DATA SYSTEMS
CENTRAL OFFICE
406A TONE GENERATOR
INSTALLATION AND CONNECTIONS

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1. GENERAL

1.01 This section contains information and instructions for the installation and connection of the 406A tone generator. This section does not cover the installation of any other equipment that is used in conjunction with the 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 406A tone generator consists of various components assembled on a printed wiring board and mounted under a 50B mounting plate cover. The board and cover assembly are mounted on a 19-inch width 224A mounting plate. The tone generator is arranged for mounting on a 19-inch relay rack or bay in the central office. Mounting on a 23-inch relay rack or bay can be made using two P-31A189 adapters. These adapters are not supplied as part of the 406A tone generator and must be ordered separately.

1.04 The 406A tone generator is a complete, functional unit. Part 2 contains connections, and Part 3 contains the installation procedures.

2. CONNECTIONS

2.01 Selections of power and output connections should be made prior to installing the 406A tone generator. Guidelines for determining which output levels and output impedances to provide are given in Section 314-821-100. This part contains connection information for each configuration of the outputs. Table A indicates the output levels available from the 406A tone generator.

A. Power Connections

2.02 The proper option strap must be made on the printed wiring board at E25, E26, and E27 as follows:

(a) For operation from a -48 volt supply, strap E26 to E27.

(b) For operation from a -24 volt supply, strap E26 to E25.

2.03 The office battery voltage is connected to either Terminal 31 or 21 on TS1 as follows:

- When using the -48 volt supply, connect to Terminal 31.
- When using the -24 volt supply, connect to Terminal 21.

The common battery ground is connected to Terminal 11.

TABLE A

OUTPUT LEVELS AVAILABLE FROM 406A TONE GENERATOR

OUTPUT (DBM)	AT TS1 TERMINALS	OUTPUT IMPEDANCE (OHMS)	SCREW SWITCH OPERATION	OUTPUT POWER INTO 600-OHM LOAD (DBM)
0	12-33, 13-33, 22-33, 23-33	600	NONE	0
0 or −5	18-38	2	S1 RELEASED	−5*
0 or −5	28-38	600	S1 RELEASED	−5
0 or −5	18-38	2	S1 OPERATED	0*
0 or −5	28-38	600	S1 OPERATED	0
0 or −11	17-37	2	S2 RELEASED	−11*
0 or −11	27-37	600	S2 RELEASED	−11
0 or −11	17-37	2	S2 OPERATED	0*
0 or −11	27-37	600	S2 OPERATED	0
0 or −17	16-36	2	S3 RELEASED	−17*
0 or −17	26-36	600	S3 RELEASED	−17
0 or −17	16-36	2	S3 OPERATED	0*
0 or −17	26-36	600	S3 OPERATED	0
0 or −23	15-35	2	S4 RELEASED	−23*
0 or −23	25-35	600	S4 RELEASED	−23
0 or −23	15-35	2	S4 OPERATED	0*
0 or −23	25-35	600	S4 OPERATED	0
0 or −29	14-34	2	S5 RELEASED	−29*
0 or −29	24-34	600	S5 RELEASED	−29
0 or −29	14-34	2	S5 OPERATED	0*
0 or −29	24-34	600	S5 OPERATED	0

* These load powers assume an external 600Ω source resistor connected in series with the generator output.

Caution: Connection of both −24 volt and −48 volt supplies to the 406A tone generator may cause internal damage to the unit.

2.04 Power should not be applied to the 406A tone generator until installation is completed and preparations for installation testing have been made.

2.05 The 406A tone generator does not contain a fuse. The tone generator should be fused by equipping a 180-mA fuse at the office fuse panel.

B. Output Connections

2.06 A typical installation of the 406A tone generator will require several 600-ohm outputs at 0 dBm. Figure 1 shows connections for up to six 2713-Hz tone jacks using only 600-ohm isolated outputs with no bussing provided. The operation of screw switches that are needed to obtain proper output levels is also indicated.

2.07 If more than six 2713-Hz tone jacks using isolated outputs without bussing are required, additional 406A tone generators must be provided. If isolation of outputs is not required, the need for additional 406A tone generators can be eliminated

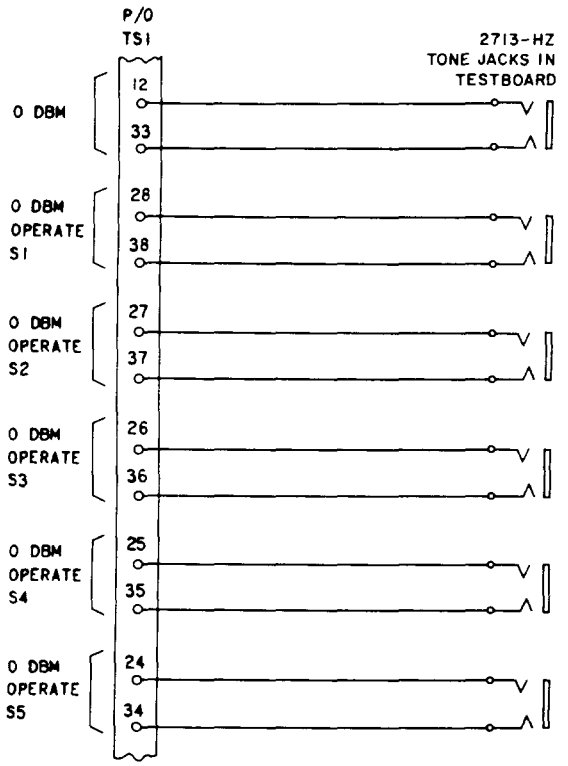

Fig. 1—Connections for Providing One to Six Isolated 600-Ohm Outputs at 0 dBm

by bussing the outputs and by using all of the nonisolated outputs at TS1 terminals 12, 13, 22, and 23. Terminal 23 should be selected last from the nonisolated outputs since the CAL jack is connected to this output. Whenever a plug connection is made to the CAL jack (in order to measure and/or adjust output levels), the output from TS1-23 is removed. Figure 2 shows connections for up to nine 2713-Hz tone jacks using 600-ohm outputs at 0 dBm without bussing. Four of the outputs are not isolated and have a common terminal (TS1 terminal 33). If more than nine tone jacks are required, they can be provided by bussing. Any number of additional jacks may be connected in parallel with the nine jacks shown in Figure 2. The additional jacks should be distributed equally among the nine outputs.

2.08 Bussing of 600-ohm outputs will allow the connection of an unlimited number of jacks to one 406A tone generator. The disadvantage of bussing the outputs is that the simultaneous connection of loads at two or more jacks that are

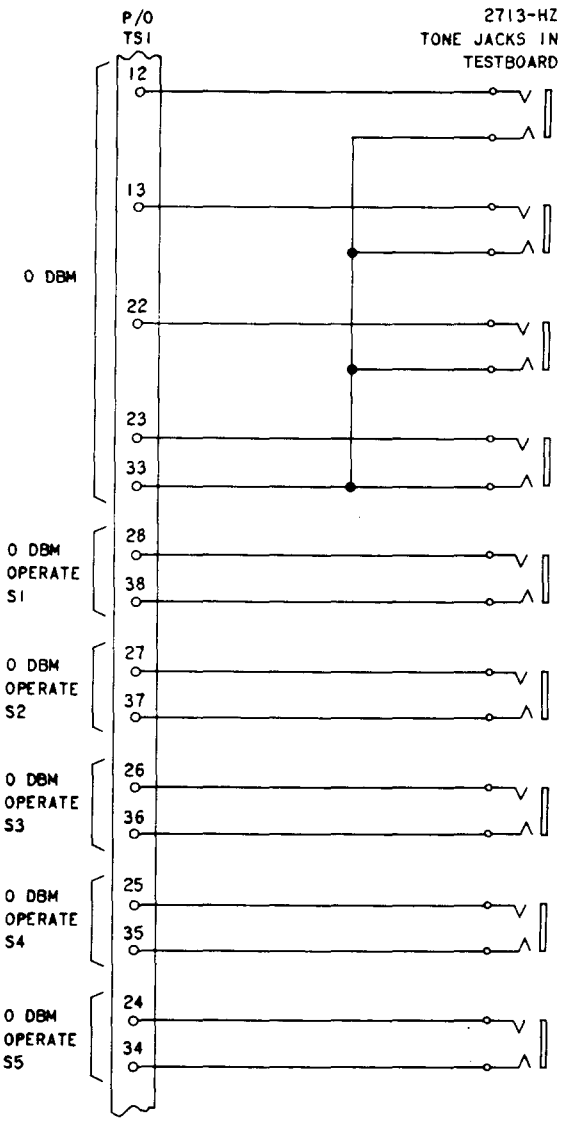

Fig. 2—Connections for Providing Nine 600-Ohm Outputs at 0 dBm

connected to the same terminals on TS1 could cause the output level to decrease enough to prevent satisfactory detector operation. Bussing at a low impedance will eliminate this problem. Figure 3 shows connections for low-impedance bussing of outputs. Each jack must have an externally mounted 600-ohm resistor wired in series with the jack to provide a 600-ohm source impedance. The bussing

is done on the generator side of the 600-ohm resistors as shown in Figure 3. The 600-ohm resistors may be mounted on the jacks if desired. The resistors should be 1 percent, 1/8 watt, or greater. The 600-ohm outputs shown in Figures 1 and 2 may be used in addition to those shown in Figure 3.

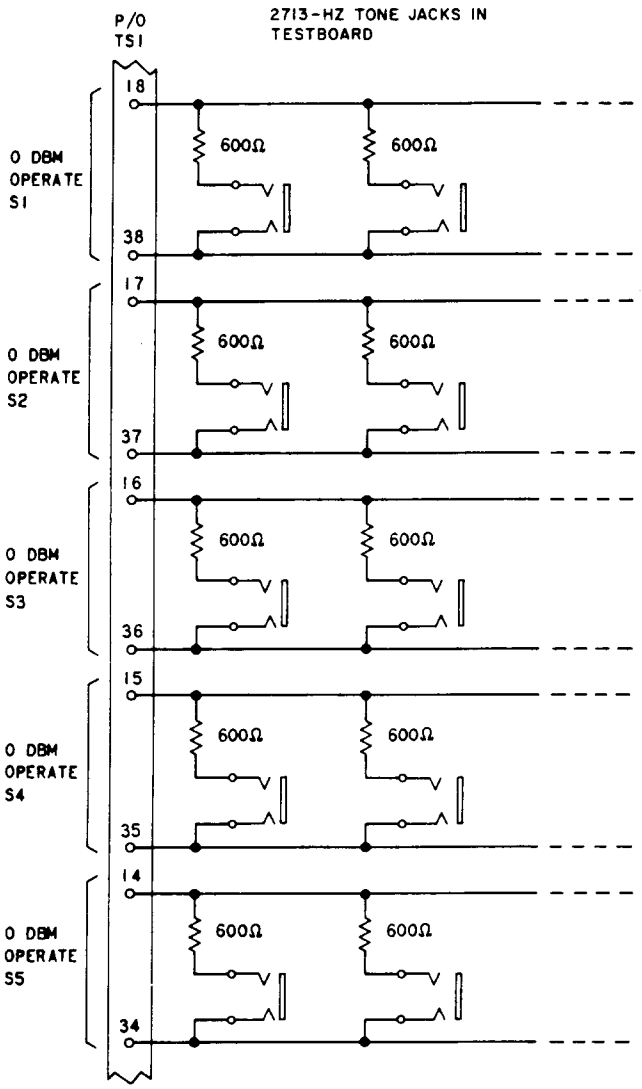

Fig. 3—Connections for Low-Impedance Bussing at 0 dBm

2.09 If attenuators are not available, one or more of the −5, −11, −17, −23, and −29 dBm outputs will be needed. These outputs can be provided at a low impedance or at 600 ohms. Figure 4 shows connections for 600-ohm bussing of the outputs. Figure 5 shows connections for low-impedance bussing of the outputs. Wiring connections to the 2713-Hz tone jacks can be made for both low-impedance bussing and 600-ohm bussing.

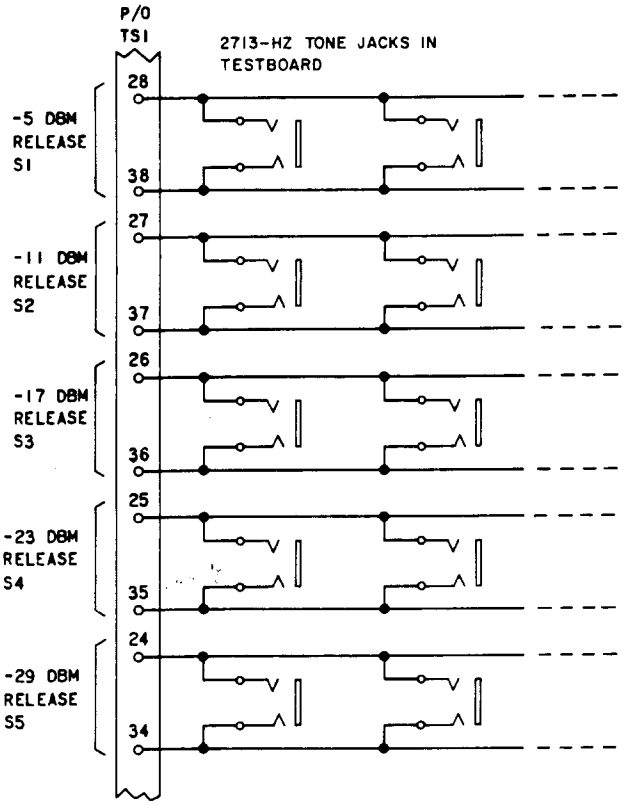

Fig. 4—Connections for Providing -5, -11, -17, -23, and -29 dBm Outputs at 600 Ohms

2.10 Guidelines are given in Section 314-821-100 for the maximum cable length between the 406A tone generator and any of the 2713-Hz tone jack appearances. These guidelines assume that the jacks will be wired to the tone generator using BU or BY twisted pair switchboard cable (22, 24, or 26 gauge). The guidelines are not valid if other types of cable are used.

3. INSTALLATION

3.01 No special tools or test equipment is required to install the 406A tone generator.

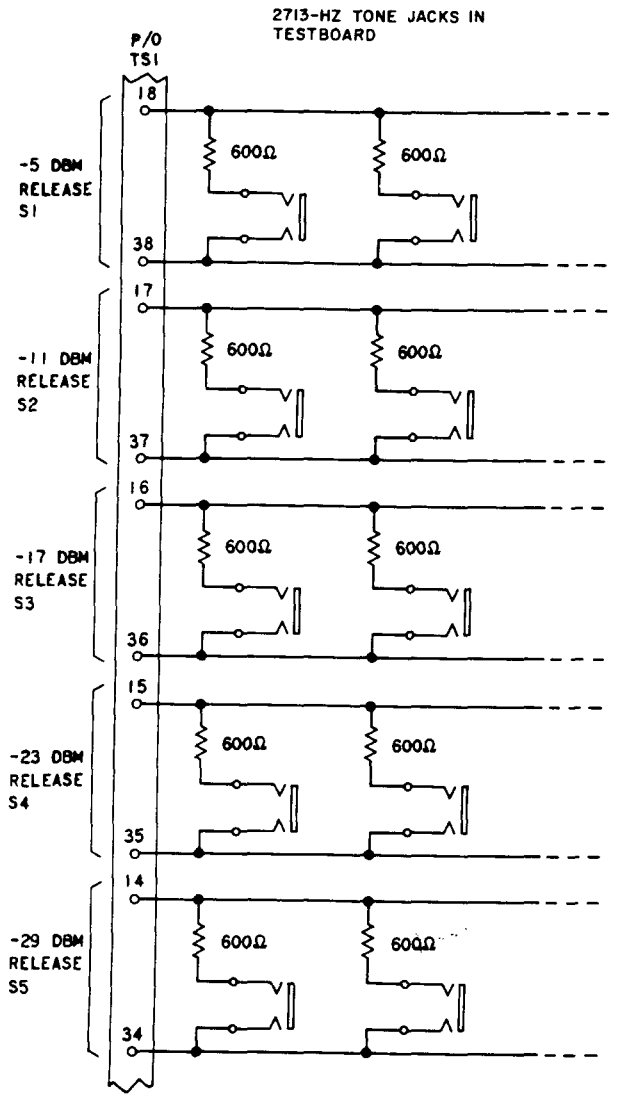

Fig. 5—Connections for Providing -5, -11, -17, -23, and -29 dBm Outputs at Low Impedance

3.02 The installation procedure for a rack- or bay-mounted installation is as follows:

(1) Mount the 406A tone generator assembly to the rack or designated area on the equipment bay.

Note: In the case of 23-inch width bays, adapter brackets will be required on each end to facilitate mounting.

(2) Remove the 50B mounting plate cover to provide access to the screw switches and power option terminals.

(3) Open or close the appropriate screw switches (S1 to S5) as indicated on the installation order. The 406A tone generator is factory shipped with all screw switches closed to provide 0 dBm at all outputs.

(4) Select the proper power supply option to be used and strap as follows:

- For −48 volt dc operation, strap terminal E26 to E27.
- For −24 volt dc operation, strap terminal E26 to E25.

Note: The 406A tone generator is strapped for −48 volt dc operation at the factory.

(5) Install the 50B mounting plate cover over the printed wiring board assembly.

(6) Using frame wire, connect the office battery supply and office common ground to terminals 31 (or 21) and 11, respectively, on TS1.

(7) Connect the output terminals to the test jacks as specified on the installation order. Install 600-ohm resistors (±1 percent, 1/8 watt or greater) where required.

(8) Apply power to the tone generator by installing a 180-mA fuse in the office fuse panel.

4. INSTALLATION TESTING

4.01 After completing the installation procedure for the 406A tone generator, it must be tested as outlined in Section 314-821-500. These tests are required to ensure proper operation following installation work.

4.02 Reinstall the 50B cover if it is removed to gain access to the CAL potentiometer R5.

5. REFERENCES

5.01 The schematic drawing and circuit description covering the 406A tone generator are SD- and CD-73093-01.

5.02 More descriptive information on equipment associated with the 406A tone generator is covered in the Bell System Practice entitled 44A1 Data Unit — Tone Detector — Description (590-100-131).