

**DATA SYSTEMS**  
**CENTRAL OFFICE**  
**406A TONE GENERATOR**  
**TEST PROCEDURES**

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**1. GENERAL**

**1.01** This section provides the test procedures to be made at the time of installation and during maintenance periods to determine the performance of the 406A tone generator.

**1.02** The 406A tone generator provides a continuous  $2713 \pm 0.5$  Hz tone at each of six output levels. The output levels of the tone generator are 0, -5, -11, -17, -23, and -29 dBm (assuming a 600-ohm source resistance and a 600-ohm load resistance). The outputs are used for providing tone-activated loop-back on 4-wire private line (PL) voiceband data channels.

**1.03** The test procedures given in this section are to be performed prior to service turnup to the local test or PL testboard.

**2. TEST EQUIPMENT**

**2.01** The test equipment recommended for use in testing the 406A tone generator is as follows:

- One portable volt-ohm-milliammeter (VOM), KS-14510-L1 or equivalent
- One voiceband transmission test set (TTS), TTS-4 BNH, WEC<sub>o</sub> 21A (or equivalent) set with 600-ohm terminating measurement capability
- One 2W6A patch cord (310 plug on one end and clip leads on the other end)
- One 3P15A cord assembly (3-conductor P3K cord equipped with 310 plugs).

**2.02** All measurements with the TTS are to be made using the 600-ohm terminating mode.

**3. INSTALLATION TESTS**

**3.01** The checkout and test of the operating performance of the installed 406A tone generator can be made by performing the following tests:

- A. Power Supply Tests
- B. Tone Output Tests

If the requirements of these tests cannot be met, refer to Part 4 (TROUBLE ISOLATION TESTS) for additional information.

## SECTION 314-821-500

### A. Power Supply Tests

**3.02** This test verifies that the proper power supply option and power supply connections

have been made at the tone generator. The input voltage is then measured to ensure the dc voltage is within a specified range. The procedures are as follows:

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STEP	PROCEDURE
1	Remove the 50B mounting plate cover and verify that strappings at E25, E26, and E27 have been made properly. For -48 volt operation, E26 is strapped to E27. For -24 volt operation, E26 is strapped to E25.
2	At the TS1 terminals, ensure that only <b>one</b> voltage supply is connected as follows:  (a) If the -48 volt supply is used, terminals 31 and 11 have connections. Terminal 21 is not connected.  (b) If the -24 volt supply is used, terminals 21 and 11 have connections. Terminal 31 is not connected.
3	Apply power to the 406A tone generator by equipping the fuse and alarm panel with a 180-mA fuse.
4	Obtain the KS-14510-L1 VOM and measure the power supply voltage at the TS1 terminals.  <b>Requirement:</b> (a) For the -48 volt supply, the voltage shall be -45 to -52 volts dc. (b) For the -24 volt supply, the voltage shall be -20 to -28 volts dc.
5	If the above requirement is <b>not</b> met, proceed to 4.04.
6	Install the 50B mounting plate cover on the tone generator.

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### B. Tone Output Tests

**3.03** This test measures the output levels of the tone generator and ensures they are within a specified range. The procedures are as follows:

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STEP	PROCEDURE
1	Obtain and place the TTS near the tone generator and apply power to the TTS.
2	Allow the TTS to warm up and stabilize; then calibrate, using instructions printed on the instrument case.
3	Using the 3P15A cord, connect the TTS to the CAL jack (J1) on the tone generator.

## STEP

## PROCEDURE

- 4 Using the 600-ohm terminating mode, read the output level in dBm and record.
- Requirement:**  $0 \pm 0.2$  dBm
- 5 If the level requirement in Step 4 is *not* met, remove the 50B mounting plate cover and adjust the CAL potentiometer R5 for the required level.
- Note:** If the 406A tone generator is located a long distance from the 2713-Hz tone jacks, it may be desirable to set the level at the CAL jack slightly higher than 0 dBm to offset the loss in the cable. The cable loss will be known after measuring the level at each of the 2713-Hz tone jacks in Step 7.
- 6 If the required level cannot be brought into adjustment by the CAL potentiometer R5, proceed to Part 4 of this section.
- 7 If the level requirement of Step 4 is met, connect the TTS to each 2713-Hz tone jack that is connected to the 406A tone generator and measure the output power. (Do not change any setting of screw switches.)

**Requirement:** Output power should be as specified in Table A.

TABLE A  
OUTPUT POWER OF 406A TONE GENERATOR MEASURED AT JACKS  
WITH TTS IN 600-OHM TERMINATING MODE

OUTPUT CONNECTED TO	TS1 TERMINALS	SCREW SWITCH OPERATED	SCREW SWITCH RELEASED	OUTPUT POWER (DBM)
0 dBm	12-33, 13-33 22-33 or 23-33			$0 \pm 1.0$
0 or -5 dBm	18-38 or 28-38	S1		$0 \pm 1.0$
0 or -5 dBm	18-38 or 28-38		S1	$-5 \pm 1.0$
0 or -11 dBm	17-37 or 27-37	S2		$0 \pm 1.0$
0 or -11 dBm	17-37 or 27-37		S2	$-11 \pm 1.0$
0 or -17 dBm	16-36 or 26-36	S3		$0 \pm 1.0$
0 or -17 dBm	16-36 or 26-36		S3	$-17 \pm 1.0$
0 or -23 dBm	15-35 or 25-35	S4		$0 \pm 1.0$
0 or -23 dBm	15-35 or 25-35		S4	$-23 \pm 1.0$
0 or -29 dBm	14-34 or 24-34	S5		$0 \pm 1.0$
0 or -29 dBm	14-34 or 24-34		S5	$-29 \pm 1.0$

STEP	PROCEDURE
8	If the level measurement requirements are met at all jacks, tone service to the testboard can be turned up.
9	If the level measurement requirements at each tone jack (as given in Table A) cannot be met, proceed to Part 4 to isolate the trouble.

#### 4. TROUBLE ISOLATION TESTS

**4.01** Trouble traced to the 406A tone generator during initial installation or during maintenance may be isolated using information in this part. Depending on trouble symptoms, the cause of trouble may be due to lack of battery voltage or an excessive load on the output. Do not change the settings of the screw switches while making these tests.

**4.02** If, during maintenance, an improper output level is found at any of the 2713-Hz tone jacks, measure and adjust, if necessary, the level at the CAL jack as given in 3.03. If the output level is within limits, proceed to 4.06. If the level is *not* within limits, proceed to 4.04.

**4.03** If, during installation tests, the level at the CAL jack is found to be out of limits, proceed to 4.04.

**4.04** Check the power supply voltage as given in 3.02. If the power supply voltage is within limits, proceed to 4.05. If the power supply voltage requirement is *not* met, check the voltage at the office fuse panel and check the power supply wiring between the 406A tone generator and the fuse panel. If no fault is found, disconnect the power supply wiring from TS1 at the 406A tone generator and recheck the power supply voltage between the disconnected wires. If the power supply voltage is still out of limits, the problem is not in the 406A tone generator. If voltage is normal with the wires disconnected, the 406A tone generator is defective and should be replaced.

**4.05** If the power supply voltage is normal but the output level at the CAL jack is out of

limits, check that the proper power supply option strapping is connected as given in 3.02. If the option is correctly strapped, the tone generator is defective and should be replaced.

**4.06** If the output level at the CAL jack is normal, check the output levels at all of the 2713-Hz tone jacks as given in Step 7 of 3.03. The output level should be as that given in Table A. Do not change the setting of the screw switches (S1 through S5) on the 406A tone generator. If the output levels at all of the tone jacks are normal, tone service to the testboard can be turned up. If the levels at some of the tone jacks are *not* normal, determine which pairs of terminals on TS1 are connected to those jacks having the out-of-tolerance output levels. At TS1, measure the output levels at each of these pairs of terminals by connecting the TTS to each terminal pair using the 2W6A cord. The level requirement for each output terminal is given in Table B. If any of these levels are normal, the wiring (and not the tone generator) should be checked. If any of the output levels are *not* within limits, disconnect the wires at the TS1 terminals and remeasure the level on the TS1 terminals. If the levels, as measured at the TS1 terminals, are still out of limits, the tone generator is defective and should be replaced. If any of the levels are now normal with the distribution wiring disconnected, the wiring should be checked.

**4.07** When trouble is cleared, the levels at the CAL jack and the 2713-Hz tone jacks should be remeasured as given in 3.03.

**4.08** Trouble traced to the tone generator should be cleared by replacing the 406A. Repair of either the internal wiring or the printed wiring board is not recommended.

TABLE B  
 OUTPUT POWER OF 406A TONE GENERATOR MEASURED  
 AT TS1 WITH TTS IN 600-OHM TERMINATING MODE

OUTPUT CONNECTED TO	TS1 TERMINALS	SCREW SWITCH OPERATED	SCREW SWITCH RELEASED	MEASURED POWER (DBM)
0 dBm	12-33			0 ±0.5
0 dBm	13-33			0 ±0.5
0 dBm	22-33			0 ±0.5
0 dBm	23-33			0 ±0.5
0 or -5 dBm	18-38		S1	+1 ±0.5
0 or -5 dBm	18-38	S1		+6 ±0.5
0 or -5 dBm	28-38		S1	-5 ±0.5
0 or -5 dBm	28-38	S1		0 ±0.5
0 or -11 dBm	17-37		S2	-5 ±0.5
0 or -11 dBm	17-37	S2		+6 ±0.5
0 or -11 dBm	27-37		S2	-11 ±0.5
0 or -11 dBm	27-37	S2		0 ±0.5
0 or -17 dBm	16-36		S3	-11 ±0.5
0 or -17 dBm	16-36	S3		+6 ±0.5
0 or -17 dBm	26-36		S3	-17 ±0.5
0 or -17 dBm	26-36	S3		0 ±0.5
0 or -23 dBm	15-35		S4	-17 ±0.5
0 or -23 dBm	15-35	S4		+6 ±0.5
0 or -23 dBm	25-35		S4	-23 ±0.5
0 or -23 dBm	25-35	S4		0 ±0.5
0 or -29 dBm	14-34		S5	-23 ±0.5
0 or -29 dBm	14-34	S5		+6 ±0.5
0 or -29 dBm	24-34		S5	-29 ±0.5
0 or -29 dBm	24-34	S5		0 ±0.5