

Instructions for Operating Model 685 Type 2, Tube Checker

In designing and producing this tube checker it has been the plan of this company to place in the hands of the operator a device of extreme electrical flexibility and modern design, having an appearance that definitely attracts attention. A new method of measuring total emission on the basis of independent loads for the various types of tubes has been incorporated in the device. The tubes are divided into three groups, a separate load resistance being used for each group, covering the NORMAL or general purpose tube, the BATTERY or "2 Volt" group and the DIODES. Using this system at no time can excessive emission be drawn from the filament, damaging the tube, yet sufficient current must be delivered by the power tubes so that faulty cathode structure will show up under heavy load conditions.

A system of independent electrode switching is used, so that any single or group of electrodes can be connected together to measure the total emission on any one portion of a tube. Likewise individual tests on single electrodes can be made, thus covering tests on all combination and double tubes. The use of a neon short test makes possible the indication of all inter-electrode shorts either of low or high resistance value.

ROTARY CONTROLS. The center knob nearest to the instrument controls the line voltage supplied to the tester transformer. It operates in conjunction with an instrument reading which can be obtained at any time by placing the TEST—LINE SHORT CHECK switch in the LINE SHORT CHECK position. This adjustment should be watched so that variations in line voltage can be balanced out and corrections for the tube load made after the tube has been placed in the socket.

A **FILAMENT SELECTOR** switch to the left of the line voltage control connects the test sockets to the correct filament transformer winding. The setting of this switch should correspond to the number called for on the instruction card.

A **TUBE SELECTOR** control is located directly to the right of the line control. This is essentially a sensitivity for the tester instrument in the form of a potentiometer operating in conjunction with a shunt circuit.

TOGGLE SWITCHES. There is one group of toggle switches lettered A thru G mounted on the control panel at the front of the tester equipped with red bakelite handles. These switches connect to the various pin positions on the sockets, thus affording an arrangement of extreme flexibility whereby any combination of electrodes can be connected for a total emission reading. When in the IN position the switch connects its corresponding electrode to the plate or positive side of the transformer winding. All switches are kept in the OUT position connecting the electrodes to the cathode or return circuit unless otherwise specified under the test readings.

The other group of toggle switches are more a functional group and are used for general operation of the tester. The two switches at the lower left and right control the system of loads previously mentioned. Both of these switches are kept in the NORMAL position except when testing tubes of "2 Volt Filament" or "Battery" type, and diodes. The asterisk and dagger engraved on the panel directly below the switches refer to the same indications appearing directly above certain of the tube type numbers. When one of these two signs is shown, the switch carrying the corresponding designation should be manipulated so that the correct load will be in the circuit. The other two switches are self-explanatory, the left-hand one being used for converting the tester instrument into a line voltage indicator and for throwing in the neon short test. The right-hand switch should be kept in the OFF position when the tester is not in use.

SHORT TEST. A neon short test has been incorporated in this device, the test being made while the tube is hot. In this way heater-cathode leakage which occurs after the heater has come up to temperature is indicated by the neon lamp, and likewise other shorts that may occur due to thermal expansion of the tube elements. The short test is made in the regular test socket with the TEST—LINE SHORT CHECK switch in the LINE SHORT CHECK position. The most common intermittent or permanent short occurs between the cathode and heater structure of the tube. The test for this can be made at all times by placing the tube in its socket and allowing it to heat up. Switch A should be thrown to the IN position leaving all other switches in the OUT position. If no short is indicated on the lamp, the tube should be tapped gently and the lamp watched carefully for intermittent flicker. Further short testing of the tube can then be made by returning this switch to the OUT position and manipulating each of the switches called for under the IN position, on the test limit chart. These switches should be thrown one at a time to the IN position and then returned.

OPERATION: NORMAL TYPE. Plug the tester into any nominal 50-60 cycle 110-125 volt A.C. line, turn on the tester and place the TEST—LINE SHORT CHECK switch in the LINE SHORT CHECK position. Note the meter reading and bring the instrument pointer to the center black line labelled LINE CHECK by rotating the LINE VOLTAGE knob.

Refer to the test limit chart under the tube type number required and set the filament and tube selectors in accordance with the readings shown. Place the tube in the socket having the corresponding pin arrangement and allow the tube to heat. A correction for line voltage should be made at this time if the instrument pointer deviates from the black arrow due to the tube load being placed on the tester transformer.

If the tube has a cathode as indicated by the small black star directly above the type number, throw switch A to the IN position and while tapping the tube gently, note whether any short indication is shown by the neon lamp. If the tube does not have a cathode, this switch should not be manipulated for short testing as the indication will mean nothing. If a complete short test is further desired this A switch should be returned to the OUT position and switches carrying letters corresponding to those indicated on the test limit chart opposite the wording "In Position" and "2nd Plate" should be thrown and returned one at a time while watching the neon lamp. This will give a complete inter-electrode short test of the tube.

The switches indicated opposite the wording "In Position" should then be placed in this position and the TEST—LINE SHORT CHECK switch should be thrown to the TEST position. The instrument will then indicate total emission reading of the tube.

If the tube has a second plate or second portion, the switches previously thrown should be returned to the OUT position and those switches indicated opposite the wording "2nd Plate" should be placed in the IN position giving the indication on this portion of the tube.

OPEN ELEMENT TEST. When checking for emission on any tube some of the electrodes handle most of the emission current because of their proximity to the cathode, resulting occasionally in a tube checking good when one of the elements, carrying only a very small current, is open. Such a tube will not operate in a radio receiver. With Weston's system of independent electrode switching this type of fault can be located readily. First set the tube up for the regular total emission check as outlined in the paragraphs under "Operation," and then throw each of the electrode switches used for the particular tube alternately from the "IN" position to the "OUT" position noting if there is a change in deflection. If there is no change in meter indication the tube should be rejected as bad due to an open element. If satisfied that the particular element is not open, return its toggle switch to the "IN" position and repeat the above procedure on each of the other electrode switches used in testing that tube. Note that certain electrodes in some tubes will give only about 1/2 division change in meter deflection when a particular switch is pulled from the "IN" to the "OUT" position. This is normal as it shows that the element under test is drawing a small current.

BATTERY TYPE*. Tubes of this variety are designated by an asterisk directly above the type number. When testing tubes of this type the lower right-hand switch labelled NORMAL-BATTERY TYPE should be thrown to the BATTERY TYPE position before testing. In all other respects the test procedure remains the same. After testing a group of battery tubes, be sure to return this switch to the NORMAL position before testing a group of general type tubes.

DIODES †. When testing diode plates the lower left-hand toggle switch should be thrown to the position engraved DIODE PLATES ONLY. A dagger appears above all tubes having diode plate readings, this marking corresponding to that on the above mentioned switch. When testing diode plates it should be noted that the tube selector control should always be placed in the "O" position. A black line and arrow on the instrument scale is used as the passing line for emission on diode plates. If the meter indication is above this line the tube should be passed as having sufficient emission.

NOTE: Should this device fail to function when plugged into an a.c. line known to be alive, the 4 corner panel screws should be removed and the tester complete lifted out of its case. The 1 ampere fuse mounted on the tester transformer should be examined, and if found to be open it should be replaced by the spare fuse supplied with the tester or any other one ampere unit of the Littlefuse type. Should the device still fail to function, the type 01A tube should be removed and tested, and replaced if found to be defective. This should clear the trouble and with the device again plugged in and the TEST—LINE SHORT CHECK switch in the LINE CHECK position a meter indication should be had.

Tube Test Data

for Model 685 Type 2

Tube Type	O1A	1	A4	A5	A6	A6	A7	B4	B5	B5	C5	C6
Fil. Selector	5		2	1	2	2	1	2	2	2	1	2
Tube Selector	33		23	20	9	18	19	20	14	0	25	14
"In" Position	BC		BCE	BCD	CF	BCEFG	BCDEF	BCE	BG	C	BCD	CF
2nd Plate										F		

T.*	Tr.*	T.*	Tr.*	T.*	*	*	*	*	Pe.*	Di.†	Pe.*	Di.†	*	*
C6	C7	C7	D7	D7	E5	E7	F4	F5	F6	F6	F7	F7	G5	H4
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	14	22	9	18	20	27	24	24	17	0	17	0	24	22
BCEFG	BD	BCDEF	BD	BCDEF	BCE	BCG	BCG	BCD	BCE	F	BEF	C	BCD	BD
										G		D		

Tube Type	H5	H5	H6	H6	J6	N5	2	4A	A4	6	7	A3
Fil. Selector	1	1	2	2	2	1		3	3	1	3	3
Tube Selector	20	0	17	0	22	23		39	43	35	38	44
"In" Position	BE	D	BF	C	BC	BCE		BCE	B	BC	BC	BC
2nd Plate				D	DF			D				

*	Tr.*	Di.†	Tri.*	T.	Pe.*	Di.†	3	*	*	*	*
A5	A6	A6	A7	A7	B7	B7	W3	0	3	6	7
3	3	3	3	3	3	3		2	2	6	6
40	40	0	40	42	36	0		19	24	40	39
BCF	BE	C	DF	BCDEF	BCE	D		BC	BCG	BCE	BC
		F				F					

Tube Type	4	2	3	7	A6	5	0	3	5	5	6
Fil. Selector		6	9	3	2		7	3	3	3	3
Tube Selector		42	43	39	20		38	41	37	0	40
"In" Position		BCF	BCF	BCG	DF		BC	BC	BE	C	BC
2nd Plate							FG			F	

*	*	*	T4	W4	X3	Y3	Z3	Z4	6	A3	A4	A5
7	8	9	5	5	5	5	5	5		6	6	6
3	3	3	5	5	5	5	5	5		6	6	6
42	42	41	41	36	36	36	39	44		42	39	42
BCEF	BCEF	BCDF	C	C	B	C	B	C		BC	BCG	BD
			F	F	C	F	C	F				

Tube Type	AB5	AB6	AC5	AD5	A6	A7	A7	A8	A8	B4	B5	B7
Fil. Selector	6	6	6	6	6	6	6	6	6	6	6	6
Tube Selector	26	31	41	42	41	39	40	39	40	43	37	37
"In" Position	BCF	BCD	BD	BD	BC	DF	BCDEF	DF	BCDEF	BD	BCF	BCE
2nd Plate					FG							

Di.†	Pe.*	Di.†	*	*	*	*	Tr.*	T.	*	*	*	Tri.*	Pe.*	*
B7	B8	B8	C5	C6	C8	D5	D6	D8	D8	E5	F5	F6	F7	F8
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
0	35	0	40	41	39	39	40	39	41	31	42	40	24	38
D	BEF	C	BD	BCEF	BE	BD	BCEF	BD	BCDEF	BCF	CE	BCD	DF	BCE
F		D			DF									BE

Tube Type	G5	G6	H6	J5	J7	J8	K5	K7	K8	L6	L7
Fil. Selector	6	6	6	6	6	6	6	6	6	6	6
Tube Selector	36	41	0	43	41	41	40	43	40	44	43
"In" Position	BCF	BCD	B	BD	BCDE	BCE	DF	BCE	BCDE	BCDEF	BCD
2nd Plate			D								BCDE

N6	N7	P7	Q6	Q6	Q7	Q7	R6	S7	SK7	U5	U7	V6	V7	V7
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
37	41	38	41	0	41	0	40	41	42	35	41	45	36	0
BCD	BD	CDEF	BE	D	BE	C	BDE	BCE	ABCF	BC	BCDE	BCD	BE	C
	CF					D								D

Tube Type	W5	X5	ZY5	Z7	7	IA	5	5	6	8	9
Fil. Selector	6	6	6	6		5	6	6	6	6	6
Tube Selector	44	43	41	42		39	41	0	39	40	41
"In" Position	B	B	B	BC		BC	BE	C	BC	BCEF	BC
2nd Plate	D	D	D	DF		F				GE	

Tri.*	Di.†	Pe.*	Di.†	*	*	Tri.*	Di.†	SA7	SJ7	SK7	Z3	Z5
A8	A8	C8	C8	J7	K7	Q7	Q7	8	8	8	8	8
8	8	8	8	8	8	8	8	8	8	8	8	8
41	0	38	0	41	40	41	0	43	42	42	43	39
BE	C	BEF	C	BCDE	BCDE	BE	C	BCDG	ABCFG	ABCFG	B	B
	D		D				D					G

Tube Type	8	0	1	2	3	4	5	5	1	A5	A7	A7
Fil. Selector		5	7	3	5	6	6	6		8	8	8
Tube Selector		36	30	44	43	42	36	0		39	40	44
"In" Position		B	B	B	B	B	BE	C		BCD	BCE	F
2nd Plate		C	C	C	C	C		F				

Tube Type	2	A6	Pe.*	R.	A7	B5	B6	L6	N6	Y5	Z3	Z5	Z6
Fil. Selector		9	9	9	9	9	9	9	9	9	9	9	9
Tube Selector		43	41	0	40	45	45	40	41	42	44	44	44
"In" Position		BCD	BCD	F	BCF	BCD	BCD	BCD	B	B	B	B	B
2nd Plate									G	G	G	D	

Tube Type	3	L6	Z4
Fil. Selector		9	9
Tube Selector		45	45
"In" Position		BCD	D
2nd Plate			

★ Test for cathode leakage by throwing "A" switch to "In" position when tube is hot; leave other switches in "Out" position.

* Battery type; throw upper right-hand switch to "Battery Types" Position.

† Diode; place upper left-hand switch in "Diodes Only" position before testing.

T—Total emission all electrodes.

R—Rectifier section.

THE FOLLOWING HAVE EQUIVALENT TEST READINGS:

00A = 71A	6L5 = 6C5	6Z4 = 84	39 = 36	52 = 6A4	88 = 83	KR25 = 2A5
1D5 = 1E5	6N5 = 6E5	10 = 50	40 = 01A	57AS = 78	89 = 6D6	KR5 = 6A4
5U4 = 5Z4	6P5 = 6C5	12A = 71A	41 = 42	58AS = 78	95 = 2A5	LA = 6A4
5V4 = 5T4	6R7 = 6Q7	14Z3 = 12Z3	43MG = 25A6	64 = 36	98 = 84	P-861 = 84
6AE6 = 6F6	6SJ7 = 6SK7	27HM = 56	44 = 36	65 = 36	482A = 71A	PZ = 47
6D7 = 6U7	6T5 = 6G5	31 = 30	45 = 27	67 = 37	586 = 50	PZH = 2A5
6E5 = 6C5	6T7 = 6Q7	32 = 1B4	46 = 47	68 = 36	841 = 50	
6E6 = 6A6	6W7 = 6U7	34 = 1B4	48 = 43	77 = 78	986 = 83	
6E7 = 6U7	6Y6 = 6V6	35 = 24A	49 = 33	82V = 82	AG = 83	
6K6 = 6F6	6Y7 = 6Z7	38 = 36	51 = 24A	83V = 83	G85S = 85	

Weston 685
Tube Data Supplement Chart
 (Source unknown)

0A4 Spec.	1	40	DEF	30 Bat.	2	19	BC	6K5 *	6	43	BE	12A8 *	8	43	BCDEF
0Z4 Spec.	1	45	B & D	35 *	3	38	BCE	6K7 *	6	40	BCDE	12B7 *	8	42	BCDF
01A	5	36	BC	36 *	6	40	BCE	6K8 *	6	44	BCDEF	12B8	8	42	BCE
				3A8 †	3	22	ABCE	6L6 *	6	43	BCD	12B8	8	43	DG
				3A8 †	3	22	ADF	6L7 *	6	43	BCDE	12C8 *	8	38	BEF
				3A8 Di. †	3	0	A & G	6N7 *	6	41	BC & DF	12C8 Di.	8	0	C & D
1A4 Bat.	2	23	BCE					6Q6 *	6	41	BE	12F5 *	8	42	CE
1A5 Bat.	1	20	BCD	42 *	6	42	BCF	6Q6 Di.	6	0	D	12J5 *	8	43	BD
1A6 Bat.	2	9	CF	43 *	9	43	BCF	6Q7 *	6	41	BE	12J7 *	8	42	BCDE
1A6 Bat.	2	18	BCEFG	45	3	38	BC	6Q7 Di.	6	0	C & D	12Q7 *	8	42	BE
1A7 Bat.	1	19	BCDEF	47	3	41	BCG	6R6 *	6	40	BDE	12Q7 Di.	8	0	C & D
1B5 Bat.	2	40	BG					6S7 *	6	41	BCDE	12SA7	8	43	BCDG
1B5 Di.	2	0	C & F					6SA7	6	43	BCDG	12SC7 ††	8	42	BH & CD
1C5 Bat.	1	25	BCD	50	7	38	BC	6SC7 ††	6	42	BH & CD	12SF5 ††	8	43	BD
1C6 Bat.	2	20	BCDEF	55 *	3	37	BE	6SF5 ††	6	42	BD	12SJ7 *	8	42	BCFG
1C7 Bat.	2	22	BCDEF	55 Di.	3	0	C & F	6SK7 *	6	42	BCFG	12SQ7 ††	8	41	FH
1D7 Bat.	2	18	BCDEF	56 *	3	40	BC	6SQ7 ††	6	41	FH	12SQ7 Di. ††	8	0	C & D
1D8 Bat.	1	22	BCD	58 *	3	42	BCEF	6SQ7 Di. ††	6	0	C & D	12Z3 *	8	43	B
1D8 Bat.	1	15	EF	5T4	5	41	C & F	6V6 *	6	45	BCD				
1D8 Di.	1	0	G	5X3	5	36	B & C	6V7 *	6	36	BE	25A6 *	9	43	BCD
1E4 Bat.	1	24	BD	5X4 ††	5	41	B & D	6V7 Di.	6	0	C & D	25A7 *	9	41	BCD
1E5 Bat.	2	20	BCE	5Y3	5	36	C & F	6W5 *	6	44	B & D	25A7	9	44	F
1E7 Bat.	2	27	BCG & DFG	5Y4 ††	5	36	B & D	6X5 *	6	43	B & D	25AC5 *	9	40	BD
1F4 Bat.	2	24	BCG	5Z3	5	39	B & C	6ZY5 *	6	41	B & D	25B5 *	9	40	BCF
1F6 Bat.	2	20	BCE	5Z4	5	44	C & F	6Z7 *	6	42	BC & DF	25C6 *	9	45	BCD
1F6 Di.	2	0	F & G									25D8	9	43	BCEH
1F7 Bat.	2	17	BEF	6A3	6	42	BC	71A	5	41	BC	25D8	9	42	DF
1F7 Di.	2	0	C & D	6A5 †	6	42	ABD	75 *	6	41	BE	25D8 Di.	9	0	G
1G5 Bat.	2	24	BCD	6A7 *	6	40	BCDEF	75 Di.	6	0	C & F	25L6 *	9	45	BCD
1G6 Bat.	1	21	BC & DE	6AB5 *	6	26	BCF	76 *	6	39	BC	25N6 *	9	40	BCD
1H4 Bat.	2	22	BD	6AB6 *	6	31	BCD	78 *	6	40	BCEF	25Y5 *	9	41	B & G
1H6 Bat.	1	20	BE	6AD5 *	6	42	BD	7A4	7	43	BF	25Z3 *	9	42	B
1H5 Di.	1	0	D	6AE5 *	6	43	BD	7A5 *	7	44	BCF	25Z5 *	9	44	B & G
1H6 Bat.	2	40	BF	6AE6 *	6	39	BCD	7A6 * Di.	7	0	C & F	25Z6 *	9	44	B & D
1H6 Di.	2	0	C & D	6AG7	6	45	BCFGH	7A7 *	7	42	BCDF				
1J6 Bat.	2	22	BC & DF	6B4	6	42	BD	7A8 *	7	41	BCDEF	32L7 *	9	42	BCD
1N5 Bat.	1	23	BCE	6B7 *	6	37	BCE	7B5	7	42	BCF	32L7	9	43	F
1N6 Bat.	1	21	BCD	6B7 Di.	6	0	D & F	7B6 *	7	42	BC				
1N6 Di.	1	0	F	6B8 *	6	35	3EF	7B6 Di.	7	0	E & F	35A5 *	10	44	BCF
1Q5 Bat.	1	28	BCD	6B8 Di.	6	0	C & D	7B7 *	7	42	BCDF	35L6 *	10	45	BCD
1T5 Bat.	1	24	BCD	6C5 *	6	40	BD	7B8 *	7	43	BCDEF	35Z3 *	10	44	B
				6C6 *	6	40	BCEF	7C5 *	7	45	BCF	35Z4 *	10	45	D
				6C8 *	6	39	BE & DF	7C6 *	7	40	BC	35Z5 †	10	45	AD
				6D8 *	6	41	BCDEF	7C6 Di.	7	0	E & F				
2A3	3	44	BC	6E5 *	6	31	BCF	7E7 *	7	40	BEF	40Z5 †	10	42	AD
2A5 *	3	40	BCF	6F5 *	6	42	CE	7E7 Di.	7	0	C & D	45Z5 †	11	45	AD
2A6 *	3	40	BE	6F6 *	6	40	BCD	7F7 *	7	41	CD & EF				
2A6 Di.	3	0	C & F	6F7 *	6	24	DF	7Q7 *	7	44	BCDEF	50L6 *	11	45	BCD
2A7 *	3	42	BCDEF	6F7	6	38	BCE	7Y4 *	7	41	C & F	50Z6 *	11	44	B & D
2B7 *	3	36	BE	6F8 *	6	42	BE & DF								
2B7 Di.	3	0	D & F	6G5	6	36	BCF	80	5	36	B & C	70L7 *	12	44	BCD
2G5	3	36	BCF	6G6	6	41	BCD	82	3	44	B & C	70L7	12	44	G
2W3	3	34	C	6H6 Di. *	6	0	B & D	83	5	43	B & C				
24A *	3	40	BCE	6J5 *	6	43	BD	84 *	6	42	B & C	117L7 *	14	42	BCD
26	1	36	BC	6J7 *	6	41	BCDE	85 *	6	36	BE	117L7	14	44	F
27 *	3	39	BC	6J8 *	6	41	BCE	85 Di.	6	0	C & F	117Z6 †	14	45	AB & AD
				6J8	6	40	DF								

THE FOLLOWING HAVE EQUIVALENT TEST READINGS:

0Z3 = 0Z4	2E5 = 2G5	6B5 = 6G5	6N5 = 6E5	6U7 = 6J7	12K7 = 12J7	32 = 1E5	41 = 42	77 = 78
1B4 = 1E5	5U4 = 5T4	6B6 = 6Q7	6P5 = 6C5	6W7 = 6J7	12SK7 = 12SJ7	33 = 1F4	44 = 36	82V = 82
1B7 = 1A7	5V4 = 5T4	6D5 = 6C5	6R7 = 6Q7	6Y6 = 6V6	25B6 = 25L6	34 = 1E5	46 = 47	83V = 83
1D5 = 1E5	5W4 = 5Y3	6D6 = 6C6	6SJ7 = 6SK7	6Y7 = 6Z7	25X6 = 25Z6	37 = 76	48 = 43	
1F5 = 1G5	6A8 = 6A7	6D7 = 6J7	6T5 = 6G5	6Z4 = 84	10 = 50	38 = 36	49 = 1F4	
1G4 = 1E4	6AC5 = 6C5	6K6 = 6F6	6T7 = 6Q7	7C7 = 7B7	12A = 71A	39 = 36	51 = 35	
1P5 = 1E5	6AC6 = 6AB6	6L5 = 6C5	6U5 = 6G5	7E6 = 7B6	31 = 30	40 = 01A	57 = 58	

† Index switch A to IN position before inserting tubes; keep in this position during complete test.
 A lighted neon lamp will indicate continuity of third filament connection during test; no short test.