

# 7000 Command Notes

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# 1 Overview

## 1.1 Introduction

This document contains instrument-specific notes for the RS232-based FIPP (Frye Instrument Packet Protocol) commands for the Fonix 7000. Descriptions of the commands can be found in the FIPP command Reference Guide, *commands.txt*.

FIPP was first implemented on the Fonix 6500. Most of the commands listed in the FIPP command Reference Guide (*commands.txt*) operate as specified. There are some minor changes in the operation of some commands due to the differences between the 7000 and other Frye instruments. These differences are described in this document.

## 2 Command Notes

### 2.1 Miscellaneous Global Commands

#### 2.1.1 Get Last Measured Curve (cmd 42)

The 7000 supports Get Last Measured Curve (cmd 42) in all modes. (The 6500 only supports it in probe modes.) However, there are a few caveats. Switching to test sequence modes like ANSI, IEC, or JIS will clear the last measured curve buffer, as will sending a curve to the 7000 via RS232.

### 2.2 Miscellaneous Modal Commands

#### 2.2.1 Set/Get Amplitude (cmd 0/21)

The 7000 allows the amplitude to be set in 0.1 dB steps from 0 to 100 dB in chamber mode, and from 0 to 90 dB in probe mode. Setting the source amplitude to 0 turns it off. Test sequences may over-ride the source setting if the source is required to be at a specific level.

The keyboard changes amplitude in 5dB steps. If amplitude has been set via RS232, amplitude changes via the keyboard will round to the nearest 5dB step.

#### 2.2.2 Set/Get Frequency (cmd 2/23)

The 7000 source can be set via RS232 to any pure tone frequency on a 50Hz boundary between 50Hz and 8000Hz for single frequency measurements. The front panel controls limit frequency to 100Hz intervals in the range allowed by the current test mode. Changing frequency with the keyboard will round to the nearest 100Hz interval.

#### 2.2.3 Get/Set Probe mode (cmd 7/35)

Commands 7 and 35 are obsolete, and will disappear in a future revision of 7000 software. Use Set/Get Instrument State (59/60) instead.

Cmd 7 instructs the 7000 to go to probe mode from coupler (value=1), and from coupler mode to probe (value=0). If called from the opening screen (major mode 0) Get/Set Probe will return a value of -1. Cmd 7 with a value=-1 will return to the opening screen from either coupler or probe. This command is not available in any other major modes of operation.

### 2.2.4 Get/Set Reference Microphone Status (cmd 52/53)

A reference microphone is not supported in chamber modes (coupler, ANSI, IEC, JIS, etc) at this time. Get Reference Microphone Status will return zero in chamber modes, and attempts to enable the reference microphone via a non-zero argument to Set Reference Microphone Status will fail.

### 2.2.5 Get/Set Operating Mode (cmd 77/78)

This command works on the 7000 in both coupler and probe modes. It is used to select between the standard source types, as shown in the following table:

Operating Modes		
0	Standard Pure Tone Sweep	1/12th octave
1	Composite Chirp	FP40 method
2	Fast Sweep	1/3rd octave
3	Single Tone	
4	Short (Burst) Sweep	1/2 octave
5	Composite Noise	6500 method
6	Digital Speech Noise	6500 method
7	ICRA Digital Speech	obsolete, use Set Filter
8,9	reserved	reserved
10	Long Sweep	6500 method, 64 frequency

### 2.2.6 Set/Get Aid Selection (cmd 123/124)

This command is used to set the aid group and/or aid type. If one argument is passed, the aid group is set. If a second argument is passed, the aid type is set. A value of 8000H retains the current setting.

Aid group settings change delays used during testing. The default per-group delay times may be adjusted individually via RS232 with Set/Get Measurement Delay (cmd 84/83), or via keyboard by menu selection.

The default Aid Group selection for the 7000 is a linear aid. The Aid Type selection defaults to None.

Aid Types	
0	None
1	BTE
2	ITE
3	ITC
4	CIC (canal)

Note that long delays may slow down instrument response times.

### 2.2.7 Get Software Information (cmd 95)

This command provides additional information about the software in the 7000, including instrument type, current software version, language and boot loader version number.

Six data are returned:

	Get Software Information (cmd 95) returned data
1	Instrument (7000)
2	Software Version (120 = 1.20)
3	Language (0 = unknown, 1 = English)
4	BootLoader Version
5	EErom Format Version
6-9	Unit Serial Number
10-11	Unit Manufacture Date

### 2.2.8 Get/Set Instrument State (cmd 59/60)

Set Instrument State is also used to navigate between screens on the instrument via RS232. It replaces individual state selection commands such as Set Probe Mode (command 7) and Set IO Mode (command 10).

Unlike the 6500 which starts a test automatically when entering automated test sequence major modes, the 7000 requires either an explicit Do Start/Stop (cmd 16) or a subsequent Set Instrument State (cmd 59) to minor mode 1 after entering a new major state in order to start a test.

Unlike the 6500 and FP40, The 7000 allows direct navigation between major modes via RS232. If backwards compatibility to such units is desired, explicit requests for major mode -1 (exit current state) should be repeated until the top screen is reached before requesting a new major mode. (The top screen is Major mode 0 on the FP35 and 7000, and Major mode 1 on FP40 and 6500.) Reset (cmd 38) can also be used to reach the top screen, but has side-effects which vary on a per-instrument basis.

## 2.3 Battery Test Commands

### 2.3.1 Do Battery (cmd 14)

Command 14 (Do Battery) is obsolete.

In early versions of the 6500, Do Battery (cmd 14) was required before collecting a battery current measurement. This command is implemented as a no-op on the 7000 for backwards compatibility.<sup>1</sup>

### 2.3.2 Get Battery Data (cmd 19)

The 7000 measures battery information continuously when the battery test is enabled. The command has been extended to return four parameters, including battery voltage and

<sup>1</sup> Battery current measurements would normally be enabled/disabled via Set Battery Type (cmd 79) command, which will appear in a future revision of 7000 software.



impedance. The Battery simulator types returned by the Get Battery Data command are as follows:

	Type	Voltage	Impedance
8	NONE (external)	N/A	N/A
9	10A/230 Zinc-Air	1.3V	6.0Ω
10	312 Silver	1.5V	10.0Ω
11	unused		
12	312 Zinc-Air	1.3V	6.0Ω
13	13 Silver	1.5V	8.0Ω
14	unused		
15	13 Zinc-Air	1.3V	6.0Ω
16	76 Silver	1.5V	5.0Ω
17	unused		
18	675 Zinc-Air	1.3V	3.5Ω
19	unused		
20	unused		
21	unused		
22	5 Zinc-Air	1.3V	8.0Ω

Battery types 0 through 7 are used by the 6500 and are not valid for the 7000.

### 2.3.3 Start Test (cmd 16)

In the 6500 this is only valid in the main coupler screen when in pure tone mode. In the 7000, this function is available in all test modes in which start or stop are valid operations from the keyboard.

### 2.3.4 Get/Set Active Status (cmd 54/55)

In the 6500 this is only valid in probe mode. In the 7000, this command is available in all modes where starting and stopping a test are valid operations from the keyboard.

### 2.3.5 Do Reset (cmd 38)

Do Reset (cmd 38) does not set the 7000 to coupler mode. Custom software originally written for the 6500 which uses Command 38 to set the instrument to coupler mode will need to be modified to follow a Do Reset by Set Instrument State (cmd 59) to set the 7000 to state 1:0.

Unlike the 6500 and FP40 which change state to the coupler screen (state 1:0), the 7000 changes state to the opening screen (state 0:0). Sending Do Reset to the 7000 will also delete test data. See [Section 2.2.8 \[instrument state\]](#), page 4 for more information on how to portably change instrument state.

Do Reset (cmd 38) does not set the 7000 to an absolute known state as it does on the 6500.

Do Reset propagates settings from the main setup menu to per-screen menus. Since the main setup menu items are user-controllable, their values cannot be known ahead of time, and thus Do Reset is not entirely deterministic on the 7000.

### 2.3.6 Set/Get KeyCode (cmd 72/58)

Set/Get KeyCode (cmd 72/58) are intended for Frye internal development and quality control purposes only. Use of these commands is strongly discouraged!

The 7000 uses a subset of 16-bit Unicode for keypresses, as listed in *7000keys.doc*. The probe keyboard and front panel keyboards return identical keypresses. Keypresses are recorded in a single-entry buffer which is cleared by sending a Set KeyCode command with keycode of zero.

Like the 6500, it is possible for Set KeyCode to place the 7000 in a state where it is no longer responsive to RS232, but is otherwise still functional via keyboard.

### 2.3.7 Set Spectrum (cmd 68)

The Set Spectrum command only affects the composite signal. The values are given in dB\*100 and are added to the respective frequency component of the 7000 composite signal. This differs from the 6500 which used multiplicative scaling factors rather than additive values.

Valid values for individual spectrum entries are between -32767 and +32767, which correspond to -327.67dB and +327.67dB, respectively. A value of zero results in no change of component amplitude in the composite signal. These corrections are effectively limited by the dynamic range of the 7000's hardware, which is approximately 65dB.

Note that the RMS level is not corrected for the generated signal loss. The overall RMS is based on an idealized composite signal with no spectrum adjustments. This allows unmodified frequencies to remain unchanged in amplitude and those which are changed to be set to the specified difference from the ideal composite signal. The Do Reset and Do Level commands will reset the spectrum shaping to flat. The uncorrected composite signal may be restored by either sending a Do Reset command, or sending Set Spectrum with all zeros for adjustment values.

## 2.4 Coupler Mode (1:0) Commands

### 2.4.1 Set/Get Weighting Mode (cmd 8/30)

Commands 8 and 30 are obsolete, and will disappear in a future revision of 7000 software. Use Set/Get Gain (12/36) to change between Gain and SPL modes, and Set/Get Filter (136/137) to change the weighting filter.

### 2.4.2 Set/Get CIC Status (cmd 88/87)

### 2.4.3 Set/Get OES Status (cmd 3/24)

Commands 88, 87, 3, and 24 are obsolete, and will dissappear in a future revision of 7000 software. Use Set/Get Coupler Type (172/173) for direct control of coupler type.

### 2.4.4 Set/Get Telecoil State (cmd 11/37)

The telecoil output transducer can be selected from within coupler mode (1:0) with Set Telecoil State.

If the transducer is changed, the generation and measurement loop will be stopped if currently active.

### 2.4.5 Set/Get Ear (cmd 75/76)

Only Left (1) and Right (2) selections of the Standard (0) configuration are currently supported.

### 2.4.6 Set/Get Static Tone (cmd 121/122)

A selection of None (0) will cause the chamber to be silent when a measurement is not active.

If Single (1) is selected, a single pure tone signal will be presented when sweep or composite is not active.

If Average (2) is selected, a three frequency average will be presented when a sweep or composite is not active. The frequency set can be queried and/or changed with Get/Set Average Frequencies (cmds 81/82).

Measurement made during static tone(s) presentation is returned by Get Microphone Data (cmd 31).

### 2.4.7 Get/Set Filter (cmd 136/137)

The filter used when weighted power or gain are selected. Flat/no filter (1), ANSI (2), ICRA (3), and ANSI92 (6) filters are currently supported.

### 2.4.8 Get/Set Coupler (cmd 172/173)

The coupler and associated corrections (if necessary) can be queried and set directly with Get and Set Coupler. The following couplers are available:

Coupler

0	none / no correction
1	2cc (no correction)
2	MZ(OES)
3	CIC

## 2.5 Real Ear IG & SPL Screen Commands

### 2.5.1 Smoothing (cmd 5/27)

Only log smoothing is available in the 7000; 100 Hz smoothing is no longer supported.

### 2.5.2 Get Microphone Data

See [Section 2.5.3 \[get refmic data\]](#), page 8

### 2.5.3 Get RefMic Data (cmd 31/57)

A value is returned only in single tone mode with the source on. An ILL will be returned if not in single tone mode.

### 2.5.4 Get/Set Ref Mic (cmd 52/53)

Like the 6500, the 7000 only allows reference mic usage in probe mode.

### 2.5.5 Set/Get Static Tone (cmd 121/122)

Producing a single or three-frequency signal when sweep or composite measurements are inactive is not possible in probe mode; it was determined that such a situation would prove annoying for the test subject. However, if presentation of single or average tones to the user is desired,

### 2.5.6 Get/Set Filter (cmd 136/137)

The filter used when weighted power or gain are selected. Flat/no filter (1), ANSI (2), and ICRA (3) filters are currently supported. In addition, when using pure-tone sweeps in probe mode, Auto (0) filter can be used which uses ANSI filter below 85dBSPL, and Flat filter at 85dBSPL and above, like to the 6500.

## 2.6 Audiogram Screen Commands

The Audiogram mode supports many of the commands available in probe mode, in addition to its own set of commands.

### 2.6.1 Do Start/Stop (cmd 16)

see notes for Set/Get Active status in the next section.

### 2.6.2 Set/Get Active status (cmd 54/55)

Commands 16 and 54 can be used to start an RECD test sweep. The instrument must already be in RECD mode and measured RECD must be selected.

### 2.6.3 Set/Get Ear (cmd 75/76)

As with Real Ear modes, the current ear being tested can be selected with the Set Ear command.

### 2.6.4 Set/Get Client Age (cmd 140/141)

Client Age is used in conjunction with Fitting Rule to generate the desired target. Client Age will also change the average REUR, REDD and RECD values, unless they have been previously measured.

### 2.6.5 Set/Get Fit Rule (cmd 134/135)

Fit Rule is used in conjunction with Client Age to generate the desired target. Fit Rule will also change average REUR, REDD and RECD values.

	Fitting Rule
0	NAL-RP
1	BERGER
2	POGO
3	1/3 Gain
4	1/2 Gain
5	2/3 Gain
6	direct
7-15	reserved

### 2.6.6 Set/Get Selected Curve (cmd 112/113)

See [Section 2.6.7 \[audiogram curve status\]](#), page 9.

### 2.6.7 Set/Get Curve status (cmd 114/115)

Set/Get Selected Curve and Curve Status work in the audiogram screen on the 7000, with the following caveats: Audiogram curves cannot be made inactive with Set Curve Status, but can be erased via Set Curve State to 0. Get Curve Status (cmd 115) will return either empty (0) or non-empty (2).

Audiogram curve 0 is the frequency curve, and cannot be selected as a measurement curve. Selecting curve 0 will be ignored.

Audiogram Curves:

Curve name	Number	Description
AU_FREQ	0	Frequency
AU_HTL	1	HTL (Hearing Threshold Level)
AU_UCL	2	UCL (Uncomfortable Client Level)
AU_RECD	3	RECD (Real-Ear to Coupler Difference)
RECD mode	Number	Description
AU_AVG_RECD	0	Average RECD
AU_MEAS_RECD	1	Measured RECD

RECD Mode selections are available when the RECD curve is selected. The current RECD mode selection will be used if a specific RECD Mode selection is not provided. RECD Mode selection is only available with the RECD curve selection.

## 2.6.8 Set/Get Curve Frame (cmd 9/25)

Audiogram curves (The data displayed in the box between the graphs) can be get and set via Set/Get Curve Frame commands. When setting a curve, the curve number can be included just before the curve frame. The set curve command length is 24 words if no curve number is included, or 25 words if it is included. See [Section 2.6.8 \[audiogram curves\], page 10](#) for a list of audiogram curve names, curve numbers and curve descriptions.

In order to set the RECD curve, first use Set Selected Curve (cmd 112) to select the measured RECD curve using 2 parameters. In order to get the RECD curve, first use Set Selected Curve (cmd 112) to select the desired average or measured RECD curve using 2 parameters.

Audiogram curves use the audiogram curve format (with 16 data points). Curves can be sent and read to the audiogram screen. The frequency curve holds the frequency list in the audiogram table, is not a regular curve, and is not modifiable.

## 2.7 Target Coupler, AI Probe

Target Coupler and Audibility Index probe modes are not currently available in 7000 software.<sup>2</sup>

## 2.8 Target Edit Mode Commands

### 2.8.1 Set/Get Curve Frame (cmd 9/25)

Target edit curves can be get and set. When setting a curve, the curve number is optionally included just before the curve frame. The set curve command length is 25 words with a

<sup>2</sup> Target Coupler is planned; future implementation of AI is still being debated.

curve number, or 24 words without. See [Section 2.9 \[target curves\]](#), page 11 for the list of target edit curves.

Target curves use the audiogram curve format (with 16 data points). Curves may be sent or read to and from the target edit screen. The frequency curve(0) is used to hold the frequency list in the audiogram format, it cannot be stored into.

### 2.8.2 Set/Get Selected Curve (cmd 112/113)

In order to set the measured REDD curve, use Set Selected Curve to select the REDD curve with the first parameter, and the measured REDD with the second parameter. In order to get the REDD curve, use Set Selected Curve to select the desired average or measured REDD curve again using 2 parameters. The frequency curve(0) can't be selected.

Target Curves:

Curve name	Number	Description
TA_FREQ	0	Frequency
TA_HTLre	1	HTL (SPLre)
TA_TARGre	2	Target (SPLre)
TA_UCLre	3	UCL (SPLre)
TA_REDD	4	REDD
TA_TARGIG	5	Target IG
REDD mode	Number	Description
TA_AVG_REDD	0	Average REDD
TA_MEAS_REDD	1	Measured REDD

## 2.9 New Commands

These commands are not available in the 6500 or FP40, but are available and behave similar to the FP35.

### 2.9.1 Set Blob (cmd 99)

The 7000 allows test results from ANSI, IEC, and JIS tests to be externally set.

### 2.9.2 Set/Get Curve status (cmd 112/113)

### 2.9.3 Set/Get Selected Curve (cmd 114/115)

### 2.9.4 Set/Get Selected Unaided Curve (cmd 116/117)

These new commands allow the currently active curve to be read or selected. Only the currently selected curve may have its status. Note: Cmd 112, 113, 114 and 115 refer to the selected curve on the screen, and not the curve ID number that the Set/Get curve (cmd 9/25) use. This may cause potential confusion since the numbers are not the same.

### 2.9.5 Set/Get Impulse Rejection (cmd 107/108)

Impulse rejection can help to improve time averaged measurements in noisy conditions. It has no effect if Noise Reduction is turned off. When the rms of a single measurement exceeds the previous measurement by the amount specified for Impulse rejection, that measurement will be discarded and another one made. The amount of Impulse rejection can be set between 0 (off) and 24db. Values smaller than 3dB in sound field measurements probably should be avoided since the probability of repeated measurements that are stable below 3db is low, which can significantly slow down the measurement system as too many valid measurements may be discarded.

### 2.9.6 Set/Get RealTime Clock (cmd 104/103)

The date and time real time clock in the 7000 can be set using this command.

### 2.9.7 Get Signal Information (cmd 109)

This command provides information on how the 7000 produces and measures signals. It provides the following information:

- 1: SampleRate           = samplerate of signal
- 2: CaptureSamples      = number of capture samples
- 3: SourceSamples       = number of samples in source
- 4: RampSamples          = ramp up/down samples
- 5: CouplerSkew          = source to coupler mic sample delay
- 6: ProbeSkew           = source to probe mic sample delay
- 7: InA.PrescaleGain    = InputA prescale gain (coupler)
- 8: InB.PrescaleGain    = InputB prescale gain (probe)
- 9: OutL.RmsOffset      = Lchan single tone to rms offset
- 10: OutR.RmsOffset     = Rchan single tone to rms offset
- 11: OutL.MaxLevel      = Lchan max possible output level
- 12: OutR.MaxLevel      = Rchan max possible output level
- 13: InA.GainIndex       = InputA prescale gain index (coupler)
- 14: InB.GainIndex       = InputB prescale gain index (probe)



## 3 Data

### 3.1 Miscellaneous Data

#### 3.1.1 Get Calibration Data (cmd 111)

In the future, this command will return calibration information for the 7000 microphones, but not until the hardware is revised.

#### 3.1.2 Get Raw Data (cmd 110)

Command	Response
-----	-----
006E Cmd number (110)	806E Rsp number
0003 Three words	xxxx Variable length
xxxx Sample Selection	xxxx Sample Selection
nnnn How to collect	xxxx Sample Style
0=get current data	xxxx Trigger Offset
1=capture n samples	xxxx Sample Rate
zzzz Number of samples	xxxx Prescale Gain
0=default count	xxxx Start Index of data
	.... Binary sample data

- The sample selections available consist of the following:
  - 0=Coupler (MicA) Raw sample data (raw time domain data)
  - 1=Probe (MicB) Raw sample data (raw time domain data)
  - 2=Coupler (MicA) Time Averaged sample data (w/noise reduction)
  - 3=Probe (MicB) Time Averaged sample data (w/noise reduction)
  - 4=Left Source

Note: if source is off, data cannot be time averaged.

- The maximum allowed samples to capture is 1024. The minimum allowed is 64. If less than the minimum is requested, the default of 256 samples will be used. If more than 1024 is requested, the number collected will be limited to 1024.

<Cmd 110 Response> - The length of the returned response is dependent upon the requested number of samples. - The Sample Selection value is a copy of the requested sample selection in the original command. - The Sample Style is 12 bits per sample. - The Trigger Offset is how far into the sample array the first synchronous data point can be found. Note that the trigger offset is different for the probe and coupler mics because of the longer delay through the probe.

The Prescale Gain is how much gain has been added to the signal. The prescale gain can be used to exactly determine the strength of the signal.

The Start index value is the location in the response array where the data starts. This should be used to find the data because future enhancements to the data structure may add more header information between the Start index value and the first data sample.

The data samples start in the received array at the location indicated by the Start Index value, assuming a zero relative word (two byte) array. Data in the 7000 is in smallint form (16 bit integers), low byte first, high byte second (Intel format).

## 3.2 Generic Curve Data

The 7000 uses curve frame types 0 and 1. There are slight differences in the curve data between the 6500 and the 7000. Normally, the 6500 will return data in all curve frame positions. When the 7000 is in pure tone, short or fast sweep mode, it does not measure all frequencies. The unmeasured frequencies will be left at 8000H (32768 decimal).

The 7000 never measures 100 Hz in curve frames.

In Long Pure Tone, the 7000 measures 100Hz intervals from 200Hz through 5600Hz, 100Hz intervals from 5800Hz through 6000Hz, 6300Hz, 6500Hz, 6700Hz, 7100Hz, 7500Hz, and 8000Hz. This mode is identical to the 64-frequency list used by the 6500.

In Normal Pure Tone, the 7000 measures 100Hz intervals from 200Hz through 2200Hz, 2400Hz, 2500Hz, 2600Hz, 2800Hz, 3000Hz, 3100Hz, 3300Hz, 3500Hz, 3700Hz, 4000Hz, 4200Hz, 4500Hz, 4700Hz, 5000Hz, 5300Hz, 5600Hz, 6000Hz, 6300Hz, 6700Hz, 7100Hz, 7500Hz, and 8000Hz.

In Fast Sweep mode, the 7000 will only measure 200Hz, 300Hz, 400Hz, 500Hz, 600Hz, 800Hz, 1000Hz, 1200Hz, 1600Hz, 2000Hz, 2500Hz, 3100Hz, 4000Hz, 5000Hz, 6300Hz, and 8000Hz.

In Short Sweep mode, the 7000 will only measure 200Hz, 500Hz, 700Hz, 1000Hz, 1500Hz, 2000Hz, 3000Hz, 4000Hz, 6000Hz, 8000Hz.

In composite mode the 7000 measures 79 frequencies (200-8KHz).

The 7000 uses curve type 0 for puretone curves, and curve type 1 for composite curves. Distortion values are only sent with pure tone curves (curve type 0).

A note about curves: When a 7000 curve frame is requested which does not contain valid data the 7000 returns an ACK.

Automatic measurement (composite or fast sweep) should always be turned off before sending a curve to the 7000 to prevent the uploaded curve from being overwritten. Smoothing should also be turned off since it may distort the data sent to the 7000.

Refer to the Curve Frame Reference Guide for a description of the curve frame and how it is used.

See the *curve.txt* document for information on time stamps.

### 3.2.1 Coupler Screen Curve Data

The 7000 has additional coupler curve information than the 6500. The curves are referenced by 'curve name' on the 7000 screen, and by 'curve number' in the FIPP commands.

curve name	number (coupler mode)
-----	
Curve 1	0 (current curve)
Curve 2-4	1-3 (unused)

Reference 1	4	(multicurve 1)
Reference 2	5	(multicurve 2)
Reference 3	6	(multicurve 3)
Reference 4	7	(multicurve 4)
Reference 5	8	(multicurve 5)
Reference 6	9	(multicurve 6)
Reference 7	10	(multicurve 7)
Reference 8	11	(multicurve 8)
Reference 9	12	(multicurve 9)
Reference 10	13	(multicurve 10)

Unlike the FP40 or 6500, the 7000 does not have a separate multicurve mode (14). The chamber coupler test screen (1) is the chamber multicurve test screen.

To maintain compatibility, curve 1 is the current selected multicurve measurement curve, regardless of the selected multicurve number, and curves 4 through 13 (reference 1-10) are the specific multicurve numbers 1 through 10.  $mc1=c4/r1$ ,  $mc2=c5/r2$ , . . . ,  $mc10=c13/r10$ .

Distortion information can be sent in the pure tone curve frames, but the distortion information will only be displayed on the screen if it is the currently selected curve on the screen. Non-100Hz harmonic frequencies are measured using a DFT, whereas 100Hz harmonic frequencies are measured with either ERMS, CRMS, TRMS, or a DFT depending on the measurement being made.

### 3.2.2 Real Ear IG & SPL Screens Curve Data

The 7000 real ear curve information is different from the 6500. The curves are referenced by 'curve name' on the 7000 screen, and by 'curve number' in the FIPP commands.

Abbrev	number	(Probe Curve Name)
-----		
REUR	0	(Unaided Response)
REAR	1	(Current Aided Response)
REIG	2	(Current Insertion Gain)
TARG	3	(Target Insertion Gain)
REAR 1	4	(Aided Response #1)
REAR 2	5	(Aided Response #2)
REAR 3	6	(Aided Response #3)
REAR 4	7	(Aided Response #4)
HTL	10	(HTL SPL Target)
LOWT	11	(LOWT SPL Target)
MIDT	12	(MID SPL Target)
HIGT	13	(HIGH SPL Target)
UCL	14	(UCL SPL Target)
REIG 1	100	(Insertion Gain #1)
REIG 2	101	(Insertion Gain #2)
REIG 3	102	(Insertion Gain #3)

**REIG 4 103 (Insertion Gain #4)**

The first four positions refer to REUR (real ear unaided response), REAR (real ear aided response), REIG (real ear insertion gain), and TARG (Target insertion gain), respectively. Curves 1 and 2 are based on the currently selected aided curve. To read the specific aided curves, read from curves 4-7.

In the 7000, the Insertion Gain curves(2,8,9,10,11) are only intended for display. They are not maintained as separate curves internally. Because of this, they cannot be directly modified as on the 6500. They can be read, but not written. To maintain compatibility with existing software, writing to curve 3 will not return an error, however, any data sent will be discarded.

The Target curves only contain data at the frequencies 200Hz, 500Hz, 700Hz, 1000Hz, 1500Hz, 2000Hz, 3000Hz, 4000Hz, 6000Hz, and 8000Hz. Additionally, the data at frequency location 200Hz is actually the data for the 250Hz target frequency, and the data at the frequency location of 700Hz, is actually the data for the 750Hz target frequency. If a target frequency does not contain data, it will contain the value 8000H (32768 decimal).

### **3.3 ANSI87/96/03, IEC, and JIS Information**

#### **3.3.1 Set/Get ANSI03 parameters (cmd 70/71)**

The ANSI03 blob is identical to the ANSI96 blob with the exception of the seventh argument to command 70, which controls the AGC switching pause before I/O and attack and release tests are run.

#### **3.3.2 Get Blob (cmd 61)**

On the 7000, if the hearing aid was not adjusted during the RTG test, the Calculated value will be returned in the blob as INVALID data. This is different the the FP40 or 6500 which return either the OSPL90-77 value or the FOGAVG value. Since the calculated value can be determined from the other information in the blob, it was considered desirable to return INVALID to indicate that the aid was not adjusted. Otherwise there is no way to indicate that condition of the test.

### **3.4 Changing State and Dynamic Data**

#### **3.4.1 Reading Dynamic Data**

Dynamic data may not be valid immediately after changing the operational state of the 7000, such as changing the source amplitude. An example sequence would be; Change Amplitude, Skip Poll(or Quick Terminate), Get Measurement, Skip Poll (or Quick Terminate). The Get Measurement may not return the desire data for the new amplitude. The hearing aid being tested may not have stabilized yet. The stabilization time needed will depend on the hearing aid. The Set Measurement Settle time command can be used to change the amount of time that will be delayed before the measurement is made.

### 3.4.2 Changing State and Reading Values

Remember that a skip poll or Quick Terminate must be performed to release the 7000 from communication mode. As an example, if the source amplitude is changed, a skip poll or quick terminate must be performed to release the 7000 so that it can do a dynamic measurement. Additionally, the first dynamic measurement taken after a system change may be incorrect because the measurement will have been taken before things have settled down. Because of this, discarding the first dynamic reading taken after a system change is suggested. A settle time may also be used.

### 3.4.3 Static and Dynamic Data

A system change is any command that causes the 7000 to change its operational state such as changing mode, source amplitude, or frequency. A dynamic reading is any command that reads dynamic measurement data in the 7000, such as GetMeasurementData. Dynamic data is measurement data that is constantly updated in the 7000. Source Amplitude is static data and will reflect the current system status. Measurement Data is dynamic data and is constantly being updated while the 7000 is running.

## 4 Delays

### 4.1 Test Delays

With the advent of AGC and Adaptive hearing aids, the test delay times used in testing hearing aids have become more important. These delay times can have a significant effect on the results of the tests performed on the hearing aid. It has become important to know what the delay times are, how they are used, and in some cases allow them to be changed for the type of aid being tested.

The 7000 sets the test delays according to the aid group selected. The default delays may be overridden by using the SetMeasurementDelays command. If the instrument is reset, or a new aid group is selected, the measurement delays for the selected aid type will be reloaded.

There are four key delay times used in the 7000 tests.

1. Sweep Start time
2. Sweep Measurement time
2. Misc Start time (eg I/O)
4. Misc Meas time (eg I/O, AVG)

The Start time is the time period used at the start of a test to let the aid settle down. This allows the agc/adaptive circuits in the aid to adjust to the test conditions. The specific action depends on the test being performed. The start time is not saved. The instrument will start up with the default predelay time based on the aid type when turned on. The start time can be changed in the local menu for the selected test, or via RS232. (See the note about Short Tone Sweep for an exception).

The Sweep Measurement time is the time period used in the midst of pure tone sweeps. This allows the aid to settle down after a frequency change is made during the test.

The Misc Start time is the time period used at the start of measurements where long settle times are used, such as the level change during an I/O test. Usually this settle time is used when a change requiring a longer settle time is made, such as the level change during the I/O test, or a larger than normal change in frequency, such as during a three frequency distortion test.

#### 4.1.1 Hardware Delays

The Predelay and Settle time delays are time delays added by the test software to improve the test results for the hearing aid. These times do not include the inherent time delays for the hardware stabilization and capture times for the 7000 when a signal is being presented and captured. The inherent time delays are variable and depend on the test selections being used. In some cases the previous test condition can have an impact.

As an example, if the previous test signal was a pure tone signal, and composite is selected, there will be approximately a 250mS delay before the composite signal is presented when the start button is pressed (the new composite signal is being created during this time period). Starting and stopping the signal once the signal type is changed won't add more delay because the signal is already created.

Other additional delays can occur if the input prescalers need to change the input gain to adjust the signal level to proper measurement range, or the weighting filters are turned on or off. It takes time for the circuits to stabilize to the new configuration. Normally this will happen in 50mS or less.

In addition to the hardware delays, there can be software loop time delays. Thus a change in source level (even if requested via RS232) will not happen immediately. It must wait for the current measurement cycle to complete before the new source level will take effect. The amount of time this takes depends on the test setup and what the test is doing.

Another internal delay is the input to source synchronization. Data collection must be synchronized to the source signal. The source duration is normally 10mS.

In the case of a frequency sweep, there is a minimum time of 10mS from when a signal is measured until the next signal can be measured. Depending on hardware delays, the hardware imposed delay time may be as long as 50mS.

### 4.1.2 Analysis and Display Delays

The primary dominant delay in the system is the analysis and display times. Analysis typically takes 50ms to 100ms per microphone. Display update time is typically 75ms to 150ms. If the displayed curve has a lot of noise in it, or the scale changes the display time will be much longer, typically 250ms to 400ms. The exact time is indeterminant as it depends on multiple interacting actions within the software. However, with a stable signal being presented, the delays will generally be consistant.

Turning the reference mic off will generally make the display update time faster since the signal from the reference mic doesn't have to be analyzed.

The real ear screens take longer to analyze the measured data because there are more calculations that must be performed. Thus the real ear screens take a little longer to be updated. Typically four times a second compared to the coupler screen which is typically eight times a second or more.

## 4.2 Software Delays

There are separate start and measurement delay times for each type of test in the 7000. They are set by the type of aid selected to be tested, but can also be changed to another value from the local menu or via RS232 if required.

### 4.2.1 Sweep Start Time:

If a Linear aid is selected, there will be a 100mS predelay time used in the test. If an AGC aid is selected, a predelay time of 500mS will be used. If an adaptive aid is selected, 2000mS is used.

### 4.2.2 Sweep Meas Time

If a Linear aid is selected, there will be a 20mS delay time used in the test. If an AGC aid is selected, a delay time of 50mS will be used. If an adaptive aid is selected, 100mS is used.

### 4.2.3 Misc Start Time

For ANSI, IEC, and JIS tests, the misc start time is used with other test sequences. At the start of FOG test, the reference test gain setting, the distortion test, and during the equivalent input noise test to separate the source on to source off time. If a linear aid is selected, the settle time is 20mS. If an AGC aid is selected, a settle time of 100mS is used. If an adaptive aid is selected 200mS will be used as the settle time.

### 4.2.4 Misc Meas Time

If a linear aid is selected, the settle time is 20mS. If an AGC aid is selected, a settle time of 50mS is used. If an adaptive aid is selected 100mS will be used as the settle time. This delay is used during an I/O test, three frequency average, and three frequency distortion test.

Once the aid type is selected, all of the above delay times can be changed from the local menu or via RS232 if desired. However remember that each time the aid type is changed, all the delay times will be reset to the predetermined value for the selected aid type. Power cycling the 7000 or pressing the reset button will also reset all the delays.

### 4.2.5 Normal Tone Sweep Start and Measurement Settle

For a Normal tone sweep, the first sweep frequency will be presented to the aid at the currently selected level for the predelay time period.

As each new frequency is presented in the test sweep, the selected short Settle time will precede the measurement at the new frequency.

### 4.2.6 Fast Tone Sweep Start and Measurement Settle

For a Fast tone sweep, the first sweep frequency will be presented to the aid at the currently selected level for the predelay time period immediately after the start button is pushed. After that period, the sweep will be repeated without any predelay between the sweeps. This allows the first test sweep to more closely represent the repeat sweep results. It also provides better RS232 control by not giving the attached computer unstable data from the test.

As each new frequency is presented in the fast test sweep, the selected Short Settle time will precede the measurement at the new frequency.

### 4.2.7 Short (Burst) Tone Sweep Start and Measurement Settle

The Short Tone does not use test delays. Its purpose is to present the signal (a burst) for as short a duration as possible to make the measurement. There is no predelay time, and no settle time for the Short tone.



### 4.2.8 Composite Start delay

In Composite mode, the composite signal will be presented to the aid at the currently selected level for the Start delay time period immediately after the start button is pushed before the first measurement is made. This allows the first test measurement to more closely represent the repeat measurement results. It also provides better RS232 control by not giving the attached computer unstable data from the test.

Once the composite mode signal has been presented and the first measurement made, successive composite mode measurements will be performed as quickly as they can be done by the 7000. The only delays will be the delay time inherent in the software test loop.

### 4.2.9 Static Tone Start and Measurement Settle

The first static measurement in single tone will be delayed by the Start delay time. Successive measurements will be done as fast as possible. There is no additional settle time used for the measurements because the source is not changed, so no settle time is needed.

### 4.2.10 I/O Start delay and Measurement Settle

The I/O test uses the currently selected test Start delay time to present the first signal level to the hearing aid before the first measurement is made. The remaining measurements will be delayed by the Misc Meas settle time selection.

### 4.2.11 Special Tests Start and measurement delays

The first single frequency RTG and distortion measurement in IEC and JIS will occur after the signal has been presented for the Misc Start delay time period. The remaining RTG single frequency loop measurements will occur as fast as possible (no settle time) after the initial pre-delay.

For three frequency average and three frequency distortion measurements, including coupler and real ear static tone, ANSI FOG, ANSI RTG, and ANSI distortion. The first frequency measurement in the sequence will be delayed by the Misc Start delay time. In addition, the first three measurement sets will be discarded. The following individual frequency measurements will be delayed by the Misc Meas settle time. Where repeat measurements are made, such as static average, or ANSI RTG, only the first measurement is delayed by the pre-delay time all others measurements use the Misc Meas time.

For the Equivalent Input Noise test, the time period from source off to measurement of the noise will be delayed by the Misc Start delay time.

## 5 Printing Information

The 7000 supports Hewlett Packard (HPCL) and Epson (Esc-P/2) printers.

### 5.1 Get/Set Printer Label (cmd 6/66/86/89)

There are two lines of text below the normal label text that are available for use by the customer. In the 6500 and FP40 this information must be specially created at the factory. In the 7000, the text can be added by the customer via an extension to the standard label command (just send two more lines of text). Command 86 was extended to add a request for the number of lines to read so that the additional custom text can be read. Command 89 allows the new label information to be stored to eeprom (permanent storage) so that it will be retained when the instrument is turned off.

### 5.2 Do Print (cmd 65)

The 7000 always prints a full screen, and does not require separate top and bottom print arguments like the 6500. The 7000 prints the entire screen when either the Top or Bottom bit flags (or both) are selected.

Print control flags:

```

Bit 0 - Print Label
Bit 1 - (Print Top)      *Print Screen
Bit 2 - (Print Bottom) *Print Screen

```

### 5.3 Do Line Feeds (cmd 64)

Currently only an argument of 1 is supported. For the internal printer, this corresponds to the same amount of paper that the FEED button produces, and is not a single step of the paper feed motor. Requesting a Feed with the external printer selected will send a form feed.

### 5.4 Printer selection flags

The 7000 has two commands to allow the selected printer to be controlled via RS232 (cmd 92/93) Get Printer Selection and Set Printer Selection.

```

Bit 0 - 0=Use internal printer    1=Use external printer
Bit 1 - 0=Print in monochrome     1=Print in color
Bit 2 - 0=Use HPCL printer        1=Use Epson ESCP2 printer
Bit 3-15 - <reserved>

```

When the internal printer is selected, the color and HPCL flags are ignored. The internal printer is always monochrome.

## 6 Option Flags Description

The 7000 contains a standard option flag indicator and a custom option flag indicator that can be read by requesting the version number from the 7000. The software version request will return the Software version installed in the 7000 followed by the option flags. Machine type and sub-type defines the machine being used.

The information is provided as an array of 16 bit words in the following form:

```
vvvv - Version number
oooo - Standard option low word
oooo - Standard option high word
cccc - Custom option low word
cccc - Custom option high word
0035 - Machine type
0000 - Machine sub-type
```

The version number is the indicated version times 100. Thus version 2.24 would be given as "224". The current version and date is also shown on the 7000's opening screen.

Following the version number is the standard option flag indicator. The standard option flag indicator consists of a 32 bit long word which is used to indicate when a standard option has been installed on the 7000. When the bit is on (1), the option has been installed in the 7000 when the bit is off (0) the option is not installed.

Following the standard option flag indicator is the custom option flag indicator. The custom option flag indicator also consists of a 32 bit long word which is used to indicate when a custom option has been installed on the 7000. When the bit is off (0), the option has been installed in the 7000 when the bit is on (1) the option is not installed (opposite of standard options).

Following the custom option flag indicator is the machine identification word and the machine sub-type word. The machine identification word indicates which Frye instrument is responding to the commands. The 7000 instrument will return a 7000 in the machine type word. The machine sub-type specifies the type of 7000. The 7000 will return a sub-type of 0 or -1.

Standard options are options which are available on all 7000s. Custom options are options provided through a special arrangement with a customer and are not available on standard 7000s.

Since custom option definitions can change over time, the individual flag definitions are not covered by this appendix. Contact Frye Electronics if specific information on a custom option is required.

## 6.1 Option Flags

Each 7000 contains a set of flags which tell what options are installed on that instrument. These are split in two categories, standard options and custom options. The two sets of flags are stored as a 32 bit long-word and can be retrieved with the get version message to the 7000. The bits in the standard option long-word are defined as follows:

bit number (long) word	flag - label	functional - description (other)	bit position 76543210 76543210
-----first word-----			
( 0) 0	- ENANSI	- <reserved>	.....X
( 1) 1	- ENIEC	- IEC	.....X.
( 2) 2	- ENISI	- ISI	.....X..
( 3) 3	- ENOP03	- <reserved>	.....X...
( 4) 4	- ENOP04	- <reserved>	.....X....
( 5) 5	- ENOP05	- <reserved>	.....X.....
( 6) 6	- ENAVG	- <reserved>	.....X.....
( 7) 7	- ENOP07	- <reserved>	.....X.....
( 8) 8	- ENPROBE	- Probe	.....X.....
( 9) 9	- ENOP09	- <reserved>	.....X.....
(10) 10	- ENOP10	- <reserved>	.....X.....
(11) 11	- ENJIS	- JIS	.....X.....
(12) 12	- ENGAIN	- <reserved>	.....X.....
(13) 13	- ENOP13	- OES	.....X.....
(14) 14	- ENVAC	- VA CORFIG	.....X.....
(15) 15	- ENRS232	- <reserved>	X.....
-----second word-----			
(16) 0	- ENCIC	- <reserved>	.....X
(17) 1	- ANSI	- ANSI (87/92/96/03)	.....X.
(18) 2	- PROFILE	- Profiler	.....X..
(19) 3	- DIGSPC	- <reserved>	.....X...
(20) 4	- ENOP20	- <reserved>	.....X....
(21) 5	- ENOP21	- <reserved>	.....X.....
(22) 6	- ENOP22	- <reserved>	.....X.....
(23) 7	- ENOP23	- <reserved>	.....X.....
(24) 8	- ENOP24	- <reserved>	.....X.....
(25) 9	- ENCRT	- <reserved>	.....X.....
(26) 10	- ENPORT	- <reserved>	.....X.....
(27) 11	- ENCOMP	- <reserved>	.....X.....
(28) 12	- ENT2CC	- <reserved>	.....X.....
(29) 13	- ENOP29	- <reserved>	.....X.....
(30) 14	- ENOP30	- <reserved>	.....X.....
(31) 15	- ENAUD	- <reserved>	X.....

Flag bits marked reserved are currently unused but may be used for any purpose in the future. Reliance on the state of these bits is a sure way to have software break. Flags may be common across analyzers, but be aware that some options (such as RS232) are

implemented as features on the 7000. For instance, although the 7000 has RS232, it does not have the RS232 option bit set.

## 7 Release Notes

### 7.1 RS232 additions in v1.10

First release of Fonix 7000 software supporting RS232.

### 7.2 RS232 Fixes and additions in v1.20

#### 7.2.1 Do Reset (cmd 38)

In previous software revisions, Do Reset (command 38) set the major:minor state to the opening screen without affecting other software state. This has been rectified in 1.20, which resets all settings and clears all curves before returning to the opening screen.

#### 7.2.2 Set/Get Coupler (cmd 172/173)

Set / Get Coupler (172/173) commands introduced.

#### 7.2.3 Set/Get Ear (cmd 75/76)

Set / Get Ear (75/76) commands implemented.

#### 7.2.4 JIS

JIS (major mode 4) introduced.

#### 7.2.5 Set Telecoil (cmd 11)

Prior to v1.20, Set Telecoil (11) did not take effect if the source was active. See [Section 2.4.4 \[telecoil state\]](#), [page 7](#) for the specifics.

### 7.3 RS232 Fixes and additions in v1.30

#### 7.3.1 ANSI03

ANSI 2003 (major mode 33) introduced.

### 7.4 RS232 Fixes and additions in v1.31

Maintenance release only; no RS232 changes.

## **7.5 RS232 Fixes and additions in v1.32**

### **7.5.1 deprecated commands**

Added notes regarding the deprecation of Set/Get Weighting (8,30).

### **7.5.2 command bugfixes**

#### **7.5.2.1 Get Curve Frame (25)**

Improved audiogram curve handling from within the real-ear screens (major modes 6, 23, 25, and 29), although not all curve flags track state correctly. This will be addressed in a future software revision.

#### **7.5.2.2 Set/Get Filter (136/137)**

Added support for ANSI92 weighting for Set/Get Filter (136/137)

AUTO\_FILTER (0) is no longer supported and will cause an error if used.