N3 CARRIER TELEPHONE SYSTEM
CHANNEL MODEM UNIT
J99300AB AND J99300AY
VOICE- AND CARRIER-FREQUENCY
INPUT AND OUTPUT TESTS
OUT-OF-SERVICE

CONTENTS PAGE

1. GENERAL

1.01 This section contains procedures for out-of-service tests on the J99300AB and J99300AY channel modem units used in the N3 and N3-L Carrier Telephone Systems.

1.02 The purpose of this reissue is to include a trouble-location test for 654-type filters. Arrows are used to indicate changes. This reissue does not affect the Equipment Test List.

1.03 The transmitting circuit of the channel modem translates voice frequencies from the compressor or VF amplifier to one of 12 carrier-frequency sidebands. The output of the modulator contains the upper and lower carrier-frequency sidebands and the modulating-carrier frequency. The transmitting channel-bandpass filter passes the upper sideband and attenuates the other modulation products.

1.04 In the receiving circuit, the channel-bandpass filter selects the desired sideband from the 12 carrier-sidebands in the signal connected from the double-channel regulator. The demodulator translates the sideband back to voice frequencies which are fed to the expandor or VF amplifier.

2. FEATURES OF TESTS

2.01 All tests are made with the modem unit and its associated voice-frequency channel removed from service.

2.02 The modem is normally tested in the bay by performing measurements at pin jacks on the front of the unit while a 1000-Hz test tone is connected to the channel. The transmitting circuit test (Test A) ensures that the proper VF level is applied to the input of the modulator and that the modulator output meets requirements. The receiving test (Test B) checks the received carrier-frequency sideband at the input of the demodulator and the demodulated VF signal.

2.03 Tests A and B should be performed on the modem at each end of the channel prior to adjustment of the channel net gain according to Section 362-900-505 for compandored channels, or Section 362-900-510 on channels equipped with VF amplifiers. This sequence ensures that modulation, carrier-frequency sideband transmission, and

demodulation meet requirements before the final lineup of the channel.

2.04 The loop test is designed to test a channel modem by connecting the transmitting to the receiving circuit. The modem is plugged into the N3 terminal test stand, which provides pin jacks on each terminal of the connector and level adjustment between transmitting and receiving circuits (see Fig. 1). These features are utilized in the loop test to locate troubles in the modem while testing at normal transmission levels.

2.05 Measurements of the modulating and demodulating carrier (Tests D and E) are performed when modulation or demodulation requirements are not met and replacement of the channel modem does not clear the trouble. If the carrier meets requirements, a trouble in the bay wiring is indicated.

2.06 The filter test (Test F) is designed to test the signal path through the transmitting and receiving 654-type channel bandpass filters (Fig. 2). This test is made when the modem unit fails to meet the requirements of the loop test. ***The 654-type filter is a fragile, crystal filter unit and should be handled with care to avoid physical damage.***

3. APPARATUS

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

1—J99300AW N3 Terminal Test Stand

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

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

1—W2FP Cord.

4. TESTS

STEP	PROCEDURE
	A. Transmitting Circuit Test
1	Remove the channel from service.
2	At the associated JK PNL or VF patch bay, connect the MOD IN or VF IN jack for the channel under test to the 1000-Hz, −16 dBm, 600Ω test-tone jack.
3	Connect a W2FP cord from the INPUT binding posts of the VTVM to the MOD IN and MOD GRD jacks on the channel modem. The grounded binding post should be connected to the MOD GRD jack through the shield of the cord.
4	Read the VTVM indication. ***Requirement:*** Between +16.3 and +17.3 dBm. ***Note:*** If this requirement is not met, the probable trouble is a defective compandor unit. Where a VF amplifier is substituted for the compandor, adjust according to Section 362-900-510.
5	Transfer the VTVM cord tip from the MOD IN jack to the MOD OUT jack.
6	Read the VTVM indication. ***Requirement:*** Between −21.0 and −19.0 dBm.

STEP	PROCEDURE

Note: If this requirement is not met, the probable trouble is a defective modem unit or an incorrect modulating-carrier level. The measurement of the modulating carrier is covered in Test D.

7 When all requirements are met, disconnect the VTVM from the modem unit.

8 If no further tests are to be performed on the channel, remove the patch cord from the 1000-Hz jack and then from the MOD IN or VF IN jack.

9 Return the channel to service.

B. Receiving Circuit Test

1 Energize the CFVM and allow time for the set to stabilize.

2 Calibrate the CFVM according to the Section covering the specific set used.

3 On the List 2 through 4 CFVM, set the SELECTOR switch to 600Ω BRG and the FUNCTION switch to SEL 250~. On the List 5 or 5A CFVM, set the SELECTOR switch to INPUT and the FUNCTION switch to 600Ω.

4 Arrange the CFVM for unbalanced measurements by connecting the ground strap to the lower input binding post.

5 Remove the channel from service.

6 Request the transmitting end to send 1000-Hz, −16 dBm test tone (Test A, Step 2).

7 Connect a W2FP cord from the CFVM input binding posts to the DEM IN and DEM GRD jacks on the modem. The grounded binding post should be connected to the DEM GRD jack through the shield of the cord.

8 Tune the CFVM for a maximum level indication at the receiving-sideband frequency listed in Table A for the channel number of the modem.

Note: If an indication cannot be obtained, check the double-channel regulator per Section 362-909-502 for a J99300AC unit or Section 362-909-503 for a J99300CA unit. If the double-channel regulator is within limits and the transmitting modem meets the requirements of Test A, the probable trouble is a defective transmitting or receiving channel-bandpass filter. Verify that the correct 654-type filters are in place and the 4075A network in the J99300AB channel modem has the appropriate screws turned down. Perform the loop test (Test C) at each end to isolate the trouble.

9 While observing the indication on the CFVM, request the transmitting end to interrupt the 1000-Hz tone by removing and reinserting one end of the patch cord.

Requirement: The meter needle momentarily deflects to the left.

Note: If this requirement is not met, the CFVM is tuned to the carrier frequency which is 1 kHz below the sideband frequency (Table A). Retune the CFVM and repeat Step 9.

TABLE A

CHANNEL NO.	CARRIER FREQUENCY	RECEIVING-SIDEBAND FREQUENCY
	kHz	kHz
1	148	149
2	152	153
3	156	157
4	160	161
5	164	165
6	168	169
7	172	173
8	176	177
9	180	181
10	184	185
11	188	189
12	192	193

STEP	PROCEDURE
10	Read the CFVM indication. ***Requirement:*** Between −36.0 and −32.0 dB. ***Note:*** If this requirement is not met, trace the trouble as outlined in the note after Step 8.
11	Disconnect the CFVM from the modem.
12	Connect a W2FP cord from the input binding posts of the VTVM to the DEM OUT and DEM GRD jacks on the channel modem. The grounded binding post should be connected to the DEM GRD jack through the shield of the cord.
13	Read the VTVM indication. ***Requirement:*** Between −6.0 and −4.0 dBm. ***Note:*** If this requirement is not met, the probable trouble is a defective modem or an incorrect demodulating-carrier level. The measurement of the demodulating carrier is covered in Test E.
14	When all requirements are met, disconnect the VTVM from the MODEM.
15	If no further tests are to be performed on the channel, request the transmitting end to remove the patch cord from the 1000-Hz test-tone jack and then from the MOD IN or VF IN jack.
16	Return the channel to service.

STEP	PROCEDURE

C. Loop Test (Trouble Location)

1 Place the VTVM, CFVM, and the N3 terminal test stand in a convenient position for connection to the channel modem.

2 Energize the VTVM and CFVM and allow time for the sets to stabilize.

3 Calibrate the CFVM according to the Section covering the specific set used.

4 Remove the channel from service.

5 In the associated JK PNL or VF patch bay, patch the MOD IN or VF jack for the channel to the 1000-Hz, −16 dBm, 600Ω test-tone jack.

6 Remove the modem unit from the bay and plug it into the CHAN MODEM position (J9) on the N3 terminal test stand.

7 Plug the P2 card extending cable and board assembly of the N3 terminal test stand into the vacated modem position in the bay.

8 Connect a W2FP cord from the input binding posts of the VTVM to the MOD IN and MOD GRD jacks on the channel modem. The grounded binding post should be connected to the MOD GRD jack through the shield of the cord.

9 Read the VTVM indication.

Requirement: Between +16.3 and +17.3 dBm.

Note: If this requirement is not met, the probable trouble is a defective compandor unit. Where a VF amplifier is substituted for the compandor, adjust according to Section 362-900-510.

10 Transfer the VTVM cord tip from the MOD IN jack to the MOD OUT jack.

11 Read the VTVM indication.

Requirement: Between −21.0 and −19.0 dBm.

Note: If this requirement is not met, the probable trouble is a defective modem unit or an incorrect modulating-carrier level. The measurement of the modulating carrier is covered in Test D.

12 Disconnect the VTVM from the modem.

13 Set the OPR switch of the N3 terminal test stand to the LOOP position.

14 On the List 2 through 4 CFVM, set the SELECTOR switch to 600Ω BRG and the FUNCTION switch to SEL 250~. On the List 5 or 5A CFVM, set the SELECTOR switch to INPUT and the FUNCTION switch to 600Ω.

STEP	PROCEDURE

15 Arrange the CFVM for unbalanced measurements by connecting the ground strap at the lower input binding post.

16 Connect a W2FP cord from the CFVM to the DEM IN and DEM GRD jacks on the modem. The grounded binding post should be connected to the DEM GRD jack through the shield of the cord.

17 Tune the CFVM for a maximum level indication at the receiving-sideband frequency listed in Table A. If an indication cannot be obtained, the trouble can be in the transmitting or receiving channel-bandpass filter. The trouble is probably the wrong 654-type filter or a defective filter. To isolate the trouble, ▶perform the filter tests in Test F.◀

18 While observing the indication on the CFVM, remove and reinsert the end of the patch cord connected to the 1000-Hz, −16 dBm jack.

Requirement: The meter needle momentarily deflects to the left.

Note: If this requirement is not met, the CFVM is tuned to the carrier frequency which is 1 kHz below the sideband frequency (Table A). Retune the CFVM and repeat Step 18.

19 Adjust the DI ADJ knob for an indication of −34.0 dB on the CFVM.

Note: If this indication cannot be obtained, the trouble can be a marginal transmitting or receiving 654-type channel-bandpass filter. ▶Perform the filter tests described in Test F.◀

20 Disconnect the CFVM.

21 Connect a W2FP cord from the VTVM to the DEM OUT and DEM GRD jacks. The grounded binding post should be connected to the DEM GRD jack through the shield of the cord.

22 Read the VTVM indication.

Requirement: Between −6.0 and −4.0 dBm.

Note: If this requirement is not met, the probable trouble is a defective modem unit or an incorrect demodulating-carrier level. The measurement of the demodulating carrier is covered in Test E.

23 When all requirements are met, remove the card extender from the bay and replace the modem unit in its normal position.

D. Modulating Carrier Test (Trouble Location)

Note: This test is required only when the modulator output signal does not meet the requirements of Test A, Step 6 or Test C, Step 11 and replacement of the modem unit does not clear the trouble.

STEP	PROCEDURE

1 If Test A was being performed when the trouble was encountered, install the channel modem unit in the N3 terminal test stand according to Steps 6 and 7 of Test C.

2 Connect a W2FP cord from the input binding posts of the VTVM to pin jacks 9 and 10 of the group labeled CHAN MODEM on the test stand.

3 Read the VTVM indication.

Requirement: Between −13.2 and −11.8 dBm.

Note: If this requirement is not met, the trouble is in the carrier distribution circuit. Refer to Section 362-915-501 where the J99300AE distribution panel is used or Section 362-915-502 for the plug-in amplifier distribution circuit.

E. Demodulating Carrier Test (Trouble Location)

Note: This test is required only when the demodulator output signal does not meet the requirements of Test B, Step 13 or Test C, Step 22 and replacement of the modem unit does not clear the trouble.

1 If Test B was being performed when the trouble was encountered, install the channel modem unit in the N3 terminal test stand according to Steps 6 and 7 of Test C.

2 Connect a W2FP cord from the INPUT binding posts of the VTVM to pin jacks 17 and 18 of the group labeled CHAN MODEM on the test stand.

3 Read the VTVM indication.

Requirement: Between −13.2 and −11.8 dBm.

Note: If this requirement is not met, the trouble is in the carrier distribution circuit. Refer to Section 362-915-501 where the J99300AE distribution panel is used or Section 362-915-502 for the plug-in amplifier distribution circuit.

F. 654-Type Filter Test (Trouble Location)

Note: This test is required only when the level indications in Test C, Step 17 or Step 19 cannot be obtained.

Caution: The 654-type crystal filter is fragile and should be handled with care to avoid damage.

1 Disconnect the W2FP cord from the DEM IN and DEM GRD jacks.

2 Connect the W2FP cord from the CFVM to the MOD OUT and MOD GRD jacks on the modem. The grounded binding post should be connected to the MOD GRD jack through the shield of the cord.

STEP	PROCEDURE
3	Read and record the CFVM indication. ***Note:*** The CFVM should indicate a level of approximately −22 dB.
4	Disconnect the W2FP cord from the modem unit.
5	Disconnect the ground strap from the bottom CFVM input binding post.
6	Connect the W2FP cord from the CFVM to jacks 6 and 7 in the CHAN MODEM group on the test stand (see Fig. 1).
7	Read the CFVM indication. ***Requirement:*** Between 11.5 and 12.5 dB less than the value recorded in Step 3.
8	If the requirement of Step 7 is met, proceed to Step 9. If it is not met, the transmitting bandpass filter (Fig. 2) is defective. Remove the modem unit from the test stand and proceed as follows: (a) Replace the transmitting filter (FL1) (Section 362-910-501). (b) Reinsert the modem unit in the test stand. (c) Disconnect the CFVM from the test stand. (d) Perform Steps 15 through 23 of Test C.
9	Remove the modem unit from the test stand and proceed as follows: (a) Interchange the transmitting (FL1) and receiving (FL2) filters (Fig. 2). (b) Reinsert the modem unit in the test stand. (c) Disconnect the CFVM from the test stand. (d) Connect the ground strap to the bottom CFVM input binding post. (e) Repeat Steps 2 through 7. (f) If the requirement of Step 7 is not met, the transmitting bandpass filter (FL1) is defective. Remove the modem unit from the test stand and perform (a) through (d) of Step 8. If the requirement is met, the bandpass filters are satisfactory and the trouble is in the modem unit. Proceed to Step 10.
10	Remove the transmitting and receiving filters from the defective modem unit.
11	Obtain a known good modem unit and install the bandpass filters removed in Step 10.
12	Perform Steps 15 through 23 of Test C.

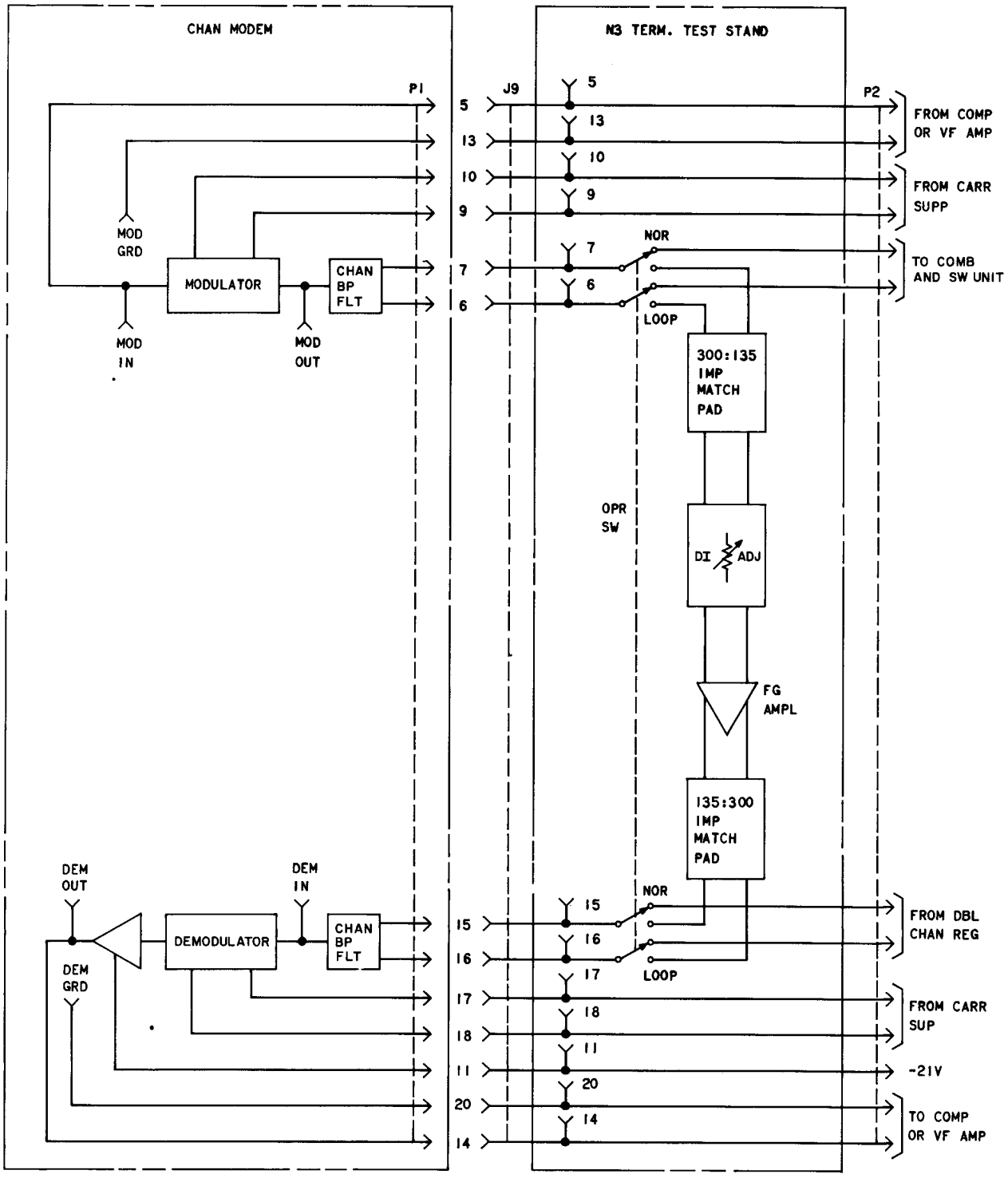
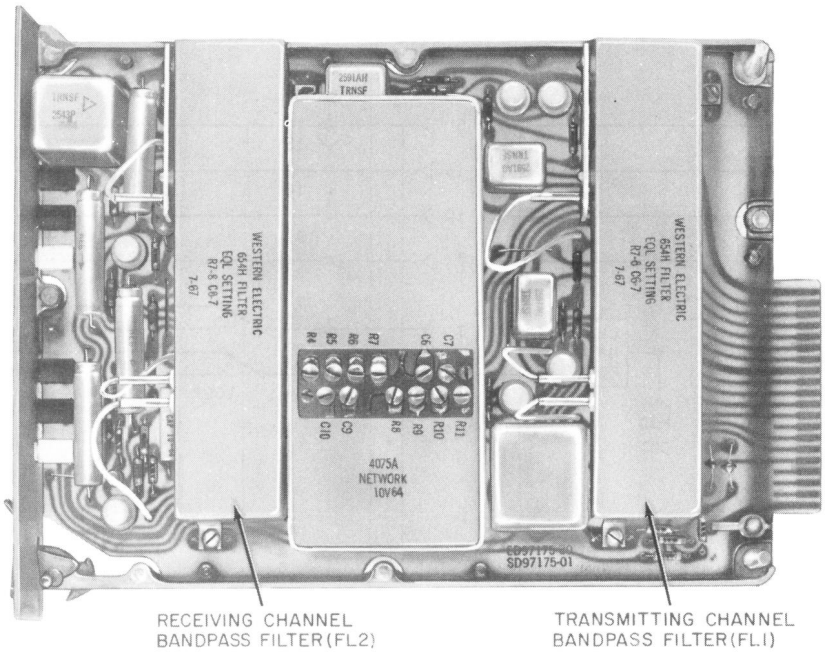
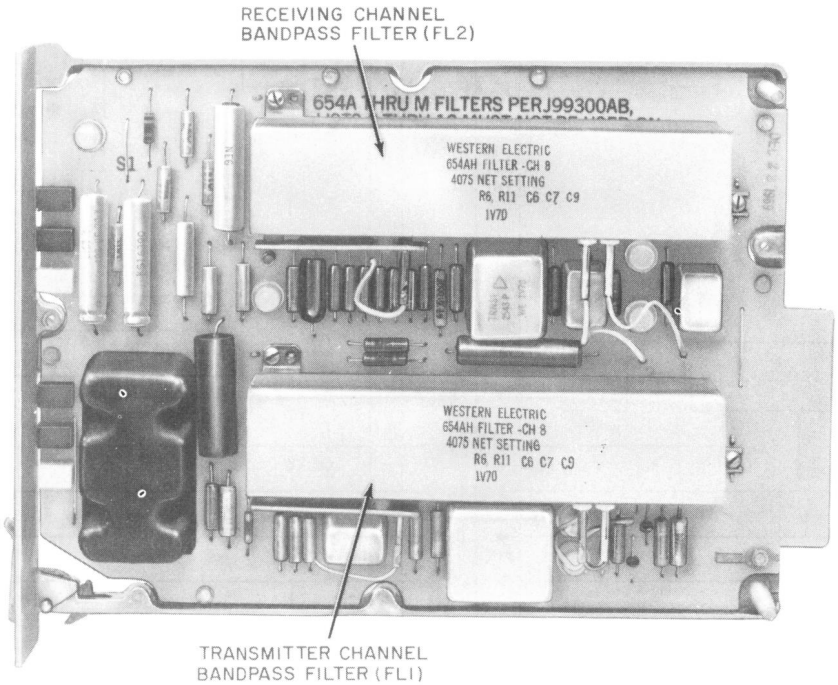


Fig. 1—Channel Modem and N3 Terminal Test Stand—Connection and Test Jacks



A - J99300AB CHANNEL MODEM UNIT



B - J99300AY CHANNEL MODEM UNIT

Fig. 2—J99300AB and J99300AY Channel Modem Units—Transmitting and Receiving Bandpass Filters