

# COMPACTION METER TEST BOX, CMT-2.

## USER'S MANUAL.

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Attachment: CMT-2 basic test guide, 24-0025-3202-64 for easy testing.	

See also the following documentation when troubleshooting:

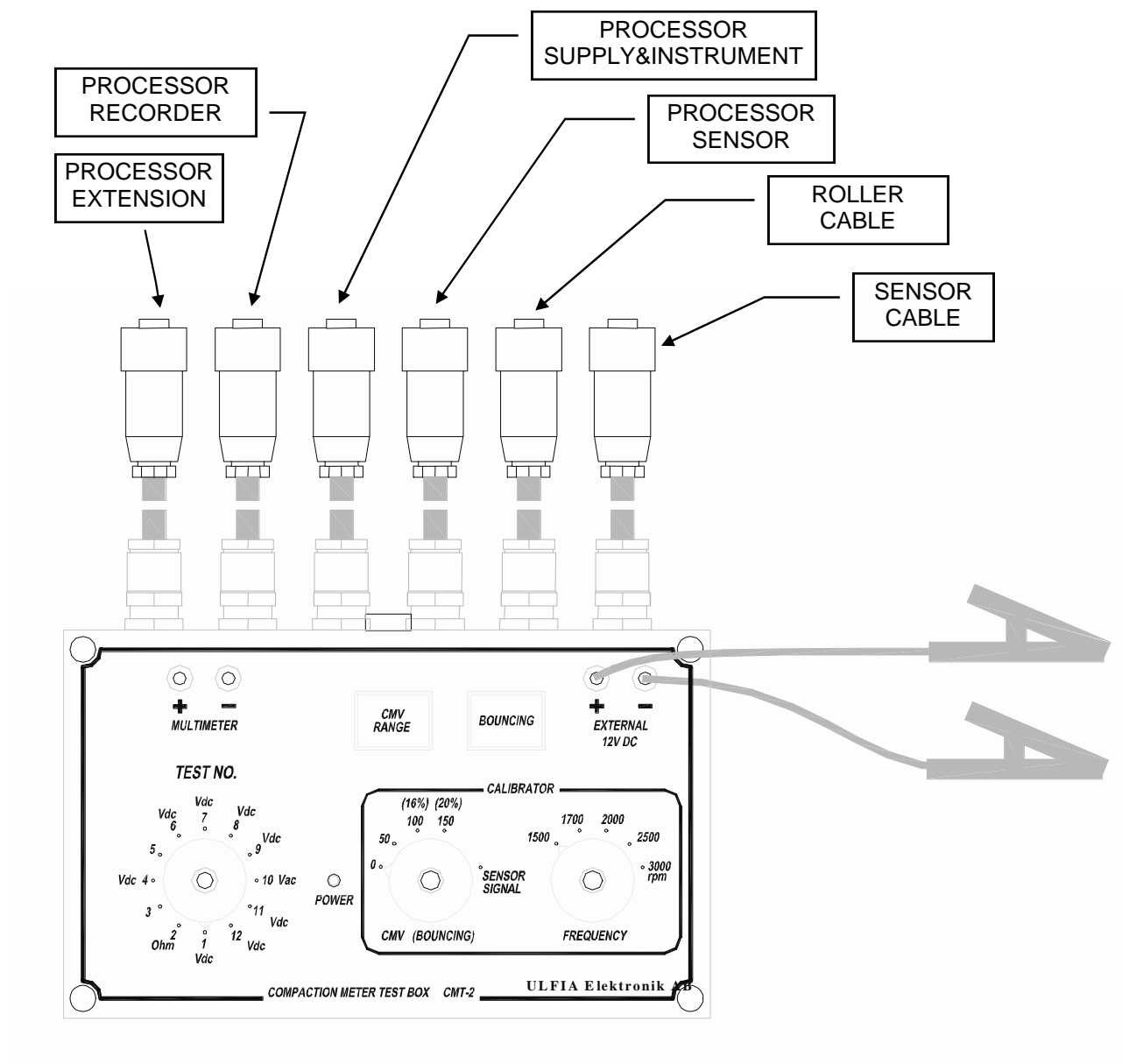
Document	ULFIA document no. (pdf)
CMT-2 basic test guide	24-0025-3202-64
CM2 installation manual	11-0027-3500-64
CM2 interconnection diagram	11-0027-1500-63
CMP-2B compaction meter operating manual	21-0026-3200-64
CM2 troubleshooting manual	11-0027-3400-64

Visit also our web-site : [www.ulfia.se](http://www.ulfia.se).

Item	Supplier	Item no.	No. of pieces
Test box CMT-2	ULFIA	24-0025	1
Carrying case: black, 450x350x130mm	TEAM ET	354105	1
User's manual	ULFIA	24-0025-3201-64	1
Basic test guide with CMT-2	"	24-0025-3201-64	1
Test lead: 4mm plugs, red, 1m	Hirschmann	MLN	1
Test lead: 4mm plugs, black, 1m	"	"	1
Crocodile clip: 4mm socket, red, insulated	Deltron	567	1
Crocodile clip: 4mm socket, black, insulated	"	"	1



Connections to :



This equipment is used for troubleshooting compaction meter system, used on vibratory rollers.

All the used units in the system could be checked, including

sensor: ULFIA item no. 23-0020.  
processor: CMP-2B (black metal box), ULFIA item no. 21-0026.  
or CMP-3 (black metal box), ULFIA item no. 21-0058.  
(**serial communication and distance pulse interface could not be tested.**)  
or ALPHA 8. (gray plastic box), ULFIA item no. 24-0012.  
CMV-indicator: ULFIA item no. 38-0005, 38-0017.  
interconnection cables:

For measurements a separate DMM (Digital MultiMeter) should be connected to the test box.  
The DMM should be able to measure DC-voltage(Vdc), AC-voltage(Vac) and resistance(ohm).  
The internal resistance of the multimeter should be  $\geq 10\text{Mohms}$ .  
To test CMP-3 you need an adapter cable, ULFIA 49-0076.

The processor and sensor could also be checked in a service location. An external power supply or battery is then connected to the test box.

The following tests could be done,

**SENSOR** : signal output : DC-voltage : constant voltage with or without vibration,  
AC-voltage when the sensor is vibrating,  
cable to sensor.

**PROCESSOR** : Power supply voltage output to : recorder or onboard computer,  
sensor.

CMV-output signal to the CMV-instrument with the sensor signal simulated  
with the built in calibrator in the test-box.

CMV-output signal and frequency pulse output to the recorder or on board  
computer with the sensor signal simulated with the built in calibrator in the test-  
box.

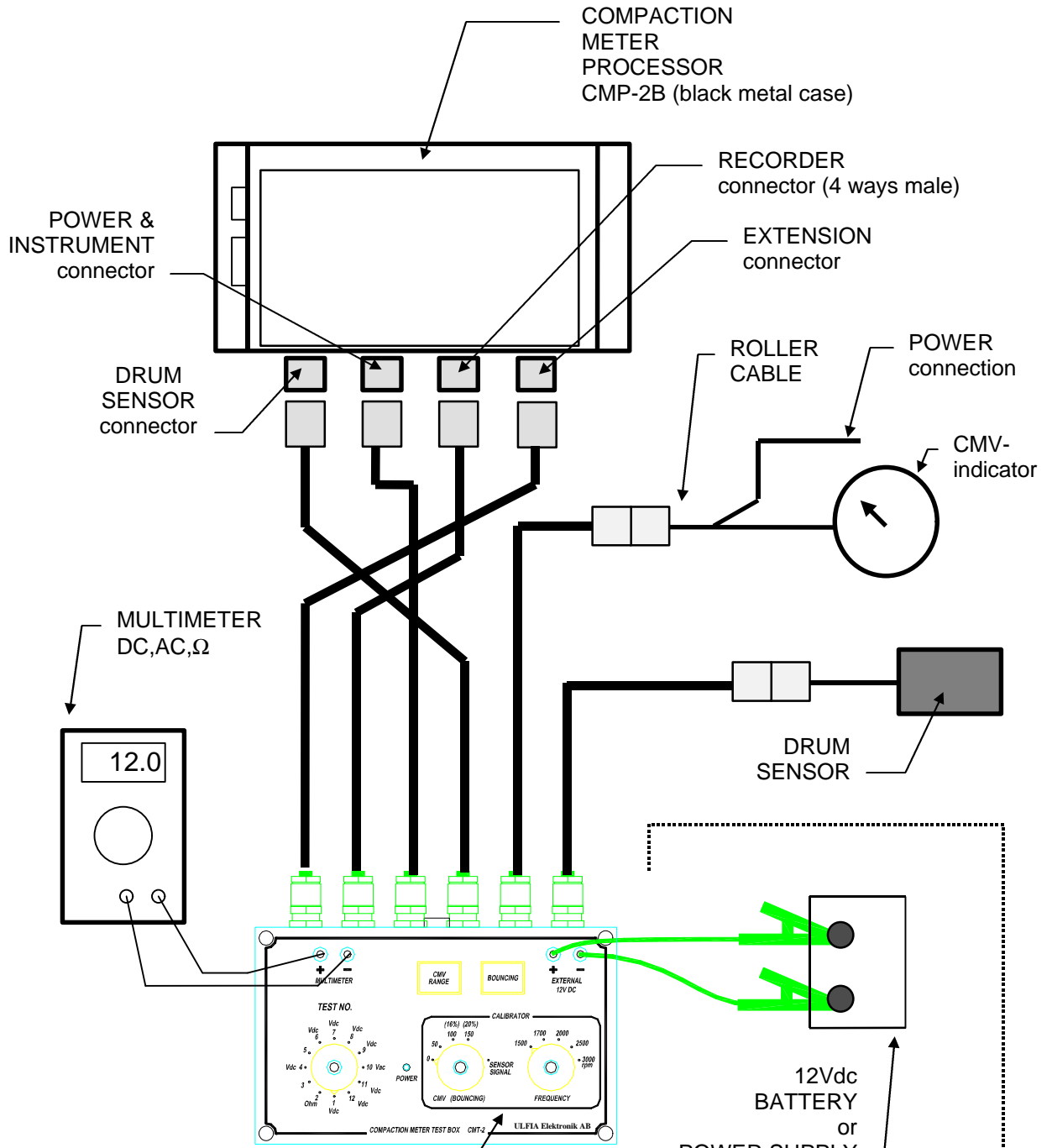
Output signal(Vdc) to analog frequency indicator.  
Output signal(Vdc) to analog amplitude indicator.

Output to bouncing- and CMV-range indicator lamps.

**CMV-indicator** : Resistance of the signal input,  
CMV-indication,  
BOUNCING and CMV-range indicator lamps.

**ROLLER** : Power supply voltage from the roller battery.  
Cable harness to processor and CMV-indicator.

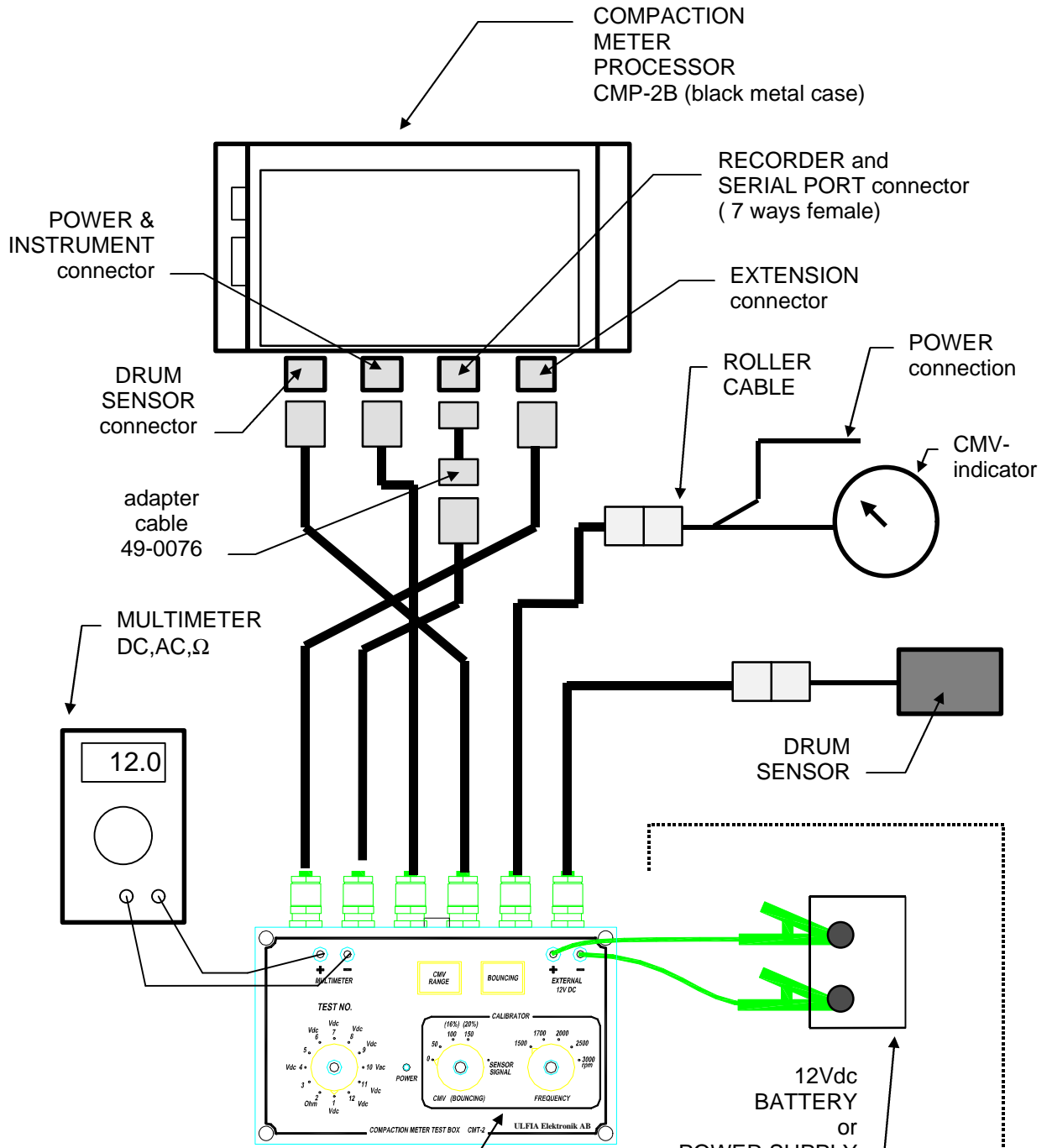
**Connecting the test box to processor CMP-2B**



Use only this battery connection when not connected to the roller.



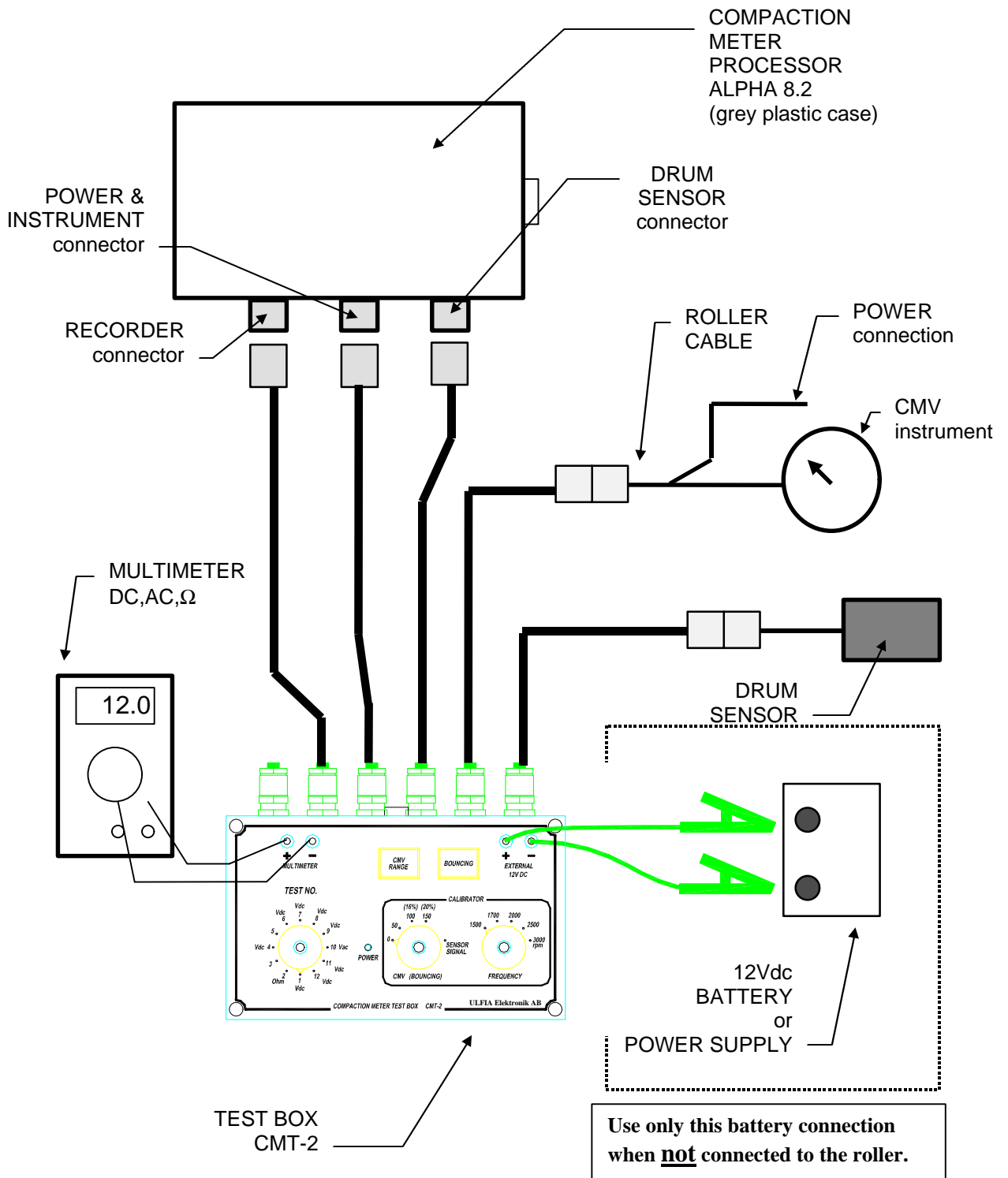
# Connecting the test box to processor CMP-3



Use only this battery connection when not connected to the roller.



Connecting the test box to processor ALPHA 8.2







To this test box a separate digital multimeter should be used for measuring DC-,AC-voltage and resistance (ohm).

The test-box also incorporates a signal generator (calibrator) that could simulate the signal from a sensor for different CMV/bouncing values and frequencies.

The signal to the processor could be selected from either the connected sensor or from the calibrator.

**Front panel :**  
-----

TEST NO : rotary switch for measurement selection  
(test no. and what measurement function that should be selected on the DMM).

CALIBRATOR : CMV=0,50,100(16%),150(20%) : rotary switch for selecting CMV-value and (bouncing)-value.  
CMV=SENSOR SIGNAL : for measuring the sensor signal.

FREQUENCY : switch for selecting vibration frequency.

INDICATOR/PUSH-BUTTON : CMV-range : indicating/selecting 0-50 CMV range  
BOUNCING : indicating/selecting bouncing

DMM+ : socket connectors(4mm) for connecting the digital multimeter.  
DMM-

EXTERNAL 12V DC : socket connectors(4mm) for connecting a DC-voltage of about 11-14V 1A to power the compaction meter system, if there is no roller cable.

POWER : lamp for indicating that there is power to the test box.

**Rear panel :**  
-----

1.25A : fuse for the EXTERNAL connected power supply.

cables (length=3m) for connecting the test box to the different units in the compaction meter system :

PROCESSOR - SUPPLY/INSTRUMENT  
ROLLER CABLE  
PROCESSOR - RECORDER  
PROCESSOR - SENSOR  
PROCESSOR EXTENSION  
SENSOR CABLE

## Connecting the test box to the compaction meter system

*Before you start to connecting the test box, the power to the compaction meter system should be switched off.*

The cables are long enough to test the processor even when it is installed on the roller.

The cables from the test box should be connected in the following way :

PROCESSOR - SUPPLY/INSTRUMENT : to processor  
PROCESSOR - RECORDER : to processor  
PROCESSOR - SENSOR : to processor  
PROCESSOR - EXTENSION : to processor  
SENSOR CABLE : to cable coming from the sensor  
ROLLER CABLE : to cable coming from roller

The DMM (digital multimeter) should be connected to the two sockets marked DMM +/-.

If the ROLLER CABLE is not connected, a power supply ( 12V DC, 1A) or a battery could be connected to the EXTERNAL 12V DC sockets and the processor and sensor could be checked.

**ATTENTION :** make sure that you are connecting with the correct polarity!

## Using the test box

Check that all units are connected to the test box.

Switch on the power to the compaction meter system or to the EXTERNAL power source.

Check that the POWER lamp on the test box is on.

Place the rotary switches on the test box in the following positions:

TEST NO. = position 1 (Vdc)

CALIBRATOR-CMV =150(20%)

CALIBRATOR-FREQUENCY = the same frequency as selected on the processor  
(if FREQ.CORR.OFF is selected on the processor, any frequency could be selected on the test box)

Frequency selected on calibrator		FREQ. CORR. rotary switch on processor
rpm	= Hz	position
1500	25	2
1700	28.3	3
2000	33.3	6
2500	41.7	8
3000	50	10
1500-3000	25 - 50	1 (frequency correction off)

CMV RANGE : not pressed / activated

BOUNCING : not pressed / activated

Step through the following tests by turning the knob TEST NO.

ROTARY SWITCH POSITION what you are measuring  
 [ *what unit you could test* ] If not mentioned all units applies.  
 = **the correct reading on the DMM**

- 
- 1** DC-voltage from the roller battery or external power supply :  
 = **e.g. 12.2Vdc, (min. 11 max. 14 Vdc).**
- 2** Resistance of CMV-indicator :  
 indicator type: 85mm **ULFIA 38-0005 = 428 - 524 ohms**  
 80mm **ULFIA 38-0017 = 890 - 925 ohms**
- 3** not used
- 4** DC-voltage supply from processor RECORDER connector to pen-recorder  
 or onboard computer (e.g. CCS-RA2) :  
 [ *CMP-2B, ALPHA 8.2* ]  
 = **0.7 to 1.2V below voltage level in test 1**
- 5** not used
- 6** DC-voltage supply to sensor from processor SENSOR-connector :  
 = **0.8 to 1.5Vdc below voltage level in test 4 with sensor connected**
- 7** DC-voltage from sensor to processor SENSOR-connector (without vibrations) :  
 = **2.9 to 3.4Vdc**

When the drum is vibrating, the signal from the sensor could be checked with the DMM in **Vac**-position and CMV-switch in **SENSOR SIGNAL** position.

Vibration frequency	Vibration amplitude	DMM reading (typical)
Hz	mm	Vac(rms)
27	1.8	0.37
29	1.6	0.38
30	1.7	0.44
33	0.8	0.25
40	0.8	0.36
50	0.5	0.36
70	0.3	0.42

## 8 Signals to CMV-indicator from processor SUPPLY/INSTRUMENT-connector :

Wait 5 s and then switch to CMV 150(20%).

With **FREQ. CORR. OFF** ( rotary switch position =1 ) selected on the processor and any frequency selected on the CMT-2 test box :

CMT-2			DMM reading = Vdc	CMV-indicator reading on 0-150 scale (0-50 scale)	CMT-2 and CMV-indicator	
Calibrator CMV position	Bouncing button	CMV-range button			Bouncing indicator	CMV-range indicator
150 (20%)	OFF	OFF	+4.8 -- +5.2	145 - 155	OFF	OFF
"	ON	OFF	+4.8 -- +5.2	145 - 155	ON	OFF
100 (16%)	ON	OFF	+3.2 -- +3,5	95 - 105	OFF	OFF
"	OFF	OFF	+3.2 -- +3,5	95 - 105	OFF	OFF
50	OFF	OFF	+1.5 -- +1.73	45 - 55	OFF	OFF
"	OFF	ON	+4.8 -- +5.2	(48 - 52)	OFF	ON
0	OFF	OFF	-0.1 -- +0.1	0 - 5	OFF	OFF

With frequency correction selected on the processor :

Frequency selected on calibrator		FREQ. CORR. rotary switch on processor
rpm	= Hz	position
1500	25	2
1700	28.3	3
2000	33.3	6
2500	41.7	8
3000	50	10
1500-3000	25 - 50	1 (frequency correction off)

CMT-2 Calibrator CMV position	DMM reading = Vdc	CMV reading on instrument
150	+4.7 -- +5.3	142 - 158
100	+3.1 -- +3,6	93 - 107
50	+1.45 -- +1.75	4 - 55
0	-0.1 -- +0.1	0 - 5

- 9 **DC-voltage ,CMV-signal, from processor RECORDER-connector to pen-recorder or onboard computer (e.g. CCS-RA2) :**  
 [ *CMP-2B, CMP-3, ALPHA 8.2* ]

Wait 5 s and then switch to CMV 150.

With **FREQ. CORR.OFF** ( rotary switch position =1 ) selected on the processor :

CMT-2		DMM reading = (Vdc)
Calibrator CMV position	Bouncing button	
150 (20%)	OFF	+4.8 -- +5.2
"	ON	+6.5 -- +7
100 (16%)	OFF	+3.2 -- +3,5
"	ON	+3.2 -- +3,5
50		+1.5 -- +1.73
0		-0.1 -- +0.1

- 10 **Vibration frequency pulses from processor RECORDER-connector to frequency meter or onboard computer (e.g. CCS-RA2) :**  
 [ *CMP-2B, CMP-3, ALPHA 8.2* ]

= 6 to 8Vac

- 11 **DC-voltage proportional to vibration frequency on EXTENSION connector :**  
 [ *CMP-2B, ALPHA 8.2* ]                      Scale factor = 0.5Vdc / 10Hz

Frequency selected on CMT-2 calibrator		DMM reading = (typical) Vdc
rpm	= Hz	
1500	25	1.25
1700	28.3	1.41
2000	33.3	1.67
2500	41.7	2.08
3000	50	2.5

- 12 **DC-voltage proportional to vibration amplitude on EXTENSION connector :**  
 [ *CMP-2B, ALPHA 8.2* ]                      Scale factor = 1Vdc / 1mm

Frequency selected on CMT-2 calibrator		DMM reading = (typical) Vdc
rpm	= Hz	
1500	25	1.4
1700	28.3	1.1
2000	33.3	0.78
2500	41.7	0.5
3000	50	0.34

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Test 2 : Range of resistance for CMV indicator 85mm : 428 - 524 ohms.  
Range of resistance for CMV indicator 80mm : 890 - 925 ohms.

Test 6 : DC-supply voltage to sensor : 0.8 to 1.5Vdc below voltage level in test 4 with sensor connected.