

P1 CARRIER TELEPHONE SYSTEM
SYSTEM LINE-UP AND MAINTENANCE
REGULATED REPEATER SYSTEMS LINE-UP

1.00 INTRODUCTION

1.01 A P1 carrier system may require repeaters that are nonregulated, regulated in one direction of transmission only, or regulated in both directions. If a repeater is nonregulated in one direction, that direction is treated as a non-regulated repeater and is covered in Section 363-103-503. The regulated direction is covered in this section.

1.02 After completing the preparation for system line-up, go to the repeater nearest the central office.

**2.00 CENTRAL OFFICE TO REMOTE
TERMINAL DIRECTION**

Install Repeater

2.01 Install the repeater nearest the central office.

2.02 Connect power supply wiring to repeater and adjust power supply.

2.03 Check board E for network code and read voltage across the following screw terminals on that board: 800AU network, screw terminals 11 and 12 (negative lead to 12).

Note: Make this measurement with board E inserted. If power over the cable is used, the 800BB board (board A) must also be inserted.

Requirement: 21.5 to 23.5 volts dc
If the requirement cannot be met, refer to

Section 167-275-301 or 167-275-302, Station Systems Power Plant, J86463A or B, respectively. If power over the cable is used and requirement cannot be met, replace the 800BB board, check wiring on board E, check the carrier to the central office, and check central office power over-the-cable circuit until trouble is found.

Total Carrier Power Output and DC Regulator Volts

2.04 Connect the carrier line toward the central office to binding posts 9 and 10 on the 386A apparatus case terminal block (7 and 8 REV).

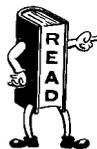
2.05 Check the test set batteries.

2.06 Turn REC switch to DET 600 Ω position.

2.07 Connect the receive cord from the REC jack on test set to HGT LINE test points, binding posts 13 (GRD) and 14 (HGT LINE) on the 386A terminal block; black to 13, red to 14 (13 and 12 REV).

2.08 Turn DET SENS-db switch to +10 position.

2.09 Adjust the ADJ OUT potentiometer on board C until DECIBEL meter reads the value specified by the engineer on P1 Carrier Record for the number of channels in use.



Caution: If the output specified is less than +10 dbm and cannot be obtained by ADJ OUT potentiometer adjustment, remove board C (board H REV). Connect the two screw terminals on board C with a bare wire strap. Reinsert board C and repeat the test. If the requirement still cannot be met, refer to Section 363-103-505.

2.10 On the KS-14510 meter, turn the selector to DC VOLTS, 12 position.



Caution: All voltage readings at the REG test point must be made with the selector in the DC VOLTS, 12 position.

2.11 Connect the KS-14510 meter across the high group REG test points, binding posts 15 (—) and 13 (+) of the 386A apparatus case terminal block [low group REG, 16 (—) and 13 (+) REV].

2.12 Compare the voltage reading of the KS-14510 meter with the range of voltages specified by the engineer for the present temperature. If the measured voltage does not fall within these limits, change the input pad on board B (board J REV) until the requirements are met (an increase in pad value decreases the voltage). If the pad value has to be changed by more than 2 db, make a note of the change and notify the engineer at the end of system line-up.

2.13 After pad changes have been made, record the output power and the pad value on the Repeater Information Card. Also record the

engineer's estimated regulator voltages for the various temperature ranges on the Repeater Information Card (see Fig. 1).

Total Carrier Power Input

2.14 Move the red lead of the receive cord from binding post 14 (HGT LINE) (12 REV) to binding post 12 (LGT LINE) (14 REV).

2.15 Connect a 600-ohm resistor between binding posts 13 and 14 (13 and 12 REV).

2.16 On test set, change REC switch to DET HI-IMP position.

2.17 Change DET SENS-db switch to obtain a DECIBEL meter reading between 0 and -10.

2.18 Add the reading on DECIBEL meter to the setting of DET SENS-db switch. This is the measured repeater input power. Record this value and the present temperature on the Repeater Information Card (see Fig. 1).

2.19 Remove the receive cord, the 600-ohm resistor, and the KS-14510 meter test leads from the 386A apparatus case terminal block.

2.20 Connect the carrier line toward the remote terminal to binding posts 7 and 8 on the 386A apparatus case terminal block (9 and 10 REV).

2.21 Close the 386A apparatus case cover temporarily.

2.22 Repeat 2.00 through 2.21 for all other regulated repeaters of the system.

3.00 INSTALL AND LINE UP TERMINALS

3.01 After the last repeater has been lined up, proceed to the nearest remote terminal location and install terminal in 386A apparatus case.

SYSTEM		1	REP 2
TRSG TO	HI GRP	---	---
	LOGRP	---	✓
CO	---	---	---
	REM	✓	---
IN. PAD	10	10	
OUT. PAD	0	2	
LINE LEVEL	TRSG ±10	} 40° -18 PIL	
	REC -14		-32 40°
REG VOLTS	MID	3.5	5.4
	20°F	3.9	5.6
	100°F	2.9	5.1
ED-97018-30,			
G—R1, A1, E1, F1, H2, K3			

Fig. 1 — Repeater Information Card

- 3.02 Adjust the terminal (see Sections 363-101-100 through 363-101-509).
- 3.03 Measure the transmitted and received carrier power at the remote terminal as covered in 2.00 through 3.07 of Section 363-103-502.
- 3.04 Connect the carrier line to binding posts 9 and 10 of 386A apparatus case terminal block. Do not connect the voice-frequency line at this time. Proceed to each remote terminal in turn and follow procedure of 3.01 through 3.03 at each remote terminal; leave a 600-ohm resistor connected to binding posts 7 and 8 of each remote terminal.

4.00 REMOTE TO CENTRAL OFFICE DIRECTION

- 4.01 Proceed to the repeater nearest the remote terminals.

Total Carrier Power Output

- 4.02 Remove carrier line from binding posts 9 and 10 (toward central office) of the 386A apparatus case at this repeater (7 and 8 REV). If this repeater is equipped with a pilot oscillator (board H), turn the PILOT potentiometer to its full counterclockwise position.

- 4.03 On test set, turn REC switch to DET 600Ω position.

- 4.04 Connect the receive cord from REC jack on test set to LGT LINE test points, binding posts 13 (GRD) and 12 (LGT LINE) on 386A apparatus case; black to 13, red to 12 (13 and 14 REV).

- 4.05 Add the reading on DECIBEL meter to the setting of the DET SENS-db switch and compare with power specified by engineer on P1 Carrier Record for the present temperature. This is the measured repeater output power.

Note: If power is not within 1 db of specified value, each channel must be measured separately by removing the 600-ohm resistors from binding posts 7 and 8 of the 386A terminal blocks of all but one of the remote

terminals. The reading is then taken at the repeater and the procedure repeated until each channel has been measured. The engineer should then be consulted and given the readings to determine what pad changes will be necessary. Change the remote terminal output pads as instructed by the engineer and record these values on the Terminal Information Cards.

- 4.06 Record this output power, the pad values, and the engineer's estimated output power for other temperature ranges on the Repeater Information Card (see Fig. 2).

SYSTEM <u>1</u> REP <u>3</u>			
	HI GRP	LO GRP	
TRSG TO	CO	<u>K</u>
	REM	<u>K</u>
IN. PAD	<u>.10</u>	<u>.2</u>	
OUT. PAD	<u>.0</u>	<u>.0</u>	
LINE LEVEL	TRSG ±.10	<u>40°</u>	<u>-.16 PIL</u>
	REC ±.12	<u>40°</u>	<u>-.20 40°</u>
REG VOLTS	MID	<u>4.8</u>	<u>OUT. POWER ±7.5</u>
	20°F	<u>5.6</u>	<u>±8</u>
	100°F	<u>4.2</u>	<u>±7</u>
ED-97018-30,			
G-R1, A1, F1, H2, K5.			

Fig. 2 — Repeater Information Card

Total Carrier Power Input

- 4.07 Move the red lead of the receive cord from binding post 12 (LGT LINE) (14 REV) to binding post 14 (HGT LINE) (12 REV).
- 4.08 Connect a 600-ohm resistor between binding posts 13 and 12 (13 and 14 REV).
- 4.09 On test set, change REC switch to DET HI-IMP position.

4.10 Change DET SENS-db switch to obtain a DECIBEL meter reading between 0 and -10.

4.11 Add the reading on DECIBEL meter to the setting of DET SENS-db switch. This is the measured repeater input power. Record this value and the present temperature on the Repeater Information Card (see Fig. 2).

Adjust Pilot Oscillator

4.12 Remove the carrier line toward the remote terminal from binding posts 7 and 8 (9 and 10 REV) on the 386A apparatus case terminal block and connect proper resistance termination (135Ω for cable or 600Ω for open wire) to binding posts 7 and 8 (9 and 10 REV).

4.13 Remove terminating resistor from binding posts 13 and 12 (13 and 14 REV).

4.14 On the test set, turn DET SENS-db switch to -10 position (-20 REV).

4.15 Change REC switch to DET 600Ω position.

4.16 Move the red lead of the receive cord from binding post 14 (HGT LINE) (12 REV) to binding post 12 (LGT LINE) (14 REV).

4.17 Adjust the PILOT potentiometer to obtain a DECIBEL meter reading of -6 (-2 REV) if no output pad is installed in the repeater. If an output pad is installed in the repeater, the DECIBEL meter should read -6 minus the output pad value. For example, if a 4-db output pad is installed in the repeater, the DECIBEL meter should read -10 (-20 dbm).

4.18 Remove the receive cord from the repeater.

4.19 Reconnect the carrier line toward the central office to binding posts 9 and 10 (7 and 8 REV) on the 386A apparatus case terminal block.

4.20 Leave the resistance termination on binding posts 7 and 8 (9 and 10 REV) of the 386A apparatus case terminal block.

4.21 Make sure that necessary information has been written on Repeater Information Card. Replace the cover of the 803B connector and place desiccant in the 386A apparatus case. Close and secure the 386A apparatus case cover and terminal block cover.

4.22 Proceed to the next repeater toward the central office.

Other Repeaters

Pilot Power Output

4.23 At this repeater, remove the carrier line toward central office from binding posts 9 and 10 (7 and 8 REV) on the 386A apparatus case terminal block. If this repeater is furnished power over the cable, do not remove the carrier line.

4.24 On test set, turn REC switch to DET 600Ω position (power over cable, DET HI-IMP position).

4.25 Turn DET SENS-db switch to -10 position (-20 REV).

4.26 Connect receive cord from REC jack on test set to LGT LINE test points, binding posts 13 (GRD) and 12 (LGT LINE) of 386A apparatus case; black to 13, red to 12 (13 and 14 REV). For power over the cable, connect the receive cord from REC jack on test set to OUT test point on board J (board B REV); red to OUT, black to yellow dot.

4.27 On the KS-14510 meter, turn the selector to DC VOLTS, 12 position.



Caution: All voltage readings at the REG test point must be made with the selector in the DC VOLTS, 12 position.

- 4.28** Connect the KS-14510 meter across the low group REG test points, binding posts 16 (−) and 13 (+) of the 386A apparatus case terminal block [high group REG, 15 (−) and 13 (+) REV].
- 4.29** Adjust the ADJ OUT potentiometer on board H until DECIBEL meter reads −6 (−2 REV) [for power over the cable, −5 (−1 REV)] if an 0-db output pad is specified for board J. If other than an 0-db output pad is specified for board J, adjust the ADJ OUT potentiometer to obtain a reading of −6 (−2 REV) minus the output pad value. For example, if board J is equipped with a 4-db output pad, adjust the ADJ OUT potentiometer to obtain a reading of −10 (−6 REV).
- 4.30** Compare the voltage reading of the KS-14510 meter with the range of voltages specified by the engineer for the present temperature. If the measured voltage does not fall within these limits, change the input pad on board B (board J REV) until the requirements are met. If the pad value has to be changed by more than 2 db, make a note of the change and notify the engineer at the end of system line-up.
- 4.31** After pad changes have been made, record the pilot output power and the pad value on the Repeater Information Card. Also record the engineer's estimated regulator voltages for the various temperature ranges indicated on the Repeater Information Card.
- Pilot Power Input*
- 4.32** Move the red lead of the receive cord from binding post 12 (LGT LINE) (14 REV) to binding post 14 (HGT LINE) (12 REV).
- 4.33** Connect a 600-ohm resistor between binding posts 13 and 12 (13 and 14 REV). If this repeater is furnished power over the cable, no resistor is required.
- 4.34** On test set, change the REC switch to DET HI-IMP position.
- 4.35** Change DET SENS-db switch to obtain a DECIBEL meter reading between 0 and −10.
- 4.36** Add the reading on the DECIBEL meter to the setting of DET SENS-db switch. This is the measured pilot input power. Record this value and the present temperature on the Repeater Information Card.
- 4.37** Remove the receive cord, the terminating resistor, and the KS-14510 meter test leads from the repeater.
- 4.38** Connect the carrier line toward the central office to binding posts 9 and 10 (7 and 8 REV) on 386A apparatus case terminal block.
- 4.39** Make sure that necessary information has been written on the Repeater Information Card. Replace the cover of the 803B connector and place desiccant in the 386A apparatus case. Close and secure the 386A apparatus case cover and terminal block cover.
- 4.40** Repeat 4.22 through 4.39 for all other regulated repeaters of the system.
- 4.41** Now all repeaters have been adjusted for pilot regulation. Remove the terminating resistor from binding posts 7 and 8 (9 and 10 REV) on the 386A apparatus case terminal block of the repeater containing the pilot oscillator. Reconnect the carrier line previously disconnected in 4.12 toward the remote terminal and proceed with end-to-end measurements.
- 5.00 END-TO-END MEASUREMENTS**
- 5.01** End-to-end measurements are covered in 4.00 through 9.03 in Section 363-103-502.
- 5.02** In addition to the end-to-end measurements above, measure the received pilot input power at the central office.
- 5.03** Remove the line boards (board A) from all central office terminals.
- 5.04** Connect a 600-ohm resistor across the input terminals of the VTVM.

- 5.05 Connect a test cord from the VTVM input terminals to the CARR test point of any central office terminal of this system.
- 5.06 Turn the selector switch on the VTVM to obtain a reading of 0 to -10.
- 5.07 Add the reading on the VTVM to the setting of the selector switch. This is the measured pilot input power. Record this value for use in 5.12 and 5.13.
- 5.08 Remove the test cord from CARR test point.
- 5.09 Reinsert the line boards (board A) in all central office terminals.
- 5.10 Connect the test cord from VTVM to REC test point of channel 3 (channel 2 of the staggered systems).
- 5.11 Turn the selector switch on the VTVM to obtain a reading between 0 and -10.
- 5.12 Add the reading on the VTVM to the setting of the selector switch. This value should be from 5 to 15 db less than the value measured in 5.07. This test checks that the reading obtained in 5.07 was pilot power not noise.

5.13 Record the value read in 5.07 and the present temperature under PIL opposite the temperature range on the Terminal Information Card of channel 3 (channel 2 staggered) of this system. Estimate the received pilot power for other temperature ranges in the same way as for received carrier power in Section 363-103-502. Record these values on the Terminal Information Card of channel 3 (channel 2 staggered) of this system (see Fig. 3).

SYS. 1.....		CH. 3N.....	
IN. PAD.....		10.....	
OUT. PAD.....		0.....	
TRSG. 84...kc		REC. 36...kc	
LINE CONN 800.8.....			
SIGNAL TONE 803...NONE.			
REC PWR: CARR		PIL	
0-40	-16.....	-35.....	
40-80	-18.....	-37.....	
80-120	-20.....	-39.....	
CARR PWR-LINE			
TERMINATED.....			
ED-97017-30,			
G-T1, F3, N2, W2.			

Fig. 3 - Terminal Information Card