TYPE N AND ON2 CARRIER TELEPHONE SYSTEMS
DEVIATION REGULATOR
ELECTRON TUBE CATHODE ACTIVITY TESTS
AMPLIFIER AND CONTROL CIRCUIT UNITS

This section provides the latest information for making in-service cathode activity tests on the electron tubes used in the amplifier and control circuit units of the deviation regulator.

When an amplifier plug-in unit is removed from the frame, the filament voltages to all of the other units are affected. Care should be taken to assure that all of the plug-in units are firmly seated in their associated jack mountings before any tube tests or filament voltage adjustments are made on the deviation regulator.

It is important to follow test procedures as outlined to prevent a premature reduction of heater current and the possible introduction into the carrier system of noise or level changes. The tube tests should be made ***only*** when the power supply conditions are relatively stable and not outside of the normal range.

The total power output of the deviation regulator should be checked continually with the 2J test set during the time tube tests are being made. If the deviation regulator should fail, immediately disconnect the 2P tube test set, and remove the regulator from service before proceeding with the tests.

APPARATUS:

2P Tube Test Set
3AF Test Set

AMPLIFIER UNIT ELECTRON TUBE TESTS

The amplifier circuit contains two amplifiers. One amplifier compensates for the flat loss of the regulating networks and comprises tubes V1 and V2 and associated apparatus. The other amplifier is a pick-off amplifier which feeds signals to the regulating circuit, and consists of one tube (V3) and associated apparatus.

STEP	PROCEDURE
	Unless otherwise stated, all of the following tests and adjustments are made on the 2P tube test set. Fig. 1 illustrates the arrangement for the test.
1	Set the HTR switch to the NORM position.
2	Adjust all of the potentiometers associated with the selector switch to the extreme left position (maximum resistance).
3	Insert the W-E, E-W, and OSC plugs in the W-E, E-W, and OSC jacks on the front of the amplifier (AMP) unit. ***Be sure that the W-E and E-W plugs are not interchanged.***

STEP	PROCEDURE
4	Set the selector switch to the HTR CUR position.
5	Check and, if necessary, adjust the FIL potentiometer associated with the amplifier unit for a reading of — ***Requirement:*** 52 ± 2% on the BLACK scale of the meter.
6	Set the selector switch successively to the V1 W-E, V2 W-E, V1 E-W, V2 E-W, and HTR positions. At each setting adjust the associated potentiometer for a reading of 0% on the BLACK scale. The controls should be adjusted slowly (at least 5 seconds for each control) in order to minimize the effect on the amplifier and to protect the meter.
7	Set the ACT ADJ control to the extreme counterclockwise position.
8	Set the HTR switch to the ADJ position and adjust the ACT ADJ control until the meter indicates 10% on the BLACK scale.
9	Allow 2 minutes for the electron tubes to reach a stable condition. Set the selector switch successively to V1 E-W, V2 W-E, and V1 W-E and at each position read the indication on the BLACK scale of the meter. The limits for each tube tested are — ***Requirement:*** 0 to 22% Caution should be exercised when faulty tubes are to be replaced in the amplifier unit. Since it is not practical to bypass the regulator with an alternate unit as is done with N carrier repeaters, the regulator must be switched out of service as covered in Section 362-504-501 when a near end-of-life tube is to be replaced. Although this may be done without an interruption of transmission, the regulation and equalization provided by the regulator will be lost when the regulator is removed from the line.

CONTROL CIRCUIT UNIT ELECTRON TUBE TESTS

These are four control circuit units, designated SLOPE, BULGE, CUBIC, and QUARTIC. Each unit contains a positive amplifier (V1 and V2) and a negative amplifier (V3 and V4). The output voltages from the two amplifiers are rectified and combined to control the operation of a dc amplifier (V5). The output of the dc amplifier controls the operation of a thermistor in an associated shape network.

The V5 tube in the control circuit unit is a dc amplifier tube, and no in-service method is provided for testing its activity. However, because the tube performs an important function in the deviation regulator, it should be replaced with a known good tube during intervals of routine maintenance. The replaced tube may then be tested in a Hickok tube tester and placed back in service, if found to be good.

The tubes in the control circuit units may be replaced without interrupting transmission or switching the regulator out of service. When a near end-of-life tube is to be replaced, the control circuit unit is switched out of service by means of the 3AF test set as covered in Section 362-504-503.

STEP	PROCEDURE
	Unless otherwise stated all of the following tests and adjustments are made on the 2P tube test set. Fig. 2 illustrates the arrangement for the test.
1	Set the HTR switch to the NORM position.

STEP	PROCEDURE
2	Adjust all of the potentiometers associated with the selector switch to the extreme left position (maximum resistance).
3	Insert W-E, E-W, and OSC plugs in the W-E, E-W, and OSC jacks on the front of the control amplifier to be tested. Be sure that the W-E and E-W plugs are not interchanged.
4	Set the selector switch to the HTR CUR position.
5	Check and, if necessary, adjust the FIL potentiometer associated with the control circuit amplifier under test for a reading of — ***Requirement:*** 52 ± 2% on the BLACK scale of the meter.
6	Set the selector switch successively to the V1 W-E, V2 W-E, V1 E-W, V2 E-W, and HTR positions. At each setting adjust the associated potentiometer to obtain the proper reading on the BLACK scale of the 2P tube test set as indicated in Table A. The controls should be adjusted slowly (at least 5 seconds for each control) in order to minimize the effect on the repeater and to protect the meter. ***IMPORTANT: Variations may occur in the meter readings when adjusting and testing tubes V2 and V4. This is a normal condition. If beats do occur, the average value of the swing should be estimated when the test set is adjusted, and when the activity measurements are made.***
7	Set the ACT ADJ control to the extreme counterclockwise position.
8	Set the HTR switch to the ADJ position and adjust the ACT ADJ control until the meter indicates 10% on the BLACK scale.
9	Allow 2 minutes for the electron tubes to reach a stable condition. Set the selector switch successively to the V2 E-W, V1 E-W, V2 W-E, and V1 W-E positions, and at each position read the indication on the BLACK scale of the meter. The per cent reading at each position should be within the limits shown in Table B.
10	Repeat the cathode activity tests on each of the control amplifiers.

TABLE A

AMPLIFIER TUBE	SELECTOR SETTING	READING
V1	V1 W-E	80
V2	V2 W-E	0
V3	V1 E-W	60
V4	V2 E-W	0
	HTR	0

Note: The V1 and V3 tubes cannot be adjusted to 0% because of the design of the control circuit unit.

TABLE B

AMPLIFIER TUBE	SELECTOR SETTING	READING
V1	V1 W-E	80 to 85
V2	V2 W-E	0 to 22
V3	V1 E-W	60 to 69
V4	V2 E-W	0 to 22

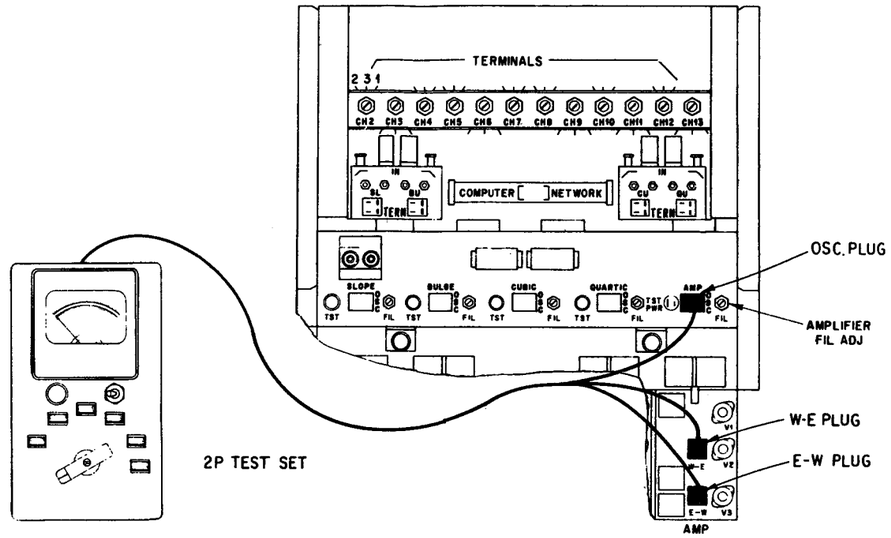

Fig. 1 – Testing Arrangements for Making Cathode Activity Tests on the Deviation Regulator Line Amplifier

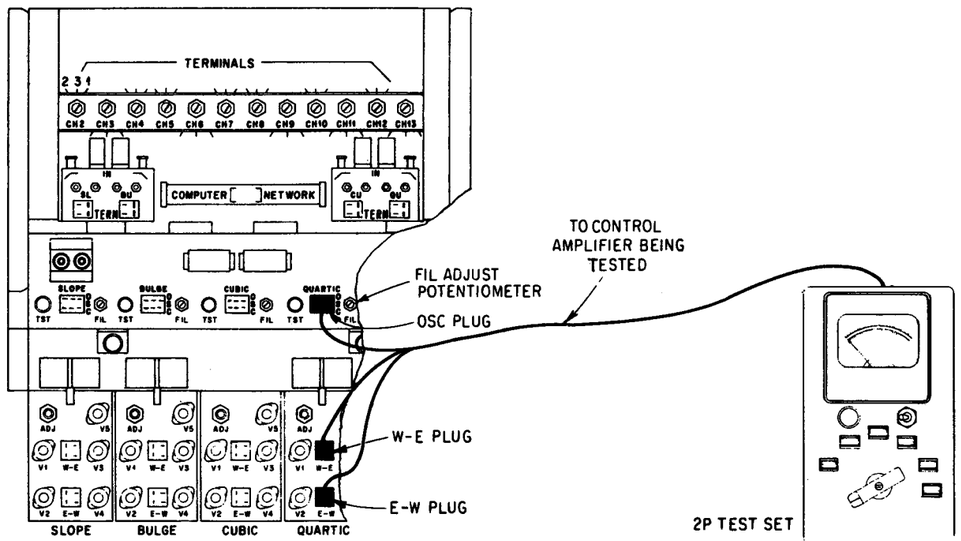

Fig. 2 – Testing Arrangements for Making Cathode Activity Tests on the Deviation Regulator Control Unit Amplifier

Fig. 1 and 2