

AFM2 airfield friction meter

KEY-PRESS

FUNCTION

[RESET]	to switch on to quit current function to see battery condition
[ENTER]	to select an instrument function to select the Editing Mode to select an instrument setting to enter a character and move on to the next to enter an edited value <u>press and hold</u>
[PRINT]	to <u>print</u> results to insert a <u>pause</u> after a test
[S]	to measure <u>slope</u> gradient to manually <u>start & stop</u> a test to enter <u>spaces</u> in the ID
[A]	to <u>arm</u> for test to print <u>all</u> results to reset the ID to <u>all</u> dashes
[↑] or [+]	to increase a value to fast increase <u>press and hold</u> to choose YES for a setting
[↓] or [-]	to decrease a value to fast decrease <u>press and hold</u> to choose NO for a setting

GETTING STARTED

The **AFM2** keypad has a tactile feel and the instrument beeps when a button is pressed. Holding a button for more than one second causes the instrument to beep rapidly. This is the *hold-mode* in which [↑] and [↓] and [ENTER] behave differently as described below.

SWITCHING ON: To turn the instrument on, press and release the switch marked [RESET]. After a short self test (see below) the display will show "*AFM2 ready*", together with the time and date. If the battery needs re-charging, the display will flash "*Charge battery*".

The battery must be fully re-charged as soon as the "*Charge battery*" warning appears. The instrument will not let you print results with the "*Charge battery*" warning on.

The instrument will not have display backlighting activated if the battery charger is plugged in during testing.

SWITCHING OFF: Providing the instrument is not armed for a test or printing, it will switch

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itself off automatically if no buttons have been pressed for 4 minutes. To manually switch off the instrument, press **[S]** and **[PRINT]** together.

DISPLAY CONTRAST: To adjust the contrast of the display press and hold **[RESET]** as the instrument is switched-on until the display goes its darkest after about 3 seconds. Then use the **[↑]** or **[↓]** buttons to darken or lighten the display respectively. Press **[ENTER]** when the required contrast is obtained. The **AFM2** will automatically remember this setting and use it each time it is switched-on. The contrast can only be adjusted as you switch the instrument on, and once set to suit you it should not normally need re-adjusting.

SELF TEST: As the **AFM2** is switched on it carries out certain self tests to make sure it is working correctly. At the end of the self test the display will show "*Calibration date*", this is the time and date when the instrument was last calibrated. If this is more than a year ago, the display will show "*PLEASE HAVE ME RE CALIBRATED*" instead.

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If the instrument detects a fault with its memory during the self test the display will show "**MEMORY ERROR**".

If the instrument has lost its calibration information the display will show "**POOR CALIBRATION**".

In both of the above cases, the instrument will automatically revert to a default calibration and is therefore still usable - albeit with reduced accuracy. In this case, after the error message, the display will show "**PLEASE HAVE ME RE CALIBRATED**". If the "**Memory Error**" warning appears always check that the Trimmable Parameters (see Appendix B) have not been corrupted before using the instrument.

MEMORY: If you press **[RESET]** while the display shows "**AFM2 ready**", the display will switch to indicating the battery voltage and the percentage of memory used. Release **[RESET]** to revert to the normal display.

The fully charged battery voltage is about 6.4 volts. It is suggested that the battery is

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recharged if its voltage drops below 6 volts.

As the percentage of memory used approaches 100% you should reduce number of tests stored to free up more memory space (see **ARMING FOR A TEST** below). Doing this erases the tests from memory so remember to first print any stored tests you wish to keep.

If the battery charger is connected the second line of the display will show the recharge current being taken by the battery instead of the percentage memory used. When full charge is reached the current will drop below 30 milli-amperes (mA), and the battery voltage will eventually rise to about 7.25 volts while the charger is connected.

EDITING MODE : The editor allows some of the instrument settings and parameters to be changed. Editing can be password protected. To select the editor press **[ENTER]** while the display shows "*AFM2 ready*", then use **[↑]** or **[↓]** to choose what to edit followed by **[ENTER]** to select:

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Operator ID: allows the user to select or change the name identification of the operator. Up to sixteen alphanumeric characters can be entered for each of the 32 Operator ID's that can be stored in the instrument. The top line of the display indicates the ID number. Press [↑] or [↓] to select the ID to change and then press [ENTER] to begin editing. This is signified by a flashing cursor on the bottom line. Pressing [↑] or [↓] changes the flashing character, then [ENTER] to move on to the next character position. Press and hold [ENTER] to save the whole name. Alternatively press [RESET] to quit without saving the changes. Pressing [A] resets the selected ID to all dashes.

Note you cannot change the Operator ID when arming for a Friction Test. You must select the appropriate ID you want to use for the testing here by first selecting it by pressing [ENTER] and then pressing and hold [ENTER]. That Operator ID will then be used for all subsequent tests until changed.

RUNWAY ID: allows the user to select or change the runway identification or name. Up to 32 Runway IDs can be stored in the instrument. Friction test results are always sorted by runway name. The characters

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are edited in the same fashion as Operator ID. Note when arming for a group of tests the user is first prompted to select the Runway ID.

Note that tables of 32 Operator IDs and 32 Runway IDs can be downloaded from a PC using the **AFM2-ID** utility program supplied with the instrument. This program also allows an **AIRPORT NAME** to be downloaded to the instrument. This name will then appear on all printouts.

Clear my Memory?: allows you to clear the instrument's memory and start again at Test 1. Remember to print out your results first, the instrument will double check with you to make sure.

Configuration: allows advanced users or the factory to change the instrument default settings. Please refer to the Configuration Guide.

USING your AFM2

MEASURING SLOPE: To measure the slope gradient press the switch marked **[S]**. The instrument will now continuously measure and display the slope gradient in percent. A negative number means a downward gradient. If a very accurate measurement is required, first trim the instrument zeros (refer to Configuration Guide Book).

The second line will show the gradient as 1 in n.

POSITIONING THE INSTRUMENT: Place the **AFM2** on the front passenger seat, passenger foot well or other suitable position in the vehicle. The Velcro on the underside of the instrument will adhere to fabric seats and carpeted foot wells. When placing on the seat also restrain by passing the passenger seatbelt through the instrument carrying handle. If placing in the footwell make sure that Velcro holds sufficiently to prevent the instrument moving forward under braking. If in doubt restrain using the carrying handle and/or position against a forward bulkhead. The accuracy of the results depends on the instrument

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remaining secure while the vehicle decelerates.

The instrument should be positioned in the vehicle so that the large arrows on its lid are pointing in the direction of travel.

Although the tilt of the instrument relative to the ground surface is automatically recorded and used to compensate the results, the very best results will be obtained when the instrument base is parallel to the runway surface.

ARMING FOR A GROUP OF TESTS: Before each group of friction tests the instrument must be armed. This is done by pressing the switch marked **[A]**.

The top line of the display will show "**ARM FOR TEST N**", where *N* is an identification number for the next test. This number, which will be between 1 and 99, is used to identify the test results on the printout and in the instrument memory. It automatically increases by 1 after each successful test.

You can delete tests using the **[↓]** button, use the **[↑]** button if you go to far. Press

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[ENTER] to confirm you want to go ahead with that test.

If you do change the test number, remember to have printed or downloaded any results you want to keep because results from tests with higher test numbers will be erased from memory .

The test number will be automatically set to 1 when you reach Test 99 or when the memory is full. However, the instrument will first give you a chance to print or download the previous tests. Note that if your tests have long stopping times, you may not reach 99 tests before the memory is full. The memory capacity is 128 kbytes.

The display then asks you to confirm the Runway ID, press **[↑]** or **[↓]** to select the ID use, then press **[A]** to accept it. Alternatively press **[ENTER]** to change the ID as described in the **Editing Mode**, then press and hold **[ENTER]** to accept.

The Operator ID that appears on the test printout will be that last selected in the **Editing Mode**.

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The display then asks you to "*Get SLOPE offset*", this is the typical runway slope on which the group test will be carried out. It also allows the instrument to compensate for its inclination in the test vehicle. Drive to a typical area and with the vehicle stationary at a representative point on the runway press **[ENTER]**

The instrument then tells you to "*Please wait*", while it determines its orientation for the test. To get the most accurate results, the **AFM2** should be aligned to move parallel with the runway surface.

Do not allow the vehicle to start moving while the display shows "*Please wait*".

After a short pause the display will show "*ARMED TEST N*", you can now proceed to do a group of tests on that runway. Accelerate the vehicle to a safe test speed for each friction test and then apply the brakes.

The vehicle need not be brought to a stop after each test.

To disarm the instrument without carrying out a test, press **[RESET]**.

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To halt a test before it is triggered press [A] again, the display will show “*HALTED*” followed by the test number. Press [A] once more to proceed.

FRICTION TESTING: The aim of the runway friction testing is to carry out a series of locked-wheel deceleration tests on a runway to determine the coefficient of friction. The instrument will automatically group together all contiguous tests with the same runway identification. At any time when a printout is initiated, the group of tests so far are divided into three parts and the average coefficient for each part (the 1/3 average) is calculated and printed together with its deviation from the overall average of all three parts.

It follows that you can keep adding tests to the group if the runway name is not changed. Remember though, if you want to do a complete new group of tests on the same runway you must delete the earlier ones (clear the memory), or separate them with one or more tests with a different runway name.

With the **AFM2** armed as described above accelerate the vehicle to the

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required test speed and fully apply the brakes to lock the wheels. The display will show "**AUTOMATIC STOP**". Measurements continue until the **AFM2** senses the vehicle has stopped decelerating.

At the end of a successful test the display will show the measured **Friction** (either as a **Peak** or **Average** depending the configuration), expressed as a fraction or % of g the acceleration due to gravity, $g = 9.81$ metres/sec/sec.

*The vehicle does not have to come to rest and you can begin accelerating again for the next test once the results appear.
Each test in the group will use the same arming settings.*

If the test was not successful, the display will indicate the possible reason.

Press **[A]** to accept the test results and add them to the current group classified under the runway name, the test number is automatically increased by one. Press **[RESET]** to reject the test results, in which case the test number does not

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change. The instrument will automatically store up to 99 tests in its memory.

The instrument will then ask whether or not you want to do another test without going through all the initialisation steps. Press **[A]** for another test or **[RESET]** to quit the testing mode.

After completing a group of tests, the instrument can then be re-armed for tests on another runway.

PRINTING RESULTS: Two type of printout can be produced. These show *either* the results summary for groups of tests *or* a more detailed results table for the individual tests.

To print the results summary press **[P]**, then use **[↑]** or **[↓]** to choose the runway identification shown on the second line of the display (the instrument always starts with the group which contains test 1). Remember the group of all contiguous tests on the chosen runway will be included in the summary and averages. Press **[ENTER]** to start printing, hold **[ENTER]** to feed paper.

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To print the results table press **[P]** for a second time, use **[↑]** or **[↓]** to select the test number, then **[ENTER]** to start printing.

The results summary produces a listing showing the test numbers in the group and their respective recorded **peak** or **average friction** as % of fraction of g, the **time & date** carried out.

If there are more than 3 results in the group, the three 1/3 averages together with the overall average are printed. The deviation of each 1/3 average from the overall is shown in brackets as a percentage of the overall average. If the number of tests in the group is not divisible by three the first one or two tests will be excluded from the averages and a warning shown on the printout. The list of tests will end at the last test carried out on that runway. The print header shows the Airport name in large text. The printout also shows the Runway ID and Operator ID, the number and date of the last test on the list, the date the next calibration is due and the instrument serial number.

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The printed results table will show the **Mean** and **Peak Deceleration**, the **Time to Stop**, **Brake Delay Time**, **Speed** at braking and **Distance**, the time and date of the test, the test number, the date the next instrument calibration is due, and the instrument serial number. Also printed are the Examiner and Runway identifications.

You can also print all the stored results from the indicated test number (N) up to the last test carried out. Do this by pressing **[A]** instead of **[ENTER]** while the display shows "*Print Test N*". This applies to the results table printout only .

Note that the **AFM2** will not allow you to print results if the low battery warning is on, or if the battery starts to fail during printing. However, since the results are automatically stored in memory, they can be printed out later on (or duplicate prints obtained) if this happens.

If at any time you wish to terminate a printout press **[RESET]**.

The printout will show "*CALIBRATION NEEDED*" if your instrument is due for re-calibration.

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PC Software

Test results recorded by your **AFM2** can be downloaded to a Windows PC for more detailed analysis and archive purposes. Information scanned in with the bar code wand is also downloaded. Thus a full database can be automatically maintained.

A PC-Link interface cable is required to allow the instrument to be connected to a PC.

AFM2 for Windows is software for Microsoft Windows with which you can download from your instrument to your PC and maintain an interactive database of your runway tests results. You can interrogate the database by runway name, examiner, test date, or runway friction value. You get on screen graphs of the runway friction, which can be manipulated and analysed with the help of "on screen" buttons, and you can produce a full test report on your Windows printer. Call the factory for more information.

AFM2-ID for Windows. This free utility allows you to create on your PC and download to the instrument groups of 32 Runway IDs and 32 Operator IDs as well as the Airport name. An unlimited number of groups of IDs can be stored on the PC for quick selection and download to the instrument.

MAINTENANCE

*There are no user serviceable parts inside the **AFM2** instrument case. The manufacturer's warranty is invalidated if the case seal is broken.*

CHARGING THE BATTERY: To re-charge the **AFM2** battery, connect the charger supplied with the instrument to the DIN connector on the rear panel. Switch on the mains power to the charger. A full charge takes about 12 hours.

With a fully charged battery, the **AFM2** can be operated for up to 20 hours, depending on how much the printer is used.

Always recharge the battery as soon as possible after the "*Charge Battery*" warning appears on the display.

To get the best performance and battery life out of your **AFM2** it is important that the battery is kept in good condition.

To keep the battery in optimum condition and the instrument ready for use we

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recommend the following charging schedules:

- 1 *If the **AFM2** is in regular use, re-connect the battery charger after every testing session and leave the instrument permanently on charge.*
- 2 *If the **AFM2** is not to be used for a month or so, fully recharge the battery and then disconnect the charger. Then at monthly intervals give the **AFM2** a 24 hour top up charge. In this way, the instrument will always be ready for use.*
- 3 *If the battery has gone into deep discharge through neglect or miss-use, it may take up to 72 hours of re-charging to fully recover its capacity.*

CHANGING PAPER ROLL AND RIBBON:

Remove the printer cover. This is held in place by the two Allen key screws on the top of the instrument. Lift out the paper roll and carrier and tear through the remaining paper strip to leave a short length feeding into the printer.

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Remove this strip of paper by carefully pulling it upwards through the printer.

Remove the printer ribbon by pressing on the right hand side near the PUSH marker.

Fit a new roll of paper onto the roll carrier so that the paper will feed upwards into the printer mechanism from the bottom of the roll. Make sure the leading edge of the paper strip is square.

Replace the paper carrier. Feed the leading edge of the paper strip into the bottom of the printer and wind through by turning the knurled plastic screw on the left hand side of the mechanism. Once the paper appears out of the top of the printer, pull through a short length to align it properly.

Pass the ribbon over the leading edge of the paper and then gently press it down onto the printer mechanism until it clicks into position. Tension the ribbon by turning the adjuster on the left hand side in the direction of the arrow.

Replace the printer cover.

CALIBRATION: The **AFM2** instrument is supplied with a self-printed **Calibration Report** with the instrument identified by its serial number. Additional copies of the Calibration Report can be printed by the instrument.

It is recommended that the **AFM2** be re-calibrated once per year or earlier if the instrument self test warns of a calibration fault.

The manufacturers and distributors can offer a full Re-calibration and Maintenance Contract for your **AFM2**.

NOTES

*All specifications and options are subject to change
without notice*

USEFUL CONTACTS

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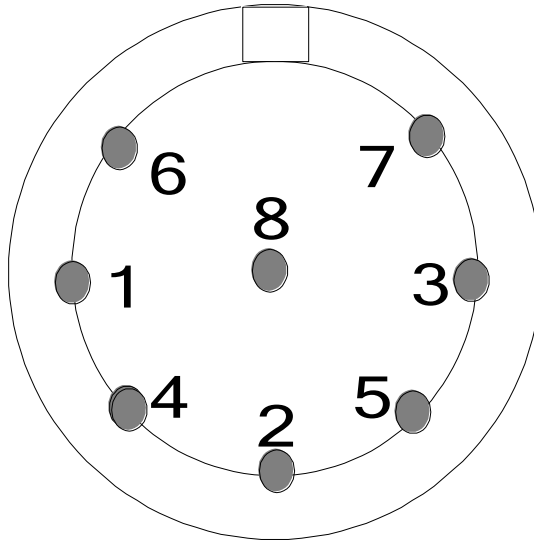
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APPENDIX A - DIN CONNECTOR

Pin Connections Viewed onto DIN Plug Mating Face



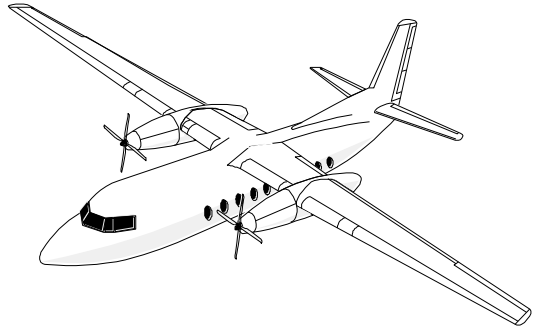
- Pin 1 external trigger input, serial out, barcode input
- Pin 2 battery charger -ve and case
- Pin 3 digital status input, serial data input
- Pin 4 pulse input
- Pin 5 signal common
- Pin 6 voltage output (5.5 volt approx)
- Pin 7 analogue input 0.4 volt to 2.0 volt (temperature)
- Pin 8 battery charger +ve

APPENDIX B - Technical Specification

Measurement Accuracy	better than $\pm 2\%$ over full scale, better than $\pm 1.5\%$ from 15% g to 90% g
Measurement Range	0 to 140% g ($g=9.81$ metre/sec/sec). Resolution 0.1 % g.
AFM2 Printer	40 column dot matrix type with graphics
AFM2 Display	2 line alphanumeric LCD with backlight
Internal Memory	128k bytes, battery backed CMOS RAM
Real Time Clock	months and leap years adjust automatically
Start Trigger	Automatic 10% g or from brake pedal

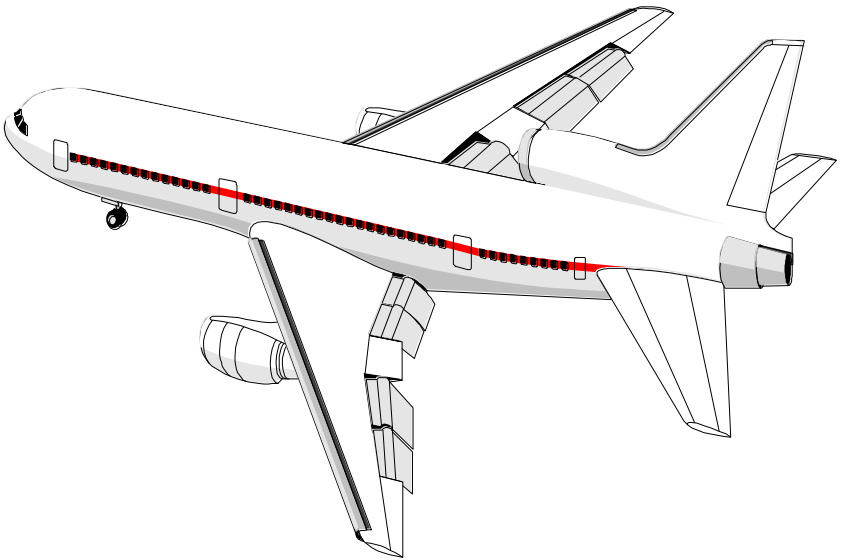
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Computer Link	serial RS232. Memory saves results of up to 99 friction tests for transfer into AFM2 for Windows
Battery	6 volt rechargeable, operates for over 16 hours from full charge. Display shows battery voltage and warns when re-charge required
Battery Charger	unregulated 12 volt DC 600mA from AC mains or car cigarette lighter. Re-charge current shown on display
Keypad	tactile feel with audio feedback. Full alphanumeric entry for examiner and runway and airport identification
Size and Weight	140 x 220 x 78 mm, 2.75 kg nett



AFM2 Mk3

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Operating Instructions

