Lucent Technologies
Bell Labs Innovations

Digital Feedback Eliminator

Installation and Use Manual

Issue 1, October 1999

Model: **LUFDBKEL**
PEC Code: 5335-611
COM Code: 408184265
Select Code: 701-000-130

Notice

Every effort was made to ensure that the information in this guide was complete and accurate at the time of printing. However, information is subject to change.

FCC Statement (Part 15) - Radio Frequency Interference

The Digital Feedback Eliminator generates and uses radio frequency energy and if not installed and used in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. Testing is being conducted for compliance with the limits for a Class B device in accordance with the specifications in Part 15 of the FCC Rules. This testing is designed to provide reasonable protection against such interference. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the Digital Feedback Eliminator unit off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the radio or TV receiving antenna.
- Relocate the Digital Feedback Eliminator unit with respect to the radio or TV receiver or vice-versa.
- Plug the Digital Feedback Eliminator unit into a different outlet so that it and the radio or TV receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet, "How To Identify and Resolve Radio-TV Interference Problems," helpful. This booklet was prepared by the Federal Communications Commission (FCC) and is available from the U.S. Government Printing Office, Washington, DC 20402. Stock order No. 004-000-00345-4.

Important Safety Information

Always follow these basic safety precautions when installing and using the system:

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. DO NOT block or cover the ventilation slots and openings. They prevent the product from overheating. DO NOT place the product in a separate enclosure or cabinet, unless proper ventilation is provided.
4. Never spill liquid on the product or drop objects into the ventilation slots and openings. Doing so may result in serious damage to the components.
5. Repair or service must be performed by a factory authorized repair facility.

6. The product is provided with a UL-CSA approved, 3-wire ground type plug. This is a safety feature. DO NOT defeat the safety purpose of the grounding type plug. DO NOT staple or otherwise attach the AC power supply cord to building surfaces.
7. DO NOT use the product near water or in a wet or damp place (such as a wet basement).
8. DO NOT use extension cords. The product must be installed within 6 feet of a grounded outlet receptacle.
9. DO NOT install telephone wiring during a lightning storm.
10. DO NOT install telephone jacks in a wet location unless the jack is specifically designed for wet locations.
11. Never touch uninsulated wires or terminals, unless the line has been disconnected at the paging or controller interface.
12. Use caution when installing or modifying paging or control lines.

Support Information

Paging systems integrated with small phone systems such as Merlin Legend and Partner are supported by the National Service Assistance Center (NSAC). The main number for the NSAC is 800-628-2888. Paging systems integrated with large switches such as the DEFINITY G3 are supported by the Technical Service Center (TSC). The main number for the TSC is 800-242-2121.

Contents

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Overview

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Features and Capabilities

The Digital Feedback Eliminator has 4 minutes of available audio memory, and can record up to 16 pages, each with a maximum message length of 1 minute long. While recording new messages, another set of up to sixteen messages can be playing back.

Also, the Digital Feedback Eliminator makes feedback over the paging system virtually impossible by opening the loop between the input microphone and the speakers. This eliminates the very potent ial for acoustic feedback while giving the user flexibility in the manner in which pages are broadcast. To insure that messages are not played during a time when other high volume noises might mask them, the system's ability to stack pages permits a user supplied ambient noise level analysis computer to tell the Digital Feedback Eliminator to hold the messages and then play them when they can actually be heard.

Multiple Record and Playback modes are supported as well as Pre-page tones, Adjustable Delay Between Messages and Message Repeat functions. ABORT and STOP functions are also available.

Transformer isolated 600 ohm line input and priority input, as well as transformer isolated switchable 8 ohm or 600 ohm audio output.

Specifications

Physical

Maximum dimension: 10 inches wide by 1.5 inches high by 6.5 inches deep without rack mount adapter. Weight 4.5 lbs. (2 kg).

Electrical

- Frequency response of 6.8 kHz, and 60 dB of dynamic range.
- Page Audio Input: 600 Ohms, transformer isolated, with -20 dBm to +4 dBm (nominal 0 dBm) input level.
- Priority Audio Input: 600 Ohms, transformer isolated, with -20 dBm to +4 dBm (nominal 0 dBm) input level.
- Audio Output: Selectable
    - Line Output: Line level (600 Ohms), transformer isolated, +4 dBm max. continuously adjustable.

OR

    - Power Output: Low impedance (8 Ohms), transformer isolated, limited to approximately 0.5 Watts into 8 Ohms, (adjustable).

    Relay contacts: All control relay contacts available are rated at 1 Amp, 24 Vdc noninductive loads.

- Power requirement: 24 Vdc., 500 mA from wall mounted power pack supplied.

Environmental

Capable of operating in ambient temperatures from 0 to +40°C (+32 to 104°F) and relative humidity from 0% to 85% (non-condensing), at altitudes up to 10,000 feet above sea level.

Interconnect

All external interface connectors are RJ12 type and/or two piece screw terminal pluggable Euro-connector type.
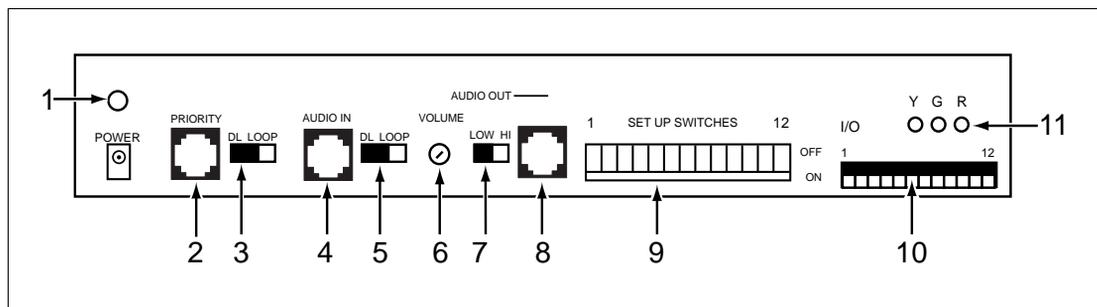
Hardware Configuration

Figure 1-1.   Digital Feedback Eliminator Front View

Key to Figure 1-1:

1.   **POWER** - Input and Indicator.

2.   **PRIORITY** - Audio/Control Input.

3.   **PRIORITY** - Input Mode Switch.

4.   **AUDIO IN -** Audio/Control Input.

5.   **AUDIO IN** - Input Mode Switch.

6.   **VOLUME** - Audio Out Control.

7.   **LO / HI** - Audio Out Switch.

8.   **AUDIO OUT/STATUS** - Connector.

9.   **SET UP SWITCHES** - For selection of optional operational functions.

10.   **General Purpose I/O** - Connector.

11.   **LED Indicators -**   Yellow (in use).
                                     Green (playing).
                                     Red (recording).

Shipping Container Contents

The following items should be found in the container of the Digital Feedback Eliminator.

- Digital Feedback Eliminator Unit
- Power Pack, 24 Vdc.
- Package of two ½-inch mounting wood screws.
- Installation Manual.

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Installation

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Contents

This section provides complete instructions for mounting the Digital Feedback Eliminator on a wall, rack or table. It also illustrates all interface requirements to auxiliary equipment, including inputs and outputs. Configuration switch settings are provided.

Installation Steps

These are the general steps for installation:

1. Mount the unit to the wall, rack or table.

2. Make cable connections from the Digital Feedback Eliminator to the PBX and the paging system.

3. Set DIP switches to the desired operation.

4. Power unit up.

5. Test unit operation.

Mounting the Unit

To mount the unit:

1. Make sure there is a standard electrical outlet into which you can plug your power pack. This outlet should not be controlled by switch.

2. Find a space on the wall, rack or table.

3. Mount the Digital Feedback Eliminator and its wiring at least 18 inches away from power supply or other equipment that generate electrical noise. Secure using the supplied mounting screws.

4. Connect the power supply. Power LED should glow green.

Example System Set Up and Connecting to the Paging System

The Digital Feedback Eliminator can be configured in several ways depending on the paging system used.

The Digital Feedback Eliminator is typically installed between the telephone system and the paging system. It interfaces with the paging controller in a zone paging environment (see Figure 2-1), and with the amplifier in a single-zone installation (see Figure 2-2).
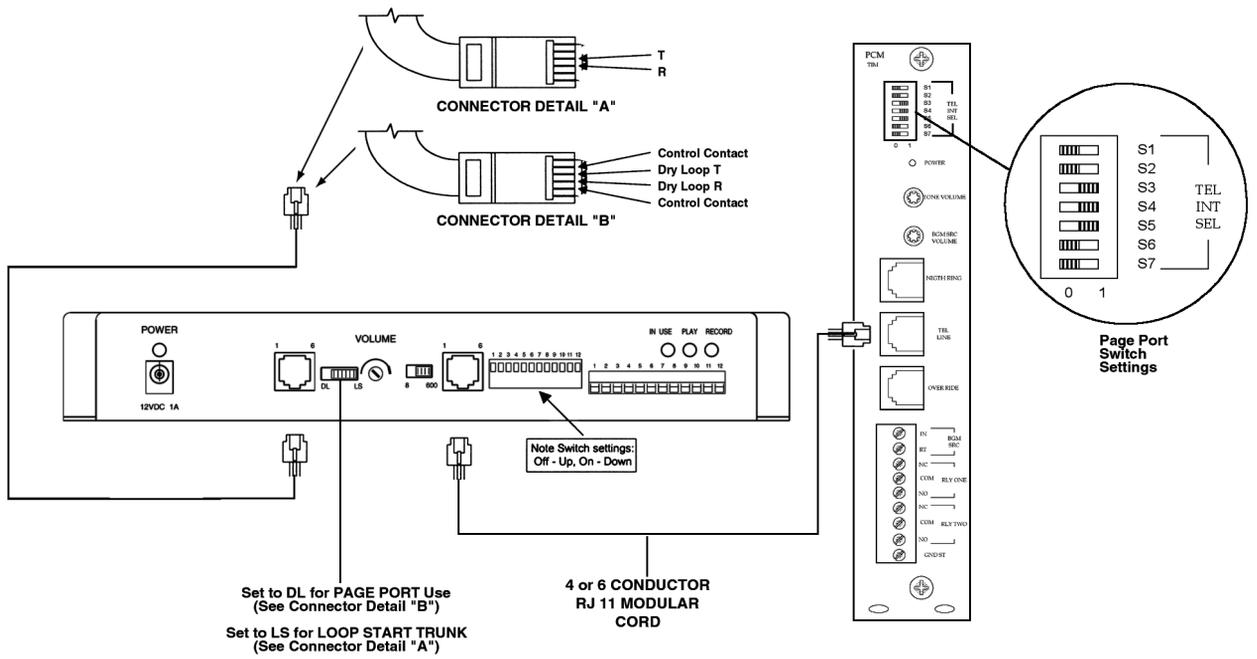
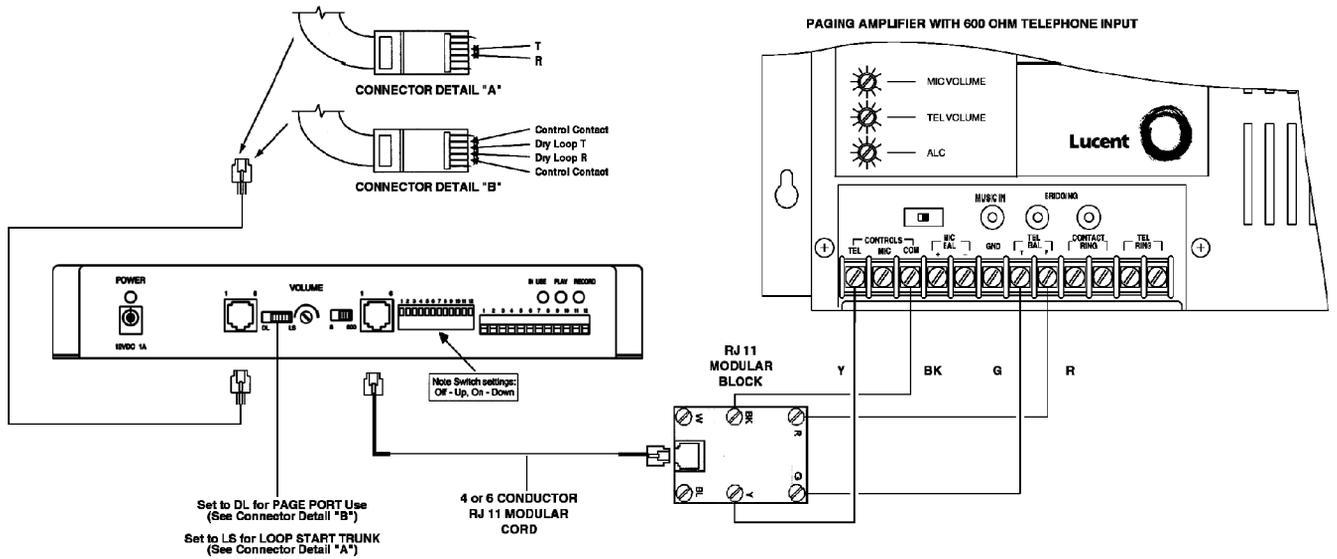Figure 2-1. Digital Feedback Eliminator Interface with
Lucent LUPCM Zone Paging System

Figure 2-2. Digital Feedback Eliminator Interface with
Telephone Paging Amplifier

Control Inputs

Power

Unit needs 24 Vdc, 500 mA. Connect power pack supplied. Chassis is connected to (-vc) side of power supply.

Priority/Control

Input, RJ12 style connector, 6 position:

1. Not used.

2. PRIORITY, bypass input. Connect to Ground (Pin 5) to operate.

3. PRIORITY Audio, ring.

4. PRIORITY Audio, tip.

5. Ground (power return). Connects to chassis.

6. Not used.

Priority Input Mode Switch

Mode 1. DRY LOOP (4 wire) — LEFT POSITION. Operates with phone system's Page/AUX Port, a dry audio interface and a contact closure is required for supervision.

Mode 2. LOOP START (2 wire) — RIGHT POSITION. For operation with a Loop Start trunk. The Digital Feedback Eliminator supplies the talk battery, loop current will start the recording.

Audio/Control

Input, RJ12 style connector, 6 position:

1. Not used.

2. Record, input. Connect to Ground (Pin 5) to operate.

3. Ring.

4. Tip.

5. Ground (power return). Connect to chassis.

6. Not used.

Audio Input Mode Switch

Mode 1. DRY LOOP (4 wire) — LEFT POSITION. Operates with phone system's Page/AUX Port, a dry audio interface and a contact closure is required for supervision.

Mode 2. LOOP START (2 wire) — RIGHT POSITION. For operation with a Loop Start trunk. The Digital Feedback Eliminator supplies the talk battery, loop current will start the recording.

Control Outputs

Audio Volume Control

Controls the volume level delivered to the paging system. It is shipped with 1:1 gain factory set.

Audio High/Low Switch

Select the type of audio drive available at the AUDIO/STATUS connector.

RIGHT for line level (600 Ohms) and left for power level (8 Ohms).

Audio Output

Connector, RJ12 style connector, 6 position (see Figure 2-3).
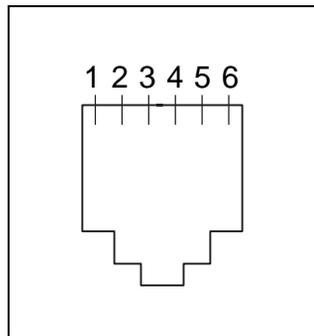

Figure 2-3.   RJ12 Connector

1.   Not used.

2.   Page Enable Contact, common.

3.   Audio Output (-).

4.   Audio Output (+).

5.   Page Enable Contact, normally Open.

6.   Not used.

General Purpose I/O Connector

Figure 2-4 shows the two-position, Euro-style, two piece, pluggable type.

```
0 0 0 0 0 0 0 0 0 0 0 0
1 2 3 4 5 6 7 8 9 10 11 12
```
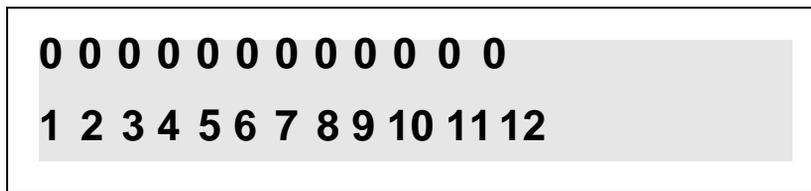
Figure 2-4.   Example of General Purpose I/O Connector

Key to Figure 2-4:

1.   COMMON to all control functions.

2.   ABORT input.

3.   PRIORITY input, paralleled on Priority/Control Input.

4.   STOP input.

5.   PLAY input.

6.   RECORD input, paralleled on Audio/Control Input.

7.   IN USE - contact, N/O.

8.   IN USE - contact, common.

9.   PLAYING - contact, N/O.

10. PLAYING - contact, common.

11. RECORDING - contact, N/O.

12. RECORDING - contact, common.

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Operation

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There are three important functions that the Digital Feedback Eliminator performs:

1. It Eliminates Feedback, by recording the incoming page(s) then playing it back.

2. It is able to repeat each page more than once, allowing for a better response in noisy environments.

3. It is capable of stacking up to 16 incoming pages by its ability to Record incoming pages while Playing back previously recorded ones, on a first-in first-out basis.

   Other important features such as the ability to Record or Block DTMF tones, used for zone selections, and a host of manual operation modes that allow Page screening function.

The Digital Feedback Eliminator is designed to run in both Manual and Automatic modes. For paging applications, the Automatic mode is the most widely used. This mode requires minimum installation time since it is the factory's default setup. RJ12 connectors are used for Audio/Control inputs and outputs. Where logical, certain control signals will be provided on the individual RJ12 connectors associated with each.

Automatic Operation

There are two methods to initiate the record mode on the Digital Feedback Eliminator. The activation mode will be selected upon power up, it cannot be changed during normal operation. The record mode will be selected via user configurable dip switch. These modes are listed and described below.

Loop Start—The Digital Feedback Eliminator will source the talk battery to the ring and tip. The Digital Feedback Eliminator will sense loop current and start the recording process for the duration of the presence of loop current.

Dry Loop—This is a 4 wire interface, 2 wires for a dry audio input and 2 wires requiring a contact closure for supervision.

Manual Operation

Terminal Block, Input Controls

General Purpose I/O Terminal blocks will be used for other control Inputs/Outputs.

Record, Play, Stop, Priority and Abort

Five input control signals are offered to the user for complete control over the recording and playback processes. None of these inputs are necessary for the use of the Digital Feedback Eliminator in Auto mode but may be required based on system requirements.

All of the Input Controls are optically coupled so as to electrically isolate each activation initiated via contact closure or open collector driver.

Page Recording

Upon receiving a valid recording signal, the Digital Feedback Eliminator will start recording at the beginning of the memory until the page is complete. While this page is playing, if a new page is requested it will be recorded. Multiple pages will be recorded in series until the playing message has completed its play routine. If, for any reason, the end of available recording memory is reached, the system will immediately cease recording, and a Busy back tone will be sent back through to the audio source signaling the user that the Digital Feedback Eliminator is not available. Any message prematurely cut off because the end of memory was reached will not be played. If the memory is filled and a new recording command is offered, the Digital Feedback Eliminator will not go into record mode and a busy back tone will be output to tell the user that the Digital Feedback Eliminator is not available.

Record Input

Note: Once the Digital Feedback Eliminator senses 8 seconds of silence, it will offer the busy back tone to the user and abort the recording. The Digital Feedback Eliminator will not be able to record new pages as long as the Record input is held active. The user will be informed that their page has been aborted, prompting them to hang-up. This mode is not defeatable.

The Record input will be used for the Dry Contact activation method. A maintained contact closure will be necessary at this input to keep the Digital Feedback Eliminator in record mode. Once the contact is closed, the Digital Feedback Eliminator will commence recording the audio input immediately. When the contact is opened (released), the unit will immediately stop recording. The recorded message must be a minimum of one second in length, any message shorter than this will be deleted.

Page Playback

Manual mode is used in applications where the Digital Feedback Eliminator may not be the only device feeding the PA system. In this mode the Digital Feedback Eliminator will record, or stack, up to sixteen messages into memory, waiting for a "Play" activation from an external controller. Upon this contact, all of the stacked pages are played in a first in first out fashion, from memory. Since the unit has two memory banks (hence the Record while playing feature) it is possible to record up to 32 messages, only in manual mode when only Record commands are initiated without any Play commands.

In Manual mode after a recording sequence is completed and no page is currently playing, the Digital Feedback Eliminator can begin playback of the previously recorded messages. If the unit is currently playing, the Digital Feedback Eliminator will sequence through both sides of the memory in seamless fashion.

Once a message has been stopped, either because the message was played, or a manual STOP command was received, that message will be tagged for overwrite. This means that messages cannot be stored and played repeatedly, or skipped for playback later.

Play Input
If the Digital Feedback Eliminator is in automatic playback mode, this input will have no effect.

When the Digital Feedback Eliminator is in manual playback mode, this input will be necessary in order to playback the messages once they are recorded. A momentary contact closure will initiate the play sequence of all messages currently in memory. A second play contact closure, while the Digital Feedback Eliminator is playing, will update the play queue to play all messages recorded (new and old) since last play activation. A maintained contact closure will essentially put the Digital Feedback Eliminator into automatic repeat mode. Message strings cannot be repeated by using the Play input after the string has already played.

Stop Input
Messages being played can be skipped/stopped using this input. A momentary contact closure will cause the message being played to be stopped. If there is a message in the playing queue it will played next. Once a message has been stopped using this command it cannot be retrieved for playback at a later time.

The **STOP** command will have no effect on the operation of the Record process. If the unit is recording at the same time it is playing, a STOP command will only stop the currently playing message, the Recording process will not be affected.

If the **STOP** input is maintained, the Digital Feedback Eliminator will stop the currently playing message and will wait for the Stop input to go away before starting the next message, if there is one in the stack. Eventually the recording stack will be filled with messages preventing the system from recording new messages. At this point the Digital Feedback Eliminator will not record, nor would it be capable of playing, while this STOP input is held active.

| Priority Input | A **PRIORITY** bypass input which, when activated, stops the play sequence to allow a separate audio input from Priority RJ12 connector, to be routed directly through the Digital Feedback Eliminator. The play sequence, when allowed to resume, will continue to playback a string from the beginning of the message it was playing when the PRIORITY (Emergency) bypass input got active. |

The activation for this input must be maintained for the amount of time which the dedicated Priority audio input is to be routed directly through the system. As soon as the activation is released, the message play sequence will resume, after a one second delay.

Normal system recording can be performed while the device is in the priority bypass mode.

| Abort Input | The ABORT input will be used to prevent a recorded message from being played back. This input is one of several different ways to do this on the Digital Feedback Eliminator. |

When the ABORT input is activated, the message which is being recorded will be immediately halted and the busy back tone sent to at the audio input. The recorded data will not be played as part of the playback message string. An example of the use of this would be the security guard monitoring the pages, and upon hearing an unauthorized page, aborting it. This causes the user to be cut off and prevents the page from being broadcast. The busy back tone will be output for as long as this input is held active.

The ABORT input has no direct effect on the playing sequence.

| Terminal Block, Output Signals | All status outputs will be provided via relay contact closure. These contact closures will be provided via terminal block to the user. The name and description of each output is shown below. |

Power Applied—Green LED. This LED will be activated for the duration which power is applied to the Digital Feedback Eliminator.

Recording Output—Form A contact closure. This relay will be active whenever the Digital Feedback Eliminator is in the actual recording process. It will not be activated just because the Record input is active, but only when the Digital Feedback Eliminator is actually storing data.

Play Output—Form A contact closure. Relay will be active while the Digital Feedback Eliminator is Playing audio through the output. It will be active during the pause between the message repeats but not during the delays between different messages within the play sequence. The Playing output will be held active when the Priority Input is active.

In Use Output—Form A contact closure. Whenever the Digital Feedback Eliminator is in some process required by the user, this output will be active. This would include the record and play processes, pauses, delays, record access tones, etc.

Other Output Signals

Busy Back Tone—A Busy back tone tells a prospective user that the Digital Feedback Eliminator is not ready to accept the recording. This record access tone will be in the form of a Busy signal and will be output for the duration which the Digital Feedback Eliminator cannot record.

Setting Operation Switches

The Digital Feedback Eliminator is designed to have several functions programmed by the user. These adjustments will be made via dip switch settings in the field. These programmable settings are listed and described below.

Configuration Switch Position

On	=	Down
Off	=	Up

Record Activation Method

The method with which the user will enter the record mode can be selected from the following: Contact closure or loop start. The default setting will be loop start.

1	**Record Activation**
OFF	Loop current will activate the record process (factory setting).
ON	Loop current in conjunction with a contact closure will activate the record process.

Confirmation Tone

The choice for this selection is ON/OFF with the default being set to ON. If the option is selected for ON, then a tone will be sent to both the telephone interface and the priority input before a page can be recorded. This is intended to alert a user that they are about to be recorded.

2	**Confirmation Tone Enable**
OFF	Active (factory setting).
ON	Not active.

DTMF Tone Stripping

DTMF tones recorded at the beginning of an audio message are typically used for zone control purposes. A repeated page should not have the zone control tones on the front end of the second page because the zone controller is already routed, therefore these tones will be stripped on any repeats of a page. Only DTMF tones at the beginning of the page would be handled in this fashion. Any DTMF tones recorded in the middle of the message would be recorded and played back in the typical manner. The actual condition which is necessary before

the DTMF tones are recorded into memory will be as follows:
Audio sensor active for three seconds before the DTMF tone is
sensed means the message has been started and proceed with
normal operation.

3   DTMF Tone Stripping

OFF   Active (factory setting).
ON   Not active.

DTMF Tone Stripping Method

This setting determines how and where the DTMF tones
coming from audio input, during a recording, are processed.
Tones can be stripped only at the beginning of the message or
in the middle of the message. If the tones are stripped in the
middle of the message all recorded information preceding those
tones will be deleted.

4   DTMF Tone Stripping Method

OFF   Strip Only tones preceding audio message
           (factory setting).
ON   Strip Any tones in message, and restart
           recording message.

DTMF Allotment

This prevents unauthorized users from playing touch tones over
the paging systems. Most paging systems require a limited
number of tones to be recorded because of zone controlling
equipment, but if a certain number of tones is exceeded the
Digital Feedback Eliminator will abort that particular recording.
The number of tones which the Digital Feedback Eliminator can
be programmed to cut off after is two, three, four, or unlimited.

5   6   DTMF Allotment

OFF	OFF	Unlimited (factory setting).
OFF	ON	4 tones.
ON	OFF	3 tones.
ON	ON	2 tones.

#, # Sign Abort Enable

This would allow the caller to abort a page directly. Should they not like the page they are recording, they can press the "#" button two times within one second and the recording will immediately be aborted and the busy back tone sent to the input. They can then call back and record another page. A single "#" sign during the recording will not have any effect.

7   # # Abort Enable

OFF   Active (factory setting).
ON   Inhibited.

PLAY Mode

This will allow for auto-replay of page after recording.

8   Play Mode

OFF   Automatic (factory setting).
ON   Manual

Pre-Page Tone

A pre-recorded tone can be output prior to message playback. This is used to alert the listeners that a message is about to be played. This tone would be output before each message in the playback queue but not before the repeated plays.

9   Pre-Page Tone

OFF   Not active (factory setting).
ON   Active.

Number of Plays

The number of times which each message plays during the playback sequence can be selected from one or two times. If multiple messages were recorded into the queue, each message will play this number of times before the next message is played.

10	**Number of Plays**
OFF	Play message one time (factory setting).
ON	Play message two times.

Delay Between Plays

To make the page sequence more intelligible, a pause can be inserted between each message in the playback sequence as well as between any repeats of each message. This delay time can be configured to be 1, 3, 5, or 10 seconds.

11	12	**DELAY Between Plays**
OFF	OFF	1 second (factory setting).
ON	OFF	3 seconds.
OFF	ON	5 seconds.
ON	ON	10 seconds.