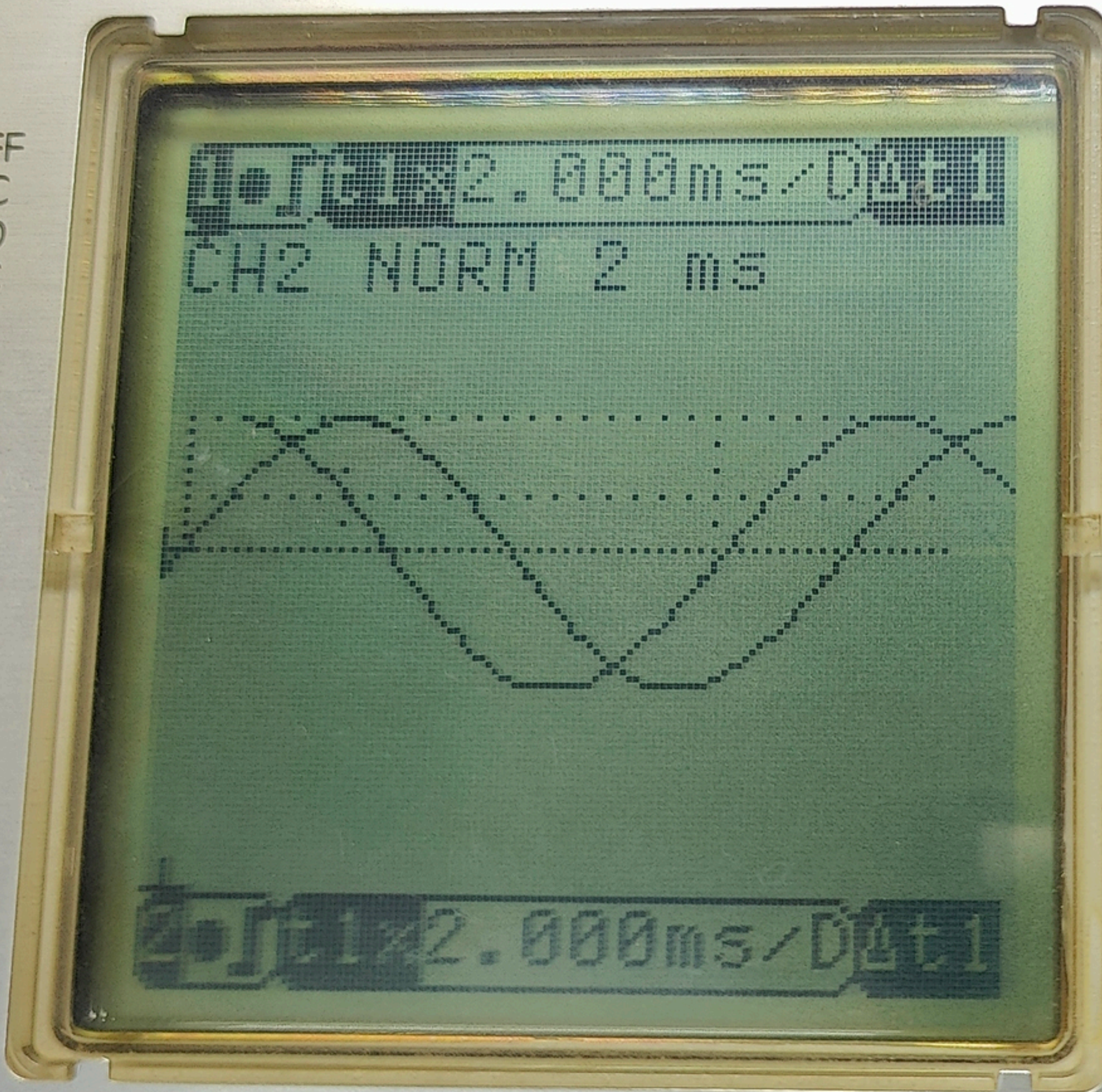


CREATEC

SC 01

OFF  
DC  
GD  
AC

V  
.01  
.02  
.05  
.10  
.20  
.50  
1  
2  
5  
10  
20

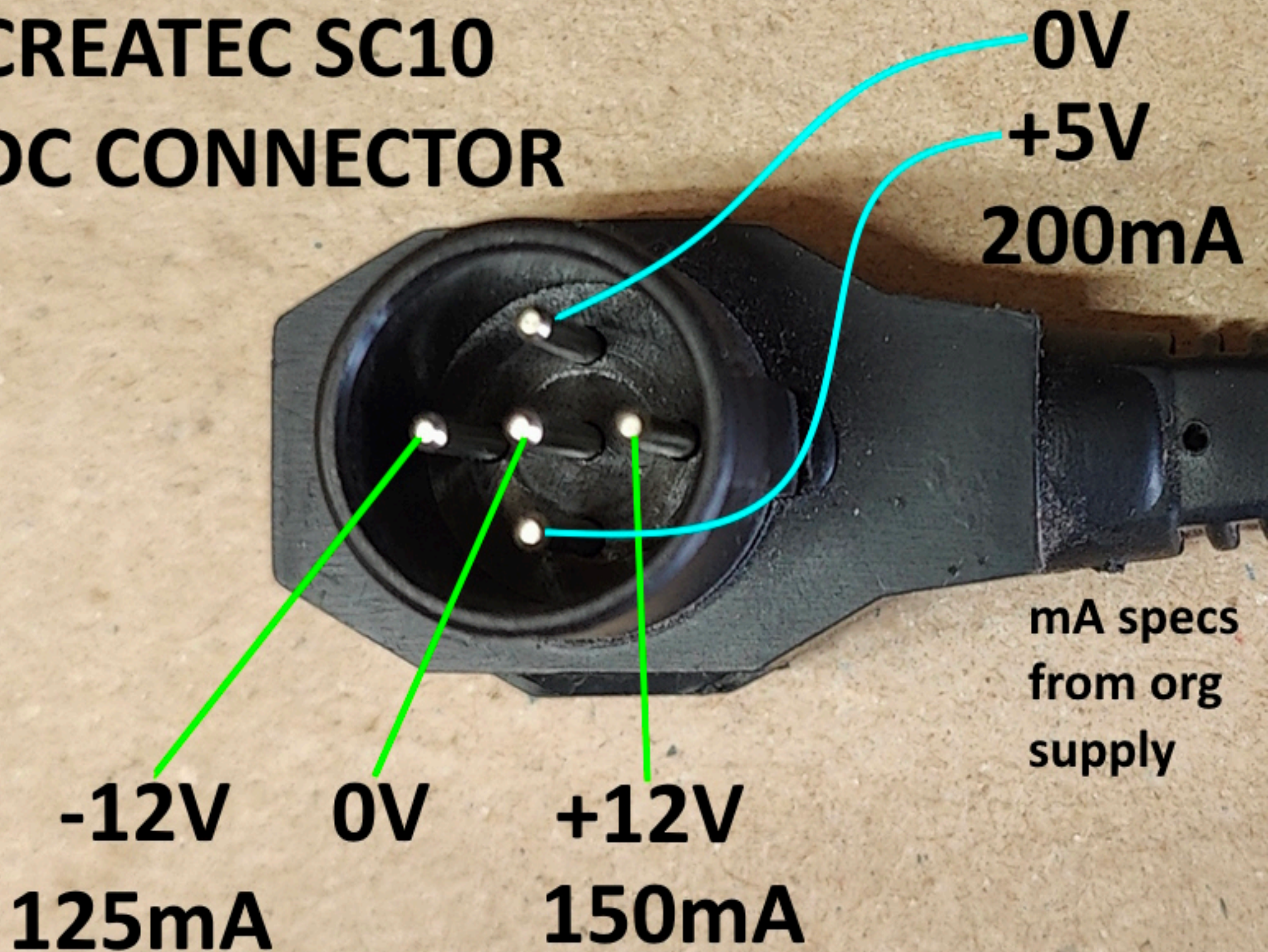


OFF  
DC  
GD  
AC

V  
.01  
.02  
.05  
.10  
.20  
.50  
1  
2  
5  
10  
20



# CREATEC SC10 DC CONNECTOR





CH 1

TRIG

CH 2

©CREATEC

SC 01

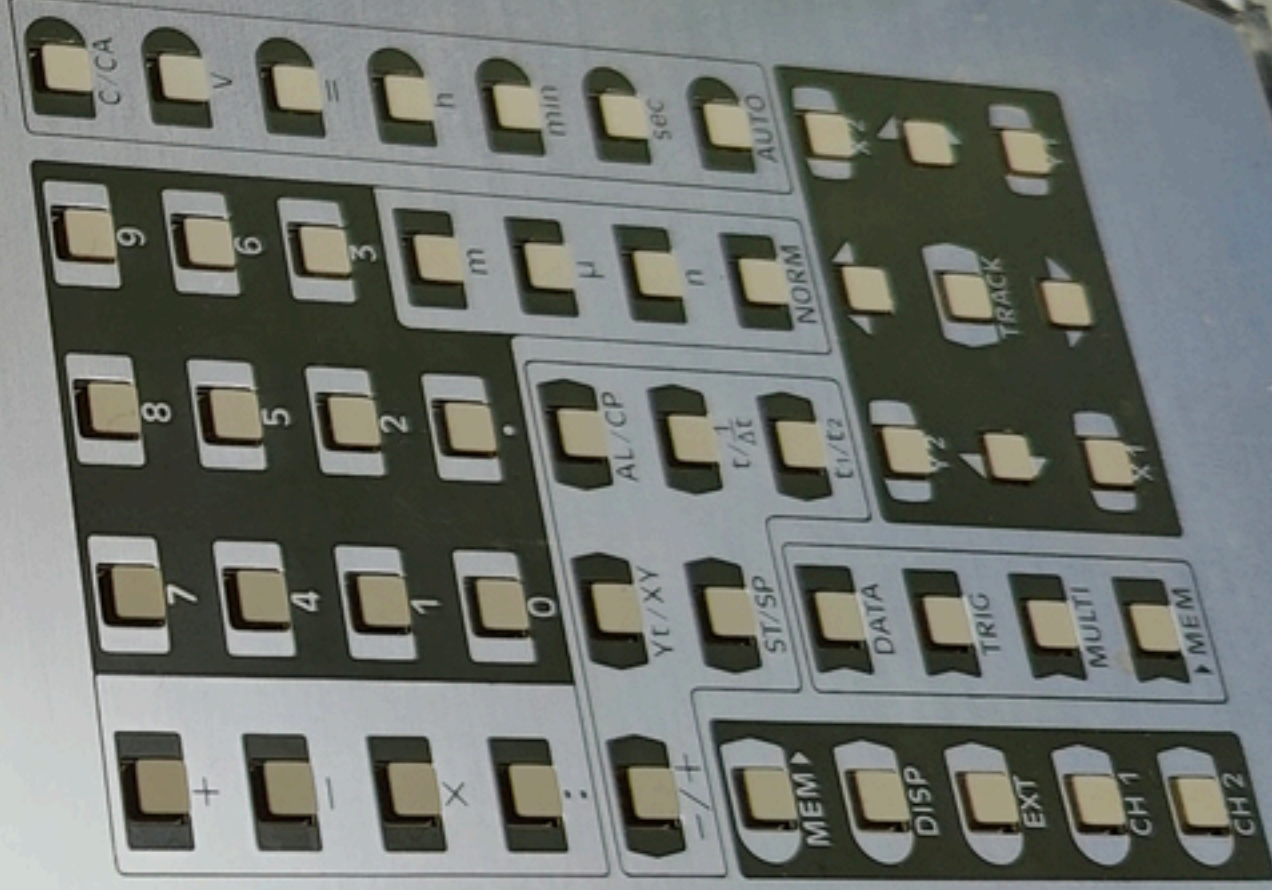


OFF  
DC  
GD  
AC

V 01 .02 .05 .10 .20 .50 1 2 5 10 20

OFF  
DC  
GD  
AC

V 01 .02 .05 .10 .20 .50 1 2 5 10 20





SC 01

OFF  
DC  
GD  
AC

V  
.01  
.02  
.05  
.10  
.20  
.50  
1  
2  
5  
10  
20



# KEY SEQUENCE CHART

## ABBREVIATIONS:

ACA	AUTO-CALIBRATION
AC	ALTERNATING CURRENT
APC	AUTO-POSITIONING OF CURSORS
ATA	AUTO-TIMEBASE ANALYSIS
ATC	AUTO-TRIGGER CONTROL
AUTO	AUTO-NORMAL TRIGGER
CH	CHANNEL
CMS	COUPLING MODE SWITCH
DC	DIRECT CURRENT
GD	GROUND
IRS	INPUT RANGE SWITCH
NORM	NORMALISE - NORMAL TRIGGER
PIXEL	SINGLE PICTURE ELEMENT
Xo	X ORIGIN - A VERTICAL LINE 4 PIXELS FROM THE LEFT HAND EDGE OF THE DISPLAY
Yo	Y ORIGIN - A HORIZONTAL LINE IN THE CENTER OF THE DISPLAY EQUIVALENT TO ZERO VOLTS
[ ]	OPTIONAL

Keys WITHIN any priority grouping  
can be interchanged

## KEY TYPES

## KEY GROUPINGS

## KEY SYMBOLS ON THE INSTRUMENT

## SOURCE KEYS

## FUNCTION KEYS

## OPERATOR KEYS

## COMMAND TERMINATION KEYS

## CHANGE-OVER KEYS

## KEY PRIORITY ORDER:

				1	2	3	4	5	6	7	8	9	10	11	12
1. OPERATION	ON	Plug in power supply Move CMS from OFF to DC, AC or GD	1	CH											
	OFF	Move CMS into the OFF position Pull out power supply	2	CH										C/CA	
	FULLY AUTOMATIC	ACA + ATA + ATC + APC	3	CH										AUTO	
2. INPUT SIGNALS	Scaling	Vertical	By range	4	USE RANGE SWITCHES (IRS) FOR CH1 OR CH2.										
			By numeric entry	5	CH		NORM				4	0	2	m	V
			Expand/Compress	6	CH		NORM		▲						
			ACA Autocalibration	7	CH		NORM		▲					AUTO	
	Horizontal	Horizontal	ATA Auto-Timebase Analysis	8	CH		NORM		▲					AUTO	
			Expand/Compress	9	CH		NORM		▲						
			By numeric entry	10	CH		NORM				8	0	2	m	sec
	Positioning	Vertical	By numeric entry	11	CH				+		1	0	0	m	V
			Step by step	12	CH				▲						
			Auto-set to Y = Yo (V = U = 0V)	13	CH				▲					AUTO	
		Horizontal	By numeric entry	14	CH				-		5	0	0	n	sec
			Step by step	15	CH				▲						
			Auto-set to Xo	16	CH				▲					AUTO	



## 3. CURSORS

3. CURSORS

Positioning

Vertical  
 $\Delta V = \Delta U = \Delta Y = Y_2 - Y_1$

By numeric entry

17

CH

Y

-

8

.

2

V

Step by step

18

CH

Y

Auto-set to  $Y = Y_0$  ( $V = U = 0V$ )

19

CH

Y

AUTO

Switch off both Y-cursors for a channel

20

CH

Y

C/CA

Horizontal  
 $\Delta t = \Delta X = X_2 - X_1$

By numeric entry

21

CH

X

+

8

0

2

m

sec

Step by step

22

CH

X

Auto-set to  $X_0$

23

CH

X

AUTO

Switch off both X-cursors for a channel

24

CH

X

C/CA

Parallel Movement

Vertical  
 $\Delta V = \Delta U = \Delta Y = Y_2 - Y_1$

By numeric entry

25

CH

Y

TRACK

+

1

8

2

m

V

Step by step

26

CH

Y

TRACK

Auto-set to  $Y = Y_0$  ( $V = U = 0V$ )

27

CH

Y

TRACK

AUTO

Horizontal  
 $\Delta t = \Delta X = X_2 - X_1$

By numeric entry

28

CH

X

TRACK

-

1

.

1

m

sec

Step by step

29

CH

X

TRACK

Auto-set to  $X = X_0$

30

CH

X

TRACK

AUTO

4. DATA FIELD

Positioning

Horizontal

Scroll in X axis

31

CH

DATA

Auto-set to start

32

CH

DATA

AUTO

Vert.

Shift in Y axis

33

CH

DATA

OFF

Switch off for a channel

34

CH

DATA

C/CA

ON

Switch on for a channel

35

CH

DATA

5. AUXILIARY TIMEBASE	Display expansion of time ( $X_2-X_1$ ) (Zoom)	Move cursors to required position and switch to aux. timebase	36	CH	X	◀ ▶											$t_2 / t_1$
		Expand/Compress (Zoom)	37			◀ ▶											
		Numeric entry of aux. timebase scaling factor	38		NORM				1	0	0	n	sec				
		Shift the starting point of the aux. timebase	39		X1	◀ ▶											
		Auto-set the starting point of the aux. timebase to $X_0$	40		X1											AUTO	
		Switch back to the primary timebase	41														$t_2 / t_1$

6. TRIGGER SOURCES	TRIGGER SOURCE		TRIGGERED CHANNEL														
	Channel 1 (CH1)	CH 1 and CH 2	42	CH 1	TRIG											=	
		CH 1	43	CH 1	TRIG				1							=	
		CH 2	44	CH 1	TRIG				2							=	
	Channel 2 (CH2)	CH 1 and CH 2	45	CH 2	TRIG											=	
		CH 1	46	CH 2	TRIG				1							=	
		CH 2	47	CH 2	TRIG				2							=	
	External Trigger (EXT)	CH 1 and CH 2	48	EXT	TRIG											=	
		CH 1	49	EXT	TRIG				1							=	
		CH 2	50	EXT	TRIG				2							=	
	Default trigger source selection		51	The first CMS moved from the OFF position will define that channel as the trigger source for both channels.													



## 8. TRIGGER PARAMETERS

ATC Auto Trigger Control		The trigger level is automatically set to $\frac{V_{max} - V_{min}}{2}$ of the AC component of the input signal. For external triggering it is set in the region of 1.5 V.																	
		The trigger edge is chosen by operating the -/+ changeover key.																	
		Auto-set of trigger level	52	CH	TRIG										AUTO	-/+			
NORM Normal Trigger		The normal (NORM) trigger mode allows the trigger parameters to be manually set in both the X axis (pre or post trigger) and the Y axis (trigger level). The instrument will only trigger if the input signal matches the preset trigger settings. The trigger will only free run if the trigger source or both channels are set to ground (GD).																	
		Internal trigger from channel input signal (pos/neg edge)	53	CH	TRIG	NORM									=	-/+			
		External trigger source (pos/neg edge)	54	EXT	TRIG	NORM									=	-/+			
AUTO Auto-normal Trigger		Identical to normal (NORM) trigger mode except trigger free runs when input signal does NOT match preset trigger parameters.																	
		Internal trigger from channel input signal (pos/neg edge)	55	CH	TRIG	NORM									AUTO	-/+			
		External trigger source (pos/neg edge)	56	EXT	TRIG	NORM									AUTO	-/+			
Single Shot Trigger (Transient events)		In this trigger mode the input parameters are set as in the normal (NORM) mode. Traces are captured in a single shot start/stop sequence when the signal level matches the preset trigger level.																	
		1. Select normal trigger (NORM)	57	CH	TRIG	NORM									=				
		2. Stop trigger sequence	58													SP / ST			
		3. Start new trigger sequence	59													SP / ST			
		4. Repeated Stop and Start (After other operations)	60		TRIG											SP / ST			
ROLL Free running Trigger		The trigger function is disabled in this mode resulting in a free running trigger – the input signal rolls across the display.																	
		Free running trigger CH1 or CH2	61	CH	TRIG										C/CA				
		Free running external trigger	62	EXT	TRIG										C/CA				
		For all internal trigger modes, the trigger parameters can be precisely defined in both X and Y axes. The external trigger input has been designed to be triggered by standard TTL voltages. The SC 01 can be set to trigger on either a pos. or neg. edge in all trigger modes. Negative numbers are used to define post-trigger delay while positive numbers denote pre-trigger (positive delay). The trigger parameters are set after choosing a trigger source (6) and defining the trigger mode (7).																	
Internal Trigger Source		Vertical	By numeric entry neg. or pos. edge	63	CH	TRIG							+	1	2	2	m	V	-/+
			Step by step neg. or pos. edge	64	CH	TRIG												-/+	
		Horizontal	By numeric entry neg. or pos. edge	65	CH	TRIG							-	5	.	3	m	sec	-/+
			Step by step neg. or pos. edge	66	CH	TRIG												-/+	
External Trigger Source		Horizontal	By numeric entry neg. or pos. edge	67	EXT	TRIG							+	2	.	3	m	sec	-/+
			Step by step neg. or pos. edge	68	EXT	TRIG												-/+	



# KEY SEQUENCE CHART

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[ ]	OPTIONAL

Keys WITHIN any priority grouping  
can be interchanged

KEY TYPES	KEY GROUPINGS	SOURCE KEYS	FUNCTION KEYS	O P E R A T O R   K E Y S							C O M M A N D T E R M I N A T I O N K E Y S		CHANGE-OVER KEYS		
				Norm Key	Cursor Keys	Track Key	Positioning Keys	Mathematical Operator Keys	Numeric Keypad	Multiplier Keys	Dimension Keys	Special Purpose Keys			
KEY SYMBOLS ON THE INSTRUMENT		MEM ▶											— / +		
		DISP	DATA	NORM	Y2		▲	+	7	8	9	V	XY / Yt		
		EXT	TRIG		Y1		▼	—	4	5	6	m	h	SP / S	
		CH 1	MULTI		X2		▲	×	1	2	3	μ	min	C / CA	CP / AL
		CH 2	▶ MEM		X1	TRACK	▼	:	0	.		n	sec	AUTO	$\frac{1}{\Delta t}$ / t
	1	2	3	4	5	6	7	8		9	10	11	12		

In multimeter mode the SC01 will automatically carry out a range of measurements and display the results. To maximise accuracy it is essential that the IRS is set to the maximum sensitivity possible without overload, thereby utilising the full 7 bit range of the SC01's A to D. The measurement error which is a function of A to D range utilisation and waveshape is automatically calculated and displayed for each measurement. Multimeter mode is entered by using the following sequence of keys:

Enter Multimeter mode

69

CH

MULTI

=

The display will have the following format:

1. RMS Voltage

70

2. Mean Voltage (DC component)

71

3. Peak to peak Voltage

72

4. Peak Voltage

73

5. Period

74

6. Frequency

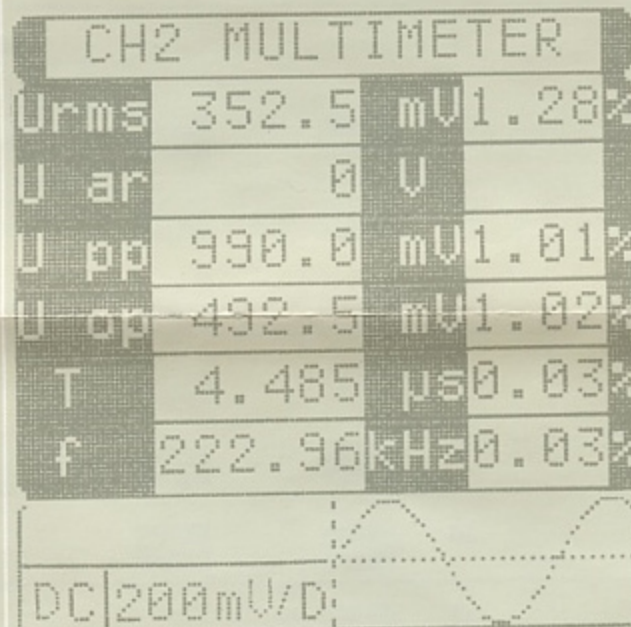
75

7. Waveform display

76

8. Input coupling mode and sensitivity

77



Display voltages only  
(faster response time than 69)

78

CH

MULTI

1

=

Freeze display

79

CH

MULTI

SP/ST

Exit Multimeter mode  
(Return to oscilloscope mode)

80

CH

MULTI

C/CA

## 9. MULTIMETER MODE

### Voltage and Frequency Measurements



## CHANGE-OVER KEYS.

These keys allow the SC01 to alternate between useful operating modes. Generally they can be used without reference to the key sequencing order and only effect the current measurement function. Operating a change-over key once will activate its secondary function. Operating it a second time will cancel the secondary function and the SC01 will revert to its prior state.

## POLARITY change-over key

If this key is operated while setting the trigger parameters, the instrument will trigger on a negative rather than a positive edge or vice versa (see key sequences 7 and 8). If this key is operated after the Display key, the display changes to reverse video.

-/+

From black on white  
to white on black

81

DISP

-/+

Operation of this key after a channel source key will invert the signal applied on the channel's input (beware of DC voltage level).

Invert channel

82

CH

-/+

## DISPLAY PARAMETER change-over key

Operation of this key results in changing from the standard (CH1 =  $V_a(t)$  and CH2 =  $V_b(t)$ ) voltage with respect to time displays to an XY display where the instantaneous voltage on CH1 is plotted in the X axis against the instantaneous voltage on CH2 in the Y axis. For meaningful results both channels should be set to the same sweep rate and signal acquisition should take place in the CHOP mode. Other permutations are possible but require a full awareness of the implications of trigger conditions and signal phase differences. A typical setup is given below:

XY/Yt

1. Choice of trigger source

83

CH

TRIG

=

2. Choice of trigger type (eg ATC)

84

AUTO

3. Choice of sweep rate  
and CHOP mode

85

CH 1

NORM

2

7

0

 $\mu$ 

sec

CP/AL

4. Enter XY display mode

86

XY/Yt

STOP/START-SINGLE SWEEP  
change-over key

The primary function of this key is to initiate single sweep working (see key sequence guide section 7). It can however be used to freeze waveforms (or measurements in Multimeter mode) on the display.

SP/ST

Freeze display

87

CH

SP/ST

CHOP/ALTERNATE  
change-over key

Dual channel working requires one of these two signal acquisition modes to be used. In CHOP mode CH2 automatically works at the same sweep rate as CH1 ( $20\mu\text{s}/\text{DIV min.}$ )

CP/AL

For example in connection  
with key sequence no. 10

88

CH 1

NORM

8

0

2

m

sec

CP/AL

1  
 $\Delta t$  / tFREQUENCY/PERIOD  
change-over key

89

This key converts the  $\Delta t$  period measurement in the data field into a frequency  $f = 1/\Delta t$  and back again if the key is operated a second time.

t<sub>2</sub> / t<sub>1</sub>AUXILIARY TIMEBASE  
change-over key

90

Operation of this key will increase the sweep rate so that the section of waveform between the X-cursors is expanded to full screen width (t<sub>2</sub>). A second operation of the key causes a reversion to t<sub>1</sub>. (See section 5)

TRACK

PARALLEL  
TRACKING KEY

91

See section 3 Cursors.



# 11. MEMORY FUNCTIONS

Memory WRITE Functions	Storing waveform data in memory	92	CH	MEM	1	...	9	=	
	If the chosen memory is already in use the SC 01 will beep and display the following message: (Memories cannot be overwritten and must be cleared before they can be reused).								MEM 8 CLEAR? YES: C/CA! NO: NEW NUMBER
	YES: Clear memory press C/CA key	93							C/CA
	NO: Choose another memory (1-9)	94			1	...	9	=	
Memory READ Functions	Display contents of a memory.	95	MEM		1	...	9	=	
	Shift memory trace in the Y axis. [Auto-set to Y = Yo (V = U = 0V)]	96	MEM		1	...	9	▲	AUTO EXCEPTION
	Shift memory trace in the X axis. [Auto-set to X = Xo]	97	MEM		1	...	9	◀	AUTO EXCEPTION
	Switch on Y-cursors for a memory See chapter 3 no. 18, 19, 20, 26 and 27 for more information	98	MEM		1	...	9	Y	EXCEPTION
	Switch on X-cursors for a memory See chapter 3 no. 22, 23, 24, 29 and 30 for more information	99	MEM		1	...	9	X	EXCEPTION
	Display the data field of a memory See chapter 4 for more information	100	MEM		1	...	9	DATA	EXCEPTION
	Display entire contents (all traces) of all memories	101	MEM					=	
	Scroll through displayed memory traces	102							
Memory ERASE Functions	Clear a memory trace from display (Press C/CA once)	103	MEM		1	...	9		C/CA
	Clear memory contents (all traces) from display	104	MEM						C/CA
	Clear individual memories (If individual trace is not displayed)	105	MEM		1	...	9		C/CA
	Clearing a memory trace from the display and clearing the actual memory contents, use the same key sequence (103 and 105).  To prevent unintentional erasure of a memory the SC 01 will beep and display the following question: MEM 8 CLEAR? If the memory is to be cleared press C/CA once. YES: C/CA! If NOT press the = key and the memory contents will be retained. NO: =								
	Clear ALL memories (1 to 9) (If no traces are displayed)	106	MEM						C/CA
	Clearing ALL memory traces from the display and clearing the contents of ALL memories, is initiated by the same key sequence (104 and 106).  To prevent unintentional erasure of a memory the SC 01 will beep and display the following question: ALL MEMORIES CLEAR? If the memories are to be cleared press C/CA once. YES: C/CA! If NOT press the = key and the contents of the memories will be retained. NO: =								
Saving Operational Settings	The current operational settings of the SC 01 (timebase, trigger parameters, etc.) can be retained in a dedicated non-volatile memory. This feature enables the user to reload the same settings the next time the instrument is used.								
	Store operational settings	107	MEM	MEM					=
	Once the operational settings have been saved, the SC 01 may be powered down. When the instrument is powered up again the old settings can be reloaded or new settings can be entered in the normal manner.								
	Load operational settings	108	MEM	MEM					AUTO



## 12. SIGNAL PROCESSING

## Basic Mathematical Operations on Signals

Signal processing can be undertaken by using the mathematical operators  $+$ ,  $-$ ,  $\times$ ,  $\div$ . The standard key sequence rules (as stated on page 6) do NOT apply for signal processing. Normal mathematical logic is used instead. Remember that the signals are digitised and that division by small values will result in very large amplitudes being displayed. Division by zero is not a valid operation. It is essential to use identical scaling factors (vertical and horizontal). To maintain phase and time relationships when working with multiple signals, signal acquisition should take place in the CHOP mode.

**Note:** Signal processing does not work with the auxiliary timebase!

**BEFORE CARRYING OUT A MATHEMATICAL OPERATION ON A SIGNAL IT IS IMPORTANT TO GIVE THE RESULT A LABEL, SO THAT IT CAN BE IDENTIFIED FOR FUTURE OPERATIONS. THIS IS DONE BY ENTERING AN INTEGER FROM 0 TO 9 FOLLOWED BY A DECIMAL POINT BEFORE ENTERING THE EQUATION.** For example entering "2." will give the result of that operation the label "2."

Adding CH1 and CH2	109	1	+	CH 1	+	CH 2	=	Use identical scaling factors.
Subtracting CH2 from CH1	110	0	+	CH 1	-	CH 2	=	Use identical scaling factors.
Multiplying CH1 by CH2	111	4	+	CH 1	$\times$	CH 2	=	Use identical scaling factors.
Dividing CH1 by CH2	112	9	+	CH 1	:	CH 2	=	Division by zero is invalid.
Adding CH1 to a waveform stored in memory 2	113	6	+	CH 1	+	MEM ▶ 2	=	Use identical scaling factors.
Subtracting a waveform stored in memory 5 from CH1	114	2	+	CH 1	-	MEM ▶ 5	=	Use identical scaling factors.
Multiplying CH1 by a waveform stored in memory 6	115	0	+	CH 1	$\times$	MEM ▶ 6	=	Use identical scaling factors.

## Operations with signal processing results

Clearing a signal processing result from the display	116	1	...	9	+			C/CA
Display signal processing result (Recall previously defined operation)	117	1	...	9	+			=
Switch on Y-cursors for a signal processing result. See chapter 3 no. 18, 19, 20, 26 and 27 for more details	118	1	...	9	+	Y		
Switch on X-cursors for a signal processing result. See chapter 3 no. 22, 23, 24, 29 and 30 for more details	119	1	...	9	+	X		
Display the data field of a signal processing result. See chapter 4 for more details	120	1	...	9	+	DATA		

## 13. GRAPHICS

## Interpolation (Continuous Trace)

The display of digitised signals has many advantages but also a disadvantage, in that the displayed trace consists of a series of dots, each dot representing one sample. This can lead to interpretation problems as the human eye sometimes finds it difficult to decipher complex waveforms such as amplitude modulated signals. To overcome this weakness the SC01 can display a continuous trace by interpolating between the samples.

Display interpolation OFF	121	DISP	MULTI					2		C/CA
Display interpolation ON	122	DISP	MULTI					2		=

## Shaded Graphics

Another powerful method of displaying signal information is the SC01's shaded graphics mode which also enables a quick assessment of a signal's DC content (does not work with memories).

Shaded graphics ON	123	DISP	MULTI					1		=
Shaded graphics OFF	124	DISP	MULTI					1		C/CA

## Graticules

Dot graticule ON	125	DISP	MULTI					3		=
Cross graticule ON	126	DISP	MULTI					4		=
Graticule OFF	127	DISP	MULTI					3	/	4 C/CA