PERFORMANCE THROUGH PRECISION

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REVERE

ELECTRONIC WEIGHING KIT

OPERATING and MAINTENANCE MANUAL

REVERE Neptune Gen 1

Doc. 155800

ELECTRONIC WEIGHING KIT

INTRODUCTION AND DESCRIPTION

INTRODUCTION:

This handbook covers the operation and service instructions for an Electronic Weighing Kit, manufactured by the Revere Corporation of America, Wallingford, Connecticut.

While this kit can be used in a variety of applications to measure forces imposed on the load cells, it is commonly used to determine weight of aircraft from forces exerted at each jack point. From this data the center of gravity can be calculated.

The weight received by each cell is transmitted through connecting cables to the indicator unit where the weight, in pounds, is obtained by summing the readings on the WEIGHT indicator and INITIAL LOAD switch.

DESCRIPTION:

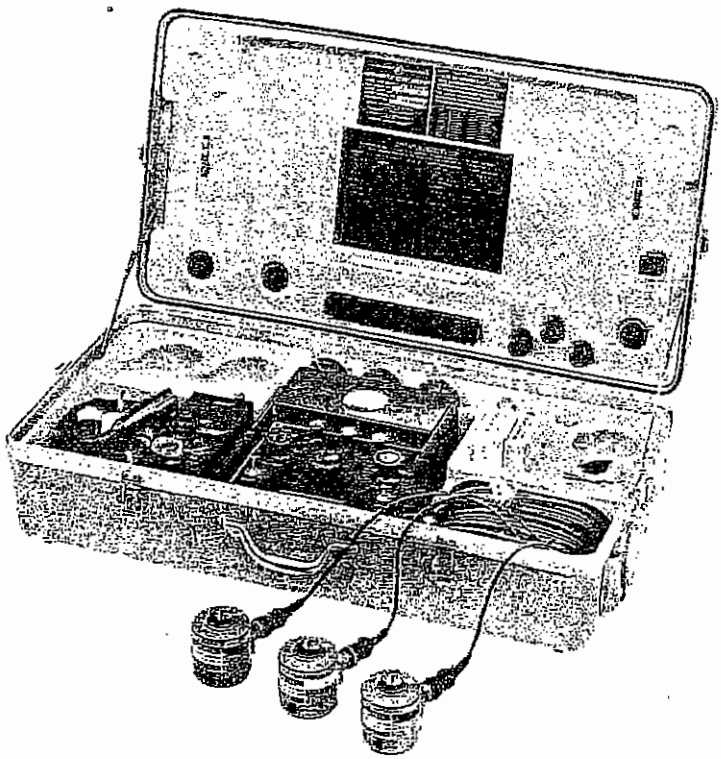
Each kit is a complete unit for weighing an aircraft. In some cases specialized jacks may be equired. A power source of 110 volts A. C. or 24 volts D. C. is required.

Each kit consists of a carrying case in which are mounted the indicator-amplifier and the power supply. The cells, cables, adapters and accessories are stored in the spaces provided within the case.

INDICATOR-AMPLIFIER: The indicator is a unit accessible for maintenance and easily removable from the case. The circuits, adjustable resistances, and amplifying equipment of the indicator are contained in a dust-proof box.

POWER SUPPLY: The power supply unit provides the controls to select 110 volts A. C. or 24 volts D. C. and to adjust the A. C. voltage. In addition, the A. C. fuse holder and the A. C. receptacle (male) are located on the power supply panel. The D. C. connection extends from the right side of the indicator amplifier.

CELLS: The kit contains hermetically sealed cells. Although similar in appearance, they are not interchangeable; each must be matched to its corresponding color coded cable. The cells have a tapped hole on the bottom to receive the plug adapter which fits into the jack. The top of the cell is shaped to receive the spherical adapter or



AN spherical jack pad. An electrical receptacle is located on the side of the cell to plug in the 50-foot cable which connects the cell and the indicator-amplifier.

CABLES: The essential 50-foot cables are reeled and stored in the case. Power cables are also provided so that the Kit may be operated by 110 volt A. C. or 24 volt D. C. power supply or battery.

ADAPTERS: For the purpose of mounting the cells under varying physical arrangements, the following adapters are provided: plug and ring adapters for securing the cell to jack, and spherical adapters to fit the cell to an AN conical jack pad. Axle adapters are added at customer request.

ACCESSORY EQUIPMENT: A separate accessory case contains instruments needed for weighing operations.

TABLE I

Equipment Furnished

All Kits

Part No.	Description	Quantity
C-46373	Power Supply	1
C-41048-1	Cell Cables, 50 Foot	As Req'd
C-42117-3	Power Cable, 110 VAC	1
C-2498-1	Power Cable, 24 VDC	1
C-2499-1	Cable-Battery Extension	1
C-5832	Spherical Adapters	As Req'd
S-2115, -1, -3	Allen Wrenches	1
C-40430-2	Accessory Kit	1
S-20131	Level	1
C-40045	Leveling Bar	1
S-20069	Rule (1 Foot)	1
C-40283	Steel Tape 50 Foot	1
C-2104	Fuel Dipper	1
C-2113-1	Hydrometers	2
C-2112	Hydrometer Jar	1
S-21034	Screw Driver, Standard	1
S-20051	Bag	1
S-20049	Chalk	1
S-20050-100	Chalk Line	1
C-2102	Plumb Bob Assembly	2
C-40439	Case Assembly	1
	Spare Tubes	

Variable Items

Kit Part No.	C-47095	C-47105	C-47160	C-47175	C-47350	C-47180	C-47185	C-47190
Total Capacity	30,000	40,000	75,000	100,000	150,000	200,000	300,000	400,000
Model No.	CS-7A	CS-7A4	CS-7C	CS-7C4	CS-7	CS-7-4	CS-7B	CS-7B4
Number of cells	3	4	3	4	3	4	3	4
Load cell capacity	10,000	10,000	25,000	25,000	50,000	50,000	100,000	100,000
Cells	C-45910	C-45910	C-46165	C-46165	C-46170	C-46170	C-46175	C-46175
Indicator-Amplifier	C-47280	C-47366	C-47284	C-47360	C-47361	C-47362	C-47320	C-47363
Carrying Case Assy.	C-41347	C-41437	C-41347	C-41437	C-41347	C-41437	C-41436	C-41436
Plug Adapters	C-2108	C-2108	C-2108	C-2108	C-2108	C-2108	C-40088	C-40088
Ring Adapters	C-2106	C-2106	C-2106	C-2106	C-2106	C-2106	C-40353	C-40353
Pipe Adapters	C-2110	C-2110	C-2110	C-2110	C-2110	C-2110	--	--
Reel Assembly	C-40138	C-40138-2	C-40138	C-40138-2	C-40138	C-40138-2	C-40138-2	C-40138-2

PRE-OPERATIONAL PROCEDURE:

Place the Kit in any convenient location within the length of the 50-foot cell cables. Power of 110 volts A. C. or 24 volts D. C. must be available. Unreel the cell cables and connect them to the proper cells observing color codings; i. e., red to red, yellow to yellow, etc.

CAUTION

CELLS AND CABLES ARE NOT INTERCHANGEABLE.

b. Turn "CELL BALANCE" switch to "OFF". Switch the toggle to 110 volts A. C. or 24 volts D. C. Battery depending on the power source used.

1) If 110 volts A. C. is used, connect the 25-foot electric cable between the A. C. output in the power supply unit and the 110 volt supply. Press the "BATTERY VOLTAGE" switch on the indicator panel. Turn the "A. C. VOLTAGE ADJUSTMENT" knob until the pointer of the balance meter rests in the center of the green area of the milliammeter scale.

2) If 24 volts D. C. is used as the power supply, connect the 15-foot power cable from the male connector on the right-hand side of the indicator to the power supply. Battery clips are also provided. Turn the toggle switch to the "24 VOLT BATTERY" position. Attach the clips of the battery cable to the battery terminals if battery is used. Press the "BATTERY VOLTAGE" switch and check for polarity. If the pointer swings to the yellow section of the milliammeter scale, the leads must be reversed. After the leads are changed, press the switch again. If the pointer rests in the red section of the scale, the D. C. voltage is either too high or too low for proper operation. Replace with a battery of proper voltage or adjust supply voltage accordingly.

CAUTION

CHECK POWER FREQUENTLY TO ASSURE THAT CORRECT VOLTAGE IS MAINTAINED. UNLESS CONSTANT VOLTAGE IS MAINTAINED THROUGHOUT THE WEIGHING OPERATION, INACCURATE READINGS MAY RESULT.

c. Keep the power on and allow the equipment to warm up for a minimum of 20 minutes.

To minimize temperature transients, it is sometimes wise to attach cells to jacks as later described and place a partial load on each cell. A stabilizing period of 20 minutes running concurrently with warm up period is advisable.

PREPARATION FOR WEIGHING AIRCRAFT:

a. Check the fixed operating equipment in the Weight and Balance Handbook of the aircraft involved. Be sure all items on the aircraft are checked on the list. Add to the list any fixed equipment that has not been listed.

b. Remove all loose equipment.

c. Clean the aircraft to remove any accumulated dirt and grease.

d. Drain oil from all tanks or fill to known capacity. Fill all reservoirs with proper liquid to normal operating levels.

e. Drain fuel tanks. If draining is not feasible, determine the quantity of fuel in the aircraft using a calibrated tank stick, fuel tank manometer or electric gages. Aircraft should be in the position for which the instrument is calibrated -- usually flight level.

f. Determine the unit weight of the fuel. Obtain a sample from the tank with Fuel Dipper and pour the sample into the test tube with one of the hydrometers from which the unit weight is directly read in pounds per gallon.

g. Inflate or deflate main gear oleo struts to normal extension or anticipated desired height. If all wing jacks or a combination of wing and axle jacks are being used, restrain the shock struts to prevent them from extending when the aircraft is lifted on the jacks.

h. Level the aircraft longitudinally and, if possible, laterally with main wheels on the hangar floor. Use the kit's level and leveling bar, if required, on the aircraft's leveling lugs. For location of the leveling lugs consult the Weight and Balance Data Handbook. Level the aircraft in accordance with approved procedure for the aircraft involved.

CAUTION

WHEN LEVELING, BE SURE THERE IS NO LOAD ON THE WEIGHING CELLS. EXCESSIVE SIDE LOADS MAY CAUSE INCORRECT READINGS, CELL BREAKAGE, AND POSSIBLE DAMAGE TO THE AIRCRAFT.

OPERATIONAL PROCEDURES:

a. Set the cells on their respective jacks, selecting jack adapters and spherical adapters in accordance with placard on the lid of the Kit. In attaching a weighing cell to a jack adapter be sure that the adapter is fully threaded into the cell. If a ring type adapter is used, see that it is centered flush on the ram, applying a partial load to it 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 RIM OF THE CELL.

b. Set the jacks and cells at their respective support points.

c. Turn "CELL BALANCE" switch to "ON". There must be no load on the cells at this time.

d. Set the "WEIGHT" indicator and the "INITIAL LOAD" selector to 0.

e. Set the "CELL SELECTOR" switch to Cell No. 1. Adjust the meter pointer to zero by turning the "ZERO SET" knob of Cell No. 1. The meter pointer moves in the same direction as the rotation of the knob. Repeat this procedure for the remaining cells. Once the cell circuits are zeroed, the "ZERO SET" knobs must not be touched until weight is off the cells.

f. Jack the aircraft until it is entirely supported by the cells.

CAUTION

KEEP THE AIRCRAFT LEVEL WHILE JACKING.

g. Set the "CELL SELECTOR" switch to the cell on which the applied weight is desired. The pointer on the balance meter should swing to the left. If the load on the cell is less than 5,000 pounds, the weight on the cell can be obtained by turning the "WEIGHT" knob until the pointer of the balance meter returns to zero (Cell Balance arrow). If the load on the cell is greater than 5,000 pounds, turn the "INITIAL LOAD" knob until the meter pointer swings to the right. Then turn the "INITIAL LOAD" knob to the next lower calibration.. For example: If the "INITIAL LOAD" knob is set on 40,000 pounds when the pointer swings to the right, return the knob to 35,000 pounds. Next, adjust the "WEIGHT" indicator until the meter pointer rests on zero. The combined reading of the "INITIAL LOAD" and the "WEIGHT" indicator is the weight on the cell.

DETERMINING THE CENTER OF GRAVITY:

a. Record the weight at the support points in the applicable spaces on the Airplane Weighing Form as shown in the Weight and Balance Data Book.

b. Make sure that the aircraft is in a level flight attitude. Use the plumb bobs provided in the kit to establish points on the ground that are directly beneath each cell and the aircraft's reference point as shown in the Weight and Data Handbook. Mark these points with the chalk provided.

c. Measure the horizontal distance from each support to the reference datum on a line parallel to the aircraft's longitudinal axis. Use the 600-inch steel tape provided which is marked in inches and tenths of inches. Enter these measurements on the weighing form in the space provided.

d. At this point, determine whether the zero set of the cell has been altered by the following procedure:

1) Remove all load from the cells.

2) Set the "INITIAL LOAD" switch to zero.

3) Adjust the "WEIGHT" indicator until the meter pointer is on zero. If a small plus reading is obtained, divide the value by two and subtract it from the total weight reading for that cell. If there is a small minus reading, add the amount indicated on the zero shift scale to the reading obtained for that cell. If there is an appreciable difference (greater than 25 pounds) repeat the entire weighing procedure.

e. With the weight of fuel known, proceed to correct the basic weight of the aircraft. First, obtain the correct fuel moment arm. No exact data is available for aircraft that have a moment arm varying with the quantity of fuel. The arm may be determined by referring to the Handbook of Weight and Balance Data. To compute the moment arm, divide the moment by the weight of the fuel quantity. Multiply the fuel weight previously determined by the arm to obtain the fuel moment. Constant fuel arms (those which do not vary with a fuel quantity) are shown in the Handbook of Weight Balance Data.

f. Determine the moments of all equipment not shown on the basic weight breakdown schedule.

Proceed as outlined in Handbook of Weight and Balance Data to determine the distance the center of gravity of the aircraft is from the reference datum.

h. Enter the values for basic weight and center of gravity on the applicable chart of the Handbook of Weight and Balance Data.

i. With the completion of weighing operations, turn off all switches, disconnect cables and replace all components in their proper place in the case.

PERIODIC INSPECTION AND TROUBLE SHOOTING

INSPECTION:

Prior to each use, the kit should be inspected for loose connections, damage, ruptured cables or defective tubes.

INSPECTION OF ZERO SET POTENTIOMETERS:

The zero set potentiometers may become dirty, causing jittery pointer action on the cell balance meter. The contacts may be cleaned by working the zero set knobs back and forth. If this does not eliminate the trouble, zero set potentiometer should be replaced.

MAINTENANCE:

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

Only routine maintenance and repair are recommended on weighing kits. Calibration of kits requires highly specialized equipment including standards and/or dead weight test facility. It is recommended that kits be returned to factory periodically for recalibration.

The following Trouble Shooting Chart contains a list of possible failures leading to improper operation of the kit.

TROUBLES AND REMEDIES CHART

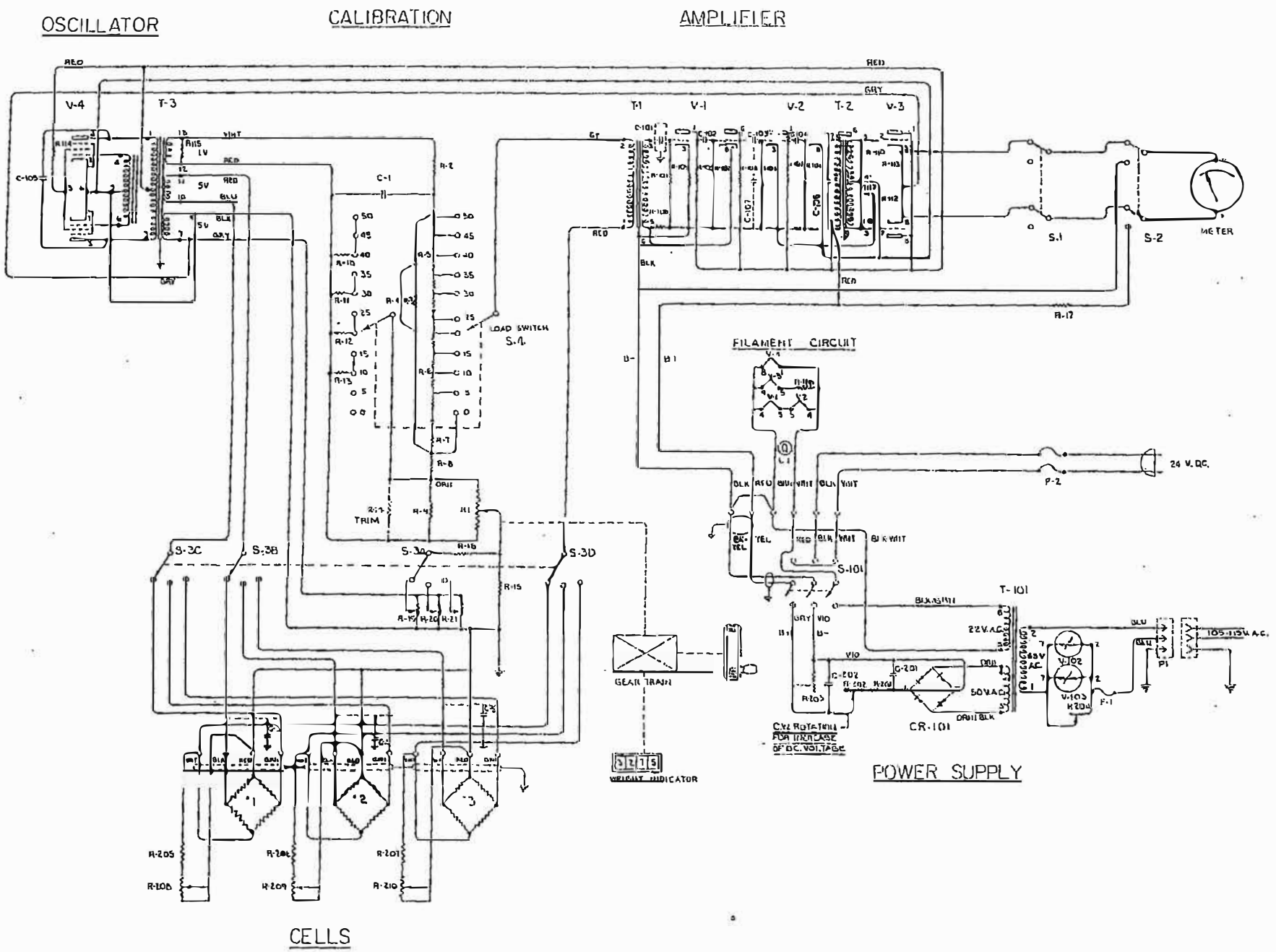
Trouble	Probable Cause	Remedy
1. Kit inoperative for D. C. use. (A. C. functional)	D. C. Fuse blown.	Replace D. C. fuse in indicator.
	Bad "24 V. BATT. 110 V. A. C." switch on power supply.	Replace switch.
2. Kit inoperative for A. C. use. (D. C. functional)	A. C. fuse blown.	Replace A. C. fuse in power supply.
	Power supply failure.	Repair or replace power supply.
3. Kit inoperative. Power okay.	Tube failure.	Replace failed or doubtful tubes with spare tubes supplied in kit. Make sure all tubes are secure.
4. Kit inoperative. Power okay.	Meter failure.	Replace meter.
5. One (or two)cell(s) cannot be zeroed at "NO LOAD" condition.	Cell (or cells) failure.	Cross cells (i.e., red cell in blue circuit) to determine whether trouble is in cable or cell. If cell is defective return kit to factory.
	Cable short (or open).	Repair or replace cable.
6. Cell reads too high.	Open cell shunt resistor.	Replace resistor with new resistor of same value.
7. Cell erratic or intermittent under load.	Cell damage.	Return kit to factory.
	Cable damage.	See 5 above.

Trouble	Probable Cause	Remedy
8. Sensitivity bad on one (or two) cell(s). Place counter at zero and adjust appropriate zero potentiometer until meter pointer is just touching right-hand side of green area. Readjust counter until meter pointer indicates zero. Counter reading should be no greater than 250 pounds.	Capacitance change in cell-cable circuit causing out of phasing between amplifier and cell-cable circuit.	Adjust phasing capacitor C-3, C-4 or C-5.
	Improper cable ground.	Check ground continuity on cables.
9. Sensitivity bad on all cells.	Low voltage level.	Increase voltage if A. C. Replace battery if D. C. Note: If voltage does not increase when turning "A. C. VOLTAGE ADJUSTMENT" on power supply, replace 1H20 tubes in power supply.
	Weak 12AU7 or 6072.	Replace with tubes supplied.
10. Excessive drift of cell balance meter		
All cells	Oscillator transformer malfunction.	Return kit to factory.
One cell	Cell malfunctioning.	Return kit to factory.
11. Erratic needle when "Zero Set" knob is turned.	Dirty, or worn potentiometer.	Clean or replace potentiometer.
12. Meter jitter - continuous	Open ground.	Ground cell, cable, etc. to locate open ground. If trouble lies within cell or oscillator, return kit to factory.
	Dirty D. C. or A. C. power cable plugs, loose connections.	Clean and tighten plugs.
13. Meter jitter - intermittent and excessive.	External interference, welding power supplies, etc.	Relocate equipment.
14. Balance potentiometer inoperative.	Wiper contact broken or not making contact.	Replace potentiometer.
15. Balance potentiometer erratic.	Worn or noisy potentiometer.	Replace potentiometer.
16. Balance potentiometer jumps at one point on scale.	Worn area on potentiometer.	Adjust indicator across erratic point several times. If condition is not alleviated, replace potentiometer.
17. Jumpy cell balance needle on all cells.	Cell balance switch on indicator is faulty.	Repair or replace switch.

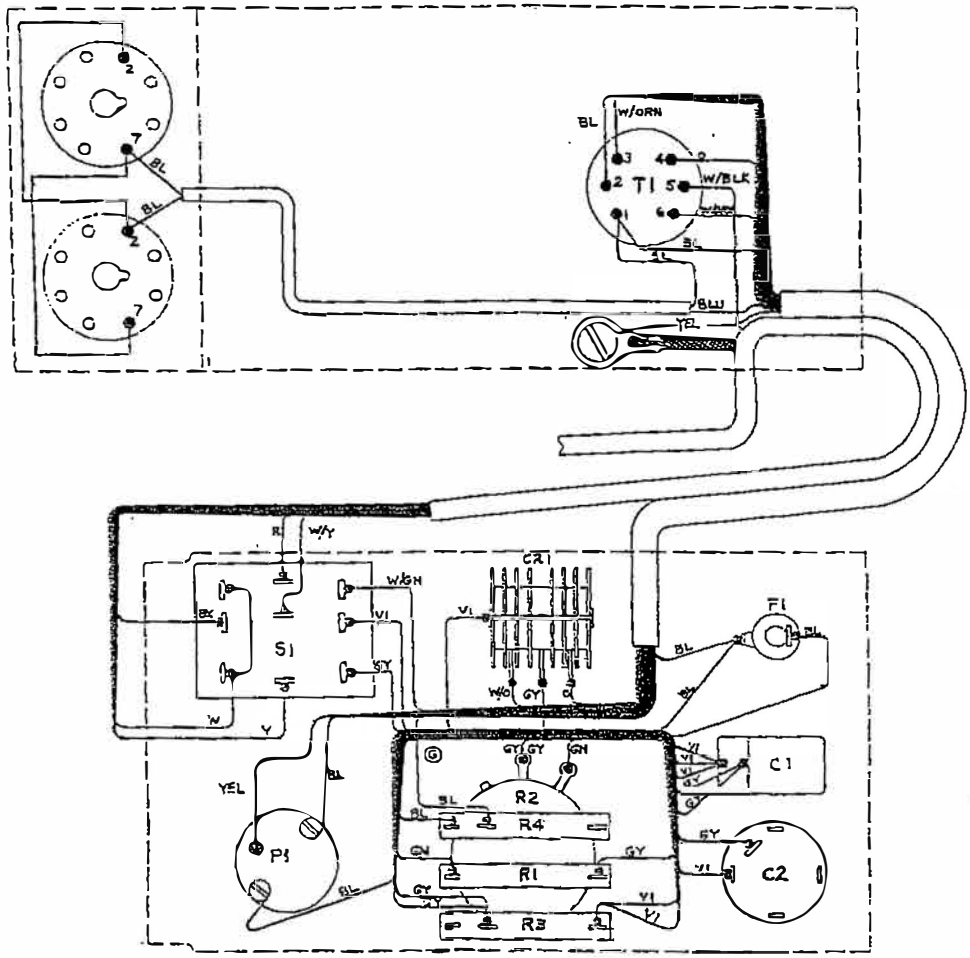
Trouble	Probable Cause	Remedy
17. Jumpy cell balance needle on all cells. (continued)	Oscillator-amplifier phasing is bad.	Return kit to factory.
	Power pack filter faulty.	Check power pack components, C-201, C-202, etc.
18. Cell balance meter pegs as amplifier cover is secured.	Short occurs somewhere on indicator terminal strip.	Secure wires properly on terminal strip.
	Harness from terminal strip to amplifier chassis is bad.	Repair.

LEGEND FOR SCHEMATIC

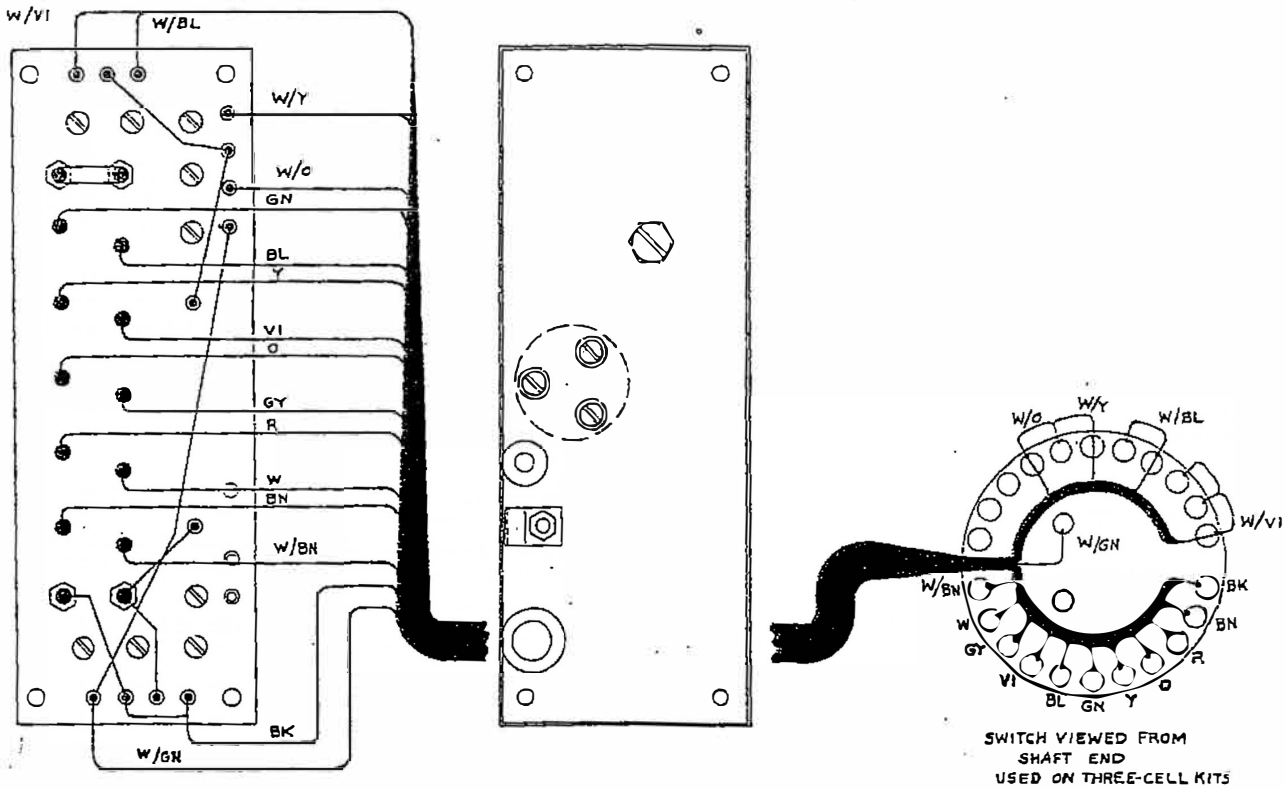
S-1	DPDT
S-2	DP Momentary on Bat.
S-3	3 Pole Switch
S-4	Load Switch 2 Pole 11 Pos.
S-101	3 PDT Ball Handle
L-1	Lamp
P-1	Receptacle
F-1	Fuse 1/2 Amp.
F-2	Fuse 2Amp.
CR-101	Rectifier
T-1	L-918 Input
T-2	L-920 Output
T-3	DS-474 Osc.
T-101	1087 Power
V1	6072 (12AX7)
V2	12AU7
V3	12AU7
V4	28D7
V102	1H20 Amperite
V103	1H20 Amperite
C-1	.33 MFD 100V.
C-3	Select on Test
C-4	Select on Test
C-5	Select on Test
C-101	.01 MFD 200 V.
C-102	.01 MFD 200 V.
C-103	.01 MFD 200 V.
C-104	.01 MFD 200 V.
C-105	.5 MFD 200 V. Select on test
C-106	.001 MFD .5% Select on test
C-107	Select on Test
C-201	10 MFD 300 V.
C-202	500 MFD 50 V.
R-1	Potentiometer
R-2	Select on Test 1/2 W. 1%
R-3	Select on Test 1/2 W. 1%
R-4	12 Ohms 1/2 W.
R-5	7.5 Ohms Tapped Spool
R-6	7.5 Ohms Tapped Spool
R-7	.07 Ohms Advance Wire
R-8	.2 Ohms 1/2 W. 1%
R-9	.65 Ohms 1/2 W.
R-10	91 Ohms 1/2 W. 1%
R-11	120 Ohms 1/2 W. 1%
R-12	180 Ohms 1/2 W. 1%
R-13	350 Ohms 1/2 W. 1%
R-15	1 Ohms 1/2 W. ±.2 Ohm
R-16	10,000 Ohms 1/2 W. 1%
R-17	260,000 Ohms 1/2 W. 1%
R-19	2,000 Ohms Potentiometer
R-20	2,000 Ohms Potentiometer
R-21	2,000 Ohms Potentiometer
R-101	2.2 Meg. 1/2 W. 10%
R-102	2.2 Meg. 1/2 W. 10%
R-103	2.2 Meg. 1/2 W. 10%
R-104	2.2 Meg. 1/2 W. 10%
R-105	.47 Meg. 1/2 W. 10%
R-106	.47 Meg. 1/2 W. 10%
R-107	.22 Meg. 1/2 W. 10%
R-108	4,700 Ohms 1/2 W. 10%
R-109	1,200 Ohms 1/2 W. 10%
R-110	22,000 Ohms 1/2 W. 10%
R-111	15,000 Ohms 1/2 W. 10%
R-112	4,700 Ohms 1/2 W. 10%
R-113	4,700 Ohms 1/2 W. 10%
R-114	2,200 Ohms 1/2 W. 10%
R-115	100 Ohms 1/2 W. 1%
R-116	75 Ohms 5 W.
R-117	3,000 Ohms Potentiometer
R-201	400 Ohms 10 W.
R-202	500 Ohms Potentiometer
R-203	2,000 Ohms 10 W.
R-204	1,000 Ohms 10 W.
R-205	Resistor
R-206	Resistor
R-207	Resistor
R-208	Trimpot
R-209	Trimpot
R-210	Trimpot



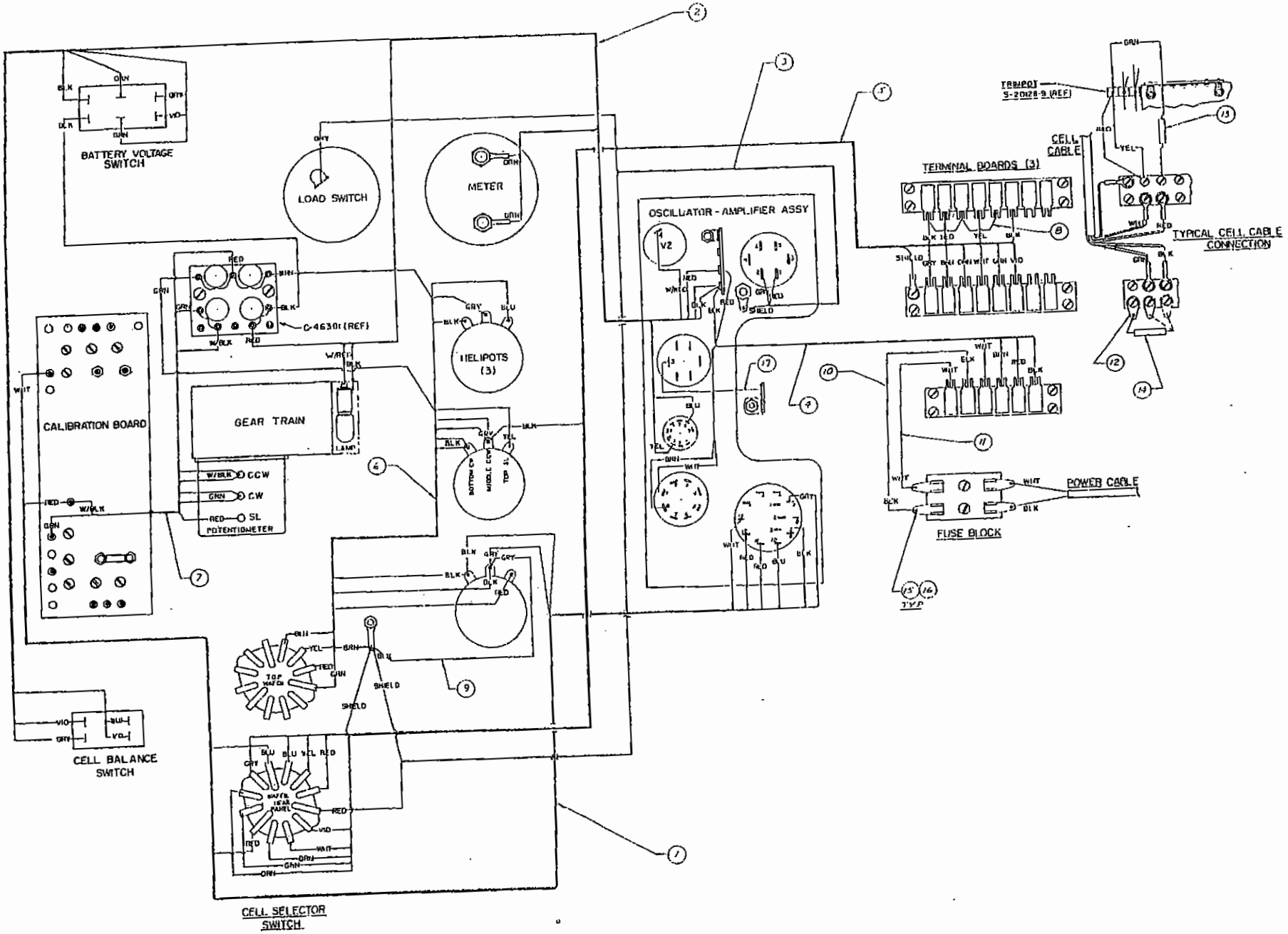
Electronic Weighing Kit -- Schematic Wiring Diagram



Case and Cover Assy Wiring Diagram



Board and Switch Assy Wiring Diagram



Indicator-Amplifier Wiring Diagram