



## Re: **PIPER CD1000I and CD1000ID motorcycle rolling roads**

We have pleasure in enclosing details of our rolling road dynamometer, which we hope, will be of interest.

The **PIPER CD** range of motorcycle rolling roads are UK designed and manufactured to meet the exacting testing requirements of engines and transmissions while fitted in their chassis. It enables design, manufacturing and / or service facilities to verify performance parameters at cost effective prices. The **CD1000I** transient or inertia type system is now complemented with the **CD1000ID** which is fitted with an electro-magnetic air-cooled dynamometer. (Please see the paragraph outlining the advantages and disadvantages of both systems). The **CD1000I** can be upgraded to **CD1000ID** if not required in the first instance, by adding our **CDDYNO** absorber package at a later stage.

The roller assembly and absorber can be mounted above or flush with the floor. Drive or run up ramps are included and we offer suitable engine cooling-fans as optional equipment. For sustained high-speed dynamometer testing, additional cooling to the dynamometer will be required.

The rolling road dynamometer tests the overall performance and system integrity of the motorcycle such as:

- Carburation progression and ignition problems identified.
- Power and torque measurement confirmed.
- Comparison test before and after adjustments.
- Chain and sprocket condition established.
- Performance through the gears available.
- Optional Air / Fuel ratio and gas emission levels monitoring.
- Can be used with Power Commander, ignition and fuel adjuster.

Future EEC directives indicate that smoke and gas emission values will need to be achieved with the engine tested under constant load conditions. **Inertia type chassis dynamometers alone will not be able to meet this requirement.**

**The system comes complete with temperature and barometric transducers, speed sensor, computer interface, a Pentium processor, Windows operating system and a hand-held load controller. A full day's training at Ashford is included.**

Please do not hesitate to contact us if you require further information or clarification.

We look forward to your response and thank you for your interest in **PIPER** products.

**Eddy Perk**

Visit our web site at [www.piper-ltd.co.uk](http://www.piper-ltd.co.uk)



## A) System Description

### (1) CD1000I - Inertia rolling-road test system

BHP is calculated by accelerating the heavy roller and measuring its rate of speed increase. Utilising a complicated formula and computer, a BHP performance curve is obtained. This type of test is ideal where a quick power verification is required. It does not allow for any steady speed or constant load problem to be simulated. All **CD1000I** models are manufactured to accept the retrofitting of the **CD1000ID** dynamometer unit.

#### Equipment Supplied

1. Main Frame with mounting flanges allowing upgrade to **CD1000 ID**
2. Manually adjustable front wheel retaining fixture with strap
3. Gas ram assisted ride up ramp
4. Exhaust gas collector box.
5. Heavy steel roller with starter ring gear
6. Roller speed sensor
7. Data acquisition computer interface card and cabling.
8. Hand held controller with buttons to activate the computation of the barometric pressure and ambient temperature and to start and stop the collection of data viz. engine RPM and roller speed
9. **Piper EDA** Windows based software
10. Two tie down straps.

#### Optional equipment

1. Starter system
2. Computer & printer
3. Dynamometer and engine cooling fans

### (2) CD1000ID - Inertia and Dynamometer rolling-road test system

This model is structurally similar to the **CD1000I** except for the addition of an air-cooled electromagnetic dynamometer mounted in tandem with the roller. A load is created by the dynamometer which subsequently loads the motorcycle. The amount of load is measured by a torque transducer mounted between the main frame and the dynamometer. By multiplying the observed torque and the roller speed, BHP is calculated.

A dynamometer test enables constant load testing to be undertaken, necessary if fuel injection or ignition mapping is a requirement or if a constant load misfire condition has to be simulated.

#### Equipment Supplied

In addition to the components listed above, the **CD1000ID** also includes:

1. 225Kw (300 BHP) Eddy Current air cooled dynamometer
2. Torque transducer
3. Dynamometer control console for 25%, 50%, 75% and 100% power capability selection
4. Interface box and cabling
5. Dynamometer roller shaft connector

#### Optional equipment

1. Starter system
2. Computer & printer
3. Dynamometer and engine cooling fan

## **B) Advantage Summary**

Advantages associated with **PIPER Chassis Dynamometers:**

	<b><u>Model CD1000I</u></b>	<b><u>Model CD1000ID</u></b>
Can it create a power curve?	Yes	Yes
Can it vary an acceleration rate?	Yes	Yes
Can it simulate an inertia load?	Yes	Yes
Can it simulate a misfire under acceleration?	Yes	Yes
Can it hold constant speed without load?	Yes	Yes
Can it simulate a misfire at a constant load?	No	Yes
Can it hold constant torque?	No	Yes
Can it plot air/fuel ratios & BSFC values	No	Yes

To monitor air/fuel ratios, brake specific fuel consumption (BSFC) and exhaust emission values, additional monitoring equipment will be required.

## **C) Piper EDA Monitoring & Data Logging Software.**

The monitoring hardware and software used with the PIPER Chassis Dynamometer is a development of the successful Piper EDA engine monitoring system. To achieve industry leading accuracy and repeatability the roller speed / acceleration is monitored using high-resolution sensors and dedicated computer counters. Bespoke PIPER "Windows" based software ensures user friendly "quick learn" operation.

The CD1000I & CD1000ID are supplied with hand-held controllers fitted with push buttons to activate the computation of the engine RPM – roller speed ratio, barometric pressure, ambient temperature and stop and start buttons to activate the performance test. The CD1000ID has an additional control switch for the selection of the dynamometer performance capability.

During an inertia or dynamometer test the engine speed and BHP is displayed on the computer screen in large format.

A number of selectable printable presentations in both graphical and numerical format are available to the operator:

### **(1) Engine RPM against BHP & Torque.**

Engine RPM is obtained by the following method. The computer software will require the operator to enter a RPM value at which he will run the bike in the test gear ratio selected. Assume this to be 4000 RPM which the operator enters into the computer. He starts the bike and accelerates the motorcycle in the gear in which he will conduct the test until he reaches the entered 4000 RPM shown on the motorcycle's RPM counter (or if available from the gas analyser). When the engine is stable he depresses the yellow button and the computer will compare the roller speed with the entered (4000 RPM). This enables the computer to establish a roller / engine gear ratio which is used in all further calculations. BHP in the inertia test is calculated by the computer taking into account the rate of acceleration of the roller while in the dynamometer test the operator activates a push button on the hand-held controller to record the actual torque reading from the dynamometer torque transducer. The graph is automatically scaled to give a presentation of BHP and torque against Engine RPM.

### **(2) MPH against BHP**

As above these results can be presented graphically or numerically. Note if numerical presentation is required engine RPM will also be displayed. This presentation can also be used when an acceleration test through the gears is required.

### **(3) Comparison presentation.**

If different test parameters are to be compared with previous tests for the same motorcycle or a similar model, the software allows the operator to select the required tests and print them in

graphical format.

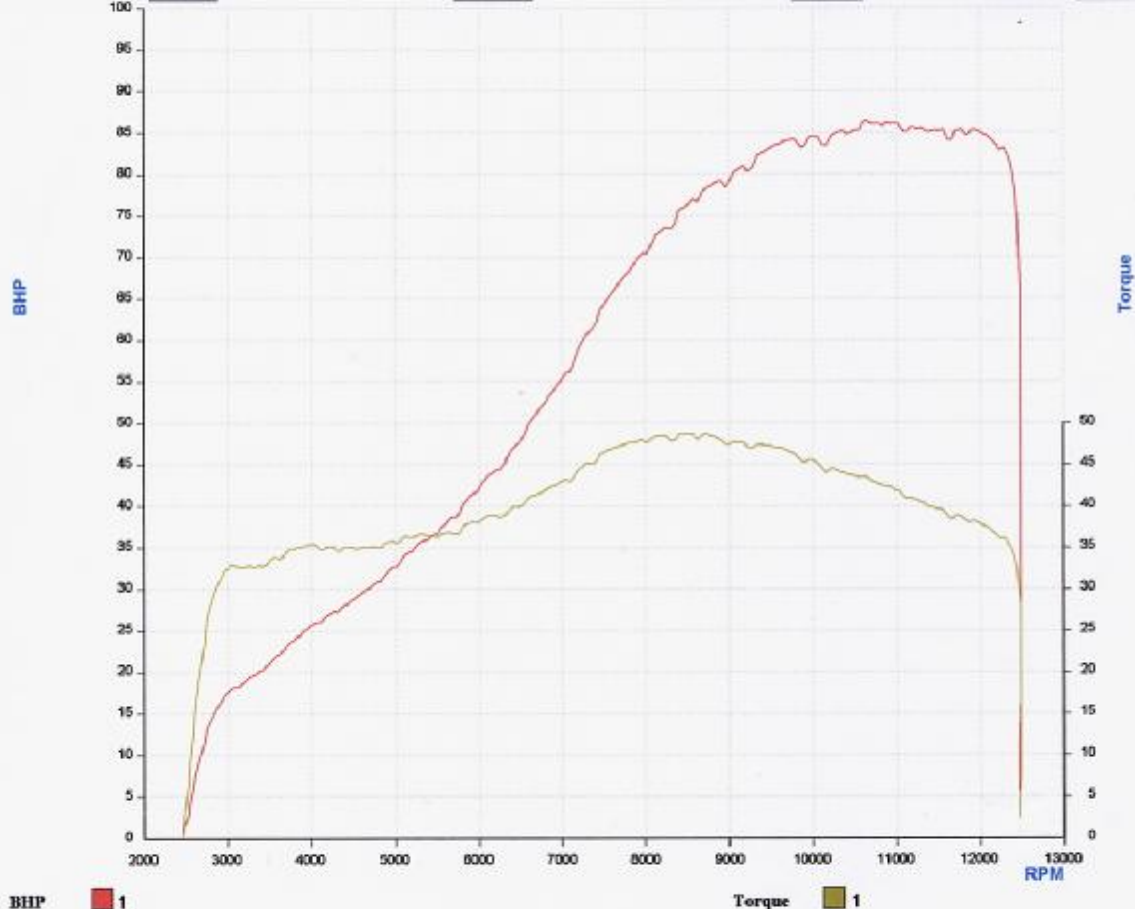
# Lloyd Cooper

MOTORCYCLES



Job No: 001115	Air cleaner: STD	Test Type: Inertia run
Date: 30/05/00	Exhaust: STD	Run No: 1
Name: LLOYD COOPER	Jetting: STD	Temperature: 22.2 °C
Reg/VIN: T497NBH	Ignition Advance: STD	Pressure: 29.66 "Hg
Make: HONDA	Needle setting: STD	Operator: RAY
Model: HORNET	Idle mixture: 2.00 turns	
Cylinders: 4	Carb/Injection: C	
Capacity: 600	Comment: 4TH GEAR	

Max BHP: 86.4      Max Speed: 123.9      Max Torque: 48.7      Max RPM: 12489



Recommendation:

Tested on Piper Test and Measurement CD1000ID  
Tel: [44] 1233 720130 email: piper@piper-ltd.co.uk

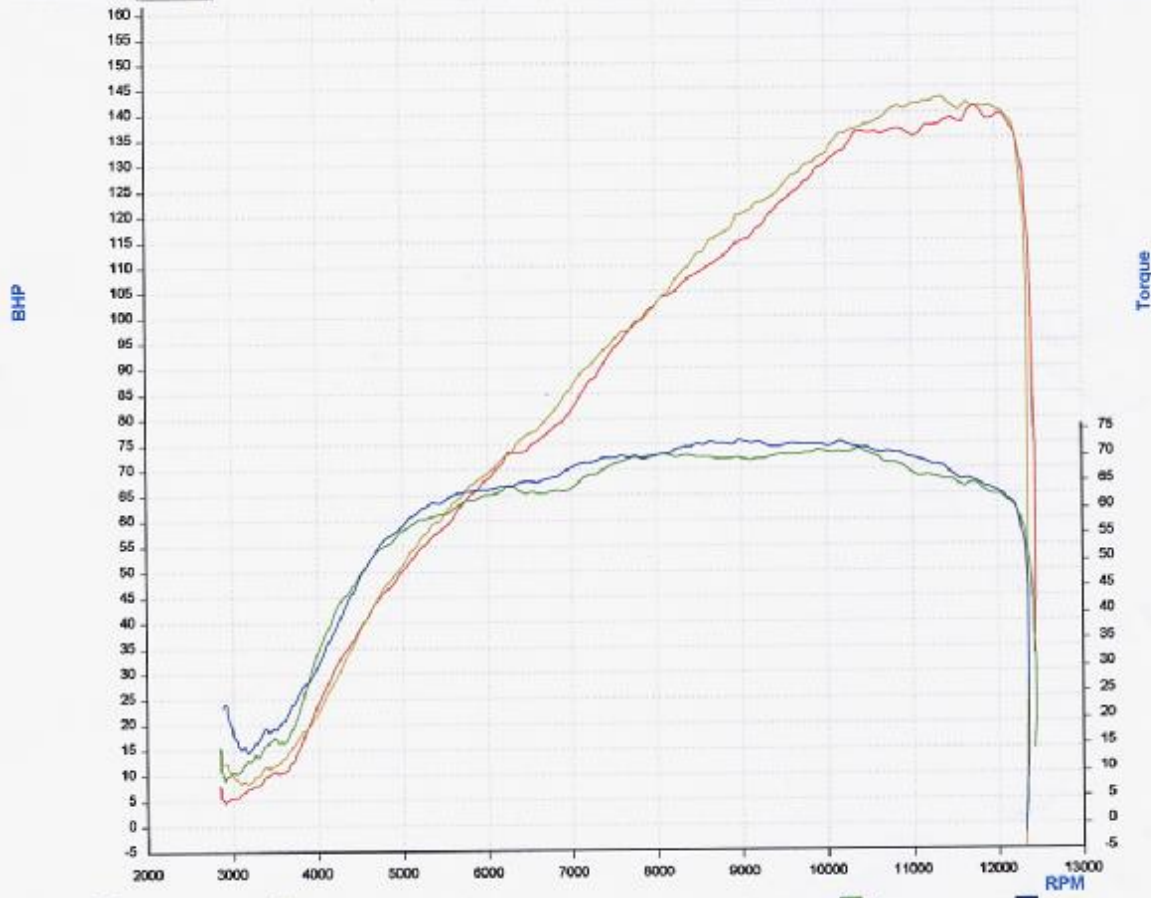
# Lloyd Cooper

MOTORCYCLES



Job No: 001111	Air cleaner: B&C	Test Type: Inertia run
Date: 30/05/01	Exhaust:	Run Nos: 15 / 16
Name: RAY READ	Jetting:	Temperature: 21.3 °C
Reg/VIN: S79KNK	Ignition Advance:	Pressure: 30.92 "Hg
Make: KAWASAKI	Needle setting:	Operator: dave
Model: ZX9RC1	Idle mixture: turns	
Cylinders: 4	Carb/Injection:	
Capacity: 900	Comment: 5th gear run	

Max BHP: 141.4    Max Speed: 148.4    Max Torque: 72.4    Max RPM: 12438



Tested on Piper CD1001 Dynamometer  
Tel: [44] 1233 720130    Email piper@piper-td.co.uk

**Lloyd Cooper**  
MOTORCYCLES



**Test Report**

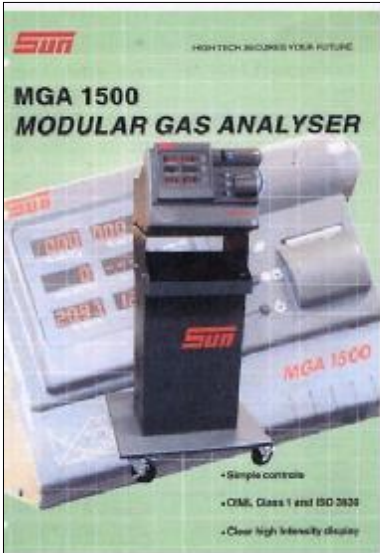
Job No: 001111      Air cleaner: B&C      Test Type: Inertia run  
 Date: 30/05/00      Exhaust:      Run No: 8  
 Name: RAY READ      Jetting:      Temperature: 20.6°C  
 Reg/VIN: S79KNK      Ignition Advance:      Pressure: 29.66 "Hg  
 Make: KAWASAKI      Needle setting:      Operator: DAVE  
 Model: ZX9RC1      Idle mixture: turns  
 Cylinders: 4      Carb/Injection:      Comment: 4TH GEAR  
 Capacity: 900

**Max BHP:** 155.1      **Max Speed:** 142.1      **Max Torque:** 75.1      **Max RPM:** 12010

Bhp:	Engine Rpm:	Engine Torque:	MPH
12.8	2529	26.5	29.9
12.6	3000	22.1	35.5
23.6	3490	35.5	41.3
38.6	3975	50.9	47
48.4	4514	56.3	53.4
56.9	4993	59.8	59.1
63.4	5485	60.7	64.9
78.5	5980	68.9	70.8
79.5	6497	64.2	76.9
87.4	6983	65.7	82.6
106.9	7480	75.1	88.5
113.2	7978	74.5	94.4
110.1	8477	68.2	100.3
118.5	8987	69.2	106.3
123.4	9497	68.2	112.4
143.1	9999	75.1	118.3
133.5	10496	66.8	124.2
137.4	11038	65.3	130.6
155.1	11512	70.7	136.2
132.7	12010	58.0	142.1

Recommendation:





# PIPER TEST & MEASUREMENT LTD

## The expert tool for every workshop!

### MGA 1500

The modular gas analyser is a modern gas analyser ready for the future. The unit is designed to meet the performance requirements of OIML Class 1 and ISO 3930. The standard software supports measurements of 4 gases, rpm, oil temperature and Lambda and a clock-calendar feature. The measurements are displayed on six, very bright, twenty millimetre LED display elements. A print-out can be made with the built-in printer. The RS 232 connection provides you with the possibility to interface with other equipment like sun's test-lanes.



### SIMPLE CONTROLS

The simple controls of the MGA 1500, thumbwheel, right/left arrow key, function-, print- and mode/cancel buttons, allow effortless navigation through the program.

### Rpm MEASUREMENT

Measuring rpm, on all types of ignition systems, is no problem for the MGA 1500. Engine speed, rpm, can be measured by an inductive pick-up clamp on ignition secondary cables, by capacitive pick-up on a primary wire or an injector wire, or via a direct connection to a square wave from the engine management system. This way you are able to measure rpm on conventional, wasted-spark and direct ignition systems.

### Technical Specifications

#### SCALE RANGES

Measured Quantity	Range & Resolution	Accuracy Relative (s) % of reading	Accuracy near zero reading
CO	0.000 to 9.999 % vol	5 %	0.06 % vol
CO	10.00 to 15.00 % vol	5 %	
CO cor.	0.00 to 9.99 % vol		
CO <sub>2</sub>	0.00 to 20.00 % vol	5 %	0.5 % vol
HC	0.00 to 9.999 ppm	5 %	12 ppm
O <sub>2</sub>	0.00 to 25.00 % vol	5 %	0.1 % vol
rpm	0 to 9,999 rpm	0.5 %	1 rpm
Oil temp	-10 to +150 °C	5 %	60 to 90 °C

#### OPERATING CONDITIONS

Temperature	5...45 °C
Relative humidity	up to 90 %
Atmospheric pressure	750...1100 mbar
Mains voltage	90...260 V-
Mains frequency	47...63 Hz

#### OPTIONS

12 to 230 V adaptor for in-car use  
 Portable test stand, cart assembly  
 Capacitive trigger pick-up  
 Primary ECU rpm adaptor  
 High temperature exhaust probe kit

\*Options subject to change per country

#### GENERAL

Weight	10 kg
Noise level	50 dB

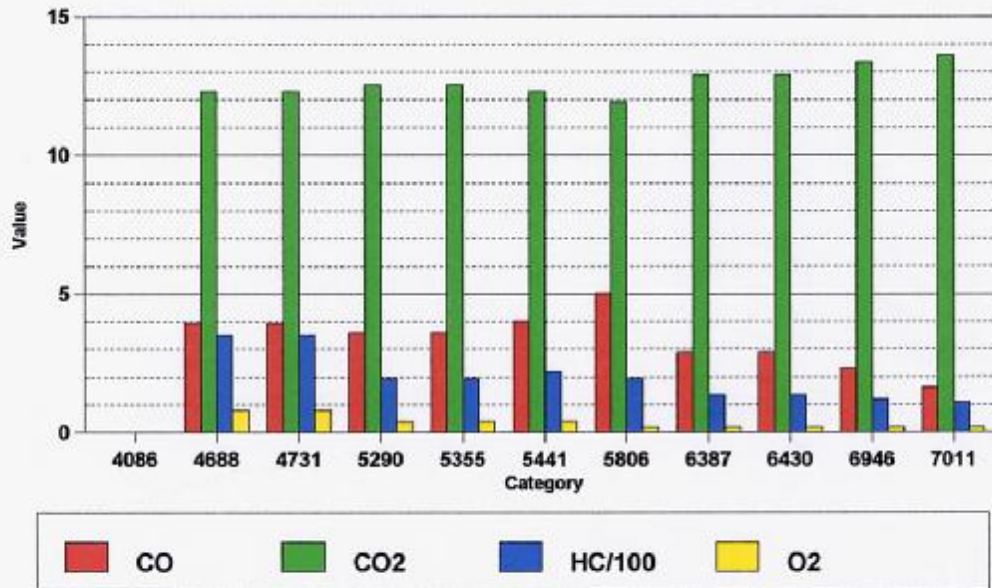


# PIPER CD1000 Rolling Road

Job No: 1574	Air cleaner: STD	Run No: 33
Date: 24/02/01	Exhaust: MOTAD	Temperature: 13.7 °C
Name: MARTIN FRAME	Jetting: STD	Pressure: 29.84 Hg
Reg/VIN: F280DGH	Ignition Advance: STD	Operator: Ed
Make: HONDA	Needle setting: STD	
Model: CB350S	Idle mixture: 2.00 turns	
Cylinders: 2	Carb/Injection: C	
Capacity: 350	Comment: Gas analysis	

RPM	BHP	HC Hydro-carbons	CO Carbon Monoxide	CO2 Carbon Dioxide	O2 Oxygen	AFR Air Fuel Ratio
4086	0.4	0	0	0	0	0
4688	1.7	350	3.94	12.31	0.8	13.40
4731	4.3	350	3.94	12.31	0.8	13.40
5441	15.3	220	4.02	12.31	0.4	13.20
5355	15.0	195	3.60	12.53	0.4	13.35
5290	15.1	195	3.60	12.53	0.4	13.35
5806	12.9	195	5.03	11.94	0.2	12.75
6387	12.4	136	2.89	12.91	0.2	13.57
6430	20.1	136	2.89	12.91	0.2	13.56
						.81
						-.09

## Gas Analysis



**Tested on Piper Test and Measurement CD1000ID**  
 Tel: [44] 1233 720130 email: piper@piper-ltd.co.uk

**D) Technical Specification**

**CD1000I and CD1000ID**

Overall length: 4000mm  
Width: 1400 mm  
Height: 400 mm. With front wheel retainer 840 mm

Weight **CD1000I** :

**CD1000ID** :

Maximum testing speed: 180 mph (288 kph)  
Maximum testing BHP: 300 BHP  
Roller diameter: 400 mm  
Torque transducer: Electronic Whetstone bridge strain gauge  
Standard screen display: MPH / Engine RPM & BHP  
Optional extra display: Air / fuel ratio

Note: Screen display is only active during dynamometer testing and can be shown in numerical or analogue gauge format

Minimum wheelbase capability: 1340 mm  
Maximum wheelbase capability: 1740 mm  
Type of absorption: Electro magnetic air-cooled dynamometer. Selectable power rating to suit power capability of motorcycle.

System operating voltage: 240 Volts AC  
Roller & dynamometer bearings: Roller type grease filled  
Minimum computer specification: Pentium computer with P.C.I. Bus and one free slot.