D.C. Voltmeters and Ammeters

SECTION 1

D.C. AMMETERS AND VOLTMETERS

GENERAL

Weston D.C. Ammeters and Voltmeters are all conventional permanent magnet moving coil instruments, their basic movement design being suitably adaptable to meet a variety of applications in aircraft instrumentation.

Standard calibrated dials have white markings on a black background (photogenic), but dials can also be made available with fluorescent markings on a black background or black markings on a white background.

All indicators in this section may be supplied with markings representing other quantities i.e. Position, Pressure, Temperature and Contents.

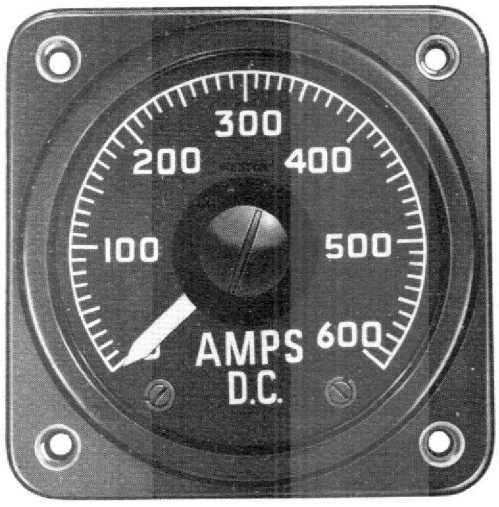
D.C. AMMETERS

For current ranges of 500 mA and above D.C. Ammeters are designed to operate in conjunction with external shunts. Under these conditions the indicator is constructed as a millivoltmeter and is calibrated so that its readings are propertional to the voltage drop across the external shunt and therefore to the current flowing through the shunt.

To enable a Shunt/Ammeter combination to operate accurately and safely under conditions of overload the range of the indicator should be such that the maximum working current does not normally exceed 2/3rds of the maximum shunt current value.

Weston Ammeters are normally calibrated allowing for an external lead resistance of 0.5 ohm. Any departure from this value must be mentioned at the time of ordering.

Plugs and sockets are not normally recommended for connection purposes and screw terminals sizes No.6UNC or No.4 BA are normally used to provide good terminal/lead contact.

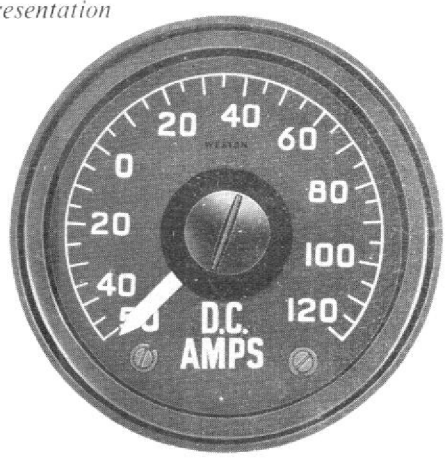


Model S 78 Form 3

Typical Presentation

Model S 451 Form 4

Typical Presentation



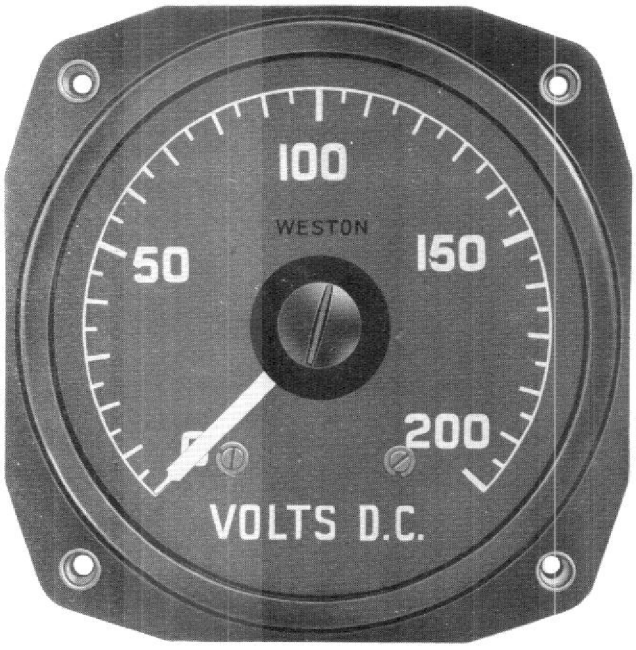
D.C. VOLTMETERS

Of the same basic design as the ammeters already mentioned in this section self contained D.C. Voltmeters can be manufactured to cover any range from 50 millivolt to 300 volts.

Higher ranges may be accommodated when required by the addition of a small accessory box. Details of this are not given in this section but may be obtained on application.

Sensitivity of the moving coil permanent magnet movement used in the construction of d.c. voltmeters is 500 ohms per volt with the exception of short scale indicators which have a sentivity of 200 ohms per volt. Models available as d.c. voltmeters are listed together with d.c. ammeters on pages 1/4 and 5. Due to the relatively low resistance of millivoltmeters it is essential that they be calibrated taking into account the external lead resistance which should be stated when ordering.

Voltmeters with suppressed zero characteristics may be made available and enquiries are invited for consideration.



Model S 78 Form 5

Typical Presentation

Model S 149 Form 2

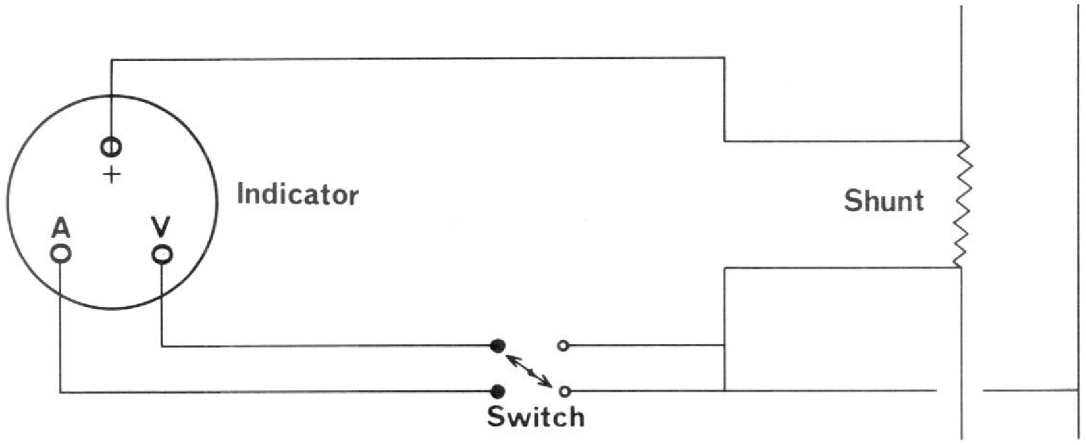
Typical Presentation

COMBINED D.C. VOLTMETERS AND AMMETERS

There are two basic types of combined D.C. Volt-ammeters. Continuous measurement of current and voltage can be indicated simultaneously by using a dual or multi-movement instrument. Each individual movement designed either as a voltmeter or ammeter. Several models can be used in this way, typical examples are models S216 - S128 - S175.

A single movement indicator calibrated for the measurement of voltage and current can be made available for certain applications. Readings of either voltage or current may be selected by switching the external circuit as shown in the theoretical circuit below.

It is important to use a high quality instrument switch such as the model S88 (section 20).



In such a system the leads from the shunt right back to the indicator must have a resistance of 0.5 ohm or some other known value previously agreed upon prior to manufacture. A limited number of ranges can be accepted depending upon the full-scale values. Current values and voltages must be multiples of each other in order to produce a dual purpose dial presentation.

A preferred model for this application is the model S231 details of which are given on page 1/5.

D.C. AMMETERS AND VOLTMETERS

MODEL	FORM	DESCRIPTION	INST. DEPTH MAX.	NOMINAL SCALE ANGLE	SCALE LENGTH	ELECTRICAL CONNECTIONS	NORMAL ACC. OF FSD	APPROX WEIGHT	F.D.
S78	3	Small S.A.E. shielded bakelite case	2.54 in (64 mm)	260°	4.125 in (105 mm)	A3 B3	± 2%	11.5 oz (326 g)	692
S78	4	Small S.A.E. shielded bakelite case	2.94 in (75 mm)	260°	4.125 in (105 mm)	A3 B3	± 2%	12.5 oz (354 g)	684
S78	5	Large S.A.E. shielded bakelite case	3.675 in (93 mm)	260°	5.875 in (149 mm)	A3 B3	± 2%	18 oz (510 g)	777
S104	3	Small S.A.E. shielded bakelite case	1.90 in (48 mm)	90°	1.6 in (41 mm)	A3 B3	± 2%	7 oz (198 g)	652
S104	5	Large S.A.E. shielded bakelite case	3.18 in (82 mm)	90°	2.25 in (57 mm)	A3 B3	± 2%	15 oz (425 g)	775
S128	5	Dual Indicator. Large S.A.E. shielded bakelite case	3.10 in (79 mm)	100°	1.75 in (44 mm)	A3 B3	± 2%	21 oz (595 g)	784
S149	2	2 in dia. flangeless steel case (Sealed)	3.90 in (99 mm)	260°	3.25 in (83 mm)	A3 B3 C3	± 2%	11 oz (312 g)	814
S149	3	2 in dia. flangeless steel case (Sealed)	3.08 in (78 mm)	260°	3.25 in (83 mm)	A3 B3	± 2%	10 oz (283 g)	1009
S174	5	4 movements. Large S.A.E. shielded bakelite case	3.18 in (82 mm)	90°	1.6 in (41 mm)	A3 B3	± 2%	19 oz (539 g)	892
S175	8	Dual Indicator. Large S.A.E. shielded bakelite case.	3.735 in (95 mm)	260% 245°	3.25 in (83 mm)	A3 B3	± 2%	19 oz (539 g)	895
S181	2	3 or 4 movement edgewise indicator 2.75 in (70 mm) x 4.625 in (118 mm)	3.25 in (83 mm)	52°	1.3 in (33 mm)	A3 B3	± 3%	17 oz (482 g)	968

continued . . .

D.C. AMMETERS AND VOLTMETERS (cont.)

MODEL	FORM	DESCRIPTION	INST. DEPTH MAX.	NOMINAL SCALE ANGLE	SCALE LENGTH	ELECTRICAL CONNECTIONS	NORMAL ACC. OF FSD	APPROX WEIGHT	F.D.
S214	2	Triple movements in 2 in dia. steel sealed case	4.09 in (104 mm)	90°	2 Mvts. 0.83 in (21 mm) 1 Mvt. 1.5 in (38 mm)	C8 C9 D1 E3 E4	±4%	12 oz (340 g)	993
S216	2	Dual movements in 2 in dia. steel sealed case	3.93 in (100 mm)	90°	0.83 in (21 mm)	C6 C7 E2	± 3%	12 oz (340 g)	972
S230	3	2 in dia. flangeless steel case (sealed). Flag indicator in addition to main movement	3 in (76 mm)	180°	2.3 in (59 mm)	A3 B3	±2%	11 oz (312 g)	1058
S231	3	Small S.A.E. shielded bakelite case. Alternative to S78.3 with improved scale linearity and accuracy	2.54 in (39 mm)	240°	3.8 in (97 mm)	A3 B3	±1.5%	11.5 oz (326 g)	692
S231	4	Small S.A.E. shielded bakelite case. Alternative to S78.4 with improved scale linearity and accuracy.	2.937 in (75 mm)	240°	3.8 in (97 mm)	A3 B3	±1.5%	12.5 oz (354 g)	684
S231	5	Large S.A.E. shielded bakelite case. Alternative to S78.5 with improved scale linearity and accuracy.	3.3 in (84 mm)	240°	4.5 in (114 mm)	A3 B3	±1%	20 oz (567 g)	777
S451	3	Small S.A.E. shielded bakelite case with flange removed	2.54 in (64 mm)	260°	4.125 in (105 mm)	A3 B3	±2%	11.5 oz (326 g)	1247
S451	4	Small S.A.E. shielded bakelite case with flange removed	2.94 in (75 mm)	260°	4.125 in (105 mm)	A3 B3	±2%	12.5 oz (354 g)	1134
S451	5	Large S.A.E. shielded bakelite case with flange removed	3.36 in (85 mm)	260°	5.875 in (149 mm)	A3 B3	±2%	16.5 oz (468 g)	1190
S454	2	2 in dia. flangeless steel case (short scale angle)	3.9 in (99 mm)	90°	1.3 in (33 mm)	A3 B3	±3%	11 oz (312 g)	1164
S458	2	2 in dia. flangeless steel case. Alternative to S149.2 with improved scale linearity and accuracy	3.9 in (99 mm)	240°	3 in (76 mm)	A3 B3	±1.5%	11 oz (312 g)	814
S458	3	2 in dia. flangeless steel case. Alternative to S149.3 with improved scale linearity and accuracy	3.08 in (78 mm)	240°	3 in (76 mm)	A3 B3	±1.5%	10 oz (283 g)	1009

continued . . .

D.C. AMMETERS AND VOLTMETERS (cont.)

MODEL	FORM	DESCRIPTION	CASE DEPTH	NOMINAL SCALE ANGLE	SCALE LENGTH	ELECTRICAL CONNECTIONS	NORMAL ACC. OF FSD	APPROX WEIGHT	F.D.
S460	4	Small S.A.E. shielded bakelite case with flange removed. Alternative to S451.4 with improved scale linearity and accuracy	2.937 in (75 mm)	240°	3.8 in (97 mm)	A3 B3	±1.5%	11.5 oz (326 g)	1134
S460	5	Large S.A.E. shielded bakelite case with flange removed. Alternative to S451.5 with improved scale linearity and accuracy	3.36 in (85 mm)	240°	4.5 in (114 mm)	A3 B3	±1%	19 oz (539 g)	1190
S478	5	Dual movement indicator. Large S.A.E. shielded bakelite case with flange removed	3.36 in (85 mm)	100°	1.75 in (44 mm)	A3 B3	±2%	19 oz (539 g)	1190
S482	5	Large S.A.E. shielded bakelite case with flange removed. Fitted with additional flag indicator	3.36 in (85 mm)	240°	4.64 in (117 mm)	A3 B3	±2%	18 oz (510 g)	1190
S483	2	2" Square front steel case with integral lighting.	4.51 in (115 mm)	240°	3.3 in (84 mm)	A6 B4 C7	± 1½%	20 oz (566 g)	1374
S484	2	2" Square front steel case with integral lighting. Dual	4.51 in (115 mm)	240°	0.9 in (23 mm)	A6 B4 C12	± 3%	16 oz (454 g)	1374
S487	3	Small S.A.E. case with flange removed	1.9 in (48 mm)	90°	1.6 in (41 mm)	A3 B3	±2%	6.75 oz (510 g)	1247
S487	5	Large S.A.E. case with flange removed	3.175 in (80 mm)	90°	2.25 in (57 mm)	A3 B3	±2%	14.5 oz (420 g)	1190
S497	6	Large S.A.E. shielded bakelite case fitted with additional flag indicator.	3.36 in (85 mm)	240°	4.65 in (117 mm)	A3 B3	±2%	18 oz (510 g)	778

SANGAMO WESTON

PREFERRED RANGES

All Screw Terminals and fixing nuts have unified threads.
Dials are Black and have White figures and markings.
The following pointers are fitted as standard:-
White Lance, Narrow Tip - Model S78
White Lance - Models S149, S231 & S458
Electrical connections are coded in the following manner:-
'A' or '1' negative, 'B' or '2' positive.

D.C. AMMETERS

F.S.D. = 50mV. For use with external shunts, lead resistance 0.5 ohm.

RANGE AMPS	2 in DIA. 6 U.N.C. SCREW TERMINALS	2 in DIA. 6 U.N.C. SCREW TERMINALS	SMALL S.A.E. SCREW TERMINALS	SMALL S.A.E. SCREW TERMINALS	LARGE S.A.E. SCREW TERMINALS	LARGE S.A.E. SCREW TERMINALS
0-60	S149.3.335	S458.3.27	S78.3.1164	S231.3.63	S78.5.1168	S231.5.68
0-100	S149.3.217	S458.3.28	S78.3.1165	S231.3.64	S78.5.1169	S231.5.69
0-200	S149.3.336	S458.3.29	S78.3.1166	S231.3.65	S78.5.1170	S231.5.70
0-300	S149.3.295	S458.3.30	S78.3.1188	S231.3.66	S78.5.1189	S231.5.71
0-500	S149.3.337	S458.3.31	S78.3.1167	S231.3.67	S78.5.1171	S231.5.72

D.C. VOLTMETERS

RANGE VOLTS	2 in DIA. SEALED 3 PIN PLUG	2 in DIA. SEALED 3 PIN PLUG	2 in DIA. 6 U.N.C. SCREW TERMINALS	2 in DIA. 6 U.N.C. SCREW TERMINALS	S SMALL S.A.E. SCREW TERMINALS	SMALL S.A.E. SCREW TERMINALS	LARGE S.A.E. SCREW TERMINALS	LARGE S.A.E. SCREW TERMINALS
0-35	S149.2.87	S458.2.32	S149.3.326	S458.3.25	S78.3.1154	S231.3.61	S78.5.1156	S231.5.74
0-150	S149.2.328	S458.2.33	S149.3.327	S458.3.26	S78.3.1155	S231.3.62	S78.5.1157	S231.5.75