

**N3 CARRIER TELEPHONE SYSTEM  
CARRIER-FREQUENCY SUPPLY  
DUAL AND DOUBLER AMPLIFIER UNIT  
MAINTENANCE**

A dual amplifier is a plug-in unit comprising two independent but identical limiting amplifier circuits. Each amplifier is intended to accept one of 14 carrier-frequency outputs from the harmonic generator and filter panel, amplify and regulate this carrier-frequency signal to the required voltage, and transmit it to a primary distribution panel card assembly for filtering and distribution via cable to the secondary carrier distribution panels in the N3 terminal bays. The dual amplifier plug-in unit also contains an alarm sensing circuit which monitors the outputs of both amplifiers and supplies information to actuate the alarm and switching circuitry when the output of either amplifier fails to meet the output requirements.

A doubler amplifier is a plug-in unit similar to the dual amplifier unit but including a frequency doubler circuit at the input to one of the limiting amplifier circuits. It accepts the 152-kc carrier-frequency output from the harmonic generator and filter panel and applies it directly to amplifier A and through the frequency doubler to amplifier B, thus producing independent outputs of 152 and 304 kc at the levels required for the primary distribution circuits. The plug-in assembly also includes an alarm sensing circuit.

An N3 common carrier-frequency supply requires seven dual amplifier units and one doubler amplifier unit to provide the 16 carrier frequencies required. If complete back-up by standby units is required, seven more dual amplifiers and one more doubler amplifier must be provided as plug-in alternate units in the N3 carrier supply bay.

The purposes of the tests described herein are as follows:

- (a) To check the carrier-frequency inputs at test jacks TST A and TST B to ensure that the input voltage is within the regulating range of the limiting amplifier.
- (b) To check the dc voltage inputs to the alarm sensing circuit at test jacks ALM IN A and ALM IN B. The dc voltage at each test jack is a function of the carrier-frequency output voltage of the amplifier circuit to which the test jack is connected; hence, these measurements are intended to ensure that the amplifier output voltages are within the requirements.
- (c) To check the operation of the alarm sensing circuit by shunting the input signal at test jacks TST A and TST B to voltages below the regulating range of the limiting amplifier to simulate an alarm condition.

With some exceptions these measurements may be made on an in-service basis. However, when measuring on working systems, caution should be exercised to avoid causing hits on systems carrying data transmissions.

**APPARATUS:**

KS-14510 Volt-ohm-milliammeter (VOM) or equivalent  
KS-14510, List 8 Test Probes  
W2FP Cord  
Hewlett-Packard 400-type Vacuum Tube Voltmeter (VTVM)  
0- to 1000-ohm Variable Resistance (Allen-Bradley J-type potentiometer or equivalent)  
equipped with 12-inch leads terminated in KS-19531, List 2 connector plugs

(A) CARRIER-FREQUENCY INPUT VOLTAGE TESTS																											
STEP	PROCEDURE																										
1	Connect the VTVM to test jacks TST A and GRD by means of the W2FP cord and measure the voltage of the incoming carrier-frequency signal to amplifier A. <b>Requirement:</b> The VTVM reading of the dual or double amplifier shall be a minimum of $-32.0$ db and a maximum of $-15.0$ db.																										
2	Connect the VTVM as in Step 1 to test jacks TST B and GRD and measure the voltage of the incoming carrier-frequency signal to amplifier B. <b>Requirement 1:</b> The VTVM reading of the dual amplifier shall be a minimum of $-32.0$ db and a maximum of $-15.0$ db. <b>Requirement 2:</b> The VTVM reading of the doubler amplifier shall be a minimum of $-18.5$ db and a maximum of $-7.5$ db. <b>Note:</b> The voltage measured at test jack TST A or TST B is a function of the input impedance of the first stage of the amplifier circuit under test. The measurements at TST A or TST B to GRD related to carrier-frequency voltages measured at the output of the harmonic generator and filter panel should be within the following limits:																										
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="4" style="text-align: center;">INPUT VOLTAGE TO DUAL AND DOUBLER AMPLIFIERS</th> </tr> <tr> <th colspan="2" style="text-align: center;">AMPLIFIERS</th> <th colspan="2" style="text-align: center;">VTVM READING</th> </tr> <tr> <th colspan="2"></th> <th style="text-align: center;">MINIMUM</th> <th style="text-align: center;">MAXIMUM</th> </tr> <tr> <th style="text-align: center;">dual</th> <th style="text-align: center;">doubler</th> <th colspan="2" style="text-align: center;">db</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">TST A or B</td> <td style="text-align: center;">TST A</td> <td style="text-align: center;">M* <math>-19.5</math></td> <td style="text-align: center;">M* <math>-14.5</math></td> </tr> <tr> <td></td> <td style="text-align: center;">TST B</td> <td style="text-align: center;">M* <math>-9.5</math></td> <td style="text-align: center;">M* <math>-7.5</math></td> </tr> </tbody> </table>				INPUT VOLTAGE TO DUAL AND DOUBLER AMPLIFIERS				AMPLIFIERS		VTVM READING				MINIMUM	MAXIMUM	dual	doubler	db		TST A or B	TST A	M* $-19.5$	M* $-14.5$		TST B	M* $-9.5$	M* $-7.5$
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<p>* M is the carrier-frequency voltmeter (CFVM) reading obtained for the appropriate carrier-frequency output from the harmonic generator and filter panel in accordance with Section 362-901-501, Test (C). (For a doubler amplifier, the carrier-frequency input is 152 kc for both TST A and TST B.)</p> <p>If a measurement exceeds the limits in the above table, and the wiring between the harmonic generator and carrier filter panel and the dual or doubler amplifier plug-in socket is satisfactory, the plug-in unit involved must be replaced.</p>																											
(B) ALARM SENSING CIRCUIT INPUT VOLTAGE TESTS																											
STEP	PROCEDURE																										
1	<p><b>Note:</b> The following measurements are directly related to the absolute output voltage of the <math>-21</math> volt dc power supply. The limits assume that the power supply has been adjusted to <math>-21.0 \pm 0.1</math> volts, in accordance with Section 362-901-505, prior to these tests.</p> <p>Set the VOM to read DC VOLTS on the 3-volt scale and connect to the test jacks indicated in the following steps by means of the KS-14510, List 8 test probes.</p>																										

STEP	PROCEDURE
2	Connect the VOM (+) terminal to test jack ALM IN A on the dual or doubler amplifier. (See Note of Step 3.)
3	<p>Connect the VOM (-) terminal to test jack ALM TST on the switching and alarm panel.</p> <p><b>Note:</b> In the requirements of Steps 3 and 5, an on-scale reading with connections as specified is defined as a positive (+) voltage reading. If it is necessary to reverse the connections to obtain an on-scale reading, the voltage is defined as negative (-) reading.</p> <p><b>Requirement 1:</b> The nominal limits shall be a minimum of -0.3 volt and a maximum of +0.6 volt.</p> <p><b>Requirement 2:</b> The alarm limit shall be a minimum of -1.0 volt and a maximum of +2.5 volts.</p>
4	Connect the VOM (+) terminal to test jack ALM IN B on the dual or doubler amplifier. (See Note of Step 3.)
5	<p>Connect the VOM (-) terminal to test jack ALM TST on the switching and alarm panel. (See Note of Step 3.)</p> <p><b>Requirement 1:</b> The nominal limits of the dual amplifier shall be a minimum of -0.3 volt and a maximum of +0.6 volt.</p> <p><b>Requirement 2:</b> The nominal limits of the doubler amplifier shall be a minimum of -0.5 volt and a maximum of +0.5 volt.</p> <p><b>Requirement 3:</b> The alarm limit of the dual amplifier shall be a minimum of -1.0 volt and a maximum of +2.5 volts.</p> <p><b>Requirement 4:</b> The alarm limit of the doubler amplifier shall be a minimum of -1.0 volt and a maximum of +2.5 volts.</p> <p><b>Note 1:</b> On initial installation, each unit should be capable of meeting the nominal limits. Failure to do so can be due either to a faulty plug-in unit or to improper termination of the amplifier. If the plug-in unit is at fault, it must be replaced.</p> <p><b>Note 2:</b> If the measurements exceed the alarm limit, the fault may be due to an insufficient input signal level, an improper termination, or a faulty plug-in unit. If the unit is at fault, it must be replaced. A measurement exceeding the alarm limit should cause the alarm indicating lamp on the switching and alarm panel to light.</p>
<b>(C) CHECK OF ALARM SENSING CIRCUIT OPERATION</b>	
STEP	PROCEDURE
1	<p><b>Caution:</b> On a working system, the following tests shall be made on a unit in the standby position only.</p> <p>Connect the shorting strap between test jacks TST A and GRD on the dual or doubler amplifier unit and observe the alarm indicating lamp on the switching and alarm panel.</p> <p><b>Requirement:</b> The alarm indicating lamp shall light when the shorting strap is connected and extinguish when the short is removed.</p>

STEP	PROCEDURE
2	<p>Repeat Step 1, connecting the shorting strap between TST B and GRD.</p> <p><b>Note:</b> If the alarm indicating lamp fails to operate as required, the trouble may be due to a faulty plug-in unit or to the connections to the alarm and switching panel. If the plug-in unit is at fault, it must be replaced.</p>
3	<p>Set the variable resistor to 1000 ohms and connect between test jacks TST A and GRD on the dual or doubler amplifier. Set the VOM to read DC VOLTS on the 3-volt scale and connect (+) terminal to ALM TST on the switching and alarm panel and (-) terminal to test jack ALM IN A on the dual or doubler amplifier unit. Slowly reduce the variable resistor until the alarm indicating lamp comes on and observe the VOM reading.</p> <p><b>Requirement:</b> The VOM reading shall be a minimum of +0.6 volt and a maximum of +1.0 volt.</p>
4	<p>Repeat Step 3 with the resistor connected between TST B and GRD on the dual or doubler amplifier unit and the VOM connected to test jacks ALM TST on the switching and alarm panel and ALM IN B on the amplifier unit.</p> <p><b>Requirement:</b> The VOM reading of the dual amplifier shall be a minimum of +0.6 volt and a maximum of +1.0 volt.</p>