Manual Supplement

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The table below lists the new and revised FSCs (contained in this document) that should be added to or should replace the pages in the above mentioned manual.

New FSCs	Revised FSCs
395	2001
M395	2002
M4000 & M4000A	33120
M4200 & M4200A	4000
M4700	4200
M4705	4700
M4707	4705
M4708	4707
M4800	4708
M4800A	4800
M4805	4800A
M4808	4805
525	4808
M525	4950
P6100	M4950
VSET	5500
	5520
	8648
	8902
	9000
	9100
	M9100
	9500
	M9500
	ASK+, ASK-
	CON
	DOS, DOSE
	IEEE
	MATH
	MEMC, MEMCX
	P700

FLUKE ®

2001

Instrument FSC

Description

The 2001 FSC programs the Keithley 2001 Multimeter to measure DC voltage, AC voltage, DC current, AC current, resistance, conductance, frequency, and temperature.

Functional Capability

Function	Nominal	MOD1	MOD2
DC Voltage	-1100 V to 1100 V		
AC Voltage[1]	100 nV to 775 V	1 Hz to 2 MHz	
DC Current	-2.1 A to 2.1 A		
AC Current	100 pA to 2.1 A	1 Hz to 100 kHz	
Resistance	0 Ω to 1.05 GΩ		
Conductance	>0.9524 nS		
Frequency[1]	1 Hz to 5 MHz 5 MHz to 15 MHz 1 Hz to 5 MHz	60 mV to 775 V 350 mV to 775 V 150 µA to 2.1 A	
Decibels[1]	-126.9 dBm to 70.79 dBm	1 Hz to 2 MHz	5Z
Decibels[1]	-128.7 dBm to 69.03 dBm	1 Hz to 2 MHz	7Z
Decibels[1]	-134.7 dBm to 63.01 dBm	1 Hz to 2 MHz	3Z
Decibels[1]	-137.7 dBm to 60.00 dBm	1 Hz to 2 MHz	6Z
Temperature[2] Pt385 RTD Type J TC Type K TC Type T TC Type E TC Type R TC Type S TC Type B TC	 -200°C to 630°C -200°C to 760°C -200°C to 1372°C -200°C to 400°C -200°C to 10000°C 0°C to 1768°C 0°C to 1768°C +350°C to 1820°C	 R1 _J _K _T _E _R _S _B	

1. Volt-Hertz product not to exceed 2^7.
2. Temperature measurement using a thermocouple requires an external thermocouple card.

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the expected measured value or a reset.

- Voltage (DC or RMS) entered as: [*numeric*][*prefix*]V
- Decibels entered as: [*numeric*][*prefix*]D
- Current entered as [*numeric*][*prefix*]A
- Resistance entered as [*numeric*][*prefix*]Z
- Conductance entered as [*numeric*][*prefix*]Y
- Frequency entered as [*numeric*][*prefix*]H
- Temperature entered as: [*numeric*][*prefix*]degC or degF
- Reset entered as *.

Rules:

- The NOMINAL field may specify decibels only when the MOD2 field specifies the reference impedance.
- The NOMINAL field must specify a resistance, or equivalent conductance, less than or equal to 21 kΩ when the MOD2 field specifies offset compensation override "O".

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies frequency for AC voltage and AC current measurements or voltage for frequency or period measurements.

- Frequency entered as *numeric*[*prefix*]H
- Voltage entered as *numeric*[*prefix*]V
- Current entered as *numeric*[*prefix*]A
- *blank* not applicable

Rules:

- The MOD1 field must be blank when the NOMINAL field specifies resistance, conductance, or temperature.
- The MOD1 field may specify frequency only when the NOMINAL field specifies voltage or current.
- The MOD1 field must specify voltage or current when the NOMINAL field specifies frequency.

MOD2

This field specifies the load impedance that the AC voltage is referenced to for decibels or the RTD or thermocouple type for temperature measurement.

- O Override offset compensation for Ω
- 5Z 50Ω
- 7Z 75Ω
- 3Z 300Ω
- 6Z 600Ω
- R1 100Ω Pt 385 RTD
- _J Type J thermocouple
- _K Type K thermocouple
- _T Type T thermocouple
- _E Type E thermocouple
- _R Type R thermocouple
- _S Type S thermocouple
- _B Type B thermocouple
- *blank* field not applicable

Rules:

- The MOD2 field may specify offset compensation override "O" only when the NOMINAL field specifies resistance or conductance and the resistance is ≤ 2.1 M Ohms.
- The MOD2 field may specify a reference impedance only when the NOMINAL field specifies decibels.
- The MOD2 field may specify a RTD or thermocouple only when the NOMINAL field specifies temperature.

MOD3

This field specifies the measurement mode. The measurement mode determines certain function settings, as well as the number of readings that are discarded and the number of readings that are averaged to obtain a measurement. The effect of the measurement mode on the programmed function is shown in the following table:

	F	***blank***	**E**
DC Volts			
Number of powerline cycles Resolution Readings thrown away averaged Autozero	1 6.5 digits 1 1 On	10 6.5 digits 1 3 On	10 7.5 digits 1 5 On
DC Current			
Number of powerline cycles Resolution Readings thrown away averaged Autozero	1 6.5 digits 1 1 On	10 6.5 digits 1 3 On	10 7.5 digits 2 5 On
Ohms (2-Wire and 4-Wire)			
Number of powerline cycles Resolution Readings thrown away averaged Autozero	1 6.5 digits 1 3 On	10 6.5 digits 2 4 On	10 7.5 digits 2 5 On
Offset Compensation ≤21 kΩ >21 kΩ	 On Off	 On Off	 On Off

AC Volts			
Number of powerline cycles	N/A	1	10
Readings			
thrown away	N/A	1	1
averaged	N/A	3	3
Resolution	N/A	5.5 digits	6.5 digits
Autozero	On	On	On
AC Current			
Number of powerline cycles	N/A	1	10
Readings			
thrown away	N/A	1	1
averaged	N/A	3	3
Resolution	N/A	5.5 digits	6.5 digits
Autozero	On	On	On
Frequency			
Readings			
thrown away	N/A	1	N/A
averaged	N/A	1	N/A
Resolution	N/A	5 digits	N/A
Autozero	Off	Off	Off
Temperature			
Number of powerline cycles	N/A	1	10
Readings			
thrown away	N/A	1	1
averaged	N/A	3	3
Resolution			
Pt385 RTD	N/A	0.001 °C	0.001 °C
Type J TC	N/A	0.1 °C	0.1 °C
Type K TC	N/A	0.1 °C	0.1 °C
Type T TC	N/A	0.1 °C	0.1 °C
Type E TC	N/A	0.1 °C	0.1 °C
Type R TC	N/A	1 °C	1 °C
Type S TC	N/A	1 °C	1 °C
Type B TC	N/A	1 °C	1 °C
Autozero	On	On	On

Rules:

- The MOD3 field may specify "E" only when the NOMINAL field specifies voltage, decibels, current, resistance, conductance, or temperature.
- The MOD3 field may specify "F" only when the MOD1 field is blank (DC) and the NOMINAL field specifies voltage, current, resistance, or conductance.

MOD4

This field specifies the type of test being performed as described in "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 3W 2-wire
- 4W 4-wire

Rules:

- The CON field may specify a 3W only when the MOD2 field specifies a RTD type.
- The CON field may specify a 4W only when the NOMINAL field specifies resistance or the MOD2 field specifies a RTD type.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" .

Examples

```
 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- Reset -----
  1.001  2001           *                                                  S
# ----- DC Voltage -----
  1.002  2001   10     10V             1% 0.01U                              2W
# ----- AC Voltage -----
  5.001  2001   1000   650V            5%            30kH                    2W
  6.001  2001   1      1V              1% 0.01U      10kH                    2W
# ----- Decibels -----
  7.001  2001   A      60.0D           0.1U          1kH          5Z         2W
# ----- DC Current -----
  9.001  2001   4000   350mA           9U                                    2W
# ----- AC Current -----
 10.001  2001   2      1A              3%            60H                     2W
# ----- Resistance -----
 11.001  2001   100    10MZ            1%                                    2W
# ----- Conductance -----
 12.001  2001   100    100nY           5%                                    2W
# ----- Setup Test -----
 13.001  2001          1V                            10kH                 S  2W
# ----- Nominal Setup Test -----
 13.002  2001   1      1V                            10kH                 N  2W
# ----- Comparison Test -----
 13.003  2001   1      1V              1% 0.1U       20kH                 C  2
```

2002

Instrument FSC

Description

The 2002 FSC programs the Keithley 2002 Multimeter to measure DC voltage, AC voltage, DC current, AC current, resistance, conductance, frequency, or temperature.

Functional Capability

Function	Nominal	MOD1	MOD2
DC Voltage	-1100 V to 1100 V		
AC Voltage[1]	100 nV to 775 V	1 Hz to 2 MHz	
DC Current	-2.1 A to 2.1 A		
AC Current	100 pA to 2.1 A	1 Hz to 100 kHz	
Resistance	0 Ω to 1.05 GΩ		
Conductance	>0.9524 nS		
Frequency[1]	1 Hz to 5 MHz 5 MHz to 15 MHz 1 Hz to 5 MHz	60 mV to 775 V 350 mV to 775 V 150 µA to 2.1 A	
Decibels[1]	-126.9 dBm to 70.79 dBm	1 Hz to 2 MHz	5Z
Decibels[1]	-128.7 dBm to 69.03 dBm	1 Hz to 2 MHz	7Z
Decibels[1]	-134.7 dBm to 63.01 dBm	1 Hz to 2 MHz	3Z
Decibels[1]	-137.7 dBm to 60.00 dBm	1 Hz to 2 MHz	6Z
Temperature[2] Pt385 RTD Type J TC Type K TC Type T TC Type E TC Type R TC Type S TC Type B TC	 -200°C to 630°C -200°C to 760°C -200°C to 1372°C -200°C to 400°C -200°C to 10000°C 0°C to 1768°C 0°C to 1768°C +350°C to 1820°C	 R1 _J _K _T _E _R _S _B	

1. Volt-Hertz product not to exceed 2^7.
2. Temperature measurement using a thermocouple requires an external thermocouple card.

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the expected measured value or a reset.

- Voltage (DC or RMS) entered as: [*numeric*][*prefix*]V
- Decibels entered as: [*numeric*][*prefix*]D
- Current entered as [*numeric*][*prefix*]A
- Resistance entered as [*numeric*][*prefix*]Z
- Conductance entered as [*numeric*][*prefix*]Y
- Frequency entered as [*numeric*][*prefix*]H
- Temperature entered as: [*numeric*][*prefix*]degC or degF
- Reset entered as *.

Rules:

- The NOMINAL field may specify decibels only when the MOD2 field specifies the reference impedance.
- The NOMINAL field may specify temperature only when the MOD2 field specifies a RTD or thermocouple type.
- The NOMINAL field must specify a resistance, or equivalent conductance, less than or equal to 21 kΩ when the MOD2 field specifies offset compensation override "O".

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies frequency for AC voltage and AC current measurements or voltage for frequency or period measurements.

- Frequency entered as *numeric*[*prefix*]H.
- Voltage entered as *numeric*[*prefix*]V.
- Current entered as *numeric*[*prefix*]A.
- *blank* not applicable

Rules:

- The MOD1 field must be blank when the NOMINAL field specifies resistance, conductance, or temperature.
- The MOD1 field may specify frequency only when the NOMINAL field specifies voltage or current.
- The MOD1 field must specify voltage or current when the NOMINAL field specifies frequency.

MOD2

This field specifies the load impedance that the AC voltage is referenced to for decibels or the RTD or thermocouple type for temperature measurement.

- O Override offset compensation for Ω
- 5Z 50Ω
- 7Z 75Ω
- 3Z 300Ω
- 6Z 600Ω
- R1 100Ω Pt 385 RTD
- _J Type J thermocouple
- _K Type K thermocouple
- _T Type T thermocouple
- _E Type E thermocouple
- _R Type R thermocouple
- _S Type B thermocouple
- *blank* field not applicable

Rules:

- The MOD2 field may specify offset compensation override "O" only when the NOMINAL field specifies resistance or conductance and the resistance is ≤ 2.1 MΩ.
- The MOD2 field may specify a reference impedance ,only when the NOMINAL field specifies decibels.
- The MOD2 field may specify a RTD or thermocouple only when the NOMINAL field specifies temperature.

MOD3

This field specifies the measurement mode. The measurement mode determines certain function settings, as well as the number of readings that are discarded and the number of readings that are averaged to obtain a measurement. The effect of the measurement mode on the programmed function is shown in the following table:

	F	***blank***	**E**
DC Volts			
Number of powerline cycles	1	1	10
Resolution	7.5 digits	7.5 digits	8.5 digits
Readings			
thrown away	1	1	1
averaged	1	10	10
Autozero	Synchronous	Synchronous	Synchronous
DC Current			
Number of powerline cycles	1	1	10
Resolution	6.5 digits	6.5 digits	7.5 digits
Readings			
thrown away	1	1	1
averaged	1	10	10
Autozero	Normal	Normal	Normal
Ohms (2-Wire and 4-Wire)			
Number of powerline cycles	1	1	10
Resolution	7.5 digits	7.5 digits	8.5 digits
Readings thrown away	1	1	1
averaged	1	10	10
Autozero	Normal	Normal	Synchronous

	F	***blank***	**E**
Offset Compensation			
≤21 kΩ	On	On	On
>21 kΩ	Off	Off	Off
AC Volts			
Number of powerline cycles	N/A	1	10
Readings			
thrown away	N/A	1	1
averaged	N/A	1	1
Resolution	N/A	5.5 digits	6.5 digits
Autozero	Normal	Normal	Normal
AC Current			
Number of powerline cycles	N/A	1	10
Readings			
thrown away	N/A	1	1
averaged	N/A	1	1
Resolution	N/A	5.5 digits	6.5 digits
Autozero	Normal	Normal	Normal
Frequency			
Readings			
thrown away	N/A	1	N/A
averaged	N/A	1	N/A
Resolution	N/A	5 digits	N/A
Autozero	Off	Off	Off
Temperature			
Number of powerline cycles	N/A	1	10
Readings			
thrown away	N/A	1	1
averaged	N/A	1	1
Resolution			
Pt385 RTD	N/A	0.001 °C	0.001 °C
Type J TC	N/A	0.1 °C	0.1 °C
Type K TC	N/A	0.1 °C	0.1 °C
Type T TC	N/A	0.1 °C	0.1 °C
Type E TC	N/A	0.1 °C	0.1 °C
Type R TC	N/A	1 °C	1 °C
Type S TC	N/A	1 °C	1 °C
Type B TC	N/A	1 °C	1 °C
Autozero	Normal	Normal	Normal

Rules:

- The MOD3 field may specify "E" only when the NOMINAL field specifies voltage, decibels, current, resistance, conductance, or temperature.
- The MOD3 field may specify "F" only when the MOD1 field is blank (DC) and the NOMINAL field specifies voltage, current, resistance, or conductance,

MOD4

This field specifies the type of test being performed as described in “General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 3W 2-wire
- 4W 4-wire

Rules:

- The CON field may specify a 3W only when the MOD2 field specifies a RTD type.
- The CON field may specify a 4W only when the NOMINAL field specifies resistance or the MOD2 field specifies a RTD type.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" .

Examples

```
 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3   4 CON
# ----- Reset -----
  1.001  2002        *                                                S
# ----- DC Voltage -----
  1.002  2002   10    10V            1% 0.01U                             2W
# ----- AC Voltage -----
  5.001  2002   1000  650V           5%            30kH                   2W
  6.001  2002   1     1V             1% 0.01U      10kH                   2W
# ----- Decibels -----
  7.001  2002   A     60.0D          0.1U          1kH            5Z      2W
# ----- DC Current -----
  9.001  2002   4000  350mA          9U                                   2W
# ----- AC Current -----
 10.001  2002   2     1A             3%            60H                    2W
# ----- Resistance -----
 11.001  2002   100   10MZ           1%                                   2W
# ----- Conductance -----
 12.001  2002   100   100nY          5%                                   2W
# ----- Setup Test -----
 13.001  2002         1V                           10kH                S  2W
# ----- Nominal Setup Test -----
 13.002  2002   1     1V                           10kH                N  2W
# ----- Comparison Test -----
  13.003  2002   1     1V             1% 0.1U       20kH                C  2W
```

33120

Instrument FSC

Description

The 33120 FSC programs the Hewlett-Packard 33120A Function Generator to output sine, square, triangle, positive ramp, and negative ramp waveforms.

Note

If the 33120A is to be controlled via its serial port, do not use the PORT FSC port configuration special construction, [P9600,N,…], to set the baud rate, parity, etc. of the port used to control the 33120A. MET/CAL executes a "Test" function for each System Instrument prior to executing any procedure statements, therefore the settings of the port used to controlling the 33120A must be set correctly before a procedure is executed. The 33120A does not support standard hardware flow control using the RS-232C request-to-send (RTS) and clear-to-send (CTS) lines.

If the 33120A is connected to COM1, COM2, COM3, or COM4, select the "Ports" application in the Windows control panel to choose the proper settings. Select "Flow Control = None". Selecting "Hardware" sets RTS/CTS flow control. The 33120A uses DTR/DSR hardware flow control. The MET/CAL 33120A driver will automatically set DTR/DSR flow control (i.e. DTR/DSR is supported at a lower level even though the Control Panel does not support direct selection of DTR/DSR flow control).

The 33120A cannot be connected to the 5500A, 5520A, 5800A, or 5820A UUT "Pass-Through" Serial port. These calibrators do not support the DTR/DSR hardware flow control required for communication with the 33120A.

Functional Capability

Waveform	Frequency
Sine	100 µHz to 15 MHz
Square	100 µHz to 15 MHz
Triangle	100 µHz to 100 kHz
Positive Ramp	100 µHz to 100 kHz
Negative Ramp	100 µHz to 100 kHz
Exponential Rise	100 µHz to 5 MHz
Exponential Fall	100 µHz to 5 MHz
Sync	100 µHz to 5 MHz
Cardiac	100 µHz to 5 MHz

Output Termination	Amplitude
50 Ω	+/-5V (DC), 50 mVpp to 10 Vpp (AC)
Open Circuit	+/-10V (DC), 100 mVpp to 20 Vpp (AC)

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the starting Nominal value of the stimulus output or expected UUT reading for the test.

- Voltage (DC or RMS) entered as: [*numeric*][*prefix*]V
- Voltage (Peak-to-Peak) entered as: [*numeric*][*prefix*]Vpp
- Decibels entered as: [*numeric*][*prefix*]D
- Frequency entered as: [*numeric*][*prefix*]H
- Period entered as: [*numeric*][*prefix*]T

Rules:

- The NOMINAL field may specify Decibels only when the MOD2 field specifies SI.
- The NOMINAL field may specify Voltage peak-to-peak, Frequency, or Period only when the MOD2 field specifies SI, SQ, TI, +R, -R, +X, -X, SY, CD, or OI (i.e MOD2 is not blank).
- When the NOMINAL field contains only units, the value is obtained from the memory register MEM.
- When the NOMINAL field contains only units and the MOD1 field is not blank, the MOD1 field must specify a value.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies amplitude or frequency or period for AC functions.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Voltage (Peak-to-Peak) entered as: [*numeric*][*prefix*]Vpp
- Decibels entered as: [*numeric*][*prefix*]D
- Frequency entered as [*numeric*][*prefix*]H.
- Period entered as [*numeric*][*prefix*]T.
- *blank* DC or Noise

Rules:

- The MOD1 field may specify Decibels only when the MOD2 field specifies SI.
- The MOD1 field must be blank when the MOD2 field specifies OI (Noise).
- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage or decibels.
- The MOD1 field may specify voltage or decibels only when the NOMINAL field specifies frequency or period.
- When the MOD1 field contains only units, the value is obtained from memory register MEM. In this case the NOMINAL field MUST contain a value.

MOD2

This field specifies the function (waveform type).

- *blank* DC Volts
- SI Sine
- SQ Square
- TI Triangle
- +R Positive Ramp
- -R Negative Ramp
- +X Exponential Rise
- -X Exponential Fall
- SY Sync Signal
- CD Cardiac Signal
- OI Noise

Rules:

- SI is inserted automatically in the MOD2 field when the MOD1 field is not blank and no MOD2 code is entered.
- The MOD2 field must be blank or OI when the MOD1 field is blank (i.e. DC Voltage or Noise is specified).

MOD3

This field is not used.

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- *blank* Unterminated
- L 50 Ohm termination

Rules:

- When the CON field is L the output is expected to be terminated with 50 Ohms. This can be accomplished by using a 50 Ohm terminator at the UUT or setting the UUT input impedance to 50 Ohms.
- L is automatically inserted the CON field when the amplitude in the Nominal or MOD1 field is expressed in dBm.
- If ASK- W or ASK- V is in effect, the procedure writer must use a DISP FSC to prompt the operator to terminate the output signal at the UUT.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in the on-line Reference Manual.

Examples

```
 STEP    FSC     RANGE NOMINAL        TOLERANCE     MOD1          MOD2   3   4 CON
# ----- Reset -----
  1.001  33120         *                                                     S
# ----- DC Voltage -----
  1.002  33120   2     1.9V           2% 0.4U                                   L
# ----- Sine Wave -----
  2.001  33120   400   3.500V         7.4U          20kH             SI         L
  3.001  33120         -10D           1U            100H             SI         L
# ----- Square Wave w/DC offset -----
  4.001  M33120        0.5Voff
  4.002  33120         1Vpp                         1kH              SQ     S   L
# ----- Triangle Wave -----
  4.003  M33120        *
  4.004  33120         75mVpp                       10kH             TI     S   L
# ----- Positive Ramp -----
  4.005  33120         1.0Vpp                       100kH            +R     S   L
# ----- Negative Ramp -----
  4.006  33120         1.0Vpp                       5MH              -R     S
# ----- Frequency -----
  4.007  33120   1000  800.0H         0.1% 0.1U     300mV            SI
```

395

Instrument FSC

Description

The 395 FSC programs the Wavetek 395 Arbitrary Waveform Generator to output DC voltage, periodic random noise, or sine, square, triangle, positive ramp, and negative ramp waveforms.

Note

If the 395 is to be controlled via its serial port, do not use the PORT FSC port configuration special construction, [P9600,N,...], to set the baud rate, parity, etc. of the port used to control the 395. MET/CAL executes a "Test" function for each System Instrument prior to executing any procedure statements. Use the Windows Control Panel to set the port configuration as follows:

Baud Rate:	*9600*
Data Bits:	*8*
Parity:	*None*
Stop Bits:	*1*
Flow Control:	*Hardware*

Press the REMOTE button on the 395 front panel.

Press F3 "RS-232".

Press F7 "setup" and select the following settings:

echo:	*off*
handshake:	*on*
timeout:	*2.0 sec*
baud:	*9600*

Functional Capability

Waveform	Frequency
Sine	1 µHz to 40MHz
Square	1 µHz to 50MHz
Triangle	1 µHz to 10MHz
Positive Ramp	1 µHz to 2MHz
Negative Ramp	1 µHz to 2MHz

Output Termination	Amplitude
50 Ohm	±5 V (DC), -5 Vp to 5 Vp (AC)

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the starting Nominal value of the stimulus output or expected UUT reading for the test.

- Voltage (DC or RMS) entered as: [*numeric*][*prefix*]V
- Voltage (Peak) entered as: [*numeric*][*prefix*]Vp
- Voltage (Peak-to-Peak) entered as: [*numeric*][*prefix*]Vpp
- Decibels entered as: [*numeric*][*prefix*]D
- Frequency entered as: [*numeric*][*prefix*]H
- Period entered as: [*numeric*][*prefix*]T

Rules:

- The NOMINAL field may specify Decibels only when the MOD2 field specifies SI.
- The NOMINAL field may specify Voltage peak-to-peak, Frequency, or Period only when the MOD2 field specifies SI, SQ, TI, +R, -R, or OI (i.e MOD2 is not blank).
- When the NOMINAL field contains only units, the value is obtained from the memory register MEM.
- When the NOMINAL field contains only units and the MOD1 field is not blank, the MOD1 field must specify a value.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies amplitude or frequency or period for AC functions.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Voltage (Peak) entered as: [*numeric*][*prefix*]Vp
- Voltage (Peak-to-Peak) entered as: [*numeric*][*prefix*]Vpp
- Decibels entered as: [*numeric*][*prefix*]D
- Frequency entered as [*numeric*][*prefix*]H.
- Period entered as [*numeric*][*prefix*]T.
- *blank* DC or Noise

Rules:

- The MOD1 field may specify Decibels only when the MOD2 field specifies SI.
- The MOD1 field must be blank when the MOD2 field specifies OI (Noise).
- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage or decibels.
- The MOD1 field may specify voltage or decibels only when the NOMINAL field specifies frequency or period.
- When the MOD1 field contains only units, the value is obtained from memory register MEM. In this case the NOMINAL field MUST contain a value.

MOD2

This field specifies the function (waveform type).

- *blank* DC Volts
- SI Sine
- SQ Square
- TI Triangle
- +R Positive Ramp
- -R Negative Ramp
- PU Pulse
- OI Periodic Random Noise

Rules:

- When the MOD2 field is PU, the M395 RANGE field must specify PER or PULSE.
- SI is inserted automatically in the MOD2 field when the MOD1 field is not blank and no MOD2 code is entered.
- The MOD2 field must be blank or OI when the MOD1 field is blank (i.e. DC Voltage or Noise is specified).

MOD3

This field is not used.

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- L 50 Ohm termination

Rules:

- L is automatically inserted the CON field when no CON field code in entered.
- The output is expected to be terminated with 50 Ohms. This can be accomplished by using a 50 Ohm terminator at the UUT or setting the UUT input impedance to 50 Ohms.
- If ASK- W or ASK- V is in effect, the procedure writer must use a DISP FSC to prompt the operator to terminate the output signal at the UUT.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in the on-line Reference Manual.

Examples

```
 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4
CON
# ----- Reset -----
  1.001  395          *                                                 S
# ----- DC Voltage -----
  1.002  395          1.00V                                             S  L
# ----- Sine Wave -----
  1.003  395    400   2.5Vp          -2.8U +2.9U   60H            SI       L
  2.001  395    400   3.500Vp        7.4U          20kH           SI       L
  3.001  395          -37.78D                      100H           SI    S  L
# ----- Square Wave w/DC offset -----
  3.002  M395                                      0.5Voff
  3.003  395          1Vp                          1kH            SQ    S  L
# ----- Triangle Wave -----
  3.004  M395         *
  3.005  395          13mVp                        10kH           TI    S  L
# ----- Positive Ramp -----
  3.006  395          1.0Vp                        100kH          +R    S  L
# ----- Negative Ramp -----
  3.007  395          1.0Vp                        20kH           -R    S  L
# ----- Pulse -----
  3.008  M395   PER   1uT
  3.009  395          10nT                         1Vp            PU    S  L
  3.010  M395         *
# ----- Frequency -----
  3.011  395          800.0H                       300mV          SI    S  L
# ----- AM Modulation -----
  3.012  M395         1kH                          10pct
  3.013  395          950kH                        1Vp            SI    S  L
# ----- FM Modulation -----
  3.014  M395         1kH                          10kH
  3.015  395          1MH                          1Vp            SI    S  L
```

M395

Auxiliary Instrument Setup FSC

Description

The M395 FSC is used to specify modulation, modulation frequency, AM depth, FM deviation, and DC offset. The M395 FSC is ignored when the 395 FSC specifies DC voltage.

Functional Capability

Pulse Period	100 ns to 10 s
Pulse Width	10 ns to 9.99 s
Modulation Frequency	1 Hz to 40 MHz
AM Depth	0 % to 200 %
FM Deviation	1 Hz to 40 MHz
DC Offset	0 V to 5 V into 50 Ohms restricted by: |Voff| + |Vp| <= Vmax

Parameters

RANGE

This field specifies one of the following:

- PULSE Pulse Width
- PER Pulse Period
- *blank* field not applicable

NOMINAL

This field specifies one of the following:

- Pulse Width entered as: [*numeric*][*prefix*]T
- Pulse Period entered as: [*numeric*][*prefix*]T
- Modulation Frequency is entered as [*numeric*][*prefix*]H.
- "*" Reset to default values
- *blank* Not applicable

Rules:

- The NOMINAL field must specify the pulse width when the RANGE field is PULSE.
- The NOMINAL field must specify the pulse period when the RANGE field is PER.
- If the Nominal field does not contain a value the value is taken from memory register MEM.

TOLERANCE

This field is not used.

MOD1

The MOD1 field specifies the following:

- DC Offset entered as: [*numeric*][*prefix*]Voff
- AM Depth entered as: [*numeric*][*prefix*]pct.
- FM Deviation entered as: [*numeric*][*prefix*]H.
- *blank* No modulation

Rules:

- The MOD1 field must specify AM depth or FM deviation when the Nominal field specifies a modulation frequency.
- When two frequency values are entered for a M395 FSC, the first is taken to be the Modulation Frequency and the second is taken to be the FM deviation.
- When the MOD1 field specifies FM deviation, the deviation must be less than or equal to the frequency specified in the 395 FSC Nominal or MOD1 field.
- When a frequency value and a percent value are entered for a M395 FSC, the frequency is taken to be the Modulation Frequency and the percent is taken to be the AM depth.
- If the MOD1 field does not contain a value the value is taken from memory register MEM.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 395 FSC.

4000

Instrument FSC

Description

The 4000 FSC controls the following functions of the Datron 4000 Autocal Standard:

- DC Voltage
- DC Current and Resistance with Option 20 installed

The M4000 FSC is used to range lock the 4000.

The M4000A FSC is used to range lock the M4000.

Note

4000 FSC can be used to control a 4000A. In this case 4000A accuracy will be used.

Functional Capability

Function	Nominal
DC Voltage	-1200 V to 1200 V
DC Current [1]	-1.999999 A to 1.999999 A
Resistance Conductance [1]	0 Ω (Short), 1 Ω to 10 MΩ, 1S to 100 nS (in decade steps)
1. With Option 20 installed.	

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.

- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Reset entered as *.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field is not used and must be blank.

MOD2

This field allows you to specify negative zero or the divider override feature of the calibration system.

- -Z Negative Zero
- O Divider Override

The internal divider allows a user to achieve higher levels ofcalibration accuracy in most circumstances; therefore the useof the divider is always automatically selected, where it is applicable.

The following table is shows effect of the MOD2 field

Function	Nominal	MOD2	Effect
DC Volts	>= 20 V	*blank*	Low output impedance
DC Volts	< 20 V	*blank*	50 Ω output impedance
DC Volts	< 20 V	0	Locked in 10 V range, low output impedance
DC Volts	0.0	-Z	Negative Zero output
DC Amps	0.0	-Z	Negative Zero output

Rules:

- The MOD2 filed may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field is not used and must be blank.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.
- The CON field may specify 4W only for resistance, conductance,and DC Voltage >= 200mV.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

```
STEP     FSC     RANGE  NOMINAL        TOLERANCE     MOD1         MOD2   3   4  CON
 1.001   4000           *                                                    S
 1.002   4000    1000   1200V          1U 1/                                      2W
 2.001   4000    10     0V             1U                                         2W
 3.001   4000    100    -22uA          10%                                        2W
 4.001   4000    10     20mV                                                 N   2W
 4.002   4000    A      1Z             5%                                         4W
```

M4000 and M4000A

Auxiliary Instrument Setup FSC's

Description

The M4000 FSC is used to range lock the 4000.

The M4000A FSC is used to range lock the 4000A.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

"*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.

The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 uV	100 µV
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000V
0 µA to 100 µA	100 µA
> 100 uA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1 A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4200

Instrument FSC

Description

The 4200 FSC controls the following functions of the Datron 4200 Autocal AC Standard:

- AC Voltage
- AC Current with Option 30 installed

The M4200 FSC is used to range lock the 4200.

The M4200A FSC is used to range lock the 4200A.

Functional Capability

Function	Amplitude	Frequency
AC Voltage	100 µV to 19.99999 V	10 Hz to 1 MHz
	20 V to 100 V	10 Hz to200 kHz
	100 V to 199.9999 V	10 Hz to 100 kHz[1]
	200 V to 1100 V	45 Hz to 33 kHz
AC Current[2]	100 µA to 1.999999 A	10 Hz to 5 kHz
1. V x Hz product not to exceed 20e+6 2. Requires Option 30		

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following:

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage or current.
- The MOD1 field may specify voltage or current only when the NOMINAL field specifies frequency or period.

MOD2

This field is not used and must be blank.

MOD3

This field is not used and must be blank.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire

- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.
- The CON field may specify 4W only for AC Voltage >= 200mV.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4200		*					S	
1.002	4200	200	220mV	10%	50H				2W
2.001	4200	1000	1000V	1U	1kH				4W
3.001	4200	2	1.999A	1% 1/	1kH				2W
4.001	4200	A	mV	0.1U	50H				2W
5.001	4200	A	A	5%	1kH				2W
6.001	4200		1.999A		1kH			S	2W
6.002	4200	10	20mV	0.5%	1kH			C	2W

M4200 and M4200A

Auxiliary Instrument Setup FSC’s

Description

The M4200 FSC is used to range lock the 4200.

The M4200A FSC is used to range lock the 4200A.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

"*" is automatically inserted in the NOMINAL field when a blank M4200 statement is entered.

The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 mV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µ A to 100 µA	100 uA
> 100 uA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1 A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4200 FSC.

4700

Instrument FSC

Description

The 4700 FSC controls the following functions of the Datron 4700 Multifunction Calibrator:

- DC Voltage
- AC Voltage
- DC Current with Option 20
- AC Current with Option 20
- Resistance with Option 20
- DC Current from the 4600 Transconductance Amplifier
- AC Current from the 4600 Transconductance Amplifier

The M4700 FSC is used to range lock the 4700.

Note

The 4700 FSC can also be used to control a 4800, 4800A 4707, 4708, or 4808. The accuracy file corresponding to the instrument that is actually configured is used at run time.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage	-199.9999 V to 199.99999 V -1100 V to 1100 V[1]		
AC Voltage	90 µV to 19.99999 V 90 µV to 199.9999 V 90 µV to 1100 V[1]	10 Hz to 1 MHz 10 Hz to 100 kHz 10 Hz to 33 kHz	
DC Current	-1.999999 A to 1.999999 A[2] -11 A to 11 A[3,2]		BC
AC Current	9 µA to 1.999999 A[2] 100 mA to 11 A[3,2]	10 Hz to 5 kHz 10 Hz to 20 kHz	BC
Resistance or Conductance [2]	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps)		

1. Requires Option 10, 1000 V Ranges (DCV & ACV)
2. Requires Option 20, DC Current, AC Current, and Resistance Functions
3. Requires Option 60, 4600 Transconductance Amplifier

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (DC or RMS) entered as:
- [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage or or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage or current.
- The MOD1 field may specify voltage or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z Negative Zero
- *blank* All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC use 4600 for current boost
- *blank* No boost or not applicable

Rules:

If the current can be created only by the Boost Amplifier, BC is inserted automatically.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.
- The CON field may specify 4W only for resistance, conductance, and DC Voltage and AC Voltage >= 200 mV.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4700		*					S	
1.002	4700	1000	1100V	1U 1/					2W
2.001	4700	10	0V	1U					2W
3.001	4700	200	220mV	10%	50H				2W
4.001	4700	1000	1100V	1U	1kH				4W
5.001	4700	100	-22uA	10%					2W
6.001	4700	2	1.999A	1% 1/	1kH				2W
7.001	4700	A	mV	0.1U	50H				2W
8.001	4700	A	A	5%	1kH				2W
9.001	4700		1.999A		1kH			S	2W
9.002	4700	10	20mV		500H			N	2W
9.003	4700	10	20mV	0.5%	1kH			C	2W
10.001	4700	A	10Z	5%					4W

M4700

Auxiliary Instrument Setup FSC

Description

The M4700 FSC is used to range lock the 4700.

Parameters

RANGE

This field specifies one of the following:

- RNGLK   Range Lock
- *blank*   field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4705

Instrument FSC

Description

The 4705 FSC controls the following functions of the Datron 4705 Multifunction Calibrator:

- DC Voltage
- AC Voltage
- DC Current
- AC Current
- Resistance
- DC Current from the 4600 Transconductance Amplifier
- AC Current from the 4600 Transconductance Amplifier

The M4705 is used to range lock the 4705.

Note

The 4705 FSC can also be used to control 4700, 4800, 4800A, 4707, 4708, or 4808. The accuracy file corresponding to the instrument that is actually configured is used at run time.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage	-1100 V to 1100 V		
AC Voltage	90 µV to 199.9999 V 90 µV to 1100 V	10 Hz to 100 kHz 45 Hz to 33 kHz	
DC Current	-1.99999 A to 1.99999 A -11 A to 11 A[1]		BC
AC Current	9 µA to 1.99999 A 100 mA to 11 A[1]	10 Hz to 5 kHz 10 Hz to 20 kHz	BC
Resistance or Conductance	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps)		
1. Requires 4600 Transconductance Amplifier.			

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (DC or RMS) entered as:
  [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage or current.

- The MOD1 field may specify voltage or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z   Negative Zero
- *blank*   All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC   use 4600 for current boost
- *blank* No boost or not applicable

Rules:

- If the current can be created only by the Boost Amplifier, BC is inserted automatically.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W   2-wire
- 4W   4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.

- The CON field may specify 4W only for resistance, conductance, and DC Voltage and AC Voltage >= 200 mV.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of the this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4705		*					S	
1.002	4705	1000	1100V	1U 1/					2W
2.001	4705	10	0V	1U					2W
3.001	4705	200	220mV	10%	50H				2W
4.001	4705	1000	1100V	2U	1kH				4W
5.001	4705	100	-22uA	10%					2W
6.001	4705	2	1.999A	1% 1/	1kH				2W
7.001	4705	A	mV	0.1U	50H				2W
8.001	4705	A	A	5%	1kH				2W
9.001	4705		1.999A		1kH			S	2W
9.002	4705	10	20mV		500H			N	2W
9.003	4705	10	20mV	1%	1kH			C	2W
10.001	4705	A	10Z	5%					4W

M4705

Auxiliary Instrument Setup FSC

Description

The M4705 FSC is used to range lock the 4705.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4707

Instrument FSC

Description

The 4707 FSC controls the following functions of the Datron 4707 Multifunction Calibrator:

- DC Voltage
- AC Voltage
- DC Current with Option 27
- AC Current with Option 27
- Resistance with Option 27
- DC Current from the 4600 Transconductance Amplifier
- AC Current from the 4600 Transconductance Amplifier

The M4707 FSC is used to range lock the 4704.

Note

The 4707 FSC can also be used to control a 4708 or 4808. The accuracy file corresponding to the instrument that is actually configured is used at run time.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage	-199.9999 V to 199.99999 V -1100 V to 1100 V [1]		
AC Voltage	90 µV to 19.99999 V 90 µV to 199.9999 V 90 µV to 1100 V [1]	10 Hz to 1 MHz 10 Hz to 100 kHz 10 Hz to 33 kHz	
DC Current	-1.999999 A to 1.999999 A [2] -11 A to 11 A [2,3]		BC
AC Current	9 µA to 1.999999 A [2] 100 mA to 11 A [2,3]	10 Hz to 5 kHz 10 Hz to 20 kHz	BC
Resistance or Conductance [2]	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps)		

1. Requires Option 17, 1000 V Ranges (DCV & ACV).
2. Requires Option 27, DC Current, AC Current, and Resistance Functions.
3. Requires Option 60, 4600 Transconductance Amplifier.

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (DC or RMS) entered as:
  [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage or or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals:

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage or current.

- The MOD1 field may specify voltage or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z Negative Zero
- *blank* All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC use 4600 for current boost
- *blank* No boost or not applicable

Rules:

- If the current can be created only by the Boost Amplifier, BC is inserted automatically.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.

- The CON field may specify 4W only for resistance, conductance, and DC Voltage and AC Voltage >= 200 mV.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4700		*					S	
1.002	4700	1000	1100V	1U 1/					2W
2.001	4700	10	0V	1U					2W
3.001	4700	200	220mV	10%	50H				2W
4.001	4700	1000	1100V	2U	1kH				4W
5.001	4700	100	-22uA	10%					2W
6.001	4700	2	1.999A	1% 1/	1kH				2W
7.001	4700	A	mV	0.1U	50H				2W
8.001	4700	A	A	5%	1kH				2W
9.001	4700		1.999A		1kH			S	2W
9.002	4700	10	20mV		500H			N	2W
9.003	4700	10	20mV	1%	1kH			C	2W
10.001	4700	A	10Z	5%					4W

M4707

Auxiliary Instrument Setup FSC

Description

The M4707 FSC is used to range lock the 4707.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4708

Instrument FSC

Description

The 4708 FSC controls the following functions of the Datron 4708 Multifunction Calibrator:

- DC Voltage with Option 10 installed
- AC Voltage with Option 20 installed
- DC Current with Option 30 and Option 10 installed
- AC Current with Option 30 and Option 20 installed
- Resistance with Option 30 and Option 10 or 20 installed
- DC Current from the 4600 Transconductance Amplifier
- AC Current from the 4600 Transconductance Amplifier

The M4708 FSC is used to range lock the 4708.

Note

The 4708 FSC can also be used to control a 4808. The accuracy file corresponding to the instrument that is actually configured is used at run time.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage [1]	-1100 V to 1100 V		
AC Voltage [2]	90 µV to 19.99999 V 90 µV to 100.0000 V 90 µV to 750 V 90 µV to 1100 V	10 Hz to 1 MHz 10 Hz to 200 kHz 10 Hz to 100 kHz 10 Hz to 33 kHz	
DC Current	-1.99999 A to 1.99999 A [1,3] -11 A to 11 A [1,3,4]		 BC
AC Current	9 µA to 1.99999 A [2,3] 100 mA to 11 A [2,3,4]	10 Hz to 5 kHz 10 Hz to 20 kHz	 BC
Resistance or Conductance [3]	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps)		

1. Requires Option 10, DC Voltage
2. Requires Option 20, AC Voltage
3. Requires Option 30, Ohms and Current
4. Requires 4600 Transconductance Amplifier

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (DC or RMS) entered as [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals.

- Voltage (RMS) entered as [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage or current.

- The MOD1 field may specify voltage or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z Negative Zero
- *blank* All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC use 4600 for current boost
- *blank* no boost or not applicable

Rules:

- If the current can be created only by the Boost Amplifier, BC is inserted automatically.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.

- The CON field may specify 4W only for resistance, conductance, and DC Voltage and AC Voltage >= 200 mV.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4708		*					S	
1.002	4708	1000	1100V	1U 1/					2W
2.001	4708	10	0V	1U					2W
3.001	4708	200	220mV	10%	50H				2W
4.001	4708	1000	1100V	1U	1kH				4W
5.001	4708	100	-22uA	10%					2W
6.001	4708	2	1.999A	1% 1/	1kH				2W
7.001	4708	A	mV	0.1U	50H				2W
8.001	4708	A	A	5%	1kH				2W
9.001	4708		1.999A		1kH			S	2W
9.002	4708	10	20mV		500H			N	2W
9.003	4708	10	20mV	0.5%	1kH			C	2W
10.001	4708	A	10Z	5%					4W

M4708

Auxiliary Instrument Setup FSC

Description

The M4708 FSC is used to range lock the 4708.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4800

Instrument FSC

Description

The 4800 FSC controls the following functions of the Datron 4800 Multifunction Calibrator:

- DC Voltage with Option 10 installed
- AC Voltage with Option 20 installed
- DC Current with Option 40 and Option 10 installed
- AC Current with Option 40 and Option 20 installed
- Resistance with Option 50 and Option 10 or 20 installed
- DC Current from the 4600 Transconductance Amplifier (Option 60 with Option 40 and Option 10 installed in 4800)
- AC Current from the 4600 Transconductance Amplifier (Option 60 with Option 40 and Option 20 installed in 4800)
- Wideband AC Voltage with Option 70 installed

Note

The 4800 FSC can also be used to control a 4800 A, 4707, 4708, or 4808. The accuracy file corresponding to the instrument that is actually configured is used at run time.

The M4800 FSC is used to range lock the 4800.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage	-199.99999 V to 199.99999 V [1] -1100 V to 1100 V [1,3]		
AC Voltage	90 µV to 19.99999 V[2] 90uV to 199.9999V[2] 100 µV to 1100 V[2,3]	10 Hz to 1 MHz 10 Hz to 100 kHz 10 Hz to 33 kHz	
Note *The maximum voltage increases linearly from 199.9999 V at 10 Hz to 1100 V at 40 Hz.*			
DC Current	-1.99999 A to 1.99999 A [1,4] -11 A to 11 A [1,4,6]		BC
AC Current	9 µA to 1.99999 A [2,4] 100 mA to 11 A[2,4,6]	10 Hz to 5 kHz 10 Hz to 20 kHz	BC
Resistance or Conductance [5 & 1 or 2]	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps)		
Wideband ACV [7]	300 µV to 3.5 V	10 Hz to 30 MHz	W

1. Requires Option 10, DC Voltage
2. Requires Option 20, AC Voltage
3. Requires Option 30, 1000V Range
4. Requires Option 40, Current
5. Requires Option 50, Resistance
6. Requires Option 60, 4600 Transconductance Amplifier
7. Requires Option 70, Wideband ACV

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (DC or RMS) entered as: [*numeric*][*prefix*]V
- Decibels entered as: [*numeric*][*prefix*]D
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage, decibels, or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage, decibels, or current.
- The MOD1 field may specify voltage, decibels, or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z   Negative Zero
- *blank*   All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC   use 4600 for current boost
- W   use Option 70, Wideband output for AC Voltage
- *blank*   No boost, wideband, or not applicable

Rules:

- If the current can be created only by the Boost Amplifier, BC is inserted automatically.
- If the amplitude and frequency combination can only be created using Option 70, Wideband AC Voltage, W is inserted automatically in the MOD3 field.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.
- The CON field may not specify 4W when any of the following conditions exist:
  1. DC Current
  2. AC Current
  3. AC or DC Voltage less than 200 mV

Use of Standard Memory Locations And Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4800		*					S	
1.002	4800	1000	1100V	1U 1/					2W
2.001	4800	10	0V	1U					2W
3.001	4800	200	220mV	10%	50H				2W
4.001	4800	1000	1100V	1U	1kH				4W
5.001	4800	100	-22uA	10%					2W
6.001	4800	2	1.999A	1% 1/	1kH				2W
7.001	4800	A	mV	0.1U	50H				2W
8.001	4800	A	A	5%	1kH				2W
9.001	4800		1.999A		1kH			S	2W
9.002	4800	10	20mV		500H			N	2W
9.003	4800	10	20mV	0.5%	1kH			C	2W
10.001	4800	A	10Z	5%					4W

M4800

Auxiliary Instrument Setup FSC

Description

The M4800 FSC is used to range lock the 4800.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4800A

Instrument FSC

Description

The 4800A FSC controls the following functions of the Datron 4800A MultifunctionCalibrator:

- DC Voltage
- AC Voltage
- DC Current
- AC Current
- Resistance
- DC Current from the 4600 Transconductance Amplifier (Option 60)
- AC Current from the 4600 Transconductance Amplifier (Option 60)
- Wideband AC Voltage with Option 70 installed

The M4800A FSC is used to range lock the 4800A.

Note

The 4800A FSC can also be used to control a 4707, 4708, or 4808. The accuracy file corresponding to the instrument that is actually configured is used at run time.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage	-199.99999 V to 199.99999 V -1100 V to 1100 V		
AC Voltage[3]	90 µV to 19.99999 V 90 µV to 199.9999 V 100 µV to 1100 V	10 Hz to 1 MHz 10 Hz to 100 kHz 10 Hz to 33 kHz	
DC Current	-1.99999 A to 1.99999 A -11 A to 11 A[1]		 BC
AC Current	9 µA to 1.99999 A 100 mA to 11 A[1]	10 Hz to 5 kHz 10 Hz to 20 kHz	 BC
Resistance or Conductance	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps)		
Wideband ACV	300 µV to 3.5 V[2]	10 Hz to 30 MHz	W

1. Requires Option 60, 4600 Transconductance Amplifier
2. Requires Option 70, Wideband ACV
3. The maximum voltage increases linearly from 199.9999 V at 10 Hz to 1100 V at 40 Hz.

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (DC or RMS) entered as:[*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage, decibels, or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals.

- Voltage (RMS) entered as: [*numeric*][*prefix*] V
- Decibels entered as: [*numeric*][*prefix*]D
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage, decibels, or current.
- The MOD1 field may specify voltage, decibels, or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z Negative Zero
- *blank* All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC use 4600 for current boost
- W use Option 70, Wideband output for AC Voltage
- *blank* No boost, wideband, or not applicable

Rules:

- If the current can be created only by the Boost Amplifier, BC is inserted automatically.
- If the amplitude and frequency combination can only be created using Option 70, Wideband AC Voltage, W is inserted automatically in the MOD3 field.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

2W 2-wire

4W 4-wire

Rules:

2W is automatically entered in the CON field when no CON field code is entered.

The CON field may not specify 4W when any of the following conditions exist:

1. DC Current

2. AC Current
3. AC or DC Voltage less than 200 mV

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of the MET/CAL Reference Manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4800A		*					S	
1.002	4800A	1000	1100V	1U 1/					2W
2.001	4800A	10	0V	1U					2W
3.001	4800A	200	220mV	10%	50H				2W
4.001	4800A	1000	1100V	1U	1kH				4W
5.001	4800A	100	-22uA	10%					2W
6.001	4800A	2	1.999A	1% 1/	1kH				2W
7.001	4800A	A	mV	0.1U	50H				2W
8.001	4800A	A	A	5%	1kH				2W
9.001	4800A		1.999A		1kH			S	2W
9.002	4800A	10	20mV		500H			N	2W
9.003	4800A	10	20mV	0.5%	1kH			C	2W
10.001	4800A	A	100Z	5%					4W
11.001	END								

M4800A

Auxiliary Instrument Setup FSC

Description

The M4800A FSC is used to range lock the 4800A.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V, A, or Z
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4805

Instrument FSC

Description

The 4805 FSC controls the following functions of the Datron 4805 Multifunction Calibrator:

- DC Voltage
- AC Voltage
- DC Current
- AC Current
- Resistance
- DC Current from the 4600 Transconductance Amplifier (Option 60)
- AC Current from the 4600 Transconductance Amplifier (Option 60)
- Wideband AC Voltage with Option 70 installed

The M4805 FSC is used to range lock the M4805.

Note

The 4805 FSC can be used to control any 4700 series or 4800 series calibrator. The accuracy file corresponding to the instrument that is actually configured is used at the time.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage	-1100 V to 1100 V		
AC Voltage	90 µV to 199.9999 V 90 µV to 1100 V	10 Hz to 100 kHz 10 Hz to 33 kHz	
Note *The maximum voltage increases linearly from 199.9999 V at 10 Hz to 1100 V at 40 Hz.*			
DC Current	-1.99999 A to 1.99999 A -11 A to 11 A[1]		BC
AC Current	9 µA to 1.99999 A 900 mA to 11 A[1]	10 Hz to 5 kHz 10 Hz to 20 kHz	BC
Resistance or Conductance	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps)		
Wideband ACV [2]	300 µV to 3.5 V	10 Hz to 30 MHz	W
1. Requires Option 60, 4600 Transconductance Amplifier 2. Requires Option 70, Wideband ACV 3. Maximum voltage = 30 x freq - 100			

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies one of the following.

- Voltage (DC or RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage, decibels, or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Decibels entered as: [*numeric*][*prefix*]D
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage, decibels, or current.
- The MOD1 field may specify voltage, decibels, or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z Negative Zero
- *blank* All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC use 4600 for current boost
- W use Option 70, Wideband output for AC Voltage
- *blank* No boost, wideband, or not applicable

Rules:

- If the current can be created only by the Boost Amplifier, BC is inserted automatically.
- If the amplitude and frequency combination can only be created using Option 70, Wideband AC Voltage, W is inserted automatically in the MOD3 field.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.
- The CON field may not specify 4W when any of the following conditions exist:
  1. DC Current
  2. AC Current
  3. AC or DC Voltage less than 200 mV

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4805		*					S	
1.002	4805	1000	1100V	1U 1/					2W
2.001	4805	10	0V	1U					2W
3.001	4805	200	220mV	10%	50H				2W
4.001	4805	1000	1100V	3U	1kH				4W
5.001	4805	100	-22uA	10%					2W
6.001	4805	2	1.999A	1% 1/	1kH				2W
7.001	4805	A	mV	0.1U	50H				2W
8.001	4805	A	A	5%	1kH				2W
9.001	4805		1.999A		1kH			S	2W
9.002	4805	10	20mV		500H			N	2W
9.003	4805	10	20mV	1%	1kH			C	2W
10.001	4805	A	1kZ	5%					4W

M4805

Auxiliary Instrument Setup FSC

Description

The M4805 FSC is used to range lock the 4805.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC
> 100 µV to 1 mV	1 mV
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4808

Instrument FSC

Description

The 4808 FSC controls the following functions of the Datron 4808 Multifunction Calibrator:

- DC Voltage with Option 10 installed
- AC Voltage with Option 20 installed
- DC Current with Option 40 and Option 10 installed
- AC Current with Option 40 and Option 20 installed
- Resistance with Option 50 and Option 10 or 20 installed
- DC Current from the 4600 Transconductance Amplifier (Option 60 with Option 40 and Option 10 installed in 4808)
- AC Current from the 4600 Transconductance Amplifier (Option 60 with Option 40 and Option 20 installed in 4808)
- Wideband AC Voltage with Option 70 installed

The M4808 FSC is used to range lock the 4808.

Note

The 4808 FSC can also be used to control a 4708. The accuracy file corresponding to the instrument that is actually configured is used at run time.

Functional Capability

Function	Amplitude	Frequency	MOD3
DC Voltage	-199.99999 V to 199.99999 V [1] -1100 V to 1100 V [1,3]		
AC Voltage	90 µV to 19.99999 V 90 µV to 199.9999 V 90 µV to 750 V 90 uV to 1100 V	10 Hz to 1 MHz 10 Hz to 100 kHz 10 Hz to 100 kHz 10 Hz to 33 kHz	
Note *The maximum voltage increases linearly from 199.9999 V at 10 Hz to 1100 V at 40 Hz. The maximum voltage decreases linearly from 199.999 9 V at 100 kHz to 19.9999 9 V at 1 MHz.*			
DC Current	-1.99999 A to 1.99999 A [1,4] -11 A to 11 A [1,4,6]		BC
AC Current	9 µA to 1.99999 A[2,4] 100 mA to 11 A[2,4,6]	10 Hz to 5 kHz 10 Hz to 20 kHz	BC
Resistance or Conductance	10 Ω to 100 MΩ, 100 mS to 10 nS (in decade steps) [5 & 1 or 2]		
Wideband ACV	300 µV to 3.5 V[7]	10 Hz to 30 MHz	W

1. Requires Option 10, DC Voltage
2. Requires Option 20, AC Voltage
3. Requires Option 30, 1000 V Range
4. Requires Option 40, Current
5. Requires Option 50, Resistance
6. Requires Option 60, 4600 Transconductance Amplifier
7. Requires Option 70, Wideband ACV

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

- Nominal

This field specifies one of the following:

- Voltage (DC or RMS) entered as: [*numeric*][*prefix*]V
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.
- Conductance entered as [*numeric*][*prefix*]Y.
- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies frequency or period, the MOD1 field must specify voltage, decibels, or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies one of the following for AC signals.

- Voltage (RMS) entered as: [*numeric*][*prefix*]V
- Decibels entered as: [*numeric*][*prefix*]D
- Current entered as [*numeric*][*prefix*]A.
- Frequency entered as [*numeric*][*prefix*]H.
- *blank* DC or not applicable

Rules:

- The MOD1 field may specify frequency or period only when the NOMINAL field specifies voltage, decibels, or current.
- The MOD1 field may specify voltage, decibels, or current only when the NOMINAL field specifies frequency or period.
- The MOD1 field must be blank when the NOMINAL field specifies resistance or conductance.

MOD2

This field allows you to specify negative zero for DC Voltage or DC Current.

- -Z Negative Zero
- *blank* All other amplitudes

Rules:

- The MOD2 field may specify Z only for DC Voltage or DC Current when the Nominal value is zero.

MOD3

This field specifies one of the following:

- BC use 4600 for current boost
- W use Option 70, Wideband output for AC Voltage
- *blank* No boost, wideband, or not applicable

Rules:

- If the current can be created only by the Boost Amplifier, BC is inserted automatically.
- If the amplitude and frequency combination can only be created using Option 70, Wideband AC Voltage, W is inserted automatically in the MOD3 field.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- 2W is automatically entered in the CON field when no CON field code is entered.
- The CON field may not specify 4W when any of the following conditions exist:
    1. DC Current
    2. AC Current
    3. AC or DC Voltage less than 200 mV

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
1.001	4808		*					S	
1.002	4808	1000	1100V	1U 1/					2W
2.001	4808	10	0V	1U					2W
3.001	4808	200	220mV	10%	50H				2W
4.001	4808	1000	1100V	1U	1kH				4W
5.001	4808	100	-22uA	10%					2W
6.001	4808	2	1.999A	1% 1/	1kH				2W
7.001	4808	A	mV	0.1U	50H				2W
8.001	4808	A	A	5%	1kH				2W
9.001	4808		1.999A		1kH			S	2W
9.002	4808	10	20mV		500H			N	2W
9.003	4808	10	20mV	0.5%	1kH			C	2W
10.001	4808	A	10kZ	5%					4W

M4808

Auxiliary Instrument Setup FSC

Description

The M4808 FSC is used to range lock the 4808.

Parameters

RANGE

This field specifies one of the following:

- RNGLK Range Lock
- *blank* Field not applicable

NOMINAL

This field specifies the range selection value or a reset to autorange.

- Range selection value entered as *numeric*[*prefix*]V or A
- Reset (autorange) entered as "*"

Rules:

- "*" is automatically inserted in the NOMINAL field when a blank M4000 statement is entered.
- The NOMINAL field may specify a range selection value only when the RANGE field specifies RNGLK.

Range Selection Value	Locked Range
0 µV to 100 µV	100 µV DC, 1 mV AC, 10 mV WB
> 100 µV to 1 mV	1 mV, 10 mV WB
> 1 mV to 10 mV	10 mV
> 10 mV to 100 mV	100 mV
> 100 mV to 1 V	1 V
> 1 V to 10 V	10 V
> 10 V to 100 V	100 V
> 100 V to 1000 V	1000 V
0 µA to 100 µA	100 µA
> 100 µA to 1 mA	1 mA
> 1 mA to 10 mA	10 mA
> 10 mA to 100 mA	100 mA
> 100 mA to 1A	1 A

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 4000 FSC.

4950

Instrument FSC

Description

The 4950 FSC programs the Datron 4950 Multifunction Transfer Standard to measure DC voltage, AC voltage, DC current, AC current, resistance and frequency.

Functional Capability

BANDS ON (MOD2 = *blank*)

Function	Range	Band	Amplitude	Frequency
DC Voltage	100 mV	0%	-15 mV to +15 mV	
	100 mV	100%	+85 mV to +115 mV	
	100 mV	100%	-115 mV to -85 mV	
	1 V	0%	-0.1 V to +0.1 V	
	1 V	100%	+0.9 V to +1.1 V	
	1 V	100%	-1.1 V to -0.9 V	
	10 V	0%	-1 V to +1 V	
	10 V	100%	+9 V to +11 V	
	10 V	190%	-11 V to -9 V	
	100 V	0%	-10 V to +10 V	
	100 V	100%	+90 V to +110 V	
	100 V	100%	-110 V to -90 V	
	1000 V	0%	-100 V to +100 V	
	1000 V	100%	+900 V to +1100 V	
	1000 V	100%	-1100 V to -900 V	

AC Voltage	1 mV	100%	0.85 mV to 1.15 mV	9 Hz to 11 Hz
	1 mV	100%	0.85 mV to 1.15 mV	18 Hz to 22 Hz
	1 mV	100%	0.85 mV to 1.15 mV	27 Hz to 33 Hz
	1 mV	100%	0.85 mV to 1.15 mV	36 Hz to 44 Hz
	1 mV	100%	0.85 mV to 1.15 mV	46.25 Hz to 63.75 Hz
	1 mV	100%	0.85 mV to 1.15 mV	270 Hz to 440 Hz
	1 mV	100%	0.85 mV to 1.15 mV	0.9 kHz to 1.1 kHz
	1 mV	100%	0.85 mV to 1.15 mV	18 kHz to 22 kHz
	1 mV	100%	0.85 mV to 1.15 mV	27 kHz to 33 kHz
	1 mV	100%	0.85 mV to 1.15 mV	45 kHz to 55 kHz
	1 mV	100%	0.85 mV to 1.15 mV	90 kHz to 110 kHz
	1 mV	100%	0.85 mV to 1.15 mV	270 kHz to 330 kHz
	1 mV	100%	0.85 mV to 1.15 mV	450 kHz to 550 kHz
	1 mV	100%	0.85 mV to 1.15 mV	0.9 MHz to 1.1 MHz
	10 mV	100%	8.5 mV to 11.5 mV	9 Hz to 11 Hz
	10 mV	100%	8.5 mV to 11.5 mV	18 Hz to 22 Hz
	10 mV	100%	8.5 mV to 11.5 mV	27 Hz to 33 Hz
	10 mV	100%	8.5 mV to 11.5 mV	36 Hz to 44 Hz
	10 mV	100%	8.5 mV to 11.5 mV	46.25 Hz to 63.75 Hz
	10 mV	100%	8.5 mV to 11.5 mV	270 Hz to 440 Hz
	10 mV	100%	8.5 mV to 11.5 mV	0.9 kHz to 1.1 kHz
	10 mV	100%	8.5 mV to 11.5 mV	18 kHz to 22 kHz
	10 mV	100%	8.5 mV to 11.5 mV	27 kHz to 33 kHz
	10 mV	100%	8.5 mV to 11.5 mV	45 kHz to 55 kHz
	10 mV	100%	8.5 mV to 11.5 mV	90 kHz to 110 kHz
	10 mV	100%	8.5 mV to 11.5 mV	270 kHz to 330 kHz
	10 mV	100%	8.5 mV to 11.5 mV	450 kHz to 550 kHz
	10 mV	100%	8.5 mV to 11.5 mV	0.9 MHz to 1.1 MHz

	100 mV	100%	85 mV to 115 mV	9 Hz to 11 Hz
	100 mV	100%	85 mV to 115 mV	18 Hz to 22 Hz
	100 mV	100%	85 mV to 115 mV	27 Hz to 33 Hz
	100 mV	100%	85 mV to 115 mV	36 Hz to 44 Hz
	100 mV	100%	85 mV to 115 mV	46.25 Hz to 63.75 Hz
	100 mV	100%	85 mV to 115 mV	270 Hz to 440 Hz
	100 mV	100%	85 mV to 115 mV	0.9 kHz to 1.1 kHz
	100 mV	100%	85 mV to 115 mV	18 kHz to 22 kHz
	100 mV	100%	85 mV to 115 mV	27 kHz to 33 kHz
	100 mV	100%	85 mV to 115 mV	45 kHz to 55 kHz
	100 mV	100%	85 mV to 115 mV	90 kHz to 110 kHz
	100 mV	100%	85 mV to 115 mV	270 kHz to 330 kHz
	100 mV	100%	85 mV to 115 mV	450 kHz to 550 kHz
	100 mV	100%	85 mV to 115 mV	0.9 MHz to 1.1 MHz
	1 V	100%	0.9 V to 1.1 mV	9 Hz to 11 Hz
	1 V	100%	0.9 V to 1.1 mV	18 Hz to 22 Hz
	1 V	100%	0.9 V to 1.1 mV	27 Hz to 33 Hz
	1 V	100%	0.9 V to 1.1 mV	36 Hz to 44 Hz
	1 V	100%	0.9 V to 1.1 mV	46.25 Hz to 63.75 Hz
	1 V	100%	0.9 V to 1.1 mV	270 Hz to 440 Hz
	1 V	100%	0.9 V to 1.1 mV	0.9 kHz to 1.1 kHz
	1 V	100%	0.9 V to 1.1 mV	18 kHz to 22 kHz
	1 V	100%	0.9 V to 1.1 mV	27 kHz to 33 kHz
	1 V	100%	0.9 V to 1.1 mV	45 kHz to 55 kHz
	1 V	100%	0.9 V to 1.1 mV	90 kHz to 110 kHz
	1 V	100%	0.9 V to 1.1 mV	270 kHz to 330 kHz
	1 V	100%	0.9 V to 1.1 mV	450 kHz to 550 kHz
	1 V	100%	9 V to 11 V	0.9 MHz to 1.1 MHz

	10 V	100%	9 V to 11 V	9 Hz to 11 Hz
	10 V	100%	9 V to 11 V	18 Hz to 22 Hz
	10 V	100%	9 V to 11 V	27 Hz to 33 Hz
	10 V	100%	9 V to 11 V	36 Hz to 44 Hz
	10 V	100%	9 V to 11 V	46.25 Hz to 63.75 Hz
	10 V	100%	9 V to 11 V	270 Hz to 440 Hz
	10 V	100%	9 V to 11 V	0.9 kHz to 1.1 kHz
	10 V	100%	9 V to 11 V	18 kHz to 22 kHz
	10 V	100%	9 V to 11 V	27 kHz to 33 kHz
	10 V	100%	9 V to 11 V	45 kHz to 55 kHz
	10 V	100%	9 V to 11 V	90 kHz to 110 kHz
	10 V	100%	9 V to 11 V	270 kHz to 330 kHz
	10 V	100%	9 V to 11 V	450 kHz to 550 kHz
	10 V	100%	9 V to 11 V	0.9 MHz to 1.1 MHz
	10 V	190%	18 V to 19.5 V	0.9 kHz to 1.1 kHz
	100 V	100%	90 V to 110 V	9 Hz to 11 Hz
	100 V	100%	90 V to 110 V	18 Hz to 22 Hz
	100 V	100%	90 V to 110 V	27 Hz to 33 Hz
	100 V	100%	90 V to 110 V	36 Hz to 44 Hz
	100 V	100%	90 V to 110 V	46.25 Hz to 63.75 Hz
	100 V	100%	90 V to 110 V	270 Hz to 440 Hz
	100 V	100%	90 V to 110 V	0.9 kHz to 1.1 kHz
	100 V	100%	90 V to 110 V	18 kHz to 22 kHz
	100 V	100%	90 V to 110 V	27 kHz to 33 kHz
	100 V	100%	90 V to 110 V	45 kHz to 55 kHz
	100 V	100%	90 V to 110 V	90 kHz to 110 kHz
	100 V	100%	90 V to 110 V	180 kHz to 220 kHz

	1000 V	70%	600 V to 800 V	45 kHz to 55 kHz
	1000 V	70%	600 V to 800 V	90 kHz to 110 kHz
	1000 V	100%	900 V to 1100 V	9 Hz to 11 Hz
	1000 V	100%	900 V to 1100 V	18 Hz to 22 Hz
	1000 V	100%	900 V to 1100 V	27 Hz to 33 Hz
	1000 V	100%	900 V to 1100 V	36 Hz to 44 Hz
	1000 V	100%	900 V to 1100 V	46.25 Hz to 63.75 Hz
	1000 V	100%	900 V to 1100 V	270 Hz to 440 Hz
	1000 V	100%	900 V to 1100 V	0.9 kHz to 1.1 kHz
	1000 V	100%	900 V to 1100 V	18 kHz to 22 kHz
	1000 V	100%	900 V to 1100 V	27 kHz to 33 kHz
DC Current	100 µa	0%	-10.µA to +10 µA	
	100 µA	100%	+90 µA to +110 µA	
	100 µA	100%	-110 µA to -90 µA	
	1 mA	0%	-0.1 mA to +0.1 mA	
	1 mA	100%	+0.9 mA to +1.1 mA	
	1 mA	100%	-1.1 mA to -0.9 mA	
	10 mA	0%	-1 mA to +1 mA	
	10 mA	100%	+9 mA to +11 mA	
	10 mA	100%	-11 mA to -9 mA	
	100 mA	0%	-10 mA to +10 mA	
	100 mA	100%	+90 mA to +110 mA	
	100 mA	100%	-110 mA to -90 mA	
	1 A	0%	-0.1 A to +0.1 A	
	1 A	100%	+0.9 A to +1.1 A	

	1 A	100%	-1.1 A to -0.9 A	
	10 A[1]	0%	-1 A to +1 A	
	10 A[1]	100%	+9 A to +11 A	
	10 A[1]	100%	-11 A to -9 A	
AC Current	100 µA	100%	90 µA to 110 µA	9 Hz to 11 Hz
	100 µA	100%	90 µA to 110 µA	18 Hz to 22 Hz
	100 µA	100%	90 µA to 110 µA	27 Hz to 33 Hz
	100 µA	100%	90 µA to 110 µA	36 Hz to 44 Hz
	100 µA	100%	90 µA to 110 µA	46.25 Hz to 63.75 Hz
	100 µA	100%	90 µA to 110 µA	270 Hz to 440 Hz
	100 µA	100%	90 µA to 110 µA	0.9 kHz to 1.1 kHz
	100 µA	100%	90 µA to 110 µA	4.5 kHz to 5.5 kHz
	100 µA	100%	90 µA to 110 µA	9 kHz to 11 kHz
	100 µA	100%	90 µA to 110 µA	18 kHz to 22 kHz
	100 µA	100%	90 µA to 110 µA	27 kHz to 33 kHz
	1 mA	100%	0.9 mA to 1.1 mA	9 Hz to 11 Hz
	1 mA	100%	0.9 mA to 1.1 mA	18 Hz to 22 Hz
	1 mA	100%	0.9 mA to 1.1 mA	27 Hz to 33 Hz
	1 mA	100%	0.9 mA to 1.1 mA	36 Hz to 44 Hz
	1 mA	100%	0.9 mA to 1.1 mA	46.25 Hz to 63.75 Hz
	1 mA	100%	0.9 mA to 1.1 mA	270 Hz to 440 Hz
	1 mA	100%	0.9 mA to 1.1 mA	0.9 kHz to 1.1 kHz
	1 mA	100%	0.9 mA to 1.1 mA	4.5 kHz to 5.5 kHz
	1 mA	100%	0.9 mA to 1.1 mA	9 kHz to 11 kHz
	1 mA	100%	0.9 mA to 1.1 mA	18 kHz to 22 kHz
	1 mA	100%	0.9 mA to 1.1 mA	27 kHz to 33 kHz

	10 mA	100%	9 mA to 11 mA	9 Hz to 11 Hz
	10 mA	100%	9 mA to 11 mA	18 Hz to 22 Hz
	10 mA	100%	9 mA to 11 mA	27 Hz to 33 Hz
	10 mA	100%	9 mA to 11 mA	36 Hz to 44 Hz
	10 mA	100%	9 mA to 11 mA	46.25 Hz to 63.75 Hz
	10 mA	100%	9 mA to 11 mA	270 Hz to 440 Hz
	10 mA	100%	9 mA to 11 mA	0.9 kHz to 1.1 kHz
	10 mA	100%	9 mA to 11 mA	4.5 kHz to 5.5 kHz
	10 mA	100%	9 mA to 11 mA	9 kHz to 11 kHz
	10 mA	100%	9 mA to 11 mA	18 kHz to 22 kHz
	10 mA	100%	9 mA to 11 mA	27 kHz to 33 kHz
	100 mA	100%	90 mA to 110 mA	9 Hz to 11 Hz
	100 mA	100%	90 mA to 110 mA	18 Hz to 22 Hz
	100 mA	100%	90 mA to 110 mA	27 Hz to 33 Hz
	100 mA	100%	90 mA to 110 mA	36 Hz to 44 Hz
	100 mA	100%	90 mA to 110 mA	46.25 Hz to 63.75 Hz
	100 mA	100%	90 mA to 110 mA	270 Hz to 440 Hz
	100 mA	100%	90 mA to 110 mA	0.9 kHz to 1.1 kHz
	100 mA	100%	90 mA to 110 mA	4.5 kHz to 5.5 kHz
	100 mA	100%	90 mA to 110 mA	9 kHz to 11 kHz
	100 mA	100%	90 mA to 110 mA	18 kHz to 22 kHz
	100 mA	100%	90 mA to 110 mA	27 kHz to 33 kHz
	1 A	100%	0.9 A to 1.1 A	9 Hz to 11 Hz
	1 A	100%	0.9 A to 1.1 A	18 Hz to 22 Hz
	1 A	100%	0.9 A to 1.1 A	27 Hz to 33 Hz
	1 A	100%	0.9 A to 1.1 A	36 Hz to 44 Hz
	1 A	100%	0.9 A to 1.1 A	46.25 Hz to 63.75 Hz
	1 A	100%	0.9 A to 1.1 A	270 Hz to 440 Hz

	1 A	100%	0.9 A to 1.1 A	0.9 kHz to 1.1 kHz
	1 A	100%	0.9 A to 1.1 A	4.5 kHz to 5.5 kHz
	1 A	100%	0.9 A to 1.1 A	9 kHz to 11 kHz
	1 A	100%	0.9 A to 1.1 A	18 kHz to 22 kHz
	1 A	100%	0.9 A to 1.1 A	27 kHz to 33 kHz
	10 A[1]	100%	9 A to 11 A	9 Hz to 11 Hz
	10 A[1]	100%	9 A to 11 A	18 Hz to 22 Hz
	10 A[1]	100%	9 A to 11 A	27 Hz to 33 Hz
	10 A[1]	100%	9 A to 11 A	36 Hz to 44 Hz
	10 A[1]	100%	9 A to 11 A	46.25 Hz to 63.75 Hz
	10 A[1]	100%	9 A to 11 A	270 Hz to 440 Hz
	10 A[1]	100%	9 A to 11 A	0.9 kHz to 1.1 kHz
	10 A[1]	100%	9 A to 11 A	4.5 kHz to 5.5 kHz
	10 A[1]	100%	9 A to 11 A	9 kHz to 11 kHz
	10 A[1]	100%	9 A to 11 A	18 kHz to 22 kHz
Resistance	10 Ω	0%	0 Ω to 1 Ω	
	10 Ω	10%	0 Ω to 2 Ω	
	10 Ω	30%	2 Ω to 4 Ω	
	10 Ω	100%	9 Ω to 11 Ω	
	10 Ω	190%	18 Ω to 19.5 Ω	
	100 Ω	0%	0 Ω to 10 Ω	
	100 Ω	30%	20 Ω to 40 Ω	
	100 Ω	100%	90 Ω to 110 Ω	
	100 Ω	190%	180 Ω to 195 Ω	
	1 kΩ	0%	0 k Ω to 0.1 kΩ	
	1 kΩ	30%	0.2 k Ω to 0.4 k Ω	

	1 kΩ	100%	0.9 kΩ to 1.1 kΩ
	1 kΩ	190%	1.8 kΩ to 1.95 kΩ
	10 kΩ	0%	0 kΩ to 1 kΩ
	10 kΩ	30%	2 kΩ to 4 kΩ
	10 kΩ	100%	9 k Ω to 11 kΩ
	10 kΩ	190%	18 kΩ to 19.5 kΩ
	100 kΩ	0%	0 kΩ to 10 kΩ
	100 kΩ	30%	20 kΩ to 40 k Ω
	100 kΩ	100%	90 kΩ to 110 kΩ
	100 kΩ	190%	180 kΩ to 195 kΩ
	1 MΩ	0%	0 MΩ to 0.1 MΩ
	1 MΩ	30%	0.2 MΩ to 0.4 MΩ
	1 MΩ	100%	0.9 MΩ to 1.1 MΩ
	1 MΩ	190%	1.8 MΩ to 1.95 MΩ
	10 MΩ	0%	0 MΩ to 1 MΩ
	10 MΩ	30%	2 MΩ to 4 MΩ
	10 MΩ	100%	9 MΩ to 11 MΩ
	10 MΩ	190%	18 MΩ to 19.5 MΩ
	100 MΩ	0%	0 MΩ to 10 MΩ
	100 MΩ	30%	20 MΩ to 40 MΩ
	100 MΩ	100%	90 MΩ to 110 MΩ

BANDS OFF (MOD2 = "O")

Function	Amplitude	Frequency
DC Voltage	-1100 V to 1100 V	
AC Voltage	0.85 mV to 19.99999 V	9 Hz to 1.1 MHz
	20 V to 199.9999 V	9 Hz to 220 kHz
	200 V to 800 V	9 Hz to 110 kHz
	>800 V to 1100 V	9 Hz to 33 kHz
Resistance	Ω to 199.999999 MΩ	
DC Current	-1.999999 A to 1.999999 A	
	-19.99999 A to 19.99999 A[1]	
AC Current	90 µA to 1.999999 A	10 Hz to 33 kHz
	2 A to 19.99999 A[1]	10 Hz to 22 kHz
Frequency	9 Hz to 1.1 MHz	0.85 mV to 19.99999 V
	9 Hz to 220 kHz	20 V to 199.9999 V
	9 Hz to 110 kHz	200 V to 800 V
	9 Hz to 33 kHz	>800 V to 1100 V
	10 Hz to 33 kHz	90 µA to 1.999999 A
	10 Hz to 22 kHz[1]	2 A to 11 A
1. Requires 4953 AC/DC Shunt		

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the expected measured value or a reset.

- Voltage (DC or RMS) entered as [*numeric*][*prefix*]V.
- Current entered as [*numeric*][*prefix*]A.
- Resistance entered as [*numeric*][*prefix*]Z.

- Frequency entered as [*numeric*][*prefix*]H.
- Reset entered as *.

Rules:

- The NOMINAL field may specify frequency only when the MOD1 field specifies voltage or current.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies frequency or amplitude for AC voltage or AC current measurements.

- Frequency entered as[*numeric*][*prefix*]H.
- Voltage entered as [*numeric*][*prefix*]V.
- Current entered as [*numeric*][*prefix*]A.
- *blank* not applicable

Rules:

- The MOD1 field may specify frequency only when the NOMINAL field specifies voltage or current.
- The MOD1 field must specify voltage or current when the NOMINAL field specifies frequency.
- The MOD1 field must be blank when the NOMINAL field specifies resistance.

MOD2

This field specifies one the band limits mode:

- *blank* Bands On
- O Override (Bands Off)

MOD3

This field specifies the accuracy mode for the instrument.

- *blank* High accuracy
- F Low accuracy
- ZR Perform input zero

Note

MOD3 does not effect the measurement accuracy of a frequency measurement. Therefore, if MOD3 is left blank for frequency, measurement execution time will be increased with no increase in accuracy.

Rules:

- The MOD3 field may specify ZR only under the following conditions:
  1. The Nominal value is zero or MEM is zero when the Nominal field does not contain a value,

     and

  2. The MOD1 field is blank (DC volts, DC amps, or ohms).

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- The CON may specify 2W only for either for the following conditions:
  1. DC Voltage, DC Current, AC Current, and Resistance measurement,

     or

  2. AC voltage and Frequency measurement when
     a) the M4950 Nominal field locks the 1 V or 10 V range and
     b) the M4950 MOD1 field is 300 kHz, 500 kHz, or 1 MHz.
- The CON may specify 4W only for AC Voltage, Frequency, or Resistance measurement.

Using the Datron 4950

In most respects the Datron 4950 functions like any other supported system instrument. However, since the 4950 is designed to internally take a sequence of measurements and return to the user the mean of the measurements and the standard error, MET/CAL handles the 4950 as a special case. When the number of measurements (NMEAS) is set to 1, and when the 4950 is in a mode in which the sample size is greater than 1, MET/CAL uses the standard error calculated by the 4950 as the basis for the determination of the standard deviation.

The calculation is:

Standard Deviation = Standard Error * (N ^ 0.5)

where N is the sample size.

Note that this operation is different from the normal operation when NMEAS is 1. Normally, when NMEAS is 1, no standard deviation is determined, which causes S1 to be zero, which in turn causes U2 to be based only on the UUT's resolution.

It remains possible, even with the Datron 4950, for the procedure writer to override the default calculation. For example, if the procedure includes a VSET statement which directly specifies the value of S1, MET/CAL will no longer use the Standard Error calculated by the 4950, even if NMEAS is set to 1 and the 4950 sample size is greater than 1.

Setting NMEAS to any value greater than 1 disables the built-in use of the standard error calculated by the 4950. For example, suppose NMEAS is 5 and the 4950 is in high accuracy DCI mode. The sample size is 32, and the 4950 calculates the standard error, but MET/CAL will make no use of the calculated standard error in the measurement uncertainty calculation. Rather, in this case, MET/CAL will simply calculate the standard deviation of 5 readings (each of which is really based on 32 internal readings).

If the 4950 is used in a mode in which the sample size is 1 (for example, low accuracy ACV), the procedure writer should set the number of measurements to a value greater than 1 in order to include in the measurement uncertainty calculation the standard deviation of a sequence of measurements.

For additional information refer to the "Sample Size and Resolution" table on page 6-17 of the "Wavetek Model 4950 Multifunction Transfer Standard Instrument User's Handbook" (December 1998).

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in this manual.

Examples

```
STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
  1.001  ASK-                                                              V

# -----  Number of Measurement to average in MET/CAL is set to one because
# -----  the 4950 internal number of samples and standard error are used
# -----  for the measurement uncertainty calculation.
  1.002  VSET         NMEAS = 1

# -----  Establish reset command for UUT.
  1.003  RESET        *CLS;*RST;*OPC?[I!]

# -----  Perform Input Zero
  1.004  M4950  RNGLK 100mV          0%
  1.005  4950         0mV                                            ZR N  2W
  1.006  ASK-         N
  1.007  M4950  RNGLK 1V             0%
  1.008  4950         0V                                             ZR N  2W
  1.009  M4950  RNGLK 10V            0%
  1.010  4950         0V                                             ZR N  2W
  1.011  M4950  RNGLK 100V           0%
  1.012  4950         0V                                             ZR N  2W
  1.013  M4950  RNGLK 1000V          0%
  1.014  4950         0V                                             ZR N  2W
  1.015  ASK+         N
  1.016  M4950  RNGLK 100uA          0%
  1.017  4950         0uA                                            ZR N  2W
  1.018  ASK-         N
  1.019  M4950  RNGLK 1mA            0%
  1.020  4950         0mA                                            ZR N  2W
  1.021  M4950  RNGLK 10mA           0%
  1.022  4950         0mA                                            ZR N  2W
  1.023  M4950  RNGLK 100mA          0%
  1.024  4950         0mA                                            ZR N  2W
  1.025  M4950  RNGLK 1A             0%
  1.026  4950         0A                                             ZR N  2W
  1.027  M4950  RNGLK 10A            0%
  1.028  4950         0A                                             ZR N  2W
  1.029  ASK+         N
  1.030  M4950  RNGLK 10Z            0%
  1.031  4950         0Z                                             ZR N  2W
  1.032  ASK-         N
  1.033  M4950  RNGLK 100Z           0%
  1.034  4950         0Z                                             ZR N  4W
  1.035  M4950  RNGLK 1kZ            0%
  1.036  4950         0kZ                                            ZR N  4W
  1.037  M4950  RNGLK 10kZ           0%
```

```
  1.038  4950         0kZ                                              ZR N  4W
  1.039  M4950  RNGLK 100kZ          0%
  1.040  4950         0kZ                                              ZR N  4W
  1.041  M4950  RNGLK 1MZ            0%
  1.042  4950         0MZ                                              ZR N  4W
  1.043  M4950  RNGLK 10MZ           0%
  1.044  4950         0MZ                                              ZR N  4W
  1.045  M4950  RNGLK 100MZ          0%
  1.046  4950         0MZ                                              ZR N  4W
  1.047  ASK-   R   Q                P                            F        V

# -----  DC Voltage
  1.048  DISP         Connect the 4950 Input Cable to the 5700A as follows:
  1.048  DISP         [32] 4950 Hi Lead to 5700A OUTPUT HI
  1.048  DISP         [32] 4950 Lo Lead to 5700A OUTPUT LO
  1.048  DISP         [32] 4950 I+ Lead to 5700A SENSE HI
  1.048  DISP         [32] 4950 I- Lead to 5700A SENSE LO
  1.049  IEEE         OUT 0V;OPER;*OPC?[I!]
  1.050  M4950  RNGLK 100mV          0%
  1.051  4950   220   0.00000mV      7P% 0.00075U                          2W
  2.001  IEEE         OUT 100mV;OPER;*OPC?[I!]
  2.002  M4950  RNGLK 100mV          100%
  2.003  4950   220   100.00000mV    7P% 0.00075U                          2W
  3.001  IEEE         *CLS;*RST;*OPC?[I!]

# -----  AC Voltage
  3.002  IEEE         OUT 1V,10Hz;OPER;*OPC?[I!]
  3.003  M4950  RNGLK 1V             100%          10H
  3.004  4950   2.2   1.000000V      550P% 100e-6U 10H                     4W
  4.001  IEEE         OUT 1V,10kHz;OPER;*OPC?[I!]
  4.002  M4950  RNGLK 1V             100%          10kH
  4.003  4950   2.2   1.000000V      75P% 7e-6U    10kH                    4W
  5.001  IEEE         *CLS;*RST;*OPC?[I!]

# -----  Resistance
  5.002  IEEE         OUT 0Ohm;EXTSENSE ON;OPER;*OPC?[I!]
  5.003  M4950  RNGLK 10Z            0%
  5.004  4950   0     0.0000000Z     0.0000500U                            4W
  6.001  IEEE         OUT 10Ohm;EXTSENSE ON;OPER;*OPC?[I!]OUT?[I]
  6.002  M4950  RNGLK 10Z            100%
  6.003  4950   10    Z              0.000028U                             4W
  7.001  IEEE         OUT 19Ohm;EXTSENSE ON;OPER;*OPC?[I!]OUT?[I]
  7.002  M4950  RNGLK 10Z            190%
  7.003  4950   19    Z              0.000026U                             4W
  8.001  IEEE         *CLS;*RST;*OPC?[I!]

# -----  DC Current
  8.002  DISP         Connect the 4950 Input cable to the 5700A as follows.
```

```
  8.002  DISP         [32] 4950 I+ Lead to 5700A OUTPUT HI
  8.002  DISP         [32] 4950 I- Lead to 5700A OUTPUT LO
  8.003  M4950  RNGLK 1mA            0%
  8.004  4950         0.000mA                                         F  N  2W
  8.005  IEEE         OUT 0mA;OPER;*OPC?[I!]
  8.006  4950   2.2   0.000mA        50P% 0.010U                            2W
  9.001  M4950  RNGLK 1mA            100%
  9.002  4950         1.000mA                                         F  N  2W
  9.003  IEEE         OUT 1mA;OPER;*OPC?[I!]
  9.004  4950   2.2   1.000mA        50P% 0.010U                            2W
 10.001  IEEE         *CLS;*RST;*OPC?[I!]

# -----  AC Current
 10.002  M4950  RNGLK 100mA          100%          10H
 10.003  4950         100.000mA                    10H                F  N  2W
 10.004  IEEE         OUT 100mA,10Hz;OPER;*OPC?[I!]
 10.005  4950   220   100.000mA      700P% 5e-6U   10H                      2W
 11.001  M4950  RNGLK 100mA          100%          1kH
 11.002  4950         100.000mA                    1kH                F  N  2W
 11.003  IEEE         OUT 100mA,1kHz;OPER;*OPC?[I!]
 11.004  4950   220   100.000mA      150P% 4e-6U   1kH                      2W
 12.001  IEEE         *CLS;*RST;*OPC?[I!]

# -----  4953 10A Current Shunt
 12.002  DISP         Connect the 4950 Input cable to 4953 Shunt as follows:
 12.002  DISP         [32] 4950 Hi Lead to 4953 Hi
 12.002  DISP         [32] 4950 Lo Lead to 4953 Lo
 12.002  DISP
 12.002  DISP         Connect the 5725A to the 4953 Shunt as follows:
 12.002  DISP         [32] 5725A CURRENT OUTPUT HI to 4953 I+
 12.002  DISP         [32] 5725A CURRENT OUTPUT LO to 4953 I-
 12.003  M4950  RNGLK 10A            100%
 12.004  4950         10.00000A                                       F  N  2W
 12.005  IEEE         OUT 10A;OPER;*OPC?[I!]
 12.006  4950   11    10.00000A      340P% 480e-9U                          2W
 13.001  M4950  RNGLK 10A            100%          40H
 13.002  4950         10.0000A                     40H                F  N  2W
 13.003  IEEE         OUT 10A,40Hz;OPER;*OPC?[I!]
 13.004  4950   11    10.0000A       400P% 170e-9U 40H                      2W
 14.001  M4950  RNGLK 10A            100%          5kH
 14.002  4950         10.0000A                     5kH                F  N  2W
 14.003  IEEE         OUT 10A,5kHz;OPER;*OPC?[I!]
 14.004  4950   11    10.0000A       850P% 380e-9U 5kH                      2W
```

M4950

Instrument FSC

Description

The M4950 FSC provides additional functions for the Datron 4950 Multimeter that are not addressed in the 4950 FSC. These functions include measurement range, percentage band, and guard.

Parameters

RANGE

This field must be "RNGLK".

Rules:

- "RNGLK" is inserted automatically if no range field code is entered.

NOMINAL

This field specifies the locked range.

- Voltage range selection value entered as: *numeric*[*prefix*]V
- Current range selection value entered as: *numeric*[*prefix*]A
- Resistance range selection value entered as: *numeric*[*prefix*]Z

Rules:

Function	M4950 Nominal	Locked Range
DC Voltage	10 mV to 100 mV	100 mV
	>100 mV to 1 V	1 V
	>1 V to 10 V	10 V
	>10 V to 100 V	100 V
	>100 V to 1000 V	1000 V
AC Voltage	0 mV to 1 mV	1 mV
	>1 mV to 10 mV	10 mV
	>10 mV to 100 mV	100 mV
	>100 mV to 1V	1 V

Function	M4950 Nominal	Locked Range
	>1 V to 10 V	10 V
	>10 V to 100 V	100 V
	>100 to 1000 V	1000 V
DC Current	0 µA to 100 µA	100 µA
	>100 µA to 1 mA	1 mA
	>1 mA to 10 mA	10 mA
	>10 mA to 100 mA	100 mA
	>100 mA to 1 A	1 A
	>1 A to 10 A	10 A
AC Current	0 µA to 100 µA	100 µA
	>100 µA to 1 mA	1 mA
	>1 mA to 10 mA	10 mA
	>10 mA to 100 mA	100 mA
	>100 mA to 1 A	1 A
	>1 A to 10 A	10 A
Resistance	0 Ω to 10 Ω	10 Ω
	>10 Ω to 100 Ω	100 Ω
	>100 Ω to 1 kΩ	1 kΩ
	>1 kΩ to 10 kΩ	10 kΩ
	>10 kΩ to 100 kΩ	100 kΩ
	>100 kΩ to 1 MΩ	1 MΩ
	>1 MΩ to 10 MΩ	10 MΩ
	>10 MΩ to 100 MΩ	100 MΩ

TOLERANCE

This field specifies the band selection value entered as: 0 %, 10 %, 30 %, 70 %, 100 %, or 190 %. The Tolerance field must be 0 % when the 4950 FSC MOD3 field is ZR.

Rules:

See MOD1 field.

MOD1

This field specifies the frequency band center:

- Band selection value entered as: *numeric* [*prefix*]H

Rules:

Function	Locked Range	M4950 Tolerance	M4950 MOD1
DC Voltage	100 mV	0%, 100%	
	1 V	0%, 100%	
	10 V	0%, 100%, 190%	
	100 V	0%, 100%	
	1000 V	0%, 100%	
AC Voltage	1 mV	100%	10, 20, 30, 40, 55, 300 Hz 1, 10, 20, 30, 50, 100, 300, 500 kHz, 1 MHz
	10 mV	100%	10, 20, 30, 40, 55, 300 Hz 1, 10, 20, 30, 50, 100, 300, 500 kHz, 1 MHz
	100 mV	100%	10, 20, 30, 40, 55, 300 Hz, 1, 10, 20, 30, 50, 100, 300, 500 kHz, 1 MHz
	1 V	100%	10, 20, 30, 40, 55, 300 Hz 1, 10, 20, 30, 50, 100, 300, 500 kHz, 1 MHz
	10 V	100%	10, 20, 30, 40, 55, 300 Hz, 1, 10, 20, 30, 50, 100, 300, 500 kHz 1 MHz
	10 V	190%	1 kHz
	100 V	100%	10, 20, 30, 40, 55, 300 Hz, 1, 10, 20, 30, 50, 100, 200 kHz
	1000 V	70%	50, 100 kHz
	1000 V	100%	10, 20, 30, 40, 55, 300 Hz 1, 10, 20, 30 kHz
DC Current	100 µA	0%, 100%	
	1 mA	0%, 100%	

Function	Locked Range	M4950 Tolerance	M4950 MOD1
	10 mA	0%, 100%	
	100 mA	0%, 100%	
	1 A	0%, 100%	
	10 A	0%, 100%	
AC Current	100 µA	100%	10, 20, 30, 40, 55, 300 Hz 1, 5, 10, 20, 30 kHz
	1 mA	100%	10, 20, 30, 40, 55, 300 Hz 1, 5, 10, 20, 30 kHz
	10 mA	100%	10, 20, 30, 40, 55, 300 Hz 1, 5, 10, 20, 30 kHz
	100 mA	100%	10, 20, 30, 40, 55, 300 Hz 1, 5, 10, 20, 30 kHz
	1 A	100%	10, 20, 30, 40, 55, 300 Hz 1, 5, 10, 20, 30 kHz
	10 A	100%	10, 20, 30, 40, 55, 300 Hz 1, 5, 10, 20 kHz
Resistance	10 Ω	0%, 10%, 30%, 100%, 190%	
	100 Ω	0%, 30%, 100%, 190%	
	1 kΩ	0%, 30%, 100%, 190%	
	10 kΩ	0%, 30%, 100%, 190%	
	100 kΩ	0%, 30%, 100%, 190%	
	1 MΩ	0%, 30%, 100%, 190%	
	10 MΩ	0%, 30%, 100%, 190%	
	100 MΩ	0%, 30%, 100%	

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is used to specify the guard connection:

"G"	remote guard
blank	local guard

CON

This field is not used.

Examples

See 4950 FSC.

525

Instrument FSC

Description

The 525 FSC provides the means to control the following functions of the Fluke 525A Temperature / Pressure Calibrator:

- DC Voltage Source
- DC Current Source
- Resistance Source and Measurement
- RTD Source and Measurement
- Thermocouple Source and Measurement

For pressure measurement, use P700 FSC (Fluke 700 Series pressure modules) or P6100 FSC (Fluke 6100 Series pressure modules).

The M525 FSC may be used to range lock DCV Source and Resistance Measurement functions.

Note

When the 525A is to be controlled via its serial port, do not use the PORT FSC port configuration special construction, [P9600,N,...], to set the baud rate, parity, etc. of the port used to control the 525A.

MET/CAL executes a "Test" function for each System Instrument prior to executing any procedure statements, therefore the settings of the port used to controlling the 525A must be set correctly before a procedure is executed.

Select the "Ports" application in the Windows control panel to choose the proper settings for port to which the 525A is connected.

Functional Capability

DC Voltage Source	0 V to 100 V
DC Current Source	0 mA to 100 mA
Resistance Source	5 Ohms to 4000 Ohms
Resistance Measurement	5 Ohms to 4000 Ohms
RTD Source and Measurement:	
100 Ohm Pt 385	-200 °C to 800 °C (-328 °F to 1472 °F)
100 Ohm Pt 3926	-200 °C to 630 °C (-328 °F to 1166 °F)
100 Ohm Pt JIS 3916	-200 °C to 630 °C (-328 °F to 1166 °F)
200 Ohm Pt 385	-200 °C to 630 °C (-328 °F to 1166 °F)
500 Ohm Pt 385	-200 °C to 630 °C (-328 °F to 1166 °F)
1000 Ohm Pt 385	-200 °C to 630 °C (-328 °F to 1166 °F)
120 Ohm Ni	-80 °C to 260 °C (-112 °F to 500 °F)
10 Ohm Cu	-100 °C to 260 °C (-148 °F to 500 °F)
YSI400	15 °C to 50 °C (59 °F to 122 °F)
PRT Source and Measurement	-500 °C to 1000 °C [1]
SPRT Measurement	-200 °C to 660 °C [2]
Thermocouple Source and Measurement:	
Type B	600 °C to 1820 °C (1112 °F to 3308.0 °F)
Type C	0 °C to 2316 °C (32 °F to 4200.8 °F)
Type E	-250 °C to 1000 °C (-418 °F to 1832.0 °F)
Type J	-210 °C to 1200 °C (-346 °F to 2192.0 °F)
Type K	-200 °C to 1372 °C (-328 °F to 2501.5 °F)
Type L	-200 °C to 900 °C (-328 °F to 1652.0 °F)
Type N	-200 °C to 1300 °C (-328 °F to 2372.0 °F)
Type R	0 °C to 1767 °C (32 °F to 3212.5 °F)
Type S	0 °C to 1767 °C (32 °F to 3212.5 °F)
Type T	-250 °C to 400 °C (-418 °F to 752.0 °F)
Type U	-200 °C to 600 °C (-328 °F to 1112.0 °F)
mV / °C	-10 mV to 75 mV
Actual range depends upon coefficients entered.	
Actual range depends upon temperature probe used.	

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the voltage, current, temperature, or reset.

- Current entered as: [*numeric*][*prefix*]A
- Resistance entered as: [*numeric*][*prefix*]Z
- Temperature entered as: [*numeric*][*prefix*]°C , °F, or K
- Reset entered as *.

Rules:

- When the NOMINAL field contains only units, the value is obtained from the memory register MEM.
- When the NOMINAL field units are ohms, the M525 RANGE and NOMINAL fields must specify the range to be used.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field is not used.

MOD2

This field specifies the temperature measurement or source type.

- *blank* DC Voltage, DC Current, or Resistance
- _B Type B thermocouple
- _C Type C thermocouple
- _E Type E thermocouple
- _J Type J thermocouple
- _K Type K thermocouple
- _L Type L thermocouple
- _N Type N thermocouple
- _R Type R thermocouple
- _S Type S thermocouple
- _T Type T thermocouple
- _U Type U thermocouple
- R1 100 Ohm Pt 385 RTD
- R2 100 Ohm Pt 3926 RTD
- R3 120 Ohm Ni RTD
- R4 200 Ohm Pt 385 RTD
- R5 500 Ohm Pt 385 RTD
- R6 1 kOhm Pt 385 RTD
- R7 100 Ohm Pt JIS 3916 RTD
- R8 10 Ohm Cu RTD
- P1 PRT, constants table 1
- P2 PRT, constants table 2
- P3 PRT, constants table 3
- P4 PRT, constants table 4
- P5 PRT, constants table 5
- RR SPRT
- Y4 YSI400 thermistor

Rules:

- _K is inserted automatically in the MOD2 field for TC Calibration when no MOD2 code is entered.
- R1 is inserted automatically in the MOD2 field for RTD Calibration when no MOD2 code is entered.
- The MOD2 field must be blank when the Nominal field specifies voltage, current, or resistance.
- The MOD field may not be blank when the Nominal field specifies temperature.

MOD3

This field is used to specify source vs measure for resistance, RTD, and thermocouple modes.

- TM Thermocouple Measurement
- TC Thermocouple Source
- ZM Resistance or RTD Measurement
- *blank* DC Voltage, DC Current, Resistance, or Temperature source.

Rules:

- The MOD3 field may specify ZM only when the Nominal field specifies resistance or the MOD3 field specifies a RTD type, PRT, or SPRT.
- The MOD3 field may specify TM or TC only when the MOD2 field specifies a thermocouple type.
- The MOD3 must be blank when the Nominal field specifies current.
- TM is automatically inserted in the MOD3 field when the MOD2
- field specifies a thermocouple type and no MOD3 code is entered.
- ZM is automatically inserted in the MOD3 field when the MOD2 field is RR and no MOD3 code is entered.

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

CON

The CONnection field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

525A Mode	CON
Voltage Source	2W
mA Source	2W
RTD / Ohms Source	2W
RTD / Ohms Measure	4W
TC Source / Measure	2W

- 2W is inserted automatically in the CON field when no CON field code is entered, and the MOD3 field is TM or TC, or the MOD3 field is blank and the Nominal field specifies voltage, current, resistance, or temperature.
- 4W is inserted automatically in the CON field when no CON field code is entered, and the MOD3 field specifies ZM.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in the on-line Reference Manual.

Examples

```
STEP     FSC     RANGE NOMINAL        TOLERANCE     MOD1         MOD2   3   4 CON
# ----- Reset -----
  1.002  525          *                                                    S
# ----- DC Voltage -----
  1.003  525     2      1.999V         2% 0.04U                                 2W
# ----- DC Voltage w/Range Lock -----
  2.001  M525    RNGLK 1V
  2.002  525     400    350.0mV        1.9% 0.4U                                2W
  3.001  M525         *
# ----- DC Voltage, TC Terminals -----
  3.002  525            35mV                                               TC S   2W
# ----- DC Current -----
  7.004  525     1      1.00mA         1%                                       2W
  8.001  525     20     19.00mA        0.07U                                    2W
# ----- Temperature Measurement -----
 21.002  525            1200.0degF                                      _J TM N   2W
# ----- Temperature Source -----
 21.004  525            50degC         1%                               _K TC     2W
 22.002  525            45degC                                          R1    S   4W
```

M525

Auxiliary Instrument Setup FSC

Description

The M525 FSC allows the specification of external thermocouple reference or range locking for Volts Source or Ohms Source or Measurement.

Parameters

RANGE

This field specifies one of the following:

- TCREF External Thermocouple Reference
- RNGLK Range Lock
- *blank* Field not applicable

Rules:

- The Range field may specify RNGLK only under the following conditions:
    1. Volts Source - the 525 FSC Nominal field units are volts "V" and the 525 FSC MOD2 field is blank.

       OR

    2. Ohms Source or Measurement - the 525 FSC Nominal field units are ohms "Z".
- The Range field must specify RNGLK for Ohms Source and Measurement (no autorange is supported).

NOMINAL

This field specifies a range lock selection value:

- External thermocouple reference value (0 °C / 32 °F)
- Range lock selection value

    -- Voltage entered as *numeric*[*prefix*]V or

    -- Resistance entered as *numeric*[*prefix*]Z
- "*" Reset to defaults (autorange/internal TC ref)

Rules:

- The NOMINAL field may specify a voltage or resistance only when the RANGE field specifies RNGLK.

Voltage	Locked Range
0 mV to 100 mV	100 mV DC
> 100 mV to 1V	1V DC
> 1V to 10V	10 mV
> 10 V to 100 V	100 V

Resistance	Locked Range
0 Ohms to 400 Ohms	400 Ohm
400 Ohms to 4000 Ohms	4000 Ohm

TOLERANCE

This field is not used.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field is not used.

CON

This field is not used.

Examples

See 525 FSC.

5500

Instrument FSC

Description

The 5500 FSC provides the means to control the following functions of the Fluke 5500A Calibrator:

- DC Voltage and DC Current
- AC Voltage and AC Current (Sine, Square, Triangle, and Truncated Sine waveforms)
- Synthesized Resistance and Capacitance
- RTD and Thermocouple Calibration stimulus
- Thermocouple measurement
- Boosted AC Voltage using the 5725A Boost Amplifier.
- Boosted DC and AC Current using the 5725A Boost Amplifier.

The 5725A must be connected to the 5500A in order to be controlled through the 5500 FSC.

When the M550 FSC is used in conjunction with the 5500 FSC the following additional 5500A functions may be controlled:

- Dual DC and Dual AC Voltage
- DC and AC Power stimulus (simultaneous voltage and current output)
- DC Voltage and DC Current range locking
- DC Offset for AC Voltage
- Duty Cycle for square waves
- Phase for Dual Voltage and Power stimulus
- Displacement Power Factor for Power stimulus
- External Reference Temperature for Thermocouple Calibration and Measurement

The following functions are available with 5500A-SC300 Scope Option:

- DC Voltage
- AC Voltage (Sine, Square, Triangle, Leveled Sine, Scope Square, Edge, Time Mark, and ScopeMeter waveforms)
- Trigger Signal

The following functions are available with 5500A-SC600 Scope Option:

- DC Voltage
- AC Voltage (Sine, Square, Triangle, Leveled Sine, Positive and Negative Scope Square, Edge, Time Mark, Pulse and Video waveforms)
- Oscilloscope Input Impedance Measurement
- Oscilloscope 50 Ohm Impedance Overload Protection Measurement
- Trigger Signal

Note

If the 5500A is to be controlled via its serial port, do not use the PORT FSC port configuration special construction, [P9600,N,...], to set the baud rate, parity, etc. of the port used to control the 5500A. MET/CAL executes a "Test" function for each System Instrument prior to executing any procedure statements, therefore the settings of the port used to controlling the 5500A must be set correctly before a procedure is executed. If the 5500A is connected to COM1, COM2, COM3, or COM4, select the "Ports" application in the Windows control panel to choose the proper settings. If the 5500A is connected to the 5520A or 5800A UUT port, select the proper settings for the UUT Serial Port from the front panel of the calibrator.

Functional Capability

Function	Amplitude	Frequency/Period	Misc.
DC Voltage:			
Normal Output	-1000 V to 1000 V		
TC Output	-329.9999 mV to 329.9999		
AC Voltage:			
Normal Output			
Sine			
Boost Off	1 mV to 33 mV	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 80 mVp
	34 mV to 330 mV	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 800 mVp
	0.4 V to 3.3 V	0.01 Hz to 9.99 Hz	Vp + |Vof f≤ 8 Vp
	4 V to 33 V	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 50 Vp
	1 mV to 32.999 mV	10 Hz to 500 kHz	Vp + |Voff ≤ 80 mVp

Function	Amplitude	Frequency/Period	Misc.
	33 mV to 329.999 mV	10 Hz to 500 kHz	Vp + |Voff ≤ 800 mVp
	0.33 V to 3.29999 V	10 Hz to 500 kHz	Vp + |Voff ≤ 8 Vp
	3.3 V to 32.9999 V	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
	33 V to 329.999 V	45 Hz to 20 kHz	
	330 V to 1000 V	45 Hz to 10 kHz	
	0.3 V to 3.3 V	1 MHz, 2 MHz	
Boost Off	-63.80 dBm to -7.29 dBm	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 80 mVp
	-27.28 dBm to -7.40 dBm	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 800 mVp
	-7.3 dBm to 12.7 dBm	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 8 Vp
	13 dBm to 32 dBm	0.01 Hz to 9.99 Hz	+ |Voff ≤ 50 Vp
	-57.78 dBm to -27.41 dBm	10 Hz to 500 kHz	Vp + |Voff ≤ 80 mVp
	-27.41 dBm to -7.41 dBm	10 Hz to 500 kHz	Vp + |Voff ≤ 800 mVp
	-7.41 dBm to 12.58 dBm	10 Hz to 500 kHz	Vp + |Voff ≤ 8 Vp
	12.59 dBm to 32.58 dBm	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
	32.59 dBm to 52.58 dBm	45 Hz to 20 kHz	
	52.59 dBm to 62.21 dBm	45 Hz to 10 kHz	
	-8 dBm to 12.7 dBm	1 MHz, 2 MHz	
Boost On	100 V to 750 V	45 Hz to 100 kHz	
	750 V to 1000 V	45 Hz to 30 kHz	
Boost On	42.22 dBm to 59.71 dBm	45 Hz to 100 kHz	
	59.72 dBm to 62.21 dBm	45 Hz to 30 kHz	
Square[1]	3 mVpp to 66 mVpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 80 mVp
	67 mVpp to 660 mVpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 800 mVp
	0.7 Vpp to 6.6 Vpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 8 V
	7 Vpp to 66 Vpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 55 Vp
	2.9 mVpp to 65.999 mVpp	10 Hz to 100 kHz	Vp + |Voff≤80 mVp
	66 mVpp to 659.999 mVpp	10 Hz to 100 kHz	Vp + |Voff ≤ 800 mVp
	0.66 Vpp to 6.59999 Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 8 Vp
	6.6 Vpp to 66 Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
Triangle &	2.9 mVpp to 92.999	10 Hz to 100 kHz	Vp + |Voff ≤ 80 mVp
Truncated Sine	93 mVpp to 929.999 mVpp	10 Hz to 100 kHz	Vp + |Voff ≤ 800 mVp
	0.93 Vpp to 9.29999 Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 8 Vp
	9.3 Vpp to 93 Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
DC Current:			
Aux. Output	-11 A to 11 A		
5725A Output			
Boost Off	-2.19999 A to 2.19999 A		
Boost On	-11 A to 11 A		
AC Current: Aux Output, Sine			

Function	Amplitude	Frequency/Period	Misc.
no toroid	29 µA to 330 mA 29 µA to 329.999 mA 0.33 A to 2.19999 A 2.2 A to 11 A	0.01 Hz to 9.99 Hz 10 Hz to 10 kHz 10 Hz to 5 kHz	
10-turn toroid	0.29 mA to 3.29999 A 3.3 A to 21.9999 A 22 A to 110 A	10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz	
30-turn toroid	0.87 mA to 8.9997 A 9.9 A to 65.9997 A 66 A to 330 A	10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz	
50-turn toroid	1.45 mA to 16.49995 A 16.5 A to 109.9995 A 110 A to 550 A	10 Hz to 10 kHz 10 Hz to 5 45 Hz to 1 kHz	
Square	47 µApp to 660 mApp 47 µApp to 659.999 mApp 0.66 App to 4.39999 App 4.4 App to 22 App	0.01 Hz to 9.99 Hz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz	
Triangle & Truncated Sine	47 µApp to 930 mApp 47 µApp to 929.999 mApp 0.93 App to 6.19999 mApp 6.2 App to 31 App	0.01 Hz to 9.99 Hz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz	
AC Current: 5725A Output Sine no toroid			
Boost Off	0.33 mA to 329.999 mA 0.33 A to 2.19999 A	10 Hz to 10 kHz 10 Hz to 5 kHz	
Boost On	1.5 A to 11 A	45 Hz to 10 kHz	
10-turn toroid			
Boost Off	3.3 mA to 3.29999 A 3.3 A to 21.9999 A	10 Hz to 10 kHz 10 Hz to 5 kHz	
Boost On	15 A to 110 A	45 Hz to 10 kHz	
30-turn toroid			
Boost Off	9.9 mA to 8.9997 A 9.9 A to 65.9997 A	10 Hz to 10 kHz 10 Hz to 5 kHz	
Boost On	45 A to 330 A	45 Hz to 10 kHz	

Function	Amplitude	Frequency/Period	Misc.
50-turn toroid			
Boost Off	16.5 mA to 16.49995 A	10 Hz to 10 kHz	
	16.5 A to 109.9995 A	10 Hz to 5 k	
Boost On	75 A to 550 A	45 Hz to 10 kHz	
Square			
Boost Off	0.47 mApp to 659.999 mApp	10 Hz to 10 kHz	
	0.66 App to 4.39999 App	10 Hz to 5 kHz	
Boost On	4.4 App to 22 App	45 Hz to 10 kHz	
Triangle & Truncated Sine			
Boost Off	0.47 mApp to 929.999 mApp	10 Hz to 10 kHz	
	0.93 App to 6.19999 App	10 Hz to 5 kHz	
Boost On	6.2 App to 31 App	45 Hz to 10 kHz	
Synthesized Res.			
4-wire & 2-wire comp.	0Ω to 109.999 kΩ		
2-wire	110 kΩ to 330 MΩ		
Synthesized Cap.			
4-wire & 2-wire	330 pF to 1100 µF		
4-wire & 2-wire comp.	110 nF to 1100 µF		
RTD Calibration			
100Ω Pt 385	-200 °C to 800 °C, -328 °F to 1472 °F		
200Ω Pt 385	-200 °C to 630 °C, -328 °F to 1166 °F		
500Ω Pt 385	-200 °C to 630 °C, -328 °F to 1166 °F		
1 kΩ Pt 385	-200 °C to 630 °C, -328 °F to 1166 °F		
100Ω Pt 3916	-200 °C to 630 °C, -328 °F to 1166 °F		
100Ω Pt 3926	-200 °C to 630 °C, -328 °F to 1166 °F		
120Ω Ni 391	-80 °C to 260 °C, -112 °F to 500 °F		
10Ω Cu	-100 °C to 260 °C, -148 °F to 500 °F		
Thermocouple Calibration & Measurement			
Type B	600 °C to 1820 °C, 32 °F to 3308 °F		
Type C	0 °C to 2316°C, 32 °F to 4201 °F		
Type E	-250 °C to 1000 °C, -418 °F to 1832 °F		

Function	Amplitude	Frequency/Period	Misc.
Type J	-210 °C to 1200 °C, -410 °F to 2192 °F		
Type K	-200 °C to 1372 °C, -328 °F to 2502 °F		
Type L	-200 °C to 900 °C, -328 °F to 2502 °F		
Type N	-200 °C to 1300 °C, -328 °F to 2372 °F		
Type R	0 °C to 1767 °C, 32 °F to 3213 °F		
Type S	0 °C to 1767 °C, 32 °F to 3213 °F		
Type T	-250 °C to 400 °C, -418 °F to 752 °F		
Type U	-200 °C to 600 °C, -328 °F to 1103 °F		
Dual DC Voltage:			
Normal Output	-1100 V to 1100 V		
Aux Output	-3.3 V to 3.3 V		
Dual AC Voltage:			Phase:
Normal Output [4]			-180 ° to +180 °
Sine [2]			
Boost Off	1 mV to 1000 V	10 Hz to 10 kHz	
Boost Off	-57.78 dBm to 62.21 dBm	10 Hz to 10 kHz	
Boost On	150 V to 1000 V	40 Hz to 10 kHz	
Boost On	45.74 dBm to 62.21 dBm	40 Hz to 10 kHz	
Square	2.9 mVpp to 66 Vpp	10 Hz to 10 kHz	
Triangle &	2.9 mVpp to 93 Vpp	10 Hz to 10 kHz	
Truncated Sine			
Aux Output			
Sine[2]	10 mV to 330 mV	0.01 Hz to 9.99 Hz	
	-27.28 dBm to -7.40 dBm	0.01 Hz to 9.99 Hz	
	0.4 V to 3.3 V	0.01 Hz to 9.99 Hz	
	-7.3 dBm to 12.7 dBm	0.01 Hz to 9.99 Hz	
	10 mV to 3.3V	10 Hz to 10 kHz	
	-37.78 dBm to 12.58 dBm	10 Hz to 10 kHz	
Square	29 mVpp to 6.6 Vpp	0.01 Hz to 10 kHz	
Triangle &			
Truncated Sine	29 mVpp to 9.3 Vpp	0.01 Hz to 10 kHz	
DC Power:			
Normal Output	-1100 V to 1100 V		
Aux Output	-11 A to 11 A		
5725A Output			
Boost Off	-2.19999 A to 2.19999 A		

Function	Amplitude	Frequency/Period	Misc.
Boost On	-11 A to 11 A		
AC Power: Normal Output [4] Sine[2] Boost Off Boost Off Boost On Boost On Square Triangle & Truncated Sine[2]	 1 mV to 1000 V -57.78 dBm to 62.21 dBm 150 V to 1000 V 45.74 dBm to 62.21 dBm 2.9 mVpp to 65.9999 Vpp 2.9 mVpp to 93 Vpp	 [3] [3] [3] [3] [3] [3]	Phase: -180° to + 180°
Aux Output [2] no toroid 10-turn toroid 30-turn toroid 50-turn toroid Square Triangle & Truncated Sine	 0.33 mA to 330 mA 0.33 mA to 329.999 mA 0.33 A to 2.19999 A 2.2 A to 11 A 0.29 mA to 3.29999 A 3.3 A to 21.9999 A 22 A to 110 A 0.87 mA to 9.89997 A 9.9 A to 65.9997 A 66 A to 330 A 1.45 mA to 16.49995 A 16.5 A to 109.9995 A 110 A to 550 A 47 mApp to 659.999 mApp 0.66 App to 4.39999 App 4.4 App to 22 App 47 mApp to 929.999 mApp 0.93 App to 6.19999 mApp 6.2 App to 31 App	 0.01 Hz to 9.99 Hz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz 10 Hz to 10 kHz 10 Hz to 5 kHz 45 Hz to 1 kHz	
AC Power: 5725A Output[4] Sine[2] Boost Off	 0.33 mA to 329.999 mA 0.33 A to 2.19999 A	 10 Hz to 10 kHz 10 Hz to 5 kHz	Phase: -180 ° to +180 °

Function	Amplitude	Frequency/Period	Misc.
Boost On	1.5 A to 11 A	45 Hz to 10 kHz	
Square			
Boost Off	0.47 mA to 659.999 mApp	10 Hz to 10 kHz	
	0.66 App to 4.39999 App	10 Hz to 5 kHz	
Boost On	4.4 App to 22 App	45 Hz to 10 kHz	
Triangle & Truncated Sine			
Boost Off	0.47 mA to 929.999 mApp	10 Hz to 10 kHz	
	0.93 App to 6.19999 App	10 Hz to 5 kHz	
Boost On	6.2 App to 31 App	45 Hz to 10 kHz	

1. A duty cycle of 1% to 99% may be specified for square waves. The default is 50%.
2. When both waveforms are sine, either the Normal or Aux output may be specified to be a harmonic from 1 to 31.
3. The frequency is the same for the voltage and the current, therefore the limits of the AC Voltage frequency are the same as those specified for the AC Current range selected.
4. The phase between the two output signals may be specified from -180 degrees to +180 degrees.

Functional Capability (5500A SCOPE Output with Option 5500A-SC300 Installed)

Function	Amplitude	Frequency	Misc.
DC voltage			
50 Ω term.	-2.2 V to 2.2 V		
1 MΩ term.	-33 V to 33 V		
AC Voltage Scope Square Wave (zero based)			
50 Ω term. 1 MΩ term.	1.8 mVpp to 2.2 Vpp 1.8 mVpp to 55 Vpp	10 Hz to 10 kHz 10 Hz to 10 kHz	
Scopemeter Square Wave			
1 MΩ term.	95 Vpp to 105 Vpp	10 Hz to 10 kHz	
Edge			
50 Ω term.	5 mVpp to 2.5 Vpp in a 1-(2.5)-5 sequence +/-10%	1 kHz to 1 MHz	
Leveled Sine			
50 Ω term.	5m Vpp to 5.5 Vpp	50 kHz to 350 MHz	
Time Markers			Period
50 Ω term.			1.8 ns to 2.2 ns 4.5 ns to 11 ns 18 ns to 22 ns 45 ns to 110 ns 180 ns to 1.1 µs 1.8 µs to 60 µs 90 µs to 12 ms 18 ms to 5.5 s

Functional Capability (5500A SCOPE Output with Option 5500A-SC300 Installed)(cont)

Function	Amplitude	Frequency	Misc.
Wavegen Sine, Square, and Triangle Waveforms (zero centered)			
50 Ω term.	1.8 mVpp to 10.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=12.5 mVp
	11 mVpp to 44.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=50.5 mVp
	45 mVpp to 109 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=125 mVp
	110 mVpp to 449 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=225 mVp
	0.45 Vpp to 1.09 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=1.25 Vp
	1.1 Vpp to 2.2 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=3.1 Vp
1 MΩ term.	1.8 mVpp to 21.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=26 mVp
	22 mVpp to 89.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=100 mVp
	90 mVpp to 219 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=260 mVp
	220 mVpp to 899 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=1000 mVp
	0.9 Vpp to 6.59 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=6.6 Vp
	6.6 Vpp to 55 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=50 Vp

Functional Capability (5500A SCOPE Output with Option 5500A-SC600 Installed)

Function	Amplitude	Frequency	Misc.
DC Voltage			
50 Ω term.	-6.599 V to 6.599 V		
1 MΩ term.	-130 V to 130 V		
AC Voltage Scope Square Wave (zero based positive and negative)			
50 Ω term. 1 MΩ term.	1.0 mVpp to 6.599 Vpp 1.0 mVpp to 130 Vpp	10 Hz to 10 kHz 10 Hz to 10 kHz	
Edge			
50 Ω term.	5 mVpp to 2.5 Vpp in a 1-(2.5)-5 sequence +/-10%	900 Hz to 11 MHz	
w/ Tunnel Diode Pulser Drive Signal	11 Vpp to 2.5 Vpp	900 Hz to 11 MHz	
Leveled Sine			
50 Ω term.	5 mVpp to 5.5 Vpp	50 kHz to 600 MHz	
Time Markers			
50 Ω term			Period
Spike Square 20 % Duty Square sine			18 ns to 5.5 s 7.5 ns to 5.5 s 75 ns to 34.99 ms 1.8 ns to 17.9 ns

Functional Capability (5500A SCOPE Output with Option 5500A-SC600 Installed)(cont)

Function	Amplitude	Frequency	Misc.
Wavegen			Max AC + DC Offset
Sine, Square, and Triangle Waveforms (zero centered)			
50 Ω term	1.8 mVpp to 10.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=12.5 mVp
	11 mVpp to 44.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=50.5 mVp
	45 mVpp to 109 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=125 mVp
	110 mVpp to 449 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=225 mVp
	0.45 Vpp to 1.09 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=1.25 Vp
	1.1 Vpp to 2.2 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=3.1 Vp
1 MΩ term	1.8 mVpp to 21.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=26 mVp
	22 mVpp to 89.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=100 mVp
	90 mVpp to 219 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=260 mVp
	220 mVpp to 899 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=1000 mVp
	0.9 Vpp to 6.59 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=6.6 Vp
	6.6 Vpp to 55 Vpp	10 Hz to 100 kHz Video	Vp + |Voff|<=50 Vp
Video			Line Marker
NTSC	-150% to 150% -1.5 Vp to 1.5 Vp -140 IRE to 140 IRE		1 to 262 Odd or Even 1 to 262 Odd or Even 1 to 262 Odd or Even
PAL	-150% to 150%		1 to 622
	-1.5 Vp to 1.5 Vp		1 to 622
PAL-M	-150% to 150%		1 to 262 Odd or Even
	-1.5 Vp to 1.5 Vp		1 to 262 Odd or Even
	-140 IRE to 140 IRE		1 to 262 Odd or Even
SECAM			
	-150% to 150%		1 to 262
	-1.5 Vp to 1.5 Vp		1 to 262
Pulse		Period	Pulse Width
50 Ω term	10 mVpp, 25 mVpp, 100 mVpp, 250 mVpp, 1 Vpp, and 2.5 Vpp	200 ns to 22 ms	2 ns to 500 ns
UUT Input Impedance Measurement (MEAS Z):			

Functional Capability (5500A SCOPE Output with Option 5500A-SC600 Installed)(cont)

Function	Amplitude	Frequency	Misc.
50 Ω			40 Ω to 60 Ω
1 MΩ			500 kΩ to 1.5 MΩ
Capacitance			5 pF to 50 pF
UUT 50 Ω Input Impedance Overload Protection Measurement (OVERLD)			
DC	5 V to 9 V		
AC	5 V to 9 V	1 kHz	

Parameters

The following table describes the basic operating modes of the 5500A Calibrator in terms of the FSC fields listed. Only the combinations of field quantities listed below are allowed. These mode names are also used in other places in this section to clarify the rules for each parameter of the 5500 FSC.

5500A Operating Modes

5500A Mode	5500 Nominal	5500 MOD1	5500 MOD3[1]	M550 Range	M550 Nominal	M550 MOD1
DC Voltage	voltage		**[TC|SC|S6|E]**	**[RNGLK**	voltage]	
AC Voltage	voltage	freq|period	**[BV|SC|S6|E]**			[DC offset]
AC Voltage	freq|period	voltage	**[BV]**			[DC offset]
AC Voltage (pulse)	p-width period[2]	voltage voltage	**S6** **S6**	**Per Pulse**	period p-width[2]	
AC Voltage	duty cycle	freq|period			voltage	[DC offset]
AC Voltage (time marks)	freq|period		**SC|S6**			
DC Current	current		**[BC|BP|E]**	**[RNGLK**	current]	
AC Current	current	freq|period	**[BC|BP|E]**			
AC Current	freq|period	current	**[BC|BP]**			
Resistance	resistance		**[E]**			

5500A Operating Modes (cont)

5500A Mode	5500 Nominal	5500 MOD1	5500 MOD3[1]	M550 Range	M550 Nominal	M550 MOD1
Resistance	conductance		**[E]**			
Capacitance	capacitance					
RTD Cal	temperature					
TC Cal	temperature		**TC**	**[TCREF**	temp.]	
TC Meas	temperature		**TM|TN**	**[TCREF**	temp.]	
Dual DC Voltage	voltage		**[AX]**		voltage	
Dual AC Voltage	voltage	freq|period	**[BV|AX]**	[**H**_n_|**H**X_n_]	voltage	
Dual AC voltage	freq|period	voltage	**[BV]**	[**H**X_n_]	voltage	
Dual AC voltage	freq|period	voltage	**AX**	[**H**_n_]	voltage	
Dual AC Voltage	phase	freq|period	**[BV|AX]**	[**H**_n_|**H**X_n_]	voltage	voltage
DC Power	power		**[BC|BP]**		voltage	
DC Power	power				current	
DC Power	voltage				current	
DC Power	current		**[BC|BP]**		voltage	
AC Power	power	freq|period	**[BC|BP]**	[**H**_n_|**H**X_n_| **LEAD|LAG]**	voltage	
AC Power	power	freq|period	**[BV]**	[**H**_n_|**H**X_n_| **LEAD|LAG]**	current	
AC Power	current	freq|period	**[BC|BP]**	[**H**_n_|**H**X_n_| **LEAD|LAG**]	voltage	
AC Power	voltage	freq|period	**[BV]**	[**H**_n_|**H**X_n_| **LEAD|LAG]**	current	

5500A Operating Modes (cont)

5500A Mode	5500 Nominal	5500 MOD1	5500 MOD3[1]	M550 Range	M550 Nominal	M550 MOD1
AC Power	freq|period	current	**[BC|BP]**	[**H***n*| **LEAD|LAG]**	voltage	
AC Power	freq|period	voltage	**[BV]**	[**H**x*n*| **LEAD|LAG]**	current	
AC Power	phase	freq|period	**[BC|BP]**	[**H***n*|**H**X*n*| **LEAD|LAG]**	voltage	current
AC Power	phase	freq|period	**[BV]**	[**H***n*|**H**X*n*| **LEAD|LAG]**	current	voltage
Video	Percent| Voltage|IRE	line marker	**S6**	ODD|EVEN		
Impedance Meas.	resistance| capacitance		**ZM**			
Overload Meas.	voltage	[freq]	**OM**	Limit	time	

1. See MOD3 parameter for description of these specification codes and rules.
2. Period and pulse width (p-width) may be entered as a frequency in Hertz.

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

Units Symbols

Units	Name	Quantity
A	Amps	current
Ap	Amps peak	current
App	Amps peak to peak	current
D	dBm	decibels
F	Farads	capacitance
H	Hertz	frequency
IRE	IRE	video amplitude
LM	Line Marker	video line marker position
T	Time	period or pulse width
V	Volts	voltage or video amplitude
Vp	Volts peak	voltage
Vpp	Volts peak to peak	voltage
W	Watts	power
Y	Siemens	conductance
Z	Ohms	resistance
deg	degrees	phase
degC	degrees Celsius	temperature
degF	degrees Fahrenheit	temperature
pct	percent	duty cycle or video amplitude

5500 FSC Nominal, MOD 1, MOD2 and MOD3 Rules

5500A Mode	5500 Nominal	5500 MOD1	5500 MOD2 [1]	5500 MOD3 [2]
DC Voltage	V			[TC|E]
AC Voltage	V|Vpp|D V|Vpp Vp H|T H|T pct	H|T H|T H|T V|Vpp|D V|Vpp H|T	SI SQ|TI|TS SI SI SQ|TI|TS SI|SQ|TI|TS	[BV|E] [BV] [BV] [BV] [BV]
DC Current	A			[BC|BP|E]
AC Current	A|App A|App Ap H|T	H|T H|T H|T A|App	SI SI|SQ|TI|TS SI|SQ|TI|TS SI|SQ|TI|TS	[BC|BP|E] [BC|BP] [BC|BP] [BC|BP]
Resistance	Z|Y			[E]
Capacitance	F			
RTD Cal	°C|°F		R1|R2|R3|R4|R5|R6| R7|R8	
TC Cal	°C|°F		_B|_C|_E|_J|_K|_L|_ N|_R|_S|_T|_U	TC
TC Meas	°C|°F		_B|_C|_E|_J|_K|_L|_ N|_R|_S|_T|_U	TM/TN
Dual DC Voltage	V			[AX]
Dual AC Voltage	V|Vp|Vpp|D V|Vp|Vpp H|T H|T	H|T H|T V|Vpp|D V|Vpp	SI SQ|TI|TS SI SQ|TI|TS	[AX|BV] [AX] [AX|BV] [AX]
DC Power	W|A V			[BC|BP]
AC Power	W V|Vp|Vpp|D V|Vp|Vpp A|Ap|App H|T H|T H|T	H|T H|T H|T H|T V|Vpp|D V|Vpp A|App	SI SI SQ|TI|TS SI|SQ|TI|TS SI SQ|TI|TS SI|SQ|TI|TS	[BV|BC|BP] [BV] [BC|BP] [BV] [BC|BP]

1. See MOD2 parameter for description of these specification codes and rules.
2. See MOD3 parameter for description of these specification codes and rules.

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

5500 FSC Nominal, MOD1, MOD2, and MOD3 Rules for 5500A-SC300

5500A Mode	5500 Nominal	5500 MOD1	5500 MOD2 [1]	5500 MOD3 [2]
DC Voltage (VOLT)	V			SC
AC Voltage (VOLT)	V|Vp|Vpp H|T	H|T V|Vpp	ZQ|SM ZQ|SM	SC SC
AC Voltage (Edge)	V|Vp|Vpp	H|T	MK	SC
AC Voltage (LEVSINE)	V|Vp|Vpp H|T	H|T V|Vp|Vpp	LS LS	SC SC
AC Voltage (MARKER)	H|T		MK	SC
AC Voltage (WAVEGEN)	V|VP|VPP H|T	H|T V|VP|VPP	SI|SQ|TI SI|SQ|TI	SC
1. See MOD2 parameter for description of these specification codes and rules. 2. See MOD3 parameter for description of these specification codes and rules.				

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

5500 FSC Nominal, MOD1, MOD2, and MOD3 Rules for 5500A-SC600

5500A Mode	5500 Nominal	5500 MOD1	5500 MOD2[1]	5500 MOD3[2]
DC Voltage (VOLT)	V			S6
AC Voltage (VOLT)	V|Vp|Vpp H|T	H|T V|Vpp	ZQ|SN ZQ|SN	S6 S6
AC Voltage (EDGE)	V|Vp|Vpp H|T	H|T V|Vpp	ED ED	S6
AC Voltage (LEVSINE)	V|Vp|Vpp H|T	H|T V|Vpp	LS LS	S6 S6
AC Voltage (MARKER)	H|T		M1|M2|M3|M4	S6
AC Voltage (WAVEGEN)	V|VP|VPP H|T	H|T V|VP|VPP	SI|SQ|TI SI|SQ|TI	S6
AC Voltage (PULSE)	H|T	VPP	PU	S6
Video (VIDEO)	pct|Vp|IRE pct|Vp	LM LM	F1|F3 F2|F4	S6 S6
Impedance Meas (MEAS Z)	Z F			ZM ZM
Overload Meas (OVERLD)	V Vpp	 H		OM OM

1. See MOD2 parameter for description of these specification codes and rules.
2. See MOD3 parameter for description of these specification codes and rules.

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

RANGE

This field specifies the UUT range as described in “General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the starting Nominal value of the stimulus output or expected UUT reading for the test entered as:

[*numeric*][*prefix*]*units symbol*

or "*" to specify a reset.

Rules:

- The NOMINAL field may not specify frequency or period when any of the following sets of conditions exist:

  1. Dual AC Voltage is specified and either

     a. the M550 RANGE field specifies H and the M550 MOD3 field specifies AX or

     b. the M550 RANGE field specifies HX and the 5500 MOD3 field specifies AX.

  2. AC Power is specified and either

     a. the M550 RANGE field specifies H and the M550 NOMINAL field specifies current or

     b. the M550 RANGE field specifies HX and the M550 NOMINAL field specifies voltage.

  3. The MOD3 field specifies E.

- When the NOMINAL field specifies frequency or period and the M550 RANGE field specifies a harmonic (H or HX), the Keyboard Entry (ASK+ K) or Go/No-Go (ASK+ G) evaluation mode must be specified, Slew is not allowed.

A duty cycle other than 50% may only be specified for square waveforms (MOD2 is SQ). Therefore keyboard entry and go-nogo evaluations may be performed at 50% duty cycle for non-square waveforms, but slew mode is not allowed. In addition the duty cycle is restricted to 50%, regardless of the type of waveform, when the DC offset is not zero.

- When the NOMINAL field specifies power and the value is slewed, if the M550 NOMINAL field specifies voltage, the voltage is held constant and a new value of current is computed by the 5500A.
- If the M550 NOMINAL field specifies current, the current is held constant and a new value of voltage is computed by the 5500A.
- When the NOMINAL field contains only units, the value is obtained from the memory register MEM.

- When the NOMINAL field contains only units and the MOD1 field is not blank, the MOD1 field must specify a value.

TOLERANCE

This field specifies the UUT tolerance as described in “General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the frequency, period, voltage, or current for AC Voltage, AC Current, Dual AC Voltage, or AC Power modes entered as:

[*numeric*][*prefix*] *units symbol*

Rules:

- When the MOD1 field contains only units, the value is obtained from memory register MEM. In this case the NOMINAL field MUST contain a value.

MOD2

This field specifies one of the following:

- The waveform type for the voltage or current specified in the NOMINAL or MOD1 field for AC Voltage or AC Current.
- The waveform type for the voltage or current not specified in the M550 FSC NOMINAL field for AC Power or Dual AC Voltage.
- The thermocouple or RTD type for TC Measurement, TC Calibration, or RTD Calibration.

blank	DC or not applicable
SI	Sine wave (WaveGen)
SQ	Square wave (WaveGen)
TI	Triangle wave (WaveGen)
TS	Truncated sine wave
LS	Leveled sine wave
ZQ	Scope square wave (DC offset is 1/2 peak-to-peak voltage)
SM	ScopeMeter wave (See 5500A manual for description)
ED	Edge signal

MK	Marker signal
_B	Type B thermocouple
_C	Type C thermocouple
_E	Type E thermocouple
_J	Type J thermocouple
_K	Type K thermocouple
_L	Type L thermocouple
_N	Type N thermocouple
_R	Type R thermocouple
_S	Type S thermocouple
_T	Type T thermocouple
_U	Type U thermocouple
R1	100 Ω Pt 385 RTD
R2	100 Ω Pt 3926 RTD
R3	120 Ω Ni RTD
R4	200 Ω Pt 385 RTD
R5	500 Ω Pt 385 RTD
R6	1 kΩ Pt 385 RTD
R7	100 Ω Pt 3916 RTD
R8	10 Ω Cu RTD
ZQ	Positive square wave (5500A-SC300 and 5500A-SC600 AC Voltage)
ZN	Negative square wave (5500A-SC600 AC Voltage)
SM	ScopeMeter wave (5500A-SC300 AC Voltage)
ED	Edge signal (5500A-SC300 and 5500A-SC600)
LS	Leveled sine wave (5500A-SC300 and 5500A-SC600)
MK	Marker signal (5500A-SC300)
M1	Spike Marker signal (5500A-SC600)
M2	Square Marker signal (5500A-SC600)
M3	20% Duty Cycle Square Marker signal (5500A-SC600)

M4 Sinusoid Marker signal (5500A-SC600)

PU Pulse wave (5500A-SC600)

F1 NTSC video signal (5500A-SC600)

F2 PAL video signal (5500A-SC600)

F3 PAL-M video signal (5500A-SC600)

F4 SECAM video signal (5500A-SC600)

Rules:

- SI is inserted automatically in the MOD2 field for AC Voltage, AC Current, Dual AC Voltage, or AC Power (i.e. the MOD1 field is not blank) if no MOD2 code is entered.
- _K is inserted automatically in the MOD2 field for TC Measurement or TC Calibration if no MOD2 code is entered.
- R1 is inserted automatically in the MOD2 field for RTD Calibration if no MOD2 code is entered.
- The M550 RANGE and NOMINAL field must specify the pulse wave period or frequency when the MOD2 field specifies PU and the NOMINAL field specifies the pulse width.
- The M550 RANGE and NOMINAL field must specify the pulse width when the MOD2 field specifies PU and the NOMINAL field specifies the pulse wave period or frequency.
- The M550 RANGE field must specify ODD or EVEN frame when the MOD2 field specifies F1 (NTSC video) or F3 (PAL-M video).

MOD3

This field specifies the calibrator output mode:

blank Default for mode specified

AX Auxiliary Voltage

BV Boost Voltage

BC Boost Current

BP Boost Port (Use Boost Amplifier port for non-boosted current)

SC Scope

TM Thermocouple Measurement (open TC detection on)

TN Thermocouple Measurement (open TC detection off)

TC	Thermocouple Cal
E	Extended Performance
SC	5500A-SC300 Scope Option
S6	5500A-SC600 Scope Option
ZM	5500A-SC600 UUT Input Impedance Measurement
OM	5500A-SC600 UUT 50 Input Overload Protection Measurement

Rules:

- The MOD3 field must specify AX when Dual DC Voltage or Dual AC Voltage is specified and the M550 FSC MOD3 field does not specify AX.
- The MOD3 field may specify BV only when the following conditions exist:
  1. AC Voltage, Dual AC Voltage, or AC Power is specified.
  2. The MOD2 field specifies SI.
  3. Voltage is specified in the NOMINAL or MOD1 field or the M550 MOD1 field or power is specified in the NOMINAL field and current is specified in the M550 NOMINAL field.
  4. The voltage specified in the NOMINAL or MOD1 field or the M550 MOD1 field or computed from the power specified in the NOMINAL field, the current specified in the M550 NOMINAL field, and any phase or power factor specified in the M550 TOLERANCE field, is within the range of the 5725A Boost Amplifier.
  5. The M550 FSC MOD3 field does not specify BV, BC, or BP.
- The MOD3 field may specify BC only when the following conditions exist:
  1. DC Current, AC Current, DC Power, or AC Power is specified.
  2. Current is specified in the NOMINAL or MOD1 field or the M550 MOD1 field or power is specified in the NOMINAL field and voltage is specified in the M550 NOMINAL field.
  3. The current specified or computed from the power specified in the NOMINAL field, the voltage specified in the M550 NOMINAL field, and any phase or power factor specified in the M550 TOLERANCE field, is within the range of the 5725A Boost Amplifier with boost on.
  4. The M550 FSC MOD3 field does not specify BC, BV, or BP.

- The MOD3 field may specify BP only when the following conditions exist:
    1. DC Current, AC Current, DC Power, or AC Power is specified.
    2. Current is specified in the NOMINAL or MOD1 field or the M550 MOD1 field or power is specified in the NOMINAL field and voltage is specified in the M550 NOMINAL field.
    3. The current specified or computed from the power specified in the NOMINAL field, the voltage specified in the M550 NOMINAL field, and any phase or power factor specified in the M550 TOLERANCE field, is within the range of the 5725A Boost Amplifier with boost off.
    4. The M550 FSC MOD3 field does not specify BC, BV, or BP.
- The MOD3 field may specify SC only when the 5500A-SC300 Scope option is configured.
- SC is inserted automatically in the MOD3 field when the MOD2 field specifies ZQ, SM, MK, ED, LS or MK, and the 5500A-SC300 Scope option is configured, and no MOD3 code is entered.
- S6 is inserted automatically in the MOD3 field when the MOD2 field specifies ZQ, ZN, ED, LS, PU, M1, M2, M3, M4, F1, F2, F3, or F4, and the 5500A-SC600 Scope Option is configured, and no MOD3 code is entered.
- The MOD3 field may specify E only when the 5500A/EP option is configured. For a full description of the 5500A/EP, see the on-line help for the 5500A when "Edit Configuration" (F12) is selected from within the MET/CAL Editor.
- The M550 FSC RANGE and NOMINAL fields must specify the time limit when the MOD3 field specifies OM.

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

Additional Rules:

- The MOD4 field must specify N (Nominal Setup Test) when the MOD3 field specifies OM (Overload Measurement).
- N is inserted automatically in the MOD4 field when the MOD3 field specifies OM and no MOD3 code is entered.

CON

The CONnection field specifies the UUT connection.

- 2W 2-wire
- 3W 3-wire
- 4W 4-wire
- CW 2-wire ohms compensated at the UUT terminals
- DV 2-wire using the external AC Divider
- TD Tunnel Diode Pulser Drive signal enabled
- T1 10-turn Toroid Coil
- T3 30-turn Toroid Coil
- T5 50-turn Toroid Coil
- L 50 Ω Termination
- *blank* 1 MΩ Termination

Rules:

- 2W is inserted automatically in the CON field when the MOD3 field does not specify SC or S6 and no CON field code is entered.
- The CON field may specify 3W only when the RTD Cal mode is specified.
- The CON field may specify CW or 4W only when RTD Cal, Resistance, or Capacitance mode is specified.
- The CON field may specify DV only when AC Voltage mode is specified, the MOD2 field specifies SI, the MOD3 field specifies a voltage of 22 mV or less.
- The CON field may specify T1, T3, or T5 only when the MOD3 field does not specify E and DC Current or DC Power mode is specified or AC Current mode is specified and the MOD2 field specifies SI or AC Power mode is specified and either:
  1. The M550 NOMINAL field specifies voltage and the 5500 MOD2 field specifies SI or
  2. The M550 NOMINAL field specifies current and the M550 MOD2 fields specifies SI. Refer to the Fluke 31/33 Instruction Manual for directions for constructing a suitable toroid coil.
- The CON field may specify L only when the MOD3 field specifies SC or S6 and the MOD3 field specifies SC.

- The CON field must specify L when the MOD2 field specifies LS, ED, or M1, M2, M3, M4, F1, F2, F3, or F4 and the MOD3 field specifies S6.
- L is inserted automatically in the CON field when the MOD2 field specifies LS, ED, or MK, the MOD3 field specifies SC and no CON field code is entered.
- L is inserted automatically in the CON field when the MOD2 field specifies LS, ED, or M1, M2, M3, M4, F1, F2, F3, or F4, the MOD3 field specifies S6 and no CON field code is entered.
- The CON field must specify 2W when the MOD3 field specifies ZM or OM.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" .

Examples

```
STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- Reset -----
  1.001  M550         *
  1.002  5500         *                                                 S
# ----- DC Voltage -----
  1.003  M550                                                              FL
  1.004  5500   20    19.99mV        2% 0.04U                              2W
# ----- DC Voltage w/Range Lock -----
  2.001  M550   RNGLK 3V
  2.002  5500   400   350.0mV        1.9% 0.4U                             2W
  3.001  M550         *
# ----- DC Voltage, TC Terminals -----
  3.002  5500         35mV                                           TC S  2W
# ----- AC Voltage -----
  3.003  5500   400   350.0mV        -2.8U +2.9U   60H           SI        2W
# ----- AC Voltage w/5725A Boost -----
  4.001  5500   400   350.0V         7.4U          20kH          SI BV     2W
# ----- AC Voltage w/External AC Divider -----
  5.001  5500         -37.78D        0.1U          100H          SI        DV
# ----- AC Voltage (Frequency Test) -----
  6.001  5500   1000  800.0H         0.1% 0.1U     300mV         SI        2W
# ----- Square Wave w/DC Offset -----
  7.001  M550                                      0.5Voff
  7.002  5500         1Vpp                         1kH           SQ     S  2W
# ----- Square Wave w/Duty Cycle Specified -----
  7.003  M550                        35pct
  7.004  5500         1Vpp                         1kH           SQ     S  2W
# ----- Square Wave (Duty Cycle Test) ------
  7.005  M550         1Vpp
  7.006  5500         30pct          2U            500H          SQ        2W
  8.001  M550         *
# ----- Triangle Wave -----
  8.002  5500         13mVpp                       10kH          TI     S  2W
# ----- Truncated Sine Wave -----
  8.003  5500         2.5mApp                      5kH           TS     S  2W
# ----- DC Current -----
  8.004  5500   4000  3500mA         9U                                    2W
# ----- AC Current at 5725A Output, Boost Off -----
  9.001  5500         35.00mA        0.37U         60H           SI BP     2W
# ----- AC Current at 5725A Output, Boost On -----
 10.001  5500   10    10A            0.12U         1kH           SI BC     2W
# ----- Dual DC Voltage -----
 11.001  M550         10mV
 11.002  5500         100mV          3%                             AX     2W
# ----- Dual AC Voltage w/5725A Boost -----
```

```
 12.001  M550         1V                                          SI AX
 12.002  5500         350Vp                        10kH           SI BV S  2W
# ----- Dual AC Voltage (Phase Test) ------
 12.003  M550         1Vpp                         1Vpp           SQ AX
 12.004  5500         30deg          1U            60H            SQ       2W
# ----- Dual AC Voltage (Harmonics) ------
 13.001  M550   H2    100V                                        SI BV
 13.002  5500         0D             1U            60H            SI AX    2W
 14.001  M550   HX3   1Vpp                                        SI AX
 14.002  5500         1Vpp           1U            60H            SI       2W
 15.001  M550         *
# ----- DC Power (Volts and Amps) -----
 15.002  M550         1mV                                               O  FL
 15.003  5500         1mA            1%                                    2W
# ----- AC Power (Volts and Amps) -----
 16.001  M550         1mA            60deg                        SI
 16.002  5500         1V                           400H           SI    S  2W
# ----- AC Power (Watts and Volts) w/Displacement Power Factor -----
 16.003  M550   LEAD  1V             0.998                        SI
 16.004  5500   20    19mW           1%            60H            SI       2W
# ----- AC Power (Watts and Vpp) w/Phase Specified -----
 17.001  M550         1Vpp           -45deg                       SI
 17.002  5500   20    1mW            1U            400H           SI       2W
# ----- AC Power (Harmonics) ------
 18.001  M550   H2    45D                                         SI BV
 18.002  5500         100W           1U            60H            SI       2W
 19.001  M550   HX3   1mApp                                       SI
 19.002  5500         1Vpp           1U            60H            SI       2W
 20.001  M550         *
# ----- Resistance -----
 20.002  5500   400   390.0Z         0.4% 0.1U                             CW
 21.001  5500   4     3.900MZ        0.05U                                 2W
# ----- Capacitance ----
 22.001  5500   10    1.100uF        2% 0.002U                             2W
# ----- Temperature Measurement -----
 23.001  5500         1200.0degF                                  _J TM N  2W
# ----- Temperature Stimulus -----
 23.002  M550   TCREF 0degC
 23.003  5500         50degC         1%                           _K TC    2W
 24.001  M550         *
 24.002  5500         45degC                                      R1    S  3W
```

```
5500A-SC300 Scope Option

 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- DC Voltage -----
  1.001  5500   20    19.99mV        4%                                 SC
# ----- AC Voltage (Scope Square Wave) -----
  2.001  5500   400   350.0mV        50U           60H            ZQ SC
# ----- AC Voltage (ScopeMeter Wave) -----
  3.001  5500         100Vpp                       1kH            SM SC S
# ----- AC Voltage (Frequency Test) -----
  3.002  5500   1000  800.0H         0.1% 0.1U     300mV          ZQ SC
# ----- Edge Signal (Scope Output) -----
  4.001  5500         0.5Vpp                       1MH            ED SC S  L
# ----- Leveled Sine Wave -----
  4.002  5500         200mVpp                      50kH           LS SC S  L
# ----- Marker Signal -----
  4.003  M550                                                              2T
  4.004  5500         1uT                                         MK SC S  L
# ----- Wavegen -----
  4.005  5500         5V                           1kH            SI SC S
# ----- Wavegen w/DC Offset -----
  4.006  M550                                      0.5Voff
  4.007  5500         1Vpp                         1kH            TI SC S
# ----- Wavegen w/Duty Cycle Specified -----
  4.008  M550                        35pct
  4.009  5500         1Vpp                         1kH            SQ SC S
  4.010  M550         *
```

```
5500A-SC600 Scope Option

 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1         MOD2  3  4 CON
# ----- DC Voltage -----
  1.001  5500   20    19.99mV        4%                               S6
# ----- AC Voltage (Positive Scope Square Wave) -----
  2.001  5500   400   350.0mV        50U           60H             ZQ S6
# ----- AC Voltage (Positive Scope Square Wave) -----
  3.001  5500         100Vpp                       1kH             ZN S6 S
# ----- AC Voltage (Frequency Test) -----
  3.002  5500   1000  800.0H         0.1% 0.1U     300mV           ZQ S6
# ----- Edge Signal (Scope Output) -----
  4.001  5500         0.5Vpp                       1MH             ED S6 S  L
# ----- Leveled Sine Wave -----

g4.002  5500         200mVpp                      50kH             LS S6 S  L
# ----- Spike Marker Signal -----
  4.003  M550                                                              2T
  4.004  5500         1uT                                          M1 S6 S  L
  4.005  M550         *
# ----- Square Marker Signal -----
  4.006  5500         1mT                                          M2 S6 S  L
# ----- 20% Duty Cycle Square Marker Signal -----
  4.007  5500         5uT                                          M3 S6 S  L
# ----- Sinusoid Marker Signal -----
  4.008  5500         2nT                                          M4 S6 S  L
# ----- Wavegen -----
  4.009  5500         5V                           1kH             SI S6 S
# ----- Wavegen w/DC Offset -----
  4.010  M550                                      0.5Voff
  4.011  5500         1Vpp                         1kH             TI S6 S
# ----- NTSC Video -----
  4.012  M550   ODD
  4.013  5500         1Vp                          262LM           F1 S6 S  L
  4.014  M550         *
# ----- PAL Video -----
  4.015  5500         50pct                        400LM           F2 S6 S  L
# ----- PAL-M Video -----
  4.016  M550   EVEN
  4.017  5500         -140IRE                      1LM             F3 S6 S  L
  4.018  M550         *
# ----- SECAM Video -----
  4.019  5500         -100pct                      622LM           F4 S6 S  L
# ----- Pulse Wave (Slew Pulse Width) -----
  4.020  M550   PER   200nT
  4.021  5500         5.0nT                        2.5Vpp          PU S6 N  L
# ----- Pulse Wave (Slew Pulse Repetition Frequency) -----
```

```
  4.022  M550   PULSE 10nT
  4.023  5500         1.00kH                       2.5Vpp        PU S6 N  L
  4.024  M550         *
# ----- Impedance Measurement (50 Ohm) -----
  4.025  5500         50Z            1U                             ZM    2W
# ----- Impedance Measurement (1 MOhm) -----
  5.001  5500         1.000MZ        1U                             ZM    2W
# ----- Impedance Measurement (Capacitance) -----
  6.001  5500         10pF                                          ZM N  2W
# ----- 50 Ohm Input Impedance Overload -----
  6.002  M550   LIMIT 10T
  6.003  5500         5V                                            OM N  2W
  6.004  EVAL   -e MEM == 0 : 50 Ohm overload protection trip not expected
  7.001  M550   LIMIT 10T
  7.002  5500         7V                                            OM N  2W
  7.003  EVAL   -e MEM : 50 Ohm overload protection trip expected
```

5520

Instrument FSC

Description

The 5520 FSC provides the means to control the following functions of the Fluke 5520A Calibrator:

- DC Voltage and DC Current
- AC Voltage and AC Current (Sine, Square, Triangle, and Truncated Sine waveforms)
- Synthesized Resistance and Capacitance
- RTD and Thermocouple Calibration stimulus
- Thermocouple measurement
- Humidity measurement

When the M5520 FSC is used in conjunction with the 5520 FSC the following additional 5520A functions may be controlled:

- Dual DC and Dual AC Voltage
- DC and AC Power stimulus (simultaneous voltage and current output)
- DC Voltage and DC Current range locking
- DC Offset for AC Voltage
- Duty Cycle for square waves
- Phase for Dual Voltage and Power stimulus
- Displacement Power Factor for Power stimulus
- External Reference Temperature for Thermocouple Calibration and Measurement

The following functions are available with SC300 Scope Option:

- DC Voltage
- AC Voltage (Sine, Square, Triangle, Leveled Sine, Scope Square, Edge, Time Mark, and ScopeMeter waveforms)
- Trigger Signal

The following functions are available with SC600 Scope Option:

- DC Voltage
- AC Voltage (Sine, Square, Triangle, Leveled Sine, Positive and Negative Scope Square, Edge, Time Mark, Pulse and Video waveforms)
- Oscilloscope Input Impedance Measurement
- Oscilloscope 50 Ohm Impedance Overload Protection Measurement
- Trigger Signal

Note

If the 5520A is to be controlled via its serial port, do not use the PORT FSC port configuration special construction, [P9600,N,...], to set the baud rate, parity, etc. of the port used to control the 5520A .MET/CAL executes a "Test" function for each System Instrument prior to executing any procedure statements, therefore the settings of the port used to controlling the 5520A must be set correctly before a procedure is executed. If the 5520A is connected to COM1, COM2, COM3, or COM4, select the "Ports" application in the Windows control panel to choose the proper settings. If the 5520A is connected to the 5500A or 5800A UUT port, select the proper settings for the UUT Serial Port from the front panel of the calibrator.

Functional Capability

Functional Capability (5520A NORMAL, AUX, and 20A Outputs)

Function	Amplitude	Frequency/Period	Misc.
DC Voltage: Normal Output TC Output	 -1020 V to 1020 V -329.9999 mV to 329.9999 mV		
AC Voltage: Normal Output Sine			
	1 mV to 33 mV	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 80 mVp
	34 mV to 330 mV	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 800 mVp
	0.4 V to 3.3 V	0.01 Hz to 9.99 Hz	Vp + |Voff≤ 8 Vp
	4 V to 33 V	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 50 Vp

Function	Amplitude	Frequency/Period	Misc.
	1 mV to 32.999 mV	10 Hz to 500 kHz	Vp + |Voff ≤ 80 mVp
	33 mV to 329.999 mV	10 Hz to 500 kHz	Vp + |Voff ≤ 800 mVp
	0.33 V to 3.29999 V	10 Hz to 500 kHz	Vp + |Voff ≤ 8 Vp
	3.3 V to 32.9999 V	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
	33 V to 329.999 V	45 Hz to 100 kHz	
	330 V to 1020 V	45 Hz to 10 kHz	
	0.3 V to 3.3 V	1 MHz, 2 MHz	
	-63.80 dBm to -7.29 dBm	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 80 mVp
	-27.28 dBm to -7.40 dBm	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 800 mVp
	-7.3 dBm to 12.7 dBm	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 8 Vp
	13 dBm to 32 dBm	0.01 Hz to 9.99 Hz	+ |Voff ≤ 50 Vp
	-57.78 dBm to -27.41 dBm	10 Hz to 500 kHz	Vp + |Voff ≤ 80 mVp
	-27.41 dBm to -7.41 dBm	10 Hz to 500 kHz	Vp + |Voff ≤ 800 mVp
	-7.41 dBm to 12.58 dBm	10 Hz to 500 kHz	Vp + |Voff ≤ 8 Vp
	12.59 dBm to 32.58 dBm	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
	32.59 dBm to 52.58 dBm	45 Hz to 20 kHz	
	52.59 dBm to 62.39 dBm	45 Hz to 10 kHz	
	-8 dBm to 12.7 dBm	1 MHz, 2 MHz	
Square[1]	3 mVpp to 66 mVpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 80 mVp
	67 mVpp to 660 mVpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 800 mVp
	0.7 Vpp to 6.6 Vpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 8 V
	7 Vpp to 66 Vpp	0.01 Hz to 9.99 Hz	Vp + |Voff ≤ 55 Vp
	2.9 mVpp to 65.999 mVpp	10 Hz to 100 kHz	Vp + |Voff≤80 mVp
	66 mVpp to 659.999 mVpp	10 Hz to 100 kHz	Vp + |Voff ≤ 800 mVp
	0.66 Vpp to 6.59999 Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 8 Vp
	6.6 Vpp to 66 Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
Triangle &	2.9 mVpp to 92.999	10 Hz to 100 kHz	Vp + |Voff ≤ 80 mVp
Truncated Sine	93 mVpp to 929.999 mVpp	10 Hz to 100 kHz	Vp + |Voff ≤ 800 mVp
	0.93 Vpp to 9.29999Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 8 Vp
	9.3 Vpp to 93Vpp	10 Hz to 100 kHz	Vp + |Voff ≤ 55 Vp
DC Current:			
Aux. Output	-2.99999 A to 2.99999 A		
20 A Output	-20.5 A to -3 A, 3 A to 20.5 A		
w/range lock	-20.5 A to 20.5 A		

Function	Amplitude	Frequency/Period	Misc.
AC Current: Aux Output LCOMP OFF Sine			
no toroid	29 uA to 330 mA	0.01 Hz to 9.99 Hz	
	29 uA to 329.999 mA	10 Hz to 30 kHz	
	0.33 A to 2.99999 A	10 Hz to 10 kHz	
10-turn toroid	0.29 mA to 3.29999 A	10 Hz to 30 kHz	
	3.3 A to 29.9999 A	10 Hz to 10 kHz	
30-turn toroid	0.87 mA to 8.9997 A	10 Hz to 30 kHz	
	9.9 A to 65.9997A	10 Hz to 10 kHz	
50-turn toroid	1.45 mA to 16.49995 A	10 Hz to 30 kHz	
	16.5 A to 109.9995 A	10 Hz to 10kHz	
Square	47 uApp to 660 mApp	0.01 Hz to 9.99 Hz	
	47 uApp to 5.99999 mApp	10 Hz to 10 kHz	
Triangle &	47 uApp to 930 mApp	0.01 Hz to 9.99 Hz	
Truncated Sine	47 uApp to 8.49999 mApp	10 Hz to 10 kHz	
20 A Output Sine			
no toroid	3 A to 20.5 A	45 Hz to 5 kHz	
10-turn toroid	30 A to 205 A	45 Hz to 5 kHz	
30-turn toroid	90 A to 615 A	45 Hz to 5 kHz	
50-turn toroid	150 A to 1025 A	45 Hz to 5 kHz	
Square	6 App to 41 App	45 Hz to 1 kHz	
Triangle & Truncated Sine	8.5 App to 57 App	45 Hz to 1 kHz	
LCOMP ON			
Sine	29 uA to 329.999 mA	10 Hz to 1 kHz	
no toroid	0.33 A to 2.99999 A	10 Hz to 440 Hz	
	0.29 mA to 3.29999 A	10 Hz to 1 kHz	
10- turn toroid	3.3 A to 29.9999 A	10 Hz to 440 Hz	
	0.87 mA to 8.9997 A	10 Hz to 1 kHz	
30-turn toroid	9.9 A to 65.9997 A	10 Hz to 440 Hz	
	1.45 mA to 16.49995 A	10 Hz to 1 kHz	
50- turn toroid	16.5 A to 109.9995 A	10 Hz to 440 Hz	
Square	47 uApp to 659.999 mApp	10 Hz to 1 kHz	
	0.66 App to 5.99999 App	10 Hz to 440 Hz	
Triangle & Truncated SIne	47 uA pp to 929.999 mApp	10 Hz to 1 kHz	
	0.93 App to 8.49999 App	10 Hz to 440 Hz	

Function	Amplitude	Frequency/Period	Misc.
20A Output			
Sine			
No toroid	3 A to 20.5 A	45 Hz to 440 Hz	
10-turn toroid	30 A to 205 A	45 Hz to 440 Hz	
30- turn toroid	90 A to 615 A	45 Hz to 440 Hz	
50 turn toroid	150 A to 1025 A	45 Hz to 440 Hz	
Square	6 App to 41 App	45 Hz to 440 Hz	
Triangle & Truncated Sine	8.5 App to 57 App	45 Hz to 440 Hz	
Synthesized Resistance: 4-wire & 2-wire comp.	0 Ω to 109.999 kΩ		
2-wire	110 kΩ to 1100 MΩ		
Synthesized Capacitance			
2-wire	330 pF to 110.00 mF 110 nF to 110.00 mF		
2-wire comp.	110 nF to 110.00 mF		
RTD Calibration			
100Ω Pt 385	-200 °C to 800 °C, -328 °F to 1472 °F		
200Ω Pt 385	-200 °C to 630 °C, -328 °F to 1166 °F		
500Ω Pt 385	-200 °C to 630 °C, -328 °F to 1166 °F		
1 kΩ Pt 385	-200 °C to 630 °C, -328 °F to 1166 °F		
100Ω Pt 3916	-200 °C to 630 °C, -328 °F to 1166 °F		
100Ω Pt 3926	-200 °C to 630 °C, -328 °F to 1166 °F		
120Ω Ni 391	-80 °C to 260 °C, -112 °F to 500 °F		
10Ω Cu	-100 °C to 260 °C, -148 °F to 500 °F		
Thermocouple Calibration & Measurement			
Type B	600 °C to 1820 °C, 32 °F to 3308 °F		
Type C	0 °C to 2316 °C, 32 °F to 4201 °F		
Type E	-250 °C to 1000 °C, -418 °F to 1832 °F		
Type J	-210 °C to 1200 °C, -410 °F to 2192 °F		
Type K	-200 °C to 1372 °C, -328 °F to 2502 °F		
Type L	-200 °C to 900 °C, -328 °F to 2502 °F		
Type N	-200 °C to 1300 °C, -328 °F to 2372 °F		
Type R	0 °C to 1767 °C, 32 °F to 3213 °F		
Type S	0 °C to 1767 °C, 32 °F to 3213 °F		
Type T	-250 °C to 400 °C, -418 °F to 752 °F		
Type U	-200 °C to 600°C, -328 °F to 1103 °F		

Function	Amplitude	Frequency/Period	Misc.
Dual DC Voltage:			
Normal Output	-1020 V to 1020V		
Aux Output	-7 V to 7 V		
Dual AC Voltage:			
Normal Output[4],			
Sine[2]	1 mV to 1020 V	10 Hz to 10 kHz	
Square	2.9 mVpp to 66 Vpp	10 Hz to 10 kHz	
Triangle &	2.9 mVpp to 93 Vpp	10 Hz to 10 kHz	
Truncated Sine			
Aux Output			
Sine[2]	10 mV to 330 mV	0.01 Hz to 9.99 Hz	
	0.4 V to 3.3V	0.01 Hz to 9.99 Hz	
	10 mV to 3.29999 V	10 Hz to 30 kHz	
	3.3 V to 5 V	10 Hz to 10 kHz	
Square	29 mVpp to 6. 59999 Vpp	0.01 Hz to 10 kHz	
Triangle &	29 mVpp to 9.29999 Vpp	0.01 Hz to 10 kHz	
Truncated Sine	9.3 Vpp to 14 Vpp	0.01Hz to 1kHz	
DC Power:			
Normal Output	-1020 V to 1020 V		
Aux Output	-2.99999 A to 2.99999 A		
20A Output	-20.5 A to 20.5 A		
AC Power:			
Normal Output[4]			
Sine[2]	1 mV to 1020 V	[3]	
	-57.78 dBm to 62.39 dBm	[3]	
Square	2.9 mVpp to 65.9999 Vpp	[3]	
Triangle &	2.9 mVpp to 93 Vpp	[3]	
Truncated Sine			
Aux Output: LCOMP OFF Sine			
no toroid	29 µA to 330 mA	0.01 Hz to 9.99 Hz	
Sine	29 µA to 329.999 mA	10 Hz to 30 kHz	
	0.33 A to 2.99999 A	10 Hz to 10 kHz	
10-turn toroid	0.29 mA to 3.29999 A	10 Hz to 30 kHz	
	3.3 A to 29.999 A	10 Hz to 10 kHz	
30-turn toroid	0.87 mA to 8.9997 A	10 Hz to 30 kHz	
	9.9 A to 65.9997 A	10 Hz to 10 kHz	
50-turn toroid	1.45 mA to 16.49995 A	10 Hz to 30 kHz	
	16.5 A to 109.9995 A	10 Hz to 10 kHz	
Square	47 µApp to 660 mApp	0.01Hz to 9.99 Hz	
	47 uApp to 5.99999 App	10 Hz to 10 kHz	
Triangle &	47 µApp to 930 mApp	0.01Hz to 9.99 Hz	
Truncated Sine	47 µApp to 8.49999 App	10 Hz to 10 kHz	

Function	Amplitude	Frequency/Period	Misc.
20 A Ouput: Sine no toroid 10-turn toroid 30-turn toroid 50-turn toroid Square Triangle & Truncated Sine	 3 A to 20.5 A 30 A to 205 A 90 A to 615 A 150 A to 1025 A 6 App to 41 App 8.5 A to 57 App	 45 Hz to 5 kHz 45 Hz to 5 kHz 45 Hz to 5 kHz 45 Hz to 5 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz	
Humidity Meas.			
1. A duty cycle of 1% to 99% may be specified for square waves. The default is 50%. 2. When both waveforms are sine, either the Normal or Aux output may be specified to be a harmonic from 1 to 31. 3. The frequency is the same for the voltage and the current, therefore the limits of the AC Voltage frequency are the same as those specified for the AC Current range selected. 4. The phase between the two output signals may be specified from -180 degrees to +180 degrees.			

Functional Capability (5520A SCOPE Output with Option SC300 Installed)

Function	Amplitude	Frequency	Misc.
DC Voltage: 50 Ω term. 1 MΩ term.	 -2.2 V to 2.2 V -33 V to 33 V		
AC Voltage: Scope Square Wave (zero based) 50 Ω term. 1 MΩ term. ScopeMeter Square Wave 1 MΩ term. Edge 50 Ω term. Leveled Sine 50 Ω term. Time Markers 50 Ω term.	 1.8 mVpp to 2.2 Vpp 1.8 mVpp to 55 Vpp 95 Vpp to 105 Vpp 5 mVpp to 2.5 Vpp in a 1-(2.5)-5 sequence +/- 10% 5 mVpp to 5.5 Vpp	 10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 10 kHz 1 kHz to 1 MHz 50 kHz to 350 MHz	Period 1.8 ns to 2.2 ns 4.5 ns to 11 ns 18 ns to 22 ns 45 ns to 110 ns 180 ns to 1.1 µs 1.8 µs to 60 µs 90 µs to 12 ms 18 ms to 5.5 s

Functional Capability (5520A SCOPE Output with Option SC300 Installed)(cont)

Function	Amplitude	Frequency	Misc.
Wavegen Sine, Square, and Triangle Waveforms (zero centered)			
50 Ω term.	1.8 mVpp to 10.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=12.5 mVp
	11 mVpp to 44.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=50.5 mVp
	45 mVpp to 109 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=125 mVp
	110 mVpp to 449 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=225 mVp
	0.45 Vpp to 1.09 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=1.25 Vp
	1.1 Vpp to 2.2 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=3.1 Vp
1 MΩ term.	1.8 mVpp to 21.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=26 mVp
	22 mVpp to 89.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=100 mVp
	90 mVpp to 219 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=260 mVp
	220 mVpp to 899 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=1000 mVp
	0.9 Vpp to 6.59 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=6.6 Vp
	6.6 Vpp to 55 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=50 Vp

Functional Capability (5520 SCOPE Output with Option SC600 Installed)

Function	Amplitude	Frequency	Misc.
DC Voltage:			
50 Ω term.	-6.599 V to 6.599 V		
1 MΩ term.	-130 V to 130 V		
AC Voltage: Scope Square Wave (zero based positive and negative)			
50 Ω term.	1.0 mVpp to 6.599 Vpp	10 Hz to 10 kHz	
1 MΩ term.	1.0 mVpp to 130 Vpp	10 Hz to 10 kHz	
Edge			
50 Ω term.	5 mVpp to 2.5 Vpp in a 1-(2.5)-5 sequence +/- 10%	900 Hz to 11 MHz	
w/ Tunnel Diode Pulser Drive Signal	11 Vpp to 2.5 Vpp	900 Hz to 11 MHz	
Leveled Sine			
50 Ω term.	5 mVpp to 5.5 Vpp	50 kHz to 600 MHz	
Time Markers			
50 Ω term			Period
Spike			18 ns to 5.5 s
Square			7.5 ns to 5.5 s
20 % Duty			75 ns to 34.99 ms
Square			1.8 ns to 17.9 ns
Sine			
Wavegen Sine, Square, and Triangle Waveforms (zero centered)			Max AC + DC Offset
50 Ω term	1.8 mVpp to 10.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=12.5 mVp
	11 mVpp to 44.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=50.5 mVp
	45 mVpp to 109 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=125 mVp
	110 mVpp to 449 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=225 mVp
	0.45 Vpp to 1.09 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=1.25 Vp
	1.1 Vpp to 2.2 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=3.1 Vp
1 MΩ term	1.8 mVpp to 21.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=26 mVp
	22 mVpp to 89.9 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=100 mVp
	90 mVpp to 219 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=260 mVp
	220 mVpp to 899 mVpp	10 Hz to 100 kHz	Vp + |Voff|<=1000 mVp
	0.9 Vpp to 6.59 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=6.6 Vp
	6.6 Vpp to 55 Vpp	10 Hz to 100 kHz	Vp + |Voff|<=50 Vp
		Video	

Functional Capability (5520 SCOPE Output with Option SC600 Installed)(cont)

Function	Amplitude	Frequency	Misc.
Video			Line Marker
NTSC	-150% to 150% -1.5 Vp to 1.5 Vp -140 IRE to 140 IRE		1 to 262 Odd or Even 1 to 262 Odd or Even 1 to 262 Odd or Even
PAL	-150% to 150% -1.5 Vp to 1.5 Vp		1 to 622 1 to 622
PAL-M	-150% to 150% -1.5 Vp to 1.5 Vp -140 IRE to 140 IRE		1 to 262 Odd or Even 1 to 262 Odd or Even 1 to 262 Odd or Even
SECAM	-150% to 150% -1.5 Vp to 1.5 Vp		1 to 262 1 to 262
Pulse		Period	Pulse Width
50 Ω term	10 mVpp, 25 mVpp, 100 mVpp, 250 mVpp, 1 Vpp, and 2.5 Vpp	200 ns to 22 ms	2 ns to 500 ns
UUT Input Impedance Measurement (MEAS Z):			
50 Ω			40 Ω to 60 Ω
1 MΩ			500 kΩ to 1.5 MΩ
Capacitance			5 pF to 50 pF
UUT 50 Ω Input Impedance Overload Protection Measurement (OVERLD)			
DC	5 V to 9 V		
AC	5 V to 9 V	1 kHz	

Parameters

The following table describes the basic operating modes of the 5520A Calibrator in terms of the FSC fields listed. Only the combinations of field quantities listed below are allowed. These mode names are also used in other places in this section to clarify the rules for each parameter of the 5520FSC.

5520 Operating Modes

5520 Mode	5520 Nominal	5520 MOD1	5520 MOD3[1]	M5520 Range	M5520 Nominal	M5520 MOD1
DC Voltage	voltage		**[TC|SC|S6]**	**[RNGLK**	voltage]	
AC Voltage	voltage	freq|period	**[SC|S6]**			[DC offset]
AC Voltage	freq|period	voltage				[DC offset]
AC Voltage (pulse)	p-width period[2]	Voltage voltage	**S6** **S6**	**Per** **Pulse**	period p-width[2]	
AC Voltage	duty cycle	freq|period			voltage	[DC offset]
AC Voltage (time marks)	freq|period		**SC|S6**			
DC Current	current			**[RNGLK**	current]	
AC Current	current	freq|period				
AC Current	freq|period	current				
Resistance	resistance					
Resistance	conductance					
Capacitance	capacitance					
RTD Cal	temperature					
TC Cal	temperature		**TC**	**[TCREF**	temp.]	
TC Meas	temperature		**TM|TN**	**[TCREF**	temp.]	
Dual DC Voltage	voltage		**[AX]**		voltage	
Dual AC Voltage	voltage	freq|period	**[BV|AX]**	[**H**_n_|**H**X_n_]	voltage	
Dual AC voltage	freq|period	voltage	**[BV]**	[**H**X_n_]	voltage	
Dual AC voltage	freq|period	voltage	**AX**	[**H**_n_]	voltage	
Dual AC Voltage	phase	freq|period	**[BV|AX]**	[**H**_n_|**H**X_n_]	voltage	voltage
DC Power	power		**[BC|BP]**		voltage	

5520 Operating Modes (cont)

5520 Mode	5520 Nominal	5520 MOD1	5520 MOD3[1]	M5520 Range	M5520 Nominal	M5520 MOD1
DC Power	voltage				current	
DC Power	current		**[BC|BP]**		voltage	
AC Power	power	freq|period	**[BC|BP]**	[**H***n*|**H**X*n*| **LEAD|LAG]**	voltage	
AC Power	power	freq|period	**[BV]**	[**H***n*|**H**X*n*| **LEAD|LAG]**	current	
AC Power	current	freq|period	**[BC|BP]**	[**H***n*|**H**X*n*| **LEAD|LAG**]	voltage	
AC Power	voltage	freq|period	**[BV]**	[**H***n*|**H**X*n*| **LEAD|LAG]**	current	
AC Power	freq|period	current	**[BC|BP]**	[**H***n*| **LEAD|LAG]**	voltage	
AC Power	freq|period	voltage	**[BV]**	[**H**x*n*| **LEAD|LAG]**	current	
AC Power	phase	freq|period	**[BC|BP]**	[**H***n*|**H**X*n*| **LEAD|LAG]**	voltage	current
AC Power	phase	freq|period	**[BV]**	[**H***n*|**H**X*n*| **LEAD|LAG]**	current	voltage
Video	Percent| Voltage|IRE	line marker	**S6**	ODD|EVEN		
Impedance Meas.	resistance| capacitance		**ZM**			
Overload Meas.	voltage	[freq]	**OM**	Limit	time	

5520 Operating Modes (cont)

5520 Mode	5520 Nominal	5520 MOD1	5520 MOD3[1]	M5520 Range	M5520 Nominal	M5520 MOD1
Humidity Meas	percent		**HM**			
Impedance Meas	Resistance | Capacitance		**ZM**			
Overload Meas	voltage	[freq]	**OM**	LIMIT	time	
Dual DC Voltage	voltage		**[AX]**		voltage	
Dual AC Voltage	voltage	freq|period	**[AX]**	[**H***n*|**H**X*n*]	voltage	
Dual AC voltage	freq|period	voltage		[**H**X*n*]	voltage	
Dual AC voltage	freq|period	voltage	**AX**	[**H***n*]	voltage	
Dual AC Voltage	phase	freq|period	**[AX]**	[**H***n*|**H**X*n*]	voltage	voltage
DC Power	power				voltage	
DC Power	power				current	
DC Power	voltage				current	
DC Power	current				voltage	
AC Power	power	freq|period		[**H***n*|**H**X*n*| **LEAD|LAG]**	voltage	
AC Power	power	freq|period		[**H***n*|**H**X*n*| **LEAD|LAG]**	current	
AC Power	current	freq|period		[**H***n*|**H**X*n*| **LEAD|LAG**]	voltage	
AC Power	voltage	freq|period		[**H***n*|**H**X*n*| **LEAD|LAG]**	current	

5520 Operating Modes (cont)

5520 Mode	5520 Nominal	5520 MOD1	5520 MOD3[1]	M5520 Range	M5520 Nominal	M5520 MOD1
AC Power	freq|period	current		[**H***n*| **LEAD|LAG]**	voltage	
AC Power	freq|period	voltage		[**H**x*n*| **LEAD|LAG]**	current	
AC Power	phase	freq|period		[**H***n*|**H**X*n*| **LEAD|LAG]**	voltage	current
AC Power	phase	freq|period		[**H***n*|**H**X*n*| **LEAD|LAG]**	current	voltage
Video	Percent| Voltage|IRE	line marker	**S6**	ODD|EVEN		

1. See MOD3 parameter for description of these specification codes and rules.
2. Period and pulse width (p-width) may be entered as a frequency in Hertz.

Note
Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

Units Symbols

Units	Symbol Name	Quantity
A	Amps	current
Ap	Amps peak	current
App	Amps peak to peak	current
D	dBm	decibels
F	Farads	capacitance
H	Hertz	frequency
IRE	IRE	video amplitude
LM	Line Marker	video line marker position
T	Time	period or pulse width
V	Volts	voltage or video amplitude
Vp	Volts peak	voltage
Vpp	Volts peak to peak	voltage
W	Watts	power
Y	Siemens	conductance
Z	Ohms	resistance
deg	degrees	phase
degC	degrees Celsius	temperature
degF	degrees Fahrenheit	temperature
pct	percent	duty cycle, video amplitude, or humidity

5520 FSC NOMINAL, MOD1, MOD2, and MOD3 Rules

5520A Mode	5520 Nominal	5520 MOD1	5520 MOD2 [1]	5520 MOD3 [2]
DC Voltage	V			[TC]
AC Voltage	V/Vpp/D V/Vpp Vp Vp H/T H/T pct	H/T H/T H/T H/T V/Vpp/D V/Vpp H/T	SI SQ/TI/TS SI SQ/TI/TS SI SQ/TI/TS SI/SQ/TI/TS	
DC Current	A			
AC Current	A/App A/App Ap H/T	H/T H/T H/T A/App	SI SI/SQ/TI/TS SI/SQ/TI/TS SI/SQ/TI/TS	
Resistance	Z/Y			
Capacitance	F			
RTD Cal	degC/degF		R1/R2/R3/R4/R5/R6/R7/R8	
TC Cal	degC/degF		_B/_C/_E/_J/_K/_L/_N/_R/_S/_T/_U	TC
TC Meas	degC/degF		_B/_C/_E/_J/_K/_L/_N/_R/_S/_T/_U	TM/TN
Humidity Meas	pct		PB	HM
Dual DC Voltage	V			[AX]
Dual AC Voltage	V/Vp/Vpp/D V/Vp/Vpp H/T H/T	H/T H/T V/Vpp/D V/Vpp	SI SQ/TI/TS SI SQ/TI/TS	[AX] [AX] [AX] [AX]
DC Power	W/A/V			

5520 FSC Nominal, MOD1, MOD2, and MOD3 Rules (cont)

5520A Mode	5520 Nominal	5520 MOD1	5520 MOD2 [1]	5520 MOD3 [2]
AC Power	W V/Vp/Vpp/D V/Vp/Vpp A/Ap/App H/T H/T H/T	H/T H/T H/T H/T V/Vpp/D V/Vpp A/App	SI SI SQ/TI/TS SI/SQ/TI/TS SI SQ/TI/TS SI/SQ/TI/TS	
1. See MOD2 parameter for description of these specification codes and rules. 2. See MOD3 parameter for description of these specification codes and rules.				

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

5520 FSC Nominal, MOD1, MOD2, and MOD3 Rules for SC300

5520A Mode	5520 Nominal	5520 MOD1	5520 MOD2[1]	5520 MOD3[2]
DC Voltage (VOLT)	V			SC
AC Voltage (VOLT)	V/Vp/Vpp H/T	H/T V/Vpp	ZQ/SM ZQ/SM	SC SC
AC Voltage (Edge)	V/Vp/Vpp	H/T	ED	SC
AC Voltage (LEVSINE)	V/Vp/Vpp H/T	H/T V/Vp/Vpp	LS LS	SC SC
AC Voltage (MARKER)	H/T		MK	SC
AC Voltage (WAVEGEN)	V/VP/Vpp H/T	H/T V/VP/Vpp	SI/SQ/TI SI/SQ/TI	SC
1. See MOD2 parameter for description of these specification codes and rules. 2. See MOD3 parameter for description of these specification codes and rules.				

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

5520 FSC Nominal, MOD1, MOD2, and MOD3 Rules for SC600

5520A Mode	5520 Nominal	5520 MOD1	5500 MOD2 [1]	5500 MOD3 [2]
DC Voltage (VOLT)	V			S6
AC Voltage (VOLT)	V/Vp/Vpp H/T	H/T V/Vpp	ZQ/SN ZQ/SN	S6 S6
AC Voltage (EDGE)	V/Vp/Vpp H/T	H/T V/Vpp	ED ED	S6
AC Voltage (LEVSINE)	V/Vp/Vpp H/T	H/T V/Vpp	LS LS	S6 S6
AC Voltage (MARKER)	H/T		M1/M2/M3/M4	S6
AC Voltage (WAVEGEN)	V/VP/VPP H/T	H/T V/VP/VPP	SI/SQ/TI SI/SQ/TI	S6
AC Voltage (PULSE)	H/T	Vpp	PU	S6
Video (VIDEO)	pct/Vp/IRE pct/Vp	LM LM	F1/F3 F2/F4	S6 S6
Impedance Meas (MEAS Z)	Z F			ZM ZM
Overload Meas (OVERLD)	V Vpp	 H		OM OM
1. See MOD2 parameter for description of these specification codes and rules. 2. See MOD3 parameter for description of these specification codes and rules				

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the starting Nominal value of the stimulus output or expected UUT reading for the test entered as:

[*numeric*][*prefix*]*units symbol*

or "*" to specify a reset.

Rules:

- The NOMINAL field may not specify frequency or period when any of the following sets of conditions exist:
  1. Dual AC Voltage is specified and either
     a. the M5520 RANGE field specifies H and the M5520 MOD3 field specifies AX

        or

     b. the M5520 RANGE field specifies HX and the 5520 MOD3 field specifies AX.
  2. AC Power is specified and either
     a. the M5520 RANGE field specifies H and the M5520 NOMINAL field specifies current

        or

     b. the M5520 RANGE field specifies HX and the M5520 NOMINAL field specifies voltage.
  3. The MOD3 field specifies E.
- When the NOMINAL field specifies frequency or period and the M5520 RANGE field specifies a harmonic (H or HX), the Keyboard Entry (ASK+ K) or Go/No-Go (ASK+ G) evaluation mode must be specified, Slew is not allowed.

  A duty cycle other than 50% may only be specified for square waveforms (MOD2 is SQ). Therefore keyboard entry and go-nogo evaluations may be performed at 50% duty cycle for non-square waveforms, but slew mode is not allowed. In addition the duty cycle is restricted to 50%, regardless of the type of waveform, when the DC offset is not zero.

- When the NOMINAL field specifies power and the value is slewed, if the M5520 NOMINAL field specifies voltage, the voltage is held constant and a new value of current is computed by the 5520A.

  If the M5520 NOMINAL field specifies current, the current is held constant and a new value of voltage is computed by the 5520A.
- When the NOMINAL field contains only units, the value is obtained from the memory register MEM.
- When the NOMINAL field contains only units and the MOD1 field is not blank, the MOD1 field must specify a value.

TOLERANCE

This field specifies the UUT tolerance as described In "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the frequency, period, voltage, or current for AC Voltage, AC Current, Dual AC Voltage, or AC Power modes entered as:

[*numeric*][*prefix*]*units symbol*

Rules:

- When the MOD1 field contains only units, the value is obtained from memory register MEM. In this case the NOMINAL field MUST contain a value.

MOD2

This field specifies one of the following:

1. The waveform type for the voltage or current specified in the NOMINAL or MOD1 field for AC Voltage or AC Current.
2. The waveform type for the voltage or current not specified in the M5520 NOMINAL field for AC Power or Dual AC Voltage.
3. The thermocouple or RTD type for TC Measurement, TC Calibration, or RTD Calibration.

blank	DC or not applicable
SI	Sine wave (5520A, SC300 and SC600 Wavegen)
SQ	Square wave (5520A, SC300 and SC600 Wavegen)
TI	Triangle wave (5520A, SC300 and SC600 Wavegen)
TS	Truncated sine wave
PB	Temperature/Humidity Probe
_B	Type B thermocouple
_C	Type C thermocouple
_E	Type E thermocouple
_J	Type J thermocouple
K	Type K thermocouple
_L	Type L thermocouple
_N	Type N thermocouple
_R	Type R thermocouple
_S	Type S thermocouple
_T	Type T thermocouple
_U	Type U thermocouple
R1	100 Ohm Pt 385 RTD
R2	100 Ohm Pt 3926 RTD
R3	120 Ohm Ni RTD
R4	200 Ohm Pt 385 RTD
R5	500 Ohm Pt 385 RTD
R6	1 kOhm Pt 385 RTD
R7	100 Ohm Pt 3916 RTD
R8	10 Ohm Cu RTD
ZQ	Positive square wave (SC300 and SC600 AC Voltage)
ZN	Negative square wave (SC600 AC Voltage)
SM	ScopeMeter wave (SC300 AC Voltage)
ED	Edge signal (SC300 and SC600)
LS	Leveled sine wave (SC300 and SC600)
MK	Marker signal (SC300)
M1	Spike Marker signal (SC600)
M2	Square Marker signal (SC600)
M3	20% Duty Cycle Square Marker signal (SC600)
M4	Sinusoid Marker signal (SC600)
PU	Pulse wave (SC600)
F1	NTSC video signal (SC600)
F2	PAL video signal (SC600)
F3	PAL-M video signal (SC600)
F4	SECAM video signal (SC600)

Rules:

- SI is inserted automatically in the MOD2 field for AC Voltage, AC Current, Dual AC Voltage, or AC Power (i.e. the MOD1 field is not blank) if no MOD2 code is entered.
- _K is inserted automatically in the MOD2 field for TC Measurement or TC Calibration if no MOD2 code is entered.

R1 is inserted automatically in the MOD2 field for RTD Calibration if no MOD2 code is entered.

- The M5520 RANGE and NOMINAL field must specify the pulse wave period or frequency when the MOD2 field specifies PU and the NOMINAL field specifies the pulse width.
- The M5520 RANGE and NOMINAL field must specify the pulse width when the MOD2 field specifies PU and the NOMINAL field specifies the pulse wave period or frequency.
- The M5520 RANGE field must specify ODD or EVEN frame when the MOD2 field specifies F1 (NTSC video) or F3 (PAL-M video).

MOD3

This field specifies the calibrator output mode:

- *blank* Default for mode specified
- AX Auxiliary Voltage
- TC Thermocouple Cal
- TM Thermocouple Measurement (open to TC detection on)
- TN Thermocouple Measurement (open to TC detection off)
- HM Humidity Measurement
- SC SC300 Scope Option
- S6 SC600 Scope Option
- ZM SC600 UUT Input Impedance Measurement
- OM SC600 UUT 50 Input Overload Protection Measurement

Rules:

- The MOD3 field must specify AX when Dual DC Voltage or Dual AC Voltage is specified and the M5520 MOD3 field does not specify AX.

- The MOD3 field may specify SC only when the SC300 Scope option is configured.
- The MOD3 field may specify S6 only when the SC600 Scope option is configured.
- SC is inserted automatically in the MOD3 field when the MOD2 field specifies ZQ, SM, ED, LS, or MK, and the SC300 Scope Option is configured, and no MOD3 code is entered.
- S6 is inserted automatically in the MOD3 field when the MOD2 field specifies ZQ, ZN, ED, LS, PU, M1, M2, M3, M4, F1, F2, F3, or F4, and the SC600 Scope Option is configured, and no MOD3 code is entered.
- The M5520 RANGE and NOMINAL fields must specify the time limit when the MOD3 field specifies OM.

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

Additional Rules:

- The MOD4 field must specify N (Nominal Setup Test) when the MOD3 field specifies OM (Overload Measurement).
- N is inserted automatically in the MOD4 field when the MOD3 field specifies OM and no MOD3 code is entered.

CON

The CONnection field specifies the UUT connection.

- 2W 2-wire
- L2W 2-wire w/load compensation enabled
- 3W 3-wire
- 4W 4-wire
- CW 2-wire ohms compensated at the UUT terminals
- DV 2-wire using the external AC Divider
- TD Tunnel Diode Pulser Drive signal enabled
- T1 10-turn Toroid Coil
- LT1 10-turn Toroid Coil w/load compensation enabled

- T3 30-turn Toroid Coil
- LT3 30-turn Toroid Coil w/load compensation enabled
- T5 50-turn Toroid Coil
- LT5 50-turn Toroid Coil w/load compensation enabled
- L 50 Ohm Termination
- *blank* 1 MOhm Termination

Rules:

- 2W is inserted automatically in the CON field when the MOD3 field does not specify SC or S6 and no CON field code is entered.
- The CON field may specify 3W only when the RTD Cal mode is specified.
- The CON field may specify CW only when RTD Cal, Resistance, or Capacitance mode is specified.
- The CON field may specify 4W only when RTD Cal, Resistance, or Capacitance mode is specified.
- The CON field may specify DV only when AC Voltage mode is specified, the MOD2 field specifies SI, the MOD3 field does not specify E and the NOMINAL or MOD1 field specifies a voltage of 22 mV or less.
- The CON field may specify T1, T3, or T5 only when the MOD3 field does not specify E and DC Current or DC Power mode is specified or AC Current mode is specified and the MOD2 field specifies SI or AC Power mode is specified and either

  1. the M5520 NOMINAL field specifies voltage and the 5520 MOD2 field specifies SI

     or

  2. the M5520 NOMINAL field specifies current and the M5520 MOD2 field specifies SI.
- The CON field may specify L2W, LT1, LT3, or LT5 only when the mode is AC Current or AC Power.
- The CON field may specify L only when the MOD3 field specifies SC or S6 and the MOD2 field does not specify SM.
- The CON field must specify L when the MOD2 field specifies LS, ED, or MK, and the MOD3 field specifies SC.
- The CON field must specify L when the MOD2 field specifies LS, ED, or M1, M2, M3, M4, F1, F2, F3, or F4, and the MOD3 field specifies S6.

- L is inserted automatically in the CON field when the MOD2 field specifies LS, ED, or MK, the MOD3 field specifies SC and no CON field code is entered.
- L is inserted automatically in the CON field when the MOD2 field specifies LS, ED, or M1, M2, M3, M4, F1, F2, F3, or F4, the MOD3 field specifies S6 and no CON field code is entered.
- CON field must specify 2W when the MOD3 field specifies ZM, HM, or OM.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs".

Examples

```
STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- Reset -----
  1.001  M5520        *
  1.002  5520         *                                                 S
# ----- DC Voltage -----
  1.003  5520   20    19.99mV        2% 0.04U                              2W
# ----- DC Voltage w/Range Lock -----
  2.001  M5520  RNGLK 3V
  2.002  5520   400   350.0mV        1.9% 0.4U                             2W
  3.001  M5520        *
# ----- DC Voltage, TC Terminals -----
  3.002  5520         35mV                                           TC S  2W
# ----- AC Voltage -----
  3.003  5520   400   350.0mV        -2.8U +2.9U   60H            SI       2W
# ----- AC Voltage w/External AC Divider -----
  4.001  5520         -37.78D        0.1U          100H           SI       DV
# ----- AC Voltage (Frequency Test) -----
  5.001  5520   1000  800.0H         0.1% 0.1U     300mV          SI       2W
# ----- Square Wave w/DC Offset -----
  6.001  M5520                                     0.5Voff
  6.002  5520         1Vpp                         1kH            SQ    S  2W
# ----- Square Wave w/Duty Cycle Specified -----
  6.003  M5520                       35pct
  6.004  5520         1Vpp                         1kH            SQ    S  2W
# ----- Square Wave (Duty Cycle Test) ------
  6.005  M5520        1Vpp
  6.006  5520         30pct          2U            500H           SQ       2W
  7.001  M5520        *
# ----- Triangle Wave -----
```

```
 7.002  5520         13mVpp                       10kH          TI    S  2W
# ----- Truncated Sine Wave -----
  7.003  5520         2.5mApp                      5kH           TS    S  2W
# ----- DC Current -----
  7.004  5520   1     1.00A          1%                                    2W
  8.001  5520   20    19.00A         0.07U                            HC   2W
# ----- Dual DC Voltage -----
  9.001  M5520        10mV
  9.002  5520         100mV          3%                               AX   2W
# ----- Dual AC Voltage -----
 10.001  M5520        1V                                         SI AX
 10.002  5520         141Vp                        10kH          SI    S  2W
# ----- Dual AC Voltage (Phase Test) ------
 10.003  M5520        1Vpp                         1Vpp          SQ AX
 10.004  5520         30deg          1U            60H           SQ       2W
# ----- Dual AC Voltage (Harmonics) ------
 11.001  M5520  H2    100V                                       SI
 11.002  5520         750mV          1U            60H           SI AX    2W
 12.001  M5520  HX3   1Vpp                                       SI AX
 12.002  5520         1Vpp           1U            60H           SI       2W
 13.001  M5520        *
# ----- DC Power (Volts and Amps) -----
 13.002  M5520        1mV                                              O  EL
 13.003  5520         1mA            1%                                   2W
# ----- AC Power (Volts and Amps) -----
 14.001  M5520        1mA            60deg                       SI
 14.002  5520         1V                           400H          SI    S  2W
# ----- AC Power (Watts and Volts) w/Displacement Power Factor -----
 14.003  M5520  LEAD  1V             0.998                       SI
 14.004  5520   20    19mW           1%            60H           SI       2W
# ----- AC Power (Watts and Vpp) w/Phase Specified -----
 15.001  M5520        1Vpp           -45deg                      SI
 15.002  5520   20    1mW            1U            400H          SI       2W
# ----- AC Power (Harmonics) ------
 16.001  M5520  H2    45V                                        SI
 16.002  5520         100W           1U            60H           SI       2W
 17.001  M5520  HX3   1mApp                                      SI
 17.002  5520         1Vpp           1U            60H           SI       2W
 18.001  M5520        *
# ----- Resistance -----
 18.002  5520   400   390.0Z         0.4% 0.1U                            CW
 19.001  5520   4     3.900MZ        0.05U                                2W
# ----- Capacitance ----
 20.001  5520   10    1.100uF        2% 0.002U                            2W
# ----- Humidity Measurement -----
 21.001  5520         50.0pct                                    PB HM N  2W
# ----- Temperature Measurement -----
 21.002  5520         1200.0degF                                 _J TM N  2W
```

```
# ----- Temperature Stimulus -----
 21.003  M5520  TCREF 0degC
 21.004  5520          50degC         1%                            _K TC    2W
 22.001  M5520         *
 22.002  5520          45degC                                       R1    S  3W

SC300 Scope Option

 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- DC Voltage -----
  1.001  5520   20     19.99mV        4%                               SC
# ----- AC Voltage (Scope Square Wave) -----
  2.001  5520   400    350.0mV        50U           60H            ZQ SC
# ----- AC Voltage (ScopeMeter Wave) -----
  3.001  5520          100Vpp                       1kH            SM SC S
# ----- AC Voltage (Frequency Test) -----
  3.002  5520   1000   800.0H         0.1% 0.1U     300mV          ZQ SC
# ----- Edge Signal (Scope Output) -----
  4.001  5520          0.5Vpp                       1MH            ED SC S  L
# ----- Leveled Sine Wave -----
  4.002  5520          200mVpp                      50kH           LS SC S  L
# ----- Marker Signal -----
  4.003  M5520                                                             2T
  4.004  5520          1uT                                         MK SC S  L
# ----- Wavegen -----
  4.005  5520          5V                           1kH            SI SC S
# ----- Wavegen w/DC Offset -----
  4.006  M5520                                     0.5Voff
  4.007  5520          1Vpp                         1kH            TI SC S
# ----- Wavegen w/Duty Cycle Specified -----
  4.008  M5520                        35pct
  4.009  5520          1Vpp                         1kH            SQ SC S
  4.010  M5520         *

SC600 Scope Option

 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- DC Voltage -----
  1.001  5520   20     19.99mV        4%                               S6
# ----- AC Voltage (Positive Scope Square Wave) -----
  2.001  5520   400    350.0mV        50U           60H            ZQ S6
```

```
# ----- AC Voltage (Positive Scope Square Wave) -----
  3.001  5520         100Vpp                        1kH            ZN S6 S
# ----- AC Voltage (Frequency Test) -----
  3.002  5520   1000  800.0H         0.1% 0.1U      300mV          ZQ S6
# ----- Edge Signal (Scope Output) -----
  4.001  5520         0.5Vpp                        1MH            ED S6 S  L
# ----- Leveled Sine Wave -----
  4.002  5520         200mVpp                       50kH           LS S6 S  L
# ----- Spike Marker Signal -----
  4.003  M5520                                                              2T
  4.004  5520         1uT                                          M1 S6 S  L
  4.005  M5520        *
# ----- Square Marker Signal -----
  4.006  5520         1mT                                          M2 S6 S  L
# ----- 20% Duty Cycle Square Marker Signal -----
  4.007  5520         5uT                                          M3 S6 S  L
# ----- Sinusoid Marker Signal -----
  4.008  5520         2nT                                          M4 S6 S  L
# ----- Wavegen -----
  4.009  5520         5V                            1kH            SI S6 S
# ----- Wavegen w/DC Offset -----
  4.010  M5520                                      0.5Voff
  4.011  5520         1Vpp                          1kH            TI S6 S
# ----- NTSC Video -----
  4.012  M5520  ODD
  4.013  5520         1Vp                           262LM          F1 S6 S  L
  4.014  M5520        *
# ----- PAL Video -----
  4.015  5520         50pct                         400LM          F2 S6 S  L
# ----- PAL-M Video -----
  4.016  M5520  EVEN
  4.017  5520         -140IRE                       1LM            F3 S6 S  L
  4.018  M5520        *
# ----- SECAM Video -----
  4.019  5520         -100pct                       622LM          F4 S6 S  L
# ----- Pulse Wave (Slew Pulse Width) -----
  4.020  M5520  PER   200nT
  4.021  5520         5.0nT                         2.5Vpp         PU S6 N  L
# ----- Pulse Wave (Slew Pulse Repetition Frequency) -----
  4.022  M5520  PULSE 10nT
  4.023  5520         1.00kH                        2.5Vpp         PU S6 N  L
  4.024  M5520        *
# ----- Impedance Measurement (50 Ohm) -----
  4.025  5520         50Z            1U                               ZM    2W
# ----- Impedance Measurement (1 MOhm) -----
  5.001  5520         1.000MZ        1U                               ZM    2W
# ----- Impedance Measurement (Capacitance) -----
  6.001  5520         10pF                                            ZM N  2W
```

```
# ----- 50 Ohm Input Impedance Overload -----
  6.002  M5520  LIMIT 10T
  6.003  5520         5V                                                OM N  2W
  6.004  EVAL   -e MEM == 0 : 50 Ohm overload protection trip not expected
  7.001  M5520  LIMIT 10T
  7.002  5520         7V                                                OM N  2W
  7.003  EVAL   -e MEM : 50 Ohm overload protection trip expected
```

8648

Instrument FSC

Description

The 8648 FSC programs amplitude and frequency of the Hewlett-Packard 8648A/B/C/D Signal Generators.

Functional Capability

Model	Frequency	Std	Amplitude [1] Opt 1EA	Opt 1EA & 1E6
8648A	100 kHz to 1000 MHz	+10 dBm	NA	NA
8648B	9 kHz to < 100 kHz	+13 dBm	+17 dBm	+13 dBm
	>= 100 kHz to < 100 MHz	+13 dBm	+20 dBm	+13 dBm
	>= 100 MHz to <= 1000 MHz	+13 dBm	+20 dBm	+18 dBm
	> 1000 MHz to <= 1500 MHz	+13 dBm	+19 dBm	+17 dBm
	> 1500 MHz to 2000 MHz	+13 dBm	+17 dBm	+15 dBm
8648C	9 kHz to < 100 kHz	+13 dBm	+17 dBm	+13 dBm
	>= 100 kHz to < 100 MHz	+13 dBm	+20 dBm	+13 dBm
	>= 100 MHz to <= 1000 MHz	+13 dBm	+20 dBm	+18 dBm
	> 1000 MHz to <= 1500 MHz	+13 dBm	+19 dBm	+17 dBm
	> 1500 MHz to <= 2100 MHz	+13 dBm	+17 dBm	+15 dBm
	> 2100 MHz to <= 2500 MHz	+13 dBm	+15 dBm	+13 dBm
	> 2500 MHz to <= 3200 MHz	+10 dBm	+13 dBm	+11 dBm
8648D	9 kHz to < 100 kHz	+13 dBm	+17 dBm	+13 dBm
	>= 100 kHz to < 100 MHz	+13 dBm	+20 dBm	+13 dBm
	>= 100 MHz to <= 1000 MHz	+13 dBm	+20 dBm	+18 dBm
	> 1000 MHz to <= 1500 MHz	+13 dBm	+19 dBm	+17 dBm
	> 1500 MHz to <= 2100 MHz	+13 dBm	+17 dBm	+15 dBm
	> 2100 MHz to <= 2500 MHz	+13 dBm	+15 dBm	+13 dBm
	> 2500 MHz to <= 4000 MHz	+10 dBm	+13 dBm	+11 dBm

1. Minimum amplitude is -136dBm for all models and all option configurations.
2. Option 1EA - High power (HP 8648B/C/D only)
3. Option 1E6 - Pulse modulation (HP 8648B/C/D only)

Parameters

RANGE

This field specifies the UUT range as described in the section "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the amplitude, frequency, period, or reset.

- Amplitude entered as: [*numeric*][*prefix*]D, V, or Vpp.
- Frequency entered as [*numeric*][*prefix*]H.
- Period entered as [*numeric*][*prefix*]T.
- Reset entered as *.

Rules:

- When the NOMINAL field specifies the amplitude, the MOD1 field must specify the frequency or period.
- When the NOMINAL field specifies the frequency or period, the MOD1 field must specify the amplitude.

TOLERANCE

This field specifies the UUT tolerance as described in the section "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the amplitude, frequency, or period.

- Frequency entered as [*numeric*][*prefix*] H.
- Period entered as [*numeric*][*prefix*] T.
- Amplitude entered as: [*numeric*][*prefix*] D, V, or Vpp.

Rules:

- When the MOD1 field specifies the frequency or period, the NOMINAL field must specify the amplitude.
- When the MOD1 field specifies the amplitude, the NOMINAL field must specify the frequency or period.

MOD2

This field specifies whether "/div" is include in after the value in the automatic range message.

- -D "/div" is not included
- *blank* "/div" is included if ASK+ D is in effect

Rules:

- The MOD2 field is automatically set to -D for a Setup Test.

MOD3

This field is not used.

MOD4

This field specifies the type of test being performed as described in the section "General Rules for Instrument Evaluation FSCs".

CON

This field is specifies which output port is used for the signal.

- CH1 Fluke 58xxA Channel 1
- CH2 Fluke 58xxA Channel 2
- CH3 Fluke 58xxA Channel 3
- CH4 Fluke 58xxA Channel 4
- CH5 Fluke 58xxA Channel 5
- *blank* 8648A/B/C/D RF Output

Rules:

- The CON field may specify CH1 or CH5 only when a Fluke 5800A or 5820Aor 5820A is configured.
- The CON field may specify CH2, CH3, or CH4 only when a Fluke 5800A is configured with the 5800A-5 Five Channel option.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "Syntax Rules for Instrument Evaluation FSCs" in Chapter 1 of this manual.

Examples

```
 STEP    FSC     RANGE NOMINAL        TOLERANCE     MOD1         MOD2   3   4 CON
# ----- Reset -----
  1.002  8648          *                                                    S
  1.003  8648    A     -42.95D        1U            100MH
  2.001  8648          100mV                        550MH           -D      S
  2.002  8648    0.5   28mV           5U            100MH
  3.001  8648    A     D              1U            100MH
  4.001  8648          V              1%            100MH
  5.001  8648    50    10uT           1% 1/ 1U      -35D
  6.001  8648    200   100nT          1% 1/ 1U      100mV
# ----- Oscilloscope bandwidth test -----
  7.001  ASK-                                                      F         W
  7.002  ASK+      D
  7.003  DISP          Connect the 8648 to UUT channel 1.
  7.004  DISP          Set UUT to 20us/div.
  7.005  8648    20    120mVpp                      100kH                   N   CH1
  7.006  ASK-          N
  7.007  MESS          Adjust stimulus for a UUT vertical reading of 4.2 div.
  7.008  8648          5MH            -100%         mVpp                        CH1
  8.001  MESS
  8.002  ASK+          N
END
```

8902

Instrument FSC

Description

The 8902 FSC programs the Hewlett-Packard 8902A Measuring Receiver and 8902S Microwave Measurement System to measure AM, FM, and Phase Modulation, Carrier Frequency, RF Power, Tuned RF Level, Audio Frequency, and Audio Distortion.

The 8902S is a 8902A, with a 11792A Sensor Module, and a 11793A Microwave Converter.

Functional Capability

Function	8902 MOD3	8902 Nominal	8902 MOD1	M8902 Nominal
AM	AM	0 to 99%	150 kHz to <10 MHz	20 Hz to 10 kHz
	AM	0 to 99%	10 MHz to 1300 MHz [3]	20 Hz to 100 kHz
FM	FM	0 Hz to 40 kHz	150 kHz to <10 MHz	20 Hz to 10 kHz
	FM	0 Hz to 400 kHz	10 MHz to 1300 MHz [3]	20 Hz to 200 kHz
PM [1]	PM	0 rad to 400 rad	150 kHz to <10 MHz	200 Hz to 10 kHz
	PM	0 rad to 400 rad	10 MHz to 1300 MHz [3]	200 Hz to 20 kHz
Frequency	FA	150 kHz to 650 MHz	-25 dBm to 30 dBm	(12 mV to 7 V)
	FA	>650 MHz to 1300 MHz [3]	-20 dBm to 30 dBm	(22 mV to 7 V)
RF Power [2]	RF	10 uW to 1 W	100 kHz to 2.6 GHz [3]	
	RF	-20 dBm to +30 dBm	100 kHz to 2.6 GHz [3]	
Tuned RF Level	TL	10 uW to 1 mW	2.5 MHz to 1300 MHz [3]	
	TL	-127 dBm to 0 dBm	2.5 MHz to 1300 MHz [3]	
Audio Freq	AF	. 20 Hz to 250 kHz	-40 dBm to -10.5 dBm	(100 mV to 3 V)
Audio Dist	AD	0.01% to 100%	380 Hz to 420 Hz	
	AD	-80 dB to 0 dB	380 Hz to 420 Hz	
	AD	0.01% to 100%	0.95 kHz to 1.05 kHz	
	AD	-80 dB to 0 dB	0.95 kHz to 1.05 kHz	

Function	8902 MOD3	8902 Nominal	8902 MOD1	M8902 Nominal
AM Calibration	CA	100.00%		
FM Calibration	CF	100.00%		
Power Zero only	ZR	0.0 W	100 kHz to 2.6 GHz [3]	
Power Zero and Calibrate	CP	1.00 mW	50 MHz	

1. Actual allowed Phase Modulation is dependent upon modulation frequency according to the the graph in the 8902A Operating Manual.
2. With HP 11711A Sensor Module
3. 8902S: 1300 MHz to 26.5 GHz

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the expected measured value or a reset.

- AM Depth entered as: [*numeric*] [*prefix*] pct.
- FM Deviation entered as: [*numeric*] [*prefix*] H.
- Phase Deviation entered as [*numeric*] [*prefix*] rad. Frequency entered as [*numeric*] [*prefix*] H.
- RF Power or Tuned RF Level entered as [*numeric*] [*prefix*] W or D.
- Audio Distortion entered as [*numeric*] [*prefix*] pct.
- Reset entered as *.

Rules:

- See Functional Capability table.
- When the Nominal field contains only units, the value is obtained from memory register MEM. In this case the MOD1 field MUST contain a value.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the carrier frequency or amplitude.

- Carrier Frequency entered as [*numeric*] [*prefix*] H.
- Amplitude entered as [*numeric*] [*prefix*] D or V.
- *blank* not applicable

Rules:

- See Functional Capability table.
- When the MOD1 field contains only units, the value is obtained from memory register MEM. In this case the Nominal field MUST contain a value.

MOD2

This field is used to specifying tuning.

- TU Tune frequency
- *blank* Do not tune or not applicable

Rules:

- When the MOD2 field specifies TU, the MOD1 field is used as the tune frequency.
- The MOD2 field my specify TU only for modulation measurements, RF power measurements, and tuned RF level measurements (MOD3 = AM, FM, PM, RF, or TL).

MOD3

This field specifies the measurement type:

- AMAM Measurement
- FM FM Measurement
- PM Phase Measurement
- RF RF Power
- TL Tuned RF Level
- FA Frequency Measurement
- AF Audio Frequency Measurement
- AD Audio Distortion Measurement
- CA Calibrate AM
- CF Calibrate FM
- ZR Zero
- CP Zero and Calibrate RF Power

Rules:

- See Functional Capability table.
- The MOD3 field may specify CA, CF, ZR, and CP only for a Nominal Setup Test (MOD4 = N).

MOD4

This field specifies the type of test being performed as described in "General Rules for Instrument Evaluation FSCs".

CON

This field is always blank.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs".

Examples

```
 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- Reset -----
  1.001  M8902        *
  1.002  8902         *                                                 S
# ----- AM Calibration -----
  1.003  8902         100.00pct                                      CA N
# ----- FM Calibration -----
  1.004  8902         100.00pct                                      CF N
# ----- RF Power Calibration -----
  1.008  HEAD         HP 8902A ZERO/CAL operations completed.
  1.009  DISP         Remove the HP 11722A Sensor Module from the HP 8902A
  1.009  DISP         CALIBRATION RF POWER OUTPUT and connect it to the UUT.
  1.007  8902         1mW                          50MH              CP N
  1.008  HEAD         HP 8902A ZERO/CAL operations completed.
  1.009  DISP         Remove the HP 11722A Sensor Module from the HP 8902A
  1.009  DISP         CALIBRATION RF POWER OUTPUT and connect it to the UUT.
# ----- Frequency Measurement -----
  1.010  8902         120MH                        11D               FA N
# ----- RF Power Zero -----
  1.007  8902         0mW                                            ZR N
# ----- RF Power Measurement -----
  1.011  8902   130   11.0D          1.0U          MH             TU RF
# ----- Tuned RF Level Measurement -----
  2.001  8902         120MH                        -13D              FA N
  2.002  8902   130   -13.0D         1.0U          MH             TU TL
# ----- AM Measurement -----
  3.001  M8902        400H                                        H0 L0    P+-
  3.002  8902         30.0pct        3.2U          0.4MH             AM
  4.001  M8902        *
# ----- FM Measurement -----
  4.002  M8902        1kH                                         H1 L2    P+-
  4.003  8902         100.0kH        7U            245MH             FM
# ----- PM Measurement -----
  5.001  8902         50.0rad        10U           50MH              PM
  6.001  M8902        *
  6.02   END
```

9000

Instrument FSC

Description

The 9000 FSC provides the means to control the following functions of the Datron 9000 Calibrator:

- DC Voltage
- AC Voltage (sine)
- DC Current
- AC Current (sine)
- Resistance (resistance or conductance)
- Frequency
- Mark/Period (pulse)
- Capacitance
- Thermocouple Temperature
- RTD Temperature

Functional Capability

DC Voltage	-1050 V to 1050 V	
AC Voltage (Sine)	0.000 V to 105 V	10 Hz to 100 kHz
	105.001 V to 350 V	40 Hz to 30 kHz
	320.01 V to 1050 V	40Hz to 30 kHz*
DC Current	-20 A to 20 A	
AC Current (Sine)	0.00000 mA to 320 mA	10 Hz to 30 kHz
	0.32001 A to 20 A	10 Hz to 10 kHz
Resistance	0 Ω to 400 MΩ	
	2.5 nS to 2.49999 mS	
Frequency	0.5 Hz to 10 MHz	+/-(0.01Vp to 30Vp)* *|Vp| + |offset| < 30Vp
Mark/Period:	0.6 µs to 2000.00 ms	+/-(0.01Vp to 30Vp)*
Pulse Width	0.3 µs to 1999.99 ms	*|Vp| + |offset| < 30Vp
Mark/Period:	0.6 µs to 2000.00 ms	+/-(0.01Vp to 30Vp)*
Pulse Width	0.3 µs to 1999.99 ms	*|Vp| + |offset| < 30Vp
% Duty:	0.05 % to 99.95 %	+/-(0.01Vp to 30Vp)*
Period:	0.6 µs to 2000.00 ms	*|Vp| + |offset| < 30Vp
Capacitance	0.5 nF to 40 mF	
RTD Temperature:		
Pt 385	-200 °C to 850 °C -328 °F to 1562 °F 7301 K to 1123.15 K	100 Ω (fixed) 100 Ω (fixed) 100 Ω (fixed)
TC Temperature:		
Type K	-250 °C to 1350 °C -418 °F to 1832 °F 23.1 K to 1273.2 K	100 Ω (fixed) 100 Ω (fixed) 100 Ω (fixed)
*ramped to 10 kHz		

Parameters

The following table describes the basic operating modes of the 9000 Calibrator in terms of the FSC fields listed. Only the combinations of field quantities listed below are allowed. These mode names are also used in other places in this section to clarify the rules for each parameter of the 9000 FSC.

Units Symbols

Units Symbol	Name	Quantity
A	Amps	current
App	Amps peak to peak	current
F	Farads	capacitance
H	Hertz	frequency
T	Time	period or pulse width
V	Volts	voltage
Vp	Volts peak	voltage
Vpp	Volts peak to peak	voltage
Y	Siemens	conductance
Z	Ohms	resistance
degC	degrees Celcius	temperature
degF	degrees Fahrenheit	temperature
K	Kelvins	temperature

9000 FSC Nominal, MOD1, MOD2, and CON Rules

9000 Mode (function)	9000 Nominal	9000 MOD1	9000 MOD2[1]	9000 CON[2]
DC Voltage	V			2W
AC Voltage	V|Vpp	H|T	SI	2W
	H|T	V|Vpp	SI	2W
DC Current	A			2W
AC Current	A|App	H|T	SI	2W
	H|T	A|App	SI	2W
Resistance	Z|Y			2W|4W
Frequency	H|T	Vp	ZQ	2W
	Vp	H|T	ZQ	2W
Mark/Period:	H|T	Vp	PU	2W
Pulse	Vp	H|T	PU	2W
% Duty (pulse)	pct	Vp	PU	2W
Capacitance	F			2W|4W
TC Temperature	degC|degF|K		_K	2W
RTD Temperature	degC|degF|K	Z	R1	2W|4W

Notes:
Blank entries are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

1. See MOD2 parameter for description of these specification codes.
2. See CON parameter for description of these specification codes.

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the starting Nominal value of the stimulus output or expected UUT reading for the test entered as:

[*numeric*][*prefix*] *units symbol*

or "*" to specify a reset.

Rules:

- When the NOMINAL field contains only units, the value is obtained from memory register MEM. In this case the MOD1 field MUST contain a value if it is not blank.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the frequency, period, voltage, or current for AC Voltage or AC Current modes or the nominal resistance for RTD Temperature mode entered as:

[*numeric*][*prefix*] *units symbol*

Rules:

- When the MOD1 field contains only units, the value is obtained from memory register MEM. In this case the NOMINAL field MUST contain a value.
- For RTD Temperature, only a nominal resistance of 100 Ohms is allowed.

MOD2

This field specifies the waveform, thermocouple, or RTD type.

- *blank* not applicable
- SI AC Voltage or AC Current (Sine)
- _K TC Temperature Mode (Type K)
- R1 RTD Temperature Mode (Pt 385)
- PU Pulse Mode (Mark/Period or % Duty)

- ZQ Frequency Mode (Hz)

Rules:

- SI is inserted automatically in the MOD2 field for AC Voltage, or AC Current (i.e. the MOD1 field is not blank) if no MOD2 code is entered.
- _K is inserted automatically in the MOD2 field for TC Temperature if no MOD2 code is entered.
- R1 is inserted automatically in the MOD2 field for RTD Temperature if no MOD2 code is entered.
- The M9000 RANGE and NOMINAL field must specify the pulse period or pulse repetition frequency when the MOD2 field specifies PU and the NOMINAL field specifies the pulse width.
- The M9000 RANGE and NOMINAL field must specify the pulse width when the MOD2 field specifies PU and the NOMINAL field specifies the pulse period or pulse repetition frequency.

MOD3

This field is not used.

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

CON

The CONnection field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire

Rules:

- The CON field may specify 4W only for resistance, capacitance, and RTD temperature modes.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in the on-line Reference Manual.

Examples

```
STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- Reset -----
  1.001  M9000        *
  1.002  9000         *                                                 S
# ----- DC Voltage -----
  1.003  9000   20    19.99mV        2% 0.04U                              2W
# ----- AC Voltage -----
  2.001  9000   400   350.0mV        -2.8U +2.9U   60H            SI       2W
# ----- DC Current -----
  3.001  9000   400   350mA          9U                                    2W
# ----- AC Current -----
  4.001  9000         350.0mA                      60H            SI    S  2W
# ----- Resistance -----
  4.002  9000   400   390.0Z         0.4% 0.1U                             4W
  5.001  9000   4     3.900MZ        0.05U                                 2W
# ----- Conductance -----
  6.001  9000         2.50uY                                            N  2W
# ----- Capacitance ----
  6.002  9000   10    1.100uF        2% 0.002U                             2W
# ----- Frequency Function -----
  7.001  9000         1kH                          1Vp            ZQ    S  2W
  7.002  M9000                                     1Voff
  7.003  9000         -1.00Vp                      1kH            ZQ    N  2W
# ----- Marker/Period (pulse) Function -----
  7.004  M9000  PULSE 10uT
  7.005  9000         1mT                          1Vp            PU    S  2W
  7.006  M9000  PER   200mT
  7.007  9000         1mT                          1Vp            PU    S  2W
  7.008  M9000  PULSE 10uT                         -10Voff
  7.009  9000         -5.00Vp                      1kH            PU    N  2W
  7.010  M9000        *
# ----- % Duty (pulse) Function -----
  7.011  M9000  PER   200mT
  7.012  9000         0.5pct                       1Vp            PU    S  2W
# ----- TC Temperature -----
  7.013  9000         50degC         1U                           _K       2W
# ----- RTD Temperature -----
  8.001  9000         45degC                       100Z           R1    S  4W
```

9100

Instrument FSC

Description

The 9100 FSC provides the means to control the following functions of the Datron 9100 Calibrator:

- DC Voltage
- AC Voltage (sine, square, pulse, triangle, trapezoid, impulse)
- DC Current
- AC Current (sine, square, pulse, triangle, trapezoid, impulse)
- Resistance (resistance or conductance)
- Frequency
- Mark/Period (pulse)
- % Duty (pulse)
- Capacitance
- Thermocouple Temperature
- RTD Temperature

9100 with Option 135 (High Voltage Resistance)

- Insulation
- Continuity

9100 with Option 250 or Option 600 (250 MHz or 600 MHz Scope Module):

- Square
- DC Voltage
- Leveled Sine
- Edge Signal
- Marker Signal

9100 with Option PWR (Power Module):

- DC Power (voltage & current or dual voltage)
- AC Power (voltage & current or dual voltage)
- AC Harmonics

Functional Capability

DC Voltage	-1050 V to 1050 V	
AC Voltage:		
Sine	0 V to 105 V	10 Hz to 100 kHz
	105.001 V to 320 V	40 Hz to 30 kHz
	320.01 V to 800 V	40 Hz to 30 kHz
	800.01 V to 1050 V	40 Hz to 20 kHz
Square	0 V to 147.9 V	10 Hz to 1 kHz
	147.9 V to 500 V	45 Hz to 65 Hz
Impulse	0 V to 78.05 V	10 Hz to 1 kHz
	78.05 V to 500 V	45 Hz to 65 Hz
Triangle	0 V to 85.7 V	10 Hz to 1 kHz
	85.7 V to 500 V	45 Hz to 65 Hz
Trapezoid	0 V to 131.9 V	10 Hz to 1 kHz
	131.9 V to 500 V	45 Hz to 65 Hz
DC Current	-20 A to 20 A	
	+/-(3.2001 A to 200 A) [1]	
	+/-(16.001 A to 1000 A)[2]	
AC Current:		
Sine	0 mA to 320 mA	10 Hz to 30 kHz
	0.32001 A to 20 A	10 Hz to 10 kHz
	3.2001 A to 200 A	10 Hz to 440 Hz[1]
	16.001 A to 1000 A	10 Hz to 100 Hz[2]
Square	0 mA to 450.8 mA	10 Hz to 1 kHz
	0.4508 A to 18 A	10 Hz to 100 Hz
	4.508 A to 180 A	10 Hz to 65 Hz[1]
	22.45 A to 900 A	10 Hz to 65 Hz[2]
Impulse	0 mA to 237.9 mA	10 Hz to 1 kHz
	0.2379 A to 15 A	10 Hz to 100 Hz
	2.379 A to 150 A	10 Hz to 65 Hz[1]
	11.9 A to 750 A	10 Hz to 65 Hz[2]
Triangle	0 mA to 261.2 mA	10 Hz to 1 kHz
	0.2612 A to 16.3 A	10 Hz to 100 Hz
	2.612 A to 163 A	10 Hz to 65 Hz[1]
	13.06 A to 815 A	10 Hz to 65 Hz[2]

Trapezoid	0 mA to 399.1 mA	10 Hz to 1 kHz
	0.3991 A to 19.2 A	10 Hz to 100 Hz
	3.991 A to 192 A	10 Hz to 65 Hz[1]
	19.95 A to 960 A	10 Hz to 65 Hz[2]
Resistance	0 Ω to 400 MΩ	
	2.5 nS to 2.5 mS	
Frequency	0.5 Hz to 10 MHz	+/-(0.01 Vp to 30 Vp)*
		*|Vp| + |offset| < 30 Vp
Mark/Period:	0.6 µs to 2000.00 ms	+/-(0.01 Vp to 30 Vp)*
Pulse Width	0.3 µs to 1999.99 ms	*|Vp| + |offset| < 30 Vp
% Duty:	0.05% to 99.95%	±(0.01 Vp to 30 Vp)
Period	0.6 µs to 2000.00 ms	*|Vp| + | offset| < 30 Vp
Capacitance	0.5 nF to 40 mF	
RTD Temperature:		
Pt 385	-200 degC to 850 degC	10 Ω to 2 kΩ
Pt 392	-200 degC to 850 degC	10 Ω to 2 kΩ
TC Temperature:		
Type B	0 degC to 1820 degC	
Type C	0 degC to 2320 degC	
Type E	-250 degC to 1000 degC	
Type J	-210 degC to 1200 degC	
Type K	-250 degC to 1372 degC	
Type L	-200 degC to 900 degC	
Type N	-200 degC to 1300 degC	
Type R	0 degC to 1767 degC	
Type S	0 degC to 1767 degC	
Type T	-250 degC to 400 degC	
1. Requires Option 200 (10-Turn Current Coil) 2. Requires Option 200 (50-Turn Current Coil)		

Option 135 (High Voltage Resistance)

Insulation:	100 kΩ to 2 GΩ
	0 V to 1350 V
	1 µA to 2.3 mA
Continuity:	0 Ω to 4 kΩ
	100 µA to 350 mA

Option PWR (Power Module)

DC Power:		
Primary Output	-1050 V to 1050 V	
Aux Output:		
Voltage	0 V to 7.5 V[1,5]	
Current	-20 A to 20 A	
	+/-(3.2001 A to 200 A)[2]	
	+/-(16.001 A to 1000 A)[3]	
AC Power:		
Primary Output:		
Sine	0 V to 105 V	10 Hz to 3 kHz[4]
	105.001 V to 1050 V	40 Hz to 3 kHz[4]
Square	0 V to 147.9 V	10 Hz to 1 kHz[4]
	147.9 V to 500 V	45 Hz to 65 H[4]
Impulse	0 V to 78.05 V	10 Hz to 1 kHz[4]
	78.05 V to 500 V	45 Hz to 65 H[4]
Triangle	0 V to 85.7 V	10 Hz to 1 kHz[4]
	85.7 V to 500 V	45 Hz to 65 Hz[4]
Trapezoid	0 V to 131.9 V	10 Hz to 1 kHz[4]
	131.9 V to 500 V	45 Hz to 65 Hz[4]

Aux Output:		
Sine		
Voltage	0.32 mV to 7.5 V	10 Hz to 3 kHz[1,4,5]
Current	0 A to 20 A	10 Hz to 3k Hz[4]
	3.2001 A to 200 A	10 Hz to 440 Hz[2,4]
	16.001 A to 1000 A	10 Hz to 100 Hz[3,4]
Square		
Voltage	0 V to 4.5 V	10 Hz to 1 kHz[1,4,5]
Current	0 mA to 450.8 mA	10 Hz to 1 kHz[4]
	0.4508 A to 18 A	10 Hz to 100 Hz[4]
	4.508 A to 180 A	10 Hz to 65 Hz[2,4]
	22.45 A to 900 A	10 Hz to 65 Hz[3,4]
Impulse		
Voltage	0 V to 2.38 V	10 Hz to 1 kHz[1,4,5]
Current	0 mA to 237.9 mA	10 Hz to 1 kHz[4]
	0.2379 A to 15 A	10 Hz to 100 Hz[4]
	2.379A to 150A	10 Hz to 65 Hz[2,4]
	11.9A to 750A	10 Hz to 65 Hz[3,4]
Triangle		
Voltage	0 V to 2.61 V	10 Hz to 1 kHz[1,4,5]
Current	0 mA to 261.2 mA	10 Hz to 1 kHz[4]
	0.2612 A to 16.3 A	10 Hz to 100 Hz[4]
	2.612 A to 163 A	10 Hz to 65 Hz[2,4]
	13.06 A to 815 A	10 Hz to 65 Hz[3,4]

Trapezoid		
Voltage	0 V to 4.02 V	10 Hz to 1 kHz[1,4,5]
Current	0 mA to 399.10 mA	10 Hz to 1 kHz[4]
	0.3991 A to 19.2 A	10 Hz to 100 Hz[4]
	3.991 A to 192 A	10 Hz to 65 Hz[2,4]
	19.95 A to 960 A	10 Hz to 65 Hz[3,4]
Phase	-180deg to 180deg	
AC Harmonic:		
Primary Output:		
Sine	0 V to 1050 V	50, 60, or 400 Hz[4]
Aux Output:		
Sine		
Voltage	0.32 mV to 7.5 V	50, 60, or 400 Hz[4]
Current	0 A to 20 A	50, 60, or 400 Hz[4]
	3.2001 A to 200 A	50, 60, or 400 Hz[2,4]
	16.001 A to 1000 A	50 or 60 Hz [3,4]
Phase	-180° to 180°	
Harmonic	1 to 40	

1. Using appropriate V/A scale factor.
2. Requires Option 200 (10-Turn Current Coil)
3. Requires Option 200 (50-Turn Current Coil)
4. Actual maximum frequency is the lower of the maximum frequency for the primary channel signal and the maximum frequency for the auxiliary channel signal.
5. Actual maximum frequency is the lower of the maximum frequency for the primary channel signal and the maximum frequency for the auxiliary channel signal.

Option 250 and Option 600 (Scope Calibrators)

Square:		
50 Ω term.	4.44 mVpp to 3.336 Vpp	1 kHz/1 ms
1 MΩ term.	4.44 mVpp to 133.44 Vpp	1 kHz/1 ms
DC Voltage:		
50 Ω term.	+/-(4.44 mV to 2.78 V)	
1 MΩ term.	+/-(4.44 mV to 133.44 V)	
Leveled Sine:		
50 Ω term.	4.44 mVpp to 5.56 Vpp	10 Hz to 250 MHz [1]
	4.44 mVpp to 5.56 Vpp	1.6666 ns to 100 ms[1]
50 Ω term.	4.44 mVpp to 5.56 Vpp	10 Hz to 600 MHz[2]
	4.44 mVpp to 5.56 Vpp	4.0000 ns to 100 ms[2]
1 MΩ term.	4.44 mVpp to 133.44 Vpp	10 Hz to 49.999 kHz
	4.44 mVpp to 133.44 Vpp	20.001 µs to 100 ms
Edge:		
50 Ω term.	88.8 mVpp to 1.112 Vpp	100 Hz to 10 MHz or
		0.1 µs to 10 ms[3]
1 MΩ term.	88.8 mVpp to 55.6 Vpp	100 Hz to 100 kHz or
		10 µs to 10 ms[3]
Marker (50 Ω only):		
	4.0000 ns to 5.5005 s[1]	0.1, 0.2, 0.5 & 1 Vpp
	0.1818 Hz to 250 MHz [1]	0.1, 0.2, 0.5 & 1 Vpp
	1.6666 ns to 5.5005 s[2]	0.1, 0.2, 0.5 & 1 Vpp
	0.1818 Hz to 600 HHz[2]	0.1, 0.2, 0.5 & 1 Vpp

1. Option 250
2. Option 600
3. In a 1-2-5 sequence.

Parameters

The following table describes the basic operating modes of the 9100 Calibrator in terms of the FSC fields listed. Only the combinations of field quantities listed below are allowed. These mode names are also used in other places in this section to clarify the rules for each parameter of the 9100 FSC.

Units Symbols

Units Symbol	Name	Quantity
A	Amps	current
App	Amps peak to peak	current
F	Farads	capacitance
H	Hertz	frequency
K	Kelvins	temperature
T	Time	period or pulse width
V	Volts	voltage
VA	Volt-Amps	power
VAR	Volt-Amps reactive	power
Vp	Volts peak	voltage
Vpp	Volts peak to peak	voltage
W	Watts	power
Y	Siemens	conductance
Z	Ohms	resistance
deg	degrees	phase
degC	degrees Celcius	temperature
degF	degrees Fahrenheit	temperature
%	duty cycle	percent

9100 FSC Nominal, MOD1, MOD2, MOD3, and CON Rules

9100 Mode (function)	9100 Nominal	9100 MOD1	9100 MOD2 [1]	9100 MOD3[2]	9100 CON[3]
DC Voltage	V				2W
AC Voltage	V|Vpp	H|T	SI|SQ|IP|TI|TZ	2W	
	H|T	V|Vpp	SI|SQ|IP|TI|TZ	2W	
DC Current	A				2W|T1|T5
AC Current	A|App	H|T	SI|SQ|IP|TI|TZ		2W|T1|T5
	H|T	A|App	SI|SQ|IP|TI|TZ		2W|T1|T5
Resistance	Z|Y				2W|4W
Frequency	H|T	Vp	ZQ		2W
	Vp	H|T	ZQ		2W
Mark/Period (pulse)	H|T	Vp	PU		2W
	Vp	H|T	PU		2W
% Duty (pulse)	pct	Vp	PU		2W
Capacitance	F				2W|4W
TC Temperature	degC|degF|K		_B|_C|_E|_J|_K| _L|_N|_R|_S|_T		2W
RTD Temperature	degC|degF|K	Z	R1|R9		2W|4W
DC Power	W|V			PR	2W|T1|T5
	A			AX	2W|T1|T5
AC Power	W|VA|VAR	H|T	SI	PR	2W|T1|T5
	V|Vpp	H|T	SI|SQ|IP|TI|TZ	PR	2W|T1|T5
	A|App	H|T	SI|SQ|IP|TI|TZ	AX	2W|T1|T5
	H|T	V|Vpp	SI|SQ|IP|TI|TZ	PR	2W|T1|T5
	deg	H|T	SI|SQ|IP|TI|TZ	PR	2W|T1|T5

AC Harmonic	V|Vpp	H	SI	MN|MX	2W|T1|T5
	A|App	H	SI	MX	2W|T1|T5
	H	V|Vpp	SI	MN	2W|T1|T5
	deg	H	SI	MN	2W|T1|T5
Scope (Square)	V|Vpp	H|T	ZQ	SC	[L]
	H|T	V|Vpp	ZQ	SC	[L]
Scope (DCV)	V			SC	[L]
Scope (Leveled Sine)	V|Vpp	H|T	LS	SC	[L]
	H|T	V|Vpp	LS	SC	[L]
Scope (Edge)	V|Vpp	H|T	ED	SC	[L]
	H|T	V|Vpp	ED	SC	[L]
Scope (Marker)	H|T	Vpp	MK	SC	L
Insulation	Z		[SE]	HV	2W
	V|A	Z	SE	HV	2W
Continuity	Z		[SE]	CO	4W
	A	Z	SE	CO	4W

Notes:

Blank entries are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

1. See MOD2 parameter for description of these specification codes.
2. See MOD3 parameter for description of these specification codes.
3. See CON parameter for description of these specification codes.

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the starting Nominal value of the stimulus output or expected UUT reading for the test entered as:

[*numeric*][*prefix*] units symbol

or "*" to specify a reset.

Rules:

- When the NOMINAL field units are "W" (Watts), the M9100 NOMINAL field must specify the auxiliary channel current.
- When the NOMINAL field units are "deg" (phase), the M9100 MOD1 field must specify the primary channel voltage.
- When the NOMINAL field contains only units, the value is obtained from memory register MEM.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the frequency, period, voltage, or current for AC Voltage, AC Current, Dual AC Voltage, or AC Power modes entered as:

[*numeric*][*prefix*] units symbol

Rules:

- When the MOD1 field contains only units, the value is obtained from memory register MEM.

MOD2

This field specifies the waveform, thermocouple, or RTD type or source vs. sense (read) for High Voltage Resistance mode.

- *blank* not applicable
- SI AC Voltage, Current, or Power Modes (Sine)
- SQ AC Voltage, Current, or Power Modes (Square)
- IP AC Voltage, Current, or Power Modes (Impulse)

- TI AC Voltage, Current, or Power Modes (Triangle)
- TZ AC Voltage, Current, or Power Modes (Trapezoid)
- _B TC Temperature Mode (Type B)
- _C TC Temperature Mode (Type C)
- _E TC Temperature Mode (Type E)
- _J TC Temperature Mode (Type J)
- _K TC Temperature Mode (Type K)
- _L TC Temperature Mode (Type L)
- _N TC Temperature Mode (Type N)
- _R TC Temperature Mode (Type R)
- _S TC Temperature Mode (Type S)
- _T TC Temperature Mode (Type T)
- R1 RTD Temperature Mode (Pt 385)
- R9 RTD Temperature Mode (Pt 392)
- PU Pulse Mode (Mark/Period or % Duty)
- ZQ Frequency Mode (Hz) or Scope Mode (Square)
- LS Scope Mode (Leveled Sine)
- ED Scope Mode (Edge signal)
- MK Scope Mode (Marker signal)
- SE Insulation or Continuity Mode (Sense "Read" Nominal value)

Rules:

- SI is inserted automatically in the MOD2 field for AC Voltage, AC Current, or AC Power mode (i.e. the MOD1 field is not blank) if no MOD2 code is entered.
- _K is inserted automatically in the MOD2 field for TC Temperature if no MOD2 code is entered.
- R1 is inserted automatically in the MOD2 field for RTD Temperature if no MOD2 code is entered.
- The M9100 RANGE and NOMINAL field must specify the pulse period or pulse repetition frequency when the MOD2 field specifies PU and the NOMINAL or MOD1 field specifies the pulse period or pulse repetition frequency.
- The M9100 RANGE and NOMINAL field must specify the pulse width when the MOD2 field specifies PU and the NOMINAL field specifies the pulse period or pulse repetition frequency.

MOD3

This field specifies the calibrator option required. In addition, for Power mode, the channel associated with the MOD2 field and the amplitude specified in the 9100 NOMINAL or M9100 MOD1 field.

- PR Option PWR (Power Module) Power mode Primary channel
- AX Option PWR (Power Module) Power mode Auxiliary channel
- MN Option PWR (Power Module) Harmonic mode Primary channel
- MX Option PWR (Power Module) Harmoinc mode Auxiliary channel
- SC Option 250 or Option 600 (Scope Calibrator)
- HV Option 135 (High Voltage Resistance) Insulation mode
- CO Option 135 (High Voltage Resistance) Continuity mode
- *blank* No option required

Rules:

9100 & M9100 NOMINAL, MOD1, and MOD3 Rules

	9100			M9100		
Mode (function)	NOMINAL	MOD1	MOD3	NOMINAL	MOD1	MOD3
DC Power	V		PR	A		AX
	A		AX	V		PR
AC Power	W|V|Vpp	H|T	PR	A|App	[deg]	AX
	A|App	H|T	AX	V|Vpp	[deg]	PR
	H|T	V|Vpp	PR	A|App	[deg]	AX
	deg	H|T	PR	A|App	V|Vpp	AX
AC Harmonic	V|Vpp	H|T	MN	A|App|V|Vpp	[deg]	MX
	A|App|V|Vpp	H|T	MX	V|Vpp	[deg]	MN
	H|T	V|Vpp	MN	A|App|V|Vp	[deg]	MX
	deg	H|T	MN	A|App|V|Vpp	V|Vpp	MX
Insulation	Z		HV			
	A	Z	HV			
	V	Z	HV			
Continuity	Z		CO			
	A	Z	CO			
Note: Blank entries are significant and must be blank.						

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

CON

The CONnection field specifies the UUT connection.

- 2W 2-wire
- 4W 4-wire
- T1 Option 200 10-turn Toroid Coil
- T5 Option 200 50-turn Toroid Coil
- L 50-Ω Termination (scope modes only)
- *blank* 1-MΩ Termination (scope modes only)

Rules:

- The CON field may specify 4W only for Resistance, Capacitance, RTD Temperature, or High Voltage Resistance mode.
- The CON field may specify T1 or T5 only when the Nominal or MOD1 field specifies current or for DC or AC Power mode and the M9100 Tolerance field does not specify a V/A scale factor.
- The CON field may specify L or be blank only for scope modes.
- The CON field must be L for Scope Marker mode.
- L is inserted automatically in the CON field for Scope Marker mode if no CON field code is entered.

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in this manual.

Examples

STEP	FSC	RANGE	NOMINAL	TOLERANCE	MOD1	MOD2	3	4	CON
# ----- Reset -----									
1.001	M9100		*						
1.002	9100		*					S	
# ----- DC Voltage -----									
1.003	9100	20	19.99mV	2% 0.04U					2W
# ----- AC Voltage (sine) -----									
2.001	9100	400	350.0mV	-2.8U +2.9U	60H	SI			2W
# ----- AC Voltage (square) -----									
3.001	9100		1V		1kH	SQ		S	2W
# ----- AC Voltage (impulse) -----									
3.002	9100		1V		1kH	IP		S	2W
# ----- AC Voltage (triangle) -----									
3.003	9100		13mVpp		100H	TI		S	2W
# ----- AC Voltage (trapezoid) -----									
3.004	9100		1V		1kH	TZ		S	2W
# ----- DC Current -----									
3.005	9100	400	350mA	9U					2W
# ----- AC Current (sine) -----									
4.001	9100		350.0mA		60H	SI		S	2W
# ----- AC Current (square) -----									
4.002	9100		1mA		1kH	SQ		S	2W
# ----- AC Current (impulse) -----									
4.003	9100		100mA		1kH	IP		S	2W
# ----- AC Current (triangle) -----									
4.004	9100		13mApp		440H	TI		S	2W
# ----- AC Current (trapezoid) -----									
4.005	9100		1mA		1kH	TZ		S	2W
# ----- Resistance -----									
4.006	9100	400	390.0Z	0.4% 0.1U					4W
5.001	9100	4	3.900MZ	0.05U					2W
# ----- Conductance -----									
6.001	9100		2.50uY					N	2W
# ----- Capacitance ----									
6.002	9100	10	1.100uF	2% 0.002U					2W
# ----- Frequency Function -----									
7.001	9100		1kH		1Vp	ZQ		S	2W
7.002	M9100				1Voff				
7.003	9100		-1.00Vp		1kH	ZQ		N	2W
# ----- Marker/Period (pulse) Function -----									
7.004	M9100	PULSE	10uT						
7.005	9100		1mT		1Vp	PU		S	2W
7.006	M9100	PER	200mT						
7.007	9100		1mT		1Vp	PU		S	2W
7.008	M9100	PULSE	10uT		-10Voff				
7.009	9100		-5.00Vp		1kH	PU		N	2W

```
# ----- % Duty (pulse) Function -----
  7.006  M9100  PER   200mT
  7.007  9100         0.5pct                      1Vp            PU    S  2W
# ----- TC Temperature -----
  7.010  M9100  TS68
  7.011  9100         50degC        1U                           _K       2W
# ----- RTD Temperature -----
  8.001  9100         45degC                      100Z           R1    S  4W

# ============================== Option 135 =================================

  8.002  DISP         Set UUT to MOhm, 250V.
  8.003  M9100                                                            HI
  8.004  9100         1.0mA                       250kZ          SE HV N  2W
  8.005  EVAL   -e MEM > 1.0 : Current [MEM]mA
  9.001  9100         250.0V        20%           250kZ          SE HV    2W
 10.001  DISP         Set UUT to MOhm, 500V
 10.002  M9100                                                            SP
 10.003  9100         1.0mA                       500kZ          SE HV N  2W
 10.004  EVAL   -e MEM > 1.0 : Current [MEM]mA
 11.001  9100         500.0V        20%           500kZ          SE HV    2W
 12.001  DISP         Set UUT to MOhm, 1000V
 12.002  M9100                                                            SP
 12.003  9100         1.0mA                       1MZ            SE HV N  2W
 12.004  EVAL   -e MEM > 1.0 : Current [MEM]mA
 13.001  9100         1000V         20%           1MZ            SE HV    2W
 14.001  DISP         Set UUT to LO Ohm.
 14.002  M9100                                                            HI
 14.003  9100         1.000mA                     1kZ            SE CO N  4W
 14.004  EVAL   -e MEM > 1.0 : Current [MEM]mA
 15.001  M9100        *

# ========================== Option 250 & 600 ===============================

# ----- DC Voltage -----
 15.002  9100   20    19.99mV       4%                              SC
# ----- Square Voltage -----
 16.001  9100   400   350.0mV       50U           1kH            ZQ SC
# ----- Edge Signal -----
 17.001  9100         0.5Vpp                      1MH            ED SC S  L
# ----- Leveled Sine Wave -----
 17.002  9100         200mVpp                     50kH           LS SC S  L
 17.003  9100         1.00MH        1%            100mVpp        LS SC    L
# ----- Marker Signal -----
 18.001  9100         1uT                         0.2Vpp         MK SC S  L

# =============================== Option PWR ================================
```

```
# ----- DC Power -----
 18.002  M9100        1V                                             PR
 18.003  9100         1.000A                                         AX S   2W
 18.004  M9100        10A            45uV/A                          AX
 18.005  9100         1W                                             PR S   2W
 18.006  M9100        10A                                            AX
 18.007  9100         1.000kW                                        PR S   2W
# ----- DC Power w/Option 200 10-turn coil -----
 18.008  M9100        100A                                           AX
 18.009  9100         10.00kW                                        PR S   T1
# ----- DC Power w/Option 200 50-turn coil -----
 18.010  M9100        500A                                           AX
 18.011  9100         -100.0kW                                       PR S   T5

# ----- AC Power (Watts) -----
 18.012  M9100        10A                          0deg           SI AX
 18.013  9100         1W                           1kH            SI PR S   2W
 18.014  M9100        10A            1mV/A                        SI AX
 18.015  9100         1W                           1kH            SI PR S   2W
# ----- AC Power (Volt-Amps) -----
 18.016  M9100        10A                          0deg           SI AX
 18.017  9100         1VA                          1kH            SI PR S   2W
# ----- AC Power (VAR) -----
 18.018  M9100        10A                          90deg          SI AX
 18.019  9100         1VAR                         1kH            SI PR S   2W
# ----- AC Power (Frequency) -----
 18.020  M9100        10A                          0deg           SI AX
 18.021  9100         60.0H          0.2U          1V             SI PR     2W
# ----- AC Power (Phase) -----
 19.001  M9100        10A                          1V             SI AX
 19.002  9100         0.0deg         0.1U          50H            SI PR     2W

# ----- AC Harmonic -----
 20.001  M9100  HX3   10A                          0deg           SI MX
 20.002  9100         1V                           60H            SI MN S   2W
 20.003  M9100  HX1   1V                           0deg           SI MN
 20.004  9100         1.000mA        0.010U        60H            SI MX     2W
 21.001  M9100  HX39  1V                           0deg           SI MN
 21.002  9100         10mV                         60H            SI MX S   2W
```

M9100

Auxiliary Instrument Setup FSC

Description

The M9100 FSC provides the additional program functions for the Datron 9100 Calibrator which are not addressed by the 9100 FSC.

Parameters

For a description of the 9100 Calibrator operating modes referenced in this section, see the 9100 Instrument FSC description.

Units Symbols

Units Symbol	Name	Quantity
A	Amps	current
App	Amps peak to peak	current
H	Hertz	frequency
T	Time	period or pulse width
V	Volts	voltage
Voff	Volts offset	DC offset
Vpp	Volts peak to peak	voltage
V/A	Volts per Amp	scale factor (see Tolerance field)
deg	degrees	phase

M9100 FSC Range, Nominal, Tolerance, MOD1, MOD2, and MOD3 Rules

Mode (function)	Range	Nominal	TOL	MOD1	MOD2	MOD3
Frequency				[Voff]		
Mark/Period (pulse)	PER|PULSE	T|H		[Voff]		
RTD Temperature	[TS68|TS90]					
TC Temperature	[TS68|TS90]					
DC Power		V	[V/A]			PR
		A	[V/A]			AX
AC Power		V|Vpp	[V/A]	[deg]	SI|SQ|IP|TI|TZ	PR
		A|App	[V/A]	[deg]	SI|SQ|IP|TI|TZ	AX
		A|App	[V/A]	[V|Vpp]	SI|SQ|IP|TI|TZ	AX
AC Harmonic	HX*n*	V|Vpp		[deg]	SI|SQ|IP|TI|TZ	MN
	HX*n*	A|App|V|Vpp		[deg]	SI|SQ|IP|TI|TZ	MX
	HX*n*	A|App|V|Vpp		[V|Vpp]	SI|SQ|IP|TI|TZ	MX
Scope Edge	RISE|FALL					
Blank entries are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.						

RANGE

This field specifies one of the following:

- HX*n* Selects harmonic on auxiliary channel, 1 to 40
- PULSE Pulse Width
- PER Pulse Period
- RISE Polarity (Edge)
- FALL Polarity (Edge)
- TS68 TS68 temperature scale
- TS90 TS90 temperature scale
- *blank* default or field not applicable

The RANGE filed must specifiy PULSE or PER when the 9100 MOD2 field is PU.

Rules:

- For RTD and TC Temperature modes, if the RANGE field does not specify the temperature scale, the default is TS90.
- For Scope Edge mode, if the RANGE field does not specify RISE or FALL, the default is RISE.

NOMINAL

This field specifies one of the following entered as:

[*numeric*][*prefix*] units symbol

- Pulse Period or Pulse Repetition Frequency
- Pulse Width
- Signal amplitude for the power or harmonic mode channel specified by the MOD3 field.
- "*" reset to default values
- *blank* field not applicable

Rules:

- The NOMINAL field must specify the pulse period or pulse repetition frequency when the M9100 RANGE field is PER.
- The NOMIMAL field must specify the pulse width when the M9100 RANGE field is PULSE.
- When the NOMINAL field contains only units, the value is obtained from memory register MEM.
- When the NOMINAL field specifies reset "*", all other fields must be blank.

TOLERANCE

This field is used to specify the scale factor applied to the auxiliary channel, when in 'auxiliary voltage' power mode, to calculate the effective voltage on the auxiliary channel. This field is entered as:

[*numeric*][*pref*ix]V/A

Rules:

- When the TOLERANCE field contains only units, the value is obtained from memory register MEM.

MOD1

This field specifies one of the following:

1. DC offset for Frequency or Mark/Period (pulse) mode and % Duty (pulse) modes, or
2. The phase for AC Power or AC Harmonic mode, or
3. The primary voltage for AC Power or AC Harmonic mode when the 9100 NOMINAL field specifies phase.

Values are entered as:

[*numeric*][*prefix*] units symbol

Rules:

- The MOD1 field may specify voltage or current only when the 9100 NOMINAL field specifies phase.
- The MOD1 field may specify DC offset only for Frequency and Mark/Period (pulse) mode.
- When the MOD1 field is blank the DC offset is set to zero.
- When the MOD1 field contains only units, the value is obtained from memory register MEM.

MOD2

This field specifies the waveform for the power mode channel specified by the MOD3 field.

- *blank* DC
- SI Sine
- SQ Square
- IP Impulse
- TI Triangle
- TZ Trapezoid

MOD3

This field specifies the channel associated with the Power mode parameters specified in the NOMINAL and MOD2 fields.

- PR Power mode Primary channel
- AX Power mode Auxiliary channel

- MN Harmonic mode Primary channel
- MX Harmoinc mode Auxiliary channel
- *blank* not applicable

Rules:

See 9100 MOD3 field rules.

MOD4

This field is not used.

CON

This field specifies the 9105 Work Mat connection for current or the UUT source current for Resistance, Capacitance, and RTD Temperature modes.

- C1 9105 Work Mat yellow lead (I+20A)
- C2 9105 Work Mat white lead (I+mA)
- LO Low UUT source current
- HI High UUT source current
- SP Super High UUT source current
- *blank* Applicable default (C1 or LO)

Rules:

Mode (function)	9100 CON	M9100 CON	Connection
DC Current	2W	[C1]	9105 Work Mat Yel & Blk
	2W	C2	9105 Work Mat Wht & Blk
	T1|T5	[C1]	9100 I+ & I-
AC Current	2W	[C1]	9105 Work Mat Yel & Blk
	2W	C2	9105 Work Mat Wht & Blk
	T1|T5	[C1]	9100 I+ & I-
Resistance	2W|4W	[LO|HI|SP]	9105 Work Mat Red & Blk
Capacitance	2W|4W	[LO|SP]	9105 Work Mat Red & Blk
RTD Temperature	2W|4W	[LO|HI|SP]	9105 Work Mat Red & Blk
Continuity	4W	[HI|SP]	9100 HI and LO Terminals 9100 1 + and 1 – as sense
Insulation	2W	[HI|SP]	9100 HI and LO Terminals

Examples

See 9100 FSC.

9500

Instrument FSC

Description

The 9500 FSC provides the means to control the following functions of the Datron 9500 and Fluke 9500B Oscilloscope Calibrator:

- DC Voltage
- Square Voltage
- Leveled Sine
- Edge
- Fast Edge
- Time Markers
- DC Current
- Square Current
- Composite Video
- Linear Ramp
- Zero Skew
- Oscilloscope 50 Ohm Input Impedance Overload Pulse
- Oscilloscope Input Impedance Measurement
- Trigger Signal
- Pulse (9500B only)

Functional Capability

9500 Model	Maximum Frequency	Minimum Period
9500/400	400 MHz	2.5 ns
9500(B)/600*	600 MHz	1.6666 ns
9500(B)/1100*	1100 MHz	909.09 ps
9500(B)/3200*	3200 MHz	312.50 ps
w/9560 Head	6.4 GHz	156.25 ps
* (B) denotes 9500 and 9500B		

Active Head	Maximum Frequency	Minimum Period
9510	1.1 GHz	909.09 ps
9520	1.1 GHz	909.09 ps
9530	3.2 Hz	312.50 ps
9550	(see Fast Edge)	
9560	6.4 GHz	256.25 ps

DC Voltage	Amplitude
Single Channel	
50 Ω term.	0 V (Gnd) and +/-(888 µV to 5.56 V)
1 MΩ term.	0 V (Gnd) and +/-(888 µV to 222.4 V)
Multi-Channel (9500B only)	
1 MΩ term.	0V (Gnd) and +/-(888 µV to 222.4V)

Square Voltage	Amplitude	Frequency
Single Channel		
50 Ω term.	35.521 µVpp to 5.56 Vpp	10 Hz to 100 kHz
1 MΩ term.	35.521 µVpp to 222.4 Vpp	10 Hz to 100 kHz
Multi-Channel (9500B only)	35.521 µVpp to 222.4 Vpp	10 Hz to 100 kHz

Leveled Sine	Frequency	Amplitude
Single Channel:		
50 Ω & 1 MΩ	100 mHz to 550 MHz	4.4401 mVpp to 5.560 Vpp
	>550 MHz to 1.1 GHz	4.4401 mVpp to 3.336 Vpp
50 Ω	>1.1 GHz to 2.5 GHz	4.4401 mVpp to 3.336 Vpp
	>2.5 GHz to 3.2 GHz	4.4401 mVpp to 2.224 Vpp
	>3.2 GHz to 6.4 GHz	22.241 mVpp to 2.224 Vpp (9560 only)
Dual Channel:		
50 Ω & 1 MΩ	100 mHz to 550 MHz	4.4401 mVpp to 2.780 Vpp
	>550 MHz to 1.1 GHz	4.4401 mVpp to 1.668 Vpp
50 Ω	>1.1 GHz to 3.2 GHz	4.4401 mVpp to 1.668 Vpp (9560 only)

Low Edge	Amplitude	Frequency	Rise Time
50 Ω & 1 MΩ	4.44 mVpp to 3.1 Vpp	10 Hz to 2 MHz	<=500 ps

High Edge	Amplitude	Frequency	Rise Time
50 Ω	888 mVpp to 5.56 Vpp	10 Hz to 100 kHz	<=150 ns
1 MΩ	888 mVpp to <100 Vpp	10 Hz to 100 kHz	<=150 ns
1 MΩ	100 Vpp to 222.4 Vpp	10 Hz to 100 kHz	<=200 ns

Fast Edge (50 Ω only)	Amplitude	Frequency	Rise Time
9510	not supported		
9520 and 9530:	4.44 mVpp to 3.1 Vpp	10 Hz to 2 MHz	<=150 ps
9550	425 mVpp to 575 mVpp	10 Hz to 1 MHz	<=25 ps
9560	22.241 mVpp to 2.224 Vpp	10 Hz to 1 MHz	<=70 ps

Time Markers (50 Ω)	Period	Amplitude
Sine	181.19 ps to 909.09 ps	100 mVpp, 250 mVpp, 500 mVpp (9560 only)
Sine	450.46 ps to 909.09 ps	100 mVpp, 250 mVpp, 500 mVpp
Sine	909.10 ps to 9 ns	909.10 ps to 9 ns
Square	9.0001 ns to 55.002 s	100 mVpp, 250 mVpp, 500 mVpp, 1 Vpp
Pulse	901.00 ns to 55.002 s	100 mVpp, 250 mVpp, 500 mVpp, 1 Vpp
Triangle	901.00 ns to 55.002 s	100 mVpp, 250 mVpp, 500 mVpp, 1 Vpp

Time Markers (1 MΩ)	Period	Amplitude
Sine	450.46 ps to 909.09 ps	100 mVpp, 250 mVpp, 500 mVpp
Sine	909.10 ps to 9 ns	100 mVpp, 250 mVpp, 500 mVpp, 1 Vpp
Square	9.0001 ns to 55.002 s	100 mVpp, 250 mVpp, 500 mVpp, 1 Vpp
Pulse	901.00 ns to 55.002 s	100 mVpp, 250 mVpp, 500 mVpp, 1 Vpp
Triangle	901.00 ns to 55.002 s	100 mVpp, 250 mVpp, 500 mVpp, 1 Vpp

Function	Amplitude
DC Current	+/-(88.8 µA to 111.2 mA)

Function	Amplitude	Frequency
Square Current	88.8 µApp to 111.2 mApp	10 Hz to 100 kHz

Video	Amplitude	Video
NTSC	0.3 Vpp	Black
	0.7 Vpp	Mid-Grey
	1.0 Vpp	White
PAL/SECAM	0.3 Vpp	Black
	0.7 Vpp	Mid-Grey
	1.0 Vpp	White

Function	Period	Amplitude
Linear Ramp	3 s, 300 ms, 30 ms, 3 ms	1 Vpp

Function	Frequency	Amplitude
Zero Skew	10 Hz to 100 MHz	1 Vpp

Function	Amplitude	Energy
Overload Pulse	+/-(5 V to 20 V)	1.6 J to 50.0 J

Function	UUT Input Impedance Measurement
Resistance	10 Ω to 150 Ω and 50 kΩ to 12 M Ω
Capacitance	1 p F to 95 pF

Parameters

Units Symbols

Units Symbol	Name	Quantity
A	Amps	current
Ap	Amps peak	current
App	Amps peak to peak	current
F	Farads	capacitance
H	Hertz	frequency
J	Joule	energy
T	Time	period
V	Volts	voltage
Vp	Volts peak	voltage
Vpp	Volts peak to peak	voltage
Z	Ohms	resistance

9500 FSC Nominal, MOD1, MOD2, and MOD3 Rules

9500 Mode	9500 Nominal	9500 MOD1	9500 MOD2[1]	9500 MOD3
DC Voltage	V			
Square Voltage	V|Vp|Vpp	H|T	SQ|ZQ|ZN	
	H|T	V|Vpp	SQ|ZQ|ZN	
Low Edge	V|Vp|Vpp	H|T	ED	
	H|T	V|Vpp	ED	
High Edge	V|Vp|Vpp	H|T	HE	
	H|T	V|Vpp	HE	
Fast Edge	V|Vp|Vpp	H|T	FE	[EF]
	H|T	V|Vpp	FE	[EF]
Leveled Sine	V|Vp|Vpp	H|T	LS	
	H|T	V|Vpp	LS	
Linear Ramp	Vpp	T	LR	
	T	Vpp	LR	
Time Marker	T	Vpp	M1|M2|M3|M4	
DC Current	A			
Square Current	A|Ap|App	H|T	SQ	
	H|T	A|App	SQ	
Video	Vpp		F1|F2	
Overload Pulse	V	J	OP	
Zero Skew	H|T	Vpp	ZK	[PR]
Impedance Meas	Z|F			ZM

1. See MOD2 parameter for description of these specification codes and rules.

Blank entries are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the starting Nominal value of the stimulus output or expected UUT reading for the test entered as:

[*numeric*][*prefix*] *units symbol*

or "*" to specify a reset.

Rules:

- When the NOMINAL field contains only units, the value is obtained from the memory register MEM.
- When the NOMINAL field contains only units and the MOD1 field is not blank, the MOD1 field must specify a value.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies frequency, period, voltage, or energy entered as:

[*numeric*][*prefix*] *units symbol*

Rules:

- When the MOD1 field contains only units, the value is obtained from memory register MEM. In this case the NOMINAL field MUST contain a value.

MOD2

This field specifies one of the following:

1. The waveform type for the voltage or specified in the NOMINAL or MOD1 field for AC Voltage.

- *blank* DC or not applicable
- SQ Squarewave (symmetrical)
- ZQ Squarewave (positive)
- ZN Squarewave (negative)
- ED Low-Edge signal
- HE High-Edge signal

- FE Fast-Edge signal
- M1 Triangle Marker signal
- M2 Square Marker signal
- M3 Pulse Marker signal
- M4 Sine Marker signal
- LS Leveled sine wave
- F1 NTSC composite video signal
- F2 PAL/SECAM composite video signal
- LR Linear Ramp
- OP Overload Pulse
- ZK Zero Skew
- PU Pulse (9500B only)

Rules:

- ZQ is inserted automatically in the MOD2 field for AC Voltage (i.e. the MOD1 field is not blank) if no MOD2 code is entered.
- SQ is inserted automatically in the MOD2 field for AC Current.(i.e. the MOD1 field is not blank) if no MOD2 code is entered.
- The MOD2 field may specify fast edge "FE", only when a 9520, 9530, or 9550 Active Head is configured on the signal channel specified in the M9500 FSC MOD2 field.
- When the MOD2 field specifies "ZK" (Zero Skew) the M9500 Tolerance field must specify two, three, four, or five signal channels.

MOD3

This field specifies the calibrator mode:

- *blank* Not applicable
- ZM Input (UUT Impedance Measurement)
- +V Positive Video Polarity
- -V Negative Video Polarity
- EF Use 9550 Active Head for Fast Edge
- 7E Use 9560 Active Head for Fast Edge
- PR Use zero skew precision adjustments already performed and stored manually.

Rules:

- ZM is inserted automatically in the MOD3 field when the Nominal field units are Ohms or Farads.
- The MOD3 field must specify +V or -V when the MOD2 field is F1 or F2.
- The MOD3 field may specify EF only when the MOD2 field specifies FE.
- The MOD3 field may specify PR only when the MOD2 field specifies ZK.
- The MOD3 field may specify 7E only when the MOD2 field specifies FE.

MOD4

This field specifies the type of test being as described in "General Rules for Instrument Evaluation FSCs".

Additional Rules:

- The MOD4 field must specify S (Setup Test) when the MOD2 field specifies OP (Overload Pulse).

CON

The CONnection field specifies the UUT connection.

- *blank* 1 MΩ Termination
- L 50 Ω Termination
- 2W 2-Wire

Rules:

- 2W is inserted automatically in the CON field when the MOD3 is ZM.
- The CON field must specify 2W when the MOD3 field specifies ZM.
- The CON field must be blank (1 MΩ for multi-channel DC Voltage (i.e. the M9500 TOLERANC field specifies two or more signal channels).
- The CON field must be L for any of the following conditions:
  1. Nominal field specifies current.
  2. MOD1 field specifies current.
  3. The MOD2 field specifies fast edge (FE).
  4. The MOD2 field specifies overload pulse (OP).
  5. The MOD2 field specifies zero skew (ZK).

- L is inserted automatically in the CON field for any of the following conditions if no CON field code is entered:
  1. Nominal field specifies current.
  2. MOD1 field specifies current.
  3. The MOD2 field specifies fast edge (FE).
  4. The MOD2 field specifies overload pulse (OP).
  5. The MOD2 field specifies zero skew (ZK).
- L is inserted automatically in the CON field for any of the following conditions if no CON field code is entered:
  6. Nominal field specifies current.
  7. MOD1 field specifies current.
  8. The MOD2 field specifies fast edge (FE).
  9. The MOD2 field specifies overload pulse (OP).
  10. The MOD2 field specifies zero skew (ZK).

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in this manual.

Examples

```
STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# ----- Reset -----
  1.001  M9500        *              CH1
  1.002  9500         *                                                 S
# ----- DC Voltage -----
  1.003  9500   20    19.99mV        4%
# ----- AC Voltage (Positive Scope Square Wave) -----
  2.001  9500   400   350.0mV        50U           60H            ZQ
# ----- AC Voltage (Negative Scope Square Wave) -----
  3.001  9500         100Vpp                       1kH            ZN    S
# ----- AC Voltage (Frequency Test) -----
  3.002  9500   1000  800.0H         0.1% 0.1U     300mV          ZQ
# ----- Low-Edge Signal (Scope Output) -----
  4.001  9500         0.5Vpp                       500kH          ED    S  L
# ----- High-Edge Signal (Scope Output) -----
  4.002  9500         100Vpp                       100kH          HE    S
# ----- Fast-Edge Signal (Scope Output) -----
  4.003  9500         100Vpp                       100kH          HE    S
  4.004  M9500                       CH12
  4.005  9500         10mVpp                       1MH            FE    S  L
# ----- Triangle Marker Signal -----
  4.006  M9500                       CH1
  4.007  9500         1uT                          1Vpp           M1    S  L
  4.008  M9500        *              CH1
# ----- Square Marker Signal -----
  4.009  9500         1mT                          1Vpp           M2    S  L
# ----- Pulse Marker Signal -----
  4.010  9500         5uT                          1Vpp           M3    S  L
# ----- Sinusoid Marker Signal -----
  4.011  9500         2nT                          1Vpp           M4    S  L
# ----- NTSC Video -----
  4.012  9500         1Vpp                                        F1 +V S  L
  4.013  M9500        *              CH1
# ----- PAL Video -----
  4.014  9500         0.7Vpp                                      F2 -V S  L
# ----- Linear Ramp Signal -----
  4.015  9500         300mT                        1Vpp           LR    S  L
# ----- Zero Skew Function -----
  4.016  M9500                       CH1234
  4.017  9500         500kH                        1Vpp           ZK    S  L
# ----- Impedance Measurement (50 Ohm) -----
  4.018  M9500        *              CH1
  4.019  9500         50Z            1U                              ZM    2W
# ----- Impedance Measurement (1 MOhm) -----
  5.001  9500         1.000MZ        1U                              ZM    2W
# ----- Impedance Measurement (Capacitance) -----
```

```
  6.001  9500         10pF                                                ZM N   2W
# ----- Overload Pulse -----
  6.002  HEAD         {CH 1 50 Ohm OVERLOAD PROTECTION}
  6.003  DISP         Connect 9500 CH 1 Active Head to UUT CH 1.
  6.004  SET          VERTICAL MODE CH 1: ON
  6.004  SET          VERTICAL MODE CH 2: OFF
  6.004  SET          VERTICAL MODE CH 3: OFF
  6.004  SET          VERTICAL MODE CH 4: OFF
  6.004  SET          COUPLING CH 1 : 50 Ohm
  6.004  SET          VOLTS/DIV CH 1 : 1V
  6.004  SET          TRIGGER SOURCE : CH 1
  6.005  HEAD         CH 1 50 Ohm OVERLOAD PROTECTION: 5V test ~60s
# 5V at 30J = 60s duration.
  6.006  9500         5V                           30J            OP    S
  6.007  MATH         MEM2 = "No overload at 5V"
  6.008  EVAL   -s MEM2 : [N]Does the UUT display show "50 Ohm OVERLOAD"?
  7.001  SET          VOLTS/DIV CH 1 : 5V
  7.002  HEAD         CH 1 50 Ohm OVERLOAD PROTECTION: 20V test ~12.5s
# 20V at 50J = 6.25s. Spec is 10s so two setup statements are needed.
  7.003  9500         20V                          50J            OP    S
  7.004  9500         20V                          50J            OP    S
  7.005  MATH         MEM2 = "50 Ohm Overload at 20V"
  7.006  EVAL   -s MEM2 : Does the UUT display show "50 Ohm OVERLOAD"?
```

M9500

Instrument FSC

Description

The M9500 FSC provides the additional program functions for the Datron 9500 and Fluke 9500B Oscilloscope Calibrators which are not addressed by the 9500 FSC.for the Datron 9500 Oscilloscope Calibrator which are not addressed by the 9500 FSC.

- Overload Pulse Time Limit
- Video Trigger
- Edge Polarity
- Signal Channel
- Trigger Output Impedance
- Trigger Channel
- Pulse Width (9500B only)
- Pulse Repetition Frequency (9500B only)
- Pulse Period (9500B only)

Parameters

9500 NOMINAL, MOD1, MOD2, MOD3 and M9500 RANGE and NOMINAL Rules

9500 Mode	9500 NOMINAL	9500 MOD1	9500 MOD2	9500 MOD3	M9500 RANGE	M9500 NOMINAL
Video	<amplitude>		F1|F2	+V|-V	[COMP|FRAME]	
Low Edge	<amplitude>	<freq|per>	ED		[RISE|FALL]	
Low Edge	<freq|per>	<amplitude>	ED		[RISE|FALL]	
High Edge	<amplitude>	<freq|per>	HE		[RISE|FALL]	
High Edge	<freq|per>	<amplitude>	HE		[RISE|FALL]	
Fast Edge	<amplitude>	<freq|per>	FE	[EF]	[RISE|FALL]	
Fast Edge	<freq|per>	<amplitude>	FE	[EF]	[RISE|FALL]	
Fast Edge	<amplitude>	<freq|per>	FE	7E	[RISE]	
Fast Edge	<freq|per>	<amplitude>	FE	7E	[RISE]	
Pulse	<width>	1Vpp	PU		PER	<freq|per>
Pulse	<freq|per>	1Vpp	PU		PULSE	<width>

Note

Blank entries in the above table are significant and must be blank. FSC field interdependencies not expressed in this table are listed under "Rules" for the appropriate parameter.

RANGE

This field specifies one of the following:

- COMP Trigger Composite (Video)
- FRAME Trigger Frame (Video)
- RISE Polarity (Edge)
- FALL Polarity (Edge)
- PULSE Pulse Width (9500B only)
- PER Pulse Period (9500B only)
- *blank* field not applicable

NOMINAL

This field specifies one of the following:

- Pulse Width entered as: [*numeric*][*prefix*]T or H
- Pulse Period entered as: [*numeric*][*prefix*]T
- Pulse Repetition Frequency entered as: [*numeric*][*prefix*]H
- "*" reset to default values
- *blank* field not applicable

TOLERANCE

This field selects the signal channel(s).

- *blank* CH 1
- CH1 CH 1
- CH2 CH 2
- CH3 CH 3
- CH4 CH 4
- CH5 CH 5
- CH12 CH 1 & CH 2
- CH13 CH 1 & CH 3
- CH14 CH 1 & CH 4
- CH15 CH 1 & CH 5
- CH23 CH 2 & CH 3
- CH24 CH 2 & CH 4
- CH25 CH 2 & CH 5
- CH34 CH 3 & CH 4
- CH35 CH 3 & CH 5
- CH45 CH 4 & CH 5

- CH123 CH 1, CH 2, & CH 3
- CH124 CH 1, CH 2, & CH 4
- CH125 CH 1, CH 2, & CH 5
- CH134 CH 1, CH 3, & CH 4
- CH135 CH 1, CH 3, & CH 5
- CH145 CH 1, CH 4, & CH 5
- CH234 CH 2, CH 3, & CH 4
- CH235 CH 2, CH 3, & CH 5
- CH245 CH 2, CH 4, & CH 5
- CH345 CH 3, CH 4, & CH 5
- CH1234 CH 1, CH 2, CH 3, & CH 4
- CH1235 CH 1, CH 2, CH 3, & CH 5
- CH1245 CH 1, CH 2, CH 4, & CH 5
- CH1345 CH 1, CH 3, CH 4, & CH 5
- CH2345 CH 2, CH 3, CH 4, & CH 5
- CH12345 CH 1, CH 2, CH 3, CH 4, & CH 5

Rules:

9500	M9500
MOD2	TOLERANCE

- When the mode is Leveled Sine (9500 MOD2 is "LS") the M9500 Tolerance field may specify one or two signal channels.
- When the mode is Zero Skew (9500 MOD2 is "ZK") the Tolerance field must specify two, three, four, or five signal channels.
- When the mode is 1 MOhm DC Voltage (9500 NOMINAL units are V and 9500 MOD1, MOD2, and CON are blank) the Tolerance field may specify two, three, four, or five signal channels.
- For all other modes and 50 Ohm DC Voltage) the TOLERANCE field may specify only one signal channel.
- When the mode is Leveled Sine or DC Voltage with multi-channel output, if any channel uses the 9560 Active Head, all other channels selected must also use a 9560 Active Head.

MOD1

This field is not used.

MOD2

This field is not used.

MOD3

This field is not used.

MOD4

This field specifies the trigger output impedance.

- *blank* 1 MΩ Termination
- L 50 Ω Termination

CON

This field specifies the trigger channel and rate. The following codes require Option 5, 5 Five Channel Output:

- *blank* Trigger Output off
- 1T1 Trigger Output on Channel 1, Normal mode
- 2T1 Trigger Output on Channel 1, 1/10 of output rate
- 3T1 Trigger Output on Channel 1, 1/100 of output rate
- 1T2 Trigger Output on Channel 2, Normal mode
- 2T2 Trigger Output on Channel 2, 1/10 of output rate
- 3T2 Trigger Output on Channel 2, 1/100 of output rate
- 1T3 Trigger Output on Channel 3, Normal mode
- 2T3 Trigger Output on Channel 3, 1/10 of output rate
- 3T3 Trigger Output on Channel 3, 1/100 of output rate
- 1T4 Trigger Output on Channel 4, Normal mode
- 2T4 Trigger Output on Channel 4, 1/10 of output rate
- 3T4 Trigger Output on Channel 4, 1/100 of output rate
- 1T5 Trigger Output on Channel 5, Normal mode
- 2T5 Trigger Output on Channel 5, 1/10 of output rate
- 3T5 Trigger Output on Channel 5, 1/100 of output rate

Rules:

- The CON field must be blank for any of the following conditions:
    1. The M9500 Tolerance field is blank.
    2. The M9500 Tolerance field specifies three or more output channels (zero skew).
    3. The 9500 MOD2 field specifies zero skew "ZK".
    4. The 9500 MOD3 field specifies impedance measurment "ZM".
- When a trigger output channel is specified the trigger channel number cannot be the same as a signal output channel specified in the Tolerance field.

Examples

See 9500 FSC.

ASK+, ASK-

Procedure Control FSCs

Description

The ASK+ and ASK- FSCs enable and disable the MET/CAL system control flags. The effect of each system flag is summarized below.

⚠Warning

The procedure writer must make certain that safety is not compromised!

Automatic Messages

The following flags control the display of messages during procedure execution.

Flag	Controls display of automatic...	Default setting
W	Connection messages, excl. divider	ASK+ W
V	Connection messages	ASK+ V
R	UUT range message	ASK+ R
S	SET FSC messages	ASK+ S
N	Instructions to perform test	ASK+ N
M	MOD1 value with test instructions	ASK+ M
D	Meter or Oscilloscope message format	*

* The default value of the D-flag depends on the type of calibration system. The default is:

```
ASK- D for a meter calibration system and
ASK+ D for a scope calibration system.
```

Refer to section 6 of the Users Manual for a Description of how to configure the calibration system type.

Stimulus Evaluation Statement Options

The following flags are used to select the method by which an operator enters a UUT Indicated value during procedure execution.

Flag	Controls evaluation mode	Default setting
G	Go/No-Go	ASK- G
B	Go/No-Go with Slew and Kybd Options	ASK- B
K	Keyboard entry	ASK- K

The G, B, and K flags are mutually exclusive. When the G, B, and K flags are all disabled, slew mode is used.

Post Test Options

The following flags determine which options in the Post Test dialog are enabled.

Flag	Enable / Disable	Default setting
A,F	display of Post Test dialog	ASK+ A
L	List option	ASK+ L
P	Repeat current step option	ASK+ P
X	Cancel option	configurable
J	Adjust option	ASK+ J
T	Terminate option	ASK+ T

Miscellaneous

Flag	Enable / Disable	Default setting
C	Use correction file (if it exists)	configurable
Q	Reset after completion of test	ASK+ Q
U	TUR checking	ASK+ U

General Characteristics

- Entering a blank ASK+ statement results in the following:

  ASK+ R D Q N B P J S U M C X A L T W
- Entering a blank ASK- statement results in the following:

  ASK- R D N B P J S U M C X A L T W

  The Q-flag is not affected by ASK- *blank*.
- Only the state of the flags specified in an ASK+ or ASK- statement is affected unless there is a relationship between the state of a specified flag and one or more unspecified flags.

Relationships between flags are explained in detail in the paragraphs below.

- The D, R, and Q flags are not allowed in an ASK+ or ASK- FSC in an adjustment block.
- The state of the flags is preserved from procedure to subprocedure and vice versa.

A-FLAG

The A and F flags control whether or not the Post Test dialog is displayed upon completion of an evaluation step.

- ASK+ A causes the Post Test dialog to be displayed after an evaluation.
- ASK- A prevents the display of the Post Test dialog after an evaluation.
- ASK- F prevents the display of the Post Test dialog upon a PASS condition.

  The Post Test dialog will be displayed if the test fails.
- The ASK+ A and ASK+ F statements have the same effect.
- The default is: ASK+ A

The table below shows the combined effect of the A, F, and J flags.

Note

In a PASS condition, the J-flag has no effect. In a FAIL condition, the J-flag has an effect only when there is an adjustment block following the evaluation statement.

	ASK+ J	ASK- J
ASK+ A, ASK+ F, or ASK- F	Adjust option enabled in Post Test dialog for a FAIL condition.	Adjust option disabled in Post Test dialog. Adjustment block automatically executed for FAIL condition upon selecting Advance.
ASK- A	No Post Test dialog. Adjustment block can never be executed!	Adjustment block automatically executed upon FAIL condition.

B-FLAG

The B-flag controls the Go/No-Go with Slew and Keyboard Entry options for a stimulus function instrument evaluation or comparison test.

- ASK+ B enables Go/No-Go with Slew and Keyboard Entry options.
- ASK- B disables the B, G, and K flags, resulting in a slew test.
- The default is: ASK- B

C-FLAG

The C-flag is used to enable or disable the MET/CAL correction mechanism.

- ASK+ C enables corrections
- ASK- C disables corrections
- The default state of the C-flag is configurable using the "ask_c_default"

- parameter in the MET/CAL initialization file ("metcal.ini"). If "ask_c_default" is set to "yes" (or "+"), the C-flag defaults to ASK+ C. If "ask_c_default" is set to "no" (or "-"), the C-flag defaults to ASK- C. For compatibility with earlier versions of MET/CAL which did not support the "ask_c_default" initialization file parameter, if "ask_c_default" is omitted from the initialization file, the C-flag defaults to ASK+ C. The "ask_c_default" parameter, if specified, should be in the "[startup]" section of the initialization file.

In order for a correction to be performed the following conditions must apply:

- The C-Flag must be enabled.
- A correction file must exist.
- The System Actual value to be corrected must match a range specified in the correction file.

Refer to Vol. 1, Chap. 7 of the MET/CAL manual for more information. During procedure execution, The Test Results dialog indicates whether a correction was performed for each test listed.

D-FLAG

The D-flag controls whether or not automatic range messages use the scope "units/division" format.

- ASK+ D enables scope format for automatic range messages.
- ASK- D disables scope format for automatic range messages.
- The default value of the D-flag depends on the type of calibration system: ASK- D for a meter calibration system and ASK+ D for a scope calibration system.

The calibration system type is determined by the "systype" parameter inthe MET/CAL initialization file ("metcal.ini").

In the "[Startup]" section of the MET/CAL initialization file, set

systype = meter

to configure the system for meter calibration.

Set

systype = oscilloscope

to configure the system for oscilloscope calibration.

The default setting of "systype" for new MET/CAL installations is

systype = meter

The "systype" initialization file parameter has no effect other than to determine the default state of the ASK 'D' flag.

Example:

The following example shows the effect of the ASK 'D' flag on automatic range messages generated for four "6060" statements. The first two "6060" statements (1.002 and 1.003) are executed with ASK- D in effect. The second two "6060" statements (1.005 and 1.006) are executed with ASK+ D in effect. The automatic range message associate with each "6060" statement is shown immediately after the procedure line. Notice that the automatic range messages for the second two "6060" statements are appropriate for scope calibration (because ASK+ D is in effect).

```
STEP    FSC    RANGE NOMINAL         TOLERANCE     MOD1        MOD2  3  4 CON
 1.001  ASK-     D
 1.002  6060   2     0.8V                          1MH                   N
Range Message:  Set UUT to the 2 V AC range.
 1.003  6060   10    10nT                          0.8V                  N
Range Message:  Set UUT to the 10 ns range.
 1.004  ASK+     D
 1.005  6060   2     0.8V                          1MH                   N
Range Message:  Set UUT to 2 V/div.
 1.006  6060   10    10nT                          0.8V                  N
Range Message:  Set UUT to 10 ns/div.
```

- Some FSCs allow "-D" to be specified in the MOD2 field. When specified, "-D" in the MOD2 field overrides the ASK 'D' flag.
- For MET/CAL versions 6.10 and earlier, the effect of the ASK 'D' flag on automatic slew messages varies for different FSCs. Most instrument FSCs do not take the ASK 'D' flag into account when constructing automatic slew messages.

For additional information, refer to Volume 1, Chapter 7.

F-FLAG

The A-flag and F-flag control whether or not the Post Test dialog is displayed upon completion of an evaluation step.

- ASK+ A causes the Post Test dialog to be displayed unconditionally after an evaluation.
- ASK- A prevents the Post Test dialog from being displayed after an evaluation.
- ASK- F prevents the display of the Post Test dialog upon a PASS condition. The Post Test dialog will be displayed upon a FAIL condition.

- The ASK+ A and ASK+ F commands have the same effect.
- The default is: ASK+ A

The table below shows the combined effect of the A, F, and J flags.

Notes

In a PASS condition, the J flag has no effect. In a FAIL condition, the J flag has an effect only when there is an adjustment block following the evaluation statement.

	ASK+ J	ASK- J
ASK+ A, ASK+ F, or ASK- F	Adjust option enabled in Post Test dialog for a FAIL condition.	Adjust option disabled in Post Test dialog. Adjustment block automatically executed for FAIL condition upon selecting Advance.
ASK- A	No Post Test dialog. Adjustment block can never be executed!	Adjustment block automatically executed upon FAIL condition.

G-FLAG

The G-flag controls the use of Go/No-Go for a stimulus function instrument evaluation or comparison test.

- ASK+ G enables Go/No-Go.
- ASK- G disables the B, G, and K flags, resulting in a slew test.
- The default is: ASK- G

J-FLAG

The J-flag controls the appearance of the Adjust option in the Post Test dialog. Refer to the description of Post Test options in the User's Manual for more information. Note that the J-flag has no effect unless (1) the test result is FAIL, and (2) an adjustment block follows the evaluation statement.

- ASK+ J enables the Adjust option in the Post Test dialog.
- ASK- J disables the Adjust option in the Post Test dialog.
- The default is: ASK+ J

The table below shows the combined effect of the A, F, and J flags.

	ASK+ J	ASK- J
ASK+ A, ASK+ F, or ASK- F	Adjust option enabled in Post Test dialog for a FAIL condition.	Adjust option disabled in Post Test dialog. Adjustment block automatically executed for FAIL condition upon selecting Advance.
ASK- A	No Post Test dialog. Adjustment block can never be executed!	Adjustment block automatically executed upon FAIL condition.

K-FLAG

The K-flag controls the use of Keyboard Entry for a stimulus function instrument evaluation or comparison test.

- ASK+ K enables Keyboard Entry.
- ASK- K disables the B, G, and K flags, resulting in a slew test.
- The default is: ASK- K

L-FLAG

The L-flag enables or disables the List option in the Post Test dialog. Refer to the description of Post Test options in the User’s Manual for more information.

- ASK+ L enables the List option in the Post Test dialog.
- ASK- L disables the List option in the Post Test dialog.
- The default is: ASK+ L

M-FLAG

The M-flag controls the appearance of the MOD1 field information in the automatic messages which describe to the operator how to perform the test. Refer to the section describing Automatic Messages in the MET/CAL Procedure Language Reference Manual for more information.

- ASK+ M enables inclusion of MOD1 information in messages.
- ASK- N disables inclusion of MOD1 information in messages.
- The default is: ASK+ M

N-FLAG

The N-flag controls the appearance of automatic messages which describe to the operator how to perform the test. Refer to the section describing Automatic Messages in the MET/CAL Procedure Language Reference Manual for more information.

- ASK+ N enables automatic messages which instruct the operator how to perform a test.
- ASK- N disables automatic messages which instruct the operator how to perform a test.
- The default is: ASK+ N

P-FLAG

The P-flag determines the statement at which a test is re-started after the operator selects "Repeat" in the Post Test dialog.

- ASK+ P causes the procedure to be re-started at the current procedure line when the operator selects the Post Test "Repeat" option.
- ASK- P causes the procedure to be re-started at the first statement of the current test when the operator selects the Post Test "Repeat" option.

(The step number of the first statement of the test has the form XX.001.)

- The default is: ASK+ P

Q-FLAG

The Q-flag controls the reset of calibration instruments after a test.

- ASK+ Q enables the reset of calibration instruments after a test. ASK+ Q is forced if any of ASK+ R, ASK+ N, ASK+ W, or ASK+ V are active.
- ASK- Q disables the reset of calibration instruments after a test. ASK- Q takes effect only if ASK- R, ASK- N, ASK- W or ASK- R, ASK- N, and ASK- V are in effect.
- The default is: ASK+ Q

⚠Warning

The procedure writer should carefully evaluate every procedure using ASK- Q for safety, potential overload conditions and potential for damaging calibration instruments and the UUT. Problems may occur when setting up a new function or range in the UUT while the stimulus of the previous test is still applied.

R-FLAG

The R-flag controls the appearance of automatic UUT range messages generated by instrument FSCs and the RNG (Range) FSC. Refer to the section describing Automatic Messages in the MET/CAL Reference Manual for more information.

- ASK+ R enables automatic UUT range messages.
- ASK- R disables automatic UUT range messages.
- The default is: ASK+ R

S-FLAG

The S-flag controls the appearance of all automatic messages defined by the SET FSC. Refer to the SET FSC in the FSC Reference for more information.

- ASK+ S enables all automatic messages defined by the SET FSC.
- ASK- S disables all automatic messages defined by the SET FSC.
- The default is: ASK+ S

T-FLAG

The T-flag controls the appearance of the Terminate option in the Post Test dialog. Refer to the description of Post Test options in the User's Manual for more information.

- ASK+ T enables the Terminate option in the Post Test dialog.
- ASK- T disables the Terminate option in the Post Test dialog.
- The default is: ASK+ T

Caution

The procedure writer is advised not to specify ASK- T before a procedure has been thoroughly tested. When ASK-T is in effect, it may be difficult to terminate a procedure.

U-FLAG

The T-flag controls Test Uncertainty Ratio (TUR) checking. Refer to the description of the TUR calculation in the User's Manual for more information.

- ASK+ U enables TUR checking.
- ASK- U disables TUR checking.
- The default is: ASK+ U

In order for TUR checking to be performed the "tur_limit", specified in the MET/CAL initialization file ("metcal.ini"), must not equal zero.

V-FLAG

The V-flag controls the appearance of automatic connection messages.

- ASK+ V enables all automatic connection messages, including those related to the External AC Divider and High Voltage Probes. ASK+ V and ASK+ W have the same effect.
- ASK- V disables all automatic connection messages, including those related to the External AC Divider and High Voltage Probes.
- The default is: ASK+ V

⚠Warning

The automatic connection and disconnection messages for the External AC Divider and High Voltage Probes are disabled when ASK- V is active. If no alternate messages are created by the procedure writer, the operator may damage the UUT or calibration equipment.

Note

The procedure writer must make absolutely sure that no safety or fire hazard is present during the execution of the procedure; when ASK- V is active, the system will assume that a connection was made to the port that was active at the time that the signal is applied.

W-FLAG

The W-flag controls the appearance of automatic connection messages.

- ASK+ W enables all automatic connection messages, including those related to the External AC Divider and High Voltage Probes. ASK+ W and ASK+ V have the same effect.
- ASK- W disables all automatic connection messages, except those related to the External AC Divider and High Voltage Probes.
- The default is: ASK+ W

Note

The procedure writer must make absolutely sure that no safety or fire hazard is present during the execution of the procedure; when ASK- W is active, the system will assume that a connection was made to the port that was active at the time that the signal is applied.

X-FLAG

The X-flag controls the appearance of the Cancel option in the Post Test dialog. Refer to the description of Post Test options in the User's Manual for more information.

- ASK+ X enables the Cancel option in the Post Test dialog.
- ASK- X disables the Cancel option in the Post Test dialog.

The default state of the X-flag is configurable using the "ask_x_default" parameter in the MET/CAL initialization file ("metcal.ini"). If "ask_x_default" is set to "yes" (or "+"), the X-flag defaults to ASK+ X. If "ask_x_default" is set to "no" (or "-"), the X-flag defaults to ASK- X. For compatibility with earlier versions of MET/CAL which did not support the "ask_x_default" initialization file parameter, if "ask_x_default" is omitted from the initialization file, the X-flag defaults to ASK- X. The "ask_x_default" parameter, if specified, should be in the "[startup]" section of the initialization file. If the procedure step terminates abnormally, the Post Test Cancel option is always disabled, regardless of the state of the X-flag. This applies both to termination due to an error and termination by the operator. In these cases no test result was generated, so there's nothing to be cancelled. If desired, use the Post Test Repeat option to retry the test.

Example

```
STEP  FSC  RANGE NOMINAL TOLERANCE MOD1 MOD2  3  4  CON
1.001 ASK+ R D   N G     P J S     M    A     L  T   W
1.001 ASK+ R       G                    A
```

Additional Information

The information below may help procedure writers in interpreting the Test Run "ASK" dialog.

Internally, each ASK flag is a single bit which is either set (1) or clear (0). The Test Run "ASK" dialog displays a vertical list of flags in which a check box is used to show the state of each flag. If a box is checked, this indicates that the corresponding ASK flag is set. If a box is not checked, this indicates that the corresponding ASK flag is clear.

In all cases except as noted in rules (1) to (7) below "ASK+ *flag*" sets *flag* and does nothing else, and "ASK- *flag*" clears *flag* and does nothing else. For example, "ASK+ X" sets the 'X' flag and has no side-effects involving other flags, and "ASK- X" clears the 'X' flag and has no side-effects involving other flags.

The following rules explain the cases in which setting or clearing an ASK flag has side-effects involving other ASK flags:

1. "ASK- A"
   This statement clears A and clears F.

   "ASK- F"
   This statement clears A and sets F.

   A and F cannot both be specified in a single ASK-statement.
2. "ASK- B"
   This statement clears B, clears G, and clears K.

   "ASK- G"
   This statement clears B, clears G, and clears K.

   "ASK- K"
   This statement clears B, clears G, and clears K.

   At most one of B, G, and K can be specified in a single ASK- statement.
3. "ASK- W"
   This statement clears W and sets V.

   "ASK- V"
   This statement clears V and clears W.

   W and V cannot both be specified in a single ASK-statement.
4. "ASK+ A"
   This statement sets A and clears F.

   "ASK+ F"
   This statement sets A and clears F.

   A and F cannot both be specified in a single ASK-statement.
5. "ASK+ B"
   This statement sets B, clears G, clears K.

   "ASK+ G"
   This statement sets G, clears B, clears K.

   "ASK+ K"
   This statement sets K, clears B, clears G.

   At most one of B, G, and K can be specified in a single ASK+ statement.

6. "ASK+ W"
   This statement sets W and sets V.

   "ASK+ V"
   This statement sets W and sets V.

   W and V cannot both be specified in a single ASK+statement.

7. "ASK+ R"
   This statement sets R and sets Q.

   "ASK+ N"
   This statement sets N and sets Q.

   "ASK+ W"
   This statement sets W and sets Q.

   "ASK+ A"
   This statement sets A and sets Q.

   In other words, setting R, N, W, or A automatically sets Q. This means that a statement like "ASK+ R" will cancel a preceding "ASK- Q" statement. It is still the case, however, that:

   ASK+ R

   ASK- Q

   leaves Q unset.

CON

Display Control Help

Description

The CON FSC invokes a standard connection message to prompt the operator to make a change to the UUT's connections. There are two reasons why, in some cases, an automatic connection message might be used in preference to a message generated using a DISP statement:

- The message format is identical to the format of automatic connection messages generated by MET/CAL instrument drivers.
- When automatic connection messages are used, MET/CAL remembers the list of current connections. This allows the automatic generation of disconnection messages when new connections are made, and also precludes the generation of redundant connection messages.

However, because automatic connection messages are worded in a general way (that is, they are not specific to a particular UUT), most procedure writers use the DISP FSC to construct messages which refer directly to the particular UUT being calibrated.

The CON FSC refers to connection messages by number. Each connection message has a number. Connection messages (and the associated numbers) are shown in the "Connection Messages Section."

⚠Warning

When the CON FSC is used to generate connection and disconnection messages, MET/CAL cannot verify that instruments to which connections are to be made are in a safe state. The procedure writer must ensure that instruments are in STANDBY or are not generating unsafe voltages before prompting the operator to make connections or disconnection's.

Format

CON *connection code message list*

CON 0

Rules

- The *connection code* field may be '=', '+', or '-'. It determines the interpretation of the following *message list* as shown in the table below:

  '=' - *message list* specifies connections to be made

  '+' - *message list* specifies connections to be added

  '-' - *message list* specifies connections to be removed

  The difference between making a connection ('=') and adding a connection ('+') is that '=' first causes a disconnection message for all present connections, followed by a connection message for the new connections. '+', on the other hand, presumes that present connections are to remain, and simply generates a prompt to add the new connections.

  When the *connection code* is '+' or '-', the *message list* must be non-empty. When the *connection_code* is '=', the *message list* may be empty. In this case, an empty *message list* causes a prompt to disconnect all present connections.

- The *message list* is a list of 1 or more connection message numbers, separated by commas.

- The statement "CON 0" may be used to generate a disconnection message for all connections. This statement is equivalent to "CON =".

  Example:

  ```
  CON    =47
  CON    =48
  CON    +49
  CON    -48, 49
  ```

  The first CON statement prompts the operator to make the connection indicated by connection message number 47. The second CON statement first causes a prompt to disconnect 47, followed by a prompt to connect 48. The third CON statement causes a prompt to connect 49. Note that, since the *connection code* is '+', it does not first trigger a disconnection message for 48. The fourth CON statement generates a disconnection message for 48 and 49.

Compatibility

For compatibility with previous versions of MET/CAL, the list of connection message numbers may be specified in binary-coded decimal format. Using this method, 53 is the maximum number which can be specified. Refer to 7411B or 7411C manuals for further information.

See Also

The ASK- W and V flags may be used to disable automatic connection messages. This applies to messages specified in CON statements, as well as to messages generated by MET/CAL instrument drivers. Refer to the ASK+ and ASK- FSC Reference for more information.

Examples

Additional CON FSC examples are shown below.

Example 1:

```
CON        =9,10
```

Disconnect any other connection, then prompt to connect the UUT to 5100B Output and 5100B Sense (if they are not already connected).

Example 2:

```
CON        +21
```

Adds a connection from the UUT to the 5450 Sense.

Example 3:

```
CON        -21
```

Disconnect the UUT from the 5450 Sense.

Example 4:

```
CON        =
CON        0
```

Remove all connections (both forms allowed).

Example 5:

```
CON        1024
```

Connect the UUT to 5100B Wideband (old BCD format).

Connection Messages

Message 5

English: UUT to CG 5001 Output using Comparator Head

Español: UBP a la salida del CG 5001 usando Cabeza Comparadora

Message 6

English: UUT to CG 5001 Output using Pulse Head

Español: UBP a la salida del CG 5001 usando Cabeza de pulso

Message 7

English: UUT to CG 5001 TRIGGER Output

Español: UBP a la salida de TRIGGER del CG 5001

Message 8

English: UUT to 5100B Output Terminals using external AC Divider

Español: UBP a los terminales de salida del 5100B usando divisor externo AC

Message 9

English: UUT to 5100B Output Terminals

Español: UBP a los terminales de salida del 5100B

Message 10

English: UUT to 5100B Sense Terminals

Español: UBP a los terminales del sense del 5100B

Message 11

English: UUT to 5100B Wideband Output

Español: UBP a la salida de Ancho de Banda del 5100B

Message 12

English: UUT to 5220A Current Output Terminals

Español: UBP a los terminales de salida de intensidad del 5220A

Message 13

English: 5205A Output Cable to UUT

Español: Cable de salida del 5205A a UBP

Message 14

English: UUT to 5200A Output Terminals

Español: UBP a los terminales de salida del 5200A

Message 15

English: UUT to 5200A Sense Terminals

Español: UBP a los terminales de sense del 5200A

Message 16

English: 5215A Output Cable to UUT

Español: Cable de salida del 5215A a UBP

Message 17

English: UUT to 5440B Divider Terminals

Español: UBP a los terminales del divisor del 5440B

Message 18

English: UUT to 5440B Guard Terminal
Español: UBP a los terminales de guarda del 5440B

Message 19

English: UUT to 5440B Output Terminals
Español: UBP a los terminales de salida del 5440B

Message 20

English: UUT to 5440B Sense Terminals
Español: UBP a los terminales de sense del 5440B

Message 21

English: UUT to 5450A Sense Terminals
Español: UBP a los terminales de sense del 5450A

Message 22

English: UUT to 5450A Output Terminals
Español: UBP a los terminales de salida del 5450A

Message 23

English: UUT to 5450A Guard Terminal
Español: UBP al terminal de guarda del 5450A

Message 25

English: UUT to 6060 RF Output
Español: UBP a la salida RF del 6060

Message 29

English: UUT to 8502/5 Ohms Sense Terminals
Español: UBP a los terminales sense de Ohmios del 8202/5

Message 30

English: UUT to 8502/5 Ohms Source Terminals
Español: UBP a los terminales fuente de Ohmios del 8205/5

Message 32

English: UUT to 8506A Volts Input Terminals
Español: UBP a los terminales de entrada Voltios del 8506A

Message 33

English: UUT to 8506A Amps Input Terminals
Español: UBP a los terminales de entrada Amperios del 8506A

Message 44

English: UUT to IEEE-488 Port 1
Español: UBP al puerto IEEE-488 1

Message 45

English: UUT to COM1
Español: UBP al COM1

Message 46

English: UUT to 5220A Current Output Terminals
Español: UBP a los terminales de salida de intensidad del 5220A

Message 47

English: UUT to 5700A Output Terminals
Español: UBP a los terminales de salida del 5700A

Message 48

English: UUT to 5700A Sense Terminals
Español: UBP a los terminales sense del 5700A

Message 49

English: UUT to 5700A Aux Current Output
Español: UBP al terminal auxiliar de intensidad del 5700A

Message 50

English: UUT to 5700A Wideband Output
Español: UBP a la salida de ancho de banda del 5700A

Message 51

English: UUT to 5700A Guard Terminal
Español: UBP al terminal de guarda del 5700A

Message 52

English: UUT to 5700A Output Terminals using external AC Divider
Español: UBP a los terminales de salida del 5700A usando divisor externo AC

Message 53

English: UUT to 5725A Current Output Terminals
Español: UBP a los terminales de salida de intensidad del 5725A

Message 54

English: UUT to 5220A Current Output Terminals
Español: UBP a los terminales de salida de intensidad del 5220A

Message 55

English: 5205A Output Cable to UUT
Español: Cable de salida del 5205A a UBP

Message 56

English: 5215A Output Cable to UUT
Español: Cable de salida del 5215A a UBP

Message 57

English: 5215A Output Cable to UUT
Español: Cable de salida del 5215A a UBP

Message 58

English: UUT to 8502/5 Volts Input Terminals
Español: UBP a los terminales de entrada de Voltios del 8502/5

Message 59

English: UUT to 8502/5 Amps Input Terminals
Español: UBP a los terminales de entrada de Amperios del 8502/5

Message 60

English: UUT to 8506A Ohms Sense Terminals
Español: UBP a los terminales Sense de Ohmios del 8506A

Message 61

English: UUT to 8506A Ohms Source Terminals
Español: UBP a los terminales fuente de Ohmios del 8506A

Message 62

English: UUT to 8842A Input Terminals using 40 kV Probe
Español: UBP a los terminales de entrada del 8842A usando sonda de 40 kV

Message 63

English: UUT to 8842A Input Terminals using 6 kV Probe
Español: UBP a los terminales de entrada del 8842A usando sonda de 6 kV

Message 64

English: UUT to 8842A Input Terminals
Español: UBP a los terminales de entrada del 8842A

Message 65

English: UUT to 8842A Sense Terminals
Español: UBP a los terminales Sense del 8842A

Message 66

English: UUT to 8842A 2A and LO Input Terminals
Español: UBP a los terminales de entrada 2A y LO del 8842A

Message 67

English: UUT to 3458A Input Terminals
Español: UBP a los terminales de entrada del 3458A

Message 68

English: UUT to 3458A Sense Terminals
Español: UBP a los terminales sense del 3458A

Message 69

English: UUT to 3458A 1A and LO Input Terminals
Español: UBP a los terminales de entrada 1A y LO del 3458A

Message 70

English: UUT to CG 5011 Output using Comparator Head
Español: UBP a la salida del CG 5011 usando la Cabeza Comparadora

Message 71

English: UUT to CG 5011 Output using Pulse Head
Español: UBP a la salida del CG 5011 usando la Cabeza de Pulso

Message 72

English: UUT to CG 5011 TRIGGER Output
Español: UBP a la salida de TRIGGER del CG 5011

Message 73

English: UUT to PM 5191 Output
Español: UBP a la entrada del PM 5191

Message 74

English: UUT to 8920A Input
Español: UBP a la entrada del 8920A

Message 75

English: UUT to PM 6666 Input A
Español: UBP a la entrada A del PM 6666

Message 76

English: UUT to PM 6666 Input C
Español: UBP a la entrada C del PM 6666

Message 77

English: UUT to PM 6666 Input A (for Ratio A/B measurement)
Español: UBP a la entrada A del PM 6666 (para medida de relación A/B)

Message 78

English: UUT to PM 6666 Input B (for Ratio A/B measurement)
Español: UBP a la entrada B del PM 6666 (para medida de relación A/B)

Message 79

English: UUT to PM 6666 Input A (for Time Interval A-B measurement)
Español: UBP a la entrada A del PM 6666 (para medida del intervalo de tiempo A-B)

Message 80

English: UUT to PM 6666 Input B (for Time Interval A-B measurement)
Español: UBP a la entrada B del PM 6666 (para medida del intervalo de tiempo A-B)

Message 81

English: UUT to SG 5030 OUTPUT using Leveling Head
Español: UBP al SG 5030 OUTPUT usando Cabeza Niveladora

Message 82

English: UUT to 5790A Input 1, reference voltage to 5790A Input 2
Español: UBP a la entrada 1 del 5790A, referencia de tensión a entrada 2 del 5790A

Message 83

English: UUT to 5790A Input 2, reference voltage to 5790A Input 1
Español: UBP a la entrada 2 del 5790A, referencia de tensióna entrada 1 del 5790A

Message 84

English: UUT to 5790A Input 1
Español: UBP a la entrada 1 del 5790A

Message 85

English: UUT to 5790A Input 2
Español: UBP a la entrada 2 del 5790A

Message 86

English: UUT to 5790A WIDEBAND Input
Español: UBP a la entrada 5790A WIDEBAND

Message 87

English: UUT to 5790A Shunt Input using A40-10mA shunt & 5790A-7001 adapter
Español: UBP a la entrada Shunt 5790A usando shunt A40-10mA y adaptador 5790A-7001

Message 88

English: UUT to 5790A Shunt Input using A40-20mA shunt & 5790A-7001 adapter
Español: UBP a la entrada Shunt 5790A usando shunt A40-20mA y adaptador 5790A-7001

Message 89

English: UUT to 5790A Shunt Input using A40-30mA shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-30mA y adaptador 5790A-7001

Message 90

English: UUT to 5790A Shunt Input using A40-50mA shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-50mA y adaptador 5790A-7001

Message 91

English: UUT to 5790A Shunt Input using A40-100mA shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-100mA y adaptador 5790A-7001

Message 92

English: UUT to 5790A Shunt Input using A40-200mA shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-200mA y adaptador 5790A-7001

Message 93

English: UUT to 5790A Shunt Input using A40-300mA shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-300mA y adaptador 5790A-7001

Message 94

English: UUT to 5790A Shunt Input using A40-500mA shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-500mA y adaptador 5790A-7001

Message 95

English: UUT to 5790A Shunt Input using A40-1A shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-1A y adaptador 5790A-7001

Message 96

English: UUT to 5790A Shunt Input using A40-2A shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-2A y adaptador 5790A-7001

Message 97

English: UUT to 5790A Shunt Input using A40-3A shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-3A y adaptador 5790A-7001

Message 98

English: UUT to 5790A Shunt Input using A40-5A shunt & 5790A-7001adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-5A y adaptador 5790A-7001

Message 99

English: UUT to 5790A Shunt Input using A40A-10A shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-10A y adaptador 5790A-7001

Message 100

English: UUT to 5790A Shunt Input using A40A-20A shunt & 5790A-7001 adapter

Español: UBP a la entrada Shunt 5790A usando shunt A40-20A y adaptador 5790A-7001

Message 101

English: UUT to PM 6680 Input A
Español: UBP a la entrada A del PM 6680

Message 102

English: UUT to PM 6680 Input C
Español: UBP a la entrada C del PM 6680

Message 103

English: UUT to PM 6680 Input A (for Ratio A/B measurement)
Español: UBP a la entrada A del PM 6680 (para medida de relación A/B)

Message 104

English: UUT to PM 6680 Input B (for Ratio A/B measurement)
Español: UBP a la entrada B del PM 6680 (para medida de relación A/B)

Message 105

English: UUT to PM 6680 Input A (for Time Interval A-B measurement)
Español: UBP a la entrada A del PM 6680 (para medida de intervalo de tiempo A-B)

Message 106

English: UUT to PM 6680 Input B (for Time Interval A-B measurement)
Español: UBP a la entrada B del PM 6680 (para medida de intervalo de tiempo A-B)

Message 107

English: UUT to 5790A SHUNT Input
Español: UBP a la entrada SHUNT del 5790A

Message 108

English: UUT to 5790A Input 1 using 792A-7004 adapter
Español: UBP a la entrada 1 del 5790A usando el adaptador 792A-7004

Message 109

English: UUT to 5790A Input 1 using A40-10mA shunt & 792A-7004 adapter
Español: UBP a la entrada 1 del 5790A usando el shunt A40-10mA y adaptador 792A-7004

Message 110

English: UUT to 5790A Input 1 using A40-20mA shunt & 792A-7004 adapter
Español: UBP a la entrada 1 del 5790A usando el shunt A40-20mA y adaptador 792A-7004

Message 111

English: UUT to 5790A Input 1 using A40-30mA shunt & 792A-7004 adapter
Español: UBP a la entrada 1 del 5790A usando el shunt A40-30mA y adaptador 792A-7004

Message 112

English: UUT to 5790A Input 1 using A40-50mA shunt & 792A-7004 adapter
Español: UBP a la entrada 1 del 5790A usando el shunt A40-50mA y adaptador 792A-7004

Message 113

English: UUT to 5790A Input 1 using A40-100mA shunt & 792A-7004 adapter
Español: UBP a la entrada 1 del 5790A usando el shunt A40-100mA y adaptador 792A-7004

Message 114

English: UUT to 5790A Input 1 using A40-200mA shunt & 792A-7004adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-200mA y adaptador 792A-7004

Message 115

English: UUT to 5790A Input 1 using A40-300mA shunt & 792A-7004 adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-300mA y adaptador 792A-7004

Message 116

English: UUT to 5790A Input 1 using A40-500mA shunt & 792A-7004 adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-500mA y adaptador 792A-7004

Message 117

English: UUT to 5790A Input 1 using A40-1A shunt & 792A-7004 adapter Español: UBP a la entrada 1 del 5790A usando el shunt A40-1A y adaptador 792A-7004

Message 118

English: UUT to 5790A Input 1 using A40-2A shunt & 792A-7004 adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-2A y adaptador 792A-7004

Message 119

English: UUT to 5790A Input 1 using A40-3A shunt & 792A-7004 adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-3A y adaptador 792A-7004

Message 120

English: UUT to 5790A Input 1 using A40-5A shunt & 792A-7004 adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-5A y adaptador 792A-7004

Message 121

English: UUT to 5790A Input 1 using A40A-10A shunt & 792A-7004 adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-10A y adaptador 792A-7004

Message 122

English: UUT to 5790A Input 1 using A40A-20A shunt & 792A-7004 adapter

Español: UBP a la entrada 1 del 5790A usando el shunt A40-20A y adaptador 792A-7004

Message 123

English: UUT to 5790A GUARD Terminal

Español: UBP al terminal de guarda del 5790A

Message 124

English: UUT to Fluke 45 Volt-Ohm-Diode and COM Input Terminals

Español: UBP a los terminales de entrada Volt-Ohm-Diode y COM del Fluke 45

Message 125

English: UUT to Fluke 45 100mA and COM Input Terminals

Español: UBP a los terminales de entrada 100mA y COM del Fluke 45

Message 126

English: UUT to Fluke 45 10A and COM Input Terminals

Español: UBP a los terminales de entrada 10A y COM del Fluke 45

Message 127

English: UUT to Fluke 45 Volt and COM Terminals using 6 kV Probe
Español: UBP a los terminales Volt y COM del Fluke 45 usando la sonda de 6 kV

Message 128

English: UUT to Fluke 45 Volt and COM Terminals using 40 kV Probe
Español: UBP a los terminales Volt y COM del Fluke 45 usando la sonda de 40 kV

Message 129

English: 5205A Output Cable to UUT
Español: Cable de salida del 5205 a la UBP

Message 130

English: UUT to 5500A NORMAL Output Terminals using external AC Divider
Español: UBP a los terminales de salida NORMAL del 5500A usando divisor externo AC

Message 131

English: UUT to 5500A NORMAL Output Terminals
Español: UBP a los terminales de salida NORMAL del 5500A

Message 132

English: UUT to 5500A AUX Output Terminals
Español: UBP a los terminales de salida AUX del 5500A

Message 133

English: UUT to 5500A SCOPE Output
Español: UBP a la salida SCOPE del 5500A

Message 134

English: UUT to 5500A TRIG OUT
Español: UBP al terminal TRIG OUT del 5500A

Message 135

English: UUT to 5500A GUARD Terminal
Español: UBP al terminal de guarda del 5500A

Message 136

English: UUT to 5500A TC Terminals
Español: UBP a los terminales TC del 5500A

Message 137

English: UUT to 5500A TC Terminals using copper wire
Español: UBP a los terminales TC del 5500A usando hilo de cobre

Message 138

English: UUT to 5500A TC Terminals using type B thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo B

Message 139

English: UUT to 5500A TC Terminals using type C thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo C

Message 140

English: UUT to 5500A TC Terminals using type E thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo E

Message 141

English: UUT to 5500A TC Terminals using type J thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo J

Message 142

English: UUT to 5500A TC Terminals using type K thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo K

Message 143

English: UUT to 5500A TC Terminals using type N thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo N

Message 144

English: UUT to 5500A TC Terminals using type R thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo R

Message 145

English: UUT to 5500A TC Terminals using type S thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo S

Message 146

English: UUT to 5500A TC Terminals using type T thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo T

Message 147

English: Type B Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo B a los terminales TC del 5500A

Message 148

English: Type C Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo C a los terminales TC del 5500A

Message 149

English: Type E Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo E a los terminales TC del 5500A

Message 150

English: Type J Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo J a los terminales TC del 5500A

Message 151

English: Type K Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo K a los terminales TC del 5500A

Message 152

English: Type N Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo N a los terminales TC del 5500A

Message 153

English: Type R Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo R a los terminales TC del 5500A

Message 154

English: Type S Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo S a los terminales TC del 5500A

Message 155

English: Type T Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo T a los terminales TC del 5500A

Message 156

English: UUT to 5500A NORMAL and AUX Terminals (3-wire configuration)
Español: UBP a los terminales AUX y NORMAL del 5500A (configuración 3-hilos)

Message 157

English: UUT to 5725A Current Output Terminals
Español: UBP a los terminales de salida de intensidad del 5725A

Message 158

English: UUT to PM 6681 Input A
Español: UBP a la entrada A del PM 6681

Message 159

English: UUT to PM 6681 Input C
Español: UBP a la entrada C del PM 6681

Message 160

English: UUT to PM 6681 Input A (for Ratio A/B measurement)
Español: UBP a la entrada A del PM 6681 (para medida de relación A/B)

Message 161

English: UUT to PM 6681 Input B (for Ratio A/B measurement)
Español: UBP a la entrada B del PM 6681 (para medida de relación A/B)

Message 162

English: UUT to PM 6681 Input A (for Time Interval A-B measurement)
Español: UBP a la entrada A del PM 6681 (para medida de intervalo de tiempo A-B)

Message 163

English: UUT to PM 6681 Input B (for Time Interval A-B measurement)
Español: UBP a la entrada B del PM 6681 (para medida de intervalo de tiempo A-B)

Message 164

English: UUT to PM 6685 Input A
Español: UBP a la entrada A del PM 6685

Message 165

English: UUT to PM 6685 Input C
Español: UBP a la entrada C del PM 6685

Message 166

English: UUT to PM 6685 Input C (for Ratio C/A measurement)
Español: UBP a la entrada C del PM 6685 (para medida de relación C/A)

Message 167

English: UUT to PM 6685 Input A (for Ratio C/A measurement)
Español: UBP a la entrada A del PM 6685 (para medida de relación C/A)

Message 168

English: UUT to HP 6060B Input Terminals
Español: UBP a los terminales de entrada del HP 6060B

Message 169

English: UUT to HP 6063B Input Terminals
Español: UBP a los terminales de entrada del HP 6063B

Message 170

English: UUT to PM 5192 Output
Español: UBP a la salida del PM 5192

Message 171

English: UUT to PM 5193 Output
Español: UBP a la salida del PM 5193

Message 172

English: UUT to COM2
Español: UBP al COM2

Message 173

English: UUT to COM3
Español: UBP al COM3

Message 174

English: UUT to COM4
Español: UBP al COM4

Message 175

English: UUT to 5500A UUT serial port
Español: UBP al puerto serie del 5500A (UUT serial port)

Message 176

English: UUT to 5130A Output Terminals using external AC Divider
Español: UBP a los terminales de salida del 5130A usando divisor externo AC

Message 177

English: UUT to 5130A Output Terminals
Español: UBP a los terminales de salida del 5130A

Message 178

English: UUT to 5130A Sense Terminals
Español: UBP a los terminales Sense del 5130A

Message 179

English: UUT to 5220A Current Output Terminals
Español: UBP a los terminales de intensidad del 5220A

Message 180

English: 5205A Output Cable to UUT
Español: El cable de salida del 5205A a UBP

Message 181

English: 5215A Output Cable to UUT
Español: El cable de salida del 5215A a la UBP

Message 182

English: UUT to 5720A Output Terminals
Español: UBP a los terminales de salida del 5720A

Message 183

English: UUT to 5720A Sense Terminals
Español: UBP a los terminales Sense del 5720A

Message 184

English: UUT to 5720A Aux Current Output
Español: UBP al terminal de salida de intensidad Aux del 5720A

Message 185

English: UUT to 5720A Wideband Output
Español: UBP a la salida de ancho de banda del 5720A

Message 186

English: UUT to 5720A Guard Terminal
Español: UBP al terminal de guarda del 5720A

Message 187

English: UUT to 5720A Output Terminals using external AC Divider
Español: UBP a los terminales de salida del 5720A usando divisor externo AC

Message 188

English: UUT to 5500A TC Terminals using type L thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo L

Message 189

English: UUT to 5500A TC Terminals using type U thermocouple wire
Español: UBP a los terminales TC del 5500A usando termopar tipo U

Message 190

English: Type L Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo L a los terminales TC del 5500A

Message 191

English: Type U Thermocouple Standard to 5500A TC Terminals
Español: Termopar estándar tipo U a los terminales TC del 5500A

Message 192

English: UUT to 34401A Input Terminals
Español: UBP a los terminales de entrada del 34401A

Message 193

English: UUT to 34401A Sense Terminals
Español: UBP a los terminales Sense del 34401A

Message 194

English: UUT to 34401A 3A and LO Input Terminals
Español: UBP a los terminales de entrada 3A y LO del 34401A

Message 195

English: UUT to 2000 Input Terminals
Español: UBP a los terminales de entrada del 2000

Message 196

English: UUT to 2000 Sense Terminals
Español: UBP a los terminales de Sense del 2000

Message 197

English: UUT to 2000 3A and LO Input Terminals
Español: UBP a los terminales de entrada 3A y LO del 2000

Message 198

English: UUT to 2001 Input Terminals
Español: UBP a los terminales de entrada del 2001

Message 199

English: UUT to 2001 Sense Terminals
Español: UBP a los terminales Sense del 2001

Message 200

English: UUT to 2001 2A and LO Input Terminals
Español: UBP a los terminales de entrada 2A y LO del 2001

Message 201

English: UUT to 2002 Input Terminals
Español: UBP a los terminales de entrada del 2002

Message 202

English: UUT to 2002 Sense Terminals
Español: UBP a los terminales Sense del 2002

Message 203

English: UUT to 2002 2A and LO Input Terminals
Español: UBP a los terminales de entrada 2A y LO del 2002

Message 204

English: UUT to 2001 Input and Sense Terminals (3-wire configuration)
Español: UBP a los terminales entrada y Sense del 2001 (configuración 3-hilos)

Message 205

English: UUT to 2002 Input and Sense Terminals (3-wire configuration)
Español: UBP a los terminales entrada y Sense del 2002 (configuración 3-hilos)

Message 206

English: UUT to 34420A Channel 1 using Low Thermal Input Cable
Español: UBP al canal 1 del 34420A usando cable Low Thermal

Message 207

English: UUT to 34420A Channel 2 using Low Thermal Input Cable
Español: UBP al canal 2 del 34420A usando cable Low Thermal

Message 208

English: UUT to 5500A SCOPE Output using Tunnel Diode Pulser
Español: UBP a la salida SCOPE del 5500A usando Diodo Túnel

Message 209

English: UUT to SG 5050 OUTPUT using Leveling Head
Español: UBP a la salida del SG 5050 usando Cabeza Niveladora

Message 210

English: UUT to 3325B Output
Español: UBP a la salida del 3325B

Message 211

English: UUT to 3325B Output with 50 Ohm termination
Español: UBP a la salida del 3325B con carga de 50 Ohmios

Message 212

English: UUT to 5520A NORMAL Output Terminals using external AC Divider
Español: UBP a los terminales NORMAL del 5520A usando divisor externo AC

Message 213

English: UUT to 5520A NORMAL Output Terminals
Español: UBP a los terminales de salida NORMAL del 5520A

Message 214

English: UUT to 5520A AUX Output Terminals
Español: UBP a los terminales de salida AUX del 5520A

Message 215

English: UUT to 5520A SCOPE Output
Español: UBP a la salida SCOPE del 5520A

Message 216

English: UUT to 5520A TRIG OUT
Español: UBP a la salida TRIG OUT del 5520A

Message 217

English: UUT to 5520A GUARD Terminal
Español: UBP al terminal GUARD del 5520A

Message 218

English: UUT to 5520A TC Terminals
Español: UBP a los terminales TC del 5520A

Message 219

English: UUT to 5520A TC Terminals using copper wire
Español: UBP a los terminales TC del 5520A usando hilo de cobre

Message 220

English: UUT to 5520A TC Terminals using type B thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar B

Message 221

English: UUT to 5520A TC Terminals using type C thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar C

Message 222

English: UUT to 5520A TC Terminals using type E thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar E

Message 223

English: UUT to 5520A TC Terminals using type J thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar J

Message 224

English: UUT to 5520A TC Terminals using type K thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar K

Message 225

English: UUT to 5520A TC Terminals using type L thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar L

Message 226

English: UUT to 5520A TC Terminals using type N thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar N

Message 227

English: UUT to 5520A TC Terminals using type R thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar R

Message 228

English: UUT to 5520A TC Terminals using type S thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar S

Message 229

English: UUT to 5520A TC Terminals using type T thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar T

Message 230

English: UUT to 5520A TC Terminals using type U thermocouple wire
Español: UBP a los terminales TC del 5520A usando cable termopar U

Message 231

English: Type B Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo B a los terminales TC del 5520A

Message 232

English: Type C Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo C a los terminales TC del 5520A

Message 233

English: Type E Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo E a los terminales TC del 5520A

Message 234

English: Type J Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo J a los terminales TC del 5520A

Message 235

English: Type K Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo K a los terminales TC del 5520A

Message 236

English: Type L Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo L a los terminales TC del 5520A

Message 237

English: Type N Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo N a los terminales TC del 5520A

Message 238

English: Type R Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo R a los terminales TC del 5520A

Message 239

English: Type S Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo S a los terminales TC del 5520A

Message 240

English: Type T Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo T a los terminales TC del 5520A

Message 241

English: Type U Thermocouple Standard to 5520A TC Terminals
Español: Termopar estándar tipo U a los terminales TC del 5520A

Message 242

English: UUT to 5520A NORMAL and AUX Terminals (3-wire configuration)
Español: UBP a los terminales NORMAL y AUX del 5520A (configuración 3-hilos)

Message 243

English: UUT to 5520A UUT serial port
Español: UBP al puerto serie UBP del 5520A (UUT serial port)

Message 244

English: UUT to 5520A SCOPE Output using Tunnel Diode Pulser
Español: UBP a la salida SCOPE del 5520A usando el Diodo Túnel

Message 245

English: UUT to 5520A 20A Current Terminals
Español: UBP a los terminales de intensidad de 20A del 5520A

Message 246

English: 1mV/deg C Temperature Probe to 5520A TC Terminals
Español: Sonda de temperatura 1mV/ºC a los terminales TC del 5520A

Message 247

English: 1mV/deg F Temperature Probe to 5520A TC Terminals
Español: Sonda de temperatura 1mV/ºF a los terminales TC del 5520A

Message 248

English: 1mV/%%rh Humidity Probe to 5520A TC Terminals
Español: Sonda de humedad 1mV/%%rh a los terminales TC del 5520A

Message 249

English: UUT to 5800A Channel 1
Español: UBP al canal 1 del 5800A

Message 250

English: UUT to 5800A Channel 2
Español: UBP al canal 2 del 5800A

Message 251

English: UUT to 5800A Channel 3
Español: UBP al canal 3 del 5800A

Message 252

English: UUT to 5800A Channel 4
Español: UBP al canal 4 del 5800A

Message 253

English: UUT to 5800A Channel 5
Español: UBP al canal 5 del 5800A

Message 255

English: UUT to 5800A Channel 1 using Tunnel Diode Pulser
Español: UBP al canal 1 del 5800A usando el Diodo Túnel

Message 256

English: UUT to 5800A Channel 2 using Tunnel Diode Pulser
Español: UBP al canal 2 del 5800A usando el Diodo Túnel

Message 257

English: UUT to 5800A Channel 3 using Tunnel Diode Pulser
Español: UBP al canal 3 del 5800A usando el Diodo Túnel

Message 258

English: UUT to 5800A Channel 4 using Tunnel Diode Pulser
Español: UBP al canal 4 del 5800A usando el Diodo Túnel

Message 259

English: UUT to 5800A Channel 5 using Tunnel Diode Pulser
Español: UBP al canal 5 del 5800A usando el Diodo Túnel

Message 260

English: UUT to 5800A Channel 1 as trigger output
Español: UBP al canal 1 del 5800A como salida del trigger

Message 261

English: UUT to 5800A Channel 5 as trigger output
Español: UBP al canal 5 del 5800A como salida del trigger

Message 262

English: UUT to 700P01 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 700P01

Message 263

English: UUT to 700P02 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 700P02

Message 264

English: UUT to 700P22 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 700P22

Message 265

English: UUT to 700P03 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 700P03

Message 266

English: UUT to 700P23 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 700P23

Message 267

English: UUT to 700P04 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 700P04

Message 268

English: UUT to 700P24 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 700P24

Message 269

English: UUT to 700P05 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 700P05

Message 270

English: UUT to 700P06 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 700P06

Message 271

English: UUT to 700P07 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 700P07

Message 272

English: UUT to 700P08 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 700P08

Message 273

English: UUT to 700P09 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 700P09

Message 274

English: UUT to 700PA3 Absolute Pressure Module
Español: UBP al Módulo de Presión Absoluta 700PA3

Message 275

English: UUT to 700PA4 Absolute Pressure Module
Español: UBP al Módulo de Presión Absoluta 700PA4

Message 276

English: UUT to 700PA5 Absolute Pressure Module
Español: UBP al Módulo de Presión Absoluta 700PA5

Message 277

English: UUT to 700PA6 Absolute Pressure Module
Español: UBP al Módulo de Presión Absoluta 700PA6

Message 278

English: UUT to 700PV3 Vacuum Module
Español: UBP al Módulo de vació 700PV3

Message 279

English: UUT to 700PV4 Vacuum Module
Español: UBP al Módulo de vacío 700PV4

Message 280

English: UUT to 700PD2 Dual Pressure Module
Español: UBP al Módulo de Presión Dual 700PD2

Message 281

English: UUT to 700PD3 Dual Pressure Module
Español: UBP al Módulo de Presión Dual 700PD3

Message 282

English: UUT to 700PD4 Dual Pressure Module
Español: UBP al Módulo de Presión Dual 700PD4

Message 283

English: UUT to 700PD5 Dual Pressure Module
Español: UBP al Módulo de Presión Dual 700PD5

Message 284

English: UUT to 700PD6 Dual Pressure Module
Español: UBP al Módulo de Presión Dual 700PD6

Message 285

English: UUT to 700PD7 Dual Pressure Module
Español: UBP al Módulo de Presión Dual 700PD7

Message 286

English: UUT to 700P29 High Pressure Module
Español: UBP al Módulo de Presión Dual 700P29

Message 287

English: UUT to 700P30 High Pressure Module
Español: UBP al Módulo de Presión Dual 700P30

Message 288

English: UUT to 700P31 High Pressure Module
Español: UBP al Módulo de Presión Dual 700P31

Message 289

English: 700P01 Differential Pressure Module for zero measurement
Español: 700P01 Módulo de Presión Diferencial para medida de cero

Message 290

English: 700P02 Differential Pressure Module for zero measurement
Español: 700P02 Módulo de Presión Diferencial para medida de cero

Message 291

English: 700P22 Differential Pressure Module for zero measurement
Español: 700P22 Módulo de Presión Diferencial para medida de cero

Message 292

English: 700P03 Differential Pressure Module for zero measurement
Español: 700P03 Módulo de Presión Diferencial para medida de cero

Message 293

English: 700P23 Differential Pressure Module for zero measurement
Español: 700P23 Módulo de Presión Diferencial para medida de cero

Message 294

English: 700P04 Differential Pressure Module for zero measurement
Español: 700P04 Módulo de Presión Diferencial para medida de cero

Message 295

English: 700P24 Differential Pressure Module for zero measurement
Español: 700P24 Módulo de Presión Diferencial para medida de cero

Message 296

English: 700P05 Gage Pressure Module for zero measurement
Español: 700P05 Módulo Indicador de Presión para medida de cero

Message 297

English: 700P06 Gage Pressure Module for zero measurement
Español: 700P06 Módulo Indicador de Presión para medida de cero

Message 298

English: 700P07 Gage Pressure Module for zero measurement
Español: 700P07 Módulo Indicador de Presión para medida de cero

Message 299

English: 700P08 Gage Pressure Module for zero measurement
Español: 700P08 Módulo Indicador de Presión para medida de cero

Message 300

English: 700P09 Gage Pressure Module for zero measurement
Español: 700P09 Módulo Indicador de Presión para medida de cero

Message 301

English: 700PA3 Absolute Pressure Module for zero measurement
Español: 700PA3 Módulo Indicador de Presión para medida de cero

Message 302

English: 700PA4 Absolute Pressure Module for zero measurement
Español: 700PA4 Módulo Indicador de Presión para medida de cero

Message 303

English: 700PA5 Absolute Pressure Module for zero measurement
Español: 700PA5 Módulo Indicador de Presión para medida de cero

Message 304

English: 700PA6 Absolute Pressure Module for zero measurement
Español: 700PA6 Módulo Indicador de Presión para medida de cero

Message 305

English: 700PV3 Vacuum Module for zero measurement
Español: 700PV3 Módulo de Vacío para medida de cero

Message 306

English: 700PV4 Vacuum Module for zero measurement
Español: 700PV4 Módulo de Vacío para medida de cero

Message 307

English: 700PD2 Dual Pressure Module for zero measurement
Español: 700PD2 Módulo de Presión Dual para medida de cero

Message 308

English: 700PD3 Dual Pressure Module for zero measurement
Español: 700PD3 Módulo de Presión Dual para medida de cero

Message 309

English: 700PD4 Dual Pressure Module for zero measurement
Español: 700PD4 Módulo de Presión Dual para medida de cero

Message 310

English: 700PD5 Dual Pressure Module for zero measurement
Español: 700PD5 Módulo de Presión Dual para medida de cero

Message 311

English: 700PD6 Dual Pressure Module for zero measurement
Español: 700PD6 Módulo de Presión Dual para medida de cero

Message 312

English: 700PD7 Dual Pressure Module for zero measurement
Español: 700PD7 Módulo de Presión Dual para medida de cero

Message 313

English: 700P29 High Pressure Module for zero measurement
Español: 700P29 Módulo de Alta Presión para medida de cero

Message 314

English: 700P30 High Pressure Module for zero measurement
Español: 700P30 Módulo de Alta Presión para medida de cero

Message 315

English: 700P31 High Pressure Module for zero measurement
Español: 700P31 Módulo de Alta Presión para medida de cero

Message 316

English: UUT to 8901A Input
Español: UBP a Entrada del 8901A

Message 317

English: 8901A Input to 8901A Calibration Output
Español: Entrada 8901A a Salida Calibración 8901A

Message 318

English: 11722A Sensor Module to UUT Español: Módulo Sensor del 11722A a la UBP

Message 319

English: 11722A Sensor Module to 8901B AM/FM Calibration Output
Español: Módulo Sensor 11722A a Salida Calibración 8901B AM/FM

Message 320

English: 11722A Sensor Module to 8902A AM/FM Calibration Output
Español: Módulo Sensor 11722A a Salida Calibración 8902A AM/FM

Message 321

English: 11722A Sensor Module to 8901B RF Power Calibration Output
Español: Módulo Sensor 11722A a Salida Calibración 8901B RF Power

Message 322

English: 11722A Sensor Module to 8902A RF Power Calibration Output
Español: Módulo Sensor 11722A a Salida Calibración 8902A RF Power

Message 323

English: UUT to 8903B Input High
Español: UBP a la entrada HIGH del 8903B

Message 324

English: UUT to 8903E Input High
Español: UBP a la entrada HIGH del 8903E

Message 325

English: UUT to 8903B Output High
Español: UBP a la salida HIGH del 8903B

Message 326

English: UUT to 4000 Hi and Lo Output Terminals
Español: UBP a los Terminales Output Hi y Lo del 4000

Message 327

English: UUT to 4000 I+ and I- Output Terminals
Español: UBP a los Terminales Output I+ e I- del 4000

Message 328

English: UUT to 4000 I+ and I- as Sense Terminals
Español: UBP a los Terminales Sense I+ e I- del 4000

Message 329

English: UUT to 4200 Hi and Lo Output Terminals
Español: UBP a los Terminales Output Hi y Lo del 4200

Message 330

English: UUT to 4200 I+ and I- Output Terminals
Español: UBP a los Terminales Output I+ e I- del 4200

Message 331

English: UUT to 4200 I+ and I- as Sense Terminals
Español: UBP a los Terminales Sense I+ e I- del 4200

Message 332

English: UUT to 4600 I+ and I- Output Terminals
Español: UBP a los Terminales Output I+ e I- del 4600

Message 333

English: UUT to 4700 Hi and Lo Output Terminals
Español: UBP a los Terminales Output Hi y Lo del 4700

Message 334

English: UUT to 4700 I+ and I- Output Terminals
Español: UBP a los Terminales Output I+ e I- del 4700

Message 335

English: UUT to 4700 I+ and I- as Sense Terminals
Español: UBP a los Terminales Sense I+ e I- del 4700

Message 336

English: UUT to 4708 Hi and Lo Output Terminals
Español: UBP a los Terminales Output Hi y Lo del 4708

Message 337

English: UUT to 4708 I+ and I- Output Terminals
Español: UBP a los Terminales Output I+ e I- del 4708

Message 338

English: UUT to 4708 I+ and I- as Sense Terminals
Español: UBP a los Terminales Sense I+ e I- del 4708

Message 339

English: UUT to 8648 RF Output
Español: UBP a la salida RF Output del 8648

Message 340

English: UUT to 2023 RF Output
Español: UBP a la salida RF Output del 2023

Message 341

English: UUT to 2024 RF Output
Español: UBP a la salida RF Output del 2024

Message 342

English: UUT to SYM01 RF Output
Español: UBP a la salida RF Output del SMY01

Message 343

English: UUT to SYM02 RF Output
Español: UBP a la salida RF Output del SMY02

Message 344

English: 8481B Power Sensor to UUT
Español: Sensor de Potencia 8481B a la UBP

Message 345

English: 8482B Power Sensor to UUT
Español: Sensor de Potencia 8482B a la UBP

Message 346

English: 8481B Power Sensor to Power Ref Output
Español: Sensor de Potencia 8481B a Power Ref Output

Message 347

English: 8482B Power Sensor to Power Ref Output
Español: Sensor de Potencia 8482B a Power Ref Output

Message 348

English: 8481H Power Sensor to UUT
Español: Sensor de Potencia 8481H a la UBP

Message 349

English: 8482H Power Sensor to UUT
Español: Sensor de Potencia 8482H a la UBP

Message 350

English: 8481H Power Sensor to Power Ref Output
Español: Sensor de Potencia 8481H a Power Ref Output

Message 351

English: 8482H Power Sensor to Power Ref Output
Español: Sensor de Potencia 8482H a Power Ref Output

Message 352

English: 8481A Power Sensor to UUT
Español: Sensor de Potencia 8481A a la UBP

Message 353

English: 8482A Power Sensor to UUT
Español: Sensor de Potencia 8482A a la UBP

Message 354

English: 8483A Power Sensor to UUT
Español: Sensor de Potencia 8483A a la UBP

Message 355

English: 8485A Power Sensor to UUT
Español: Sensor de Potencia 8485A a la UBP

Message 356

English: 8487A Power Sensor to UUT
Español: Sensor de Potencia 8487A a la UBP

Message 357

English: Q8486A Power Sensor to UUT
Español: Sensor de Potencia Q8486A a la UBP

Message 358

English: R8486A Power Sensor to UUT
Español: Sensor de Potencia R8486A a la UBP

Message 359

English: W8486A Power Sensor to UUT
Español: Sensor de Potencia W8486A a la UBP

Message 360

English: 8481A Power Sensor to Power Ref Output
Español: Sensor de Potencia 8481A a Power Ref Output

Message 361

English: 8482A Power Sensor to Power Ref Output
Español: Sensor de Potencia 8482A a Power Ref Output

Message 362

English: 8483A Power Sensor to Power Ref Output
Español: Sensor de Potencia 8483A a Power Ref Output

Message 363

English: 8485A Power Sensor to Power Ref Output
Español: Sensor de Potencia 8485A a Power Ref Output

Message 364

English: 8487A Power Sensor to Power Ref Output
Español: Sensor de Potencia 8487A a Power Ref Output

Message 365

English: Q8486A Power Sensor to Power Ref Output
Español: Sensor de Potencia Q8486A a Power Ref Output

Message 366

English: R8486A Power Sensor to Power Ref Output
Español: Sensor de Potencia R8486A a Power Ref Output

Message 367

English: W8486A Power Sensor to Power Ref Output
Español: Sensor de Potencia W8486A a Power Ref Output

Message 368

English: 8481D Power Sensor to UUT
Español: Sensor de Potencia 8481D a la UBP

Message 369

English: 8484A Power Sensor to UUT
Español: Sensor de Potencia 8484A a la UBP

Message 370

English: 8485D Power Sensor to UUT
Español: Sensor de Potencia 8485D a la UBP

Message 371

English: 8487D Power Sensor to UUT
Español: Sensor de Potencia 8487D a la UBP

Message 372

English: Q8486D Power Sensor to UUT
Español: Sensor de Potencia Q8486D a la UBP

Message 373

English: R8486D Power Sensor to UUT
Español: Sensor de Potencia R8486D a la UBP

Message 374

English: 8481D Power Sensor to Power Ref Output using 30dB attenuator
Español: Sensor pot. 8481D al Power Ref Output usando atenuador 30dB

Message 375

English: 8484A Power Sensor to Power Ref Output using 30dB attenuator
Español: Sensor pot. 8484A al Power Ref Output usando atenuador 30dB

Message 376

English: 8485D Power Sensor to Power Ref Output using 30dB attenuator
Español: Sensor pot. 8485D al Power Ref Output usando atenuador 30dB

Message 377

English: 8487D Power Sensor to Power Ref Output using 30dB attenuator
Español: Sensor pot. 8487D al Power Ref Output usando atenuador 30dB

Message 378

English: Q8486D Power Sensor to Power Ref Output using 30dB attenuator
Español: Sensor pot. Q8486D al Power Ref Output usando atenuador 30dB

Message 379

English: R8486D Power Sensor to Power Ref Output using 30dB attenuator
Español: Sensor pot. R8486D al Power Ref Output usando atenuador 30dB

Message 380

English: UUT to 5335A Input A

Español: UBP a la entrada A del 5335A

Message 381

English: UUT to 5335A Input C

Español: UBP a la entrada C del 5335A

Message 382

English: UUT to 5335A Input A (for Ratio A/B measurement)

Español: UBP a la entrada A del 5335A (para medida de relación A/B)

Message 383

English: UUT to 5335A Input B (for Ratio A/B measurement)

Español: UBP a la entrada B del 5335A (para medida de relación A/B)

Message 384

English: UUT to 5335A Input A (for Time Interval A-B measurement)

Español: UBP a la entrada A del 5335A (para medida Intervalo de tiempo A-B)

Message 385

English: UUT to 5335A Input B (for Time Interval A-B measurement)

Español: UBP a la entrada B del 5335A (para medida Intervalo de tiempo A-B)

Message 386

English: UUT to 5335A DCV and COM Input Terminals

Español: UBP a las entradas DCV y COM del 5335A

Message 387

English: UUT to 856X Input

Español: UBP a la Entrada 856X

Message 388

English: UUT to 8566B RF Input

Español: UBP a la Entrada RF del 8566B

Message 389

English: UUT to 8568B Signal Input 1

Español: UBP a la Señal de Entrada 1 del 8568B

Message 390

English: UUT to 8568B Signal Input 2

Español: UBP a la Señal de Entrada 2 del 8568B

Message 391

English: UUT to 859X Input

Español: UBP a la entradaa del 859X

Message 392

English: UUT to 5820A Channel 1

Español: UBP al Canal 1 del 5820A

Message 393

English: UUT to 5820A Channel 2

Español: UBP al Canal 2 del 5820A

Message 394
English: UUT to 5820A Channel 3
Español: UBP al Canal 3 del 5820A

Message 395
English: UUT to 5820A Channel 4
Español: UBP al Canal 4 del 5820A

Message 396
English: UUT to 5820A Channel 5
Español: UBP al Canal 5 del 5820A

Message 397
English: UUT to 5820A Channel 1 using Tunnel Diode Pulser
Español: UBP al Canal 1 del 5820A usando el Diodo Túnel

Message 398
English: UUT to 5820A Channel 2 using Tunnel Diode Pulser
Español: UBP al Canal 2 del 5820A usando el Diodo Túnel

Message 399
English: UUT to 5820A Channel 3 using Tunnel Diode Pulser
Español: UBP al Canal 3 del 5820A usando el Diodo Túnel

Message 400
English: UUT to 5820A Channel 4 using Tunnel Diode Pulser
Español: UBP al Canal 4 del 5820A usando el Diodo Túnel

Message 401
English: UUT to 5820A Channel 5 using Tunnel Diode Pulser
Español: UBP al Canal 5 del 5820A usando el Diodo Túnel

Message 402
English: UUT to 5820A Channel 1 as trigger output
Español: UBP al Canal 1 del 5820A como salida trigger

Message 403
English: UUT to 5820A Channel 5 as trigger outpu
Español: UBP al Canal 5 del 5820A como salida trigger

Message 404
English: Insert 2620T Temperature Probe
Español: Inserte la sonda de temperatura en el 2620T

Message 405
English: Insert 2635T Temperature Probe
Español: Inserte la sonda de temperatura en el 2635T

Message 406
English: UUT to 33120A Output
Español: UBP a la salida del 33120A

Message 407
English: UUT to 33120A Output with 50 Ohm termination
Español: UBP a la salida del 33120A con terminación de 50 Ohmios

Message 408

English: Insert Rosemount 162CE SPRT Probe
Español: Inserte la sonda SPRT Rosemount 162CE

Message 409

English: Insert Hart Scientific 5628 PRT Probe
Español: Inserte la sonda PRT Hart Scientific 5628

Message 410

English: UUT to 9500 Channel 1 Active Head

Message 411

English: UUT to 9500 Channel 2 Active Head

Message 412

English: UUT to 9500 Channel 3 Active Head

Message 413

English: UUT to 9500 Channel 4 Active Head

Message 414

English: UUT to 9500 Channel 5 Active Head

Message 415

English: UUT to 9500 Channel 1 Trigger Cable

Message 416

English: UUT to 9500 Channel 2 Trigger Cable

Message 417

English: UUT to 9500 Channel 3 Trigger Cable

Message 418

English: UUT to 9500 Channel 4 Trigger Cable

Message 419

English: UUT to 9500 Channel 5 Trigger Cable

Message 420

English: UUT Probe to 9500 Channel 1 Active Head using Current Loop Assembly

Message 421

English: UUT Probe to 9500 Channel 2 Active Head using Current Loop Assembly

Message 422

English: UUT Probe to 9500 Channel 3 Active Head using Current Loop Assembly

Message 423

English: UUT Probe to 9500 Channel 4 Active Head using Current Loop Assembly

Message 424

English: UUT Probe to 9500 Channel 5 Active Head using Current Loop Assembly

Message 425

English: UUT to 4800 Hi and Lo Output Terminals

Message 426

English: UUT to 4800 I+ and I- Output Terminals

Message 427

English: UUT to 4800 I+ and I- as Sense Terminals

Message 428
English: UUT to 4805 Hi and Lo Output Terminals
Message 429
English: UUT to 4805 I+ and I- Output Terminals
Message 430
English: UUT to 4805 I+ and I- as Sense Terminals
Message 431
English: UUT to 4808 Hi and Lo Output Terminals
Message 432
English: UUT to 4808 I+ and I- Output Terminals
Message 433
English: UUT to 4808 I+ and I- as Sense Terminals
Message 434
English: UUT to 4705 Hi and Lo Output Terminals
Message 435
English: UUT to 4705 I+ and I- Output Terminals
Message 436
English: UUT to 4705 I+ and I- as Sense Terminals
Message 437
English: UUT to 4707 Hi and Lo Output Terminals
Message 438
English: UUT to 4707 I+ and I- Output Terminals
Message 439
English: UUT to 4707 I+ and I- as Sense Terminals
Message 440
English: UUT to 1271 Hi and Lo Input Terminals
Message 441
English: UUT to 1271 I+ and I- as Sense Terminals
Message 442
English: UUT to 1271 I+ and I- Input Terminals
Message 443
English: UUT to 1281 Hi and Lo Input Terminals
Message 444
English: UUT to 1281 I+ and I- as Sense Terminals
Message 445
English: UUT to 1281 I+ and I- Input Terminals
Message 446
English: UUT to 4950 Hi and Lo Input Terminals
Message 447
English: UUT to 4950 I+ and I- as Sense Terminals
Message 448
English: UUT to 4950 I+ and I- Input Terminals

Message 449

English: 4953 AC/DC Shunt Hi and Lo Terminals to 4950 Hi and Lo Terminals

Message 450

English: UUT to 4953 I+ and I- Input Terminals

Message 451

English: UUT to 9005 Red Lead (Hi and sH)

Message 452

English: UUT to 9005 Black Lead (sH and LI-)

Message 453

English: UUT to 9005 Yellow Lead (I+20A)

Message 454

English: UUT to 9005 White Lead (I+mA)

Message 455

English: UUT to 9005 TC Terminals

Message 456

English: UUT to 9105 Red Lead (Hi and sH)

Message 457

English: UUT to 9105 Black Lead (sH and LI-)

Message 458

English: UUT to 9105 Yellow Lead (I+20A)

Message 459

English: UUT to 9105 White Lead (I+mA)

Message 460

English: UUT to 9105 Thermocouple Adapter

Message 461

English: UUT to 9100 Hi and Lo Output Terminals

Message 462

English: UUT to 9100 I+ and I- Output Terminals

Message 463

English: Option 200 10-Turn coil to 9100 I+ and I- Output Terminals. Clamp UUT around the center of the coil.

Message 464

English: Option 200 50-Turn coil to 9100 I+ and I- Output Terminals. Clamp UUT around the center of the coil.

Message 465

English: UUT to 9100 SIG OUT (on rear).

Message 466

English: UUT to 525A Hi and Lo Volts Source Terminals

Message 467

English: UUT to 525A Hi and Lo mA Source Terminals

Message 468

English: UUT to 525A Hi and Lo RTD/Ohms Source Terminals

Message 469

English: UUT to 525A Hi and Lo RTD/Ohms Measure Terminals

Message 470

English: UUT to 525A Hi and Lo RTD/Ohms Sense Terminals

Message 471

English: UUT to 525A TC Terminal

Message 472

English: UUT to 525A TC Terminals using copper wire

Message 473

English: UUT to 525A TC Terminals using type B thermocouple wire

Message 474

English: UUT to 525A TC Terminals using type C thermocouple wire

Message 475

English: UUT to 525A TC Terminals using type E thermocouple wire

Message 476

English: UUT to 525A TC Terminals using type J thermocouple wire

Message 477

English: UUT to 525A TC Terminals using type K thermocouple wire

Message 478

English: UUT to 525A TC Terminals using type L thermocouple wire

Message 479

English: UUT to 525A TC Terminals using type N thermocouple wire

Message 480

English: UUT to 525A TC Terminals using type R thermocouple wire

Message 481

English: UUT to 525A TC Terminals using type S thermocouple wire

Message 482

English: UUT to 525A TC Terminals using type T thermocouple wire

Message 483

English: UUT to 525A TC Terminals using type U thermocouple wire

Message 484

English: Type B Thermocouple Standard to 525A TC Terminals

Message 485

English: Type C Thermocouple Standard to 525A TC Terminals

Message 486

English: Type E Thermocouple Standard to 525A TC Terminals

Message 487

English: Type J Thermocouple Standard to 525A TC Terminals

Message 488

English: Type K Thermocouple Standard to 525A TC Terminals

Message 489

English: Type L Thermocouple Standard to 525A TC Terminals

Message 490

English: Type N Thermocouple Standard to 525A TC Terminals

Message 491

English: Type R Thermocouple Standard to 525A TC Terminals

Message 492

English: Type S Thermocouple Standard to 525A TC Terminals

Message 493

English: Type T Thermocouple Standard to 525A TC Terminals

Message 494

English: Type U Thermocouple Standard to 525A TC Terminals

Message 495

English: 100 Ohm Pt 385 RTD Standard to 525A RTD Measure and Sense Terminals

Message 496

English: 100 Ohm Pt 3926 RTD Standard to 525A RTD Measure and Sense Terminals

Message 497

English: 120 Ohm Ni RTD Standard to 525A RTD Measure and Sense Terminals

Message 498

English: 200 Ohm Pt 385 RTD Standard to 525A RTD Measure and Sense Terminals

Message 499

English: 500 Ohm Pt 385 RTD Standard to 525A RTD Measure and Sense Terminals

Message 500

English: 1 kOhm Pt 385 RTD Standard to 525A RTD Measure and Sense Terminals

Message 501

English: 100 Ohm Pt 3916 RTD Standard to 525A RTD Measure and Sense Terminals

Message 502

English: 10 Ohm Cu Standard to 525A RTD Measure and Sense Terminals

Message 503

English: PRT Standard to 525A RTD Measure and Sense Terminals

Message 504

English: SPRT Standard to 525A RTD Measure and Sense Terminals

Message 505

English: UUT to 6000P04 Differential Pressure Module
Español: UBP al Módulo de Presión Diferencial 6000P04

Message 506

English: UUT to 6000P05 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 6000P05

Message 507

English: UUT to 6000P06 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 6000P06

Message 508

English: UUT to 6000P07 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 6000P07

Message 509

English: UUT to 6000P08 Gage Pressure Module
Español: UBP al Módulo indicador de Presión 6000P08

Message 510

English: UUT to 6000PA4 Absolute Pressure Module
Español: UBP al Módulo de Presión Absoluta 6000PA4

Message 511

English: UUT to 6000PV4 Vacuum Module
Español: UBP al Módulo de vacío 6000PV4

Message 512

English: UUT to 6000P29 High Pressure Module
Español: UBP al Módulo de Presión Dual 6000P29

Message 513

English: 6000P04 Differential Pressure Module for zero measurement
Español: 6000P04 Módulo de Presión Diferencial para medida de cero

Message 514

English: 6000P05 Gage Pressure Module for zero measurement
Español: 6000P05 Módulo Indicador de Presión para medida de cero

Message 515

English: 6000P06 Gage Pressure Module for zero measurement
Español: 6000P06 Módulo Indicador de Presión para medida de cero

Message 516

English: 6000P07 Gage Pressure Module for zero measurement
Español: 6000P07 Módulo Indicador de Presión para medida de cero

Message 517

English: 6000P08 Gage Pressure Module for zero measurement
Español: 6000P08 Módulo Indicador de Presión para medida de cero

Message 518

English: 6000PA4 Absolute Pressure Module for zero measurement
Español: 6000PA4 Módulo Indicador de Presión para medida de cero

Message 519

English: 6000PV4 Vacuum Module for zero measurement
Español: 6000PV4 Módulo de Vacío para medida de cero

Message 520

English: 6000P29 High Pressure Module for zero measurement
Español: 6000P29 Módulo de Alta Presión para medida de cero

DOS, DOSE

Procedure Control FSCs

Description

The DOS and DOSE FSCs run user-provided programs or batch files.

The programs may be MS-DOS executables, Windows executables, MS-DOS batch files, or Windows PIF files.

The difference between the DOS and DOSE FSCs is that DOSE is an evaluation FSC which generates a result.

Format

DOS [-*arg*] *program*

DOSE [-*arg*] *program*

Rules

- The *program* field, plus any arguments, may contain up to 56 characters.

  Example:

  ```
  1.001  DOS      USERPROG
  ```

- This statement will execute the user-provided program named "USERPROG.EXE".

  Example:

  ```
  2.003  DOS      USER.BAT
  ```

- This statement will execute the user-provided batch file named "USER.BAT".

  The program or batch file to be executed must be in the current directory or in one of the directories listed in the "PATH" environment variable.

Arguments

1. Valid arguments are:

   -n - write all numeric registers to data file

   -a - write all registers to data file

   -x - pay attention to user program’s exit status

   -i - ignore user program’s exit status

2. One or more arguments may be specified for a DOS or DOSE procedure statement. Arguments, if any, must follow the FSC ("DOS" or "DOSE") and precede the user program name.

   For example:

   ```
   DOS -n myprog.exe
   ```

   is valid, but

   ```
   DOS myprog.exe -n
   ```

   is not valid (unless "-n" is an argument you wish to pass to "myprog.exe").

3. Arguments are case-sensitive.
4. No argument may be specified more than once for the same statement.
5. "-a" and "-n" may not both be specified for the same statement.
6. "-x" and "-i" may not both be specified for the same statement.
7. Each argument must be preceded and followed by one or more spaces.
8. The "-b" argument is used if you want MET/CAL to retain leading and trailing spaces on string register values read from the data file ("dosdose.dat"). For example,if you specify a MEM2 value of "x", MET/CAL will normally strip off the leading and trailing spaces and the value of MEM2 will be "x". If "-b" is specified,however, MEM2 will have the value "x" after the DOS or DOSE statement completes.

More information on the "-n" and "-a" arguments is provided in the DATA FILE section below.

More information on the "-x" and "-i" arguments is available in the EXIT CODE section below.

The *program* specifier may include optional command-line arguments and/or I/O redirection where appropriate.

These arguments are not the same as the DOS/DOSE arguments described above. Program arguments appear after the user program name, and are simply passed to the user program.

Example:

```
4.001 DOS       USER1.EXE 1.9 15.4 > TMP.DAT
```

The user-provided program "USER1.EXE" will be executed with two command-line arguments (1.9 and 15.4). Output will be directed to the file "TMP.DAT".

The following special constructions may be used to specify arguments to the user program.

(1) [MEM], [MEM1], and [MEM2]
(2) [M1], [M2], ..., [M255]
(3) [S1], [S2], ..., [S32]
(4) [SREG1], [SREG2], ..., [SREG32]
(5) [V*variable*]
(6) {*text*}

This capability is new with V6.0.

The constructions [SREG1], [SREG2], [SREG32] are identical to [S1], [S2], ..., [S32], and are included only for compatibility with the IEEE FSC.

There is an optional initialization file parameter which can be used to disable the evaluation of special constructions in user program arguments, if necessary. It is probably unlikely, but if a user program has command line arguments which include literal bracket or brace characters ('[', ']', '{', or '}'), it will be necessary to disable special construction parsing for DOS and DOSE procedure statements. To do this, add the line:

dos_sc_eval = no

to the "[startup]" section of the MET/CAL initialization file.Specifying "dos_sc_eval = yes", or simply omitting any "dos_sc_eval" specification, enables special construction evaluation.

Example:

```
5.001 MATH      M[3] = 2.97 ; S[5] = "-x"
5.002 DOS       USER1 [S5] [M3]
```

The user-provided program "USER1.EXE" will be executed with two command-line arguments. The first argument will be "-x", which is the value of register S[5]. The second argument will be "2.97", which is the value of register M[3].

Data File

Parameters are passed between MET/CAL and the user-written program by way of an ASCII data file named "dosdose.dat". Before executing the *program* specified in the DOS or DOSE statement, MET/CAL writes the current values of the MET/CAL memory registers into this file.

A user-written program may alter the values in this file. When MET/CAL resumes, it reads back the data file, and starts up with the values present at that time in "dosdose.dat". The file is then removed.

Optional arguments allow the procedure writer to control which memory register values are written to the data file.

The "-n" argument causes all of the numeric registers to be written, instead of just the first 20.

The "-a" argument causes all of the numeric and all of the string registers to be written.

If neither "-n" nor "-a" are specified, the data file is compatible with MET/CAL 4.0 and previous.

The following table shows the affect of the "-n" and "-a" arguments on the data file:

Argument	MEM	MEM1	MEM2	M Registers	S Registers
none	yes	yes	yes	1 - 20	none
-n	yes	yes	yes	1 - 255	none
-a	yes	yes	yes	1 - 255	1 - 32

If neither "-n" nor "-a" are specified, the registers are written in the order MEM, MEM1, MEM2, M[1], M[2], ..., M[20]. Each memory register value is written on a separate line.

If the "-n" argument is specified, the registers are written in the order MEM, MEM1, MEM2, M[1], M[2], ..., M[255]. Each memory register value is written on a separate line.

If the "-a" argument is specified, the registers are written in the order MEM, MEM1, MEM2, M[1], M[2], ..., M[255], S[1], S[2], ..., S[32]. Up to M[255], each memory register value is written on a separate line. The S registers are written out using two lines for each register. The first line is an integer which specifies the length of the following string, and the second line is the string. An empty string is written as a single LINEFEED character, with the length set to 0.

Example:

Consider the procedure fragment:

```
MATH    s[1] = "abc"
MATH    S[3] = "defgh"
DOS     -a <program>
```

The beginning of the string register section of the DOS/DOSE data file will look like:

```
3
abc
0

5
defgh
.
.
.
```

The "3" indicates that the length of the following string ("abc") is 3. The 0 indicates that S[2] is empty, the 5 indicates that the length of the following string

("defgh") is 5, and so on.

When the DOSE FSC is used, the user-written program must append either 1 or 2 lines to "dosdose.dat". The first appended line is a result text string (not more than 64 characters). It is included in the Post Test Summary. The second appended line is optional. If present, it may be "PASS" to indicate a PASS condition, "FAIL" to indicate a FAIL condition, or a floating-point number to indicate the percent error for the test. This information determines the pass/fail status of the evaluation as displayed in the Post Test Summary and written to the results. If the second appended line is omitted, the evaluation is a default PASS.

Note that the DOSE mechanism described above (the requirement that the user program append 1 or 2 lines to the data file, and the fact that MET/CAL uses that information to generate a PASS/FAIL result) is the only difference between the DOS and DOSE FSCs.

Exit Code

The procedure writer may control whether MET/CAL uses the exit code of the user program to determine if the user program succeeded or failed.

Control is provided in two ways.

1. The "-i" and "-x" arguments may be used on individual DOS or DOSE statements to specify how the exit code is to be handled for that statement only. If "-i" is specified, MET/CAL ignores the exit code of the user program. This is compatible with MET/CAL 4.0 through 4.2 and, in fact, was the only option for those versions of the software. If "-x" is specified, MET/CAL uses the user program's exit code to determine whether or not the user program succeeded. If the user program returns zero, the execution is successful. Any non-zero return value is regarded as a failure of the user program.

   "Success" and "failure", as used here, do not refer to the PASS/FAIL status of the test. To control the PASS/FAIL status of an evaluation step involving a user program, you must use the DOSE FSC and write the appropriate test status into the "dosdose.dat" data file. This is discussed in more detail elsewhere in this help document.

2. The second way to control the handling of user program exit codes is to specify the optional initialization file parameter "uexit_code". If "uexit_code" is set to "yes", MET/CAL pays attention to the exit codes of all user programs invoked by DOS statements, unless overridden by "-I" arguments on individual DOS or DOSE statements. If "uexit_code" is set to "no", MET/CAL ignores the exit codes of all user programs invoked by DOS or DOSE statements, unless overridden by "-x" arguments on individual DOS or DOSE statements. If "uexit_code" is not specified in the initialization file ("metcal.ini", "STARTUP" section) it defaults to "no". Thus, the default behavior is to ignore all user program exit codes. This is compatible with versions 4.2 and previous of Windows MET/CAL. (Note, however, that DOS MET/CAL did pay attention to the user program's exit code. Compatibility with DOS MET/CAL can be achieved by setting "uexit_code" to "yes".)

If a user program fails (returns a non-zero value) and MET/CAL is configured to pay attention to the exit code (as discussed above), the behavior of the system is as follows:

1. An error message displaying the name of the user program and the non-zero exit code is displayed.
2. After the operator chooses "OK" to remove the error message, the Post Test dialog appears with a message indicating that the DOS or DOSE statement was terminated by the preceding error. At this point the operator may repeat the test, terminate the procedure, or use any of the other Post Test options.

With some versions of BASIC it may be difficult (or impossible) to control the exit code of the user program. If this problem arises, the simplest solution is to ignore the exit code. As described above, this is done either by specifying "uexit_code = no" in the initialization file and specifying neither "-i" nor "-x" on the DOS or DOSE statement, or by specifying "-i" on the DOS or DOSE statement, which overrides the initialization file setting.

If the exit code of the user program cannot be easily controlled, but there is a need to handle user program errors, this can be dealt with by ignoring the user program's exit code (using "-i" or "uexit_code = no", as discussed above), and using an available memory register as an error indicator. That is, the user program can write a known value into a predetermined register in the "dosdose.dat" file. The procedure can then be written to jump to an error handling section if the register contains the pre-defined error indication value after return from execution of the user program.

Additional Information

The following additional information is provided for procedure writers familiar with the MS-DOS and/or Windows programming environments.

- If the *program* given in the DOS or DOSE statement specifies a batch file, or includes input/output redirection symbols ('>', '<', or '|'), MET/CAL uses the standard MS-DOS command interpreter "COMMAND.COM" to execute the batch file or executable program.
- If the *program* specifies an executable program (with extension ".EXE" or ".COM"), and no input/output redirection is specified, MET/CAL executes the program directly. The program executes either as an MS-DOS program or as a Windows program, depending on how the executable was built.
- The file name extension of the user-written program to be executed must be ".EXE", ".COM", ".BAT", or ".PIF". The extension must be explicitly specified in the DOS or DOSE statement if it is ".COM", ".BAT", or ".PIF". The extension is optional if it is ".EXE".

- The DOS or DOSE FSCs cannot be used to directly execute commands which are built into the MS-DOS command interpreter ("command.com"). For example, the statement "DOS dir" will not work. However, "command.com" may be invoked to execute built in commands. For example, "DOS command.com /c dir" will invoke the MS-DOS command interpreter to execute the built in "dir" command.

If a user-written program displays information on the PC screen, the program should pause until the operator has had time to read the display. Otherwise, when MET/CAL resumes execution, information displayed by the user program may be destroyed or overwritten. If the user program is an MS-DOS batch file, the necessary pause can be accomplished by using a "pause" statement in the batch file.

Example:

Create a batch file called "xyz.bat" which contains:

```
DIR /W
PAUSE
```

Execute the following line in a MET/CAL procedure:

```
DOS     XYZ.BAT
```

When the DOS statement is executed, an MS-DOS window will be created. A directory listing will be shown in the window (the output of the "DIR /W" command). This will be followed by the prompt:

```
Press any key to continue . . .
```

in the MS-DOS window. When the operator presses a key, the MS-DOS window will be closed, and MET/CAL will resume execution with the statement after the DOS statement.

The procedure writer may wish to use the Windows "PIF" editor to create a ".PIF" file to control the invocation of a user-written DOS or DOSE program. This allows individual control over whether the user-written program runs full screen or in a window, the window title, and other parameters.

Example:

Suppose you have an MS-DOS batch file named "XYZ.BAT" which you wish to run in a window, with the window title "Enter Parameters". Start the Windows "PIF" editor. Set "Program Filename" to "COMMAND.COM", set "Window Title" to "Enter Parameters", set "Optional Parameters" to "/c XYZ.BAT", and under "Display Usage" choose "Windowed".

Choose "Save As..." in the "File" menu and save the file as "XYZ.PIF".

Then, in your MET/CAL procedure, enter the statement:

```
DOS      XYZ.PIF
```

Compatibility

- In general, memory limitations are less evident in Windows MET/CAL that in DOS MET/CAL. If the user's PC Windows environment is configured to use disk storage as virtual memory, then memory used by the MET/CAL program itself can become available to the user program invoked by the DOS FSC.

  (In Windows 3.1, virtual memory configuration is done under "Control Panel" : "386 Enhanced" : "Virtual Memory".)

- To retain compatibility with DOS MET/CAL, only the first 20 auxiliary memory registers (M[1], M[2], ..., M[20]) are written to "dosdose.dat" before execution of a DOS FSC unless the DOS or DOSE statement specifies one of the optional arguments "-n" or "-a".

  In Windows MET/CAL the file name extension of the user-program must be explicitly specified unless the extension is ".EXE". (In DOS MET/CAL ".BAT" and ".COM" files could be executed without specifying the file name extension.)

IEEE

Interface Control FSC

Description

The IEEE FSC is used to control IEEE-488 instruments. Both UUTs and system calibration instruments may be controlled. The IEEE FSC may be used to control system calibration instruments which are not directly supported by MET/CAL. It may also be used to control supported instruments in cases where the built-in MET/CAL driver does not provide the required function.

Format

IEEE *message*

Rules

- An IEEE statement may include multiple lines.
- A maximum of 56 characters is allowed in a single IEEE *message*.
- A MET/CAL system may include 0, 1, or 2 IEEE-488 interfaces. In a system with two IEEE-488 interfaces, board 0 is reserved for system calibration instruments, and board 1 is reserved for the UUT.

  In a system with one IEEE-488 interface, board 0 is used for both system calibration instruments and the UUT.
- Leading and trailing blanks in a *message* are ignored.
- When an IEEE statement is executed, characters in the *message* which are not part of a special construction (enclosed by square brackets) are written to the currently addressed device on the IEEE-488 bus.
- The following special constructions may be used in an IEEE statement:

[@<*address*>]	select <*address*> as current address
[D<*delay*>]	delay execution for <*delay*> milliseconds
[EOI ON|OFF]	enable/disable assertion of EOI on a write
[GTL]	puts an instrument into local control state
[IFC <*port*>]	causes an Interface Clear on specified port
[I]	read number from current address, store in MEM
[I$]	read string from current address, store in MEM2
[I > <*file*>]	read from current address, write to file
[I >> <*file*>]	read from current address, append to file
[I!]	read from current address, discard data

[LLO]	disable instrument front panel controls
[MEM]	write value of register MEM to current address
[MEM1]	write value of register MEM1 to current address
[MEM2]	write value of register MEM2 to current address
[<*integer*>]	write <*integer*> (ASCII) to current address
[<*numeric*>]	write number (ASCII) to current address
[O < <*file*>]	read from file, write to current address
[REN]	sets the Remote Enable line on the IEEE-488 bus
[SDC]	sends a Selected Device Clear to current address
[S <*delay*>]	sets delay between transmitted characters
[SPL<*mask*>]	serial polls current address
[SRQ <*delay*>,<*mask*>]	wait for IEEE Service Request
[SRQ ON|OFF]	enable/disable UUT Service Request processing
[TERM <*integer*>]	sets terminator character to <*integer*> (ASCII)
[TERM <number>]	sets terminator character to <*number*> (ASCII)
[TERM ’<*c*>’]	sets terminator character to *‘<c>’* (character)
[TERM CR]	sets terminator character to Carriage Return
[TERM LF]	sets terminator character to Line Feed
[TERM NONE]	indicates there is no terminator character
[TERM OFF]	indicates there is no terminator character
[T<*integer*>]	sets bus timeout to <*integer*> milliseconds
[T <numeric>]	sets bus timeout to <*numeric*> milliseconds
[TRIG]	triggers instrument at current address
[V<*variable*>]	write value of <*variable*> to current address
{<*text*>}	send braced <*text*> to result file as well
[M<*nreg*>]	write value of numeric register to current address
[SREG<*nreg*>]	write value of string register to current address

Constructions (2), (11-14), (30), and (31) are used by a number of FSCs and are described in "Special Constructions" in Chapter 1 of this manual. Except for (32) and (33), the rest of the constructions in the list above are either specific to the IEEE FSC, or are used only by IEEE and PORT. Detailed descriptions of these constructions, including (32) and (33), are provided in the sections below.

IEEE-488 Bus Addresses

A special IEEE construct is used to identify the IEEE-488 bus address of the instrument to receive the IEEE command; actual IEEE-488 addresses can be used or symbolic IEEE-488 addresses. IEEE-488 bus addresses are specified as follows:

[@*primary address:secondary address*]

- If only a *primary address* is specified, secondary addressing will not be used.
- If IEEE-488 port 1 is used, add 100 to the instrument address. For example, if the instrument address is 1 and the instrument is connected to IEEE port 1, it is addressed in the IEEE FSC as [@101].
- Addresses 0 and 100 cannot be used.
- There is no preset default for IEEE addresses. Once an address is specified, it becomes the default address until another address is assigned.
- A procedure line can specify a change of address within a single IEEE FSC message line.
- If no default address is established in the first IEEE FSC which requires sending out a command string to an instrument or obtain a reading from an instrument, one of two things can happen:

    1. If a second IEEE-488 port is available, MET/CAL software will attempt to find the address automatically.
    2. The operator will be prompted for the IEEE-488 bus default address to be used.

Note

If a UUT with a remote IEEE-488 interface is connected with an IEEE-488 port of the calibration system, you have to make sure that its address does NOT conflict with any of the addresses used by the calibration instruments in the system.

Where possible you should have all your calibration instruments on one IEEE-488 port and leave the other solely for the use by a UUT, so address conflicts never occur.

Refer to the instructions in the Configuration Manual for information on IEEE-488 addresses used. Generally IEEE-488 address 10 is left unused by calibration instruments.

Under the following conditions, the MET/CAL software will automatically find the IEEE-488 address of a UUT:

- The IEEE-488 address was not specified in a previous IEEE FSC.
- The searching is done on an IEEE FSC that would normally prompt for the UUT address.
- The UUT is by itself on port 1 (the secondary port).
- The first device found on the second port is assumed to be the UUT. Searching starts at IEEE-488 address 1 and ends at address 30.

Note

Address 0 cannot be searched since this address is reserved for the IEEE-488 card of the Instrument Controller.

Symbolic bus addresses are shown as [@*alias*], where the alias the name used in the Configuration file (CONFIG.DAT). Symbolic names enhance readability of the procedure.

IEEE-488 Bus Input Commands

The following special constructs are available which perform an input from the specified address.

- [I] The special construct [I] performs an input from the current address. Data strings returned by a remotely controlled instrument normally contain just a numeric value. In a few cases units are also sent. The non-numeric characters are deleted from the string.

  The numeric value is stored as the contents of memory register MEM. The current contents of MEM are overwritten.
- [I$] The special construct [I$] performs an input from the current address. The input is an alphanumeric string, and it is stored in memory register MEM2, overwriting the current contents of that memory register. The MEM2 register is 4096 characters long.
- [I>*filename*] This special construct stores the returned information in a file with the name *filename*. Any existing file is overwritten. This construct should be used, if the returned string is expected to be longer than 4096 characters. The DOS FSC is used to call a program, which processes the string and returns relevant information in the MET/CAL memory registers.
- [I>>*filename*] This special construct appends the returned information to a file with the name *filename*. If the file does not exist, then it will be created. This construct should be used, if the returned string is expected to be longer than 4096

characters. The DOS FSC is used to call a program which processes the string and returns relevant information in the MET/CAL memory registers.

The TERM special constructs is available to define the terminator character for IEEE-488 data messages for messages sent by an instrument to the controller. This construct does not affect messages written by the controller to an instrument. Valid TERM special constructs are:

- [TERM *integer integer* is a decimal integer between 0 and 255, but not 64.
- [TERM *'c'*] *'c'* is any printable character other than '@'. There must be exactly one character between the quotes, i.e. one cannot say: "[TERM ' x ']" and expect the blanks to be ignored. The case of the character between quotes IS case sensitive (in general special constructs are case insensitive).
- [TERM CR] Specifies that the terminator character is Carriage Return. This is equivalent to "[TERM 13]".
- [TERM LF] Specifies that the terminator character is Line Feed. This is equivalent to "[TERM 10]".
- [TERM NONE] Specifies that there is no terminator character. In this case the instrument must assert EOI to indicate the end of the message.
- [TERM OFF] Specifies that there is no terminator character. In this case the instrument must assert EOI to indicate the end of the message. This is just an alternate form for "[TERM NONE]".

IEEE-488 Bus Output Commands

- Alphanumeric characters, not part of a special construct will be sent to the addressed instrument. The strings are always terminated by an EOI (no CR or LF). Each line of a multiple line message will be terminated this way.
- Braces ('{' and '}') or square brackets ('[' and ']') can not be entered literally, since they are used to define special constructs for the IEEE FSC (see the following paragraph).
- The EOI special construct is used to disable or enable the assertion of EOI to terminate an IEEE-488 data message written by the controller to an IEEE-488 instrument using the IEEE FSC. The EOI special construct has no affect on data messages read by the controller from an IEEE-488 instrument. Allowed EOI special constructs are:

  [EOI ON] and [EOI OFF]

- The "Slow" special construction specifies the inter-byte delay between characters sent from the controller to the instrument when the IEEE FSC is used. The format is:

  [S *inter-byte delay*]

  where *inter-byte delay* is an integer between 0 and 65536.

- The inter-byte delay is the number of milliseconds to delay between bytes when a data message consisting of 2 or more bytes is written to an IEEE-488 instrument by a MET/CAL IEEE statement.

- The default is 0. The delay, if a non-zero value is specified, affects only the current IEEE statement. It is reset to the default at the beginning of each new IEEE statement.

Note

There is no delay before the first byte, or after the last byte, of the data message. If such a delay is required, the procedure writer should use the [Ddelay] construct.

This construct is used to be able to support older non-compatible IEEE-488 interfaces (e.g. DATA PROOF scanners).

- Output from a file directly to the instrument:

  Special construct is [O<filename] ('O' for Output).

  The contents of the file "filename" is sent over the IEEE-488 bus.

- The following other special constructs may be used:

  [MEM], [MEM1], and [MEM2]

  The contents of memory register MEM, MEM1 or MEM2 will be included in the IEEE command string.

  [*integer*]

  The character with the *integer* ASCII value will be included in the IEEE command string.

Note

The [integer] construct should be used to output braces and brackets. [<Dinteger]

The [D*integer*] special construct will cause a delay of the message line by *numeric* milliseconds (*integer* is between 0 and 32767).

{*text*}

Text in braces in addition to being used in the IEEE command string, is copied literally into the results file (without numerical substitutions for [MEM] for example).

[V *variable name*] special construction

This construct evaluates to the value of the named variable. The variable must, at run time, be present in the MET/CAL variable file (default name "VARIABLE.DAT").

Example: IEEE [V DATE$]?

[M*nreg*]

The contents of the specified numeric register are included in the IEEE command string.

The constructions [M1], [M2], ..., M[255] refer to the numeric registers. Up to 12 significant digits are included in the value. Refer to the MATH FSC on-line help for additional information on the numeric registers.

[SREG*sreg*]

The contents of the specified string register are included in the IEEE command string.

The constructions [SREG1], [SREG2], ..., [SREG32] refer to the string registers. Refer to the MATH FSC on-line help for additional information on the string registers.

Note

*Other FSCs, like DISP, EVAL, OPBR, HEAD, and others, support the [S*sreg*] special construction. [S*sreg*] is identical to [SREG*sreg*], but could not be used in the IEEE FSC, because [S*n*] had already been used to specify an inter-byte delay.*

IEEE-488 Bus Timeout, SRQ and Serial Polls

A number of special constructs are available to specify IEEE-488 bus timeouts, timeouts, wait for SRQs and perform a Serial Poll on the IEEE-488 bus. These constructs are unique to the IEEE FSC.

- [T<*timeout*>]

This construct sets the timeout of the IEEE-488 bus to the specifiednumber of milliseconds. If the timeout is set to zero, there is notimeout. The specified timeout must be between 0 and 32767 ms. Thedefault timeout is 15 seconds. The timeout specification affects onlythe current IEEE FSC statement.

- [SRQ<*timeout*>,<*mask*>]

  This construct causes the calibration system to wait for an IEEE Service Request from the device at the default IEEE-488 address (on either IEEE port if both are installed and configured). The <timeout> entry specifies the maximum time to wait in milliseconds (range 0 to 86,400,000). The <mask> expression is ANDed to the serial poll status byte and the result is stored in memory register MEM.In addition :

  1. If 0 or no delay numeric is specified, the maximum timeout is infinite.
  2. The <*mask*> entry is optional. If no mask is specified, a mask of 255 decimal is assumed. The serial poll status byte is always ANDed with the mask and the result stored in memory register MEM.
  3. This instruction disables any other interrupts.
  4. If <*timeout*> is exceeded, then the following error message will be displayed:

     Timed out waiting for SRQ from device at address <##>

     where <##> will be replaced by the current IEEE FSC default address.

  5 After an SRQ is detected MET/CAL determines whether or not the SRQwas generated by the device at the current IEEE-488 default address.

     Note that when the SRQ was generated by the expected device the serial poll done by MET/CAL to determine that fact will clear the RQS status bit. If the SRQ did not come from the default address, the error message "Unexpected SRQ from device at address ##" will be displayed and the program will present the Post Test Summary dialog, just as if the operator had pressed Terminate.

  6 To specify a <mask> without a <timeout> the syntax is either:

     - [SRQ 0, <mask] or [SRQ , <mask>]

  7 Procedure writers should be cautious when specifying an infinite timeout. If the waited-for SRQ does not occur, you may, in effect, lock up the application.

- [SRQ ON] and [SRQ OFF]

  This special SRQ related construct allows you to deal with a power up SRQ by a UUT, before an IEEE statement has been performed and the UUT address determined. Rules:

  1. [SRQ ON] and [SRQ OFF] are illegal unless the system is in DEMO MODE or has two (2) IEEE-488 ports. These constructs do not work if the UUT and the calibration instruments share the same IEEE-488 port.

2. The current UUT address must not be a port 0 address. Example:

```
IEEE        abc
IEEE        [SRQ OFF]
IEEE        [@24] xyz
IEEE        [SRQ ON]
IEEE        [@115] def
```

   generates a run time error when the fourth IEEE statement is executed. At that time when the [SRQ ON] statement is evaluated, the current UUT address is 24. The solution may be to specify [@115] before the [SRQ ON] and then write "def".

3. If no UUT address is currently set at the time an [SRQ ON] occurs, it triggers an automatic search and/or prompt for the UUT address. [SRQ OFF] does not have this effect.

- [SPL *integer*]

  This special construct does a Serial Poll on the most recently addressed instrument. The *integer* expression is a mask, which is ANDed to the serial poll status byte and the result is stored in memory register MEM. In addition:

  1. The range of possible values is from 0 to 255.
  2. If no mask numeric is specified, then a mask of 255 decimal is assumed. The serial poll status byte is always ANDed with the mask and the result stored in memory register MEM.
  3. The SPL instruction may or may not clear the RQS bit. This is UUT dependent.

IEEE-488 Bus SDC, REN, GTL, LLO, TRIG and IFC Commands

The following additional IEEE-488 bus functions can be controlled through the special constructs in the IEEE FSC:

- [SDC] Selected Device Clear

  This construct sends a Selected device clear to the last instrument addressed with the IEEE FSC. It sends the bus commands UNL, UNT, MLA(address), SDC.

- [REN] Remote Enable

  This construct sets the Remote Enable line on the IEEE-488 bus. It sends the commands REN, UNL, UNT, MLA(address).

- [GTL] Go To Local

  This construct will set an instrument into the local control state. Typically this means that front panel controls are activated. It sends the commands UNL, UNT, MLA(address), GTL.

- [LLO] Local Lockout

  This construct typically disables front panel controls and any "Return To Local" function button that may be on an instrument. It sends the commands REN, LLO.

- [TRIG] Trigger

  This construct addresses and then triggers an instrument. It sends out the commands UNL, UNT, MLA(address), GET.

- [IFC *port number*]

  The IFC special construct causes an IEEE-488 Interface Clear on a specified IEEE-488 port. In MET/CAL only port 1 (the UUT port) can use IFC. The only legal option therefore is [IFC 1].

- [O< *filename*]

  The contents of the specified file are included in the IEEE command string.

Miscellaneous

During procedure execution, the MET/CAL calibration software depends heavily on the configuration table and the information about the IEEE-488 boards in the STARTUP file needs to be absolutely correct, and does no error checking on this input. If the information is wrong, unexpected errors may occur or the system may hang. This is especially important in cases where SRQs may occur.

If you are experiencing problems of this type, check first the following values in the Startup file (refer to the information on the Startup file in the Configuration Manual for appropriate values):

ib_nport =
ib_type =
ib_dmachan =
ib_ioaddr =

Also check the IEEE-488 addresses in the configuration file to make sure they are correct.

When the calibration system is in the DEMO MODE, no actual interactions on the IEEE bus will take place. The effect of the IEEE FSC in this mode is as follows:

- If an IEEE input is expected, the user will be prompted to enter the expected reading.
- The SRQ and SPL constructs are ignored.

Examples

```
STEP     FSC     RANGE  NOMINAL        TOLERANCE     MOD1         MOD2   3   4 CON
2.005    IEEE           [@124]VR1?[I][D500]?[I]
3.004    IEEE           {[@1][MEM][MEM1][MEM2]}
4.002    IEEE           {[@1][MEM][MEM1][MEM2]}
5.007    IEEE           {[@1][127][D32767][T32767]}
6.008    IEEE           [SRQ 32767]
7.001    IEEE           [SPL 255]
8.002    IEEE           [I] [I$]
```

MATH

Memory Register Operation FSC

Description

The MATH FSC evaluates arithmetic and string expressions and assigns the result to a specified memory register.

Format

MATH *memory register* = *expression*

Multiple assignments may be included in a single MATH statement, separated by semicolons.

Rules

- Registers *memory register* must be MEM, MEM1, M[1], M[2], M[255], MEM2, S[1], S[2], or S[32].

  The index of a numeric register (M[*index*]) or a string register (S[*index*]) must be a literal integer. It cannot be an expression. For example, "M[MEM + 3]" is not a legal construction in a MATH statement.

  MEM2, S[1], S[2], and S[32] are string registers. MEM2 is limited to 4096 characters. The S registers cannot exceed 32767 characters each, subject to available memory.

- Operators

  The MATH FSC supports the following binary operators:

Operation	**Symbol**
addition	+
subtraction	-
multiplication	*
division	/
exponentiation	^
string concatenation	&
less than	<
less than or equal to	≤
greater than	>
greater than or equal to	≥
not equal to	!=

The relational operators (<, <=, >, >=, = =, and !=) evaluate to 1 or 0, depending on whether the relation is true or false. For example, "MATH MEM1 = MEM < 10" sets MEM1 to 1 if the value of MEM is less than 10, and sets MEM1 to 0 if the value of MEM is greater than or equal to 10.

Procedures which make use of any of the operators "<=", ">=", "==", and "!=" should be tested carefully. There is some risk of unexpected behavior due to internal floating-point rounding in numerical calculations. For example, the statement:

MATH mem = (13.7 * 16.6 == 227.42)

will set MEM to zero, even though 13.7 * 16.6 really is equal to 227.42.

- Functions

In addition to the operators listed above, expressions may also make use of function calls. Supported functions are listed below:

ABS

Purpose:	Computes the absolute value of its argument.
Result Type:	Numeric
Argument Type:	Numeric

ACOS

Purpose:	Computes the arccosine of its argument.
Result Type:	Numeric (radians)
Argument Type:	Numeric (radians)

ASIN

Purpose:	Computes the arcsine of its argument.
Result Type:	Numeric (radians)
Argument Type:	Numeric (radians)

ATAN

Purpose:	Computes the arctangent of its argument.
Result Type:	Numeric (radians)
Argument Type:	Numeric (radians)

AVG

Purpose: Computes the average of a set of numbers. The function arguments specifies the indices of a range of numeric registers the values of which are to be averaged.

Result Type: Numeric

Argument Type: Numeric, Numeric

Example:

```
MATH M[5] = 25
MATH M[6] = 45
MATH M[7] = 20
MATH MEM = AVG(5, 7)
```

After the last MATH statement executes the value of MEM will be 30.

Purpose: Computes the smallest integer greater than or equal to its argument.

Result Type: Numeric

Argument Type: Numeric

CMP

Purpose: Case-sensitive string comparison. Returns 1 if strings are the same, -1 otherwise. May be used in conjunction with JMPF.

Result Type: Numeric

Argument Type: String, String

CMPI

Purpose: Case-insensitive string comparison. Returns 1 if strings are the same, -1 otherwise. May be used in conjunction with JMPF.

Result Type: Numeric

Argument Type: String, String

COS

Purpose: Computes the cosine of its argument.

Result Type: Numeric (radians)

Argument Type: Numeric (radians)

COSH

Purpose: Computes the hyperbolic cosine of its argument.

Result Type: Numeric (radians)

Argument Type: Numeric (radians)

DATE

Purpose: Returns the current date.

The argument is a string which controls the date format. The following format descriptors may be used:

DD - day number
MM - month number
MON - 3-letter month name
MONTH - full month name
YY - 2-digit year number(window 1970 - 2069)

No format descriptor may occur more than once in a format control string.

At most one of { MM, MON, MONTH } may occur in a format control string.

At most one of { YY, YYYY } may occur.

Characters which do not match a valid format descriptor are copied unchanged to the formatted date string.

Format descriptors are case-insensitive.

Result Type: String

Argument Type: String

Compatibility: Requires V6.0 or later.
Month names are English-only in V6.0.

Example 1:

```
MATH S[5] = date("DD/MM/YY")
```

This produces a date string like "04/20/99" and stores it in string register S[5].

Example 2:

```
MATH MEM2 = date("month dd, yyyy")
```

This produces a formatted date like "April 20, 1999" and stores it in string register MEM2.

DEGC

Purpose: Converts from degrees F to degrees C.

Result Type: Numeric (degrees Celsius)

Argument Type: Numeric (degrees Fahrenheit)

DEGF

Purpose: Converts from degrees C to degrees F.

Result Type: Numeric (degrees Fahrenheit)

Argument Type: Numeric (degrees Celsius)

DEFILE

Purpose: Returns the full path name of the MET/CAL DOS/DOSE datafile.

This function may be used to pass the DOS/DOSE data file name to a user program to be invoked with the DOS or DOSE FSC.

Result Type: String

Argument Type: None

Compatibility: Requires V6.0 or later.

Example:

```
MATH S[5] = DFILE() DOS  USER1 [S5]
```

In this example the full path name of the DOS/DOSE data file is stored in string register S[5], and then passed as the first (and only) argument to the user program USER1.

EXP

Purpose: Computes the exponential function of its argument.

Result Type: Numeric

Argument Type: Numeric

FIND

Purpose: Finds the index of the n-th occurrence of a specified substring in a specified string. The first argument is the string to be searched. The second argument is the substring to search for. The third argument is the number of the desired occurrence. This function is case-sensitive.

Result Type: Numeric

Argument Type: String, String, Numeric

Example 1:

```
MATH S[5] = "abcxyzabcxyz"
MATH MEM  = FIND(S[5], "abc", 2)
```

After the second math statement is executed the value of MEM will be 7, since 7 is the index of the beginning of the second occurrence of "abc".

Example 2:

```
MATH MEM = FIND("abcdef", "z", 1)
```

Since "z" does not occur in "abcdef", MEM will be set to zero.

FLD

Purpose: Extracts a specified field from a string. The first argument is the string from which the field is to be extracted. The second argument specifies which field to extract. (The first field is number 1.) The third argument is a string which specifies the field separator.

Result Type: String

Argument Type: String, Numeric, String

Example 1:

```
MATH S[1]="FLUKE,5500A,6320007,NONE+1.2"
MATH MEM2=FLD(S[1], 2, ",")
```

After this statement executes the value of MEM2 will be "5500A".

Example 2:

```
# Setup RS232-communication
1.001  PORT    [P1200,N,8,1,X]
# Enable the SERVICE-mode of the
# ScopeMeter test tool.
1.002  PORT    EX110,0[13][I]
1.003  PORT    FLUKPHIL[13][I]
# Query Scopemeter Cal Fields
# returns Total Cal Fields,
# Free
1.004  PORT    QN[13][I][I$]
1.005  MATH    MEM = FLD(MEM2, 2, ",")
1.006  DISP    Fields Available [MEM]
```

FMT

Purpose: Formats a number. Format specifiers have the form: % *width.precisioncode*

width is the minimum field width.

precision is the precision of the result.

code is 'f', 'e', or 'g'.

'f' specifies fixed-point.

'e' specifies floating-format.

'g' uses 'f' or 'e', whichever is more compact. The precision specifies the maximum number of significant digits.

Result Type: String

Argument Type: Numeric, String

Example:

```
MATH MEM2 = FMT(1.234567, "%4.2f")
```

After this statement executes the value of MEM2 will be "1.23".

GETV

Purpose: Get value from MET/CAL variable file.

If the name does not exist in the variable file, or the value is empty, the return value is an empty string.

All variable names must end with '$'. However, if the '$' is omitted in a MATH statement, it is automatically added before the value is retrieved.

Variable names are case-insensitive.

The MET/CAL variable file is cached (in memory) during normal program operation. It is used by the pre-prompt and post-prompt dialogs, and accessed by the [V...] special construction.

Result Type: String

Argument Type: String

See Also: MATH function "PUTV"

Compatibility: Requires V6.0 or later.

Example:

```
MATH MEM2 = GETV("PROC_NAME$")
```

IFILE

Purpose: Returns the full path name of theMET/CAL initialization file.

This function may be used to pass the initialization file name to a user program to be invoked with the DOS or DOSE FSC.

Result Type: String

Argument Type: None

Compatibility: Requires V6.0 or later.

Example:

```
MATH S[5] = IFILE()
```

INI

Purpose: Retrieves the value of a specifiedMET/CAL initialization file parameter.

This function takes two arguments. The first argument specifies the initialization file section. The second argument specifies the initialization file parameter.

The return value is an empty string if the specified parameter does not exist in the specified section, or if the parameter exists but has no value.

The section name and parameter name arguments are case-insensitive.

One use of this function is to pass values from the initialization file to user program invoked with the DOS (or DOSE) FSC.

Result Type: String

Argument Type: String, String

Compatibility: Requires V6.0 or later.

Example:

```
MATH M[10] = INI("startup", "tur_lim")
```

In this example, the value of the "tur_lim" parameter (usually 4.0) is stored in numeric register M[10]. "tur_lim" specifies the T.U.R. limit used by MET/CAL. Note also that "INI" has a string return value, but in this example the return value is assigned to a numeric register. The MATH FSC automatically converts the string valueto a numeric value when necessary.

INT

Purpose: Computes the largest integer less than or equal to its argument.

Result Type: Numeric

Argument Type: Numeric

LEN

Purpose: Computes the length of a string.
Result Type: Numeric
Argument Type: String

LN

Purpose: Computes the natural logarithm of its argument.

Result Type: Numeric

Argument Type: Numeric

LOG

Purpose: Computes the base 10 logarithm of its argument.

Result Type: Numeric

Argument Type: Numeric

MAX

Purpose: Computes the maximum of a set of numbers. The function arguments specifies the indices of a range of numeric registers for which the maximum is to be determined.

Result Type: Numeric

Argument Type: Numeric, Numeric

Example:

```
MATH M[5] = 25
MATH M[6] = 45
MATH M[7] = 20
MATH MEM = MAX(5, 7)
```

After the last MATH statement executes the value of MEM will be 45.

MAX2

Purpose: Computes the maximum of two values.

Result Type: Numeric

Argument Type: Numeric, Numeric

Example:

```
MATH M[5] = 3.7
MATH M[6] = 4.1
MATH MEM = MAX2(M[5], M[6])
```

After the last MATH statement executesthe value of MEM will be 4.1.

MIN

Purpose: Computes the minimum of a set of numbers. The function arguments specifies the indices of a range of numeric registers for which the minimum is to be determined.

Result Type: Numeric

Argument Type: Numeric, Numeric

Example:

```
MATH M[5] = 25
MATH M[6] = 45
MATH M[7] = 20
MATH MEM = MIN(5, 7)
```

After the last MATH statement executes the value of MEM will be 20.

MIN2

Purpose: Computes the minimum of two values.

Result Type: Numeric

Argument Type: Numeric, Numeric

Example:

```
MATH M[5] = 3.7
MATH M[6] = 4.1
MATH MEM = MIN2(M[5], M[6])
```

After the last MATH statement executesthe value of MEM will be 3.7.

POW

Purpose: Raises a specified value to a specified power. (The exponentiation operator, '^', may also be used to raise a value to a power. For example, "pow(5,2) is equivalent to "5^2".)

Result Type: Numeric

Argument Type: Numeric, Numeric

Example:

```
MATH MEM = POW(5, 2)
```

After this statement executes the value of MEM will be 25.

PUTV

Purpose: Store value in MET/CAL variable file.

The first argument is the variable name.

The second argument is the variable value.

The return value is the previous value, if any, of the variable.

The variable name may refer to an existing variable, or may cause the creation of a new variable.

All variable names must end with '$'. However, if the '$' is omitted in a MATH statement, it is automatically added before the value is stored.

Variable names are case-insensitive.

The MET/CAL variable file is cached (in memory) during normal program operation. It is used by the pre-prompt and post-prompt dialogs, and accessed by the [V...] special construction.

The MET/CAL variable file contains lines which have a maximum of 511 characters. This includes the terminating linefeed character, as well as the equals sign ('=') used to separate the name from the value. The MATH FSC, therefore, does not allow the combined length of the name and value strings for a variable to exceed 509 characters.

Result Type: String

Argument Type: String, String

See Also: MATH function "GETV"

Compatibility: Requires V6.0 or later.

Example:

```
MATH S[32] = PUTV("Humidity", S[30])
```

The above example assumes that string register S[30] contains the formatted relative humidity value.

Caution: Function "PUTV" must be used with caution. Modifying the value of a variable written automatically by the MET/CAL run system may cause unforeseen changes in the results.

RAD

Purpose: Converts from degrees to radians.

Result Type: Numeric (radians)

Argument Type: Numeric (degrees)

RHT_HUMIDITY

Purpose: Returns the most recent RHT relative humidity.

A run time error occurs if RHT use is not enabled on the workstation on which the procedure is being executed, or if RHT parameters in the MET/CAL initialization file are incorrect, or if RHT data values in the RHT data file are invalid or inaccessible.

Result Type: Numeric

Argument Type: None

Compatibility: Requires V6.11 or later.

Example:	MATH M[1] = RHT_HUMIDITY()

RHT_TEMP

Purpose:	Returns the most recent RHT temperature. Temperature units are either degC or degF, depending on the configuration of the RHT. A run time error occurs if RHT use is not enabled on the workstation on which the procedure is being executed, or if RHT parameters in the MET/CAL initialization file are incorrect, or if RHT data values in the RHT data file are invalid or inaccessible.
Result Type:	Numeric
Argument Type:	None
Compatibility:	Requires V6.11 or later.
Example:	MATH M[1] = RHT_TEMP()

RHT_TIME

Purpose:	Returns the most recent RHT timestamp in seconds since midnight Jan 01, 1970 UTC (coordinated universal time). A run time error occurs if RHT use is not enabled on the workstation on which the procedure is being executed, or if RHT parameters in the MET/CAL initialization file are incorrect, or if RHT data values in the RHT data file are invalid or inaccessible.
Result Type:	Numeric
Argument Type:	None
Compatibility:	Requires V6.11 or later.
Example:	MATH M[1] = RHT_TIME()

RND

Purpose:	Rounds a number to the nearest integer.
Result Type:	Numeric
Argument Type:	Numeric

SDEV

Purpose: Computes the standard deviation of a set of numbers. The function arguments specify the indices of a range of numeric registers the values of which are to be included in the calculation of the standard deviation.

Result Type: Numeric

Argument Type: Numeric, Numeric

Example:

```
MATH M[5] = 10
MATH M[6] = 11
MATH M[7] = 10
MATH M[8] = 11
MATH MEM = SDEV(5, 8)
```

After the last MATH statement executes the value of MEM will be .5774.

SGN

Purpose: Determines the arithmetic sign of a number. Returns 1 for positive numbers, -1 for negative numbers, and 0 for zero.

Result Type: Numeric

Argument Type: Numeric

SIN

Purpose: Computes the sine of its argument.

Result Type: Numeric (radians)

Argument Type: Numeric (radians)

SINH

Purpose: Computes the hyperbolic sine of its argument.

Result Type: Numeric (radians)

Argument Type: Numeric (radians)

SQRT

Purpose: Computes the square root of its argument.

Result Type: Numeric

Argument Type: Numeric

SUB

Purpose: Extracts a substring of a specified length starting at a specified index. The first argument is the string from which the substring is to be extracted. The second argument is the starting index of the substring. The third argument is the length of the substring.

Result Type: String

Argument Type: String, Numeric, Numeric

Example:

```
MATH MEM2 = SUB("abcdef", 2, 3)
```

After this statement executes the value of MEM2 will be "bcd".

TAN

Purpose: Computes the tangent of its argument.

Result Type: Numeric (radians)

Argument Type: Numeric (radians)

TANH

Purpose: Computes the hyperbolic tangent of its argument.

Result Type: Numeric (radians)

Argument Type: Numeric (radians)

TIME

Purpose: Returns the current time.

The format of the time string is HH:MM:SS.

The hour number (HH) is a number in the range 00 to 23.

The minute and second numbers (MM and SS) are numbers in the range 00 to 59.

Result Type: String

Argument Type: None

Compatibility: Requires V6.0 or later.

Example:

MATH S[5] = time()

This produces a time string like "10:12:59" and stores it in string register S[5].

UTIME

Purpose: Returns the current time in seconds since midnight Jan 01, 1970 UTC (coordinated universal time).

Result Type: Numeric

Argument Type: None

Compatibility: Requires V6.11 or later.

Example: MATH M[1] = UTIME()

VERS

Purpose: Returns MET/CAL version string.

Result Type: String

Argument Type: None

Example 1:

```
MATH mem2 = vers()
```

Example 2:

```
MATH mem = vers()
```

In the second example, the version string is converted to numeric form. This allows the version number to betested in a relational expression.

ZCMP

Purpose: Case-sensitive string comparison. Returns 1 if strings are the same, 0 otherwise. (Same as CMP except returns 0 instead of -1 when strings are not the same.) May be used in conjunction with JMPZ.

Result Type: Numeric

Argument Type: String, String

ZCMPI

Purpose: Case-insensitive string comparison. Returns 1 if strings are the same, 0 otherwise. (Same as CMPI except returns 0 instead of -1 when strings are not the same.) May be used in conjunction with JMPZ.

Result Type: Numeric

Argument Type: String, String

- Literal Values

  Literal values may be numeric or string values.

  Numeric values may be integer, fixed-point or floating-point.

  Examples:

integer	23
fixed-point	3.56
floating-point	2.4E3

- String values must be enclosed in double quotes. String values may not contain embedded NUL characters (zero).

- Literal strings may include the following backslash escape sequences:

\r	carriage return
\n	linefeed
\\	backslash
\"	double quote
\ddd	decimal integer (where ddd = 001 to 255)
\xdd	hex integer (where xdd = x01 to xFF)

- Value Conversion

  Each operator has an expected type for its operands, each function has an expected type for its arguments, and each destination register has a type.

  Automatic conversions from strings to integers, and vice versa, are done as needed during expression evaluation.

  A string is converted to a numeric value by searching for the first numeric character (including ’+’, ’-’, and ’.’) and converting the number which begins at that point. A run time error results if the string does not contain a numeric value.

  Example:

  ```
  MATH MEM = "abc1.4xyz"
  ```

  After the statement is executed, the value of MEM will be 1.4.

- Implicit Conversions

  When an implicit conversion from a numeric value to a string value is done, MET/CAL formats the numeric value to retain up to 6 significant digits.

  If a procedure has a requirement for a conversion which results in a different number of significant digits, the FMT function should be used to explicitly specify the conversion.

Example:

```
MATH MEM = 13579.24
MATH MEM2 = MEM
DISP MEM2 = [MEM2]
```

The implicit conversion which occurs when the assignment MEM2 = MEM is done retains only 6 significant digits. If you display the value of MEM2 after this conversion you will see "13579.2". The 7th significant digit, '4', has been discarded.

To retain all significant digits in this example, use the FMT function:

```
MATH MEM = 13579.24
MATH MEM2 = FMT(MEM, "%.10g")
DISP MEM2 = [MEM2]
```

In the example above, the format descriptor "%.10g" causes up to 10 significant digits to be retained. When you display MEM2 you will now see "13579.24", which has 7 significant digits. The format descriptor should be chosen so as to retain at least as many as the required number of significant digits.

- Operator Precedence

  The following table shows operator precedence from highest to lowest. Operators at the same level have the same precedence and are evaluated left to right.

Level 1	(Highest) ^
Level 2	*, /
Level 3	+, -, &
Level 4	<, <=, >, >=, ==, !=

The default precedence of an operator may be overridden by using parentheses to group sub-expressions.

Example:

```
MATH   MEM = (M[1] + M[2]) * (M[3] - M[4])
```

This expression is evaluated as follows:

1. The sum of M[1] and M[2] is calculated.
2. The difference between M[3] and M[4] is calculated.
3. The result of step 1 is multiplied by the result of step 2.
4. The result of step 3 is stored in MEM.

Note

the expression in the example above would not be the same if the parentheses were removed.

5. Restrictions

   Unary sign operators may not precede non-literal values.

   For example, "MATH MEM = 1 - -MEM1" is illegal.

   Instead, write: "MATH MEM = 1 - (-1 * MEM1)".

   Unary sign operators may precede literal values, however. For example, "MATH MEM = 1 - -3" is legal.

   Array indices must be literal numeric values.

   For example, "MATH MEM = M[MEM1]" is illegal.

- Error Handling

  Division by zero is not allowed. A run time error results if division by zero occurs.

  Run time errors occur if function parameters are out of range or otherwise illegal.

  Examples

```
MATH       MEM     = MEM + M[1] + M[20]
MATH       M[3]    = 7
MATH       MEM1    = M[2] / M[3]
MATH       MEM     = MEM * MEM1 - 4.321

# Assign the string value "xyz" to string register 1.
MATH    S[1] = "xyz"

# Assign the concatenation of the string in S[1] with "abc" to MEM2.
MATH       MEM2 = S[1] & "abc"

# Calculate the square root of 2.
MATH       MEM = sqrt(2)

# Swap MEM and MEM1, using M[1] as a temporary register.
MATH       M[1] = MEM; MEM = MEM1; MEM1 = M[1]
```

MEMC, MEMCX

Evaluation FSCs

Description

The MEMC and MEMCX FSCs performs evaluations based on a comparison between the UUT Indicated value and the System Actual value.

For MEMC:

If the statement specifies a Nominal value, that value is used as the UUT Indicated value. If no value is specified in the NOMINAL field, the value of memory register MEM1 is used as theUUT Indicated value.

The value of memory register MEM is used as the System Actual value.

For MEMCX:

If the statement specifies a Nominal value, that value is used as the System Actual value. If no value is specified in the NOMINAL field, the value of memory register MEM1 is used as the System Actual value.

The value of memory register MEM is used as the UUT Indicated value.

Execution of a MEMC or MEMCX statement does not change the values of MEM or MEM1.

MEMCX is new with MET/CAL V6.1. With MEMCX it should no longer be necessary to precede the evaluation with a MEME statement to swap the MEM and MEM1 registers. Depending on the type of test, it is now always sufficient to use either a MEMC or MEMCX evaluation, without the preceding MEME statement. See the "Historical Note" in the EXAMPLE section (below) for more information.

Format

MEMC *range nominal tolerance mod1*

MEMCX *range nominal tolerance mod1*

Rules

- RANGE Field

  The RANGE field follows the same rules as an instrument FSC. Refer to "General Rules for Instrument FSCs" in this manual.

- NOMINAL Field

  The NOMINAL field is limited to 14 characters.

  The format of the NOMINAL field is:

  [*value*][*string*]

  <*value*> is an NR1, NR2, or NR3-format number.

  NR1-format is integer format (like "12").

  NR2-format is fixed point format (like "15.3").

  NR3-format is scientific notation (like "2.36E+3").

  In a MEMC statement, the value specifies the UUT Indicated value which will be compared to the value stored in MEM. If *value* is not specified, the value of MEM1 is used.

  In a MEMCX statement, the value specifies the System Actual value which will be compared to the value stored in MEM. If *value* is not specified, the value of MEM1 is used.

  value and *string* are both optional. However, at least one of *value* and *string* must be specified.

  Note

  Although the MEMC and MEMCX FSCs are similar in appearance to instrument evaluation statements, they use the registers MEM and MEM1 differently. In an instrument FSC, if no numerical quantity is specified in the NOMINAL field, the value is taken from MEM. In the MEMC and MEMCX FSCs, the value is taken from MEM1.

  string cannot include blanks, and cannot end with 'R', '/', '%' or 'U'.

  The *string* does not affect the numerical value used for the comparison. For example, "10mV" causes the value 10 to be used for the comparison.

  In a MEMC statement, procedure writer must ensure that the original UUT reading is in the same units as specified in the NOMINAL field of the MEMC FSC.

Similarly, in a MEMCX statement, procedure writer must ensure that the original System Actual value is in the same units as specified in the NOMINAL field of the MEMCX FSC.

If the MEMC or MEMCX NOMINAL field specifies a *value*, or ASK- U is specified for the test, the specified *string* is appended to the UUT Indicated and System Actual values in the results generated for the test. In other cases, the units written to the results for the test are based on the previous instrument setup or ACC statement.

Very often the *string* consists of a prefix followed by units. However, that is not a requirement of the MEMC and MEMCX FSCs.

- TOLERANCE Field

  The TOLERANCE field follows the same rules as an instrument FSC. Refer to "General Rules for Instrument FSCs" in this manual.

- MOD1 Field

  The MOD1 field is transferred directly to the results. Anything may be included in this field. Typically the frequency parameter of the test is entered here.

  The length of the field cannot exceed 14 characters.

  The field must not end with R, /, %, or U, and "TOL" is not allowed.

Example

```
STEP  FSC   RANGE NOMINAL TOLERANCE MOD1 MOD2  3  4  CON
1.001 5700        19V                             S  2W
1.002 IEEE        ?[I]
1.003 MEMCX 20    19V     1% 1/
```

Explanation:

The 5700 statement sets up the stimulus for the desired Nominal value. This value, 10, is stored in MEM1 when the 5700 statement executes.

The IEEE statement takes a reading from an IEEE-488 controlled UUT. The numeric result of the reading is stored in MEM. It is presumed in this example that the UUT reading is reported in volts.

The MEMCX FSC compares the System Actual value specified in the MEMCX NOMINAL field (which is the same as the value of the 5700 stimulus specified in the 5700 setup) with the value in MEM (which is the UUT Indicated value).

Historical Note:

Prior to MET/CAL V6.1 the test in the above example would have been coded as follows:

```
STEP  FSC  RANGE NOMINAL TOLERANCE MOD1 MOD2  3  4  CON
   1.001 5700      19V                           S  2W
   1.002 IEEE      ?[I]
   1.003 MEME
   1.004 MEMC 20   V        1% 1/
```

The reason for the difference is that the MEMCX statement did not exist in V6.01 and earlier.

One problem with the old way is that it required the presence of a MEME statement before the MEMC statement. By interchanging the values of MEM and MEM1, the MEME stored the values to be compared in the appropriate places before the MEMC statement was evaluated. Specifically, since the 5700 setup statement stores the System Actual value in MEM1, this value must be moved into MEM, which is where MEMC looks for the System Actual. And since the [I] construct in the IEEE statement stores the UUT Indicated value in MEM, this value must be moved into MEM1, which is where MEMC looks for the UUT Indicated value. The old method generally works, but is potentially incompatible with the measurement uncertainty calculation. The fundamental issue is that using MEME to swap the MEM and MEM1 registers also makes it absolutely necessary to repeat the 5700 setup each time through the measurement uncertainty loop. (When the number of measurements for the measurement uncertainty calculation is greater than 1 MET/CAL automatically repeats the steps of each test the specified number of times.)

Thus, if the procedure writer were to re-code the old-style test as:

```
STEP  FSC  RANGE NOMINAL TOLERANCE MOD1 MOD2  3  4  CON
1.001 5700      19V                           S  2W
1.002 TARGET    -M
1.003 IEEE      ?[I]
1.004 MEME
1.005 MEMC 20   V        1% 1/
```

the test would now be incompatible with the measurement uncertainty calculation. The "optimization" of not repeating the 5700 setup each time through the uncertainty loop prevents the MET/CAL 5700 driver from re-establishing the System Actual value in MEM1, which leads to invalid values in MEM and MEM1 after the MEME. This in turn causes the calculated measurement uncertainty to be incorrect.

This potential problem with the measurement uncertainty calculation in MEMC-based tests provided the primary impetus for the creation of the MEMCX FSC. Since, for a test like the above example, it's no longer necessary to swap MEM and MEM1 before the MEMCX, the procedure writer is now free to skip the 5700 setup on the second and subsequent measurements:

```
STEP  FSC   RANGE NOMINAL TOLERANCE MOD1 MOD2  3  4  CON
1.001 5700        19V                             S  2W
1.002 TARGET      -M
1.003 IEEE        ?[I]
1.004 MEMCX 20    19V     1% 1/
```

P6100

Instrument FSC

Description

The P6100 FSC programs the Fluke 525A Temperature/Pressure Calibrator to measure pressure using a Fluke 6100 Series Pressure Module.

Functional Capability

Model	Minimum	Maximum
6100P02	0.0 psi	1.0000 psi
	0.0 mmHg	51.715 mmHg @ 0 °C
	0.0 inHg	1.0360 inHg @ 32 °F
	0.0 inH_2O	27.680 inH_2O @ 39.2 °F
	0.0 inH_2O	27.729 inH_2O @ 68 °F
	0.0 ftH_2O	2.3067 ftH_2O @ 39.2 °F
	0.0 ftH_2O	2.3107 ftH_2O @ 68 °F
	0.0 mmH_2O	703.07 mmH_2O @ 4 °C
	0.0 mmH_2O	704.31 mmH_2O @ 20 °C
	0.0 cmH_2O	70.307 cmH_2O @ 4 °C
	0.0 cmH_2O	70.431 cmH_2O @ 20 °C
	0.0 mbar	68.948 mbar
	0.0 kPa	6.8948 kPa
	0.0 g/cm2	70.307 g/cm2
6100PA4	0.0 psi	15.000 psi
	0.0 mmHg	775.73 mmHg @ 0 °C
	0.0 inHg	30.540 inHg @ 32 °F
	0.0 inH_2O	415.20 inH_2O @ 39.2 °F
	0.0 inH_2O	415.93 inH_2O @ 68 °F
	0.0 ftH_2O	34.600 ftH_2O @ 39.2 °F
	0.0 ftH_2O	34.661 ftH_2O @ 68 °F
	0.0 cmH_2O	1054.6 cmH_2O @ 4 °C

	0.0 cmH_2O	1056.5 cmH_2O @ 20 °C
	0.0 mH_2O	10.546 mH_2O @ 4 °C
	0.0 mH_2O	10.565 mH_2O @ 20 °C
	0.0 bar	1.0342 bar
	0.0 kPa	103.42 kPa
	0.0 kg/cm2	1.0546 kg/cm2
6100P05	0.0 psi	30.000 psi
	0.0 mHg	1.5515 mHg
	0.0 inHg	61.081 inHg @ 32 °F
	0.0 inH_2O	830.40 inH_2O @ 39.2 °F
	0.0 inH_2O	831.87 inH_2O @ 68 °F
	0.0 ftH_2O	69.200 ftH_2O @ 39.2 °F
	0.0 ftH_2O	69.322 ftH_2O @ 68 °F
	0.0 cmH_2O	2109.2 cmH_2O @ 4 °C
	0.0 cmH_2O	2112.9 cmH_2O @ 20 °C
	0.0 mH_2O	21.092 mH_2O @ 4 °C
	0.0 mH_2O	21.129 mH_2O @ 20 °C
	0.0 bar	2.0684 bar
	0.0 kPa	206.84 kPa
	0.0 kg/cm2	2.1092 kg/cm2
6100P06/	0.0 psi	100.00 psi
6100PA6	0.0 mHg	5.1715 mHg
	0.0 inHg	203.60 inHg @ 32 °F
	0.0 inH_2O	2768.0 inH_2O @ 39.2 °F
	0.0 inH_2O	2772.9 inH_2O @ 68 °F
	0.0 ftH_2O	230.67 ftH_2O @ 39.2 °F
	0.0 ftH_2O	231.07 ftH_2O @ 68 °F
	0.0 cmH_2O	7030.7 cmH_2O @ 4 °C
	0.0 cmH_2O	7043.1 cmH_2O @ 20 °C
	0.0 mH_2O	70.307 mH_2O @ 4 °C

	0.0 mH_2O	70.431 mH_2O @ 20 °C
	0.0 bar	6.8948 bar
	0.0 kPa	689.48 kPa
	0.0 kg/cm2	7.0307 kg/cm2
6100P07/	0.0 psi	500.00 psi
6100PA7	0.0 mHg	25.858 mHg
	0.0 inHg	1018.0 inHg @ 32 °F
	0.0 inH_2O	13840 inH_2O @ 39.2 °F
	0.0 inH_2O	13864 inH_2O @ 68 °F
	0.0 ftH_2O	1153.3 ftH_2O @ 39.2 °F
	0.0 ftH_2O	1155.4 ftH_2O @ 68 °F
	0.0 cmH_2O	35153cmH_2O @ 4 °C
	0.0 cmH_2O	35216 cmH_2O @ 20 °C
	0.0 mH_2O	351.53 mH_2O @ 4 °C
	0.0 mH_2O	352.16 mH_2O @ 20 °C
	0.0 bar	34.474 bar
	0.0 MPa	3.4474 Mpa
	0.0 kg/cm2	35.153 kg/cm2
6100P08/	0.0 psi	1000.0 psi
6100PA8	0.0 mHg	51.715 mHg
	0.0 inHg	2036.0 inHg @ 32 °F
	0.0 inH_2O	27680 inH_2O @ 39.2 °F
	0.0 inH_2O	27729 inH_2O @ 68 °F
	0.0 ftH_2O	2306.7 ftH_2O @ 39.2 °F
	0.0 ftH_2O	2310.7 ftH_2O @ 68 °F
	0.0 cmH_2O	70307 cmH_2O @ 4 °C
	0.0 cmH_2O	70431 cmH_2O @ 20 °C
	0.0 mH_2O	703.07 mH_2O @ 4 °C
	0.0 mH_2O	704.31 mH_2O @ 20 °C
	0.0 bar	68.948 bar

	0.0 MPa	6.8948 Mpa
	0.0 kg/cm2	70.307 kg/cm2
6100P29	0.0 psi	3000.0 psi
	0.0 mHg	155.15 mHg
	0.0 inHg	6108.1 inHg @ 32 °F
	0.0 inH_2O	83040 inH_2O @ 39.2 °F
	0.0 inH_2O	83187 inH_2O @ 68 °F
	0.0 ftH_2O	6920.0 ftH_2O @ 39.2 °F
	0.0 ftH_2O	6932.2 ftH_2O @ 68 °F
	0.0 cmH_2O	21092 cmH_2O @ 4 °C
	0.0 cmH_2O	21129 cmH_2O @ 20 °C
	0.0 kmH_2O	2.1092 kmH_2O @ 4 °C
	0.0 kmH_2O	2.1129 kmH_2O @ 20 °C
	0.0 bar	206.84 bar
	0.0 MPa	20.684 Mpa
	0.0 kg/cm2	210.92 kg/cm2
6100PV4	-15.000 psi	0.0 psi
	-775.73 mmHg	0.0 mmHg @ 0 °C
	-30.540 inHg	0.0 inHg @ 32 °F
	-415.20 inH_2O	0.0 inH_2O @ 39.2 °F
	-415.93 inH_2O	0.0 inH_2O @ 68 °F
	-34.600 ftH_2O	0.0 ftH_2O @ 39.2 °F
	-34.661 ftH_2O	0.0 ftH_2O @ 68 °F
	-1054.6 cmH_2O	0.0 cmH_2O @ 4 °C
	-1056.5 cmH_2O	0.0 cmH_2O @ 20 °C
	-10.546 mH_2O	0.0 mH_2O @ 4 °C
	-10.565 mH_2O	0.0 mH_2O @ 20 °C
	-1.0342 bar	0.0 bar
	-103.42 kPa	0.0 kPa
	-1.0546 kg/cm2	0.0 kg/cm2

Units Symbols

Units Symbol	Name
bar	Bar
cmH_2O	centimeters of water
ftH_2O	feet of water
g/cm2	grams per square centimeter
inH_2O	inches of water
InHg	inches of mercury
mH_2O	meters of water
MHg	meters of mercury
Pa	Pascal
psi	pounds per square inch

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the expected measured value or a reset.

- Pressure entered as: [*numeric*][*prefix*]*units symbol*
- Reset entered as *.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the temperature of the water.

- Temperature entered as *numeric*[*prefix*] degC or degF

Rules:

- The MOD1 field may specify temperature only when the NOMINAL field units are inH_2O, ftH_2O, cmH_2O, or mH_2O.
- Allowed values are 4 °C and 20 °C.

MOD2

This field is not used.

MOD3

This field is used to zero a pressure module.

- "ZR"   zero pressure module
- *blank*   not applicable

Rules:

- When the MOD3 field is "ZR" the MOD4 field must specify a Nominal Setup Test ("N").
- When the MOD3 field is blank the outcome of executing the statement is determined by the type of test specified in the MOD4 field.

MOD4

This field specifies the type of test being performed as described in "General Rules for Instrument Evaluation FSCs".

CON

The CONnection field specifies the model number of the 700 Series Pressure Module used.

CON	Model Number
P02	FLUKE-6100P02
P05	FLUKE-6100P05
P06	FLUKE-6100P06
P07	FLUKE-6100P07
P08	FLUKE-6100P08
P29	FLUKE-6100P29
PA4	FLUKE-6100PA4
PA6	FLUKE-6100PA6
PA7	FLUKE-6100PA7
PV4	FLUKE-6100PV4

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs" in the on-line Reference Manual.

Examples

```
 STEP    FSC     RANGE  NOMINAL        TOLERANCE     MOD1         MOD2  3  4  CON
# ----- Reset -----
  1.001  P6100          *                                                  S
# ----- Zero -----
  1.002  P6100          0.00inH2O                    4degC              ZR N   PA4
# ----- Evaluation (Relative to zero measurement) -----
  1.003  P6100   10     5.00inH2O      0.15U         4degC                     PA4
  2.001  P6100          0.0inH2O                     60degF             ZR N   P29
  2.002  P6100          35.0inH2O      1.0U          60degF                    P29
  3.001  P6100          0.000psi                                        ZR N   P05
  3.002  P6100          0.300psi       4%                                      P05
  4.001  MEMI           Enter zero value for 6100PA5 absolute pressure module.
  4.002  P6100          mmHg                                            ZR N   PA4
  4.003  P6100   1000   754mmHg        2/                                      PA4
  5.001  P6100          0kg/cm2                                         ZR N   PV4
# ----- Setup Test -----
  5.002  P6100          -1.0kg/cm2                                         S   PV4
```

P700

Instrument FSC

Description

The P700 FSC programs the Fluke 525A Temperature/Pressure Calibrator or the Fluke 5520A Multi-Product Calibrator to measure pressure using a Fluke 700 Series Pressure Module.

Functional Capability

Model	Minimum	Maximum
700P01	0.0 psi	0.3613 psi
	0.0 mmHg	18.680 mmHg @ 0 °C
	0.0 inHg	0.7356 inHg @ 32 °F
	0.0 inH_2O	0.000 inH_2O @ 39.2 °F
	0.0 inH_2O	10.011 inH_2O @ 60 °F (5520A only)
	0.0 inH_2O	10.018 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	0.83340 ftH_2O @ 39.2 °F
	0.0 ftH_2O	0.83323 ftH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	0.83387 ftH_2O @ 68 °F (525A only)
	0.0 mmH_2O	254.02 mmH_2O @ 4 °C
	0.0 mmH_2O	254.47 mmH_2O @ 20 °C (525A only)
	0.0 cmH_2O	25.402 cmH_2O @ 4 °C (525A only)
	0.0 cmH_2O	25.447 cmH_2O @ 20 °C (525A only)
	0.0 mbar	24.910 mbar
	0.0 kPa	2.4910 kPa
	0.0 g/cm2	25.400 g/cm2
700P02/700P22	0.0 psi	1.0000 psi
	0.0 mmHg	51.715 mmHg @ 0 °C
	0.0 inHg	2.0360 inHg @ 32degF
	0.0 inH_2O	27.680 inH_2O @ 39.2 °F
	0.0 inH_2O	27.707 inH_2O @ 60 °F (5520A only)

Model	Minimum	Maximum
	0.0 inH_2O	27.729 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	2.3067 ftH_2O @ 39.2 °F
	0.0 ftH_2O	2.3090 ftH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	2.3107 ftH_2O @ 68 °F (525A only)
	0.0 mmH_2O	703.07 mmH_2O @ 4°C
	0.0 mmH_2O	704.31 mmH_2O @ 20°C (525A only)
	0.0 cmH_2O	70.307 cmH_2O @ 4°C (525A only)
	0.0 cmH_2O	70.431 cmH_2O @ 20°C (525A only)
	0.0 mbar	68.948 mbar
	0.0 kPa	6.8948 kPa
	0.0 g/cm2	70.307 g/cm2
700P03/700P23/700PA3	0.0 psi	5.0000 psi
	0.0 mmHg	258.58 mmHg @ 0 °C
	0.0inHg	10.180 inHg @ 32 °F
	0.0inH_2O	138.40 inH_2O @ 39.2 °F
	0.0inH_2O	138.54 inH_2O @ 60 °F (5520A only)
	0.0inH_2O	138.64 inH_2O @ 68 °F (525A only)
	0.0ftH_2O	11.533 ftH_2O @ 39.2 °F
	0.0ftH_2O	11.545 ftH_2O @ 60 °F (5520A only)
	0.0ftH_2O	11.554 ftH_2O @ 68 °F (525A only)
	0.0cmH_2O	351.53 cmH_2O @ 4 °C (525A only)
	0.0cmH_2O	352.16 cmH_2O @ 20 °C (525A only)
	0.0 mH_2O	3.5153 mH_2O @ 4 °C
	0.0 mH_2O	3.5216 mH_2O @ 20 °C (525A only)
	0.0 mbar	344.74 mbar
	0.0 kPa	34.474 kPa
	0.0 g/cm2	351.53 g/cm2

Model	Minimum	Maximum
700P04/700P24/700PA4	0.0 psi	15.000 psi
	0.0 mmHg	775.73 mmHg @ 0 °C
	0.0 inHg	30.540 inHg @ 32 °F
	0.0 inH_2O	415.20 inH_2O @ 39.2 °F
	0.0 inH_2O	415.61 inH_2O @ 60 °F (5520A only)
	0.0 inH_2O	415.93 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	34.600 ftH_2O @ 39.2 °F
	0.0 ftH_2O	34.634 ftH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	34.661 ftH_2O @ 68 °F (525A only)
	0.0 cmH_2O	1054.6 cmH_2O @ 4 °C (525A only)
	0.0 cmH_2O	1056.5 cmH_2O @ 20 °C (525A only)
	0.0 mH_2O	10.546 mH_2O @ 4 °C
	0.0 mH_2O	10.565 mH_2O @ 20 °C (525A only)
	0.0 bar	1.0342 bar
	0.0 kPa	103.42 kPa
	0.0 kg/cm2	1.0546 kg/cm2
700P05/700PA5	0.0 psi	30.000 psi
	0.0 mHg	1.5515 mHg
	0.0 inHg	61.081 inHg @ 32 °F
	0.0 inH_2O	830.40 inH_2O @ 39.2 °F
	0.0 inH_2O	831.21 inH_2O @ 60 °F (5520A only)
	0.0 inH_2O	831.87 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	69.200 ftH_2O @ 39.2 °F
	0.0 ftH_2O	69.269 ftH_2O 60 °F (5520A only)
	0.0 ftH_2O	69.322 ftH_2O @ 68degF (525A only)
	0.0 cmH_2O	2109.2 cmH_2O @4 °C (525A only)
	0.0 cmH_2O	2112.9 cmH_2O @ 20 °C (525A only)
	0.0 mH_2O	21.092 mH_2O @ 4 °C

Model	Minimum	Maximum
	0.0 mH_2O	21.129 mH_2O @ 20 °C (525A only)
	0.0 bar	2.0684 bar
	0.0 kPa	206.84 kPa
	0.0 kg/cm2	2.1092 kg/cm2
700P06/700PA6	0.0 psi	100.00 psi
	0.0 mHg	5.1715 mHg
	0.0 inHg	203.60 inHg @ 32 °F
	0.0 inH_2O	2768.0 InH_2O @ 39.2 °F
	0.0 inH_2O	2770.7 inH_2O @ 60 °F (5520A only)
	0.0 inH_2O	2772.9 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	230.67 ftH_2O @ 39.2 °F
	0.0 ftH_2O	230.90 ftH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	231.07 ftH_2O @ 68 °F (525A only)
	0.0 cmH_2O	7030.7 cmH_2O @ 4 °C 525A only)
	0.0 cmH_2O	7043.1 cmH_2O @ 20 °C (525A only)
	0.0 mH_2O	70.307 mH_2O @ 4 °C
	0.0 mH_2O	70.431 mH_2O @ 20 °C (525A only)
	0.0 bar	6.8948 bar
	0.0 kPa	689.48 kPa
	0.0 kg/cm2	7.0307 kg/cm2
700P07	0.0 psi	500.00 psi
	0.0 mHg	25.858 mHg
	0.0 inHg	1018.0 inHg @ 32 °F
	0.0 inH_2O	13840 inH_2O @ 39.2 °F
	0.0 inH_2O	13854 inH_2O @ 60 °F (5520A only)
	0.0 inH_2O	13864 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	1153.3 ftH_2O @ 39.2 °F
	0.0 ftH_2O	1154.5 ftH_2O @ 60 °F (5520A only)

Model	Minimum	Maximum
	0.0 ftH_2O	1155.4 ftH_2O @ 68 °F (525A only)
	0.0 cmH_2O	35153 cmH_2O @ 4 °C
	0.0 cmH_2O	352.16 cmH_2O @ 20 °C (525A only)
	0.0 mH_2O	351.53 mH_2O @ 4 °C
	0.0 mH_2O	352.16 mH_2O @ 20 °C (525A only)
	0.0 bar	34.474 bar
	0.0 Mpa	3.4474 MPa
	0.0 kg/cm2	35.153 kg/cm2
700P08	0.0 psi	1000.0 psi
	0.0 mHg	51.715 mHg
	0.0 inHg	2036.0 inHg @ 32°C
	0.0 inH_2O	27680 inH_2O @ 39.2°C
	0.0 inH_2O	27707 inH_2O @ 60°C (5520A only)
	0.0 inH_2O	27729 inH_2O @ 68°C (525A only)
	0.0 ftH_2O	2306.7 ftH_2O @ 39.2°C
	0.0 ftH_2O	2309.0 ftH_2O @ 60°C (5520A only)
	0.0 ftH_2O	2310.7 ftH_2O @ 68°C (525A only)
	0.0 cmH_2O	70307 cmH_2O @ 4°C
	0.0 cmH_2O	70431 cmH_2O @ 20°C (525A only)
	0.0 mH_2O	703.07 mH_2O @ 4 °C
	0.0 bar	68.948 bar
	0.0 MPa	6.8948 MPa
	0.0 kg/cm2	70.307 kg/cm2
700P09	0.0 psi	1500.0 psi
	0.0 mHg	77.573 mHg
	0.0 inHg	3054.0 inHg @ 32 °F
	0.0 inH_2O 0.0 inH_2O	41520 inH_2O @ 39.2 °F 41561 inH_2O @ 60 °F (5520A only)

Model	Minimum	Maximum
	0.0 inH_2O	41593 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	3460.0 ftH_2O @ 39.2 °F
	0.0 ftH_2O	3463.4 ftH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	3466.1 ftH_2O @ 68 °F (525A only)
	0.0 kmH_2O	1.0546 kmH_2O @ 4 °C (5520A only)
	0.0 bar	103.42 bar
	0.0 MPa	10.342 MPa
	0.0 kg/cm2	105.46 kg/cm2
700PV3	-5.0000 psi	0.0 psi
	-258.58 mmHg	0.0 mmHg @ 0 °C
	-10.180 inHg	0.0 inHg @32 °F
	-138.40 inH_2O	0.0 inH_2O @ 39.2 °F
	-138.54 inH_2O	0.0 inH_2O @ 60 °F (5520A only)
	-138.64 inH_2O	0.0 inH_2O @ 68 °F (525A only)
	-11.533 ftH_2O	0.0 ftH_2O @ 39.2 °F
	-11.545 ftH_2O	0.0 ftH_2O @ 60 °F (5520A only)
	-11.554 ftH_2O	0.0 ftH_2O @ 68 °F (525A only)
	-351.53 cmH_2O	0.0 cmH_2O @ 4 °C (525A only)
	-352.16 cmH_2O	0.0 cmH_2O @ 20 °C (525A only)
	-3.5153 mH_2O	0.0 mH_2O @ 4 °C
	-3.5216 mH_2O	0.0 mH_2O @ 20 °C (525A only)
	-344.74 mbar	0.0 mbar
	-34.474 kPa	0.0 kPa
	-351.53 g/cm2	0.0 g/ cm2
700PV4	-15.000 psi	0.0 psi
	-775.73 mmHg0	0 mmHg @ 0 °C
	-30.540 inHg0	0 inHg @ 32 °F
	-415.20 inH_2O	0.0 inH_2O @ 39.2 °F

Model	Minimum	Maximum
	-415.61 inH_2O	0.0 inH_2O @ 60 °F (5520A only)
	-415.93 inH_2O	0.0 inH_2O @ 68 °F (525A only)
	-34.600 ftH_2O	0.0 ftH_2O @ 39.2 °F
	-34.634 ftH_2O	0.0 ftH_2O @ 60 °F (5520A only)
	-34.661 ftH_2O	0.0 ftH_2O @ 68 °F (525A only)
	-1054.6 cmH_2O	0.0 cmH_2O @ 4 °C (525A only)
	-1056.5 cmH_2O	0.0 cmH_2O @ 20 °C (525A only)
	-10.546 mH_2O	0.0 mH_2O @ 4 °C
	-10.565 mH_2O	0.0 mH_2O @ 20 °C (525A only)
	-1.0342 bar	0.0 bar
	-103.42 kPa	0.0 kPa
	-1.0546 kg/cm2	0.0 kg/cm2
700PD2	-1.0000 psi	1.0000 psi
	-51.715 mmHg	51.715 mmHg @ 0°C
	-1.0360 inHg	1.0360 inHg @ 32°C
	-27.680 inH_2O	27.680 inH_2O @ 39.2°C
	-27.707 inH_2O	27.707 inH_2O @ 60°C (5520A only)
	-27.729 inH_2O	27.729 inH_2O @ 68°C (525A only)
	-2.3067 ftH_2O	2.3067 ftH_2O @ 39.2°C
	-2.3090 ftH_2O	2.3090 ftH_2O @ 60°C (5520A only)
	-2.3107 ftH_2O	2.3107 ftH_2O @ 68°C (525A only)
	-703.07 mmH_2O	703.07 mmH_2O @ 4 °C
	-704.31 mmH_2O	704.31 mmH_2O @ 20 °C (525A only)
	-70.307 cmH_2O	70.307 cmH_2O @ 4 °C (525A only)
	-70.431 cmH_2O	70.431 cmH_2O @ 20 °C (525A only)
	-68.948 mbar	68.948 mbar
	-6.8948 kPa	6.8948 kPa
	-70.307 g/cm2	70.307 g/cm2

Model	Minimum	Maximum
700PD3	-5.0000 psi	5.0000 psi
	-258.58 mmHg	258.58 mmHg @ 0 °C
	-10.180 inHg	10.180 inHg @ 32 °F
	-138.40 inH_2O	138.40 inH_2O @ 39.2 °F
	-138.54 inH_2O	138.54 inH_2O @ 60 °F (5520A only)
	-138.64 inH_2O	138.64 inH_2O @ 68 °F (525A only)
	-11.533 ftH_2O	11.533 ftH_2O @ 39.2 °F
	-11.545 ftH_2O	11.545 ftH_2O @ 60 °F (5520A only)
	-11.554 ftH_2O	11.554 ftH_2O @ 68 °F (525A only)
	-351.53 cmH_2O	351.53 cmH_2O @ 4 °C (525A only)
	-352.16 cmH_2O	3.5153 mH_2O @ 20 °C (525A only)
	-3.5153 mH_2O	3.5153 mH_2O @ 4 °C
	-3.5153 mH_2O	3.5153 mH_2O @ 20 °C (525A only)
	-344.74 mbar	344.74 mbar
	-34.474 kPa	34.474 kPa
	-351.53 g/cm2	351.53 g/cm2
700PD4	-15.000 psi	15.000 psi
	-775.73 mmHg	775.73 mmHg @ 0 °C
	-30.540 inHg	30.540 inHg @ 32 °F
	-415.20 inH_2O	415.20 inH_2O @ 39.2 °F
	-415.61 inH_2O	415.61 inH_2O @ 60 °F (5520A only)
	-415.93 inH_2O	415.93 inH_2O @ 68 °F (525A only)
	-34.600 ftH_2O	34.600 ftH_2O @ 39.2 °F
	-34.634 ftH_2O	34.634 ftH_2O @ 60 °F (5520A only)
	-34.661 ftH_2O	34.661 ftH_2O @ 68 °F (525A only)
	-1054.6 cmH_2O	1054.6 cmH_2O @ 4 °C (525A only)
	-1056.5 cmH_2O	1056.5 cmH_2O @ 20 °C (525A only)
	-10.546 mH_2O	10.546 mH_2O @ 4 °C

Model	Minimum	Maximum
	-10.565 mH_2O	10.565 mH_2O @ 20 °C (525A only)
	-1.0342 bar	1.0342 bar
	-103.42 kPa	103.42 kPa
	-1.0546 kg/cm2	1.0546 kg/cm2
700PD5	-15.000 psi	30.000 psi
	-775.73 mmHg	1.5515 mHg
	-30.540 inHg	61.081 inHg @ 32 °F
	-415.20 inH_2O	830.40 inH_2O @ 39.2 °F
	-415.61 inH_2O	831.21 inH_2O @ 60 °F (5520A only)
	-415.93 inH_2O	831.87 inH_2O @ 68 °F (525A only)
	-34.600 ftH_2O	69.200 ftH_2O @ 39.2°F
	-34.634 ftH_2O	69.269 ftH_2O @ 60 °F (5520A only)
	-34.661 ftH_2O	69.322 ftH_2O @ 68 °F (525A only)
	-1054.6 cmH_2O	2109.2 cmH_2O @ 4 °C (525A only)
	-1056.5 cmH_2O	2112.9 cmH_2O @ 20 °C (525A only)
	-10.546 mH_2O	21.092 mH_2O @ 4 °C
	-10.565 mH_2O	21.129 mH_2O @ 20°C (525A only)
	-1.0342 bar	2.0684 bar
	-103.42 kPa	206.84 kPa
	-1.0546 kg/cm2	2.1092 kg/cm2
700PD6	-15.00 psi	100.00 psi
	-775.73 mmHg	5.1715 mHg
	-30.540 inHg	203.60 inHg @ 32 °F
	-415.20 inH_2O	2768.0 inH_2O @ 39.2 °F
	-415.61 inH_2O	2770.7 inH_2O @ 60 °F (5520A only)
	-415.93 inH_2O	2772.9 inH_2O @ 68 °F (525A only)
	-34.600 ftH_2O	230.67 ftH_2O @ 39.2 °F
	-34.634 ftH_2O	230.90 ftH_2O @ 60 °F (5520A only)

Model	Minimum	Maximum
	-34.661 ftH_2O	231.07 ftH_2O @ 68 °F (525A only)
	-1054.6 cmH_2O	7030.7 cmH_2O @ 4 °C (525A only)
	-1056.5 cmH_2O	7043.1 cmH_2O @ 20 °C (525A only)
	-10.546 mH_2O	70.307 mH_2O @ 4 °C
	-10.565 mH_2O	70.431 mH_2O @ 20°C (525A only)
	-1.0342 bar	6.8948 bar
	-103.42 kPa	689.48 kPa
	-1.0546kg/cm2	7.0307 kg/cm2
700PD7	-15.00 psi	200.00 psi
	-775.73 mmHg	10.343 mHg
	-30.540 inHg	407.20 inHg @ 32 °F
	-415.20 inH_2O	5536.0 inH_2O @ 39.2 °F
	-415.61 inH_2O	5541.4 inH_2O @ 60 °F (5520A only)
	-415.93 inH_2O	5545.8 inH_2O @ 68 °F (525A only)
	-34.600 ftH_2O	461.33 ftH_2O @ 39.2 °F
	-34.634 ftH_2O	461.79 ftH_2O @ 60 °F (5520A only)
	-34.661 ftH_2O	462.15 ftH_2O @ 68 °F (525A only)
	-1054.6 cmH_2O	14061 cmH_2O @ 4 °C (525A only)
	-1056.5 cmH_2O	14086 cmH_2O @ 20 °C (525A only)
	-10.546 mH_2O	140.61 mH_2O @ 4 °C
	-10.565 mH_2O	140.86 mH_2O @ 20 °C (525A only)
	-1.0342 bar	13.790 bar
	-103.42 kPa	1.3790 MPa
	-1.0546 kg/cm2	14.061 kg/cm2
700P29	0.0 psi	3000.0 psi
	0.0 mHg	155.15 mHg (5520A only)
	0.0 inHg	6108.1 inHg @ 32 °F
	0.0 inH_2O	83040 inH_2O @ 39.2 °F

Model	Minimum	Maximum
	0.0 inH_2O	83121 inH_2O @ 60 °F (5520A only)
	0.0 inH_2O	83187 inH_2O @ 68 °F (525A only)
	0.0 ftH_2O	6920.0 ftH_2O 39.2 °F (5520A only)
	0.0 ftH_2O	6926.9 ftH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	6932.2 ftH_2O @ 68 °F (525A only)
	0.0 kmH_2O	2.1092 kmH_2O @ 4 °C (5520A only)
	0.0 bar	206.84 bar
	0.0 MPa	20.684 MPa
	0.0 kg/cm2	210.92 kg/cm2
700P30	0.0 psi	5000.0 psi
	0.0 mHg	258.58 mHg (5520A only)
	0.0 inHg	10180 inHg @ 32 °F
	0.0 kinH_2O	138400 inH_2O @ 39.2 °F (5520A only)
	0.0 kinH_2O	138540 inH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	11533 ftH_2O @ 39.2 °F (5520A only)
	0.0 ftH_2O	11545 ftH_2O @ 60 °F (5520A only)
	0.0 kmH_2O	3.5153 kmH_2O @ 4 °C (5520A only)
	0.0 bar	344.74 bar
	0.0 MPa	34.474 MPa
	0.0 kg/cm2	351.53 kg/cm2
700P31	0.0 psi	10000 psi
	0.0 mHg	517.15 mHg (5520A only)
	0.0 inHg	20360 inHg @ 32 °F
	0.0 kinH_2O	276800 inH_2O @ 39.2 °F (5520A only)
	0.0 kinH_2O	277070 inH_2O @ 60 °F (5520A only)
	0.0 ftH_2O	23067 ftH_2O @ 39.2 °F (5520A only)
	0.0 ftH_2O	23090 ftH_2O @ 60 °F (5520A only)
	0.0 kmH_2O	7.0307 kmH_2O @ 4 °C (5520A only)

Model	Minimum	Maximum
	0.0 bar	689.48 bar
	0.0 Mpa	68.948 MPa
	0.0 kg/cm2	703.07 kg/cm2

Units Symbols

Units	Symbol Name
bar	Bar
ftH_2O	Feet of water
cmH20	Centimeters of water
g/cm2	Grams per square centimeter
inH_2O	Inches of water
inHg	Inches of mercury
mH_2O	meters of water
mHg	meters of mercury
Pa	Pascal
psi	Pounds per square inch

Parameters

RANGE

This field specifies the UUT range as described in "General Rules for Instrument Evaluation FSCs".

NOMINAL

This field specifies the expected measured value, zero value, or a reset.

- Pressure entered as: [*numeric*] [*prefix*] units symbol
- Reset entered as *.

TOLERANCE

This field specifies the UUT tolerance as described in "General Rules for Instrument Evaluation FSCs".

MOD1

This field specifies the temperature of the water.

- Temperature entered as *numeric*[*prefix*] °C or °F

Rules:

The MOD1 field may specify temperature only when the NOMINAL field units are "mHg", "inHg", "inH_2O", "ftH_2O", "cmH_2O", or "mH_2O".

- Allowed values are as follows:

525A Temperature Calibrator

Nominal Units	MOD1
mHg	0 °C
inHg	32 °F
inH_2O	39.2 °F or 68 °F
ftH_2O	39.2 °F or 68 °F
cmH_2O	4 °C or 20 °C
mH_2O	4 °C or 20 °C

5520A Multi-Product Calibrator

Nominal Units	MOD1
mHg	0 °C
inHg	32 °F
inH_2O	39.2 °F or 60 °F
ftH_2O	39.2 °F or 60 °F
mH_2O	4 °C

MOD2

This field is enables and disables the filter.

- "FL" enable filter (5520A only)
- *blank* disable filter

MOD3

This field is used to zero a pressure module.

- "ZR" zero pressure module

- "RL" relative measurement to one taken with "ZR"
- <*blank*> 525: same as "RL", 5520A: no zero offset

Rules:

- When the MOD3 field is "ZR" the MOD4 field must specify a Nominal
- When the MOD3 field is blank the outcome of executing the statement is determined by the type of test specified in the MOD4 field.

MOD4

This field specifies the type of test being performed as described in "General Rules for Instrument Evaluation FSCs".

CON

The CONnection field specifies the model number of the 700 Series Pressure Module used.

CON	Model Number
P01	FLUKE-700P01
P02	FLUKE-700P02
P03	FLUKE-700P03
P04	FLUKE-700P04
P05	FLUKE-700P05
P06	FLUKE-700P06
P07	FLUKE-700P07
P08	FLUKE-700P08
P09	FLUKE-700P09
P22	FLUKE-700P22
P23	FLUKE-700P23
P24	FLUKE-700P24
P29	FLUKE-700P29
P30	FLUKE-700P30
P31	FLUKE-700P31
PA3	FLUKE-700PA3
PA4	FLUKE-700PA4
PA5	FLUKE-700PA5
PA6	FLUKE-700PA6
PD2	FLUKE-700PD2
PD3	FLUKE-700PD3
PD4	FLUKE-700PD4
PD5	FLUKE-700PD5
PD6	FLUKE-700PD6
PD7	FLUKE-700PD7
PV3	FLUKE-700PV3
PV4	FLUKE-700PV4

Use of Standard Memory Locations and Results Reporting

System memory locations MEM and MEM1 are used. For more information, refer to the "General Rules for Instrument Evaluation FSCs".

Examples

```
STEP    FSC     RANGE NOMINAL         TOLERANCE     MOD1          MOD2   3   4 CON# --
--- Reset -----
  1.001  P700          *                                                     S
# ----- Zero -----
  1.002  P700          0.00inH2O                    4degC               ZR N   P01
# ----- Evaluation (Relative to zero measurement) -----
  1.003  P700   10     5.00inH2O      0.15U         4degC               RL     P01
  2.001  P700          0.0inH2O                     60degF              ZR N   P23
  2.002  P700          35.0inH2O      1.0U          60degF              RL     P23
  3.001  P700          0.000psi                                      FL ZR N   P02
  3.002  P700          0.300psi       4%                             FL RL     P02
  4.001  MEMI          Enter zero value for 700PA5 absolute pressure module.
  4.002  P700          mmHg                                          FL ZR N   PA5
  4.003  P700   1000   754mmHg        2/                             FL RL     PA5
  5.001  P700          0kg/cm2                                          ZR N   PV4
# ----- Setup Test -----
  5.002  P700          -1.0kg/cm2                                       RL S   PV
```

VSET

Miscellaneous FSC

Description

The VSET FSC is a general purpose FSC used to assign values to certain system parameters.

Assignments made in a VSET statement are global in the sense that they affect all subsequent steps in the execution of a procedure, whether those steps are in the main procedure or in a subprocedure, and remain in effect until overridden or reset by another VSET statement.

In V6.0, most VSET parameters are related to the measurement uncertainty calculation. This on-line help file contains general information about the measurement uncertainty calculation which will be of interest even when the procedure does not include any VSET statements.

Notes

1. Initialization File

   The following document refers in numerous places to the "MET/CAL initialization file". The initialization file is normally named "metcal.ini" and is located in the Windows directory on your system. In the sample version of the product the initialization file is called "mcsample.ini".The initialization file is not directly related to the VSET FSC. However, many parameters which can be set using the VSET FSC can also be set in the initialization file. Whenever a parameter is set both in the initialization file and in a VSET statement, the VSET specification always has precedence and overrides the initialization file specification.

2. Exponentiation

   In this document the caret symbol ('^') is used to indicate exponentiation. For example, "3 ^ 0.5" means "3 to the 1/2 power", which is the square root of 3.

3. Units

   Please refer to the UNITS section near the end of this help file for important information about using VSET to override values of physical quantities.

4. Measurement Uncertainty Hints

   Refer to MEASUREMENT UNCERTAINTY HINTS near the end of this help file for general information about enabling and using the measurement uncertainty calculation.

5. Datron 4950

   Refer to the section USING THE DATRON 4950 for a description of how to use the Datron 4950 in conjunction with the measurement uncertainty calculation.

Rules:

1. The general form of a VSET statement is:

   VSET *name* = *value*

   where *name* is a recognized parameter name selected from the parameter list (see below), and value is a valid value for the specified parameter.

2. A VSET statement may contain multiple assignments on a single line:

   VSET *name1* = *value1 name2* = *value2*

   The procedure line length limits the number of assignments which may be made on a single line.

3. All string comparisons are case-insensitive, and spaces before or after the equals sign in an assignment are not significant.

4. A VSET specification always overrides all other specifications. What the "other specifications" are depends on the particular parameter. Typically, the other specifications are by way of one or more of the following:

   - Built-in calculation.
   - Initialization file specification.
   - Database specification.
   - Default value.

5. A VSET specification of a parameter persists for the duration of a procedure's execution until it is either overridden or reset in a subsequent VSET statement.

6. A VSET parameter specification can always be reset by assigning the special value "*".

   When a VSET parameter is reset, it is as if the procedure had never had a VSET specification for that parameter. In other words, the determination of the parameter value reverts to being based on one of the other specification methods for that parameter (see Rule 4, above).

7. Special Constructions

A VSET parameter *value* specification may include one or more MET/CAL special constructions. The following special constructions are supported in a VSET statement:

- [MEM], [MEM1], and [MEM2]
- [M1], [M2], ..., [M255]
- [S1], [S2], ..., [S32]
- [SREG1], [SREG2], ..., [SREG32]
- [V*variable*]

Refer to "Special Constructions" in Chapter 1 of the MET/CAL Procedure Language Reference Manual for more information on special constructions.

The constructions [M1], [M2], ..., M[255] access the numeric registers. Up to 12 significant digits are included in the value. Refer to the MATH FSC on-line help for additional information on the numeric registers.

The constructions [S1], [S2], ..., [S32] access the string registers. Refer to the MATH FSC on-line help for additional information on the string registers.

The constructions [SREG1], [SREG2], ..., [SREG32] are identical to [S1], [S2], ..., [S32], and are included only for compatibility with the IEEE FSC.

The two primary reasons for using a special construction in a VSET parameter value specification are:

1. To allow the parameter value to be calculated using the MATH FSC.
2. To allow the operator to be prompted for the parameter value.

   For example, to prompt the operator for the value of the VSET parameter "nmeas", include the procedure statements:

   ```
   MEMI Please enter the number of measurements:
   VSET nmeas = [mem]
   ```

When using special constructions in a VSET statement, it is important for the procedure writer to realize that doing so prevents the MET/CAL compile time system from checking the value to make sure it’s valid. This means that an error in the value specification will result in a run time error. In some cases it may be difficult or impossible for the operator to correct such a mistake, and procedure execution may be terminated or the results may be invalidated.

Special constructions cannot be used in VSET parameter names, only in parameter values.

Parameter Summary

The following table lists all supported VSET parameters. For full information on each parameter refer to the "Parameter List" section below.

Except for "NTHROW" and "TOL_REF", all VSET parameters are related to the measurement uncertainty calculation.

CONF	confidence value
COV_FAC	coverage factor
EXP_UNC	expanded uncertainty
F	student's T factor
MEAS	specifies measurement quantity for MEMC w/o NOM
MEASURE_ONLY	flag to disable meter setup in meter drivers
MEMC_IRPT	control instrument statements in MEMC tests
MFILE	name of measurement uncertainty output file
MFILE_FORMAT	measurement uncertainty output file format
NMEAS	number of measurements
NSD	number of significant digits
NTHROW	number of measurements to discard
S1	(SDEV / (N ^ 0.5)) * F
S2	(UUT_RES * 0.5) / (3 ^ 0.5)
STD_UNC	standard uncertainty
SYS_ACC	accuracy of system instrument
TOL_REF	UUT_INDICATED or NOMINAL
U1	normalized system accuracy
U2	RSS(S1, S2)
U3	optional uncertainty component
U4	optional uncertainty component
U5	optional uncertainty component
U6	optional uncertainty component
U7	optional uncertainty component
U8	optional uncertainty component
U9	optional uncertainty component
U10	optional uncertainty component
USE_ST	enables use of Student's T to determine F
UUT_RES	absolute resolution of UUT

Parameter List

CONF

The "CONF" parameter allows a Confidence to be specified for use in the measurement uncertainty calculation. The Confidence is a statistical measure of the confidence associated with the specifications given for a calibration standard.

The Confidence must be specified as a sigma value, not as a percentage. For example, if the specifications for a calibration standard are stated as having a 99% confidence, the Confidence should be set to 2.58, which is the equivalent sigma value.

In cases where the confidence associated with the specification of a calibration standard is unknown, you may wish to use 1.73 (that is, 3 ^ 0.5). This is a conservative choice based on the assumption of a rectangular distribution.

The Confidence is used to calculate Normalized System Accuracy.

Recall that:

Standard Uncertainty = RSS(U1, U2, ..., U10)

where U1 is the Normalized System Accuracy, calculated as:

System Accuracy / Confidence

The System Accuracy is the accuracy of the calibration standard, and is usually determined by looking up the value in a MET/CAL accuracy file.

There are 3 ways to specify the Confidence for a calibration standard:

1. Accuracy File Header

   The Confidence is a required part of the accuracy file header. When MET/CAL looks up the specifications of a supported system instrument in an accuracy file, it also reads the Confidence from the accuracy file header. Unless overridden in a VSET statement or in the initialization file, the value from the accuracy file is used in the measurement uncertainty calculation.

2. VSET Statement

   Syntax:

   VSET conf = *value*

   Example:

   VSET conf = 2.58

   Specifying the Confidence using a VSET statement in a procedure overrides the accuracy file specification and the initialization file specification, if any.

3. Initialization File

   It is possible to specify the Confidence in the "[startup]" section of the MET/CAL initialization file.

   In general, however, it is not advisable to specify the Confidence in the initialization file, because the specification overrides all confidence specifications in all accuracy file headers, and will be used globally in the measurement uncertainty calculation unless overridden at the procedure level using a VSET statement.

COV_FAC

COV_FAC specifies the Coverage Factor used to calculate the Expanded Uncertainty as:

Coverage Factor * Standard Uncertainty

By convention, the value typically used for the coverage factor is 2, and MET/CAL V6.0 is shipped with the coverage factor set to 2 in the database.

The are three ways to specify the coverage factor:

1. Database

   As shipped, the coverage factor is set to 2 in the V6.0 database. To change the database specification choose "Uncertainty..." in the "Configure" menu of the Metrology Database Customization and Configuration application. A dialog will appear which allows a different coverage factor to be specified. This value will apply to all workstations at your site, unless overridden at the workstation level by an initialization file specification or at the procedure level by a VSET specification.

2. Initialization File

   The coverage factor may be specified in the "[startup]" section of the MET/CAL initialization file. An initialization file specification applies to all uncertainty calculations on the workstation, and overrides the database specification.

3. VSET Statement

   A VSET specification overrides the database and initialization file specifications, if any.

   Example:

   VSET cov_fac = 1.8

The default coverage factor value is 2. This is the value which would be used if there were no database, initialization file, or procedure specification.

In V6.0, the coverage factor is one of three quantities which can be written to the results. Use the MET/CAL variable MU_COV$ in the format file, usually "rslt_db.frm", to cause the coverage factor to be included in the result line for each test. (If the measurement uncertainty is not calculated for a particular test, MU_COV$ will be blank.)

There is no provision in V6.0 for automatically determining the coverage factor as a function of the number of degrees of freedom.

EXP_UNC

EXP_UNC is the expanded measurement uncertainty.

If measurement uncertainty is enabled, MET/CAL normally calculates the expanded uncertainty as:

    EXP_UNC = STD_UNC * COV_FAC

where STD_UNC is the standard uncertainty and COV_FAC is the coverage factor.

However, it is possible to directly specify the expanded uncertainty in a procedure by using a VSET statement. This overrides the built-in calculation of expanded uncertainty.

Example:

    VSET EXP_UNC = 0.01

Setting EXP_UNC directly is appropriate when MET/CAL's built-in measurement uncertainty calculation does not yield correct results for a particular test, and where the procedure writer has externally determined the uncertainty.

To reset the overriding of EXP_UNC, use the standard VSET reset convention:

    VSET EXP_UNC = *

Directly specifying the value of the expanded uncertainty in this way removes any dependency on the measured values, number of measurements, UUT resolution, confidence value, and Student's T distribution, for those tests. The dependency is removed only for the expanded uncertainty, however, not for the standard uncertainty, which will still be calculated in the normal way, unless its calculation is also overridden using a VSET statement.

In general, in cases where the procedure writer has calculated the measurement uncertainty externally, it will usually make more sense to use VSET to override STD_UNC and, possibly, COV_FAC, and allow MET/CAL to continue to calculate the expanded uncertainty as:

    EXP_UNC = STD_UNC * COV_FAC

F

F is a factor based on the Student's T distribution and the number of degrees of freedom.

Recall that the basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, U3, ..., U10)

where

U2 = RSS(S1, S2)

and where

S1 = (SDEV / (NMEAS ^ 0.5)) * F

SDEV is the standard deviation of the measurements, NMEAS is the number of measurements, and S2 is based on the resolution of the UUT.

Unless overridden or disabled, the value of F is determined per Table G.2 of Annex G of the document ANSI/NCSL Z540-2-1997. The values of F used by MET/CAL are exactly half the values shown in the 95.45% column of Table G.2.

Note that MET/CAL uses the simplifying assumption that the number of degrees of freedom is one less than the number of measurements (NMEAS). If this assumption is not acceptable, it may be possible for the metrologist / procedure writer to directly calculate F and override MET/CAL's built-in determination of F (see below).

Overriding F

There are two ways to override the value of F:

1. F can be specified in the "[startup]" section of the initialization file. specifying F in this way is of limited use, however, because it applies to all measurement uncertainty calculations, regardless of the number of measurements, unless overridden at the procedure level in a VSET statement. (If you don't want to use the factor F at all in the measurement uncertainty calculation, see the section "Disabling F" below.)

2. F can be directly specified at the procedure level in a VSET statement. A VSET specification of F overrides the normal built-in calculation of F, and also overrides an initialization file specification, if any. It does not, however, enable the use of F if it is disabled.

   Example:

   VSET F = 1.5

Disabling F

Some metrologists believe that the calculation of S1 should be simply:

S1 = (SDEV / (NMEAS ^ 0.5))

To disable the use of F in the calculation of S1, set the USE_ST parameter to "no". This can be done at the database, workstation, or procedure level. See the description of USE_ST below.

MEAS

MEAS is a parameter which can be set to "SA" or "UI".

The default is "UI" if MEAS is not specified.

MEAS affects the measurement uncertainty calculation when the evaluation step is a MEMC statement in which a numeric NOMINAL value is not specified. The problem which MEAS is design to address is that for some MEMC evaluations it is not possible to determine from procedure information whether the UUT Indicated is the measurement and the System Actual is the measurand, or vice versa. This ambiguity does not arise when a literal numeric value is specified in the MEMC NOMINAL field because, in that case, the UUT Indicated (NOMINAL) is a constant and the System Actual must be the measurement. However, when there's no numeric MEMC NOMINAL, it can go either way. In the case where the standard is a user-configured meter, the System Actual is the measurement (i.e., the System Actual is the parameter which can vary each time through the measurement uncertainty loop), and the System Actual is therefore the parameter which must be averaged, and must be used to calculate the standard deviation of the measurements. On the other hand, if the standard is a user-configured source device, the system actual is the output (stimulus) of the source, and does not vary, so the measurement is the UUT Indicated value. These considerations apply both to manual procedures, as well as to procedures where the standard and/or UUT are remotely controlled using IEEE or PORT statements.

The MEAS parameter did not exist in V6.00. V6.01 or later is required to use the MEAS parameter.

Example:

VSET MEAS = SA

MEASURE_ONLY

MEASURE_ONLY is a parameter which can be set to "Yes" or "No".

If MEASURE_ONLY is "Yes", MET/CAL meter drivers do not re-setup the meter on the 2nd and subsequent measurements of a sequence of measurements.

This can speed up execution of certain meter-based procedures when NMEAS is greater than 1.

It is up to the metrologist and/or procedure writer to determine whether the increased speed compromises the measurement uncertainty calculation. Re-setting up the meter prior to each measurement will, if nothing else, slow down the procedure and may slightly increase the chance of seeing significant deviations from one measurement to the next.

There are two ways to specify MEASURE_ONLY:

1. Initialization File

   MEASURE_ONLY can be specified in the "[startup]" section of the MET/CAL initialization file. Legal values are "yes" and "no".

   The initialization file specification, if any, applies to all executions of MET/CAL meter drivers when NMEAS is greater than 1 and the current measurement is not the first measurement in a sequence of measurements, unless overridden at the procedure level in a VSET statement.

2. VSET Statement

   MEASURE_ONLY can be specified at the procedure level in a VSET statement.

   Example:

   VSET measure_only = yes

   A VSET specification of MEASURE_ONLY overrides an initialization file specification, if any, and remains in effect for the duration of the procedure until changed or reset in a subsequent VSET statement.

MEASURE_ONLY defaults to "no".

MEMC_IRPT

MEMC_IRPT is a parameter which can be set to "Yes" to "No".

If MEMC_IRPT is "Yes", instrument SETUP and NOMSET statements in MEMC tests are, by default, repeated on the second and subsequent pass through the test for the measurement uncertainty calculation.

If MEMC_IRPT is "No", instrument SETUP and NOMSET statements in MEMC tests are, by default, skipped on the second and subsequent pass through the test for the measurement uncertainty calculation.

MEMC_IRPT may be specified in the [Startup] section of the MET/CAL initialization file. A VSET specification of MEMC_IRPT overrides an initialization file specification.

If MEMC_IRPT is not specified in the initialization file or in the procedure, it defaults to "Yes".

A "TARGET" or "TARGET -m" statement in a MEMC test overrides a MEMC_IRPT specification.

It is critical for a procedure writer to understand that a test which has the structure:

X.001 Stimulus Instrument Setup Statement

X.002 IEEE ...

X.003 MEME

X.004 MEMC *Units w/o Numeric NOMINAL*

must, for measurement uncertainty to work properly, re-execute the instrument setup statement prior to each measurement. Failure to meet this requirement, either by setting MEMC_IRPT to "No", or by inserting a "TARGET" or "TARGET -m" statement after X.001, causes the System Actual value to be incorrectly reported in the results.

(The underlying problem is that the MEME statement interchanges MEM and MEM1 each time through the measurement uncertainty loop. Because of this the instrument setup statement must be allowed to re-establish the System Actual in register MEM1 at the beginning of each loop execution.)

Compatibility: Requires V6.01 or later.

MFILE

MFILE, if set, specifies the name of the optional measurement uncertainty output file.

The measurement uncertainty output file contains intermediate data used in the measurement uncertainty calculation. The file may be useful for understanding, validating, or trouble-shooting the calculation.

There is a choice of formats for the output file. Refer to the description of the MFILE_FORMAT parameter below for an explanation of the file formats.

If the file name is a full path specification, the name is used as specified.

If the file name is a partial path specification, or a simple file name (base name + extension), the name is taken to be relative the the user data directory, if any, specified in the MET/CAL initialization file. If no user data directory is specified, the name is used as specified, even if it is not a full path specification.

The user data directory can be specified using the "user_data_dir" parameter in the initialization file.

If the name of the output file is changed during a procedure run, the currently open output file, if any, is closed, and the new file is opened.

Output can be enabled for selected tests by specifying a value for MFILE before the first test for which output is to be generated, and then resetting MFILE ("VSET MFILE=*") after the last test for which output is to be generated.

If the specified output file already exists, measurement uncertainty data are appended to it. MET/CAL will never delete or clear a measurement uncertainty output file.

If the measurement uncertainty calculation is not enabled, no data are written to the output file.

The output file, if any, is automatically closed at the termination of procedure execution.

Example:

1.001 ASK+ K

1.002 VSET NMEAS = 5

1.003 VSET MFILE = meas.txt

1.004 5700 1.00V 1%

MFILE may be specified in the MET/CAL initialization file, if desired. If MFILE is specified in the initialization file, measurement uncertainty data for all procedure executions, for which the measurement uncertainty calculation is enabled, are written to the specified file. In this case a VSET MFILE specification in a procedure can redirect the data to a different file, but cannot turn off the output. Executing a "VSET MFILE = *" statement will cause output to revert to the file specified in the initialization file.

Compatibility: Requires V6.10 or later.

MFILE_FORMAT

MFILE_FORMAT specifies the format of the measurement uncertainty output file.

There are four format choices:

- DELIM
- DELIM-Q
- DELIM-STD
- VERBOSE

The default is DELIM. However, a per-workstation default can be specified in the MET/CAL initialization file. If MFILE_FORMAT is specified in the initialization file, the specified value is used as the format unless overridden by a VSET specification at the procedure level.

DELIM Format

If MFILE_FORMAT is set to DELIM, the output file contains one line of separated data values for each test. Values which are not set in the calculation are left blank in the output file. The first line of the file contains column headers which can be used to identify the data values.

The DELIM format is designed for importation into other programs (e.g., Microsoft Excel). It is not designed to be easy to read with a plain text editor. Columns will not necessarily line up from row to row, nor will they necessarily line up with the column headers.

In DELIM format the list separator and decimal separator are based on system locale settings.

In the United States the list separator will typically be a comma and the decimal separator will typically be a period.

In Europe the decimal separator will typically be a comma, so a comma is not a good choice for the list separator when DELIM format is used. A semi-colon might make a good list separator in this case.

DELIM-Q Format

DELIM-Q format is the same as DELIM format except that all value, including column headers, are surrounded by double quotes. When DELIM-Q is used, it may be possible to have the system locale list separator the same as the system local decimal separator. For example, the system could be configured so that the comma was used for both separators, and, in that case, programs like Microsoft Excel will still be able to read the file.

DELIM-STD Format

DELIM-STD format is the same as DELIM format except that the system locale settings are not used to determine the list separator and the decimal separator. In DELIM-STD format the list separator is always a comma and the decimal separator is always a period. I.e., DELIM-STD is identical to DELIM for a typical PC in the United States.

VERBOSE Format

If MFILE_FORMAT is set to VERBOSE, the output file contains one multi-line record for each test step. The format of each line is *name* = *value*, where *name* is the parameter name and *value* is the numeric data value. Values which are not set in the calculation are shown as "N/A" in the output file.

The system locale information is used to determine the decimal separator.

In all formats numeric values are shown with up to 10 significant digits.

In all formats the output file contains the following data items for each test:

Step Number
Asset
Start Date
Start Time
UUT Indicated
System Actual
Expanded Uncertainty
Standard Uncertainty
Confidence
Coverage
F
System Accuracy
S1
S2
Standard Deviation
RSS
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
UUT Resolution
NThrow
Number of Measurements
Value #1
Value #2
.
.
.
Value #*N* where *N* is the number of measurements.

In VERBOSE format, the output file also contains a timestamp for each record, as well as a blank line used to separate records.

The "Asset", "Start Date", and "Start Time" data items are available only in Run Time, not in Test Run. In Run Time, the "Start Date" format is YYYY-MM-DD and the "Start Time" format is HH:MM:SS.

Example:

1.001 ASK+ K

1.002 VSET NMEAS = 5

1.003 VSET MFILE = meas.txt

1.004 VSET MFILE_FORMAT = VERBOSE

1.005 5700 1.00V 1%

Compatibility: Requires V6.10 or later.

NMEAS

NMEAS specifies the number of measurements to take for the measurement uncertainty calculation.

Legal values for NMEAS range from 0 to 1000.

Setting NMEAS to zero disables the measurement uncertainty calculation.

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, ..., U10)

where U2 is calculated as:

U2 = RSS(S1, S2)

and where S1 is calculated as:

S1 = (SDEV / (NMEAS ^ 0.5)) * F

In other words, S1 is based on the standard deviation of a series of measurements, where the number of measurements is specified using the NMEAS parameter.

Although it is legal to set NMEAS to 1, notice that this means that the standard deviation is, in effect, zero. This, in turn, means that U2 becomes just S2, and the entire 2^{nd} uncertainty component is then based only on the UUT resolution.

In general, it is therefore not a good idea to set NMEAS to 1. However, there may be some cases where it is acceptable to do so. One such case involves the pre-calculation of S1 or U2, which can then be directly specified at the procedure level.

A second case where setting NMEAS to 1 may be acceptable is when the accuracy of the standard is sufficiently greater than the resolution of the UUT so that any practical sequence of measurements is very likely to result in a standard deviation of zero (i.e., where all measurements are the same).

When NMEAS is set to a value greater than 1, MET/CAL automatically repeats each test step the specified number of times, unless the test step is incompatible with the measurement uncertainty calculation.

Incompatible test steps are:

1. EVAL, DOSE, and PICE

   These are Go / No Go evaluations. There are no numerical measurements on which to base the uncertainty calculation.

2. Tests where ASK+ K Not Set

   When an instrument evaluation step is performed, MET/CAL supports three distinct measurement modes:

   - Keyboard Entry
   - Slewing
   - Go / No Go

   Only the first mode, keyboard entry, allows the measurement uncertainty calculation to be done.

   The second mode, slewing, is not compatible with the measurement uncertainty calculation because by slewing the calibrator until the UUT reading matches an expected value, one would produce a series of measurement (UUT readings) in which all values were the same. The standard deviation would therefore be zero, the the calculated uncertainty would not be valid. A future version of MET/CAL may support slewing in the measurement uncertainty calculation by taking the standard deviation of the sequence of calibrator output values. In V6.0, however, this is not supported.

   The third mode, go / no go, is incompatible with measurement uncertainty for the same reason that the EVAL, DOSE, and PICE FSCs are. There is no sequence of numerical measurements on which to base the standard deviation calculation.

3. Tests where ASK+ U Not Set

   Although the Test Uncertainty Ratio (T.U.R.) calculation is not strictly dependent on the measurement uncertainty calculation, both calculations normally require that a MET/CAL accuracy file be accessed to determine the accuracy of the standard. Since, in the current implementation, clearing the ASK 'U' flag (ASK- U) disables access to accuracy files, it disables the measurement uncertainty calculation as well as the T.U.R. calculation.

Note, however, than when ASK- U is in effect, the measurement will still be repeated the specified number of times, and the reported UUT Indicated value will be the average of the sequence of measurements. The measurement uncertainty will not be calculated, however, and MU_STD$, MU_EXP$, and MU_COV$ will be blank.

As previously mentioned, when NMEAS is greater than 1, MET/CAL automatically repeats each test step the specified number of times, unless the test is incompatible with the measurement uncertainty calculation (see above). It is important to understand how MET/CAL determines which procedure statements to repeat when it automatically repeats a test step.

1. If the procedure test contains a blank "TARGET" statement, or a "TARGET -m" statement, the TARGET statement defines the sequence point for beginning the 2nd and subsequent repetitions of a test step.

   Refer to the on-line help for the TARGET FSC for more information.

2. If the statement is a source (stimulus) or sensor (meter) instrument evaluation step, and there's no applicable TARGET statement in the test, only the instrument evaluation statement is repeated.

   Example:

   ```
   1.001 DISP  Please connect A to B.
   1.002 5700  1V 1%
   ```
   In this example the test consists of two procedure statements, When the measurement is automatically repeated, only the 5700 statement will be executed

3. If the test step is a MEMC evaluation, and there's no applicable TARGET statement in the test, the repeat target is determined by scanning forward from the first statement of the test until one of the following statements is found:

   CALL
   IEEE
   INSTR SENSOR SETUP or NOMSET
   JMP
   JMPF
   JMPL
   JMPT
   JMPZ
   MATH
   MEM*
   MEM+
   MEM-
   MEM/
   MEM2

MEMI
PORT

This implies that the following statements are skipped over in the scan to find the repeat target for the measurement uncertainty calculation in a MEMC test:

ACC
ASK+
ASK-
CON
DISP
DRAW
HEAD
INSTR SRC SETUP or NOMSET
MESS
PIC
RNG
RSLT
SET
STD
TOL

The procedure writer must be aware of how MET/CAL automatically determines repeat targets for the measurement uncertainty calculation, and add "TARGET" or "TARGET -m" statements as needed if the automatic determination is not adequate for a particular test.

There are three ways to set NMEAS:

- Database

  As shipped, the number of measurements is set to zero in the V6.0 database. (This is also the case in the V6.1 database.) That is, the measurement uncertainty calculation is, by default, not enabled. To change the database specification choose "Uncertainty..." in the "Configure" menu of the Metrology Database Customization and Configuration application. A dialog will appear which allows the number of measurements to be specified. This value will apply to all workstations at your site, unless overridden at the workstation level by an initialization file specification or at the procedure level by a VSET specification.

- Initialization File

  NMEAS may be specified in the "[startup]" section of the MET/CAL initialization file. An initialization file specification overrides the database specification for all measurement uncertainty calculations on the workstation.

- VSET Statement

  NMEAS may be set at the procedure level in a VSET statement.

  For example:

  VSET nmeas = 5

  A VSET specification of NMEAS overrides any initialization file and database specification, and remains in effect for the duration of procedure execution until overridden or reset in a subsequent VSET statement.

  Suppose, for example, it were necessary to disable the measurement uncertainty calculation for a particular test. This could be done by specifying:

  VSET nmeas = 0

  as the first statement of the test, and then specifying:

  VSET nmeas = *

  as the initial statement of the following test. (This example assumes linear procedure flow. The procedure writer and/or operator must not jump around the second VSET statement.)

NSD

NSD is used to specify the number of significant digits in the reported values of the expanded uncertainty (EXP_UNC), the standard uncertainty (STD_UNC), and the coverage factor (COV_FAC).

The number of significant digits may be specified at any time during procedure execution using the VSET FSC. When the number of significant digits is specified in a VSET statement, the specification remains in effect until it is changed or reset using a subsequent VSET statement.

The number of significant digits may also be specified on a per-workstation basis in the initialization file. To do this specify "nsd = <n>", where <n> is the number of significant digits, in the [startup] section of "metcal.ini".

Lastly, the number of significant digits may also be specified on a per-site basis in the database. To do this start the "Metrology Database Customization and Configuration" application and choose "Uncertainty..." in the top-level "Configure" menu.

A procedure specification of NSD overrides an initialization file specification or a database specification. An initialization file specification overrides a database specification.

The default is 6 significant digits if no NSD specification exists. NSD allows the number of significant digits to be specified, but does not provide full formatting control of the uncertainty values. In V6.10 the measurement uncertainty values are always shown in base units, using scientific notation (E-format). The units are referenced to the NOMINAL units, but they are not shown with the uncertainty value.

For example, if the NOMINAL value is specified in mV, the uncertainty values are reported in volts (not millivolts), and the units are not shown.

Compatibility: Requires V6.10 or later.

NTHROW

NTHROW specifies the number of measurements to be discarded before each reading.

In V6.00 and V6.01 NTHROW affects only MET/CAL's meter drivers. Corresponding FSCs are: { 2000, 2001, 2002, 34401, 34420, 3458, 437, 45, 5335, 5790, 6666, 6680, 6681, 6685, 8505, 8506, 8560, 8566, 8568, 8590, 8842, 8901, 8902, 8903, 8920, HP60, HP63, and P700 }.

In V6.10 NTHROW applies to all evaluations.

Legal values for NTHROW are -1 to 100.

If NTHROW is -1, meter drivers are compatible with V5.1 and earlier. In some cases this means that the driver will take and discard some number of readings, possibly dependent on the value of the MOD3 field. Refer to on-line help for individual meter-type FSCs for details.

If NTHROW is 0, no readings are discarded.

There are two ways to specify NTHROW:

- Initialization File

  NTHROW can be specified in the "[startup]" section of the MET/CAL initialization file.

  The initialization file specification, if any, applies to all executions of MET/CAL meter drivers, unless overridden at the procedure level in a VSET statement.

- VSET Statement

  NTHROW can be specified at the procedure level in a VSET statement.

  Example:

      VSET nthrow = 3

A VSET specification of NTHROW overrides an initialization file specification, if any, and remains in effect for the duration of the procedure until changed or reset in a subsequent VSET statement.

The default value of NTHROW is -1. That is, if NTHROW is not specified in the initialization file, and is not specified in the procedure in a VSET statement, the meter drivers run in "compatibility mode".

NTHROW does not directly affect the measurement uncertainty calculation. However, to the extent that it is necessary to discard one or more initial meter readings in order to get a reliable reading, NTHROW certainly can affect the sequence of readings, and thereby change the standard deviation and affect the calculated measurement uncertainty.

S1

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, ..., U10)

where U2 is calculated as:

U2 = RSS(S1, S2)

and where S1 is normally calculated as:

S1 = (SDEV / (NMEAS ^ 0.5)) * F

In other words, S1 is normally based on the standard deviation of a series of measurements, where the number of measurements is specified using the NMEAS parameter.

However, it is possible to use a VSET statement override the normal calculation of S1 at the procedure level and directly assign its value.

Example:

VSET S1 = 0.1

To reset the overriding of S1, use the standard VSET reset convention:

VSET S1 = *

If a VSET statement is used to override the value of S1 for one or more tests, this removes any dependency on the number of measurements in the measurement uncertainty calculation for those tests. The procedure writer should, in that case, set NMEAS to 1, unless it is specifically expected that the UUT Indicated value be reported as an average of values rather than as a single measurement.

S2

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, ..., U10)

where U2 is calculated as:

U2 = RSS(S1, S2)

and where S2 is normally calculated as:

S2 = (UUT_RES * 0.5) / (3 ^ 0.5)

In other words, S2 is normally a function of the UUT resolution.

However, it is possible to use a VSET statement override the normal calculation of S2 at the procedure level and directly assign its value.

Example:

VSET S2 = 0.05

To reset the overriding of S2, use the standard VSET reset convention:

VSET S2 = *

If a VSET statement is used to override the value of S2 for one or more tests, this removes any dependency on the UUT resolution in the measurement uncertainty calculation for those tests.

STD_UNC

The basic measurement uncertainty calculation is:

STD_UNC = RSS(U1, U2, ..., U10)

where STD_UNC is the standard uncertainty.

However, it is possible to use a VSET statement override the normal calculation of STD_UNC at the procedure level and directly assign its value.

Example:

VSET STD_UNC = 0.05

To reset the overriding of STD_UNC, use the standard VSET reset convention:

VSET STD_UNC = *

Overriding the normal calculation of STD_UNC is appropriate only where the procedure writer has externally determined the measurement uncertainty associated with a test.

Directly specifying the value of the standard uncertainty in this way removes any dependency on the measured values, number of measurements, UUT resolution, confidence value, and Student's T distribution, for those tests.

The only subsequent calculation performed using the specified standard uncertainty is:

EXP_UNC = STD_UNC * COV_FAC

where EXP_UNC is the Expanded Uncertainty, and where COV_FAC is the Coverage Factor.

Refer to the descriptions of EXP_UNC and COV_FAC in this on-line help file for more information.

SYS_ACC

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, ..., U10)

where U1 is the Normalized System Accuracy, calculated as:

SYS_ACC / CONF

where SYS_ACC is the system accuracy and where CONF is the confidence.

System Accuracy is represented in absolute units (e.g., 0.1 V), and Confidence is expressed as a sigma value (e.g., 2.58 sigma).

Normally the System Accuracy is looked up in a MET/CAL accuracy file. The accuracy file used is typically selected automatically, based on the instrument (the calibration standard), and the calibration interval specified for the particular configured standard in use. (The ACCF FSC can be used to force the use of a particular accuracy file.)

However, it is possible to use a VSET statement override the normal determination of SYS_ACC at the procedure level and directly assign its value.

Example:

VSET SYS_ACC = 0.01

To reset the overriding of SYS_ACC, use the standard VSET reset convention:

VSET SYS_ACC = *

It is important to understand that using a VSET statement to override the determination of the system accuracy does not affect the T.U.R. calculation, which is still based on the accuracy file lookup.

An alternative approach, which can be used in closed-loop, MEMC-based tests the ACC FSC can be used to directly specify the system accuracy in a way which affects both the T.U.R. and the measurement uncertainty.

Using VSET to specify the System Accuracy is particularly useful in cases where MET/CAL's built-in accuracy file lookup is not adequate to determine the accuracy of a standard. For example, counter accuracies typically cannot be represented as:

(percentage of NOMINAL) + floor

and therefore the standard accuracy file lookup does not work for these devices.

The procedure writer may wish to directly specify the system accuracy in these cases in order to allow the measurement uncertainty calculation to proceed.

TOL_REF

Legal values for TOL_REF are "UUT_INDICATED" and "NOMINAL". The default value (as MET/CAL is shipped) is "UUT_INDICATED".

TOL_REF is normally specified on a per-workstation basis in the MET/CAL initialization file.

However, it is possible to use a VSET statement to override the initialization file setting of TOL_REF.

Example:

VSET TOL_REF = NOMINAL

To reset the overriding of TOL_REF, use the standard VSET reset convention:

VSET TOL_REF = *

The TOL_REF parameter specifies the reference value for the calculation of the test tolerance.

The TOL_REF setting has no effect unless the TOLERANCE field specifies the test tolerance as a percentage or PPM value.

The following calculated quantities are affected by the TOL_REF setting:

1. Test Tolerance

   If TOL_REF is set to NOMINAL, the test tolerance is calculated with respect to the Nominal value.

   If TOL_REF is set to UUT_INDICATED, the test tolerance is calculated with respect to the UUT Indicated value.

   Example:

Suppose you have a MET/CAL test like:

ASK+ K

5500 10V 1%

Suppose also that the UUT (a meter) reads 10.1V.

If TOL_REF is NOMINAL the test tolerance is +/- 0.1V, because 0.1V is 1% of 10V.

If TOL_REF is UUT_INDICATED the test tolerance is +/- 0.101, because 0.101 is 1% of 10.1V.

2. Test Uncertainty Ratio (T.U.R.)

   The test tolerance is the numerator of the T.U.R., so changing the test tolerance calculation changes the T.U.R.

3. Error

   Except in some special cases (like dBm in the NOMINAL field), MET/CAL displays the error for a particular test as a percentage.

   If TOL_REF is UUT_INDICATED, the error is displayed as a percentage of the UUT Indicated value.

   If TOL_REF is NOMINAL, the error is displayed as a percentage of the Nominal value.

4. Error % Tol

   MET/CAL calculates the error for a test as the difference between the System Actual and the UUT Indicated. It then displays the error as a percentage of the test tolerance. Since the test tolerance is affected by the TOL_REF setting, as described above, the error expressed as a percentage of the test tolerance is also affected by TOL_REF.

   It is important to remember that TOL_REF makes a difference only for tests where the UUT Indicated and Nominal values are different.

   If the system instrument is a source instrument (like a 5700A or 5500A), and the UUT is a meter, TOL_REF makes a difference for keyboard-entry (ASK+ K) and closed-loop tests, but does not make a difference for tests where the actual output of the calibrator is slewed until the meter reading matches the Nominal value.

U1

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, ..., U10) where U1 is the Normalized System Accuracy, calculated as:

SYS_ACC / CONF

where SYS_ACC is the system accuracy and where CONF is the confidence.

However, it is possible to use a VSET statement to override the normal determination of U1 and directly assign its value.

Example:

VSET U1 = 0.03

To reset the overriding of U1, use the standard VSET reset convention:

VSET U1 = *

When U1 is directly specified in a VSET statement the calculated measurement uncertainty no longer depends on the System Accuracy or Confidence, both of which are usually based on accuracy file lookup.

U2

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, ..., U10)

where U2 is calculated as:

U2 = RSS(S1, S2)

and where S1 is normally calculated as:

S1 = (SDEV / (NMEAS ^ 0.5)) * F

and where S2 is normally calculated as:

S2 = (UUT_RES * 0.5) / (3 ^ 0.5)

However, it is possible to use a VSET statement to override the normal determination of U2 and directly assign its value.

Example:

VSET U2 = 0.016

To reset the overriding of U2, use the standard VSET reset convention:

VSET U2 = *

When U2 is directly specified in a VSET statement the calculated measurement uncertainty no longer depends on the measured values, nt enumber of measurements, the Student’s T distribution, or the UUT resolution.

Directly specifying U2 is appropriate in cases where the procedure writer or metrologist has determined that MET/CAL should calculate measurement uncertainty using the usual RSS (root sum square) calculation, including the normalized system accuracy component, and, possibly, optional uncertainty components U3, U4, ..., U10, but where the usual (empirical) determination of uncertainty component U2 based on the standard deviation of the measured values and the resolution of the UUT (Unit Under Test) is incorrect or inappropriate.

U3

U4

U5

U6

U7

U8

U9

U10

The basic measurement uncertainty calculation is:

STD_UNC = RSS(U1, U2, U3, ..., U10)

where STD_UNC is the Standard Uncertainty, and where U3, U4, ..., U10 are optional uncertainty components which can be directly specified to augment the measurement uncertainty calculation.

U3, U4, ..., U10 can be directly specified using a VSET statement. The default value for each of these components is zero. Thus, in the absence of a VSET statement to assign non-zero values to one or more of these optional uncertainty components, they make no contribution to the RSS (root sum square) calculation, and therefore no contribution to the measurement uncertainty.

Recall also that the Expanded Uncertainty is calculated as:

EXP_UNC = STD_UNC * COV_FAC

Thus, a specification of U3, U4, ..., and/or U10 affects both the Standard Uncertainty (STD_UNC) and the Expanded Uncertainty (EXP_UNC).

Example:

VSET U3 = 0.1

To reset the VSET specification of an optional uncertainty component use, for example:

VSET U3 = *

It is up to the metrologist or procedure writer to decide when it is appropriate to assign values to the optional uncertainty components U1, U2, ..., U10. In general, these optional uncertainty components are intended for Type B uncertainties. These uncertainties are not directly based on the sequence of measured values, the accuracy of the main calibration standard, or the resolution of the UUT, because those uncertainty components are incorporated in U1 and U2, which are, typically, automatically calculated by MET/CAL. As stated in ANSI/NCSL Z540-2-1997, information used to determine Type B uncertainties includes:

- previous measurement data
- knowledge of relevant behavior and properties of
- materials and instruments
- manufacturer’s specifications
- calibration certificates
- uncertainties assigned to reference data taken from handbooks

In practice, sources of additional, optional uncertainty components may include:

- test leads
- terminators
- attenuators
- power splitters
- thermocouples
- other signal conditioners
- environmental factors (temperature, humidity)

In some cases it may be appropriate to leave all optional uncertainty components unassigned (i.e., set to zero). For example, if you are using a Fluke 5720 to calibrate a Fluke 10 DMM, the resolution of the UUT may well dominate the measurement uncertainty calculation, and any uncertainty contribution from, say, test leads, will probably be negligible. On the other hand, if you are using, for example, an HP 3458A to measure a precision resistor, uncertainty due to test leads and temperature fluctuations in the lab may be important.

USE_ST

The USE_ST parameter is used to enable or disable the use of the Student's T distribution to determine the factor F used in the measurement uncertainty calculation.

Legal values for USE_ST are "Yes" and "No".

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, U3, ..., U10)

where

U2 = RSS(S1, S2)

and where

S1 = (SDEV / (NMEAS ^ 0.5)) * F

Recall that F is a factor based on the Student's T distribution and the number of degrees of freedom.

(In MET/CAL's uncertainty calculation the simplifying assumption is made that the number of degrees of freedom is one less than number of measurements.)

When USE_ST is set to "Yes", the factor F is determined, unless overridden or disabled, per Table G.2 of Annex G of the document ANSI/NCSL Z540-2-1997. The values of F used by MET/CAL are exactly half the values shown in the 95.45% column of Table G.2.

When USE_ST is set to "No", the factor F is set to 1.0, so the calculation of S1 becomes simply:

S1 = (SDEV / (NMEAS ^ 0.5))

By default (as distributed) MET/CAL V6.0 sets USE_ST to "No". In other words, the factor F is set to 1 and it is presumed that the Coverage Factor (COV_FAC), typically set to 2, and used to determine the Expanded Uncertainty based on the Standard Uncertainty, is sufficient to incorporate the confidence in the standard deviation of the measured values as a function of the number of measurements. When NMEAS is 10 or more, F is close to 1 in any case, and so this presumption would appear to be justified.

For small NMEAS values, on the other hand, the Student's T-based F value can be significant (for example, F is 6.985 when NMEAS is 2), and the decision as to whether it's appropriate to set F to 1 unconditionally or not has to be based on the judgement of the metrologist. Based on comments from various European and American sources, it was determined that the best approach for MET/CAL is to provide the option and allow each site to decide how to implement this aspect of the uncertainty calculation.

There are three ways to set USE_ST:

1. Database

   As shipped, USE_ST is set to "No" in the V6.0 database. That is, the use of the Student's T-based factor F in the uncertainty calculation is, by default, not enabled. To change the database specification choose "Uncertainty..." in the "Configure" menu of the Metrology Database Customization and Configuration application. A dialog will appear which allows the USE_ST parameter specified. This value will apply to all workstations at your site, unless overridden at the workstation level by an initialization file specification or at the procedure level by a VSET specification.

2. Initialization File

   USE_ST may be specified in the "[startup]" section of the MET/CAL initialization file. An initialization file specification overrides the database specification for all measurement uncertainty calculations on the workstation.

3. VSET Statement

   USE_ST may be set at the procedure level in a VSET statement.

   For example:

   VSET use_st = yes

   A VSET specification of USE_ST overrides any initialization file and database specification, and remains in effect for the duration of procedure execution until overridden or reset in a subsequent VSET statement.

   To reset a VSET specification of USE_ST specify:

   VSET use_st = *

UUT_RES

The basic measurement uncertainty calculation is:

Standard Uncertainty = RSS(U1, U2, ..., U10)

where U2 is calculated as:

U2 = RSS(S1, S2)

and where S1 is normally calculated as:

S1 = (SDEV / (NMEAS ^ 0.5)) * F

and where S2 is normally calculated as:

S2 = (UUT_RES * 0.5) / (3 ^ 0.5)

Unless overridden, MET/CAL attempts to infer the UUT's resolution based on information in the procedure. (Actually, MET/CAL has always done this, but prior to V6.0 the inferred information was used only to control the formatting of certain result variables.) In V6.0, the resolution is needed to determine the measurement uncertainty. If the automatically determined UUT resolution is incorrect or inadequate, the procedure writer can directly specify the UUT resolution in a VSET statement.

For example:

    VSET UUT_RES = .0001

The UUT resolution is expressed in absolute units (Volts, Amps, etc.)

To reset the overriding of UUT_RES, use the standard VSET reset convention:

    VSET UUT_RES = *

The following description explains how MET/CAL attempts to infer the UUT resolution based on procedure information. Procedure writers should attempt to understand what happens, because in some cases it may be necessary to override the automatic determination of the UUT resolution in order ensure correctness of the measurement uncertainty calculation.

1. If the test evaluation step is an instrument FSC statement:

    1.1. If the NOMINAL value is specified in the procedure statement:

    The UUT resolution is based on the specified NOMINAL value.

    1.2. If the NOMINAL value is taken from MEM:

        1.2.1. If the test tolerance is specified in absolute units ('U') and there are 1 or more digits to the right of the decimal point:

        The UUT resolution is based on the specified test tolerance.

        1.2.2. If the test tolerance is not specified in absolute units ('U') or there no digits to the right of the decimal point:

        An attempt is made to guess the UUT resolution based on the NOMINAL value. The algorithm involves formatting the NOMINAL value with up to 10 significant digits, and then counting the number of digits to the right of the decimal point.

2. If the test evaluation step is a MEMC statement:

    2.1. If the MEMC statement specifies a literal numeric value in the NOMINAL field, the UUT resolution is based on the number of digits to the right of the decimal point in the MEMC NOMINAL value.

2.2. Otherwise, if the test contains a prior ACC statement, and T.U.R. checking is enabled, and there's a literal numeric value in the ACC NOMINAL field, the UUT resolution is based on the number of digits to the right of the decimal point in the ACC NOMINAL value.

2.3. Otherwise, if the test contains a prior instrument setup statement, and T.U.R. checking is enabled, and there's a literal numeric value in the NOMINAL field of the setup statement, the UUT resolution is based on the number of digits to the right of the decimal point in the setup statement's NOMINAL value.

2.4. Otherwise, if the MEMC TOLERANCE field specifies a tolerance in absolute units ('U'), and there are one or more digits to the right of the decimal point, the UUT resolution is based on the number of digits to the right of the decimal point in the tolerance field specification.

2.5. Otherwise, an attempt is made to guess the resolution of the UUT based on the NOMINAL value. The algorithm involves formatting the NOMINAL value with up to 10 significant digits, and then counting the number of digits to the right of the decimal point.

In this case the NOMINAL value is determined as follows:

2.5.1. If there's a prior ACC statement in the test and T.U.R. checking is enabled, use the ACC NOMINAL value.

2.5.2. Otherwise, if there's a prior instrument setup statement in the test, and T.U.R. checking is enabled, use the setup NOMINAL value.

2.5.3. Otherwise, use the system actual value, which, since the current statement is a MEMC statement, is just the value in memory register MEM at the time of the MEMC statement's execution.

It is important to be aware of the fact that the units portion of the NOMINAL field in a MEMC or ACC statement is simply an unevaluated string. This is different from the units field in an instrument statement, where the units code must be recognized, and where a units prefix may be specified. Thus, MET/CAL scales the UUT resolution based on a units prefix only when the evaluation step is an instrument evaluation step, or where it's a MEMC statement preceded by an instrument setup statement, and not preceded by an ACC statement, in the sametest.

Examples:

5700 0.03mV 1%

UUT resolution is 0.01 mV.

5700 0.03mV S

MEMC mV 1%

UUT resolution is 0.01 mV.

ACC 0.03mV 1%

MEMC mV 1%

UUT resolution is 0.01, not 0.01 mV.

This may appear to be confusing, but the reason for it is that the "mV" portion of the ACC NOMINAL field is not parsed or evaluated by MET/CAL. One could equally well have written:

ACC 0.03xyz 1%

MEM xyz 1%

MEMC mV .002U

UUT resolution is 0.001, not 0.001 mV.

Like the preceding example, the units portion of the MEMC NOMINAL is not interpreted by MET/CAL.

UNITS

1. All VSET Specifications are in Base Units
   Many of the quantities which can be specified in a VSET statement refer to quantities with physical units (voltage, current, frequency, etc.) A VSET specification of a dimensioned quantity is always taken to be a base units specification, with the units determined by reference to a corresponding instrument setup or evaluation statement.

   Example:

   VSET U3 = 0.001

   5700 10mV 0.1%

In this example, the optional uncertainty component, U3, is set to 0.001V. Note that U3 is not 0.001mV, even though the NOMINAL field in the 5700 statement specifies mV.

2. dBm Specifications are Linearized

   For tests where the UUT indicates a value specified in dBm, or where the standard is programmed or specified in dBm, MET/CAL linearizes all dBm values by converting to RMS Volts before calculating the uncertainty.

   All VSET specifications which apply to dBm tests must be in Vrms.

   Example:

   VSET NMEAS = 5

   VSET U3 = 0.0025

   5700 10D 10kH .1%

   The 5 dBm measurements are converted to Vrms before themean and standard deviation are calculated.

   The optional uncertainty component, U3, is taken to be a Vrms specification, even though the units of the evaluation quantity are dBm ("D").

For dBm tests, the reported average value and reported uncertainty are converted back to dBm, but the internal calculations are done in terms of RMS voltage.

Measurement Uncertainty Hints

To enable the measurement uncertainty calculation in V6.0, the following requirement must be satisfied:

1. Number of Measurements

   The number of measurements must be set to a number greater than or equal to 1.

   Normally this parameter is set in the database. However, it can be specified in an individual procedure. For example:

   VSET nmeas = 5

2. ASK+ K

   Measurement uncertainty is not calculated unless the ASK 'K' flag is set.

   Note that most closed-loop procedures, as shipped, do not specify ASK+ K. This is true even if those procedures make no use of slewing mode.

3. Reporting Measurement Uncertainty

The measurement uncertainty variables which can be written to results are:

MU_STD$ - standard uncertainty

MU_EXP$ - expanded uncertainty

MU_COV$ - coverage factor

To write one or more of these quantities to the formatted result line you must modify the "rslt_db.frm" (default name) format file. For example, TU$ (the T.U.R.) could be replaced by "MU_EXP$". This would also require a change to the column header in the Crystal Reports report file.

The standard uncertainty is also shown in the Post Test dialog when that dialog appears.

In V6.0, measurement uncertainty is not shown in the Test Results window.

4. Using the MEMC FSC

   Measurement uncertainty can be calculated for tests which perform MEMC evaluations, however:

   a. If the MEMC test contains a MEME statement to swap the values of register MEM and MEM1, do not place a "TARGET" or "TARGET -m" statement after the statements which set up the standard. Otherwise, incorrect values of System Actual and/or UUT Indicated will be reported, and the calculated measurement uncertainty will be incorrect.

   b. For some MEMC tests it is necessary to tell the system which quantity is the measurement quantity. This is done by specifying "MEAS = SA" or "MEAS = UI". Refer to the description of the VSET MEAS parameter for additional information. Remember that VSET parameter values persist for the duration of procedure execution until changed or reset.

Using the Datron 4950

In most respects the Datron 4950 functions like any other supported system instrument. However, since the 4950 is designed to internally take a sequence of measurements and return to the user the mean of the measurements and the standard error, MET/CAL handles the 4950 as a special case. When the number of measurements (NMEAS) is set to 1, and when the 4950 is in a mode in which the sample size is greater than 1, MET/CAL uses the standard error calculated by the 4950 as the basis for the determination of the standard deviation.

The calculation is:

Standard Deviation = Standard Error * (N ^ 0.5)

where N is the sample size.

Note that this operation is different from the normal operation when NMEAS is 1. Normally, when NMEAS is 1, no standard deviation is determined, which causes S1 to be zero, which in turn causes U2 to be based only on the UUT's resolution.

It remains possible, even with the Datron 4950, for the procedure writer to override the default calculation. For example, if the procedure includes a VSET statement which directly specifies the value of S1, MET/CAL will no longer use the Standard Error calculated by the 4950, even if NMEAS is set to 1 and the 4950 sample size is greater than 1.

Setting NMEAS to any value greater than 1 disables the built-in use of the standard error calculated by the 4950. For example, suppose NMEAS is 5 and the 4950 is in high accuracy DCI mode. The sample size is 32, and the 4950 calculates the standard error, but MET/CAL will make no use of the calculated standard error in the measurement uncertainty calculation. Rather, in this case, MET/CAL will simply calculate the standard deviation of 5 readings (each of which is really based on 32 internal readings).

If the 4950 is used in a mode in which the sample size is 1 (for example, low accuracy ACV), the procedure writer should set the number of measurements to a value greater than 1 in order to include in the measurement uncertainty calculation the standard deviation of a sequence of measurements.

For additional information refer to the "Sample Size and Resolution" table on page 6-17 of the "Wavetek Model 4950 Multifunction Transfer Standard Instrument User's Handbook" (December 1998).