

RIMIK
AGRICULTURAL ELECTRONICS

**RIMIK CP10 CONE
PENETROMETER
INSTRUCTION MANUAL**



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CONE PENETROMETER CP10 OPERATING INSTRUCTIONS

The Rimik CP10 is a sophisticated cone penetrometer and data logger with either 32 k or 64 k of data storage memory. Up to 100 files (250 for 64 k unit) of data can be stored in the unit and then retrieved. When retrieving data, the output can be to either an 80 column dot-matrix printer or to a computer. The printer interface and RS232 interface are integral parts of the unit.

FEATURES AND CONTROLS

Figure 1 shows the front panel of the penetrometer with the main operating controls. Details of these controls are as follows:

(a) *Display*

The 16 digit display shows messages which indicate items such as file numbers, calibration data, mode, etc. The display can be seen best when viewed at an angle other than perpendicular to the display.

(b) *On/Off Switch*

When switched on, the unit will always emit a 1 second duration beep. The display will be blank during the 1 second duration.

(c) *Battery Charge Indicator*

This red indicator comes on when battery voltage drops below 10.5V when in the "FIELD MODE". When in the "OFFICE MODE", the indicator is on when voltage is below 14.3 volts and the light will stay off when the battery is fully charged.

(d) *Mode Switch*

This switch determines whether the unit is in "FIELD MODE" for data acquisition, calibration or data checking or in the "OFFICE MODE", for data retrieval.

(e) *Function Switch*

In conjunction with the setting of the "MODE SWITCH", the "FUNCTION SWITCH" determines the operation of the instrument.

Both the "MODE" and "FUNCTION" switches must be set to the correct positions before turning the unit on.

(f) Start Switch

This is the small red button on the right-hand-side of the enclosure. Its main function is to start the data-acquisition process when inserting the penetrometer in the soil. The start switch is also used for other functions such as setting file numbers and calibrating the unit.

(g) Rear Panel of Instrument

The battery charger socket is located at the lower left corner. The 25 pin socket on the right is for the printer and RS232 Interfaces.

OPERATION

Before using the penetrometer it is advisable to check the offset calibration. See section 3 for information on the procedure for calibration.

To ready the penetrometer for use, the probe and tip must be screwed onto the loadcell at the base of the penetrometer and the foot clipped to the depth measuring tape.

FIELD MODE FUNCTIONS**1. RUN FUNCTION (FOR DATA ACQUISITION)**

The system is designed so that data is stored in files numbering from 1 to 99 (1 to 249 for 64 k unit). Each file contains data from three individual insertions; these three insertions are intended to be made in close proximity to each other. The unit must not be switched off during the process of recording a file as the data is only stored at completion of the last insertion of each file.

DO NOT USE FILE NUMBERS GREATER THAN 99 (249 FOR 64 k UNIT).

Before switching on, set the "MODE" switch to the "FIELD" position and the "FUNCTION" switch to the "RUN" position (middle position of switch).

Switch on the unit. A beep will be emitted and then the display will show:

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** RIMIK CP10 **
* Field Mode *
Press START!

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Pull the depth measuring tape out about 50 mm beyond the end of the probe and place the foot on the ground where the first probe is to be made. Hold the foot in position by standing on the end of it. Position the probe tip about 50 mm above the hole in the

foot and press the "START" button. The display will show,

or
 FN xx PROBE NO 1
 FN xxx PROBE NO 1 (64 k unit)

It is very important that the top of the probe is at least 5 mm above the top surface of the foot when the "START" button is pushed.

Indicating the current file number and probe number.

The probe should now be pushed slowly into the soil through the hole in the foot at a uniform speed. Push the probe down to a depth of 450 mm and the buzzer will then beep. Withdraw the probe, move to the site of the next probe, position the probe 50 mm above the foot and press the "START" button. The display will show:

or
 FN xx PROBE NO 2
 FN xxx PROBE NO 2 (64 k unit)

Repeat the previous procedure to record data for probe No. 2 and then repeat the whole process for probe No. 3.

After completing probe No. 3, the display will show "Press START!" after the beep. The unit should now be switched off as the recording process for the file is complete.

During each probe the insertion speed is constantly monitored. Speeds above 45 mm/sec and below 5 mm/sec cause the insertion to be terminated (no further data is measured). However, at all times the system allows 1 depth interval to be "too fast" provided the next interval is in the acceptable speed range. The operator is warned of a "too fast" depth interval by a short beep. Whenever two depth intervals in a row are too fast, the insertion is terminated and the display will show: "Too Fast". When insertion speed is too slow, termination of the probe will be indicated by the display showing: "Too Slow".

When recording data for depths less than 450 mm, the recording can be terminated by making the insertion speed too fast or too slow.

When a probe is terminated through being too fast or too slow, proceed with the next insertion as normal (remove the probe, hold it above the foot and press START.)

At the completion of each file the file number is automatically incremented by one. If a file is to be abandoned for any reason, simply switch off before completing the third insertion. This prevents the file number being incremented.

Changing Current File Number

The current file number can be changed at any time by holding down the "START" button as the instrument is turned on with the function switch in the "RUN" position. When the display shows;

RIMIK CP10

release the button. After the display has shown: "Press START", there will be a beep and the display will show:

or

Set File No 00
Set File No 000 (64 k unit)

The units of the file number will then start to increment from 00 through to 09 (000 through to 009 for 64 k unit). Pressing the "START" button at the appropriate stage sets the units value, and gives a beep. The tens will then start to increment and again pressing the "START" button at the appropriate time sets the tens value. The new file number is then set and the instrument is ready to record the next file of data. When the file number is entered it is always incremented by one. Therefore always enter a file number 1 less than the desired number. With a 64 k instrument an additional stage is required to set the hundreds.

2. DATA VIEWING FUNCTION

Data that has been recorded can be read on the display at any time. To view the data in the last recorded file, simply switch the function switch to "READ" and turn the unit on. The display will show:

```
  ** RIMIK CP10 **  
  * Field Mode *  
  FILE NO xx  
  MM P1 P2 P3  
  15 XXX YYY 222
```

Showing the cone index values for probes 1, 2 and 3 for the 15 mm depth interval. The values shown are kilopascals divided by 10.

Pressing the "START" button causes the display to show the cone index values for the 30 mm depth interval. Each time the "START" button is pressed the next set of cone index values is displayed and a beep is emitted.

When wanting to read data from a file other than the last recorded one the file number must first be entered. This is done by putting the function switch in the "READ" position and switching the instrument on with the "START" switch held down. Release the switch when ****RIMIK CP10**** shows on the display. After the preliminary display sequence, you will be able to enter a file number in the same way as described in section I. After entering the desired file number, the data for that file will appear as described above.

If a file number is entered which currently contains no data the instrument will default to the file of last recorded data.

When a probe has been terminated, the cone index values for all the remaining depths for that probe will read zero.

3. CALIBRATION FUNCTION

Periodically the calibration of the unit should be checked. This requires the use of a test stand and test weights. The test stand can comprise a flat plate with an 11 mm hole in the middle attached to a suitable support. Use the 3/8 bolt supplied to bolt the penetrometer unit to the plate in an upright position. The test weights should be hung from the handles -an equal weight on each side. For preference, a total test weight of around 50 kg should be used, made up of 4 individual weights each of about 12.5 kg. When loading keep the out-of-balance moment as low as possible at all times.

At any time the offset can be checked by putting the function switch to the "LOAD" position and turning the unit on. After the preliminary display sequence, the display will show the current load on the instrument. When holding the instrument by the handles with the probe not attached, a load of 0.0 kg should be shown. If the indicated load is greater than 0.2 kg or less than -0.2kg the offset should be reset.

To check the calibration, mount the instrument on the test stand and add the test weights. The total weight shown should be the sum of the test weights and the instrument weight (approx. 4.7 kg). If the indicated weight is in error by more than 0.5 kg, the instrument should be recalibrated.

RECALIBRATION

Switch the instrument on with the function switch in the "LOAD" position and the "START" switch held down. After the preliminary display sequence, the display will show:

Press START when
Ready for offset

Hold the instrument by the handles (with probe removed) and press the "START" switch. The unit will emit a beep, blank the display then read the load and store the value in non-volatile memory as the offset. If only the offset is to be redone, the instrument can now be switched off. If continuing with calibration, the display will show:

Press START when
Load is stable

Mount the unit on the test stand, add the test weights and when the instrument is steady press "Start". The display will go blank and then show:

Load = ? 00.0 kg

The actual test load can now be entered in the same way that the file numbers are entered. The calibration values are now all saved in non-volatile memory. The display will now show the load on the instrument which will be the test load previously entered.

OFFICE MODE FUNCTIONS

Functions available in the Office Mode allow data to be retrieved and printed out on a printer or directed to a computer via the inbuilt RS232 interface. Another function is to clear all data from the memory.

When using the instrument in the "OFFICE" mode, it is desirable to have the battery charger connected and switched on as this avoids draining the battery unnecessarily.

Make sure the appropriate cable is connected to the connector at the back of the instrument.

1. PRINTER OUTPUT

Put the mode switch in the "OFFICE" position and the function switch in the "PRINT" position. Switch the instrument on and the display will show:

```

** RIMIK CP10 **
* Office Mode *
Start File No ?
Set File No xx (Set File No xxx = 64 k unit)

```

Enter the number of the first file to be printed out in the same way that other file numbers have been entered. The display will now show:

```

Finish File No ?
Set File No xx (Set File No xxx = 64 k unit)

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Enter the file number of the last file for printing out and after a short pause the printer will start printing. Printing will continue until the last file is completed when the display will show:

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*** DONE! ***

```

**MAKE SURE THE CP10 IS SWITCHED OFF
WHEN THE LAST FILE HAS BEEN PRINTED**

2. RS232 OUTPUT

Put the function switch in the RS232 position and proceed exactly as for the printer output function, making sure the destination computer is set up to receive data.

3. CLEAR DATA MEMORY

WARNING - Make sure all required data has been printed out or saved to another computer before clearing the memory module.

Turn on the unit with the mode switch set in the "OFFICE" position, the function switch in the "RUN" position and the "START" switch pressed down. After the initial display sequences, the display will show.

Press Start to
Clear MEMORY

The start button should now be pressed and the display will show each file No. being cleared. At the finish the display will show:

*** DONE! ***

BATTERY CHARGING

To conserve battery power, switch off whenever possible. The battery provides power for more than 3 hours of continuous operation. This should be enough for a normal day in the field. The indicator on the front panel will light when the battery power is exhausted (below 10.5 volts). Do not use the unit once the indicator comes on. Recharge the battery with the charger unit supplied. The socket for the charger is located at the back of the unit in the lower left hand corner. Up to 12 hours will be required to charge a fully discharged battery.

When charging the battery, the mode switch should be in the "OFFICE" position. In this position (with the instrument switched on, the battery indicator will be ON until the battery is charged. During the charging process, switch the instrument on periodically to see whether the indicator light stays off. If desired, the battery voltage can be measured at the battery charger socket at the rear of the instrument.

DO NOT LEAVE THE INSTRUMENT SWITCHED ON SO THAT THE BATTERY IS COMPLETELY DISCHARGED. THIS WILL EITHER DESTROY THE BATTERY, REDUCE ITS CAPACITY OR REDUCE ITS LIFE.

DATA FORMAT

The format of the characters and data transmitted via the RS232 interface is as follows:

Carriage return (CR)

File number (CR)

P1,1 P1,10 CR

P1,11 P1,20 CR

P1,21 P1,30 CR

P2,1 P2,10 CR

P2,11 P2,20 CR

P2,21 P2,30 CR

P3,1 P3,10 CR

P3,11 P3,20 CR

P3,21 P3,30 CR

Checksum flag CR

End of file char CR (Control 2)

P1,1 means : Probe 1, depth interval 1 etc

CR means : Carriage return

Checksum flag : Anything but 0 indicates an error in transfer to or from the memory module within instrument

RS232 PROTOCOL

1200 Baud

7 Bits

Even Parity

2 Stop Bits

WARRANTY

This instrument is warranted for a period of 6 months from date of despatch. Please return to RIMIK PTY. LTD. for any repairs.

CONNECTOR DETAILS - CP10 PENETROMETER

J5 CONNECTOR

PIN NO.		PIN NO.	
1	GND	2	GND
3	D7	4	D6
5	D5	6	D4
7	D3	8	D2
9	D1	10	D0
25	A0	26	GND
27	GND	28	GND
29	+5V	30	+5V
31	RAM SELECT	32	RAM DISABLE
33	R/W	34	02
35	GND	36	EXT
37	RESET	38	GND
39	NMI	40	GND
41	PA0	42	PA1
43	PA2	44	PA3
45	PA4	46	PA5
47	-	48	-
49	GND	50	GND

J3 CONNECTOR

PIN NO.		PIN NO.	
1	RXD	2	GND
3	TXD	3	GND

J5 CONNECTOR

PIN NO.		PIN NO.	
1	-7V	2	+5V
3	GND	4	GND
5	+8V		

BATTERY CHARGER CONNECTOR

PIN NO.	
1	12V
5	GND

J2 CONNECTOR

PIN NO.		PIN. NO.	
1		2	
3	PB7	4	PB6
5	PB5	6	PB4
7	PB3	8	PB2
9	PB1	10	PB0
11	PG7	12	PG6
13	PG5	14	PG4
15	PG3	16	PG2
17	PG1	18	PG0
23	PF7	24	PF6
25	PF5	26	PF4
27	PF3	28	PF2
29	PF1	30	PF0
31	PE7	32	PE6
33	PE5	34	PE4
35	PE3	36	PE2
37	PE1	38	PE0
39	GND	40	GND

BACK PANEL CONNECTOR

PIN NO.	
1	STB
2	D0
3	D1
4	D2
5	D3
6	D4
7	D5
8	D6
9	D7
10	BUSY
11	GND
16	GND
15	RXD
14	TXD

RS232 CONNECTOR CABLE

PIN NO.	
1	GND
2	RXD
3	TXD
4 & 5	CONNECTED
6 & 20	CONNECTED
7	GND

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ADDENDUM TO CP10 PENETROMETER INSTRUCTIONS

To overcome problems experienced when using the CP10 in certain soil conditions the operation of the system has been modified so that faster insertion speeds may be used.

The insertion speed monitoring built into the CP10 system ensures that the user keeps the insertion speed close to that specified by ASAE Standard S313.2. By staying within this speed range the user will obtain the best quality data, free from inertia effects. There are situations however, when the upper speed restriction causes problems; particularly when going through a hard soil layer into a soft layer. To help overcome this problem the maximum insertion speed may now be set by the user.

It is important to try and keep insertion speeds close to the value specified in the standard (ie. approx 2 metres/minute). The higher insertion speeds now available are intended to prevent the system aborting an insertion when the speed is momentarily too fast.

To change the maximum allowable insertion speed proceed as follows:

1. Set the MODE switch to the OFFICE position.
2. Set the FUNCTION switch to the RS232 position.
3. Push in the START switch and hold it down while switching the power on. Release the START switch when the first display message appears.
4. The display will show (in sequence):
RIMIK CP10
Office Mode
Press START to
Set Speed = x

The value of x will initially be 1 then it will increment from 1 up to 9 and 0 and then back to 1 again. The value of 1 corresponds to the standard insertion speed. The value of 9 allows the highest insertion speed.

5. Press the START switch when the desired value appears on the display. The unit will store this value in memory and the display will show: *** Done! ***. Switch the unit off. The new speed setting will be maintained until it is changed. For most situations a speed value of 1, 2 or 3 will be adequate. Do not use values higher than necessary.