JetWeigh
Aircraft
Weighing Kits

PERFORMANCE THROUGH PRECISION

INSTRUCTION MANUAL

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ISO 9001 Certified

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Revere Transducers
Electronic
Aircraft Weighing Kit

INTRODUCTION

This handbook provides information on the operation of the JetWeigh series aircraft electronic weighing kits manufactured by Revere Transducers. It includes technical information relating to the solid state circuitry plus routine troubleshooting data.

The kits have been designed primarily for the weighing of aircraft and aerospace vehicles, but can be used for other precision weighing applications, as well as for the calibration of force generating machines. The kits have been calibrated using Revere's dead weight machines. These machines are maintained to better than ±0.001% with respect to the nominal weight value. The degree of uncertainty for all of the individual weights is approximately ±0.005% with respect to true values. All readings are corrected to standard "g" as required by MIL-W-7327C.

The JW-600 kit is calibrated on Revere's high capacity precision hydraulic transfer standard. On completion of this calibration, the JetWeigh data is verified on the dead weight machine up to the 100,000-lb. point. Maximum acceptable deviation between the transfer standard and dead weight data is ±0.05%. Both the dead weight machine and the transfer standard are secondary standards and are directly traceable to NIST.

It is recommended that the kit be returned to the factory for routine calibration every twelve (12) months or sooner if trouble is observed or erroneous readings are suspected.

The load imposed on a load sensor produces an output signal directly proportional to the load applied. The signal is transmitted through connecting cables to the JetWeigh enclosure mounted in the case where the weight is read directly. Analog load sensor signals are processed digitally to remove linearity and latitude errors prior to display. Presentation in pounds or kilograms is selectable by the operator pressing the UNITS key. An integral printer provides a permanent record of all pertinent weighment information including any deviations that are accepted by the operator.

The Revere Transducers JetWeigh series aircraft weighing kits are Year 2000 Compliant. The operation of the JetWeigh series aircraft weighing kits are not impacted in any way by the year 2000.

A. DESCRIPTION

Each kit contains the necessary equipment for weighing an aircraft with the exception of specialized jacks and a power source. The kit may be operated on 110 VAC or 230 VAC, 50/60 Hz single phase. This feature is field selectable. Operation is also possible on 10 to 32 VDC. A power cord is supplied for each input power level.

1. ELECTRONIC WEIGHT COMPUTER

The JetWeigh system is accessible for maintenance and may be removed from the case. All circuits are solid state and are composed of the highest reliability components available. This circuitry is contained in an RFI/EMI shielded, stainless steel dust-proof box to protect the instrumentation from possible adverse environmental conditions encountered during the operation of the kit. Power and sensor cables are plugged in through RFI filtered receptacles on the left side of the box.

2. SENSORS

The kit contains from 3 to 5 hermetically sealed strain gage load sensors. These sensors are precision devices and will withstand 150% overload without damage. Dropping the sensor however, could damage the electrical connector, the diaphragm, or other components affecting its operation or accuracy.

Although the sensors provided with each kit appear identical, they are not interchangeable. Each must be connected to the kit observing the color-coding. The load sensors have a tapped hole on the bottom to receive a plug or a ring jack adapter. The top surface has a ¾" radius concave surface to receive either the spherical surface of an adapter or the aircraft jack pad directly. (See Figure 1.)

3. CABLES

The three to five 50 or 75-foot load sensor cables are reeled and stored in the case when not in use. Three power cables are provided; a 25 foot 110 VAC cable, a 25 foot 230 VAC cable, and a 15-foot DC cable. When using DC input, the black wire is positive (+). See Table I for parts listings.

4. ADAPTERS

For the purpose of mounting load cell sensors under varying physical arrangements, several adapters are provided (See Figure 1):

a) Plug and ring adapters for securing the cell to the hydraulic jack.

b) Spherical adapters to allow interfacing transition between the cells and conical jack pads or flat surfaces

c) Axle adapters which allow transition from the cell to the cylindrical surface of the axle.

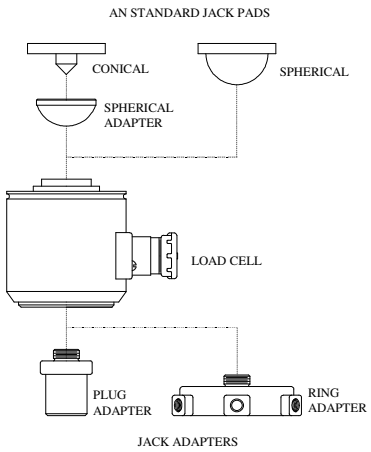


FIGURE 1

5. ACCESSORY EQUIPMENT

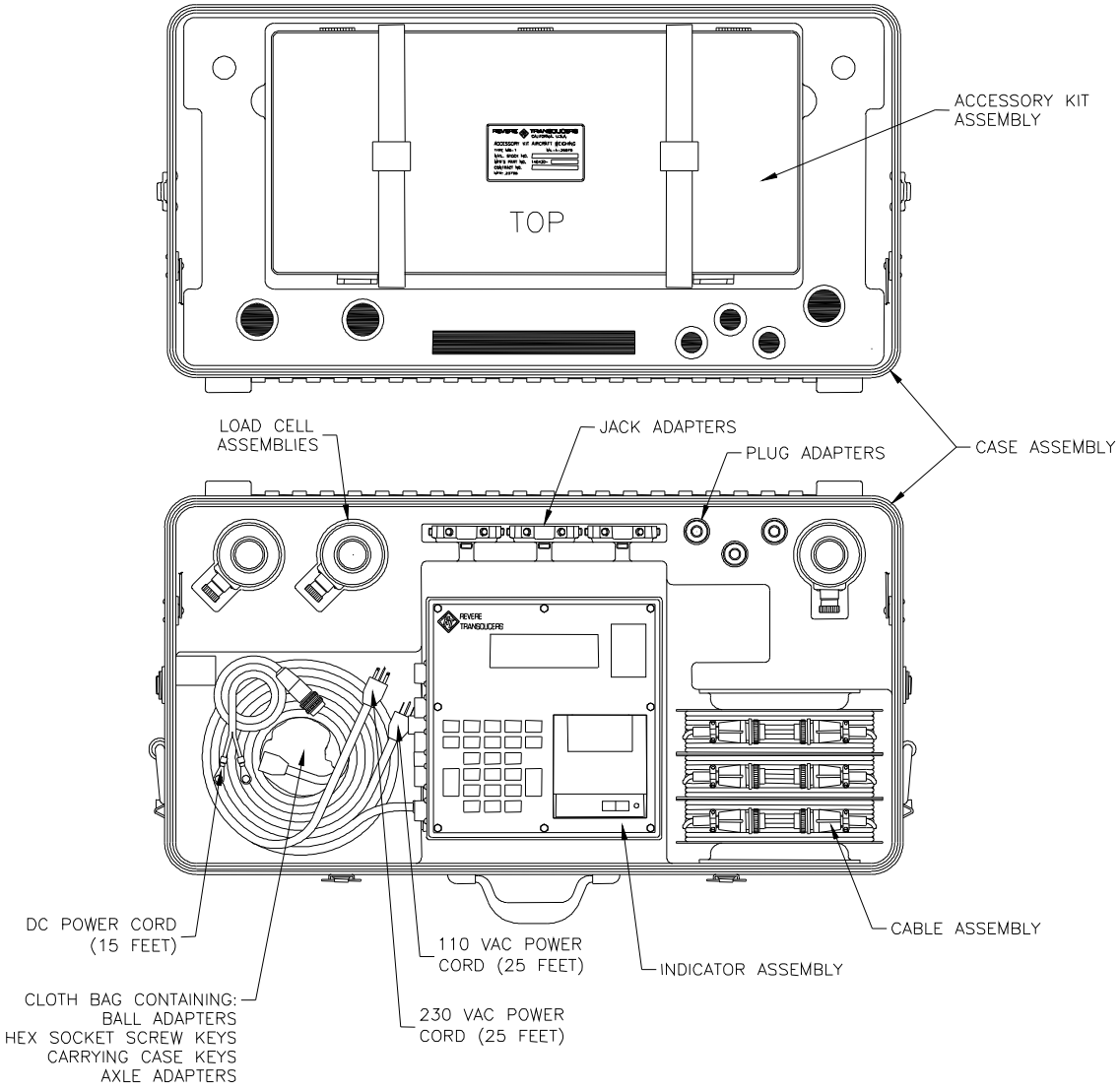
For the single case kits, the accessory equipment is stored in the upper lid of the kit. For kits over 400,000 lbs., accessory equipment is stored in various carrying cases. See Figures 2, 3 and 4.

6. WIDE BODY AIRCRAFT WEIGHING KITS

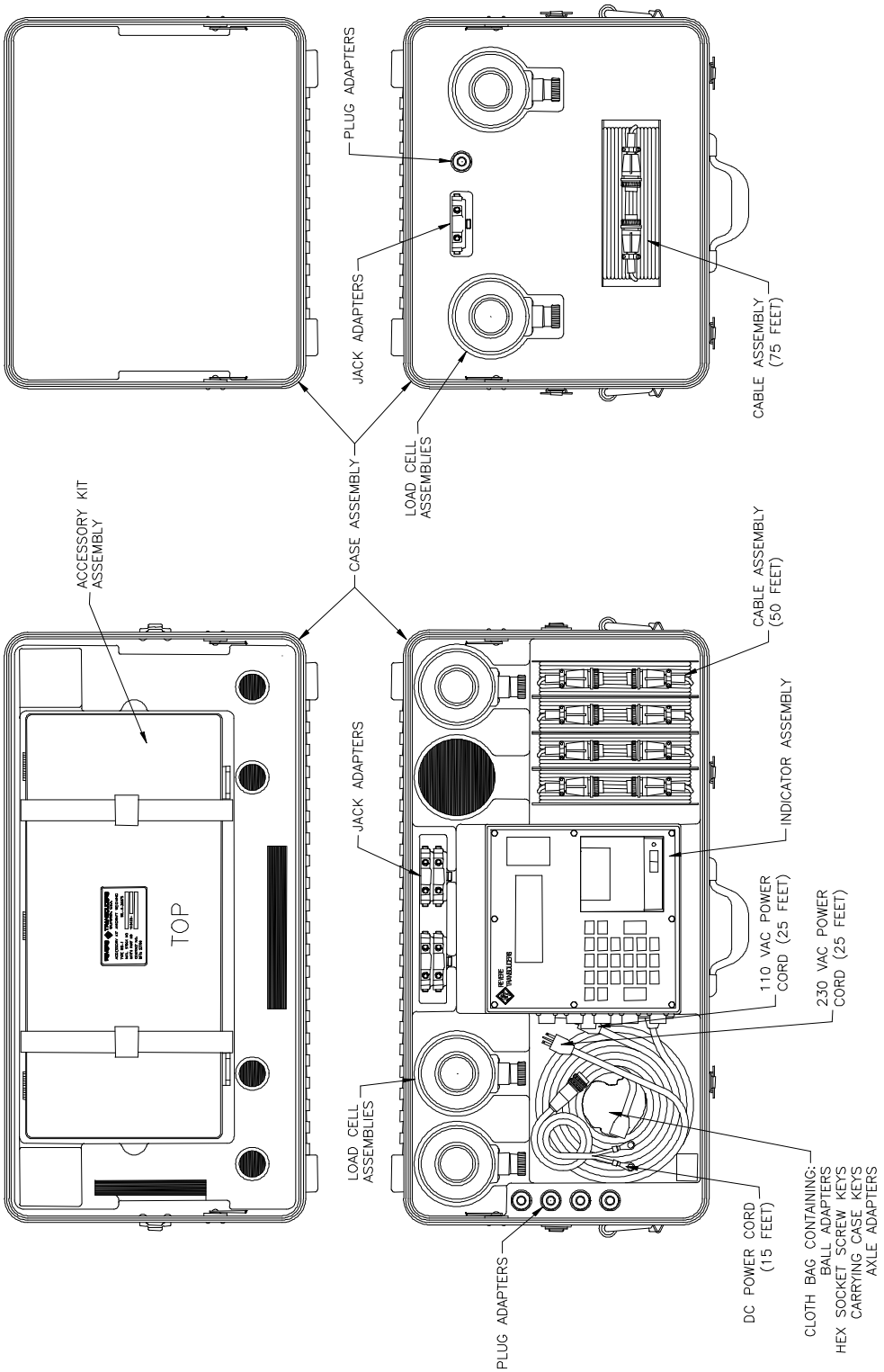
Weighing kits are offered in higher capacities for the wide body jet aircraft. The choice of these kits is primarily dependent on the jack types available and existing customer maintenance procedures. For example, a wide body aircraft may be weighed by supporting two of the four bogies each with two 100,000 lb. capacity cells and the nose with one 100,000 lb. capacity cell. This requires the JW-500 kit. Alternatively, these aircraft can be weighed by the JetWeigh kit utilizing two 200,000 lb. capacity cells at the wing roots near the leading edge and the third 200,000-lb. capacity cell at the tail. Revere recommends axle jack weighing techniques.

Due to the size and weight of the wide body JetWeigh kits, they are housed in two (2)-carrying cases to maintain portability. Figure 3 provides a listing of the equipment furnished. The operation of these kits, however, is identical with that of the lower capacity kits.

7. FIGURE 2 -- JetWeigh STANDARD CONFIGURATION



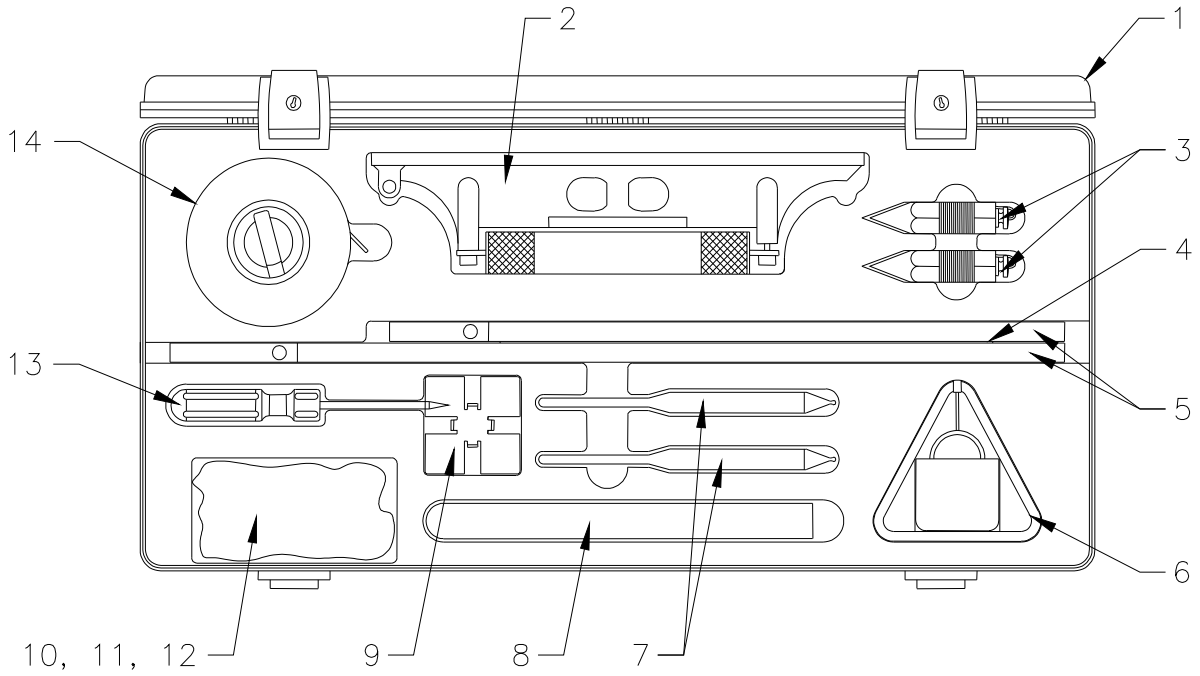
8. FIGURE 3 -- JetWeigh WIDE BODY CONFIGURATION



9. FIGURE 4 -- ACCESSORY KIT CONFIGURATION

140430-00 ACCESSORY KIT, CONSISTING OF:

ITEM	PART NO.	DESCRIPTION	QTY
1	140439-00	Case Assembly	1
2	320131-00	Level	1
3	64990	Plumb Bob Assembly	2
4	320069-00	Rule, 1 Foot	1
5	145997-00	Leveling Bar	1
6	102104-00	Fuel Dipper	1
7	102113-01	Hydrometer	2
8	302112-00	Hydrometer Jar	1
9	102264-00	Hydrometer Base	1
10	320051-00	Bag	1
11	320049-00	Chalk	1
12	600398-00	Chalk Line	1
13	320134-00	Screw Driver, Standard	1
14	140283-00	Steel tape, 50 Foot	1



B. PRE-OPERATIONAL PROCEDURES

1. Place the kit in any convenient location within the length of the load sensor cables. Unreel the sensor cables and connect them to the proper sensors, observing color codes; i.e., red to red, yellow to yellow, etc. On some models the fifth (white) channel cable will be longer (75 ft.). This cable and cell combination is dedicated to the nose wheel. All kits can be configured by the operator from the keyboard for 1 or up to the maximum channels provided for each kit. This feature provides stabilization of unused channels without connecting load cells, and will allow the kit to be used in weighing applications involving less than 3 load cells.

⇨ CAUTION ⇦
CELLS AND CABLES ARE NOT INTERCHANGEABLE

It is also important to insure that cables are never pinched or cut, and that open connectors are never exposed to water, grease or other conductive material that may cause shorting of the channel excitation voltage. This could lead to permanent circuit board damage.

⇨ CAUTION ⇦
The main AC fuse must be replaced with a 1-amp fuse for 230 VAC operation prior to applying power. The kit is configured for 110 VAC operation with a 2-amp fuse, standard from the factory.

2. If AC mains are used as a power source, connect the associated 25-foot AC power cable between the AC receptacle on the left side of the indicator and the source of power. The small indicator on the power input receptacle must agree with the AC voltage applied. The input may be set for 110 or 230 volts. See section F, part 2 (POWER LEVEL SELECTION OR FUSE REPLACEMENT) for instructions if a change is required.

3. If DC power is used, connect the 15-foot DC power cable between the DC receptacle on the left side of the indicator and the source of power. Observe the correct polarity. Damage will not occur with incorrect polarity, however, the equipment will not operate. No additional switching is required to operate on DC input power. ***Power is applied to the indicator when the power source is turned on and plugged in. There is no On/Off switch.***

4. Allow the equipment to warm up for approximately 20 minutes.

C. PREPARATION FOR WEIGHING AIRCRAFT

1. Review the Equipment List of the aircraft being weighed. Update the list as required. Make sure the particular equipment, which will normally be installed, but is missing at the time of the weighing, is added in the later calculations.

2. Remove all equipment, which will not be included in the above list.

3. Clean the aircraft to remove accumulated dirt, grease and trapped water.

4. Fill the oil tanks to a known quantity. Fill all reservoirs, such as anti-icing fluid, to capacity.

5. Drain fuel tanks. If draining is not practical, fill the tanks to capacity. Add or account for unusable fuel.

6. Determine the unit weight of fuel. Obtain a sample from the fuel tank with the supplied fuel dipper and pour the sample into the test tube. Using the hydrometers, the weight of fuel in pounds per gallon can be observed. Variations in fuel weight, particularly in the case of jet aircraft, can cause appreciable difference in the final empty weight and CG determinations. Be alert for partially filled non-symmetrical fuel tanks.

7. With tricycle gear aircraft, it is often desirable to level the aircraft as closely as possible before lifting on the jacks. Changing oleo strut extensions can do this.

8. A stabilizing period of 20 minutes running concurrently with warm-up period is advisable. When using jack adapters, be sure the adapter is fully threaded into the cell. With ring adapters, make sure it is centered flush on the ram before tightening the setscrews.

⇨ CAUTION ⇦
USE PROPER ADAPTERS TO PREVENT JACKS FROM SLIPPING OR BUCKLING. DAMAGE TO THE AIRCRAFT OR INACCURATE WEIGHT READINGS MAY RESULT IF IMPROPER ADAPTERS ARE USED. NEVER APPLY LOAD TO THE RIM OF THE CELL

9. It is recommended that the load sensors be exercised prior to performing an actual weighment. Exercise the load sensors 2 – 3 times by lifting the aircraft with the load sensors and jacking system in place.

10. The JetWeigh is programmed to identify left, right, nose, or the sum of both sensors on a bogie. This requires that specific channels (sensors) be

dedicated to a specific location when preparing for a weighment. These location identifiers will normally appear on the printout. However, they will not appear during 1 and 2 channel operation. Table I shows the required layout for various configurations.

TABLE I. Channel Configuration

3 SENSORS		
Channel I	(RED)	LEFT
Channel 2	(YEL)	RIGHT
Channel 3	(BLU)	NOSE

4 SENSORS	HELICOPTERS	FIXED WING
Channel I (RED)	FWD LEFT	LEFT
Channel 2 (YEL)	FWD RIGHT	RIGHT
Channel 3 (BLU)	AFT LEFT	NOSE
Channel 4 (ORN)	AFT RIGHT	SPARE

5 SENSORS	
Channel I (RED)	LEFT (1)
Channel 2 (YEL)	RIGHT (1)
Channel 3 (BLU)	LEFT (2)
Channel 4 (GRN)	RIGHT (2)
Channel 5 (WHT)	NOSE

D. WEIGHING / OPERATING PROCEDURE

I. SETUP

The JetWeigh Aircraft Weighing Kit will perform several self-diagnostic tests when power is applied. When power is applied, after a short time for self-diagnostics, the display will read

```
REVERE TRANSDUCERS
AIRCRAFT WEIGHING KIT
```

The checkout includes the printer printing the word “READY”, followed by a line feed (tape advance). When the entire checkout is complete, the display indicates channel capacity for this particular kit. Typically,

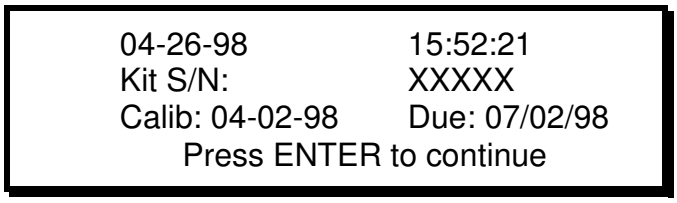
```
Channel Capacity:
1) XXXXXX Lbs.    2) XXXXXX Lbs.
3) XXXXXX Lbs.

Press ENTER to continue
```

A note about general operation of the JetWeigh. There are 5 keys located below the display that are not labeled. These are referred to as “soft” keys. They are “soft” because their functions or meanings change depending on the current weighing or data entry sequence in use during the weighing procedure.

Frequently the display will ask the operator if the data is to be changed. The operator should respond by pressing the YES or NO soft keys.

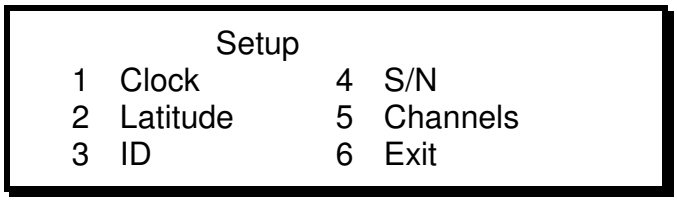
Additionally, the large ENTER key will be used like an accept key and the large ESCAPE key will be used to terminate a function.

The display will remain in this mode until the operator presses the ENTER key.



The top line presents month, day, year, hour and minute. Next is the kit serial number followed by the month and year of last calibration and the due date for the next calibration. Press ENTER to continue.

In the setup mode the operator is presented with several options for changing the information that will be printed on the weighment record.



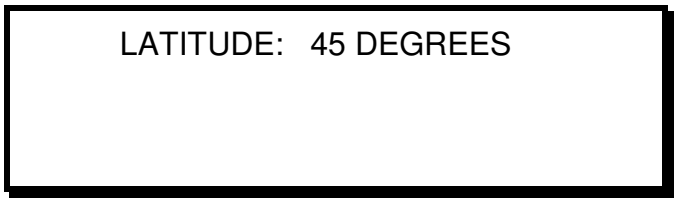
Select a number to change any settings. When finished, select #6.

a) CLOCK

The clock has an on-board maintenance, free, 10-year lithium battery to keep the clock running while the scale is unplugged. Selecting #1 will remind the operator how to access the password-protected menu to change the clock. To change the clock, hold the ESCAPE key for 5 seconds. When the display prompts for a password, key in 111 and press ENTER.

Press the first soft key, which is labeled CLOCK. Key in the hour and press ENTER. ***(Use 24-hour format)*** Then key in the minutes and press ENTER. Key in seconds and press ENTER. Key in year, all four digits. Key in the number of the month and press ENTER. e.g. 6 represents June. Key in day of month and press ENTER. Key in the day of the week. e.g. 3 represents Tuesday. When done, press the soft key labeled EXIT.

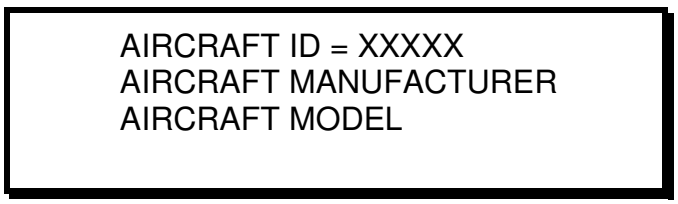
b) LATITUDE



"45 DEGREES" is a default maintained in the JetWeigh memory. The degrees may be adjusted up or down in five (5) degree increments to compensate for the difference in weight at the weighing location. The input of the nearest latitude value allows the JetWeigh to perform the correction computation automatically. (This function was previously required of the operator after weighment was completed and an arithmetic correction factor obtained from the table affixed to the case was applied.)

If a change is required, press the YES key, then key in the new latitude and press ENTER. If not, press NO.

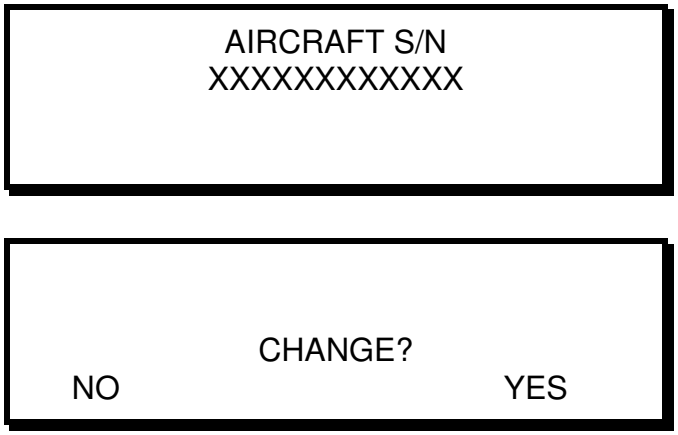
c) AIRCRAFT ID



If a change is required, press the YES key, then key in the new ID and press ENTER. The ID is the reference number in the back of this manual for the aircraft the is to be weighed. If no change is required, press NO.

Section J. Table I, provides a list of aircraft programmed into your JetWeigh system. Identify the aircraft type to be weighed and enter the corresponding code number into the keypad (see section H). Press ENTER. The information will be stored and the screen will advance to the aircraft S/N screen. ***If the aircraft is not listed, press ENTER without entering a number and the JetWeigh will prompt for the entry of the aircraft information.***

d) SERIAL NUMBER



If a change is required, press the YES key, then key in the new serial number and press ENTER. If not, press NO.

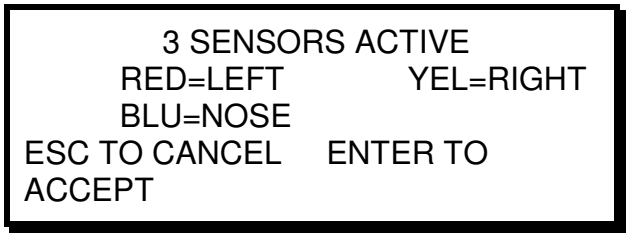
Twelve (16) alphanumeric characters may be entered into this field to identify the aircraft being weighed. To use alpha characters or special characters, user the CHR↑ key to select the desired character and then press ADV→ to move to the next character position. Press ENTER to store the S/N and exit to the SETUP menu.

e) CHANNEL RECONFIGURATION

Channel reconfiguration allows the operator to select, via software, which sensor is to be used for a given channel. You are not required nor should you physically relocate each sensor***. You must leave them connected per their color assignment.***

Keep in mind that the unique weigh location on the print out, (Left, Right, Nose, and Tail) is fixed with each channel location and can't be changed. Only the sensor location can be changed. Please refer to page 26, figure 5.

While in setup, enter #5 from the keypad. The following reconfigure screen will appear



The top line indicates the current sensor configuration.

> **NOTE:** All kits will initialize configured at their maximum channel number, i.e., a 5 sensor kit will always be set to 5 channels when power is applied.

To change the number of sensors, press ESCAPE. The display will prompt with the color, you key in the number according to the table below. To delete a sensor, key in the digit "0" instead of 1-5. To accept the number as shown, just press ENTER. *When a sensor is turned off, it will still be displayed, but with a reading of 0 LBS. On the printout, it will show the sensor as being "OFF".*

Once finished assigning the sensors to channels, you will be returned to view the sensor assignments and asked to accept them or change them again.

Sensor Assignments (Moveable via software only)

Typical 3 Sensor System	**Typical 4 Sensor System**	**Typical 5 Sensor System**
1 = L	1 = FL	1 = L (1)
2 = Rt	2 = FR	2 = Rt (1)
3 = Nose	3 = AL	3 = L (2)
	4 = AR	4 = Rt (2)
		5 = Nose

Sensor & Cable Color
(R) Red
(Y) Yellow
(B) Blue
(G) Green
(W) White

Example; On a 3 sensor system, the setup could be … The Scale prompts red, you key in 2 for the Right hand sensor. The scale prompts yellow, you key in 1 for the left hand sensor. The scale prompts blue, you key in 3 for the nose gear.

You are then returned to the WEIGH MENU

```
        WEIGH  MENU
  1  WEIGH        2  CG
  3  HISTORY      4  SETUP
```

You may return to setup again if necessary to re-edit your setup by selecting option “4”.

2. WEIGHING AN AIRCRAFT

NOTE: Prior to entering "1" (Weigh Mode), it is important that all load interface adapters/fixtures be in place. *Sensors with or without fixtures should never be in contact with the aircraft until after the "Lift Aircraft" message is displayed.* The JetWeigh will tare out any weight up to 2% of channel capacity. Weights exceeding 2% will force an error message, and a return to the mode screen.

Before weighing the aircraft, the user must select a stability criteria. The stability criteria is defined as the threshold for each sensor. Threshold, being the maximum change in weight increments allowed on an acceptable weighment and the maximum zero return error allowed within a specified time frame. ***The stability criteria does in no way affect the overall accuracy of the aircraft weighing kit. It defines the capture range only.***

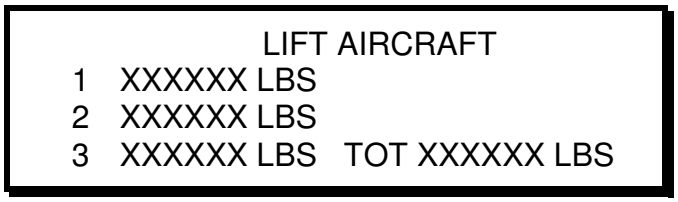
```
Select stability criteria:
      1 - Normal
      2 - Relaxed
      3 - User
```

There are three modes of stability criteria to choose from. “Normal”, "Relaxed" & "User”. The "Normal" mode is the default and recommended mode. The "Relaxed" mode increases the "Normal" mode threshold by a factor of 2. The "Relaxed" mode may be used in an environment where perhaps an aircraft is being weighed outside of a hangar and the Normal mode doesn't allow you to proceed through the automated weighing process. The 'User' mode has no threshold value or defined time for a capture range. When the "User" mode is applied, the Weighmaster determines when a weighment and zero return are acceptable. This is done manually by pressing the ENTER key to capture the weight. The stability criteria will be identified on the weighment printout.

a) After entering the Weigh Mode and having selected either "Normal", "Relaxed", or “User” under stability criteria, a three (3) second message will be displayed indicating that the sensors are being automatically zeroed. As mentioned above, any tare weight representing interface adapters, etc., will be subtracted from the sensor weight output at this time.

IF UNDER STABILITY CRITERIA, "USER" WAS SELECTED, PLEASE GO TO STEP “H”

The next screen will display the information shown below. A three-(3) channel instrument is shown. There may be up to five (5) channels plus total.



The "Lift Aircraft" message will continue to be displayed until the JetWeigh senses a minimum threshold weight on each sensor, and monitors stability for approximately 20 seconds.

When a load is imposed on each load sensor, the associated display will continuously indicate the weight value and the total weight value will be, calculated and displayed.

b) After a stable reading is obtained from all channels for a brief period of time, the "Lift Aircraft" prompt will automatically change to

```
    READING IS STABLE
1   XXXXXX LBS
2   XXXXXX LBS
3   XXXXXX LBS   TOT  XXXXXX LBS
```

The instrument will hold at this point until either the operator accepts the weighment by pressing ENTER or the scale is disturbed by some external force causing the reading to change, which in turn will return the JetWeigh to the "Lift Aircraft" mode.

The operator must be satisfied that the weighment is valid in addition to the instruments "stable" prompt. Operator acceptance takes into consideration factors such as: the aircraft is completely clear of the ground (floor) and all items aboard are accounted for, etc. The scale will enter the "stable" condition after an undisturbed period regardless of the amount of load applied. The operator is free to change the loading until a final weighment is acceptable on the display. Any outside force, wind on control surfaces, vibration, etc., may keep the scale from reaching a "stable" condition. ***It is important for the operator to exercise good judgment at this point. The scale can only recognize stability and has no way to confirm that loading is complete and acceptable.***

c) The operator may accept a weighment in two (2) ways. If the "stable" prompt is flashing, then press ENTER. If the 'Lift Aircraft" prompt is flashing then ESCAPE may be entered from the keypad. If ESCAPE is pressed, the tape printout will contain an error message. One of the two-(2) choices must be entered to proceed with the weighment.

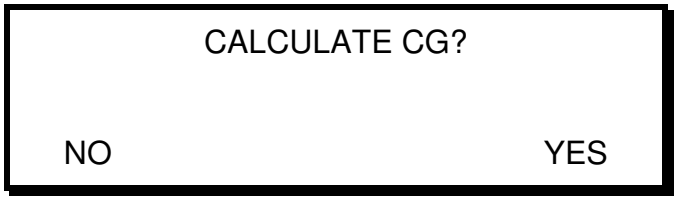
d) The next screen remains unchanged except for the first line. The prompt "LIFT AIRCRAFT" or "READING IS STABLE" changes to "REMOVE AIRCRAFT". At this point the aircraft should be lowered to remove the load from the sensors.

DO NOT REMOVE ANY INTERFACE HARDWARE. It is important that all load sensors are clear of the aircraft to provide a good zero return. The JetWeigh performs automatic checks to assure a good zero return and compensate for minor tolerance variations during zero return. If the return is not satisfactory for any reason, an error condition will result. The weighmaster must review all error messages and the data on the printout tape to decide if the weighment can be accepted or the aircraft must be re-weighed.

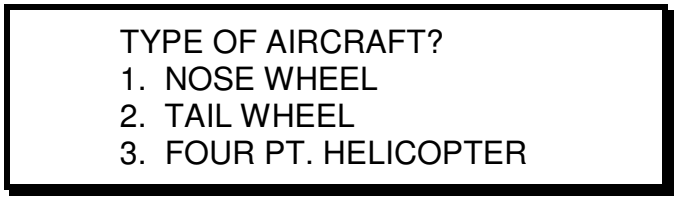
e) At the conclusion of the weighment the top line on the scale screen will indicate “Weighment Accepted" if a normal weighment was performed. Press ENTER to continue. If the ESCAPE key was used anywhere in the weighing process, the top line will indicate "Weighment Forced". The “Weighment Forced" screen must be exited by pressing the ESCAPE key.

f) The next screen will ask if the center of gravity is to be calculated.

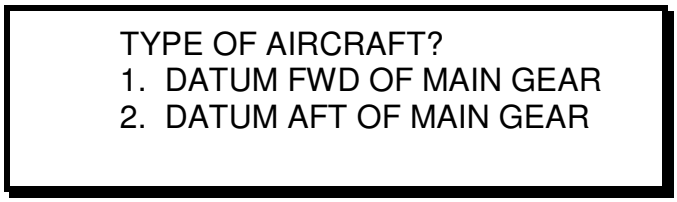
Please refer to Section L., Appendix 2 for the Center of Gravity formulas that are used to calculate the Center of Gravity.



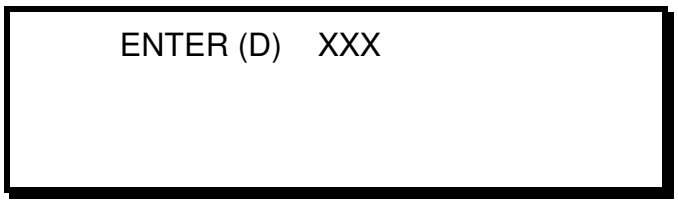
If the center of gravity is required, press the YES key, then key in the data as requested and press ENTER. If not, press NO.



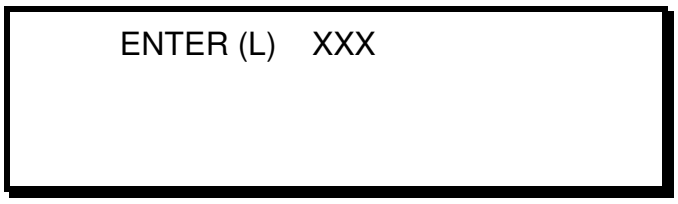
Select 1, 2, or 3. If you select 1 or 2 you will then see



Select 1 or 2 (See appendix 2 for assistance selecting the appropriate option)



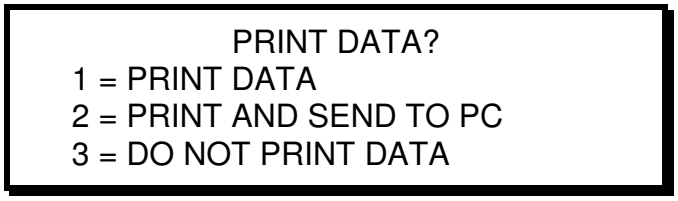
Press ENTER when done.



Press ENTER when done. (Again, see appendix 2 for questions on D or L)

NOTE: If you chose option 3, the four pt. helicopter type, you must enter 4 datum distances rather than 3 as shown above.

The next screen will allow the operator to select a print of the data and/or the transmission of the same data to a PC in ASCII text format.



NOTE: If for any reason, such as a printer paper jam or paper misfeed, and you need to print out the last weighment completed, you must enter the WEIGH MENU and go to #2 CG. Simply press NO, or YES if you want to recalculate the CG and this will automatically take you back to the print data screen. A reminder, 1) print data will only print out the last weighment that was done, only if power wasn't removed.

Option 2) PRINT AND SEND DATA TO PC will send the weighment information in a comma-delimited text format.

g) At this point, the weighment is complete and data is stored in memory. The operator is returned to the SETUP menu, ready to change data for the next aircraft.

h) The next screen will display the information shown below. A three-(3) channel instrument is shown. There may be up to five (5) channels plus total.

```
AUTO ZEROING ALL CHANNELS
```

Then

```
    LIFT AIRCRAFT
1   XXXXXX LBS
2   XXXXXX LBS
3   XXXXXX LBS   TOT XXXXXX LBS
```

The "Lift Aircraft" message will continue to flash until the weighmaster determines that the weighment is acceptable by pressing the ENTER key.

When a load is imposed on each load sensor, the associated display will continuously indicate the weight value and the total weigh value will be calculated and displayed.

```
    USER
1   XXXXXX LBS
2   XXXXXX LBS
3   XXXXXX LBS   TOT XXXXXX LBS
```

The weighmaster should ensure that the aircraft is clear of the ground and level at this point before proceeding by pressing ENTER.

i) The next screen remains unchanged except for the first line. The prompt changes to

```
    REMOVE  AIRCRAFT
1   XXXXXX LBS
2   XXXXXX LBS
3   XXXXXX LBS   TOT XXXXXX LBS
```

At this point the aircraft should be lowered to remove the load from the sensors. DO NOT REMOVE ANY INTERFACE HARDWARE. It is important that all load sensors are clear of the aircraft to provide a good zero return. When the weighmaster is satisfied with the zero return, press the ENTER key to proceed.

Return to step e) for the final instructions

3. HISTORY

If an operator wishes to see data for a previously weighed aircraft, select "3 HISTORY" from the WEIGH MENU.

The next screen will be:

```
        HISTORY MENU
    1. VIEW      2. ERASE
```

Choosing 1. will allow one to view and/or print a summary of previous weighings.

The screen will look like the following:

```
    ID:XXXXXXX  S/N XXXXXXXX
    CG:  XXXXXXXX
    TOTAL WT: XXXXXX
ENTER-NEXT   PRINT   ESCAPE-EXIT
```

Follow the instructions on screen to scroll through history, print, or leave the history menu.

If you want to print this screen, press the 

key.

If 2. is selected a confirmation screen will be displayed to verify the intent to erase all history. This operation is not reversible.

E. TECHNICAL INFORMATION

This section is intended to support and expand on the information presented previously in this manual. The JetWeigh® kit is not intended to be field maintained. Replacement of power cables or fuses will not affect accuracy. Other maintenance should be performed at a qualified depot or, preferably, the factory.

1. FACTORY SPECIFICATIONS

1. Overall Description:
   The Jetweigh Kit is a self contained, fully programmable, Intel microprocessor based weight indicator.
   The indicator is self-contained in a dust tight stainless steel enclosure, which in turn is mounted in a fiberglass carrying case along with the appropriate load cells, loading hardware, cables and accessories.
   The indicator panel contains a 24-key keyboard, a 32 x 128 dot vacuum fluorescent display capable of sharing all necessary indications during the force measuring process, and a 20-column dot matrix printer to print out results from the measurement process. A printout of data may be obtained at any time during the cycle. The system will also print any error messages identifying an abnormal situation.
   Information on the printout includes:
      1. Date and time
      2. Serial number and model number of unit
      3. Last calibration date
      4. Weighment units
      5. Latitude
      6. Aircraft I.D.
      7. Channel weight
      8. Total weight/center of gravity
      9. Error messages
   A calendar clock is provided to date and time stamp the measuring operation. This information is printed on each printout and displayed on the LCD display. An on board long life battery keeps the time and date running when the unit is not powered. The clock is set by means of the keyboard and display.
   On power up the unit guides the operator step by step using the display and keyboard entry.

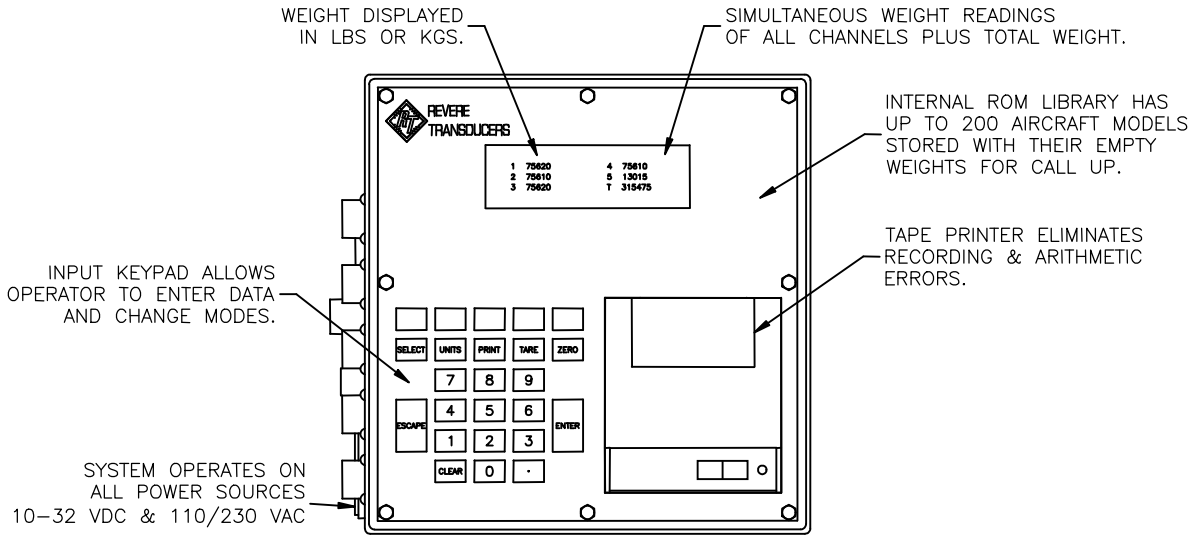
2. Indicator Configuration:
   Display: 1" H x 4.3" W vacuum fluorescent pixel graphic display (32 x 128 pixels)
   Keyboard: 24-Key keyboard, including 5 soft keys
   Printer: 20 Column dot matrix printer with full alphanumeric capability. The 64-character ASCII set of characters is used.

3. Environmental Characteristics:
   Temperature:
      Operating: 14ºF to +120ºF
      Storage: -60ºF to +165ºF
   Humidity: Up to 90% noncondensing
   EMI/RFI Susceptibility: CE approved.
   Construction: Indicator is packaged in a dust tight, rugged, stainless steel case, particular attention is given to ease of assembly, repair and calibration.
4. Performance Characteristics:
   The display indicates the channel and total weight continuously, updating its display approximately once every second during the weigh mode. This cycle continues as specified per the weigh mode selected
   Calibration: Span and linearity adjustments are controlled by software data in memory.
   Diagnostic Data: Diagnostic algorithms are used to evaluate indicator status. Resultant information will be displayed and/or printed. Power-on diagnostics include system test and load cell tests.
   Zero Shift Data Processing:
      Correction for zero return offset:
         If larger than ±.01% full scale, a "poor zero return" message will result.
   Accuracy: ±0.1% of reading or ±0.02% of capacity, whichever is greater.
      Accuracy includes:
         1. Repeatability error
         2. Linearity error
         3. Zero vs. Time = 1 Hour
                  vs. Temperature Change of 10ºF
            Span vs. Time = 6 Months
                  vs. Temp +14ºF to +120ºF
   Sensitivity: .01% F.S. (Resolve one digit)
   Inputs: Channels: 1 - 5
      Channel Rating: (Typical)
         1. 0.4 to 4.0 mV/V
         2. Load cell excitation, 10 VDC or 10 VAC square wave.
   Primary Power: (Any one of the following)
      1. 10 to 32 VDC
      2. 110 VAC @ .50 A
      3. 230 VAC @ .25 A
   Outputs: Visual and Printer tape
            Com port: RS232 serial port for PC interface.

5. Physical Characteristics:
   Size: Max 20" wide x 34" long x 9" deep A/B

2. INSTRUMENT FEATURES

The JetWeigh® instrument with its major features highlighted below, and printed tape example illustrates the results of a typical wide body jet weighment. An error message has been included to indicate a possible format.



SAMPLE PRINTOUT

TIME AND DATE SET/RESET FROM KEYBOARD. CLOCK & RAM POWERED BY INTERNAL 10 YEAR LITHIUM BATTERY

LB/KG SELECTED BY KEYBOARD. AUTOMATIC DEFAULT TO LBS.

LATITUDE SELECTION FROM 0° TO 90° BY KEYBOARD. AUTOMATIC DEFAULT TO 45° VALUE.

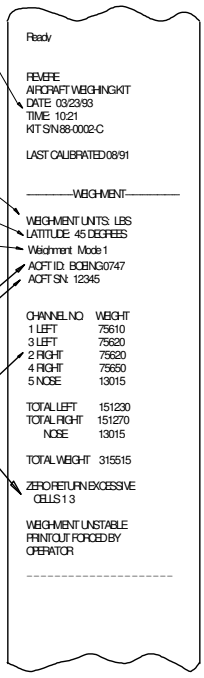
STABILITY CRITERIA.

AIRCRAFT ID SELECTED BY KEYBOARD FROM MEMORY LIBRARY.

AIRCRAFT ID NO. ENTERED FROM KEYBOARD.

WEIGHT DATA - UP TO 5 CHANNELS DEPENDING ON KIT MODEL.

LOCATION FOR ERROR MESSAGES.
a) OPERATOR FORCED PRINTOUT.
b) UNSTABLE WEIGHMENT.
c) POOR ZERO RETURN.
d) PRINTOUT ABORTED.
e) SYSTEM DIAGNOSTIC FAILURE.



F. MAINTENANCE

OVERVIEW

Equipment should be kept free of dirt and grease. Dust caps should be kept on the electrical receptacles of the load cells when not in use.

Only routine maintenance and minor repairs are recommended on the aircraft weighing kits. Calibration of the kits requires highly specialized equipment including standards and/or dead weight testing facilities. It is recommended that the kits be returned to the factory on a annual basis for calibration and re-certification or sooner if trouble is observed or erroneous readings are suspected.

INSPECTION

The technician who receives the aircraft weighing kit should note the kit serial number and model number before a complete inspection is started.

A receiving report, issued by the end user, should be used to record the condition of the kit and its internal parts. Also, a complete inventory of the kit should be taken at the time of receipt. Page 9 and Section H (pages 35-37) list the equipment that is to be found in the aircraft weighing kits. Replacement parts can be ordered directly through the Factory.

1. PRINTER

Field maintenance consists of changing printout tape and ribbon. Both are accessible by removing the plastic covers on the printer.

To replace the printer ribbon, press down on both sides of the paper tape exit slot in the area of the small marked squares. The forward edge of the tape cover will pop up. Grasp the front edge and gently lift to remove the cover. The ribbon cartridge is identified by its black color. It is removed by pressing down on the right edge over the word "push". The left side will pop up allowing gentle removal. To install a replacement, reverse the process. The exposed ribbon goes on top of the paper tape. The exposed end of the paper tape may be pulled out longer to facilitate passing the ribbon in front of it. **DO NOT TRY TO REWIND THE PAPER ON THE ROLL OR THE PRINTER WILL BE DAMAGED.**

If the printer continues to print illegibly after ribbon replacement, the new ribbon may be defective. A simple test will determine this. Remove the ribbon cartridge, hold the left side with one hand, gently turn the notched wheel in the direction of the arrow by pressing a rubber pencil eraser on the notched area and turning. The exposed portion of the ribbon should move.

Table I contains replacement ribbon information. It is suggested that replacement ribbons be obtained locally.

To replace the paper tape, grasp the clear plastic cover by the front center and rear face center. Pull gently upwards.

Remove the tape cover as described above. Cut the remaining roll and pull the paper remaining in the printer forward. **NEVER PULL THE PAPER BACKWARD OR THE PRINTER WILL BE DAMAGED.**

Trim the new paper roll straight. Insert and hold in the paper compartment feed slot. Push the "paper feed" button on the printer to feed paper into printer. Twelve (12) line feeds will result. Guide the paper between the ribbon and the ribbon cartridge. Insert through the slot in the tape cover and reinstall the tape cover. Reinstall the clear plastic cover. See Table III for paper roll replacement information. It is suggested that paper supplies be obtained locally.

2. AC POWER LEVEL SELECTION OR FUSE REPLACEMENT

⇨ CAUTION ⇦

The main AC fuse must be replaced with a 1-amp fuse for 230 VAC operation prior to applying power. The kit is configured for 110 VAC operation with a 2-amp fuse, standard from the factory.

a) Select the power cord with the correct wall socket interface.
b) Observe the small indicator on the power inlet receptacle. The indication must be set to 110 VAC or 230 VAC to conform to the supply available.
c) Insert a small blade in the top center slot on the receptacle and pry down and out.
d) Reset the indicator to 110 or 230 as required.
e) The fuse may be replaced if defective by pulling the black plastic clip outward.
f) Make sure the drum is secure in its hub and close the cover by pressing inward on the top.

3. TABLE I - PRINTER SPARE SUPPLIES

Printer Ribbon Cartridge		**Epson ERC-09**
Printer Paper Roll		**Texas Inst. PL-52 (3 roll box)**
or	**REVERE TRANSDUCERS 14192 FRANKLIN AVE. TUSTIN, CA 92680-7016 (MINIMUM ORDER APPLIES)**	

G. TROUBLESHOOTING GUIDELINES

The following guidelines are provided to correct possible failures relating to improper operation of the kit.

TROUBLE	PROBABLE CAUSE	ERROR MESSAGE	REMEDY
Kit inoperative for DC use.	DC fuse blown.	None	Replace DC fuse on side of kit.
Kit inoperative for AC use.	AC fuse blown	None	Replace AC fuse inside power receptacle.
Kit inoperative with power applied.	Incorrect power applied to kit.	None	Verify correct power level selection.
Printer doesn't work.	Loose connection or hardware failure.	Printer Not Ready	Cycle power and allow the kit to perform a system check. Verify internal connection. Return to Factory. Replace Printer by authorized repair station.
During the Weigh Mode, the kit never passes the zero return verification.	Faulty cable. System never initiated auto-zero mode.	None. The computer will stay in checking zero return mode forever, unless forced into next mode of operation by user.	Initiate weigh mode again. Verify all cables and connectors are secure. Weigh the aircraft using a different stability criteria. If cable or connector is found bad, replace.
Weight of aircraft is made by forced printout only.	Unstable conditions external to aircraft such as high winds. User isn't allotting the required times for the computer to complete each task during the Weigh Mode.	Weighment Unstable Printout Force By Operator	Verify all load cells in the system are connected. Verify all cables and connectors are secure. Weigh aircraft again using a different stability criteria. Weigh aircraft in hangar if excessive wind.

TROUBLESHOOTING GUIDELINES (Continued)

Display doesn't work.	Loose connection or hardware failure.	None.	Check the power & ribbon connectors to the display. Return to Factory. Replace Display Assembly by authorized repair station.
Excessive zero return during the Weigh Mode.	Excessive weight on load cells after aircraft has been lowered. Load Cell is going bad. Faulty load cell cable.	Zero Return Excessive	Verify the aircraft is not touching the load cell when it is lowered from the jacks. Verify all connections. Watch the display to isolate which channel may be causing the problem and then proceed to verify the cable and load cell is okay. Return to factory.
Load Cell reading is unstable.	Loose connection. Bad load cell or faulty cable. Unstable conditions.	Weighment Unstable	Verify all cables and connectors are secure. Try weighing the aircraft using a different stability criteria. Return to Factory.

1. TROUBLESHOOTING HINT

For channel isolation purposes, even though load cells are not interchangeable, swap the suspected load cell or cable with another and re-weigh the aircraft. If the problem travels to the new channel, then the load cell or cable that was exchanged is bad. If the problem doesn't travel, then there is a problem with that particular channel of the instrument and it is recommended that the kit be returned to the factory for repair.

This method of isolation can be used to narrow down the root cause of most problems.

2. ERROR MESSAGES

System Check Error 1	Internal Ram Test Failure
Zero Return Excessive.....	Zero Return Not Within Limits Compared With Zero at Start of Weighment
Weighment Unstable.....	Consecutive Weighment Readings Not Within Limits
Printout Forced By Operator	May Not Indicate A Scale Failure Can Be Caused By External Forces

3. AIRCRAFT WEIGHING KIT LOAD CELLS

Table I & Table II can be used for load cell trouble shooting guidelines along with figure 1. Load Cell resistance testing should include measuring and verification of R_{in}, R_{out} & Insulation Resistance.

Use only a precision, calibrated digital multi-meter with a measuring accuracy of $\pm$ 0.5Ω and $\pm$ 0.1mV, to measure the integrity of the load cell bridge circuit. For insulation resistance measurements, a megohmmeter capable of measuring 5000 MΩ with an accuracy of 500 MΩ at 50 volts. *Megaohmmeters, which supply voltages greater than 50 volts could cause permanent damage.*

Should any measurements be outside the specified tolerances and the aircraft weighing kit indicates one or more system problems, it is recommended that you contact the factory for repair.

Table I. Load Cell Specifications

CAPACITY lb.	INPUT RESISTANCE Ω	OUTPUT RESISTANCE Ω	INSULATION RESISTANCE Meg Ω (Max)	BRIDGE SYMMETRY Ω(1)	RATED OUTPUT mV/V (2)	Zero BALANCE %F.S. (3)
5,000	546 ± 5	480 ± 5	5000	≤ 3.5	2.295 ± 0.205	±1.0
10,000	450 ± 5	480 ± 5	5000	≤ 3.5	0.800 ± 0.1%	±1.0
25,000	450 ± 5	480 ± 5	5000	≤ 3.5	2.000 ± 0.1%	±1.0
50,000	450 ± 5	480 ± 5	5000	≤ 3.5	2.000 ± 0.1%	±1.0
100,000	450 ± 5	480 ± 5	5000	≤ 3.5	2.000 ± 0.1%	±1.0
200,000	450 ± 5	480 ± 5	5000	≤ 3.5	2.000 ± 0.1%	±1.0

Notes:

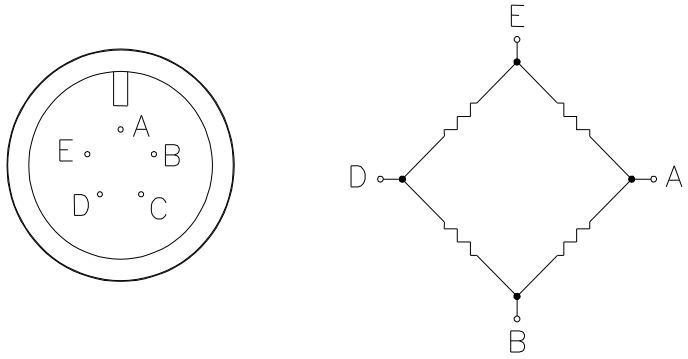
1) Bridge symmetry is measured by attaching one lead of a DMM to pin E (+input) & measure the resistance difference between Pin A (-output) & pin D (+output). The difference between these two measurements is the bridge symmetry.
2) Provided for reference only. Verification is only possible using dead weight standards as outlined in the introduction (page 4).
3) Measured in mV/V as a % of F.S., (Full Scale), (i.e. with an excitation voltage of 20 VDC (max.) & measuring a 50,000 lb. load cell, the maximum output with no load applied would be 0.400 mV, @ 20 VDC excitation.)

4. AIRCRAFT WEIGHING KIT LOAD CELL PIN ASSIGNMENTS

Table II. Load Cell Pin Assignments

Pin	*Description*
A	***- Output***
B	***- Input***
C	***Load Cell Housing***
D	***+ Output***
E	***+ Input***

FIGURE 1. Load Cell Pin Out & Basic Schematic



H. PARTS LISTINGS

TABLE I. Cable Parts

Part Number	Description	Quantity
64000-01	Load Cell Cable, 50'	1 per cell
64000-02	Load Cell Cable, 75'	1*
607608-00	Power Cable, 110V, 15'	1
607609-00	Power Cable, 230 VAC	1
607610-00	Battery Cable	1
140138-02	Load Cell Cable Reel, 50’	1 per cell
140138-03	Load Cell Cable Reel, 75’	1*

*Used only for nose gear in a Wide Body Jet Aircraft Weighing Kit.

TABLE II. Computer Assembly Spare Parts

Description	Part Number
Printer Assembly	31123
Printer Tape	607441-00
Printer Ribbon Cartridge (Epson P/N ERC-09)	607441-01
Keypad Assembly	63706

TABLE III. Aircraft Weighing Kit Equipment

Model	JW 15	JW 20	JW 30	JW 40	JW 75
Part Number	64001-00	64001-01	64001-02	64001-03	64001-04
No. of Cells	3	4	3	4	3
Cell Capacity	5000	5000	10,000	10,000	25,000
Kit Capacity lb.	15,000	20,000	30,000	40,000	75,000
Load Cell	155910-00		ACLC-D3-10K-C5P5		ACLC-D3-25K-C5P5
Load Cell Material	Epoxy Painted Steel		Stainless Steel		
Instrument	64974-03	64974-04	64974-03	64974-04	64974-03
Case Assembly	155802-01	155899-01	155802-01	155899-01	155802-01
Spherical Adapter*	105832-00				
Ring Adapter*	102106-00				
Plug Adapter*	102108-00				
Axle Adapter**	102110-00				

Model	JW 100	JW 150	JW 200	JW 300	JW 400
Part Number	64001-05	64001-06	64001-07	64001-08	64001-09
No. of Cells	4	3	4	3	4
Cell Capacity	25,000	50,000	50,000	100,000	100,000
Kit Capacity lb.	100,000	150,000	200,000	300,000	400,000
Load Cell	ACLC-D3-25K-C5P5	ACLC-D3-50K-C5P5		ACLC-D3-100K-C5P5	
Load Cell Material	Stainless Steel				
Instrument	64974-04	64974-03	64974-04	64974-03	64974-04
Case Assembly	155899-01	155802-01	155899-01	155812-01	155812-01
Spherical Adapter*	105832-00			105832-00	
Ring Adapter*	102106-00			140353-00	
Plug Adapter*	102108-00			140088-00	
Axle Adapter**	102110-00			N/A	

*One per Load Cell
**Two required
Figure 2 Section A, page 7 show an overview of these kits

TABLE IV. Wide Body Jet Aircraft Weighing Kits

Model	JW 425	JW 450	JW 500	JW 600
Part Number	64001-12	64001-13	64001-14	64001-15
No. of Cells	5	5	5	3
Cell Capacity, Mains	100,000	100,000	100,000	200,000
Cell Capacity, Nose	25,000	50,000	100,000	200,000
Kit Capacity lb.	425,000	450,000	500,000	600,000
Load Cell, Main	ACLC-D3-100K-C5P5			ACLC-D3-200K-C5P5
Load Cell, Nose	ACLC-D3-25K-C5P5	ACLC-D3-50K-C5P5	ACLC-D3-100K-C5P5	ACLC-D3-200K-C5P5
Load Cell Material	Stainless Steel			
Instrument	64974-05	64974-05	64974-05	64974-03
Case Assembly	155812-01	155812-01	155812-01	-
Spherical Adapter*	105832-00	105832-00	105832-00	162009-00
Ring Adapter, Main*	140353-00	140353-00	140353-00	-
Plug Adapter, Main*	140088-00	140088-00	140088-00	140088-00
Ring Adapter, Nose*	102106-00	102106-00	140353-00	-
Plug Adapter, Nose*	102108-00	102108-00	140088-00	140088-00

*One per Load Cell

Figure 3 Section A, page 8 show an overview of these kits

I. RECERTIFICATION OF JetWeigh AIRCRAFT SCALES

In accordance with Part 43, paragraph 43.13 of the FAA Regulations governing maintenance of aircraft, Revere Aircraft Weighing Scales are precision devices that require special equipment and test apparatus to periodically recertify their accuracy. Class "C" certified mass standards (±0.006% accuracy & corrected for gravity), assembled in a testing machine to provide incremental loads up to the rated capacity of the weight sensors are recommended.

The acceptable calibration tolerance for Revere Aircraft Scales is equal to one-half the published tolerance values, ±0.05% of the applied load or ±0.01% of channel capacity, whichever is greater.

A one-year certification period is recommended which is consistent with requirements for similar accuracy class scales used in commerce.

For complete assurance that the equipment is maintained within the published accuracy limits, it should be returned to Vishay Precision Group SI Onboard.

North America
Vishay PG SI Onboard
801 Sentous Ave
City of Industry CA 91748
USA
Tel: (626) 636-7500
Fax: (626) 332-3418

Europe
PM Onboard
Airedale House
Canal Road Bradford BD2 1AG
UK
PH: +44 (0) 1274 771177
FAX: +44 (0) 1274 781178

Web Site
http://www.Vishaypg.com

Accredited by the RvC,
Dutch Council for Certification
Certification No. 97-106

ISO 9001 Certified

J. TABLE I - AIRCRAFT ENTRY CODE NUMBERS

KEYPAD ENTRY NUMBER	MANUFACTURER	MODEL	AVERAGE EMPTY WEIGHT
0	Blank	Blank	Blank
1	Aerospatiale (AE)	ATR42	22000
2	Airbus (A1)	A300	195000
3	Airbus (A1)	A310	195000
4	Airbus (A1)	A320	86000
5	Beech (BE)	58	3481
6	Beech (BE)	58P	4026
7	Beech (BE)	C90A	6045
8	Beech (BE)	F90-1	6704
9	Beech (BE)	C99	6700
10	Beech (BE)	100	7112
11	Beech (BE)	200	7538
12	Beech (BE)	300	8290
13	Beech (BE)	400	10115
14	Beech (BE)	1900C	9100
15	Beech (BE)	2000	8916
16	Boeing (BO)	707-120	135000
17	Boeing (BO)	707-320	147000
18	Boeing (BO)	727-200	100000
19	Boeing (BO)	737-100	58000
20	Boeing (BO)	737-200	66000
21	Boeing (BO)	737-300	69400
22	Boeing (BO)	737-400	72700
23	Boeing (BO)	747-100	379000
24	Boeing (BO)	747-200	395400
25	Boeing (BO)	747-300	396000
26	Boeing (BO)	747-SP	334000
27	Boeing (BO)	747-400	394000
28	Boeing (BO)	757-200	126000

KEYPAD ENTRY NUMBER	MANUFACTURER	MODEL	AVERAGE EMPTY WEIGHT
29	Boeing (BO)	767-200	164000
30	Boeing (BO)	767-200ER	169000
31	Boeing (BO)	767-300	175400
32	Boeing (BO)	767-300ER	179400
33	Israel Aircraft (IS)	WWI	12300
34	Israel Aircraft (IS)	WWII	13250
35	Israel Aircraft (IS)	1125	12770
36	Sabreline (SA)	Sabreliner	14154
37	British Aerospace (BR)	BAC111	53000
38	British Aerospace (BR)	HS125	15120
39	British Aerospace (BR)	146-100	49000
40	British Aerospace (BR)	146-200	50400
41	British Aerospace (BR)	146-300	54000
42	British Aerospace (BR)	BAC31	7606
43	British Aerospace (BR)	BAC748	23000
44	Canadair (CAN)	600	23285
45	Canadair (CAN)	600E	23285
46	Canadair (CAN)	601	24585
47	Canadair (CAN)	212-100	7600
48	Canadair (CAN)	212-200	8333
49	Cessna (CE)	152	7577
50	Cessna (CE)	208	3800
51	Cessna (CE)	310	3500
52	Cessna (CE)	CONQ 1	4915
53	Cessna (CE)	CONQ II	5715
54	Cessna (CE)	CIT I	7150
55	Cessna (CE)	CIT II	7289
56	Cessna (CE)	CIT S11	8002
57	Cessna (CE)	CIT 111	11811
58	Dassault (DAS)	FAL 10	10760

KEYPAD ENTRY NUMBER	MANUFACTURER	MODEL	AVERAGE EMPTY WEIGHT
59	Dassault (DAS)	FAL 20	19000
60	Dassault (DAS)	FAL 50	19840
61	Dassault (DAS)	FAL 100	11145
62	Dassault (DAS)	FAL 200	18190
63	Dassault (DAS)	FAL 900	23402
64	Dassault (DAS)	HU25A	19000
65	DeHavilland (DE)	DHC5	25160
66	DeHavilland (DE)	DHC6-300	9700
67	DeHavilland (DE)	DASH 7	27690
68	DeHavilland (DE)	DASH 8	21590
69	Fokker (FO)	F-27	28090
70	Fokker (FO)	F-28	39000
71	Dornier (DO)	228-100	6570
72	Dornier (DO)	228-200	6803
73	Embraer (EM)	EMB-110	7915
74	Embraer (EM)	BRA120	14240
75	Fairchild (FA)	MER III	8450
76	Fairchild (FA)	MER IV	9250
77	Gates/Lear (GA)	25-D	7950
78	Gates/Lear (GA)	35-A	9571
79	Gates/Lear (GA)	55	12130
80	Gates/Lear (GA)	55XLR	12306
81	Gulfstream (GU)	G I	25000
82	Gulfstream (GU)	G II	39100
83	Gulfstream (GU)	G III	38000
84	Gulfstream (GU)	G IV	39300
85	Lockheed (LO)	L-1011-500	245000
86	Lockheed (LO)	C-130	75832
87	Lockheed (LO)	C-141	160000
88	Lockheed (LO)	C-5B	374000

KEYPAD ENTRY NUMBER	MANUFACTURER	MODEL	AVERAGE EMPTY WEIGHT
89	McDonnell Douglas (MD)	DC-8	165600
90	McDonnell Douglas (MD)	DC-9	62000
91	McDonnell Douglas (MD)	DC-10	271000
92	McDonnell Douglas (MD)	MD80	80563
93	Pilatus (P1)	Norman	3738
94	Mitsubishi (MI)	DIA I	9410
95	Mitsubishi (MI)	DIA II	9265
96	Saab-Fairchild (SA)	SF340	17415
97	Shorts (SH)	SD330	14750
98	Shorts (SH)	SD360	16490
99	Piper (PI)	CHEY II	4980
100	Piper (PI)	CHEY III	6240
101	MMB (MB)	BO105	2820
102	Aerospatiale (AE)	A300-600R	198000
103	Aerospatiale (AE)	ATR-72	27600
104	Boeing (BO)	727-100	100000
105	Boeing (BO)	757-223	126000
106	Boeing (BO)	767-223	169000
107	Boeing (BO)	767-223ER	169000
108	Boeing (BO)	767-323ER	180000
109	British Aerospace (BR)	JS3100	12000
110	British Aerospace (BR)	JS3200	12000
111	Fokker (FO)	F100	55000
112	McDonnell Douglas (MD)	DC10-10	245000
113	McDonnell Douglas (MD)	DC10-30	271000
114	McDonnell Douglas (MD)	MD83	81000
115	McDonnell Douglas (MD)	MD11	280000
116	Saab-Fairchild (SA)	2000	28000
117	Shorts (SH)	SD360-200	18000
118	Shorts (SH)	SD360-300	18000

KEYPAD ENTRY NUMBER	MANUFACTURER	MODEL	AVERAGE EMPTY WEIGHT
119	Bell	205	5300
120	Bell	205A1	5600
121	Bell	212	6100
122	Bell	206B	1700
123	Bell	206L-1	2300
124	Bell	412	6600
125	Pilatus (P1)	PC6B	2800
126	Pilatus (P1)	PC6C	2800
127	Sivel (SI)	SD3 30	18640
128	Shorts (SH)	SKYVAN	7400
129	NewCal (NE)	DHC4	18700
130	Fokker (FO)	F50	27600
131	Casa (CA)	CN-235	21600

K. APPENDIX 1 - ACCURACY VERIFICATION CONSIDERATIONS

Accuracy Verification

Prior to verifying accuracy of an aircraft weighing kit, it is important that:

a. the basis of the unit of measure of the test load being applied be accurately determined.

b. the latitude of the calibration site be accurately determined, and

c. the value of the latitude setting of the weighing kit's instrument at the time of reading be verified.

Force Versus Mass

The JetWeigh® Aircraft Weighing Kit operates as a mass measuring device. This is because the mass of the airplane must be accurately determined. There is a physical difference between the concepts of force and mass that is important to understand.

When a mass rests on a surface, it applies a force to that surface. The amount of force is proportional to the influence of gravity. If there is no influence of gravity, the force becomes zero, as in the case of an orbiting astronaut who experiences weightlessness. Nevertheless, the mass of the astronaut has not changed. Similarly, the mass of an airplane will not change, but the amount of force it applies to the weighing kit load cells will vary dependent on the actual influence of gravity at the site of the weighing operation. As the weighing kit is a portable weighing device, provisions have been included to allow for site gravitational variances.

Gravitational Variance on Earth

Because the Earth is spinning about its polar axis, the Earth is not a perfect sphere. The distance between the center of the Earth and its outer surface is greater at the Equator than at the Poles. The influence of gravity becomes less as the distance from the center of the Earth becomes greater. For this reason, the amount of force generated by an airplane on the weighing kit load cells will be less at the Equator than if the same airplane were placed on the load cells at either one of the Poles.

Provided the operator enters (via the kit instrument's keyboard) the correct latitude of the weighing site, the JetWeigh® Series Aircraft Weighing Kit will internally correct for gravity variation. It will then indicate the accurate mass of the airplane without the need for further correction.

Basis of Unit of Measure of Test Loads

In the English system of units, the unit "pound" is applied to both the measurement of force and the measurement of mass. To be complete, the unit should be further defined as either “pounds force” or “pounds mass”.

In the Metric system of units, the unit "Newton" is applied to the measurement of force and the unit "kilogram" to the measurement of mass. In practice, the unit "kilogram" is sometimes applied (incorrectly) to both the measurement of force and mass. In such cases, it is important to know whether the unit refers to "kilograms force" or "kilograms mass".

Basis of Weighing Kit Calibration

At calibration, JetWeigh® Aircraft Weighing Kits are adjusted in accordance with Military Specification MIL-W-7327C. This specification requires that the setting of 45° latitude must correspond exactly with the Standard Acceleration of Gravity ($g = 980.665\ cm/sec^2$).

Relationship Between Force and Mass

The relationship between force and mass is defined by Newton's Second Law, force is equal to mass multiplied by acceleration ($F = m \times a$). In this case, the acceleration is the influence of gravity and force equals mass multiplied by the acceleration of gravity ($F = m \times g$).

By definition, a one pound Standard Mass[1] is adjusted to produce one pound force when under the influence of Standard Gravity and in a vacuum (no air).

In practice, a weighing device is calibrated by applying a Standard Mass in air. The weighing device is adjusted to read exactly the face value of the Standard Mass. Accordingly, there is an additional relationship between force and mass, which results from the buoyancy of air.

When a one pound Standard Mass is applied under the influence of Standard Gravity in air, the force it produces is slightly less than when it is in a vacuum. The amount is:

$$1 \text{ pound mass} \times \frac{(8.0 - 0.0012)}{8.0} = 0.99985 \text{ pound force}$$

With the JetWeigh® Kit instrument set at 45° latitude, the application of 0.99985 pounds force to the load cell should result in a weight reading of exactly 1.00000 pound.

Likewise, with the JetWeigh® Kit located at a site where the influence of gravity is equal to Standard Gravity, and with the instrument set at 45° latitude, the application of a 1 pound Standard Mass to the load cell should result in a weight reading of exactly 1.00000 pound.

[1] A Standard Mass is one which has been adjusted on the basis of "apparent mass versus material of density 8.0 g/cm^3 in air of density 1.2 mg/cm^3".

Application of Force Unit Based Test Loads During Kit Verification

The relationship between test load applied and instrument reading will be dependent upon the instrument's latitude setting. As previously explained, with the instrument set to 45° latitude a test load of 0.99985 force units will result in an instrument reading of 1.0000. The amount of test load, which will result in an instrument reading of 1.0000 at other latitude settings, is as follows:

Latitude Setting	Test Load in Force Units	Instrument Reading
0	0.99716	1.0000
5	0.99720	1.0000
10	0.99732	1.0000
15	0.99752	1.0000
20	0.99778	1.0000
25	0.99810	1.0000
30	0.99848	1.0000
35	0.99890	1.0000
40	0.99934	1.0000
45	0.99985	1.0000
50	1.00026	1.0000
55	1.00071	1.0000
60	1.00112	1.0000
65	1.00150	1.0000
70	1.00183	1.0000
75	1.00209	1.0000
80	1.00229	1.0000
85	1.00241	1.0000
90	1.00245	1.0000

NOTE: The actual instrument reading will be subject to the resolution capability of the specific kit, dependent on channel capacity and weighing increment value.

Application of Mass Based Test Loads During Kit Verification

So long as the instrument latitude setting corresponds with the latitude of the site of application of mass basis test loads, the instrument reading should equal the test load value.

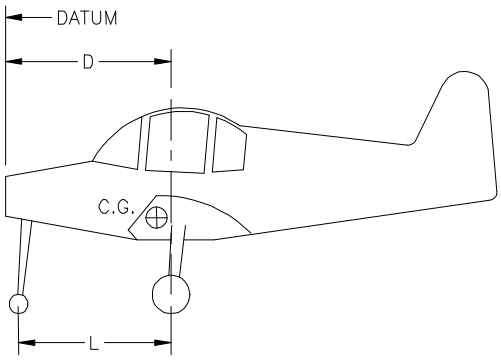
In the event that the instrument is maintained at its default setting of 45° latitude, and only under that condition, the instrument reading resulting from application of a 1.0000 mass unit test load is as follows:

Actual Site Latitude	Instrument Latitude Setting	Instrument Reading
0	45	0.9974
5	45	0.9974
10	45	0.9976
15	45	0.9978
20	45	0.9980
25	45	0.9984
30	45	0.9987
35	45	0.9991
40	45	0.9996
45	45	1.0000
50	45	1.0005
55	45	1.0010
60	45	1.0014
65	45	1.0017
70	45	1.0021
75	45	1.0023
80	45	1.0025
85	45	1.0026
90	45	1.0027

NOTE: The actual instrument reading will be subject to the resolution capability of the specific kit, dependent on channel capacity and weighing increment value.

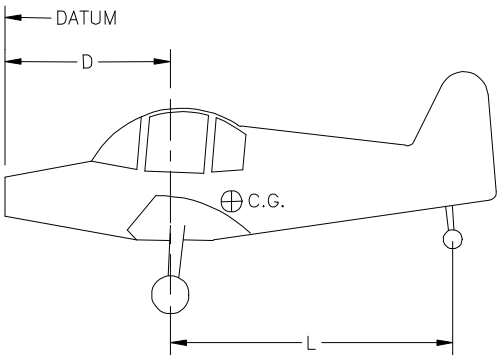
L. APPENDIX 2 – CENTER OF GRAVITY FORMULAS

Below are the center of gravity formulas used for nose & tail wheel aircraft.



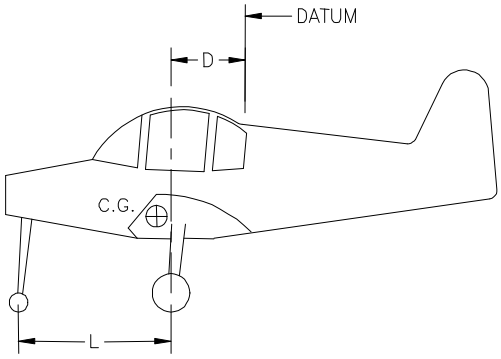
NOSE WHEEL TYPE AIRCRAFT
DATUM LOCATED FORWARD OF THE MAIN WHEELS

$$C.G. = D - \frac{F \times L}{W}$$



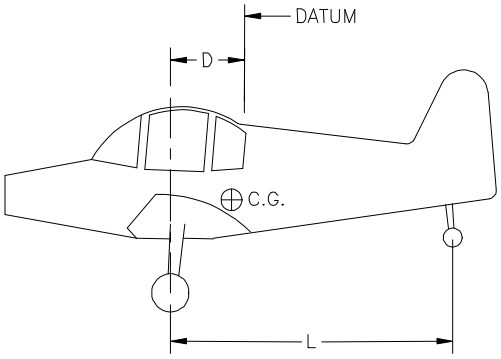
TAIL WHEEL TYPE AIRCRAFT
DATUM LOCATED FORWARD OF THE MAIN WHEELS

$$C.G. = D + \frac{R \times L}{W}$$



NOSE WHEEL TYPE AIRCRAFT
DATUM LOCATED AFT OF THE MAIN WHEELS

$$C.G. = -D + \frac{F \times L}{W}$$



TAIL WHEEL TYPE AIRCRAFT
DATUM LOCATED AFT OF THE MAIN WHEELS

$$C.G. = -D + \frac{R \times L}{W}$$

C.G. = DISTANCE FROM DATUM TO CENTER OF GRAVITY OF THE AIRCRAFT
W = THE WEIGHT OF THE AIRCRAFT AT THE TIME OF WEIGHING
D = THE HORIZONTAL DISTANCE MEASURED FROM THE DATUM TO THE MAIN WHEEL WEIGHING POINT
L = THE HORIZONTAL DISTANCE MEASURED FROM THE MAIN WHEEL WEIGHING POINT TO THE NOSE OR TAIL WEIGHING POINT
F = THE WEIGHT AT THE NOSE WEIGHING POINT
R = THE WEIGHT AT THE TAIL WEIGHING POINT

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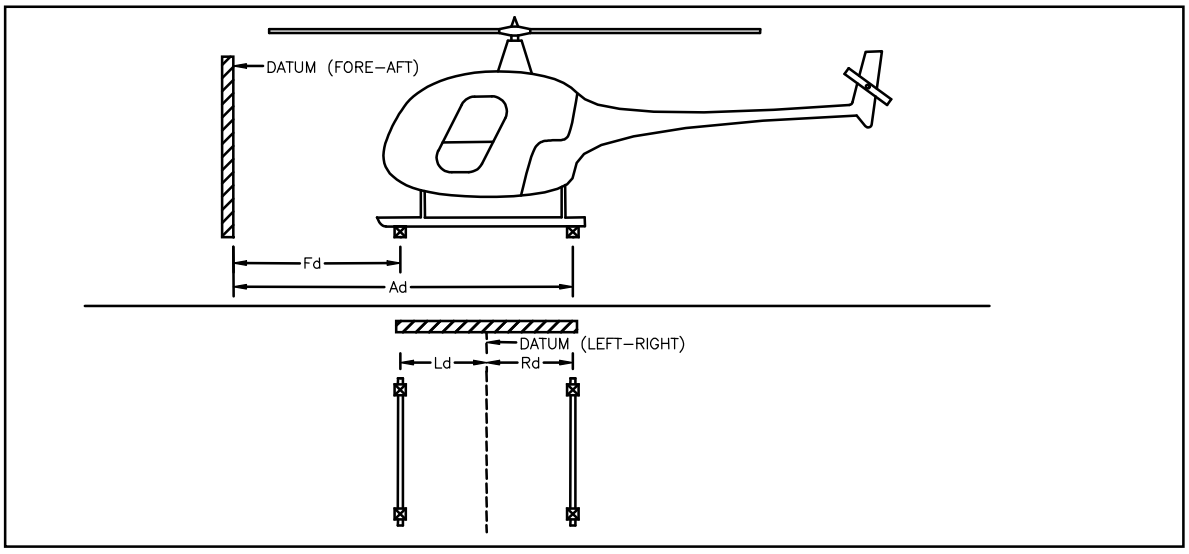
CENTER OF GRAVITY FORMULAS - CONTINUED

HELICOPTER 4 CELL FORMULA



Front to back CG calculation where F_d and A_d are distances to an arbitrary datum. All other variables are weights. The resulting distance is the distance from the reference point to the CG along the longitudinal axis.

$$(FORE-AFT)CG=\left[\frac{(FL+FR)(F_d)+(RL+RR)(A_d)}{(FL+FR+RL+RR)}\right]$$

Side to side CG calculation where L_d and R_d are distances to arbitrary datum. All other variables are weights. The resulting distance is the distance from the reference point to the CG along the horizontal axis.

$$(LEFT-RIGHT)CG=\left[\frac{(FL+RL)(L_d)+(FR+RR)(R_d)}{(FL+FR+RL+RR)}\right]$$

Variable	Meaning
F	Front
A	Aft
R	Right
L	Left

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