7. SPECIFICATION

7.1 Measurement Functions

7.1.1 DC voltage measurement

Range, maximum voltage display, resolution, input impedance, and maximum input voltage :

Range	7 1/2 digit display		6 1/2 digit display		5 1/2 digit display		4 1/2 digit display	
	Maximum display	Resolu-tion	Maximum display	Resolu-tion	Maximum display	Resolu-tion	Maximum display	Resolu-tion
200mV	199.9999mV	0.1μV	199.9999mV	0.1μV	199.999mV	1μV	199.99mV	10μV
2000mV	1999.9999V	0.1μV	1999.999V	1μV	1999.99V	10μV	1999.9V	100μV
20V	19.999999V	1μV	19.99999V	10μV	19.9999V	100μV	19.999V	1mV
200V	199.99999V	10μV	199.9999V	100μV	199.999V	1mV	199.99V	10mV
1000V	1100.0000V	100μV	1100.000V	1mV	1100.00V	10mV	1100.0V	100mV

Range	Input impedance	Maximum input voltage		
		Bet. input Hi and Lo Terminals	Bet. GUARD and chassis	Bet. GUARD and Lo Terminal
200mV	$10^{10}\Omega$ or more	±1100Vpeak 10sec, or ±500Vpeak continuous	±500Vpeak continuous	±500Vpeak continuous
2000mV				
20V				
200V	10MΩ±0.5%	±1100Vpeak continuous		
1000V				

Measurement accuracy: A value is displayed with a positive and negative allowance ±(% of reading + digit) when the Auto Zero and Auto Calibration functions are turned on (with the calibration time interval of 1 hour or less).

Measurement accuracy during 4 1/2 digit display :

<table>
<tr><th rowspan="2">Integration Time (IT)</th><th rowspan="2">Range</th><th colspan="3">Measurement accuracy</th></tr>
<tr><th>24 hours (at 23°C ± 1°C)</th><th>90 days (at 23°C ± 5°C)</th><th>180 days (at 23°C ± 5°C)</th></tr>
<tr><td rowspan="5">100µs</td><td>200mV</td><td>0.06 + 10</td><td colspan="2" rowspan="5">Same as for 24 hours</td></tr>
<tr><td>2000mV</td><td rowspan="3">0.05 + 4</td></tr>
<tr><td>20V</td></tr>
<tr><td>200V</td></tr>
<tr><td>1000V</td><td>0.05 + 3</td></tr>
<tr><td>1ms</td><td>200mV to 1000V</td><td colspan="3">1/10 of the digit value of 5 1/2 digit display measurement accuracy</td></tr>
<tr><td>10ms to 1PLC</td><td>200mV to 1000V</td><td colspan="3">1/100 of the digit value of 6 1/2 digit display measurement accuracy</td></tr>
<tr><td>5PLC to 100PLC</td><td>200mV to 1000V</td><td colspan="3">1/100 of the digit value of 6 1/2 digit display measurement accuracy</td></tr>
</table>

Measurement accuracy during 5 1/2 digit display :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
1ms	200mV	0.008 + 50	Same as for 24 hours	
	2000mV	0.006 + 6		
	20V	0.006 + 4		
	200V	0.006 + 6		
	1000V	0.006 + 3		
10ms to 1PLC	200mV to 1000V	1/10 of the digit value of 6 1/2 digit display measurement accuracy		
5PLC to 100PLC	200mV to 1000V	1/10 of the digit value of 6 1/2 digit display measurement accuracy		

Measurement accuracy during 6 1/2 digit display :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
10ms	200mV	0.007 + 300	0.008 + 300	Same as for 24 hours
	2000mV	0.007 + 60	Same as for 24 hours	
	20V	0.006 + 40		
	200V	0.006 + 60		
	1000V	0.006 + 20		
1PLC	200mV	0.0025 + 40	0.004 + 40	0.005 + 40
	2000mV	0.0015 + 8	0.003 + 8	0.004 + 8
	20V	0.0012 + 5	0.0027 + 5	0.0037 + 5
	200V	0.0015 + 8	0.003 + 8	0.004 + 8
	1000V	0.0015 + 4	0.003 + 4	0.004 + 4
5PLC to 100PLC	200mV	0.0025 + 35	0.004 + 35	0.005 + 35
	2000mV	0.0015 + 6	0.003 + 6	0.004 + 6
	20V	0.0012 + 4	0.0027 + 4	0.0037 + 4
	200V	0.0015 + 6	0.003 + 6	0.004 + 6
	1000V	0.0015 + 3	0.003 + 3	0.004 + 3

Measurement accuracy during 7 1/2 digit display :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
5PLC to 100PLC	2000mV	10 of the digit value of 6 1/2 digit display measurement accuracy		
	20V			
	200V			
	1000V			

Temperature coefficient: Indicated as a value ±(% of reading + digit) per temperature (°C) in the temperature range of +18 to +28°C. 0.0001 is added to this value if the temperature is between 0 to +18°C or between +28 to +40°C.

Range	7 1/2 digit display	6 1/2 digit display	5 1/2 digit display	4 1/2 digit display
200mV	—	0.0003 + 3	0.0003 + 0.3	0.0003 + 0.03
2000mV	0.0003 + 3	0.0003 + 0.3	0.0003 + 0.03	0.0003 + 0.003
20V	0.0002 + 2	0.0002 + 0.2	0.0002 + 0.02	0.0002 + 0.002
200V	0.0003 + 3	0.0003 + 0.3	0.0003 + 0.03	0.0003 + 0.003
1000V	0.0003 + 1	0.0003 + 0.1	0.0003 + 0.01	0.0003 + 0.001

Noise suppression: Between Guard and Lo terminals with the 1kΩ unbalanced impedance

Integration Time	Effective CMR		NMR 50/60Hz ± 0.09%
	50/60HZ ± 0.09%	DC	
10msec or less	100dB	140dB	0dB
1PLC or more	160dB	140dB	60dB

7.1.2 DC current measurement –Only the R6871E is enabled.–

Range, maximum voltage display, maximum resolution, and input impedance :

Range	6 1/2 digit display		5 1/2 digit display		4 1/2 digit display		Input impedance	Over-current protection
	Maximum display	Resolu-tion	Maximum display	Resolu-tion	Maximum display	Resolu-tion		
2000µA	1999.999µA	1nA	1999.99µA	10nA	1999.9µA	100nA	102Ω or less	2A current fuse
20mA	19.99999mA	10nA	19.9999mA	100nA	1.9999mA	1µA	12Ω or less	
200mA	199.9999mA	100nA	199.999mA	1µA	199.99mA	10µA	3Ω or less	
2000mA	1999.999mA	1µA	1999.99mA	10µA	1999.9mA	100µA	2Ω or less	

Measurement accuracy: A value is displayed with a positive and negative allowance ± (% of reading + digit) when the Auto Zero and Auto Calibration functions are turned on (with the calibration time interval of 1 hour or less).

Measurement accuracy during 4 1/2 digit display :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
100µs	2000µA	0.12 + 10	0.15 + 10	0.18 + 10
	20mA		0.14 + 10	0.16 + 10
	200mA		0.12 + 10	0.13 + 10
	2000mA	0.125	0.145 + 10	0.17 + 10
1ms	2000µA to 2000mA	1/10 of the digit value of 5 1/2 digit display measurement accuracy		
10ms to 1PLC	2000µA to 2000mA	1/100 of the digit value of 6 1/2 digit display measurement accuracy		
5PLC to 100PLC	2000µA to 2000mA	1/100 of the digit value of 6 1/2 digit display measurement accuracy		

Measurement accuracy during 5 1/2 digit display :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
1ms	2000μA	0.06 + 50	0.1 + 50	0.13 + 50
	20mA		0.09 + 50	0.11 + 50
	200mA		0.07 + 50	0.075 + 50
	2000mA	0.065 + 50	0.09 + 50	0.125 + 50
10ms to 1PLC	2000μA to 2000mA	1/10 of the digit value of 6 1/2 digit display measurement accuracy		
5PLC to 100PLC	2000μA to 2000mA	1/10 of the digit value of 6 1/2 digit display measurement accuracy		

Measurement accuracy during 6 1/2 digit display :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
10ms	2000µA	0.06 + 300	0.1 + 300	0.13 + 300
	20mA		0.085 + 300	0.11 + 300
	200mA		0.065 + 300	0.075 + 300
	2000mA	0.065 + 300	0.09 + 300	0.115 + 300
1PLC	2000µA	0.06 + 40	0.1 + 40	0.13 + 40
	20mA		0.085 + 40	0.11 + 40
	200mA		0.065 + 40	0.075 + 40
	2000mA	0.065 + 40	0.09 + 40	0.115 + 40
5PLC to 100PLC	2000µA	0.06 + 300	0.1 + 35	0.13 + 35
	20mA		0.085 + 35	0.11 + 35
	200mA		0.065 + 35	0.075 + 35
	2000mA	0.065 + 35	0.09 + 35	0.115 + 35

Temperature coefficient: Indicated as a value ± (% of reading + digit) per temperature (°C) in the temperature range of 0 to +40°C.

Range	6 1/2 digit display	5 1/2 digit display	4 1/2 digit display
2000µA	0.0035 + 5	0.0035 + 0.5	0.0035 + 0.05
20mA			
200mA	0.0015 + 5	0.0015 + 0.5	0.0015 + 0.05
2000mA			

7.1.3 Resistance measurement

Range, maximum resistance display, maximum resolution, measurement current, voltage between open terminals, and maximum input voltage :

Range	Maximum resistance display (7 1/2 digit) display	Resolution				Measure-ment current	Max. voltage bet. open terminals	Maximum input voltage		
		7 1/2 digit	6 1/2 digit	5 1/2 digit	4 1/2 digit			Bet. terminals	Bet. GUARD and chassis	Bet. terminals and GUARD
10Ω	11.99999Ω	10μΩ	10μΩ	100μΩ	1mΩ	10mA	24V	±350Vpeak continuous	±500Vpeak continuous	±50Vpeak continuous
100Ω	119.99999Ω	10μΩ	100μΩ	1mΩ	10mΩ	10mA				
1kΩ	1199.9999Ω	100μΩ	1mΩ	10mΩ	100mΩ	10mA*				
10kΩ	11.999999Ω	1mΩ	10mΩ	100mΩ	1Ω	1mA				
100kΩ	119.99999Ω	10mΩ	100mΩ	1Ω	10Ω	100μA	18V			
1MΩ	1199.9999kΩ	100mΩ	1Ω	10Ω	100Ω	10μA				
10MΩ	11.999999MΩ	1Ω	10Ω	100Ω	1kΩ	1μA				
100MΩ	119.99999MΩ	10Ω	100Ω	1kΩ	10kΩ	100nA	24V			
1000MΩ	1199.9999MΩ	100Ω	1kΩ	10kΩ	100kΩ	10nA				

* For option 10, 1mA is enabled.

Measurement accuracy: Values measured at 4 terminals are displayed with a positive and negative allowance ± (% of reading + digit) when the Auto Zero and Auto Calibration functions are turned on (with the calibration time interval of 1 hour or less).

The measurement accuracy for 2WΩ (measurement at 2 terminals) is equal to the measurement accuracy for 4WΩ (measurement at 4 terminals) added by 0.2Ω maximum.

Note: If a cable, whose line resistance is less than that of the cable used for 2WΩ calibration (measurement at 2 terminals), a negative sign (–) is displayed during zero point measurement.

Measurement accuracy during 4 1/2 digit display :

<table>
<tr><th rowspan="2">Integration Time (IT)</th><th rowspan="2">Range</th><th colspan="3">Measurement accuracy</th></tr>
<tr><th>24 hours (at 23°C ± 1°C)</th><th>90 days (at 23°C ± 5°C)</th><th>180 days (at 23°C ± 5°C)</th></tr>
<tr><td rowspan="10">100µs</td><td>10Ω</td><td>0.08 + 10</td><td rowspan="8">Same as for 24 hours</td><td rowspan="10">Same as for 90days</td></tr>
<tr><td>100Ω</td><td rowspan="2">0.07 + 4</td></tr>
<tr><td>1kΩ*</td></tr>
<tr><td>1kΩ</td><td rowspan="3">0.06 + 3</td></tr>
<tr><td>10kΩ</td></tr>
<tr><td>100kΩ</td></tr>
<tr><td>1MΩ</td><td>0.07 + 3</td></tr>
<tr><td>10MΩ</td><td>0.09 + 3</td></tr>
<tr><td>100MΩ</td><td>0.25 + 3</td><td>0.3 + 3</td></tr>
<tr><td>1000MΩ</td><td>2.5 + 3</td><td>3 + 3</td></tr>
<tr><td>1ms</td><td>10Ω to 1000MΩ</td><td colspan="3">1/10 of the digit value of 5 1/2 digit display measurement accuracy</td></tr>
<tr><td>10ms to 1PLC</td><td>10Ω to 1000MΩ</td><td colspan="3">1/100 of the digit value of 5 1/2 digit display measurement accuracy</td></tr>
<tr><td>5ms to 100PLC</td><td>10Ω to 1000MΩ</td><td colspan="3">1/100 of the digit value of 6 1/2 digit display measurement accuracy</td></tr>
</table>

*: When measurement current is 1mA (selectable for option 10)

Measurement accuracy during 5 1/2 digit display :

<table>
<tr><th rowspan="2">Integration Time (IT)</th><th rowspan="2">Range</th><th colspan="3">Measurement accuracy</th></tr>
<tr><th>24 hours (at 23°C ± 1°C)</th><th>90 days (at 23°C ± 5°C)</th><th>180 days (at 23°C ± 5°C)</th></tr>
<tr><td rowspan="10">1ms</td><td>10Ω</td><td>0.011 + 50</td><td rowspan="7">Same as for 24 hours</td><td rowspan="10">Same as for 90days</td></tr>
<tr><td>100Ω</td><td rowspan="2">0.009 + 6</td></tr>
<tr><td>1kΩ*</td></tr>
<tr><td>1kΩ</td><td rowspan="3">0.08 + 4</td></tr>
<tr><td>10kΩ</td></tr>
<tr><td>100kΩ</td></tr>
<tr><td>1MΩ</td><td>0.01 + 4</td></tr>
<tr><td>10MΩ</td><td>0.036 + 4</td></tr>
<tr><td>100MΩ</td><td>0.2 + 5</td><td>0.25 + 5</td></tr>
<tr><td>1000MΩ</td><td>2 + 5</td><td>2.5 + 5</td></tr>
<tr><td>10ms to 1PLC</td><td>10Ω to 1000MΩ</td><td colspan="3">1/10 of the digit value of 6 1/2 digit display measurement accuracy</td></tr>
<tr><td>5ms to 100PLC</td><td>10Ω to 1000MΩ</td><td colspan="3">1/10 of the digit value of 6 1/2 digit display measurement accuracy</td></tr>
</table>

*: When measurement current is 1mA (selectable for option 10)

Measurement accuracy during 6 1/2 digit display :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
10ms	10Ω	0.008 + 300	0.009 + 300	Same as for 90days
	100Ω	0.008 + 60	0.009 + 60	
	1kΩ*			
	1kΩ	0.007 + 30	0.008 + 30	
	10kΩ			
	100kΩ			
	1MΩ	0.009 + 30	0.01 + 30	
	10MΩ	0.03 + 30	0.036 + 30	
	100MΩ	0.2 + 30	0.25 + 30	
	1000MΩ	2 + 30	2.5 + 30	
1PLC	10Ω	0.004 + 40	0.006 + 40	0.007 + 40
	100Ω	0.003 + 8	0.005 + 8	0.006 + 8
	1kΩ*			
	1kΩ	0.002 + 4	0.004 + 4	0.006 + 4
	10kΩ			
	100kΩ			
	1MΩ	0.004 + 4	0.006 + 4	0.007 + 4
	10MΩ	0.022 + 5	0.028 + 4	0.03 + 4
	100MΩ	0.15 + 4	0.2 + 4	0.21 + 4
	1000MΩ	1.5 + 4	2 + 4	2 + 4

*: When measurement current is 1mA (selectable for option 10)

(Cont'd)

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
5PLC to 100PLC	10Ω	0.004 + 35	0.006 + 35	0.007 + 35
	100Ω	0.003 + 6	0.005 + 6	0.006 + 6
	1kΩ*			
	1kΩ	0.002 + 3	0.004 + 3	0.006 + 3
	10kΩ			
	100kΩ			
	1MΩ	0.004 + 3	0.006 + 3	0.007 + 3
	10MΩ	0.022 + 3	0.028 + 3	0.03 + 3
	100MΩ	0.15 + 3	0.2 + 3	0.21 + 3
	1000MΩ	1.5 + 3	2 + 3	2.1 + 3

Measurement accuracy during 7 1/2 digit display (10 times of smoothing turned on) :

Integration Time (IT)	Range	Measurement accuracy		
		24 hours (at 23°C ± 1°C)	90 days (at 23°C ± 5°C)	180 days (at 23°C ± 5°C)
5PLC to 100PLC	100Ω	0.003 + 40	0.005 + 40	0.006 + 40
	1kΩ*			
	1kΩ	0.002 + 25	0.004 + 25	0.006 + 25
	10kΩ			
	100kΩ			
	1MΩ	0.004 + 25	0.006 + 25	0.007 + 25
	10MΩ	0.022 + 25	0.028 + 25	0.03 + 25
	100MΩ	0.15 + 25	0.2 + 25	0.21 + 25
	1000MΩ	1.5 + 25	2 + 25	2.1 + 25

* : When measurement current is 1mA (selectable for option 10)

Temperature coefficient: Indicated as a value for 4WΩ ±(% of reading + digit) per temperature (°C) in the temperature range of 0 to +40°C.
(The coefficient for 2WΩ is equal to this value added by 0.02Ω per temperature (°C).)

Range	7 1/2 digit display	6 1/2 digit display	5 1/2 digit display	4 1/2 digit display
10Ω	—	0.0004 + 3	0.0004 + 0.3	0.0004 + 0.03
100Ω 1kΩ*	0.0004 + 3	0.0004 + 0.3	0.0004 + 0.03	0.0004 + 0.003
1kΩ 〜 1MΩ	0.0004 + 2	0.0004 + 0.2	0.0004 + 0.02	0.0004 + 0.002
10MΩ	0.0015 + 2	0.0015 + 0.2	0.0015 + 0.02	0.0015 + 0.02
100MΩ	0.015 + 2	0.015 + 0.2	0.015 + 0.02	0.015 + 0.002
1000MΩ	0.15 + 2	0.15 + 0.2	0.15 + 0.02	0.15 + 0.002

*: When measurement current is 1mA (selectable for option 10)

7.1.4 Network Resistance Measurement Accuracy –Only the R6871E-OHM is enabled–

Measurement accuracy during 6 1/2 digit display:

Range	Measurement accuracy (180days, at 23°C ± 5°C), ± % of Reading ± Digit			
	1:100 or less	1:50 or less	1:20 or less	1:10 or less
1kΩ	—	—	—	± 0.015% ± 5
1kΩ*	—	—	—	± 0.08% ± 5
10kΩ	—	± 0.045% ± 5	± 0.025% ± 5	± 0.015% ± 5
100kΩ	± 0.08% ± 5	± 0.045% ± 5	± 0.025% ± 5	± 0.015% ± 5
1MΩ	± 0.09% ± 5	± 0.05% ± 5	± 0.03% ± 5	± 0.02% ± 5
10MΩ	± 0.14% ± 5	± 0.11% ± 5	± 0.09% ± 5	± 0.08% ± 5

Minimum resistance value in closed circuit : 300Ω or more (5MΩ or less)
Resistance ratio : 1:100 or less
Integration time : 5PLC to 100PLC

The value is displayed with a positive and negative allowance ± (% of reading + digit) when the Auto Zero and Auto Calibration functions are turned on (with the calibration time interval of 1 hour or less).

Temperature coefficient during 6 1/2 digit display:

Range	Temperature coefficient (0 to 18°C, 28°C to 40°C), (± % of Reading ± Digit)/°C			
	1:100 or less	1:50 or less	1:20 or less	1:10 or less
1kΩ	—	—	—	± 0.0006% ± 0.2
1kΩ*	—	—	—	± 0.0021% ± 0.3
10kΩ	—	± 0.0013% ± 0.2	± 0.0008% ± 0.2	± 0.0006% ± 0.2
100kΩ	± 0.0021% ± 0.2	± 0.0013% ± 0.2	± 0.0008% ± 0.2	± 0.0006% ± 0.2
1MΩ	± 0.0021% ± 0.2	± 0.0013% ± 0.2	± 0.0008% ± 0.2	± 0.0006% ± 0.2
10MΩ	± 0.0036% ± 0.2	± 0.0028% ± 0.2	± 0.0023% ± 0.2	± 0.0021% ± 0.2

*: When measurement current is 1mA (selectable for option 10)

7.1.5 AC voltage measurement (True RMS): Only the R6871E is enabled.

Range, maximum voltage display, maximum resolution, input impedance, and maximum applicable voltage :

Range	Maximum voltage display (5 1/2 digit display)	Resolution		Input Impedance	Maximum applicable voltage
		5 1/2 digit	4 1/2 digit		
200mV	199.999mV	1μV	10μV	1MΩ ± 2%, 300pF or less, AC coupling	520Vrms (750V peak) between Hi and Lo terminals
2000mV	1999.99V	10μV	100μV		
20V	19.9999V	100μV	1mV		
200V	199.999V	1mV	10mV		
500V	500.00V	10mV	100mV		

Measurement accuracy : The value is displayed with a positive and negative allowance ± (% of reading + digit) when the Auto Zero and Auto Calibration functions are turned on (with the calibration time interval of 1 hour or less).
This value is reliable for the input in 5% or more of the full scale or 1×10^7 VHz or less.

Measurement accuracy (ACV) during 5 1/2 digit display :

Integration time (IT)	1ms to 10ms		1ms to 10ms	
Frequency range	24 hours (23°C ± 1°C)	180days (23°C ± 5°C)	24 hours (23°C ± 5°C)	180days (23°C ± 5°C)
20Hz to 45Hz	0.25 + 800	0.35 + 800	0.25 + 70	0.35 + 90
45Hz to 300Hz	0.1 + 400	0.2 + 400	0.1 + 70	0.2 + 90
300Hz to 10kHz	0.1 + 400	0.2 + 400	0.1 + 70	0.2 + 90
10kHz to 100kHz	0.8 + 700	1 + 900	0.8 + 700	1 + 900
100kHz to 1MHz	7 + 3000	8 + 4000	7 + 3000	8 + 4000

For 200mV range, the above listed accuracy should be added by 100 digits.
Measurement accuracy during 4 1/2 digit display; Equal to 1/10 of the measurement accuracy during 5 1/2 digit display

Temperature coefficient : 1/10 of the 24-hour measurement accuracy of 1 to 100PLC (per temperature (°C))

Crest factor : 1:4

Response time : Time period required for setup within 0.2% of input step
Fast: Approx. 200msec
Slow: Approx. 2sec

Note : Slow : 20Hz to 1MHz
Fast : 300Hz to 1MHz
In the fast sampling of 20 to 300Hz frequency, data is measured but the measurement accuracy is unreliable.

Measurement accuracy of AC + DC voltages
: Equal to the AC voltage measurement accuracy + 70 digits

7.1.6 AC current measurement (True RMS): Only the R6871E is enabled.

Range, maximum current display, maximum resolution, and input impedance :

Range	5 1/2 digit display		4 1/2 digit display		Input Impedance	Over-current protection
	Maximum display	Resolu-tion	Maximum display	Resolu-tion		
2000μV	1999.99mA	10nA	1999.9mA	100nA	102Ωor less	2A current fuse
20mA	19.9999mA	100nA	19.999mA	1μA	12Ωor less	
200mA	199.999mA	1μA	199.99mA	10μA	3Ωor less	
2000mA	1999.99A	10μA	1999.9A	100μA	2Ωor less	

Measurement accuracy : The value is displayed with a positive and negative allowance ±(% of reading + digit) when the Auto Zero and Auto Calibration functions are turned on (with the calibration time interval of 1 hour or less).

Measurement accuracy during 5 1/2 digit display
(reliable for input of 5% or more on the full scale) :

Integration time (IT)	1ms to 10ms		1PLC to 100PLC	
Frequency range	24 hours (23°C ± 1°C)	180days (23°C ± 5°C)	24 hours (23°C ± 5°C)	180days (23°C ± 5°C)
20Hz to 45Hz	0.5 + 200	0.65 + 220	0.5 + 180	0.65 + 200
45Hz to 5kHz	0.35 + 200	0.5 + 220	0.35 + 180	0.5 + 200

Measurement accuracy during 4 1/2 digit display
: Equal to 1/10 of the measurement accuracy during 5 1/2 digit display

Temperature coefficient : 1/10 of the 24-hour measurement accuracy of 1 to 100PLC (per temperature (°C)) for each measurement range and frequency range

Crest factor : 1:4

Response time : Same as for AC voltage measurement

Measurement accuracy of AC + DC voltages
: Equal to the measurement accuracy of AC current + 70 digits

7.2 Measurement Speed

(1) DATA OUT Mode 0 (Mode that allows data output to all output lines)

For display output only

Sampling mode	:	RUN	Sampling interval	:	0ms
COMPUTE	:	OFF	A ZERO	:	OFF
STORE	:	OFF	A CAL	:	OFF
SMOOTH	:	OFF	Line	:	50Hz
NULL	:	OFF			

Measurement function / Integration time (IT)	DC voltage	AC*1 voltage (AC + DC)	DC*1 current	AC*1 current (AC + DC)	2WΩ (10β to 1000MΩ)	4WΩ (10Ω to 100kΩ)	4WΩ (1000kΩ)	4WΩ (10MΩ)	4WΩ (100MΩ)	4WΩ (1000MΩ)
100μs (4 1/2 digit)	2.2ms	2.5ms	2.5ms	2.5ms	2.5ms	23.4ms	65.6ms	222ms	536ms	2591ms
1ms (5 1/2 digit)	3.5ms	3.4ms	3.9ms	3.4ms	3.5ms	25.7ms	67.5ms	224ms	538ms	2593ms
10ms (6 1/2 digit)	12.4ms	12.4ms	13.1ms	12.4ms	12.7ms	43.9ms	85.7ms	242ms	556ms	2611ms
5PLC (7 1/2 digit)	102ms	102ms	103ms	102ms	103ms	224ms	266ms	423ms	736ms	2791ms

*1 Only the R6871E is enabled.

* Except for 4WΩ, measuring cycles in the integration time range from 1ms to 100PLC can be obtained by (measuring cycle at an integration time of 100μs) + (integration time desired). For 4WΩ, they can be obtained by [(measuring cycle at an integration time of 100μs) + (integration time desired)] × 2.

For output onto the GPIB

Controller : HP300 series
GPIB output format : Minimum length, with header = OFF and block delimiter = EOI

Measurement function / Integration time (IT)	DC voltage	AC*1 voltage (AC + DC)	DC*1 current	AC*1 current (AC + DC)	2WΩ (10β to 1000MΩ)	4WΩ (10Ω to 100kΩ)	4WΩ (1000kΩ)	4WΩ (10MΩ)	4WΩ (100MΩ)	4WΩ (1000MΩ)
100µs (4 1/2 digit)	2.5ms	2.8ms	2.9ms	2.8ms	2.9ms	24.1ms	66.0ms	223ms	536ms	2591ms
1ms (5 1/2 digit)	3.8ms	3.8ms	4.3ms	3.8ms	3.9ms	26.1ms	67.9ms	225ms	538ms	2593ms
10ms (6 1/2 digit)	12.9ms	12.8ms	13.5ms	12.8ms	13.0ms	44.3ms	86.1ms	243ms	556ms	2611ms
5PLC (7 1/2 digit)	103ms	103ms	104ms	103ms	103ms	224ms	266ms	423ms	736ms	2791ms

*1 Only the R6871E is enabled.

* Add about 300 s if the GPIB output format has been set to the standard format (header = OFF, block delimiter = CR/LF (EOI)).

* Add about 1.5ms if SINGLE (Hold-Trigger) has been selected as the sampling mode.

(2) DATA OUT mode 2 (Mode that allows data output to the data memory only, data is saved after true-value calculation)

COMPUTE :	OFF	Function :	VDC
STORE :	ON	Range :	20V
SMOOTH :	OFF	Sampling mode :	RUN
NULL :	OFF	Sample interval :	0ms
A CAL :	OFF	A ZERO :	OFF
		Line :	50Hz

Integration time (IT)	100µs	1ms	10ms	1PLC	5PLC	10PLC	20PLC	50PLC	100PLC
Measure-ment period	1.6ms	2.9ms	11.9ms	22.0ms	102ms	202ms	402ms	1002ms	2002ms

(3) DATA OUT mode 3 (Maximum-speed mode that allows data output to the data memory only, raw datais saved)

Function	:	Previous status	Sampling mode	:	RUN
Range	:	Previous status	Sampling interval	:	0ms
Integrate time	:	100µs	Auto calibration	:	OFF
Auto ZERO	:	OFF	STORE	:	ON
COMPUTE	:	OFF	NULL	:	OFF
SMOOTHING	:	OFF			

Measurement function (Measurement range)	DC voltage	AC*1 voltage (AC + DC)	DC*1 current	AC*1 current (AC + DC)	2WΩ (10Ω to 1000MΩ)	4WΩ (10Ω to 100kΩ)	4WΩ (1000kΩ)	4WΩ (10MΩ)	4WΩ (100MΩ)	4WΩ (1000MΩ)
Measurement period	500µs	500µs	500µs	500µs	500µs	21.3ms	62.3ms	216ms	523ms	2534ms

*1 : Only the R6871E is enabled.

7.3 Integration Time

The following integration times can be set :

100µsec, 1msec, 10msec, 1PLC, 5PLC, 10PLC, 20PLC, 50PLC, or 100PLC (9 modes)

PLC is the sorted power line cycle.

In the 4 1/2 igit display mode, the integration time can be set within the range of 100 sec to 100PLC.

In the 5 1/2 digit display mode, it can be set within the range of 1msec to 100PLC.

In the 6 1/2 digit display mode, it can be set within the range of 10msec to 100PLC.

In the 7 1/2 digit display mode, it can be set within the range of 5PLC to 100PLC.

7.4 Null Function

When the Null function is turned on, the null value is measured and the subsequent measurement data is automatically subtracted by the null value.

The correction range is within ±1% of each range.

7.5 Input Terminals

One of the Front Input, and Rear Input, inputs can be selected, and must be selected by the selector switch on the panel.

(1) Front Input DC/AC V, DC/AC I, 2WΩ, 4WΩ NWΩ *2

(2) Rear Input DC/AC V, *1DC/AC I, 2WΩ, 4WΩ NWΩ *2

*1 Signal can be input to the rear current input terminal only when the Front/Rear selector switch is set to the Front position.

*2 One of the FRONT and REAR sets of input terminals, irrespective of pressing selector switch.

7.6 Smoothing Function

When the smoothing function is turned on, the moving average is determined based on the data measured for the number of times set by the SM TIME key.

7.7 Sampling

(1) RUN : Data sampling continues at the interval specified by SI (Sample Interval).

(2) SINGLE : Data is sampled only once for a single trigger input signal after the DELAY (Trigger Delay)

(3) MULTI : Data is sampled for the specified number of times when a single trigger input signal is received. Data sampling starts after the DELAY has passed and data is sampled at the SI interval.

(4) MULTI BULK : Sampling is performed NS times at intervals of SI in response to a trigger signal 1 input. After sampling is performed NS times, the measurement data of NS samples is output to the GPIB all together in response to the data output request.

SI (Sample Interval) : 0 to 60000ms
DELAY (Trigger Delay) : 0 to 60000ms (0ms for MULTI BULK)
NS (No. of Sample) : 1 to 10000 (1 to 1000 for MULTI BULK)

(5) Trigger source

① Panel switch

② GET command of GPIB "E"

③ TRIGER dingle line signal (negative TTL pulse ⌐└┐)

7.8 Data Memory Functions

(1) Memory function on/off control : Measurement data storage is controlled by the STORE key.

(2) No. of memory data : Any 10,000 data before and after trigger point can be stored in memory. (Available pre-trigger and display-trigger)

(3) Measurement data acquisition : Any single data can be read from memory by using the RECALL key or data number setup (step output mode). Any number of data can also be read sequentially (continuous output mode). The read data is output to the display, or GPIB output terminal. The data is output continuously at the SI interval in the continuous output mode.

7.9 Calculation Function

7.9.1 Primary Calculation Functions

The following calculations can be made for measurement value D :

(1) Scaling $R = \frac{D - Y}{X} * Z$ (X, Y, and Z are constants.)

(2) % Deviation $R = \frac{D - X}{|X|} * 100$ (%)

(3) Delta $R = D_t - D_{t-1}$ (difference between the previous measurement value)

(4) Multiply $R = D_t * D_{t-1}$ (multiplication with the previous measurement value)

(5) Decibel conversion $R = 20 * Y * \log |D/X|$ (dB)

(6) RMS value $R = \sqrt{\frac{1}{X} \sum_{K=1}^{X} Dk^2}$

(7) dBm conversion $R = 10 \log_{10} \frac{D^2 / X}{1mW}$ (D : Measurement voltage)

where
- R : value (dBm) to be converted by dBm based on 1 mW (= 0 dBm)
- D : voltage measurement value (V)
- X : Standard resistance value (Ω)

(8) Temperature Correction of Resistance

$$R_{20} = \frac{Rx}{1 + 0.00393*(X-20)} * \frac{1000}{Y} \ [\Omega/km]$$

where
- R_{20} : Resistance of leads (Ω/km) at the room temperature (20°C)
- Rx : Measurement resistance (Ω) at temperature X°C
- X : Room temperature (°C) during measurement
- Y : Cable length measures (meters)

7.9.2 Secondary Calculation Functions

There are 3 types of secondary calculation functions : calculation of measurement data, calculation of primary calculation results, and calculation of data recalled from memory.

Calculation type, item and expression	Constant setup range	Calculation result display
(1) COMPARATOR 1 (comparator-1) R (HIGH2) : HIGH2 < D R (HIGH1) : HIGH1 < D ≦ HIGH2 R (PASS) : LOW1 ≦ D ≦ HIGH1 R (LOW1) : LOW2 ≦ D < LOW1 R (LOW2) : D < LOW2	HIGH1, HIGH2, LOW1, LOW2: Upper and lower limits if: HIGH1 ≦ HIGH2 LOW2 ≦ LOW1 (HIGH LOW is also allowed)	Indicated by the lamp as follows: R(HIGH2) : HIGH lamp lights R(HIGH1) : HIGH lamp lights R(PASS) : PASS lamp lights R(LOW1) : LOW lamp lights. R(LOW2) : LOW lamp lights. Display values: The measurement value is displayed if the primary calculation is not set. The primary calculation result is displayed if it is set.
(2) COMPARATOR-2 (comparator-2) H2 = LIMIT + %2 H1 = LIMIT + %1 L2 = LIMIT – %2 L1 = LIMIT – %1 R (HIGH2) : HIGH2 < D R (HIGH1) : HIGH1 < D ≦ HIGH2 R (PASS) : LOW1 ≦ D ≦ HIGH1 R (LOW1) : LOW2 ≦ D < LOW1 R (LOW2) : D < LOW2	LIMIT: Reference value (except 0) %1 and %2: Tolerance (%), 0.000 to 100.0 where, %1 ≦ %2	Indicated by the lamp as follows: R(HIGH2) : HIGH lamp lights R(HIGH1) : HIGH lamp lights R(PASS) : PASS lamp lights R(LOW1) : LOW lamp lights R(LOW2) : LOW lamp lights Display values: The measurement value or primary calculation result is converted into percent deviation and displayed based on the reference.

(3) Statistical preocessing

R (COUNT):	Sample count		
R (MAX)	: Maximum value		
R (MIN)	: Minimum value		
R (AVE)	: Average	$\frac{1}{N}\sum_{K=1}^{N} D_k$	
R (P-P)	: Inconstant width	$\lvert R(MAX) - R(MIN) \rvert$	
R (δ)	: Standard deviation	$\sqrt{\frac{1}{N-1}\sum_{K=1}^{N}(D_k - \bar{D})^2}$	
R (UCL)	: Upper control line	R (AVE) + 3R (δ)	
R (LCL)	: Lower control line	R (AVE) – 3R (δ)	

7.10 GPIB Interface

(1)	Standard	IEEE-488-1978
(2)	Interfacing Functions	SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, CO, and E2
(3)	Remote programming	Anylyzer front panel key functions (except for POWER switch and front/rear input selector switch)
(4)	Data output	ASCII format

7.11 Output of Comparator Operation Result –Only the R6871E-OHM is enabled.–

(1) Operation result is output. (Open collector)
HIGH2, HIGH1, PASS, LOW1, LOW2

(2) TRIGGER input signal (TTL negative pulse, 100µsec or more)

(3) Data output signal (TTL negative pulse, approx, 130µsec)

7.12 Control Signals (Single Line Signals)

(1) TRIGGER input signal (TTL negative pulse, 100µsec or more)

(2) COMPLETE output signal (TTL negative pulse, approx. 130µsec)

(3) Input terminals : BNC connectors

7.13 Buzzer Function (with ON/OFF Switching)

The buzzer sounds when :

(1) Data is entered from panel keys.

(2) An error occurs.

(3) Comparator calculation is executed.

7.14 General Specifications

Measurement technique : Integration measurement

Data input : Floating and guarded

Range selection modes : Auto, manual, or remote

Data display : 7-segment green LEDs

Polarity indication : Negative polarity indication

Display unit : 5×7-dot matrix LEDs

Software calibration : Each function and range of DC voltage/current, AC voltage/current, and resistance can be calibrated through main panel key operation or GPIB program.

Storage temperature : –25°C to +70°C

Environment conditions : Temperature of 0 to +40°C and relative humidity of 85% or less (70% or less in the 10MΩ, 100MΩ, and 1000MΩ resistance range)

Power supply : The power voltage of the equipment is set at the delivery according to the customer's ordering information.

Type	Standard	Option 32	Option 42	Option 44
Source voltage (VAC)	90 to 110	103 to 132	198 to 242	207 to 250

Line frequencey : 48Hz to 66Hz

Power comsumption : R6871E/E-OEM ; 35VA or less
R6871E-DC ; 30VA or less

Dimensions : Approx. 300(W) × 132(H) × 450(D)mm

Weight : R6871E ; 9.5kg or less
R6871E-DC/E-OHM ; 8.5kg or less

Current of resistance measurement : The current of the equipment is set at the delivery according to the customer's ordering information.

Type	Standard	Option 10
Measurement current (mA)	10	1

8. OPERATIONS

8.1 General

By using the built-in microprocessor, the R6871E/E-DC can process various measurement data required for output (to data memory, display, and GPIB).

This chapter explains the general operation of the R6871E/E-DC by using operational diagrams and charts.

Figure 8-1 shows the operation concept of the R6871E/E-DC from data measurement to data output. Figure 8-2 shows the block diagram of the R6871E/E-DC.

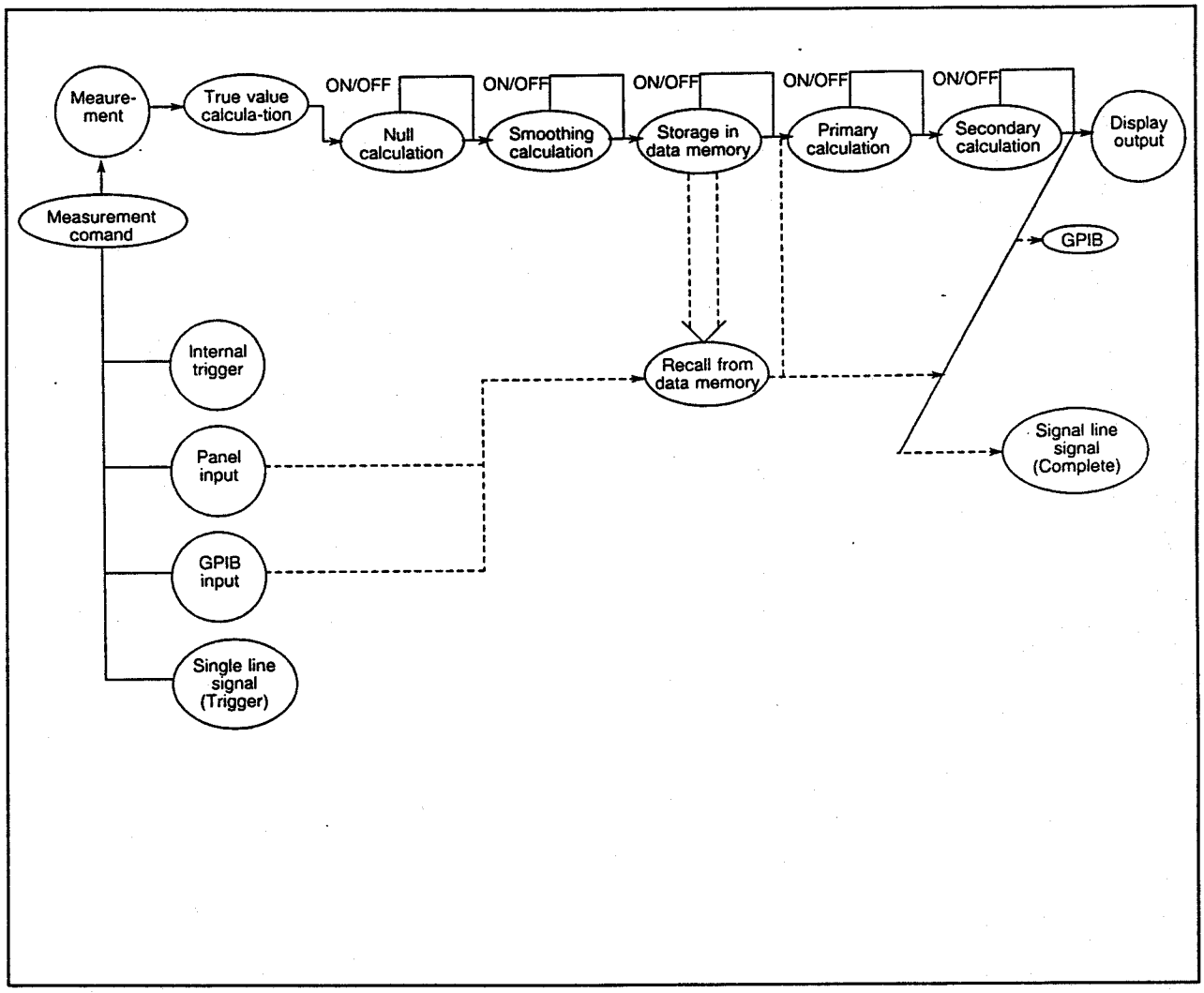


Figure 8-1 Operation Concept

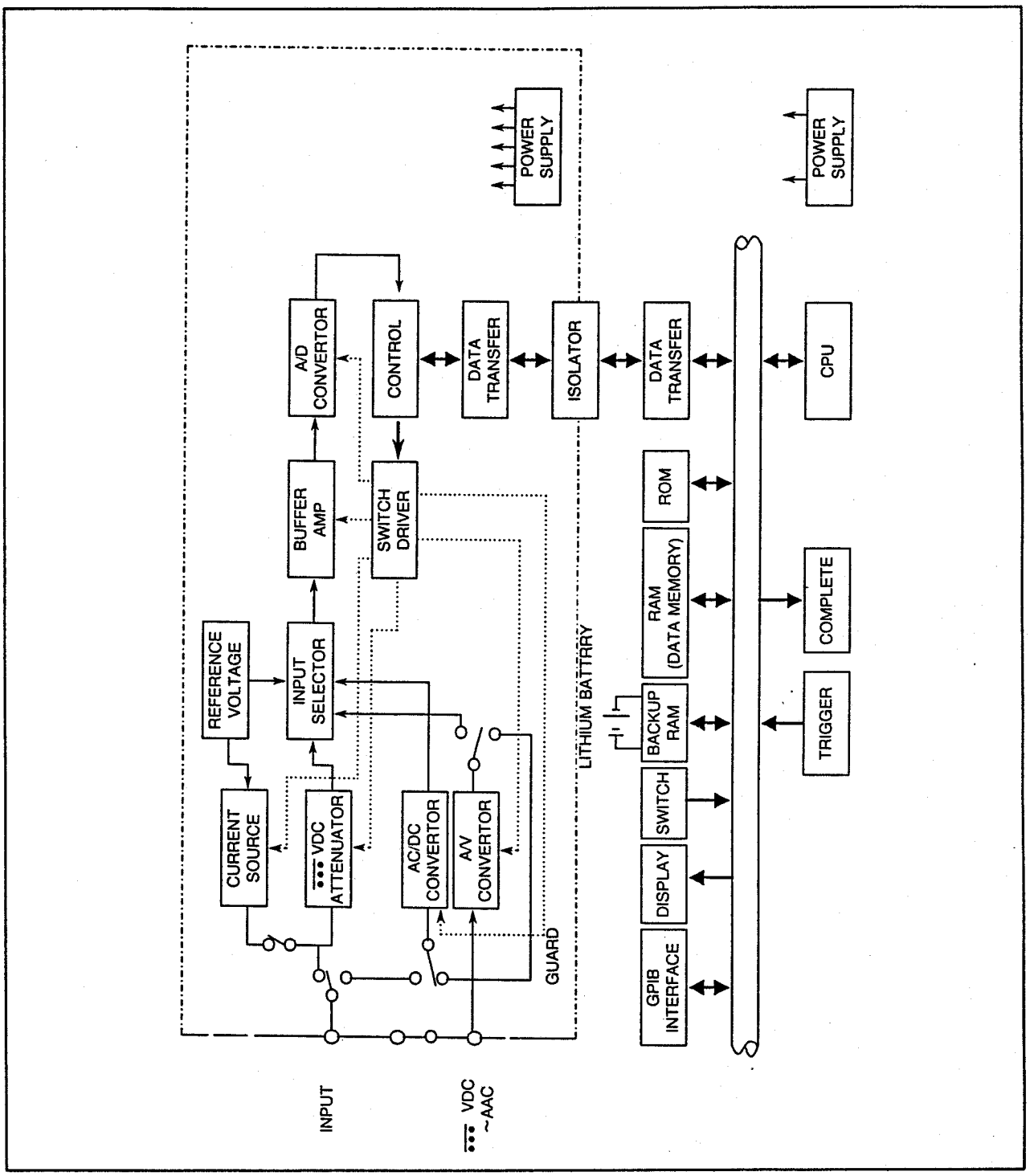


Figure 8-2 Block Diagram

8.2 Operations

Figure 8-3 shows the R6871E/E-DC data processing timing chart.

The R6871E/E-DC starts measurement when receiving an internal or external measurement command. After the measurement has completed, the R6871E/E-DC calculates and determines the true value by using various measurement functions.

The measurement value of input is determined. If the Auto Range mode has been selected (by turning on the AUTO key), the measurement range selection appropriate to the input can be checked. If not selected, the measurement range should be changed and the same operation (input measurement or true value calculation) should be repeated.

After the data has been measured, it is processed by various data processing functions (such as NULL and smoothing functions) which are turned on or off.

If the data memory function is on (that is, if the lamp of STORE key is on), the measured data or the resulting data of NULL or smoothing calculation is stored in the data memory.

The data is processed through primary and secondary calculation in succession.

When the sequential data processing is complete, the data is output to each output (such as display, and GPIB.) Single line signals (approximately 130µsec negative pulses output from the COMPLETE output terminal) are also output simultaneously.

To increase the sampling rate, turn off all function that can be turned on or off (such as NULL, smoothing, data memory, and calculation functions), set the SI parameter of 0msec, and turn off the Auto Zero function.

Analog data is calibrated in the cycle set by the A CAL parameter during automatic calibration. This calibration precedes the measurement commands.

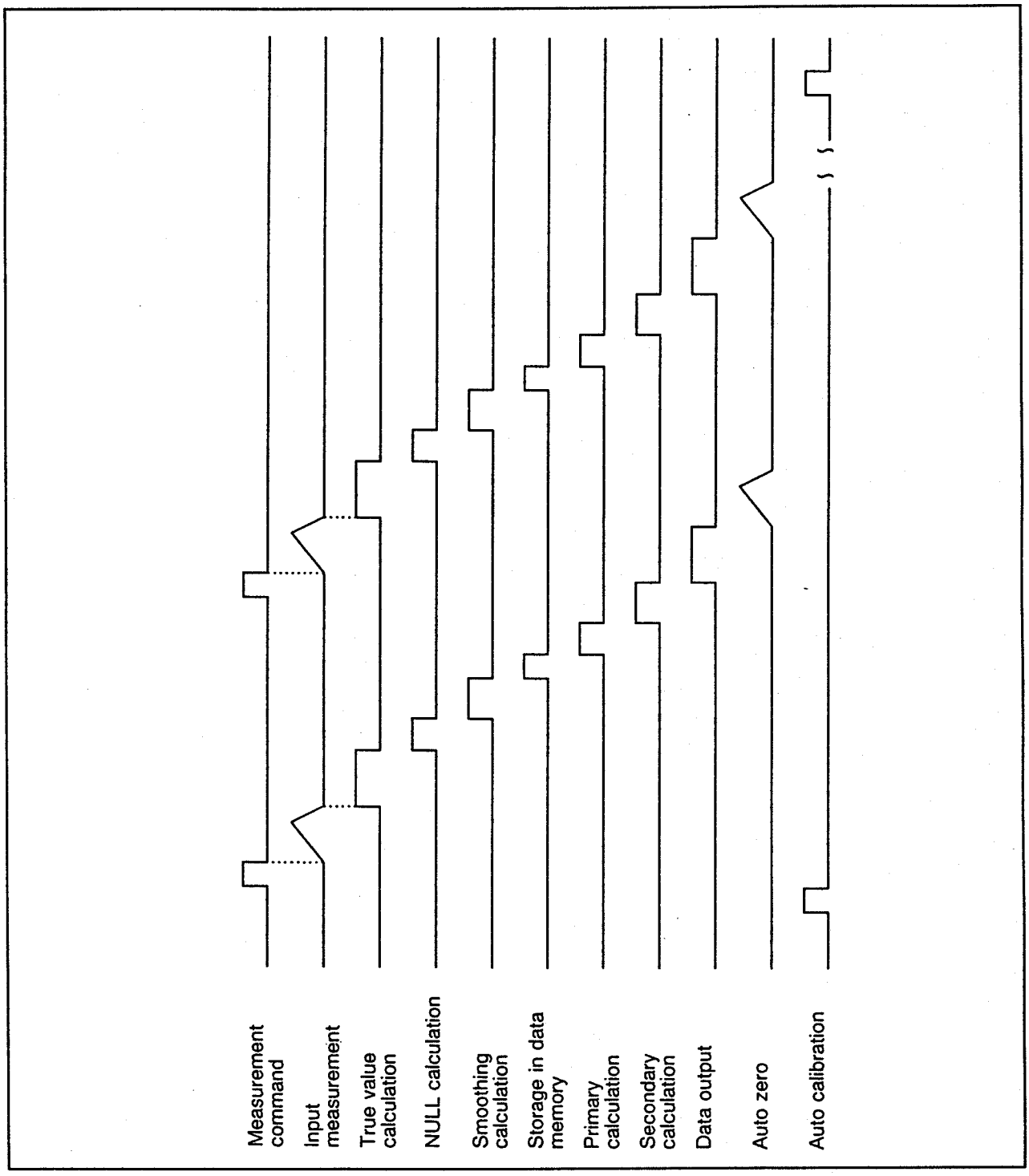


Figure 8-3 Data Processing Timing Chart

APPENDIX 1. TERMINOLOGIES

Sensitivity and Resolution

The resolution of a digital voltmeter is the minimum unit of quantization. For example, the maximum sensitivity range of the R6871E/E-DC digital multimeter is 200mV and the resolution if, therefore, 0.1μV/digit.

This value also represents the sensitivity. The values indicating the sensitivity and resolution of a digital voltmeter are vital factors for voltmeter selection. They also indicates the limit of voltmeter performance.

Measurement Accuracy

The measurement accuracy is defined as follows:

$$\text{Measurement accuracy} = \frac{(\text{Reading value} - \text{True value})}{(\text{Full scale value})} + 1 \text{ digit}$$

The reading value minus true value is called a reading error. The reading error of the R6871E/E-DC is indicated as ±0.00XX% of rdg. The full-scale error is indicated as of fs (or digits). The full-scale error and quantization error (explained below) result from different causes. However, the full-scale error may be added the quantization error and displayed for simple calculation of measurement accuracy. The full-scale error is primarily caused by zero-point drifting. This drifting is automatically corrected by the automatic zero point correction circuit.

An error within ±1 digit is called the quantization error. This may occur during data conversion from analog into digital form.

Input Impedance

A digital voltmeter has its inherent input resistance (Rin). This is usually called as an input impedance. Voltage Es of the power supply (shown in Figure A-1) to be measured is reduced by the output resistance (Rs) of the power supply and the input impedance (Rin), and voltage Es' is displayed on the digital voltmeter. To reduce the loading error, the input impedance (Rin) of the digital voltmeter must be increased.

In addition to the error due to the output resistance (Rs) of the power supply and the input impedance of multimeter, an error due to current offset exists. This current offset occurs inside the digital voltmeter. A voltage offset may also occur, but it can be ignored even when output resistance Rs increases.

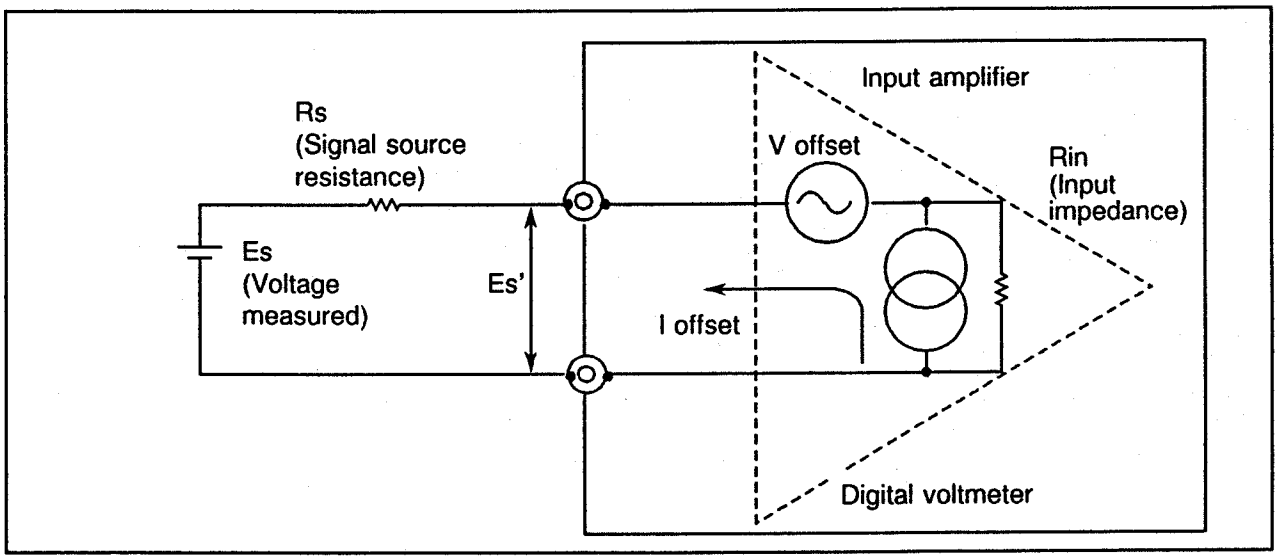


Figure A-1 Input Equivalent Circuit by Considering Current and Voltage Offsets and Input Impedance

The current offset is caused by elements used in the primary stage of input amplifier. To minimize the the offset, field effect transistors (FETs) are used. Therefore, if the power supply to be measured has output resistance Rs, voltage Es' appearing at the input terminal of the digital voltmeter can be defined in the following equation. Resistance Rs divided by resistance Rin, and resistance Rs multiplied by I offset should be considered.

$$Es' = \frac{1}{1 + \frac{Rs}{Rin}} Es - Rs \times I\,offset$$

Normal Mode Noise Voltage Rejection Ratio (NMRR) and Common Mode Noise Voltage Rejection Ratio (CMRR)

A certain level of noise always exits during measurement and this noise causes a measurement error. During low-voltage signal measurement below 10μV, a measurement error is often caused by troubles of grounding or cables, ground current, or induction noise from the power supply. The measurement may fail due to errors. To solve such measurement problems, the R6871E/E-DC digital multimeter involves the integration measurement and the noise rejectors are included in its power supply.

The noise source can be eliminated during measurement by using the measuring circuit shown in Figure A-2. Noise voltage 'en' is called the normal mode noise voltage or series mode noise voltage. The noise voltage is fed in series in the signal line. This noise usually consists of power frequency components and their subharmonics. The affection of these noise components on the measurement or the noise elimination efficiency is called the normal mode noise voltage rejection ratio (NMRR). The NMRR can be determined by the following equattion:

$$NMRR = 20 \log \frac{en}{\Delta en}$$

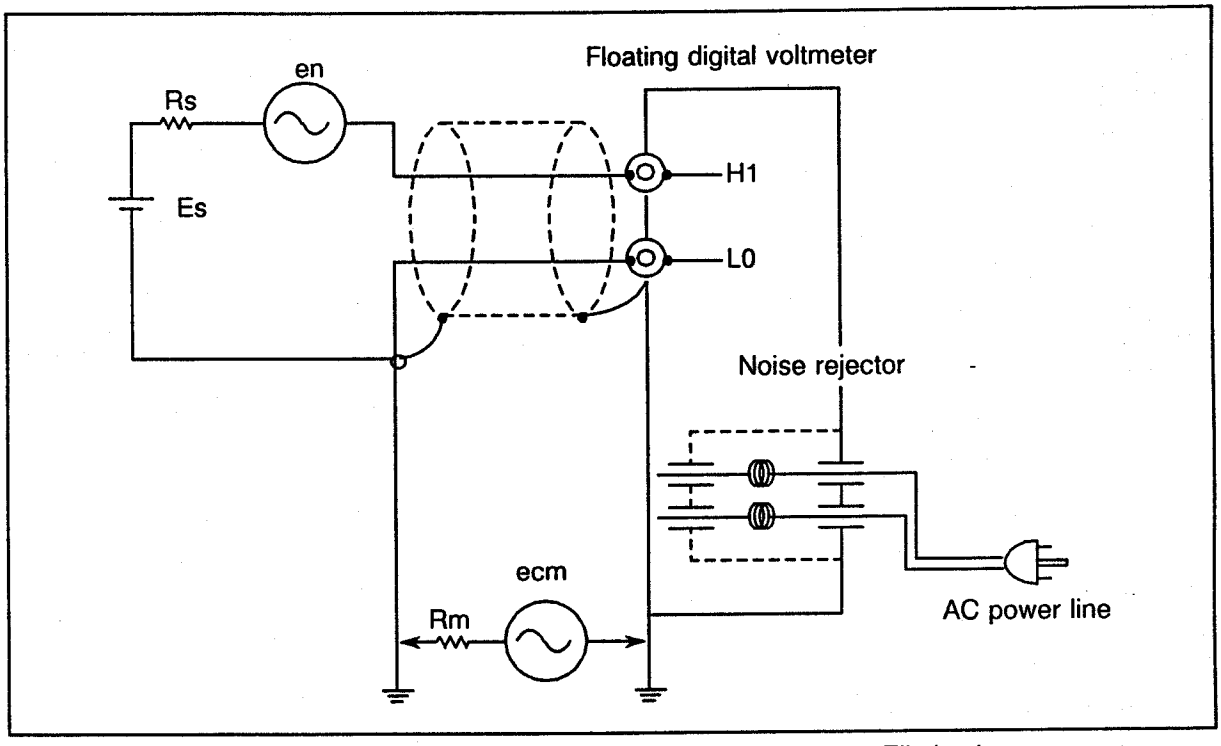


Figure A-2 Measuring Circuit Featuring Effective Noise Elimination

'Δen' is the measurement error caused by 'en'. 'ecm' is a noise, called the common mode noise voltage, and occurs between the signal line and the ground of the voltmeter. The noise level increase if the distance between them increases.

The affection of the noise components on the measurement, or its noise elimination efficiency is called the common mode noise voltage rejection ratio (CMRR). The CMRR can be defined by the following equation:

$$NMRR = 20 \log \frac{ecm}{\Delta ecm}$$

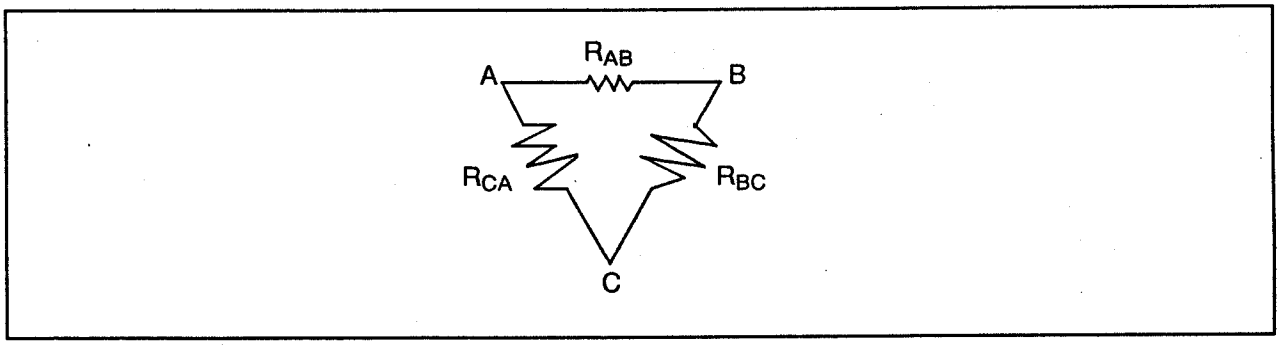
'Δecm' is the voltage that appears at the input terminal of the voltmeter. The combination efficiency of the above two noise voltage rejection ratios is indicated as the effective CMR. The R6871E/E-DC/E-OHM multimeter using the integration calculation can provide the higher NMR.

The CMR greatly varies depending on the frequency of noise voltage, signal source circuit, shielding, input cable type, and input connection. If the CMR of 120dB is shown on the multimeter document and if the errors are ignored in the 'ecm' voltage exceeding $1/10^6$, the measured data is unreliable.
A shielded cable should be connected to the multimeter to eliminate any induction, and the ground lead of the power cable should be connected directly to the ground. The voltmeter digital display (calculation) section is electrically disconnected from the A/D converter section. Dual shielding of the measuring circuits from the ground allows the highest common mode noise voltage rejection ratio.

Measurement of Network Resistance

Resistance R_{AB}, R_{BC}, and R_{CA} are shown like the figure below.

R_{BA} + R_{CA} will become parallel resistance of R_{AB} if the digital multimeter is connected to measure R_{AB} between A-B points and R_{AB} cannot be measured correctly.



So far, it was measured so as not to become parallel resistance cutting somewhere of the loop of R_{ABC}.

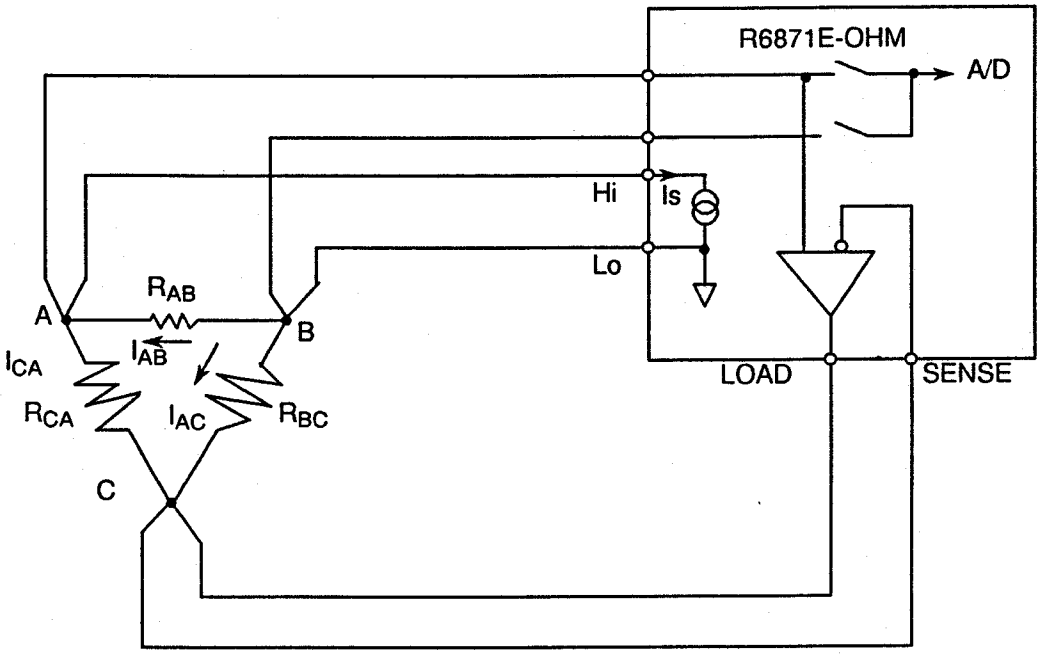
The buffer amplifier is added and the potential of C point is set in the same potential as A point.

$$I_{BC} = \frac{V_C - V_B}{R_{BC}}$$

$$I_{CA} = \frac{V_C - V_A}{R_{CA}} = 0$$

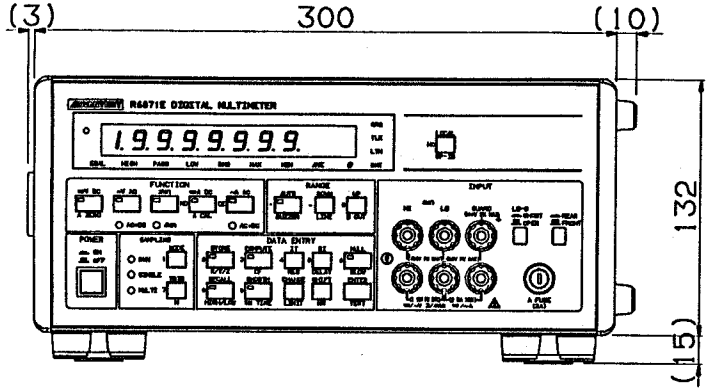
$$I_{AB} = \frac{V_B - V_A}{R_{AB}} = I_S$$

Then R_{AB} can be measured.

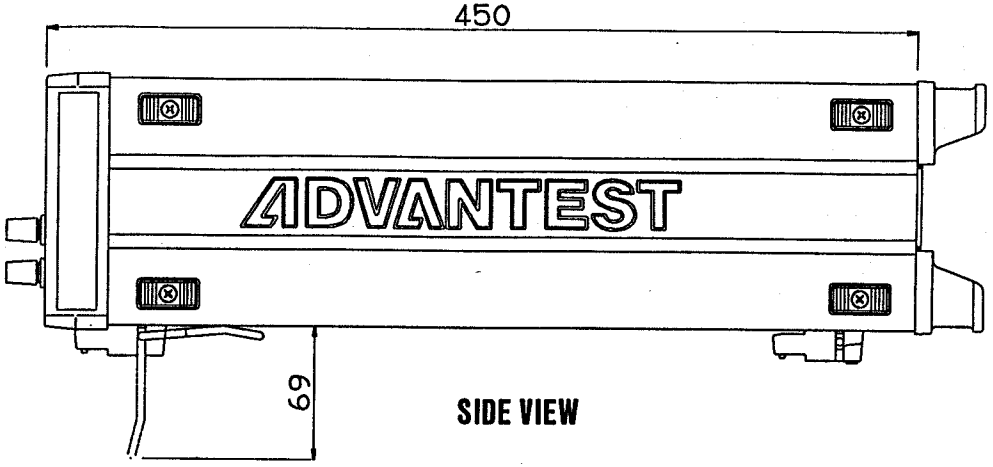


MEMO

ALPHABETICAL INDEX

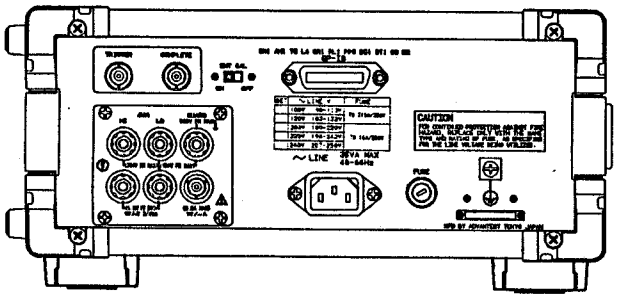


FRONT VIEW



SIDE VIEW

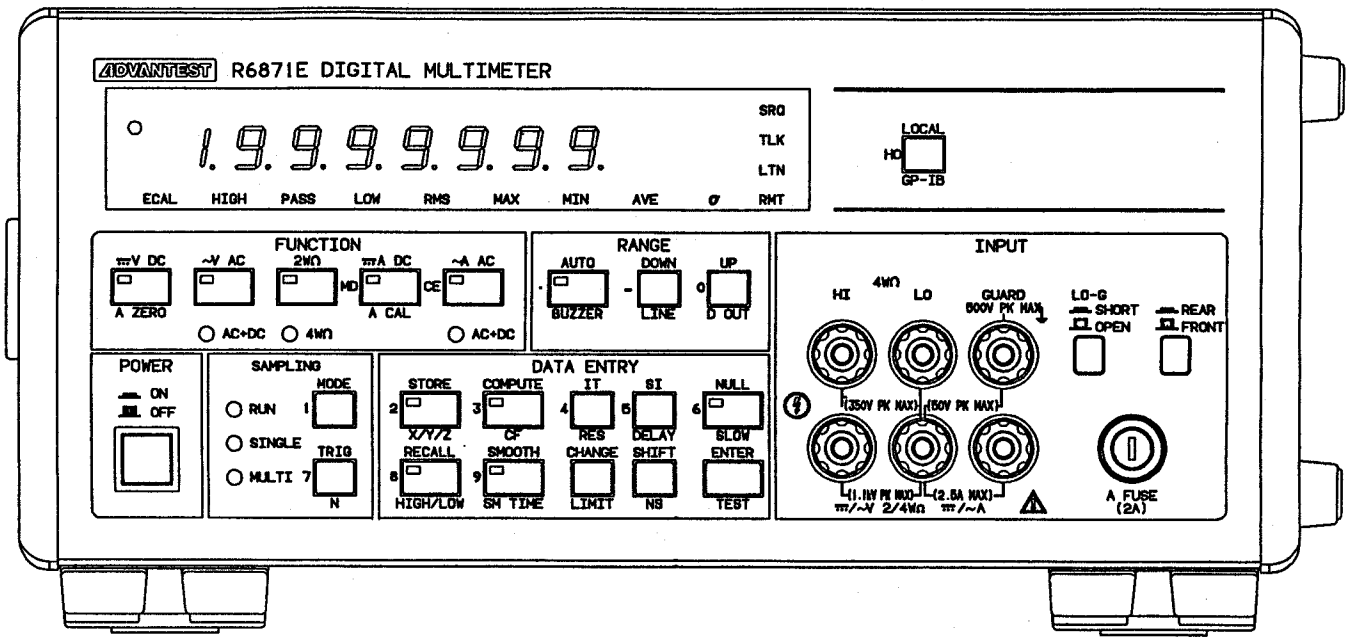
Unit: mm



REAR VIEW

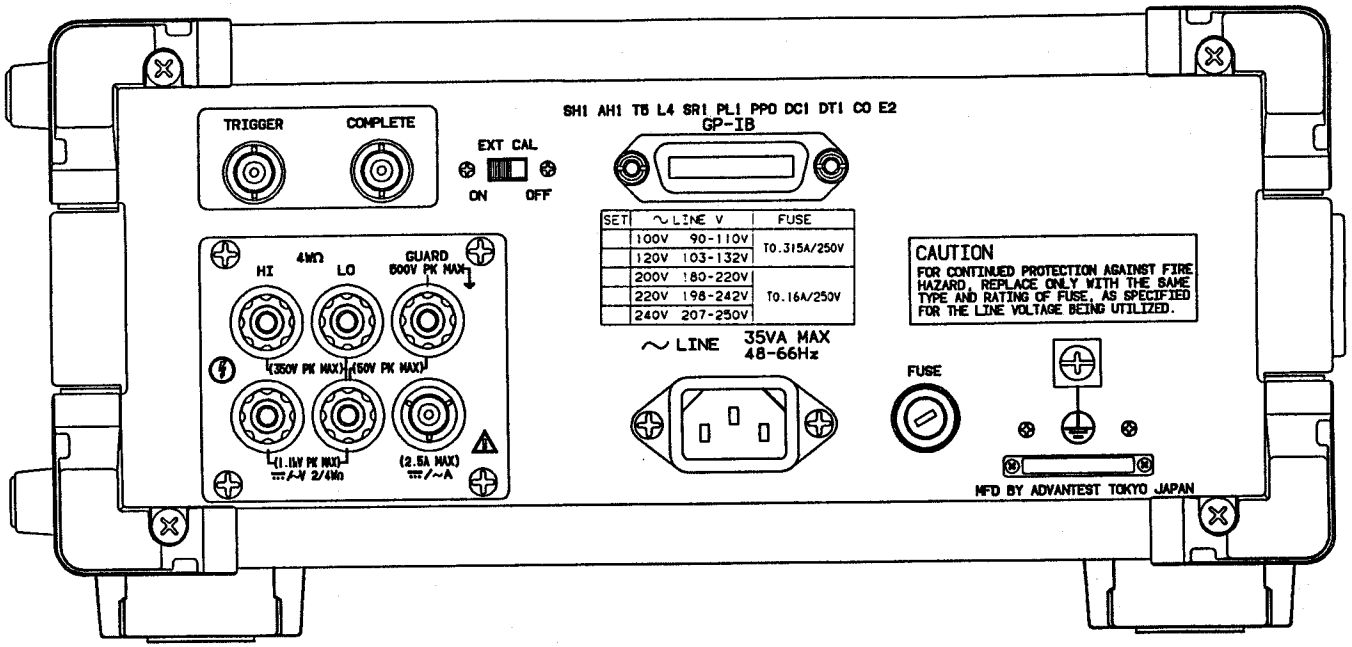
EXT1-9009-B

R6871E
EXTERNAL VIEW



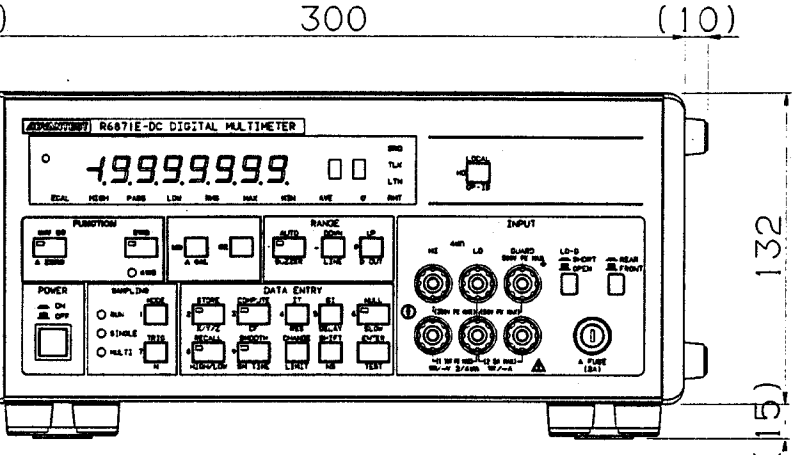
EXT2-712-A

R6871E
FRONT VIEW



EXT3-9009-B

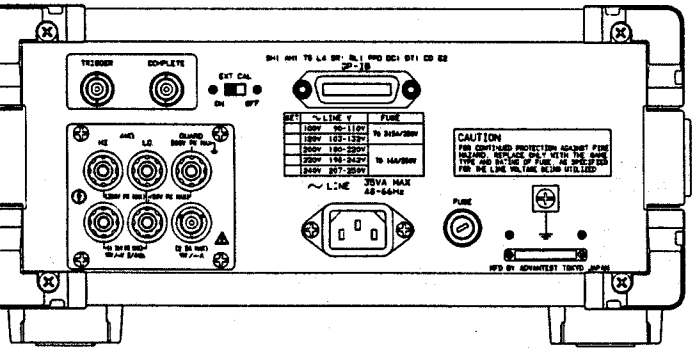
R6871E
REAR VIEW



FRONT VIEW

SIDE VIEW

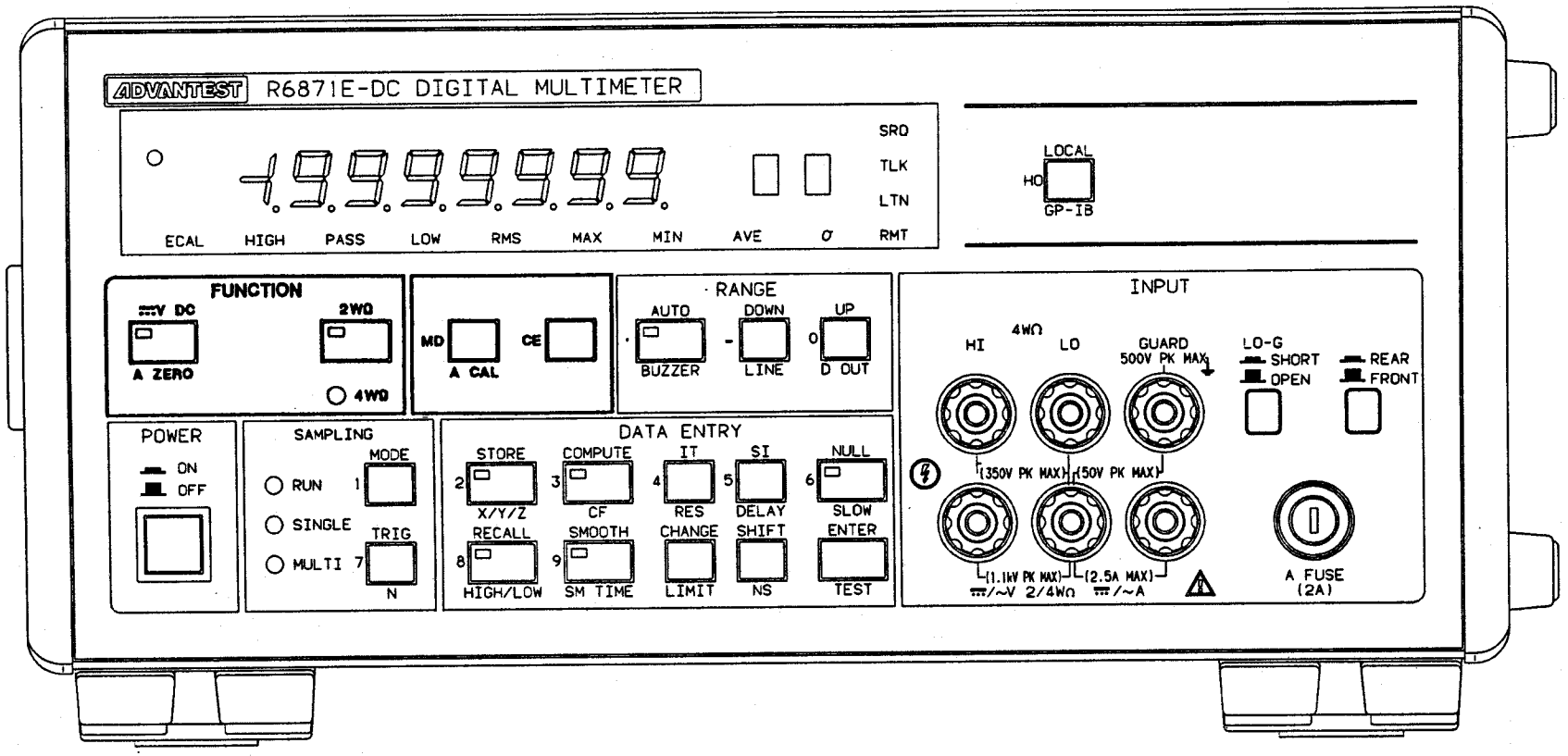
Unit: mm



REAR VIEW

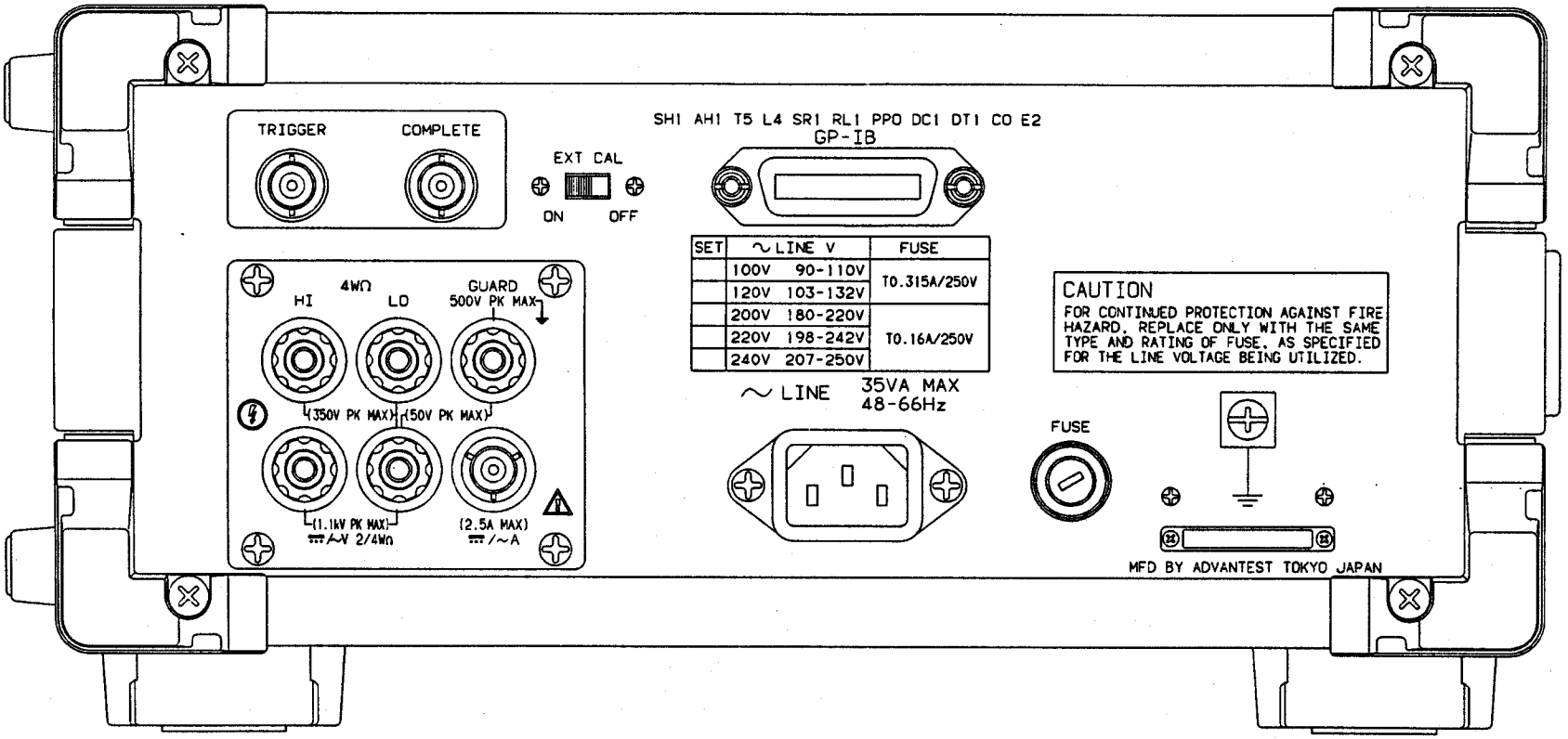
EXT4-9009-B

R6871E-DC
EXTERNAL VIEW



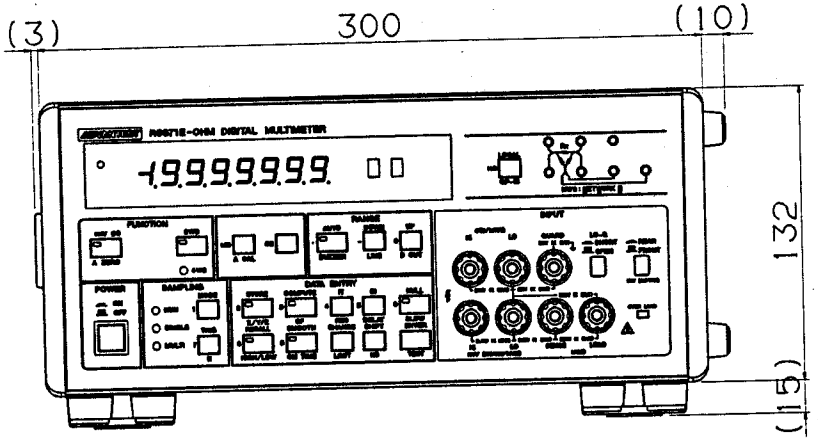
EXT5-9009-B

R6871E-DC
FRONT VIEW

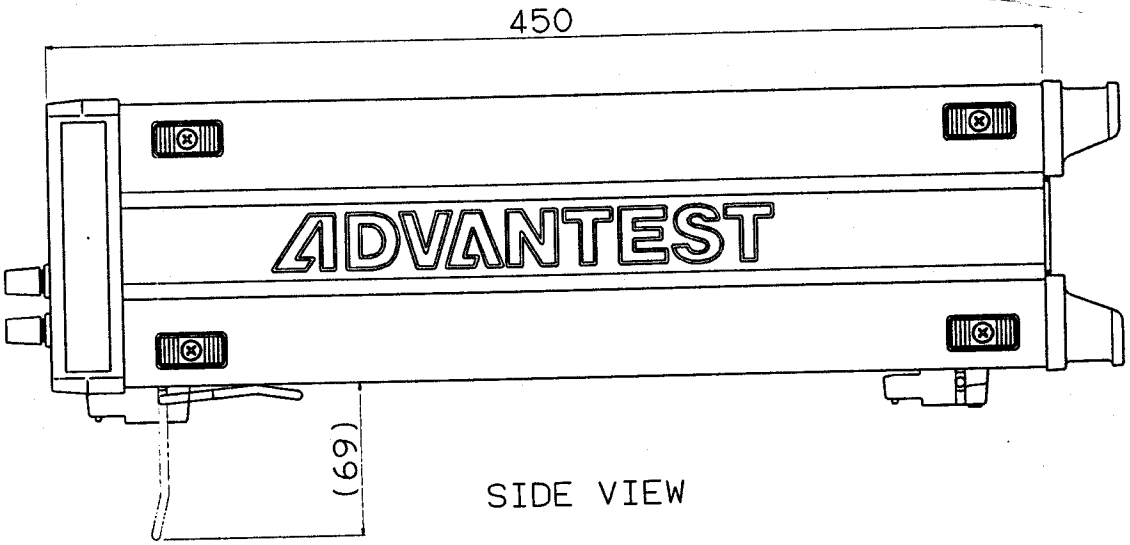


EXT6-9009-B

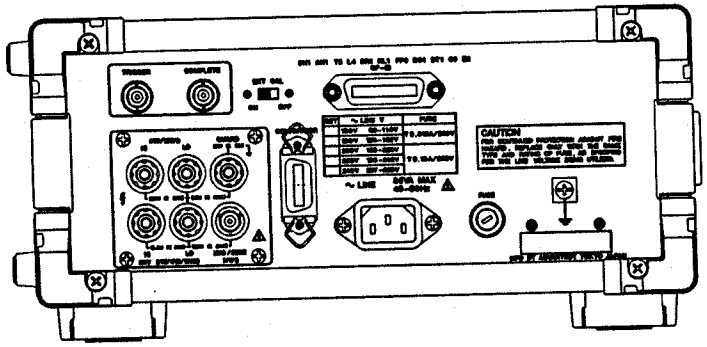
R6871E-DC
REAR VIEW



FRONT VIEW



SIDE VIEW

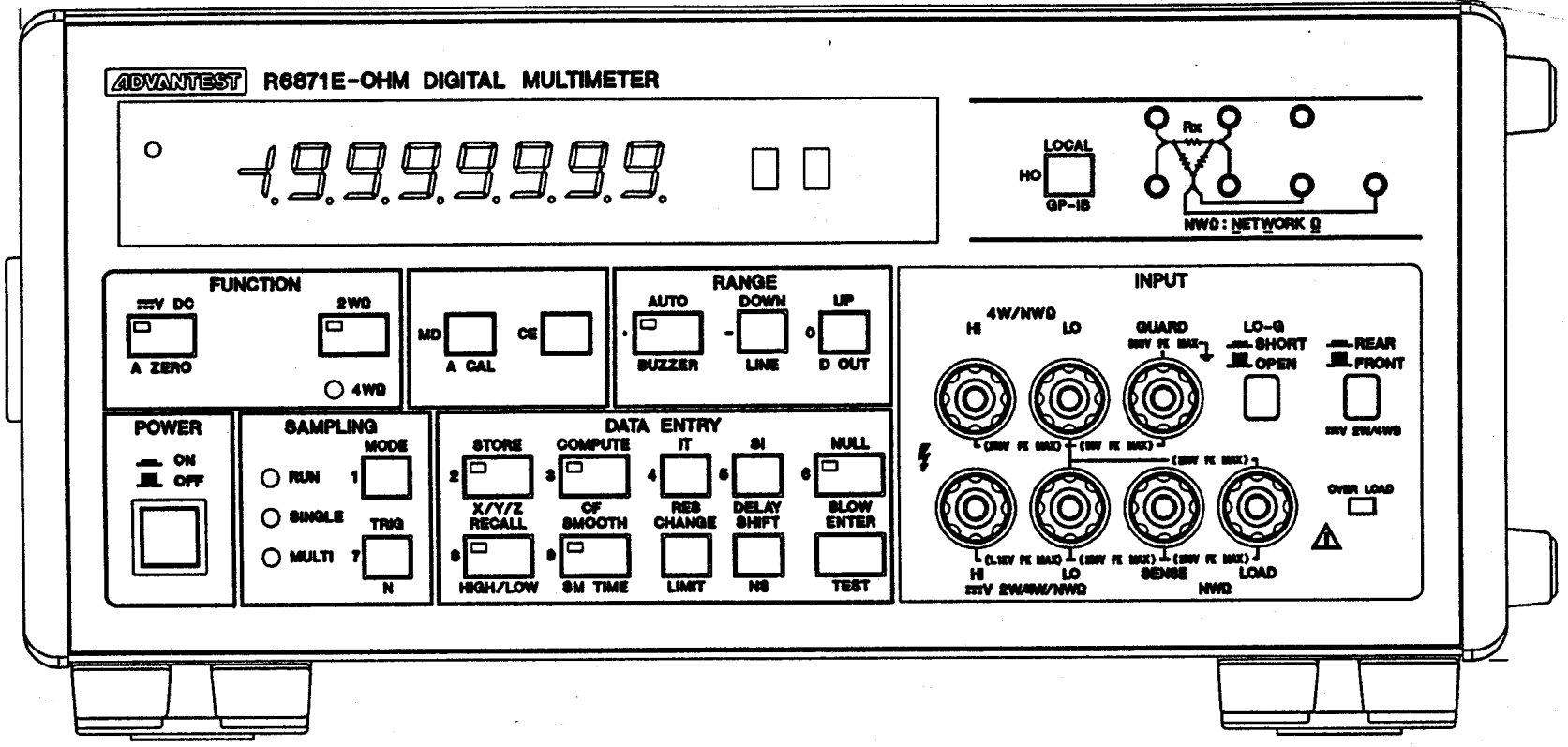


REAR VIEW

Unit: mm

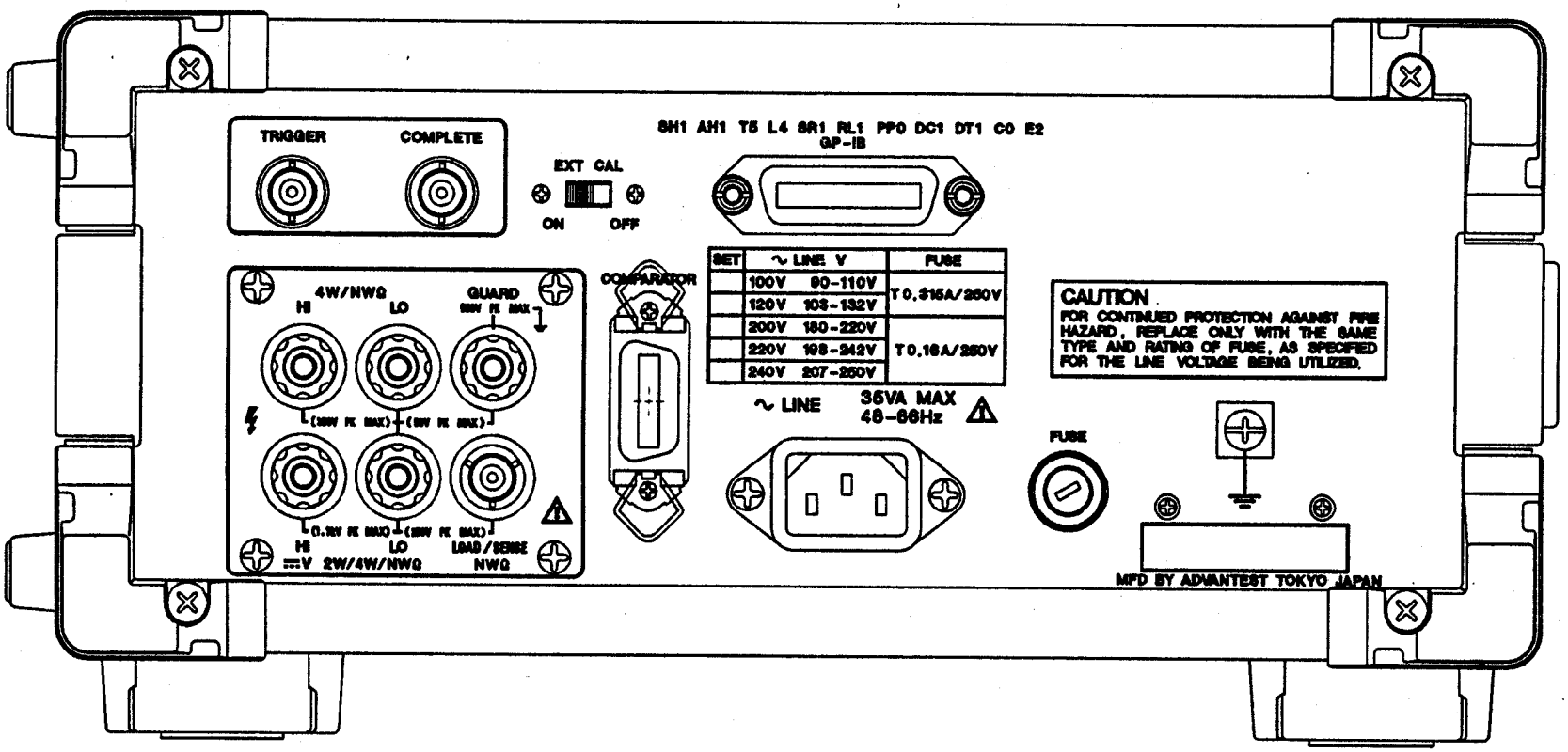
EXT7-9212-A

R6871E-OHM EXTERNAL VIEW



EXT8-9212-A

R6871E-OHM FRONT VIEW



R6871E-OHM
REAR VIEW

EXT9-9212-A

WARRANTY

ADVANTEST product is warranted against defects in material and workmanship for a period of one year from the date of delivery to original buyer.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by buyer, unauthorized modification or misuse, accident or abnormal conditions of operations.

No other warranty is expressed or implied. ADVANTEST specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

ADVANTEST shall not be liable for any special incidental or consequential damages, whether in contract, tort or otherwise.

Any and all warranties are revoked if the product is removed from the country in which it was originally purchased.

SERVICE

During the warranty period, ADVANTEST will, at its option, either repair or replace products which prove to be defective.

When trouble occurs, buyer should contact his local supplier or ADVANTEST giving full details of the problem and the model name and serial number.

For the products returned to ADVANTEST for warranty service, buyer shall prepay shipping and transportation charges to ADVANTEST and ADVANTEST shall pay shipping and transportation charges to return the product to buyer. However, buyer shall pay all charges, duties, and taxes incurred in his country for products returned from ADVANTEST.

CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL BUYER

The product should be throughly inspected immediately upon original derivery to buyer. All material in the container should be checked against the enclosed packing list or the instruction manual alternatively. ADVANTEST will not be responsible for shortage unless notified immediately.

If the product is damaged in any way, a claim should be filed by the buyer with carrier immediately. (To obtain a quotation to repair shipment damage, contact ADVANTEST or the local supplier.) Final claim and negotiations with the carrier must be completed by buyer.

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