

CMS™ 400 Line Quality Analysis

User's Guide

13D20A-7/B 8/94

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About This Manual

Manual Description

The Communications Management Series (*CMS*) 400 *Line Quality Analysis (LQA) User's Guide* is designed to help you understand and operate your CMS 400 LQA software.

It is important that you have prior knowledge of your network configuration and understand the concepts of an IBM PC-based network, before attempting to perform any of these functions.

Use this manual for specific operations associated with the CMS 400 LQA software option.

- **Chapter 1 – Introduction** provides the general information required to use LQA.
- **Chapter 2 – Operation** describes the general operation of the LQA functionality.

The best way to utilize the CMS 400 documentation is to first read the *CMS 400 Installation Manual* (Doc. No. 13D26A-14). This manual is used to install your hardware and software. It provides a complete description of system components, power, and cabling requirements.

Then read your *CMS 400 Reference Manual* (Doc. No. 13D26A-10). This manual is used as a reference for standard function keys and common procedures. It is also used as a reference for interfacing with your CMS 400 System.

Use the *CMS 400 User's Guide* (Doc. No. 13D26A-7) as a reference for specific functions and familiarize yourself with the appendices in the back of the manual.

Terminology and Conventions

Text appearing on a personal computer screen is shown in Courier non-bold type:

Display Test Results

Characters that must be input by you exactly as shown in Courier boldface type:

RUN_LQA

A key that must be pressed on the keyboard is shown within a box:

ENTER

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CAUTION

In order to conform with Federal regulations, the user is required to disconnect the External Diagnostic Multiplexer, Station Distribution Multiplexer, and Distributed Diagnostic Multiplexer (which are Class A devices) before the Personal Computer is taken to and operated in a Class B residential environment.

Chapter 1

Introduction

General Information

The CMS 400 Line Quality Analysis (LQA) software gives you the ability to execute LQA tests on modems that have the LQA option installed. Modems with LQA are able to generate standard reference tones for analyzing line quality which confirm to Bell requirements.

The line quality test results can be displayed textually or graphically on the screen of your CMS 400 network management system. If you are testing one unit at a time, you may toggle between graphic and textual displays. The results may also be stored in a file for later review. Figure 1-1 is an application illustrating the operation of the LQA option.

Note: LQA tests are interruptive and will disrupt the normal data flow on the associated unit(s).

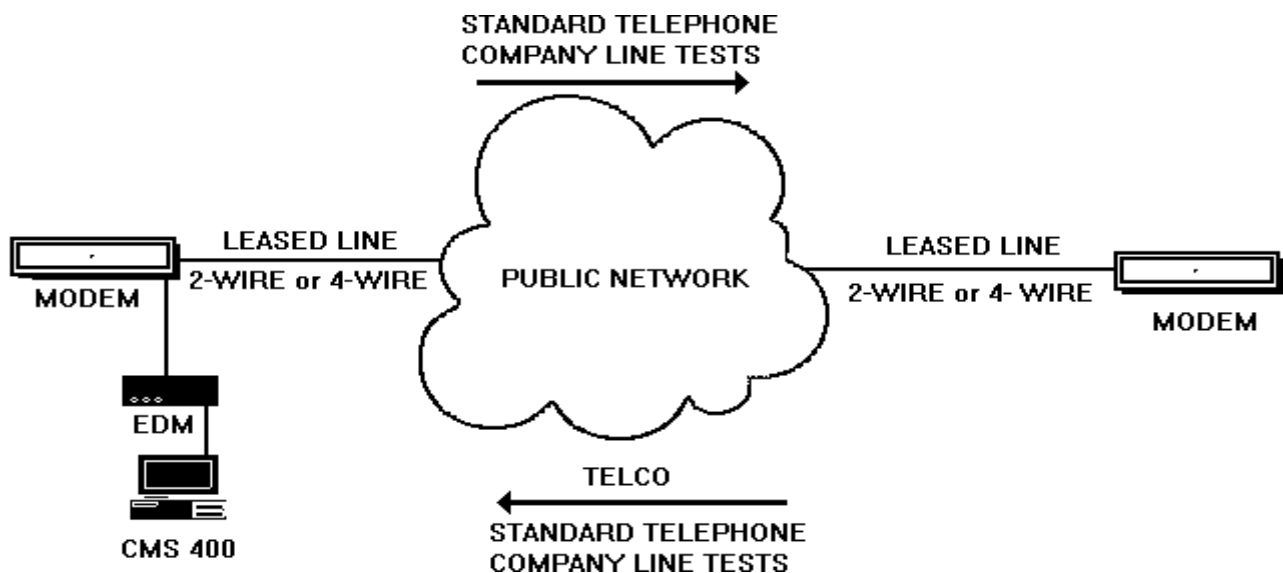


Figure 1-1. CMS 400 LQA Application

Chapter 2

Operation

Getting Started

To access the LQA software option, you must first successfully install LQA (refer to your *CMS 400 Installation Manual*). After installing LQA, bring up your CMS 400 System.

About LQA Tests

There are several tests that you may run via the LQA option. These tests operate in conjunction with your modems equipped with LQA to enable central-site monitoring of the quality of conditioned lines. (Refer to Table 2-1 for descriptions and Table 2-2 for threshold limits.)

Table 2-1. LQA Test Definitions

Test	Definition
Amplitude Jitter	The cumulative disturbing effect of incidental amplitude modulation and additive tones on a holding tone signal.
Attenuation Distortion	The relative loss at any frequency when compared to the loss of a 1004 Hz reference signal.
C-Notched Noise	The noise measured at the receiving end of a circuit when the 1004 Hz tone was inserted at the sending end is filtered out.
Dropouts	Signal decreases greater than 12 dB, lasting longer than four milliseconds. Dropouts interrupt the information flow between the two modems causing data to be lost.
Envelope Delay Distortion	The measurement of the difference in time in the propagation of a specified frequency, relative to the delay experienced at 1804 Hz. In a limited-bandwidth analog system such as a voice-grade telephone line, not all frequency components of the input signal propagate to the receiving end at the same time.
Frequency Translation	The measurement of the shift in frequency (caused by line distortion) of the received signal, measured in Hertz.
Gain Hits	A sudden increase or decrease in amplitude not exceeding 12 dB below the received signal. Gain Hits last at least four milliseconds, but may continue for hours.

Table 2-1. LQA Test Definitions (Continued)

Test	Definition
Impulse Noise	A component of the received noise signal that is greater in amplitude than the normal peaks of the message circuit noise, and occurs as short duration spikes and/or energy bursts.
Loss at 1004 Hz	The loss at the voice-band reference frequency (1004 Hz) from one end of the circuit to the other.
Phase Hits	A change in the received signal phase lasting more than four milliseconds.
Phase Jitter	The cumulative disturbing effect of incidental phase modulation and additive tones on a holding tone signal.
Phase Modulation	Undesired phase "wiggling" of the holding tone. This figure will generally be the Phase Jitter reading minus the effects of random noise.
Signal-to-Noise Ratio	The measurement of the relation between the signal strength and the noise strength, measured in decibels.

Refer to Table 2-2 for a list of the LQA Line Threshold Limitations.

Table 2-2. LQA Line Threshold Limits

Parameter	Line Threshold Limits
Loss at 1004 Hz	-3 dB to -36 dB
Frequency Translation	-10 Hz to 10 Hz The Omnimode 96, 14.4, and 1614 have a frequency translation limit equal to approximately 7 Hz.
Phase Jitter	25 degrees maximum (peak-peak)
Phase Modulation	25 degrees maximum (peak-peak)
Amplitude Jitter	20 percent maximum
C-Notched Noise	-70 dBmC to -9 dBmC
Signal-to-Noise Ratio	12 dB to 36 dB

Table 2-2. LQA Line Threshold Limits (Continued)

Parameter	Line Threshold Limits
Envelope Delay Distortion: Range Line Threshold	300 Hz to 3200 Hz 6000 msec maximum <i>Note: The Omnimode 96 does not record 300 Hz.</i>
Attenuation Distortion: Range Line Threshold	300 Hz to 3200 Hz -6 dB to 18 dB
Impulse Noise	999 counts maximum (1 to 60 minutes)
Phase Hits	999 hits maximum (1 to 60 minutes)
Gain Hits	999 hits maximum (1 to 60 minutes)
Dropouts	999 dropouts maximum (1 to 60 minutes)

Bell Standard Line Threshold sampling periods are 15 minutes for impulse noise, gain hits, and phase hits; and 60 minutes for dropouts. If you wish to compare test results with predefined Line Thresholds, ensure that the test time duration(s) entered when selecting tests to execute equal(s) the reference times for the predefined Line Thresholds of the line you are testing.

Dropouts are measured with impulse noise, gain hits, and phase hits. Therefore, if test results for dropouts are to be compared with predefined Line Thresholds, ensure that at least one test time duration entered when selecting tests to execute equals the predefined reference time for dropouts for the line you are testing.

Graphic and text displays are used to tell you whether a circuit is in or out of specification.

Initiating an LQA Test

To initiate an LQA test, follow these steps:

1. Choose **Test** from the CMS 400 Main menu bar.
2. Select **Line Quality Analysis** from the Test menu. The **Select An Operation** screen is displayed.

3. Select **Initiate Tests** and the standard **Unit Criteria Selection** screen is displayed. Select a remote unit to place into test and press **PGDN**. The selected unit is polled to determine its current status. The **LQA Test Selection** screen is displayed (refer to Figure 2-1).

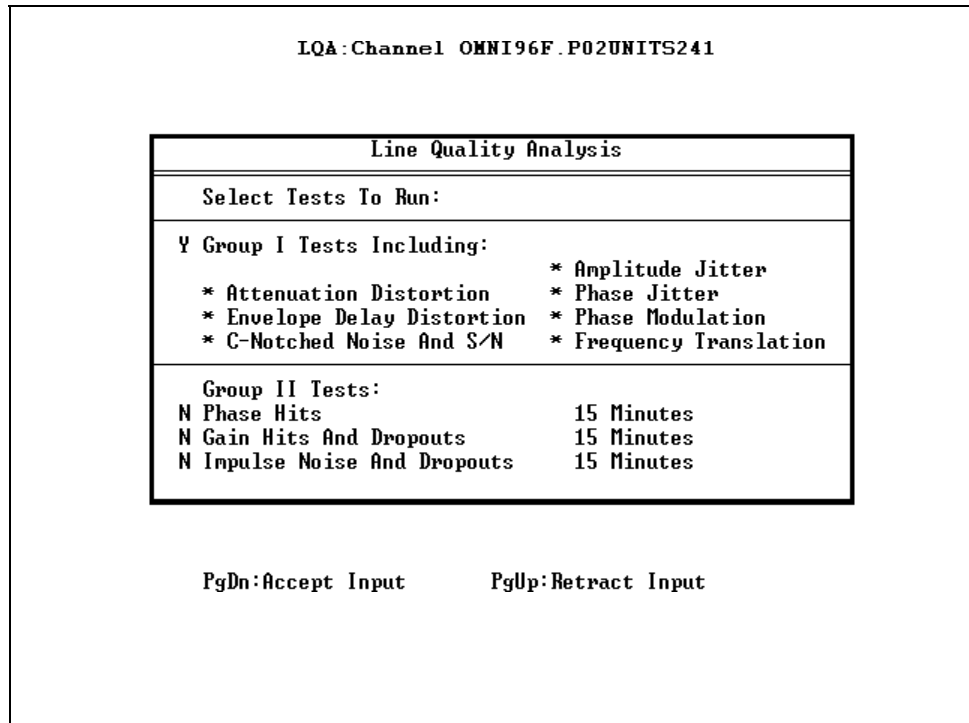


Figure 2-1. LQA Test Selection Screen

4. Choose the LQA tests by entering a **Y** (yes) or **N** (no) next to the appropriate test in the LQA Selection screen. Refer to Table 2-1 for a list of the LQA Test Definitions.
5. Press **PGDN** to put the selected unit and its associated central into test.

Group I Tests run in a minute or so, but Group II Tests take 15 to 60 minutes each. Once a test is initiated, you are presented with a menu that allows you to select whether to wait for completion or exit.

Tests are executed and results are retrieved from the central unit. You can leave the current test running and exit the wait screen. The next section explains how to return to the wait screen.

Waiting for an LQA Test to Complete

You may wait for an LQA test to complete by following this step:

1. With the LQA Select An Operation screen displayed, choose `Wait For Completion` and the system checks to see if an LQA test is in progress.

If a test is active, the system waits for all scheduled tests to complete. If no test is active, a message is displayed allowing you to continue with another operation.

Note: If tests are running and you exit this operation, only the currently-running test completes; subsequent tests are executed when you re-enter the Wait For Completion mode.

Displaying your Test Results

To display your LQA test results, follow this step:

1. With the LQA Select An Operation screen displayed, select `Display Test Results` and the results of the LQA tests are displayed.

These results are stored in temporary memory, and are time and date stamped against a chosen standard. Table 2-3 defines the test accuracy's.

Note: The following results are stored in a temporary location in memory. The message: "Data not available" is displayed when the current LQA results are not stored in temporary memory.

Advancing Through Test Results

The test results display first defaults to a graphic format where in-tolerance ranges are shown in green and out-of-tolerance ranges are shown in red.

Press the space bar to toggle between the graphic and text display.

Press `ENTER` or `PGDN` to advance through the result screens.

Press `TAB` to step through the various line conditioning standards (refer to Figures 2-2 through 2-5) for examples of test results.

LQA:Channel OMNI96F.P02UNITS241			
01/06/93 16:41:38	Channel CHANNEL_273 Remote 2		Central 1
Line Quality Parameter	Remote Receive	Central Receive	C1 Cond Standard
Transmit Level	0 dBm	0 dBm	
Receive Level	-15.3 dBm	-15.6 dBm	
Loss at 1004 Hz	15 dB	16 dB	12 to 20 dB
Phase Modulation	0 °	0 °	°
Phase Jitter	1 °	0 °	10 °
Amplitude Jitter	0 %	0 %	%
Frequency Translation	0 Hz	0 Hz	-5 to 5 Hz
C-Notched Noise	- 53 dBmC	- 53 dBmC	dBmC
Signal-To-Noise Ratio	38 dB	38 dB	24 dB
ESC:Done	PgDn/PgUp:More	Tab:Next Standard	Space:Graphics

Figure 2-2. LQA Results (Text Format)

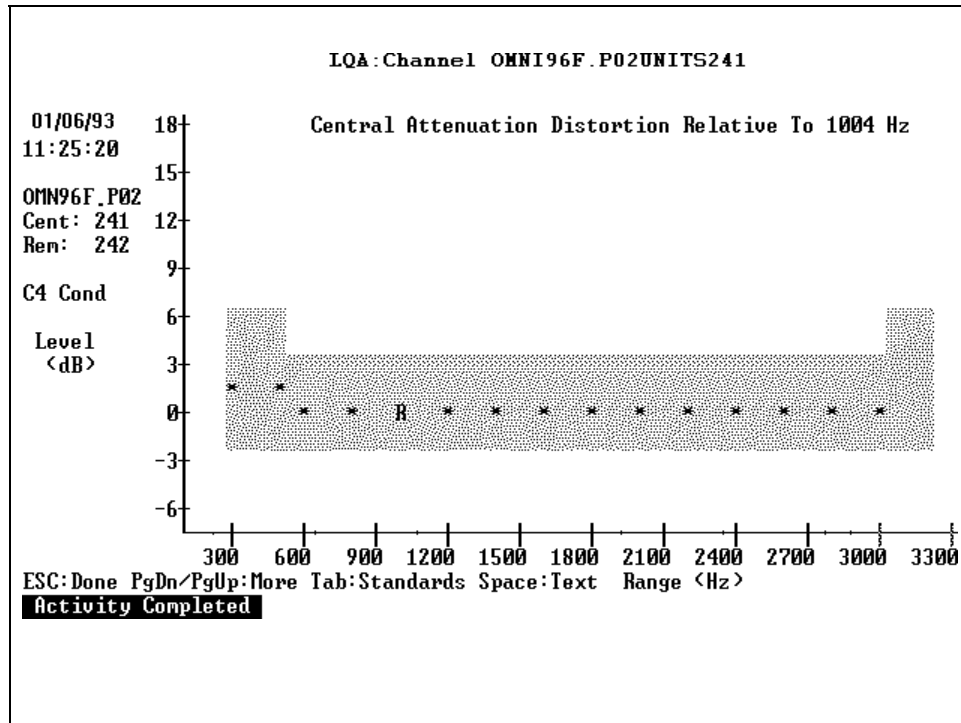


Figure 2-5. Attenuation Distortion Results (Graphic Format)

Press **[PGUP]** to back up through the LQA test result screens.

LQA Test Accuracy's

LQA test accuracy's are standard parameters that are used to conform to a standard measurement or true value of a line. Refer to Table 2-3 for a list of LQA Test Accuracy's.

Table 2-3. LQA Test Accuracy's

Parameter	Accuracy		
Loss	± 1 dB Flat		
Frequency Translation	± 0.5 Hz		
Phase Jitter	± 1 Degree		
Phase Modulation	± 1 Degree		
Amplitude Jitter	± 1 %		
C-Notched Noise	± 1 dB		
Signal-to-Noise Ratio	± 1 dB		
Envelope Delay Distortion	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Excalibur 19.2: 304 Hz - 604 Hz: + 50 us 1004 Hz - 2604 Hz: + 25 us 2804 Hz - 3204 Hz: + 50 us</p> <p>Omnimode 48, 14.4 and 1614: 304 Hz - 604 Hz: ± 50 us 1004 Hz - 2604 Hz: ± 25 us 2800 Hz - 300 Hz: ± 50 us</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Omnimode 96: 504 Hz: + 100 us 604 Hz - 804 Hz: + 50 us 1004 Hz - 2604 Hz: + 25 us 2804 Hz - 3204 Hz: + 50 us</p> </td> </tr> </table>	<p>Excalibur 19.2: 304 Hz - 604 Hz: + 50 us 1004 Hz - 2604 Hz: + 25 us 2804 Hz - 3204 Hz: + 50 us</p> <p>Omnimode 48, 14.4 and 1614: 304 Hz - 604 Hz: ± 50 us 1004 Hz - 2604 Hz: ± 25 us 2800 Hz - 300 Hz: ± 50 us</p>	<p>Omnimode 96: 504 Hz: + 100 us 604 Hz - 804 Hz: + 50 us 1004 Hz - 2604 Hz: + 25 us 2804 Hz - 3204 Hz: + 50 us</p>
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Attenuation Distortion	<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Excalibur 19.2: 304 Hz - 2604 Hz: $\pm .5$ dB 2804 Hz - 3204 Hz: ± 1 dB 1804 Hz - 2204 Hz: ± 0.5 dB 2404 Hz - 3204 Hz: ± 0.8 dB</p> <p>Omnimode 48: 304 Hz - 604 Hz: ± 0.75 dB 804 Hz - 2604 Hz: ± 0.3 dB 2804 Hz - 3204 Hz: ± 0.4 dB</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Omnimode 96, 14.4, and 1614: 304 Hz - 604 Hz: ± 0.4 dB 804 Hz - 1604 Hz: ± 0.3 dB 1804 Hz - 2204 Hz: ± 0.5 dB 2404 Hz - 3204 Hz: ± 0.8 dB</p> </td> </tr> </table>	<p>Excalibur 19.2: 304 Hz - 2604 Hz: $\pm .5$ dB 2804 Hz - 3204 Hz: ± 1 dB 1804 Hz - 2204 Hz: ± 0.5 dB 2404 Hz - 3204 Hz: ± 0.8 dB</p> <p>Omnimode 48: 304 Hz - 604 Hz: ± 0.75 dB 804 Hz - 2604 Hz: ± 0.3 dB 2804 Hz - 3204 Hz: ± 0.4 dB</p>	<p>Omnimode 96, 14.4, and 1614: 304 Hz - 604 Hz: ± 0.4 dB 804 Hz - 1604 Hz: ± 0.3 dB 1804 Hz - 2204 Hz: ± 0.5 dB 2404 Hz - 3204 Hz: ± 0.8 dB</p>
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Impulse Noise	± 0.5 dB for each level		
Phase Hits	$\pm 5\%$ of threshold level plus ± 2 degrees		
Gain Hits	± 0.5 dB for each level		
Dropouts	± 1 dB		

Storing Test Results to a File

To store your previous test results to a file, follow this step:

1. After the LQA tests are complete, select `Store Results to File` and the results are then stored into a file for later access. These results are time and date stamped. Refer to the "Retrieving Test Results from a File" for a description of result files.

Note: If you exit out of the LQA operation the results are erased from memory.

Saving Test Results in a Report File

To save test results in a report file, follow these steps:

1. With the `Select An Operation` screen displayed, choose `Display Test Results` and the `Select A Destination` screen is displayed.
2. Select `Disk File` and a prompt is displayed to enter any name with a `.REP` extension and press `PGDN`.

The `Mode and Standard` prompt is displayed to select the `Mode` (graphic or tabular) and the `Standard` (Bell, etc.) to a report file.

3. Choose `Report` from the CMS 400 Main menu bar.
4. Select `File Report` from the `Report` menu and the file path prompt is displayed.
5. Enter the file name of your report press `PGDN`. The `Select A Destination` screen is displayed to select either: `Screen`, `Hub Printer`, or `Station Printer`. Refer to "Selecting A Destination for your Results" for a description of destinations for your LQA results.

Retrieving Test Results from a File

To retrieve results from a file, follow these steps:

1. Choose `Test` from the CMS 400 Main menu bar.
2. Select `Line Quality Analysis` from the `Test` menu and the `Select An Operation` screen displayed.
3. Select `Fetch Results From File` and the LQA stored results screen is displayed.

The system prompts you for a specific set of LQA results from the LQA result file. These results have been stored in a result file and are time and date stamped.

4. Press **[PGDN]** until the date, time and channel name of your test is displayed.
5. Press the space bar to select the LQA stored results of your choice.
6. Select **Display Test Results** and the **Select A Destination** screen is displayed. Refer to "Selecting A Destination for your Results" for a description of destinations for your LQA results.

Note: The message: Data Not Available is displayed when LQA result(s) are not stored in the LQA result file.

Selecting A Destination for your Results

To choose a destination on which the LQA results are sent, select either **Screen**, **Hub Printer**, or **Station Printer** and press **[ENTER]**.

If **Screen** is selected, the LQA test results are displayed on your workstation.

If **Hub Printer** is selected, the LQA test results are printed on the Hub Printer.

If **Station Printer** is selected, the LQA test results are printed on the Station Printer.

Removing all Test Results from a File

To erase all LQA Test results from a file, follow this step:

1. With the **Select An Operation** screen displayed, choose **Erase Results in File** and the LQA Test results in the file are automatically erased.

Deleting Individually Stored Test Result Files

To delete individually stored LQA test result files, follow these steps:

1. With the **Select An Operation** screen displayed, choose **Fetch Results From File** and the LQA stored results screen is displayed.

The system prompts you for a specific set of LQA results from the LQA result file. The result files have been automatically stored from previous tests and are time and date stamped.

2. Press **[PGDN]** or use the arrow keys until the date, time and channel name of your test result is highlighted.

3. Press to remove the selected stored LQA result. You are then prompted: Are you certain Press to confirm. Press any other key to cancel. If Yes is chosen, the LQA test result is deleted.

Canceling an LQA Test

To cancel a current LQA Test, follow this step:

1. With the Select An Operation screen displayed, choose Cancel Tests and the central and remote units are reset, terminating any current tests in progress.

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_____ Too technical _____ Suitable technical level _____ Not technical enough

Are technical terms clearly defined?

_____ Excellent _____ Good _____ Fair _____ Poor

Rate the quality of the illustrations:

_____ Excellent _____ Good _____ Fair _____ Poor

Are the manual's instructions clearly written?

_____ Excellent _____ Good _____ Fair _____ Poor

Rate the quantity of the illustrations in this manual:

_____ Too many _____ Suitable amount _____ Not enough

Does this manual contain all the information you require? (Y/N)

If not, what would you suggest we add to make the manual more useful?

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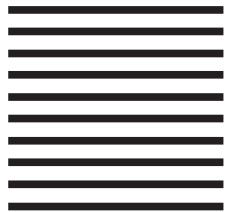
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