

106A LONG LINE ADAPTER CARD

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1. GENERAL

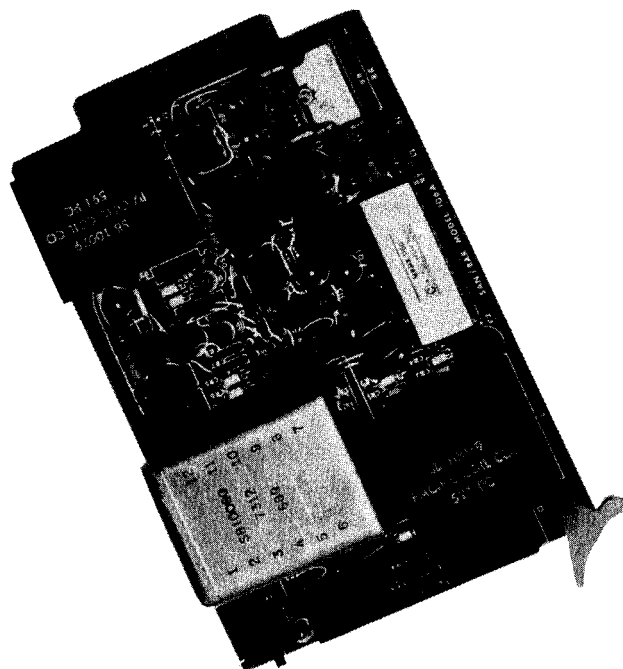
1.1 This section provides circuit description, installation and basic testing information for the San/Bar 106A Long Line Adapter Card.

1.2 The 106A Long Line Adapter (LLA) is of compact, straight forward design to provide ringing supervision, pulse repetition, and adequate transmission current for long subscriber loops of up to 5200 ohms including the telephone instrument. The design features operation with 48 volt negative battery or with both 48 volt negative and 48 volt positive batteries, totaling 96 volts of telephone company furnished voltage. Special steps have been taken to provide maximum protection against lightning strikes and other transient phenomena. Due to the low distortion contributed while repeating dial pulses, two 106A LLA cards may be used in tandem.

2. SPECIFICATIONS

2.1 List of Applicable Drawings

- (a) Equipment Assembly Drawing No. ED-0106-000A
- (b) Schematic No. SD-0106-000C



SB106A

- (c) Bill of Materials No. BM-0106-000B
- (d) Artwork No. AW-0106-000A
- 2.2 Electrical Characteristics
 - 2.2.1 Operating Voltage (each battery)
 - 2.2.2 Current Consumption (Local Battery)
 - (a) Idle - 0 ma
 - (b) Operating - 42 ma typical 120 ma Maximum (short circuit)
 - 2.2.3 Operating Temperature Range
 - 0°C to 60°C
 - 2.2.4 Battery Noise Attenuation
 - 40 db of C-message noise rejection

2.2.5 Central Office Loop Resistance

0 to 1500 ohms

2.2.6 Subscriber Loop Resistance*

| Line Current | Line Resistance (ohms) | | | |
|--------------|------------------------|------|--------|------|
| | 45V | 48V | at 90V | 96V |
| 17 ma | 1500 | 1600 | 3400 | 3740 |
| 20 | 1750 | 1900 | 3900 | 3095 |
| 23 | — | — | 4900 | 2610 |
| 30 | 2400 | 2700 | — | 1835 |

*Includes 200 ohms for telephone station

2.2.7 Lightning Protection

The 106A will absorb the energy from a 2 uFd capacitor, charged to 2000 VDC without damage to the card. (R.E.A. PE-61, 7.1)

2.2.8 Line Balance

70 db (C-message weighted) of longitudinal balance from 180 Hz to 100 Hz.

2.2.9 Bridged Ringing

The 106A will operate with bridged ringing from a local ringing generator (RRT, RRR "U" links), subject to adequate ringing voltage being available.

2.2.10 Ringing Penalty

0.75 db at any ringing frequency

2.2.11 Ring Trip

The 106A will trip c.o. ringing voltage in either the ringing or silent period of the ringing cycle over the operating range of any system which has a superimposed 48 VDC. Where D.C. is not available with the ringing supply, ring trip will occur during the silent period only.

2.2.12 False Ringing

The 106A will not respond to paralleled dialing on the central office side or to induce a.c. voltages across the line.

2.2.13 Insertion Loss

0.6 db maximum with 100 ma total loop current at 1 kHz with 600 ohms termination.

2.2.14 Frequency Response

±1.0 db from 200 Hz to 3000 Hz

2.2.15 Return Loss

- (a) Total loop current: 100 ma
- (b) Termination: 900 ohms in series with 2 uFd.
- (c) Return loss is equal to or better than the following:

| Frequency | R.L. (min) | R.L. (typical) |
|-----------|------------|----------------|
| 200 Hz | 12 db | 12 db |
| 300 | 14 | 16 |
| 500 | 18 | 22 |
| 1 K | 24 | 28 |
| 3 K | 22 | 28 |
| SRL | 14 | 18 |
| ERL | 24 | 28 |
| SRLH | 22 | 28 |

2.2.16 Cross Talk

70 db cross talk attenuation with 1.75 inch card-to-card spacing.

2.2.17 Busy Lamp

The 106A has a lamp and momentary switch to indicate whether or not the LLA is in use. If in use the lamp will illuminate when the switch button is depressed.

2.2.18 Dial Pulse Distortion

Distortion of repeated dial pulses is less than 2% for subscriber loops from 400 to 1900 ohms at 48 VDC.

2.3 Physical Characteristics

- (a) Double sided P.C: board, glass epoxy.
- (b) 0.062" thick x 6.75" x 4.3".

(2.3 Continued)

- (c) Weight is 1 lb. 13½ oz.
- (d) Edge connector of 15 pins (numbered 2 through 30) with 0.156 pin spacing.

3. INSPECTION

3.1 Inspect the unit thoroughly, as soon as possible after delivery. If any part of the unit has been damaged in transit, report the extent of damage to the transportation company immediately. If the unit is to be stored for some time before installation, make an operational check at once. The purpose of this check is to make sure that the unit is in proper working order as received from the factory. If the check indicates satisfactory performance, the unit may be stored for future installation. If the system is to be installed at once, make an operational check after the installation is completed.

4. MOUNTING

The model SB304A mounting shelf will accept twelve (12) 106A LLA cards in 5.25 inches of vertical height on the 23 inch equipment rack. The assembly, 5.25 inches deep, with the side mounting brackets four (4) inches from the face, is finished in San/Bar green, and is enclosed top and bottom. The assembly features rear mounted edge-type wire-wrap connectors. A .25 inch tie-bar is mounted across the lower rear of the unit for installation cabling and wiring purposes.

5. INSTALLER CONNECTIONS

5.1 For installation purposes, the printed circuit boards must be inserted with the components to the left and the white movable ejector uppermost. To remove a unit, first lift the white ejector. This will bring the card forward out of its connector to permit simple removal from the card guides.

5.2 There are no adjustments to be made, only unit insertion after the wiring of the mounting assemblies with main battery, ground, ringing and generator ground commons, also the central office and subscriber's line wired and cabled. Check positions of all "U" links.

5.3 For by-pass ringing, there is no requirement for a ringing generator supply common. The "U" links should be in the BYT and BYR positions, being by-pass ringing on the tip side and by-pass ringing on the ring side. In the RRT and RRR positions, it is necessary to furnish a ringing generator supply for repeated ringing.

5.4 The units are shipped with the "U" links in the by-pass position. For 96 volt operation, a supply of positive 48 volt battery or inverter power must be wired as a common between units (printed circuit board contact #18).

Units are shipped with the two 48/96 volt "U" links in the 48 volt position. Long nosed pliers are advised for "U" link changes.

5.5 J-K "U" link is the ring trip relay "shorted" position and must be used when the ringing supply has no superimposed DC voltage. The J-K "U" link applies the maximum ringing voltage for very long subscriber lines.

Units are shipped with the J-K "U" links normal (not shorted).

5.6 The remaining "U" link sockets should conform to the central office line loop length. If less than 600 ohms, the SL (short loop) position should have the "U" link inserted. If the central office loop is more than 600 ohms, then the LL (long line) should have the "U" link inserted.

The units are shipped with the "U" links in the SL position.

5.7 For tandem operation into more than 1500 ohms of central office or mid-section line, do not use socket C-D.

5.8 For extreme range operation of subscriber line (including telephone) insert A-B "U" link.

6. CIRCUIT DESCRIPTION

6.1 Please refer to schematic SD-0106-000C for the following circuit description.

6.2 Ring Detection

Ringings from the C.O. appears across pins 8 and 10, passes through the primary windings of T1, through C1, and is full-wave rectified by diodes CR1-CR4. R2 and C2 form a low pass filter to select the DC component of the rectified ringing voltage. Relay coil RR is actuated by the derived DC voltage and releases as soon as ringing voltage ceases.

6.3 Ring Trip

(a) The closing of the OP relay contacts completes a DC path in the C.O. loop through the primary windings of T1, the OP contacts, L1 and R1. Choke L1 serves to provide a high impedance across C4 to improve return loss at low frequencies. DC current is now able to flow in the C.O. loop which causes ringing voltage from the C.O. to cease.

(b) During the ringing period (vs. the silent period between rings) relay RR is actuated. Assuming J6 is in BYT mode and J8 is in BYR mode, the LLA is by-passed, except for the RT Relay coil. RT will respond to DC loop current, but C6 and C7 prevent AC from actuating the relay. The contacts of RT then turn on Q3, which actuates OP, and ringing is tripped in the C.O.

(c) During the silent period between rings, relay RR is in the state shown in the schematic. The subscriber loop is formed by pins 28 and 30, through the RR contacts, through the secondary windings of T1, through R3 and R5, as well as through R4, Q1, R6, and Q2, through DS1 and DS2, L2, and finally to the battery

across pins 20, 22 and 2, 4. CR12 prevents damage to circuitry in the event the battery should be connected with the wrong polarity. Should the subscriber answer during the silent period, DC loop current flows, actuating Q1 and Q2, which actuate Q4 and Q3. Q3 operates the OP relay which effects ring trip in the C.O.

6.4 Dial Pulse Detection and Repeating Dialing at the subscriber station causes momentary opening and closing of the loop between pins 28 and 30. A loss of subscriber loop current accompanies the opening of the loop which allows Q1 and Q2 to turn off. Q1, Q2, Q3, Q4 and the OP relay are designed to respond quickly to the opening and closing of the loop. The OP relay contacts accurately reproduce opening and closing of the C.O. loop, thus repeating the incoming dial pulses toward the C.O.

6.5 Battery Filter

Choke L2 and capacitor C9 serve as a two-way noise filter to isolate noise to and from the battery.

6.6 Current Limiting

DS1-DS4 are 14V lamps used to limit current in the subscriber loop under short loop or temporary short circuit conditions. R1 provides current limiting for the C.O. loop.

6.7 Transient Protection

Surge suppressors SG-1 and SG-2 will protect the subscriber side of the line against lightning strikes producing a voltage greater than 350 volts peak. For lower grade strikes CR5-CR11, R4 and R6 provide protection for the solid state circuitry.

6.8 Miscellaneous Components

- (a) C1 blocks DC current from the ring detection circuitry.
- (b) C3 provides inductive transient protection for the OP contacts during dial pulse repeating.
- (c) C4 and C5 provide a low impedance path to audio frequencies while allowing battery feed to the center terminals of T1.
- (d) R3 and R5 prevent Q1 and Q2 from turning on in the presence of leakage currents that may exist in the subscriber loop during the idle state of the LLA.
- (e) C8 and C10 may be connected to prevent excessive AC noise from actuating Q1 or Q2. The use of these capacitors causes a 2 to 4 percent increase in dial pulse distortion.
- (f) C11 may be connected for extremely long C.O. loops to improve consequent dial pulse distortion.

7. TESTING

- 7.1 If trouble is encountered with the operation of the 106A LLA card, check that all installer connections and LLA strappings have been properly made. Verify that the LLA card is making good connection with the mounting assembly card connector.
- 7.2 If the LLA card remains inoperative after the steps in 7.1 have been taken, return the 106A LLA card to San/Bar Corp. for repair or replacement.

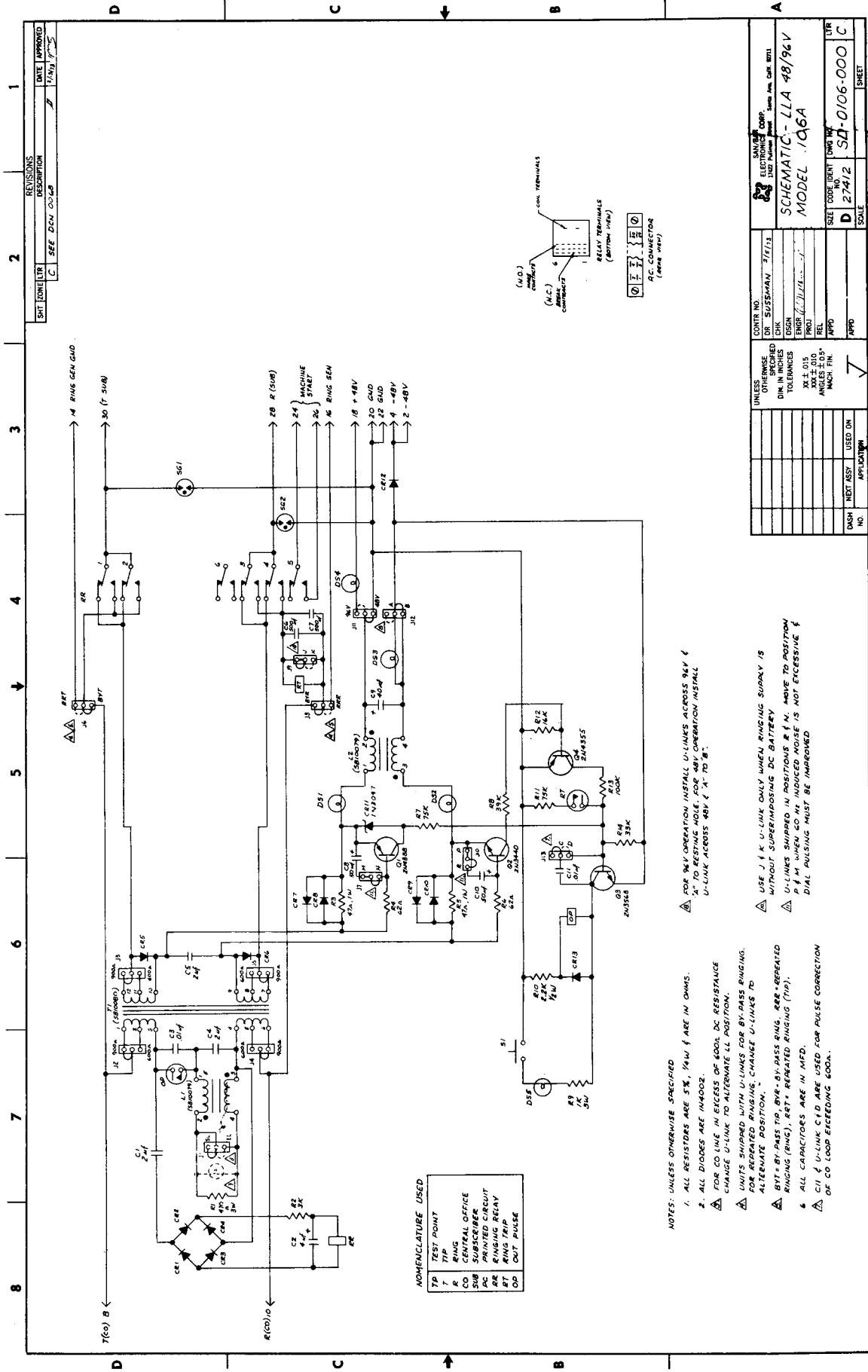


Figure 2