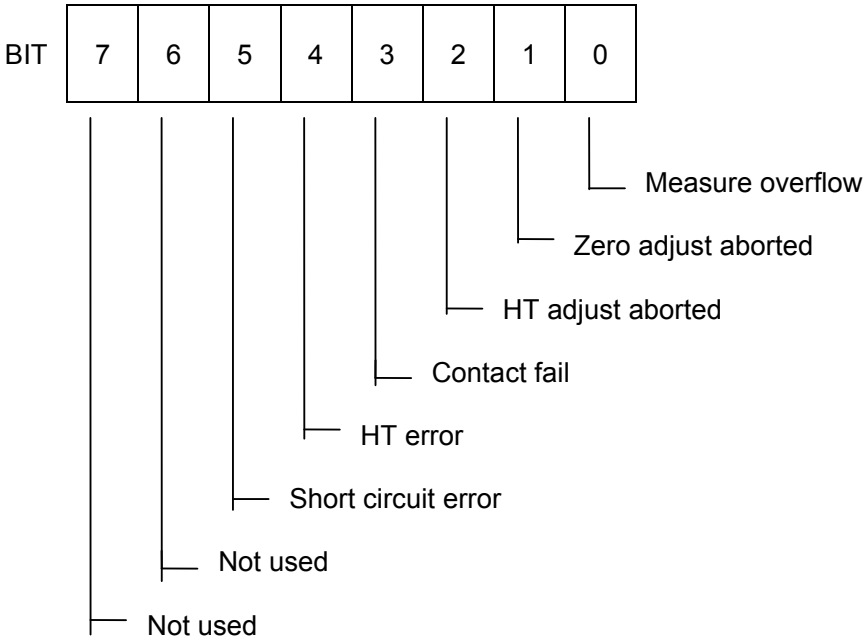
Standard Event Status Register

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 DB62X 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 Commands

*TRG	Device trigger
*IDN?	Return device identifier. DANBRIDGE, DB62X, 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.
BARGRAPH	Bargraph ON/OFF ON or 1 = Bargraph on OFF or O = Bargraph off.
BARGRAPH?	Recall bargraph on/off setting.

BGSCALE

Set bargraph scale.
CURRENT:
A = Auto scale
1 = 1 pA - 100 pA
2 = 10 pA - 1 nA
3 = 100 pA - 10 nA
4 = 1 nA - 100 nA
5 = 10 nA - 1 uA
6 = 100 nA - 10 uA
7 = 1 uA - 100 uA
8 = 10 uA - 1 mA

RESISTANCE:
A = Auto scale
1 = 10 kOhm - 1 MOhm
2 = 100 kOhm - 10 MOhm
3 = 1 MOhm - 100 MOhm
4 = 10 MOhm - 1 Gohm
5 = 100 MOhm - 10 Gohm
6 = 1 GOhm - 100 Gohm
7 = 10 GOhm - 1 Tohm
8 = 100 GOhm - 10 Tohm
9 = 1 TOhm - 100 Tohm
10 = 10 TOhm - 1 POhm

BGSCALE?

Recall bargraph scale setting.

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.

CHTIME

Set charge time.

CHTIME?

Recall charge time setting.

CLIM

Clear all limits

CONTINOUS

Start continuous measurements

DATATRANS

Data Transmission ON (or 1) / OFF (or 0)
(Introduced in SW version CA17)

DATATRANS?

Recall Data Transmission 0 for OFF / 1 for ON
(Introduced in SW version CA17)

DISPLAY	Display ON/OFF. ON or 1 = Display on. OFF or O = Display off.
DISPLAY?	Recall display ON/OFF setting.
DMODE	Set output/display mode. I = Current reading. R = Resistance reading.
DMODE?	Recall display mode setting.
DISCHARGE	Set discharge ON/OFF. ON or 1 = Discharge on. OFF or 0 = Discharge off.
DISCHARGE?	Recall discharge on/off setting.
HUMREJECT	Set humreject 50 or 60 Hz. 50 = 50Hz. 60 = 60Hz.
HUMREJECT?	Recall humreject setting.
HTADJUST	Perform an HT ADJUST
HTALARM	Set HT Alarm ON/OFF ON or 1 = HT Alarm on. OFF or 0 = HT Alarm off.
HTALARM?	Recall HT Alarm setting.
HTCURRENT	Set HT1 current limit. Y:0, 1, 2 .XXXX: Password Format: HTCU Y,XXXX
HTCURRENT?	Recall HT1 current limit.
HT2CURRENT	Set HT2 current limit . Y:0, 1, 2 .XXXX: Password Format: HTCU Y,XXXX (Dual HT supply units only)
HT2CURRENT?	Recall HT2 current limit. (Dual HT supply units only)

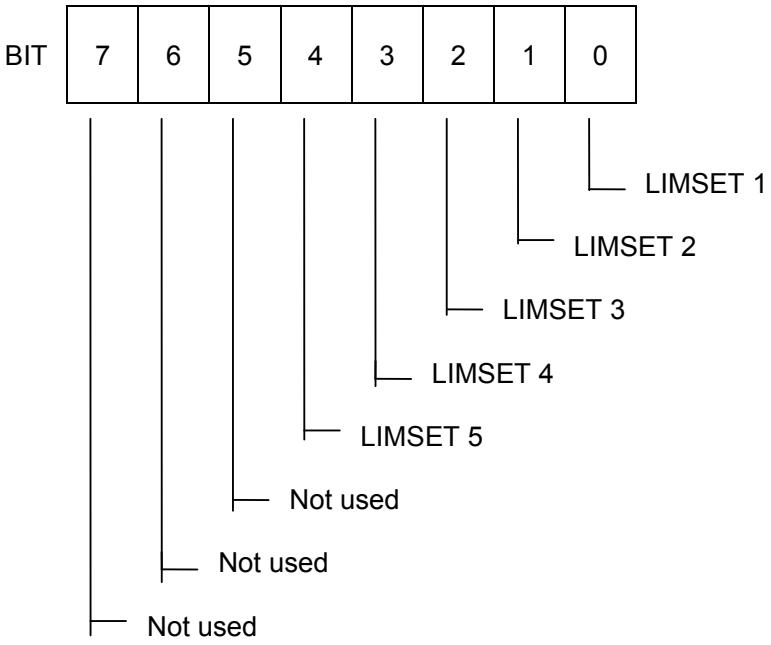
HTEXTERNAL	Set DB62X in external HT mode. (internal HT supply off) ON or 1 = External HT is used. OFF or 0 = Internal HT supply is used.
HTEXTERNAL?	Recall HT external
HTGND	Set HT on ground feature ON/OFF. (DB620 only) ON or 1 = HT on ground on. OFF or 0 = HT on ground off.
HTGND?	Recall HT on ground ON/OFF setting.
HTMVOLT?	Recall actual HT voltage.
HT2MVOLT?	Recall actual HT2 voltage.
HTVOLT	HT voltage setting.
HTVOLT?	Recall HT voltage setting.
HT2VOLT	HT voltage setting. (Dual HT supply units only)
HT2VOLT?	Recall HT voltage setting. (Dual HT supply units only)
HTOUTPUT	Set HT output ON/OFF. ON or 1 = HT on. OFF or 0 = HT off.
HTOUTPUT?	Recall HT output ON/OFF setting.
LIM0	Enter lim0 value. Format: LIM0 I/R, value
LIM0?	Recall lim0 value.
LIM1	Enter lim1 value. Format: LIM1 I/R, value
LIM1?	Recall lim1 value.
LIM2	Enter lim2 value. Format: LIM2 I/R, value
LIM2?	Recall lim2 value.

LIM3	Enter lim3 value. Format: LIM3 I/R, value
LIM3?	Recall lim3 value.
LIM4	Enter lim4 value. Format: LIM4 I/R, value
LIM4?	Recall Lim4 value.
LIMIT	Set limit ON/OFF. ON or 1 = Limit on. OFF or 0 = Limit off.
LRCNOM	Set Low Resistance Compensation Nominal value. Format: LRCN R, value Value is between 10.8K and 13.2K ohm. This feature is present on DB620, DB621, DB622 and DB623.
LRCNOM?	Recall Low Resistance Compensation Nominal value.
LRCCOMP	Perform Low Resistance Compensation Or clear it/turn off. ON or 1 = Perform. OFF or 0 = Clear. Valid on DB620, DB621, DB622 and DB623
LRCCOMP?	Perform Low Resistance Compensation Or clear it/turn off. Returns 1 = Performed, or 0 = Disabled.
LIMIT?	Recall limit ON/OFF information.
MDELAY	Set measurement delay time.
MDELAY?	Recall measurement delay time.

MESTB?	Read MEASUREMENT ERROR STATUS REGISTER.
MEER	Set MEASUREMENT ERROR ENABLE STATUS REGISTER.
MEER?	Recall MEASUREMENT ERROR ENABLE STATUS REGISTER SETTING.
NRESISTANCE	Set Reject on negative result. ON or 1 = Reject on negative result on. OFF or 0 = Reject on negative result off.
NRESISTANCE?	Recall Reject on negative result.
RANGE	Range setting information. 1 = Range 1 2 = Range 2 3 = Range 3 4 = Range 4 0 or A = Auto range (Continuous measurements only)
RANGE?	Recall range 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.

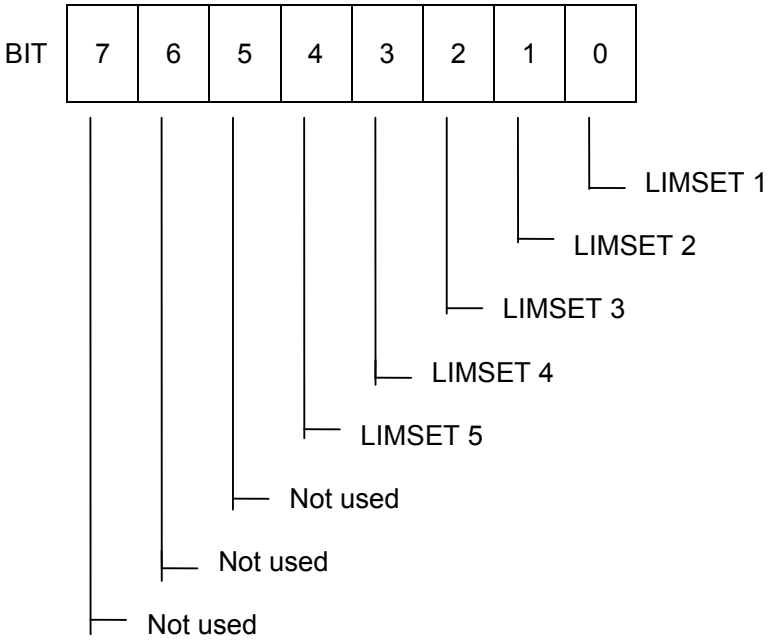
RLIMSET?Recall which limset are stored.



0 = FREE
1 = STORED

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.



0 = FREE
1 = STORED

SQSELECT — Set which sequence is selected.
Note: 1-4 are fixed, others are user defined.
Example: SQSELECT 5
Note: Available on software version CA44+

SQSELECT? — Recall which sequence is selected.
Note 1-4 are fixed, others are user defined
Note: Available on software version CA44+

SQCLEAR x — Clear a given sequence (x) number. Fixed sequences (1-4) cannot be cleared (and will return the error: ERROR OUT OF RANGE)
Example: SQCLEAR 5
Will clear the first user defined sequence (5).
Note: Available on software version CA44+

SQCLEAR [sequence number]?

Recall whatever sequence is cleared/empty. Fixed sequences (1-4) cannot be cleared, however returns that is is fixed.
Return values are:
SQCLEAR x [type]
Where x is the number requested, and type is one of the following:

FIXED
USERDEFINED
EMPTY

Example:
SQCLEAR 1?
Returns:
SQCLEAR 1 FIXED

Note: Available on software version CA44+

SQACTIVE

Set sequences ON or OFF, note a sequence should be selected first (See SQSELECT).
ON or 1 = ON
OFF or 0 = OFF

Note: Available on software version CA44+

SQACTIVE?

Recall whatever sequences is ON or OFF.
Returns:
SQACTIVE 0 when off
SQACTIVE 1 when on

Note: Available on software version CA44+

SQTYPE?

Recall what kind of sequence is selected.
Returns:
SQTYPE FIXED for FIXED sequences
SQTYPE USERDEFINED when non-empty sequence is selected.
SQTYPE EMPTY when empty sequence is selected.

Note: Available on software version CA44+

SQAVAILABLE?

Recall total number of available sequences (fixed user defined (whatever empty or not).

Note: Available on software version CA44+

SQFIXEDAVAILABLE? Recall total number of available FIXED sequences.

Note: Available on software version CA44+

SQPARAMETER [sequence#], [step#],[COMMAND](,[parameters])
Set given sequence step commands in user defined sequences.

Sequence# is the given sequence number (5-8). FIXED sequences (1-4) cannot be set, and trying will return an "ERROR OUT OF RANGE". It is however possible to request such commands.

Step# is the step number (1-20) in the given user defined sequence.

The following commands are possible, and parameters format is as below.

CHARGE,[volt],[time]
WAIT,[volt],[time]

MEASURE,[Range],[Zi],[average], [limset#]

MEASCONT,[volt],[range],[Zi],[average], [limset#],[time]

MEASTOGO,[range], [Zi],[average], [limset#],[time]

FLASHTEST,[range],[limset#],[time]

DISCHARGE,[time]
Time = 0 is auto

NONE
(Removes any present command at the given step)

Where:
range is wanted range, A or 0 is auto range.
Limset# is limit set number (0-4).
Zi is range 1 Zi:
H : Range 1 Zi = 1M Ohm
L : Range 1 Zi = 1k Ohm
(For other ranges, a valid Zi is still needed for simplicity).

Examples:

SQPA 5,1,CHARGE,100V,1800MS
SQPA 5,2,WAIT,100V,5S
SQPA 5,3,MEASURE,1,H,20,0
SQPA 5,4,0MS
SQPA 5,5,NONE

Note: Available on software version CA44+

SQPARAMETER [sequence number], [step number]?

Recall the given step parameter from the given sequence.
Example:
SQPARAMETER 1, 1?
Returns the first steps parameters from the first fixed sequence, for example:

SQPARAMETER CHARGE, 100V, 1000MS

Note that on fixed sequences, volt depends on the general HT voltage setting.

Return values is in the following format, depending on the sequence command:

CHARGE,[volt]V,[time]MS

WAIT,[volt]V,[time]MS

MEASCONT,[volt]V,[range],[High/Low],[average count],[limset],[time]MS

MEASURE,[range],[High/Low],[average],[limset]

MEASTOGO,[range],[High/Low],[average],[limset],[time]MS

DISCHARGE,[time]MS

FLASHTEST,[range],[High/Low],[limset],[time]MS

Where:

time is in ms
range can be given range or A for auto
High/Low is either H for High or L for low

Note: Available on software version CA44+

SQPROGRESSDATAOUT [ON/OFF/0/1]
Selects Normal (OFF/0) data out during sequences or a mode to show progress.
Note: Available on software version CA45+

SQPROGRESSDATAOUT?
Recall sequence data out mode.
Normal (0) or Progress (1)
Note: Available on software version CA45+

TRIG	External TRIG ON/OFF. ON or 1 = Enable external trig. OFF or 0 = Disable external trig.
TRIG?	Recall External trig on/off setting.
ZADJUST	Perform a ZERO ADJUST. 1/2/3/4 = Range number ALL = All ranges
ZADJUST?	Recall Zero adjust setting/status.

Some commands are only valid in some modes, and on some devices.

DB60x compatibility commands

BURST	Set burst mode ON/OFF ON or 1 = Burst mode on. OFF or O = Burst mode off.
BURST?	Recall burst mode ON/OFF setting .
HTCVOLT	HT2 voltage setting . (Dual HT supply units only)
HTCVOLT?	Recall HT2 voltage setting . (Dual HT supply units only)
HTFVOLT	HT1 voltage setting . (Dual HT supply units only)
HTFVOLT?	Recall HT1 voltage setting (Dual HT supply units only)
XYGRAPH	XY graph ON/OFF ON or 1 = XY graph on OFF or O = XY graph off.
XYGRAPH?	Recall XY graph on/off setting.
XYGXTIME	XY graph time (in seconds)
XYGXTIME?	Recall XY grapg time setting
XYGYSCALE	Set XY graph scale. A = Auto scale 1 = 10 pA 2 = 100 pA 3 = 1 nA 4 = 10 nA 5 = 100 nA 6 = 1 uA 7 = 10 uA 8 = 100 uA 9 = 1 mA
XYGYSCALE?	Recall XY graph time 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 a 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
ZADJUST	DONE	
RAN”GE		SYNTAX ERROR

DONE? Recall done on/off setting.

LOCAL Goto local.

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

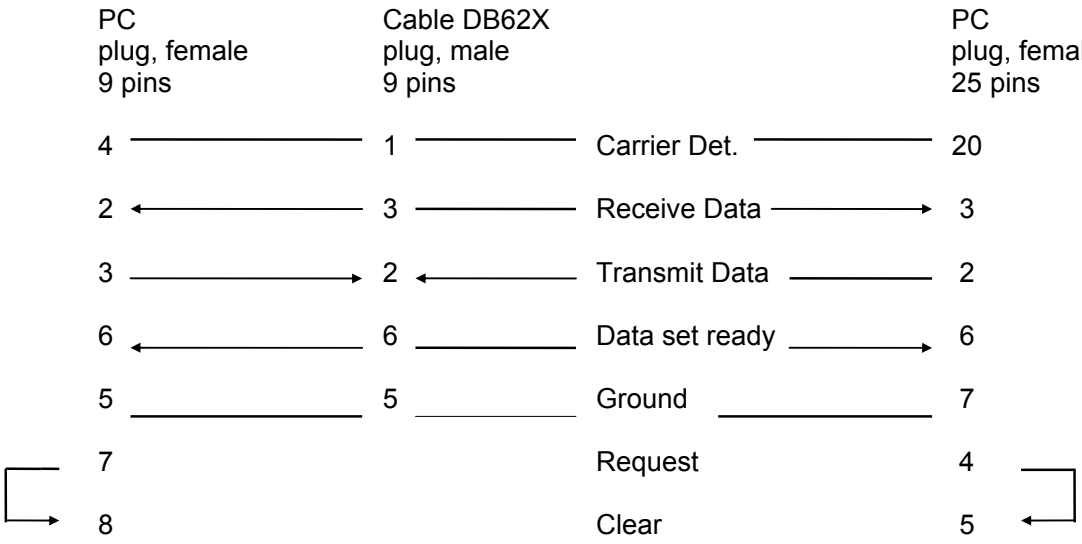
The input and output formats are the same as for IEEE, see this section for details.

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

All output data are terminated with CR LF.

Cable Connections

RS232 Cable Connections



Application note:

Insulation Testing of Capacitors

There are some limiting factors to be considered when measuring the Insulation Resistance of High Quality Capacitors.

There is a maximum value of obtainable insulation Resistance depending on the capacitance value and the applied test voltage. See Fig. 22 and 23 on the following pages. This is caused by the residual regulation noise in the 0.1 Hz to 10 Hz range from the H.T. Power supply, which is impossible to either reduce or filter out in the Current Input stage without prolonging the stabilization time of the H.T. or the settling time for the Current Input Amplifier.

Most Capacitors show a memory effect by Insulation Resistance measurements. The resistance value will grow when they are charged repeatedly to the same voltage with the same polarity, and if the polarity is changed the resistance value will be lower than normal. I.e. if a 60 sec Insulation Resistance measurement according to the international standards has to be repeated, the capacitor under test must be carefully discharged and the second measurement must be delayed about 24 hours in order to obtain comparable measurements.

Some Capacitors with very high Insulation Resistance f.ex. Polystyrene and Polypropylene Film Capacitors will, when exposed to an absolute DC voltage, for a long period of time, i.e. more than 200 sec. start to generate a current noise due to internal charging phenomena. This appears on the display as if the resistance value starts decreasing and the readout becomes noisy.

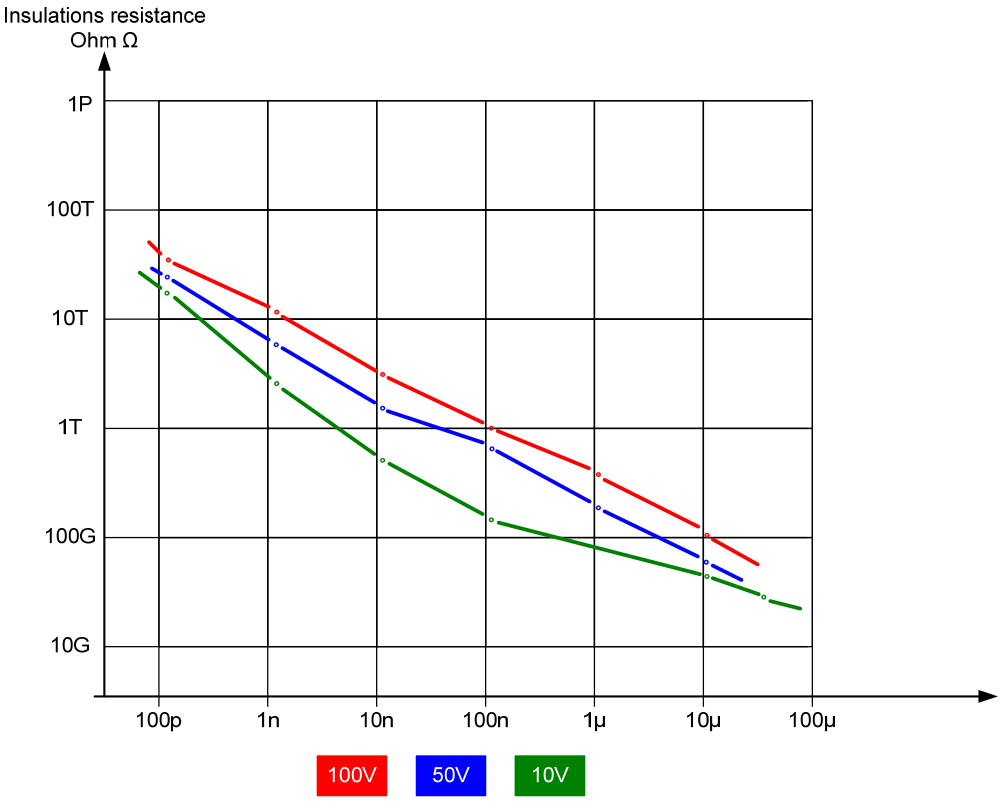

Insulations resistance
Ohm Ω
1P
100T
10T
1T
100G
10G
100p
1n
10n
100n
1µ
10µ
100µ
100V
50V
10V

Fig. 22.

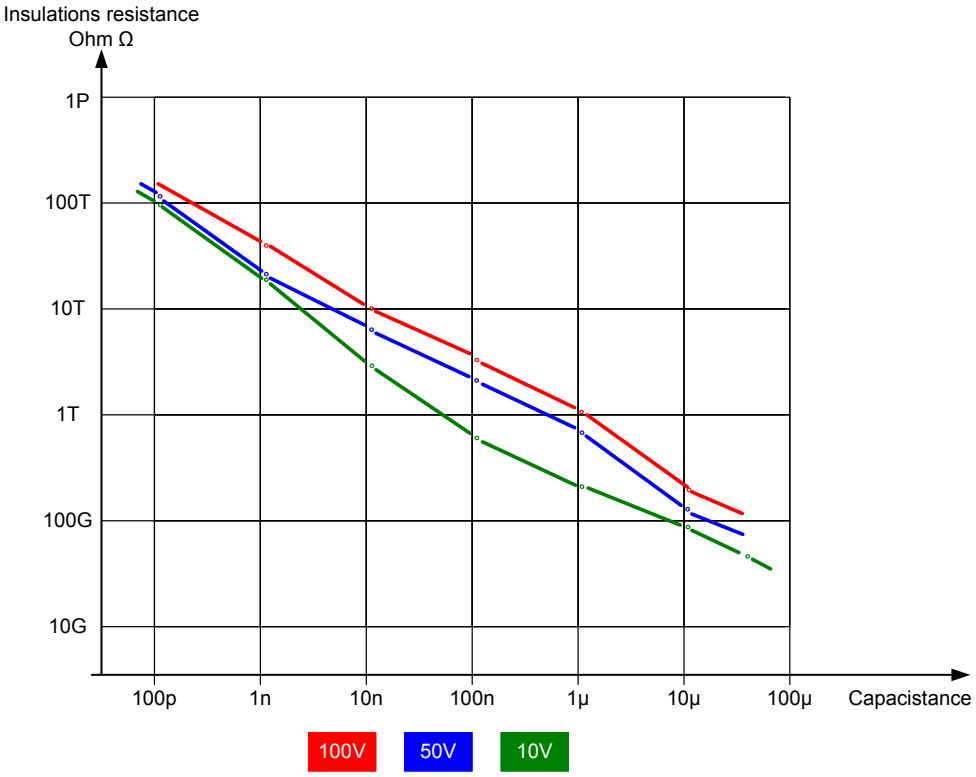
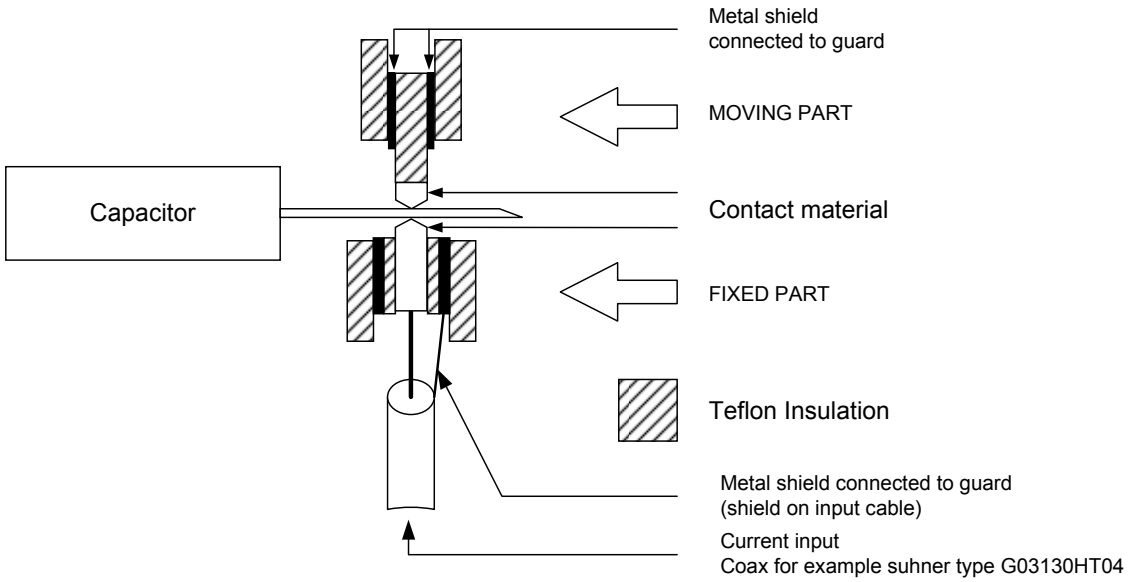

Insulations resistance
Ohm Ω
1P
100T
10T
1T
100G
10G
100p
1n
10n
100n
1µ
10µ
100µ
Capacistance
100V
50V
10V

Fig. 23.



The movement must be between the metal shield and the outer teflon insulation
in order to avoid electrostatic charges in the current input terminal

Fig. 24.

Appendix A – Sequences

This covers software versions CA16/MA16 or later. Compared to previous versions the sequence commands have been slightly changed, a flash test command has been added and it is now possible to type in current or resistance limits independent of the measurement mode.

The DB62X megohmmeters can be programmed to run a sequence of measurements after being triggered from the keyboard or remotely. The measurements can be compared with limits and set the bin out signals to approve or reject the device under test. In order to avoid some of the pitfalls associated with this, especially when testing capacitors, a basic understanding of the functions of the megohmmeter is required.

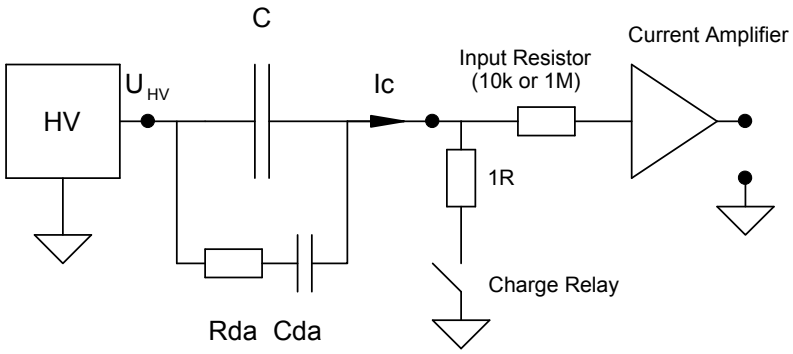


Fig. A-1

Fig. A-1 shows the HV supply and the input stage of the current amplifier. The test object is a capacitance. First, the capacitance is charged, the start current limited by the current limit setting of the HV supply. In order to speed up charging and to protect the current amplifier, the charge relay short circuits the input during charging. The charge relay is controlled by an internal signal ILIM which is high when the output current of the HV supply is larger than 2mA. In sequence mode, the charge relay remains activated if the preset charge time exceeds the time it takes for the current to fall below 2mA (the charge relay is active until both ILIM is reset AND charge time has expired). The charge relay is also activated during discharge.

When measuring capacitance's the effect of "dielectric absorption" must be considered. This effect is also referred to as "soaking". It can be described with the equivalent shown in Fig. A-1. Cds will typically have a value of 0.1 - 1% of C and the time constant of Rda and Cda will be app. 1 - 10 sec. This means that after C has been fully charged a current larger than the leakage current will flow into the capacitor. However, just after the charge relay is deactivated the absorption current is delivered by the main capacitance and the current amplifier measures a very small value. 1 to 3 seconds later the absorption current is measured. It is clear that care has to be taken when planning the timing of the sequence.

Fig. A-2 below shows a typical sequence when measuring the leakage current (or IR) of a foil capacitor with dielectric absorption.

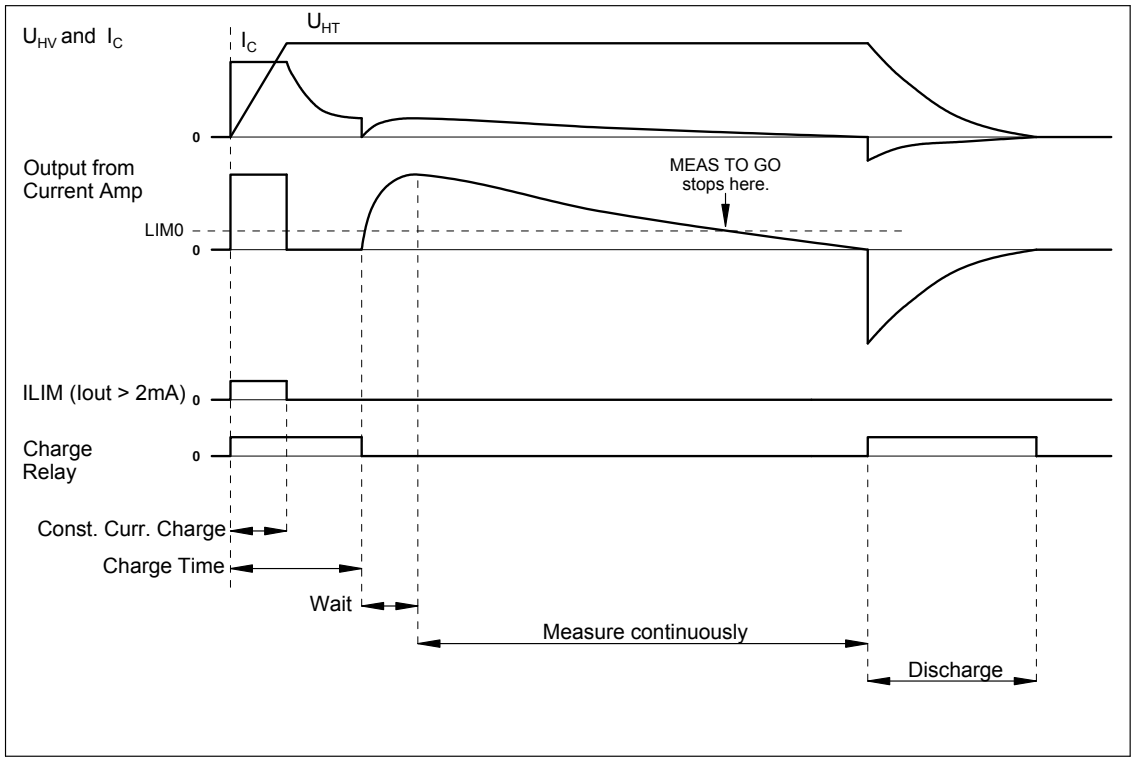


Fig. A-2

The charge relay is activated during the preset charge time, which is longer than it takes for the current to fall below 2mA. When the charge time expires, the charge relay is deactivated. Immediately after this the measured current is very low (and hence the calculated resistance very high), but in the period after the absorption current begins to flow through the capacitor. To avoid premature approval of a component measurement should not start until typ. 1-3 sec. after the charge relay has been deactivated.

In the following the sequence commands are described.

CHARGE Charge the DUT

Input param.: HT voltage
Time in ms

Maximum CHARGE current is set in:

MENU > MEASURE SETUP > HT CONTROL > MAXIMUM CURRENT

the constant current charge time can be calculated from:

$$T_{Limit} = \frac{C \cdot U}{I_{Lim}}$$

WAIT Wait without comparing the measurements with the limits

Input param.: HT Voltage
Time in ms

MEASURE Make a single measurement

Input param.: Range (RN)
Average Count (AVC)
Limitset (0: limits disabled)
(Time is calculated as AVC × 40ms)

The ranges are as follows:

Range 1: 1pA - 10nA
Range 2: 2nA - 100nA
Range 3: 20nA - 10uA
Range 4: 2uA - 1mA

In range 1 an input resistance of either 10kohm or 1Mohm can be chosen.

BIN out will be updated after the measurement when a limit set different from 0 is selected.

MEAS. CONT. Measure continuously (similar to the earlier MEAS. DELAY except that range, avc and limitset can be specified)

Input param.: HT Voltage

Range (RN)
Average Count (AVC)
Limitset (0: limits disabled)
Time in ms

BIN out will be updated continuously when a limit set different from 0 is selected.

MEAS. TO GO Measure continuously until limit is met, then stop and discharge (see Fig. A-2)

Input param.: Range (RN)
Average Count (AVC)
Limitset (0: limits disabled)
Time in ms

The limitset should only contain one limit (LIM0). If the limit is not met the sequence will continue until the set time. BIN out will be updated continuously when a limitset different from 0 is selected.

FLASH TEST Measure current, if the current exceeds the first limit then stop and set BIN 0

Range (RN)
Limitset (0: limits disabled)
Time in ms

This instruction is intended to register flash-over at extended voltage. Please note, that the Bin Out signal has been reversed (BIN 0 means "bad component") compared to the normal current mode. This is because the flash test normally is followed by an insulation resistance test which sets BIN 0 for a "bad" component.

DISCHARGE Turn off HT and discharge DUT (internal 10kohm)

Input param.: Time in ms

If 0ms is set AUTO discharge has been selected. This will discharge the DUT until the voltage is below app. 7V in HT High Range and 0.7V in Low Range.

Example 1: 20 sec. Measure to Go

STEP	FUNCTION	HT VOLT	RN	AVC	LIM SET	TIME SEC
1	CHARGE	500	N/A.	N/A.	N/A.	1.0s
2	WAIT	500	N/A.	N/A.	N/A.	1.0s
3	MEAS. TO GO		1H	4	1	18.0s
4	DISCHARGE					2.0
5						

The megohmmeter is in resistance mode and a limit LIM0 of say 500Gohm is stored in LIMSET 1.

The DUT is charged to 500V for 1 sec. second, then there is a wait state of 1 sec. before measurement starts. If the measured resistance exceeds 500Gohm within 18 sec. BIN5 is set, the sequence is stopped and the DUT is discharged for 2 sec. If the resistance do not exceed 500Gohm the actual value is measured after a total of 20 sec., BIN0 is set and the DUT is discharged.

Example 2: Flash test followed by IR test

STEP	FUNCTION	HT VOLT	RN	AVC	LIM SET	TIME SEC
1	CHARGE	400	N/A.	N/A.	N/A.	1.0s
2	WAIT	400	N/A.	N/A.	N/A.	1.0s
3	FLASH TEST		3	1	1	2.0s
4	DISCHARGE					AUTO
5	CHARGE	100	N/A.	N/A.	N/A.	1.0s
6	WAIT	100	N/A.	N/A.	N/A.	1.0s
7	MEAS. TO GO		1H	4	2	18.0
8	DISCHARGE					AUTO

LIMSET 1 is a current limit for the flash test. It should be larger than the absorption current in order not to detect a flash over immediately after the wait state. If a flash over occurs, the sequence is stopped and BIN0 is set. If the DUT passes the flash test, BIN5 is set. Then an insulation resistance test is performed at the rated voltage. LIMSET2 is a resistance limit. If the IR is to low, BIN0 is set, otherwise BIN5 is set.

Appendix B – Limits and BIN OUT

The Bin Out connector is used to for external triggering of the instrument and to output "bin" signals in accordance with predefined limits. Fig. B-1 shows the layout of the connector.

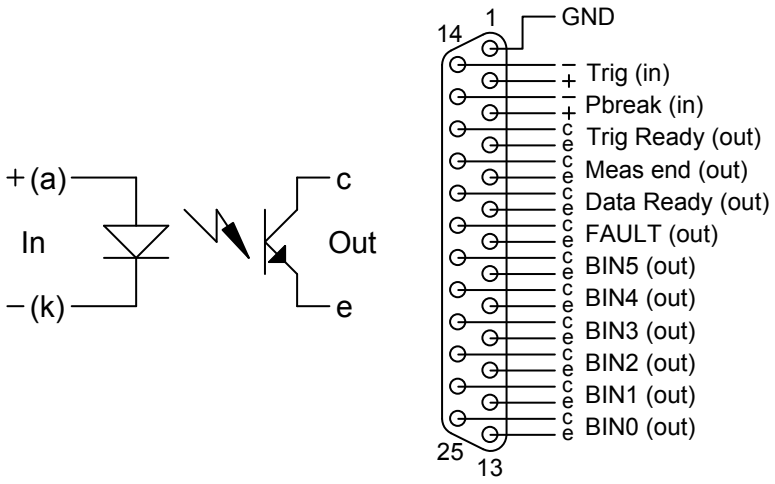


Fig. B-1

The Pbreak input is used to shut down the high voltage supply without having to restart the instrument, as is the case when activating HV Break.

The optocoupler input triggers the DB62X by an input current of 10mA (maximum 30mA forward and maximum 6V reverse). The optocoupler outputs are rated 25V and 10mA each. Both input and output require external power and series resistors.

Fig. B-2 shows how the Bin Out signals are set in accordance with the Limits. If the value is between LIM1 and LIM2, the BIN2 output is active (the output phototransistor is on).

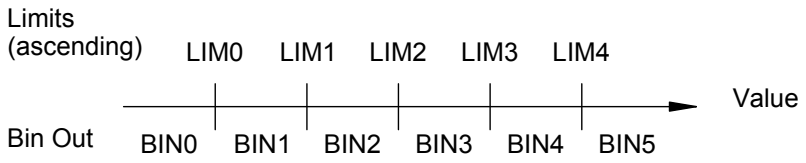


Fig. B-2

Resistance mode

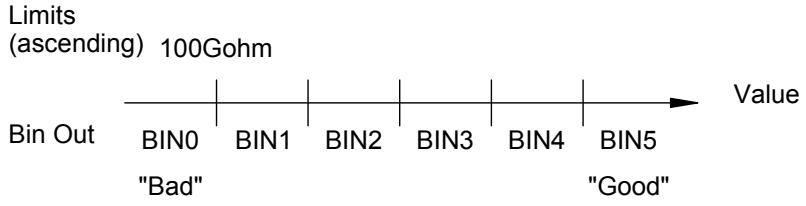


Fig. B-3

Current mode

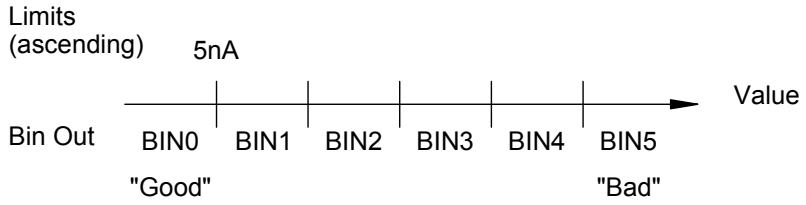


Fig. B-4

Both in resistance (Fig. B-3) and in current (Fig. B-4) modes the limits should be organized in ascending order. This means that in resistance mode and with only one LIM defined a "good" component will set BIN 5, in current mode it will set BIN 0. More limits could be used to exclude shorted or open components.

When using resistance limits the instrument must be in resistance measuring mode, when using current limits it must be in current measuring mode.

SETUP FOR IR AND FLASH TEST

Fig. B-5 shows an example of a setup that can be used to perform flash test and/or IR test. In both cases the BIN0 is set if there is a flash over or if the insulation resistance is too low. Otherwise the BIN5 is set if the component is approved. The series resistances is calculated from:

$$R_{Trig} = \frac{6V - 2V}{10mA} \qquad R_{LED} = \frac{6V - 2V}{3mA}$$

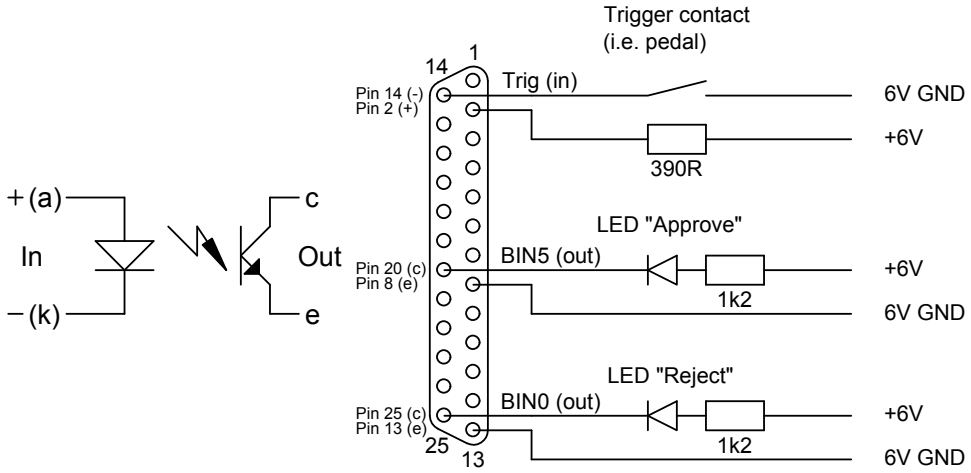


Fig. B-5

Index