



TRUE RMS AC VOLTMETER (20 MHz)

M2170

Instruction Manual

DA00010371-002

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Instruction Manual

----- WARRANTY -----

NF Corporation certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from our factory.

All **NF** products are warranted against defects in materials and workmanship for a period of one year from the date of shipment. During the warranty period of, **NF** will, at its option, either will repair the defective product without any charge for the parts and labor, or either repair or replace products which prove to be defective. For repair service under warranty, the product must be returned to a service center designed by **NF**. Purchaser shall prepay all shipping cost, duties, and taxes for the product to **NF** from another country, and **NF** shall pay shipping charge to returned the product to purchaser.

This warranty shall not apply to any defect, failure or damage caused by improper use, improper or inadequate maintenance and care or modified by purchaser or personnel other than **NF** representatives.

NF Corporation

After-sales service policy

In the unlikely event that a breakdown or unidentified problem has occurred, contact NF Corporation or an NF Corporation sales representative.

When contacting us, please indicate the model name (or product name), manufacturer's serial number, and a detailed description of the problem and the use conditions under which it occurred.

Although we do our best to repair products as promptly as possible, repair of products older than five years may be delayed by difficulties in obtaining replacement parts.

Note that, in cases where replacement parts are no longer being manufactured, repairs may be declined if the product in question has extensive damage or has been substantially modified.

Preface

Thank you for purchasing the M2170 True RMS AC Voltmeter.

Be sure to read the section entitled “Safety Precautions” in advance to ensure safe use of this electrical product.

■ Caution Symbols Used in This Manual

The following caution symbols are used in this manual. Be sure to observe these caution symbols and their contents to ensure the safety of the user and avoid damage to the equipment.

WARNING

This mark indicates information for the avoidance of a hazard such as electric shock that may endanger human life or cause injury during handling of the equipment.

CAUTION

This mark indicates information for the avoidance of damage to the equipment during handling.

Safety Precautions

To ensure safe use, be sure to observe the following warnings and cautions.

NF Corporation shall not be held liable for damages that arise from a failure to observe these warnings and cautions.

- **Be sure to observe the contents of this user's manual.**

This user's manual contains information for the safe operation and use of this product.

Be sure to read this information first before using this product.

All the warnings in the user's manual must be heeded to prevent hazards that may cause major accidents.

- **Be sure to ground the product.**

To prevent accidental electrocution, always connect the M2170 to a grounding source rated as a Type 3 grounding source in the Technical Requirements for Electrical Appliances.

Use the supplied power cord (3-pin connector) to connect the M2170 to a power outlet with a three-prong, grounded contact.

If only two-prong power outlets are available, use a conversion adapter.

In such cases, the conversion adapter's grounding wire should be attached to a nearby ground terminal before connecting the power cord to the outlet.

- **Check the power supply voltage.**

This product operates on the power supply voltage indicated in **2.4 Power Supply and Grounding** in this instruction manual.

Prior to connecting the power supply, check that the voltage of the power supply matches the rated power supply of the product.

- **Observe the fuse ratings.**

If not observed a fire may occur. Use fuses with the ratings specified in **2.4 Power Supply and Grounding**.

Be sure to disconnect the power cord from the outlet when replacing the fuses.

- **In case of suspected anomaly**

If this product emits smoke, an abnormal smell, or abnormal noise, immediately power it off and stop using it.

If such an anomaly occurs, do not use this product until it has been repaired, and immediately report the problem to the location of purchase (either NF Corporation or your distributor).

- **Do not use this product when gas is present**

Do not use this product when gas is present, as this may cause an explosion.

- **Do not remove the cover.**

This product contains high-voltage parts. Absolutely never remove its cover.

Even when the inside of this product needs to be inspected, do not touch the inside. All such inspections are to be performed by service technicians designated by NF Corporation.

- **Do not modify this product.**

Use only parts designated by NF Corporation as replacement parts. Use of non-designated parts may result in new hazards or may interfere with repairs when breakdowns occur.

- **Safety-related symbols**

The general definitions of the safety-related symbols used on this product and in the instruction manual are provided below.



Instruction Manual Reference Symbol

This symbol is displayed to alert the user to potential danger and refer him/her to the instruction manual.



Warning Symbol

This symbol indicates information for avoiding danger to human life or bodily injury such as electric shock while handling this product.



Caution Symbol

This symbol indicates information for preventing damage to the product when handling it.

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1. GENERAL DESCRIPTION

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1.1 Outline

Model M2170 is a wide-band AC voltmeter designed to measure the true RMS (Root Mean Square) values of input signals. This product is equipped with AC output terminals that enable connection to a 50 Ω terminating resistor, so it can also be used as a signal conditioner. Input impedance is 1 M Ω (Typ.), which means this product also can be connected to various commercially available oscilloscope probes.

Signals whose crest factor^{Note} is 7 at full scale and not more than 14 at one-half full scale can be measured. When the sensitivity adjuster is set to CAL, an alarm lamp lights up when signals with excessively large crest factors are detected.

Since this product is equipped with DC output terminals, it also can be used as an RMS-DC converter and it supports recording functions as well. Its response speed is approximately 0.1 seconds.

Note Crest factor =
$$\frac{\text{Peak value}}{\text{RMS value}}$$

 When ordering the M2170, note that an evenly divided decibel scale is available and can be ordered as the “dB linear scale option.”

1.2 Features

- True RMS indication
Crest factor = 7 (when at full scale and CAL setting), with alarm lamp
- Wide frequency band
5 Hz to 20 MHz
- AC/DC output terminals provided
- Sensitivity adjuster provided
0 to -10 dB
- Mirror is provided with meter for easier legibility
- Equally divided decibel scale is provided

1.3 Applications

- Large meters are used to facilitate in-line inspections.
- The sensitivity adjuster can be used to measure S-N ratios.
- This product can also be used as a signal conditioner (variable-gain preamplifier).
- This product can also be used as an attenuator with 250 V peak input voltage.
- Voltage variation data can be recorded by connecting a recorder or A/D board to this product's DC output terminals.

1.4 Specifications

1.4.1 Electrical ratings

- **Measurement range**

Voltage measurement range: 1 mVrms/FS^{Note} to 100 Vrms/FS
1 or 3 series, 11 ranges
Frequency range: 5 Hz to 20 MHz

Note Full scale is defined as level 10 on a meter with an 11-level scale.

- **Accuracy (at 23°C ±5°C, at least 1/5 of full scale, with CAL setting. % relative to full scale)**

Meter indicator

5 Hz to 20 MHz: within ±10%
10 Hz to 10 MHz: within ±5%
30 Hz to 1 MHz: within ±3%

DC outputs

5 Hz to 20 MHz: within ±10%
10 Hz to 10 MHz: within ±5%
30 Hz to 1 MHz: within ±2%

- **Inputs**

Input connector: BNC-R
Input impedance: 1 MΩ Typ., 25 pF or less
Non-destructive maximum input voltage
1 to 100 V range: Peak value of AC + DC ±250 V
Frequency [Hz] × Voltage [V] = 10⁸
1 to 300 mV range: AC ±10 V peak, peak value of AC + DC ±250 V
Overvoltage category: 1

- **Sensitivity adjustment range**

0 to -10 dB or more

- **Indication**

True RMS values (thermal conversion system)

- **Measurable crest factor**

7 or above, during full-scale input and when set to CAL

The crest factor is inversely proportional to the meter indication. When set to UNCAL, it is directly proportional.

- **Meter**

Taut-band system with mirror

Voltage scales: 0 to 11, 0 to 3.5

Decibel scale: -20 to +1 dBV
-16 to +3 dBm (0 dBm = 1 mW, 600 Ω)

Note Any value less than 0.1 of full scale is not indicated on the scale.

- **AC output**

- Output connector: BNC-R
- Output impedance: 50 Ω (Typ.)
- Output voltage: 1 V_{rms} \pm 2% (with full-scale input, no load, and 1 kHz)
- Frequency characteristics (with 1 kHz reference frequency, 50 Ω termination, 1 V_{rms} output voltage, and CAL setting):
 - 5 Hz to 10 MHz \pm 1 dB
 - 10 to 20 MHz \pm 3 dB
- Distortion factor:
 - 0.03% (Typ.) (with 300 mV range, 1 kHz, full scale input, and 10 harmonics)
- Noise (with shorted input and full scale for each range):
 - 1 mV range: 30 mV (Typ.)
 - 3 mV to 100 V range: 30 mV or less
- Output limiter's operation voltage^{Note 1}:
 - 18 V_{rms} (Typ.) (with no load)
- Maximum instantaneous output voltage^{Note 2}:
 - 3.5 V peak (5 Hz to 5 MHz, 50 Ω termination, linear operation)
- Maximum instantaneous output current^{Note 2}:
 - 70 mA peak (linear operation)

- Notes
1. In the case of waveforms with low crest factors, the output voltage is restricted if this voltage is exceeded for more than a few milliseconds.
 2. These are the peak voltage and peak current values for waveforms with high crest factors.

- **DC output**

- Output connector: BNC-R
- Output impedance: 50 Ω (Typ.) (recommended load impedance: at least 5 k Ω)
- Output voltage: 1 V (with full-scale input, no load)
- Maximum output current: 10 mA (Typ.) (linear operation)
- Ripple: 0.14 V_{p-p} (Typ.) (with no load, full-scale input, and 10 Hz)

- **Power source**

- 100 V AC, 120 V, 230 V \pm 10%
- 50/60 Hz
- 25 V_{Amax}
- Overvoltage category: II
- Contamination level: 2

1.4.2 Mechanical ratings

- **Dimensions (mm)**

140 (W) \times 177 (H) \times 300 (D) (not including legs, handles, knobs, etc.)

- **Weight**

3.5 kg (Typ.)

1.4.3 Installation requirements

- **Ambient temperature and humidity**

- In operation: 0 to 40°C, 10 to 95% RH (no condensation)
- In storage: -10 to 60°C, 10 to 80% RH (no condensation)

1.4.4 Options

- **dB linear scale option (when ordering)**

Voltage scales: 2.2 to 11, 0.7 to 3.5

Decibel scales: -13 to 1 dBV

-10 to 3 dBm (0 dBm = 1 mW, 600 Ω)

DC output voltage: 1 V (with full-scale input, no load)

0 V (with full-scale input - 10 dB, no load)

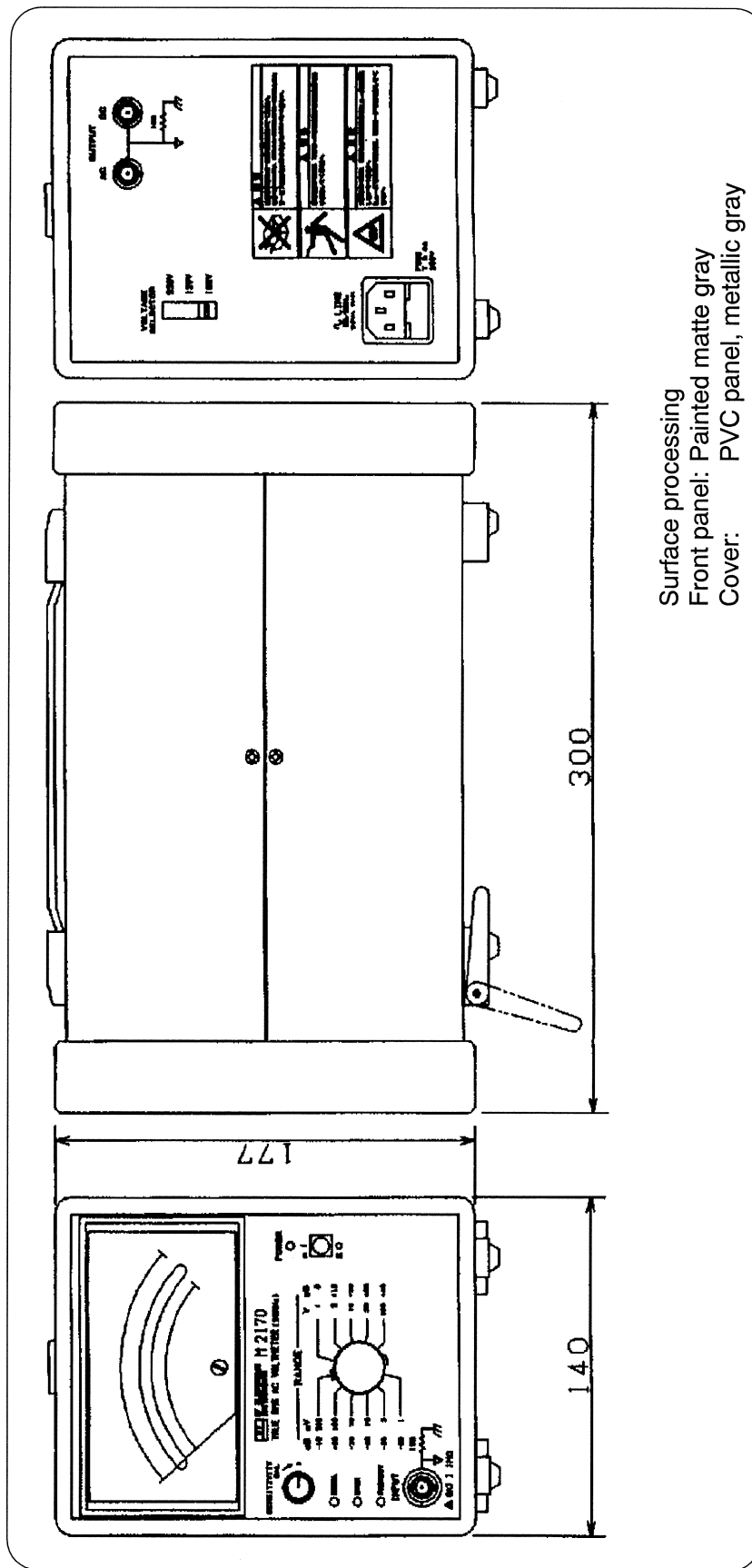


Figure 1-1. External Dimensions Diagram

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2.1 Unpacking

After unpacking, check for any damage that may have occurred during shipment. Although all parts are carefully checked before shipment, there may be loose components such as control knobs. Also, check the accessories against the component list shown in “Table 2-1 Component List” to make sure none are missing.

2.2 Components

The M2170’s standard components are listed in “Table 2-1 Component List” below.

Table 2-1. Component List

• Main unit	1
• Instruction Manual	1
• Accessories	
Power cord (3-prong, 2-meter length).....	1
Plug conversion adapter	1
Fuses ^{Note} (0.4 A, 250 V time lag, $\phi 5.2 \times 20$ mm)	1

Note Fuses are provided in fuse holder.

2.3 Installation

- **Installation site**

Set the main unit so that the rubber feet on the bottom and the stand are on a smooth flat surface such as a desk or table.

- **Install this product in an environment that meets the following ambient temperature and humidity requirements.**

In operation: 0 to 40°C, 10 to 95% RH

In storage: -10 to +50°C, 10 to 85% RH

This product should be used in a condensation-free environment.

- **Do not install this product in any of the following types of environments.**

- An environment where flammable gas is present

To avoid risk of explosion, never install or use this product in an environment where flammable gas is present.

- An outdoors site or other location that is exposed to direct sunlight or is close to a source of flame or heat

This product may suffer degraded performance or operation faults in such environments.

- An environment where corrosive gas or vapor, dust, or dirt is present or where the humidity is high
- Such environments can cause this product to corrode or break down.

- A site close to a strong electromagnetic field source, high-voltage equipment, or power transmission lines

This product may suffer degraded performance or operation faults at such sites.

- A high-vibration environment

This product may suffer operation faults or breakdowns in such an environment.

Also note that in some environments, such as where pulsed noise is superimposed on signal lines, the M2170 may have degraded performance. Although the M2170 comes with a built-in line filter, an additional external line filter should be used in cases where not all noise is filtered out, so that the M2170 can have power supply input free of pulsed noise components.

Do not install the power cord near an input cable.

2.4 Power Supply and Grounding

(1) Power supply

The M2170 operates under the following power supply requirements.

- 100/120/230 Vrms $\pm 10\%$ AC power, controlled via power switch on rear panel
- 50/60 Hz, 25 VA or less
- Fuses: 0.4 A/250 V (time lag), $\phi 5.2 \times 20$ mm
- Overvoltage category: II
- Contamination level: 2

The power cord bundled as a standard accessory, which has a voltage rating of 125 V AC and a dielectric withstand voltage of 1250 V for one minute, is intended for use in Japan only. The power cord must be changed to enable use outside of Japan or at a voltage higher than 125 V AC. For information, please contact our company.

CAUTION

- The power supply voltage setting is factory-set at 100 V AC. Please confirm this setting.
-

WARNING

- Always remove the power plug from the outlet before changing the power supply voltage setting or replacing a fuse.
 - Set the power supply voltage control switch correctly to one of the three possible voltage setting positions. Note with caution that the 120 V setting position has about 2 mm of loose positioning above and below.
 - Check the power supply voltage control switch's setting before turning on the power.
 - Use only fuses that have the specified capacity.
-

(2) Grounding

WARNING

Always ground this product using a grounding line connected to the power cord in order to prevent power problems and to ensure the safety of operators.

Ground the supplied power cord (3-pin connector) by connecting it to a power outlet that has a three-prong, grounded contact.

If only two-prong power outlets are available, use the bundled conversion adapter. In such cases, the conversion adapter's (green) grounding wire should be attached to a nearby ground terminal before plugging the power cord into the outlet.

3. OPERATION AND HANDLING

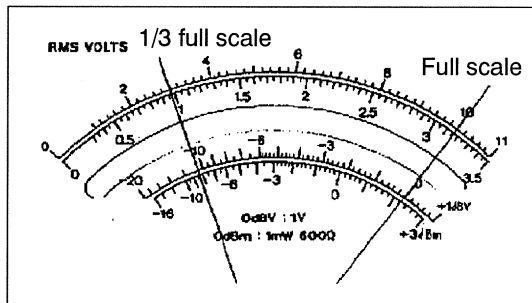
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3.1 Part Names and Functions

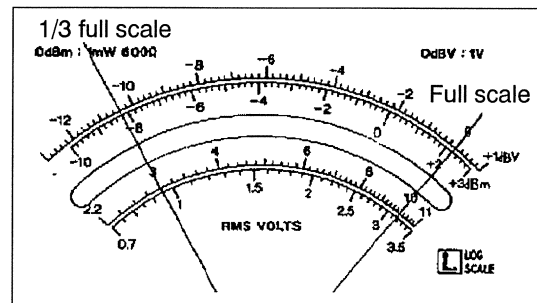
(1) METER Meters

The voltage scale on the M2170 measurement meters are from 0 to 3.5 and 0 to 11, and the decibel scales are from -16 to +3 dBm and from -20 to +1 dBV.

When the dB linear scale option is attached, the decibel scale is a linear scale with ranges from -10 to 3 dBm and -13 to 1 dBV, and its voltage scales are from 0.7 to 3.6 and 2.2 to 11.



Normal scale



Scale using dB linear scale option

(2) POWER ON Power switch

This is the power control switch. When this switch is pressed, its lamp lights up to indicate that the M2170 is in operation-ready mode.

(3) SENSITIVITY Sensitivity adjuster

This adjuster is able to alter the meter's sensitivity in 10 dB increments. When the dial is turned completely clockwise, the value that was set with "RANGE" will become the meter sensitivity.

When the dial is turned counterclockwise until the UNCAL lamp lights up, the sensitivity is reduced and this may prevent direct readouts, in which case relative values must be read. This sensitivity adjuster is used for S/N and/or decibel measurements.

(4) OVER "Crest factor over" lamp

The M2170 is able to measure signals with a crest factor of up to 7 while set to CAL during full-scale input.

When set to CAL, if the input signal is within the meter scale but the crest factor is too high, this lamp lights up to indicate a large measurement error. Even if the meter's needle comes loose, this lamp will not light up if the crest factor is too small.

$$\text{Crest factor} = \frac{\text{Peak value}}{\text{RMS value}}$$

3.2 I/O Connections

(5) INPUT Input terminal

This is a BNC receptacle that is used to connect input signals. Its input impedance is $1\text{ M}\Omega$ and its parallel capacity is 25 pF or less.

If the M2170's internal protection circuits are activated and the PROTECT lamp lights up, disconnect any excessive input and/or switch to a lower sensitivity range.

(6) RANGE Meter sensitivity switch

By switching the voltage sensitivity of the M2170, the 11 sensitivity ranges will be comprised of 10 dB steps. When measuring unknown voltages, start with the 100 volt range and gradually increase the sensitivity. Measure with the meter's range which goes from $1/3$ to 1.1 full scale.

(7) VOLTAGE SELECTOR

 Refer to "2.4 Power Supply and Grounding".

(8) AC OUTPUT AC output terminal

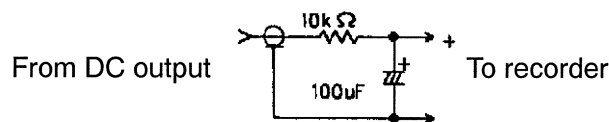
The AC output terminal is used whenever this voltmeter is used as a waveform monitor or amplifier. The output voltage is 1 V during full scale mode and the output impedance is $50\ \Omega$ (Typ.). When this voltmeter is used to monitor waveforms or frequencies of at least 1 MHz , be sure to insert a $50\ \Omega$ terminal resistor.

(9) DC OUTPUT DC output terminal

The DC output terminal is used to record measured values via a recorder. The output voltage is $+1\text{ V}$ at the meter's full scale.

Ripple increases as the measuring frequency is reduced. If problems occur, connect a resistor and electrolytic capacitor as in the example shown in the figure. However, this will slow the DC output response speed. When the dB linear scale option is attached, the output may become negative, in which case a nonpolarized electrolytic capacitor should be used.


Also, when the dB linear scale option is attached, the DC output becomes logarithmic output. The meter scale becomes $+1\text{ V}$ when at 0 dBV or 0 V when at -10 dBV , i.e., 0.1 V/dB .



(10) ~LINE 50/60 Hz

Use this connector to connect the power cord. Make sure the power cord plug is fully inserted so it will not come loose easily.

A fuse holder is located below this connector. The cap on the fuse holder can be removed with a flat-head screwdriver after the power cable has been removed.

 Refer to "2.4 Power Supply and Grounding".

3.2 I/O Connections

Connect the signal cable to the input terminal. If a reduced input capacity is desired, use a shorter line to connect the M2170 to the object to be measured via the shortest possible distance.

When using this voltmeter as a waveform monitor or amplifier, connect an oscilloscope (or similar device) to the AC output terminal.

When using a recorder to record data, connect it to the DC output terminal.

3.3 Startup

The M2170 operates via the following sequence.

1. Make sure the power switch is correctly set for the power supply voltage to be used.
2. Plug in the power cord.
3. Check the meter's mechanical zero point (when using the dB linear scale, the black mark at the left edge of the meter scale is the mechanical zero point).
4. Set "RANGE" to a low sensitivity level (100 V range).
5. Turn on the power via the power switch.
6. Let device unit warm up for at least 30 minutes.
7. Apply a signal and set the meter to a range between 1/3 full scale and 1.1 full scale.

3.4 Cautions for Use

- (1) The M2170 features not only a wide band but also input impedance as high as 1 M Ω . Consequently, using a solid wire for the input cable or a wire with inadequate shielding will enable increased noise and may result in abnormal oscillation.
- (2) When a cable is connected to the AC output terminal, induction occurs between the input cable and the AC output cable during high-sensitivity mode, which may increase the margin of error or cause oscillation. In such cases, increase the distance between the input cable and the AC output cable or add more extensive shielding.
- (3) When used as an amplifier
When the meter's indicator goes off scale, the output waveform may become distorted and abnormal oscillation may occur. Also, if the input is not sine wave input, the meter output may be distorted even when the meter's indicator is not off scale.
- (4) Applying an excessive input will damage the M2170. The maximum non-destructive input voltage is as follows.

1 to 100 V range: AC + DC peak value \pm 250 V
Frequency [Hz] \times Voltage [V] = 10^8

1 to 300 mV range: AC \pm 10 V peak, AC + DC peak value \pm 250 V

In the 1 to 300 mV range, application of an excessive input may reduce the input impedance to about 300 Ω . When the DC component's voltage is at least 10 V, set the range to at least 1 V before connecting an input and wait at least one second before setting the optimum range.

If the M2170's built-in protection circuit is activated and the PROTECT lamp lights up, either disconnect the excessive input or switch it to a lower sensitivity range.

- (5) The input terminal's overvoltage category is category I.

WARNING

- Do not directly measure the voltage from a commercial power source such as a distribution panel or power outlet.
-

3.4 Cautions for Use

- (6) After signals that include a DC component are measured, a DC charge is applied to the input terminal. This charge is retained even after the M2170's power is turned off, which poses a risk of electric shock when discharge occurs.

⚠ WARNING

- Input should be shorted for at least one second after measuring a signal with a large DC component.

- (7) A 10 Ω impedance exists between the GND side of I/O terminals and the case. This is to prevent errors in readouts in cases where the case is also connected to a rack or to another device.

⚠ CAUTION

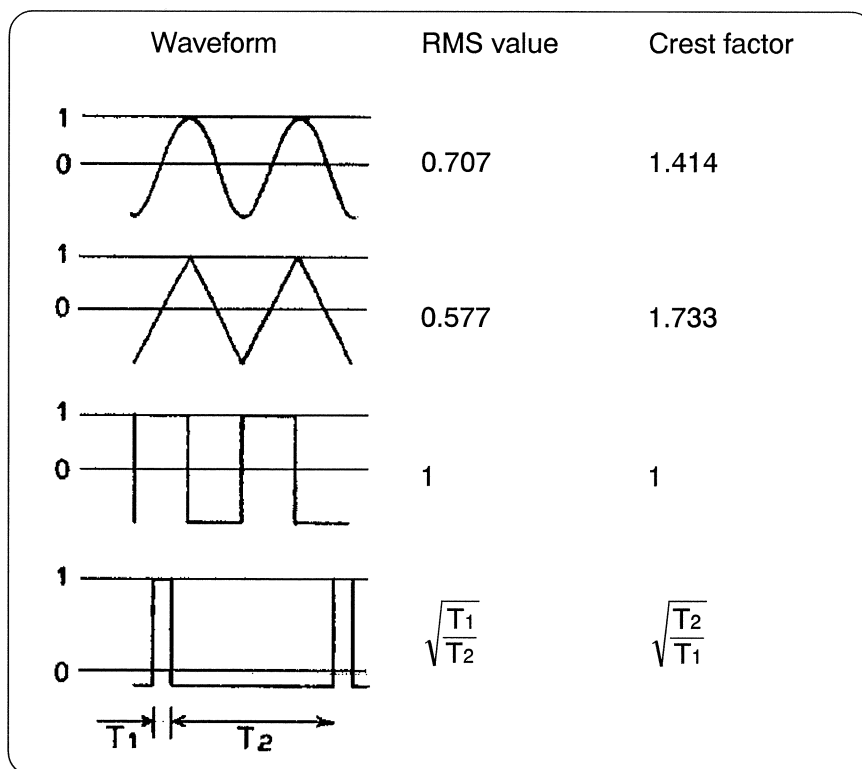
Do not apply a signal or DC voltage of 1 V or more between the GND side of I/O terminals and the case.

- (8) The standard level in the S-N or decibel measurement can be set to any level by adjusting the SENSITIVITY control. However, in such cases frequency characteristics change at frequencies of 1 MHz or above.

- (9) Crest factor

Definition:
$$\text{Crest factor} = \frac{\text{Peak value}}{\text{RMS value}}$$

Crest factors for typical waveforms:



The M2170's measurable crest factor is 7 or less when at full scale and set to CAL. Since the crest factor is inversely proportional to the meter's indicated value, when -6 dBV is indicated the crest factor is 14 and when -10 dBV is indicated it is 22.

When you use the SENSITIVITY knob to adjust the sensitivity (until the UNCAL lamp lights up), the measurable crest factor is reduced in direct proportion to the sensitivity. Thus, when sensitivity is reduced to -10 dB, the measurable crest factor is reduced to 2.2.

Also, during this UNCAL mode, the OVER lamp may not light up even when a measurement error occurs due to a high crest factor.

The crest factor can be measured by measuring the AC OUT output with an oscilloscope.

$$\text{Crest factor} = \frac{\text{AC OUT's peak value}}{\text{Meter's indicated value}}$$

- (10) The M2170 measures only the RMS value of the AC component. Consequently, when a signal contains a DC component that is superimposed on the AC component, the RMS value that contains the DC component can still be measured by using the following equation.

$$E (\text{AC} + \text{DC})_{\text{rms}} = \sqrt{E^2_{\text{AC(rms)}} + E^2_{\text{DC}}}$$

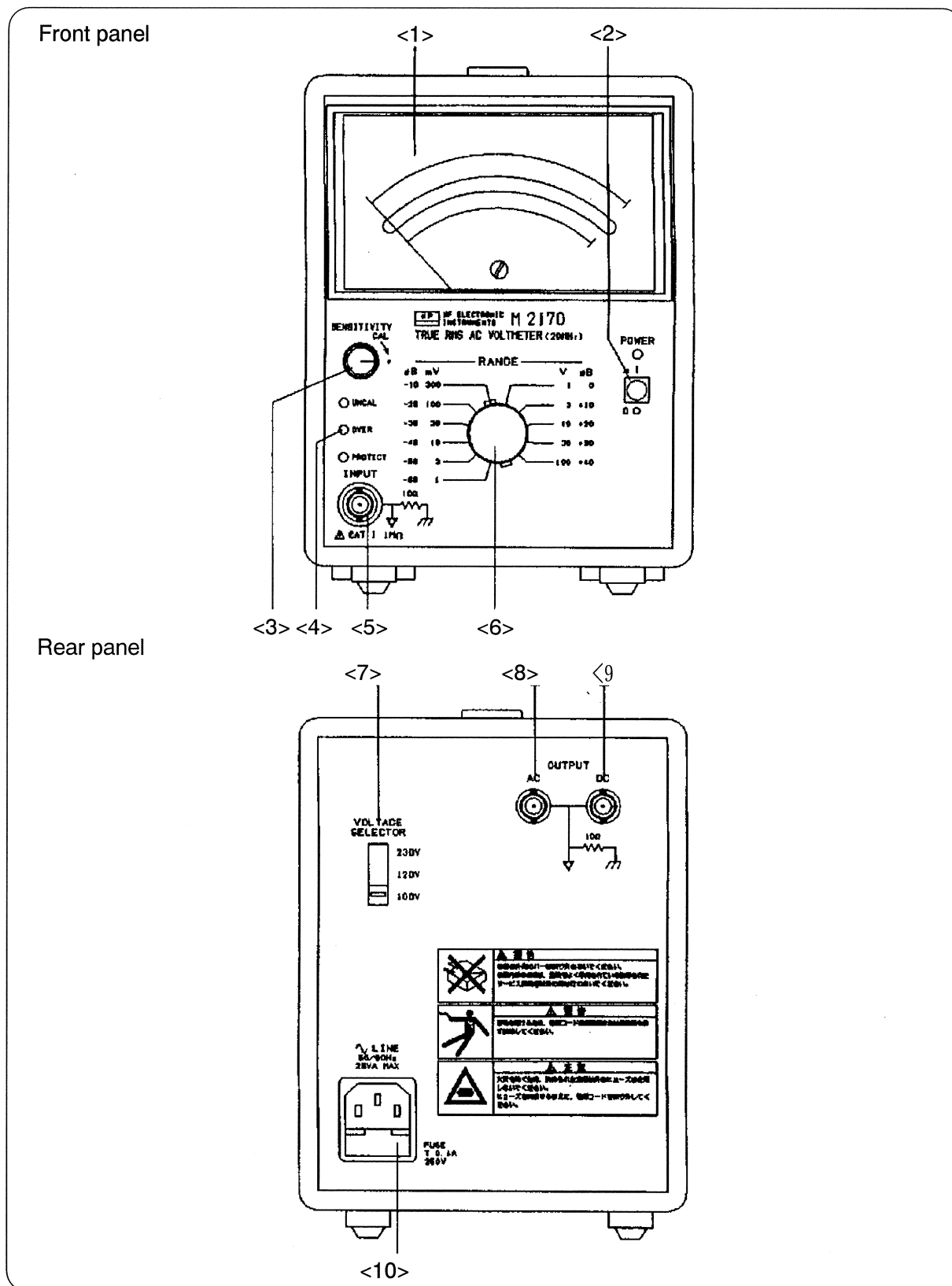


Figure 3-1. Front and Rear Panels

4. PRINCIPLES OF OPERATION

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4.1 Block Diagram

Input is applied to ATT1, and its AC component is blocked by capacitor C.

SENSITIVITY is a variable resistor which can be used to vary the meter's sensitivity in a range from 0 to -10 dB. RMS CONV is a heat exchange system that converts between RMS values and DC values.

When using the dB linear scale option, LOG AMP is inserted between RMS CONV and the meter. In such cases, the DC output is logarithmic.

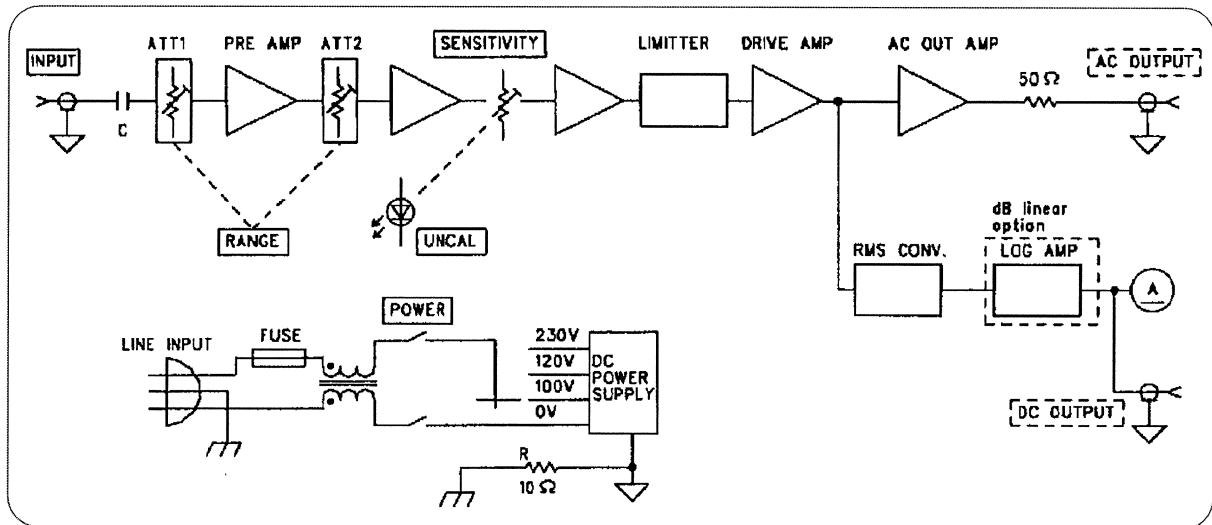


Figure 4-1. Block Diagram

4.2 Operation of RMS CONV

The figure below illustrates the circuitry of the RMS – DC converter (RMS CONV), and the section enclosed in a broken line uses ICs. This section also includes two sets of thermocouples and heaters, each of which is thermally insulated.

When an input signal is applied to R1, R1 generates heat equivalent to the input signal's RMS value, which alleviates the thermocouples and generates electromotive force via TC1.

Since each thermocouple is connected to the corresponding input on a differential amplifier (Q1), when an input signal is applied to R1, Q1's output is changed toward the positive direction.

When this output from Q1 is applied to R2, thermo-electromotive force is also generated via TC2.

When output from TC1 and TC2 (i.e., the differential between the Q1's two inputs) reaches the zero point, this circuitry is balanced. If the characteristics of R1, TC1 and R2, TC2 are identical, then the Q1 output will equal the effective value of the input signal and the equivalent value of the DC voltage.

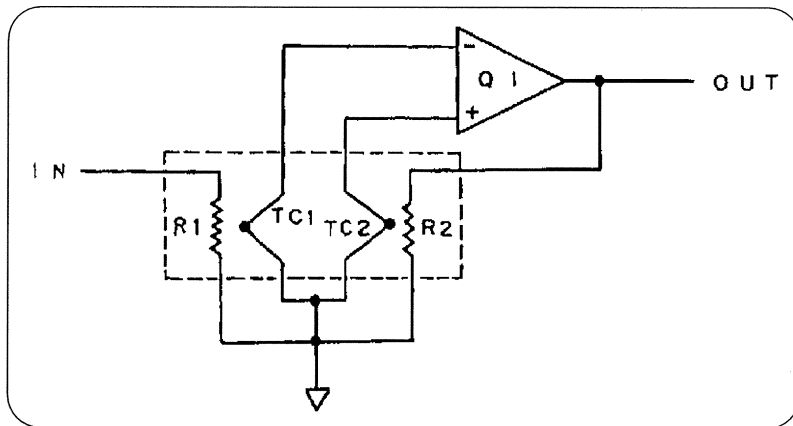


Figure 4-2. Operation of RMS CONV

5. MAINTENANCE

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5.1 Outline

Proper maintenance is required to keep this device in optimum condition. Normally, such maintenance includes the following four steps.

(1) Operational check

Make sure the device operates correctly, according to the rated values.

(2) Adjustment and calibration

If the device is not operating correctly, adjust or calibrate the specified parts.

(3) Detecting fault locations

If there are failures, check for sources of the problem, and investigate fault locations.

(4) Troubleshooting

This instruction manual describes only relatively simple methods for checking operations, adjusting and calibrating this device, and performing aging checks on faulty parts.

For more complicated checks, calibrations, or repairs, contact an NF Corporation sales office or your local NF Corporation sales representative.

5.2 Operation Checks

First, make sure the power is OFF, then check the meter's zero point. The screw at the bottom center of the meter frame can be used to adjust the mechanical zero point.

Keep the SENSITIVITY knob set to the CAL position.

(1) Indication accuracy check

The following measuring instruments are needed to check the accuracy of the meter's indicated values.

AC standard voltage generator

Frequency: 400 Hz or 1 kHz

Output voltage: 1 mV to 100 V_{rms} ±0.1%

Connect the generator to the M2170 and read the indicated values for each range while the meter is at full scale. Indicated values are normal if their error margin is within ±1%.

If this kind of generator is not available, use an oscillator in combination with another calibrated AC voltmeter, an accurate differential voltmeter, or a digital voltmeter to check operations.

(2) Frequency characteristics check

Measuring instrument: Sine-wave oscillator (5 Hz to 20 MHz)

Connect a resistance attenuator that is suited to the oscillator's output impedance and also connect a terminal resistor to the oscillator.

The frequency response is normal if the meter's indicated frequency is within the following ranges. The oscillator being used should have about 1/3 of the following frequency characteristics.

30 Hz to 1 MHz $\pm 10\%$

10 Hz to 10 MHz $\pm 5\%$

5 Hz to 20 MHz $\pm 2\%$

(3) Residual noise check

Use a wire, etc., to short the M2170's input terminal and allow a 30-minute warm-up period, then read the indicated value.

The allowable noise level is up to 7% of full scale for any range (the indicated value may be to the left of the meter's zero point depending on the ambient temperature).

When using the db linear scale option, use an AC voltmeter to measure AC OUT. The indicated value will be to the left of the meter's zero point when the measured value is 100 mV or less in the 1 mV range or 30 mV or less in the 3 mV range.

6. AGING CHECKS ON FAULTY PARTS

Note

In the event that a breakdown or other abnormality has occurred in the M2170, check the following things first.

If you are still not able to clearly judge the source of the problem, please submit a report of the symptoms and your check results. This will help us provide the right kind of service and will make it easier for us to resolve the problem, so your cooperation is kindly requested.

(1) The devices does not operate at all.

- Is the power cord's input connector correctly plugged into an AC outlet?
- Is there a blown fuse?

(2) The meter's indicator goes off scale.

- Is excessive input being applied?
- Is the input connected correctly? (Check for disconnection of signal cable on GND side, etc.)
- Is oscillation occurring due to monitoring of the M2170's output?
- Does the meter's indicator go off scale even when the input is shorted?

(3) Indicated values are abnormal.

- Is the sensitivity adjuster being used? (Is the UNCAL lamp ON?)
- Is the crest factor within the rated range? (Is the OVER lamp ON?)
- Is the input frequency within the specified range?
- Is oscillation occurring due to monitoring of the M2170's output?
- Are other ranges also abnormal?

WABUN: (D:508453-2)

If there are any misplaced or missing pages, we will replace the manual. Contact the sales representative.

NOTES:

- Reproduction of the contents of this manual is forbidden by applicable laws.
- The contents of this manual may be revised without notice.
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M2170 INSTRUCTION MANUAL

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