OPERATOR'S MANUAL

for

SIMPSON

MODELS 325 & 333 / 220 & 222

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SIMPSON ELECTRIC CO.
5216-18 KINZIE STREET
CHICAGO 44, ILL.

OPERATING INSTRUCTIONS

MODEL R M A TUBE TESTER

1. General: THE FOLLOWING INSTRUCTIONS ARE OF VITAL IMPORTANCE IN THE CORRECT CHECKING OF TUBES. BE SURE THE SWITCHES ARE SET TO THE POSITIONS NOTED IN SHORT CHECK SECTION AND TUBE CHART. Due to specially tapped filaments, extreme care must be taken when testing tubes. Especially tubes marked with symbols, etc.

A system of independent electrode switching is used for testing all or any portion of the tube. Separate load resistances are used for the different classes of tubes, preventing excessive emission and yet allowing sufficient current to indicate faulty structure within a tube.

A neon short test allows the indication of all inter-electrode shorts and leakages. A standard jack is provided for the insertion of a head phone plug to facilitate detection of noisy and leaky tubes.

2. Electrode Switches: The group of bakelite toggle switches at the front of the panel connect to the various pin positions on the sockets. This allows extreme flexibility, whereby any combination of electrodes can be connected for test. When a switch is thrown to the IN position the corresponding electrode is connected to the positive side of the transformer winding. All switches are left in the OUT position, connecting the corresponding electrodes to the cathode, or return circuit, except those specified on the tube chart.

3. Filament Selector: This switch selects the voltage delivered to the filament circuit. It should be set as specified on the TUBE CHART.

4. Filament Return: This switch connects the return filament transformer winding to the proper socket terminal for the type tube being tested. The use of this switch in connection with the group of electrode toggle switches allows filament voltage to be applied to the correct socket terminals regardless of where the filament pins may be located by the tube manufacturers.

5. Circuit Selector: This switch turns on the tester and selects the proper load resistance for the type tube

being tested. The SHORT CHECK circuit is also selected with this switch.

6. Tube Selector: This control adjusts the sensitivity of the meter so that the proper deflection is obtained for the various types of tubes.

7. Line Adjustment: Adjustment can be made for line voltages varying from 100 to 130 volts. To make this adjustment, press the LINE TEST button and rotate the LINE ADJUSTMENT control until the meter pointer is over the center line on the dial.

8. Short Check: A neon tube of the proper sensitivity is employed to detect inter-electrode shorts or leakages, the test being made while the tube is hot. In this way cathode-heater 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.

Set the CIRCUIT SELECTOR switch to the SHORT CHECK position. Place the FILAMENT SELECTOR and FILAMENT RETURN switches in the position indicated on the TUBE CHART. Adjust the line voltage as described in 7.

Cathode-Heater Leakage of tubes is as follows, by throwing toggle switches to the IN position and rotating FILAMENT RETURN to position on chart. Be sure switches are returned to OUT position after each test.

For tubes marked * throw switch A

For tubes marked [*] throw switches A and B

For tubes marked ▲ throw switches A and I

For tubes marked ■ throw switches A and C

For tubes marked [FG] rotate FILAMENT RETURN to F and throw switch A. Rotate FILAMENT RETURN to G for inter-element shorts and tube quality tests.

For tubes marked • leakage and quality tests must be made in strict accordance with the chart. Turn Circuit Selector off after each test. Note the different FILAMENT Return positions. Improper checking may damage tube.

The most common or intermittent type of short occurs between the cathode and heater. The test for this type of short is

made by placing the tube in its socket and allowing it to heat. If no short is indicated, the tube should be tapped gently and the Neon lamp watched carefully for intermittent flicker.

Further short testing of the elements in the tube can be made by returning switches for Cathode-Heater Leakage, to the OUT position and throwing each of the switches called for on the chart to the IN position, and return, one at a time. Note: DO NOT THROW SWITCHES TO THE IN POSITION THAT ARE NOT DESIGNATED ON THE CHART IN THE COLUMN "TOGGLES, TEST 1 AND TEST 2."

Filament Return selector at I for most tubes.
Exceptions below:-

Ⓑ Set selector in B position.
Ⓖ Set selector in G position.
Ⓗ Set selector in H position.
Ⓓ Set selector in D position.

9. Tube Quality Test: Adjust for line voltage as described in 7. Set the FILAMENT SELECTOR, FILAMENT RETURN, CIRCUIT SELECTOR, and TUBE SELECTOR in accordance with the TUBE CHART for the particular type tube being tested.

Place the tube in the socket having the corresponding pin arrangement and allow the tube to heat. Check the LINE voltage at this time and make an adjustment if the pointer deviates from the center line due to the tube load being placed on the tester transformer.

Throw the toggle switches called for on the chart to the IN position and read the quality of the tube directly on the GOOD-BAD scale. Tubes having dual triodes, dual diodes, etc. have the two sections tested separately under TEST 1 and TEST 2 on the chart. When testing the diodes of tubes and tubes marked with a ♦ read their condition on the lower arc of the dial.

10. Open Elements: An open element in a tube does not occur very frequently, except of course the filament itself which may be burned out. In the case of a few tubes, certain elements which are comparatively distant from the cathode may be open without a great deal of change in the total reading on the dial, so that the pointer will remain in the GOOD portion of the dial. To detect such open elements, return each toggle-switch one at a time, from the IN to the OUT position. If any of the

elements are open there will be no change in the pointer deflection as the corresponding toggle is returned to the OUT position. Exception must be made to the above statements only when the toggles A, AB, or AI appear in column marked "TOGGLES, TEST 1, TEST 2." Leave these toggles to the IN position when testing for open elements of this type tube.

11. Pilot and Christmas Tree Lights: The center of the 7-prong socket is arranged for insertion of pilot lamps and Christmas tree bulbs. To test the lamps rotate the FILAMENT SELECTOR switch to the proper position for the voltage of the lamp under test, as follows:

Fil. Sel.	Approx. Volts	Fil. Sel.	Approx. Volts
1.0	1.5	5.5	35.0
1.5	2.0	6.0	40.0
2.0	2.5	6.5	50.0
2.5	3.0	7.0	60.0
3.0	5.0	7.5	70.0
3.5	6.0	8.0	80.0
4.0	7.5	8.5	90.0
4.5	12.0	9.0	100.0
5.0	25.0	9.5	110.0

For example, when testing a 2.5 volt pilot lamp, set the FILAMENT SELECTOR to position 2. Be sure that good contact is made when holding the bulb in the socket.

12. Ballast Tubes: The most common failure in resistance tubes is burning out of the element causing an open circuit. In the testing of these tubes set the CIRCUIT SELECTOR switch in the SHORT CHECK position. Adjust the line voltage as described in 7. Leave the FILAMENT SELECTOR switch in position 12.5.

When testing the 4-pin glass tubes leave the FILAMENT RETURN switch in the H position. Throw the toggle switch which corresponds to the pin to which one end of the resistance element is connected, to the IN position.. Leave the toggle switch, which corresponds to the pin to which the other end of the resistance element is connected, in the OUT position. The neon bulb should glow if the circuit through the resistance element is complete and not open or burned out. For the 4-pin glass tubes the RMA pin numbers corresponding to the toggle switches at the front of the panel are as follows:

1-A, 2-B, 3-C, 4-I.

For example, in testing a 250 A tube which has the resistance element connected to pins 1 and 4, leave toggle A in the OUT position and throw toggle I to the IN position.

When testing the octal metal type tubes leave the FILAMENT SELECTOR switch in the F position. Follow the same procedure as above. For the octal metal tubes, the RMA pin numbers corresponding to the toggle switches are as follows:

1-H, 2-A, 3-B, 4-C, 7-I, 8-G

As an example, in testing metal tube 92 A which has the resistance element connected to pins 3 and 7, leave toggle B in the OUT position and throw toggle I to the IN position.

13. Fuse: The tester is suitably protected by a standard one ampere automobile type fuse in one side of the A.C. line. To replace this fuse, remove the panel mounting screws.

SPECIAL INSTRUCTIONS

Model 220 and 222

Load 1 on chart corresponds to Cathode on Model 220 and Model 222.
Load 2 on chart corresponds to Battery on Model 220 and Model 222.
Load 3 on chart corresponds to Diodes on Model 220 and Model 222.
No load 4 on Models 220 and 222.

Model 220 diode setting should be 15 instead of 0.

(See FILAMENT conversion chart applying to old style testers).

The following chart is a conversion table to change the 24 position filament selector settings to the 12 position filament selector settings for old style testers which have not been modernized. Tubes requiring filament voltage above 30 volts cannot be tested.

12 Position Old Style	24 Position New Style
1	1.0
2	1.5
3	2.0
4	2.5
5	3.0
6	3.5
7	4.0
8	4.5
9	5.0

ADAPTERS

The adapters used in conjunction with a modernized tester are as follows:

7730	Hytron Bantam Junior HY113-115-123-125-145-155.
7985	R. C. A. Miniature 1R5 - 1S4 - 1S5 - 1T4.
8357	Black Loctal 1LC5 - 1LN5
8358	Black Octal 50Z7 - 70A7
8359	Brown Octal 35Z5 - 40Z5 - 45Z5

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
00A	3.0	1	39	BC	
01A	3.0	1	36	BC	
* 1	3.5	1	46	B	
1A3	1.0	3	0	BG	Short B-G
1A4	1.5	2	31	BCE	
1A5	1.0	2	33	BCD	
1A6					
Tri.	1.5	2	24	CF	
Tot.			30	BCEFG	
1A7					
Tri.	1.0	2	28	DF	
Tot.			32	BCDEF	
1B4	1.5	2	32	BCE	
1B5					
Tri.	1.5	2	30	BG	
Dio.		3	0	C	F
1B7					
Tri.	1.0	2	33	DF	
Tot.			36	BCDEF	
1B8					
Tri.	1.5 *	2	35	EF	
Pen.		2	35	BCD	
Dio.		3	0	G	
1C5	1.0	2	36	BCD	
1C6					
Tri.	1.5	2	27	CF	
Tot.			32	BCEFG	
1C7					
Tri.	1.5	2	26	DF	
Tot.			32	BCDEF	
Ⓗ 1C21		4	38	D	
			4		I
1D5	1.5	2	32	BCE	
1D7					
Tri.	1.5	2	23	DF	
Tot.			29	BCDEF	
1D8					
Tri.	1.0	2	32	EF	
Pen.		2	36	BCD	
Dio.		3	0	G	
1E4	1.0	2	37	BD	
1E5	1.5	2	31	BCE	
1E7	1.5	2	35	BCG	DFG
1F4	1.5	2	33	BCG	
1F5	1.5	2	34	BCD	
1F6					
Pen.	1.5	2	32	BCE	
Dio.		3	0	F	G
1F7					
Pen.	1.5	2	27	BEF	
Dio.		3	0	C	D
1G4	1.0	2	37	BD	
1G5	1.5	2	36	BCD	
1G6	1.0	2	35	BC	DF
1H4	1.5	2	32	BD	
1H5					
Tri.	1.0	2	31	BE	
Dio.	1.0	3	0	D	

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
1H6					
Pen.	1.5	2	28	BF	
Dio.		3	0	C	D
1J5	1.5	2	32	BCD	
1J6	1.5	2	31	BC	DF
1L4	1.0	2	34	BCG	
1LA4	1.0	2	35	BCF	
1LA6	1.				
Tri.	1.0	2	36	DF	
Tot.			32	BCDFH	
1LB4	1.0	2	34	BCF	
1LC5	1.0	2	34	BCDF	Adapter # 8357
1LC6	1.0	2	32	BCDFH	
1LD5					
Pen.	1.0	2	36	BCF	
Dio.		3	0	D	
1LE3	1.0	2	35	BF	
1LH4					
Tri.	1.0	2	35	BF	
Dio.		3	0	D	
1LN5	1.0	2	38	BCDF	Adapter # 8357
1N5	1.0	2	35	BCE	
1N6					
Pen.	1.0	2	35	BCD	
Dio.		3	0	F	
1P5	1.0	2	36	BCE	
1Q5	1.0	2	38	BCD	
1R4	1.0	3	0	D	
1R5	1.0	2	34	BCDG	Adapter # 7985
1S4	1.0	2	37	BCDG	Adapter # 7985
1S5					Adapter # 7985
Pen.	1.0	2	30	DFG	
Dio.		3	0	C	
1SA6	1.0	2	36	BCFG	
1SB6					
Pen.	1.0	2	34	BCG	
Dio.		3	0	D	
1T4	1.0	2	35	BCG	Adapter # 7985
1T5	1.0	2	38	BCD	
* 1V	3.5	1	45	B	
2A3	2.0	1	46	BC	
2A3H	2.0	1	46	BC	
2A4	2.0	1	46	B	D
* 2A5	2.0	1	41	BCF	
* 2A6					
Tri.	2.0	1	41	BE	
Dio.		3	0	C	F
* 2A7					
Tri.	2.0	1	38	DF	
Tot.			41	BCDEF	
* 2B6					
In	2.0	1	35	CD	
Out			42	BCDF	
* 2B7					
Pen.	2.0	1	34	BCE	
Dio.		3	0	D	F

TYPE	FIL. SEL.	LOAD MNO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
* 2C21					
Tri.1	3.5	1	41	CE	
Tri.2			41	DF	
* 2C22	3.5	1	44	E	Note: Connect caps in succession for short test, parallel for quality test.
Ⓓ 2D21	3.5	1	47	ACFGI	Short F-1
* 2E5	2.0	1	34	BCF	
* 2G5	2.0	1	34	BCF	
* 2S-4S	2.0	3	0	B	C
Ⓖ 2W3	2.0	1	36	C	
2X2	2.0	4	34	E	
2Y2	2.0	4	32	E	
2Z2	2.0	1	30	B	
Ⓕ 3A4	1.0	2	37	BCDG	Short B-G
Ⓓ 3A5					
Tri.1	1.0	2	38	BC	
Tri.2			38	FG	
Ⓗ 3A8					
Tri.	1.0	2	34	DF	
Pen.		2	37	BCE	
Dio.		3	0	G	
Ⓖ 3B5	1.0	2	37	BCD	
Ⓓ 3B7					
Tri.1	1.0	2	37	BC	
Tri.2			37	FG	
Ⓖ 3C5	1.0	2	36	BCD	
Ⓖ 3D6	1.0	2	39	BCF	
Ⓖ 3LF4	1.0	2		BCH	
Ⓕ 3Q4	1.0	2	38	BCDG	Short B-G
Ⓖ 3Q5	1.0	2	34	BCD	
Ⓕ 3S4	1.0	2	35	BCDG	
Ⓖ 4A6	1.5	2	37	BC	DF
Ⓖ 5R4-GY	3.0	1	42	C	F
Ⓖ 5T4	3.0	1	43	C	F
Ⓖ 5U4	3.0	1	41	C	F
Ⓖ 5V4	3.0	1	46	C	F
Ⓖ 5W4	3.0	1	36	C	F
5X3	3.0	1	41	B	C
Ⓖ 5X4	3.0	1	43	B	D
Ⓖ 5Y3	3.0	1	36	C	F
5Y4	3.0	1	35	B	D
5Z3	3.0	1	41	B	C
Ⓖ 5Z4	3.0	1	44	C	F
6A3	3.5	1	45	BC	
6A4	3.5	1	43	BCG	
Ⓖ 6A5	2.5	1	43	BD	
* 6A6	3.5	1	41	BC	FG
* 6A7					
Tri.	3.5	1	38	DF	
Tot.			41	BCDEF	
* 6A8					
Tri.	3.5	1	39	DF	
Tot.	3.5	1	42	BCDEF	
* 6AB5	3.5	3	13	BCF	
* 6AB6	3.5	1	37	BCD	
* 6AB7	3.5	1	45	BCFG	

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
* 6AC5	3.5	1	42	BD	
* 6AC6	3.5	1	42	BCD	
* 6AC7	3.5	1	47	BCFG	
* 6AD5	3.5	1	39	BD	
♦ * 6AD6					
Tar.	3.5	4	0	D	
Con.			0	BD	CD
* 6AD7					
Tri.	3.5	1	7	FH	
Pen.			41	BCD	
* 6AE5	3.5	1		BD	
* 6AE6	3.5	1	42	BCD	
* 6AE7	3.5	1	42	BC	BF
* 6AF5	3.5	1	44	BD	
♦ * 6AF6					
Tar.	3.5	4	0	D	
Con.			0	BD	CD
Ⓓ■ 6AG5	3.5	1	46	ACFG	Short B-I
* 6AG7	3.5	1	47	CFGH	
Ⓖ 6AH7	3.5	1	42	BH	DF
Ⓓ■ 6AK5	3.5	1	44	ACFG	Short B-I
Ⓓ■ 6AK6	3.5	1	42	ABCFG	
Ⓓ* 6AL5	3.5	3	0	B	I
* 6AL6	3.5	1	45	CDE	
6B4G	3.5	1	45	BD	
* 6B5	3.5	1	36	BCF	
* 6B6					
Tri.	3.5	1	42	BE	
Dio.	3.5	3	0	C	D
* 6B7					
Pen.	3.5	1	34	BCE	
Dio.		3	0	D	F
* 6B8					
Pen.	3.5	1	32	BEF	
Dio.		3	0	C	D
Ⓓ■ 6C4	3.5	1	44	ACFG	Short A-F
* 6C5	3.5	1	41	BD	
* 6C6	3.5	1	42	BCEF	
* 6C7					
Tri.	3.5	1	42	BE	
Dio.		3	0	D	F
* 6C8	3.5	1	36	BE	DF
* 6D5	3.5	1	40	BD	
* 6D6	3.5	1	40	BCEF	
* 6D7	3.5	1	43	BCDE	
* 6D8					
Tri.	3.5	1	41	DF	
Tot.			41	BCDEF	
* 6E5	3.5	1	34	BCF	
* 6E6	3.5	1	41	BC	FG
* 6E7	3.5	1	42	BCDE	
* 6F5	3.5	1	43	CE	
* 6F6	3.5	1	40	BCD	
* 6F7					
Tri.	3.5	1	8	DF	
Pen.			38	BCE	
* 6F8	3.5	1	43	BE	DF

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
* 6G5	3.5	1	34	BCF	
* 6G6	3.5	1	42	BCD	
* 6H4	3.5	3	0	C	
* 6H5	3.5	1	34	BCF	
* 6H6	3.5	3	0	B	D
* 6J5	3.5	1	45	BD	
Ⓓ■ 6J6					
Tri.1	3.5	1	45	AF	
Tri.2			45	BG	
* 6J7	3.5	1	42	BCDE	
* 6J8					
Tri.	3.5	1	37	DF	
Hep.			45	BCDE	
* 6K5	3.5	1	43	BE	
* 6K6	3.5	1	41	BCD	
* 6K7	3.5	1	40	BCDE	
* 6K8					
Tri.	3.5	1	45	DF	
Hex.			45	BCDE	
* 6L5	3.5	1	44	BD	
* 6L6	3.5	1	45	BCD	
* 6L7	3.5	1	44	BCDE	
* 6N5	3.5	3	13	BCF	
* 6N6	3.5	1	36	BCD	
* 6N7	3.5	1	42	BC	DF
* 6P5	3.5	1	39	BD	
Ⓑ* 6P7					
Tri.	3.5	1	8	FI	
Pen.			34	CDE	
* 6Q6					
Tri.	3.5	1	40	BE	
Dio.		3	0	D	
* 6Q7					
Tri.	3.5	1	42	BE	
Dio.		3	C	C	D
* 6R6	3.5	1	37	BDE	
* 6R7					
Tri.	3.5	1	38	BE	
Dio.		3	0	C	D
* 6S6	3.5	1	46	CEG	
* 6S7	3.5	1	41	BCDE	
* 6SA7	3.5	1	45	BCDGH	
Ⓖ▲ 6SC7	3.5	1	41	ABI	CD
* 6SD7	3.5	1	46	BCFG	
* 6SE7	3.5	1	46	BCFG	
FG 6SF5	3.5	1	43	BD	
Ⓖ▲ 6SF7					
Pen.	3.5	1	41	ACFI	
Dio.		3	0	D	
* 6SG7	3.5	1	46	CFG	
* 6SH7	3.5	1	46	CFG	
* 6SJ7	3.5	1	43	BCFG	
* 6SK7	3.5	1	42	BCFG	
Ⓖ▲ 6SL7	3.5	1	42	AHI	CD
Ⓖ▲ 6SN7	3.5	1	43	AHI	CD
Ⓖ▲ 6SQ7					
Tri.	3.5	1	41	AFI	
Dio.		3	0	C	D

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
Ⓖ▲ 6SR7					
Tri.	3.5	1	40	AFI	
Dio.		3	0	C	D
* 6SS7	3.5	1	42	BCFG	
Ⓖ ▲ 6ST7					
Tri.	3.5	1	41	AFI	
Dio.	3.5	3	0	C	D
* 6T5	3.5	1	34	BCF	
* 6T7					
Tri.	3.5	1	40	BE	
Dio.	3.5	3	0	C	D
* 6U5	3.5	1	35	BCF	
* 6U6	3.5	1	46	BCD	
* 6U7	3.5	1	42	BCDE	
* 6V6	3.5	1	43	BCD	
* 6V7					
Tri.	3.5	1	41	BE	
Dio.		3	0	C	D
* 6W5	3.5	1	44	B	D
* 6W6	3.5	1	43	BCD	
* 6W7	3.5	1	43	BCDE	
* 6X5	3.5	1	42	B	D
* 6Y5	3.5	1	47	C	G
* 6Y5V	3.5	1	44	C	G
* 6Y6	3.5	1	46	BCD	
* 6Y7	3.5	1	40	BC	DF
* 6Z3	3.5	1	46	B	
* 6Z4	3.5	1	42	B	C
⊡ 6Z5	3.5	1	42	C	G
* 6Z7	3.5	1	41	BC	DF
* 6ZY5	3.5	1	40	B	D
* 7A4	3.5	1	44	BF	
* 7A5	3.5	1	46	BCF	
* 7A6	3.5	1	40	C	F
* 7A7	3.5	1	44	BCDF	
* 7A8	3.5	1	42	BCDFH	
* 7B4	3.5	1	44	BF	
* 7B5	3.5	1	43	BCF	
* 7B6					
Tri.	3.5	1	43	BC	
Dio.	3.5	3	0	F	H
* 7B7	3.5	1	42	BCDF	
* 7B8					
Tri.	3.5	1	41	BD	
Tot.			44	BCDFH	
* 7C4	3.5	3	0	D	
* 7C5	3.5	1	44	BCF	
* 7C6					
Tri.	3.5	1	41	BC	
Dio.		3	0	F	H
* 7C7	3.5	1	45	BCDF	
⊡ 7E5	3.5	1	44	ABCGH	
* 7E6					
Tri.	3.5	1	43	BC	
Dio.		3	0	F	H
7E7					
Pen.	3.5	1	40	BFH	
Dio.		3	0	C	D
* 7F7	3.5	1	42	CD	FH

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
* 7G7	3.5	1	47	BCDF	
* 7H7	3.5	1	45	BCDF	
* 7J7					
Tri.	3.5	1	40	CD	
Hex.			45	BDFH	
* 7K7					
Tri.	3.5	1	43	CD	
Dio.		3	0	H	F
* 7L7	3.5	1	46	BCDF	
* 7N7	3.5	1	44	CD	FH
* 7Q7	3.5	1	44	BCDFH	
* 7R7					
Pen.	3.5	1	46	BFH	
Dio.		3	0	C	D
* 7S7					
Tri.	3.5	1	40	CD	
Hep.			46	BDFH	
* 7V7	3.5	1	46	BCDF	
* 7W7	3.5	1	37	BCFH	
* 7Y4	3.5	1	43	C	F
* 7Z4	3.5	1	36	C	F
10	4.0	1	38	BC	
12A	3.0	1	42	BC	
Ⓒ▲ 12A5	3.5	1	41	BCD	
* 12A6	4.5	1	41	BCD	
* 12A7					
Rec.	4.5	1	46	F	
Pen.			40	BCE	
* 12A8					
Tri.	4.5	1	40	DF	
Tot.			43	BCDEF	
G 12AH7	4.5	1	35	BH	DF
* 12B7	4.5	1	43	BCDF	
* 12B8					
Tri.	4.5	1	45	DG	
Pen.			43	BCE	
* 12C8					
Pen.	4.5	1	36	BEF	
Dio.		3	0	C	D
* 12E5	4.5	1	40	BD	
* 12F5	4.5	1	43	CE	
* 12H6	4.5	3	0	B	D
* 12J5	4.5	1	44	BD	
* 12J7	4.5	1	42	BCDE	
* 12K7	4.5	1	41	BCDE	
* 12K8					
Tri.	4.5	1	46	DF	
Hex.			46	BCDE	
* 12L8	4.5	1	42	BCD	DGH
* 12Q7					
Tri.	4.5	1	43	BE	
Dio.		3	0	C	D
* 12SA7	4.5	1	45	BCDGH	
Ⓖ▲ 12SC7	4.5	1	41	ABI	CD
Ⓖ 12SF5	4.5	1	44	BD	
Ⓖ▲ 12SF7					
Pen.	4.5	1	40	ACFI	
Dio.		3	0	D	

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
* 12SG7	4.5	1	46	CFG	
* 12SH7	4.5	1	46	CFG	
* 12SJ7	4.5	1	45	BCFG	
* 12SK7	4.5	1	42	BCFG	
Ⓒ▲ 12SL7	4.5	1	42	AHI	CD
Ⓒ▲ 12SN7	4.5	1	44	AHI	CD
Ⓒ▲ 12SQ7					
Tri.	4.5	1	43	AFI	
Dio.		3	0	C	D
Ⓒ▲ 12SR7					
Tri.	4.5	1	43	AFI	
Dio.		3	1	C	D
* 12Z3	4.5	1	46	B	D
12Z5	3.5	1	42	C	G
* 14	4.5	1	40	BCE	
* 14A4	4.5	1	44	BF	
* 14A5	4.5	1	40	BCF	
* 14A7	4.5	1	44	BCDF	
* 14B6					
Tri.	4.5	1	44	BC	
Dio.		3	0	F	H
* 14B8	4.5	1	43	BCDFH	
* 14C5	4.5	1	44	BCF	
* 14C7	4.5	1	44	BCDF	
* 14E6					
Tri.	4.5	1	41	BC	
Dio.		3	0	F	H
* 14E7					
Pen.	4.5	1	40	BHF	
Dio.		3	0	C	D
* 14F7	4.5	1	43	CD	FH
* 14H7	4.5	1	45	BCDF	
* 14J7					
Tri.	4.5	1	39	CD	
Hex.			45	BDFH	
* 14N7	4.5	1	44	CD	FH
* 14Q7	4.5	1	45	BCDFH	
* 14R7					
Pen.	4.5	1	46	BFH	
Dio.		3	0	C	D
* 14S7					
Tri.	4.5	1	39	CD	
Hep.			46	BFH	
* 14W7	4.5	1	37	BCFH	
* 14Y4	4.5	1	43	C	F
* 14Z3	4.5	1	46	B	
* 15	1.5	2	28	BCE	
* 17	4.5	1	37	BC	
* 18	4.5	1	42	BCF	
19	1.5	2	34	BC	FG
20	2.5	2	27	BC	
22	2.5	2	22	BCE	
* 24A	2.0	1	40	BCE	
25					
Tri.	1.5	2	30	BG	
Dio.		3	0	C	F
* 25A6	5.0	1	43	BCD	

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
* 25A7					
Rec.	5.0	1	44	F	
Pen.			42	BCD	
* 25AC5	5.0	1	43	BD	
* 25B5	5.0	1	41	BCF	
* 25B6	5.0	1	45	BCD	
* 25B8					
Tri.	5.0	1	44	DG	
Pen.			44	BCE	
* 25C6	5.0	1	45	BCD	
* 25D8					
Tri.	5.0	1	42	DF	
Pen.		1	44	BCE	
Dio.		3	0	G	
* 25L6	5.0	1	46	BCD	
* 25N6	5.0	1	41	BCD	
* 25X6	5.0	1	43	B	D
* 25Y4	5.0	1		D	
* 25Y5	5.0	1	45	B	G
25Z3	5.0	1	46	B	
* 25Z4	5.0	1	47	D	
* 25Z5	5.0	1	46	B	G
* 25Z5MG	5.0	1	46	B	D
* 25Z6	5.0	1	46	B	D
26	1.0	1	36	BC	
* 27	2.0	1	37	BC	
* 27HM	2.0	1	41	BC	
* 28D7	5.0	2	46	BCD	CGH
* 29	2.0	1	35	BC	BF
30	1.5	2	32	BC	
30S	1.5	2	32	CE	
31	1.5	2	33	BC	
32	1.5	2	32	BCE	
* 32L7					
Rec.	5.5	1	46	F	
Tet.			45	BCD	
33	1.5	2	35	BCG	
34	1.5	2	31	BCE	
* 35-51	2.0	1	40	BCE	
* 35A5	5.5	1	46	BCF	
* 35L6	5.5	1	47	BCD	
● 35Y4					
ⓓ	3.5	Short		AI	
ⓘ	5.0	Check		AD	ADB
ⓘ	5.0	1	46	ADB	
* 35Z3	5.5	1	47	B	
* 35Z4	5.5	1	46	D	
* 35Z5	5.5	1	47	D	Adapter # 8359
* 35Z6	5.5	1	47	B	D
* 36	3.5	1	41	BCE	
* 37	3.5	1	39	BC	
* 38	3.5	1	40	BCE	
* 39-44	3.5	1	37	BCE	
* 39 A	3.5	1	37	BCE	
40	3.0	1	38	BC	

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES	
				Test 1	Test 2
* 40Z5	6.0	1	45	D	Adapter # 8359
* 41	3.5	1	43	BCF	
* 42	3.5	1	43	BCF	
* 43	5.0	1	46	BCF	
* 43MG	5.0	1	46	BCD	
* 44-39	3.5	1	37	BCE	
45	2.0	1	41	BC	
* 45Z3	5.5	1	45	BG	Short B-G
* 45Z5	6.0	1	45	D	Adapter # 8359
46	2.0	1	42	BCG	
47	2.0	1	42	BCG	
* 48	5.0	1	45	BCF	
49	1.5	2	34	BCG	
50	4.0	1	40	BC	
* 50A5	6.5	1	47	BCF	
* 50C6	6.5	1	47	BCD	
* 50L6	6.5	1	46	BCD	
* 50Y6	6.5	1	46	B	D
* 50Z7	6.5	1	46	B	D Adapter #8358
* 51-35	2.0	1	40	BCE	
52	3.5	1	43	BCG	
* 53	2.0	1	42	BC	FG
* 55					
Tri.	2.0	1	34	BE	
Dio.		3	0	C	F
* 56	2.0	1	40	BC	
* 56A	3.5	1	38	BC	
* 57	2.0	1	42	BCEF	
* 57A	3.5	1	42	BCEF	
* 58	2.0	1	41	BCEF	
* 58A	3.5	1	40	BCEF	
* 59	2.0	1	42	BCDF	
* 70A7	7.5	1	44	BCD	Adapter # 8358
* 70L7					
Rec.	7.5	1		G	
Tet.		1		BCD	
71A	3.0	1	41	BC	
* 75					
Tri.	3.5	1	41	BE	
Dio.		3	0	C	F
* 76	3.5	1	39	BC	
* 77	3.5	1	41	BCEF	
* 78	3.5	1	41	BCEF	
* 79	3.5	1	41	BC	EG
80	3.0	1	37	B	C
80M	3.0	1	47	B	C
81	4.0	1	33	B	
81M	4.0	1	47	B	
82	2.0	1	47	B	C
82V	2.0	1	45	B	C
83	3.0	1	47	B	C
83V	3.0	1	45	B	C
* 84	3.5	1	42	B	C

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
* 85					
Tri.	3.5	1	34	BE	
Dio.		3	0	C	F
88	3.0	1	47	B	C
* 89	3.5	1	41	BCEF	
* 117L7					
Rec.	9.5	1	45	F	
Pen.			46	BCD	
* 117M7					
Rec.	9.5	1	46	F	
Tet.			47	BCD	
* 117N7					
Rec.	9.5	1	46	G	Note: reverse meter to read
Tet.			46	BCD	
* 117P7					
Rec.	9.5	1	45	G	Note: reverse meter to read
Tet.			47	BCD	
* 117Z4	9.5	1	46	D	
* 117Z6	9.5	1	46	B	D
Ⓗ▲ 117Z6C	7.0	1	46	B	D
182A	3.0	1	41	BC	
182B	3.0	1	42	BC	
183	3.0	1	41	BC	
231D	2.0	2	28	BC	
239A	1.0	2	28	BC	
245A	1.5	1	33	BCE	
257	3.0	2	37	BCG	
482A	3.0	1	41	BC	
482B	3.0	1	42	BC	
483	3.0	1	41	BC	
* 484	2.5	1	41	BC	
* 484A	2.5	1	41	BC	
* 485	2.5	1	41	BC	
585	4.0	1	39	BC	
586	4.0	1	39	BC	
840	1.5	2	33	BCEG	
864	1.0	2	30	BC	
* 884	3.5	1	45	BD	
* 775	2.0	1	45	BC	
950	1.5	2	32	BCG	
951	1.5	2	34	BCE	
986	3.0	1	47	B	C
* 1203A	3.5	3	0	D	
* 1221	3.5	1	42	BCEF	
* 1223	3.5	1	42	BCDE	
* 1231	3.5	1	42	BCDF	
* 1232	3.5	1	47	BCDF	
1294	1.0	3	0	D	
Ⓖ 1299	1.0	2	39	BCF	
* 1603	3.5	1	37	BCEF	
1609	1.0	1	38	BCG	
* 1612	3.5	1	45	BCDE	
* 1620	3.5	1	41	BCDE	
* 1621	3.5	1	41	BCD	
* 1622	3.5	1	45	BCD	
* 1629	4.5	1	36	BCD	
* 1631	4.5	1	45	BCD	
* 1632	4.5	1	45	BCD	

TYPE	FIL. SEL.	LOAD NO.	TUBE SEL.	TOGGLES Test 1	TOGGLES Test 2
Ⓖ▲1633	5.0	1	42	AHI	CD
Ⓖ▲1634	4.5	1	41	ABI	CD
* 1635	3.5	1	42	BC	DF
1642					
Tri.1	3.5	1	41	CE	
Tri.2			41	DF	
* 1644	4.5	1	42	BCD	DGH
* 1851	3.5	1	47	BCDE	
* 1852	3.5	1	47	BCFG	
* 1853	3.5	1	45	BDFG	
* 2050	3.5	1	47	BDF	
* 2051	3.5	1	47	BDF	
* 7000	3.5	1	42	BCDE	
* 7193	3.5	1	44	E	Note: Connect caps in succession for short test, parallel for quality test.
* 7700	3.5	1	42	BCEF	
Ⓓ■9001	3.5	1	44	ACFG	Short B-I
Ⓓ■9002	3.5	1	44	ACFG	Short B-I-A-F
Ⓓ■9003	3.5	1	44	ACFG	Short B-I
Ⓓ■9006	3.5	3	0	ACF	Short B-I-A-F
* AD	3.5	1	47	B	
AF	2.0	1	47	B	C
AG	3.0	1	47	B	C
AX	3.0	1	36	BC	
BX	2.5	2	0	BC	
D ½	4.0	1	32	B	
D 1	3.0	1	35	B	C
* DE 1	2.0	1	37	BC	
* G2	2.0	3	0	B	C
* G4	2.0	3	0	B	C
G84	2.0	1	30	B	C
H	3.0	1	39	BC	
HY113	1.0	3	0	BC	Adapter # 7730
HY115	1.0	3	5	BCG	Adapter # 7730
HY123	1.0	3	0	BC	Adapter # 7730
HY125	1.0	3	5	BCG	Adapter # 7730
HY145	1.0	3	5	BCG	Adapter # 7730
HY155	1.0	3	5	BCG	Adapter # 7730
* K24	2.0	1	40	BCE	
* KR1	3.5	1	46	B	
* KR2	3.0	1	46	B	
KR5	3.5	1	42	BCG	
* KR25	2.0	1	41	BCF	
* KR28	3.5	1	42	B	C
* KR48	2.0	1	40	BCG	
* KR98	3.5	1	42	B	C
LA	3.5	1	42	BCG	
OA4		4	41	D	
OZ4		4	46	B	D
* P861	3.5	1	42	B	C
PZ	2.0	1	42	BCG	
* PZH	2.0	1	42	BCF	
Ⓖ XXB	1.0	2		CD	FH
* XXD	4.5	1	43	CD	FH
* XXFM					
Tri.	3.5	1	41	BC	
Dio.		3	0	F	H
* XXL	3.5	1	45	BF	