P1 CARRIER TELEPHONE SYSTEM

ADJUSTMENTS AND MAINTENANCE

CENTRAL OFFICE AND REMOTE TERMINAL

GENERAL INFORMATION AND TEST EQUIPMENT

1.00 INTRODUCTION

1.01 The tests, adjustments, and inspections for the central office and remote terminals are rearranged into the following sections.

363-101-100	GENERAL INFORMATION AND TEST EQUIPMENT
363-101-101	PREPARATION FOR CENTRAL OFFICE TERMINAL
363-101-502	CENTRAL OFFICE TERMINAL TESTS—TRANSMITTING
363-101-503	CENTRAL OFFICE TERMINAL TESTS—RECEIVING
363-101-504	PREPARATION FOR REMOTE TERMINAL
363-101-505	REMOTE TERMINAL TESTS —TRANSMITTING
363-101-506	REMOTE TERMINAL TESTS —RECEIVING
363-101-507	PREPARATION FOR CONNECTING TO LINE
363-101-508	ABBREVIATED ADJUSTMENT PROCEDURE
363-101-509	HOW TO LOCATE TROUBLE

1.02 This section is reissued to:

- Add information on terminals adjusted at the factory.
- Add information on the 7F test set.

2.00 GENERAL

2.01 The adjustment procedure is a series of tests to be made on the central office and remote terminal equipment before the terminal equipment is connected to the carrier line. The tests and adjustments are not required for terminals which are received with their potentiometers sealed or locked. For line-up and maintenance of the over-all system (after terminals and repeaters have been connected to the carrier line), see the several sections entitled P1 Carrier Telephone System, System Line-Up and Maintenance.

2.02 All of the tests and adjustments may be performed either with the terminals mounted at their in-service locations, or at a central location where arrangements have been made for supplying power for the operation of the equipment. This arrangement can also be used for locating trouble in equipment that has been removed from service.

2.03 Listed below are the adjustments and tests to be performed and a brief explanation of each.

Note: For convenience in designating network boards, each board is referred to by a letter (A through J) indicating its position in the 803-type connector. For example, the 800U network occupies position E in the 803A connector and will be referred to as board E.

Adjustments

A. Signaling Tone Oscillators: This adjustment sets the output of each signaling tone oscillator to its proper level. These oscillators generate tones in the audible frequency range. When transmitted as a single tone or as a combination of tones, they are selected by the remote terminal equipment to produce a ringing signal on the desired side of the subscriber's line. These adjustments are made on board G with the potentiometers designated OSC-1, OSC-2, and OSC-3. OSC-3 is not required unless 4-party full selective or 8-party semiselective ringing is to be used.

B. Transmitted Carrier Power: This adjustment sets the carrier power at the output of the terminal to the proper level. Adjustment B is made on board B by adjusting the potentiometer designated CARR.

C. Compressor: This adjustment sets the sideband power at the output of the terminal to its proper level. Adjustments B and C together result in a 50 per cent modulated carrier wave. Adjustment C is made on board E by adjusting the potentiometer designated COMP.

D. Signaling Tone Amplifier: This adjustment sets the signaling tone amplifier output to the proper level. The output of this amplifier is applied to the modulator. Adjustments B and D together result in a carrier wave which is modulated 25 per cent by each signaling tone. Adjustment D is made on board J with the potentiometer designated SIG and applies only to the central office terminal.

E. Regulator: This adjustment controls the output of the regulator. The adjustment is made on board D with the potentiometer designated REC. The regulator is then tested for proper regulating range.

F. Expandor: This adjustment sets the expandor output to the proper level. The adjustment is made on board F with the potentiometer designated EXP.

Tests

G. Supervisory: This test checks the central office terminal for the proper functioning of the supervisory circuit.

H. Signaling: This test checks the remote terminal for recognition of signal-tone frequencies, operation of the ringing relays, and the ringing voltage output.

2.04 The adjustments and tests that apply to the central office and remote terminals are as follows:

Terminal	Adjustments and Tests	
	Transmitting	Receiving
Central Office	A, B, C, D	E, F, G
Remote	B, C	E, F, H

2.05 Two methods for adjusting a terminal are presented. The first is a detailed step-by-step method; the second is an abbreviated adjustment procedure using Charts I and II in Section 363-101-508. No attempt should be made to use the charts until familiarity with the tests and the operation of the test set has been gained by using the detailed procedure.

2.06 When adjusting a terminal, make all tests and adjustments in the order in which they are listed.

2.07 Before replacing a network board due to failure to meet a requirement, check that the test set cord connections and switch settings are in accordance with instructions. After a network board has been replaced, repeat all adjustment and maintenance tests specified for that portion of the terminal (transmitting or receiving) being tested.

Caution: Always remove the network board in position A before removing any of the other network boards. This is necessary to prevent surge voltages that could damage circuit components.

2.08 The central office and remote terminals are shown in Fig. 1 and 2, respectively. The letters stenciled along the side of the 803A connector indicate the network board position in the connector.

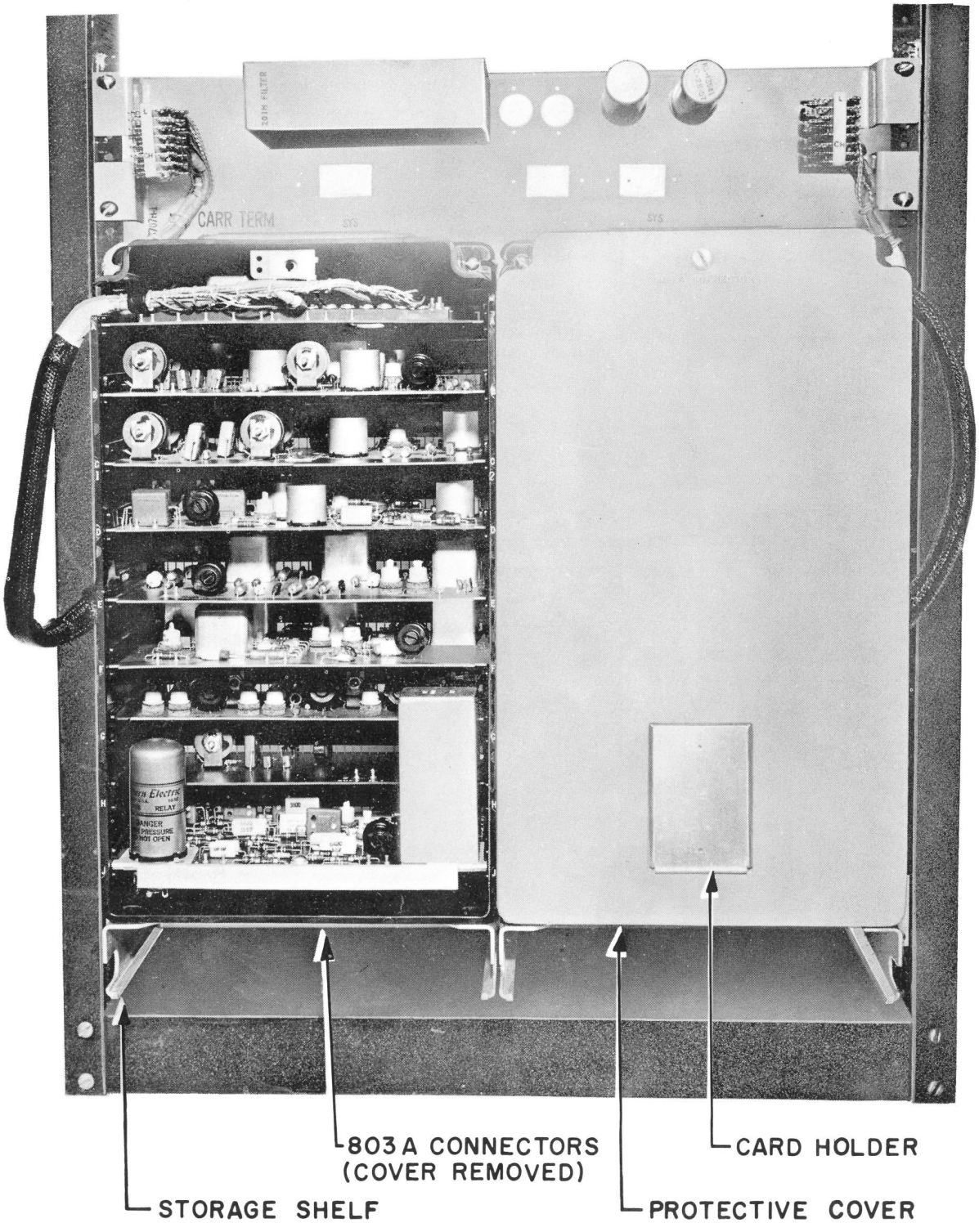

Fig. 1 — Central Office Terminal

Fig. 2 — Remote Terminal

2.09 Trouble locating procedure for the P1 carrier telephone system when trouble has been isolated to the carrier plant may be divided into four basic steps:

1. Isolation of the trouble to a particular terminal or repeater, eg, central office terminal, remote terminal, or a specific repeater.
2. Replacement of the terminal and return of the defective equipment to a convenient location for trouble analysis.
3. Isolation of trouble to an individual network board by means of the maintenance procedure.
4. Adjustment, if possible, to bring circuit back within operating requirements. If adjustment is not possible, replace the individual network board and return the defective network boards for repair.

2.10 Section 363-101-509 contains charts showing the logical order of performing the adjustments and tests and the replacement of networks to isolate trouble to a particular network.

2.11 When a defective terminal has been removed from service and taken to a convenient location for repairs, the terminal should be prepared for adjustment as outlined in Sections 363-101-101 and 363-101-504; the adjustment procedure should be performed in the same manner as for a new terminal. In all cases where the original line board (800A or B network) was not removed from service along with the terminal, a good spare will have to be inserted into the connector before proceeding with the adjustment.

2.12 Throughout the adjustment and trouble locating procedure, trouble conditions are cleared by replacement of network boards or relays. Such troubles as bent or broken grid wires, defective pads, etc, may be causing the trouble condition. Therefore, a visual inspection of the equipment may be necessary to locate the trouble.

2.13 Following is a list of the applicable schematic drawings:

SD-95231-01—Application Schematic

SD-95232-01—Carrier and Voice Frequency Circuit

SD-95233-01—Central Office Signaling and Voice Frequency Circuit

SD-95234-01—Remote Signaling and Voice Frequency Circuit

SD-95235-01—Line Connecting Circuit

SD-97001-01—P1 Carrier Test Set

SD-97010-01—Central Office Signaling and Voice Frequency Circuit

SD-97011-01—Remote Signaling and Voice Frequency Circuit

SD-97014-01—Compressor Circuit

SD-97015-01—Oscillator—Modulator—Transmitting Filter

SD-97016-01—Transmitting-Amplifier Circuit

SD-97017-01—Expandor Circuit

SD-97018-01—Receiving Amplifier—Demodulator Circuit

2.14 The frequency of routine maintenance visits to the remote locations should be based on the need for inspecting power supplies. Routine maintenance of the P1 carrier terminals is not contemplated at this time.

3.00 APPARATUS

3.01 The following apparatus is required when adjusting a central office or remote terminal:

6 — Clips, Alligator, small (Mueller Electric Company No. 30 or eqivalent) to be soldered on resistor leads

1 — Cord, 1W13B, equipped with two KS-6269 clips (or equivalent) used for grounding test set

2 — Cords, W1Y (shorting strap) or equivalent

1 — Network Board, 800A or B (see 2.11)

1 — Network Board, 803D or E, central office terminal use only (see 3.03)

1 — Plug, 258C (dummy plug), central office use only

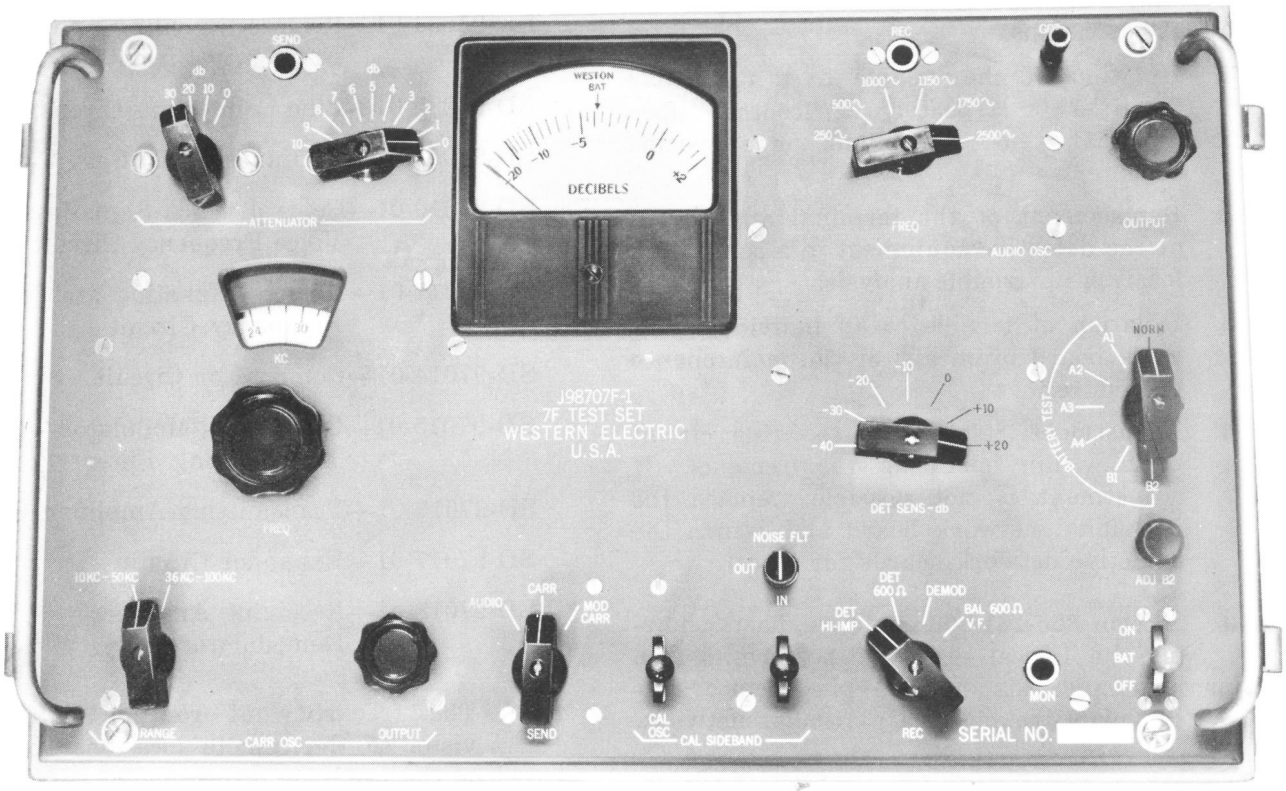

Fig. 3 — P1 Carrier Test Set

1 — Resistor, 3900 ohm, 10 watt (KS-8512, L5, or equivalent), equipped with two Mueller Electric Company No. 30 clips, for remote terminal use only

2 — Resistors, 145A, 600 ohm, equipped with two Mueller Electric Company No. 30 clips

1 — Test Set, P1 Carrier, J98707F, L1, equipped with send and receive cords (see Fig. 3)

1 — Tool, 603A (relay extractor)

1 — Volt-Ohm-Milliammeter, KS-14510, L1, (see Fig. 4)

3.02 The P1 carrier 7F test set (J98707F, List 1) is a portable battery-powered instrument. It contains audio- and carrier-frequency oscillators, a modulator, a demodulator, an attenuator, a detector circuit, and a decibel meter. It is furnished with one 3-conductor shielded send cord, one 2-conductor receive cord, and a receiver. (See Fig. 3.)

The dry batteries in the 7F test set do not operate satisfactorily at temperatures below freezing. If the test set is to be used for extended periods at below freezing temperatures, operate the test set in a heated vehicle by using longer test leads. The test leads shall be made locally.

3.03 The signaling tone oscillators are installed in only one central office terminal of a system. The other central office terminals on the same system receive these tones over local cable leads from this one terminal. However, when a central office terminal is to be adjusted at a bench location, it must contain the signaling tone oscillators (803D or E network) so that the signaling tone amplifier may be adjusted. If the terminal being adjusted is to have the tones supplied by another terminal when it is returned to service, remove the 803D or E network board after adjustment has been completed. (This procedure is not necessary when the adjustment is to be performed with the terminal installed.)

3.04 The necessary apparatus for testing the remote terminal power supply is listed in the section covering J86463-type power plants.

3.05 To provide the proper operating voltages to the terminal equipment when making the adjustments or maintenance tests at a bench location, use a spare J86463 power supply or connect the following apparatus to form the network shown in Fig. 5.

1 — Capacitor, KS-13541, 50 uf
1 — Resistor, 144E, 274 ohm
1 — Resistor, 144E, 750 ohm

Note: When 24-volt central office battery is not available, two 12-volt automobile-type batteries connected in series may be used. Do not attempt to use dry cell batteries as the required current drain of the remote terminal during ringing tests is too great.

Fig. 4 — KS-14510 Volt-Ohm-Milliammeter

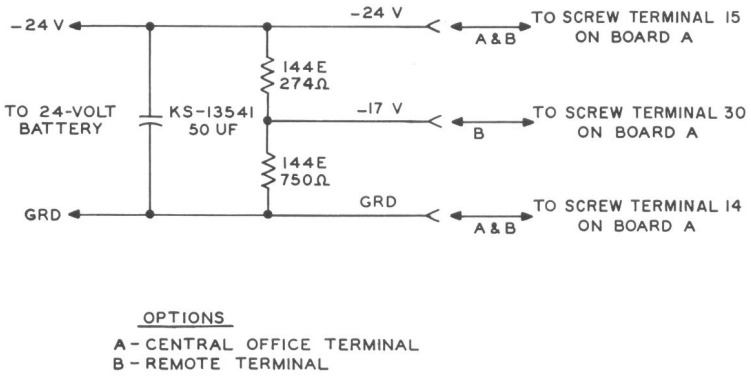

Fig. 5 — Battery Connections for Bench Adjustments