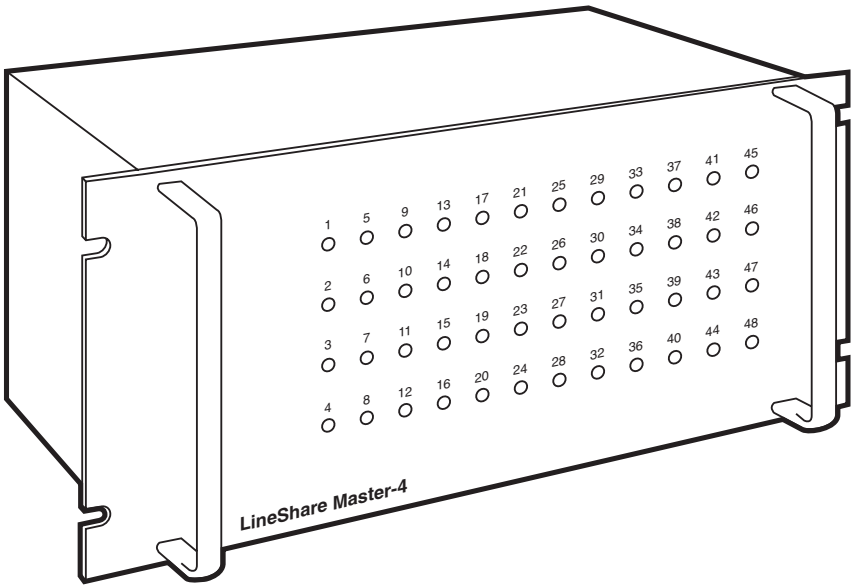
BLACK BOX®
NETWORK SERVICES

NOVEMBER 1996
FX156C
FX157A

Lineshare Master—4
Lineshare Rack



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FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

Class B Digital Device. This equipment has been tested and found to comply with the limits for a Class B computing device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or telephone reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an experienced radio/TV technician for help.

Caution:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To meet FCC requirements, shielded cables and power cords are required to connect this device to a personal computer or other Class B certified device.

NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

TRADEMARKS

CONTENTS

1. Specifications

Number of Ports — 4 dispatchers in one card

Indicators — 4 power/device port

Programming — From DTMF tones of phone

Ringer Equivalency — 1.0 B, DOC load=30

Interface Type — 2-wire (tip/ring)

Leads Supported — 4 sets of Tip/Ring

Power — 120 VAC for FX157A

Size — *FX157A*: 7"H x 19"W x 15"D (17.8 x 48.2 x 38.1 cm)

Weight — *FX156C*: 2 lb. (0.9 kg), *FX157A*: 28 lb. (12.7 kg)

2. Introduction

2.1 Before You Begin

This guide introduces you to the various installation and operational procedures for using the Lineshare Master-4.

Read through this guide and select the installation procedures appropriate for your specific application before attempting to connect or operate the Lineshare Master-4.

NOTE

We recommend surge protection for all telecommunications devices. Use surge suppressors and/or line-conditioning devices on the input power supply, as well as the connected telephone line.

2.2 About the Lineshare Master-4

The Lineshare Master-4 is a state-of-the-art device that produces a variety of routing tones on outbound phone calls. It is designed to work in conjunction with a modem, fax, or any type of automatic- or manual-dial telephone device. The Lineshare Master-4 allows any fax or modem device to automatically route calls through line-sharing devices that detect fax CalliNG (CNG) tones, reverse modem tones, or various single-frequency tones.

The Lineshare Master-4 works best when installed between the telephone company's line and a fax or modem device. The Lineshare Master-4 allows connection of up to 48 individual telephone lines, and up to 48 individual modems (or other telephone devices). When a device accesses the telephone line through the Lineshare Master-4, the unit pauses until dialing is complete. It then places the calling device on hold and transmits a series of user-selectable calling tones.

When used in conjunction with a Lineshare Pro (part number FX150A or FX150A-D48), the Lineshare Master-4 can access multiple modem-type devices on a single phone line.

NOTE

The Lineshare Pro is a four-port line-sharing device designed to identify and route any specified tone produced by the Lineshare Master-4.

Read through the rest of this guide to learn how to properly operate the Lineshare Master-4.

3. Installation

Before you install the Lineshare Master-4, connect all phone lines and modems (or other telephone devices) to the patch panels and amphenol connectors in their proper configuration. Although your configuration may vary, all phone lines and telephone devices connect to the Lineshare Master-4 the same way.

CAUTION

Do not connect all telephones in an office environment through the Lineshare Master-4. During power failure, the unit will not pass the telephone line through to the phones.

To perform the installation procedures in the following sections, you may need the following equipment:

- up to four 24-pair telco cables (part number ELN25T-0000-MF)
- up to two 48-pair patch panels (part number JPM002)
- additional telephone cables—typically supplied with equipment by the manufacturer. You need additional telephone cables (part number EL04M-00) for as many pieces of equipment as you intend to connect to the Lineshare Master-4.
- extension cables—required if the connecting equipment is not located near the Lineshare Master-4.

3.1 Lineshare Master-4 Rack Rear Panel

The rear panel of the Lineshare Master-4 Rack has four 24-pair telco connectors, a one-amp fuse, a power input port, and a system ground, as shown in **Figure 3-1**.

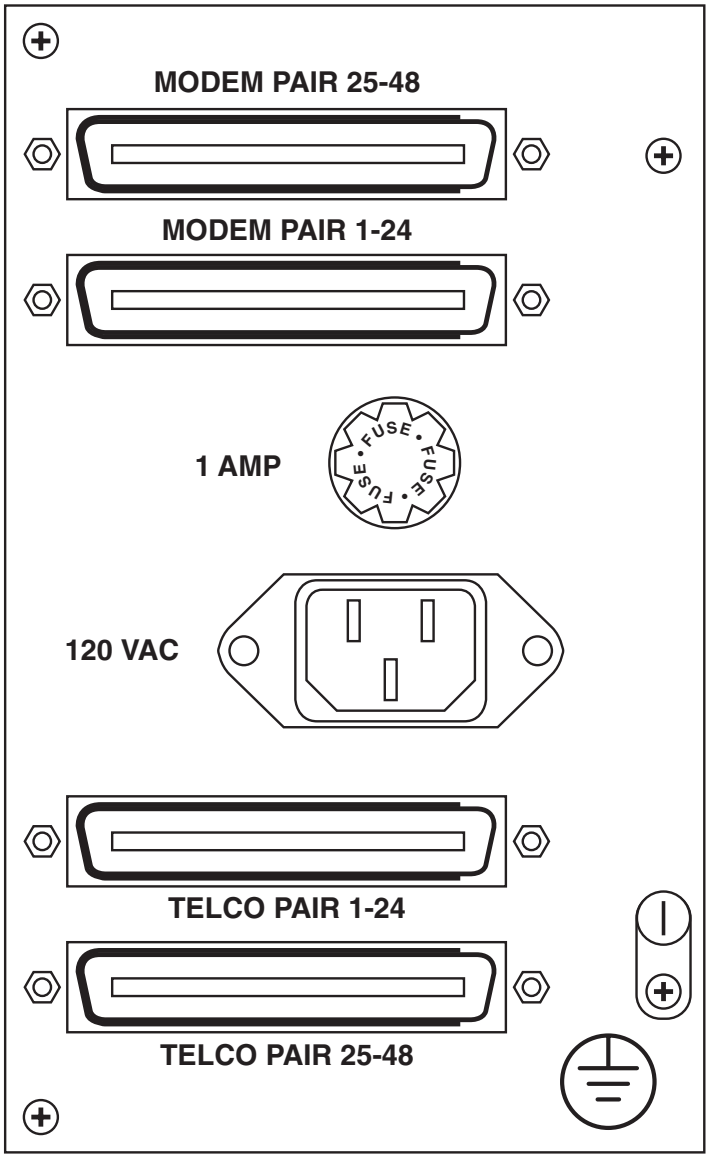
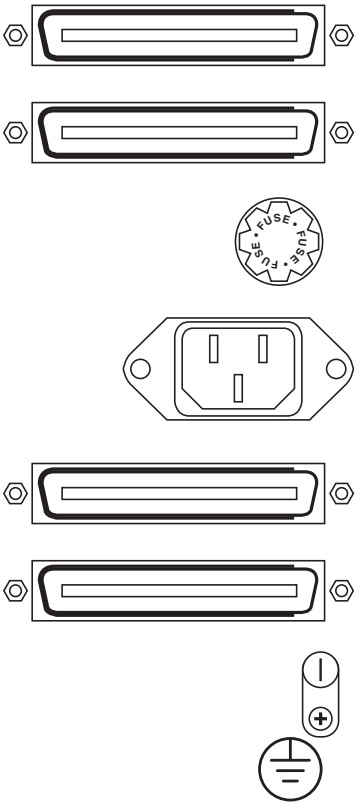


Figure 3-1. Rear Panel of the Lineshare Master-4 Rack.

Connect the telephone equipment to the Lineshare Master-4 Rack as follows:



Connect up to 48 modems using 24-pair telco cables between a patch panel and these connectors.

Replace (when necessary) with a one amp fuse.

Connect the external 120-VAC power supply to this power input.

Connect up to 48 telephone lines using 24-pair telco cables between a patch panel and these connectors.

Connect the system ground at this point.

Figure 3-2. Connecting the Telephone Equipment to the Lineshare Master-4.

3.2 Installing the Lineshare Master-4 on Dedicated Data Lines

Figure 3-3 shows the Lineshare Master-4 installed on dedicated data lines.

To install the Lineshare Master-4 in this application, perform the following steps:

1. Connect your phone lines to the RJ-11 side of a patch panel.
2. Plug one end of the 24-pair telco cable into the top right telco connector on the back of the patch panel.
3. Plug the other end of the 24-pair telco cable into the telco connector on the back of the Lineshare Master-4 labeled "TELCO PAIR 1-24."

   If you are using more than 24 phone lines, repeat steps 1 through 3 for the phone lines and appropriate connectors numbered 25-48.
4. Connect your modems to the RJ-11 side of the patch panel.
5. Plug one end of the 24-pair telco cable provided into the top right telco connector on the back of the patch panel.
6. Plug the other end of the 24-pair telco cable into the telco connector on the back of the Lineshare Master-4 labeled "MODEM PAIR 1-24."

   If you are using more than 24 phone lines, repeat steps 4 through 6 for the modems and appropriate connectors numbered 25-48.

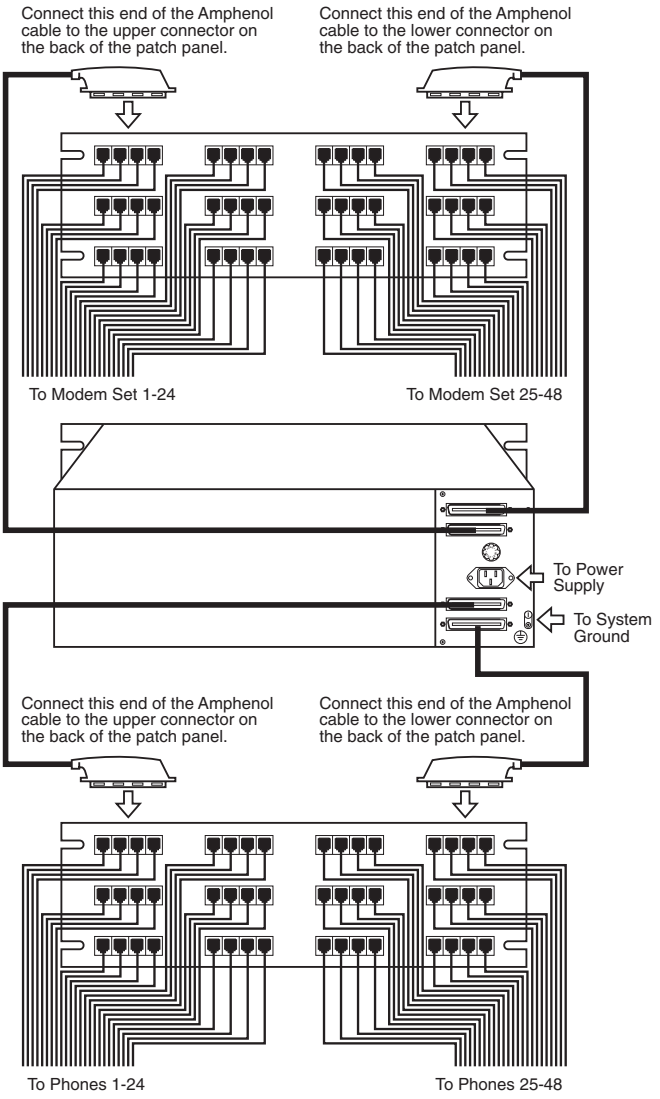


Figure 3-3. Connecting the Lineshare Master-4 to Dedicated Lines.

3.3 Installing Circuit Boards in the Lineshare Master-4

The Lineshare Master-4 is capable of handling up to 12 circuit boards. Each circuit board contains four individual Lineshare Master units. Each unit is capable of connecting a single phone line and a modem-type device. **Figure 3-4** shows a Lineshare Master-4 circuit board.

3.4 Powering On the Unit

Plug the appropriate end of an AC power cord into the power input port labeled 120 VAC on the back of the unit. Plug the other end into its proper power source.

The Lineshare Master-4 begins a self-test soon after power is applied. When the Lineshare completes its self-check, the PORT LEDs remain ON.

NOTE

The LINE must be installed for the unit to pass the self-test and show proper indication of LED ON.

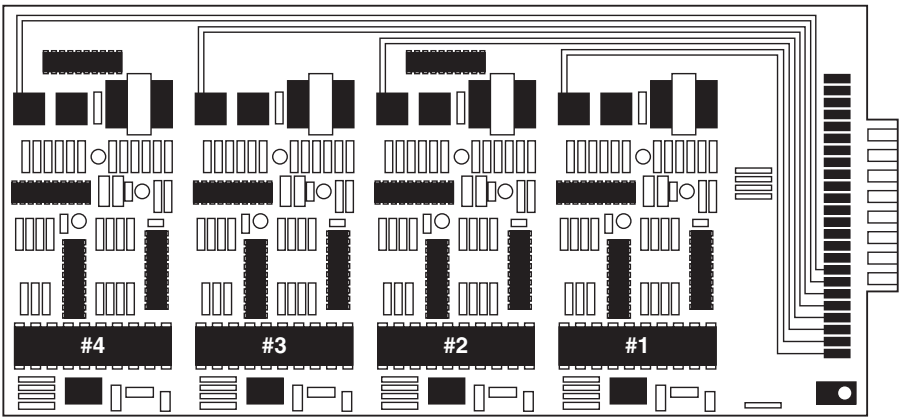


Figure 3-4. The Lineshare Master-4 Circuit Board.

You can remove a circuit board after removing the back panel by gently pulling the board straight out the back. You can replace a board by inserting the new board into the proper slots and gently pushing it to the front of the unit. **Figure 3-5** shows circuit boards installed in the Lineshare Master-4.

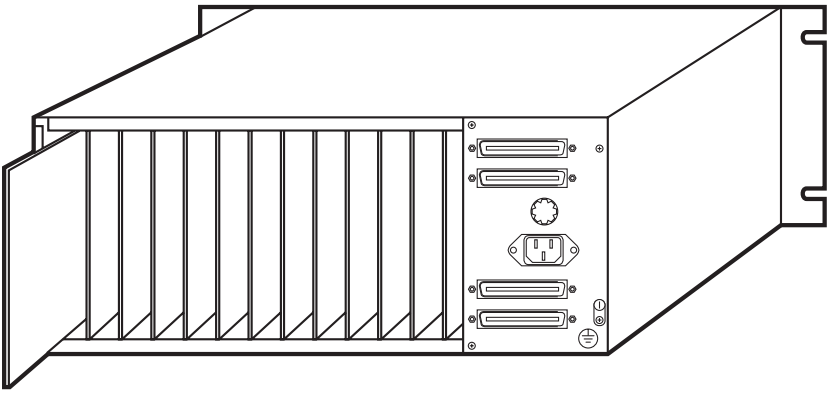


Figure 3-5. The Lineshare Master-4's Removable Circuit Boards.

NOTE

The circuit board closest to the rear panel (far right) is the number 1 circuit board.

4. Using the Lineshare Master-4

When a device dials a tone phone number through the Lineshare Master-4, the unit starts a two-second timer each time it detects a tone. This continues until the two-second timer expires without detecting a tone. The Lineshare Master-4 then places the calling device connected to the unit on hold. It then begins to transmit a series of calling tones (the frequency of the tone depends on user settings). If the Lineshare Master-4 detects an answer carrier from a fax or modem, it immediately stops transmitting the calling tones and releases the line to the calling device.

You can turn the Lineshare Master-4 on or off using tone commands. To turn the Lineshare Master-4 on, press # *. Once you enter the # * command, the Lineshare Master-4's timing registers are activated. To turn the Lineshare Master-4 off, press # #.

You can also use tone commands in the following ways:

- to enter the programming mode
- to set calling tones
- to set timing registers
- to use the Call Hold Function
- to reset factory settings

4.1 Setting the Calling Tones

By dialing the * key and one of the eight allowable digits at the end of a phone number, you can set the Lineshare Master-4 to produce the following tones:

0 = 1000hz tone

1 = 1100hz tone (typically fax CNG tone)

2 = 1200hz tone

3 = 1300hz tone

4 = 1400hz tone

5 = 1500hz tone

6 = 1600hz tone

9 = 2225hz tone (typically reverse modem tone)

The factory setting is 2225hz with the unit turned on.

If all calls from this system are to transmit the same calling tone, it is not necessary to enter the * after each telephone number. The Lineshare Master-4 retains the previous command in memory and will send the same tone on every call. If power fails, the Lineshare Master-4 will maintain the previous settings once power is restored.

NOTE

All of the tones produced by the Lineshare Master-4 can be used on an outbound call for routing purposes. However, they work best when used in conjunction with the Lineshare Pro.

To set the tone frequency for the Lineshare Master-4 transmissions, enter the * and a single digit 0 through 6 or 9 at the end of a phone number. The digit you enter sets the tone frequency.

For example, pressing * 1 at the end of a phone number (555-1234*1) will send a fax (CNG) tone. This allows the Lineshare Master-4 to produce CNG tones for a fax machine that cannot produce the tone. With the help of the Lineshare Master-4, your fax machine can automatically access other fax machines that use a line-sharing device to detect and route according to the CNG tone.

In the same way, pressing * 9 at the end of a phone number will send a series of 2225hz reverse modem tones. This allows the Lineshare Master-4 to produce reverse modem tones for modems that cannot produce the tones. With the help of the Lineshare Master-4, your modem can automatically access other modems that use a line-sharing device to detect and route according to the reverse modem tone.

4.2 Using the Reverse Modem Tone

To route through a line-sharing device using the reverse modem tone, perform the following steps:

1. Set each modem to normally send and receive calls. Do not set either of the modems in the Reverse Modem mode.

2. Turn on the reverse modem detection feature in the line-sharing device that is receiving the call from the modem/ Lineshare Master-4 combination.

3. At the end of the phone number in the modem's communication software, enter the * 9 command.

4. Place the call using the modem's communication software.

The calling modem then accesses the phone line through the Lineshare Master-4 and dials the number of the receiving modem. The Lineshare Master-4 detects the * 9 and sets the tone emulation register to transmit the 2225hz tone. Three seconds after the last digit (9) is dialed, the Lineshare Master-4 begins transmitting a series of 2225hz tones.

When the line-sharing device answers the call, it detects the reverse modem tone from the Lineshare Master-4 and routes the call to the receiving modem. When the receiving modem answers the call, the Lineshare Master-4 detects its carrier signal and releases the line to the calling modem. The two systems then establish their communications link.

5. Using the Lineshare Master-4's Custom Functions

The Lineshare Master-4 includes many options that enable you to customize its operation to meet specific application needs. The programmable functions offered by the Lineshare Master-4 allow you to change the length of its tones, time between tones, time before the first tone, number of tones to transmit, and the call-hold feature.

The Lineshare Master-4's functions are factory-preset, and it is unlikely that you will need to make many changes. However, if you desire, you can alter any program by using a tone phone connected to the appropriate RJ-11 jack on the patch panel. The Lineshare Master-4 cannot be programmed with a rotary/pulse dialing phone.

NOTE

Before attempting to program any function, we recommend that you first thoroughly read the programming procedures. Then read "Changing functions" in Section 5.1 and decide if you want to make changes.

To change the Lineshare Master-4's functions, we recommend using the following steps:

1. Using **Table 5-1**, write down the sequence of changes.
2. Enter the programming mode.
3. Change the functions.

The following sections explain how to enter the programming mode and change the functions.

5.1 Using the Programming Mode

To enter the programming mode, perform the following steps:

1. Make sure that the telephone line from the phone company is connected to the patch panel, and then to the Lineshare Master-4.
2. Plug a tone phone into the appropriate RJ-11 jack on the modem patch panel in place of the modem.
3. Pick up the phone receiver and make sure you hear dial tone.
4. Within five seconds, press and release the * key and then the # key on the telephone keypad.

The Lineshare Master-4 then enters the programming mode, and you will hear a busy tone or a repeating message from the intercept operator.

Ignore the activity on the phone line and continue with your changes. If the phone company resets your line and you receive a busy tone, re-enter * #, or hang up the phone for 10 seconds, re-enter programming and continue with your changes. If a reset occurs in the middle of a command (before receiving confirmation tones), re-enter that command only. Any previous entries have been saved.

5. To exit the programming mode after completing your changes, press the # key.

   The Lineshare Master-4 produces three quick beeps and exits the programming mode.

   If you adjust any of the timing registers, be sure to properly calculate the amount of time before the Lineshare Master-4 drops the line (about five seconds before the calling device connects to it). See **Section 5.2, Calculating the Timing Parameters**, for more information.

6. After you complete programming changes, remove the tone phone from the modem patch panel, and replace it with the modem previously connected.

Table 5-1. The Lineshare Master-4's Custom Functions.

Function Number	Function	Factory Setting	Options Available
1	Tone Time	0.5	0.1 - 9.9
2	Silence Time	1.5	0.5 - 9.9
3	Time Before First Tone	1.5	0.5 - 9.9
4	Number of Tones to Send	10	01 - 99
6	Call Hold Function	1	1=ON 0=OFF
9 9 9	Reset to Factory Settings		
*Exit Programming Mode			

The following sections contain specific information about each function and how to change the setting.

Changing Functions

In the previous section, **Table 5-1** lists the functions that can be altered to customize the operation of the Lineshare Master-4.

The functions are numbered [1] through [9] [9] [9]. In this section, you will find a description of each function and instructions for customizing the function.

[1] Tone Time

This function sets the length of each tone that the Lineshare Master-4 transmits. A tone length of 0.5 seconds is factory-preset, but you can select a tone length from 0.1 seconds up to 9.9 seconds.

The first digit you enter is equal to seconds, and the second digit equals tenths of a second. For example, an entry of 1 2 changes the tone length to 1.2 seconds. An entry of 0 5 changes the tone length to 0.5 seconds.

Example: To set a tone length to 1.5 seconds, enter the programming mode and press the following on your tone phone:

1 Tone Time

1 Tone length in seconds

5 Tone length in tenths of a second

(3 beeps indicate correct entry)

(optional entries for additional changes)

Save changes and exit programming

[2] Silence Time

This function sets the length of time between each tone that the Lineshare Master-4 transmits. A Silence Time of 1.5 seconds is factory-preset, but you can select a Silence Time from 0.5 seconds up to 9.9 seconds.

The first digit you enter is equal to seconds, and the second digit equals tenths of a second. For example, an entry of 1 2 changes the Silence Time to 1.2 seconds. An entry of 0 5 changes the Silence Time to 0.5 seconds. If an entry is less than 0.5 seconds, the Lineshare Master-4 defaults to 0.5 seconds.

Example: To set a Silence Time to 2.0 seconds, enter the programming mode and press the following on your tone phone:

2 Silence Time

2 Silence Time in seconds

0 Silence Time in tenths of a second

(3 beeps indicate correct entry)

(optional entries for additional changes)

Save changes and exit programming

[3] Time Before First Tone

This function sets the amount of time (waiting period) that the Lineshare Master-4 waits before transmitting the first tone. A time of 1.5 seconds is factory-preset, but you can select a time from 0.5 seconds up to 9.9 seconds.

The first digit you enter is equal to seconds, and the second digit equals tenths of a second. For example, an entry of 1 2 changes the waiting period to 1.2 seconds. An entry of 0 5 changes the waiting period to 0.5 seconds. If an entry is less than 0.5 seconds, the Lineshare Master-4 defaults to 0.5 seconds.

Example: To set a waiting period to 2.0 seconds, enter the programming mode and press the following on your tone phone:

3 Time Before First Tone

2 Waiting period in seconds

0 Waiting period in tenths of a second

(3 beeps indicate correct entry)

(optional entries for additional changes)

Save changes and exit programming

[4] Number of Tones

This function sets the Number of Tones that the Lineshare Master-4 transmits. The Number of Tones is factory-preset to 10, but you can select any number of tones from 1 to 99.

You must enter two digits per entry. If the entry is less than 10, enter a [0] in front of the single digit. An entry of 0 9 sets the Number of Tones to 9. An entry of 4 8 sets the Number of Tones to 48.

Example: To set the Number of Tones to 20, enter the programming mode and press the following on your tone phone:

4 Number of Tones

2 Number multiplied by 10

0 Number multiplied by 1

(3 beeps indicate correct entry)

(optional entries for additional changes)

Save changes and exit programming

[6] Call Hold Function

This function is an ON/OFF setting. For best performance from the system, we recommend leaving this function ON. When ON, the unit acts in the following manner:

The device connected to the Lineshare Master-4 accesses the phone line and dials a phone number. Two seconds after the last tone is dialed, the Time Before First Tone register (see page 25) activates its timer. When this timer expires, the Lineshare Master-4 puts the device on hold and transmits its programmed tones. The calling device will not be able to access the phone line or produce any dialing tones during this period.

Between each tone the Lineshare Master-4 transmits, it listens for a response signal from the called device. If the Lineshare Master-4 detects this carrier tone, it stops transmitting the tones, releases the device on hold, and takes itself off-line.

If the Lineshare Master-4 does not detect the answer carrier from the called device, it completes its tone cycle and then releases the line to the connected device.

If the Call Hold Function is turned OFF, the device is able to detect the activity on line. In this mode, the dialing device can produce tones after the phone number is dialed. However, if the device receives a busy tone and drops the line, the Lineshare Master-4 will continue with its tone cycle until complete. This can cause a timing problem if the connected device attempts to redial while the Lineshare Master-4 is transmitting tones.

If the calling device can detect a busy tone, it is also likely that it will abort the call and reset for another call. If so, the Lineshare Master-4 should have the Call Hold Function turned ON. Then, if a call is placed to a phone number that is busy, the Lineshare Master-4 will not allow the calling device to detect the busy tone until the end of its time-out period. This is necessary to maintain the proper timing sequence between the Lineshare Master-4 and the calling device on a redial attempt.

For example, the Lineshare Master-4 will not detect a modem disconnecting 15 seconds into the call because of a busy signal. The Lineshare Master-4 will maintain the connection with the telephone line until its timing programs have completed. Meanwhile, the modem would continue attempting to access the line and could not because the Lineshare Master-4 is holding it open, resulting in a non-polled number.

The Call Hold Function is factory-preset ON. If you want to turn this function OFF, enter the programming mode and press the following on your tone phone:

6 Call Hold Function

0 OFF

(3 beeps indicate correct entry)

(optional entries for additional changes)

Save changes and exit programming

[9] [9] [9] Reset to Factory Settings

To reset all functions to their original factory settings, enter the programming mode and press the following on your tone phone:

9 9 9 Reset to Factory Settings

(3 beeps indicate correct entry)

(Optional entries for additional changes)

Save changes and exit programming

5.2 Calculating the Timing Parameters

For the best performance from the system, set the Lineshare Master-4 to stop sending tones and drop the line five (5) seconds before the fax or modem time-out period expires.

If a modem dials a phone number through the Lineshare Master-4 and the modem stays on-line about 45 seconds, the Lineshare Master-4 should stay on-line for 40 seconds of the call. This allows the Lineshare Master-4 to have the best chance of routing a call to the proper device.

If adjustment to any of the timing registers is necessary, make sure you have the proper calculation so that the Lineshare Master-4 drops the line about five seconds before the calling device. To calculate the timing parameters, perform the following steps:

1. Multiply the Tone Time (TT) and the Number of Tones (NT): 0.5 seconds x 8 tones=4 seconds

2. Multiply the Silence Time (ST) and the Number of Tones (NT): 3.5 seconds x 8 tones=28 seconds

3. Add these two totals together: 4 + 28 = 32 seconds

4. Add the total from #3 to the Time Before First Tone (TBFT) and two seconds for the tone-detection timer; 32 seconds + 0.5 seconds + 2.0 seconds=34.5 seconds

The total of these calculations is equal to the length of time that the Lineshare Master-4 stays on line after a phone number is dialed.

In the above example, the Lineshare Master-4 will drop the line about 35 seconds (34.5) after the phone number was dialed. If the modem is on line for 40 seconds after dialing, the two systems will function properly.

If you are on an extension phone and the Lineshare Master-4 is active, at the end of a phone number you can enter the # # command to turn the unit OFF. When you are ready for the Lineshare Master-4 to transmit the tones again, enter # * at the end of a phone number. This reactivates the Lineshare Master-4 to start transmitting the tones.

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