

REPAIR SERVICE INSTRUCTIONS — CALIBRATION

2231-20 4-20 Milliamp Clamp Meter

Environmental Condition

Perform all calibration at an ambient temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ / $73.4^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$ and relative humidity of 80% - allow the fork meter to sit at this temperature for a minimum of 30 minutes before proceeding.



REPAIR SERVICE INSTRUCTIONS

Calibration



MILWAUKEE ELECTRIC TOOL CORPORATION
13135 WEST LISBON ROAD • BROOKFIELD, WISCONSIN 53005-2550 • USA

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SAFETY

Review the following safety precautions to avoid injury and prevent damage to this product or products connected to it. To avoid potential hazards, use the product only as specified.

▲WARNING: These statements identify conditions or practices that could result in personal injury or loss of life.

CAUTION: These statements identify conditions or practices that could result in damage to the equipment or other property.

Specific precautions

To reduce the risk of injury, user must read and understand operator's manual.

Do not operate without covers. To avoid personal injury, do not apply any voltage or current to the product without covers in place.

Electric overload. Never apply a voltage to a connector on the product that is outside the range specified for that connector.

Avoid electric shock. To avoid injury or loss of life, do not connect or disconnect probes or test leads from the meter while they are connected to a voltage source.

Do not operate in wet/damp conditions. To avoid electric shock, do not operate this product in wet or damp conditions.

▲WARNING

To avoid shock or injury, do not perform the verification tests or calibration procedures described in the manual unless you are qualified to do so.

The information provided in this document is for the use of qualified personnel only.

CAUTION

The 2231-20 contain parts that can be damaged by static discharge.

Follow the standard practices for handling static sensitive devices.

Precautions and Safety Information

Use the Meter only as described in the Operator's Manual. If you do not do so, the protection provided by the Meter may be impaired. Read the "Safety Information" page before servicing this product.

In this manual, a **▲WARNING** identifies conditions and actions that pose hazard (s) to the user; a

CAUTION identifies conditions and actions that may damage the Meter or the test instruments.

1. Scope

This service manual applies to the digital DC MILLIAMP clamp meter 2231-20.

2. Contents

This service manual consists of the following items.

- (1) Construction Drawing
- (2) Disassembly Procedure
- (3) Adjustment Procedure
- (4) Trouble Shooting
- (5) List of Spare parts

3. Construction Drawing

As per Fig. 1 at the next page.

4. Disassembly Procedure

4.1 Removal of Battery compartment cover

- (1) Loosen two screws 13 fixing the battery compartment cover, and then remove the battery compartment cover.
- (2) Remove batteries 14.

4.2 Removal of Front panel

- (1) Loosen six screws 11 fixing the Front panel.
- (2) Remove the battery harness 7 from PCB.

4.3 Removal of PCB

- (1) Loosen one screw 6 fixing the PCB.
- (2) Remove the PCB assembly 5 from Front panel 1.
- (3) Remove the sensor module 16 from PCB.

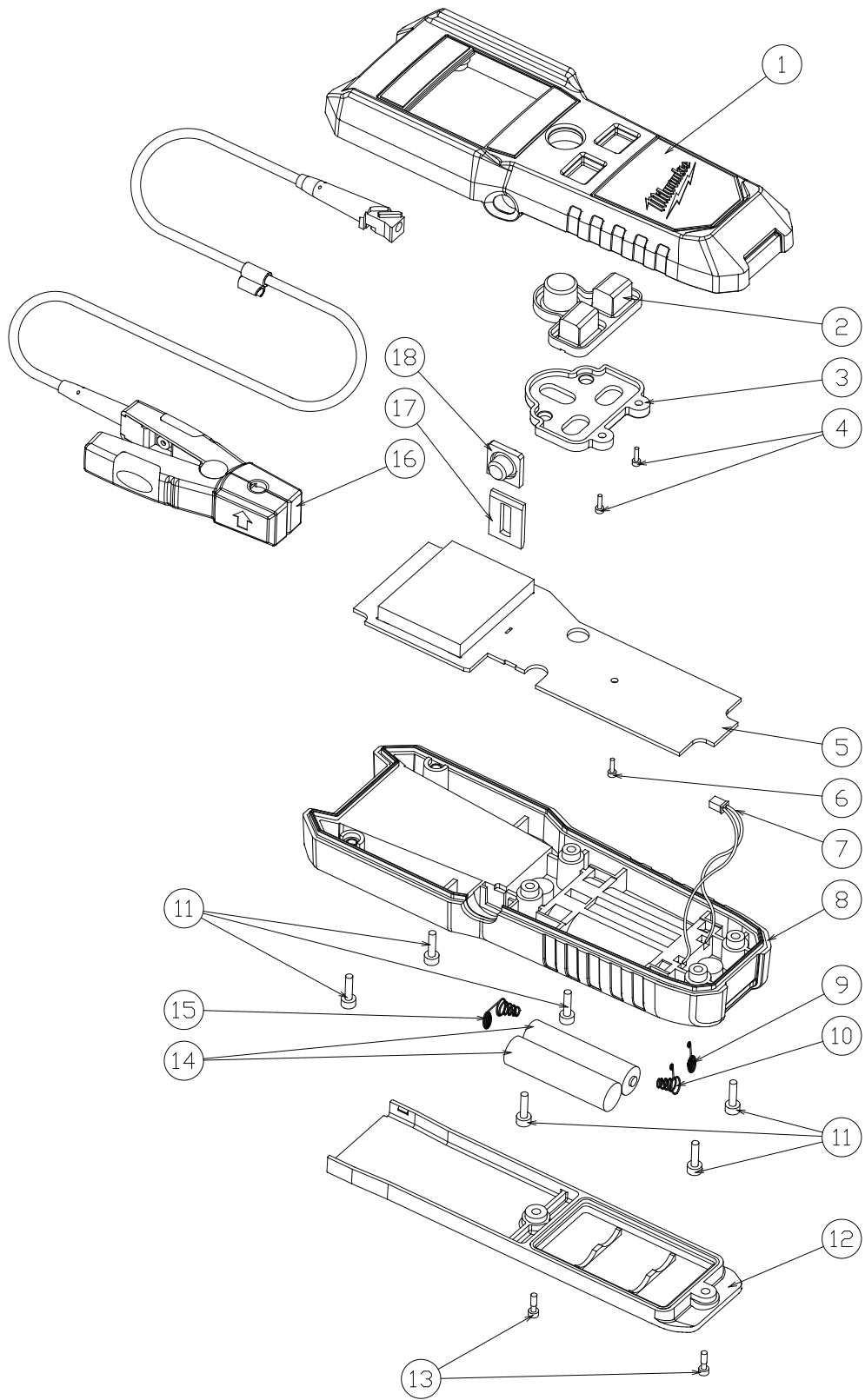
5. Adjustment Procedure

Caution! : For your safety, do not open 2231-20 in adjusting procedure.
And close the battery compartment cover.

5.1 Required equipments & tools

Prepare the following items for adjustment.

- (1) DC Current generator (Adjustment point: DC0mA, $\pm 20\text{mA}$, $\pm 100\text{mA}$)
- (2) Coil (1 turn)



-Fig. 1 Construction Drawing-

5.2 How to adjust

5.2.1 The transition to the adjustment mode

- (1) Press the power switch while holding down zero adjustment switch and the data hold switch at the same time.
- (2) Make sure that the LCD is lit all, press and hold the light switch over 1 second.
- (3) LCD will show the software version and CAL mark flashing, and then 2231-20 will move to the adjustment mode.

5.2.2 Each key operation in the adjustment mode

- ① Data hold switch: Change the adjustment point
- ② Zero adjustment switch: Run adjustment

5.2.3 DC current adjustment

- (1) Set to the adjustment mode (Measured value is shown in the main display, adjustment point is displayed in the sub-display).
- (2) Connect the coil unit and current generator.
- (3) Clamp the conductor of the coil unit.
- (4) Ensure that the sub-display shows 0.00mA.
If the sub-display does not show 0.00mA, press the data hold switch, then the sub-display will show 0.00mA.
- (5) Generate the current as same as the adjustment point.
- (6) After waiting for 10 seconds, press the zero adjustment switch, to perform the adjustment.
- (7) Press the Data Hold switch to move the next adjustment point.
- (8) Up to -100mA, repeat (5) (6) (7) procedure.

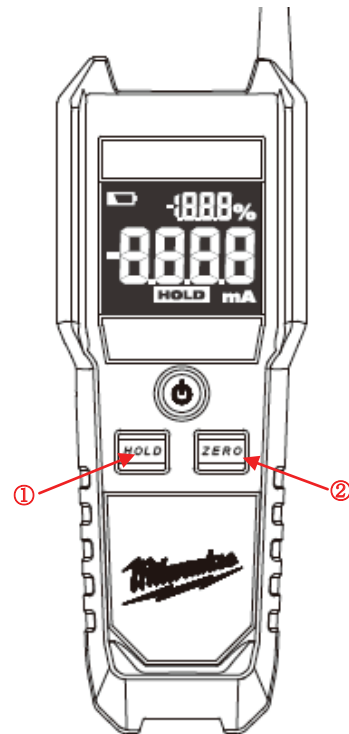


Table 1DC Current adjustment point

adjustment procedure #	adjustment point	
1	20mA range	0mA
2		+20mA
3		0mA
4		-20mA
5	100mA range	0mA
6		+100mA
7		0mA
8		-100mA

6. Trouble Shooting

Defective Symptom	Possible Cause	Recommended remedy
Power does not turn on	Shortage of battery capacitance	Replace the batteries.
	Contact failure at Battery contact	Replace the battery contact.
Inaccurate measurement is caused.	Shortage of battery capacitance	Replace the batteries.
	Defect of adjustment	Readjustment
	Defect of circuit components	Replace the PCB.
	Defect of circuit sensor module	Replace the sensor module.
Display value changes over 20digits at zero point , when repeating the JAW open and close,	Defect of circuit sensor module	Replace the sensor module.
Lack of the segment, or abnormal lighting,	Defect of circuit components	Replace the PCB.
LCD backlight or LED light is not lit	Defect of circuit components	Replace the PCB.

7. List of Spare parts

No.	Spare parts No.	Parts Name	Qty.	Remark
18	9000018895	Lamp Button 2231-20 UL	1	-
17	9000019044	Lamp Button Bracket 2231-20	1	-
2	9000018894	Control Button 2231-20 UL	1	-
1	9000018890	Enclosure-Front Case 2231-20UL	1	-
5,6	122310200A	2231-20 PCB MAIN	1	with LCD and one screw
8	9000018891	Enclosure-Rear Case 2231-20 UL	1	-
11	9000014595	Screw For Bottom Case	6	-
12,13	9000018892	Battery Door 2231-20 UL	1	with two screws
16	122310100A	2231-20 Clamp and Wire	1	with wire clip
3,4	9000018896	Control Button Support 2231-20	1	with two screws
14	9000017226	Battery maxell LR6(GD)E 4PT	2	-