

**OPERATOR'S MANUAL  
MODEL LS100A and LS200A  
MINI-PBX SIMULATOR**

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All requests for repairs should be directed to the factory .

This instrument is warranted against defective workmanship and materials for a period of six months. There will be no warranty when the instrument is misused, or when the factory seal on the instrument is broken.

Printed in U.S.A.

Specification and price change privileges are reserved.

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## SECTION 1

### INTRODUCTION

The Micro Seven Models LS100A and LS200A Mini-PBX Simulators are redesigned new models providing multiple independent simulated telephone lines with new features. New features include programmable telephone numbers, call progress tones, pseudo-line impairment mode with random noise, simulated PBX mode, stutter dial tone, programmable disconnect signal, programmable network response delay, and distinctive ringing features. They are still specially designed to let engineers and technicians test modems and fax machines without obtaining extra in-house telephone lines. The LS100 is a small portable unit, and provide four telephone lines. The LS200 is a rack-mount unit, and provides eight lines.

Each line may be assigned a single-digit telephone number, corresponding to its line number, or programmable telephone number. Both rotary pulse and DTMF (tone) dialing are accepted for dialing. Features include dial tone, ring-back tone, and busy tone at the calling station. The ring signal is generated at the called line. A line connection is established between two stations when a call is answered. Pseudo line impairment circuit is selected when dialing unique numbers by providing additional 20 dB insertion losses for both signal directions and generating random noise. A transmit-power adjust potentiometer is provided for each line to lower signal output for testing telecommunication equipment at much lower signal levels. Indicators are included for POWER ON (front panel LED), and OH/BUSY for all lines (rear panel of LS100, front panel of LS200).

The models LS100 and LS200 provides many programmable features including telephone number method, telephone numbers, random noise amplitude, call progress tones (LS100 and some LS200 models), network response delay, disconnect signals, PBX mode, and stutter dial tone.

## SECTION 2

### SPECIFICATIONS

**The LS200-8A with higher serial number of 4295000 and LS100-4A with higher serial number of 8506000 contain the following new features:**

Without this new feature, wrong number dialing with digit “0” and any number may place this instrument in different telephone lines and dialing modes such as pseudo-line impairment mode that enables 20 dB insertion loss with random noise or dual frequency call progress tones mode that restricts DTMF dialer mode. And this new change disables the programming by dialing on power-up until dialing the following sequence. This new change also provides programming of a telephone number that starts with “0” like international telephone number.

After powering up the instrument, programming by dialing “0” is disabled. But when dialing “#####” enables programming by dial until power is turned off.

The procedure to program a telephone number starting “0” is as follows:

1. Dial #####, and hang up. (to enable programming)
2. Dial “022012345678” and hang up. (to program 012345678+(line number) for secondary telephone number mode)
3. Dial “044” to select secondary telephone number mode
4. Turn off LS100 power for five seconds and turn back on to disable programming
5. To test programmed condition, dial 0123456782 at line 1 to ring line 2.

#### **Dialing:**

Telephone numbers:

1. Primary telephone number: A single-digit telephone number, which is equal to a line number

of a called line. selected by dialing 043 or line 1 or 2 as a factory default.

2. Secondary telephone number: selected by dialing 044.

DTMF dialing signal power: -13dBm to +5dBm per a frequency with no more than 4dB difference between frequencies.

DTMF dialing detection time: 45 ms

Pulse dialing: Break period: 45 to 75 ms (60 ms nominal), Make period: 30 to 60 ms (40 ms

nominal)

Note: simultaneous dialing from multiple lines is prohibited by suppressing generation of dial tones to more than one line because there is one DTMF receiver circuit in a box. Multi-line DTMF dialer option for LS200 eliminates the inconvenience of dialing restriction, and enables all lines to dial in DTMF and/or rotary-pulse method simultaneously.

**Programming secondary telephone number:** 022 (telephone number)

The factory default condition is 123456789+(line number).

**Telephone number digit:** 0 # 096 \* n n n \*, where nnn forms a 3-digit decimal number. The default value is 10 digit. The maximum number is 18.

**Simulated PBX Mode:**

By dialing "9", dial tone returns when the Simulated PBX Mode was selected. Dialing "0#097\*004\*" for Simulated PBX Mode with dual frequency call progress tone or 0#097\*012\* for Simulated PBX Mode with secondary call progress tone. Note that the regular dialing methods work as well here. For example, if the secondary dialing method with a telephone number of 3456789012 and the PBX mode are enabled, dialing of 3456789012 or 93456789012 would ring the other line. To return to non-PBX mode, dial 0#097\*000\* with dual frequency call progress tone or dial 0#097\*008\* with secondary call progress tone.

**Line Characteristics:**

Input impedance at 1 k Hz: 600 ohms +/- 5%

Signal Bandwidth: 150 HZ to 5 k HZ without high-frequency option, 150 HZ to 150 k HZ with high-frequency option

**Transmit Power Adjustment:** A potentiometer for each line, accessible through a rear panel (LS100) or front panel (LS200) hole, provides a control range of 0 to -40 dB(maximum at full clockwise).

**Pseudo-Line Impairment Mode:**

When a number of 00 and line-number is dialed, line impairment circuit with additional 20dB of insertion loss and -55dBm of random noise are added to signals between line 1 and 2. Random noise amplitude is also programmable. Frequency attenuation characteristics and envelope delay distortion of signals are not affected. Note: Generic Line Impairment Options are also available for frequency attenuation characteristics and envelope delay distortion.

**Random noise amplitude programming:** 0#091\*nnn\*

The random noise amplitude is set at -55 dBm as a factory default value, but it may be changed by the above dialing method. The factory default value is obtained with nnn=017.

The smaller number, the lower signal power. i.e. nnn=176 for -31 dBm, nnn=088 for -37 dBm, nnn=044 for -43 dBm, nnn=022 for -49 dBm, nnn=005 for -61 dBm , nnn=000 for -67 dBm of random noise.

**Non-pseudo-Line Impairment mode:**

When a number of 09 and a line number is dialed, the insertion loss between lines becomes only 1 dB, and the random noise is removed. This is the factory default condition.

**Battery-feed voltage (loop voltage) and loop current:** -20 volts and 25 mA

**Ring Signal:**

60 +/- 2% Hz sine wave. Normally 2 sec on 4 sec off with exception of distinctive ringing features programmed. 20Hz ring signal option (adjustable ring signal option) is available

to adjust frequency and amplitude of ring signal. 30Hz ring signal (square wave) is available in LS100-4B.

### **Distinctive ring signal features:**

The following distinctive ringing pattern is enabled instead of standard 2 sec on/ 4 sec off ringing pattern:

- (a). Dialing 0 \* 1 + (line number): 2 sec on/ 4 sec off (default condition)
- (b). Dialing 0 \* 2 + (line number): 0.8 sec on, 0.4 sec off, 0.8 sec on, 4 sec off
- (c). Dialing 0 \* 3 + (line number): 0.4 sec on, 0.2 sec off, 0.4 sec on, 0.2 sec off, 0.8 sec on,  
4 sec off
- (d). Dialing 0 \* 4 + (line number): 0.3 sec on, 0.2 sec off, 1 sec on, 0.2 sec off, 0.3 sec on,  
4 sec off

**Off-hook impedance requirement:** 400 ohms maximum DC, 600 ohms nominal AC

### **Call Progress Tones:**

1. Dual-frequency call progress tones  
Signal power: nominal -20 dBm.  
Dial Tone: 350 Hz + 440 Hz, continuous unless programmed for stutter dial tone  
Ring-back Tone: 440 Hz + 480 Hz, 2 sec ON/4 sec OFF.  
Busy Tone: 480 Hz + 620 Hz, 0.5 sec ON/0.5 sec OFF.  
Accuracy in frequency component: +/- 1%.

**Caution:** *When dual-frequency call progress tones are selected, new dial tone will not be generated until a called line is answered or a calling line aborts a call.*

**Caution:** *The dual-frequency call progress tones are not available as a standard feature in LS200 with Multi-Line DTMF Dialer Option, but they are available as an All-line Dual Frequency Call Progress Tone Option.*

2. Secondary Call Progress Tones  
Frequency: 480 Hz +/- 1%  
Dialing 07 enables the secondary call progress tones. Instead of generating dual frequency call progress tones, single-frequency tone of 480 Hz is produced . Dialing 07 switches back to the dual frequency call progress tones.

**Note:** **The secondary call progress tone is a factory-default condition.**

### **Stutter dial tone:**

Dialing 046 enables stutter dial tone with three of 0.1 seconds on/off period following with continuous dial tone. Dialing 045 disables the stutter dial tone. It is a factory default condition.

**Line Input Jacks:** USOC-RJ11-C, standard modular phone jacks

**Power Switch:** on rear panel

**Network response delay:**

Time delay between the end of dialing and ring-signal application is programmable by dialing: 0#095\*nnn\*, where nnn is a 3-digit decimal number between 1 and 255. The time delay is determined by  $8.6 \text{ ms} \times (\text{nnn}-1)$ . The number, nnn, must be non-zero. The factory default is 0 seconds.

**Forced called-party disconnect:**

When two lines are connected and one line hangs up, disconnect signal is generated to both lines.

**Programmable disconnect signal:**

The disconnect signal, which is interruption of loop current at the end of call when one line hangs up is programmable by the following dialing: 0#094\*nnn\*, where nnn is a 3-digit decimal number between 1 and 255. The time delay is determined by  $8.6 \text{ ms} \times (\text{nnn})$ . The number, nnn, should not be zero. The factory default is 320 ms.

**Power Requirements:**

LS100: 100-130 VAC, 50/60 Hz, 18 watts maximum, LS200: 100-130 VAC, 50/60 Hz, 36 watts maximum.

**Fuse:**

LS100: 0.15A, 3AG, SLO-BLO, LS200: 0.3A, 3AG, SLO-BLO.

**Dimensions:**

LS100: 8.35 in (21.2 cm) Wide x 2.5 in (6.35 cm) High x 7.25 in (18.4 cm) Long.

LS200: 19.0 in (48.3 cm) Wide x 3.3 in (8.38 cm) High x 12.0 in (30.5 cm) Long.

**Line Status Display:** red LED for each line to indicate off-hook status (continuous on) or ringing status (blinking)

**Calibration:** not required

**Power On Indicator:** green LED display on front panel.

**Weight:** LS100: 3.5 lbs. (1.6 kg.), LS200: 10 lbs. (4.5 kg).

**Environmental:** Operating temperature: 0 to 35 degree C, Humidity: 85% RH at 35 degree C

**Warranty/Service:** 6 months limited warranty. No warranty if any factory seal is broken. Service is performed at the factory, usually within 5 working days.

**Programmable parameters:**

Programmable parameters are restored in non-volatile memory.

**Caution:** The maximum number of changing programmable parameters is limited; therefore, continuous changes of programmable parameters should be avoided.

**The restoration of factory default is done by dialing 04#:**

The factory default conditions are as follows:

- primary (short) dialing method (single digit).
- No pseudo-line impairment mode is selected.
- The random noise amplitude is set at -55dBm for the line impairment mode.
- Continuous dial tone, not stutter dial tone.
- Secondary telephone number is set for 123456789+(line number), ten digits.
- No network response delay
- Disconnect signal of 320 ms
- Secondary call progress tone instead of dual frequency call progress tones

**Available options:**

1. Serial Interface Option (for programming telephone numbers, call progress tones, pseudo-line impairment mode, random noise, network delay, disconnect signal, PBX mode, all parameters)
2. 20Hz ring signal option (adjustable frequency and amplitude of ring signal)
3. Generic Line Impairment Option or All Line Impairment Option ( for frequency attenuation characteristics and envelope delay distortion)
4. Multi-Line DTMF Dialer option (to enable all line dialing simultaneously) for LS200
5. Satellite Delay Option
6. Caller-ID Option
7. 40V Battery-feed Option
8. All lines dual frequency call progress tones option ( to generate dual frequency call progress tones to all lines simultaneously for LS200
9. 230V AC power input option
10. Audio monitor for LS200
11. Outside line interface for LS200

## SECTION 3

### OPERATION

**Warning: To preclude the possibility of electrical shock, do not remove the instrument cover.**

#### 3.1 Operating Voltage

This instrument will operate only from a 100-130 volt, 50/60 Hz AC source unless 230V power option is equipped. Refer to the Specification for additional details regarding power.

#### 3.2 Safety Information

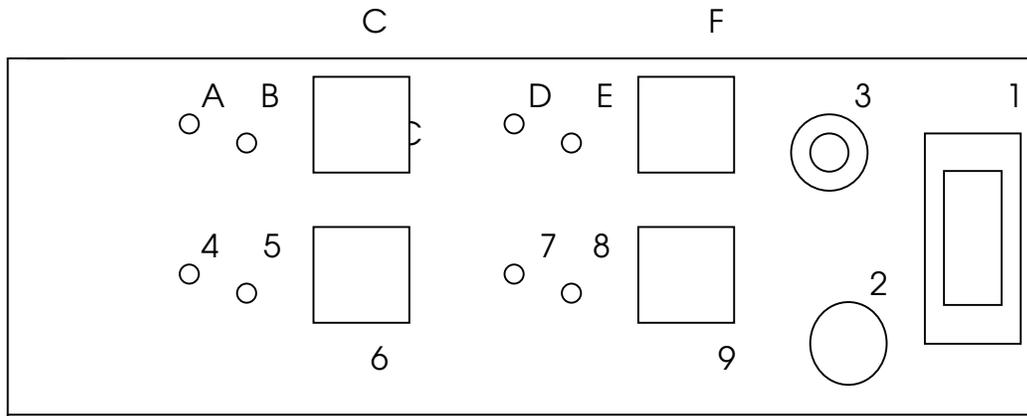
This instrument operates from a single-phase power source with one of the current-carrying conductors (the neutral conductor) at ground (earth) potential. Operation from power sources where both current-carrying conductors are live with respect to ground (such as phase-to-phase on a 3-wire system) is not recommended, since only the line conductor has over-current (fuse) protection within the instrument.

These instruments use a 3-wire cord with a 3-terminal polarized plug for connection to the power source and safety earth; the LS100 power cord is fixed to the instrument, while the LS200 power cord is detachable. In either case, the ground terminal is directly connected to the metal parts of the instrument. For electrical shock protection, insert this plug only into a mating outlet with a safety earth contact.

#### 3.3 Controls, Indicators, and Connectors

The user should become familiar with all controls, indicators, and connectors before turning the instrument power on. Figure 3-1 shows the rear panel of the LS100. The LS100 front panel contains only the **POWER ON** indicator, which should light when the instrument is connected to the proper power source and the rear panel **POWER** switch is in the **ON** position.

The LS200 contains power switch, fuse holder, and AC power connectors on the rear panel, and power indicator, off-hook/busy indicators, phone connectors are on the front panel.

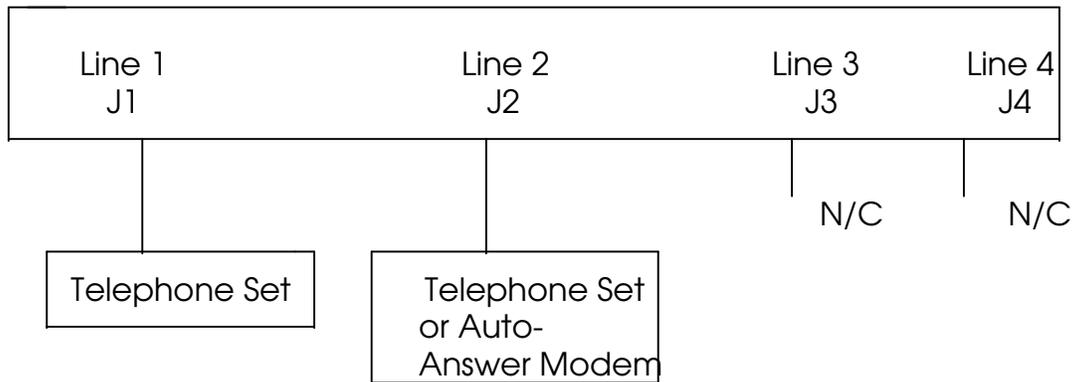


1. **POWER ON/OFF:** Rocker switch turns instrument power on or off
2. **Power Input Cord:** AC power is supplied through this cord.
3. **Fuse:** Use correct fuse as specified. Warning: for continued fire protection, replace fuse only with same type and rating.
4. **LINE 1 TRANS ADJ:** Screwdriver adjustment to lower transmit power output from LINE 1.
5. **LINE 1 OH/BUSY Indicator:** LED to indicate "Off Hook" status, blinking for ringing
6. **J1 (TO DAA):** Line 1 input jack for connection to modems/Data Access Arrangements
7. **LINE 2 TRANS ADJ:** Same as 4 except for Line 2
8. **LINE 2 OH/BUSY Indicator:** Same as 5 except for Line 2
9. **J2 (TO DAA):** Line 2 input jack for connection to modems/DAAs
- A. **LINE3 TRANS ADJ:** Same as 4 except for Line 3
- B. **Line 3 OH/BUSY Indicator:** Same as 5 except for Line 3
- C. **J3 (TO DAA):** Line 3 input jack for connection to modems/DAAs
- D. **LINE 4 TRANS ADJ:** Same 4 except for Line 4
- E. **Line 4 OH/BUSY Indicator:** Same as 5 except for Line 4
- F. **J4 (TO DAA):** Line 4 input jack for connection to modems/DAAs.

**Figure 3-1 LS100 rear panel. Danger - high voltage appears at J1-J4**

### 3.4 First-Time Operation

Use this procedure when turning the instrument on for the first time. The procedure will also serve to explain the operation of the instrument. Although LS100 is used as an example, the procedure is equally applicable to the LS200. Two telephone sets, or one telephone set and an auto-answer modem, are required, as shown in Figure 3-2. Refer to the Specification section for tone characteristics.



**Figure 3-2 Connection the first time operation (LS100)**

First, connect the instrument to the correct input power source, then turn the rear panel **POWER** switch to **ON**. Observe that the front panel **POWER** indicator LED comes on. With nothing connected to any of the line input jacks, the **OH/BUSY** lights for all lines should be off.

Connect a standard telephone set, either rotary or tone, to J1. Connect an auto-answer modem or another telephone set to J2. Check that the **OH/BUSY** lights are still off. If any light is on, check to see if the telephone is off-hook, or the modem is in its off-hook condition.

Lift the Line 1 telephone receiver; the Line 1 **OH/BUSY** light should come on the one-frequency dial tone should be audible at the Line 1 receiver. Dial a rotary pulse or DTMF "2" at the Line 1 set; after completing the dialing, the ring-back tone should be audible. The high-voltage ring signal is generated at the J2 connection. If a second telephone is connected to Line 2 instead of an auto-answer modem, sound may be produced on the telephone set at Line 2. If the phone has a bell-type ringer, little sound may be produced, because most bells are sensitive to a lower ringing frequency.

When the call from Line 1 is answered at Line 2 by closing relay contact in the modem or lifting the receiver, the ring-back tone at Line 1 and the high-voltage ring signal at Line 2 will be turned off. Observe also that the **OH/BUSY** light for Line 2 is now on. Signal paths between Line 1 and Line 2 are established. When an auto-answer modem is used at Line 2, it generally waits 2 to 3 seconds before generating a continuous 2.2 kHz answer tone.

### 3.5 Transmit Power Adjustment

To check the transmit power adjustment, leave the unit connected as in Figure 3-2; check the transmit power adjustment on Line 1 as follows:

1. Apply music or voice to Line 2 if using a telephone receiver, or enable a continuous tone if using an auto-answer modem.

2. Using a slotted screwdriver, turn the Line 1 **TRANS ADJ** potentiometer approximately 30 degrees counter-clockwise; some attenuation should be noted in the sound heard at Line 1.
3. Turn the Line 1 **TRANS ADJ** potentiometer fully counter-clockwise, the sound should now be attenuated to the point that it can hardly be heard, if at all (-40 dB).
4. Return the control to its fully clockwise position.

### **3.6 Checking Busy Tone**

The busy tone is generated whenever the called line is off-hook or connected to another line, or an invalid number is called. The busy tone can be checked as follows:

1. Connect a telephone set to Line 1, with no other lines connected
2. Dial "9" at Line 1; since there is no Line 9, the busy tone should be heard at the Line 1 receiver. Caution: the instrument must be in the factory default condition where PBX mode is disabled.
3. Leave the set at Line 1 off-hook and connect another telephone set or an auto-answer modem at Line 2. Dial a "1" at Line 2; this should generate a busy tone at Line 2.

### **3.7 Dialing Restriction from Multiple Lines and Multi-Line DTMF Dialer Option**

Simultaneous dialing from multiple lines is prohibited by suppressing generation of dial tones to more than one line at a time because of single DTMF receiver in LS100 or LS200. If a line, that is producing dial tone, does not dial for more than fifteen seconds, the dial tone will change to a busy tone, and it may not be able to dial any more until it goes on hook and goes off-hook again. A line that is waiting for dial tone will receive dial tone. Multi-Line DTMF Dialer Option for LS200 is available as an option to include DTMF receiver circuit for each line.

### **3.8 Four Modem Operation**

A modem can be connected to each of the four possible lines of an LS100. In this configuration, any line can be connected to any other line unless the called line is busy or off-hook. For example, Line 1 could be connected to Line 3, and Line 2 connected to Line 4, all at the same time.

### **3.9 Pseudo-Line Impairment**

The factory default condition is non-pseudo-line-impairment mode, which provides ideal telephone line condition. Dialing "00" and hanging up at any line selects the Pseudo-Line Impairment Mode. The Pseudo-Line Impairment does not contain frequency attenuation and envelope delay distortion characteristics of (Generic) Line

Impairment Option as in model LS100-2J. The Pseudo Line-Impairment mode adds 20 dB insertion losses with random noise for signals between two lines. To return to non-impairment mode, dial "09" at either line, and hang up.

### 3.10 Noise Amplitude Adjustment

Amplitude of the random noise in the Pseudo-Line Impairment Mode is programmable by dialing "0#091\*nnn\*", where "nnn" forms a 3-digit decimal number. The random noise amplitude is set at -55 dBm as a factory default value, but it may be changed by the above dialing method. The factory default value is obtained with nnn=017. The smaller number, the lower signal power. i.e. nnn=176 for -31 dBm, nnn=088 for -37 dBm, nnn=044 for -43 dBm, nnn=022 for -49 dBm, nnn=005 for -61 dBm, nnn=000 for -67 dBm of random noise.

### 3.11 Dual-Frequency and Secondary Call Progress Tones

As defined in the Section 2, Specifications, the standard call progress tones including dial tone, ring-back tone, and busy tone are single-frequency secondary call progress tone types as being used in U.S. and Canada. In LS100 and LS200 without Multi-Line DTMF Dialer Option, dialing "07" switches between dual frequency call progress tone and single-frequency secondary call progress tone.

### 3.12 Simulated PBX Mode

The Simulated PBX Mode generates dial tone again after receiving dialing of "9" as dialing "9" is required to access an outside line. To enable this Simulated PBX Mode, DTMF dialing of "0#097\*004\*" for dual frequency call progress tones or dialing of "0#097\*012\*" for the secondary call progress tones. Note that dialing "9" is not required to complete dialing; for example, dialing "92" or "2" at the Line 1 will ring the Line2. To return to non Simulated-PBX Mode, dial "0#097\*000\*" for dual frequency call progress tones or "0#097\*008\*" for secondary call progress tones. Also note that dialing "9" as a primary telephone number in non-Simulated-PBX mode will generate busy signal.

### 3.13 Stutter Dial-Tone

By dialing "046", the stutter dial-tone is enabled. By dialing "045", it is switched back to non-stutter dial-tone.

### 3.14 Network Response Delay

The network response delay, that is between the end of dialing and start of ring signal application and ring-back tone generation, may be implemented by dialing "0#095\*nnn\*" where "nnn" forms a 3-digit decimal number. The delay is determined by 8.64 ms multiplied by a number, "nnn". For example, by dialing "0#095\*255\*", the network response delay of 2.2 seconds is obtained.

### 3.15 Forced Called-Party Disconnect and Programming Disconnect Signal

When two lines are connected and one line hangs up, disconnect signal, which is interruption of loop current, is generated at two lines for 320 ms.

The disconnect signal duration is programmable by dialing "0#094\*nnn", where "nnn" forms a 3-digit decimal number. The duration is determined by 8.64 ms multiplied by a number, "nnn".

### 3.16 Distinctive Ring Signal

Instead of the normal ringing interval of 2 sec on / 4 sec off, the following three different ringing patterns are provided:

Caution: The ringing pattern must be set for each dialing sequence.

#### **Pattern 1: 2 sec on, 4 sec off**

Dial 0 \* 1 + (Line Number), default condition

#### **Pattern 2: .8 sec on, .4 sec off, .8 sec on, and 4 sec off**

Dial 0 \* 2 + (Line Number)

#### **Pattern 3: .4 sec on, .2 sec off, .4 sec on, .2 sec off, .8 sec on, and 4 sec off**

Dial 0 \* 3 + (Line Number)

#### **Pattern 4: .3 sec on, .2 sec off, 1 sec on, .2 sec off, .3 sec on, and 4 sec off**

0 \* 4 + (Line Number)

### 3.17 Telephone Number Programming

Secondary telephone number, programmable telephone number, may be programmed by dialing the following:

#### **022 + telephone number**

Example 1: to program 503-987-654+(line number) dial 022503987654, and hang up.

Example 2: 800-555-121+(line number), dial 022800555121, and hang up.

#### **Factory-default condition of calling numbers: 123456789+(line number)**

### 3.18 Programming telephone number length

Programming for length of secondary telephone number is obtained by dialing: 0#096\*nnn\*, where "nnn" is a 3-digit decimal number between 0 and 18. The maximum telephone number is eighteen digits. The factory default is set at 10 digits.

### 3.19 Restoring Factory Default Condition

After dialing \*\*\*\*\*, hang up the telephone at any line, dial "04#" to restore factory default conditions that are listed in Appendix A.

## **SECTION 4**

### **FCC RULES, PART-15**

#### **Warning**

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which cases the user at his own expense will be required to take whatever measures may be required to correct the interference.

## SECTION 5

### OPTIONS

This instrument, Model \_\_\_\_\_, Serial No. \_\_\_\_\_, is equipped with the following options marked below. Refer to the appropriate appendix for more information about each option.

\_\_\_\_\_ Serial Interface Option

\_\_\_\_\_ 20Hz(adjustable) Ring Signal Option, which also enables programming of frequency and amplitude when the serial interface option is equipped.

\_\_\_\_\_ High-Frequency Signal Bandwidth Option

\_\_\_\_\_ (All Lines)Dual Frequency Call Progress Tone Option (LS200)

\_\_\_\_\_ Generic (True) Line Impairment Option 1

\_\_\_\_\_ Generic (True) Line Impairment Option 2

\_\_\_\_\_ Satellite Delay Option 1

\_\_\_\_\_ Satellite Delay Option 2

\_\_\_\_\_ 230 VAC Power Option

\_\_\_\_\_ Multi-Line DTMF Dialer Option, which enables all lines dialing in DTMF mode simultaneously.

\_\_\_\_\_ Caller-ID/Call waiting Option

\_\_\_\_\_ 40V Battery-feed Option

\_\_\_\_\_ Audio Monitor Option for LS200

\_\_\_\_\_ Outside line interface for LS200

\_\_\_\_\_ Ground start Option

\_\_\_\_\_ 30Hz ring signal option (standard for LS100-2A and LS100-4A)



## APPENDIX A

### PROGRAMMING SUMMARY

Note: "nnn" is a 3-digit decimal number. It must be 3 digit long.

Primary Telephone Number: 043 (factory default)

Secondary Telephone Number: 044

The telephone number length: 0#096\*nnn\*, 10 digits default

Pseudo-Line Impairment mode: 00

No Pseudo-Line-Impairment mode: 09 (factory default)

Distinctive Ringing : 0\*n where n=1-4 (Note: the ringing pattern must be programmed for each dialing sequence.)

045: disable stutter dial tone (default)

046: enable stutter dial tone

04#: restore programmed parameters to the factory default conditions

07: switch between dual frequency call progress tone and the secondary call progress tone(factory default)

0#094\*nnn\*: disconnect signal programming

0#095\*nnn\*: network response delay

0#097\*004\* or 0#097\*012\* (with secondary dial tone): PBX mode

0#097\*000\* or 0#097\*008\* (with secondary dial tone): no PBX mode (factory default)

Random Noise Amplitude Programming: 0#091\*nnn\*

**APPENDIX B**

**SIGNAL POWER TABLE (dBm)**

**1. dBm versus peak-to-peak voltage of sine wave with no harmonic distortion**

$$\text{dBm} = 10 \log_{10}(((\text{peak-to-peak voltage}) \cdot 0.3535)^2 / 600 \text{E-3})$$

dBm		Peak to-Peak Voltage							
10	6.92716	-7	0.97849	-24	0.13822	-41	0.01952	-58	0.00275
9	6.17384	-8	0.87208	-25	0.12318	-42	0.01740	-59	0.00245
8	5.50244	-9	0.77724	-26	0.10979	-43	0.01551	-60	0.00219
7	4.90405	-10	0.69272	-27	0.09785	-44	0.01382	-61	0.00195
6	4.37074	-11	0.61738	-28	0.08720	-45	0.01232	-62	0.00174
5	3.89543	-12	0.55024	-29	0.07772	-46	0.01098	-63	0.00155
4	3.47180	-13	0.49041	-30	0.06927	-47	0.00979	-64	0.00138
3	3.09425	-14	0.43707	-31	0.06173	-48	0.00872	-65	0.00123
2	2.75775	-15	0.38954	-32	0.05502	-49	0.00777	-66	0.00109
1	2.45785	-16	0.34718	-33	0.04904	-50	0.00693	-67	0.00097
0	2.19056	-17	0.30943	-34	0.04371	-51	0.00617	-68	0.00087
-1	1.95234	-18	0.27578	-35	0.03895	-52	0.00550	-69	0.00077
-2	1.74002	-19	0.24579	-36	0.03472	-53	0.00490	-70	0.00069
-3	1.55080	-20	0.21906	-37	0.03094	-54	0.00437	-71	0.00061
-4	1.38215	-21	0.19523	-38	0.02758	-55	0.00390	-72	0.00055
-5	1.23184	-22	0.17400	-39	0.02458	-56	0.00347	-73	0.00049
-6	1.09789	-23	0.15508	-40	0.02191	-57	0.00309	-74	0.00043

**2. dBm versus RMS voltage**

$$\text{dBm} = 10 \log_{10} (V^2 / 600 \text{ E-3})$$

Note: The term "dBm" is defined as a log-scale comparison of signal power into 600 ohms to 1 milliwatts.

dBm		RMS VOLTAGE							
10	2.44949	-7	0.34600	-24	0.04887	-41	0.00690	-58	0.00097
9	2.18311	-8	0.30837	-25	0.04356	-42	0.00615	-59	0.00086
8	1.94570	-9	0.27484	-26	0.03882	-43	0.00548	-60	0.00077
7	1.73411	-10	0.24495	-27	0.03460	-44	0.00489	-61	0.00069
6	1.54552	-11	0.21831	-28	0.03084	-45	0.00436	-62	0.00061
5	1.37745	-12	0.19457	-29	0.02748	-46	0.00388	-63	0.00054
4	1.22765	-13	0.17341	-30	0.02450	-47	0.00346	-64	0.00048
3	1.09415	-14	0.15455	-31	0.02183	-48	0.00308	-65	0.00043
2	0.97516	-15	0.13775	-32	0.01946	-49	0.00275	-66	0.00038
1	0.86911	-16	0.12276	-33	0.01734	-50	0.00245	-67	0.00034
0	0.77460	-17	0.10942	-34	0.01546	-51	0.00218	-68	0.00030
-1	0.69036	-18	0.09752	-35	0.01377	-52	0.00195	-69	0.00027
-2	0.61528	-19	0.08691	-36	0.01228	-53	0.00173	-70	0.00024
-3	0.54837	-20	0.07746	-37	0.01094	-54	0.00155	-71	0.00021
-4	0.48874	-21	0.06904	-38	0.00975	-55	0.00138	-72	0.00019
-5	0.43559	-22	0.06153	-39	0.00869	-56	0.00123	-73	0.00017
-6	0.38822	-23	0.05484	-40	0.00775	-57	0.00109	-74	0.00015



## Appendix C

### Serial interface option for LS100 and LS200

#### Installation procedure

##### Communication port selection

The provided software on the disk assumes that your serial communication port is set as communication port 1. Please follow the menu in the Control Software to change the communication port assignment.

##### Copying Control Software into your hard disk directory

Create a directory called "LS200" in hard disk drive.  
Copy the following files in a disk provided into this directory.  
LS200.exe  
LS200dat  
Default

##### Computer requirement

XT-compatible, 500k bytes RAM

##### Operating instruction of LS100/LS200 Control Software

Restart the computer in MSDOS.  
c:  
cd LS200  
LS200

Warning: The power of LS100 or LS200 must be on before the LS100/LS200 control software is operated. The power switch of LS100 or LS200 should not be turned off during entire LS100/LS200 control software operation. If power of LS100 or LS200 is turned off or serial interface connection is disconnected, PC may hung, and the PC may be required to be restarted.

When adjustable ring signal option is equipped, the control software enables programming of ring signal frequency and amplitude.

## Appendix D

### Generic (True) Line Impairment Option

The Generic (True) Line Impairment Option simulates “worst case” noise, envelope delay, and attenuation characteristics of long distance telecommunication lines. This option is intended for testing telecommunication equipment under adverse conditions. The delay and frequency-attenuation characteristics are based on the Bell 3002 line schedule. The Line Impairment Option 1 provides line impairment in one signal direction only. To provide line impairment for two signal directions, Line Impairment Options 1 and 2 are required. The Line Impairment Option 1 provides line impairment of a signal from Lines 8 to Lines 1-7 in the LS200-8. The Line Impairment Option 2 provides line impairment of a signal from Lines 1-7 to Lines 8 in the LS200-8. In a typical LS200-8 application, a reference modem and the modems to be tested are connected to Line 8 and Lines 1-7, respectively. With Line Impairment Option 2 installed, receive and transmit characteristics of the modems can be fully tested. Generic (true) Line Impairment Option requires Serial Port Interface Option to select an impairment condition and random noise.

#### Specifications

##### Line Impairment conditions:

Selection among full line impairment mode, partial line impairment mode, frequency attenuation mode and no line impairment mode is provided in the control software.

##### Note:

**The pseudo line impairment mode must be disabled when full line impairment, partial line impairment, or frequency attenuation mode in the Generic (True) Line Impairment Option is selected.**

##### Random Noise:

The random noise is inserted when full-line impairment, partial impairment, or frequency attenuation impairment, and signal power is programmable by control software. Please read section 3-10 and also pseudo-line impairment condition.

**Insertion Loss:** 22 dB for full, partial, or frequency attenuation impairment mode and 0 dB for non-impairment mode

##### Note

**The Transmit Power Adjustment Potentiometers must be set fully clockwise to obtain these insertion loss figures.**

##### Relative Signal Attenuation Characteristic to 1 kHz:

+12 dB +/- 1.5 dB @ 300 Hz.  
 + 8 dB +/- 2.0 dB @ 500 Hz.  
 + 8 dB +/- 1.5 dB @ 2500 Hz.  
 +12 dB +/- 1.5 dB @ 3000 Hz.  
 Above Band (>3000 Hz): 80 dB/octave roll-off to 50 dB holding to 10kHz  
 Below band (<300 Hz): 24 dB/octave roll-off.

##### Envelope Delay Distortion:

1. Full line impairment mode: envelope delay distortion relative to 1700 Hz:

- 800-2600 Hz: 1750 microseconds nominal
- 300-3000 Hz: 3000 microseconds nominal at both band edges
- 2. Partial line impairment mode: envelope delay distortion relative to 1700 Hz:
  - 800-2600 Hz: 1250 microseconds nominal
  - 300-3000 Hz: 2000 microseconds nominal at both band edges
- 3. Frequency attenuation mode:
  - No envelope delay distortion
- 4. No Line Impairment mode:
  - No envelope delay distortion

## Appendix E

### (All line) Dual Frequency Call Progress Tone Option

The (All line) Dual Frequency Call Progress Tone Option provides dual frequency call progress tones for each line in LS200-8A that is equipped with Multi-Line DTMF Dialer Option. Call progress tones that contain two frequency components for dial tone, ring-back tone, and busy tone are generated for each line separately with this option. The signal power and frequency components are as follows:

By dialing "07" or using the control software, call progress tone between single-frequency (480 Hz) and dual frequency call progress tones is changed.

Signal power: nominal -20 dBm.

Dial Tone: 350 Hz + 440 Hz, continuous unless programmed for stutter dial tone

Ring-back Tone: 440 Hz + 480 Hz, 2 sec ON/4 sec OFF.

Busy Tone: 480 Hz + 620 Hz, 0.5 sec ON/0.5 sec OFF.

Accuracy in frequency component: +/- 1%.

By dialing "07" or using the control software, call progress tones are changed from dual frequency call progress tones to single-frequency (480 Hz) or vice versa.

## Appendix F

### Audio Monitor option

The Audio Monitor provides audio signal monitoring of line signal at an external audio monitor device. The audio signal at a selected line is output at audio jack at the rear panel of LS200. The audio channel is only selected in a menu of the control software that is provided with serial interface option.

#### Specifications:

Connector: audio mini-jack on the rear panel

Output impedance: 1 k ohm

Signal range: 5 dBm maximum

Signal attenuation from line to audio output: 0 dB

Selected line for the audio monitor is restored upon power-off and power-on. Restoring factory default condition by dialing 04# does not change selected line for audio monitor.

## **Appendix G**

### **20Hz Ring Signal Option**

This option provides a nominal 20Hz ring signal at the RJ11C connectors when any line is called by another line. The actual frequency is adjustable from 15.3 Hz to 68 Hz; it is set at the factory set to 30Hz. The amplitude is adjustable from 40 to 90 volts RMS, and is set at the factory for 85 volts.

The amplitude and frequency are adjustable with a slotted screwdriver, through openings in the bottom plate. The frequency and amplitude both increase when their respective adjustments are turned counter-clockwise.

## **Appendix H**

### **Multi-Line DTMF Dialer Option**

The Multi-Line DTMF Dialer Option allows all lines dialing by DTMF methods simultaneously. The limitation that is described in section 3.7 Dialing Restriction from Multiple Lines and Multi-Line DTMF Dialer Option is eliminated, and all lines receive dial tone.

## Appendix I

### Satellite delay option

This option simulates the delays experienced in long distance communication via satellite. Three different delay values among 294, 146, and 73 msec are selectable. Satellite Delay Option 1 provides signal delay in one direction only, while Option 2 adds signal delay in the opposite direction. (Option 2 is therefore required to simulate complete delay in two signal paths.)

Option 1 will simulate signal delay from Line 1 to Line 2 of the LS100-2A, and from Line 8 to Line 1-7 of the LS200-8A. Adding Option 2 lets you simulate delay from Line 2 to Line 1 of the LS100-2A, and from Lines 1-7 to Line 8 in the LS200-8A. The High-frequency Signal Bandwidth Option is not available in conjunction with this option.

On instruments equipped with the Satellite Delay Option, signal bandwidth is limited to 300 to 3000 Hz.

Note: The additional insertion loss for 293 msec delay is +/- 5 dB; the additional insertion loss for 146 msec and 73 msec is +/- 2 dB.

Programming of satellite delay is accomplished by using control software that is provided with this option.