INSTRUCTIONS FOR C-µ

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1.0. INTRODUCTION

Congratulations! You have just purchased one of Coralba's high quality road data measurement meters. **C-µ** meters are named after the Greek letter µ (mu) which in scientific literature stands for the coefficient of friction. **C-µ** meters are used to accurately collect numerous road data measurements such as: coefficient of friction, speed, distance, temperature, inventories, and road conditions. **C-µ** meters are indispensable instruments for: highway engineers; surveyors; and technical staff who work with highway maintenance, inventory collections, planning, and counting. The instrument has been developed and tested by highway engineers and meets or exceeds all industry standards. Coralba's quality design allows **C-µ** to carry out most types of longitudinal measurement **quickly** and **safely** - all from the **comfort** of your vehicle.

Mounted in a vehicle and connected to the speedometer - **C-µ** is basically a precision odometer/speedometer that is also capable of measuring the coefficient of friction between your vehicle's tires and the road surface. Additional data collection functionality is defined in *chapter 4.0. Function*. The precision of the meter is achieved by a simple calibrating procedure. After calibration the meter is capable of generating values to a 0.03% error rate.

Also available as a separate option is a precision temperature probe.

A complete **C-µ** set consists of:

- Instrument
- Cables
- Fastening device (universal joint) and Velcro
- Pulse generator for your vehicle
- Fitting and using instruction

*NOTE! Before mounting the **C-µ** please check that you have received all of the necessary parts.*

2.0. HOW TO START

1. Before installation - please check to see that you have all necessary components (*see chapter 1.0. Introduction*).
2. Install the pulse generator according to separate instructions. Pulse generator is specific for your vehicle (make, model, year, and type of speedometer - electrical or mechanical).
3. Connect the electrical wires according to chapter *2.2. Electrical connections*
4. *Install the temperature sensor, if you have purchased one (optional).*
5. Fasten the instrument in a safe place, we suggest the dash, either by using the supplied bracket and universal joint or with a piece of Velcro.
6. Calibrate your instrument, *see chapter 3.0. Calibration.*
7. Your **C-µ** meter is now ready for high accuracy measurement.

2.1. Pulse generator

The pulse generator may be of different types:

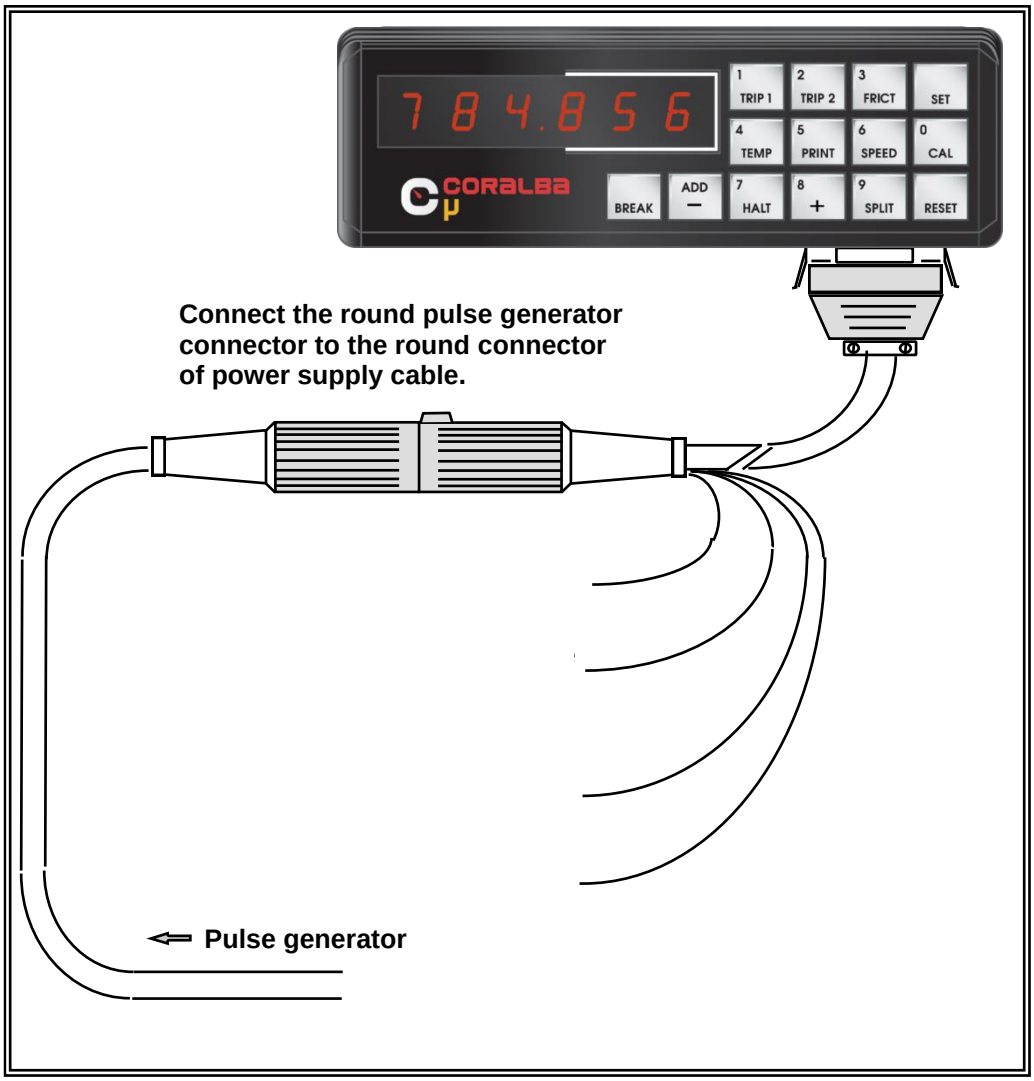
- CAN Bus-interface
- Proximity switch pulse generator
- Interface for a vehicle with electronic speedometer

Separate instructions are provided for installation of your pulse generator.

2.2. Electrical connections

Care must be taken when installing the meter as damage is possible if incorrectly wired. The system must have a negative ground.

- **Red** cable (power) shall be connected to a continous +12V supply through a fuse of 1 A.
- **Brown** cable shall be connected to ground. It is important to use the ground from the 12V-power supply system.
- **Yellow** cable shall be connected to a reverse-signal, either to an analogue signal or to the CAN-system using a CAN Bus-interface. This wire needs to be supplied with +12 volts when the vehicle is driven in reverse in order to change the counting direction. If this is not possible, connect the yellow cable to the ground - the meter will count forward continuously.
- **White** cable shall be connected to a minus signal (ground) activated when the driver brakes. This should be done with a separate relay activated by the brake-lights, or by the brake-signal from the CAN Bus-interface.



Make sure all connections are done professionally. The cables should be fixed to avoid damage. Most disturbances in function that occur are caused by poor connections to the power supply.

2.2.1. Power supply 24 V instead of 12 V

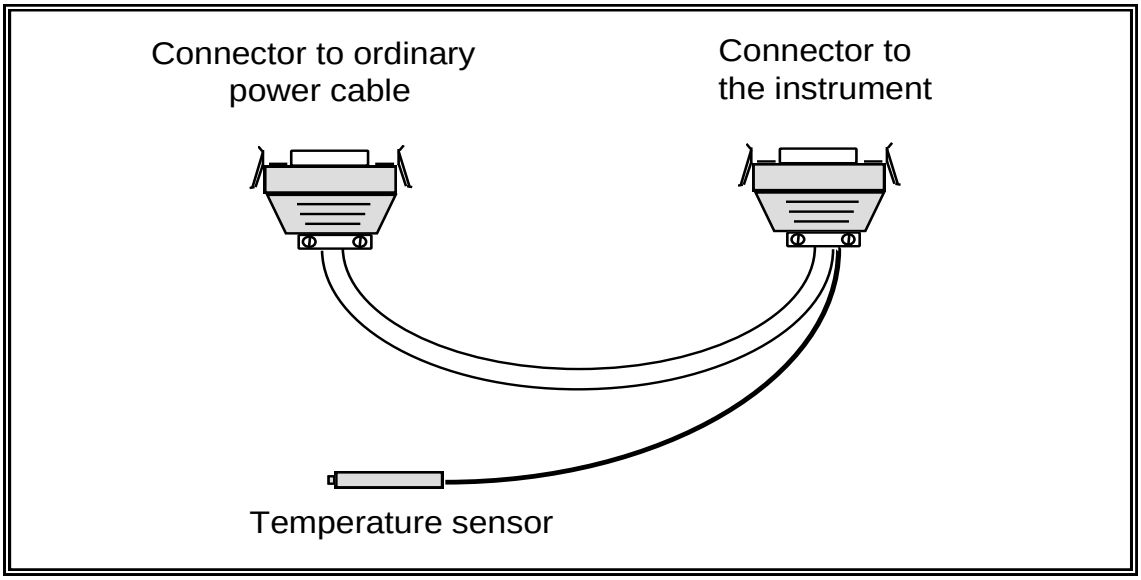
For vehicles equipped with 24-volt power you will need to install one of Coralba's 24-volt wiring kits. The **RED** power cable for the instrument can only handle +12V.

2.2.2. Power on /off

There is no On/Off switch for the **C-µ** meter. The meter wills automatically power up when any key is pressed or the vehicle starts moving. The meter will automatically switch itself to the idling mode (display and keyboard unlit) within 7 minutes after your vehicle has stopped and there has been no activity on the keyboard.

2.3. Fitting temperature probe (optional)

The temperature probe should be mounted between the connector of the power supply cable and the meter. To disconnect the cable from the meter - press the two locking springs of the connector together while pushing the connector towards the meter. The springs will unlock from the meter and the connector can easily be detached.



Once the probe is connected it must be calibrated. *See chapter 3.2. Calibrate C-µ, TEMPERATURE.*

The probe should be fitted on the vehicle so that mud or water does not affect it. A commonly used position is the inside of the front bumper.

3.0. CALIBRATION

3.1. Calibrate C-µ, DISTANCE

In order for the **C-µ** to measure accurately it first must be calibrated. Additionally, any time alterations are made to your vehicle's tires or transmission ratios it is important to re-calibrate the meter.

If this is the first time you have calibrated the meter you will need to check that the desired units have been selected for display (meters, feet, miles, Km/h, MPH, etc.). *See chapter 5.7. Set up units in C-µ* if you need additional instructions on how to display, select and set units. You will also need to check tire pressure and inflate to factory recommended values. Next, you will need to be able to locate an exact calibrating distance. For best results it should be at least 1000 meters/feet/miles. If you do not have access to an exact distance the local police or the local road authorities are usually prepared to advise you of a number of sites. You are now ready to calibrate the meter. Follow the calibration steps listed below:

Procedure	**C-µ shows**
Select any [1 TRIP 1] or [6 SPEED]	Selected register
Press [0 CAL]	Current calibrating constant
Press [0 CAL]	Display flashes. Flash text (.dri.E.)
Drive the calibrating distance and stop.	".dri.E." and the calibrating constant flash alternatively.
	
Press [SET] (start input)	.LEn9hE
Enter the calibrating distance length. The calibration distance length should be at least four digits (e.g. 1.000 or greater)	xxx.xxx
Press [SET] (store value)	New calibrating constant for a short time, and you will be back at TRIP 1.

If the calibrating sequence has been carried out correctly, and the distance used for this calibration was correct, you will usually be able to measure to an accuracy better than 0.03% (30 cm/km).

Check the accuracy by travelling over your calibrating distance whilst measuring its length. If all factors are correct the length should correlate exactly.

You have now calibrated your **C-µ** for distance, speed and friction.
Even if **C-µ** is disconnected from the power supply it will keep its calibrating constant in memory. For highest accuracy the calibration should be checked at least once a month and when tires are changed. Using the standard SET procedure as described in chapter *5.5.* may of course change the value.

NOTE! Your instrument will never be more accuracy than the accuracy of your calibration.

3.2. Calibrate C-µ, TEMPERATURE

First check that you have selected the desirable display mode. °C or °F is shown when you press [4 TEMP] . If not see chapter *5.7. Set up units in C-µ*.

To calibrate temperature, place the sensor into ice water. Ice water has a know temperature of 32 degrees Fahrenheit or 0 degrees Celsius. Next, follow the calibration steps listed below:

Procedure	**C-µ shows**
Press [4 TEMP]	Current temperature (temp in °C or °F)
Press [0 CAL]	.CALib. then current temperature
Press [SET] (start input)	Current temperature flashes
Enter correct temperature. INCLUDE one figure for fractional part	xx.x
Press [SET] (store with SET-key)	Calibrated temperature.

4.0. FUNCTION

Now that the **C-µ** is calibrated various functions of the meter need to be further explained. This chapter will attempt to familiarize you with all meter functions

The keyboard has four different kinds of keys:

- Selector keys: 1 TRIP 1 | 2 TRIP 2 | 3 FRICT | 4 TEMP | 5 PRINT | 6 SPEED | 0 CAL which will select different registers and display its value in the main display.
- Operator keys: SET | ADD − | 7 HALT | 8 + | RESET which will operate on the value in the selected register.
- Display key: 9 SPLIT which will freeze the display.
- Numeric keys: 0 CAL - 9 SPLIT which will switch to their numeric functions automatically when a numeric input is required.

Furthermore a BREAK key will always bring you back to default setting of the mode of operation.

The basic philosophy for **C-µ** is that when you press any of the keys you do not influence any other register in the instrument other than the one that you see in the display. The register in the display is called the current register. While pressing a key to select a new register the display shows a leading text telling you which current register will be shown next.
Some keys have more than one register / function and are selected by repeatedly pressing the key, until you have done a “loop” and back to the beginning. For every press the leading text tell you which current register will be next.

4.1. Key explanation

The following is an explanation of the four different groups of keys:

- Selector keys
- Operator keys
- Display key
- Numeric keys

4.1.1. Selector Keys

Key	*Leading text*	*Function*	*Appropriate keys*
First press 1 TRIP 1	.trı P. .1	Counts the distance with a resolution of 1 in the chosen unit. *(see chapter 5.7. for set up)* Every trip register is independent of the other.	SET, 0 CAL, ADD −, 7 HALT, 8 +, RESET
Second press 1 TRIP 1	.ΠΕΠΟrY	This is a memory register that allows you to set in a number into the meter's memory. When you RESET this register the display will be blank. This is the only way to «turn the display off»	SET, RESET
First press 2 TRIP 2	.trı P. .2	Counts the distance with a resolution of 1 in the chosen unit. *(see chapter 5.7. for set up)* Every trip register is independent of the other.	SET, 0 CAL, ADD −, 7 HALT, 8 +, RESET
Second press 2 TRIP 2	.SS.Hour	Used for time measurement. Displays total time in hour, minutes and seconds, since TRIP 2 started to count from zero.	
Third press 2 TRIP 2	.A.SPEEd	Average speed since TRIP 2 started to count from zero.	
Fourth press 2 TRIP 2	.toP.SPd	Maximum speed since TRIP 2 started to count from zero or .toP.SPd. was reset.	RESET
First press 3 FRICT	.FrıcE.	Allows you to test the coefficient of friction between the road surface and the tire. After applying the brakes maximally, the meter displays the coefficient of friction. *See chapter 5.2.*	0 CAL, RESET
Second press 3 FRICT	.Cor.Frc	Displays the coefficient of friction eliminating the influence of wind resistance and similar effects. *See chapter 5.2.1.*	0 CAL, RESET
Third press 3 FRICT	.trı P. .3	Counts the distance with a resolution of 1 in the chosen unit. *(see chapter 5.7. for set up)* Every trip register is independent of the other.	SET, 0 CAL, ADD −, 7 HALT, 8 +, RESET
First press 4 TEMP	. . .°C. .	Shows the outdoor temperature if the optional probe is fitted. ...°C. or ...°F can be defined by the user, *(see chapter 5.7. for set up)*	CAL

Key	*Leading text*	*Function*	*Appropriate keys*
Second press 4 TEMP	. .Uni t.	This is a counting register. It allows you to tabulate any item of interest. Its value is increased by pressing '+' and decreased by pressing '-'.	SET ADD − 8 + RESET
First press 5 PRINT	. .nodE.	Combined with any TRIP register you can use this function to automatically measure to and from the centre of a junction. If your meter is optionally equipped with the print function - this button will activate a print out.	
First press 6 SPEED	.SPEEd.	A precision speedometer shows the exact speed of your vehicle.	
Second press 6 SPEED	.SPd.thr	Sets the speed threshold to warn against speeding. The value can be set by the normal SET procedure. The warning can be either a light or sound signal. This is option.	SET
First press CAL if any TRIP or SPEED is selected	.CAL.di S	Prepares the instrument for calibration of distance and speed. The keys for every TRIP, SPEED and CAL will light up. RESET will give access to a set up mode for different units, *see chapter 5.7. for set up.*	SET RESET
Second press CAL if any TRIP or SPEED is selected	.CALib. and then .drivE.	The instrument is now telling you to drive the calibration distance. Press SET at the end of reference length and set in the length of the distance.	SET RESET
First press CAL if TEMP is selected	.CALib.	Prepares the instrument for temperature calibration if an optional temperature probe is installed. The LED indicator in keys for TEMP and CAL will light up.	SET RESET
First press CAL if FRICT is selected	.Frc.CAL	Prepares the instrument for friction calibration. The FRICT and CAL lights will be illuminated. *See chapter 5.2.2. Comparative Friction Measurement.*	SET

4.1.2. Operator keys

This chapter deals with various functions associated with the instrument's Operator keys.

Key	*Used with key*	*Function*
SET	1 TRIP 1 / 2 TRIP 2	SET is used to input a displayed register value. When SET is used with any TRIP one can define the beginning distance. Press SET once and the display will flash. Key in any numeric beginning distance value. Press SET a second time to store this value.
SET	4 TEMP	SET in combination with TEMP is used in the calibration sequence of the temperature sensor. *See chapter 3.2.* If you have pressed TEMP twice, and then press SET, you are allowed to SET in a number for the UNIT counter.
ADD −	1 TRIP 1 / 2 TRIP 2	Allows you to count in a NEGATIVE direction for any TRIP register chosen.
ADD −	SET	When you are in the SET mode for TRIP 1,2 and 3 and then press ADD/- your numerical input will be negative. When used after the input of figures in the SET mode, you will add this number to the value of actual TRIP.
ADD −	4 TEMP	When you press the ADD/- key after pressing the TEMP key twice - the displayed value will decrease 1 unit for each ADD/- key press.
7 HALT	1 TRIP 1 / 2 TRIP 2	HALT will stop the current register from counting. Any register may be stopped. To start counting again - simply decide if you want to begin counting in a positive direction (press +) or a negative direction (press -).
8 +	1 TRIP 1 / 2 TRIP 2	Allows you to count in a POSITIVE direction for any TRIP register chosen.
8 +	4 TEMP	When you use the (+) key after pressing the TEMP key twice - the displayed value will increase 1 unit for each (+) press.
RESET	1 TRIP 1 / 2 TRIP 2	Will set the current register to zero. Each register has to be RESET individually.
RESET	3 FRICT	RESET when used in combination with .Frict. or .Cor.frc. resets the friction register to zero. The instrument is now ready for another friction test.
RESET	4 TEMP	When you use RESET after twice pressing TEMP - the UNIT register will be set to zero.
RESET	SET	If you use RESET in the SET mode, you will restore the previous value. RESET is also used in the SET UP of the instrument *(see chapter 5.7. for set up)*

4.1.3. Display key

There is only one key with the DISPLAY function. It is identified 

. SPLIT is a display function and causes all registers to momentarily freeze their values. This function was developed to display a value when it is impossible to stop due to traffic conditions.
You are allowed to use this function in combination with almost every other function, except of when you are in the different SET UP modes.

4.1.4. Numeric keys

C-µ has 10 different numeric keys 

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. Once pressed, these keys will automatically switch to their numeric function.

5.0. MORE ADVANCED USE AND PRACTICAL EXAMPLES

5.1. Distance measurement.

When measuring DISTANCES **C-µ** has three different dedicated registers, TRIP 1, TRIP 2, and TRIP 3 (TRIP 3 at third press of FRICT). Each individual TRIP register may be set to count plus (+) or minus (-) and may be stopped by pressing the HALT key. 'SPLIT' freezes the values of all registers in the instrument.
If measurements need to be taken in the negative direction simply press the '-' key. The trip registers will automatically switch counting direction when the vehicle is going in reverse if the meter's yellow cable is correctly connected to the reverse light.

Example: Let's say that you want to determine both the total distance of a road segment and the distance needing re-asphalting. Drive to the starting point and RESET every TRIP register to zero. (In this example we will use TRIP 1 for the total distance and TRIP 2 for the distance needing re-asphalting). Since TRIP 1 will be used to log the total distance driven - we want it to count continuously - so therefore, we will RESET it to zero and then leave it alone. Since TRIP 2 will log the sections requiring re-asphalting - we will press HALT whenever the vehicle is travelling over good pavement - and press + whenever the vehicle is travelling over bad pavement. At the end of the road TRIP 1 will read the total distance driven and TRIP 2 will read the distance requiring re-asphalting.

5.1.1. Pre-set a value

Setting a pre-set value into any of the meter's trip registers (TRIP 1, TRIP 2, or TRIP 3 (TRIP 3 at third press of FRICT) before taking measurements is easy. Simply select any trip register, press the SET key and then key in your pre-set value using the numeric keys, '0-9'. Your input is confirmed by pressing the SET key again. Now your measurement will start from the pre-set value. If you require the measurement to start from a negative value, the pre-set value must be preceded by a minus sign ('-'). If you change your mind it is possible to return to the original value by pressing 'RESET' instead of 'SET' as the confirmation.

Example: Let's say you done some registration work yesterday and you had to stop at 5500 meter. Today you want to continue from this position, simply choose a TRIP register press SET (the actual value will flash) and use your numeric keys and set in the value 5500, and confirm with SET.

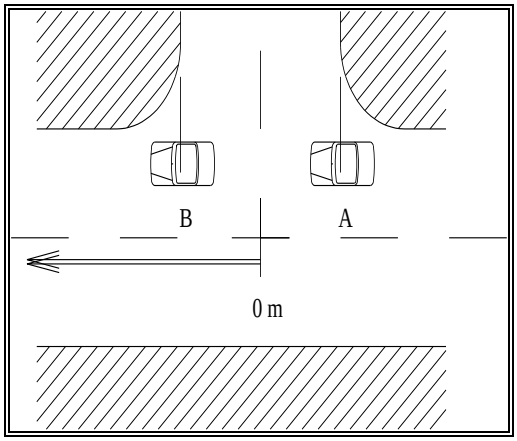
5.1.2. Adding and adjusting a number to a trip value

Trip registers may be adjusted to reflect a distance value taken from a master plan or survey. For instance, say that a survey map shows that a junction is located at 43,670 meters from the start point - but the meter reads a different value. If you want the trip register to reflect this value you do not even have to stop the vehicle to make this adjustment. Simply reset the current trip register at the junction marker by pressing the 'RESET' key. Continue driving while pressing the 'SET' key and input the desired value (43,670 meters) with the numeric keys. Finish by pressing the 'ADD/-' key. The meter will now be measuring from the junction with the new corrected value.
Trip registers may also be adjusted to a master plan value by adding or subtracting the difference between the trip value and the master plan value. At the junction the current register may be adjusted by first pressing the 'SET' key, and then input the appropriate numeric value. If the numeric value is to be subtracted from the current register value you will need to use a minus sign ('-') in front of your adjustment value. Finish by pressing the 'ADD/-' key.

5.1.3. Centre point measuring

The **C-µ** meter has a special function that allows it to calculate the centre of an intersection without resetting or stopping the current register. This feature is necessary since many roads are defined to begin or end at the centre of an intersection. The feature also insures road safety since stopping in the middle of an intersection is dangerous.

The centre point function is toggled on at the beginning of the intersection and toggled off at the end of the intersection. During this time the display switches between the flashed text and the measured value. The measured value is automatically divided by two. This function only effects the current trip register.
To begin distance measurement from the centre point of an intersection the following steps should be taken:



Toggle on centre point measuring before the intersection by pressing 'PRINT'. At the start of the intersection (A) reset the current trip register to zero. The display changes from the flashed text (..nodE) to '0'. Drive to the end of the intersection (B) and again press 'PRINT' to turn off this function. The displayed value will be one half of the travelled distance (or the centre point distance).

To end distance measurement to the centre point of an intersection the following steps should be taken: At the beginning of the intersection (A) press 'PRINT'. The LED will now display flashed text (..nodE). At the end of the intersection (B) press 'HALT'. **C-µ** will automatically adjust the distance to end at the centre of the intersection. Toggle off centre point measuring by pressing 'PRINT' again.

5.2. Friction testing

The coefficient of friction is calculated based on how quickly your vehicle decelerates after applying a maximum brake pressure of the vehicle. The quicker your vehicle decelerates - the greater the coefficient of friction will be. It is extremely important to use maximum braking pressure when conducting friction testing.

Friction testing is accomplished by following these instructions:

Step	*Action*	*Flash text*	*C-µ shows*	*Showed format*
❶	Press 3 FRICT	.Frict.	Last measured value of coefficient of friction.	x.xx
❷	Press RESET	.rESEt.	0.00	
Now the meter is set to record the friction value next time you brake. You may select another register in the mean time - the measurement will take place anyway.				
❸	When you approach the measurement location depress your vehicle's clutch pedal (or shift your automatic transmission into NEUTRAL) and allow it to roll freely for at least 10 m (30 feet). The speed of the vehicle should be min. 50 km/h.			
❹	Brake firmly for 1 to 6 seconds. Your wheels may lock - this is OK. After 1-6 seconds of maximum braking - release the brake pedal. (Note: Maximum braking potential must be used during the measurement process, as the mean value of the deceleration will be recorded.)			
❺	Allow the vehicle to roll freely until the friction value appears in the display. This will take about 10 m (30 feet). During this time keep the clutch pedal depressed (or your automatic transmission in NEUTRAL). If your vehicle comes to a complete stop, brakes must be released within the 6 seconds - if you do not release the brake pedal within 6 seconds you will not develop a coefficient of friction.			
❻	Read the displayed coefficient of friction.			
NOTE: By pressing FRICT once again the corrected coefficient will be displayed. See Chapter 5.2.1.				
❼	Reset the friction register to zero by pressing 'RESET'. The meter is now ready for another friction test.			

*NOTE: The **C-µ** meter can only develop friction values relative to your braking habits. Typical values for most vehicles range from 0.15 on icy roads up to 0.75 on dry asphalt roads.*

5.2.1. Wind resistance

During driving and braking your vehicle is affected by forces other than friction, e.g. wind resistance and up/down hill bias. The **C-µ** meter is able to adjust for these values if desired. When 'FRICT' is depressed once the display will flash '.Frict.' along with a friction value developed as if there were no other factors present. If '.FRICT.' is depressed a second time the display will flash '.Cor.Frc' along with a corrected value for friction. By selecting 'RESET' you will zero out both registers.

5.2.2. Comparative friction measurement

Often it is beneficial to have a fleet of vehicles that are able to develop the same coefficient of friction. To calibrate one vehicle to another you must first make comparative friction measurements under similar conditions. One vehicle's friction calibration value needs to be considered the standard, while the calibrating friction values of the other vehicles will be adjusted (as a percentage of the standard calibration friction value) to match the standard. These values may be adjusted from 0.01 up to 2.50.

Example:
Say that we need to increase the measured friction values by 34%. We would then enter a new calibrating friction factor of 1.34. Say that we need to decrease the measured friction value by 34%. We would enter a new calibrating friction value of 0.66 (1.00 - 0.34).

The friction calibrating factor is correctly set with the following sequence:

Procedure	***C-µ shows***
Select friction [3 FRICT]	Selected register (.FrictE. or .Cor.Frc)
Press [0 CAL]	Current calibrating factor (.Frc.CAL)
Press [SET] (start input)	Current calibrating factor flashes
Enter the new calibrating factor	x.xx
Press [SET] (store with SET-key)	New calibrating factor.

You have now calibrated your **C-µ** for comparative friction measurement.

Now **C-µ** is calibrated. Even if **C-µ** is disconnected from the power supply it will keep its calibrating constant in memory.

NOTE! The above calibration is only necessary if you want to make comparative friction measurements. Your meter is already calibrated to your specific vehicle when you originally calibrated distance and speed.

5.3. Memory register / Display on/off

As mentioned earlier - there is no On/Off switch for the meter. The LED display may be made to go blank by first selecting a memory register - this is accomplished by pressing ‘TRIP 1’ twice - and then pressing 'RESET'.

5.4. Automatic journey measurements

This option monitors a journey's travelled distance, elapsed time, and average and maximum speed. Resetting TRIP 2 activates this option. Measurement will start automatically when the vehicle is driven the first meter. These values may be read at any time by pressing TRIP 2. The following chart gives more information:

Action		Flash text	C-µ shows	Showed format
First press	2 TRIP 2	.tr1 P. .2	Distance travelled of Trip 2	xxx.xxx
Second press	2 TRIP 2	.SS.Hour	Time of journey	xx.xx.xx
Third press	2 TRIP 2	.A.SPEEd	Average speed	xxx.x
Fourth press	2 TRIP 2	.toP.SPd	Maximum achieved speed	xxx
Fifth press	2 TRIP 2	.tr1 P. .2	Back to distance travelled of Trip 2	

Except for maximum speed it is not possible to control these functions any other way than through TRIP 2. The maximum speed may be reset to zero separately.

5.5. SET procedure

As mentioned previously SET is used to set or change **any** register to a desired value. Since we think this is so important - we will repeat these instructions again. Select the register to be set by pressing the desired key. It now will be visible in the display. Next press 'SET' and the old value will be displayed flashing. Enter the new value with the numeric keys. A negative value may be entered but it must be preceded by a minus sign ('-'). Pressing ‘SET’ again sets the new input. The new value is then visible in the display.

NOTE! If you for any reason wish to retrieve the original value - say if you made a mistake - simply press 'RESET' instead of 'SET'.

5.6. Unit counting (press TEMP twice)

The **C-µ** meter is equipped with a counting register. The register is selected by pressing 'TEMP' twice (flashing text ..Unit.). Its value is increased by pressing '+', decreased by pressing '-', and reset to zero by pressing 'RESET'. The value may be pre-set or adjusted with 'SET' like any other register.

Example: Let's say that you want to tabulate how many traffic signs will need to be replaced over a certain distance. RESET one of the TRIP registers to zero, select the Unit function by pressing the 'TEMP' key twice, and press RESET once again. For every traffic sign that needs to be replaced, press the (+) key. This will add one unit to the counting register. If you made an error in counting, simply press (-) to remove one sign from tabulation. At the end of the logged distance (selected TRIP) the register will display the total number of signs which need to be replaced.

5.7. Set up units in C-µ

You may select different units for distance, speed and temperature in a special set up mode. From the factory the unit is set to the most common units (meter, km/h, C°). If you want to change units it is important to have your desired units set up before the calibration takes place. After the calibration has been carried out, the set up may be changed without re-calibrating the unit.

Procedure	**C-µ shows**
Select any 1 TRIP 1 or 6 SPEED	Selected register
Press 0 CAL	Current calibrating constant
Press RESET for about 2 seconds to entering set up mode	.SEt.UP. 'CAL' indicator flashes
Press any of the selection keys as listed below	Flash text shows current setting
Press the same key once more to change	Flash text shows new setting and .SEt.UP. setting starts to flash, indicating that something has been changed
Repeat selection key until desired set up is ready	
Press SET (store with SET-key)	If something is changed you will be brought back to the 'BREAK' status. Otherwise to calibrating constant.

You may exit any time from the set up mode without changing anything by pressing:
RESET
You have now set up your **C-µ** to show your desired units. Even if the instrument is disconnected from the power supply it keeps it set up in its memory.
The following selection keys and choices are available (the corresponding flash text is shown in the leading text):

Function	***Selector key***	***Choice***	***Leading text***
Change counting unit for DISTANCE	First press 1 TRIP 1	Meters	METER
	Second press 1 TRIP 1	Miles	MILES
	Third press 1 TRIP 1	Miles + yards	MI YArd
	Fourth press 1 TRIP 1	Feet	FEEt
	Fifth press 1 TRIP 1	Nautical miles	nAutMIl
	Sixth press 1 TRIP 1	Miles + feet	MI FEEt
	Seventh press 1 TRIP 1	(Back to) Meters	METER

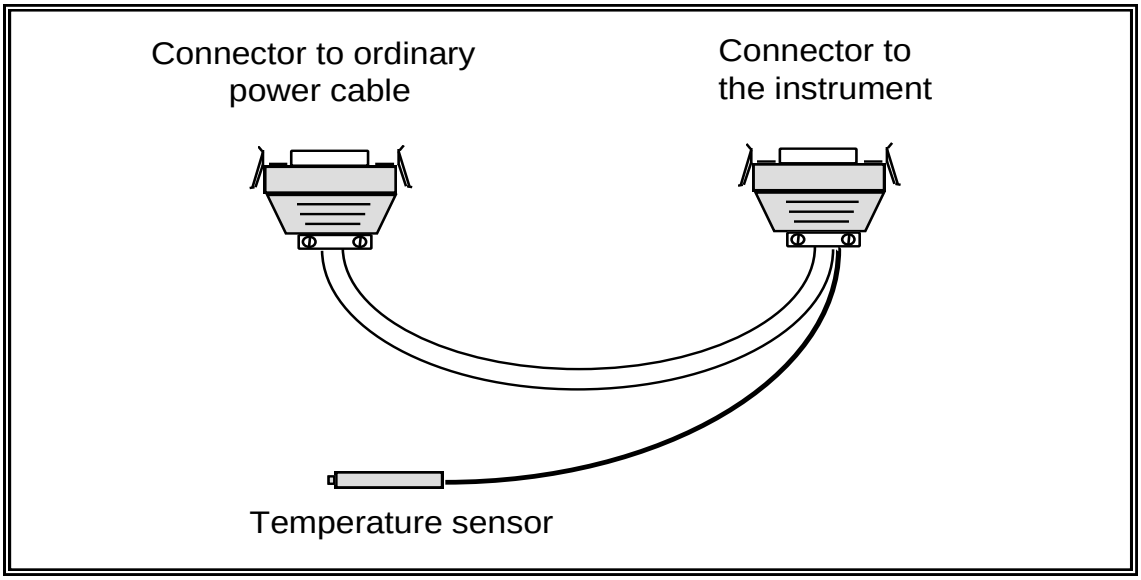
Function	***Selector key***	***Choice***	***Leading text***
Change counting unit for SPEED	First press 3 FRICT	Kilometres per hour	KiloMrH
	Second press 3 FRICT	Miles per hour	MPH
	Third press 3 FRICT	Meters per minute	MrMin
	Fourth press 3 FRICT	Feet per minute	FtrMin
	Fifth press 3 FRICT	Knots	FtrMin
	Sixth press 3 FRICT	Meters per second	MrSEc
	Seventh press 3 FRICT	(Back to) Km/h	KiloMrH

Function	***Selector key***	***Choice***	***Leading text***
Change measuring unit for TEMPERATURE	First press 4 TEMP	Degrees Celsius	°C
	Second press 4 TEMP	Degrees Fahrenheit	°F
	Third press 4 TEMP	(Back to) °C	°C

6.0. OPTIONS

6.1. Temperature measurement (optional)

As an option a temperature probe is available for **C-µ**. Temperature is selected by pressing 'TEMP' once. The temperature is shown in format xx.x. Units are set to ^{o}C or ^{o}F in the set mode. *See chapter 5.7. Set up units in C-µ*. Before using it for the first time the temperature sensor must be calibrated to show you a correct value. *See chapter 3.2. Calibrate C-µ, TEMPERATURE*.



7.0. TROUBLE SHOOTING

This Chapter will present both an explanation of Error Codes and give you practical Trouble-Shooting advice.

7.1. Error Codes

In some occasions an error code may appear in the display. The following codes are available:

Code	Reason	Action to be taken
PG-Err	This error message appears when the vehicle reverses its direction and the meter believes the vehicle is travelling at 10 (km/h or MPH) or greater.	The meter is calibrated incorrectly or has a faulty Set-up. Re-calibrate Distance. See chapter *3.1. Calibrate C-µ, DISTANCE* or / and check «set up» of different counting units according to chapter *5.7. Set up units in C-µ.*
	There has been a change in polarity in the yellow cable (reverse light wire.)	Check for a short in either the yellow wire or pulse generator.
Code	**Reason**	**Action to be taken**
S.U.-Err	Probably caused by a bad connection in power supply	Consult your Coralba dealer for service
CAL.Err	Probably caused by a bad connection in power supply	Re-calibrate distance. See chapter *3.1 Calibrate C-µ, DISTANCE*

7.2. Problem solving

The following table outlines a number of common Problems and the appropriate Trouble Shooting actions:

Problem	Reason	Action to be taken
No lights in the instrument at all, even if you press any of your keys.	Incorrect power supply	-Check every connections, also '+' and '-' battery cables. -Check fuse.
Light in the instrument only after you have pressed any of your keys.	No pulses are sent to the instrument.	-Check every connection between instrument and pulse generator. -Install a new pulse generator
The instrument counting incorrectly	Wrong calibration number	-Check your calibration number. -Re-calibrate your instrument.
The instrument counting incorrectly for only distances or speeds.	Faulty «set up» for different counting units.	-Check «set up» of different counting units according to chapter *5.7. Set up units in C-µ.*

No friction coefficient other than 0.00 presented after a braking test.	No braking pulses are sent to the instrument.	-Check the connection of the white cable to the braking light.
No friction coefficient other than 0.00 presented after a braking test.	The friction calibration number is too low - close to 0.01.	-Change the calibration number. Normally it should be 1.00. Typically this number is not equal to 1.00 if it has been adjusted to measure comparative friction.
No friction coefficient other than 0.00 presented after a braking test.	No noticeable speed reduction. The brake pedal was not pressed maximally.	-Do a correct test with maximum brake pressure.
No other value than -.-- after you have done the friction test	- Speed too low -You have depressed the brake pedal for more than 6 seconds. -You accelerated too soon after the test.	- Minimum speed should be 50 km/h -You must not have your brake pedal depressed any longer than 6 seconds. Normally you don't need to press it for more than 1-2 seconds. -You are not allowed accelerate immediately after the test. Wait for at least 3 seconds.