PERFORMANCE THROUGH PRECISION

JETWEIGH SERIES

AIRCRAFT
WEIGHING KITS

INSTRUCTION MANUAL

Doc # 607613 Rev. I.

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Electronic 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 ± 0.02% with respect to the nominal weight value. The degree of uncertainty for all of the individual weights is approximately ±0.0052% 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 the National Bureau of Standards.

It is recommended that the kit be returned to the factory for routine calibration every twelve (12) months, 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. The signal is transmitted through connecting cables to the weight computer 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. A menu driven display and keypad guides the operator through the selection process. An integral printer provides a permanent record of all pertinent weighment information including any deviations that are accepted by the operator.

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 100 to 130 VAC or 205 to 250 VAC, 50 to 400 Hz. This feature is field selectable. Operation is also possible on 22 to 28 VDC. A power cord is supplied for each input power level.

1. ELECTRONIC WEIGHT COMPUTER

The computer is accessible for maintenance and may be removed from the case. All circuits are fully solid state and are composed of the highest reliability components available. This circuitry is contained in an RFI shielded, dust-proof box to protect the instrumentation from possible adverse environment 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 3/4" 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 115V AC cable, a 25 foot 220 VAC cable, and a 15 foot DC cable. When using DC input the black wire is positive (+).

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.

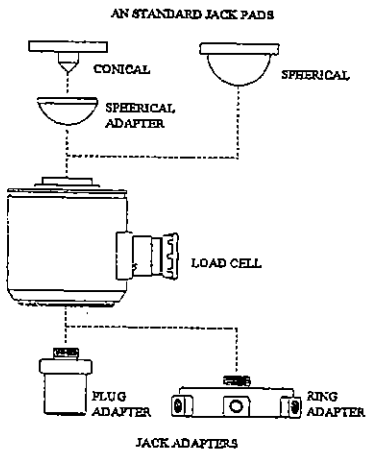


FIGURE 1

5. *ACCESSORY EQUIPMENT*

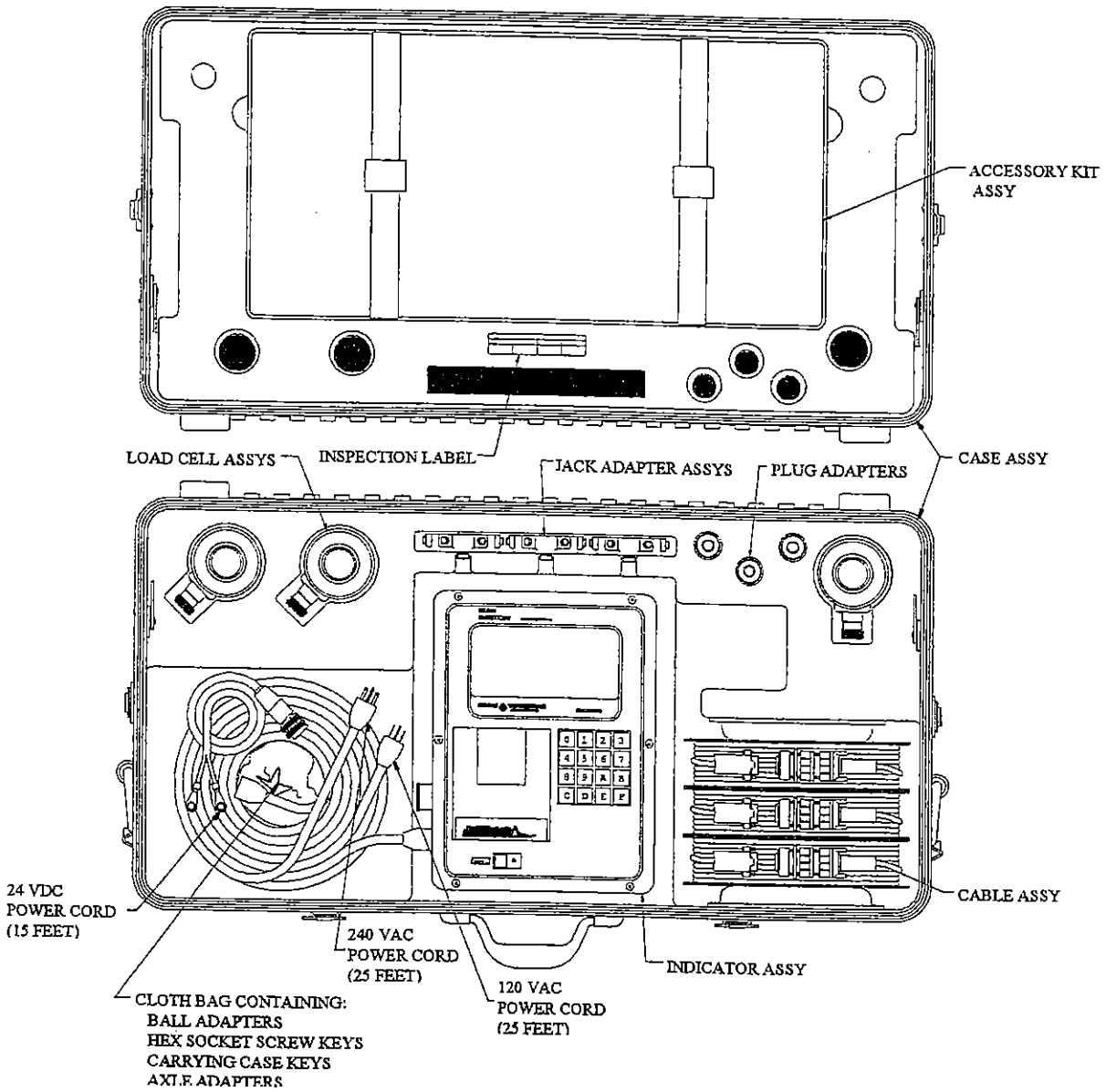
For the single case kits, the accessory equipment is stored in the upper lid of the kit. For kits over 400,000 lbs., accessory equipment is stored in various carrying cases. See Figures 1, 2 and 3.

6. *WIDE BODY AIRCRAFT WEIGHING KITS*

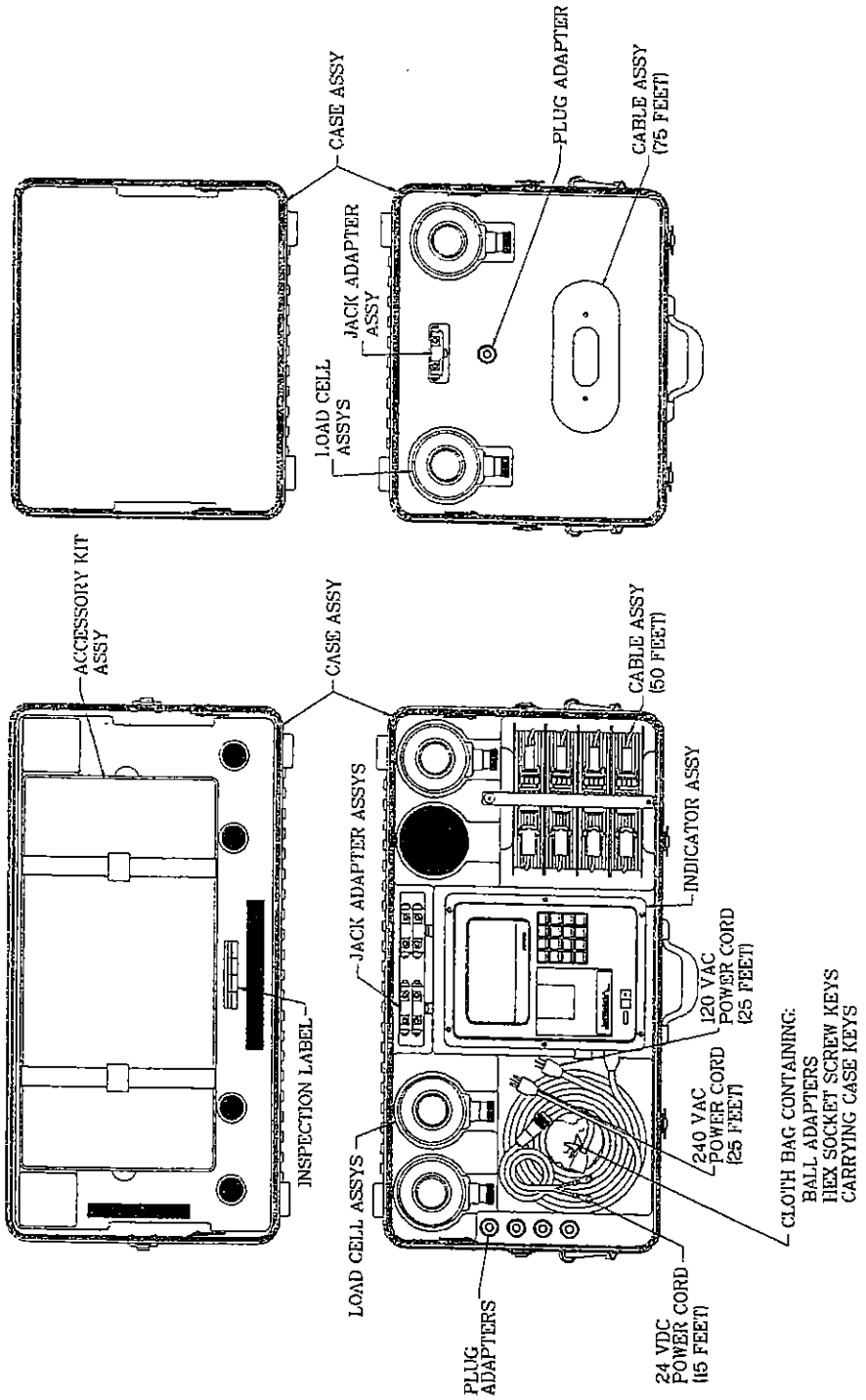
Weighing kits are offered in higher capacities for the wide body jet aircraft. The choice of these kits is primarily dependent on the jack types available and existing customer maintenance procedures. For example, a wide body aircraft may be weighed by supporting two of the four bogies each with two 100,000 lb. capacity cells and the nose with one 100,000 lb. capacity cell. This requires the JW-500 kit. Alternatively, these aircrafts can be weighed by the JW-600 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



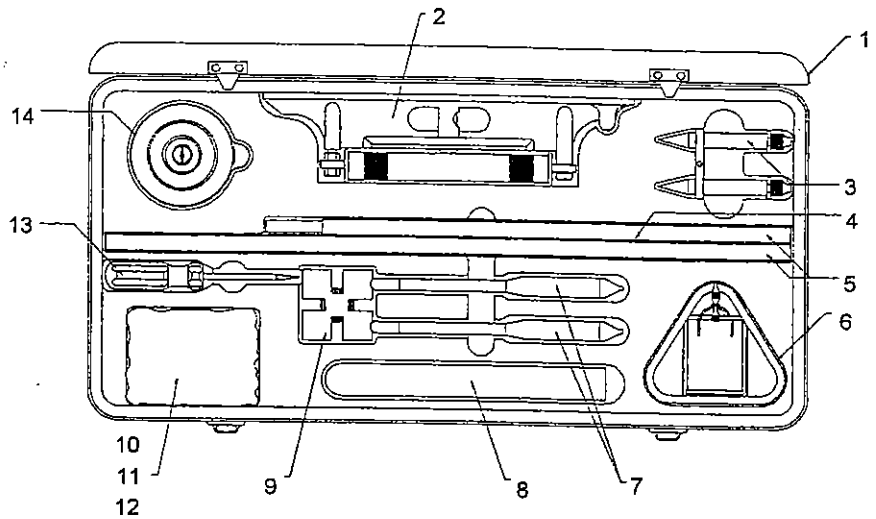
8. FIGURE 3 - JETWEIGH WIDE BODY CONFIGURATION



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	102102-00	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 codings; i.e., red to red, yellow to yellow, etc. The opposite end of the cable contains a "slide lock" type connector which, when inserted into the mating connector on the side of the weight computer, will lock in place when pressed down and will unlock when pressed up. On some models the fifth (clear) channel cable will be longer (75 ft.). This cable and cell are dedicated to the nose wheel. A few special kits will have an undedicated printer format to allow special flexibility of use. All kits can be configured by the operator from the keyboard for 1 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.

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 120 or 240 volts. See section F, part 2 (POWER LEVEL SELECTION OR FUSE REPLACEMENT) for instructions if a change is required. Power is applied to the indicator by pressing the power switch.

3. If 24 VDC 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 by pressing the power 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 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 as closely as possible before lifting on the jacks. This can be done by changing oleo strut extensions.

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 set screws.

- 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 RIM OF THE CELL.

9. The weight computer is programmed to identify left, right, nose, or the sum of both sensors on a bogie. This requires that specific channels (sensor) be dedicated to the 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 1 (next page) shows the required layout for various configurations.

TABLE 1

3 SENSORS			
CHAN 1	(RED)	LEFT	
CHAN 2	(YEL)	RIGHT	
CHAN 3	(BLU)	NOSE	
4 SENSORS		**HELICOPTERS**	**FIXED WING**
CHAN 1	(RED)	LEFT FWD	LEFT
CHAN 2	(YEL)	RIGHT FWD	RIGHT
CHAN 3	(BLU)	LEFT AFT	NOSE
CHAN 4	(GRN)	RIGHT AFT	SPARE
5 SENSORS			
CHAN 1	(RED)	LEFT	
CHAN 2	(YEL)	RIGHT	
CHAN 3	(BLU)	LEFT	
CHAN 4	(GRN)	RIGHT	
CHAN 5	(NO COLOR BAND)	NOSE	

D. WEIGHING/OPERATING PROCEDURE

1. INTRODUCTION

The JetWeigh® Aircraft Weighing Kit computer contains three processors, the startup protocol causes each to perform a self check followed by a "handshake" with the main processor. A more complete description is contained in the theory section. While the startup checkout is in process, a display indicates partial completion of this process.

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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 Lbs.
1 100000 2 100000
3 100000
C = Continue

The display will remain in this mode until an input is initiated by the operator.

2. *SETUP*

The operator must input "C" from the keypad to continue from the startup mode to the setup mode. In this mode, the operator is presented with several options for changing the information to be printed on the weighment record. The next display typically looks like this:

04/26/88	**10:52:47**
Kit S/N	**88-0001-C**
Calibrated:	**04/88**
A=Accept	**C=Change**

The top line presents month, day, year, hour, minute and second. Next is the kit serial number followed by the month and year of last calibration. Last are the necessary prompts for accepting or changing information. Only the time and date may be changed. Some screens do not provide prompt messages. If no prompt is displayed an input of "E" from the keypad will exit the screen. A forced exit from screens displaying an error message will result in an error message printout on the tape.

E = Exit

a) CLOCK

For this example, we will go to the setup screen and review a typical change. Proceed in the following order:

Input "C" from the key pad.

The following setup screen appears:

SETUP	**1. CLOCK**
2. KGS/LBS	**3. LATITUDE**
4. ACFT ID	**5. ACFT SN**
6. RECONFG	**7. QUIT**

Input "1" (clock)

The following time screen appears:

	TIME	
04/26/88		**10:52**
B=BACK	**F=FWD**	**A-OK**

We will adjust the time to 11:53.

Input "F" seven (7) times - the cursor will now be under the "0" of 10:52.

Enter "1" from the keypad. The "10" will change to "11" and the cursor will advance to the next number.

Enter "F" from the keypad to advance the cursor under the "2".

Enter "3" from the keypad. The time will now read 11:53.

Enter "A" from the keypad to exit from the clock setup. **NOTE:** The clock will not advance while the computer is in the clock setup mode.

Enter "6" or "7" as appropriate from the keypad to quit the setup screen. This will return you to the beginning.

Time and date line should now reflect the new input.

04/26/88 11:53:00

The seconds should be advancing.

When you are satisfied with the time and date line enter "A" from the keypad.

The clock has an on-board, maintenance free, 10 year lithium battery for periods of non-operation. You may accept the time and date as maintained by the backup clock battery operation. If no changes are entered, the final printout will indicate "Default Value Used".

During this example, we did not use the "B" entry. Entering "B" moves the cursor backwards one (1) space.

b) LATITUDE AND WEIGHMENT UNITS

On acceptance of the time screen, the following screen appears:

LATITUDE: 45 DEGREES
UNITS: LBS
A=ACCEPT C=CHANGE

While in setup, enter "6" from the keypad. The following reconfigure screen will appear:

```
ACTIVE SENSORS = 5
TO RECONFIGURE KIT
ENTER 1, 2, 3, 4, OR 5
AND/OR C TO CONTINUE
```

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.

The next two lines prompt the operator to select a new channel configuration from the keypad. When the number is entered, then the top line will change to the selected number.

If the number of active sensors has been changed from the default number, or maximum channel configuration, you need to enter "C" from the keypad to allocate a sensor to a given channel. Otherwise, if the number of active sensors is left at the default number, press "C" to continue.

Computer Assignments (Fixed via hardware) *1

Channel	Color
1	Red
2	Yellow
3	Blue
4	Green
5	No Color

Sensor Assignments (Moveable via software only) *2

Sensor	Color
1	(R) Red
2	(Y) Yellow
3	(B) Blue
4	(G) Green
5	(C) No Color

The example below shows a 5 channel kit reconfigured in the following manner:

*1 *4 sensors active*

*2 *Sensor #2 is assigned to channel 1*
Sensor #4 is assigned to channel 2
Sensor #1 is assigned to channel 3
Sensor #3 is assigned to channel 4

*1
*2

```
CHAN: 1 2 3 4
CELL: 2 4 1 3
R=1 Y=2 B=3 G=4 C=5
A=ACCEPT  C=CHANGE
```

When you have properly entered the reconfigure sequence, press "A" to continue or "C" to change the sensor configuration. Any time you are in this screen, you must enter a cell assignment in order to proceed through this menu.

The computer will maintain the selected number of channels until the kit is reconfigured or the power is turned off.

f) SYSTEM CHECK

The system check evaluates the input of all channels for poor signals caused by cable failures, etc. If a radically different signal is received by the weight computer than existed at calibration time an error message is shown on the screen. This is a gross error caused by damaged load sensors or cables. The system check will require approximately 20 seconds. If the computer is satisfied the mode screen will appear. An unsatisfactory system check will require operator acknowledgment. The operator may force an exit from the system check by pressing "E", however, an error message will be printed on the tape if the automatic advance is overridden. See Table II for information on error signal identification. Exiting the system check enters the mode screen shown below:

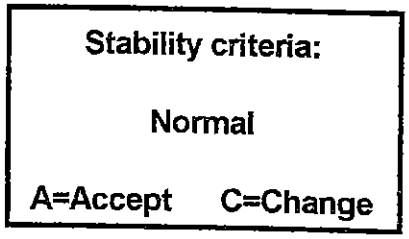
```
MODE
1. WEIGH
2. PRINT
3. SETUP
```

You may return to setup again if necessary to re-edit your setup by selecting Option "3". When exiting, setup will return you to the mode screen.

3. *WEIGH MODE*

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 weight computer 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 minimum & maximum change in weight increments placed on an acceptable weighment and zero return within a specified time frame, (capture range), as seen by the computer. *The (Stability Criteria) does in no way affect the overall accuracy of the aircraft weighing kit. It defines the capture range only.*



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 "A" key for accept during each mode of weighing. Each stability criteria will be identified on the "Weighment" printout as the following:

Stability Criteria	Weighment Mode #
Normal	1
Relaxed	2
User	3

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 g).

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 flash until the computer interprets a minimum threshold weight on each sensor, and monitors a stable signal for approximately 20 seconds.

LIFT AIRCRAFT			
1	0	2	0
3	0		
		T	0

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.

b) After a stable reading is interpreted from all channels for a brief period of time, the "Lift Aircraft" prompt will automatically change to "Stable A=Accept". The instrument will hold at this point until either the operator accepts the weighment or the scale is disturbed by some external force causing the reading to change which in turn will return the computer to the "Lift Aircraft" mode. The operator must satisfy himself that the weighment is valid in addition to the instrument's "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 A=Accept" prompt is flashing then input "A" from the keypad. If the "Lift Aircraft" prompt is flashing then "E" may be entered from the keypad. If "E" is entered, 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 "Stable A=Accept" 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 weight computer performs automatic checks to assure a good zero return and compensate for minor in tolerance variations in 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. If the "E" input was used anywhere, the top line will indicate "Weighment Forced". The "Weighment Forced" screen must be exited by input of an "E" on the keypad. The "Weighment Accepted" screen will automatically return to the mode screen after approximately 20 seconds.

f) At this point, the weighment is complete and data is stored in memory. A printout should be made to document a permanent record. If the printout variables were set incorrectly, the operator may re-enter the setup mode and modify the variables. The basic weight data will remain locked in memory. The printout values of weight, of course, will correspond to latitude value changes. Entering weigh mode will erase previously stored weight data.

End of "Weigh" mode.

The following steps are for "User" mode under (Stability criteria) only.

g) 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 flash until the weighmaster deteremines that the weighment is acceptable by pressing the "A" key.

LIFT ACFT – A=Stable			
1	0	2	0
3	0		
		T	0

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.

The weighmaster should insure that the aircraft is clear of the ground and level at this point before proceeding.

h) The next screen remains unchanged except for the first line. The prompt "LIFT ACFT – A=Stable " changes to "Remove - A=Zero Ok". 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 "A" key to proceed.

Proceed back to step e) for the final instructions.

4. OPERATIONS UNDER POOR LIGHTING CONDITIONS

The JetWeigh® weight computer display is visible in subdued light to extremely bright light. Additionally, a soft green backlight will allow display visibility in total darkness. The backlight may be actuated at any time by simultaneously inputting "D" and "F" (darkness feature) from the keypad. The backlight will self extinguish in approximately five (5) minutes. It may be reactivated if required.

5. ADJUSTMENT FOR OPTIMUM VIEWING ANGLE

The display viewing angle may be adjusted for the most pleasing contrast by the operation of the flush control directly above the keypad. A gentle side-to-side rotation will provide a vertical angle change of approximately 20°.

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. EQUIPMENT DESCRIPTION

Figure 5 shows the JetWeigh® instrument with its major features highlighted, and printed tape example illustrating the results of a typical wide body jet weighment. An error message has been included to indicate a possible format.

2. CIRCUIT DESCRIPTION

Strain gage load cells receive excitation in the form of square wave ± five (5) volt supply. The output of the load cells is fed to an eight (8) channel multiplexer. The multiplexer selects each assigned channel (up to five (5)) sequentially. The excitation and high quality ground are also sampled. This provides a "ratiometric" type signal.

The results are amplified and presented to a voltage to frequency converter. This pulse stream is "gated" and presented to the processor. The processor controls the selector gate resulting in an identified "pulse stream". The raw analog to digital signal is processed digitally to achieve engineering units. The conditioning information is programmed in an EPROM which is dedicated to each specific instrument at calibration time. A basic block diagram is included in Figure 6.

3. INITIALIZATION

At power up, the main processor initiates itself then looks for the "printer busy" signal to go away. It also writes a stored number to its own RAM then withdraws the number and compares it to the original. The main processor also looks for a "display available" signal. When received, the processor sends a "blank" signal to the upper left hand corner of the display. When the "printer busy" signal goes away the processor sends a "line feed" to the printer.

During the period the main processor is initiating, the printer is performing its own self-test. The successful conclusion of this test is indicated by printing the word "ready" and releasing the "printer busy" line.

Concurrent with the above self-tests, the display also initiates and self-tests. The display self-test concludes with writing the screen "blank" followed by a "display available" signal to the processor. When the main processor receives the "display available" signal it writes a "blank" as previously described, then "reads" the display buffer to confirm the correct signal. When the display portion of the self-test is incomplete the processor writes the

"Revere Transducers" screen shown in the Operational Procedures section. After a completely successful self-test the "channel capacity" screen is displayed.

The initialization process may be repeated if required by turning the power switch off, waiting ten (10) seconds, then turning power back on.

If a failure of the printer has been detected an error message will be shown on the screen. If a display failure is detected a printout will be initiated to advise you. Potential error messages are shown in Table II.

Once operational, a watchdog circuit guards against "lockup" in the event that an outside signal influences the computer's operation.

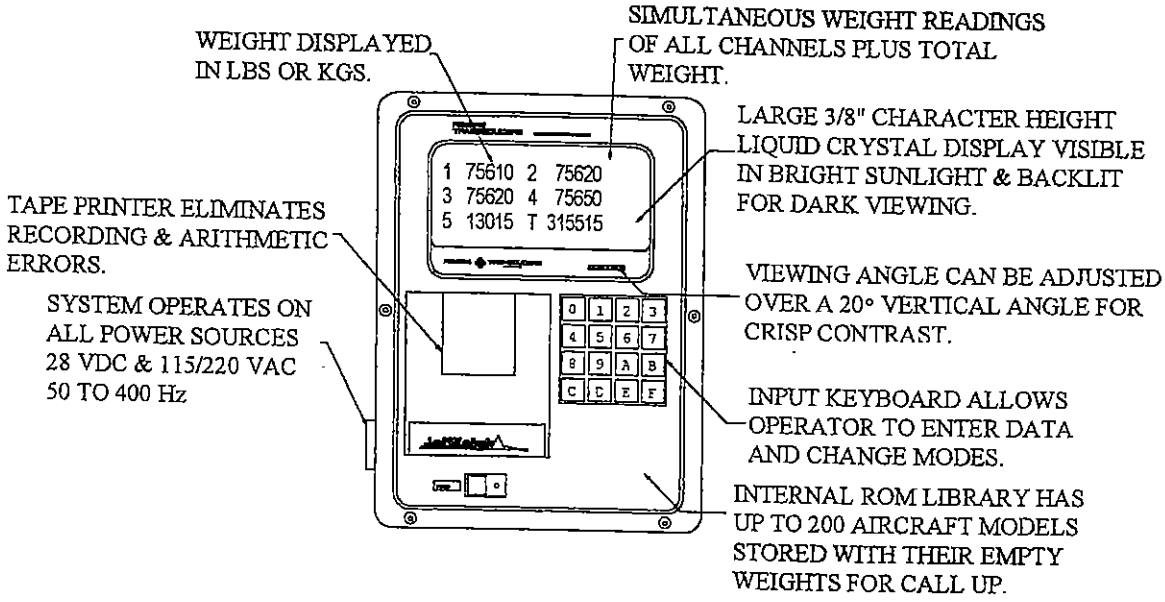
4. SETUP

If, during setup, the operator incorrectly sets the time, latitude, aircraft I.D., or aircraft SN, they can be corrected before a new "weigh" command is initiated, provided primary power is not interrupted. The new printout will indicate the results of the changes. Obviously, no anti-fraud control exists here so the weighmasters signature must bear integrity for the weighment.

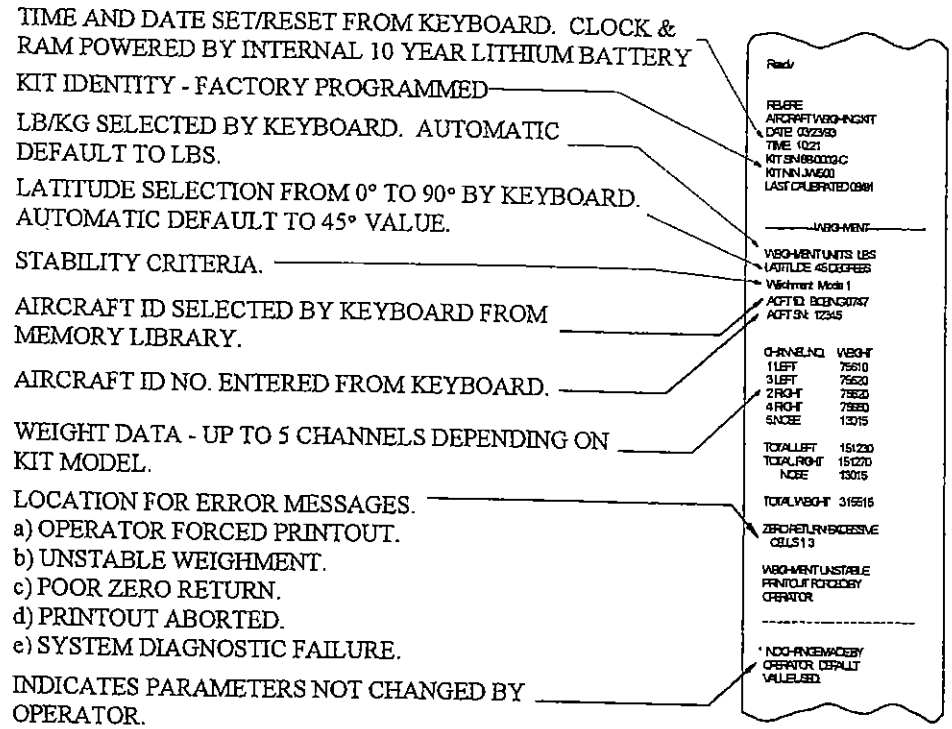
5. SYSTEM CHECK

The "system check" is a "gross failure" test. It is provided to detect damaged load cells, cables, etc. The system check error messages are shown in Table II. The weighmaster at his discretion may decide to proceed with the weighment and resolve the error messages later. The printout tape will contain any unresolved error messages.

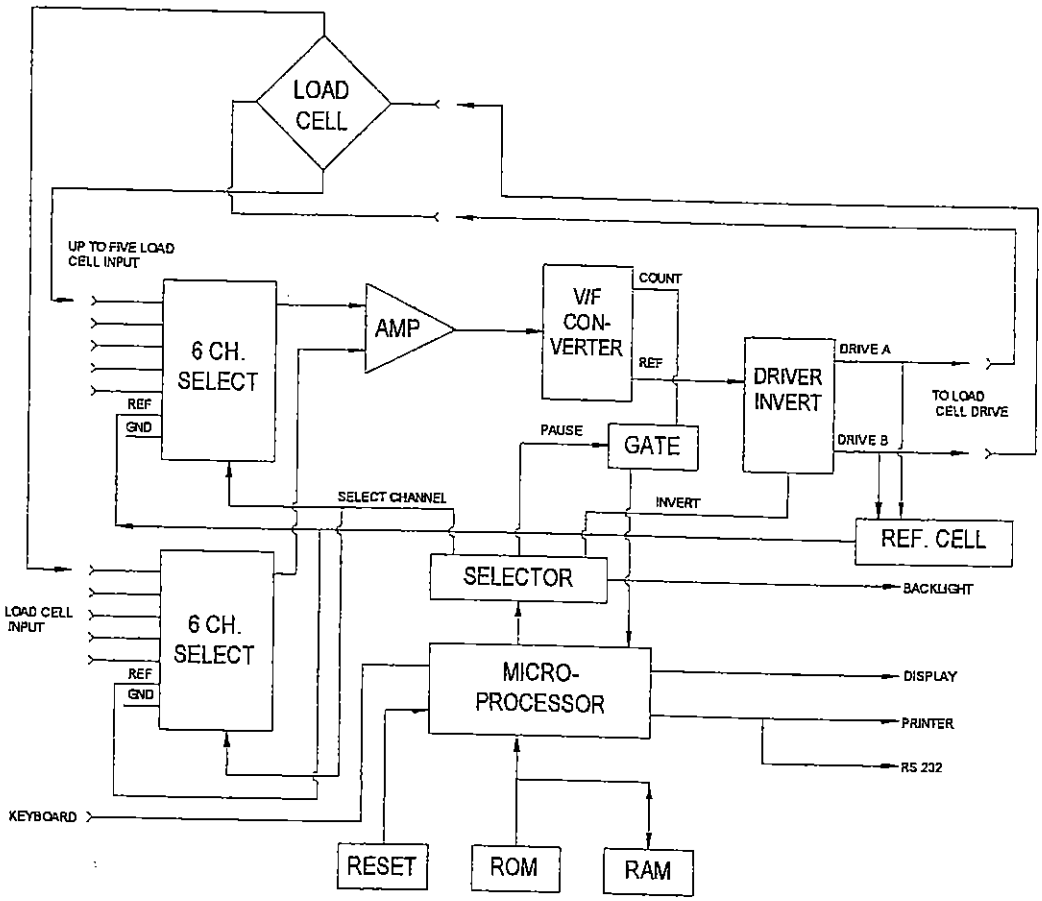
6. *FIGURE 5 - INSTRUMENT FEATURES*



SAMPLE PRINTOUT



7. *FIGURE 6 - BLOCK DIAGRAM*



8. *ERROR MESSAGES TABLE II*

System Check Error 1	Internal Ram Test Failure
System Check Error 2	Clock Not Running
System Check Error 3	Printer Problem
Fatal System Error	System Start-up Test Failure
Printer Not Detected	Initialize Handshake Failure
Printer Failure	Data Transfer Handshake Failure
Bad Ground Reference	Analog Reference Not Within Limits
Bad Cell Connection	Cell Output Not Within Limits
Display Failure	Data Transfer Handshake Failure (Written on Printer Tape)
Printer Not Ready	Printer Did Not Initialize Within 10 Seconds
SCI Timeout	Serial Interface Always Busy
System Check Error 4	Consecutive Cell Reading Not Within Limits
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
Printout Aborted By Operator	Operator Aborted Printout By Entering The "E" From Keyboard

9. SCREEN BACKLIGHT

The screen is provided with a backlight for poor lighting conditions. This backlight is controlled by a five (5) minute timer. Continuous operation of the backlight can affect the display life. Normal use of the backlight should provide long and useful service.

10. ADDITIONAL DIAGNOSTICS

The following information is intended for the weighmaster or maintenance technician. Exit the mode screen by simultaneously pressing "C" and "F". The diagnostics screen will appear as shown below. This entry can only be made from mode screen.

DIAGNOSTICS	
1. WGT DSP	4. FEED
2. A/D DSP	5. TEST
3. PRT TST	6. QUIT

a) WEIGHT DISPLAY (WGT DSP)

This mode will provide a continuous scale display with no interlocks or prompts. It is intended for laboratory or experimental work. No printout is available. Input "E" to return to the diagnostics menu.

b) A TO D DISPLAY (A/D DSP)

This mode will show the raw unconditioned output from the analog to digital converter, and reference signal data. The excitation reference and signal ground presentation should remain constant during the life of the instrument. A variation or instability exceeding ten (10) counts indicates potential problems. The instrument should be evaluated, repaired and recalibrated if this occurs. The identification of the presentation is shown below.

1. CHAN 1	2. CHAN 2
3. CHAN 3	4. CHAN 4
5. CHAN 5	6. EXCITATION REF. (HI)
7. EXCITATION REF.(LO)	8. SIGNAL GND.

Uncommitted channels will display an unrelated number, which can be disregarded. If a problem with the JetWeigh® kit is experienced the information in this mode may help in troubleshooting source of the problem. Input "E" to return to the diagnostics menu.

c) PRINTER TEST (PRT TEST)

The printer test commands the printer to print every character in every column sequentially. This results in the classic "barber pole" printout. The test may be terminated by inputting "E" from the keypad.

d) PRINTER LINE FEED (FEED)

This command will provide twelve (12) line feeds to the printer. It is intended to assist with installation of a new paper roll. The line feeds may be terminated by inputting "E" from the keypad.

e) TEST

This mode repeats the initialization self-test and exits. The screen will not change. Data in memory may be lost.

f) QUIT

Exits to the mode select display.

F. MAINTENANCE

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 III 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. Enter diagnostics mode and input "4" to feed paper into the 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. POWER LEVEL SELECTION OR FUSE REPLACEMENT

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 120 VAC or 240 VAC to conform with the supply available. Do not use the 100 VAC or 220 VAC settings on the indicator.
c) Insert a small blade in the top center slot on the receptacle and pry down and out.
d) Reset the indicator to 120 or 240 as required.
e) The fuse may be replaced if defective by pulling the white 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 III - 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. 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 Revere.

H. TABLE IV - 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		A310	195000
4		A320	86000
5	Beech (BE)	58	3481
6		58P	4026
7		C90A	6045
8		F90-1	6704
9		C99	6700
10		100	7112
11		200	7538
12		300	8290
13		400	10115
14		1900C	9100
15		2000	8916
16	Boeing (BO)	707-120	135000
17		707-320	147000
18		727-200	100000
19		737-100	58000
20		737-200	66000
21		737-300	69400
22		737-400	72700
23		747-100	379000
24		747-200	395400
25		747-300	396000
26		747-SP	334000
27		747-400	394000
28		757-200	126000

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

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

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

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".

Considerations for 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.

Considerations for 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.