

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. A complete list of commands available for the Fonix 7000 can be found in *7000cmds*. 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 differences and extentions to 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 Quick Terminate (cmd 32767)

The original implementation of FIPP relied on timeouts to terminate a communication cycle between a Fonix instrument and controlling computer. Quick Terminate was introduced as a method to terminate a communication cycle without having to rely on a timeout, thus speeding communications.

The RS232 processing loop on the 7000 will immediately send polls after parsing and performing minimal processing of each RS232 command. This makes it possible to send back-to-back commands in batches, starting with the first command, and ending with a Quick Terminate. Batching commands with this method is quicker than sending individual command / Quick Terminate pairs or command / timeout pairs.

Quick terminate is normally used:

- before collecting new measurements when unit is actively measuring (get curve, get mic input, get blob, etc...)
- after a Do Reset (cmd 38)
- if a timeout would otherwise be used

FRYERS.DLL can be configured to automatically generate quick terminate responses if it receives a poll and has no pending requests for the analyzer. However, in this mode FRYERS.DLL will continue to send pending commands even if a command has failed, so extra care must be taken to handle errors to ensure that the controlling program does not fall out of sync with the instrument.

2.1.2 Set/Get Poll Delay and Hold-off (cmd 73/74)

Software version 1.42 introduced a second parameter to Poll Delay commands (cmd 73/74) for Poll Hold-off. Poll Delay controls the amount of time the instrument will wait for a reply after sending a poll. Poll Hold-off controls the amount of time the analyzer will wait before sending a subsequent poll after a command response.

As a result of empirical testing at Frye and in the field, the Poll Delay now defaults to 30ms, and Poll Hold-off defaults to 20ms. This was found to be the best tradeoff for running the analyzer from FRYERS32.DLL on the Windows XP platform.

2.1.3 Get Last Measured Curve (cmd 42)

The 7000 supports Get Last Measured Curve (cmd 42) in most modes where curve frames are generated. (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 was 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 Set/Get 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) Set/Get 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 Set/Get Auto Mode (cmd 48/49)

Cmd 48 sets Auto Mode to Off (value=0), Semi-Automatic (value=1), or Fully Automatic (value=2). If called from the default settings menu, the global setting is set, and the coupler screen value will be reset to the new global setting on the next entry to the coupler screen. If called from the coupler screen, the coupler setting is set and will remain while in this screen, but the global setting is unchanged and the global setting will be reapplied to the coupler screen on next re-entry to the coupler screen.

Cmd 49 gets the global Auto Mode setting when called from the default settings menu. Cmd 49 gets the coupler screen setting when called from the coupler screen.

2.2.5 Set/Get 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 parameter to Set Reference Microphone Status will fail.

2.2.6 Set/Get 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:

Set/Get Operating Mode (cmd 77/78) source type enumerations

0	Standard Pure Tone Sweep	1/12th octave, nearest 100Hz
1	Composite Chirp	FP40 method
2	Fast Sweep	1/3rd octave, nearest 100Hz
3	Single Tone	
4	Short (Burst) Sweep	1/2 octave
5	Composite Noise	6500 method
6	Digital Speech Noise	6500 method
8,9	reserved	reserved
10	Long Sweep	6500 method, 64 frequency

2.2.7 Set/Get Aid Selection (cmd 123/124)

This command is used to set the aid group and/or aid type. If one parameter is passed, the aid group is set. If a second parameter 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. Long delays will slow down test sequences, and may affect instrument response times.

The default Aid Group selection for the 7000 is stored in EEPROM. The Aid Type selection defaults to None.

Set/Get Aid Selection (cmd 123/124) Aid Type enumerations	
0	None
1	BTE
2	ITE
3	ITC
4	CIC (canal)

2.2.8 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 parameters	
1	Instrument (7000)
2	Software Version (140 = 1.40)
3	Language (0 = unknown, 1 = English)
4	BootLoader Version
5	EEPROM Format Version
6-9	Unit Serial Number
10-11	Unit Manufacture Date

2.2.9 Set/Get 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).

The 7000 requires either an explicit Set Active State (cmd 54) to 1 (active) or Set Instrument State (cmd 59) to minor mode 1 after entering a new major state in order to start a test.

The 7000 allows direct navigation between major modes via RS232. If backwards compatibility to older 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 Battery Major (35)

The Battery Major mode is new on the 7000 as of release 1.40.

2.3.2 Do Battery (cmd 14)

In v1.42, Do Battery was expanded with a parameter to enable and disable battery current measurement. An parameter of 0 disables battery current measurement, and a parameter of 1 enables it. Sending Do Battery with no parameter (6500-style) unconditionally enables battery current measurement.

The battery pill plugged into the 7020 chamber is always supplied with power even if battery current measurements are disabled on the 7000.

2.3.3 Get Battery Data (cmd 19)

The 7000 measures battery information continuously when the battery test is enabled. Get Battery Data (cmd 19) returns current (in mA*100) and chemistry, as described in *commands.txt*.

The chemistry returned by command 19 is enumerated as follows:

Battery Information chemistry enumerations	
0	custom
1	Mercury ¹
2	Zinc-Air
3	Silver
-32768	unknown

¹ Mercury is no longer an available chemistry on the 7020, but is assigned a place-holder for backwards compatibility to the 6020 sound chamber.

2.3.4 Set/Get Battery Information (cmd 79/179)

Set Battery Information (cmd 79) takes up to five parameters:

Set/Get Battery Information (cmd 79/179) parameters	
1	chemistry
2	pill size
3	capacity (in mAH)
4	voltage (in V*100)
5	impedance (in Ω *100)

Pill sizes are enumerated as follows:

Set/Get Battery Information (cmd 79/179) pill size enumerations	
0	unspecified
1	10A
2	230
3	312
4	13
5	76
6	675
7	41
8	AA
9	5A

The “unspecified” (0) pill selection is available to express the lack of settings enforcement between the 7000’s screen label and the button pressed in the 7020 chamber.² The “unspecified” pill selection still generates chemistry, voltage, and impedance according to the button pressed in the 7020 chamber, and does not affect the 7000’s current drain readings.

Due to hardware limitations of the 7000 and 7020, chemistry, voltage, and impedance are read-only, and determined by the push buttons on the battery simulator in the 7020 chamber, and do not necessarily reflect the pill size indicated on the screen. Attempts to set the chemistry, voltage, or impedance to anything other than -32768 will fail. Future battery simulator hardware will not have such restrictions.

The battery size displayed on the screen and used for battery life estimation is set on the 7000 either via the 7000’s keyboard or via the Set Battery Information (cmd 79) command.

As an example, to set the analyzer to simulate and display for a #13 zinc-air pill, press the #13 zinc-air battery button in the 7020 chamber, and set the pill size to #13 via RS232, with Set Battery Information command (cmd 79), with unknown chemistry (-32768), and #13 pill size (4) as parameters. If the screen does not need to be labeled, press the #13 zinc-air battery button in the 7020 chamber, and set the pill to “unspecified” via RS232,

² The physical battery pill itself cannot be detected by the 7020 battery simulator.

with Set Battery Information (cmd 79), with unknown chemistry (-32768), and unspecified pill size (0).

2.3.5 Start Test (cmd 16)

Start Test (cmd 16) is obsolete. Set/Get Active Status (cmd 54/55) with an explicit state should be used.

2.3.6 Set/Get Active Status (cmd 54/55)

Set/Get Active Status is available in all modes where starting and stopping a test are valid operations from the keyboard.

2.3.7 Do Reset (cmd 38)

Do Reset (cmd 38) sets the 7000 to a user-defined screen, as selected in the main setup menu (state 16:0). The 7000 can be configured to reset to the coupler screen if desired, to emulate 6500 behavior. See [Section 2.5 \[Main Menu\]](#), page 11

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 2.2.9 \[instrument state\]](#), page 4, for more information on how to portably change instrument state.

Do Reset (cmd 38) erases all curves on the instrument, loads the current user's settings from EEPROM, and propagates settings from the main setup menu to the screens. See [Section 2.5 \[Main Menu\]](#), page 11 for more information on modifying settings used during Reset.

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

2.3.8 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 not supported, and they are provided on an as-is basis.

Barring bugs or missing features, it is never necessary to use Set/Get KeyCode commands in the course of normal operation.

The 7000 uses a subset of 16-bit Unicode for keypresses, as shown the following table:

Key Label	Value (hexadecimal)
F1	0xf300

F2	0xf301
F3	0xf302
F4	0xf303
F5	0xf304
F6	0xf305
F7	0xf306
F8	0xf307
Up	0xf384
Down	0xf385
Right	0xf387
Left	0xf386
Start	0xf38b
Stop	0xf3c5
Exit	0xf382
Help	0xf38a
Menu	0xf10a
Level	0xf3c3
Print	0xf3c2
Feed	0xf3c4
Reset	0xf381

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.

It may be 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.³

2.3.9 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. Set Spectrum is cumulative with leveling corrections.

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

³ The 7000 should always be available via RS232; repeatable bug reports are always welcome.

Level commands will reset the spectrum shaping. The 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 dissappear 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 Coupler Curves (cmd 9/25/112/113/114/115)

The column marked ‘Frame’ in the table below is used for Set/Get curve frame (cmds 9/25).

The column marked ‘Stat./Sel.’ in the table below is used for and Set/Get Selected Curve (cmd 112/113) and Set/Get Curve Status (cmd 114/115).⁴ Curves marked with ‘N/S’ are not selectable, although their data can still be read with Get Curve Frame.

Coupler Curve (current curve)	Stat./Sel.	Frame
	N/A	0
Cx1	0	4
Cx2	1	5
Cx3	2	6
Cx4	3	7
Cx5	4	8
Cx6	5	9
Cx7	6	10
Cx8	7	11
Cx9	8	12
CxX	9	13

In the above table, ‘x’ is replaced with ‘L’/‘R’ or ‘A’/‘B’ depending on the curve set and labeling scheme selected.

The 7000 does not have a separate multicurve mode (14:0). The chamber coupler test screen (1:0) is the chamber multicurve test screen.

2.4.3 Set/Get Curve Frame (cmd 9/25)

Distortion information can be sent in pure tone curve frames, but will only be displayed for the currently selected curve.

2.4.4 Set/Get CIC Status (cmd 88/87)

⁴ The split between Frame numbers and Stat./Sel. is a byproduct of providing limited backwards compatibility to previous instruments.

2.4.5 Set/Get OES Status (cmd 3/24)

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

2.4.6 Set/Get Source Method Selection (cmd 11/37)

The telecoil output transducer can be selected from within coupler mode (1:0) with Set Source Method Selection. SPL / Chamber (0) and Telecoil (1) are available.

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

2.4.7 Set/Get Ear (cmd 75/76)

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

2.4.8 Set/Get Selected Curve (cmd 112/113)

2.4.9 Set/Get Curve Status (cmd 114/115)

The 10 curves available in coupler are directly enumerated from 0-9 for Set/Get Selected Curve (cmd 112/113) and Set/Get Curve Status (cmd 114/115) in the coupler major mode. This differs from the enumeration scheme used for Set/Get Curve Frame.

2.4.10 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 Set/Get Average Frequencies (cmds 81/82).

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

2.4.11 Set/Get 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.

2.4.12 Set/Get Coupler (cmd 172/173)

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

Coupler enumerations	
0	none / no correction

- 1 2cc (no correction)
- 2 MZ(OES)
- 3 CIC

2.5 Default Setup Menu (16) Commands

The Default Setup Menu allows default settings to be read and set via RS232, as well as interaction with EEPROM.

2.5.1 Set/Get Noise Reduction (cmd 4/26)

2.5.2 Set/Get Filter Selection (cmd 137/136)

Set/Get Noise Reduction and Filter Selection change the setting depending on the current Operating Mode (cmd 77/78) selected. If composite noise or digital speech is selected, the composite noise reduction / filter setting is changed. If pure tone is selected, the tone noise reduction / filter setting is changed.

2.5.3 Set/Get Option Parameters (cmd 70/71)

The Main Menu major (16) has its own parameter block defined as follows:

Set/Get Option Parameter (cmd 70/71) for Main Menu (16)

- 1 Starting Major Mode

All automated test Major Modes (ANSI, IEC, JIS), the Opening Screen (0), and Coupler (1) Major Modes are supported as starting major modes.

2.5.4 Set/Get User Number (cmd 150/151)

Set User Number (cmd 150) is used to load either factory defaults (0) or a user's saved settings (1-5) from EEPROM.

2.5.5 Do Save (cmd 177)

Do Save (cmd 177) takes one or two parameters, as shown below:

Do Save (cmd 177) parameters

- 1 action to perform (0-2)
- 2 setup number (optional, 0-5)

Setup 0 is the factory default setup. It cannot be modified.

Do Save (cmd 177) action enumerations

- 0 Reset user to factory default selections
- 1 Restore user settings from storage
- 2 Save user settings to storage

The Flash-based EEPROM on the 7000 has a rated write lifetime of 100,000 cycles and may easily be worn out by frequent writing from an automated test sequence. The ability to write EEPROM via RS232 is provided as a courtesy to assist in initial instrument installation only.

For comparison, the read lifetime of the EEPROM is *not* limited.

2.5.6 Set/Get Measurement Delay Times (cmd 84/83)

Set/Get Measurement Delay Times (cmd 84/83) have been extended in the Main Setup menu to five parameters, to allow setting of I/O delays, as described in *commands.txt*.

2.5.7 Set/Get Curve Group (cmd 182/183)

Cmd 182 sets the Default Curve Group value, and cmd 183 retrieves this value. This value indicates which curve group to load automatically on entry to the Coupler screen. The command takes one parameter, with these valid values:

Set/Get Curve Group (cmd 182/183) valid parameter values	
0	None
1	Group 1
2	Group 2
3	Group 3

2.5.8 Set/Get AGC (cmd 184/185)

Cmd 184 sets the specified AGC value. The command takes two parameters. The first parameter specifies the frequency for the command; frequency 0 is used to specify AGC Switching. Valid frequencies are 250, 500, 1000, 2000, 4000. The second parameter sets the value for the frequency specified. Valid values are On (value=1) or Off (value=0).

Cmd 185 gets the specified AGC value. The command takes two parameters. The first parameter specifies the frequency for the command. Valid values are the same as for cmd 184 above. The second parameter is ignored on input. On return, the first parameter repeats the frequency value, and the second parameter returns the On or Off setting for that frequency.

2.6 Real Ear IG (6:0) & SPL Screen (23:0) Commands

2.6.1 Smoothing (cmd 5/27)

Only log smoothing is available in the 7000; 100Hz smoothing is no longer supported.⁵

2.6.2 Get Mic Input (cmd 31)

2.6.3 Get RefMic Input (cmd 57)

Valid values are returned only in single tone mode with the source on.

2.6.4 Set/Get Ref Mic (cmd 52/53)

The reference mic can only be used in probe mode.

⁵ 100Hz smoothing wouldn't be tough to add back in; does anybody use it?

2.6.5 Real-Ear Curves (cmd 9/25/112/113/114/115)

The column marked 'Frame' in the table below is used for Set/Get curve frame (cmds 9/25).

The column marked 'Stat./Sel.' in the table below is used for and Set/Get Selected Curve (cmd 112/113) and Set/Get Curve Status (cmd 114/115).⁶ Curves marked with 'N/S' are not selectable, although their data can still be read with Get Curve Frame.

Shared IG/SPL Curves	Stat./Sel.	Frame	Description
REUR1	0	0	Real-Ear Unaided Response
REAG/REAR	N/S	1	(current) Real-Ear Aided Gain/Resp.
TARG	N/S	3	TARGet
REAG2/REAR2	1	4	Real-Ear Aided Gain/Response
REAG3/REAR3	2	5	Real-Ear Aided Gain/Response
REAG4/REAR4	3	6	Real-Ear Aided Gain/Response
REAG5/REAR5	4	7	Real-Ear Aided Gain/Response
IG Curves	Stat./Sel.	Frame	Description
REIG	N/S	2	(current) Real-Ear Insertion Gain
REIG6	N/S	100	Real-Ear Insertion Gain
REIG7	N/S	101	Real-Ear Insertion Gain
REIG8	N/S	102	Real-Ear Insertion Gain
REIG9	N/S	103	Real-Ear Insertion Gain
shared SPL/Visible	Stat./Sel.	Frame	Description
Speech Curves			
HTL	N/S	10	Hearing Threshold Levels (in SPL)
LOWT	N/S	11	LOW Target (in SPL)
MIDT	N/S	12	MID Target (in SPL)
HIGT	N/S	13	HIGH Target (in SPL)
UCL	N/S	14	UnComfortable Levels (in SPL)
Visible Speech Curves	Stat./Sel.	Frame	Description
E1	0	50-59	Envelope 1 (in SPL)
E2	1	60-69	Envelope 2 (in SPL)
E3	2	70-79	Envelope 3 (in SPL)

2.6.6 Set/Get Curve Frame (cmd 9/25)

REAR and REIG (Frames 1 and 2) are based on the currently selected aided curve.

REIG curves (Frames 2, 100-103) are derived from the REUR and respective REAG curves, and cannot be directly modified.

For E1, E2, and E3 curves (Frames 50-79), a curve number ending in zero contains the latest measurement, a curve number ending in '1' contains the mean of measurements, a curve number ending in '2' contains the standard deviation of measurements, a curve number ending in '3' contains the maximum of measurements, and a curve number ending in '4'

⁶ The split between Frame numbers and Stat./Sel. is a byproduct of having curves displayed on-screen which cannot be directly selected by the end-user.

contains the minimum of measurements. The remaining curve numbers are reserved for future use.

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

Set Curve Status (cmd 114) sets the status of the selected measured curve to either empty (0), which deletes the curve, non-empty and not visible (1), or non-empty and visible (2).

Get Curve Status (cmd 115) will return the status of the selected measured curve as either empty (0), or non-empty and not visible (1), or non-empty and visible (2).

2.6.8 Set/Get Static Tone (cmd 121/122)

Producing a single or three-frequency signal when sweep or composite measurements are inactive is not possible via the keyboard 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, it can be accomplished from RS232.

2.6.9 Set/Get 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. Auto (0) filter setting is no longer supported.

2.7 Audiogram Screen (25:0) Commands

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

2.7.1 Set/Get Active status (cmd 54/55)

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

2.7.2 Set/Get Ear (cmd 75/76)

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

2.7.3 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.

2.7.4 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	POGO

2	BERGER
3	1/3 Gain
4	1/2 Gain
5	2/3 Gain
8	NAL-NL1
9-14	reserved
15	direct

2.7.5 Audiogram Curves (cmd 9/25/112/113/114/115)

Audiogram Curves share numbering between Set/Get Curve Frame (cmd 9/25), Set/Get Selected Curve (cmd 112/113), and Set/Get Curve Status (cmd 114/115).

Curve name	Stat./Sel. / Frame	Description
AU_FREQ	0	Frequency
AU_HTL	1	HTL (Hearing Threshold Level)
AU_UCL	2	UCL (Uncomfortable Client Level)
AU_TARGET	3	Target (Not available on 7000)
AU_RECD	4	RECD (Real-Ear to Coupler Difference)
AU_BONE	5	Bone Conduction

2.7.6 Set/Get Curve Frame (cmd 9/25)

Audiogram curves can be manipulated 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.

Audiogram curves use the audiogram curve format (with 16 data points). The frequency curve (Frame 0) holds the frequency list in the audiogram table, is not a regular curve, and is not modifiable.

2.7.7 Set/Get Selected Curve (cmd 112/113)

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

2.7.7.1 Set/Get RECD

The RECD Mode is chosen by providing an additional parameter to Set/Get Selected Curve (cmd 112/113).

RECD mode	Stat./Sel.	Description
AU_AVG_RECD	4,0	Average RECD
AU_MEAS_RECD	4,1	Measured RECD

The current RECD mode selection will not be changed if the second parameter is not provided.

2.7.8 Set/Get Curve Status (cmd 114/115)

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).

2.8 Target Coupler, AI Probe

Target Coupler and Audibility Index probe modes are not currently available in 7000 software.⁷

2.9 Target Edit Mode (29:0) Commands

2.9.1 Target Curves (cmd 9/25/112/113/114/115)

Target Curves share numbering between Set/Get Curve Frame (cmd 9/25), Set/Get Selected Curve (cmd 112/113), and Set/Get Curve Status (cmd 114/115).

Curve name	Stat./Sel. / Frame	Description
TA_FREQ	0	Frequency
TA_HTLre	10	HTL (SPLre)
TA_TARGre	12	Target (SPLre)
TA_UCLre	14	UCL (SPLre)
TA_REDD	110	REDD (Real-Ear to Dial Difference)
TA_TARGIG	3	Target IG

2.9.2 Set/Get Curve Frame (cmd 9/25)

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 curve number, or 24 words without.

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 written.

2.9.3 Set/Get Selected Curve (cmd 112/113)

The frequency curve(0) can not be selected.

2.9.3.1 Set/Get REDD

The REDD mode is chosen by providing an additional parameter to Set/Get Selected Curve (cmd 112/113).

REDD mode	Stat./Sel.	Description
TA_AVG_REDD	110,0	Average REDD
TA_MEAS_REDD	110,1	Measured REDD

If an additional parameter is not provided to Set Selected Curve, the REDD mode will not be changed.

⁷ Target Coupler is planned; Audibility Index has no known demand.

2.10 New Commands

These commands are not available in the 6500 or FP40, but are available on the 7000. Their behavior is similar to the FP35.

2.10.1 Set BLOB (cmd 99)

The 7000 allows test results from ANSI, IEC, and JIS tests to be externally set, so they may be viewed on the 7000. Be aware that all test parameters are not included in some BLOBs. To correctly display test results requires sending a parameter block and possibly other parameters in addition to the BLOB.

2.10.2 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.

2.10.3 Set/Get Real-Time Clock (cmd 104/103)

The date and time real time clock in the 7000 read using Get RealTime Clock (103). Set RealTime Clock (104) will be supported in a future release of 7000 software.

2.10.4 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)

The OutR members are not applicable to the 7000, as it has a single (multiplexed) output channel.

3 Data

3.1 Miscellaneous Data

3.1.1 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

If source is off, data cannot be time averaged.

The maximum allowed samples to capture is 512. The minimum allowed is 64. If less than the minimum is requested, the default of 256 samples will be used. If more than 512 is requested, the number collected will be limited to 512.

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 Real Ear IG (6:0) & SPL Screen (23:0) Curve Data

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 ANSI S3.22 (87/96/03), IEC (94/05), and JIS (2000)

3.3.1 Set/Get parameters (cmd 70/71)

Commands 70 and 71 will not be globally available in a future revision of 7000 software. They will move to their respective major modes.

Enter a test's major state before modifying its parameters.

IEC05's parameter block may only be changed within IEC05's major state.

Set/Get parameters were originally implemented on the 6500, and as such are “stateless”: they are available regardless of current major mode. On the 6500 it was necessary to set parameters for a given major mode with command 70 before entering the major mode with command 59, which immediately started the test. Since the 7000 does not start a test when entering a new major mode, the parameters for that major mode can be set within the major mode.

3.3.2 Print Control

The 7000 displays complete test results on a single screen; the print control parameter to command 70 is ignored.

3.3.3 ANSI03

3.3.3.1 blob

The ANSI03 blob is identical to the ANSI96 blob.

3.3.3.2 parameters

The seventh parameter to command 70 controls the AGC switching pause before I/O and attack and release tests are run.

3.3.4 IEC05

The introduction of IEC 60118-7 2005 represents a large change in the way automated test sequences function on the 7000. Advanced minor states are available in order to facilitate re-testing of individual failed test steps. Both the parameter block and BLOBs have been expanded to minimize the amount of communication overhead for setting and retrieving test parameters and results.

3.3.4.1 IEC 60118-7 2005 minor states

The following basic minor states are available in the IEC05 major mode (major mode 37):

Mode	Minor
Start of Test	0
FOG (telecoil)	1

RTG	2
RTG (telecoil)	3
AGC Switching (AGC switch) / End of telecoil (telecoil)	4
Test Complete	5

Requesting the basic minor states behaves like other automated test sequences. The test may be stepped through by requesting Test Complete (minor 5), Set Active State (cmd 54) to Active (1).

The following advanced minor states are available in the IEC05 major mode (major mode 37). Some minors are duplicated between the basic and advanced minor states, and switching between basic and advanced minors in the middle of a test is permitted.

Mode	Minor
Start of Test	0
OSPL90 sweep	100
FOG sweep	200
FOG (telecoil)	300

Minor states after this point are dependent on OSPL90

RTG	400
-----------	-----

Minor states after this point are dependent on RTG

Response sweep	500
Distortion Test	600
Current Measurement (battery)	700
Input Noise (EQIN)	800
RTG (telecoil)	900
AGC Switching (AGC switch)	1000

Minor states after this point are dependent on AGC switching

first I/O (AGC)	1100
second I/O (AGC)	1110
third I/O (AGC)	1120
fourth I/O (AGC)	1130
fifth I/O (AGC)	1140
first attack/release (AGC)	1200
second attack/release (AGC)	1210
third attack/release (AGC)	1220
fourth attack/release (AGC)	1230
fifth attack/release (AGC)	1240
Test Complete	32000

It is possible to re-test components of the sequence by requesting advanced minor states.

Minor states which have not been enabled via Set Option Parameters (cmd 70) may not be requested. For example, if telecoil has not been enabled, a request to run FOG telecoil (minor 300) will always fail.

If an advanced minor state is requested which has already been run, the unit will re-run the measurements for the requested minor, and stop at the end of the requested minor so that the results may be verified.

For example, from RTG (minor 2 or 400), the OSPL90 sweep can be re-tested by requesting minor 100. The sequence will stop at minor 100, so that the OSPL90 curve may be checked with Get Curveframe (Cmd 25, curve 1). Continuing the test with Set Active State (cmd 54) will skip the FOG sweep, and return to RTG if aid adjustment for RTG is necessary.

If an advanced minor state is requested which has not yet been run, the unit will run enabled tests in all minors up to and including the requested minor.

For example, starting from Start of Test (minor 0), requesting Response Sweep (minor 500) will run OSPL90 (minor 100), FOG sweep (minor 200), FOG telecoil (minor 300, if enabled), and RTG (minor 400) before running the response sweep (minor 500).

Some minors are dependent on the results of others, as shown in the previous table. Measurements dependent on a requested minor will be invalidated.

For example, requesting an OSPL90 sweep (minor 100) from AGC Switching (minor 1000) will invalidate the measured RTG, since the target RTG is dependent on OSPL90. Since the RTG is invalidated, all measurements performed after RTG setting must also be invalidated, and will be re-measured if the test is allowed to proceed.

3.3.4.2 IEC 60118-7 2005 Parameters

The parameter block for IEC05 has been expanded to include all parameters available in the IEC05 test, including all settle times. It is comprehensive and allows complete state for IEC05 to be set with a single command.

Averaging Frequencies are restricted to 50Hz intervals from 200-8000Hz.

Delay times are restricted to 10ms intervals from 20-32000ms¹.

Attack and Release windows are restricted to 10ms intervals from 10-5000ms.

IEC05 Parameter

- 1 Ear (1: Left, 2: Right)
- 2 Aid Group (0: Standard/Linear, 1: AGC, 2: Adaptive AGC)
- 3 OSPL90 Start Settle (milliseconds)
- 4 OSPL90 Measurement Settle (milliseconds)
- 5 Response and FOG Start Settle (milliseconds)
- 6 Response and FOG Measurement Settle (milliseconds)
- 7 Miscellaneous Start Settle (milliseconds)
- 8 Miscellaneous Measurement Settle (milliseconds)

¹ Yes, you may set a delay of 32 seconds, to create the SLOWEST-RUNNING TEST EVER.

- 9 Noise Reduction (0-127)
- 10-12 Averaging Frequencies (HFA is 1000, 1600, 2500; other frequencies from 200-8000 may be specified as SPA)
- 13-15 Distortion Frequencies (Per section 8.6 of IEC 60118-7, the distortion frequencies are derived from the Averaging Frequencies. The actual distortion frequencies used for testing are returned in the parameter block, but must be sent as NVD16.)
- 16 Telecoil (0: off, 1: on)
- 17 12dB Rule (0: off, 1: on)
- 18 Equivalent Input Noise (0: off, 1: on)
- 19 AGC Switching (0: off, 1: on)
- 20 Battery Test (0: off, 1: on)
- 21 Battery Chemistry (Chemistry as selected on the 7020 chamber is returned, but NVD16 must be sent.)
- 22 Battery Size (See [Section 2.3.4 \[Set Battery Information\]](#), page 6)

The following AGC parameters may be omitted if a Standard/Linear Aid Group is selected

- 23 250 Hz AGC Test (0: disable, 250: enable)
- 24 250 Hz AGC Start Delay (milliseconds)
- 25 250 Hz AGC Measurement Delay (milliseconds)
- 26 250 Hz AGC Attack Window (milliseconds)
- 27 250 Hz AGC Release Window (milliseconds)
- 28-32 500 Hz AGC parameters (as above)
- 33-37 1000 Hz AGC parameters (as above)
- 38-42 2000 Hz AGC parameters (as above; 2000 Hz must always be enabled when AGC testing, per section 8.9.1 of IEC 60118-7)
- 43-47 4000 Hz AGC parameters (as above)

3.3.4.3 IEC 60118-7 2005 BLOB

The IEC 2005 BLOB contains all the outputs of the IEC 2005 test sequence.

IEC05 BLOB data

- 1 Major (always 37 for IEC05)
- 2 Minor (usually 5, Test Complete)
- 3 Size (size of the blob in words. 18 for short blob, 342 for long blob)
- 4 OSPL90 average (dB*100)
- 5 FOG average (dB*100)
- 6 Telecoil MASL (dB*100)
- 7 Target RTG (dB*100)
- 8 Measured RTG (dB*100)
- 9 Aid adjusted for RTG (0: Aid gain was not adjusted, 1: Aid gain was adjusted)
- 10 Response Limit (Hz)
- 11 R1 Response Frequency (Hz, 199 returned when R1 is <200)
- 12 R2 Response Frequency (Hz)

13-15	Distortion measurements (% * 100)
16	Battery Current (in microAmps. 32767 (NO RESPONSE) indicates no measurement was made)
17	Equivalent Input Noise (dB*100)
18	Telecoil ETLIS (dB*100)

The Long Blob includes the following:

19-106	OSPL90 curve frame
107-194	FOG curve frame
195-282	Response curve frame
283-292	250Hz I/O frame
293-302	500Hz I/O frame
303-312	1000Hz I/O frame
313-322	2000Hz I/O frame
323-332	4000Hz I/O frame
333	250Hz attack time
334	500Hz attack time
335	1000Hz attack time
336	2000Hz attack time
337	4000Hz attack time
338	250Hz release time
339	500Hz release time
340	1000Hz release time
341	2000Hz release time
342	4000Hz release time

3.3.5 Get Blob (cmd 61)

The B_BATT_TYPE parameter in all blobs returned from the 7000 indicates battery chemistry. See [Section 2.3.3 \[Get Battery Data\]](#), page 5 for the enumerated list of battery chemistries.

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. Get Measurement may not return the desired data for the new amplitude unless an explicit Quick Terminate is sent following any operational state changes. A correct sequence would be: Change Amplitude, Quick Terminate, Get Measurement. Even in our example case, the hearing aid being tested may not have stabilized yet. Stabilization time needed depends on the hearing aid. The Set Measurement Delay command can be used to change the amount of time the analyzer will wait for the aid to settle before a measurement is made.

3.4.2 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 always include the time delays necessary for the hardware stabilization for signal is presentation and capture. Such 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 180mS 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. 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.

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 on will generally make the display update slower since the signal from the reference mic has 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. Each time the aid type is changed, all the delay times will be reset to the default values for the selected aid type.

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 predelays 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 predelay.

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 predelay 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 Set/Get 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. 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 parameters 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
```

The current label can be printed to the currently selected printer with a parameter of 1 to Do Print.

5.3 Do Line Feeds (cmd 64)

Currently a parameter 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 118-7 1983 (1994)	.....X.
(2) 2	- ENISI	- <reserved>	.....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 (S3.22 / S3.42)	.....X.
(18) 2	- PROFILE	- <reserved>	.....X..
(19) 3	- DIGSPC	- <reserved>	.....X...
(20) 4	- ENOP20	- <reserved>	.....X....
(21) 5	- ENOP21	- <reserved>	.....X.....
(22) 6	- ENIEC05	- IEC 60118-7 2005	.....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 was 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 2.4.6 \[telecoil state\]](#), [page 10](#), 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.

7.6 RS232 Fixes and additions in v1.33

Maintenance release only; no RS232 changes.

7.7 RS232 Fixes and additions in v1.40

Battery (major 35) added.

Coupler I/O (major 11) and Fixed Attack & Release (major 9) added Set/Get Active State (54/55).

7.8 RS232 Fixes and additions in v1.41

All audiogram (type 2) frames sent and received from the 7000 now start with a 125Hz component. Previous software releases started with a 250Hz component, in violation of the curve frame definition in *curve.txt*.

7.9 RS232 Fixes and additions in v1.42

7.9.1 Telecoil

The coupler output transducer (speaker or telecoil) incorrectly tracked the telecoil setting for automated test sequences in v1.40 and v1.41, requiring the user to turn off telecoil after entering coupler mode by using command 11, or manually setting the output transducer in the coupler local menu. This was reverted back to previous behavior in v1.42.

7.9.2 Battery

Do Battery (cmd 14) was expanded to enable and disable the battery test. See [Section 2.3.2 \[Do Battery\]](#), [page 5](#) for more information.

Get Battery Data (cmd 19) was reverted to 6500-style behavior, returning only current and chemistry. See [Section 2.3.3 \[Get Battery Data\]](#), [page 5](#) for more information.

Set/Get Battery Information (cmd 79/179) implemented. See [Section 2.3.4 \[Set Battery Information\]](#), [page 6](#).

7.9.3 Do Reset (cmd 38)

Do Reset (cmd 38) now returns to the startup screen specified by the user in the main setup menu, and loads the current user's settings from EEPROM. As of v1.42, the opening or coupler screens can be chosen as startup screens. See [Section 2.5 \[Main Menu\]](#), [page 11](#) for further information on selecting the startup screen.

7.9.4 Set Operating Mode (cmd 77)

ICRA digital speech (7) is no longer supported as a directly-selectable source type. Use digital speech (6) and set the ICRA filter (3) with Set Filter (cmd 136) command as a replacement.

7.9.5 Set/Get Poll Delay (cmd 73/74)

Set and Get Poll Delay now handle a second parameter to indicate the poll hold-off time as well as the poll delay. See [Section 2.1.2 \[Poll Delay\]](#), page 2.

7.9.6 Main Menu (major 16)

7.9.6.1 Coupler Parameter controls

RS232 control over coupler parameters (and a few others, including startup screen,) have been introduced in the Main Menu (Major 16). See [Section 2.5 \[Main Menu\]](#), page 11.

7.9.6.2 EEPROM manipulation

user setups and EEPROM can now be manipulated via RS232 commands Set/Get User Number (cmd 150/151), and Do Save (cmd 177). See [Section 2.5 \[Main Menu\]](#), page 11.

7.10 RS232 Fixes and additions in v1.43

Maintenance release only; no RS232 changes.

7.11 RS232 Fixes and additions in v1.50

7.11.1 Real-Ear

Visible Speech screen (36:0) added. Commands available are listed in *7000cmds*.

NAL-NL1 fitting algorithm was added to real-ear screens. Additional real-ear parameter commands for further manipulation of fitting algorithms were added, see *7000cmds* for an exhaustive listing, and *commands.txt* for command descriptions.

Bone conduction curve frames are now available in the Audiogram Screen (25:0) when NAL-NL1 fitting algorithm is selected. See [Section 2.7.5 \[audiogram curves\]](#), page 15.

The fitting enumerations for Set/Get Fit Rule (cmd 134/135) were previously incorrect for POGO and BERGER fitting rules. This was corrected. See [Section 2.7.4 \[fit rules\]](#), page 14.

7.12 RS232 Fixes and additions in v1.51

Maintenance release only; no RS232 changes.

7.13 RS232 Fixes and additions in v1.60

Set/Get Telecoil State (cmd 11/37) renamed to Set/Get Source Method Selection to match *commands.txt*.

7.13.1 Coupler (major 1)

Set Leveling State (cmd 174) added. In conjunction with Do Leveling (cmd 17), all chamber leveling operations (level, unlevel, load and save) are now available via RS232.

Set/Get Auto Mode (cmd 48/49) added.

7.13.2 Default Setup Menu (major 16)

The following commands were added to the Default Setup Menu (major 16):

Set Auto Mode	48
Set Curve Group	182
Set AGC	184
Get Auto Mode	49
Get Curve Group	183
Get AGC	185

Previous software releases did not save Auto Mode state to EEPROM, and defaulted to "Off" condition after reset. Software written for previous 7000 versions may be used unmodified if Auto Mode "Off" is stored in EEPROM. For maximum forward compatibility, it is advised to unconditionally disable Auto Mode (cmd 48, single argument of 0) after entering Coupler Mode (Major 1) following a Do Reset.

Previous software releases did not automatically load a Curve Group from EEPROM on reset, and defaulted to 60dB source level and the coupler reset source. Software written for previous 7000 versions may be used unmodified if the "none" Curve Group is stored in EEPROM. For maximum forward compatibility, it is advised to explicitly set the Operating Mode (cmd 77), Source Amplitude (cmd 0), Noise Reduction (cmd 4), Filter Selection (cmd 136), and Source Method Selection (cmd 11) after entering Coupler Mode (Major 1) following a Do Reset.

Previous software releases did not store AGC settings to EEPROM. AGC Switching defaulted to "On", and only 2000Hz was enabled. Software written for previous 7000 versions may be used unmodified if these defaults are stored in EEPROM. For maximum forward compatibility, it is advised to use Set Option Parameters to explicitly set AGC switching and AGC frequencies used in automated test sequences.

See [Section 2.5 \[Main Menu\]](#), page 11.

7.13.3 IEC

IEC 60118-7 2005 introduced. See [Section 3.3.4 \[IEC05\]](#), page 20.

The following commands were removed from IEC94:

Command	Number
Set Reference Microphone Status	52
Get Last Measured Curve Data	‡ 42
Get Reference Microphone Status	53

The following commands were removed from IEC94 Set reference test gain (minor 1).

Command	Number
Set Noise Reduction Value	4
Set Measurement Delay Times	84
Set Blob	99

7.13.4 Quick Terminate (Cmd 32767) and Set Instrument State (Cmd 59)

Quick Terminate (Cmd 32767) is no longer required after Set Instrument state (Cmd 59). Sequences containing Quick Terminate after Set Instrument State will still function correctly.