N3 CARRIER TELEPHONE SYSTEM

CARRIER-FREQUENCY SUPPLY

GENERAL MAINTENANCE CONSIDERATIONS

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1. GENERAL

1.01 This section supplements the other sections that specify testing procedures and requirements for maintenance of the N3 carrier-frequency supply. It contains general information and lists the recommended test equipment.

1.02 This section is reissued to make minor changes in the text and to update for new power supply arrangements. Since this reissue covers a general revision, arrows ordinarily used to indicate changes have been omitted.

1.03 Each carrier supply may furnish all of the carrier frequencies for as many as 26 N3 carrier terminals. Therefore, a common carrier supply requires careful maintenance to ensure that deviations from normal performance are detected and corrected before service in up to 624 channels is impaired.

2. TEST EQUIPMENT

2.01 The following test equipment is used for the initial adjustment and maintenance of the N3 carrier-frequency supply. Meters should be calibrated periodically in accordance with the sections covering their use.

J99300AU N3 Switching Set

KS-14510 Volt-ohm-milliammeter (VOM)

KS-14510, List 8 Test Probes for VOM

KS-15538, List 4 or later Carrier-frequency Voltmeter (CFVM)

400L (or 400H) Hewlett-Packard Vacuum Tube Voltmeter (VTVM)

10110-A Hewlett-Packard Adapter (BNC to banana plug connector)

AC-60A or 11004A Hewlett-Packard Line Matching Transformer (used with VTVM and electronic frequency counter)

5232A or 5532A Hewlett-Packard Electronic Frequency Counter (Two methods for the adjustment and checking of the frequency of the 61A oscillator are given in Section 362-901-501. The preferred procedure requires the frequency counter. If a counter is not available, the comparison method utilizing the VTVM may be used provided one end of one of the N3 systems is connected to an office having a 4-kc primary frequency source known to be within the prescribed tolerances.)

P2DR Cord (used with switching set) (See Note)

W1BC Cord (used as shorting strap)

W2DW Cord (used with VTVM)

W2FP Cord (used with VTVM)

600-ohm 145A Resistor with KS-19531, List 2 Pin Plugs (used for switching and alarm maintenance)

0-1000 ohm variable resistance equipped with test leads and connector tips (Fig. 1) (used for alarm sensing test).

Note: The P2DR cord is required only if Z option pin jacks are furnished on switching and alarm panel. The cord is not required if a Y option PWR TST jack is furnished.

3. TESTING CONSIDERATIONS

A. Test Requirements

3.01 Tests should be performed as specified in the appropriate sections and at the intervals recommended in Section 362-901-300. Unauthorized procedures may cause irregularities which affect the performance of the N3 terminals.

3.02 Requirements are usually given as actual scale readings on a specified meter. Meters other than those recommended should not be used unless it is certain that equivalent results can be obtained. Any corrections due to using a meter calibrated for one impedance in a circuit having a different impedance have been included in the requirements.

3.03 In some tests, requirements may be expressed in absolute power (dBm). A reading expressed in dBm means that the power of the signal at the point concerned is so many decibels greater or less than a reference power of 1 milliwatt (0 dBm). For example, a reading expressed as —20 dBm is a power 20 dB less than 1 milliwatt. Similarly, a reading 20 db greater than 1 milliwatt is expressed as +20 dbm.

3.04 If a requirement is given as a meter reading in dB (decibels) and not in dBm (decibels with respect to 1 milliwatt), it is an indication that the requirement is the voltage as read on the dB scale of the meter and does not specify an actual amount of power.

3.05 Requirements may also be expressed in volts read on a specified meter scale.

B. Test Procedures and Cautions

3.06 *General Maintenance Procedures:* The manual keys and lights located on the switching and alarm panel have been provided as aids for maintenance. Always use the keys in the manner recommended below and in the applicable sections of this series. Unnecessary hits and service interruptions may result from unauthorized procedures.

Caution: Check the state of the system by observing the key position and the warning lights before performing a test or removing a unit from its receptacle.

3.07 *In-Service Maintenance Procedures:* The carrier-frequency supply is equipped with two adjacent plug-in positions, one regular (REG) and one alternate (ALT), for each of the required plug-in units. If duplicate units are provided, both the regular and the alternate units are kept in an operating condition and their outputs are monitored at all times. Protective switching is provided between pairs of 4-kc generators, dual and doubler amplifiers. Either of these units may be made the working unit and its mate will become the standby unit. The selection of the working unit is determined by the position of a manual key associated with a pair of units. The REG unit will ordinarily be chosen as the working unit and the unit in the ALT receptacle will be the standby unit.

Caution: Operation of the manual key associated with the 4-kc generators, dual and doubler amplifiers, will cause a relay to transfer the working load from one unit to the other. To minimize service interruptions, the manual key should be operated only in accordance with the instructions given in the applicable sections of this series.

The manual key associated with the REG and ALT —21 volt power supplies does not provide switching between the two power supplies. The key completes switching paths when the carrier supply is equipped with only one power supply unit. Always pay close attention to the position of this key when performing in-service maintenance.

Caution: The arrow on the key designated PWR SUP should point to NORM when two power supply units are installed in the carrier supply. The arrow on the key should point to the working power supply unit (REG or ALT) when only one power supply unit is present.

3.08 ***In-Service Test Procedures:*** The output of each plug-in unit is monitored continuously by a sensing circuit. If the output is not within specified limits, the sensing circuit relay will cause an automatic transfer of the working load to the standby unit. This may cause a hit. Logic circuits inhibit automatic switching if a standby unit is not available or if its output is not within specified limits.

Caution: Tests which require changes in the input signal should be performed carefully with the manual key in the recommended position. The manual key associated with the dual and doubler amplifiers and 4-kc generators will not prevent an automatic transfer. Never remove a working unit from its receptacle.

3.09 ***Minor Alarm Procedures:*** A minor alarm indicates that the output of at least one of the units is not within specified limits. If a working unit fails, the load will be transferred automatically to the standby unit. If a standby unit fails, no transfer can occur. In either case, the sensing circuit relay on the affected unit causes the associated lamp to be energized and a minor alarm to be initiated. Thus, a minor alarm indicates that a short service interruption may have occurred and that at least one unit is operating without standby protection. The trouble should be located and corrected promptly.

Caution: When a minor alarm occurs, it is recommended that the index mark on the manual key, associated with the REG and ALT amplifiers, be turned to the working amplifier, i.e., index mark pointed toward lamp which is not lighted. This procedure prevents repeated transfers. Always reset the minor alarm circuit by depressing the button (MN ALM) so that other minor alarms can be indicated if they occur.

3.10 ***Major Alarm Procedures:*** A major alarm always indicates serious trouble and may be caused by (a) the outputs of both the REG and the ALT units of a particular pair not being within specified limits, (b) failure of either of the —21 volt power supplies, and (c) the failure of any single unit if a standby unit has not been provided. This will produce both major and minor alarms. The sensing circuit relay in each of the affected units causes the associated lamp to be lighted. Thus, a major alarm indicates that a service impairment has occurred and that at least one pair of units is not delivering an output within specified limits. The trouble should be located and corrected immediately.

Caution: When a major alarm occurs, it is recommended that the units be replaced by spares. The manual key and the associated switching circuit also provides means for connecting either amplifier into the system when both are out of limits. Temporary emergency operation (with impaired performance) may be possible if either amplifier has suffiicient output to keep the system in service.

3.11 ***Office Alarms:*** The major and minor alarm relays in the carrier-frequency supply are caused to release when a short pulse having sufficient amplitude is received by a trigger circuit. Thus, the possibility of initiating a false alarm exists when a large pulse is received from an external source such as the common control lead for the aisle alarm relay. To prevent false alarms in the carrier-frequency supply, large voltage pulses on office wiring must be suppressed.

4. PLUG-IN UNITS

A. Placement of Plug-in Units

4.01 The active components of the N3 carrier-frequency supply are assembled as plug-in units. Extreme care should be exercised when inserting a unit into a receptacle. When a unit is to be inserted, feel for the proper positioning of the connector plug with its jack assembly; then firmly push the unit in place. If more force is required than experience indicates is necessary, remove the unit and examine the connector and jack assembly for bent or broken parts.

4.02 Plug-in units are locked into place by a latch. Care should be taken to ensure that the latch locks in place when a unit is inserted into a receptacle. When a unit is to be removed, the latch should be pulled down first, thus releasing the unit before it is pulled out.

4.03 Designations on the front of the switching and alarm panel serve to indicate the positions of the various units on the shelves immediately above and below the panel. The designations appear near the keys and lights that are below the units on the upper shelf and above the units on the lower shelf.

4.04 The dual and doubler amplifiers are similar in appearance and care should be exercised to avoid inserting a dual amplifier in the doubler amplifier receptacle and vice versa. If a doubler amplifier is inadvertently placed in a dual amplifier receptacle, one of the outputs will be very low and the sensing circuit will initiate a minor alarm and light the associated lamp. If a dual amplifier is misplaced in a doubler amplifier receptacle, one of the amplifiers will receive no input and the sensing circuit will initiate a minor alarm and light the associated lamp.

B. Spare Plug-in Units

4.05 Spare plug-in units are required for proper maintenance of the N3 carrier-frequency supply. Since the dual amplifier units are all alike, it is possible to borrow the standby unit from a pair for use in maintaining a partially protected system. It is recommended that the spares for the other three plug-in units be placed in the ALT position where they will be working spares.

4.06 Table A provides a list of the plug-in units and the frequencies assigned to each dual amplifier position on the shelves. The ten working units shown in the first column are required to provide all of the frequencies needed for the terminals. Additional units, shown in the remaining columns, will provide the amount of standby protection needed for a particular installation. With minimum protection, the failure of a single unit will not disable more than half of the channels. With medium protection, the failure of a single unit will not disable more than two channels per terminal. With maximum protection, standby equipment is available for all carrier frequencies.

4.07 The regular positions should be equipped in a carrier supply with less than maximum protection. Failure of a regular power supply unit will result in failure of all regular amplifier units. The system will switch to those amplifier units in the alternate positions. The regular amplifier units will be repowered and made available for protective switching when the faulty power supply unit is physically removed and when the appropriate selection on the manual key (PWR SUP) is made.

TABLE A

PLUG-IN UNITS		WORKING UNITS	STANDBY UNITS		
UNIT	ASSIGNED FREQUENCY KC	REQUIRED UNITS	PROTECTION		
			MINIMUM*	MEDIUM†	MAXIMUM‡
—21 Volt Power Supply		1	1	1	1
4-kc Generator		1	1	1	1
Doubler Amplifier	152 and 304	1	1	1	1
Dual Amplifier	168 and 280	1		1	1
	172 and 232	1		1	1
	176 and 256	1			1
	148 and 180	1			1
	156 and 184	1			1
	160 and 188	1			1
	164 and 192	1			1

* With minimum protection, the failure of any dual amplifier will not disable more than half of the channels. The failure of a regular power supply will disable all channels until the faulty power supply unit can be physically removed.

† With medium protection, the failure of any dual amplifier will not disable more than two channels. Failure of a regular power supply will disable not more than ten channels until that power supply unit can be physically removed.

‡ Maximum protection provides for no loss of carriers with the failure of any unit.

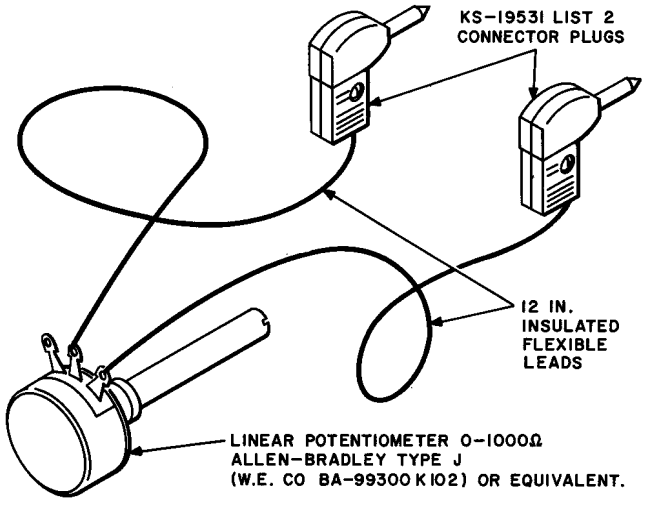

Fig. 1 — 0-1000 Ohm Variable Resistance