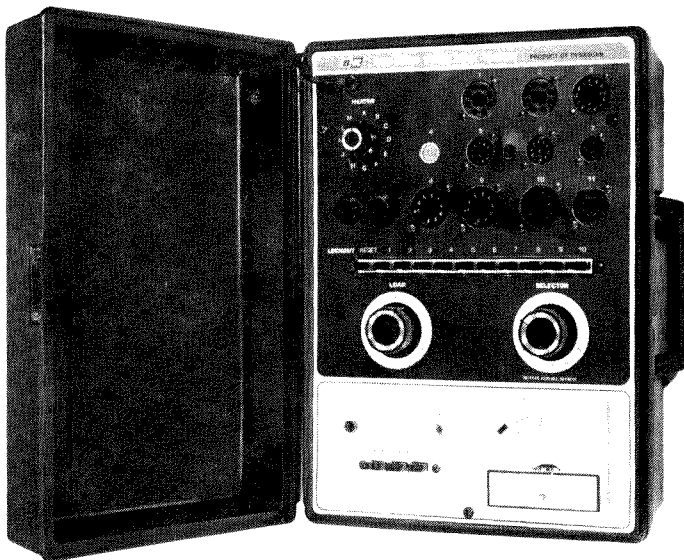


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B&K Model **667**

SOLID STATE TUBE TESTER



Product of **DYNASCAN CORPORATION**
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

INSTRUCTION MANUAL

FOR

Model 667

SOLID STATE TUBE TESTER

B & K DIVISION OF DYNASCAN CORPORATION

1801 West Belle Plaine Avenue

Chicago, Illinois 60613

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MODEL 667 SOLID STATE TUBE TESTER

BRIEF DESCRIPTION OF MODEL 667 SOLID STATE TUBE TESTER

The B&K Model 667 is a versatile, up-to-date, completely solid state, portable tube tester that will test all tubes commonly used in today's electronic industry, including many foreign tube types.

The following tests are made on each tube:

- 1.) Shorts and leakage between any element and all other elements, with a sensitivity of 1 megohm. Because of exclusive "multiple lockout switch" all modern tubes which have more than one pin connected to the same element can still be completely tested for shorts from each element to every other element.
- 2.) Quality is checked in a test circuit that determines the full capability of cathode emission under current loads and voltages simulating actual operating conditions.
- 3.) Grid emission, gas, grid contamination, or obscure grid to cathode leakage are all disclosed by an exceptionally sensitive grid current check. This test will indicate with less than 1 microampere of grid current.

This tester incorporates the easy-to-use lockout pushbuttons to increase testing capability and prevent obsolescence and a special tube chart display holder to facilitate rapid, error-free testing.

The tester is housed in a highly attractive, weatherproof, very durable, VIP/Attache-type carrying case.

SUMMARY OF HOW TO USE THE 667 SOLID STATE TUBE TESTER

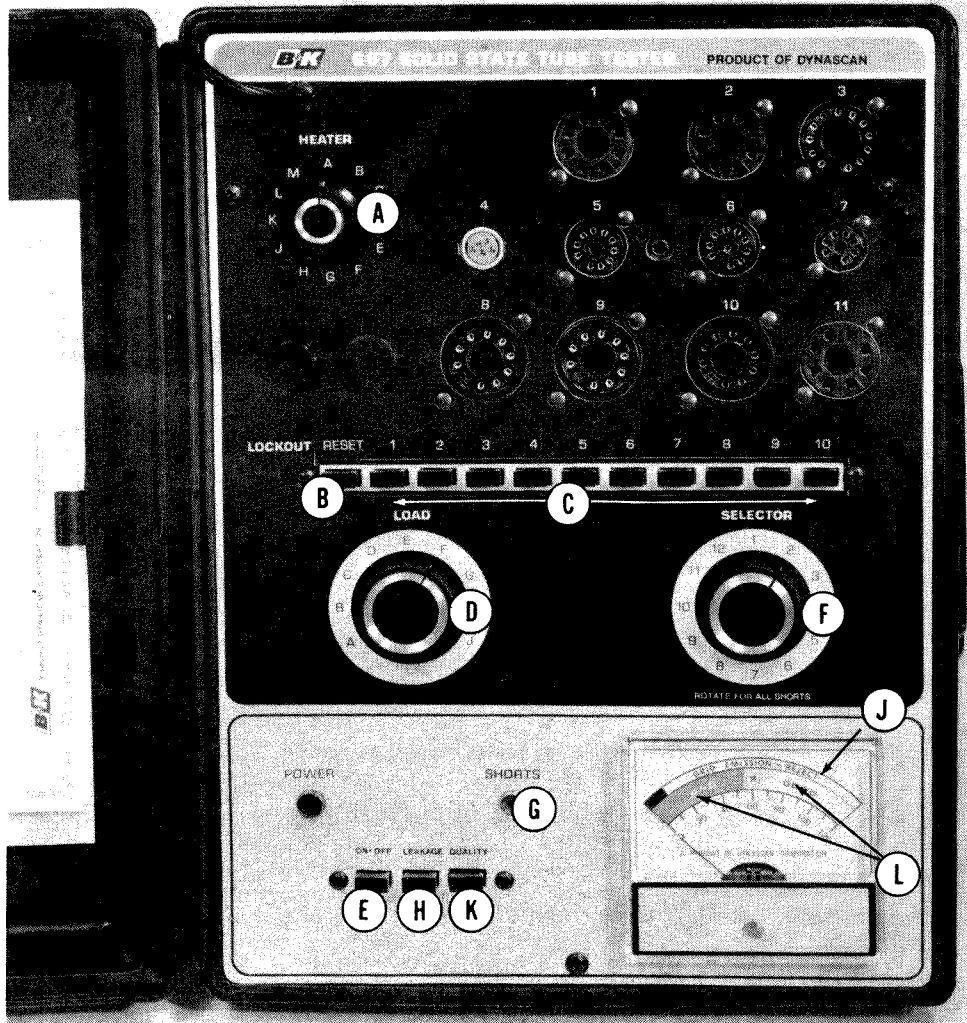
1. Look up tube in chart.
2. Rotate HEATER voltage switch "A" to indicated setting.
3. Insert tube in indicated socket.
4. Depress RESET pushbutton "B".
5. Depress LOCKOUT switches "C" as indicated.
6. Set LOAD switch "D" to position indicated.
7. Actuate (depress) POWER switch "E".
8. To test for all shorts: Rotate SELECTOR switch "F", pausing in each of its twelve positions, and observe SHORTS Lamp "G". A *steady* glowing of the SHORTS Lamp on any position of switch is cause for rejection of the tube. (Momentary flashes between positions are to be ignored).

A light tapping of the tube with the finger tip while rotating for shorts will help to locate intermittent shorts. Never tap with a screwdriver or other hard object, as this does not constitute a valid test and may cause damage to the tube. Certain types of video amplifier tubes with high Gm of 15,000 or more such as 12HG7, 6GN7, and others, should not be tapped at all. Tapping of these Frame Grid tubes may cause a grid short.

9. Set SELECTOR switch to position indicated.
10. Depress LEAKAGE button "H". A deflection of the meter pointer into the GRID EMISSION—REJECT area of the top scale "J" is cause for rejection of the tube.
11. Depress QUALITY button "K". Observe test results on the GOOD-BAD scale of the meter "L".
12. This completes the test. Turn tester power off by releasing the POWER pushbutton.

CAUTION

Always set the heater switch to the correct filament voltage position *before* inserting the tube in the socket. Failure to observe this precaution may result in burning out the filament of the tube.



SPECIFICATIONS—MODEL 667

Type of Tests: Cathode Emission, Shorts, Grid Emission and Gas

Test Capabilities and Method:

- a. Tests all commonly encountered tubes plus many special and industrial types.
- b. Multiple filament voltages, loads and lockouts provided.
- c. F.E.T. solid state DC amplifier drives precision meter.

Short Sensitivity: 1 Megohm

Short Indicator: Neon Bulb

Grid Leakage Sensitivity: 100 Megohms

Grid Leakage Indicator:

High input impedance F.E.T. amplifier drives meter.

Special Features:

- a. Multiple lockout pushbuttons permit rapidly opening any desired combination of tube pin connections.
- b. Reset button clears all lockouts simultaneously.

Case: Portable attache-type constructed of black, weatherproof, durable molded plastic.

Size: 10" x 13" x 5 $\frac{1}{8}$ " thick, including cover

Input Power: 117 VAC

60 Hz continuous duty

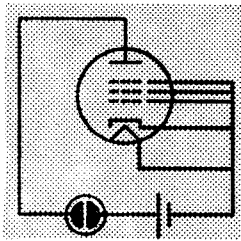
50 Hz intermittent duty

Actual Weight: 6 lbs.

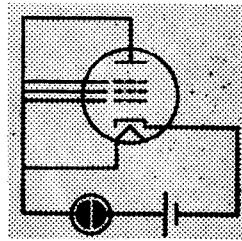
DESCRIPTION OF 667 TESTER

Basic Test Connections Used in Detecting Shorts

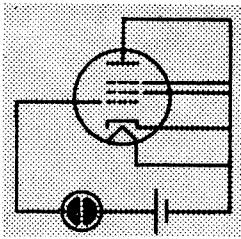
Shorts and leakages to one megohm are indicated by a neon SHORTS light. The SELECTOR switch is rotated through all twelve positions, selecting one element and shorting all others together (See Fig. 1).



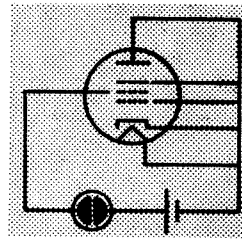
1A. Plate Selected



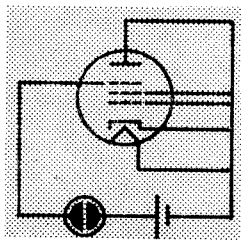
1B. Cathode Selected



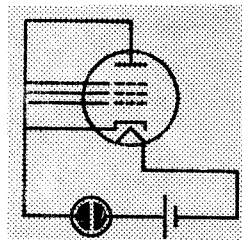
1C. Control Grid Selected



1D. Screen Grid Selected



1E. Suppressor Grid Selected



1F. Heater Selected

FIGURE 1. Tube Element Connections Made in Shorts/Leakage Test

Preventing Misleading Shorts Indications by Lockout Switching

In figure 2, the schematic for a 6KG6 or 21KQ6 tube is shown (both popular horizontal deflection amplifier types). The control grid has two connections (1, 8), the screen grid has two connections (3, 6) and the

suppressor grid also has two connections (2, 7). On a normal tube tester without multiple lockout switches, the SHORTS lamp would glow in positions 2, 3, 6 and 7 and the chart would have to say "normally shows short in positions 2, 3, 6, 7". By using the lockout switch we open pins 6, 7 and 8. A short in the tube between screen grid and suppressor will now show up in positions 2 and 3 of the Selector switch. Without the multiple lockouts—this short would go undetected!

Through the use of this lockout technique we know that any time the SHORTS lamp glows, there is definitely a SHORTS defect in the tube.

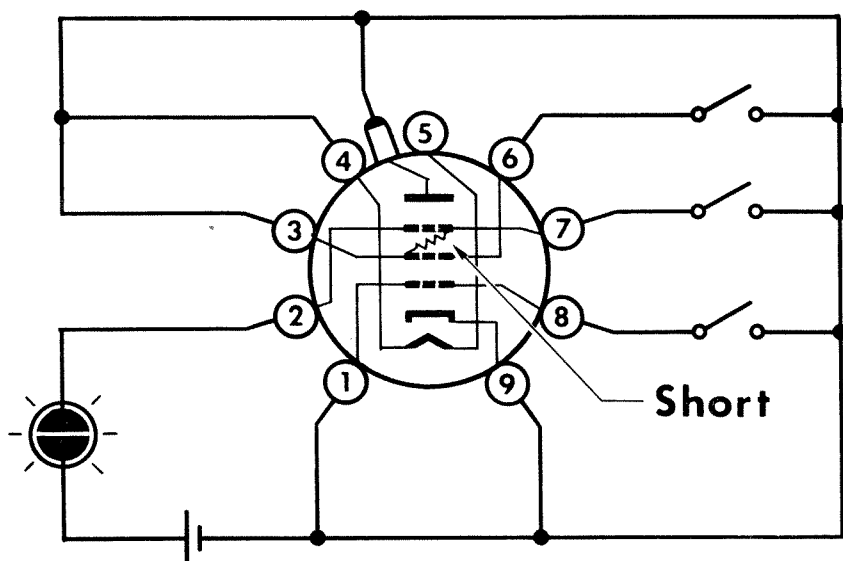


FIGURE 2. Checking for shorts between Suppressor Grid and all other elements. Pins 6, 7, and 8 are locked out

Testing Tubes for Quality

The test for the quality of a tube is a comprehensive cathode emission test. It is important to test the tube under a load condition which will insure that a tube passing this test will have adequate emission to properly operate in a circuit. One of a number of different voltage-load resistor combinations is selected to offer the most appropriate test for a particular tube type. The resultant cathode current is measured by a sensitive solid state amplifier and a quantitative reading is obtained on the meter (See Figure 3). The meter is divided into three sections: Bad-Questionable-Good, allowing a fast and accurate determination of the tube's quality.

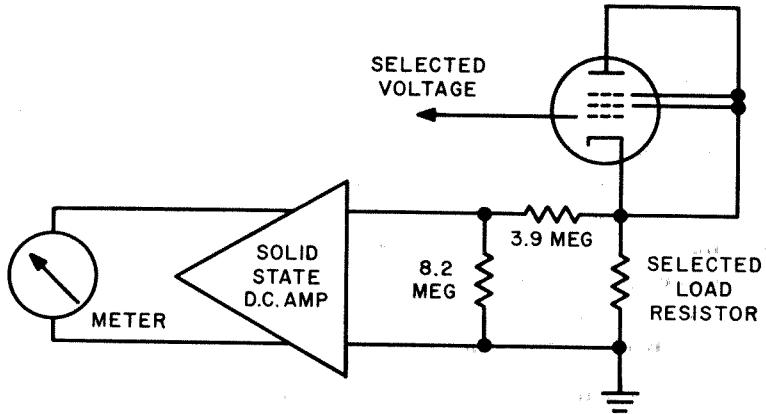


FIGURE 3. Cathode Emission Test

Testing Tubes for Grid Emission and Gas

The Grid Emission and Gas Test is a valuable aid in TV servicing because it quickly picks out those tubes which can cause trouble in a.g.c., sync, I.F. amplifier, and R.F. tuner circuits.

In order to understand how a tube can have “grid emission” and “gas current” we must look into the theory of electron tubes.

There is normally some gradual evaporation of the electron emitting material which the tube manufacturer applies to the cathode. Some of this vaporized material tends to deposit on the grid and gives rise to what is known as “grid emission”, where the grid itself emits electrons and draws current commonly known as “negative grid current”. The flow of this “negative grid current” can be followed in Figure 4.

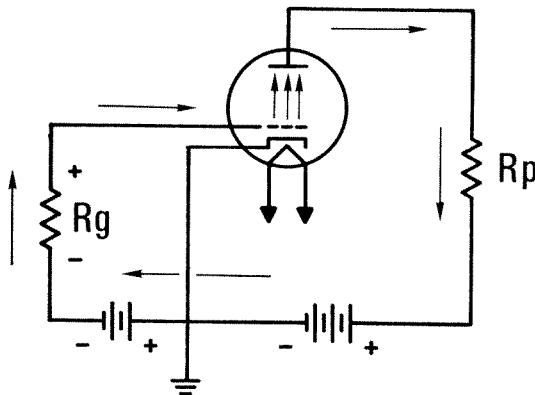


FIGURE 4. Negative Grid Current

The electrons flow from the grid to the plate then back through the power supply to the grid leak resistor R_g and up to the grid again. Notice that the voltage drop across the grid leak resistor R_g is such that it causes the grid to go more positive than it normally would with no grid emission.

If a slight amount of "gas" is present in a tube, some of the electrons from the cathode will collide with molecules of the gas and may knock off one or more electrons, leaving positive ions (ionization). Some of these positive ions may then strike the grid, taking an electron from the grid to form a gas molecule again. The electron flow of this "gas current" is in the same direction as the "grid emission current" and can be traced on Figure 4. Notice again that the grid is made more positive by this "gas current".

To achieve a sensitive grid emission or gas test, the circuit shown in Figure 5 is employed.

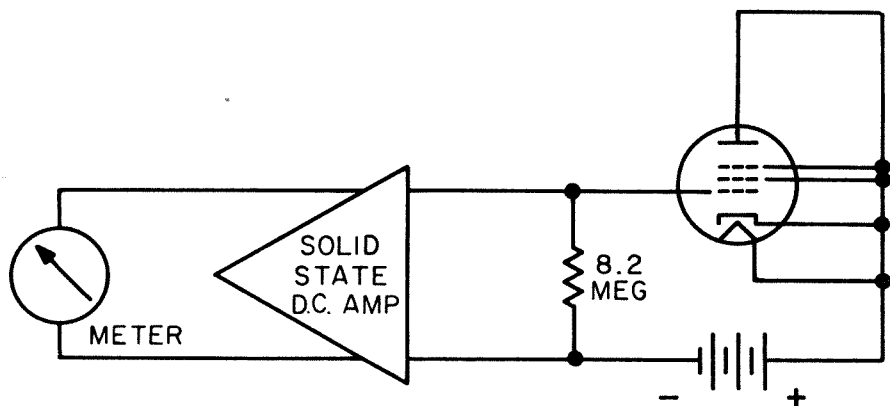


FIGURE 5. Grid Emission & Gas Test

The tube under test has its normal plate voltage applied with the grid biased beyond cutoff. This bias is applied to the tube under test through the 8.2 megohm resistor which is also the input resistor of the solid state D.C. amplifier. The DC amplifier is biased so that it is cutoff unless the tube is gaseous or its grid contaminated with some of the cathode coating. Then current will flow from grid to plate of the tube through the 8.2 megohm resistor. This produces a voltage across the resistor which is amplified by the solid state D.C. Amp, causing a deflection of the meter. The meter is marked "grid emission" and is divided into two parts for this test, the reject area being above 10% deflection and the good area below. A meter deflection of 10% is equivalent to a leakage of 100 megohms.

NOTE: Some tube manufacturers recommend that 10 Megohms of grid

leakage be the rejection criteria. This is a reading of 110 on the bottom meter scale. If the operating impedance of the tube in its circuit is low, the amount of grid leakage is not nearly as critical as in applications such as RF amplifiers, IF amplifiers, etc., where any grid leakage is cause for rejection. This should be taken into consideration by the operator before rejecting a tube.

CALIBRATION INSTRUCTIONS

The sensitivity of the leakage test circuit in the Model 667 is adjusted at the factory so that a leakage of 100 megohms just reads in the GRID EMISSION—REJECT area of the meter scale.

Should this sensitivity control require readjustment, proceed in the following manner:

- 1.) Remove main panel from case, after removing screws from panel and center of bottom of carrying case. (Between molded feet)
- 2.) Place a 100 megohm resistor in tube socket #6 between pin 1 and 9.
- 3.) Rotate SELECTOR switch to position #1.
- 4.) Depress the LEAKAGE pushbutton and observe the meter. Adjust the white trimpot on the P.C. board adjacent to the meter until the meter pointer reads at the division of the GREEN and the GRID EMISSION—REJECT sections of the scale.

The shorts test circuit is factory adjusted to a sensitivity of one megohm. Should this circuit require readjusting, proceed in the following manner.

- 1.) Remove main panel from case as above.
- 2.) Place a one megohm resistor in tube socket #6 between pin 1 and 9.
- 3.) Rotate the SELECTOR switch to position #1.
- 4.) While observing the SHORTS light, adjust the blue trimmer potentiometer on the P.C. board until the SHORTS light just barely glows.
- 5.) Reassemble tester.