C. G. M. METRIX

ANNECY FRANCE

MULTIMETER MX 202B

MAINTENANCE MANUAL

IM 464

IC 3.2071
JM/pb

C O N T E N T S

DIAGRAMS :

1 - REPLACEMENT OF MOVEMENT

Tools and instruments required :

- Screw driver
- Soldering iron
- Pipe spanner (4 mm)
- Pair of tweezers
- Flattened piece of wire
- Compressed air
- Jig
- Demagnetization instrument (Metrix AU 007)
- DC supply (20 µA) (similar to Fluke 760 A)
- Steering-holder JL 125 - 5 - 8
- Zero reset tool JL 158 - 2 - 3
- Counterweight driver JL 85 - 3 - 4
- Dummy protection cover
- Damping resistance 10 kΩ ± 10 % ½ W

OPERATIONS.

A) To open the instrument.

Remove the back cover - After removing the two screws, lift the back, screw side first.

B) Preliminary removals.

Unsolder blue and red leads between meter and printed circuit board. Remove the screw (18) to remove the circuit board from the instrument. (See Fig.1 Meter movement adjustment diagram) .

Remove the clip and the thumb selector wheel.

Replace the wheel by a rubber grommet. This grommet is used to maintain the axis of gear-movement.

Unscrew the two screws (1 A) and (1 B) (See Multimeter assembly - exploded view) .

Remove the dial holder and the dial-movement assemblies from the glass and gasket assembly with front cover. (The front cover includes zero reset screw) .

Remove the two screws (2 A) and (2 B) (rear of meter case) .

Separate the dial holder assembly from the dial-movement assembly.

Mount the dial-movement assembly on the steering-holder JL 125 - 5 - 8 .

Remove nuts (3 A) and (3 B) with a pipe spanner (4 mm) .

Separate the meter dial from the meter movement.

Remove the counterweights (A) (B) and (C) from pointer holder (6) (See meter movement exploded view) .

Unsolder red and blue leads in order to set them on the new movement.

C) To balance the movement before replacement.

1 - Magnetization. R_i = 1150 - 1510 Ω

Meter movements for replacements are magnetized before dispatching.

2 - Balancing operations.

- Solder red and blue leads on the new movement.
- Fit the movement on the steering holder JL 125 - 5 - 8 .
- Set the dial with the movement (nuts (3 A) and (3 B)).
- Remove this assembly from the steering holder.
- Check that the fork (2) (See Fig.2 of meter movement adjustments diagram) is set at mid-course and pointing downwards.
- Remove the piece of paper used to lock the movement. Then adjust end stops of the dial. Use a pair of tweezers to obtain (as indicated Fig.2) a 3 mm space between end stops and end scale deviations.

Adjust zero reset as follows :

The dial-meter movement assembly lying horizontally on the jig, place the zero reset tool JL 158 - 2 - 3 prongs into the notches provided on parts (19) and (20) at the rear of the movement (See exploded view) .

Turn the movement slightly (action on the suspension bands) to set the pointer one division left of the zero graduations.

Fit the dummy protection cover to protect the moving parts from draughts.

Act on fork (2) to set the pointer at zero.

Balance the pointer and moving coil assembly as explained on meter movement adjustments diagram.

- Régler le zéro mécanique :

  Pour cela, engager la griffe JL 158-2-3 sur les pièces (19) et (20) de l'équipage mobile (partie inférieure représentée sur la vue éclatée). Le cadran et l'équipage étant placés à plat horizontalement sur le chevalet en bois, on opère ainsi une torsion sur la bande pour amener l'aiguille approximativement au zéro (il est conseillé de décaler volontairement la position de l'aiguille d'une division à gauche de la graduation 0).

- Placer un plastron fictif dans lequel on a pratiqué un orifice qui assure l'accès aux mécanismes du cadre mobile.

- La raquette (2) ayant été initialement centrée sur l'axe de symétrie du cadran, la déplacer pour amener l'aiguille sur la graduation 0 des échelles.

Toutes ces opérations préliminaires étant réalisées, entreprendre les trois équilibrages suivants :

- Aiguille horizontale,
- Aiguille verticale,
- Aiguille en position normale d'utilisation.

Il est conseillé de brancher préalablement une résistance d'amortissement de 10 kΩ aux extrémités des fils bleu et rouge (ceci permet d'éviter les rebondissements en amortissant le cadre coupé qui réagit lorsqu'il se trouve placé dans un circuit magnétique).

a) Equilibrage horizontal :

Se conformer aux instructions de la figure 3.

Déplacer la boudinette arrière (C) pour amener l'aiguille au zéro des échelles, à l'aide de l'outil JL 85-3-4 (Ce réglage est approximatif, la boudinette arrière équipe systématiquement les équipages neufs).

Visser ou dévisser, selon le cas, la spirale sur l'ergot correspondant du porte-aiguille, pour amener l'aiguille à l'horizontale en coïncidence avec les graduations 0.

(L'aiguille étant au-dessous du zéro, il conviendra de dévisser la boudinette C pour l'éloigner de l'axe de rotation).

Dans le cas où le contrepoids est trop élevé, couper une spire de la boudinette.

Fit the front cover with the protecting glass and gasket assembly.

Check that the excentric tip of the zero reset screw is pointing downwards.

Check zero adjustment, the instrument being laid horizontally and the resistance 10 kΩ being connected to blue and red leads.

Turn slightly zero screw if necessary (free play = ± 2 divisions) .

Check balancing operations b) and c) .

D) Demagnetization.

Use the instrument Metrix AU 007 (Specifications on request) .

Check that screws (4 A) and (4 B) of the new movement are screwed. Don't modify this adjustment before instructions indicated hereafter.

1 - Feed the coil directly (20 µA DC supply) . The pointer must overshoot the end scale (division 150) .

2 - Demagnetize to adjust the pointer at 150 as follows :

Connect the 10 kΩ damping resistance to red and blue leads, shunted by 20 µA supply. The pointer is moving above division 134 . Demagnetize to adjust pointer at 134 . When moving back, if the pointer is overshooting division 134 but not reaching division 128 , it will be not necessary to remagnetize the movement.

Unscrew (4 A) and (4 B) to gain 6 divisions from 128 to 134 (0.8 µA in regard of a full scale deviation 20 µA) .

Disconnect damping resistance only.

Check pointer is at 150 .

Feed 10 µA DC and check the pointer is at division 25 on scale 50 .

E) Fit the thumb selector wheel with its clip after removing the rubber grommet.

Fit the printed circuit board.

Check multimeter calibration (See instructions indicated, Chapter 2) .

Replace the back cover and fit it with two screws.

O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O-O

2 - CALIBRATION INSTRUCTIONS

Instruments required :

- Ohmmeter
- Decade resistance box
- Power supply (similar to Fluke 760 A)

A) Meter power input :

Note : A 10 µA and 20 µA DC power supply, accurate to 0.2 % is required to calibrate this meter.

Proceed as follows to adjust meter M1 power input.

- Remove the printed circuit board.
- Connect M1 moving coil terminals to the power supply.
- Check that the pointer deflects at end scale with 20 µA and at half scale with 10 µA .

  If not :

  - Remove the adhesive cloth that covers the holes A and B .
  - Using a small screwdriver turn either the screw A or B to bring the pointer to the appropriate positions.

    (These screws adjust a magnetic shunt) .

B) DC Calibration :

The power supply required is 50 mV ± 0.3 % at 69° F (20° C) .

When the ambiant temperature is other than 69° F , the power supply should be rated accordingly.

Note : The meter readings lag 1.44 % per 18° F (10° C) increase in temperature.

Proceed as follows :

- Check that the pointer is at zero on the scale ; if not adjust by turning the bakelite screw situated underneath the window.
- Apply 50 mV DC , corrected for ambiant temperature, on jacks + and - COM. (instrument switched to 50 mV DC) .
- Adjust with R29 (See Fig.2) . Access to the potentiometer spindle is at (2) on Fig.1 .
- Calibration is complete when the pointer reaches exactly 50 at FSD .

C) AC Calibration :

The power supply required is :

- Voltage : 15 mV AC
- Current : 1 mA AC

} Perfectly stabilized with respect to the mains.

- Accuracy must be : ± 0.3 %

Proceed as follows :

- Set the meter index to 15 V AC and apply successively 15 V AC and 1 mA AC to jacks " - COM " and " + " .
- Calibration is done by varying R24 resistance (see Fig.3) .
- Access to this potentiometer is in (3) , see Fig.1 .
- Calibrate by slowly rotating the potentiometer spindle with a small screw-driver and by trial make the best compromise between the two end scale measurements.

D) Ohm ranges adjustment.

Proceed as follows :

- Gain access into the instrument :

  Unscrew the two screws at the rear and remove the back screw side first.

- Connect plug + to plug - COM. (See Fig. 4) .
- Range Ω × 1 : Adjust R30 to set meter needle at 0 Ω .
- Range Ω × 100 : Adjust R31 to set meter needle at 0 Ω .
- Range Ω × 1000 : Adjust R32 to set meter needle at 0 Ω .

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REGLAGES SUR EQUIPAGE MOBILE
METER MOVEMENT ADJUSTMENTS

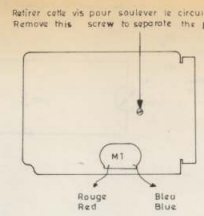
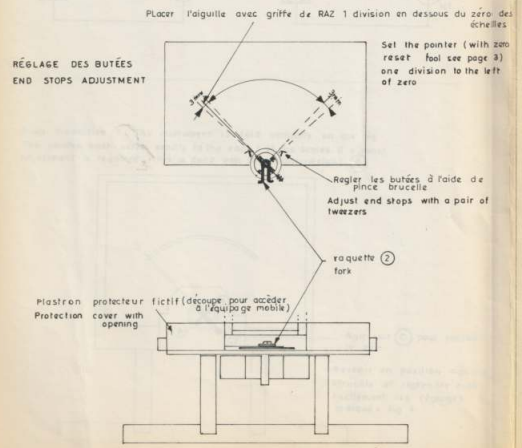


FIG 1



L'appareil étant posé à plat horizontalement sur le chevalet agir sur la raquette de la remise à zéro pour placer l'aiguille au zéro des échelles
The instrument lying horizontally on the jig slightly turn the fork to adjust the pointer to zero on the dial

FIG 2

EQUILIBRAGE DE L'ÉQUIPAGE
BALANCING THE MOVEMENT

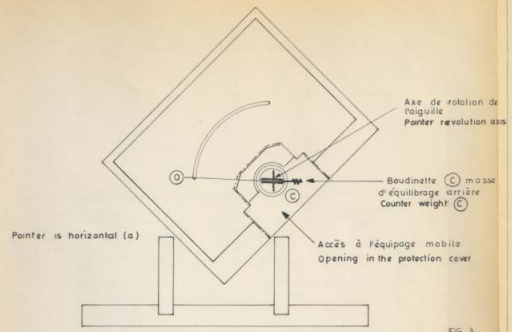


FIG 3

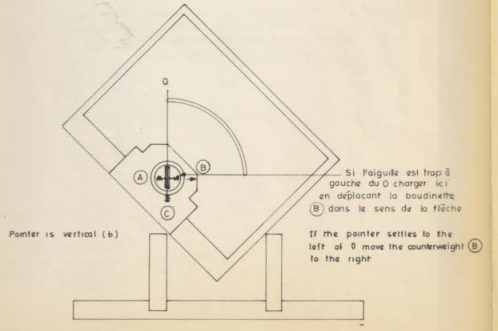


FIG 4

DEMAGNETISATION
MAGNETIC ADJUSTMENT (see instructions page 5)

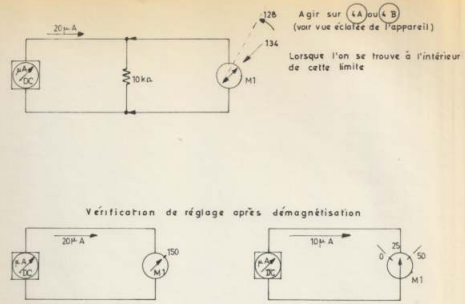


FIG 6

Final inspection C The instrument is laid vertically on the jig
The pointer must settle exactly to the end 0 of the scales if a minor adjustment is required, this is done with the counterweight (C)

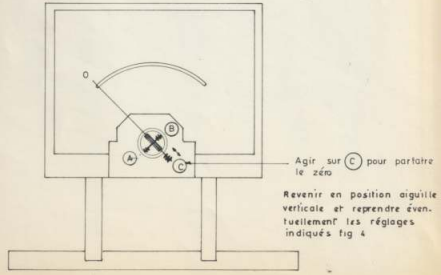
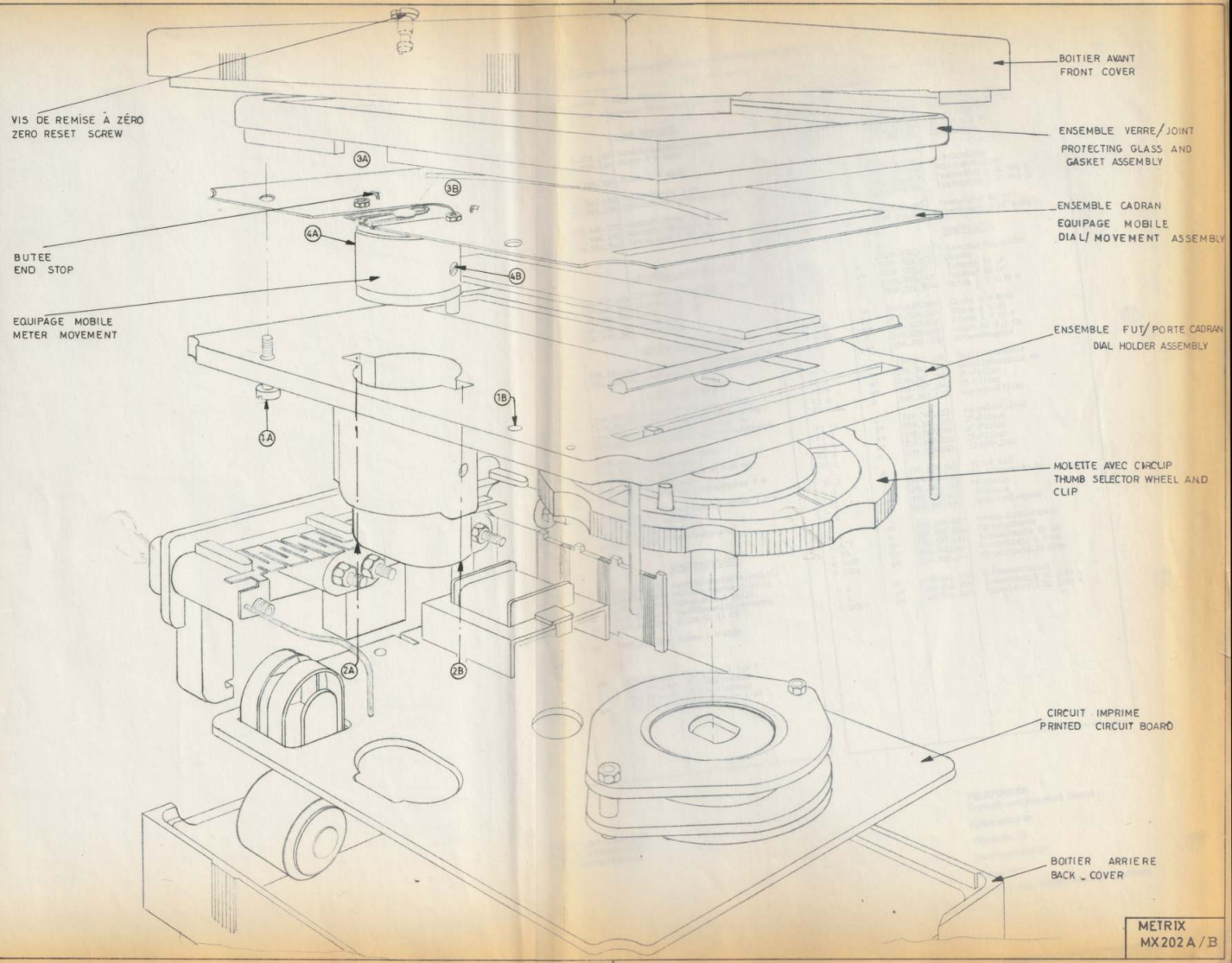


FIG 5

VUE ÉCLATÉE DE L'APPAREIL
MULTIMETER ASSEMBLY EXPLODED VIEW



METRIX
MX202A/B

1 - Canon supérieur avec cosse de suspension.
Upper tube with lug for suspension band.

2 - Raquette de remise à zéro.
Zero reset fork.

3 - Colonnette de fixation supérieure.
Upper spacer.

4 - Rondelle ressort supérieure.
Upper spring washer.

5 - Pont supérieur.
Upper bridge.

6 - Porte-aiguille - Aiguille - Masses d'équilibrage ABC.
Pointer holder - Pointer - Counter weights ABC.

7 - Pontet supérieur.
Upper holder.

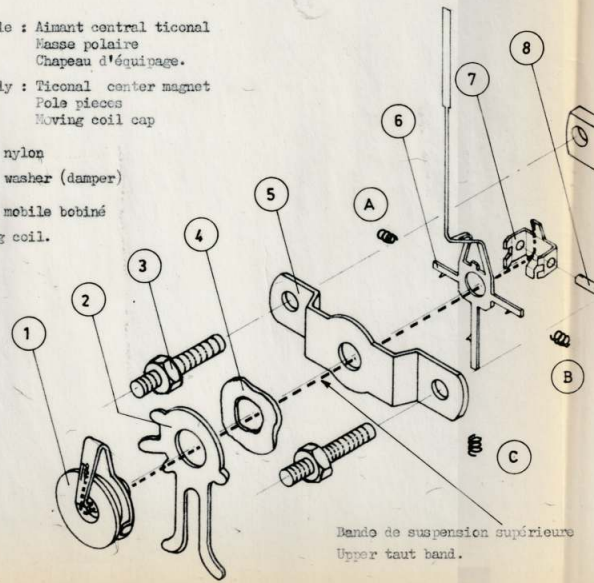
8 - Goupille
Stop.

9 - Ensemble : Aimant central ticonal
Masse polaire
Chapeau d'équipage.

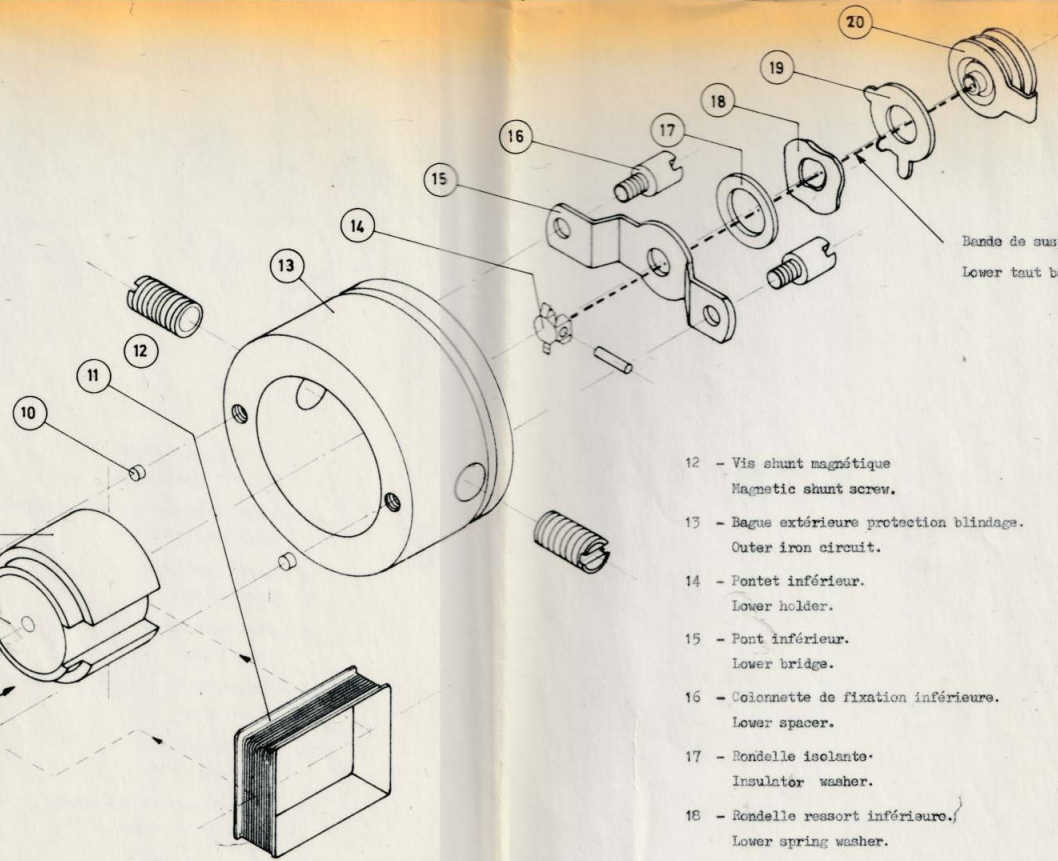
Assembly : Ticonal center magnet
Pole pieces
Moving coil cap

10 - Frein nylon
Nylon washer (damper)

11 - Cadre mobile bobiné
Moving coil.



Bande de suspension supérieure
Upper taut band.



Bande de suspension inférieure
Lower taut band.

12 - Vis shunt magnétique
Magnetic shunt screw.

13 - Bague extérieure protection blindage.
Outer iron circuit.

14 - Pontet inférieur.
Lower holder.

15 - Pont inférieur.
Lower bridge.

16 - Colonnette de fixation inférieure.
Lower spacer.

17 - Rondelle isolante.
Insulator washer.

18 - Rondelle ressort inférieure.
Lower spring washer.

19 - Fausse raquette
Fictive fork.

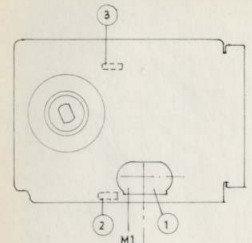
20 - Canon inférieur avec cosse de suspension et corps isolant.
Lower tube with lug for suspension and insulator assembly.

VUE ÉCLATÉE D'UN ÉQUIPAGE MOBILE A SUSPENSION PAR BANDES
EXPLODED VIEW METER MOVEMENT ASSEMBLY TAUTBAND SUSPENSION

METRIX
MX 202 A/B

ETALONNAGE DE L'APPAREIL
MULTIMETER CALIBRATION

FIG: 1



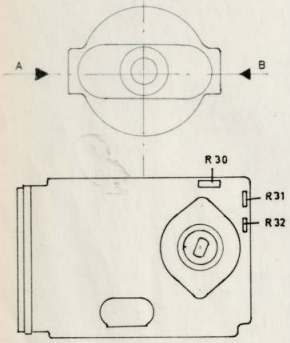


FIG 4

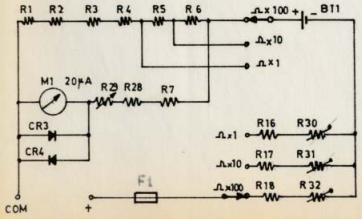
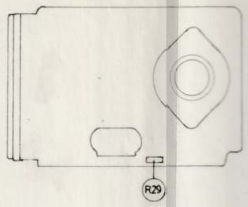
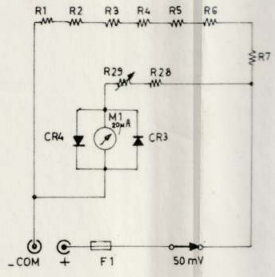


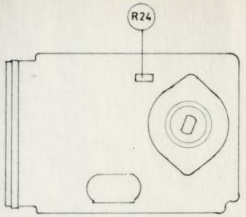
FIG: 2

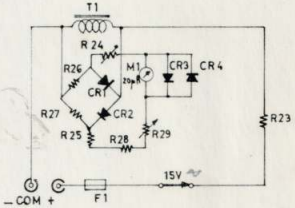




R1	0,05 Ω
R2	0,45 Ω
R3	4,5 Ω
R4	45 Ω
R5	450 Ω
R6	4,5 kΩ
R7	5 kΩ
R28	1,1 kΩ
R29	470 Ω variable
R16	200 Ω
R17	2 kΩ
R18	22 kΩ
R30	47 Ω variable
R31	470 Ω variable
R32	4,7 kΩ variable

FIG: 3





R23	14,5 kΩ
R24	470 Ω Variable
R25	5,9 kΩ
R26	200 Ω
R27	200 Ω
R28	1,1 kΩ
R29	470 Ω variable

METRIX
MX 202 B

NOMENCLATURE ILLUSTREE

REPAIR PARTS LIST

N° D'ORDRE CODE Nb	DESIGNATION	NAME OF PART	REFERENCE	Qt
1	Remise à zéro	zero reset	MB0503	1
2	Demi boîtier supérieur	molded front cover	XMB0492	1
3	Verre imprimé (version ITT)	printed glass (ITT version)	IE1519 (IE2735)	1
4	Cadre verre	Glass-holder	MC0056	1
5	Bague d'arrêt caoutchouc	rubber washer	AA0309	1
6*	Cadran imprimé (version STTA)	printed dial (french military version)	IA4583 (IA4583R)	1
7	Equipage mobile	meter movement	JF0304	1
8*	Platine mécanique équipée	dial holder	XMB0496	1
9	Vis d'assemblage	assembly screw	X1VA3310LN	2
10	Bobine fusible	Fuse wire	LC502	1
11	Shunt assemblé	assembly shunt	XLE0274	1
12	Vis de fixation de l'équipage mobile	meter movement screw	XVA2310LN	2
13	Pile	Battery	AL0018	1
14	Pied caoutchouc	rubber-footing	MC0057	1
15	Rondelle pour vis (16)	Washer	OB0123	1
16	Vis de fixation du circuit imprimé	printed circuit screw	X1VA3328LN	1
17	Demi-boîtier inférieur	molded back cover	XMB0494	1
18	Vis de bouclage	lock in screw	X1VA3340LN	1
19*	Circuit imprimé équipé (équipé câblé)	printed circuit (with wire and components)	CI579 (HD0453)	1
20	Contacteur	Switch	XKE0760	1
21	Cosse-relais	relay-lug	OC0176	3
22	Transformateur	transformer	LA0301	1
23	Shunt multiple	multiple shunt	LE0273	1
24	Loupe de curseur	index way lens	MD0232	1
25	Miroir	mirror	WA0073	1
26	Rondelle	washer	OB110	2
27	Ecrou de fixation de l'équipage mobile	meter movement nut	VB0004LN	2

* Voir détails sur vues séparées - See details on separated views.

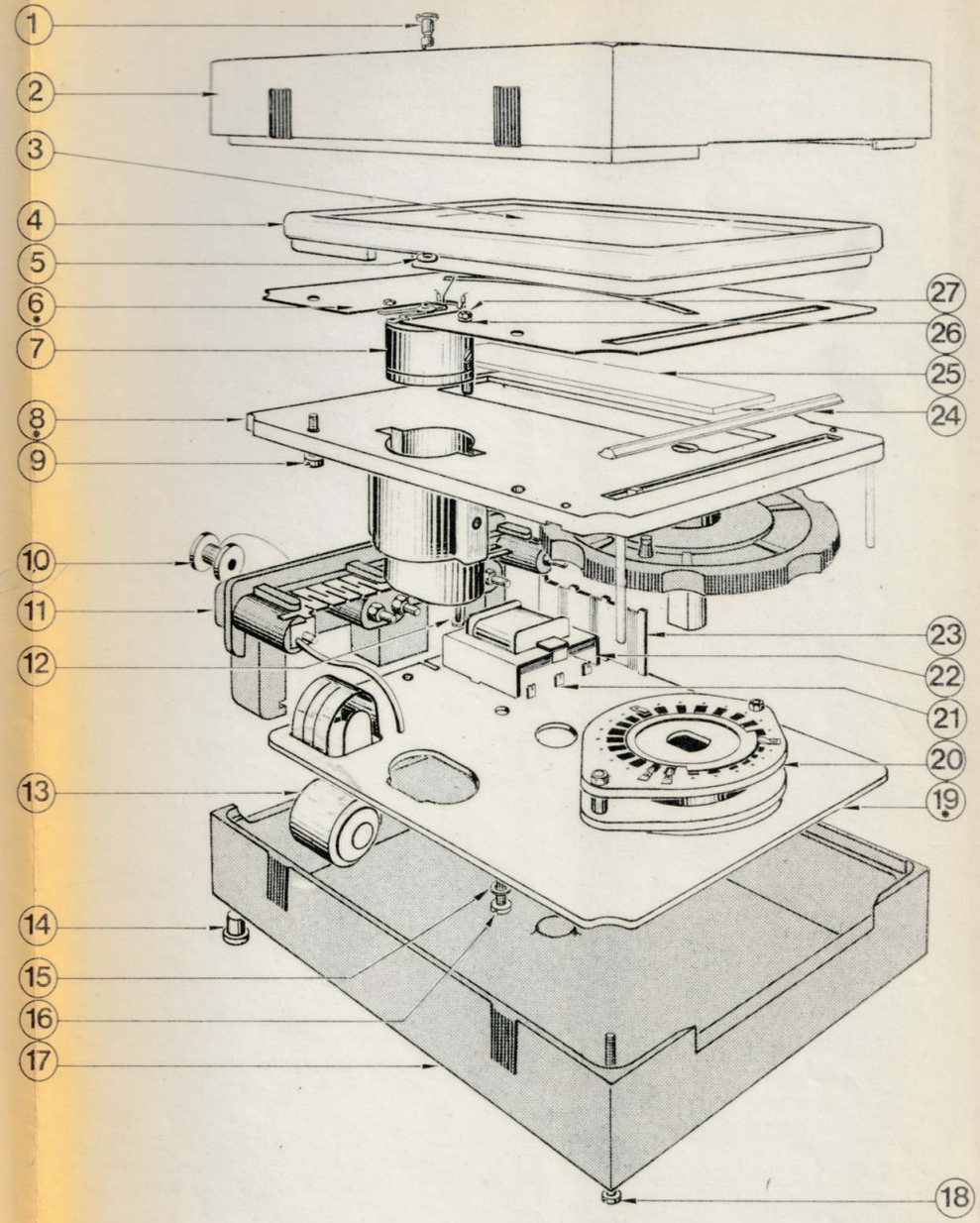
LOT DE RECHANGE

REPLACEABLE PARTS LIST

SYMB.	REF.	DESIGNATION / NAME	Nb.	N°REPERE CODE Nb
		1er Degré (First Degree)		
BT1	AL0018	Pile 1,35 V (dry cell battery)	1	13
	AG0044	Jeu de cordons (test leads)	1	
F1	LC0502	Bobine fusible équipée (fuse)	1	10
	OC1.76	Cosse-relais (relay lug)	3	21
	MC0057	Pieds caoutchouc (rubber footing)	4	14
		2ème Degré (Second Degree)		
	XMB0494	Demi-boîtier inférieur (molded back cover)	1	17
R1	XLE0274	Shunt assemblé (assembly shunt)	1	11
	GF0390	Cache bille (ball cover)	1	32
	RA0084	Ressort d'encliquetage (driving-spring disk)	1	40
	AA0535	Bille ∅ 5 (ball)	2	36
	MB0497	Disque de commande (thumb selector)	1	30
CR1/CR2	01 820 111 500 004	Diode	2	
CR3/CR4	01 820 211 500 018	Diode	2	
R2/R3/R4	LE0273	Shunt 0,45 - 4,5 - 45 Ω	1	23
	KE0760-02 (partie de XKE0760)	Galette contacteur (switch deck)	1	20
R5	00 211 445 000 021	Résistance 450 Ω 0,5 % $\frac{1}{2}$W	1	
R6	00 211 300 450 121	Résistance 4,5 kΩ 0,5 % 1/4 W	1	
R7	00 211 300 500 121	Résistance 5 kΩ 0,5 % 1/4 W	1	
R8	00 211 301 800 121	Résistance 18 kΩ 0,5 % 1/4 W	1	
R9	00 211 304 000 121	Résistance 40 kΩ 0,5 % 1/4 W	1	
R10	00 211 314 000 121	Résistance 140 kΩ 0,5 % 1/4 W	1	
R11	00 211 340 000 121	Résistance 400 kΩ 0,5 % 1/4 W	1	
R12	00 211 400 140 221	Résistance 1,4 MΩ 0,5 % $\frac{1}{2}$ W	1	
R13	00 211 500 400 222	Résistance 4 MΩ 0,5 % 1 W	1	
R14	UF0046	Résistance 14 MΩ 1 % 1 W	1	

SYMB.	REF.	DESIGNATION / NAME	Nb.	N°REPERE CODE Nb
R15	UF0047	Résistance 20 MΩ 1 % 1 W	1	
R16	00 213 320 000 051	Résistance 200 Ω 5 % 1/3 W	1	
R17	00 213 300 200 151	Résistance 2 kΩ 5 % 1/3 W	1	
R18	00 213 302 200 151	Résistance 22 kΩ 5 % 1/3 W	1	
R19	00 211 550 000 131	Résistance 500 kΩ 1 % 1 W	1	
R20	00 211 535 000 131	Résistance 350 kΩ 1 % 1 W	1	
R21	00 211 410 000 131	Résistance 100 kΩ 1 % 1/2 W	1	
R22	00 211 303 500 131	Résistance 35 kΩ 1 % 1/4 W	1	
R23	00 211 301 450 121	Résistance 14,5 kΩ 1 % 1/4 W	1	
R25	00 211 300 590 131	Résistance 5,9 kΩ 1 % 1/4 W	1	
R26/R27	00 211 320 000 031	Résistance 200 Ω 1 % 1/4 W	2	
R28	00 211 300 103 131	Résistance 1030 Ω 1 % 1/4 W	1	
R30	01 241 004 700 301	Résistance 47 Ω 20 % variable	1	
R31	01 241 047 000 304	Résistance 470 Ω 20% variable	1	
R32	01 241 000 470 406	Résistance 4,7 kΩ 20%variable	1	
	XMB0492	Demi-boîtier supérieur (molded front cover)	1	2
	IE1519	Verre imprimé (printed glass)	1	3
	MC0056	Cadre pour verre (glass holder)	1	4
		3ème Degré (Third Degree)		
	LA0301	Auto transfo de mesure (Transformer)	1	22
	CI0579	Circuit imprimé (mécanique-ment équipé (Printed circuit)	1	19
S1	XKE0760	Contacteur (switch)	1	23
M1	XNA2208 XNA2253(STTA) XNA2257(ITT)	Galvanomètre en boîtier (mounted meter)	1	
R24/R29	01 241 047 000 304	Résistance variable 470 Ω linéaire	2	
	JF0304	Equipage mobile (meter movement)	1	7

VUE GENERALE - GENERAL VIEW

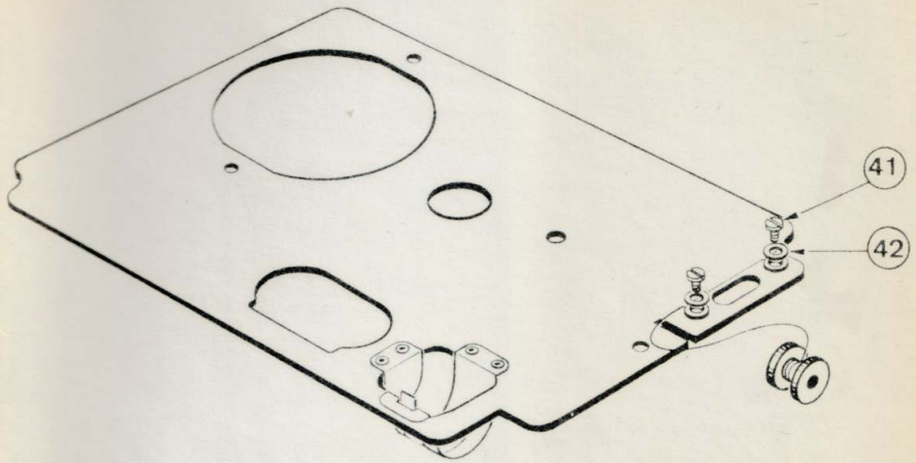


(6*) (8*) (19*) Voir planches détails
See detail views

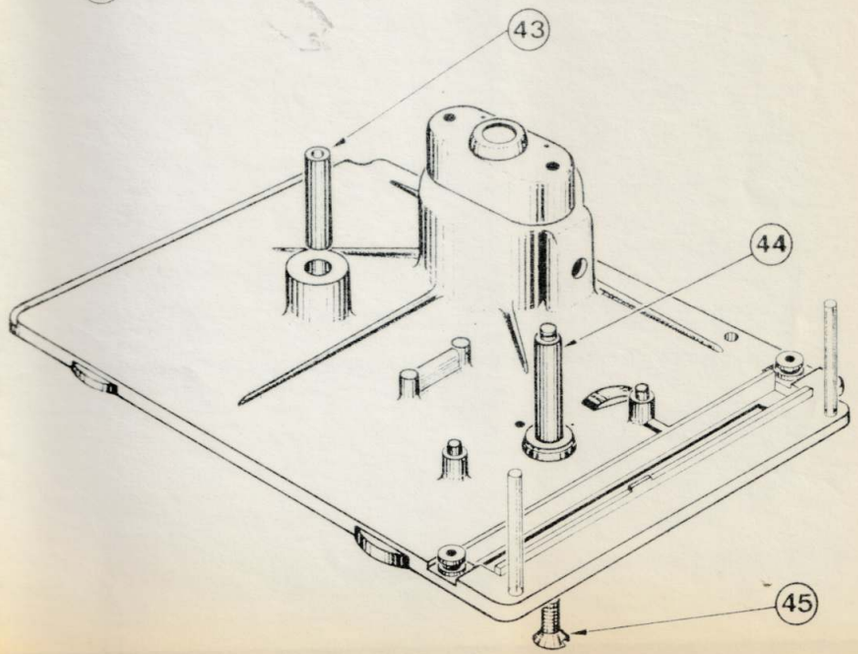
MX202 A/B

N° d'ordre code Nb	désignation	name of part	reference	quant.
41	vis de fusible	fuse screw	VE 255	2
42	rondelle	washer	OB 0121	2
43	canon isolant pour vis 16.	insulating tube	DG 0326	1
44	axe	axis	XDA 0411	1
45	vis d'axe	axis screw	X1VA 4410LN	1

DETAIL (19*) Fixation fusible - To fit fuse

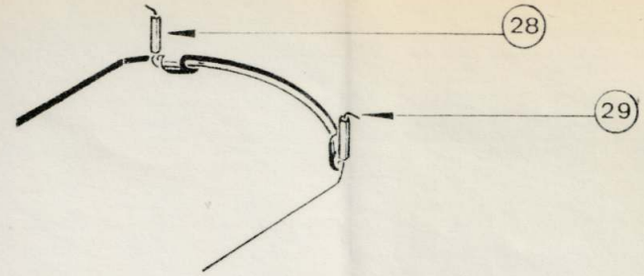


DETAIL (8*) Platine mécanique équipée - Dial holder



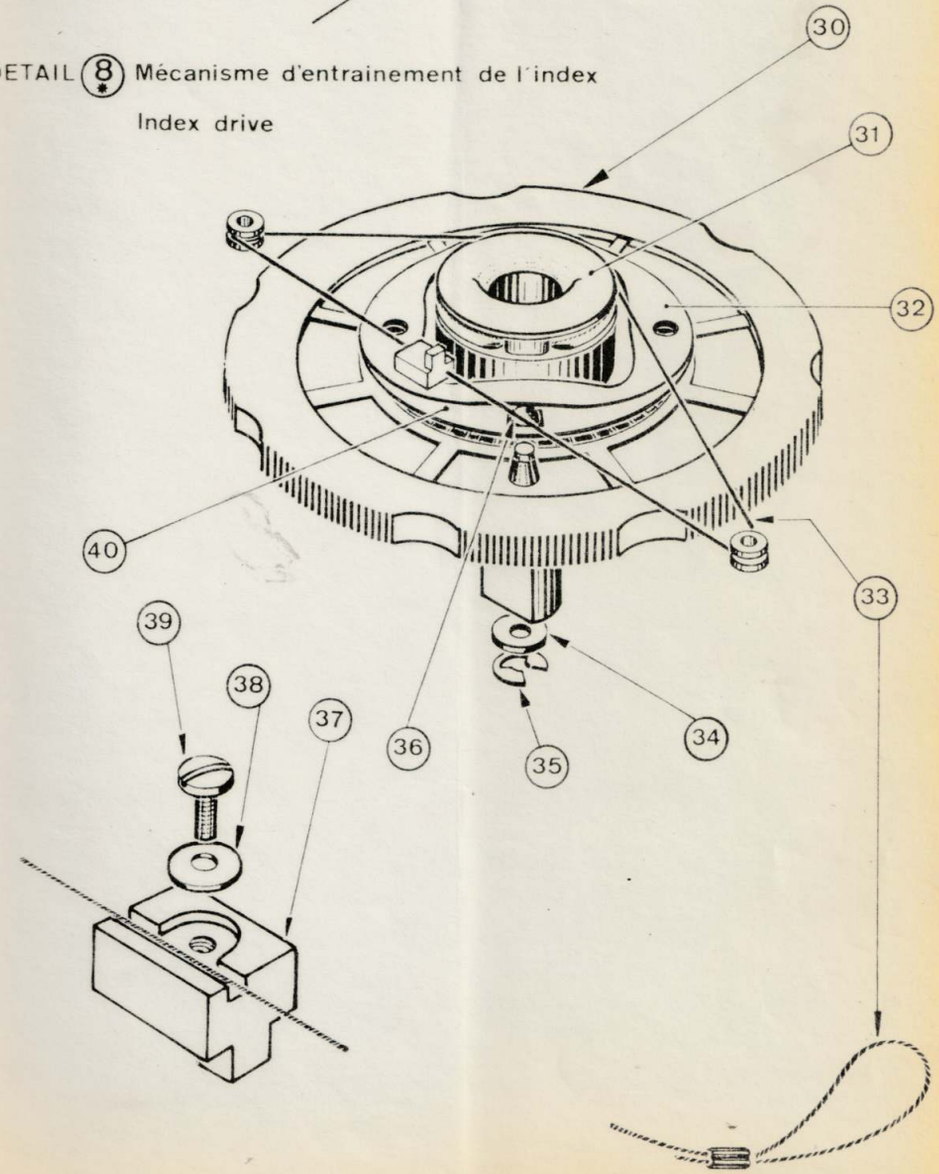
N° d'ordre code Nb	Désignation	Name of part	Reference	Quant.
28	Butee isolante	insulator tube	AA 0575	2
29	Ressort porte butée	end stop spring	RD 0065	2
30	Disque de commande	Thumb selector wheel	MB 497	1
31	Poulie	Driving pulley	MI 0066	1
32	Cache bille	Ball cover	GF 0390	1
33	Cable d'index	Index driving lace	AG 0110	1
34	Rondelle	Washer	OB 1454	1
35	Rondelle d'arret	Clip	OB 0042	1
36	Bille ⌀ 5	Ball ⌀ 5	AA 0535	2
37	Index	Index	IE 1533	1
38	Rondelle	Washer	OB 0110	1
39	Vis d'index	Index screw	OVA 2320LN	1
40	Ressort d'encliquetage	Driving spring disk	RA 0084	1

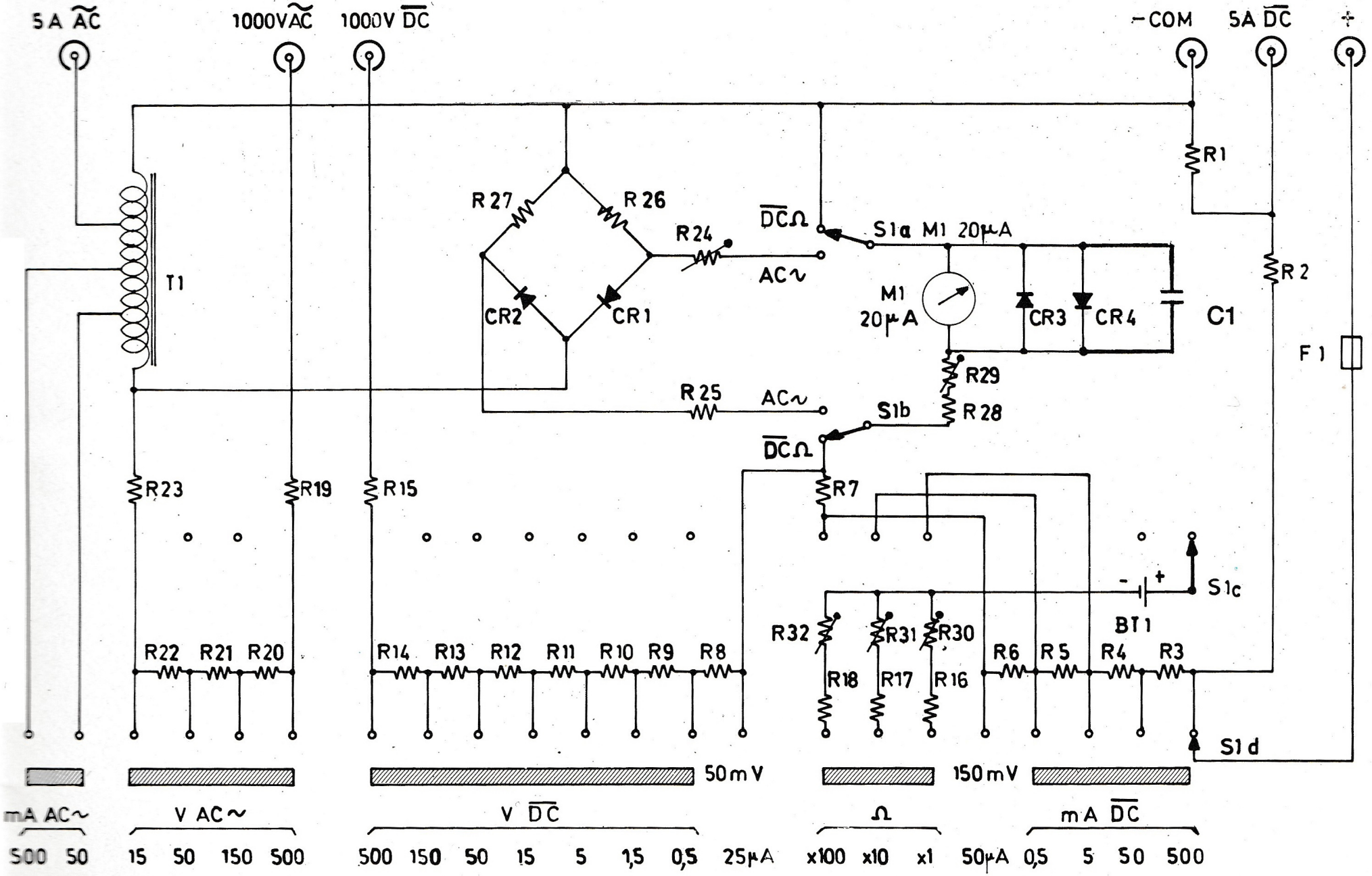
DETAIL (6) Butées - End stops



DETAIL (8) Mécanisme d'entrainement de l'index

Index drive




5A AC
1000VAC
1000V DC
-COM
5A DC
+
R1
R2
R27
R26
R24
DCΩ
S1a M1 20µA
AC∿
T1
M1
20µA
CR3
CR4
C1
F1
CR2
CR1
R29
R28
R25
AC∿
S1b
DCΩ
R7
R23
R19
R15
S1c
BT1
R32
R31
R30
R22
R21
R20
R14
R13
R12
R11
R10
R9
R8
R18
R17
R16
R6
R5
R4
R3
S1d
50mV
150mV
mA AC∿
V AC∿
V DC
Ω
mA DC
500 50
15 50 150 500
500 150 50 15 5 1,5 0,5 25µA
x100 x10 x1 50µA
0,5 5 50 500