Appendix A

Specifications

INTRODUCTION

Appendix A contains the specifications of the Fluke 45 Dual Display Multimeter.

These specifications assume:

o A l-year calibration cycle
o An operating temperature of 18 to 280C (64.4 to 82.4'F)
o Relative humidity not exceedingg}Vo (non-condensing) (707ofor 1,000 kO range
and above)

Accuracy is expressed as A(percentage of reading + digits).

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SPECIFICATIONS - DC VOLTAGE

F1 uK,t /{
DISPLAY COUNTS AND READING RATES

RS.232 AND IEEE.488 READING TRANSFER RATES

Response Times

Refer to Section 4 for detailed information.

DC VOLTAGE

Rale Readings per Second Full Range Display Counts

Slow
Medium
Fast

2.5
5
20

99,999*
30,000
3,000

* Ohms full range will typically be 98,000 counts

Rate

Readlno Per Second

Internal Trigger Operatlon
(TRIGGER 1)

Internal Trlgger Operatlon
(TRIGGER 4)

Print Mode Operatlon
(Prlnt set at 1)

Slow

Medium

Fast

2.5

4.5

4.5

1.5

2.4

3.8

2.5

5.0

13.5

Range

Resolulion Accuracy

Slow Medium Fast (6 Monlhs) (1 Yeao

300 mV
3V
30v
300v
1000v

10/V
100pV
1mV

'10 mV
100 mV

100 sV
1mV
10 mV
100 mV
1V

0.02% + 2
O.02c/o + 2
0.02o/o + 2
0.02%+2
0.02V0 + 2

0.025o/o + 2
0.025% + 2
0.025o/o + 2
0.025% + 2
0.0250/o + 2

100 mV
1000 mV
10v
100v
1000v

1pv
10 pY
100pV
1mV
10 mV

0.02% + 6
0.02o/o + 6
0.02% + 6
0.02o/o + 6
0.02V0 + 6

0.025% + 6
0.025Vo + 6
0.02590 + 6
0.0250/0 + 6
0.0250/0 + 6

A-2

Range

Max Allowable
Peak AC
Voltage

Peak Normal Mode Signal

NMRR* >80 dB.l NMRR >60 dBl

300 mV
3V
30v
300v
1000v

100 mV
1000 mV
10v
100v
1000v

20v
20v
1000v
1000v
1000v

15V
15V
50v
50v
200v

15V
15V
300v
300v
1000v

* NMRR is the Normal Mode Rejection Ratio

t Normal Mode Rejection Ratio at 50 or 60 Hz t 0.10/o

Inpul lmpedance

10 MQ in parallel with (100 pF

NOTE

ln the dual display mode, when the volts ac and volts dc functions are selected, the 10 MQ dc input divider is in parallel with the 1 MQ ac divider.

Normal Mode Rejection Ratio

>80 dB at 50 or 60 Hz, slow and medium rates
>54 dB for frequencies between 50-440 Hz, slow and medium rates
>60 dB at 50 Hz, fast rate (Note: Fast rate has no filtering)

Maximum Allowable AC Voltage While Measudng DG Voltage

Common Mode Reiection Ralio

>90 dB at dc, 50 or 60 Hz, (1 kQ unbalanced, medium and slow rates)

Maximum Input

1000V dc or peak ac on any range

SPECIFICATIONS - DC VOLTAGE

A-3

SPECIFICATIONS _ TRUE RMS AC VOLTAGE

TRUE RMS AC VOLTAGE. AC-COUPLED

Accuracy

Accuracy specifications apply within the following limits, based on reading rate:

Slow Reading Rate: Between 15,000 and 99,999 counts (full range) Medium Reading Rate: Between 1,500 and 30,000 counts (full range)
Fast Reading Rate: Between 150 and 3,000 counts (full range)

Decibel Resolulion

I

t

Range

Resolution

Slow Medium Fast

300 mV
3V
30v
300v
750V

100 mV
1000 mV
10v
'100v

750V

1pv
10 pV

'100 sV
1mV
10 mV

10 /V
100 pV
1mV
10 mV
100 mV

100 pV
1mV
10 mV
100 mV
1V

Frequency

Linear Accuracy dB Accuracy
Power*

Max Input at
Slow Medium Fast Slow/Med Fast Upper Freq

20-50 Hz
50 Hz -10 kHz
10-20 kHz
20-50 kHz
50-100 kHz

1olo + 100
0.2o/o + 100
0.50/o + 100
2o/o + 200
5olo + 500

1olo + '10
0.20/o + 10
0.50/o + 10
2o/o + 20
5olo + 50

7o/o + 2
Q.So/o + 2
0.5o/o + 2
2o/o + 3
5y0+b

0.15
0.08
0.11
0.29
0.70

0.72
0.17
0.17
0.34
0.78

2o/o + 10
O.4o/o + 10
1o/o + 10
4o/o + 20
100/o + 50

750 V
750 V
750 V
400 v
200 v

" Error in power mode will not exceed twice the linear accuracy specification

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b

SPECIFICATIONS - TRUE RMS AC VOLTAGE

DECIBEL REFERENCE RESISTANCE

8000c! s00Q 124f/. 8ot
12000 300cr 110o 4fit
10000 2500 93o 2ol
900cr 1s0cl 75cl
800f,) 135ct 50o
60oQ* 125c) 16c!1

" Default rEsistance

t Reading displayed in watts (POWER)

Input lmpedance

1 MO in parallelwith (100 pF

itlaxlmum Grest Factor

3.0

Common Mode Rejectlon Ratlo

>60 dB at 50 or 60 Hz (1 kO unbalanced medium rate)

Maxlmum Inpul q

750V rms, 1000V peak

2 x 107 Volt-Hertz product on any range, normal mode input

1 x 106 Volt-HerE product on any range, common mode input

(AC + DC) Voltage Accuracy

Total Measurement Error will not exceed the sum of the separate ac and dc accuracy specifications, plus 1 display count.

Maximum Frequency of AC l/oltage Input While Measuring AG Currenl

When the meter makes ac current and ac voltage measurements using the dual display, the maximum frequency of the voltage input is limited to the maximum lrequency of the current function. For example, if you are making an ac current measurement on the 10A range, the maximum frequency of the voltage input must be less than 2 kHz.

A-5

SPECIFICATIONS _ DC CURRENT

Ftu KC /;

DC CURRENT

Maximum Input

To be used in protected, low energy circuits only, not to exceed 250V or 4800 VoltAmps. (lEC 664 Install-ation Category ll.)

mA 300 mA dc or ac rms. Protected with a 500 mA, 250V IEC 127-sheet l, fast blow fuse

A 10A dc or ac rms continuous, or 20A dc or ac rms for 30 seconds maximum. Protected with a 15A, 250V 10,0004 interrupt rating, fast blow fuse.

NOTE

Resistance between the COM binding post and the meter's internal measuring circuits is approximately .003Q.

I

b

Range

Resolulion

Accuracy Burden

Slow Medium Fasl Voltage*

30 mA
100 mA
10A

10 mA
100 mA
10A

100 nA
1pA
100/A

1pA
10 sA
1mA

10 r/A
100 /A
10 mA

0.050/o + 3
0.050/o + 2
0.20/o + 5

0.050/o + 15
0.050/o + 5
0.20/o + 7

0.45V
1.4V
0.25V

0.14V
1.4V
0.25V

* Typical at full range

A-6

SPECIFICATIONS - AC CURRENT

h/dt(E /{

AC CURRENT

Accuracy

'!

mA accuracy specifications apply within the following limits, based on reading rate:

Slow Reading Rate: Between 15,000 and 99,999 counts (full range)
Medium Reading Rate: Between 1,500 and 30,000 counts (full range)
Fast Reading Rate: Between 150 and 3,fi)0 counts (full range)

llaxlmum Crest Factor

3.0

Maximum Input

To be used in protected,low energycircuits only, notto exceed 250V or4800Volt-Amps. (lEC 664Installa-tion Category ll.)

mA 300 mA dc or ac rms. Protected with a 500 mA, 250v lEc 127-sheet l,fast blow fuse

A 10A dc or ac rms continuous, or 20A dc or ac rms for 30 seconds maximum. Protected with a 15A, 250 V 10,000A interrupt rating, fast blow fuse.

NOTE

Resistance between the COM binding post and the.meter's internal measuring circuib is approximately .003O.

Range

Resolulion
Burden
Slow Medium Fast Voltrage*

10 mA
30 mA
100 mA
10A

100 nA

1 ttA
100/A

1pA
10/A
1mA

10pA
100gA
10 mA

0.14V
0.45V
1.4V
0.25V

* Typical at full range

Range Frequency

Accuracy

Slow lledlum Fast

mA fio 100 mA)
mA (Io 100 mA)
mA (Io 100 mA)
A (1-10A)
A (1-10A)
A (0.5 to 1A)
A (0.5 to 1A)

20-50 Hz
50 Hz-'10 kHz
10-20 kHz
20-50 Hz
50 Hz-2kHz
20-50 Hz
50Hz-2kHz

2Vo + 100
0.5% + 100
2%+2OO
2%+ 1@
1016 + 100
2%+ 300
1% + 300

2%+'10
9.596 + 10
n6+20
2Vo + 10
1Vo + 10
2ch + 30
1%+30

7ch+ 2
0.8V0 + 2
2%+3
7V6+2
1.3% + 2
Tcvb + 4
1.3%+ 4

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SPECIFICATIONS _ OHMS

OHMS

Open Circuit Voltage

3.2 volts maximum on the 100Q, 3000, 30 MO, 100 MQ, and 300 MQ ranges, 1.5 volts maximum on all other ranges.

Inpul Prolection

500V dc or rms ac on all ranges

U

Range

Resolution
Accuracy

TypicalFull
Full Scale
Voltage

Max Curreni
Through the
Slow Medium Fast Unknown

300c)
3ko
30 kQ
300 ko
3MO
30 MO
300 MQ*

100rl
1000c)
10 ko
100 ko
1000 kQ
10 MO
100 Mo*

'1 mQ
10 mQ

'100 mO
1Q

10c)
100cl
100 ko

10 mQ
100 Mo
1Q

10c)
100cl
1ko
100 kQ

100 Mo
1cl
10r)
100n
1ko
10 ko
1MO

0.050/o+2+0.02e
0.050/o + 2
0.050/o + 2
0.050/o + 2
0.060/o + 2
0.25o/o + 3
2a/o

0.050/o+8+0.02e
0.05%+8+0.02Q
0.050/o + 8
0.050/o + 8
0.060/o + 8
0.250/o + 6
2o/o + 2

0.25
0.24
0.29
0.29
0.3
2.25
2.9

0.09
0.10
0.11
0.11
0.12
1.5
2.75

1mA

120 pA
141t4
1.5 /A
150/A
3201t4
320 pA

1mA

120 pA
14 pA
1.59A
150/A
150/A
320 pA

*Because of the method used to measure resistance, the 100 MO (slow) and 300 MO (medium and fast) ranges cannot measure below 3.2 MO and 20 MO, respectively. "UL" (underload) is shown on the display for resistances below these nominal points, and the computer interface outputs "+1 E-9".

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b

SPECI FICATIONS - DIODE TEST/CONTINUITY

DIODE TEST/CONTINUITY

Test Cunent

Approximately 0.7 mA when measuring afonrard biased junction.

Audlble Tone

Continuous tone for continuity. Brief tone for normal forward biased diode or semiconductor junction.

Open Circuit Vollage

3.2 volts maximum

Conllnully Caplure Tlme

50 us maximum, 10 us typical

Inpul Proleclion

500 volb dc or rms ac

NOTE

When the meter is sef fo measure lrequency and there is no input signal (i.e.,
input terminals are open), the meter may read approximately 25 kHz (rather
than the expected zero).Ihls ls due to lnternalcapacitive pickup olthe inverter
power supply intothe high-impedance, input circuitry.With source impedance
ot12 K), this pickup will not altect the accuracy or stability ot the trequency reading.

Maximum Reading Resolulion

Slow
Medium
Fast

999.99 mV
2.5V
2.5V

10pV
100/V
1mV

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SPECIFICATIONS - FREQUENCY

FREOUENCY

Frequency Range

5Hzto)1MHz

Applicable Functions

Volts AC and Current AC

Sensitivity of AC Voltage

b

30 mV rms
100 mV rms
1V V rnrs

Not specified

NOTE

llhen the meter is set to measurefrequency and there is no input signar (i'e', the input terminals are op"i\, ihe ^et* may read approximatery 25 kHz (rather thon zero). This is due to internor cipacitrviprckup oTtie inv ert er. pow er supp ly,tnt o^ t he hig h-impedance, tnput ciicuitry. wit h

tou.'!.1 imp-edance of 12 kQ, this pickup wilr not affect the accuracy or stability of t he .frequency reading.

b

1000 Hz
10 kHz
100 kHz
1000 kHz
1 MHz*

. 01H2
. 1 Hz
1Hz
10 Hz
100 Hz

:l Hz
1Hz
10 Hz
100 Hz
1 kHz

. 050/o + 2

. 050/o + 'l
. 050/o + 1
. 05o/o + 1
Not Specified

* Specified to 1 MHz, but will measure above 1 MHz.

5 Hz-100 kHz
100 kHz - 300 kHz
300kHz-1MHz
Above 1 MHz

Sensitivity Level of AC Current

FREQUENCY INPUT LEVEL

5 Hz-20 kHz
45 Hz-2k1z

100 mA
104

)3 mA rms
)3 A rms

A-10

ENVIRONMENTAL

Warmup time

Temperature Coeflicienl

Operaling Temperalure

Slorage Temperalure

Relalive Humidity
(non-condensing)

Vibralion

Shock

GENERAL

Common Mode Voltage

Slze

Weight

Power

Standards

RS-232-C

Operating
Non-operating

3G@55H2

0 to 10,000 feet
0 to 40,000 feet

t hour to rated specifications for warmup (t hour, add 0.005% to all accuracy specifications.

(0.1 times the applicable accuracy specification per degree C for OoC to 18oC and 28oC to 50oC (32 to 64.40F and 82.4 lo 122oF)

OoC to 50oC (321o122'F)

- 40oC to + 70oC (-40 to 158'F)

Elevated temperature storage of battery will accelerate battery self-discharge. Maximum storage time before battery must be recharged:
20 - 250C

500c

1000 days

180 days

70oC 40 days

To 90% at OoC to 28C (32-82.4'Fl,
To 80% at 28oC to 35oC (82.4-95'F),
ToTO% at 35'C to 50'C (95-1220F)exceptto 7(M at 0oC to 50oC (32-122"F) for the 1000 kO,3 MO, 10 MO,30 MO, 100 MO, and 300 MO ranges.

Half sine 40 G. Per Mil-T- 28800D, Class 3, Style E.
Bench Handling. Per Mil-T-28800D, Class 3.

1000V dc or peak ac maximum from any input to earth

9.3 cm high, 21.6 cm wide, 28.6 cm deep (3.67 in high, 8.5 in wide, 11.27 in deep)

Net,2.4 kg (5.2 lbs) without battery;
3.2 kg (7.0lbs) with battery;
Shipping,4.0 kg (8.7 lbs)without battery;
4.8 (10.5lbs) with battery

90 to 264V ac (no switching required),50 and 60 Hz (15 VA maximum

Complies with: IEC 948,UL1244, CSA Bulletin 5668
EMC: Part 15 subpartJ of FCC Rules, and VDE 0871.

Baud rates:300,600, 120f,24fi0,4800 and 9600
Odd, even or no parity
One stop bit

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SPECIFICATIONS - OPTIONS

OPTIONS

Battery (Option -01K)
Type 8V Lead-Acid

OperatingTime Shours(typical). E! tighewhenlesslhanlhhourof batteryoperation
remains. Meter still meets specilications.

Recharge Time 16 hours (typical) with'meterturned off and plugged into line power. Battery
will not charge when meter is tumed on.

IEEE-488 (Option -05K)
Capability codes SH1, AH1, T5, L4, SR1, RL1, PPO, DC1, DT1, E1, TEO, LEO and G0

External Trigger Input
VIH 1.35 V minimum
VIL 1.25 V maximum

Input Threshold Hysteresis 0.6 V minimum

?

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