CHAPTER

08

LEVELING AND WEIGHING

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 08
LEVELING AND WEIGHING

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CHAPTER 08
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08-CONTENTS

GENERAL - DESCRIPTION AND OPERATION

1. Description

A. The aircraft must be operated within established weight and balance limits; therefore, it is essential that the weight and center of gravity be accurately determined. The aircraft weight and center of gravity are determined from information obtained by leveling and weighing. The aircraft is weighed by using the load cells of an electronic weighing kit, mounted on jacks under the aircraft.

B. The aircraft must be level during weighing operations. To assist in the leveling operations, inclinometers and brackets for the support of a leveling plate, upon which any standard leveling device may be placed, are provided. The leveling plate and standard leveling device should be used to level the aircraft whenever a high degree of accuracy is required.

C. Plumb bob inclinometers and brackets for support of leveling devices are located in right side of the nose landing gear wheelwell. Storage provisions for the plumb bob are located on the right side of the nose landing gear wheelwell.

LEVELING - DESCRIPTION AND OPERATION

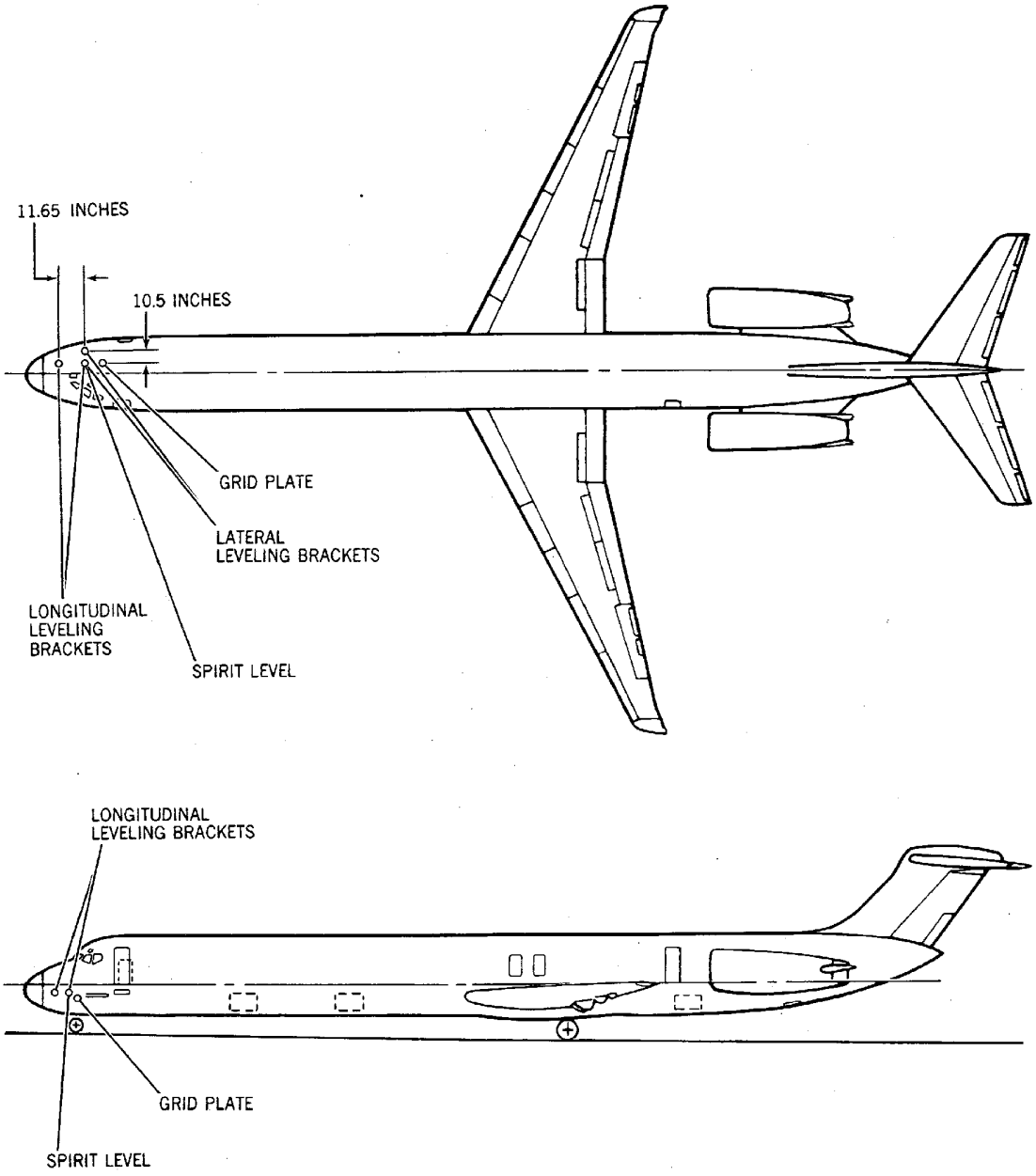
1. General

A. An inclinometer and leveling pads are located in the right side of the nosegear wheel well for determining attitude of the aircraft roll and pitch axes.

B. The inclinometer consists of a preset grid plate graduated in degrees of roll and pitch, and a captive plumb bob. The plumb bob is suspended over the grid plate by a cord. Aircraft attitude is determined by location of the plumb in relation to grid plate markings. A stowage clip is provided to secure the plumb bob when not in use.

C. Leveling pads are provided for both the roll and pitch axes of the aircraft. When a higher degree of aircraft leveling accuracy is required, the leveling pads are used with a master level.

D. The inclinometer grid plate and leveling pads are permanently fixed in the aircraft within 1/8-degree of the aircraft roll and pitch axes in the level attitude.



Airplane Leveling
Figure 1/08-10-00-990-801

LEVELING - MAINTENANCE PRACTICES

1. General

A. The aircraft can be leveled by jacking at the wing and aft fuselage jack points or at the nose and main gear jack points. Refer to CHAPTER 07 for jacking procedures.

2. Leveling

CAUTION: MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED, AND THAT STATIC GROUND CABLES ARE CONNECTED.

A. Leveling Instructions

(1) Jack aircraft. (CHAPTER 07)

(2) Manually open the left and right forward NLG doors with manual release handle on the forward door links to access the plumb bob.

(3) Remove plumb bob from stowage clip. (Figure 201)

(4) Adjust jacks as necessary until plumb bob indicates level attitude on grid plate.

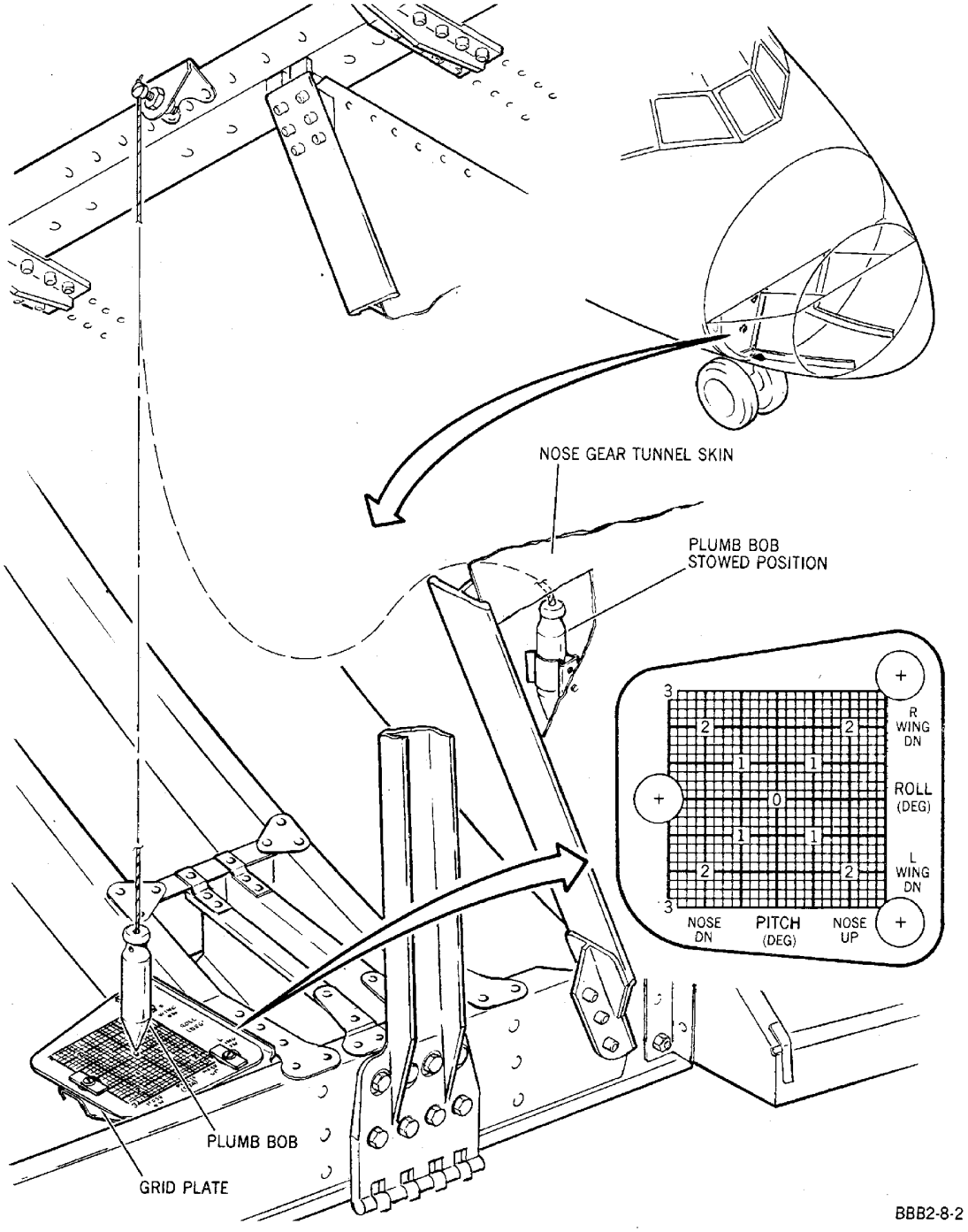
NOTE: If a greater degree of accuracy is required, use master level in conjuction with leveling brackets. (Figure 202)

(5) Stow plumb bob in clips.

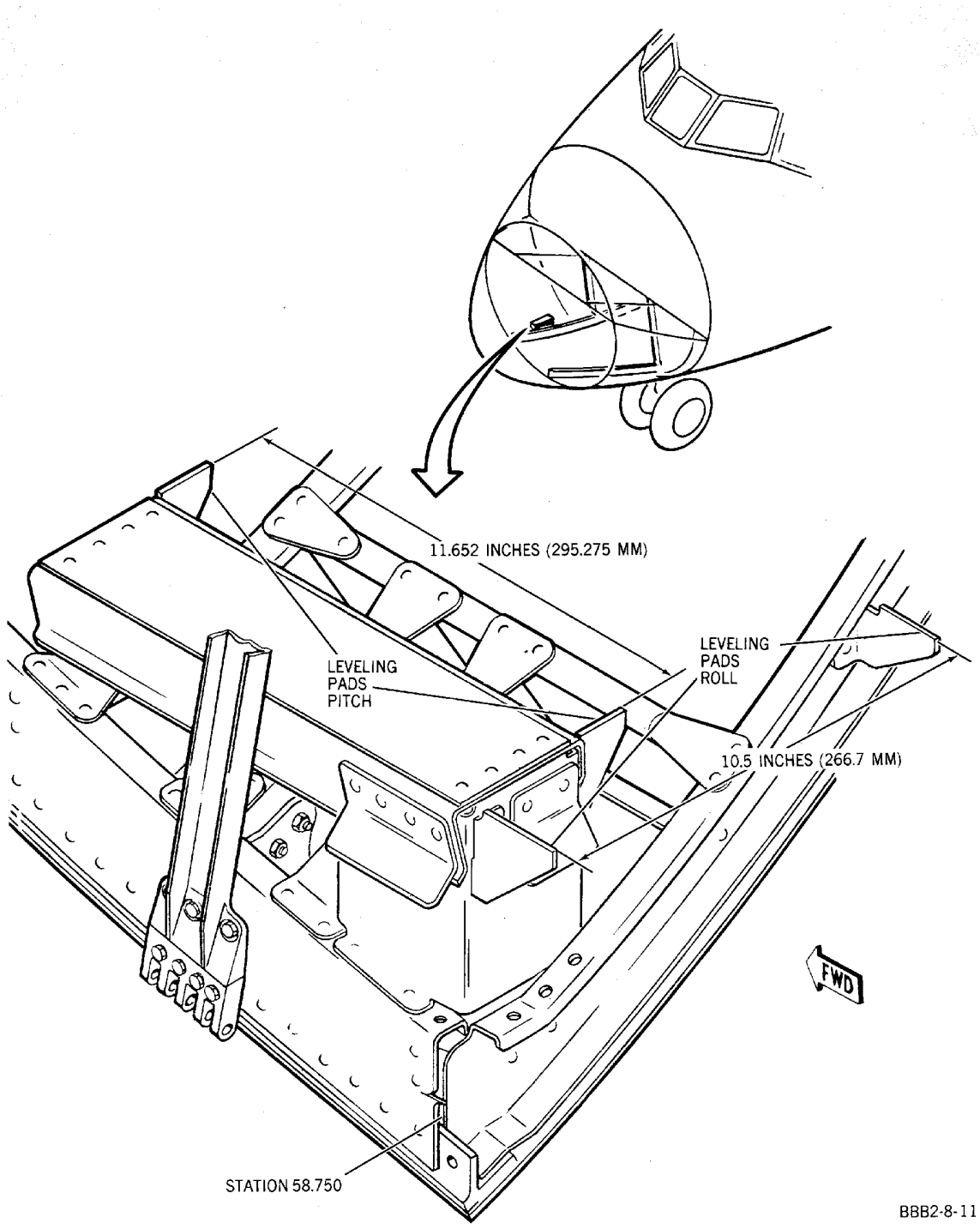
(6) Manually close the left and right forward NLG doors.

(a) Pull down on the doors to make sure the left and right forward NLG doors links are locked.

(7) On completion of leveling, lower and remove jacks clear of aircraft. (CHAPTER 07)



Leveling Inclinometer Location
Figure 201/08-10-00-990-802



Leveling Pads Location
Figure 202/08-10-00-990-804

WEIGHING - DESCRIPTION AND OPERATION

1. General

A. The recommended method of weighing the aircraft is to use electronic load cells mounted on suitable jacks at the wing and aft fuselage jack points. An alternate method is to use the electronic load cells mounted on suitable jacks at the nose and main gear axle jacking points. (Figure 1)

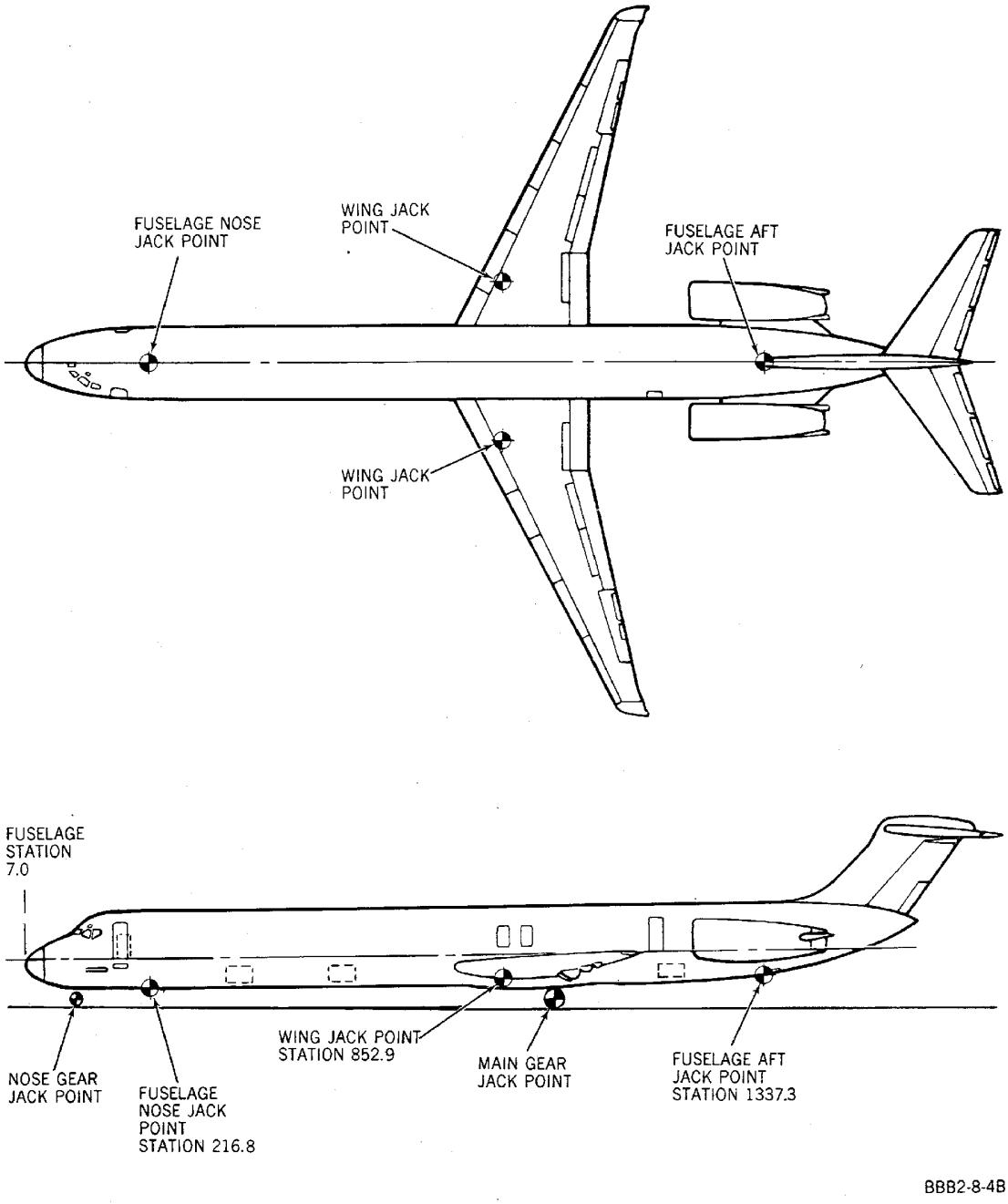
WJE 405-411, 415-427, 429, 861-866, 868, 869, 871, 872, 880, 881, 883, 884, 886, 887, 891

B. The recommended method of weighing the aircraft is to use electronic load cells mounted on suitable jacks at the wing and aft fuselage jack points. An alternate method is to use the electronic load cells mounted on suitable jacks at the nose and main gear axle jacking points. (Figure 2)

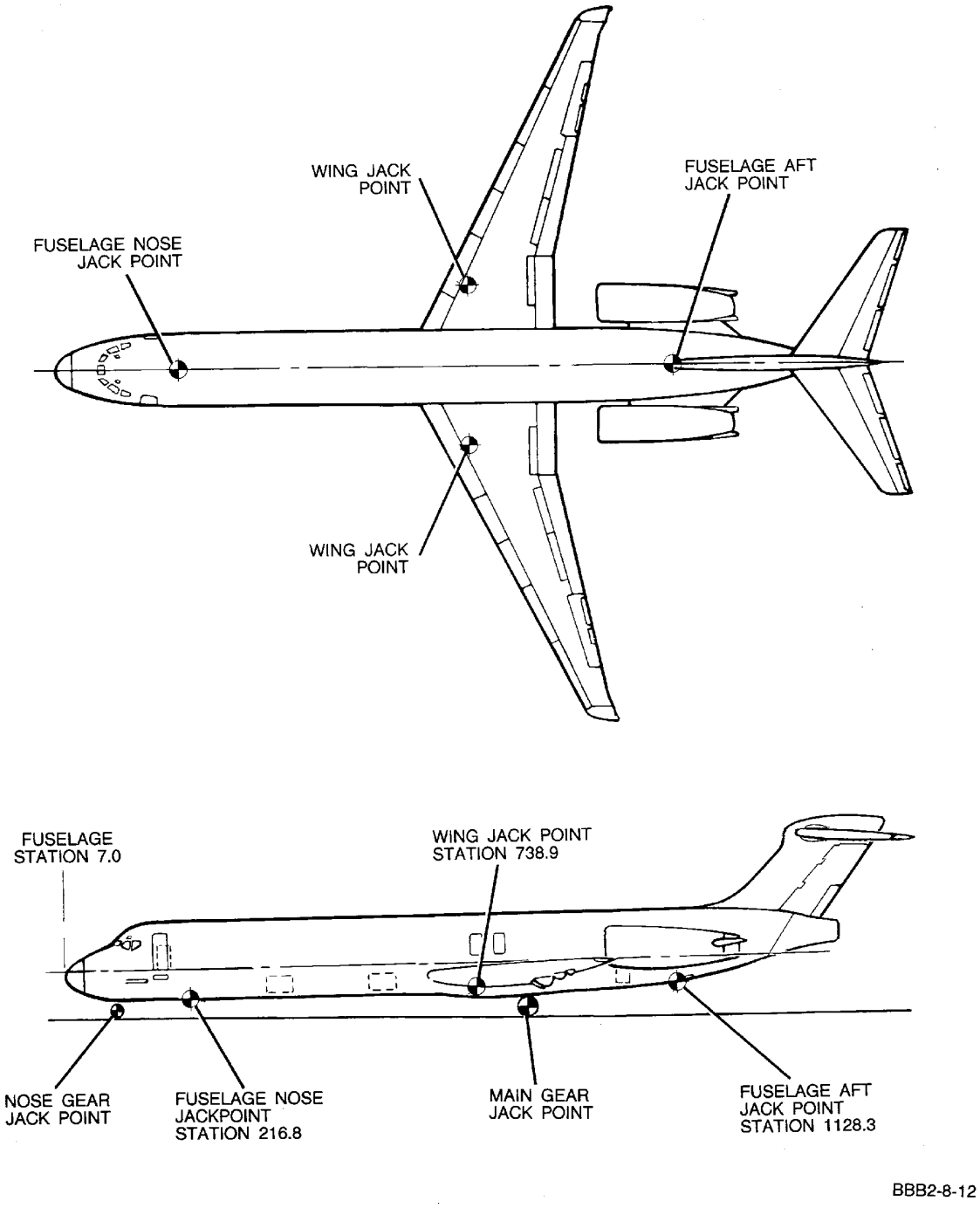
WJE ALL

C. Weighing the aircraft at the wing and aft fuselage jack points is recommended from a standpoint of utility and speed. The alternate method requires the use of a special nosegear jacking adapter and extensive measurements (while in level condition when weights are read) in order to calculate the aircraft center of gravity.

D. Cantilever type jacks are not suitable for use with a weight cell because of the side load imposed on the cell.



Aircraft Jack Points
Figure 1/08-20-00-990-801



Aircraft Jack Points -- MD-87
Figure 2/08-20-00-990-802

WEIGHING - MAINTENANCE PRACTICES

1. General

A. The following information is provided to prepare the aircraft for weighing. Refer to WING AND FUSELAGE JACKING - MAINTENANCE PRACTICES, PAGEBLOCK 07-11-00/201, for jacking procedures.

2. Tools and Equipment Required

NOTE: Equivalent substitutes may be used instead of the following listed items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Electronic weighing kit	
Wing jack adapter, 4916702-1 or -501	Douglas Aircraft Co.
Fuselage jack adapter, 4916701-1	Douglas Aircraft Co.

3. Weigh Aircraft

A. Preliminary Instructions

CAUTION: MAKE CERTAIN LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT STATIC GROUND CABLES ARE CONNECTED.

(1) Position aircraft so that attitude is 1.0° nose down and laterally level.

NOTE: For tare fuel condition, the entire fuel system must be fully primed by running engines for a few minutes. Each tank must contain at least 1,000 pounds of fuel to ensure that the boost and feed pumps will prime properly.

(2) Defuel all fuel tanks using boost pump method. (DEFUELING - SERVICING, PAGEBLOCK 12-11-01/301)

(3) Position aircraft on level area inside hangar or other protected area. All hangar doors and windows should be closed during weighing operation, and all air ventilation/ circulation units turned off.

(4) Drain fuel tanks and remove fuel from sumps with vacuum pumps. (DEFUELING - SERVICING, PAGEBLOCK 12-11-01/301)

(5) Drain aircraft water system. (WATER TANK DRAIN VALVE - MAINTENANCE PRACTICES, PAGEBLOCK 38-11-03/201 Config 1)

(6) Drain toilet waste tanks. (WASTE DISPOSAL SYSTEM - SERVICING, PAGEBLOCK 12-14-02/301)

(7) Remove all trash and empty aircraft waste containers and return containers to proper location.

(8) Remove all tools and working equipment from flight compartment, cargo compartment, and cabin.

(9) Protective coverings should be removed from carpets and seats.

NOTE: A descriptive listing of all on board items is valuable when empty weight of the aircraft is to be determined.

(10) Prepare list of equipment on board including location and known weights. Any discrepancies should be noted on Aircraft Weight Recored Form.

(11) Check the following items:

Table 202

Item	Condition
Engine oil tanks	Filled (ENGINE OIL SYSTEM - SERVICING, PAGEBLOCK 12-12-04/301)
APU oil system	Filled (AUXILIARY POWER UNIT (APU) - SERVICING, PAGEBLOCK 12-12-01/301)
CSD oil system	Filled (CONSTANT SPEED DRIVE (CSD) TRANSMISSION - SERVICING, PAGEBLOCK 12-12-02/301)
Oxygen tanks	Filled (CREW OXYGEN CYLINDER AND SUPPLY PRESSURE REGULATOR - MAINTENANCE PRACTICES, PAGEBLOCK 35-10-01/201 Config 1 or CREW OXYGEN CYLINDER AND SUPPLY PRESSURE REGULATOR - MAINTENANCE PRACTICES, PAGEBLOCK 35-10-01/201 Config 2 or CREW OXYGEN CYLINDER AND SUPPLY PRESSURE REGULATOR - MAINTENANCE PRACTICES, PAGEBLOCK 35-10-01/201 Config 3)
Potable water bottles	Empty and in position
Hydraulic system	Filled (HYDRAULIC SYSTEMS GENERAL - SERVICING, PAGEBLOCK 12-13-02/301)
Main gear struts (static position)	2 inches from fully compressed position
Nose gear strut (static position)	1.5 inches from fully compressed position
Slats, flaps and other aircraft controls	Normal
Aircraft doors including flight compartment and passenger aft entrance doors	Closed

(12) All hangar heating, air-conditioning, and ventilation equipment should be turned off when reading scales during aircraft weighing.

(13) Check aircraft exterior and interior to make certain that nothing interferes with weighing operation.

(14) Check that aircraft is level.

4. Weighing Instructions - Wing and Aft Fuselage Jack Points

A. Place jacks near aircraft jack points. Use 35 tons minimum capacity jacks at wings and 15 tons minimum capacity at aft fuselage.

B. Remove load cells, cell adapters, and electrical harnesses from Electronic Weighing Kit; connect load cells to scale.

NOTE: The load cells, cell balance knobs, and electrical harnesses are color coded. Make sure that colors are matched in assembled units.

C. Remove adapter from each jackscrew and install weighing cell adapter of proper size on the jackscrew. (Figure 201)

D. Screw cell adapter into each load cell and place load cells on jacks. Position jacks beneath jack points.

E. Connect Electronic Weighing Kit Model CS-7 Figure 202 to power source and turn on power to cells as follows:

(1) If 24 Volt DC battery is used, place toggle switch on power converter to 24 Volt DC and check battery voltage as follows:

(a) Place BATTERY VOLTAGE switch to the ON position. (Switch is spring-loaded to "off" position.)

(b) Needle on CELL BALANCE indicator should read in green arc to left of zero.

(c) If needle reads to right of zero, power leads are reversed (reversed polarity).

CAUTION: INCORRECT VOLTAGE WILL CAUSE AN ERRONEOUS WEIGHT INDICATION ON SCALE.

(d) If needle reads in red arcs for low or high voltage, battery with correct voltage must be acquired.

(2) If 110 Volt AC is used, place toggle switch on power converter to 110 Volt AC and adjust voltage as follows:

(a) Place BATTERY VOLTAGE switch to ON, or right position. (Switch is spring-loaded to "off" position.)

(b) Turn AC VOLTAGE ADJUSTMENT knob until needle on CELL BALANCE indicator reads in green arc.

NOTE: The electronic scale must be allowed 20 to 25 minutes to warm up and stabilize before attempting any weighing cell calibration or weighing of the aircraft. This should be accomplished while the aircraft is being readied for weighing.

F. Install jack fittings on aircraft. (Figure 203)

G. Prior to jacking aircraft, calibrate each weighing cell to indicate ZERO pounds as follows:

(1) Place CELL BALANCE switch in forward position.

(2) Rotate CELL SELECTOR to Cell No. 1 position and adjust Zero Set knob until needle on Cell Balance indicator lines up with "0" center mark.

(3) Perform Paragraph 4.G.(2) for Cell No. 2 and Cell No. 3.

CAUTION: IF ZERO SET KNOBS ARE MOVED, ERRONEOUS READINGS WILL BE OBTAINED.

(4) Place CELL BALANCE switch to aft position. (Figure 204)

H. Raise aircraft to level configuration as follows: (observe jacking Cautions in WING AND FUSELAGE JACKING - MAINTENANCE PRACTICES, PAGEBLOCK 07-11-00/201.

(1) Remove leveling plumb bob from stowage, and hang plumb bob so it just clears grid plate. (Figure 204)

NOTE: A plumb bob is stowed in the nosegear well and a hook or clip is located directly above the grid plate. An inclinometer grid plate is built into the basic structure on the right side of the nosewheel well.

CAUTION: PROPER JACK ALIGNMENT, AND AN EVEN RATE OF JACKING AT ALL POINTS IS NECESSARY TO PREVENT SIDE LOADS BEING IMPOSED ON WEIGHING CELLS. SIDE LOADS CAN DAMAGE CELLS OR AIRCRAFT IF LOAD CELL SHOULD SLIP DURING JACKING.

(2) If aircraft is not level, position appropriate jack and level aircraft by extending appropriate jack. After aircraft is level, position all jacks used for weighing and raise jacks simultaneously maintaining level aircraft.

I. Set locking devices on jacks.

J. Check aircraft for level attitude. Make certain that no person or extra equipment is aboard aircraft and that all doors are in closed position.

K. Record no-load reading of each weighing cell, as soon as aircraft is on floor and weighing cells are no longer in contact with aircraft jack fittings, by accomplishing following:

(1) Place cell selector to Cell No. 1 position.

(2) Set Initial Load selector to approximate weight on jack point. Approximate initial loads are:

Table 203

Jack Point	Weight
Aft fuselage	15,000
Left wing	30,000
Right wing	30,000

(3) Adjust Weight Add Initial Load selector until Cell Balance indicator needle indicates "0".

(4) Read weight indicated on scale window and add to initial load selection.

(a) Record total on Aircraft Weight Record Form.

(5) Perform Paragraph 4.K.(1) through Paragraph 4.K.(4) for Cell No. 2 and No. 3 positions.

L. Lower aircraft. Keep aircraft level by lowering jacks simultaneously.

M. Record no-load reading of each weighing cell, as soon as aircraft is on floor and weighing cells are no longer in contact with aircraft jack fittings, by accomplishing following:

(1) Place cell selector to Cell No. 1 position.

(2) Set Initial Load Selector to "0".

(3) With Cell Balance Switch "on", adjust Add Initial Load Knob until balance needle reads "0".

(4) Read weight indicated on scale window.

(5) If no-load reading of any cell exceeds +100/-50 pounds (+45.4/-22.7 kg), aircraft must be reweighed.

NOTE: A positive reading is to the right of "0" and a negative reading to the left of "0".

(6) If no-load readings do not exceed +100/-50 pounds (+45.4/22.7 kg), proceed to Paragraph 4.M.(7).

(7) If there is a positive reading, divide by two and record this value in weighing cell correction box on Aircraft Weight Record Form, preceded by a minus (-) sign. (Positive values are subtracted from weighing cell reading to determine net weight.)

(8) If there is a negative reading, record this reading in weighing cell correction box on Aircraft Weight Record Form preceded by a plus (+) sign. (Negative readings are added to weighing cell reading to determine net weight.)

(9) Perform Paragraph 4.M.(1) through Paragraph 4.M.(6) for number 2 and 3 cells and record readings.

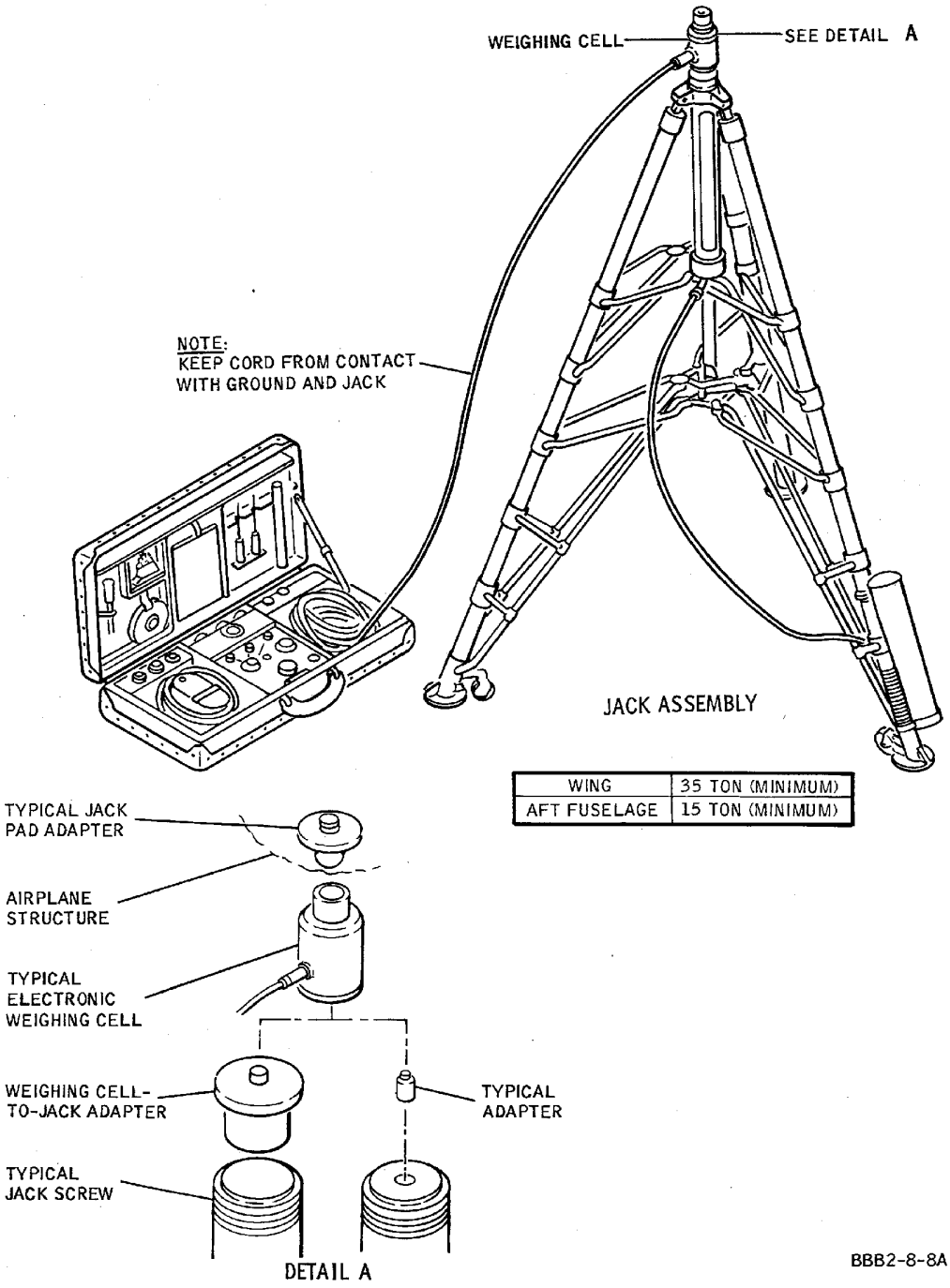
N. Stow leveling plumb bob.

O. Remove weighing cells and stow weighing equipment.

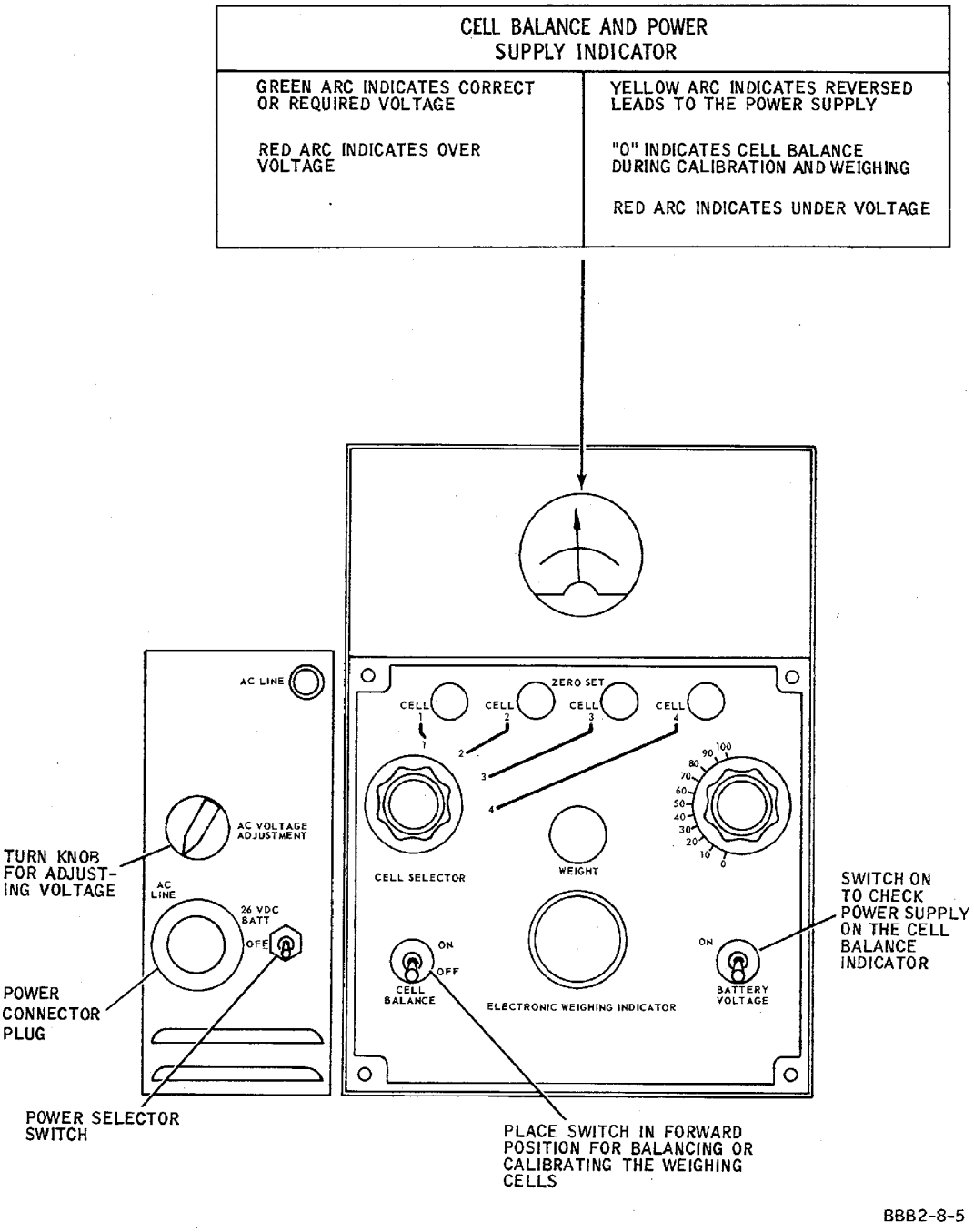
P. Install aircraft adapters on jackscrews.

Q. Remove and stow aircraft jack fittings.

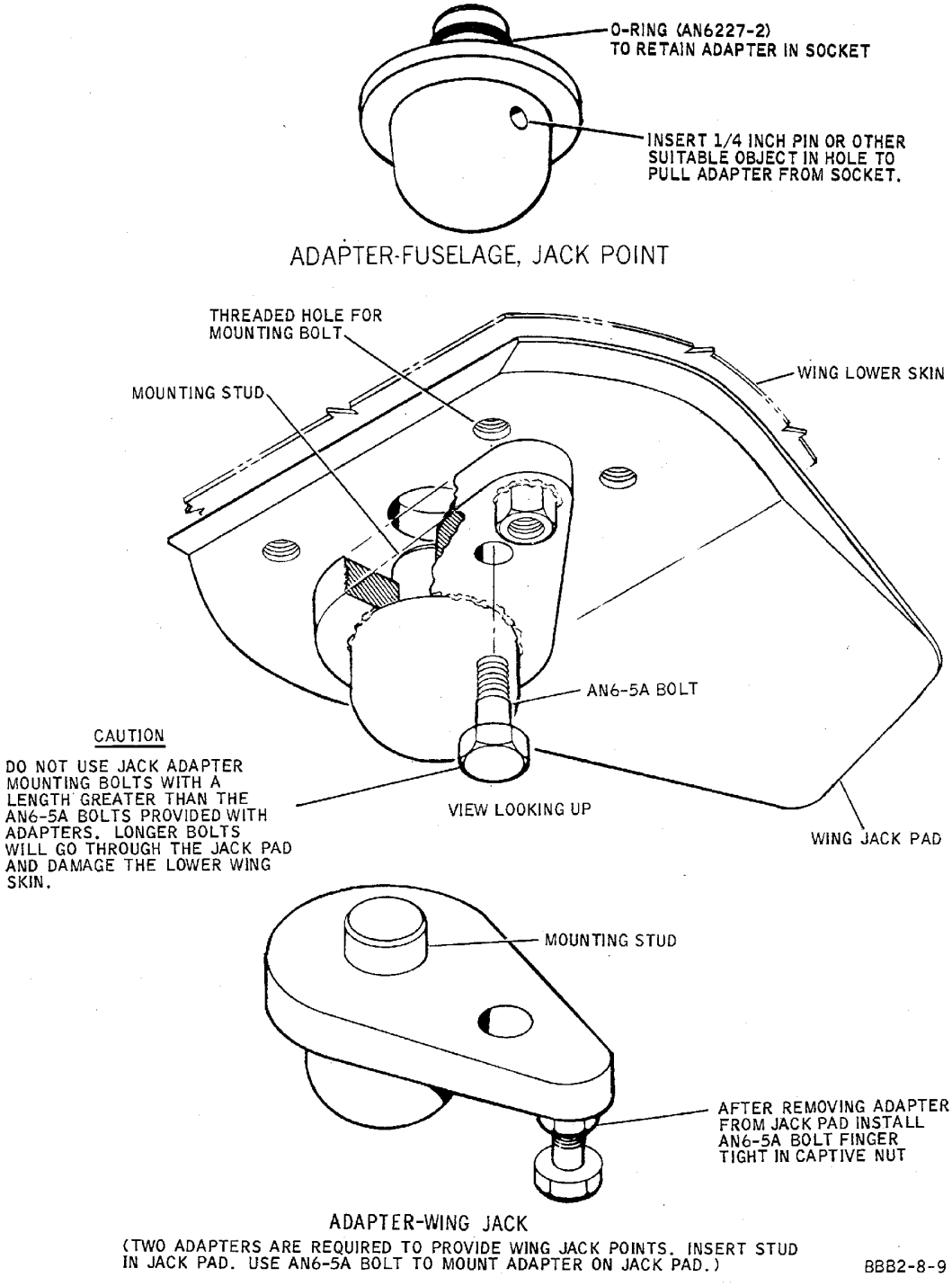
R. Check landing gear strut height and service as required.



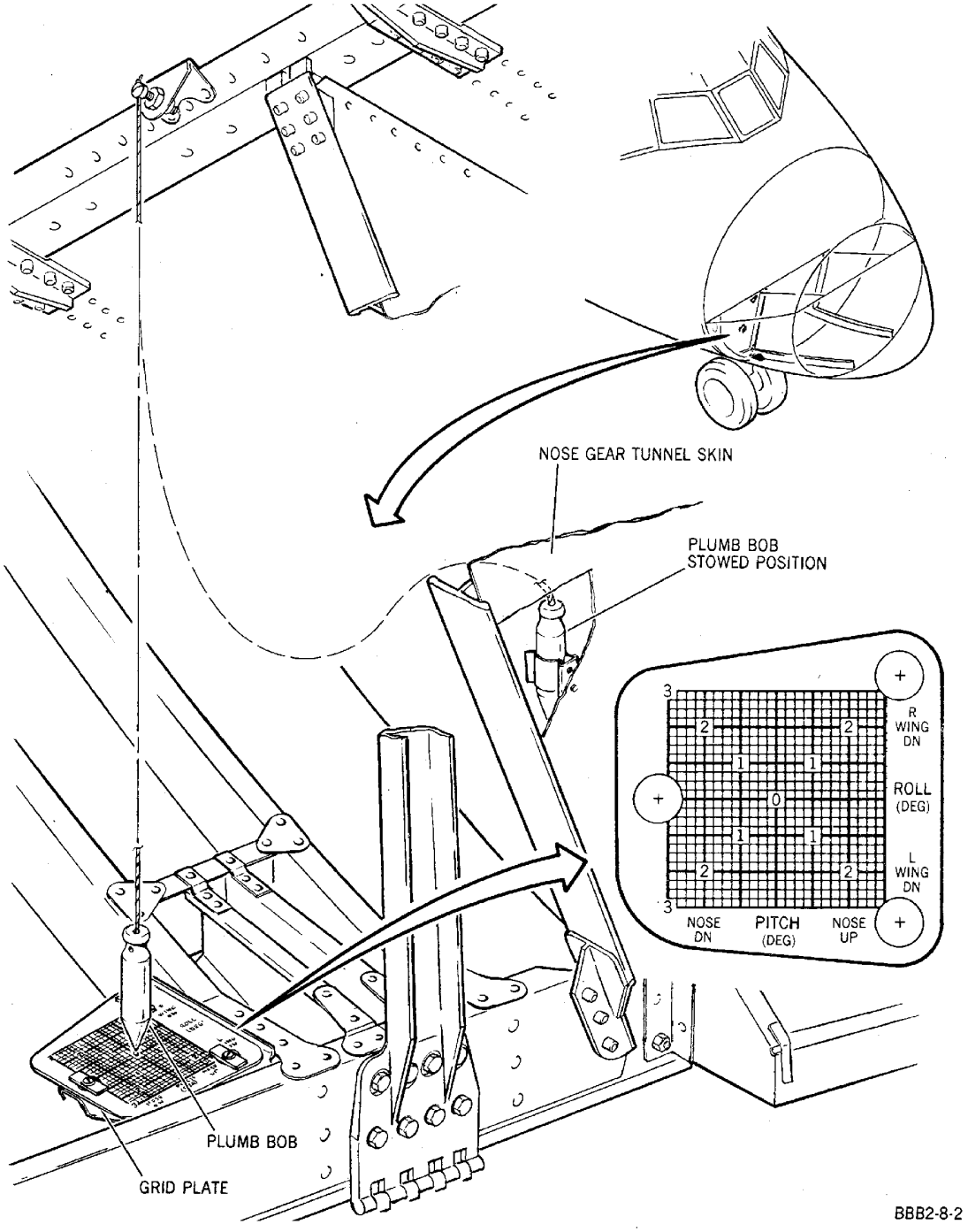
Weighing Equipment -- Wing and Aft Fuselage Method
Figure 201/08-20-00-990-803



Aircraft Electronic Weigh Kit
Figure 202/08-20-00-990-804



Aircraft Jack Adapters
Figure 203/08-20-00-990-805



Leveling Inclinometer Location
Figure 204/08-20-00-990-806

5. Weighing Instructions Using Platform Scales

A. The following procedure outlines the method for weighing the aircraft on portable or floor level platform scales. The scales may be mechanical beam or electronic. Follow weighing equipment manufacture's operating instruction.

B. Weighing

(1) Zero the platform scales prior to putting the aircraft on the scales. All undesirable tare should be off the scales.

(2) Position the aircraft on the scales. The approach should be straight and the aircraft should be brought slowly and smoothly to a stop, without applying aircraft brakes.

(3) Inflate or deflate landing gear oleos as required to obtain the desired longitudinal attitude. Check the attitude with the plumb bob. (Figure 204)

NOTE: A plumb bob is stowed in the nosegear well and a hook or clip is located directly above the grid plate. An inclinometer grid plate is built into the basic structure on the right side of the nosewheel well.

(4) Record landing gear oleo extensions.

(5) Record weight reading obtained from each aircraft weight reaction point.

(6) Remove the aircraft from the scales.

(7) Check the scales for zero load condition.

(8) Repeat weighing procedure as needed to verify aircraft weight.