TecQuipment

AFA2

Single Component Lift and Drag Balance

User Guide

Introduction

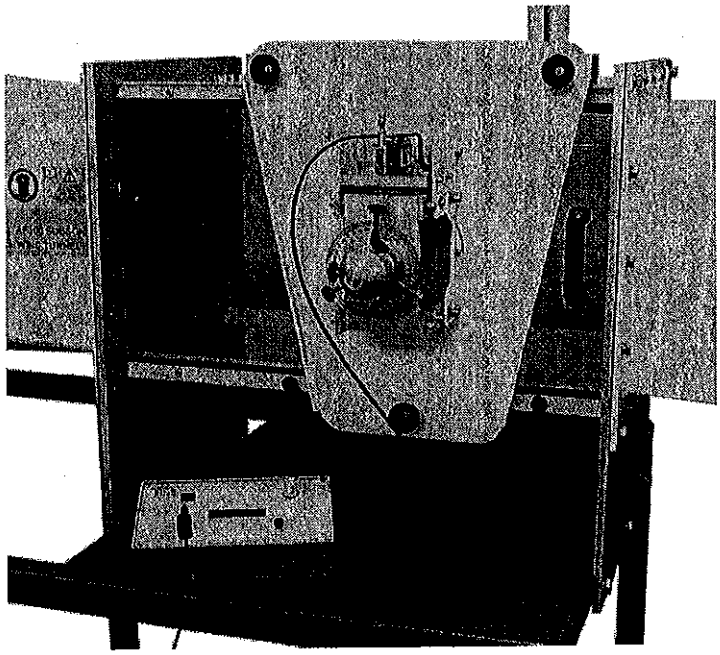

Figure 1 The AFA2 Single Component Lift and Drag Balance (Shown Mounted on a Wind Tunnel)

VDAS ***This product works with VDAS***

The AFA2 Module works with TecQuipment's AF100 Wind Tunnel. It provides a means to measure and display the lift or drag on a selection of optional models. A range of suitable models are available from TecQuipment.

The module is in two parts:

- The Balance Assembly, which is an articulated parallelogram, linked to a load cell. The parallelogram resists bending moments, so that only the force (not the moment) on the model is transmitted to the load cell.
- The Display Unit, that displays the force measured by the load cell

The Balance Assembly may be mounted underneath the working section of the AF100 series Wind Tunnel, or to the side of the working section, by means of the triangular back plate (supplied).

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TecQuipment has taken care to make the contents of this manual accurate and up to date. However, if you find any errors, please let us know so we can rectify the problem.

TecQuipment supply a Packing Contents List (PCL) with the equipment. Carefully check the contents of the package(s) against the list. If any items are missing or damaged, contact TecQuipment or the local agent.

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TecQuipment

Parts of the AFA2

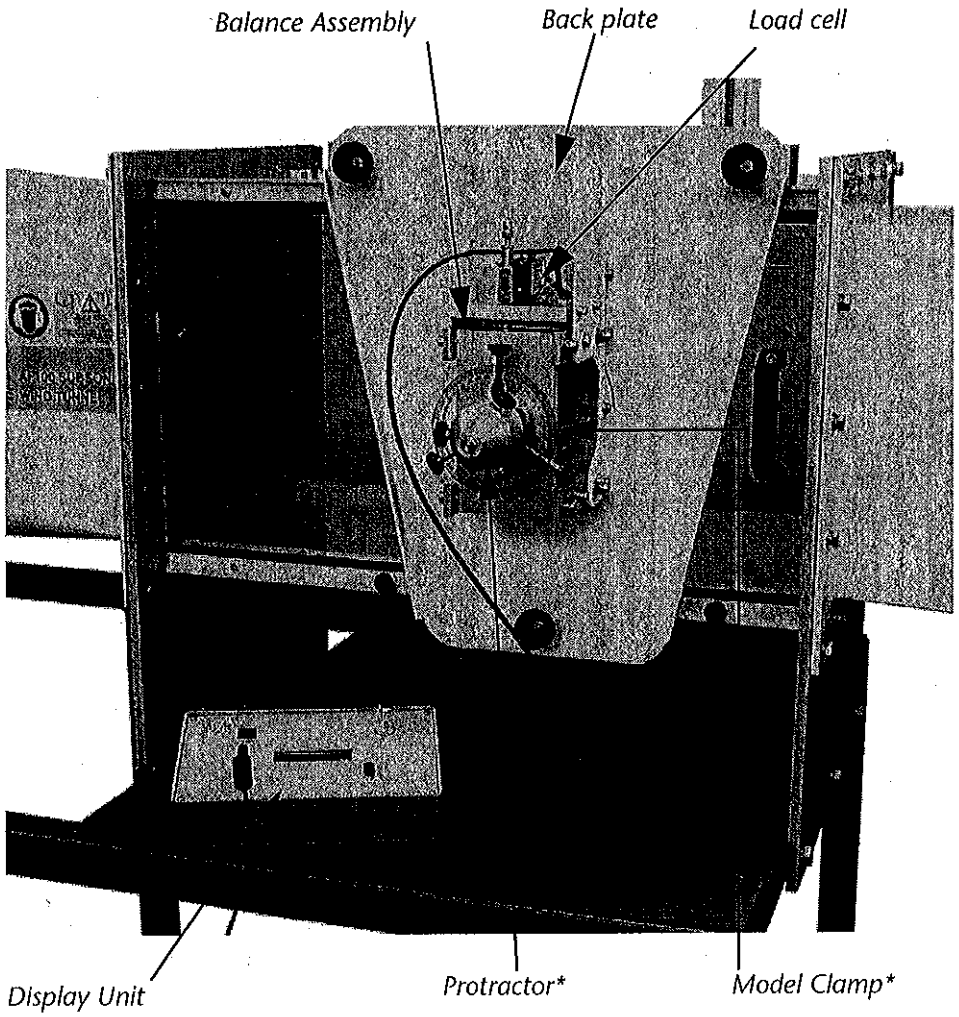


*Figure 2 Parts of the AFA2. * The Protractor and Model Clamp are Supplied with the AF100 Tunnel*

Technical Details

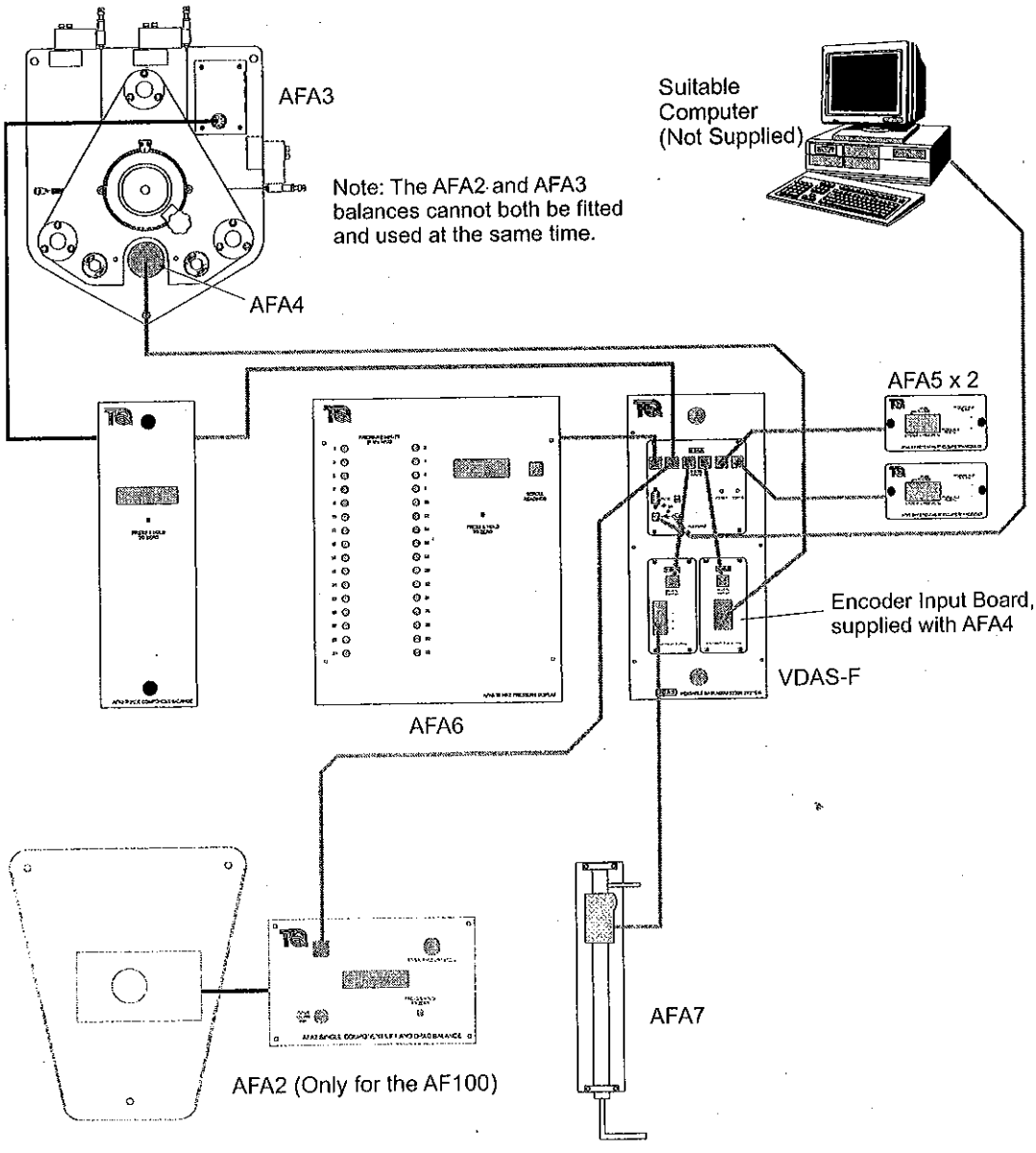
Item	Details
Weights	Display Unit (with power supply): 1 kg Balance Assembly (on back plate): 5 kg
Maximum Load	10 kg (100 N) *The load cell is rated at 20 kg
Display Unit	12 VDC input
Power Supply	100 VAC to 240 VAC input at 1 A 50 Hz to 60 Hz 12 VDC output

Table 1 Technical Details

Optional Instrument Modules

- AFA3 - A Three Component Balance
- AFA4 - Angle Feedback Device for use with the AFA3
- AFA5 - Differential Pressure Transducer
- AFA6 - Multi-way Pressure Display System
- AFA7 - Pitot Traverse Unit
- VDAS - A two-part (hardware and software) automatic data acquisition system

Figure 3 shows a system diagram for the other ancillaries available for these wind tunnels and how they connect to the VDAS.



Assembly

The terms **left, right, front** and **rear** of the apparatus refer to the operators' position, facing the unit.

Procedure

The Balance Assembly may be mounted underneath or to the side of the working section on the AF100 series wind tunnel. The choice is determined by the model that you need to test.

WARNING *Disconnect the electrical supply to the wind tunnel before you install the AFA2.*

Side Mounting (for lift and drag measurements)

This mounting method is used for the optional aerofoil, cylinder and flat plate models.

1. Face the side of the wind tunnel so that the air flow is from right to left (fan housing is to your left and the air inlet is to your right).
2. Remove the blanking plug from the middle of the clear window on your side of the working section.
3. Use the thumbscrews and washers (supplied) to fix the triangular back plate to your side of the working section (see Figure 5).
4. Fit the model clamp to the Balance Assembly (the model clamp is supplied with the AF100 tunnel) (see Figure 4).

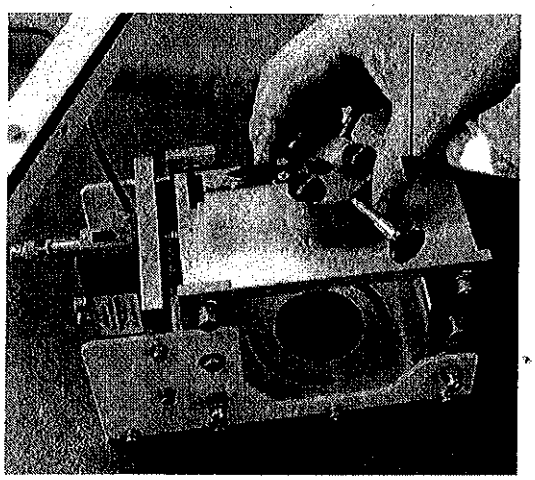


Figure 4 Fit the Model Clamp to the Balance Assembly

5. Place the Balance Assembly onto the back plate and use the smaller thumbscrews and washers (supplied) to fix it onto the back plate. For drag measurement, fit the assembly so that the load cell is to the right (see Figure 6). For lift measurement, rotate and fix the assembly so that the load cell

is to the top (see Figure 7), you will hear and feel a ball spring mechanism lock into place when the assembly is in position.

NOTE  *When the load cell is to the right, the Balance Assembly will only measure drag, when it is vertical, it will only measure lift.*

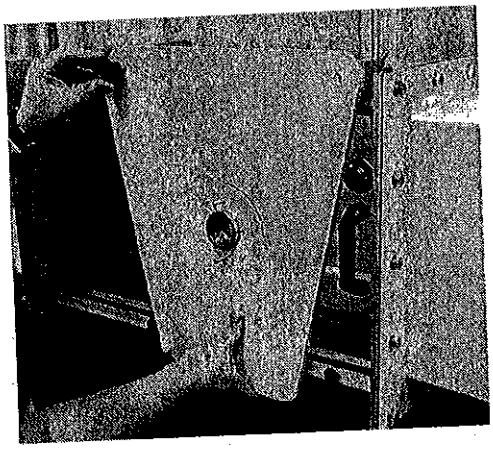


Figure 5 Use the Thumbscrews and Washers to Fix the Back Plate into Place.

6. Remove the clear window from the opposite side of the working section.

7. Place your model into the working section and slide its support shaft through the hole in the middle of the AFA2 Balance Assembly. Set the model to the correct angle for your tests (usually zero incidence for aerofoil models) and tighten the three thumbscrews on the Balance Assembly to clamp the model (see Figure 8).

8. Fit the protractor to the model shaft and set it to 0 degrees. Tighten the protractor clamp screws (see Figure 9). The protractor is supplied with the AF100 wind tunnel.

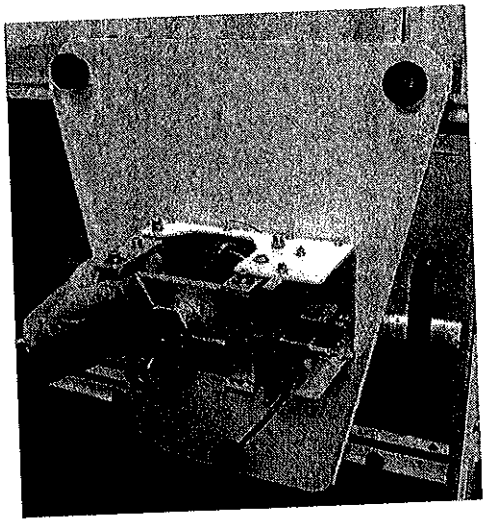


Figure 6 Use the Thumbscrews and Washers to Fix the Balance Assembly to the Back Plate

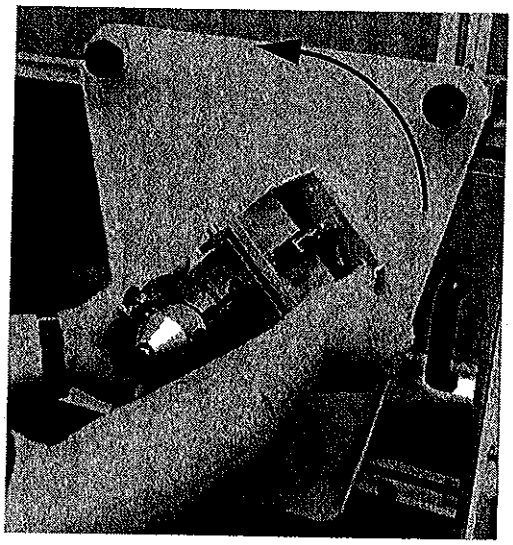


Figure 7 For Lift Measurement, Rotate the Assembly so That the Load Cell is Uppermost

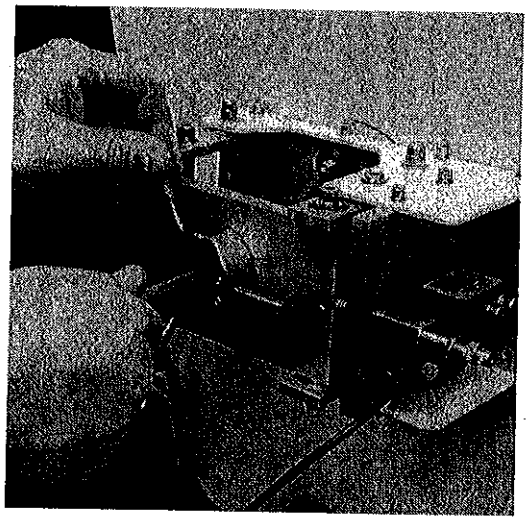


Figure 8 Insert Your Model from inside the Working Section and Clamp it into Position.

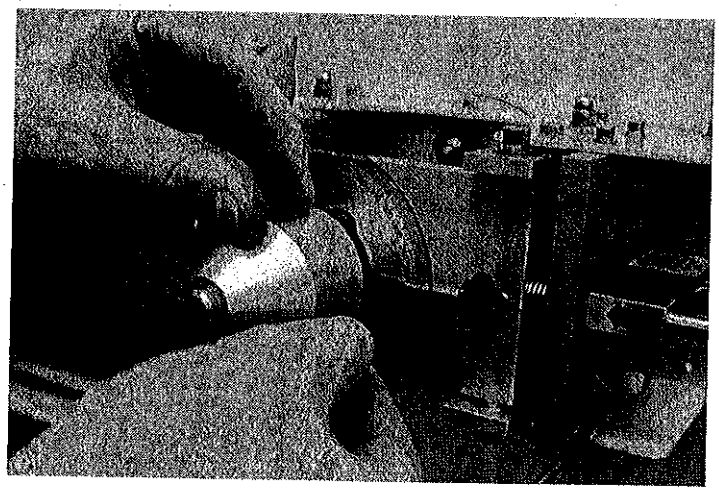


Figure 9 Fit the Protractor and Set to Zero Degrees.

9. Replace the clear window to the opposite side of the working section.
10. Connect the Display Unit as described in **To Connect the Display Unit** on page 11.

WARNING ***Always switch off the Wind Tunnel before you adjust the Balance Assembly from the lift to the drag position, or your model may be damaged.***

To Mount the Balance Underneath the Working Section (drag measurements only)

This method is used to mount model cars or buildings.

NOTE *The balance will only measure drag when it mounted underneath the working section.*

1. Remove one of the clear windows of the working section.
2. Remove the balance assembly from the triangular back plate (if necessary). Fit the model clamp (if necessary) (see Figure 10). The model clamp is supplied with the AF100 wind tunnel.

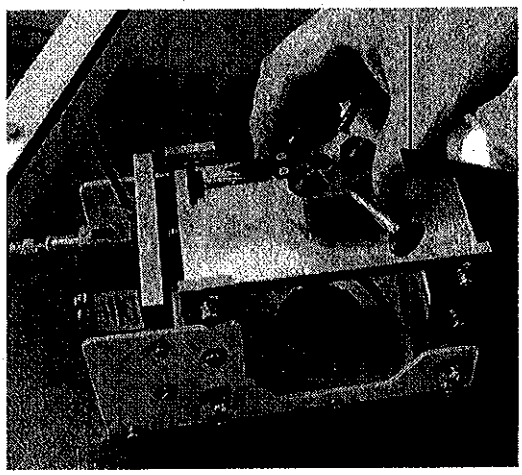


Figure 10 Fit the Model Clamp to the Balance Assembly

3. Remove the blanking plug from the bottom of the working section (see Figure 11).
4. Put the balance assembly over the fixing points on the table, underneath the working section (load cell towards the air inlet) (see Figure 12).
5. From underneath the table, use the fixings (supplied) to fix the balance assembly into position (see Figure 13).

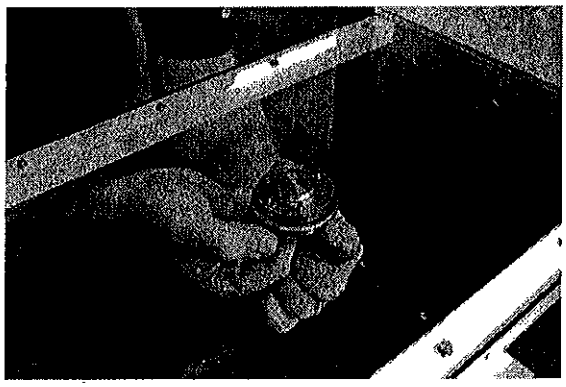


Figure 11 Remove the Blanking Plug from the Bottom of the Working Section

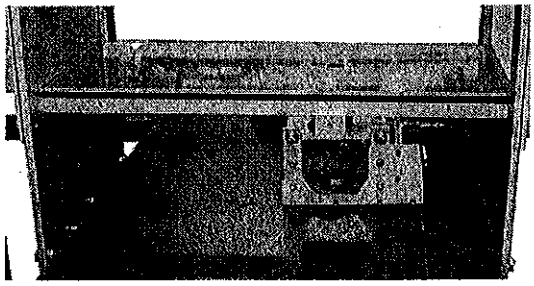


Figure 12 Put the Balance Unit on the Table Underneath the Working Section (Load Cell Towards the Inlet)

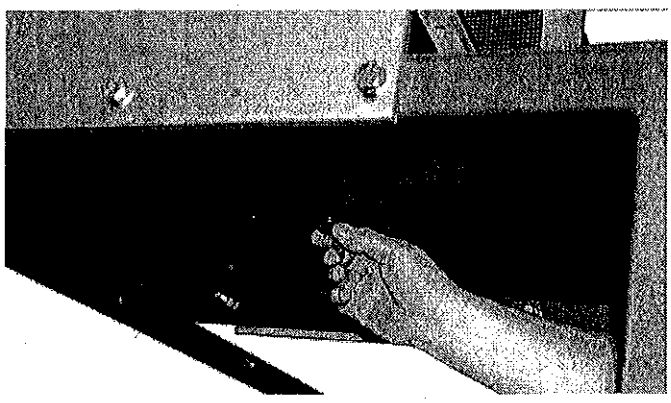


Figure 13 Reach Under the Table and Fix the Balance Assembly Into Position.

6. From inside the working section, insert the model support shaft through the bottom of the working section and into the Balance Assembly (see Figure 14). The model must face into the airflow (towards the inlet).

7. Adjust the model support shaft so that the model does not rest on the floor of the working section (see Figure 15).

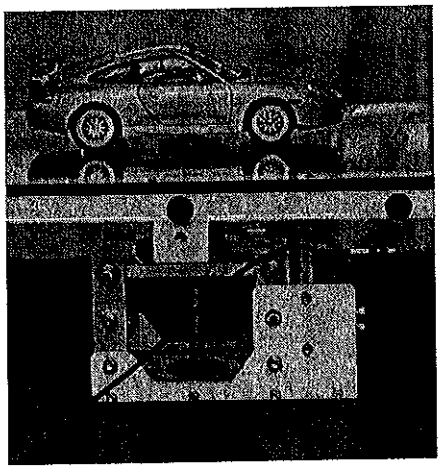


Figure 14 Insert the Model Support Shaft into the Balance Assembly (Model Car Shown - Not Included)

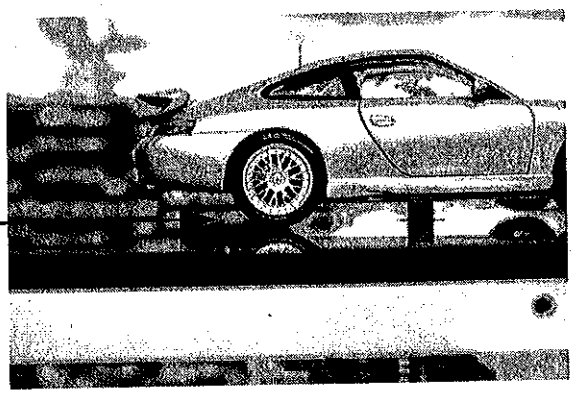


Figure 15 The Model Must Not Rest on the Floor (Model Car Shown - Not Included)

8. Tighten the model clamp on the Balance Assembly (see Figure 16).
9. Refit the clear windows.
10. Connect the Display Unit as described in **To Connect the Display Unit** on page 11.

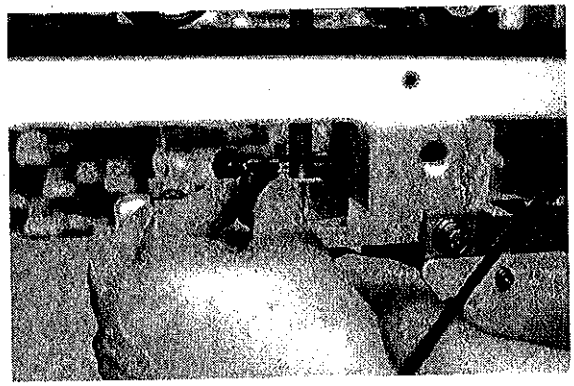


Figure 16 Tighten the Model Clamp

To Connect the Display Unit

1. Connect the cable from the Balance Assembly load cell to the socket marked 'To Balance Load Cell'.

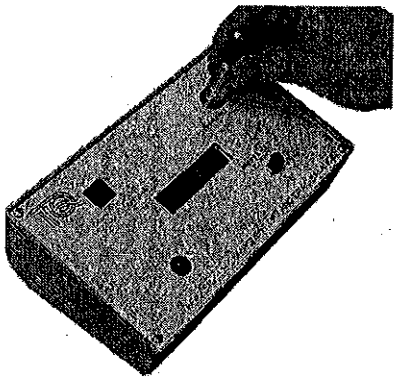


Figure 17 Connect the Plug from the Balance Assembly to the Display Unit

2. If you need to connect to the optional VDAS, use one of the cables supplied with the VDAS and connect it to the socket marked 'Digital Output' on the AFA2 Display Unit. Refer to the VDAS manual for more details.

3. Connect the cable from the power supply (supplied) to the socket marked 'Input 12 V'.

4. Connect the power supply to one of the electrical supply sockets on the rear of the Control and Instrumentation Frame of the AF100.

To Use the AFA2 Module

1. Make sure that the model is set up and the balance assembly is fitted for drag or lift measurements as described in **Assembly** on page 5.
2. Switch on the power to the Control and Instrumentation Unit of your wind tunnel.
3. The AFA2 Display Unit will show 'TecQuipment Ltd', then 'AFA2' and the force reading.
4. Leave the Display Unit to stabilize for 5 minutes.
5. Make sure that the model is set up correctly, then press and hold the zero button for at least four seconds to re-zero the force reading.
6. Start your experiment.

Maintenance, Spare Parts and Customer Care

General

When it is not in use, disconnect the Display Unit power supply from the electrical supply.

To clean the apparatus, wipe clean with a damp cloth - do not use abrasive cleaners.

Electrical

There are no replaceable electrical fuses or circuit breakers on the AFA2 apparatus.

WARNING  ***The Display Unit power supply is a sealed unit. If it fails, do not attempt to repair it. Buy a replacement unit from TecQuipment.***

Spare Parts

Check the Packing Contents List to see what spare parts we send with the apparatus.

If you need technical help or spares, please contact your local TecQuipment Agent, or contact TecQuipment direct.

When you ask for spares, please tell us:

- Your Name
- The full name and address of your college, company or institution
- Your email address
- The TecQuipment product name and product reference
- The TecQuipment part number (if you know it)
- The serial number
- The year it was bought (if you know it)

Please give us as much detail as possible about the parts you need and check the details carefully before you contact us.

If the product is out of warranty, TecQuipment will let you know the price of the spare parts.

Customer Care

We hope you like our products and manuals. If you have any questions, please contact our Customer Care department:

Telephone: +44 115 954 0155

Fax: +44 115 973 1520