

**N3 CARRIER TELEPHONE SYSTEM**  
**CHANNEL GROUP MODEM UNIT J99300AD**  
**TRANSMITTING AND RECEIVING TRANSMISSION TEST**  
**TRANSISTOR EMITTER CURRENT TEST**

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**1. GENERAL**

**1.01** Procedures are provided in this section for testing the J99300AD channel group modem unit contained in N3 and N3-L Carrier Telephone Systems. All tests are performed on an in-service basis.

**1.02** This section is reissued to include requirements for N3-L Type A and Type C Junctions. Significant changes are indicated by arrows. This reissue does *not* affect Equipment Test Lists.

**1.03** Each N3 terminal, N3-L Type A Junction, and N3-L Type C Junction contains two J99300AD channel group modems. In the transmitting direction, the input signal to a modem consists of 6 channel-carrier frequencies and 12 associated sidebands in the frequency range of 148 to 196 kHz. The group 1 modulator uses a 280-kHz carrier to translate this input to channel group 1 frequencies. The carrier for channel group 2 is 232 kHz. Channel groups 1 and 2 are connected to a combining network for transmission as a 12-carrier, 24-channel signal over the N line.

**1.04** The group modulators in an N3 terminal are fed from multiples which combine 12 channel-modulator outputs. The input signal to the group modulators in an N3-L Type A Junction is formed by carrier enhancement units which are a part of the L to N3 equipment. In an N3-L Type C Junction, the group 1 modulator is fed by

a combining multiple; group 2, by a carrier enhancement unit.

**1.05** The receiving equipment feeds the 12 carriers and 24 associated sidebands from the N line to the two channel group demodulators via the combining and switching unit. The filter at the input to the demodulator selects the proper frequency band and the group carrier is used to translate this band back to 6 channel-carrier frequencies and 12 sidebands. The channel group 1 demodulating carrier is 280 kHz and the channel group 2 carrier is 232 kHz. To provide the correct filter, a List 1 or 3 modem is required for channel group 1; a List 2 or 4 modem, for channel group 2.

**1.06** The input carrier frequency for the channel group modulator is obtained from a common carrier supply, while the demodulating carrier is obtained from the frequency-correction unit. Each carrier input is amplified to the level needed by the modem.

**2. FEATURES OF TESTS**

**2.01** Operation of the transmitting circuit is checked in Test A by measuring the level of each carrier frequency at the output of the modem.

**2.02** In the receiving direction, the power of the six demodulated carriers is measured at the output of the modems in Test B. An emitter current measurement is made in Test C to ensure proper operation of the demodulator amplifier.

**2.03** If the levels at the modem outputs are not satisfactory, additional measurements at the signal and carrier inputs are specified to locate the trouble.

**SECTION 362-906-501**

**2.04** Caution should be exercised while performing these tests since the shorting or grounding of leads can affect service. Care should be taken to avoid causing hits on systems carrying data or special services.

KS-14510 Volt-Ohm-Milliammeter (VOM), or equivalent

KS-14510, List 8 Cords

**2.05** Input and output measurements are made by attaching to terminals of connector jacks at the back of the bay. The jacks involved in each test should be located prior to energizing the carrier-frequency voltmeter, so that the meter can be placed in a convenient position for reading the scale and connecting leads.

KS-15538, List 4 Carrier-Frequency Voltmeter (CFVM), or equivalent

W2DW Test Cord equipped with alligator clips

W2DW Test Cord equipped with KS-19531, Lists 1 and 2 tips

**3. APPARATUS**

**3.01** The following apparatus is required to perform the tests in this section:

Hewlett-Packard 400-Type Vacuum-Tube Voltmeter (VTVM), or equivalent

STEP	PROCEDURE																												
1	<p><b>A. Transmitted Carrier Power Test (In-Service Test)</b></p> <p>Energize the CFVM and allow adequate time for the meter to stabilize. Calibrate the CFVM per Section 103-400-104.</p>																												
2	<p>Operate the SELECTOR switch to 135 <math>\Omega</math> BRG and the FUNCTION switch to 250 ~.</p>																												
3	<p>Arrange the CFVM for balanced measurements by disconnecting the <u>ground strap</u> at the lower input terminal.</p>																												
4	<p>Connect a W2DW cord equipped with alligator clips between the CFVM and terminals 17 and 18 of the connector jack for the <sup>CRP MODEM</sup> modem (rear of bay). The connector jack designation for each type of equipment and channel group is listed in Table A. Care should be taken not to short or ground the terminals while attaching the alligator clips.</p>																												
<p><b>TABLE A</b> <b>CHANNEL GROUP MODEM — MODULATOR REQUIREMENTS</b></p>																													
<table border="1"> <thead> <tr> <th rowspan="2">TYPE OF EQUIPMENT</th> <th rowspan="2">CHANNEL GROUP</th> <th rowspan="2">CONNECTOR JACK DESIG</th> <th colspan="2">TRANSMITTING CARRIER REQUIREMENTS</th> </tr> <tr> <th>INPUT POWER</th> <th>OUTPUT POWER</th> </tr> </thead> <tbody> <tr> <td rowspan="2">N3 Terminal</td> <td>1</td> <td>J29</td> <td rowspan="2">-45.0 to -46.0 dBm</td> <td rowspan="2">-49.5 to -50.5 dBm</td> </tr> <tr> <td>2</td> <td>J40</td> </tr> <tr> <td rowspan="2">N3-L Type A Junction</td> <td>1</td> <td>J5</td> <td rowspan="2">-42.0 to -46.0 dBm</td> <td rowspan="2">-45.5 to -51.5 dBm</td> </tr> <tr> <td>2</td> <td>J16</td> </tr> <tr> <td rowspan="2">N3-L Type C Junction</td> <td>1</td> <td>J29</td> <td rowspan="2">-45.0 to -46.0 dBm</td> <td rowspan="2">-49.5 to -50.5 dBm</td> </tr> <tr> <td>2</td> <td>J40</td> </tr> </tbody> </table>		TYPE OF EQUIPMENT	CHANNEL GROUP	CONNECTOR JACK DESIG	TRANSMITTING CARRIER REQUIREMENTS		INPUT POWER	OUTPUT POWER	N3 Terminal	1	J29	-45.0 to -46.0 dBm	-49.5 to -50.5 dBm	2	J40	N3-L Type A Junction	1	J5	-42.0 to -46.0 dBm	-45.5 to -51.5 dBm	2	J16	N3-L Type C Junction	1	J29	-45.0 to -46.0 dBm	-49.5 to -50.5 dBm	2	J40
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N3-L Type C Junction	1	J29	-45.0 to -46.0 dBm	-49.5 to -50.5 dBm																									
	2	J40																											

280 b3  
232 5A

17+18  
17+18

97185-

STEP	PROCEDURE									
	<p><b>A. CG2 Lineup for Type A and C Junctions</b></p> <p><b>Note:</b> CG1 of the type A junction must be lined up according to Section 362-922-501 before this procedure is undertaken.</p> <p>1 Confirm that the B2 L-L group connector for CG2 has been adjusted according to 356-020-502 and 356-020-503.</p> <p>2 Energize the CFVM and allow adequate time for the meter to stabilize.</p> <p>3 Operate the SELECTOR switch to 135Ω and the FUNCTION switch to 250 ~.</p> <p>4 Arrange the CFVM for balanced measurements by disconnecting the ground strap at the lower input terminal.</p> <p>5 Connect the W2DW cord equipped with alligator clips from the CFVM to terminals 17 and 18 of connector jack J5 for the type A junction or J29 for the type C junction. These jacks are located on the rear of the bay.</p> <p>6 Measure the 88-kHz carrier level and the other carriers in CG1. Record the measured 88-kHz level as value A in the required range for a type A junction or as value B in the required range for a type C junction.</p> <p><b>Requirement:</b></p> <table border="1" data-bbox="576 1207 1201 1470"> <thead> <tr> <th></th> <th>TYPE A *</th> <th>TYPE C *</th> </tr> </thead> <tbody> <tr> <td>88 kHz:</td> <td>-49.0 to -51.0 dBm = A</td> <td>-49.5 to -50.5 dBm = B</td> </tr> <tr> <td>96, 104, 112, 120, and 128 kHz:</td> <td>A ± 2.0 dB</td> <td>-49.5 to -50.5 dBm</td> </tr> </tbody> </table> <p>*No two carriers more than 2 dB apart.</p> <p>7 Transfer the meter connections to pins 17 and 18 on J16 for the type A junction or on J40 for the type C junction.</p> <p>8 Adjust the L-L group connector associated with CG2 to obtain the requirements related to the value recorded in Step 6.</p>		TYPE A *	TYPE C *	88 kHz:	-49.0 to -51.0 dBm = A	-49.5 to -50.5 dBm = B	96, 104, 112, 120, and 128 kHz:	A ± 2.0 dB	-49.5 to -50.5 dBm
	TYPE A *	TYPE C *								
88 kHz:	-49.0 to -51.0 dBm = A	-49.5 to -50.5 dBm = B								
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220  
330

CG2

STEP	PROCEDURE									
	<p data-bbox="261 317 444 344"><b>Requirement:</b></p> <table border="1" data-bbox="456 422 1081 663"> <thead> <tr> <th></th> <th>TYPE A *</th> <th>TYPE C *</th> </tr> </thead> <tbody> <tr> <td>80 kHz:</td> <td>A <math>\pm</math>0.1 dB</td> <td>B <math>\pm</math>0.1 dB</td> </tr> <tr> <td>40, 48 56, 64, and 72 kHz:</td> <td>A <math>\pm</math>2.0 dB</td> <td>B <math>\pm</math>2.0 dB</td> </tr> </tbody> </table> <p data-bbox="518 684 1008 714">*No two carriers more than 2 dB apart.</p> <p data-bbox="261 827 1403 888"><b>Note 1:</b> The COARSE attenuator on the B2 L-L group connector is adjustable in 1-dB steps and the FINE adjustor is capable of a continuous 0- to 1.5-dB loss adjustment.</p> <p data-bbox="261 921 1403 1014"><b>Note 2:</b> The L-L group connector should be suitably tagged or otherwise marked to indicate that an adjustment has been made to alter its basic circuit adjustment which was initially made per 356-020-503.4</p> <p data-bbox="261 1052 870 1079"><b>B. Transmitted Carrier Power Test (In-Service Test)</b></p> <ol data-bbox="155 1110 1403 1549" style="list-style-type: none"> <li>1 Energize the CFVM and allow adequate time for the meter to stabilize.</li> <li>2 Operate the SELECTOR switch to 135<math>\Omega</math> BRG and the FUNCTION switch to 250 ~ .</li> <li>3 Arrange the CFVM for balanced measurements by disconnecting the ground strap at the lower input terminal.</li> <li>4 Connect a W2DW cord equipped with alligator clips between the CFVM and terminals 17 and 18 of the connector jack for the modem (rear of bay). The connector jack designation for each type of equipment and channel group is listed in Table A. Care should be taken not to short or ground the terminals while attaching the alligator clips.</li> <li>5 Measure the output carrier power for each of the carriers in the channel group being tested per Table A.</li> </ol> <p data-bbox="261 1583 1198 1612"><b>Requirement:</b> The output power meets the requirements listed in Table A.</p> <ol data-bbox="155 1646 1403 1864" style="list-style-type: none"> <li>6 If the requirement of Step 5 is met, the unit is satisfactory. Repeat Steps 4 through 6 for the other channel group.</li> <li>7 If the requirement is not met, continue with Steps 7 through 11 to determine whether the trouble is in the unit or is associated with the external circuitry. Disconnect the W2DW cord clips from terminals 17 and 18 of the connector jack used in Step 4 and connect them to terminals 19 and 20 of the same jack.</li> </ol>		TYPE A *	TYPE C *	80 kHz:	A $\pm$ 0.1 dB	B $\pm$ 0.1 dB	40, 48 56, 64, and 72 kHz:	A $\pm$ 2.0 dB	B $\pm$ 2.0 dB
	TYPE A *	TYPE C *								
80 kHz:	A $\pm$ 0.1 dB	B $\pm$ 0.1 dB								
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TABLE A  
CHANNEL GROUP MODEM – MODULATOR REQUIREMENTS

TYPE OF EQUIPMENT	CONNECTOR JACK DESIG	CHANNEL GROUP	TRANSMITTING CARRIER REQUIREMENTS	
			INPUT	OUTPUT
N3 TERMINAL	J29	1	152, 160, 168, 176, 184, and 192 kHz:	All CXRs (See Note 1):
	J40	2	-44.75 to -46.0 dBm	-49.25 to -50.5 dBm
N3-L TYPE A JUNCTION	J5	1	192 kHz: -44.0 to -47.0 dBm = C	88 kHz: -48.5 to -51.5 dBm = G
			184, 176, 168, 160, and 152 kHz: C ± 2.5 dB	96, 104, 112, 120, and 128 kHz: G ± 2.5 dB
	J16	2	152 kHz: C ± 0.1 dB = D	80 kHz = G ± 0.1 dB = H
			160, 168, 176, 184, and 192 kHz: D ± 2.5 dB	72, 64, 56, 48, and 40 kHz: H ± 2.5 dB
N3-L TYPE C JUNCTION	J29	1	192 kHz: -44.5 to -46.5 dBm = E	88 kHz: -49.0 to -51.0 dBm = J
	J40	2	152 kHz: E ± 0.1 dB = F	80 kHz: J ± 0.1 dB = K
			160, 168, 176, 184, and 192 kHz: F ± 2.5 dB	72, 64, 56, 48, and 40 kHz: K ± 2.5 dB

Note 1: 88, 96, 104, 112, 120, and 128 kHz are CG1 CXRs and 40, 48, 56, 64, 72, and 80 kHz are CG2 CXRs.

Note 2: C, E and G, J are measured values in the required ranges for 192 and 88 kHz, respectively.

Note 3: D, F and H, K are measured values in the required ranges for 152 and 80 kHz, respectively.

Note 4: No two carriers in the same channel group shall be more than 3 dB apart.

STEP	PROCEDURE
8	Measure the input carrier power for each of the carriers listed in Table A.  <b>Requirement:</b> The input power meets the requirements listed in Table A.
9	Using the VTVM (which has been calibrated) and the W2DW cord, connect the clips to terminals 15 and 16 of the same connector jack and measure the input modulating carrier level. The VTVM grounded terminal must be connected to terminal 16 of the connector jack.  <b>Requirement:</b> $-2.8$ to $-4.8$ dB. ✓
10	If the requirements of Steps 8 and 9 are met, the unit is defective and must be replaced. Repeat Steps 4 through 6 for the replacement unit.

+1.5  
-1.5

TABLE C  
1523d4  
120  
72

STEP	PROCEDURE
11	<p>If the requirements of Steps 8 and 9 are not met, the trouble is probably in the secondary carrier distribution circuitry. Perform trouble location tests as prescribed in Section 362-915-501 or 362-915-502 for N3 terminals or N3-L Type C Junctions. Perform trouble location tests for N3-L Type A Junction distribution amplifiers per Section 362-924-501. If the cause of trouble in Step 8 is not found, refer to 362-923-501 for testing the carrier enhancement unit.</p> <p><b>C. Received Carrier Power Test (In-Service Test)</b></p> <p>1 Energize the CFVM and allow adequate time for the meter to stabilize.</p> <p>2 Operate the SELECTOR switch to 135Ω BRG and the FUNCTION switch to 250 ~ .</p> <p>3 Arrange the CFVM for balanced measurements by disconnecting the ground strap at the lower input terminal.</p> <p>4 Connect a W2DW cord equipped with alligator clips between the CFVM and terminals 3 and 4 of the connector jack for the <u>modem</u> (rear of bay). The connector jack designation for each type of equipment and channel group is listed in Table B. Care should be taken not to short or ground the terminals while attaching the alligator clips.</p> <p>5 Measure the received output carrier power for each of the output carriers listed in Table C for the channel group being tested. <span style="float: right;">2.4 - A.8</span></p> <p><b>Requirement:</b> The output meets the requirement listed in Table B.</p> <p>6 If the requirement of Step 5 is met, the unit is satisfactory. Repeat Steps 4 through 6 for the other channel group. If the requirement is not met, continue with Steps 7 through 11 to determine if the trouble is in the unit or is associated with the external circuitry.</p> <p>7 Disconnect the W2DW cord clips from terminals 3 and 4 of the connector jack and connect them to terminals 9 and 10 of the same jack.</p> <p>8 Measure the received input carrier power for each of the input carriers listed in Table C.</p> <p><b>Requirement:</b> The input meets the requirements listed in Table B.</p> <p>9 Using the VTVM (which has been calibrated) and the W2DW cord, connect the clips to terminals 6 and 7 of the same connector jack and measure the input demodulating carrier level. The VTVM grounded terminal must be connected to terminal 7 of the connector jack.</p> <p><b>Requirement:</b> -2.55 to -3.95 dB.</p> <p>10 If the requirements of Steps 8 and 9 are met, the unit is defective and must be replaced. Repeat Steps 4 through 6 on the replacement unit. If the requirement of Step 8 is not met, perform trouble location tests on the secondary carrier supply per Section 362-915-501 or 362-915-502 for N3 terminals or N3-L Type C Junctions. Perform trouble location tests for N3-L Type A Junction distribution amplifiers per Section 362-924-501.</p>