

## Si468x PROGRAMMING GUIDE

### 1. Introduction

This document provides an overview of the programming requirements for the Si468x FM/HD/DAB receiver. The hardware control interface and software commands are detailed along with several examples of the required steps to configure the device for various modes of operation. Table 1 provides a programming guide cross-reference for each Si468x part released by Skyworks Solutions to date. This programming guide focuses on the (most current) Si468x-A10 release.

**Table 1. Si468x Programming Guide and Firmware Revisions<sup>1,2</sup>**

Release Name	Release Index	Part	FM/FMHD Radio	DAB Radio	AM/AMHD Radio	Bootloader Full Patch	Mini-Patch	Programming Guide Revision
120725	1	A10	2.0.12					0.5
120731	2	A10	2.0.12	0.0.2				0.6
120914	3	A10	2.0.12	0.0.6				0.7
121120	4	A10	2.0.12	1.0.4				0.8
130215	5	A10	3.0.11	2.0.3		ROM0.016	ROM0.MINI.003	0.9
130524	6	A10	3.0.16	3.0.5		ROM0.016	ROM0.MINI.003	1.0
130927	7	A10	3.0.16	3.2.0		ROM0.016	ROM0.MINI.003	1.3
131122	8	A10	3.0.17	3.2.0		ROM0.016	ROM0.MINI.003	1.4
131209	9	A10	3.0.17	3.2.1		ROM0.016	ROM0.MINI.003	1.5
131213	10	A10	3.0.17	3.2.1	0.0.6	ROM0.016	ROM0.MINI.003	1.6
140210	11	A10	3.0.18	3.2.1	0.0.6	ROM0.016	ROM0.MINI.003	1.7
140708	12	A10	3.0.19	3.2.9	1.0.5	ROM0.016	ROM0.MINI.003	1.8
141202	13	A10	4.0.10	4.0.3	2.0.9	ROM0.016	ROM0.MINI.003	1.9
161212	14	A10	5.1.0	5.0.9	3.0.6	ROM0.016	ROM0.MINI.003	1.10

**Notes:**

1. Grayed items are for evaluation or have been retired and should not be used for new designs.
2. If you have been provided a firmware release that is newer than those listed in this table, please see the firmware release notes for any necessary programming-related changes necessary until this guide has been updated (the new value is shown in this table).

## 2. Overview

This family of products is programmed using commands and responses. To perform an action, the system controller writes a command byte and associated arguments, which cause the device to execute the given command. The device will, in turn, provide a response depending on the type of command that was sent.

**Table 2. Product Family Function**

Part Number	Description	Audio Output	FM	RDS	AM	HD Radio	DAB, DAB+
Si4682	FM/HD Radio Receiver w/ RDS	X	X	X		X	
Si4683	FM/AM/HD Radio Receiver w/ RDS	X	X	X	X	X	
Si4684	FM/DAB Receiver w/ RDS	X	X	X			X
Si4688	FM/HD Radio/DAB Receiver w/ RDS	X	X	X		X	X
Si4689	FM/AM/HD Radio/DAB Receiver w/ RDS	X	X	X	X	X	X

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## 3. Terminology

- **CTS**—Clear to send
- **STC**—Seek/Tune Complete
- **NVM**—Non-volatile internal device memory
- **Device**—Refers to the Receiver/Demodulator
- **System Controller**—Refers to the system microcontroller
- **CMD**—Command byte
- **ARGn**—Argument byte (n = 1 to 7)
- **STATUS**—Status word of 32 bits.
- **RESPn**—Response byte (n = 1 to 15)

## 4. Commands/Properties Summary

### 4.1. Commands Summary—FMHD

**Table 3. Commands Summary—FMHD**

Cmd	Name	Description
0x00	RD_REPLY	Returns the status byte and data for the last command sent to the device.
0x01	POWER_UP	Power-up the device and set system settings.
0x04	HOST_LOAD	Loads an image from HOST over command interface
0x05	FLASH_LOAD	Loads an image from external FLASH over secondary SPI bus
0x06	LOAD_INIT	Prepares the bootloader to receive a new image.
0x07	BOOT	Boots the image currently loaded in RAM.
0x08	GET_PART_INFO	Reports basic information about the device.
0x09	GET_SYS_STATE	Reports system state information.
0x0A	GET_POWER_UP_ARGS	Reports basic information about the device such as arguments used during POWER_UP.
0x10	READ_OFFSET	Reads a portion of response buffer from an offset.
0x12	GET_FUNC_INFO	Returns the Function revision information of the device.
0x13	SET_PROPERTY	Sets the value of a property.
0x14	GET_PROPERTY	Retrieve the value of a property.
0x17	GET_AGC_STATUS	Reports the status of the AGC.
0x30	FM_TUNE_FREQ	Tunes the FM receiver to a frequency in 10 kHz steps.
0x31	FM_SEEK_START	Initiates a seek for a channel that meets the validation criteria for FM.
0x32	FM_RSQ_STATUS	Returns status information about the received signal quality.
0x33	FM_ACF_STATUS	Returns status information about automatically controlled features.
0x34	FM_RDS_STATUS	Queries the status of RDS decoder and Fifo.
0x35	FM_RDS_BLOCKCOUNT	Queries the block statistic info of RDS decoder.
0x80	GET_DIGITAL_SERVICE_LIST	Gets a service list of the ensemble.
0x81	START_DIGITAL_SERVICE	Starts an audio or data service.
0x82	STOP_DIGITAL_SERVICE	Stops an audio or data service.
0x84	GET_DIGITAL_SERVICE_DATA	Gets a block of data associated with one of the enabled data components of a digital services.
0x92	HD_DIGRAD_STATUS	Returns status information about the digital radio and ensemble.
0x93	HD_GET_EVENT_STATUS	Gets information about the various events related to the HD services.
0x94	HD_GET_STATION_INFO	Retrieves information about the ensemble broadcaster.
0x95	HD_GET_PSD_DECODE	Retrieves PSD information.

**Table 3. Commands Summary—FMHD (Continued)**

<b>Cmd</b>	<b>Name</b>	<b>Description</b>
0x96	HD_GET_ALERT_MSG	Retrieves the HD Alert message.
0x97	HD_PLAY_ALERT_TONE	Plays the HD Alert Tone.
0x98	HD_TEST_GET_BER_INFO	Reads the current BER information.
0x99	HD_SET_ENABLED_PORTS	Sets default ports retrieved after acquisition.
0x9A	HD_GET_ENABLED_PORTS	Gets default ports retrieved after acquisition.
0x9C	HD_ACF_STATUS	This command Returns status information about HD automatically controlled features.
0xE5	TEST_GET_RSSI	Returns the reported RSSI in 8.8 format.

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## 4.1.1. FMHD Commands

### Command 0x00. RD\_REPLY

RD\_REPLY command must be called to return the status byte and data for the last command sent to the device. This command is also used to poll the status byte as needed. To poll the status byte, send the RD\_REPLY command and read the status byte. This can be done regardless of the state of the CTS bit in the status register. Please refer to individual command descriptions for the format of returned data. RD\_REPLY is a hardware command and can be issued while device is powered down. For commands where the size of the response is returned, the user should send the RD\_REPLY command to read the SIZE first. Each time the RD\_REPLY command is sent, the STAUS bytes will still be returned.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x00							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	DAC-QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	DATA_0[7:0]							
RESP5	DATA_N[7:0]							

Name	Function
CTS	Clear to Send. 0 : Wait before sending next command. 1 : Clear to send next command. The next command may be sent.
ERR_CMD	Command Error. 0 : No error 1 : Error. The previous command failed. Read byte 5 of the reply to get the error code. The next successfully executed command will clear the error.



Name	Function
DACQINT	Digital radio link change interrupt indicator. Indicates that something in the digital radio ensemble acquisition status has changed. Service via the HD_DIGRAD_STATUS commands.
DSRVINT	Indicates that an enabled data component of one of the digital services requires attention. Service using the GET_DIGITAL_SERVICE_DATA command.
RSQINT	Received Signal Quality interrupt indicator. Indicates that a received signal metric is above or below a threshold defined by threshold properties. Service via FM_RSQ_STATUS command.
RDSINT	RDS Data Interrupt indicator. Service via [ref FM_RDS_STATUS].
ACFINT	Automatically controlled features interrupt indicator. Indicates the one of the dynamically system modifiers has crossed a programmed threshold. Service via FM_ACF_STATUS command.
STCINT	Seek/Tune complete. 0 : Tune complete has not been triggered. Do not send a new TUNE/SEEK command. 1 : Tune complete has been triggered. It is safe to send a new TUNE/SEEK command.
DEVNTINT	Digital radio event change interrupt indicator. Indicates that a new event related to the digital radio has occurred. Service via the HD_DIGRAD_STATUS commands.
DACFINT	HD radio ACF status change interrupt indicator. Indicates that a new interrupt related to the HD radio ACF feature has occurred. Service via the [ref HD_ACF_STATUS] command.
PUP_STATE[7:6]	Indicates the powerup state of the system. 0 : The system has been reset but no POWER_UP command has been issued. The system is currently waiting on the POWER_UP command. 1 : Reserved 2 : The bootloader is currently running. 3 : An application was successfully booted and is currently running.
RFFE_ERR	When set indicates that the RF front end of the system is in an unexpected state.
DSPERR	The DSP has encountered a frame overrun. This is a fatal error.
REPOFERR	When set the control interface has dropped data during a reply read, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the given data arbiter and memory speed.
CMDOFERR	When set the control interface has dropped data during a command write, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the data arbiter and memory speed.
ARBERR	When set an arbiter error has occurred.
ERRNR	When set a non-recoverable error has occurred. The system keep alive timer has expired.

Name	Function
DATA_0[7:0]	First Data byte. If ERR_CMD bit is set, this byte returns the error code. Possible command error codes are: 0x01 : unspecified 0x02 : reply overflow 0x03 : not available 0x04 : not supported 0x05 : bad frequency 0x10 : command not found 0x11 : bad arg1 0x12 : bad arg2 0x13 : bad arg3 0x14 : bad arg4 0x15 : bad arg5 0x16 : bad arg6 0x17 : bad arg7 0x18 : command busy 0x19 : at band limit, or cannot further seek. 0x20 : bad NVM 0x30 : bad patch 0x31 : bad bootmode 0x40 : bad property 0x50 : not acquired 0xff : APP not supported
DATA_N[7:0]	Nth Data byte.

## Command 0x01. POWER\_UP

The POWER\_UP initiates the boot process to move the device from power down to power up mode. There are two possible boot scenarios: Host image load and FLASH image load. When the host is loading the image the host first executes the POWER\_UP command to set the system settings (REF\_CLK, etc). A LOAD\_INIT command then prepares the bootloader to receive a new image. After the LOAD\_INIT command, using the HOST\_LOAD command loads the image into the device RAM. After the RAM is loaded the host issues the BOOT command. When booting a FLASH image the host issues the POWER\_UP command to set the system settings. Then issues the FLASH\_LOAD command to select and load the image from FLASH. Once the image is loaded the host sends the BOOT command to boot the application. Power-up is complete when the CTS bit is set. This command may only be sent while the device is powered down. Note: FLASH\_LOAD is not supported in A0A or A0B revisions.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x01							
ARG1	CTSIEN	0	0	0	0	0	0	0
ARG2	0	0	CLK_MODE[1:0]		TR_SIZE[3:0]			

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG3	0	IBIAS[6:0]						
ARG4	XTAL_FREQ[7:0]							
ARG5	XTAL_FREQ[15:8]							
ARG6	XTAL_FREQ[23:16]							
ARG7	XTAL_FREQ[31:24]							
ARG8	0	0	CTUN[5:0]					
ARG9	0	0	0	1	0	0	0	0
ARG10	0							
ARG11	0	0	0		0	0		
ARG12	0				0	0		
ARG13	0	IBIAS_RUN[6:0]						
ARG14	0							
ARG15	0							

Name	Function
CTSIE	The bootloader will toggle a host interrupt line when CTS is available. 0 : Disable toggling host interrupt line. 1 : Enable toggling host interrupt line.
CLK_MODE[5:4]	Choose clock mode. See refclk spec sheet for more information 0 : Oscillator and buffer are powered down. 1 : Reference clock generator is in crystal mode. 2 : Oscillator is off and circuit acts as single ended buffer. 3 : Oscillator is off and circuit acts as differential buffer.
TR_SIZE[3:0]	XOSC TR_SIZE. See refclk spec sheet for more information. Range: 0-15
IBIAS[6:0]	XTAL IBIAS current at startup. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. 10 uA steps, 0 to 1270 uA. Range: 0-127
XTAL_FREQ[31:0]	XTAL Frequency in Hz. The supported crystal frequencies are: [5.4 MHz - 6.6 MHz] [10.8 MHz - 13.2 MHz] [16.8 MHz - 19.8 MHz] [21.6 MHz - 26.4 MHz] [27 MHz - 46.2 MHz]. The system designer should consult the part specific data sheet for information regarding tested/recommended xtal frequency ranges before choosing a xtal.
CTUN[5:0]	CTUN. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. Range: 0-63

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Name	Function
IBIAS_RUN[6:0]	XTAL IBIAS current at runtime, after the XTAL oscillator has stabilized. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. 10 uA steps, 10 to 1270 uA. If set to 0, will use the same value as IBIAS. Range: 0-127

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]	RSVD_STAT[1:0]	REPOFERR	CMDOFERR	ARBERR	ERRNR		

Name	Function
CTS	Clear to Send. 0 : Wait before sending next command. 1 : Clear to send next command. The next command may be sent.
ERR_CMD	Error. 0 : No error 1 : Error. The previous command failed. If STATUS1 is non-zero, it provides an indication of the cause of the error.
PUP_STATE[7:6]	Indicates the powerup state of the system. 0 : The system has been reset but no POWER_UP + command has been issued. The system is currently waiting on the POWER_UP command. 1 : Reserved 2 : The bootloader is currently running. 3 : An application was successfully booted and is currently running.
RSVD_STAT[5:4]	RFU (Reserved For Future Use).
REPOFERR	When set the control interface has dropped data during a reply read, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the given data arbiter and memory speed.
CMDOFERR	When set the control interface has dropped data during a command write, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the data arbiter and memory speed.
ARBERR	When set an arbiter error has occurred.
ERRNR	When set a non-recoverable error has occurred. The system keep alive timer has expired.

**Command 0x04. HOST\_LOAD**

HOST\_LOAD loads an image from HOST over command interface. It sends up to 4096 bytes of application image to the bootloader. Note: This command is much more efficient when the image is sent as multiples of 4 bytes. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x04							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	IMAGE_DATA0[7:0]							
ARG5	IMAGE_DATA1[7:0]							
ARG6	IMAGE_DATA2[7:0]							
ARG7	IMAGE_DATA3[7:0]							
ARG8	IMAGE_DATA_N[7:0]							

Name	Function
IMAGE_DATA0[7:0]	First byte of data stream from boot_img.
IMAGE_DATA1[7:0]	Second byte of data stream from boot_img.
IMAGE_DATA2[7:0]	Third byte of data stream from boot_img.
IMAGE_DATA3[7:0]	Fourth byte of data stream from boot_img.
IMAGE_DATA_N[7:0]	Nth byte of data stream. Maximum of 4096 bytes of data per HOST_LOAD command. For best results, N should be a multiple of 4.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO-FERR	CMDO-FERR	ARBERR	ERRNR

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## Command 0x05. FLASH\_LOAD

---

FLASH\_LOAD loads the firmware image from an externally attached SPI flash over the secondary SPI bus. The image must be contiguous on the flash. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: FLASH\_LOAD is only supported after patching the bootloader.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x05							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	FLASH_START_ADDR[7:0]							
ARG5	FLASH_START_ADDR[15:8]							
ARG6	FLASH_START_ADDR[23:16]							
ARG7	FLASH_START_ADDR[31:24]							
ARG8	0							
ARG9	0							
ARG10	0							
ARG11	0							

Name	Function
FLASH_START_ADDR[31:0]	Flash byte starting address of image to load

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPOFERR	CMDOFERR	ARBERR	ERRNR

**Command 0x06. LOAD\_INIT**

LOAD\_INIT prepares the bootloader to receive a new image. It will force the bootloader state to waiting for a new LOAD command (HOST\_LOAD or FLASH\_LOAD.) LOAD\_INIT command must always be sent prior to a HOST\_LOAD or a FLASH\_LOAD command. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x06							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO-FERR	CMDO-FERR	ARBERR	ERRNR

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## Command 0x07. BOOT

---

BOOT command boots the image currently loaded in RAM. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x07							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

---

## Command 0x08. GET\_PART\_INFO

---

GET\_PART\_INFO reports basic information about the device such as Part Number, Part Version, ROM ID, etc. This command will hold CTS until the reply is available. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: GET\_PART\_INFO command is not supported in firmware revision A0A.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x08							
ARG1	0							



## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	CHIPREV[7:0]							
RESP5	ROMID[7:0]							
RESP6	X							
RESP7	X							
RESP8	PART[7:0]							
RESP9	PART[15:8]							
RESP10	X							
RESP11	X							
RESP12	X							
RESP13	X							
RESP14	X							
RESP15	X							
RESP16	X							
RESP17	X							
RESP18	X							
RESP19	X							
RESP20	X							
RESP21	X							
RESP22	X							

Name	Function
CHIPREV[7:0]	Chip Mask Revision
ROMID[7:0]	ROM Id

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Name	Function
PART[15:0]	Part Number (decimal)

## Command 0x09. GET\_SYS\_STATE

GET\_SYS\_STATE reports basic system state information such as which mode is active; FM, DAB, etc. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: GET\_SYS\_STATE command is not supported in firmware revision A0A.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x09							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	IMAGE[7:0]							
RESP5	X							

Name	Function
IMAGE[7:0]	<p>This field indicates which firmware image processed this command.</p> <p>0 : Bootloader is active</p> <p>1 : FMHD is active</p> <p>2 : DAB is active</p> <p>3 : TDMB or data only DAB image is active</p> <p>4 : FMHD Demod is active</p> <p>5 : AMHD is active</p> <p>6 : AMHD Demod is active</p> <p>7 : DAB Demod is active</p> <p>16 : RESERVED</p>

### Command 0x0A. GET\_POWER\_UP\_ARGS

GET\_POWER\_UP\_ARGS reports basic information about the device such as which parameters were used during power up. This command will hold CTS until the reply is available. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x0A							
ARG1	0							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X							
RESP5	X	X	X	X	X	X	X	X
RESP6	X	X	CLK_MODE[1:0]		TR_SIZE[3:0]			

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP7	X	IBIAS[6:0]						
RESP8	XTAL_FREQ[7:0]							
RESP9	XTAL_FREQ[15:8]							
RESP10	XTAL_FREQ[23:16]							
RESP11	XTAL_FREQ[31:24]							
RESP12	X	X	CTUN[5:0]					
RESP13	X	X	X	X	X	X	X	X
RESP14	X							
RESP15	X	X	X		X	X		
RESP16	X				X	X		
RESP17	X	IBIAS_RUN[6:0]						

Name	Function
CLK_MODE[5:4]	See POWER_UP command
TR_SIZE[3:0]	See POWER_UP command
IBIAS[6:0]	See POWER_UP command
XTAL_FREQ[31:0]	See POWER_UP command
CTUN[5:0]	See POWER_UP command
IBIAS_RUN[6:0]	See POWER_UP command

## Command 0x10. READ\_OFFSET

READ\_OFFSET is used for applications that cannot read the entire response buffer. This type of application can use this command to read the response buffer in segments. The host must pass in an offset from the beginning of the response buffer to indicate the starting point from which to read. This offset must be modulo 4. The response buffer remains intact as in the READ\_REPLY command so that the response can be read again if needed. This function is available for both I2C and SPI mode. This is a software command, therefore it is best to read as much data in each calling as possible. This will reduce the overhead associated with using this command. It is recommended that the minimum reply size be on the order of 512 bytes. This means that for APIs that return less the 512 bytes the standard READ\_REPLY should be used. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x10							
ARG1	0x00							
ARG2	OFFSET[7:0]							
ARG3	OFFSET[15:8]							

Name	Function
OFFSET[15:0]	The offset from the beginning of the response buffer from where to begin reading. The OFFSET parameter must be modulo four. An error is returned otherwise. For example to read a 1024 byte response in two chunks the host can call the READ_MORE command twice. The first call would have OFFSET set to 0 and the second call would have OFFSET set to 512. In both cases the host will clock out 516 bytes of data. The first chunk will include 4 bytes for the status word plus 512 bytes of response. The second chunk will include 4 bytes of status word plus the remaining 512 bytes of response. The response sections will be concatenated to form the entire response.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	DATA0[7:0]							

Name	Function
DATA0[7:0]	The first byte of the data chunk.

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## Command 0x12. GET\_FUNC\_INFO

GET\_FUNC\_INFO returns the function revision number for currently loaded firmware (FMHD, AM etc.) as opposed to GET\_PART\_INFO command that provides the revision number for the combo firmware. For example, GET\_PART\_INFO would return A0B is the firmware revision while GET\_FUNC\_INFO would return 1.0.4 for FM function revision if the currently running firmware function is FM. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x12							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	REVEXT[7:0]							
RESP5	REVBRANCH[7:0]							
RESP6	REVINT[7:0]							
RESP7	NOSVN	X	LOCATION[1:0]		X	X	MIXE- DREV	LOCALM OD
RESP8	SVNID[7:0]							
RESP9	SVNID[15:8]							
RESP10	SVNID[23:16]							
RESP11	SVNID[31:24]							

Name	Function
REVEXT[7:0]	Major revision number (first part of 1.2.3).

Name	Function
REVB[7:0]	Minor revision number (second part of 1.2.3).
REVINT[7:0]	Build revision number (third part of 1.2.3).
NOSVN	If set the build was created with no SVN info. This image cannot be tracked back to the SVN repo.
LOCATION[5:4]	The location from which the image was built (Trunk, Branch or Tag). 0x0 : The image was built from an SVN tag. Revision numbers are valid. 0x1 : The image was built from an SVN branch. Revision numbers will be 0. 0x2 : The image was built from the trunk. Revision number will be 0.
MIXEDREV	If set, the image was built with mixed revisions.
LOCALMOD	If set, the image has local modifications.
SVNID[31:0]	SVN ID from which the image was built.

### Command 0x13. SET\_PROPERTY

SET\_PROPERTY sets the value of a property. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x13							
ARG1	0x00							
ARG2	PROPID[7:0]							
ARG3	PROPID[15:8]							
ARG4	DATA0[7:0]							
ARG5	DATA0[15:8]							

Name	Function
PROPID[15:0]	The property ID of the property to set.
DATA0[15:0]	Value for the written property.

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## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

## Command 0x14. GET\_PROPERTY

GET\_PROPERTY retrieves the value of a property or properties. The host may read as many properties as desired up to the end of a given property group. An attempt to read passed the end of the property group will result in zeros being read. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x14							
ARG1	COUNT[7:0]							
ARG2	PROPID[7:0]							
ARG3	PROPID[15:8]							

Name	Function
COUNT[7:0]	The number of properties to read.
PROPID[15:0]	The id of the property to retrieve.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT



Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	DATA0[7:0]							
RESP5	DATA0[15:8]							

Name	Function
DATA0[15:0]	Value of the first property.

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**Command 0x17. GET\_AGC\_STATUS**


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**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x17							
ARG1	WRITE_AS_0[7:0]							

Name	Function
WRITE_AS_0[7:0]	Reserved parameter, always write as 0.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	DAC-QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP4	X							
RESP5	X							
RESP6	X							
RESP7	X							
RESP8	X							
RESP9	X							
RESP10	X							
RESP11	X							
RESP12	X							
RESP13	X							
RESP14	VHFLNA[7:0]							
RESP15	VHFCATT[7:0]							
RESP16	VHFRATT[7:0]							
RESP17	VHFRATT[15:8]							
RESP18	X							
RESP19	X							
RESP20	X							
RESP21	RFINDEX[7:0]							
RESP22	X							

Name	Function
VHFLNA[7:0]	VHF LNA Gain setting
VHFCATT[7:0]	VHF Front End Capacitive attenuator setting
VHFRATT[15:0]	VHF Front End Resistive attenuator setting
RFINDEX[7:0]	RF AGC table index Range: 0-60

**Command 0x30. FM\_TUNE\_FREQ**

FM\_TUNE\_FREQ tunes the FM receiver to a frequency in 10 kHz steps. The optional STC interrupt is set when the command completes the tune. Sending this command clears any pending STCINT, RSQINT, or RDSINT bit in STATUS. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x30							
ARG1	0	0	DIR_TUNE	0	TUNE_MODE[1:0]		INJECTION[1:0]	
ARG2	FREQ[7:0]							
ARG3	FREQ[15:8]							
ARG4	ANTCAP[7:0]							
ARG5	ANTCAP[15:8]							
ARG6	PROG_ID[7:0]							

Name	Function
DIR_TUNE	Enables the direct tune feature. When this bit is set, the service specified in the PROG_ID field will be rendered automatically. When this bit is 0 the MPS will be rendered. 0 : MPS is selected. 1 : The program ID specified in PROG_ID will be rendered.
TUNE_MODE[3:2]	Set the desired tuning mode. 0 : Tune and render analog audio as fast as possible, do not attempt to acquire HD. 1 : Reserved 2 : Tune and render analog audio as fast as possible, try to acquire HD and cross-fade to HD if acquired. Always selects the Main Program Service. To select an SPS use the START_DIGITAL_SERVICE command after the HD has been acquired. 3 : Tune and attempt to acquire HD and render audio if successful. The Main Program Service (MPS) will be rendered. To select an SPS use the START_DIGITAL_SERVICE command after the HD has been acquired.
INJECTION[1:0]	Injection selection 0 : Automatic injection selection. 1 : Low-side injection. 2 : High-side injection.
FREQ[15:0]	Frequency in multiples of 10.0 kHz added to a starting frequency of 0 Hz

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Name	Function
ANTCAP[15:0]	When non-zero this parameter sets the antenna tuning capacitor value to (ANT-CAP-1)*250 fF (31.75 pF Max). Range: 0-128 0 : Automatically determines the cap setting.
PROG_ID[7:0]	This optional parameter sets the rendered program ID. This field is required when the DIR_TUNE options bit is set otherwise this field is ignored and can be omitted. Setting this field to 0 when DIR_TUNE = 1 has the same effect as a normal tune. Range: 0-7

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

## Command 0x31. FM\_SEEK\_START

FM\_SEEK\_START begins searching for a valid station. The search starts at FM\_RSQ\_STATUS:READFREQ + FM\_SEEK\_FREQUENCY\_SPACING in the specified direction. In order for a station to be considered valid, each of the following thresholds must be met: FM\_VALID\_SNR\_THRESHOLD, FM\_VALID\_RSSI\_THRESHOLD, FM\_VALID\_MAX\_TUNE\_ERROR, and FM\_VALID\_HDLEVEL\_THRESHOLD (if the value is non-zero, which indicates an HD seek). Clears any pending STCINT, RSQINT, or RDSINT interrupt status. Seek can be cancelled through setting the CANCEL bit in the FM\_RSQ\_STATUS command. The optional STC interrupt is set when the command completes. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: This command is not implemented in Si46xx-A0A or Si46xx-A0B releases. Note: The OPEN\_LOOP, FORCE\_WB, TUNE\_MODE, INJECTION, and ANTCAP parameters will not be functional until the Si46xx-A0C release.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x31							
ARG1	0	0	0	FORCE_ WB	TUNE_MODE[1:0]		INJECTION[1:0]	
ARG2	0	0	0	0	0	0	SEEKUP	WRAP

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG3	0x00							
ARG4	ANTCAP[7:0]							
ARG5	ANTCAP[15:8]							

Name	Function
FORCE_WB	Forces the DFE into wideband mode. 0 : Normal operation. 1 : Force Wide bandwidth
TUNE_MODE[3:2]	Set the desired tuning mode. 0 : Tune and render analog audio as fast as possible, do not attempt to acquire HD. 1 : Reserved 2 : Tune and render analog audio as fast as possible, try to acquire HD and cross-fade to HD if acquired. Always selects the Main Program Service. 3 : Tune and attempt to acquire HD and render audio if successful. After the station has been acquired, use START_DIGITAL_SERVICE to select services.
INJECTION[1:0]	Injection selection 0 : Automatic injection selection. 1 : Low-side injection. 2 : High-side injection.
SEEKUP	determines direction of seek and band limit. 0 : Seek down. Band limit is FM_SEEK_BAND_BOTTOM. 1 : Seek up. Band limit is FM_SEEK_BAND_TOP.
WRAP	determines seek behavior upon reaching a band limit. 0 : Halt seek at band limit. 1 : When band limit is hit, continue seek from opposite band limit.
ANTCAP[15:0]	When non-zero this parameter sets the antenna tuning capacitor value to (ANTCAP-1)*250 fF (31.75 pF Max). Range: 0-128 0 : Automatically determines the cap setting.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR

## Command 0x32. FM\_RSQ\_STATUS

FM\_RSQ\_STATUS returns status information about the received signal quality. This command returns the Received Signal Strength Indicator (RSSI), Signal to Noise Ratio (SNR), frequency offset (FREQOFF), and Multipath (MULT) associated with the desired channel. It also indicates valid channel (VALID) and AFC rail status (AFCRL). This command can be used to check if the received signal is above the RSSI high threshold as reported by RSSIHINT or below the RSSI low threshold as reported by RSSILINT. It can also be used to check if the signal is above the SNR high threshold as reported by SNRHINT or below the SNR low threshold as reported by SNRLINT. It can be used to check if the detected multipath is above the Multipath high threshold as reported by MULTHINT or below the Multipath low threshold as reported by MULTLINT. The command clears the RSQINT, BLENDINT, SNRHINT, SNRLINT, RSSIHINT, RSSILINT, MULTHINT, and MULTLINT interrupt bits when the RSQACK bit of ARG1 is set. These are sticky meaning they will remain set until RSQACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire assuming that bit is enabled in FM\_RSQ\_INTERRUPT\_SOURCE. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Multipath metric and related interrupts/thresholds are not implemented in Si46xx-A0A or Si46xx-A0B releases.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x32							
ARG1	0	0	0	0	RSQACK	ATTUNE	CANCEL	STCACK

Name	Function
RSQACK	Clears RSQINT, SNRHINT, SNRLINT, RSSIHINT, RSSILINT if set.
ATTUNE	Return the values as of FM_VALID_SNR_TIME after tune. Only the signal quality metrics RSSI, SNR, ISSI, ASSI, MULT, DEV and the status bits INJECT, AFCL, and VALID are affected by setting this bit. 0 : Return the current status 1 : Return the snapshot taken at FM_VALID_SNR_TIME
CANCEL	Aborts a seek currently in progress. 0 : Don't abort 1 : Abort
STCACK	Clears the STC interrupt status indicator if set.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	HDLEV- ELHINT	HDLEV- ELLINT	SNRHIN T	SNRLINT	RSSI- HINT	RSSILIN T
RESP5	BLTF	X	HDDE- TECTED	FLT_HD- DETECT ED	X	X	AFCRL	VALID
RESP6	READFREQ[7:0]							
RESP7	READFREQ[15:8]							
RESP8	FREQOFF[7:0]							
RESP9	RSSI[7:0]							
RESP10	SNR[7:0]							
RESP11	MULT[7:0]							
RESP12	READANTCAP[7:0]							
RESP13	READANTCAP[15:8]							
RESP14	X							
RESP15	HDLEVEL[7:0]							
RESP16	FILTERED_HDLEVEL[7:0]							
RESP17	X	X	X	X				
RESP18	X							
RESP19	X							
RESP20	X							
RESP21	X							

Name	Function
HDLEVELHINT	Indicates FILTERED_HDLEVEL above FM_RSQ_HDLEVEL_HIGH_THRESH-OLD.
HDLEVELLINT	Indicates FILTERED_HDLEVEL below FM_RSQ_HDLEVEL_LOW_THRESHOLD.
SNRHINT	Indicates SNR above FM_RSQ_SNR_HIGH_THRESHOLD.
SNRLINT	Indicates SNR below FM_RSQ_SNR_LOW_THRESHOLD.
RSSIHINT	Indicates RSSI above FM_RSQ_RSSI_HIGH_THRESHOLD.
RSSILINT	Indicates RSSI below FM_RSQ_RSSI_LOW_THRESHOLD.
BLTF	Band Limit after FM_SEEK_START. Reports if a seek hit the band limit or wrapped to the original frequency. This does not indicate that the seek failed, only that further seeks from the current location would be unproductive. Tune Failed after FM_TUNE_FREQ tuning with CONDITIONALRETURN bit set, reports '1' if the current station failed to meet the associated criteria and the original frequency was returned to.
HDDETECTED	Reports if HDLEVEL metric is above a threshold. 0 : HDLEVEL metric is below the threshold. Configure FM_RSQ_HDDETECTED_THD to set the threshold. 1 : HDLEVEL metric is above the threshold. Configure FM_RSQ_HDDETECTED_THD to set the threshold.
FLT_HDDETECTED	Reports if filtered HDLEVEL metric is above a threshold. 0 : Filtered HDLEVEL metric is below the threshold. Configure FM_RSQ_HDDETECTED_THD to set the threshold. 1 : Filtered HDLEVEL metric is above the threshold. Configure FM_RSQ_HDDETECTED_THD to set the threshold.
AFCRL	AFC rail indicator.
VALID	Reports if the channel is valid based on the settings of FM_VALID_RSSI_THRESHOLD, FM_VALID_SNR_THRESHOLD, FM_VALID_HDLEVEL_THRESHOLD, FM_VALID_MAX_TUNE_ERROR
READFREQ[15:0]	Returns the currently tuned frequency. If the ATTUNE option is used, returns the frequency of the last completed tune. Applies during a normal tune and during seek.
FREQOFF[7:0]	Signed frequency offset in BPPM (2 PPM) Range: -128-127
RSSI[7:0]	Received signal strength indicator in dBuV. Range: -128-127
SNR[7:0]	RF SNR indicator in dB. Range: -128-127
MULT[7:0]	Multipath indicator. Range: 0-255



Name	Function
READANTCAP[15:0]	Returns the antenna tuning cap value.
HDLEVEL[7:0]	Reports a HD availability confidence factor that is normalized to the number of symbols periods examined. The HD detection algorithm looks at both the upper and lower side bands to determine this number. A value higher than 20 generally means that there is a high likelihood of HD presence. Please see FM_RSQ_HD_DETECTION to configure this metric. Range: 0-100
FILTERED_HDLEVEL[7:0]	Reports a filtered version of the HD availability confidence factor that is normalized to the number of symbols periods examined. The HD detection algorithm looks at both the upper and lower side bands to determine this number. A value higher than 20 generally means that there is a high likelihood of HD presence. Please see FM_RSQ_HD_DETECTION and FM_RSQ_HD_LEVEL_TIME_CONST to configure this metric. Range: 0-100

### Command 0x33. FM\_ACF\_STATUS

FM\_ACF\_STATUS returns status information about automatically controlled features of the device. The automatically controlled features include blend, high cut, and softmute. The bits BLEND\_INT, HIGHCUT\_INT, and SMUTE\_INT are sticky meaning they will remain set until ACFACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire. See the FM\_ACF\_INTERRUPT\_SOURCE property for information on enabling the ACFINT. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x33							
ARG1	0	0	0	0	0	0	0	ACFACK

Name	Function
ACFACK	Clears ACFINT and any ACF interrupt bits if set.

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	X	X	X	X	X	BLEND_INT	HIGH-CUT_INT	SMUTE_INT
RESP5	X	BLEND_CONV	HIGH-CUT_CONV	SMUTE_CONV	X	BLEND_STATE	HIGH-CUT_STATE	SMUTE_STATE
RESP6	X	X	X	ATTN[4:0]				
RESP7	HIGHCUT[7:0]							
RESP8	PILOT	STBLEND[6:0]						
RESP9	X							
RESP10	X							

Name	Function
BLEND_INT	Indicates that stereo separation has crossed below the blend threshold set by FM_ACF_BLEND_THRESHOLD.
HIGHCUT_INT	Indicates that the highcut cutoff frequency has crossed below the highcut threshold as set by FM_ACF_HIGHCUT_THRESHOLD.
SMUTE_INT	Indicates that softmute attenuation has increased above the softmute threshold as set by FM_ACF_SOFTMUTE_THRESHOLD.
BLEND_CONV	Stereo blend convergence indicator. 0 : Audio blend is in transition. 1 : Audio blend is not in transition and is within the tolerance set by FM_ACF_BLEND_TOLERANCE.
HIGHCUT_CONV	High Cut convergence indicator. 0 : The high cut filter is in transition. 1 : The high cut filter is not in transition and is within the tolerance set by FM_ACF_HIGHCUT_TOLERANCE.
SMUTE_CONV	Softmute convergence indicator. 0 : Softmute is in transition. 1 : Softmute is not in transition and is within the tolerance set by FM_ACF_SOFTMUTE_TOLERANCE.

Name	Function
BLEND_STATE	Stereo blend indicator. Indicates that the audio is either at max stereo separation or blended between max stereo and min stereo separation. When set to 1, this bit indicates that stereo separation is less than the maximum stereo as defined by the FM_BLEND_XXX_STEREO_SEP properties. Note: when the pilot indicator is 0 this bit is also 0 and the audio will be mono. See the STBLEND field of the FM_ACF_STATUS command for the current value of stereo separation. 0 : Audio is not blended (max separation). 1 : Audio is blended.
HIGHCUT_STATE	High Cut indicator. 0 : Audio is not frequency limited 1 : Audio is frequency limited.
SMUTE_STATE	Soft Mute indicator. 0 : Audio is not soft muted. 1 : Audio is soft muted.
ATTN[4:0]	Soft mute attenuation level in dB. Range: 0-31
HIGHCUT[7:0]	Hicut cutoff frequency in units 100Hz. Range: 10-200
PILOT	Stereo pilot indicator 0 : Stereo pilot is not present. 1 : Stereo pilot is present.
STBLEND[6:0]	Indicates the current stereo separation in percent of the min and max stereo separation limits set by the FM_BLEND_XXX_STEREO_SEP properties. A value of 0 means stereo separation is at its minimum value and a value of 100 means stereo separation is at its maximum. STBLEND will only be non-zero if PILOT=1

### Command 0x34. FM\_RDS\_STATUS

FM\_RDS\_STATUS returns RDS information for current channel and reads an entry from the RDS FIFO. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: FM\_RDS\_STATUS command is not supported in firmware revision A0A.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x34							
ARG1	0	0	0	0	0	STATU- SONLY	MTFIFO	INTACK

Name	Function
STATUSONLY	Determines if data should be removed from the RDS receive FIFO. 0 : Data in BLOCKA, BLOCKB, BLOCKC, BLOCKD and BLE contain the oldest data in the RDS FIFO and are removed from the FIFO. 1 : Data in BLOCKA, BLOCKB, BLOCKC, BLOCKD and BLE will contain the last valid block A data received for the current station. Data in BLOCKB will contain the last valid block B data received for the current station. Data in BLE will describe the bit errors for the data in BLOCKA and BLOCKB.
MTFIFO	Clears the FIFO counts of the RDS Receive FIFO to zero if set. The FIFO counts will always be cleared during FM_TUNE_FREQ and FM_SEEK_START.
INTACK	Clears the STATUS:RDSINT bit if set.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	RDSTPP TYINT	RDSP- INT	X	RDSSYN CINT	RDS- FIFOINT
RESP5	X	X	X	TPPTY- VALID	PIVALID	X	RDSSYN C	RDSFI- FOLOST
RESP6	X	X	TP	PTY[4:0]				
RESP7	X							
RESP8	PI[7:0]							
RESP9	PI[15:8]							
RESP10	RDSFIFOUSED[7:0]							
RESP11	BLEA[1:0]		BLEB[1:0]		BLEC[1:0]		BLED[1:0]	
RESP12	BLOCKA[7:0]							
RESP13	BLOCKA[15:8]							
RESP14	BLOCKB[7:0]							
RESP15	BLOCKB[15:8]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP16	BLOCKC[7:0]							
RESP17	BLOCKC[15:8]							
RESP18	BLOCKD[7:0]							
RESP19	BLOCKD[15:8]							

Name	Function
RDSTPPTYINT	Traffic Program (TP) flag and Program Type (PTY) code has changed.
RDSPINT	Program Identification (PI) code has changed.
RDSSYNCINT	RDS synchronization status changed.
RDSFIFOINT	RDS Data was received and the RDS receive FIFO is full or has at least FM_RDS_INTERRUPT_FIFO_COUNT entries.
TPPTYVALID	Indicates that the TP flag and PTY code are valid.
PIVALID	Indicates that the PI code is valid.
RDSSYNC	Indicates that RDS is currently synchronized.
RDSFIFOLOST	One or more RDS groups have been discarded due to FIFO overrun since the last call to FM_RDS_STATUS.
TP	Current channel's TP flag if RDSTPPTY is 1
PTY[4:0]	Current channel's PTY code if RDSTPPTY is 1
PI[15:0]	Current channel's Program Identification if RDSPINT is 1
RDSFIFOUSED[7:0]	Indicates number of groups remaining in the RDS FIFO (0 if empty). If this is non-zero, BLOCKA-BLOCKD contain the oldest entry in the FIFO and RDSFIFOUSED will decrement by one on the next call to FM_RDS_STATUS (assuming no new RDS Data is received in the interim).
BLEA[7:6]	Bit Errors corrected in BLOCKA 0 : Block received with no bit errors. 1 : Block had one or two bit errors corrected. 2 : Block had three, four or five bit errors corrected. 3 : Block is uncorrectable.
BLEB[5:4]	Bit Errors corrected in BLOCKB
BLEC[3:2]	Bit Errors corrected in BLOCKC
BLED[1:0]	Bit Errors corrected in BLOCKD
BLOCKA[15:0]	Block A data from RDS FIFO if STATUSONLY is 0.
BLOCKB[15:0]	Block B data from RDS FIFO if STATUSONLY is 0.

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Name	Function
BLOCKC[15:0]	Block C data from RDS FIFO if STATUSONLY is 0.
BLOCKD[15:0]	Block D data from RDS FIFO if STATUSONLY is 0.

## Command 0x35. FM\_RDS\_BLOCKCOUNT

FM\_RDS\_BLOCKCOUNT command queries the block statistic info of RDS decoder. This command returns RDS expected, received and uncorrectable, block statistic information. Information from this command can be reset by setting CLEAR bit or sending FM\_TUNE\_FREQ command. Once EXPECTED saturates at 65535, all other block count statistics will be frozen until the counts are cleared. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: FM\_RDS\_BLOCKCOUNT command is not supported in firmware revision A0A.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x35							
ARG1	0	0	0	0	0	0	0	CLEAR

Name	Function
CLEAR	Clears the block counts if set. The current block counts will be reported before they are cleared.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	EXPECTED[7:0]							
RESP5	EXPECTED[15:8]							
RESP6	RECEIVED[7:0]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP7	RECEIVED[15:8]							
RESP8	UNCORRECTABLE[7:0]							
RESP9	UNCORRECTABLE[15:8]							

Name	Function
EXPECTED[15:0]	Number of expected RDS blocks.
RECEIVED[15:0]	Number of received RDS blocks. Under ideal conditions, EXPECTED and RECEIVED would be identical. The difference between these two numbers is the number of blocks lost.
UNCORRECTABLE[15:0]	Number of uncorrectable RDS blocks. These blocks have been received, but were found to have uncorrectable errors. The block error rate (BLER) is calculated by: $BLER = (UNCORRECTABLE + (EXPECTED - RECEIVED)) / EXPECTED$

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#### Command 0x80. GET\_DIGITAL\_SERVICE\_LIST

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GET\_DIGITAL\_SERVICE\_LIST gets a service list of the ensemble. This command should be issued each time an audio or data service list is updated as indicated by the ASRVLISTINT or DSRVLISTINT bit of the HD\_GET\_EVENT\_STATUS command. This occurs shortly after tune time when a digital radio tuning mode is selected and the ensemble has been acquired. Please refer to iBiquity document: RX\_IDD\_2206 Appendix L (Get\_All\_Data\_Services\_Info and Get\_All\_Audio\_Services\_Info) for the format of the HD Radio Service List. In the case of HD this command also retrieves the audio or data service info when the appropriate service type option is selected. This service info is available whenever the AINFO or DINFO bit(s) are set in the HD\_GET\_EVENT\_STATUS response. This audio and data information provides a quick look at the services in the ensemble and can be used to reduce scan time as this information is ready for parsing well before the service lists. The payload of these responses are defined in Table 5-4 of the RX\_IDD\_2206 main document. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x80							
ARG1	0	0	0	0	0	0	SERTYPE[1:0]	

# AN649

Name	Function
SERTYPE[1:0]	Sets the type of service list to retrieve. 0 : Get the audio(HD) service list. 1 : Get the data(HD) service list. 2 : Get the HD audio info. 3 : Get the HD data info.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	SIZE[7:0]							
RESP5	SIZE[15:8]							
RESP6	DATA_0[7:0]							
RESP7	DATA_N[7:0]							

Name	Function
SIZE[15:0]	The size of the service list in bytes.
DATA_0[7:0]	A max of 2047 bytes of service information. Please see the supplemental Digital Services User's Guide.
DATA_N[7:0]	A max of 2047 bytes of service information. Please see the supplemental Digital Services User's Guide. N(max) = SIZE-2.



**Command 0x81. START\_DIGITAL\_SERVICE**

START\_DIGITAL\_SERVICE starts an audio or data service. This command is used for HD audio and data services. To determine what services exist in an ensemble please use the GET\_DIGITAL\_SERVICE\_LIST command. In HD radio applications the broadcaster does not always transmit this service information. In this case no data services are available but there may be multiple audio programs available. To view which audio services are available use the HD\_DIGRAD\_STATUS command's AUDIO\_PROG\_AVAIL field to see which audio programs can be selected. In addition the SERVICE\_ID (service number) is not required when selecting an audio or data service. In this case please set the SERVICE\_ID parameter to 0. In the case of starting an audio service, it is not required to stop a currently running audio service/program before starting a new one. The currently running audio service will be stopped automatically when the new service is requested. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x81							
ARG1	0	0	0	0	0	0	0	SER- TYPE
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICE_ID[7:0]							
ARG5	SERVICE_ID[15:8]							
ARG6	SERVICE_ID[23:16]							
ARG7	SERVICE_ID[31:24]							
ARG8	COMP_ID[7:0]							
ARG9	COMP_ID[15:8]							
ARG10	COMP_ID[23:16]							
ARG11	COMP_ID[31:24]							

Name	Function
SERTYPE	Sets the type of service to start for HD applications. 0 : Select an audio service. 1 : Select a data service.
SERVICE_ID[31:0]	The service's Service Number (HD). This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command. NOTE: For HD applications the is referred to as the service number and not the global service ID that is provided as part of the component information.

# AN649

Name	Function
COMP_ID[31:0]	The service's Port/Program Number (HD). This ID is found in the component section of the service list returned by the GET_DIGITAL_SERVICE_LIST command. Note: COMP_ID will only accept 0 as a value for A0A release.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

## Command 0x82. STOP\_DIGITAL\_SERVICE

STOP\_DIGITAL\_SERVICE stops an audio or data service. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x82							
ARG1	0	0	0	0	0	0	0	SER- TYPE
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICE_ID[7:0]							
ARG5	SERVICE_ID[15:8]							
ARG6	SERVICE_ID[23:16]							
ARG7	SERVICE_ID[31:24]							
ARG8	COMP_ID[7:0]							
ARG9	COMP_ID[15:8]							
ARG10	COMP_ID[23:16]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG11	COMP_ID[31:24]							

Name	Function
SERTYPE	Sets the type of service list to start. 0 : Select an audio service. 1 : Select a data service.
SERVICE_ID[31:0]	The service's service ID. This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command.
COMP_ID[31:0]	The service's Component ID or Port Number of the service to stop. This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command. Note: COMP_ID will only accept 0 as a value for A0A release.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

### Command 0x84. GET\_DIGITAL\_SERVICE\_DATA

GET\_DIGITAL\_SERVICE\_DATA gets a block of data associated with one of the enabled data components of a digital service. Information about this block of data is found in the data header that is returned at the beginning of the data block. In order to determine the ideal number of PAYLOAD bytes to read, the header information can be read first followed by a second read of the full (header + PAYLOAD) length - it is unnecessary to call GET\_DIGITAL\_SERVICE\_DATA twice to use this method. The data associated with this transaction will be discarded at the receipt of a next GET\_DIGITAL\_SERVICE\_DATA command if STATUS\_ONLY = 0. Reading past the end of the buffer will result in zeros for the invalid bytes. Please refer to iBiquity document: SY\_IDD\_1019s Rev F (sections 5 and 6) for the format of the HD Radio data service data. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

# AN649

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x84							
ARG1	0	0	0	STA-TUS_ON LY	0	0	0	ACK

Name	Function
STATUS_ONLY	Returns only the interrupt source and available buffers information. No digital service data is removed from the service queue. This option should be used when polling for available data.
ACK	Acknowledge the reading of a data buffer or acknowledge one of the error interrupts. Whenever the ACK bit is set the DSRVINT bit in the status register will be cleared before CTS is released unless there are more data blocks to be read. All interrupt source bits associated with this command will also be cleared. 0 : Don't acknowledge the interrupt 1 : Acknowledging the interrupt will clear the DSRVINT bit and the interrupt source bits.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	X	X	X	DSR- VOV- FLINT	DSRVP- CKTINT
RESP5	BUFF_COUNT[7:0]							
RESP6	SRV_STATE[7:0]							
RESP7	DATA_SRC[1:0]		DSCTy[5:0]					
RESP8	SERVICE_ID[7:0]							
RESP9	SERVICE_ID[15:8]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP10	SERVICE_ID[23:16]							
RESP11	SERVICE_ID[31:24]							
RESP12	COMP_ID[7:0]							
RESP13	COMP_ID[15:8]							
RESP14	COMP_ID[23:16]							
RESP15	COMP_ID[31:24]							
RESP16	RFU[7:0]							
RESP17	RFU[15:8]							
RESP18	BYTE_COUNT[7:0]							
RESP19	BYTE_COUNT[15:8]							
RESP20	SEG_NUM[7:0]							
RESP21	SEG_NUM[15:8]							
RESP22	NUM_SEGS[7:0]							
RESP23	NUM_SEGS[15:8]							
RESP24	PAYLOAD0[7:0]							
RESP25	PAYLOADN[7:0]							

Name	Function
DSRVOVFLINT	The data services system has overflowed. This indicates that the host processor is not reading the services data out of the device fast enough. At most 8 outstanding data blocks can be queued in the device.
DSRVPCKTINT	Data for an enabled data service is ready for transfer to the host.
BUFF_COUNT[7:0]	Indicates the remaining number of buffers in the data service buffer queue.
SRV_STATE[7:0]	<p>The status indicator for the associated service component.</p> <p>0 : Indicates that the service is playing out normally.</p> <p>1 : Indicates that the data service has stopped and that this is the last data block associated with the service.</p> <p>2 : Indicates that the system was not able to forward a packet due to a memory overflow. If this status is present the host is not reading the packet data fast enough.</p> <p>3 : Indicates the this data packet represents the beginning of a new data object.</p> <p>4 : Indicates the this data packet was received with errors.</p>

# AN649

Name	Function
DATA_SRC[7:6]	For DAB indicates the payload source. Not used in HD modes of operation. 0 : Indicates that the payload is from a standard data service and DATA_TYPE is DSCTy. 1 : Indicates that the payload is non-DLS PAD and DATA_TYPE is DSCTy. 2 : Indicates that the payload is DLS PAD and DATA_TYPE is 0. 3 : Reserved for future use.
DSCTy[5:0]	Used for DAB only. Returns 0 or the DSCTy depending on the DATA_SRC field. See DATA_SRC for details.
SERVICE_ID[31:0]	The Service ID this data is associated with.
COMP_ID[31:0]	The Component ID or Port Number this data is associated with.
RFU[15:0]	Reserved for future use.
BYTE_COUNT[15:0]	The length of this data block in bytes excluding the DSRV header.
SEG_NUM[15:0]	The segment number for this data block. If the data is associated with a stream this value represents a sequence number. Note that segment numbers can be returned out of order. Therefore the host must store and reassemble the data as needed.
NUM_SEGS[15:0]	The total number of segments to be returned for this data object. If NUM_SEGS=0 then no object length information is known or the associated service is a stream.
PAYLOAD0[7:0]	The first payload byte.
PAYLOADN[7:0]	The Nth payload byte where N = BYTE_COUNT-1.

## Command 0x92. HD\_DIGRAD\_STATUS

HD\_DIGRAD\_STATUS returns status information about the digital radio and ensemble. The bits AERRHINT, AEERLINT, CDNRHINT, CDNRLINT, and ACQINT are sticky meaning they will remain set until DIGRAD\_ACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire assuming that bit is enabled in HD\_DIGRAD\_INTERRUPT\_SOURCE. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x92							
ARG1	0	0	0	0	0	0	0	DIGRAD_ACK

Name	Function
DIGRAD_ACK	Clears all pending digital radio interrupts.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	HDLO- GOINT	SRCA- NAINT	SRC- DIGINT	X	AUDAC- QINT	ACQINT	CDN- RHINT	CDN- RLINT
RESP5	HDLOGO	SRCANA	SRCDIG	X	AUDACQ	ACQ	CDNRH	CDNRL
RESP6	BCTL[1:0]		DAAI[5:0]					
RESP7	CDNR[7:0]							
RESP8	X	X	X	TX_GAIN[4:0]				
RESP9	AUDIO_PROG_AVAIL[7:0]							
RESP10	AUDIO_PROG_PLAYING[7:0]							
RESP11	AUDIO_CA[7:0]							
RESP12	CORE_AUDIO_ERR[7:0]							
RESP13	CORE_AUDIO_ERR[15:8]							
RESP14	CORE_AUDIO_ERR[23:16]							
RESP15	CORE_AUDIO_ERR[31:24]							
RESP16	ENH_AUDIO_ERR[7:0]							
RESP17	ENH_AUDIO_ERR[15:8]							
RESP18	ENH_AUDIO_ERR[23:16]							
RESP19	ENH_AUDIO_ERR[31:24]							
RESP20	PTY[7:0]							
RESP21	PS_MODE[7:0]							
RESP22	CODEC_MODE[7:0]							

Name	Function
HDLOGOINT	Indicates a change in the HD Logo display state.
SRCANAINT	Indicates a change in the Analog Audio Source state. Setting of this bit will only occur when the blend state of the analog audio changes.
SRCDIGINT	Indicates a change in the Digital Audio Source state. Setting of this bit will only occur when the blend state of the digital audio changes.
AUDACQINT	Indicates a change in the audio acquisition state. This could be a change to audio acquisition status or a change to the number of available programs as indicated in the AUDIO_PROG_AVAIL field of the HD_DIGRAD_STATUS command.
ACQINT	Indicates a change in the ensembles acquisition state. Setting of this bit will only occur when the acquisition state of the ensemble changes.
CDNRHINT	Indicates that CDNR has risen above the CDNR high threshold. This threshold is set in the HD_DIGRAD_CDNR_HIGH_THRESHOLD property.
CDNRLINT	Indicates that CDNR has dropped below the CDNR low threshold. This threshold is set in the HD_DIGRAD_CDNR_LOW_THRESHOLD property.
HDLOGO	HD Logo display 0 : Consumer radio should not display HD Logo 1 : Consumer radio should display HD Logo
SRCANA	Audio source is analog. If both SRCANA and SRCDIG are set, the audio is blending. 0 : Audio source is not analog 1 : Audio source is analog
SRCDIG	Audio source is digital. If both SRCDIG and SRCANA are set, the audio is blending. 0 : Audio source is not digital 1 : Audio source is digital
AUDACQ	When set the HD demod has acquired digital audio and it is now available to render. See the AUDIO_PROG_AVAIL field of this command to determine which programs are available. 0 : HD audio has not been acquired. 1 : HD audio has been acquired.
ACQ	The ensemble has been acquired.
CDNRH	Indicates that CDNR is currently above the CDNR high threshold. This threshold is set in the HD_DIGRAD_CDNR_HIGH_THRESHOLD property.
CDNRL	Indicates that CDNR is currently below the CDNR low threshold. This threshold is set in the HD_DIGRAD_CDNR_LOW_THRESHOLD property.
BCTL[7:6]	Reflects the state of the TX blend control bits communicated by the broadcast system..



Name	Function
DAAI[5:0]	Digital Audio quality indicator, Indicates the current estimate of the audio quality of the currently selected audio service. lower numbers indicate poorer quality. The number is unitless and provided in 4.2 format.
CDNR[7:0]	Indicates the current estimate of the carrier to noise ratio as seen by the digital radio subsystem.
TX_GAIN[4:0]	Indicates the amount of gain the receiver must apply to the digital audio signal relative to analog audio. In 5-bit two's complement format.
AUDIO_PROG_AVAIL[7:0]	Indicates which of the 8 audio programs are available. This field is a bit field where bit 0 represents the MPS and bits 1-7 represent the SPS. For example if this field is set to 0x83 then SPS7, SPS1, and the MPS are available. To select one of these services use the START_DIGITAL_SERVICE command.
AUDIO_PROG_PLAYING[7:0]	Indicates which of the audio programs is currently playing.
AUDIO_CA[7:0]	Indicates which of the audio programs have CA associated with them.
CORE_AUDIO_ERR[31:0]	Indicates the total number of core audio frames received in error.
ENH_AUDIO_ERR[31:0]	Indicates the total number of enhanced audio frames received in error.
PTY[7:0]	Indicates the current audio program type PTy.
PS_MODE[7:0]	Indicates the primary service mode for the currently tuned ensemble.
CODEC_MODE[7:0]	Indicates the audio codec configuration for the currently selected audio program. 0 : FM Hybrid single-stream on P1 Channel 1 : FM All Digital dual-stream w/ mono core 2 : AM Hybrid/All Digital dual-stream 3 : FM All Digital dual-stream w/ stereo core 10 : FM dual-stream on SPS 13 : FM Hybrid/All Digital single-stream on P3 Channel

### Command 0x93. HD\_GET\_EVENT\_STATUS

HD\_GET\_EVENT\_STATUS retrieves the status of HD related events. This includes items such as new alarms available, new PSD, New station info, etc. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x93							
ARG1	0	0	0	0	0	0	0	EVENT_ACK

# AN649

Name	Function
EVENT_ACK	Clears all pending digital radio event interrupts.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	DIN- FOINT	AIN- FOINT	X	ALERTIN T	PSDINT	SISINT	DSRV LIS TINT	ASRV LIS TINT
RESP5	DINFO	AINFO	X	X	PSD	SIS	DSRV LIS T	ASRV LIS T
RESP6	ASRVLISTVER[7:0]							
RESP7	ASRVLISTVER[15:8]							
RESP8	DSRVLISTVER[7:0]							
RESP9	DSRVLISTVER[15:8]							
RESP10	X	X	X	SIS_LO- CATION	X	SIS_LON G_NAME	SIS_SHO RT_NAM E	SIS_ID
RESP11	X	X	SIS_SLO GAN	SIS_BA- SIC_SIS	SIS_UNI- V_SHOR T_NAME	SIS_LEA P_SEC	SIS_TI- MEZONE	SIS_MES SAGE
RESP12	X	TEXT	SHORT	LANG	GENRE	ALBUM	ARTIST	TITLE
RESP13	ID	OWNER	DESC	NAME	RECV	URL	VALID	PRICE
RESP14	X	X	X	X	X	ARMS- GAVAIL	ARFRM0	ARFRM
RESP15	ARFRAMECNT[7:0]							
RESP16	ARMSGID[7:0]							
RESP17	ARCRC7[7:0]							

Name	Function
DINFOINT	New Data Info. Indicates that the data service info has been updated. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
AINFOINT	New Audio Info. Indicates that the audio service info has been updated. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
ALERTINT	New Alert interrupt. Indicates that a new alert has been issued by the broadcaster. Retrieve the event info with the HD_GET_ALERT_MSG command.
PSDINT	New Program Service Data interrupt. Indicates that new program service data on the currently playing audio service is available. Retrieve the PSD with the HD_GET_PSD_DECODE command.
SISINT	New station information interrupt. Indicates that the station information service data has changed. The updated information is retrieved with the HD_GET_STATION_INFO command.
DSRVLISTINT	New data service list interrupt. Indicates that a new digital data service list is available. The new service list is retrieved with the GET_DIGITAL_SERVICE_LIST command.
ASRVLISTINT	New audio service list interrupt. Indicates that a new digital audio service list is available. The new service list is retrieved with the GET_DIGITAL_SERVICE_LIST command.
DINFO	Data Service Info is available. Indicates data service info is available. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
AINFO	Audio Service Info is available. Indicates audio service info is available. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
PSD	Program Service Data is available. Indicates program service data on the currently playing audio service is available. Retrieve the PSD with the HD_GET_PSD_DECODE command.
SIS	Station information is available. Indicates that station information service data is available. The station information service data is retrieved with the HD_GET_STATION_INFO command.
DSRVLIST	Data Service list available. Indicates that a digital data service list is available.
ASRVLIST	Audio Service list available. Indicates that a digital audio service list is available.
ASRVLISTVER[15:0]	Indicates the current version of the audio service list. This field is incremented by 1 each time the audio service list is updated. The host can use this field to help determine if a new audio service list needs to be collected.
DSRVLISTVER[15:0]	Indicates the current version of the data service list. This field is incremented by 1 each time the data service list is updated. The host can use this field to help determine if a new data service list needs to be collected.
SIS_LOCATION	station location is available.
SIS_LONG_NAME	station long name is available.

# AN649

Name	Function
SIS_SHORT_NAME	station short name is available.
SIS_ID	station ID is available.
SIS_SLOGAN	station slogan is available.
SIS_BASIC_SIS	the logical OR of bits SIS_LOCATION, SIS_LONG_NAME, SIS_SHORT_NAME and SIS_ID.
SIS_UNI-V_SHORT_NAME	station universal short name is available.
SIS_LEAP_SEC	station leap seconds is available.
SIS_TIMEZONE	station time zone is available.
SIS_MESSAGE	station message is available.
TEXT	PSD Comment:The actual text is available
SHORT	PSD Comment:Short Content Description is available
LANG	PSD Comment:Language is available
GENRE	PSD Genre is available
ALBUM	PSD Album is available
ARTIST	PSD Artist is available
TITLE	PSD Title is available
ID	PSD UFID:Owner ID is available
OWNER	PSD UFID:Owner is available
DESC	PSD Commercial:Description is available
NAME	PSD Commercial:Name of Seller is available
RECV	PSD Commercial:Received As is available
URL	PSD Commercial:Contact URL is available
VALID	PSD Commercial:Valid Until is available
PRICE	PSD Commercial:Price is available
ARMSGAVAIL	Complete AR MSG is available
ARFRM0	AR Frame 0 has been received
ARFRM	AR Frame (any) has been received
ARFRAMECNT[7:0]	The Alert message frame counter.
ARMSGID[7:0]	A complete alert message is available. The message can be retrieved with the HD_GET_ALERT_MSG command.
ARCRC7[7:0]	The alert message CRC7 value extracted from frame 0.

**Command 0x94. HD\_GET\_STATION\_INFO**

HD\_GET\_STATION\_INFO retrieves information about the ensemble broadcaster. The station information is defined in the 2206 standard. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x94							
ARG1	INFO_SELECT[7:0]							

Name	Function
INFO_SELECT[7:0]	<p>Selects which information returned by this command.</p> <p>0 : RSVD Do not use</p> <p>1 : Returns a station message. An arbitrary text message such as telephone number, URL, etc. High-priority messages should take precedence over all other SIS data and PSD. For the station message, a maximum length of 190 bytes is currently supported. The Station Message is only returned when updates have been received OTA. A LENGTH of 0 will be returned if no update has been received since the last request.</p> <p>2 : Returns the Local time zone and daylight savings time (DST) information, allowing receivers to automatically calculate and display time of day.</p> <p>3 : Returns a leap-second correction factor occasionally adjusts UTC by one second to keep it synchronized with astronomical time. Since GPS time does not apply this correction, the two standards have diverged slightly over the years.</p> <p>4 : Provides an alternative to basic short station name, for countries where different text-encoding schemes may be required. The Append Byte indicates whether "-FM" should be appended to the short station name by the HC. The maximum length for the name is 12 bytes. For US markets, the Station Name (short form) should be retrieved using then BASICSIS option.</p> <p>5 : Returns basic SIS data. See the 2206 documentation for full details. Basically this includes items such as the station ID and station location. The information returned by this option is controlled by the HD_EVENT_SIS_CONFIG property.</p> <p>6 : Returns the station slogan. This field supersedes the long station name returned by the BASIC SIS option 5. For the slogan, a maximum length of 95 bytes is currently supported.</p>

# AN649

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	LENGTH[7:0]							
RESP5	LENGTH[15:8]							
RESP6	DATA0[7:0]							

Name	Function
LENGTH[15:0]	The number of data bytes returned by this command.
DATA0[7:0]	The first of LENGTH data bytes returned by this command. Please see the 2206 SIS documentation for details about then returned data.

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## Command 0x95. HD\_GET\_PSD\_DECODE

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Retrieves PSD information.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x95							
ARG1	PROGRAM[7:0]							
ARG2	FIELD[7:0]							

Name	Function
PROGRAM[7:0]	Program Number 0 : MPS 1 : SPS 1 2 : SPS 2 3 : SPS 3 4 : SPS 4 5 : SPS 5 6 : SPS 6 7 : SPS 7 0xFF : Currently playing audio service
FIELD[7:0]	PSD Field 0 : Title 1 : Artist 2 : Album 3 : Genre 4 : Comment: Language 5 : Comment: Short Content Description 6 : Comment: The actual text 8 : Commercial: Price 9 : Commercial: Valid Until 10 : Commercial: Contact URL 11 : Commercial: Received As 12 : Commercial: Name of Seller 13 : Commercial: Description 14 : UFID: Owner 15 : UFID: Owner ID

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X							
RESP5	X							
RESP6	DATATYPE[7:0]							
RESP7	LENGTH[7:0]							

# AN649

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP8	DATA0[7:0]							

Name	Function
DATATYPE[7:0]	0 : 8 bit character: ISO/IEC 8859-1:1998 1 : 16 bit character: ISO/IEC 10646-1:2000
LENGTH[7:0]	The number of data bytes returned by this command.
DATA0[7:0]	The first of LENGTH data bytes returned by this command. Please see the 2206 SIS documentation for details about then returned data.

## Command 0x96. HD\_GET\_ALERT\_MSG

HD\_GET\_ALERT\_MSG retrieves alert message. Alerts are special messages provided by the broadcaster that may signal important information about emergencies or events. Full details about Alerts can be found in the 2206 standard. This API is used to collect the alert data and is used in response to an alert event. See the HD\_GET\_EVENT\_STATUS command for details on the alert event. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x96							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	LENGTH[7:0]							



Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP5	LENGTH[15:8]							
RESP6	DATA0[7:0]							

Name	Function
LENGTH[15:0]	The number of data bytes returned in the alert payload. The length of the alert message will not exceed 395 bytes.
DATA0[7:0]	The first of LENGTH data bytes returned by this command. Please see the 2206 Alert documentation for details about then returned data.

### Command 0x97. HD\_PLAY\_ALERT\_TONE

HD\_PLAY\_ALERT\_TONE plays the alert tone. Alerts are special messages provided by the broadcaster that may signal important information about emergencies or events. Full details about Alerts can be found in the 2206 standard. This API is used to play an alert tone at the host's discretion. It is recommended that the host play this tone for each unique alert message it receives. If the host chooses it can also have these tones played automatically on every alert message. See the HD\_EVENT\_ALERT\_CONFIG property for details on playing alert tones automatically. Also see the HD\_GET\_EVENT\_STATUS command for details on the alert event. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x97							
ARG1	0							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

# AN649

## Command 0x98. HD\_TEST\_GET\_BER\_INFO

HD\_TEST\_GET\_BER\_INFO reads the current BER information for the HD digital demod. The information returned by this command is only meaningful if the BER test vector (IB\_FMr208c\_e1wfc204 for FMHD, IB\_AMr208a\_e1awfb00 for AMHD) is being received. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x98							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	PIDS_BLOCK_ERRORS[7:0]							
RESP5	PIDS_BLOCK_ERRORS[15:8]							
RESP6	PIDS_BLOCK_ERRORS[23:16]							
RESP7	PIDS_BLOCK_ERRORS[31:24]							
RESP8	PIDS_BLOCKS_TESTED[7:0]							
RESP9	PIDS_BLOCKS_TESTED[15:8]							
RESP10	PIDS_BLOCKS_TESTED[23:16]							
RESP11	PIDS_BLOCKS_TESTED[31:24]							
RESP12	PIDS_BIT_ERRORS[7:0]							
RESP13	PIDS_BIT_ERRORS[15:8]							
RESP14	PIDS_BIT_ERRORS[23:16]							
RESP15	PIDS_BIT_ERRORS[31:24]							
RESP16	PIDS_BITS_TESTED[7:0]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP17	PIDS_BITS_TESTED[15:8]							
RESP18	PIDS_BITS_TESTED[23:16]							
RESP19	PIDS_BITS_TESTED[31:24]							
RESP20	P3_BIT_ERRORS[7:0]							
RESP21	P3_BIT_ERRORS[15:8]							
RESP22	P3_BIT_ERRORS[23:16]							
RESP23	P3_BIT_ERRORS[31:24]							
RESP24	P3_BITS_TESTED[7:0]							
RESP25	P3_BITS_TESTED[15:8]							
RESP26	P3_BITS_TESTED[23:16]							
RESP27	P3_BITS_TESTED[31:24]							
RESP28	P2_BIT_ERRORS[7:0]							
RESP29	P2_BIT_ERRORS[15:8]							
RESP30	P2_BIT_ERRORS[23:16]							
RESP31	P2_BIT_ERRORS[31:24]							
RESP32	P2_BITS_TESTED[7:0]							
RESP33	P2_BITS_TESTED[15:8]							
RESP34	P2_BITS_TESTED[23:16]							
RESP35	P2_BITS_TESTED[31:24]							
RESP36	P1_BIT_ERRORS[7:0]							
RESP37	P1_BIT_ERRORS[15:8]							
RESP38	P1_BIT_ERRORS[23:16]							
RESP39	P1_BIT_ERRORS[31:24]							
RESP40	P1_BITS_TESTED[7:0]							
RESP41	P1_BITS_TESTED[15:8]							
RESP42	P1_BITS_TESTED[23:16]							
RESP43	P1_BITS_TESTED[31:24]							

Name	Function
PIDS_BLOCK_ERRORS[31:0]	The number of PIDS blocks received with errors.
PIDS_BLOCKS_TESTED[31:0]	The total number of PIDS blocks received.
PIDS_BIT_ERRORS[31:0]	The number of PIDS bits received with errors.
PIDS_BITS_TESTED[31:0]	The total number of PIDS bits received.
P3_BIT_ERRORS[31:0]	The number of P3 bits received with errors.
P3_BITS_TESTED[31:0]	The total number of P3 bits received.
P2_BIT_ERRORS[31:0]	The number of P2 bits received with errors.
P2_BITS_TESTED[31:0]	The total number of P2 bits received.
P1_BIT_ERRORS[31:0]	The number of P1 bits received with errors.
P1_BITS_TESTED[31:0]	The total number of P1 bits received.

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## Command 0x99. HD\_SET\_ENABLED\_PORTS

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HD\_SET\_ENABLED\_PORTS sets the default HD ports retrieved/enabled when HD has been acquired. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x99							
ARG1	LENGTH[7:0]							
ARG2	DATA_0[7:0]							
ARG3	DATA_0[15:8]							

Name	Function
LENGTH[7:0]	The numbers of ports included in this command. Maximum 64.
DATA_0[15:0]	The first port address of LENGTH addresses.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

**Command 0x9A. HD\_GET\_ENABLED\_PORTS**

HD\_GET\_ENABLED\_PORTS gets the default HD ports retrieved when HD has been acquired. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x9A							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	LENGTH[7:0]							
RESP5	X							
RESP6	DATA_0[7:0]							
RESP7	DATA_0[15:8]							

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Name	Function
LENGTH[7:0]	The numbers of ports previously set. Maximum 64.
DATA_0[15:0]	If set, the first port byte.

## Command 0x9C. HD\_ACF\_STATUS

This command Returns status information about HD automatically controlled features.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x9C							
ARG1	0	0	0	0	0	0	0	ACFACK

Name	Function
ACFACK	Clears ACFINT and any ACF interrupt bits if set.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	X	X	X	X	COM- F_NOISE _INT
RESP5	X	X	X	COM- F_NOISE _CONV	X	X	X	COM- F_NOISE _STATE
RESP6	COMFORT_NOISE_LEVEL[7:0]							
RESP7	COMFORT_NOISE_LEVEL[15:8]							

Name	Function
COMF_NOISE_INT	Indicates that comfort noise level has increased above the noise level threshold as set by HD_ACF_COMF_NOISE_THRESHOLD.
COMF_NOISE_CONV	Comfort noise level convergence indicator. 0 : Comfort noise level is in transition. 1 : Comfort noise level is not in transition and is within the tolerance set by HD_ACF_COMF_NOISE_TOLERANCE.
COMF_NOISE_STATE	Comfort noise indicator. 0 : Comfort noise is not present. 1 : Comfort noise is present.
COMFORT_NOISE_LEVEL[15:0]	Comfort noise level as a fractional number between 0 and 1. Where 0 is off and 0x3FFF is 0dBFS. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property.

### Command 0xE5. TEST\_GET\_RSSI

TEST\_GET\_RSSI returns the reported RSSI in 8.8 format. This command is used to help calibrate the frontend tracking circuit. It returns the RSSI value in dBuV to 1/256 of a dB. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: TEST\_GET\_RSSI command is not supported in firmware revision A0A or A0B.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xE5							
ARG1	0							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	DACQINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	X	X	DEVNTINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPOFERR	CMDOFERR	ARBERR	ERRNR
RESP4	RSSI_HIGHRES[7:0]							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP5	RSSI_HIGHRES[15:8]							

Name	Function
RSSI_HIGHRES[15:0]	The RSSI measurement in dBuV to 1/256 of a dB.



## 4.2. Properties Summary—FMHD

**Table 4. Properties Summary—FMHD**

Prop	Name	Description	Default
0x0000	INT_CTL_ENABLE	Interrupt enable property	0x0000
0x0001	INT_CTL_REPEAT	Interrupt repeat property	0x0000
0x0200	DIGITAL_IO_OUTPUT_SELECT	Selects digital audio Master or Slave.	0
0x0201	DIGITAL_IO_OUTPUT_SAMPLE_RATE	Sets output sample audio rate in units of 1Hz.	48000
0x0202	DIGITAL_IO_OUTPUT_FORMAT	Configure digital output format.	0x1800
0x0203	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_1	Deviations from the standard framing mode	0
0x0204	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_2	Deviations from the standard framing mode	0
0x0205	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_3	Deviations from the standard framing mode	0
0x0206	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_4	Deviations from the standard framing mode	0
0x0300	AUDIO_ANALOG_VOLUME	Sets the audio analog volume.	63
0x0301	AUDIO_MUTE	AUDIO_MUTE property mutes/unmutes each audio output independently.	0x0000
0x0302	AUDIO_OUTPUT_CONFIG	AUDIO_OUTPUT_CONFIG is used to configure various settings of the audio output.	0x0000
0x0800	PIN_CONFIG_ENABLE	Pin configuration property	0x8001
0x0900	WAKE_TONE_ENABLE	Enables the wake tone feature.	0
0x0901	WAKE_TONE_PERIOD	Sets the wake tone duty cycle.	250
0x0902	WAKE_TONE_FREQ	Sets the wake tone frequency.	750
0x0903	WAKE_TONE_AMPLITUDE	Sets the wake tone amplitude.	8
0x170C	AGC_RF_THRESHOLD	Adjusts the midpoint of threshold for the RF Threshold Detector.	0
0x1710	FM_TUNE_FE_VARM	FM Front End Varactor configuration slope	0
0x1711	FM_TUNE_FE_VARB	FM Front End Varactor configuration intercept	0
0x1712	FM_TUNE_FE_CFG	Additional configuration options for the front end.	0x0000
0x3100	FM_SEEK_BAND_BOTTOM	Sets the lower seek boundary of the FM band in multiples of 10kHz.	8750
0x3101	FM_SEEK_BAND_TOP	Sets the upper seek boundary for the FM band in multiples of 10kHz.	10790

Table 4. Properties Summary—FMHD (Continued)

Prop	Name	Description	Default
0x3102	FM_SEEK_FREQUENCY_SPACING	Sets the frequency spacing for the FM band in multiples of 10kHz when performing a seek.	10
0x3200	FM_VALID_MAX_TUNE_ERROR	Sets the maximum frequency error allowed before setting the AFCRL indicator.	114
0x3201	FM_VALID_RSSI_TIME	Sets the amount of time in ms to allow the RSSI/ISSI metrics to settle before evaluating.	15
0x3202	FM_VALID_RSSI_THRESHOLD	Sets the RSSI threshold for a valid FM Seek/Tune.	17
0x3203	FM_VALID_SNR_TIME	Sets the amount of time in ms to allow the SNR metric to settle before evaluating.	40
0x3204	FM_VALID_SNR_THRESHOLD	Sets the SNR threshold for a valid FM Seek/Tune.	10
0x3206	FM_VALID_HDLEVEL_THRESHOLD	Sets the HDLEVEL threshold for a valid FM Seek/Tune.	0
0x3300	FM_RSQ_INTERRUPT_SOURCE	Configures interrupt related to Received Signal Quality metrics.	0
0x3301	FM_RSQ_SNR_HIGH_THRESHOLD	FM_RSQ_SNR_HIGH_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the SNR is above this threshold.	127
0x3302	FM_RSQ_SNR_LOW_THRESHOLD	FM_RSQ_SNR_LOW_THRESHOLD sets the low threshold, which triggers the RSQ interrupt if the SNR is below this threshold.	-128
0x3303	FM_RSQ_RSSI_HIGH_THRESHOLD	FM_RSQ_RSSI_HIGH_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the RSSI is above this threshold.	127
0x3304	FM_RSQ_RSSI_LOW_THRESHOLD	Sets low threshold which triggers the RSQ interrupt if the RSSI is below this threshold.	-128
0x3307	FM_RSQ_HD_DETECTION	Configures the Fast HD Detection routine.	0x000d
0x3308	FM_RSQ_HD_LEVEL_TIME_CONST	Configures the Fast HD Detection Level Metric Filtering Time Constant.	32
0x3309	FM_RSQ_HDDETECTED_THD	Configures the HD Level Detected Threshold.	0x1e1e

Table 4. Properties Summary—FMHD (Continued)

Prop	Name	Description	Default
0x330A	FM_RSQ_HDLEVEL_HIGH_THRESHOLD	Sets high threshold which triggers the RSQ interrupt if FILTERED_HDLEVEL is above this threshold.	100
0x330B	FM_RSQ_HDLEVEL_LOW_THRESHOLD	Sets low threshold which triggers the RSQ interrupt if FILTERED_HDLEVEL is below this threshold.	0
0x3400	FM_ACF_INTERRUPT_SOURCE	Enables the ACF interrupt sources.	0
0x3401	FM_ACF_SOFTMUTE_THRESHOLD	Sets the softmute interrupt threshold in dB attenuation.	31
0x3402	FM_ACF_HIGHCUT_THRESHOLD	Sets the high cut interrupt threshold.	0
0x3403	FM_ACF_BLEND_THRESHOLD	Sets the stereo blend interrupt threshold.	0
0x3404	FM_ACF_SOFTMUTE_TOLERANCE	Sets the distance from the final softmute value that triggers softmute convergence flag.	2
0x3405	FM_ACF_HIGHCUT_TOLERANCE	Sets the distance from the final high cut frequency that triggers the high cut convergence flag.	20
0x3406	FM_ACF_BLEND_TOLERANCE	Sets the distance from the final blend state that triggers the blend convergence flag.	5
0x3500	FM_SOFTMUTE_SNR_LIMITS	Sets the SNR limits for soft mute attenuation.	0x0602
0x3501	FM_SOFTMUTE_SNR_ATTENUATION	Sets the SNR based softmute attenuation limits.	0x0008
0x3502	FM_SOFTMUTE_SNR_ATTACK_TIME	Sets the soft mute attack time.	16
0x3503	FM_SOFTMUTE_SNR_RELEASE_TIME	Sets the soft mute release time.	4000
0x3600	FM_HIGHCUT_RSSI_LIMITS	RSSI based high cut limits.	0x0C06
0x3601	FM_HIGHCUT_RSSI_CUTOFF_FREQ	RSSI based high cut cutoff frequencies.	0xC828
0x3602	FM_HIGHCUT_RSSI_ATTACK_TIME	RSSI based high cut attack time.	16
0x3603	FM_HIGHCUT_RSSI_RELEASE_TIME	RSSI based high cut release time.	4000
0x3604	FM_HIGHCUT_SNR_LIMITS	SNR based high cut limits.	0x0903
0x3605	FM_HIGHCUT_SNR_CUTOFF_FREQ	SNR based high cut cutoff frequencies.	0xc828
0x3606	FM_HIGHCUT_SNR_ATTACK_TIME	SNR based high cut attack time.	16
0x3607	FM_HIGHCUT_SNR_RELEASE_TIME	SNR based high cut release time.	4000
0x3608	FM_HIGHCUT_MULTIPATH_LIMITS	Multipath based high cut limits.	0x2D3C
0x3609	FM_HIGHCUT_MULTIPATH_CUTOFF_FREQ	Multipath based high cut cutoff frequencies.	0xc828
0x360A	FM_HIGHCUT_MULTIPATH_ATTACK_TIME	Multipath based high cut attack time.	16
0x360B	FM_HIGHCUT_MULTIPATH_RELEASE_TIME	Multipath based high cut release time.	4000

**Table 4. Properties Summary—FMHD (Continued)**

Prop	Name	Description	Default
0x3700	FM_BLEND_RSSI_LIMITS	This property sets the RSSI limits for RSSI controlled stereo separation.	0x2010
0x3702	FM_BLEND_RSSI_ATTACK_TIME	RSSI based stereo to mono attack time in ms.	16
0x3703	FM_BLEND_RSSI_RELEASE_TIME	RSSI based mono to stereo release time in ms.	4000
0x3704	FM_BLEND_SNR_LIMITS	Sets the SNR limits for SNR controlled stereo separation.	0x180F
0x3706	FM_BLEND_SNR_ATTACK_TIME	SNR based stereo to mono attack time in ms.	16
0x3707	FM_BLEND_SNR_RELEASE_TIME	SNR based mono to stereo release time in ms.	4000
0x3708	FM_BLEND_MULTIPATH_LIMITS	Sets the multipath limits for multipath controlled stereo separation.	0x2D3C
0x370A	FM_BLEND_MULTIPATH_ATTACK_TIME	Multi-path based stereo to mono attack time in ms.	16
0x370B	FM_BLEND_MULTIPATH_RELEASE_TIME	Multi-path based mono to stereo release time in ms.	4000
0x3900	FM_AUDIO_DE_EMPHASIS	Sets the FM Receive de-emphasis.	0
0x3C00	FM_RDS_INTERRUPT_SOURCE	This property configures interrupt related to RDS..	0x0000
0x3C01	FM_RDS_INTERRUPT_FIFO_COUNT	Configures minimum received data groups in fifo before interrupt.	0x0000
0x3C02	FM_RDS_CONFIG	Enables RDS and configures acceptable block error threshold.	0x0000
0x3C03	FM_RDS_CONFIDENCE	Configures rds block confidence threshold.	0x1111
0x8100	DIGITAL_SERVICE_INT_SOURCE	Configures the interrupt sources for digital services	0x0000
0x8101	DIGITAL_SERVICE_RESTART_DELAY	sets the delay time (in milliseconds) to restart digital service when recovering from acquisition loss	8000
0x9101	HD_BLEND_OPTIONS	This property provides options to control HD/analog audio blend behavior. This property is only valid for Hybrid (non-All-Digital HD) Broadcasts.	0x000A
0x9102	HD_BLEND_ANALOG_TO_HD_TRANSITION_TIME	This property sets the amount of time it takes in ms to blend from analog to HD. This property only applies to primary service channel.	750

Table 4. Properties Summary—FMHD (Continued)

Prop	Name	Description	Default
0x9103	HD_BLEND_HD_TO_ANALOG_TRANSITION_TIME	This property sets the amount of time it takes in ms to blend from HD to analog. This property only applies to primary service channel.	100
0x9106	HD_BLEND_DYNAMIC_GAIN	This property sets the digital audio dynamic linear scaling factor. Setting DGAIN_OVERRIDE bit to 1 will override the broadcaster specified digital gain. The DGAIN field is a signed 8 bit fractional number where the linear gain is equal to DGAIN/128.	0
0x9109	HD_BLEND_DECISION_ANA_TO_DIG_THRESHOLD	This property defines the analog to digital blend threshold.	58
0x910A	HD_BLEND_DECISION_ANA_TO_DIG_DELAY	This property defines the analog to digital blend delay.	5000
0x910B	HD_BLEND_SERV_LOSS_RAMP_UP_TIME	Sets the service re-acquisition unmute time in ms.	750
0x910C	HD_BLEND_SERV_LOSS_RAMP_DOWN_TIME	Sets the service switching mute time in ms.	250
0x910D	HD_BLEND_SERV_LOSS_NOISE_RAMP_UP_TIME	Sets the comfort noise unmute time in ms.	1000
0x910E	HD_BLEND_SERV_LOSS_NOISE_RAMP_DOWN_TIME	Sets the comfort noise mute time in ms.	250
0x910F	HD_BLEND_SERV_LOSS_NOISE_LEVEL	Sets the service loss noise level.	512
0x9110	HD_BLEND_SERV_LOSS_NOISE_DAAI_THRESHOLD	Sets the DAAI threshold below which comfort noise will engage.	40
0x9111	HD_BLEND_SERV_LOSS_NOISE_AUDIO_START_DELAY	Sets the audio restart delay used by the comfort noise ramping algorithm.	4
0x9112	HD_BLEND_SERV_SWITCH_RAMP_UP_TIME	Sets the service switching unmute time in ms.	184
0x9113	HD_BLEND_SERV_SWITCH_RAMP_DOWN_TIME	Sets the service switching mute time in ms.	184
0x9200	HD_DIGRAD_INTERRUPT_SOURCE	Configures interrupts related to digital receivers HD_DIGRAD_STATUS command.	0
0x9201	HD_DIGRAD_CDNR_LOW_THRESHOLD	Configures CDNR LOW interrupt interrupt threshold.	0
0x9202	HD_DIGRAD_CDNR_HIGH_THRESHOLD	Configures CDNR HIGH interrupt interrupt threshold.	127
0x9300	HD_EVENT_INTERRUPT_SOURCE	Configures interrupts related to digital receiver (HD_GET_EVENT_STATUS).	0

**Table 4. Properties Summary—FMHD (Continued)**

Prop	Name	Description	Default
0x9301	HD_EVENT_SIS_CONFIG	This property configures which basic SIS information is returned by the HD_GET_STATION_INFO command BASICSIS option.	0x0017
0x9302	HD_EVENT_ALERT_CONFIG	This property configures HD alerts. Alert information is returned by the HD_GET_ALERT_MSG command.	0x0001
0x9400	HD_ACF_INTERRUPT_SOURCE	Enables the HD ACF interrupt sources.	0
0x9401	HD_ACF_COMF_NOISE_THRESHOLD	Sets the comfort noise interrupt threshold.	512
0x9404	HD_ACF_COMF_NOISE_TOLERANCE	Sets the distance from the final comfort noise level that triggers the comfort noise convergence flag.	5
0x9500	HD_PSD_ENABLE	Sets which audio services will provide program service data.	0
0x9501	HD_PSD_FIELD_MASK	Sets which PSD fields will be decoded.	0xFFFF
0x9700	HD_AUDIO_CTRL_FRAME_DELAY	Controls the value of the delay of decoded digital audio samples relative to the output of the audio quality indicator.	6
0x9701	HD_AUDIO_CTRL_PROGRAM_LOSS_THRESHOLD	Controls the duration before reverting to MPS audio after an SPS audio program is removed or lost.	0
0x9702	HD_AUDIO_CTRL_BALL_GAME_ENABLE	Selects the audio output for hybrid waveforms when the TX Blend Control Status (BCTL) bits are set to 01.	1
0x9900	HD_CODEC_MODE_0_BLEND_THRESHOLD	Blend threshold for Codec Mode 0	3
0x9901	HD_CODEC_MODE_0_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 0	3697
0x9902	HD_CODEC_MODE_0_BLEND_RATE	Blend Rate for Codec Mode 0	1
0x9903	HD_CODEC_MODE_2_BLEND_THRESHOLD	Blend threshold for Codec Mode 2	3
0x9904	HD_CODEC_MODE_2_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 2	0
0x9905	HD_CODEC_MODE_2_BLEND_RATE	Blend Rate for Codec Mode 2	1
0x9906	HD_CODEC_MODE_10_BLEND_THRESHOLD	Blend threshold for Codec Mode 10	3
0x9907	HD_CODEC_MODE_10_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 10	0
0x9908	HD_CODEC_MODE_10_BLEND_RATE	Blend Rate for Codec Mode 10	1
0x9909	HD_CODEC_MODE_13_BLEND_THRESHOLD	Blend threshold for Codec Mode 13	3
0x990A	HD_CODEC_MODE_13_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 13	0
0x990B	HD_CODEC_MODE_13_BLEND_RATE	Blend Rate for Codec Mode 13	1
0x990C	HD_CODEC_MODE_1_BLEND_THRESHOLD	Blend threshold for Codec Mode 1	3
0x990D	HD_CODEC_MODE_1_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 1	0

Table 4. Properties Summary—FMHD (Continued)

Prop	Name	Description	Default
0x990E	HD_CODEEC_MODE_1_BLEND_RATE	Blend Rate for Codec Mode 1	1
0x990F	HD_CODEEC_MODE_3_BLEND_THRESHOLD	Blend threshold for Codec Mode 3	3
0x9910	HD_CODEEC_MODE_3_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 3	0
0x9911	HD_CODEEC_MODE_3_BLEND_RATE	Blend Rate for Codec Mode 3	1
0x9A00	HD_SERVICE_MODE_CONTROL_MP11_ENABLE	This property Enables MP11 mode support. If MP11 support is disabled using this property the receiver will fall back to MP3 mode of operation when tuned to a station that is transmitting the MP11 subcarriers.	0x0000
0x9B00	HD_EZBLEND_ENABLE	This property enables and disables HD EZ blend.	0
0x9B01	HD_EZBLEND_MPS_BLEND_THRESHOLD	This property sets the threshold for determining when to blend between digital audio and analog audio for Hybrid MPS.	3
0x9B02	HD_EZBLEND_MPS_BLEND_RATE	This property configures the hysteresis in the blending process for Hybrid MPS.	3
0x9B03	HD_EZBLEND_MPS_SAMPLES_DELAY	This property is used to perform audio alignment between analog and Hybrid MPS digital audio.	3697
0x9B04	HD_EZBLEND_SPS_BLEND_THRESHOLD	This property sets the threshold for determining when to blend between digital audio and mute for SPS programs as well as All Digital MPS programs.	4
0x9B05	HD_EZBLEND_SPS_BLEND_RATE	This property configures the hysteresis in the blending process for SPS programs and All Digital MPS programs.	1
0xE800	HD_TEST_BER_CONFIG	Enables the HD BER test.	0
0xE801	HD_TEST_DEBUG_AUDIO	Used to put the analog audio output in to special test modes for debug purposes.	0

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## 4.2.1. FMHD Properties

### Property 0x0000. INT\_CTL\_ENABLE

INT\_CTL\_ENABLE property enables top-level interrupt sources. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		DEVNTIEN	Reserved					CTSIEN	ERR_CMDIEN	DACQIEN	DSRVIE N	RSQIEN	RDSIEN	ACFIEN	STCIEN
Default	0x0		0	0x00					0	0	0	0	0	0	0	0

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	DEVNTIEN	Interrupt when DEVNTINT is set
12:8	Reserved	Always write to 0x00.
7	CTSIEN	Interrupt when CTS is set. Note: The default will be 0x1 if POWER_UP:CTSIEN was set.
6	ERR_CMDIEN	Interrupt when ERR_CMD is set
5	DACQIEN	Interrupt when DACQINT is set
4	DSRVIE N	Interrupt when DSRVINT is set
3	RSQIEN	Interrupt when RSQINT is set
2	RDSIEN	Interrupt when RDSINT is set
1	ACFIEN	Interrupt when ACFINT is set
0	STCIEN	Interrupt when STCINT is set

### Property 0x0001. INT\_CTL\_REPEAT

INT\_CTL\_REPEAT is used to set repeat interrupt pulses for a given interrupt even if this particular interrupt was previously generated but not acknowledged. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		DEVNTR EP	Reserved							DACQREP	DSRVREP	RSQREP	RDSREP	ACFREP	STCREP
Default	0x0		0	0x00							0	0	0	0	0	0



Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	DEVNTREP	Repeat interrupt pulse when DEVNTINT is set, even if a previous interrupt was generated but not acknowledged.
12:6	Reserved	Always write to 0x00.
5	DACQREP	Repeat interrupt pulse when DACQINT is set, even if a previous interrupt was generated but not acknowledged.
4	DSRVREP	Repeat interrupt pulse when DSRVINT is set, even if a previous interrupt was generated but not acknowledged.
3	RSQREP	Repeat interrupt pulse when RSQINT is set, even if a previous interrupt was generated but not acknowledged.
2	RDSREP	Repeat interrupt pulse when RDSINT is set, even if a previous interrupt was generated but not acknowledged.
1	ACFREP	Repeat interrupt pulse when AFCINT is set, even if a previous interrupt was generated but not acknowledged.
0	STCREP	Repeat interrupt pulse when STCINT is set, even if a previous interrupt was generated but not acknowledged.

#### Property 0x0200. DIGITAL\_IO\_OUTPUT\_SELECT

DIGITAL\_IO\_OUTPUT\_SELECT configures the digital audio output to be I2S Master or Slave. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MAS TER	Reserved														
Default	0	0x0000														

Bit	Name	Function
15	MASTER	0 : Slave mode selected 1 : Master mode selected
14:0	Reserved	Always write to 0x0000.

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## Property 0x0201. DIGITAL\_IO\_OUTPUT\_SAMPLE\_RATE

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DIGITAL\_IO\_OUTPUT\_SAMPLE\_RATE sets output sample audio rate in units of 1Hz. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 48000

Units: Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	OUTPUT_SAMPLE_RATE[15:0]															
Default	0xBB80															

Bit	Name	Function
15:0	OUTPUT_SAMPLE_RATE[15:0]	DIGITAL_IO_OUTPUT_SAMPLE_RATE sets output sample audio rate in units of 1Hz. Range: 32000-48000 32000 : The minimum output sample rate in Hz. 48000 : The minimum output sample rate in Hz.

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## Property 0x0202. DIGITAL\_IO\_OUTPUT\_FORMAT

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DIGITAL\_IO\_OUTPUT\_FORMAT configures the digital audio output format. This property may only be written before the first tune. Writes after first tune will return error. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x1800

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		SAMPL_SIZE[5:0]						SLOT_SIZE[3:0]				FRAMING_FORMAT[3:0]			
Default	0x0		0x18						0x0				0x0			

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:8	SAMPL_SIZE[5:0]	Determines the number of bits in a sample. Only the specified number of bits per sample are used. The value of any bits sent over the sample size will be determined by the FILL field of the DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_2 property. Sample sizes of less than 8 are not supported. Range: 8-24
7:4	SLOT_SIZE[3:0]	Determines slot size; must be larger than or equal to SAMPL_SIZE. 0x0 : Matches Sample Size 0x2 : 8 bits 0x4 : 16 bits 0x5 : 20 bits 0x6 : 24 bits 0x7 : 32 bits
3:0	FRAMING_FORMAT[3:0]	Determines when the data is transmitted relative to frame sync. 0x0 : I2S mode 0x6 : DSP mode 0x7 : Left justified dsp mode 0x8 : Left justified mode 0x9 : Right justified mode

#### Property 0x0203. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_1

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_1 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		FSL ATE _EN	FSIN V_E N	RJU ST_ EN	CLK- INV_ EN	SWA P_E N	BIT ORD ER_ EN	Reserved		FSL ATE	FSIN V	RJU ST	CLK- INV	SWA P	BIT ORD ER
Default	0x0		0	0	0	0	0	0	0x0		0	0	0	0	0	0

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	FSLATE_EN	Enable the FSLATE override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
12	FSINV_EN	Enable the FSINV override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
11	RJUST_EN	Enable the RJUST override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
10	CLKINV_EN	Enable the CLKINV override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
9	SWAP_EN	Enable the SWAP override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
8	BITORDER_EN	Enable the BITORDER override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
7:6	Reserved	Always write to 0x0.
5	FSLATE	0 : Sample data on the rising edge of the 2nd clock after DFS 1 : Sample data on the rising edge of the 1st clock after DFS
4	FSINV	0 : Use the DFS signal as is 1 : Invert the DFS signal
3	RJUST	0 : Left Justified 1 : Right Justified
2	CLKINV	Inverts the data clock 0 : The bit clock is not inverted. DFS will be captured on rising edge of DCLK. 1 : The bit clock is inverted. DFS will be captured on falling edge of DCLK.
1	SWAP	Swap position of the left and right channels. 0 : Transmit the left sample first 1 : Transmit the right sample first
0	BITORDER	Determine if the MSB or LSB is transmitted first. 0 : Transmit MSB first 1 : Transmit LSB first

**Property 0x0204. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_2**

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_2 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved	FILL_EN	Reserved				SEQEN_EN	FSE DGE_EN	FILL[1:0]		Reserved				SEQEN	FSE DGE
<b>Default</b>	0	0	0x0				0	0	0x0		0x0				0	0

Bit	Name	Function
15	Reserved	Always write to 0.
14	FILL_EN	Enable the FILL override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
13:10	Reserved	Always write to 0x0.
9	SEQEN_EN	Enable the SEQEN override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
8	FSE DGE_EN	Enable the FSE DGE override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
7:6	FILL[1:0]	Defines the fill value for unused data bits. 0 : The unused bits are filled with 0's 1 : The unused bits are filled with 1's 2 : The unused bits are sign extended 3 : The unused bits are filled with a random sequence
5:2	Reserved	Always write to 0x0.
1	SEQEN	0 : Only one mono sample is sent per trigger of DFS 1 : Both mono samples are sent sequentially after each trigger from DFS
0	FSE DGE	0 : One mono sample is sent on only one edge of DFS 1 : One mono sample is sent every edge (rising and falling) of DFS

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## Property 0x0205. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_3

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DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_3 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FSH_EN	FSH[14:0]														
Default	0	0x0000														

Bit	Name	Function
15	FSH_EN	Enable the FSH override value to take effect. 0 : Use the default value for the specified framing format 1 : Use the value specified in this property
14:0	FSH[14:0]	Number of samples FS will remain high. Range: 0-32767

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## Property 0x0206. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_4

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DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_4 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FSL_EN	FSL[14:0]														
Default	0	0x0000														

Bit	Name	Function
15	FSL_EN	Enable the FSH override value to take effect. 0 : Use the default value for the specified framing format 1 : Use the value specified in this property
14:0	FSL[14:0]	Number of samples FS will remain low. Range: 0-32767

**Property 0x0300. AUDIO\_ANALOG\_VOLUME**

AUDIO\_ANALOG\_VOLUME sets the analog audio volume. A value of 0 will mute the audio; a value of 1 applies 62 dB of attenuation, and a value of 63 applies no attenuation. Each step accounts for 1 dB of change in the output. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 63

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved										VOL[5:0]					
<b>Default</b>	0x000										0x3F					

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	VOL[5:0]	Controls the analog volume level. Range: 0-63 0 : The minimum audio level. 63 : The maximum audio level.

**Property 0x0301. AUDIO\_MUTE**

AUDIO\_MUTE property mutes/unmutes each audio output independently. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved														MUTE[1:0]	
<b>Default</b>	0x0000														0x0	

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1:0	MUTE[1:0]	Controls the audio mute on each audio output 0 : Do not mute audio outputs 1 : Mute Left Audio Out. 2 : Mute Right Audio Out. 3 : Mute both Left and Right Audio Out

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## Property 0x0302. AUDIO\_OUTPUT\_CONFIG

AUDIO\_OUTPUT\_CONFIG is used to configure various settings of the audio output. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															MONO
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	MONO	Puts the analog (DAC) output into mono mode. 0 : Audio outputs render normal, stereo audio will be in stereo. 1 : Both analog and digital outputs are in mono.

## Property 0x0800. PIN\_CONFIG\_ENABLE

PIN\_CONFIG is used to enable and disable the various I/O features of the device. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x8001

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	INTBOU TEN	Reserved													I2SO UTE N	DAC OUT EN
Default	1	0x0000													0	1

Bit	Name	Function
15	INTBOUTEN	When set enables the INTB output.
14:2	Reserved	Always write to 0x0000.
1	I2SOUTEN	When set enables the I2S the digital audio output. A change to this bit will take effect on the next tune or seek. On automotive parts, only I2SOUTEN or DACOUTEN can be enabled at a time. If both enabled, only analog audio output is enabled.
0	DACOUTEN	When set enables the analog audio output. A change to this bit will take effect on the next tune or seek. On automotive parts, only I2SOUTEN or DACOUTEN can be enabled at a time. If both enabled, only analog audio output is enabled.



**Property 0x0900. WAKE\_TONE\_ENABLE**

WAKE\_TONE\_ENABLE is used to enable the wake tone feature. The wake tone feature is a simple alert tone that can be used for various audible alarms such as a wake alarm. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables the wake tone feature, the wake tone will be played instead of normal audio content.

**Property 0x0901. WAKE\_TONE\_PERIOD**

WAKE\_TONE\_PERIOD is used to configure the wake tone feature's on/off period. This property sets the on and off time periods in units of ms. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 250

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	PERIOD[15:0]															
Default	0x00FA															

Bit	Name	Function
15:0	PERIOD[15:0]	The amount of time the wake tone will be on for each alarm cycle in units of ms. Set to 0 for a continuous tone. Range: 50-2000

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## Property 0x0902. WAKE\_TONE\_FREQ

---

WAKE\_TONE\_FREQ is the frequency of the wake tone in Hz. The wake tone is a simple square wave whose frequency is defined by this property. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 750

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FREQ[15:0]															
Default	0x02EE															

Bit	Name	Function
15:0	FREQ[15:0]	WAKE_TONE_FREQ is the frequency of the wake tone in Hz. The wake tone is a simple square wave whose frequency is defined by this property. Range: 100-2000

---

## Property 0x0903. WAKE\_TONE\_AMPLITUDE

---

WAKE\_TONE\_AMPLITUDE sets the wake tone's output amplitude. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 8

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											AMP[4:0]				
Default	0x000											0x08				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	AMP[4:0]	The linear wake tone amplitude. Range: 0-31

---

## Property 0x170C. AGC\_RF\_THRESHOLD

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Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RF_THRESHOLD[15:0]															
Default	0x0000															

Bit	Name	Function
15:0	RF_THRESH-OLD[15:0]	Adjusts the midpoint of threshold for the RF Threshold Detector. Signed Q15.1 format. Each index unit is 0.5 dB When tuning to analog only mode, range is from -12 to 12. When tuning to HD mode, range is from -12 to 6. Range: -12-12

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**Property 0x1710. FM\_TUNE\_FE\_VARM**


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FM\_TUNE\_FE\_VARM FM Front End Varactor configuration slope (x 1000) which has been calculated for a particular board design. Both FM\_TUNE\_FE\_VARB and FM\_TUNE\_FE\_VARM must be configured. This takes effect upon FM\_TUNE\_FREQ. This is a signed value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FE_VARM[15:0]															
Default	0x0000															

Bit	Name	Function
15:0	FE_VARM[15:0]	FM Front End Varactor configuration slope (x 1000) which has been calculated for a particular board design. Both FM_TUNE_FE_VARB and FM_TUNE_FE_VARM must be configured. This takes effect upon FM_TUNE_FREQ. This is a signed value.

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**Property 0x1711. FM\_TUNE\_FE\_VARB**


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FM\_TUNE\_FE\_VARB FM Front End Varactor configuration intercept which has been calculated for a particular board design. Both FM\_TUNE\_FE\_VARB and FM\_TUNE\_FE\_VARM must be configured. This takes effect upon FM\_TUNE\_FREQ. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FE_VARB[15:0]															
Default	0x0000															

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Bit	Name	Function
15:0	FE_VARB[15:0]	FM Front End Varactor configuration intercept which has been calculated for a particular board design. Both FM_TUNE_FE_VARB and FM_TUNE_FE_VARM must be configured. This takes effect upon FM_TUNE_FREQ.

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## Property 0x1712. FM\_TUNE\_FE\_CFG

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FM\_TUNE\_FE\_CFG Additional configuration options for the front end. These take effect upon FM\_TUNE\_FREQ. See FM\_TUNE\_FE\_VARB and FM\_TUNE\_FE\_VARM The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														VHF CAP S	VHF SW
Default	0x0000														0	0

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	VHFCAPS	Configure Varactor matching for changes in the AGC's capacitive attenuators 0 : Varactor will compensate for changes in the CATT 1 : Varactor is decoupled from the CATT
0	VHFSW	VHFSW sets the open or closed state for the front end switch. 0 : Switch Open 1 : Switch Closed

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## Property 0x3100. FM\_SEEK\_BAND\_BOTTOM

---

FM\_SEEK\_BAND\_BOTTOM sets the lower seek boundary of the FM band in multiples of 10kHz. See FM\_SEEK\_START. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 8750

Units: 10kHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FMSKFREQ[15:0]															
Default	0x222E															

Bit	Name	Function
15:0	FMSKFREQL[15:0]	FM Seek Band Bottom. Range: 7600-10800 7600 : Japan Range Minimum 7800 : Wide Range Minimum 8750 : Standard Range Minimum 9000 : Japan Range Maximum 10790 : Standard Range Maximum 10800 : Wide Range Maximum

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**Property 0x3101. FM\_SEEK\_BAND\_TOP**


---

FM\_SEEK\_BAND\_TOP sets the upper seek boundary of the FM band in multiples of 10kHz. See FM\_SEEK\_START. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 10790

Units: 10kHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FMSKFREQH[15:0]															
Default	0x2A26															

Bit	Name	Function
15:0	FMSKFREQH[15:0]	FM Seek Band Top. Range: 7600-10800 7600 : Japan Range Minimum 7800 : Wide Range Minimum 8750 : Standard Range Minimum 9000 : Japan Range Maximum 10790 : Standard Range Maximum 10800 : Wide Range Maximum

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## Property 0x3102. FM\_SEEK\_FREQUENCY\_SPACING

---

FM\_SEEK\_FREQUENCY\_SPACING sets the frequency spacing for the FM band in multiples of 10kHz when performing a seek. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 10

Units: 10kHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											FMSKSPACE[4:0]				
Default	0x000											0x0A				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	FMSKSPACE[4:0]	FM Seek Frequency Spacing. Range: 1-31 5 : 50kHz 10 : 100kHz 20 : 200kHz

---

## Property 0x3200. FM\_VALID\_MAX\_TUNE\_ERROR

---

FM\_VALID\_MAX\_TUNE\_ERROR sets the maximum freq error allowed in units of bppm before setting the AFC rail indicator (AFCRL). This will take effect on the next tune. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 114

Units: bppm

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								FMMAXTUNEERR[7:0]							
Default	0x00								0x72							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	FMMAX-TUNEERR[7:0]	Frequency error in bppm (2 ppm). Range: 0-126

**Property 0x3201. FM\_VALID\_RSSI\_TIME**

FM\_VALID\_RSSI\_TIME sets the amount of time in ms to allow the RSSI/ISSI metrics to settle before evaluating. The reliability of the valid bit for identifying valid stations relies on this parameter being set properly. NOTE: Setting this property to a value lower than 4 will result in the metric not being measured correctly at tune time. To disable metric as a tune qualifier set the validation time to 0 and set the validation threshold to the minimum value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 15

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										SSIVALTIME[5:0]					
Default	0x000										0x0F					

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	SSIVALTIME[5:0]	Validation time in ms Range: 0-63 - Specified in units ms.

**Property 0x3202. FM\_VALID\_RSSI\_THRESHOLD**

Sets the RSSI threshold for a valid FM Seek/Tune. If the desired channel RSSI is above this threshold, then it is considered valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 17

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										FMVALRSSI[7:0]					
Default	0x00										0x11					

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	FMVALRSSI[7:0]	FM Seek/Tune Received Signal Strength Threshold. Range: -128-127 - Specified in units of dBuV in 1 dBuV steps. -128 : RSSI is not used as a criterion in determining the validity of a station.

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## Property 0x3203. FM\_VALID\_SNR\_TIME

---

FM\_VALID\_SNR\_TIME sets the amount of time in ms to allow the SNR metric to settle before evaluating. The reliability of the valid bit for identifying valid stations relies on this parameter being set properly. NOTE: Setting this property to a value lower than 4 will result in the metric not being measured correctly at tune time. To disable metric as a tune qualifier set the validation time to 0 and set the validation threshold to the minimum value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 40

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										SNRVALTIME[5:0]					
Default	0x000										0x28					

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	SNRVALTIME[5:0]	Validation time in ms Range: 0-63 - Specified in units ms.

---

## Property 0x3204. FM\_VALID\_SNR\_THRESHOLD

---

FM\_VALID\_SNR\_THRESHOLD sets the SNR threshold for a valid FM Seek/Tune. If the desired channel SNR is above this threshold, then it is considered valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 10

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										FMVALSNR[7:0]					
Default	0x00										0x0A					

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	FMVALSNR[7:0]	FM Seek/Tune SNR Threshold. Range: -128-127 - Specified in units of dB in 1 dB steps. -128 : SNR is not used as a criterion in determining the validity of a station.



**Property 0x3206. FM\_VALID\_HDLEVEL\_THRESHOLD**

Sets the HDLEVEL threshold for FM Seek stop. If the desired channel HDLEVEL threshold is above this threshold, then it is considered valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								FMVALHDLEVEL[7:0]							
<b>Default</b>	0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	FMVALH-DLEVEL[7:0]	FM Seek/Tune Received Signal HDLevel Threshold. Range: 0-100 - Specified in units of % in 1 % steps.

**Property 0x3300. FM\_RSQ\_INTERRUPT\_SOURCE**

FM\_RSQ\_INTERRUPT\_SOURCE configures interrupt related to Received Signal Quality metrics. See FM\_RSQ\_STATUS. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								MULT THINT	MULT TLINT	HDL EVE LHINT	HDL EVE LLINT	SNR HINT	SNR LINT	RSS IHINT	RSS ILINT
<b>Default</b>	0x00								0	0	0	0	0	0	0	0

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7	MULTHINT	Enables the interrupt for multipath High. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if Multipath level goes above FM_RSQ_MULTIPATH_HIGH_THRESHOLD.
6	MULTLINT	Enables the interrupt for multipath Low. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if Multipath level goes below FM_RSQ_MULTIPATH_LOW_THRESHOLD.
5	HDLEVELHINT	Enables the interrupt for HD Level High. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if FILTERED_HDLEVEL goes above FM_RSQ_HDLEVEL_HIGH_THRESHOLD.
4	HDLEVELLINT	Enables the interrupt for HD Level Low. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if FILTERED_HDLEVEL goes below FM_RSQ_HDLEVEL_LOW_THRESHOLD.
3	SNRHINT	Enables the interrupt for SNR High. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if SNR goes above FM_RSQ_SNR_HIGH_THRESHOLD.
2	SNRLINT	Enables the interrupt for SNR Low. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if SNR goes below FM_RSQ_SNR_LOW_THRESHOLD.
1	RSSIHINT	Enables the interrupt for RSSI High. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if RSSI goes above FM_RSQ_RSSI_HIGH_THRESHOLD.
0	RSSILINT	Enables the interrupt for RSSI Low. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if RSSI goes below FM_RSQ_RSSI_LOW_THRESHOLD.

**Property 0x3301. FM\_RSQ\_SNR\_HIGH\_THRESHOLD**

FM\_RSQ\_SNR\_HIGH\_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the SNR is above this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 127

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								SNRH[7:0]							
<b>Default</b>	0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SNRH[7:0]	FM RSQ SNR High Threshold. Range: -128-127 - Specified in units of dB in 1 dB steps.

**Property 0x3302. FM\_RSQ\_SNR\_LOW\_THRESHOLD**

FM\_RSQ\_SNR\_LOW\_THRESHOLD sets the low threshold, which triggers the RSQ interrupt if the SNR is below this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: -128

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								SNRL[7:0]							
<b>Default</b>	0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Always write to 0xFF.
7:0	SNRL[7:0]	Low threshold for SNR interrupt in dB. Range: -128-127 - Specified in units of dB in 1 dB steps.

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## Property 0x3303. FM\_RSQ\_RSSI\_HIGH\_THRESHOLD

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FM\_RSQ\_RSSI\_HIGH\_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the RSSI is above this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 127

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								RSSIH[7:0]							
Default	0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	RSSI[7:0]	High threshold for RSSI interrupt in dBuV. Range: -128-127 - Specified in units of dBuV in 1 dBuV steps.

---

## Property 0x3304. FM\_RSQ\_RSSI\_LOW\_THRESHOLD

---

FM\_RSQ\_RSSI\_LOW\_THRESHOLD sets the low threshold, which triggers the RSQ interrupt if the RSSI is below this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: -128

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								RSSIL[7:0]							
Default	0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Always write to 0xFF.
7:0	RSSIL[7:0]	Low threshold for RSSI interrupt in dBuV. Range: -128-127 - Specified in units of dBuV in 1 dBuV steps.

**Property 0x3307. FM\_RSQ\_HD\_DETECTION**

Configures the Fast HD Detection routine.

Default: 0x000d

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								SAMPLES[7:0]							
<b>Default</b>	0x00								0x0D							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SAMPLES[7:0]	Sets the number of HD OFDM symbols to look at during HD Detection. Each HD OFDM symbol is ~2.9ms so the detection time is about 2.9 times this number. Enabling this feature will extend the tune time by this amount minus the SNR and RSSI validation times. Setting this field to 0 disables Fast HD Detect. If HD is enabled, the detection period will be larger of the RSSI or SNR validation times or SAMPLES*3ms. Range: 5-64

**Property 0x3308. FM\_RSQ\_HD\_LEVEL\_TIME\_CONST**

Configures the Fast HD Detection Level Metric Filtering Time Constant.

Default: 32

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								FILTER_TIME_CONSTANT[7:0]							
<b>Default</b>	0x00								0x20							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	FILTER_TIME_CONSTANT[7:0]	Sets the HDLEVEL filter time constant to achieve desired HDLEVEL detection moving average. Range: 1-255

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## Property 0x3309. FM\_RSQ\_HDDETECTED\_THD

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Configures the HD Level Detected Threshold.

Default: 0x1e1e

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	HDDETECTED_THD[7:0]								FLT_HDDETECTED_THD[7:0]							
Default	0x1E								0x1E							

Bit	Name	Function
15:8	HDDETECT-ED_THD[7:0]	Sets the HDLEVEL metric detected threshold. If HDLEVEL metric is above this threshold, HDDETECTED bit will be set. Range: 1-100
7:0	FLT_HDDETECT-ED_THD[7:0]	Sets the filtered HDLEVEL metric detected threshold. If FILTERED_HDLEVEL metric is above this threshold, FLT_HDDETECTED bit will be set. Range: 1-100

---

## Property 0x330A. FM\_RSQ\_HDLEVEL\_HIGH\_THRESHOLD

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FM\_RSQ\_HDLEVEL\_HIGH\_THRESHOLD sets the filtered HDLEVEL metric high threshold, which triggers the RSQ interrupt if FILTERED\_HDLEVEL is above this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 100

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HDLEVELH[7:0]							
Default	0x00								0x64							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HDLEVELH[7:0]	High threshold for FILTERED_HDLEVEL interrupt in %. Range: 0-100 - Specified in units of % in 1 % steps.

**Property 0x330B. FM\_RSQ\_HDLEVEL\_LOW\_THRESHOLD**

FM\_RSQ\_HDLEVEL\_LOW\_THRESHOLD sets the filtered HDLEVEL metric low threshold, which triggers the RSQ interrupt if FILTERED\_HDLEVEL is below this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								HDLEVELL[7:0]							
<b>Default</b>	0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HDLEVELL[7:0]	Low threshold for FILTERED_HDLEVEL interrupt in %. Range: 0-100 - Specified in units of % in 1 % steps.

**Property 0x3400. FM\_ACF\_INTERRUPT\_SOURCE**

FM\_ACF\_INTERRUPT\_SOURCE Enables the ACF interrupt sources. When one of the interrupts is enabled, the ACFINT bit of the status word will be set when the controlling indicator crosses the threshold set its ACF threshold property. If the interrupt is acknowledged and the condition persists, the interrupt will immediately repeat. If the ACFINT hardware interrupt is enabled by setting the ACFIEN bit of the INT\_CTL\_ENABLE, the interrupt line will toggle. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved													BLE ND_I NTE N	HIG HCU T_IN TEN	SMU TE_I NTE N
<b>Default</b>	0x0000													0	0	0

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Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2	BLEND_INTEN	Enables the blend interrupt. 0 : The blend interrupt is disabled 1 : The blend interrupt is enabled
1	HIGHCUT_INTEN	Enables the Hicut Interrupt 0 : The Hicut interrupt is disabled 1 : The Hicut interrupt is enabled
0	SMUTE_INTEN	Enables the softmute interrupt 0 : The softmute interrupt is disabled 1 : The softmute interrupt is enabled

## Property 0x3401. FM\_ACF\_SOFTMUTE\_THRESHOLD

FM\_ACF\_SOFTMUTE\_THRESHOLD sets the softmute interrupt threshold. When softmute attenuation rises above the level set by this property the SMUTE\_INT bit of the FM\_ACF\_STATUS command will be set. If the SMUTE\_INTEN bit of the FM\_ACF\_INTERRUPT\_SOURCE property is set the ACFINT interrupt will be asserted in the status word. See FM\_ACF\_INTERRUPT\_SOURCE for details. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 31

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											SMATTN_THRESH[4:0]				
Default	0x000											0x1F				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	SMATTN - THRESH[4:0]	Sets the softmute interrupt threshold in dB. Range: 0-31



**Property 0x3402. FM\_ACF\_HIGHCUT\_THRESHOLD**

FM\_ACF\_HIGHCUT\_THRESHOLD sets the high cut interrupt threshold. When the cutoff frequency falls below this threshold, the HIGHCUT\_INT bit of FM\_ACF\_STATUS command will be asserted. If the high cut interrupt is enabled, the ACFINT bit in the status word will also be asserted. See FM\_ACF\_INTERRUPT\_SOURCE for details. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								HIGHCUT_THRESH[7:0]							
<b>Default</b>	0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HIGHCUT_- THRESH[7:0]	High cut interrupt threshold in units of 100Hz Range: 0-200

**Property 0x3403. FM\_ACF\_BLEND\_THRESHOLD**

FM\_ACF\_BLEND\_THRESHOLD sets the Stereo Blend interrupt threshold. When the stereo separation falls below this threshold the BLEND\_INT bit of the FM\_ACF\_STATUS command will be set. If the blend interrupt is enabled, the ACFINT bit of the status word will also be asserted. See the FM\_ACF\_INTERRUPT\_SOURCE property for more details. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								BLEND_THRESH[6:0]							
<b>Default</b>	0x000								0x00							

Bit	Name	Function
15:7	Reserved	Always write to 0x000.
6:0	BLEND_- THRESH[6:0]	Stereo separation in units of dB. Range: 0-100

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## Property 0x3404. FM\_ACF\_SOFTMUTE\_TOLERANCE

---

FM\_ACF\_SOFTMUTE\_TOLERANCE sets the distance from the final softmute value that triggers the softmute convergence flag. Convergence is indicated by setting the SMUTE\_CONV flag in the FM\_ACF\_STATUS command reply. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 2

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											SMUTE_TOL[4:0]				
Default	0x000											0x02				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	SMUTE_TOL[4:0]	When the softmute value is this many dB away from its final value the SMUTE_CONV flag will be set. Range: 0-31

---

## Property 0x3405. FM\_ACF\_HIGHCUT\_TOLERANCE

---

FM\_ACF\_HIGHCUT\_TOLERANCE Sets the distance from the final high cut freq that triggers the high cut convergence flag. Convergence is indicated by a setting HIGHCUT\_CONV flag of FM\_ACF\_STATUS command reply. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 20

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HIGHCUT_TOL[7:0]							
Default	0x00								0x14							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HIGH-CUT_TOL[7:0]	When the high cut state is N*100Hz away from its final value the HIGHCUT_CONV flag will be set. Range: 0-200

**Property 0x3406. FM\_ACF\_BLEND\_TOLERANCE**

FM\_ACF\_BLEND\_TOLERANCE sets the distance from the final blend state that triggers the blend convergence flag. Blend convergence is indicated by setting the BLEND\_CONV flag of the FM\_ACF\_STATUS command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 5

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved									BLEND_TOL[6:0]						
<b>Default</b>	0x000									0x05						

Bit	Name	Function
15:7	Reserved	Always write to 0x000.
6:0	BLEND_TOL[6:0]	When the stereo separation is this many dB away from its final value the BLEND_CONV flag will get set. Range: 0-100

**Property 0x3500. FM\_SOFTMUTE\_SNR\_LIMITS**

FM\_SOFTMUTE\_SNR\_LIMITS sets the SNR limits for soft mute attenuation. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0602

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	XMAX[7:0]									XMIN[7:0]						
<b>Default</b>	0x06									0x02						

Bit	Name	Function
15:8	XMAX[7:0]	Value of SNR in dB which causes the minimum audio attenuation. Range: -20-64
7:0	XMIN[7:0]	Value of SNR in dB which causes the maximum audio attenuation. Range: -20-64

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## Property 0x3501. FM\_SOFTMUTE\_SNR\_ATTENUATION

---

FM\_SOFTMUTE\_SNR\_ATTENUATION sets the SNR attenuation limits. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0008

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTENMIN[7:0]								ATTENMAX[7:0]							
Default	0x00								0x08							

Bit	Name	Function
15:8	ATTENMIN[7:0]	Sets the minimum attenuation amount in dB for SNR based softmute. Range: 0-31
7:0	ATTENMAX[7:0]	Sets the maximum attenuation amount in dB for SNR based softmute. Range: 0-31

---

## Property 0x3502. FM\_SOFTMUTE\_SNR\_ATTACK\_TIME

---

FM\_SOFTMUTE\_SNR\_ATTACK\_TIME sets the attack time to mute the audio. The attack time is the time it takes the softmute attenuation to go from YMIM to YMAX if the SNR made a step change from XMAX to XMIN. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK[15:0]															
Default	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	The softmute attack time in ms for SNR based softmute. Range: 16-65535

**Property 0x3503. FM\_SOFTMUTE\_SNR\_RELEASE\_TIME**

FM\_SOFTMUTE\_SNR\_RELEASE\_TIME Sets the release time to unmute the audio. The release time is the time it takes the softmute attenuation to go from YMAX to YMIN if the SNR made a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RELEASE[15:0]															
<b>Default</b>	0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	The softmute release time in ms for SNR based softmute. Range: 16-65535

**Property 0x3600. FM\_HIGHCUT\_RSSI\_LIMITS**

FM\_HIGHCUT\_RSSI\_LIMITS sets the RSSI limits for RSSI based high cut. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0C06

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	XMAX[7:0]								XMIN[7:0]							
<b>Default</b>	0x0C								0x06							

Bit	Name	Function
15:8	XMAX[7:0]	Value of RSSI which causes the maximum cutoff frequency. Range: -20-120
7:0	XMIN[7:0]	Value of RSSI which causes the minimum cutoff frequency. Range: -20-120

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## Property 0x3601. FM\_HIGHCUT\_RSSI\_CUTOFF\_FREQ

---

FM\_HIGHCUT\_RSSI\_CUTOFF\_FREQ sets the audio cutoff frequencies for RSSI based high cut. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0xC828

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	YMAX[7:0]								YMIN[7:0]							
Default	0xC8								0x28							

Bit	Name	Function
15:8	YMAX[7:0]	Sets the maximum cutoff frequency for RSSI based high cut. Range: 0-200
7:0	YMIN[7:0]	Sets the minimum cutoff frequency for RSSI based high cut. Range: 0-200

---

## Property 0x3602. FM\_HIGHCUT\_RSSI\_ATTACK\_TIME

---

FM\_HIGHCUT\_RSSI\_ATTACK\_TIME sets the transition time for which RSSI based high cut lowers the cutoff frequency. The transition time is the time it will take the cutoff frequency to go from YMAX to YMIN assuming RSSI makes a step change from XMAX to XMIN. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK[15:0]															
Default	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Range: 1-65535

**Property 0x3603. FM\_HIGHCUT\_RSSI\_RELEASE\_TIME**

FM\_HIGHCUT\_RSSI\_RELEASE\_TIME sets the transition time for which RSSI based high cut increases the cutoff frequency. The transition time is the time it will take the cutoff frequency to go from YMIN to YMAX assuming RSSI makes a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RELEASE[15:0]															
<b>Default</b>	0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Range: 1-65535

**Property 0x3604. FM\_HIGHCUT\_SNR\_LIMITS**

FM\_HIGHCUT\_SNR\_LIMITS sets the SNR limits for SNR based high cut. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0903

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	XMAX[7:0]								XMIN[7:0]							
<b>Default</b>	0x09								0x03							

Bit	Name	Function
15:8	XMAX[7:0]	Value of SNR which causes the maximum cutoff frequency. Range: -20-64
7:0	XMIN[7:0]	Value of SNR which causes the minimum cutoff frequency. Range: -20-64

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## Property 0x3605. FM\_HIGHCUT\_SNR\_CUTOFF\_FREQ

---

FM\_HIGHCUT\_SNR\_CUTOFF\_FREQ sets the audio cutoff frequencies for SNR based high cut. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0xc828

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	YMAX[7:0]								YMIN[7:0]							
Default	0xC8								0x28							

Bit	Name	Function
15:8	YMAX[7:0]	Sets the maximum cutoff frequency for SNR based high cut. Range: 0-200
7:0	YMIN[7:0]	Sets the minimum cutoff frequency for SNR based high cut. Range: 0-200

---

## Property 0x3606. FM\_HIGHCUT\_SNR\_ATTACK\_TIME

---

FM\_HIGHCUT\_SNR\_ATTACK\_TIME sets the transition time for which SNR based high cut lowers the cutoff frequency. The transition time is the time it will take the cutoff frequency to go from YMAX to YMIN assuming SNR makes a step change from XMAX to XMIN. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK[15:0]															
Default	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Range: 1-65535



**Property 0x3607. FM\_HIGHCUT\_SNR\_RELEASE\_TIME**

FM\_HIGHCUT\_SNR\_RELEASE\_TIME sets the transition time for which SNR based high cut increases the cutoff frequency. The transition time is the time it will take the cutoff frequency to go from YMIN to YMAX assuming SNR makes a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RELEASE[15:0]															
<b>Default</b>	0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Range: 1-65535

**Property 0x3608. FM\_HIGHCUT\_MULTIPATH\_LIMITS**

FM\_HIGHCUT\_MULTIPATH\_LIMITS sets the multipath limits for multipath controlled stereo separation. The limits are in % AM modulation at 1kHz. They are also negated and therefore the max value represents the point at which limiting will begin. The MAX value must be less than the MIN value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x2D3C

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	XMAX[7:0]								XMIN[7:0]							
<b>Default</b>	0x2D								0x3C							

Bit	Name	Function
15:8	XMAX[7:0]	Value of multipath which causes the maximum cutoff frequency. Range: 0-255
7:0	XMIN[7:0]	Value of multipath which causes the minimum cutoff frequency. Range: 0-255

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## Property 0x3609. FM\_HIGHCUT\_MULTIPATH\_CUTOFF\_FREQ

---

FM\_HIGHCUT\_MULTIPATH\_CUTOFF\_FREQ sets the audio cutoff frequencies for the multipath based high cut. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0xc828

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	YMAX[7:0]								YMIN[7:0]							
Default	0xC8								0x28							

Bit	Name	Function
15:8	YMAX[7:0]	Sets the maximum cutoff frequency for multipath based high cut. Range: 0-200
7:0	YMIN[7:0]	Sets the minimum cutoff frequency for multipath based high cut. Range: 0-200

---

## Property 0x360A. FM\_HIGHCUT\_MULTIPATH\_ATTACK\_TIME

---

FM\_HIGHCUT\_MULTIPATH\_ATTACK\_TIME sets the transition time for which multipath based high cut lowers the cutoff frequency. The transition time is the time it will take the cutoff frequency to go from YMAX to YMIN assuming multipath makes a step change from XMAX to XMIN. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK[15:0]															
Default	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Range: 1-65535

**Property 0x360B. FM\_HIGHCUT\_MULTIPATH\_RELEASE\_TIME**

FM\_HIGHCUT\_MULTIPATH\_RELEASE\_TIME sets the transition time for which multipath based high cut increases the cutoff frequency. The transition time is the time it will take the cutoff frequency to go from YMIN to YMAX assuming multipath makes a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RELEASE[15:0]															
<b>Default</b>	0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Range: 1-65535

**Property 0x3700. FM\_BLEND\_RSSI\_LIMITS**

FM\_BLEND\_RSSI\_LIMITS sets the RSSI limits for RSSI controlled stereo separation. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x2010

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	XMAX[7:0]								XMIN[7:0]							
<b>Default</b>	0x20								0x10							

Bit	Name	Function
15:8	XMAX[7:0]	Value of RSSI which causes maximum stereo separation. Range: -20-120
7:0	XMIN[7:0]	Value of RSSI which causes minimum stereo separation. Range: -20-120

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## Property 0x3702. FM\_BLEND\_RSSI\_ATTACK\_TIME

---

FM\_BLEND\_RSSI\_ATTACK\_TIME ms The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK[15:0]															
Default	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Range: 16-65535

---

## Property 0x3703. FM\_BLEND\_RSSI\_RELEASE\_TIME

---

FM\_BLEND\_RSSI\_RELEASE\_TIME sets the mono to stereo release time for RSSI based blend. The release time is the time it will take the stereo separation to go from YMIN to YMAX assuming RSSI makes a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RELEASE[15:0]															
Default	0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Range: 16-65535

**Property 0x3704. FM\_BLEND\_SNR\_LIMITS**

FM\_BLEND\_SNR\_LIMITS sets the SNR limits for SNR controlled stereo separation. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x180F

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	XMAX[7:0]								XMIN[7:0]							
<b>Default</b>	0x18								0x0F							

Bit	Name	Function
15:8	XMAX[7:0]	Value of SNR which causes maximum stereo separation. Range: -20-64
7:0	XMIN[7:0]	Value of SNR which causes minimum stereo separation. Range: -20-64

**Property 0x3706. FM\_BLEND\_SNR\_ATTACK\_TIME**

FM\_BLEND\_SNR\_ATTACK\_TIME sets the stereo to mono attack time for SNR based blend. The attack time is the time it will take the stereo separation to go from YMAX to YMIN assuming SNR makes a step change from XMAX to XMIN. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	ATTACK[15:0]															
<b>Default</b>	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Range: 16-65535

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## Property 0x3707. FM\_BLEND\_SNR\_RELEASE\_TIME

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FM\_BLEND\_SNR\_RELEASE\_TIME sets the mono to stereo release time for SNR based blend. The release time is the time it will take the stereo separation to go from YMIN to YMAX assuming SNR makes a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RELEASE[15:0]															
Default	0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Range: 16-65535

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## Property 0x3708. FM\_BLEND\_MULTIPATH\_LIMITS

---

FM\_BLEND\_MULTIPATH\_LIMITS sets the multipath limits for multipath controlled stereo separation. The limits are in % AM modulation at 1kHz. They are also negated and therefor the max value represents the point at which limiting will begin. The MAX value must be less then the MIN value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x2D3C

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	XMAX[7:0]								XMIN[7:0]							
Default	0x2D								0x3C							

Bit	Name	Function
15:8	XMAX[7:0]	Value of Multipath which causes maximum stereo separation. Range: 0-255
7:0	XMIN[7:0]	Value of Multipath which causes minimum stereo separation. Range: 0-255

**Property 0x370A. FM\_BLEND\_MULTIPATH\_ATTACK\_TIME**

FM\_BLEND\_MULTIPATH\_ATTACK\_TIME sets the stereo to mono attack time for multi-path based blend. The attack time is the time it will take the stereo separation to go from YMAX to YMIN assuming multipath makes a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	ATTACK[15:0]															
<b>Default</b>	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Range: 16-65535

**Property 0x370B. FM\_BLEND\_MULTIPATH\_RELEASE\_TIME**

FM\_BLEND\_MULTIPATH\_RELEASE\_TIME sets the mono to stereo release time for multi-path based blend. The release time is the time it will take the stereo separation to go from YMIN to YMAX assuming multipath makes a step change from XMAX to XMIN. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RELEASE[15:0]															
<b>Default</b>	0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Range: 16-65535

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## Property 0x3900. FM\_AUDIO\_DE\_EMPHASIS

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FM\_AUDIO\_DE\_EMPHASIS property sets the FM Receive de-emphasis to 50 or 75 us. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode. The default is 75 us.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														DE_EMPH[1:0]	
Default	0x0000														0x0	

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1:0	DE_EMPH[1:0]	0 : 75us - Standard in USA 1 : 50us - Standard in Europe 2 : De-emphasis disabled.

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## Property 0x3C00. FM\_RDS\_INTERRUPT\_SOURCE

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FM\_RDS\_INTERRUPT\_SOURCE configures interrupt related to RDS. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode. Note: FM\_RDS\_STATUS command is not supported in firmware revision A0A.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											RDS TPP TY	RDS PI	Res erve d	RDS SYN C	RDS REC V
Default	0x000											0	0	0	0	0



Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4	RDSTPPTY	If set, generates RDS Interrupt when new valid Block B data has been received. 0 : Disabled 1 : Enabled
3	RDSPI	If set, generates RDS Interrupt when new valid Block A data has been received. 0 : Disabled 1 : Enabled
2	Reserved	Always write to 0.
1	RDSSYNC	If set, generates RDS interrupt when RDS Synchronization changes. 0 : Disabled 1 : Enabled
0	RDSRECV	If set, generate an interrupt whenever the RDS FIFO has at least FM_RDS_INTERRUPT_FIFO_COUNT entries. 0 : Disabled 1 : Enabled

#### Property 0x3C01. FM\_RDS\_INTERRUPT\_FIFO\_COUNT

FM\_RDS\_INTERRUPT\_FIFO\_COUNT sets the minimum number of RDS groups stored in the RDS FIFO before RDSRECV is set. RDSRECV is disabled if set to 0. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								DEPTH[7:0]							
Default	0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	DEPTH[7:0]	Sets the minimum number of RDS Groups stored in the RDS FIFO required before RDSRECV is set. RDSRECV is disabled if set to 0. Range: 0-25

## Property 0x3C02. FM\_RDS\_CONFIG

FM\_RDS\_CONFIG configures RDS settings to enable RDS processing (RDSEN) and set RDS block error thresholds. When a RDS Group is received, all block errors must be less than or equal to the associated block error threshold for the group to be stored in the RDS FIFO. If blocks with errors are permitted into the FIFO, the block error information can be reviewed when the group is read using the FM\_RDS\_STATUS command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								BLETHB[1:0]		BLETHCD[1:0]		Reserved			RDS EN
Default	0x00								0x0		0x0		0x0			0

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:6	BLETHB[1:0]	Block Error Threshold For BLOCKB. Recommended value for BLETHB: 0, 1 or 2. Block B is most critical because it tells what C and D contain. Adjust depending on how tolerant the user wants to be on errors, with lower numbers being less tolerant. 0 : No block errors 1 : 1-2 bit errors detected and corrected 2 : 3-5 bit errors detected and corrected 3 : Uncorrectable
5:4	BLETHCD[1:0]	Block Error Threshold For BLOCKC and BLOCKD. The error count used to determine if the group is stored in the FIFO is min(BLEC,BLED). Recommended value for BLETHCD: 0, 1 or 2. 0 : No block errors 1 : 1-2 bit errors detected and corrected 2 : 3-5 bit errors detected and corrected 3 : Uncorrectable
3:1	Reserved	Always write to 0x0.
0	RDSEN	Enables RDS Processing. 0 : RDS Disabled. 1 : RDS Enabled.

**Property 0x3C03. FM\_RDS\_CONFIDENCE**

FM\_RDS\_CONFIDENCE sets the confidence threshold for deciding if each RDS block is valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x1111

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	CONFIDENCEA[3:0]				CONFIDENCEB[3:0]				CONFIDENCEC[3:0]				CONFIDENCED[3:0]			
<b>Default</b>	0x1				0x1				0x1				0x1			

Bit	Name	Function
15:12	CONFIDENCEA[3:0]	Confidence threshold for Block A data. Range: 1-15 0 : Reserved. 1 : Lowest confidence required. A valid and usable confidence threshold. 15 : Highest confidence required. This setting may result in all blocks being marked as uncorrectable.
11:8	CONFIDENCEB[3:0]	Confidence threshold for Block B data. Range: 1-15 0 : Reserved. 1 : Lowest confidence required. A valid and usable confidence threshold. 15 : Highest confidence required. This setting may result in all blocks being marked as uncorrectable.
7:4	CONFIDENCEC[3:0]	Confidence threshold for Block C data. Range: 1-15 0 : Reserved. 1 : Lowest confidence required. A valid and usable confidence threshold. 15 : Highest confidence required. This setting may result in all blocks being marked as uncorrectable.
3:0	CONFIDENCED[3:0]	Confidence threshold for Block D data. Range: 1-15 0 : Reserved. 1 : Lowest confidence required. A valid and usable confidence threshold. 15 : Highest confidence required. This setting may result in all blocks being marked as uncorrectable.

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## Property 0x8100. DIGITAL\_SERVICE\_INT\_SOURCE

DIGITAL\_SERVICE\_INT\_SOURCE configures which digital service events will set the DSRVINT status bit. When one of the bits described below is set, the corresponding event will cause the DSRVINT bit of the status word to be set. To clear the DSRVINT bit the GET\_DIGITAL\_SERVICE\_DATA command must be executed with the ack option. If the DSRVIEN interrupt is enabled, a host interrupt will also be generated. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														DSR VOV FLIN T	DSR VPC KTIN T
Default	0x0000														0	0

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	DSRVOVFLINT	Configures the data service overflow interrupt. When this interrupt occurs data service data has been lost and indicates that the host is not retrieving the data service data in a timely fashion. 0 : Interrupt disabled 1 : Interrupt enabled
0	DSRVPCKTINT	Enables the DSRVPCKTINT interrupt of the GET_DIGITAL_SERVICE_DATA command. 0 : Interrupt disabled 1 : Interrupt enabled

## Property 0x8101. DIGITAL\_SERVICE\_RESTART\_DELAY

DIGITAL\_SERVICE\_RESTART\_DELAY sets the delay time (in milliseconds) to restart digital service. When the system recovers from an acquisition loss, the service that had previously been started will be restarted after this delay. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 8000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RESTART_DELAY[15:0]															
Default	0x1F40															

Bit	Name	Function
15:0	RESTART_DELAY[15:0]	DIGITAL_SERVICE_RESTART_DELAY sets the delay time (in milliseconds) to restart digital service. When the system recovers from an acquisition loss, the service that had previously been started will be restarted after this delay. Range: 100-65535

#### Property 0x9101. HD\_BLEND\_OPTIONS

HD\_BLEND\_OPTIONS provides options to control HD/analog audio blend behavior. This property is only valid for Hybrid (non-All-Digital HD) Broadcasts. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x000A

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved									SER V_S WIT CH_ RAM P_E NAB LE	SER V_L OSS _NO ISE_ ENA BLE	SER V_L OSS _RA MP_ ENA BLE	BLE ND_ DEC ISIO N_E NAB LE	BLE ND_ PIN_ CTR L	ACQ_LOS S[1:0]	
Default	0x000									0	0	0	1	0	0x2	

Bit	Name	Function
15:7	Reserved	Always write to 0x000.
6	SERV_SWITCH_RAMP_ENABLE	This field is used to enable the service switching audio transition ramp. This ramp is applied to the audio when switching audio services. The ramp transition times are programed by the HD_BLEND_SERV_SWITCH_RAMP_UP_TIME and HD_BLEND_SERV_SWITCH_RAMP_DOWN_TIME properties. 0 : Disables audio ramping during a service switch. 1 : Enables audio ramping during a service switch.
5	SERV_LOSS_NOISE_ENABLE	This field is used to enable the comfort noise associated with a service loss. This noise is applied to the audio when audio services are lost and the service is an either SPS or MPS all-digital. The ramp transition times for the noise are programed by the HD_BLEND_SERV_NOISE_RAMP_UP_TIME and HD_BLEND_SERV_NOISE_RAMP_DOWN_TIME properties. 0 : Disables audio ramping during a service switch. 1 : Enables audio ramping during a service switch.
4	SERV_LOSS_RAMP_ENABLE	This field is used to enable the service loss audio transition ramp. This ramp is applied to the audio when a service is lost and or reacquired. When enabled the audio will ramp to silence or comfort noise when noise is enabled using SERV_LOSS_NOISE_ENABLE. The ramp transition times are programed by the HD_BLEND_SERV_LOSS_RAMP_UP_TIME and HD_BLEND_SERV_LOSS_RAMP_DOWN_TIME properties. 0 : Disables audio ramping during a service loss. 1 : Enables audio ramping during a service loss.
3	BLEND_DECISION_ENABLE	Enables and disables blend decision. Blend decision avoids frequent blends and allows a transition to digital only when the signal conditions exceed the preset threshold. In marginal coverage areas, Blend Decision improves the consumer experience. Changes to this bit take effect at tune time. 0 : Disables blend decision. The Blending functionality is the same as prior software releases. 1 : Enables blend decision.
2	BLEND_PIN_CTRL	Blend pin control. This option is to control the state of the blend pin. Changes take effect upon HD_ACQUIRE. 0 : Automatically determine the state of the blend pin based on HD quality (normal HD operation). 1 : Force the blend pin to low (force analog blend mode).
1:0	ACQ_LOSS[1:0]	Upon digital acquisition loss, blend to silence or analog. This option only takes effect if using hybrid tune mode. 0 : Always blend to analog: Acq. loss, blend to analog, reacquire, blend to previously selected service. 1 : Always blend to silence: Acq. loss, blend to silence, reacquire, blend to previously selected service. 2 : Service dependent blend: MPS Selected: Acq. loss, blend to analog, reacquire, blend to MPS. SPSn Selected: Acq. loss, blend to silence, reacquire, blend to previous SPSn.

**Property 0x9102. HD\_BLEND\_ANALOG\_TO\_HD\_TRANSITION\_TIME**

HD\_BLEND\_ANALOG\_TO\_HD\_TRANSITION\_TIME sets the amount of time it takes in ms to blend from analog to HD. This property only applies to primary service channel. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 750

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	BLEND_TIME[15:0]															
<b>Default</b>	0x02EE															

Bit	Name	Function
15:0	BLEND_TIME[15:0]	The amount of time in ms it takes blend from analog reception to HD reception.

**Property 0x9103. HD\_BLEND\_HD\_TO\_ANALOG\_TRANSITION\_TIME**

HD\_BLEND\_HD\_TO\_ANALOG\_TRANSITION\_TIME sets the amount of time it takes in ms to blend from HD to analog. This property only applies to primary service channel. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 100

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	BLEND_TIME[15:0]															
<b>Default</b>	0x0064															

Bit	Name	Function
15:0	BLEND_TIME[15:0]	The amount of time in ms it takes blend from analog reception to HD reception.

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## Property 0x9106. HD\_BLEND\_DYNAMIC\_GAIN

HD\_BLEND\_DYNAMIC\_GAIN sets the digital audio dynamic linear scaling factor. Setting DGAIN\_OVERRIDE bit to 1 will override the broadcaster specified digital gain. The DGAIN field is a signed 8 bit fractional number where the linear gain is equal to DGAIN/128. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: Q0.7

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved							DGAIN_OVERRIDE	DGAIN[7:0]							
Default	0x00							0	0x00							

Bit	Name	Function
15:9	Reserved	Always write to 0x00.
8	DGAIN_OVERRIDE	override the broadcaster specified digital gain. 0 : Do not override the broadcaster specified digital gain. 1 : Override the broadcaster specified digital gain with gain specified in DGAIN field.
7:0	DGAIN[7:0]	HD audio linear scaling factor (Q0.7) format. Range: -128-127

## Property 0x9109. HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_THRESHOLD

This property defines the analog to digital blend threshold. When Cd/No exceeds this threshold for HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_DELAY milliseconds, blend to digital.

Default: 58

Units: dBHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved							A2D_THRESHOLD[7:0]								
Default	0x00							0x3A								

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	A2D_THRESHOLD[7:0]	defines the analog to digital blend threshold.



**Property 0x910A. HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_DELAY**

This property defines the analog to digital blend delay. When Cd/No exceeds HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_THRESHOLD for the given period of milliseconds, blend to digital.

Default: 5000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	A2D_DELAY[15:0]															
<b>Default</b>	0x1388															

Bit	Name	Function
15:0	A2D_DELAY[15:0]	defines the analog to digital blend delay.

**Property 0x910B. HD\_BLEND\_SERV\_LOSS\_RAMP\_UP\_TIME**

HD\_BLEND\_SERV\_LOSS\_RAMP\_UP\_TIME sets the audio service re-acquisition unmute time in ms. When audio is acquired the audio will ramp up to full level in the time programmed. Service loss ramping is enabled via the HD\_BLEND\_OPTIONS property.

Default: 750

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	SERV_LOSS_RAMP_UP_TIME[15:0]															
<b>Default</b>	0x02EE															

Bit	Name	Function
15:0	SERV_LOSS_RAMP_UP_TIME[15:0]	HD_BLEND_SERV_LOSS_RAMP_UP_TIME sets the audio service re-acquisition unmute time in ms. When audio is acquired the audio will ramp up to full level in the time programmed. Service loss ramping is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 50-2000

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**Property 0x910C. HD\_BLEND\_SERV\_LOSS\_RAMP\_DOWN\_TIME**

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HD\_BLEND\_SERV\_LOSS\_RAMP\_DOWN\_TIME sets the audio service lost mute time in ms. When audio is lost the audio will ramp down to mute in the time programed. Service loss ramping is enabled via the HD\_BLEND\_OPTIONS property.

Default: 250

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_RAMP_DOWN_TIME[15:0]															
Default	0x00FA															

Bit	Name	Function
15:0	SERV_LOSS_RAMP_DOWN_TIME[15:0]	HD_BLEND_SERV_LOSS_RAMP_DOWN_TIME sets the audio service lost mute time in ms. When audio is lost the audio will ramp down to mute in the time programed. Service loss ramping is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquistion time. Range: 50-2000

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**Property 0x910D. HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_UP\_TIME**

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HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_UP\_TIME sets the comfort noise unmute time in ms. When audio is lost and the comfort noise is eanbled the noise will ramp up to the level specified HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL in the time programed. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 1000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_RAMP_UP_TIME[15:0]															
Default	0x03E8															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_RAMP_UP_TIME[15:0]	HD_BLEND_SERV_LOSS_NOISE_RAMP_UP_TIME sets the comfort noise unmute time in ms. When audio is lost and the comfort noise is eanbled the noise will ramp up to the level specified HD_BLEND_SERV_LOSS_NOISE_LEVEL in the time programed. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquistion time. Range: 50-2000

**Property 0x910E. HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_DOWN\_TIME**

HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_DOWN\_TIME sets the comfort noise mute time in ms. When audio is acquired and comfort noise is enabled the noise will ramp down to 0 in the time programmed. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 250

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	SERV_LOSS_NOISE_RAMP_DOWN_TIME[15:0]															
<b>Default</b>	0x00FA															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_RAMP_DOWN_TIME[15:0]	HD_BLEND_SERV_LOSS_NOISE_RAMP_DOWN_TIME sets the comfort noise mute time in ms. When audio is acquired and comfort noise is enabled the noise will ramp down to 0 in the time programmed. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 50-2000

**Property 0x910F. HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL**

HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL sets the unmuted comfort noise level as a fractional number between 0 and 1. Where 0 is off and 0x3FFF is 0dBFS. The actual level can be calculated from  $N = 20\log(\text{HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL}/131072)$ , where N will be in dBFS. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 512

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	SERV_LOSS_NOISE_LEVEL[15:0]															
<b>Default</b>	0x0200															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_LEVEL[15:0]	HD_BLEND_SERV_LOSS_NOISE_LEVEL sets the unmuted comfort noise level as a fractional number between 0 and 1. Where 0 is off and 0x3FFF is 0dBFS. The actual level can be calculated from $N = 20\log(\text{HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL}/131072)$ , where N will be in dBFS. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 0-16383

## Property 0x9110. HD\_BLEND\_SERV\_LOSS\_NOISE\_DAAI\_THRESHOLD

HD\_BLEND\_SERV\_LOSS\_NOISE\_DAAI\_THRESHOLD sets the DAAI level below which comfort noise will engage and audio will ramp down (if loss ramping is enabled). A lower setting of this property will result more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove the DAAI metric from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 only the availability of digital audio will control the noise state. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 40

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_DAAI_THRESHOLD[15:0]															
Default	0x0028															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_DAAI_THRESHOLD[15:0]	HD_BLEND_SERV_LOSS_NOISE_DAAI_THRESHOLD sets the DAAI level below which comfort noise will engage and audio will ramp down (if loss ramping is enabled). A lower setting of this property will result more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove the DAAI metric from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 only the availability of digital audio will control the noise state. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Range: 0-60

## Property 0x9111. HD\_BLEND\_SERV\_LOSS\_NOISE\_AUDIO\_START\_DELAY

HD\_BLEND\_SERV\_LOSS\_NOISE\_AUDIO\_START\_DELAY sets the amount of time in 40ms increments to delay the audio once audio is available and DAAI is greater than the value set by HD\_BLEND\_SERV\_LOSS\_NOISE\_DAAI\_THRESHOLD. A lower setting of this property will result more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove audio start delay from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 no audio holdoff delay will be applied. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 4

Units: 40ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_AUDIO_START_DELAY[15:0]															
Default	0x0004															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_AUDIO_START_DELAY[15:0]	HD_BLEND_SERV_LOSS_NOISE_AUDIO_START_DELAY sets the amount of time in 40ms increments to delay the audio once audio is available and DAAI is greater than the value set by HD_BLEND_SERV_LOSS_NOISE_DAAI_THRESHOLD. A lower setting of this property will result in more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove audio start delay from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 no audio holdoff delay will be applied. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Range: 0-200

### Property 0x9112. HD\_BLEND\_SERV\_SWITCH\_RAMP\_UP\_TIME

HD\_BLEND\_SERV\_SWITCH\_RAMP\_UP\_TIME sets the service switching unmute time in ms. The service switching ramp feature is enabled using the HD\_BLEND\_OPTIONS property.

Default: 184

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_SWITCH_RAMP_UP_TIME[15:0]															
Default	0x00B8															

Bit	Name	Function
15:0	SERV_SWITCH_RAMP_UP_TIME[15:0]	HD_BLEND_SERV_SWITCH_RAMP_UP_TIME sets the service switching unmute time in ms. The service switching ramp feature is enabled using the HD_BLEND_OPTIONS property. Range: 50-2000

### Property 0x9113. HD\_BLEND\_SERV\_SWITCH\_RAMP\_DOWN\_TIME

HD\_BLEND\_SERV\_SWITCH\_RAMP\_DOWN\_TIME sets the service switching mute time in ms. The service switching ramp feature is enabled using the HD\_BLEND\_OPTIONS property.

Default: 184

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_SWITCH_RAMP_DOWN_TIME[15:0]															
Default	0x00B8															

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Bit	Name	Function
15:0	SERV_SWITCH_RAMP_DOWN_TIME[15:0]	HD_BLEND_SERV_SWITCH_RAMP_DOWN_TIME sets the service switching mute time in ms. The service switching ramp feature is enabled using the HD_BLEND_OPTIONS property. Range: 50-2000

## Property 0x9200. HD\_DIGRAD\_INTERRUPT\_SOURCE

HD\_DIGRAD\_INTERRUPT\_SOURCE configures interrupts related to digital receiver (HD\_DIGRAD\_STATUS). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HDL OG OIN TEN	SRC ANA INTE N	SRC DIGI NTE N	Res erve d	AUD ACQ INTE N	ACQ INTE N	CDN RHI NTE N	CDN RLIN TEN
Default	0x00								0	0	0	0	0	0	0	0

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7	HDLOGOINTEN	Enables the HD logo interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
6	SRCANAINTE	Enables the analog audio source interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
5	SRCDIGINTEN	Enables the digital audio source interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
4	Reserved	Always write to 0.
3	AUDACQINTEN	Enables the audio acquire interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
2	ACQINTEN	Ensemble acquisition change interrupt enable. 0 : Interrupt disabled 1 : Interrupt enabled

Bit	Name	Function
1	CDNRHINTEN	Enables the CDNR high interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
0	CDNRLINTEN	Enables the CDNR low interrupt. 0 : Interrupt disabled 1 : Interrupt enabled

#### Property 0x9201. HD\_DIGRAD\_CDNR\_LOW\_THRESHOLD

HD\_DIGRAD\_CDNR\_LOW\_THRESHOLD sets the CDNR level (in dB) below which the CDNRLINT interrupt will occur. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	CDNR_LOW_THRESHOLD[15:0]															
Default	0x0000															

Bit	Name	Function
15:0	CDNR_LOW_THRESHOLD[15:0]	This property sets the CDNR level (in dB) below which the CDNRLINT interrupt will occur. To make this interrupt set the DACQINT in the status word the CDNRLINTEN bit must be set in the HD_DIGRAD_INTERRUPT_SOURCE property.

#### Property 0x9202. HD\_DIGRAD\_CDNR\_HIGH\_THRESHOLD

HD\_DIGRAD\_CDNR\_HIGH\_THRESHOLD sets the CDNR level (in dB) above which the CDNRHINT interrupt will occur. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 127

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	CDNR_HIGH_THRESHOLD[15:0]															
Default	0x007F															

Bit	Name	Function
15:0	CDNR_HIGH_THRESHOLD[15:0]	This property sets the CDNR level (in dB) above which the CDNRHINT interrupt will occur. To make this interrupt set the DACQINT in the status word the CDNRHINTEN bit must be set in the HD_DIGRAD_INTERRUPT_SOURCE property.

## Property 0x9300. HD\_EVENT\_INTERRUPT\_SOURCE

HD\_EVENT\_INTERRUPT\_SOURCE property configures interrupts related to HD Events (see DEVENTINT status bit). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								DINFO_INTEN	AINFO_INTEN	Reserved	ALERT_INTEN	PSD_INTEN	SIS_INTEN	DSRVLIST_INTEN	ASRVLIST_INTEN
Default	0x00								0	0	0	0	0	0	0	0

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7	DINFO_INTEN	Enables the Data Info interrupt. 0 : Disables the Data Info interrupt. 1 : Enable interrupt to occur whenever a updated data info is available.
6	AINFO_INTEN	Enables the Audio Info interrupt. 0 : Disables the Audio Info interrupt. 1 : Enable interrupt to occur whenever a updated audio info is available.
5	Reserved	Always write to 0.
4	ALERT_INTEN	Enables the Alert interrupt. 0 : Disables the Alert interrupt. 1 : Enable interrupt to occur whenever a new Alert occurs.
3	PSD_INTEN	Enables the Program Service Data (PSD) interrupt. 0 : Disables the PSD interrupt. 1 : Enable interrupt to occur whenever PSD is available.
2	SIS_INTEN	Enables the Station Information (SIS) interrupt. 0 : Disables the SIS interrupt. 1 : Enable interrupt to occur whenever SIS is available.
1	DSRVLIST_INTEN	Enables the data service list event interrupt. 0 : Disables the service list update interrupt. 1 : Enable interrupt to occur whenever a data service list update occurs.
0	ASRVLIST_INTEN	Enables the audio service list event interrupt. 0 : Disables the audio service list update interrupt. 1 : Enable interrupt to occur whenever an audio service list update occurs.



**Property 0x9301. HD\_EVENT\_SIS\_CONFIG**

HD\_EVENT\_SIS\_CONFIG configures which basic SIS information is returned by the HD\_GET\_STATION\_INFO command BASICSIS option. Takes effect at tune time. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0017

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											LOCATION	RSVD	NAME_LF	NAME_SF	ID
Default	0x000											1	0	1	1	1

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4	LOCATION	When set the station location will be returned when BASICSIS option is used in the HD_GET_STATION_INFO command.
3	RSVD	Reserved
2	NAME_LF	When set the long form station name will be returned when BASICSIS option is used with the HD_GET_STATION_INFO command.
1	NAME_SF	When set the short form station name will be returned when BASICSIS option is used with the HD_GET_STATION_INFO command.
0	ID	When set the station ID will be returned when BASICSIS option is used in the HD_GET_STATION_INFO command.

**Property 0x9302. HD\_EVENT\_ALERT\_CONFIG**

HD\_EVENT\_ALERT\_CONFIG configures HD alerts. Alert information is returned by the HD\_GET\_ALERT\_MSG command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0001

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														PLAY_TONE	ENABLE
Default	0x0000														0	1

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Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	PLAY_TONE	When set the HD radio will automatically insert a 2 second tone into the audio every time an alert is sent by the broadcaster. This can be quite often so it is recommended that the host use the HD_PLAY_ALERT_TONE command to play a tone each time a unique alert message is received.
0	ENABLE	When set the Alert system is enabled. Please see the HD_GET_ALERT_MSG command and the HD_GET_EVENT_STATUS commands for more details about alerts.

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## Property 0x9400. HD\_ACF\_INTERRUPT\_SOURCE

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HD\_ACF\_COMF\_NOISE\_THRESHOLD Enables the HD ACF interrupt sources. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															COMF_NOISE_INTERRUPT
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	COMF_NOISE_INTEN	Enables the HD ACF comfort noise level interrupt 0 : The HD ACF comfort noise level interrupt is disabled 1 : The HD ACF comfort noise level interrupt is enabled

---

## Property 0x9401. HD\_ACF\_COMF\_NOISE\_THRESHOLD

---

HD\_ACF\_COMF\_NOISE\_THRESHOLD Sets the comfort noise interrupt threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 512

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	COMF_NOISE_THRESH[15:0]															
Default	0x0200															

Bit	Name	Function
15:0	COMF_NOISE_-THRESH[15:0]	Sets the comfort noise interrupt threshold. Range: 0-16383

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**Property 0x9404. HD\_ACF\_COMF\_NOISE\_TOLERANCE**


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HD\_ACF\_COMF\_NOISE\_TOLERANCE Sets the distance from the final comfort noise level that triggers the comfort noise convergence flag. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 5

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	COMF_NOISE_TOL[15:0]															
Default	0x0005															

Bit	Name	Function
15:0	COM-F_NOISE_TOL[15:0]	When the comfort noise level is this many away from its maximum value the COMF_NOISE_CONV flag will get set. Range: 0-100

---

**Property 0x9500. HD\_PSD\_ENABLE**


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HD\_PSD\_ENABLE sets which audio services will provide program service data. The PSD data is forwarded through the data service DSRV interface. Once PSD data is available it is forwarded automatically for each service that is enabled. The PSD data packet is formatted as a collection of ID3 tags that must be decoded by the host. Please refer to the DSRV Users guide and the iBiquity Advanced Applications Services Guide for more information on using the DSRV and PSD information. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ASP S7	ASP S6	ASP S5	ASP S4	ASP S3	ASP S2	ASP S1	AMP S	SPS 7	SPS 6	SPS 5	SPS 4	SPS 3	SPS 2	SPS 1	MPS
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Bit	Name	Function
15	ASPS7	Always enable program services data for Secondary Program Service 7. This PSD will be forwarded with a CID of 0x5207.
14	ASPS6	Always enable program services data for Secondary Program Service 6. This PSD will be forwarded with a CID of 0x5206.
13	ASPS5	Always enable program services data for Secondary Program Service 5. This PSD will be forwarded with a CID of 0x5205.
12	ASPS4	Always enable program services data for Secondary Program Service 4. This PSD will be forwarded with a CID of 0x5204.
11	ASPS3	Always enable program services data for Secondary Program Service 3. This PSD will be forwarded with a CID of 0x5203.
10	ASPS2	Always enable program services data for Secondary Program Service 2. This PSD will be forwarded with a CID of 0x5202.
9	ASPS1	Always enable program services data for Secondary Program Service 1. This PSD will be forwarded with a CID of 0x5201.
8	AMPS	Always enable program services data for Main Program Service. This PSD will be forwarded with a CID of 0x5100.
7	SPS7	Enable program services data for Secondary Program Service 7 when tuned to this service. This PSD will be forwarded with a CID of 0x5207.
6	SPS6	Enable program services data for Secondary Program Service 6 when tuned to this service. This PSD will be forwarded with a CID of 0x5206.
5	SPS5	Enable program services data for Secondary Program Service 5 when tuned to this service. This PSD will be forwarded with a CID of 0x5205.
4	SPS4	Enable program services data for Secondary Program Service 4 when tuned to this service. This PSD will be forwarded with a CID of 0x5204.
3	SPS3	Enable program services data for Secondary Program Service 3 when tuned to this service. This PSD will be forwarded with a CID of 0x5203.
2	SPS2	Enable program services data for Secondary Program Service 2 when tuned to this service. This PSD will be forwarded with a CID of 0x5202.
1	SPS1	Enable program services data for Secondary Program Service 1 when tuned to this service. This PSD will be forwarded with a CID of 0x5201.
0	MPS	Enable program services data for the Main Program Service when tuned to this service. This PSD will be forwarded with a CID of 0x5100.

## Property 0x9501. HD\_PSD\_FIELD\_MASK

This property sets which PSD fields will be decoded and available via HD\_GET\_PSD\_DECODE.

Default: 0xFFFF

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ID	OWNER	DESC	NAME	RECV	URL	VALID	PRI CE	Reserved	TEXT	SHORT	LANG	GENRE	ALBUM	ARTIST	TITLE

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Default	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Bit	Name	Function
15	ID	UFID: Owner ID
14	OWNER	UFID: Owner
13	DESC	Commercial: Description
12	NAME	Commercial: Name of Seller
11	RECV	Commercial: Received As
10	URL	Commercial: Contact URL
9	VALID	Commercial: Valid Until
8	PRICE	Commercial: Price
7	Reserved	Always write to 1.
6	TEXT	Comment: The actual text
5	SHORT	Comment: Short Content Description
4	LANG	Comment: Language
3	GENRE	Genre
2	ALBUM	Album
1	ARTIST	Artist
0	TITLE	Title

### Property 0x9700. HD\_AUDIO\_CTRL\_FRAME\_DELAY

HD\_AUDIO\_CTRL\_FRAME\_DELAY controls the value of the delay of decoded digital audio samples relative to the output of the audio quality indicator. For CODEC modes 0 and 2, the actual delay value is a sum of this parameter and the Digital Audio Delay for a given codec mode, see HD\_CODEC properties. The maximum hold-off for HD is 18 audio frames (0x12). Any value exceeding this maximum is limited to 0x12. This parameter is applicable in hybrid service modes only. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 6

Units: frames

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												DELAY[3:0]			
Default	0x000												0x6			

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Bit	Name	Function
15:4	Reserved	Always write to 0x000.
3:0	DELAY[3:0]	The number of audio frames to delay the audio. Range: 4-21

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## Property 0x9701. HD\_AUDIO\_CTRL\_PROGRAM\_LOSS\_THRESHOLD

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HD\_AUDIO\_CTRL\_PROGRAM\_LOSS\_THRESHOLD controls the duration before reverting to MPS audio after an SPS audio program is removed or lost. The same value applies to all SPS audio programs. The timeout is calculated as follows: Timeout = Value X 1.486 seconds. To hold the SPS audio program indefinitely, a value of 0 should be used. In this case, if the SPS audio program is lost or terminated, the system will not automatically revert to MPS and the SPS audio output will be muted and will continue to dwell on the selected supplemental program until commanded otherwise by the HC/listener. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: frames

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												TRESH[3:0]			
Default	0x000												0x0			

Bit	Name	Function
15:4	Reserved	Always write to 0x000.
3:0	TRESH[3:0]	The delay before reverting to MPS audio. Range: 0-14

---

## Property 0x9702. HD\_AUDIO\_CTRL\_BALL\_GAME\_ENABLE

---

HD\_AUDIO\_CTRL\_BALL\_GAME\_ENABLE selects the audio output for hybrid waveforms when the TX Blend Control Status (BCTL\_EN of HD\_DIGRAD\_STATUS) bits are set to 01 (i.e., ballgame mode). Since analog diversity delay is not applied by the transmitter in this state, the receiver must disable audio blending and force either analog or digital audio to avoid audible discontinuities. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															MO DE
Default	0x0000															1

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	MODE	When 1 selects Ball Game mode. Range: 0-1

---

**Property 0x9900. HD\_CODEC\_MODE\_0\_BLEND\_THRESHOLD**


---

HD\_CODEC\_MODE\_0\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 0. The same threshold applies to all audio programs that utilize codec mode 0. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved													LEVEL[2:0]		
Default	0x0000													0x3		

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

**Property 0x9901. HD\_CODEC\_MODE\_0\_SAMPLES\_DELAY**


---

HD\_CODEC\_MODE\_0\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3697

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0E71													

# AN649

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

## Property 0x9902. HD\_CODEC\_MODE\_0\_BLEND\_RATE

HD\_CODEC\_MODE\_0\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

## Property 0x9903. HD\_CODEC\_MODE\_2\_BLEND\_THRESHOLD

HD\_CODEC\_MODE\_2\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 2. The same threshold applies to all audio programs that utilize codec mode 2. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												LEVEL[2:0]			
Default	0x0000												0x3			



Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

**Property 0x9904. HD\_CODEC\_MODE\_2\_SAMPLES\_DELAY**


---

HD\_CODEC\_MODE\_2\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

**Property 0x9905. HD\_CODEC\_MODE\_2\_BLEND\_RATE**


---

HD\_CODEC\_MODE\_2\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

# AN649

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

## Property 0x9906. HD\_CODEC\_MODE\_10\_BLEND\_THRESHOLD

HD\_CODEC\_MODE\_10\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 10. The same threshold applies to all audio programs that utilize codec mode 10. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												LEVEL[2:0]			
Default	0x0000												0x3			

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

**Property 0x9907. HD\_CODEC\_MODE\_10\_SAMPLES\_DELAY**

HD\_CODEC\_MODE\_10\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved		COUNT[13:0]													
<b>Default</b>	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

**Property 0x9908. HD\_CODEC\_MODE\_10\_BLEND\_RATE**

HD\_CODEC\_MODE\_10\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								HOLD[7:0]							
<b>Default</b>	0x00								0x01							

# AN649

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

---

## Property 0x9909. HD\_CODEC\_MODE\_13\_BLEND\_THRESHOLD

---

HD\_CODEC\_MODE\_13\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 13. The same threshold applies to all audio programs that utilize codec mode 13. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved													LEVEL[2:0]		
Default	0x0000													0x3		

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

## Property 0x990A. HD\_CODEC\_MODE\_13\_SAMPLES\_DELAY

---

HD\_CODEC\_MODE\_13\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

**Property 0x990B. HD\_CODEC\_MODE\_13\_BLEND\_RATE**


---

HD\_CODEC\_MODE\_13\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

---

**Property 0x990C. HD\_CODEC\_MODE\_1\_BLEND\_THRESHOLD**


---

HD\_CODEC\_MODE\_1\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 1. The same threshold applies to all audio programs that utilize codec mode 1. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												LEVEL[2:0]			
Default	0x0000												0x3			

# AN649

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

## Property 0x990D. HD\_CODEC\_MODE\_1\_SAMPLES\_DELAY

---

HD\_CODEC\_MODE\_1\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

## Property 0x990E. HD\_CODEC\_MODE\_1\_BLEND\_RATE

---

HD\_CODEC\_MODE\_1\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

#### Property 0x990F: HD\_CODEC\_MODE\_3\_BLEND\_THRESHOLD

HD\_CODEC\_MODE\_3\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 3. The same threshold applies to all audio programs that utilize codec mode 3. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												LEVEL[2:0]			
Default	0x0000												0x3			

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

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---

## Property 0x9910. HD\_CODEC\_MODE\_3\_SAMPLES\_DELAY

---

HD\_CODEC\_MODE\_3\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

## Property 0x9911. HD\_CODEC\_MODE\_3\_BLEND\_RATE

---

HD\_CODEC\_MODE\_3\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							



Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

---

**Property 0x9A00. HD\_SERVICE\_MODE\_CONTROL\_MP11\_ENABLE**


---

This property Enables MP11 mode support. If MP11 support is disabled using this property the receiver will fall back to MP3 mode of operation when tuned to a station that is transmitting the MP11 subcarriers.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	When set enables MP11 mode support.

---

**Property 0x9B00. HD\_EZBLEND\_ENABLE**


---

This property enables and disables HD EZ blend.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables and disables HD EZ blend. 0 : Use codec mode blend parameters. 1 : Use HD EZ blend parameters.

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---

## Property 0x9B01. HD\_EZBLEND\_MPS\_BLEND\_THRESHOLD

---

This property sets the threshold for determining when to blend between digital audio and analog audio for Hybrid MPS.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								MPS_BLEND_THRESHOLD[7:0]							
Default	0x00								0x03							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	MPS_BLEND_THRESHOLD[7:0]	sets the threshold for determining when to blend between digital audio and analog audio for Hybrid MPS. Range: 0-7

---

## Property 0x9B02. HD\_EZBLEND\_MPS\_BLEND\_RATE

---

This property configures the hysteresis in the blending process for Hybrid MPS.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								MPS_BLEND_RATE[7:0]							
Default	0x00								0x03							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	MPS_BLEND_RATE[7:0]	This property configures the hysteresis in the blending process for Hybrid MPS. Range: 1-8

**Property 0x9B03. HD\_EZBLEND\_MPS\_SAMPLES\_DELAY**

This property is used to perform audio alignment between analog and Hybrid MPS digital audio.

Default: 3697

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	MPS_SAMPLES_DELAY[15:0]															
<b>Default</b>	0x0E71															

Bit	Name	Function
15:0	MPS_SAMPLES_DELAY[15:0]	This property is used to perform audio alignment between analog and Hybrid MPS digital audio.

**Property 0x9B04. HD\_EZBLEND\_SPS\_BLEND\_THRESHOLD**

This property sets the threshold for determining when to blend between digital audio and mute for SPS programs as well as All Digital MPS programs.

Default: 4

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								SPS_BLEND_THRESHOLD[7:0]							
<b>Default</b>	0x00								0x04							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SPS_BLEND_THRESHOLD[7:0]	sets the threshold for determining when to blend between digital audio and mute for SPS programs as well as All Digital MPS programs. Range: 0-7

**Property 0x9B05. HD\_EZBLEND\_SPS\_BLEND\_RATE**

This property configures the hysteresis in the blending process for SPS programs and All Digital MPS programs.

Default: 1

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								SPS_BLEND_RATE[7:0]							
<b>Default</b>	0x00								0x01							

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Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SPS_BLEND_RATE[7:0]	configures the hysteresis in the blending process for SPS programs and All Digital MPS programs. Range: 1-8

---

## Property 0xE800. HD\_TEST\_BER\_CONFIG

---

HD\_TEST\_BER\_CONFIG Enables the HD BER test. The HD BER test requires a special test vector (IB\_FMr208c\_e1wfc204 for FMHD, IB\_AMr208a\_e1awfb00 for AMHD). To run this test start the vector signal generator with the BER test vector, tune to the frequency indicated on the generator, and enable the test using this property. Once the test is running collect the BER information using the HD\_TEST\_GET\_BER\_INFO command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables the BER test. Once enabled the BER information can be collected using the HD_TEST_GET_BER_INFO command.

---

## Property 0xE801. HD\_TEST\_DEBUG\_AUDIO

---

HD\_TEST\_DEBUG\_AUDIO is used to put the DAC audio output in to a special test mode for debug purposes. This is typically used for performing time alignment between the analog audio and the HD audio. The user has the option of selecting either the left or right audio from both the analog demod and the HD demod at the same time. Changes to the system take effect on the first tune following a change to this property. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															TEST-MODE[1:0]
Default	0x0000															0x0

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1:0	TESTMODE[1:0]	Selects which analog and HD audio channel to render. 0 : Normal operation 1 : Left output contains HD audio L, Right output contain analog audio L. 2 : Left output contains HD audio R, Right output contain analog audio R. 3 : Left output contains HD audio L+R, Right output contain analog audio L+R.

## 4.3. Commands Summary—DAB

**Table 5. Commands Summary—DAB**

Cmd	Name	Description
0x00	RD_REPLY	Returns the status byte and data for the last command sent to the device.
0x01	POWER_UP	Power-up the device and set system settings.
0x04	HOST_LOAD	Loads an image from HOST over command interface
0x05	FLASH_LOAD	Loads an image from external FLASH over secondary SPI bus
0x06	LOAD_INIT	Prepares the bootloader to receive a new image.
0x07	BOOT	Boots the image currently loaded in RAM.
0x08	GET_PART_INFO	Reports basic information about the device.
0x09	GET_SYS_STATE	Reports system state information.
0x0A	GET_POWER_UP_ARGS	Reports basic information about the device such as arguments used during POWER_UP.
0x10	READ_OFFSET	Reads a portion of response buffer from an offset.
0x12	GET_FUNC_INFO	Returns the Function revision information of the device.
0x13	SET_PROPERTY	Sets the value of a property.
0x14	GET_PROPERTY	Retrieve the value of a property.
0x15	WRITE_STORAGE	Writes data to the on board storage area at a specified offset.
0x16	READ_STORAGE	Reads data from the on board storage area from a specified offset.
0x80	GET_DIGITAL_SERVICE_LIST	Gets a service list of the ensemble.
0x81	START_DIGITAL_SERVICE	Starts an audio or data service.
0x82	STOP_DIGITAL_SERVICE	Stops an audio or data service.
0x84	GET_DIGITAL_SERVICE_DATA	Gets a block of data associated with one of the enabled data components of a digital services.
0xB0	DAB_TUNE_FREQ	Tunes the DAB Receiver to tune to a frequency between 168.16 and 239.20 MHz defined by the frequency table through DAB_SET_FREQ_LIST.
0xB2	DAB_DIGRAD_STATUS	Returns status information about the digital radio and ensemble.
0xB3	DAB_GET_EVENT_STATUS	Gets information about the various events related to the DAB radio.
0xB4	DAB_GET_ENSEMBLE_INFO	Gets information about the current ensemble
0xB5	DAB_GET_ANNOUNCEMENT_SUPPORT_INFO	DAB_GET_ANNOUNCEMENT_SUPPORT_INFO gets the announcement support information.
0xB6	DAB_GET_ANNOUNCEMENT_INFO	DAB_GET_ANNOUNCEMENT_INFO gets announcement information from the announcement queue.

**Table 5. Commands Summary—DAB (Continued)**

<b>Cmd</b>	<b>Name</b>	<b>Description</b>
0xB7	DAB_GET_SERVICE_LINKING_INFO	Provides service linking (FIG 0/6) information for the passed in service ID.
0xB8	DAB_SET_FREQ_LIST	Sets the DAB frequency table. The frequencies are in units of kHz.
0xB9	DAB_GET_FREQ_LIST	Gets the DAB frequency table
0xBB	DAB_GET_COMPONENT_INFO	Gets information about components within the ensemble if available.
0xBC	DAB_GET_TIME	Gets the ensemble time adjusted for the local time offset or the UTC.
0xBD	DAB_GET_AUDIO_INFO	Gets audio service info
0xBE	DAB_GET_SUBCHAN_INFO	Gets sub-channel info
0xBF	DAB_GET_FREQ_INFO	Gets ensemble freq info
0xC0	DAB_GET_SERVICE_INFO	Gets information about a service.
0xC1	DAB_GET_OE_SERVICES_INFO	Provides other ensemble (OE) services (FIG 0/24) information for the passed in service ID.
0xC2	DAB_ACF_STATUS	Returns status information about automatically controlled features.
0xE5	TEST_GET_RSSI	Returns the reported RSSI in 8.8 format.
0xE8	DAB_TEST_GET_BER_INFO	Reads the current BER rate

## 4.3.1. DAB Commands

### Command 0x00. RD\_REPLY

RD\_REPLY command must be called to return the status byte and data for the last command sent to the device. This command is also used to poll the status byte as needed. To poll the status byte, send the RD\_REPLY command and read the status byte. This can be done regardless of the state of the CTS bit in the status register. Please refer to individual command descriptions for the format of returned data. RD\_REPLY is a hardware command and can be issued while device is powered down. For commands where the size of the response is returned, the user should send the RD\_REPLY command to read the SIZE first. Each time the RD\_REPLY command is sent, the STAUS bytes will still be returned.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x00							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	DAC-QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	DATA_0[7:0]							
RESP5	DATA_N[7:0]							

Name	Function
CTS	Clear to Send. 0 : Wait before sending next command. 1 : Clear to send next command. The next command may be sent.
ERR_CMD	Command Error. 0 : No error 1 : Error. The previous command failed. Read byte 5 of the reply to get the error code. The next successfully executed command will clear the error.



Name	Function
DACQINT	Digital radio link change interrupt indicator. Indicates that something in the digital radio ensemble acquisition status has changed. Service via the DAB_DIGRAD_STATUS commands.
DSRVINT	Indicates that an enabled data component of one of the digital services requires attention. Service using the GET_DIGITAL_SERVICE_DATA command.
STCINT	Seek/Tune complete. 0 : Tune complete has not been triggered. Do not send a new TUNE/SEEK command. 1 : Tune complete has been triggered. It is safe to send a new TUNE/SEEK command.
DEVNTINT	Digital radio event change interrupt indicator. Indicates that a new event related to the digital radio has occurred. Service via the DAB_DIGRAD_STATUS commands.
DACFINT	RFU.
PUP_STATE[7:6]	Indicates the powerup state of the system. 0 : The system has been reset but no POWER_UP command has been issued. The system is currently waiting on the POWER_UP command. 1 : Reserved 2 : The bootloader is currently running. 3 : An application was successfully booted and is currently running.
RFFE_ERR	When set indicates that the RF front end of the system is in an unexpected state.
DSPERR	The DSP has encountered a frame overrun. This is a fatal error.
REPOFERR	When set the control interface has dropped data during a reply read, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the given data arbiter and memory speed.
CMDOFERR	When set the control interface has dropped data during a command write, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the data arbiter and memory speed.
ARBERR	When set an arbiter error has occurred.
ERRNR	When set a non-recoverable error has occurred. The system keep alive timer has expired.

Name	Function
DATA_0[7:0]	First Data byte. If ERR_CMD bit is set, this byte returns the error code. Possible command error codes are: 0x01 : unspecified 0x02 : reply overflow 0x03 : not available 0x04 : not supported 0x05 : bad frequency 0x10 : command not found 0x11 : bad arg1 0x12 : bad arg2 0x13 : bad arg3 0x14 : bad arg4 0x15 : bad arg5 0x16 : bad arg6 0x17 : bad arg7 0x18 : command busy 0x19 : at band limit 0x20 : bad NVM 0x30 : bad patch 0x31 : bad bootmode 0x40 : bad property 0x50 : not acquired 0xff : APP not supported
DATA_N[7:0]	Nth Data byte.

## Command 0x01. POWER\_UP

The POWER\_UP initiates the boot process to move the device from power down to power up mode. There are two possible boot scenarios: Host image load and FLASH image load. When the host is loading the image the host first executes the POWER\_UP command to set the system settings REF\_CLK, etc). A LOAD\_INIT command then prepares the bootloader to receive a new image. After the LOAD\_INIT command, using the HOST\_LOAD command loads the image into the device RAM. After the RAM is loaded the host issues the BOOT command. When booting a FLASH image the host issues the POWER\_UP command to set the system settings. Then issues the FLASH\_LOAD command to select and load the image from FLASH. Once the image is loaded the host sends the BOOT command to boot the application. Power-up is complete when the CTS bit is set. This command may only be sent while the device is powered down. Note: FLASH\_LOAD is not supported in A0A or A0B revisions.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x01							
ARG1	CTSIEN	0	0	0	0	0	0	0
ARG2	0	0	CLK_MODE[1:0]		TR_SIZE[3:0]			

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG3	0	IBIAS[6:0]						
ARG4	XTAL_FREQ[7:0]							
ARG5	XTAL_FREQ[15:8]							
ARG6	XTAL_FREQ[23:16]							
ARG7	XTAL_FREQ[31:24]							
ARG8	0	0	CTUN[5:0]					
ARG9	0	0	0	1	0	0	0	0
ARG10	0							
ARG11	0	0	0		0	0		
ARG12	0				0	0		
ARG13	0	IBIAS_RUN[6:0]						
ARG14	0							
ARG15	0							

Name	Function
CTSIE	The bootloader will toggle a host interrupt line when CTS is available. 0 : Disable toggling host interrupt line. 1 : Enable toggling host interrupt line.
CLK_MODE[5:4]	Choose clock mode. See refclk spec sheet for more information 0 : Oscillator and buffer are powered down. 1 : Reference clock generator is in crystal mode. 2 : Oscillator is off and circuit acts as single ended buffer. 3 : Oscillator is off and circuit acts as differential buffer.
TR_SIZE[3:0]	XOSC TR_SIZE. See refclk spec sheet for more information. Range: 0-15
IBIAS[6:0]	XTAL IBIAS current at startup. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. 10 uA steps, 0 to 1270 uA. Range: 0-127
XTAL_FREQ[31:0]	XTAL Frequency in Hz. The supported crystal frequencies are: [5.4 MHz - 6.6 MHz] [10.8 MHz - 13.2 MHz] [16.8 MHz - 19.8 MHz] [21.6 MHz - 26.4 MHz] [27 MHz - 46.2 MHz]. The system designer should consult the part specific data sheet for information regarding tested/recommended xtal frequency ranges before choosing a xtal.
CTUN[5:0]	CTUN. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. Range: 0-63

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Name	Function
IBIAS_RUN[6:0]	XTAL IBIAS current at runtime, after the XTAL oscillator has stabilized. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. 10 uA steps, 10 to 1270 uA. If set to 0, will use the same value as IBIAS. Range: 0-127

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]	RSVD_STAT[1:0]	REPOFERR	CMDOFERR	ARBERR	ERRNR		

Name	Function
CTS	Clear to Send. 0 : Wait before sending next command. 1 : Clear to send next command. The next command may be sent.
ERR_CMD	Error. 0 : No error 1 : Error. The previous command failed. If STATUS1 is non-zero, it provides an indication of the cause of the error.
PUP_STATE[7:6]	Indicates the powerup state of the system. 0 : The system has been reset but no POWER_UP + command has been issued. The system is currently waiting on the POWER_UP command. 1 : Reserved 2 : The bootloader is currently running. 3 : An application was successfully booted and is currently running.
RSVD_STAT[5:4]	RFU (Reserved For Future Use).
REPOFERR	When set the control interface has dropped data during a reply read, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the given data arbiter and memory speed.
CMDOFERR	When set the control interface has dropped data during a command write, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the data arbiter and memory speed.
ARBERR	When set an arbiter error has occurred.
ERRNR	When set a non-recoverable error has occurred. The system keep alive timer has expired.

**Command 0x04. HOST\_LOAD**

HOST\_LOAD loads an image from HOST over command interface. It sends up to 4096 bytes of application image to the bootloader. Note: This command is much more efficient when the image is sent as multiples of 4 bytes. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x04							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	IMAGE_DATA0[7:0]							
ARG5	IMAGE_DATA1[7:0]							
ARG6	IMAGE_DATA2[7:0]							
ARG7	IMAGE_DATA3[7:0]							
ARG8	IMAGE_DATA_N[7:0]							

Name	Function
IMAGE_DATA0[7:0]	First byte of data stream from boot_img.
IMAGE_DATA1[7:0]	Second byte of data stream from boot_img.
IMAGE_DATA2[7:0]	Third byte of data stream from boot_img.
IMAGE_DATA3[7:0]	Fourth byte of data stream from boot_img.
IMAGE_DATA_N[7:0]	Nth byte of data stream. Maximum of 4096 bytes of data per HOST_LOAD command. For best results, N should be a multiple of 4.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO-FERR	CMDO-FERR	ARBERR	ERRNR

---

## Command 0x05. FLASH\_LOAD

---

FLASH\_LOAD loads the firmware image from an externally attached SPI flash over the secondary SPI bus. The image must be contiguous on the flash. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: FLASH\_LOAD is only supported after patching the bootloader.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x05							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	FLASH_START_ADDR[7:0]							
ARG5	FLASH_START_ADDR[15:8]							
ARG6	FLASH_START_ADDR[23:16]							
ARG7	FLASH_START_ADDR[31:24]							
ARG8	0							
ARG9	0							
ARG10	0							
ARG11	0							

Name	Function
FLASH_START_ADDR[31:0]	Flash byte starting address of image to load

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

**Command 0x06. LOAD\_INIT**

LOAD\_INIT prepares the bootloader to receive a new image. It will force the bootloader state to waiting for a new LOAD command (HOST\_LOAD or FLASH\_LOAD.) LOAD\_INIT command must always be sent prior to a HOST\_LOAD or a FLASH\_LOAD command. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x06							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

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## Command 0x07. BOOT

---

BOOT command boots the image currently loaded in RAM. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x07							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

---

## Command 0x08. GET\_PART\_INFO

---

GET\_PART\_INFO reports basic information about the device such as Part Number, Part Version, ROM ID, etc. This command will hold CTS until the reply is available. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: GET\_PART\_INFO command is not supported in firmware revision A0A.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x08							
ARG1	0							



## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	CHIPREV[7:0]							
RESP5	ROMID[7:0]							
RESP6	X							
RESP7	X							
RESP8	PART[7:0]							
RESP9	PART[15:8]							
RESP10	X							
RESP11	X							
RESP12	X							
RESP13	X							
RESP14	X							
RESP15	X							
RESP16	X							
RESP17	X							
RESP18	X							
RESP19	X							
RESP20	X							
RESP21	X							
RESP22	X							

Name	Function
CHIPREV[7:0]	Chip Mask Revision
ROMID[7:0]	ROM Id

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Name	Function
PART[15:0]	Part Number (decimal)

## Command 0x09. GET\_SYS\_STATE

GET\_SYS\_STATE reports basic system state information such as which mode is active; FM, DAB, etc. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: GET\_SYS\_STATE command is not supported in firmware revision A0A.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x09							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	IMAGE[7:0]							
RESP5	X							

Name	Function
IMAGE[7:0]	<p>This field indicates which firmware image processed this command.</p> <p>0 : Bootloader is active</p> <p>1 : FMHD is active</p> <p>2 : DAB is active</p> <p>3 : TDMB or data only DAB image is active</p> <p>4 : FMHD Demod is active</p> <p>5 : AMHD is active</p> <p>6 : AMHD Demod is active</p> <p>7 : DAB Demod is active</p> <p>16 : RESERVED</p>

### Command 0x0A. GET\_POWER\_UP\_ARGS

GET\_POWER\_UP\_ARGS reports basic information about the device such as which parameters were used during power up. This command will hold CTS until the reply is available. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x0A							
ARG1	0							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X							
RESP5	X	X	X	X	X	X	X	X
RESP6	X	X	CLK_MODE[1:0]		TR_SIZE[3:0]			

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP7	X	IBIAS[6:0]						
RESP8	XTAL_FREQ[7:0]							
RESP9	XTAL_FREQ[15:8]							
RESP10	XTAL_FREQ[23:16]							
RESP11	XTAL_FREQ[31:24]							
RESP12	X	X	CTUN[5:0]					
RESP13	X	X	X	X	X	X	X	X
RESP14	X							
RESP15	X	X	X		X	X		
RESP16	X				X	X		
RESP17	X	IBIAS_RUN[6:0]						

Name	Function
CLK_MODE[5:4]	See POWER_UP command
TR_SIZE[3:0]	See POWER_UP command
IBIAS[6:0]	See POWER_UP command
XTAL_FREQ[31:0]	See POWER_UP command
CTUN[5:0]	See POWER_UP command
IBIAS_RUN[6:0]	See POWER_UP command

## Command 0x10. READ\_OFFSET

READ\_OFFSET is used for applications that cannot read the entire response buffer. This type of application can use this command to read the response buffer in segments. The host must pass in an offset from the beginning of the response buffer to indicate the starting point from which to read. This offset must be modulo 4. The response buffer remains intact as in the READ\_REPLY command so that the response can be read again if needed. This function is available for both I2C and SPI mode. This is a software command, therefore it is best to read as much data in each calling as possible. This will reduce the overhead associated with using this command. It is recommended that the minimum reply size be on the order of 512 bytes. This means that for APIs that return less the 512 bytes the standard READ\_REPLY should be used. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x10							
ARG1	0x00							
ARG2	OFFSET[7:0]							
ARG3	OFFSET[15:8]							

Name	Function
OFFSET[15:0]	The offset from the beginning of the response buffer from where to begin reading. The OFFSET parameter must be modulo four. An error is returned otherwise. For example to read a 1024 byte response in two chunks the host can call the READ_MORE command twice. The first call would have OFFSET set to 0 and the second call would have OFFSET set to 512. In both cases the host will clock out 516 bytes of data. The first chunk will include 4 bytes for the status word plus 512 bytes of response. The second chunk will include 4 bytes of status word plus the remaining 512 bytes of response. The response sections will be concatenated to form the entire response.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	DATA0[7:0]							

Name	Function
DATA0[7:0]	The first byte of the data chunk.

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## Command 0x12. GET\_FUNC\_INFO

GET\_FUNC\_INFO returns the function revision number for currently loaded firmware (FMHD, AM etc.) as opposed to GET\_PART\_INFO command that provides the revision number for the combo firmware. For example, GET\_PART\_INFO would return A0B is the firmware revision while GET\_FUNC\_INFO would return 1.0.4 for FM function revision if the currently running firmware function is FM. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x12							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	REVEXT[7:0]							
RESP5	REVBRANCH[7:0]							
RESP6	REVINT[7:0]							
RESP7	NOSVN	X	LOCATION[1:0]		X	X	MIXE- DREV	LOCALM OD
RESP8	SVNID[7:0]							
RESP9	SVNID[15:8]							
RESP10	SVNID[23:16]							
RESP11	SVNID[31:24]							

Name	Function
REVEXT[7:0]	Major revision number (first part of 1.2.3).

Name	Function
REVB[7:0]	Minor revision number (second part of 1.2.3).
REVINT[7:0]	Build revision number (third part of 1.2.3).
NOSVN	If set the build was created with no SVN info. This image cannot be tracked back to the SVN repo.
LOCATION[5:4]	The location from which the image was built (Trunk, Branch or Tag). 0x0 : The image was built from an SVN tag. Revision numbers are valid. 0x1 : The image was built from an SVN branch. Revision numbers will be 0. 0x2 : The image was built from the trunk. Revision number will be 0.
MIXEDREV	If set, the image was built with mixed revisions.
LOCALMOD	If set, the image has local modifications.
SVNID[31:0]	SVN ID from which the image was built.

### Command 0x13. SET\_PROPERTY

SET\_PROPERTY sets the value of a property. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x13							
ARG1	0x00							
ARG2	PROPID[7:0]							
ARG3	PROPID[15:8]							
ARG4	DATA0[7:0]							
ARG5	DATA0[15:8]							

Name	Function
PROPID[15:0]	The property ID of the property to set.
DATA0[15:0]	Value for the written property.

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## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

---

## Command 0x14. GET\_PROPERTY

---

GET\_PROPERTY retrieves the value of a property or properties. The host may read as many properties as desired up to the end of a given property group. An attempt to read passed the end of the property group will result in zeros being read. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x14							
ARG1	COUNT[7:0]							
ARG2	PROPID[7:0]							
ARG3	PROPID[15:8]							

Name	Function
COUNT[7:0]	The number of properties to read.
PROPID[15:0]	The id of the property to retrieve.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT



Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	DATA0[7:0]							
RESP5	DATA0[15:8]							

Name	Function
DATA0[15:0]	Value of the first property.

### Command 0x15. WRITE\_STORAGE

WRITE\_STORAGE writes data to the no board storage area at the specified offset. the largest block of data that can be written at one time is 256 bytes. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x15							
ARG1	0x00							
ARG2	OFFSET[7:0]							
ARG3	OFFSET[15:8]							
ARG4	LENGTH[7:0]							
ARG5	LENGTH[15:8]							
ARG6	0x00							
ARG7	0x00							
ARG8	DATA0[7:0]							

Name	Function
OFFSET[15:0]	The byte offset within the storage buffer at which the data will be written.

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Name	Function
LENGTH[15:0]	The number of bytes to write.
DATA0[7:0]	The first data byte to write.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

---

## Command 0x16. READ\_STORAGE

---

READ\_STORAGE reads data from the on board storage area from a specified offset. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x16							
ARG1	0x00							
ARG2	OFFSET[7:0]							
ARG3	OFFSET[15:8]							

Name	Function
OFFSET[15:0]	The byte offset within the storage buffer from which the data will be read.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	DATA0[7:0]							

Name	Function
DATA0[7:0]	The first byte of the read data.

**Command 0x80. GET\_DIGITAL\_SERVICE\_LIST**

GET\_DIGITAL\_SERVICE\_LIST gets a service list of the ensemble. This command should be issued each time an audio or data service list is updated as indicated by the SRVLISTINT bit of the DAB\_GET\_EVENT\_STATUS command. This occurs shortly after tune time when a digital radio tuning mode is selected and the ensemble has been acquired. Please refer to the (DAB Service List Information) section of this document for the format of DAB Service List. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x80							
ARG1	0	0	0	0	0	0	SERTYPE[1:0]	

Name	Function
SERTYPE[1:0]	Sets the type of service list to retrieve. 0 : Get the complete(DAB, DMB) service list. 1 : Get the data(HD) service list. 2 : Get the HD audio info. 3 : Get the HD data info.

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## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	SIZE[7:0]							
RESP5	SIZE[15:8]							
RESP6	DATA_0[7:0]							
RESP7	DATA_N[7:0]							

Name	Function
SIZE[15:0]	The size of the service list in bytes.
DATA_0[7:0]	A max of 2047 bytes of service information. Please see the supplemental Digital Services User's Guide.
DATA_N[7:0]	A max of 2047 bytes of service information. Please see the supplemental Digital Services User's Guide. N(max) = SIZE-2.

## Command 0x81. START\_DIGITAL\_SERVICE

START\_DIGITAL\_SERVICE starts an audio or data service. This command is used for DAB audio and data services. To determine what services exist in an ensemble please use the GET\_DIGITAL\_SERVICE\_LIST command. In the case of starting an audio service, it is not required to stop a currently running audio service/program before starting a new one. The currently running audio service will be stopped automatically when the new service is requested. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x81							
ARG1	0	0	0	0	0	0	0	SER- TYPE

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICE_ID[7:0]							
ARG5	SERVICE_ID[15:8]							
ARG6	SERVICE_ID[23:16]							
ARG7	SERVICE_ID[31:24]							
ARG8	COMP_ID[7:0]							
ARG9	COMP_ID[15:8]							
ARG10	COMP_ID[23:16]							
ARG11	COMP_ID[31:24]							

Name	Function
SERTYPE	Sets the type of service to start for DAB applications. For DAB/DMB applications there is no distinction between audio and data services so this parameter should be written as 0. 0 : Select an audio service. 1 : Select a data service.
SERVICE_ID[31:0]	The service's Service ID (DAB). This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command.
COMP_ID[31:0]	The service's component ID (DAB). This ID is found in the component section of the service list returned by the GET_DIGITAL_SERVICE_LIST command. Note: COMP_ID will only accept 0 as a value for A0A release.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

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## Command 0x82. STOP\_DIGITAL\_SERVICE

STOP\_DIGITAL\_SERVICE stops an audio or data service. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x82							
ARG1	0	0	0	0	0	0	0	SER- TYPE
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICE_ID[7:0]							
ARG5	SERVICE_ID[15:8]							
ARG6	SERVICE_ID[23:16]							
ARG7	SERVICE_ID[31:24]							
ARG8	COMP_ID[7:0]							
ARG9	COMP_ID[15:8]							
ARG10	COMP_ID[23:16]							
ARG11	COMP_ID[31:24]							

Name	Function
SERTYPE	Sets the type of service list to start. 0 : Select an audio service. 1 : Select a data service.
SERVICE_ID[31:0]	The service's service ID. This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command.
COMP_ID[31:0]	The service's Component ID or Port Number of the service to stop. This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command. Note: COMP_ID will only accept 0 as a value for A0A release.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

## Command 0x84. GET\_DIGITAL\_SERVICE\_DATA

GET\_DIGITAL\_SERVICE\_DATA gets a block of data associated with one of the enabled data components of a digital service. Information about this block of data is found in the data header that is returned at the beginning of the data block. In order to determine the ideal number of PAYLOAD bytes to read, the header information can be read first followed by a second read of the full (header + PAYLOAD) length - it is unnecessary to call GET\_DIGITAL\_SERVICE\_DATA twice to use this method. The data associated with this transaction will be discarded at the receipt of a next GET\_DIGITAL\_SERVICE\_DATA command if STATUS\_ONLY = 0. Reading past the end of the buffer will result in zeros for the invalid bytes. Please refer to the (DAB Service List Information) section of this document for the format of DAB Service List. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x84							
ARG1	0	0	0	STA- TUS_ON LY	0	0	0	ACK

Name	Function
STATUS_ONLY	Returns only the interrupt source and available buffers information. No digital service data is removed from the service queue. This option should be used when polling for available data.

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Name	Function
ACK	<p>Acknowledge the reading of a data buffer or acknowledge one of the error interrupts. Whenever the ACK bit is set the DSRVINT bit in the status register will be cleared before CTS is released unless there are more data blocks to be read. All interrupt source bits associated with this command will also be cleared.</p> <p>0 : Don't acknowledge the interrupt 1 : Acknowledging the interrupt will clear the DSRVINT bit and the interrupt source bits.</p>

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	X	X	X	DSR- VOV- FLINT	DSRVP- CKTINT
RESP5	BUFF_COUNT[7:0]							
RESP6	SRV_STATE[7:0]							
RESP7	DATA_SRC[1:0]		DSCTy[5:0]					
RESP8	SERVICE_ID[7:0]							
RESP9	SERVICE_ID[15:8]							
RESP10	SERVICE_ID[23:16]							
RESP11	SERVICE_ID[31:24]							
RESP12	COMP_ID[7:0]							
RESP13	COMP_ID[15:8]							
RESP14	COMP_ID[23:16]							
RESP15	COMP_ID[31:24]							
RESP16	UATYPE[7:0]							
RESP17	UATYPE[15:8]							
RESP18	BYTE_COUNT[7:0]							
RESP19	BYTE_COUNT[15:8]							



Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP20	SEG_NUM[7:0]							
RESP21	SEG_NUM[15:8]							
RESP22	NUM_SEGS[7:0]							
RESP23	NUM_SEGS[15:8]							
RESP24	PAYLOAD0[7:0]							
RESP25	PAYLOADN[7:0]							

Name	Function
DSRVOVFLINT	The data services system has overflowed. This indicates that the host processor is not reading the services data out of the device fast enough. At most 8 outstanding data blocks can be queued in the device.
DSRVPCKTINT	Data for an enabled data service is ready for transfer to the host.
BUFF_COUNT[7:0]	Indicates the remaining number of buffers in the data service buffer queue.
SRV_STATE[7:0]	The status indicator for the associated service component. 0 : Indicates that the service is playing out normally. 1 : Indicates that the data service has stopped and that this is the last data block associated with the service. 2 : Indicates that the system was not able to forward a packet due to a memory overflow. If this status is present the host is not reading the packet data fast enough. 3 : Indicates the this data packet represents the beginning of a new data object. 4 : Indicates the this data packet was received with errors.
DATA_SRC[7:6]	For DAB indicates the payload source. Not used in HD modes of operation. 0 : Indicates that the payload is from a standard data service and DATA_TYPE is DSCTy. 1 : Indicates that the payload is non-DLS PAD and DATA_TYPE is DSCTy. 2 : Indicates that the payload is DLS PAD and DATA_TYPE is 0. 3 : Reserved for future use.
DSCTy[5:0]	Used for DAB only. Returns 0 or the DSCTy depending on the DATA_SRC field. See DATA_SRC for details.
SERVICE_ID[31:0]	The Service ID this data is associated with.
COMP_ID[31:0]	The Component ID or Port Number this data is associated with.
UATYPE[15:0]	User application type. Set property DAB_XPAD_ENABLE to enable user application types.
BYTE_COUNT[15:0]	The length of this data block in bytes excluding the DSRV header.

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Name	Function
SEG_NUM[15:0]	The segment number for this data block. If the data is associated with a stream this value represents a sequence number. Note that segment numbers can be returned out of order. Therefore the host must store and reassemble the data as needed.
NUM_SEGS[15:0]	The total number of segments to be returned for this data object. If NUM_SEGS=0 then no object length information is known or the associated service is a stream.
PAYLOAD0[7:0]	The first payload byte.
PAYLOADN[7:0]	The Nth payload byte where N = BYTE_COUNT-1.

## Command 0xB0. DAB\_TUNE\_FREQ

DAB\_TUNE\_FREQ sets the DAB Receiver to tune to a frequency between 168.16 MHz and 239.20 MHz defined by the table through DAB\_SET\_FREQ\_LIST. The optional STC interrupt is set when the command completes the tune. Sending this command clears any pending STCINT bit in the STATUS. The default list that will be used by the tuner is the European frequency list. To change this list (example: for T-DMB), the user must first call DAB\_SET\_FREQ\_LIST before calling the DAB\_TUNE\_FREQ command. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB0							
ARG1	0	0	0	0	0	0	INJECTION[1:0]	
ARG2	FREQ_INDEX[7:0]							
ARG3	0x00							
ARG4	ANTCAP[7:0]							
ARG5	ANTCAP[15:8]							

Name	Function
INJECTION[1:0]	Injection selection 0 : Automatic injection selection. 1 : Low-side injection. 2 : High-side injection.
FREQ_INDEX[7:0]	Frequency index for the tuned frequency, see the DAB_SET_FREQ_LIST command that sets the frequency table.

Name	Function
ANTCAP[15:0]	Antenna tuning capacitor value in 250 fF units (31.75 pF Max) Range: 0-128 0 : Automatically determines the cap setting.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]	RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR	

### Command 0xB2. DAB\_DIGRAD\_STATUS

DAB\_DIGRAD\_STATUS returns status information about the digital radio and ensemble including a change in ensemble acquisition state, current estimates for ensemble's MSC (Main Service Channel) BER (bit error rate), FIC (Fast Information Channel) BER along with number of FIBs (Fast Information Block) that failed a CRC check and number of Reed-Solomon decoder errors (DAB+ and DMB only). The bits RSSILINT, RSSIHINT, ACQINT are sticky meaning they will remain set until DIGRAD\_ACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire assuming that bit is enabled in DAB\_DIGRAD\_INTERRUPT\_SOURCE. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB2							
ARG1	0	0	0	0	DIGRAD _ACK	ATTUNE	FIBER- R_ACK	STC_AC K

Name	Function
DIGRAD_ACK	Clears all pending digital radio interrupts.

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Name	Function
ATTUNE	Return the values as of DAB_VALID_RSSI_TIME after tune. Only the signal quality metric RSSI is affected by setting this bit. 0 : Return the current status 1 : Return the snapshot taken at DAB_VALID_RSSI_TIME
FIBERR_ACK	Clears the Fast Information Blocks error counter (FIB_ERROR_COUNT) when set. The FIB error counter will reset to 0 and continue counting.
STC_ACK	Clears the STC interrupt status when set.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	X	FICER- RINT	ACQINT	RSSI- HINT	RSSILIN T
RESP5	X	X	X	X	FICERR	ACQ	X	VALID
RESP6	RSSI[7:0]							
RESP7	SNR[7:0]							
RESP8	FIC_QUALITY[7:0]							
RESP9	CNR[7:0]							
RESP10	FIB_ERROR_COUNT[7:0]							
RESP11	FIB_ERROR_COUNT[15:8]							
RESP12	TUNE_FREQ[7:0]							
RESP13	TUNE_FREQ[15:8]							
RESP14	TUNE_FREQ[23:16]							
RESP15	TUNE_FREQ[31:24]							
RESP16	TUNE_INDEX[7:0]							
RESP17	FFT_OFFSET[7:0]							
RESP18	READANTCAP[7:0]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP19	READANTCAP[15:8]							
RESP20	CU_LEVEL[7:0]							
RESP21	CU_LEVEL[15:8]							
RESP22	FAST_DECT[7:0]							

Name	Function
FICERRINT	Indicates the FIC decoder has encountered unrecoverable errors. This is likely due to poor signal conditions.
ACQINT	Indicates a change in the ensemble acquisition state.
RSSIHINT	Indicates RSSI below DAB_DIGRAD_RSSI_LOW_THRESHOLD.
RSSILINT	Indicates RSSI above DAB_DIGRAD_RSSI_HIGH_THRESHOLD.
FICERR	When set to 1 the ensemble is experiencing FIC errors. Signal quality has been degraded and acquisition may be lost.
ACQ	When set to 1 the ensemble is acquired.
VALID	When set to 1, the RSSI is at or above the valid threshold. It is recommended that the valid bit be used as part of tune validation. Once STC is set the valid bit can be checked to verify that then tune has passed both the RSSI valid threshold and that acquisition has been achieved. The host should set the RSSI threshold, validation time and acquisition time to achieve solid tune time performance. Doing this helps insure an accurate tune indication and helps to decrease scan times due to quick station disqualification.
RSSI[7:0]	Received signal strength indicator. Range: -128-63
SNR[7:0]	Indicates the current estimate of the digital SNR in dB. Range: 0-20
FIC_QUALITY[7:0]	Indicates the current estimate of the ensembles FIC quality. The number is provided is between 0 and 100. Range: 0-100
CNR[7:0]	Indicates the current estimate of the CNR in dB. The CNR is the ratio of the OFDM signal level during the on period and during the off (null) period. Range: 0-54
FIB_ERROR_COUNT[15:0]	Indicates the num of Fast Information Blocks received with errors.
TUNE_FREQ[31:0]	indicates the currently tuned frequency in kHz.
TUNE_INDEX[7:0]	Indicates the currently tuned frequency index. Range: 0-47

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Name	Function
FFT_OFFSET[7:0]	Indicates the frequency offset of the DQPSK tones of the OFDM signal relative to the center of the FFT bins of the digital demod.
READANTCAP[15:0]	Returns the antenna tuning cap value.
CU_LEVEL[15:0]	Returns the CU usage indicator (number of currently decoded CU's ) Range: 0-470
FAST_DECT[7:0]	Returns the statistical metric for DAB fast detect. The metric is a confidence level that dab signal is detected. The threshold for dab detected is greater than 4.

## Command 0xB3. DAB\_GET\_EVENT\_STATUS

DAB\_GET\_EVENT\_STATUS gets information about the various events related to the DAB radio. These events include signaling the reception of new PAD (Programme-Associated Data) data, service lists and announcements. The bits SVRLISTINT, ANNOINT, RECFGWRNINT, and RECFGINT are sticky meaning they will remain set until EVENT\_ACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire assuming that bit is enabled in DAB\_EVENT\_INTERRUPT\_SOURCE. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB3							
ARG1	0	0	0	0	0	0	0	EVENT_ACK

Name	Function
EVENT_ACK	Clears all pending digital radio event interrupts.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	RECF-GINT	RECFG-WRNINT	X	ANNOINT	OESERVINT	SERVLINKINT	FREQINFOINT	SVRLISTINT
RESP5	X	X	X	ANNO	OESERV	SERVLINK	FREQ_INFO	SVRLIST
RESP6	SVRLISTVER[7:0]							
RESP7	SVRLISTVER[15:8]							

Name	Function
RECFGINT	Ensemble reconfiguration event. Indicates that an ensemble reconfiguration has occurred. All changes to the service list that occurred after the RECFGWRNINT event will now take effect. If a service that was in operation no longer exists it will be stopped. All other services that did not change should remain active across the reconfiguration boundary. At this time the host should communicate any relevant changes to the user.
RECFGWRNINT	Ensemble reconfiguration warning. Indicates that an ensemble reconfiguration will occur in 6 seconds. From this point on all service list updates will apply to the new ensemble configuration. These changes will not take effect until the RECFGINT is received. At this time the host act upon all changes in the service list.
ANNOINT	Announcement information interrupt. Indicates that an announcement event (started or stopped) is available. The event is retrieved with the DAB_GET_ANNOUNCEMENT_INFO command.
OESERVINT	Other Ensemble (OE) Services interrupt. Indicates that new OE service information is available or has changed. The other ensemble information is retrieved with the DAB_GET_OE_SERVICES_INFO command.
SERVLINKINT	Service linking information interrupt. Indicates that new service linking information is available or has changed. The service linking information list is retrieved with the DAB_GET_SERVICE_LINKING_INFO command.
FREQINFOINT	New Frequency Information interrupt. Indicates that new Frequency Information is available. The Frequency Information list is retrieved with the DAB_GET_FREQ_INFO command. The rate at which frequency information interrupts can occur is defined by the DAB_EVENT_MIN_FREQINFO_PERIOD property.
SVRLISTINT	New service list interrupt. Indicates that a new digital service list is available. The new service list is retrieved with the GET_DIGITAL_SERVICE_LIST command.
ANNO	Announcement available. 0 : No announcement is active. 1 : One or more announcements are active.

Name	Function
OESERV	Indicates that OE service information is available (FIG0/24). The OE service information is retrieved with the DAB_GET_OE_SERVICES_INFO command.
SERVLINK	Service linking information (FIG 0/6) available. Indicates that service linking information is available. The service linking information list is retrieved with the DAB_GET_SERVICE_LINKING_INFO command.
FREQ_INFO	Frequency Information (FI) (FIG0/21) available. Indicates that Frequency Information (FI) is available. The FI list is retrieved with the DAB_GET_FREQ_INFO command.
SVRLIST	Service list available. Indicates that a digital service list is available. The service list is retrieved with the GET_DIGITAL_SERVICE_LIST command. If a service list is not available or it is in transition, this bit will be low. When the service list is in transition, this bit will remain low until the service list debounce timer has expired. See the DAB_EVENT_MIN_SVRLIST_PERIOD property for more details.
SVRLISTVER[15:0]	Indicates the current version of the digital service list. This field is incremented by 1 each time the service list is updated. The host can use this field to help determine if a new service list needs to be collected.

## Command 0xB4. DAB\_GET\_ENSEMBLE\_INFO

DAB\_GET\_ENSEMBLE\_INFO gets information about the current ensemble such as the ensemble ID and label. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB4							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR



Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP4	EID[7:0]							
RESP5	EID[15:8]							
RESP6	LABEL0[7:0]							
RESP7	LABEL1[7:0]							
RESP8	LABEL2[7:0]							
RESP9	LABEL3[7:0]							
RESP10	LABEL4[7:0]							
RESP11	LABEL5[7:0]							
RESP12	LABEL6[7:0]							
RESP13	LABEL7[7:0]							
RESP14	LABEL8[7:0]							
RESP15	LABEL9[7:0]							
RESP16	LABEL10[7:0]							
RESP17	LABEL11[7:0]							
RESP18	LABEL12[7:0]							
RESP19	LABEL13[7:0]							
RESP20	LABEL14[7:0]							
RESP21	LABEL15[7:0]							
RESP22	ENSEMBLE_ECC[7:0]							
RESP23	CHARSET[7:0]							
RESP24	CHAR_ABREV[7:0]							
RESP25	CHAR_ABREV[15:8]							

Name	Function
EID[15:0]	The ensemble ID EID. See section 6.4 of ETSI EN 300401.
LABEL0[7:0]	First of 16 characters for the ensemble label.
LABEL1[7:0]	The second of 16 characters of the component label.
LABEL2[7:0]	The third of 16 characters of the component label.
LABEL3[7:0]	The fourth of 16 characters of the component label.
LABEL4[7:0]	The fifth of 16 characters of the component label.

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Name	Function
LABEL5[7:0]	The sixth of 16 characters of the component label.
LABEL6[7:0]	The seventh of 16 characters of the component label.
LABEL7[7:0]	The eighth of 16 characters of the component label.
LABEL8[7:0]	The ninth of 16 characters of the component label.
LABEL9[7:0]	The tenth of 16 characters of the component label.
LABEL10[7:0]	The eleventh of 16 characters of the component label.
LABEL11[7:0]	The twelfth of 16 characters of the component label.
LABEL12[7:0]	The thirteenth of 16 characters of the component label.
LABEL13[7:0]	The fourteenth of 16 characters of the component label.
LABEL14[7:0]	The fifteenth of 16 characters of the component label.
LABEL15[7:0]	The sixteenth of 16 characters of the component label.
ENSEMBLE_ECC[7:0]	The ensemble Extended Country Code (ECC).
CHARSET[7:0]	Charset of the ensemble label.
CHAR_ABREV[15:0]	The component label abbreviation mask. Used to indicate which characters in the label are used to create the abbreviated label.

## Command 0xB5. DAB\_GET\_ANNOUNCEMENT\_SUPPORT\_INFO

DAB\_GET\_ANNOUNCEMENT\_SUPPORT\_INFO gets the announcement support information encoded in FIG 0/18 (Announcement Support), FIG 0/25 (OE Announcement Support) and FIG 0/27 (FM Announcement Support). The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB5							
ARG1	0	0	0	0	0	0	SRC[1:0]	
ARG2	0x00							
ARG3	0x00							
ARG4	SID[7:0]							
ARG5	SID[15:8]							
ARG6	SID[23:16]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG7	SID[31:24]							

Name	Function
SRC[1:0]	Announcement source 0 : Current ensemble. Gets announcement support information encoded in FIG 0/18 (Announcement Support). 1 : Other ensemble. Gets other ensemble announcement support information encoded in FIG 0/25 (OE Announcement Support). 2 : FM. Gets FM announcement support information encoded in FIG 0/27 (FM Announcement Support).
SID[31:0]	The service ID of which the announcement support information will be returned.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	NUM_IDS[7:0]							
RESP5	RESERVED[7:0]							
RESP6	ASU[7:0]							
RESP7	ASU[15:8]							
RESP8	ID0[7:0]							
RESP9	ID0[15:8]							
RESP10	IDn[7:0]							
RESP11	IDn[15:8]							

Name	Function
NUM_IDS[7:0]	Number of IDs in the ID list.

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Name	Function
RESERVED[7:0]	RESERVED.
ASU[15:0]	ASu (Announcement support) flag. This 16-bit field specifies the types of announcements by which the service may be interrupted. The interpretation of this field is defined in TS 101 756, table 14. Host can set property DAB_ANNOUNCEMENT_ENABLE to select interested announcement types.
ID0[15:0]	The first ID in the ID list. When SRC is current ensemble, this is the cluster id. When SRC is other ensemble, this is other ensemble EID. When SRC is FM, this is the FM PI.
IDn[15:0]	The last ID in the ID list. When SRC is current ensemble, this is the cluster id. When SRC is other ensemble, this is other ensemble EID. When SRC is FM, this is the FM PI.

## Command 0xB6. DAB\_GET\_ANNOUNCEMENT\_INFO

DAB\_GET\_ANNOUNCEMENT\_INFO gets announcement information from the announcement queue. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB6							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	X	X	X	X	ANNO_Q _OVFL
RESP5	X	X	X	ANNO_Q_SIZE[4:0]				
RESP6	CLUSTER_ID[7:0]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP7	X	X	X	X	ANNO_S TAT	REGION _FLAG	SRC[1:0]	
RESP8	ASW[7:0]							
RESP9	ASW[15:8]							
RESP10	ID1[7:0]							
RESP11	ID1[15:8]							
RESP12	ID2[7:0]							
RESP13	ID2[15:8]							
RESP14	REGIONID1[7:0]							
RESP15	REGIONID2[7:0]							

Name	Function
ANNO_Q_OVFL	announcement queue overflow flag 0 : queue has not overflowed. 1 : queue has overflowed. Some announcement event has been discarded and cannot be recovered.
ANNO_Q_SIZE[4:0]	Indicates number of events that have been queued up in the announcement queue. The announcement queue can hold up to 10 announcement events.
CLUSTER_ID[7:0]	Cluster ID of the announcement. This field identify the announcement cluster for which the announcement is intended. Please refer to clause 8.1.6.2, 8.1.10.5.2 and 8.1.11.2.2 of ETSI EN 300 401 V1.4.1
ANNO_STAT	announcement status 0 : Indicates that an announcement has stopped. 1 : Indicates that an announcement has started.
REGION_FLAG	region flag 0 : region id is not available 1 : region id is available
SRC[1:0]	announcement source 0 : Current ensemble 1 : Other ensemble 2 : FM 3 : RESERVED
ASW[15:0]	This field specifies the announcement types which apply to the announcement. The individual bits indicate whether or not a particular announcement type is signalled. 0 indicates that announcement type is invalid. 1 indicates that announcement type is valid. The interpretation of the flags shall be as defined in TS 101 756, table 14.

Name	Function
ID1[15:0]	Announcement ID1 indicates the ID information where the host can retrieve the announcement. If announcement source (SRC) is current ensemble, this field is the service ID. Note that it is the lower 16 bits of the service ID and it is assumed that the upper 16 bits are 0. Use the component ID in ID2 field to locate the announcement service in current ensemble. If announcement source (SRC) is other ensemble, this field is other ensemble EID. If announcement source (SRC) is FM, this field is FM PI.
ID2[15:0]	Announcement ID2 indicates the ID information where the host can retrieve the announcement. If announcement source (SRC) is current ensemble, this field is component ID. Use the service ID in ID1 field to locate the announcement service in current ensemble. If announcement source is other ensemble, this field is other ensemble cluster ID. If announcement source is FM, this field is 0.
REGIONID1[7:0]	If REGION_FLAG is set, this field shall identify the region in the current ensemble to which the announcement is targeted. It uses the lower part of the Region Identifier. The upper part of the Region Identifier shall be set to 0. See clause 8.1.16 of ETSI EN 300 401 V1.4.1.
REGIONID2[7:0]	If REGION_FLAG is set, this field shall identify the region in the other ensemble to which the announcement is targeted. It uses the lower part of the Region Identifier. The upper part of the Region Identifier shall be set to 0. See clause 8.1.16 of ETSI EN 300 401 V1.4.1. This field is only valid if announcement source (SRC) is other ensemble. Set to 0 when SRC is current ensemble or FM.

## Command 0xB7. DAB\_GET\_SERVICE\_LINKING\_INFO

DAB\_GET\_SERVICE\_LINKING\_INFO provides the FIG 0/6 service linking information for the passed in service ID. It provides service IDs for alternate services or supplemental services relating to the passed in service ID. These services may be found in the current ensemble, another ensemble, or an FM broadcast. Please see clause 8.1.15 of ETSI 300-401 and ETSI TS 103-176 for full details regarding service linking and this commands response. This command is intended to be used in conjunction with the DAB\_GET\_OE\_SERVICES\_INFO and DAB\_GET\_FREQ\_INFO commands to paint a complete service linking picture. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB7							
ARG1	ACTIVE	0	LINKTYPE[1:0]		SELRS-VD2	SELRS-VD1	HARD	ILS
ARG2	ACTIVEEN	0	0	LINK-TYPEEN	ENRES-VD2	ENRES-VD1	HARDEN	ILSEN

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG3	0x00							
ARG4	SERVICEID[7:0]							
ARG5	SERVICEID[15:8]							
ARG6	SERVICEID[23:16]							
ARG7	SERVICEID[31:24]							

Name	Function
ACTIVE	<p>Selects between active and inactive links when the ACTIVEEN bit of the ENABLE parameter is set. This field will be ignored when the ACTIVEEN bit is cleared. In this case both active and inactive link sets will be returned.</p> <p>0 : Only show inactive links when ACTIVEEN is set. 1 : Only show active links when ACTIVEEN is set.</p>
LINKTYPE[5:4]	<p>Selects which link type will be returned when the LINKTYPEEN bit of the ENABLE parameter is set. This field will be ignored when the LINKTYPEEN bit is cleared. In this case all link types will returned.</p> <p>0 : Select only DAB/DMB service links. 1 : Select only RDS PI-code links. 2 : Select only AM and FM service links (currently not used per ETSI TS 103-176). 3 : Select only DRM and AMSS service links.</p>
SELRSD2	RFU
SELRSD1	RFU
HARD	<p>Selects between hard and soft links when the HARDEN bit of the ENABLE parameter is set. This field is ignored when the HARDEN bit is cleared. In this case both hard and soft links will be returned.</p> <p>0 : Only show soft links when HARDEN is set. 1 : Only show hard links when HARDEN is set.</p>
ILS	<p>Selects international links when set. This field is ignored when the ILSSEN bit of the ENABLE parameter is cleared. In this case both national and international links will be returned.</p> <p>0 : Only national links are returned when ILSSEN is set. 1 : Only international links are returned when ILSSEN is set.</p>
ACTIVEEN	<p>When set the ACTIVE bit will be honored and all links returned will be either active or inactive depending on the state of the ACTIVE bit.</p> <p>0 : Ignore the ACTIVE bit and show all activated and deactivated links. 1 : Show links as selected by the ACTIVE bit.</p>
LINKTYPEEN	<p>When set the LINKTYPE field will be honored and all links returned will be of the type specified by LINKTYPE.</p> <p>0 : Ignore the LINKTYPE bit and show link types. 1 : Show links as selected by the LINKTYPE bit.</p>

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Name	Function
ENRESVD2	RFU
ENRESVD1	RFU
HARDEN	When set the HARD bit will be honored and all links returned will be either hard or soft depending on the state of the HARD bit. 0 : Ignore the HARD bit and show all hard and soft links. 1 : Show links as selected by the HARD bit.
ILSEN	When set the ILS bit will be honored and all links returned will be either notional or or international depending on the state of the ILS bit. 0 : Ignore the ILS bit and show all national and international links. 1 : Show links as selected by the ILS bit.
SERVICEID[31:0]	The service ID in the current ensemble for which the service linking information will be returned. This service ID is provided in the digital service list.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	SIZE[7:0]							
RESP5	SIZE[15:8]							
RESP6	NUM_LINKSETS[7:0]							
RESP7	X							
RESP8	LSN_0[7:0]							
RESP9	LSN_0[15:8]							
RESP10	ACTIVE	SHD	LINK_TYPE[1:0]		RSVD2	RSVD1	HARD	ILS
RESP11	NUM_LINKS_0[7:0]							
RESP12	LINKID_0_0[7:0]							
RESP13	LINKID_0_0[15:8]							
RESP14	LINKID_0_0[23:16]							
RESP15	LINKID_0_0[31:24]							



Name	Function
SIZE[15:0]	The total number of bytes returned in the service linking information payload.
NUM_LINKSETS[7:0]	The total number of Linkage Set segments returned in the payload. Note: If a linkage set contains several link types multiple (up to 4) linkage set segments will be returned for each Linkage Set. The remaining reply fields will be repeated NUM_LINKSETS times for each linkage set segment returned.
LSN_0[15:0]	The Linkage Set Number (LSN) for linkage set segment 0.
ACTIVE	Indicates whether or not this linkage set segment is activated or deactivated. 0 : The links in this linkage set segment are not activated. 1 : The links in this linkage set segment are activated.
SHD	Indicates whether or not this linkage set has the SHD (shorthand) flag set. When set service IDs in the linkage set having bits b11 to b8 in the range of 0x04 to 0x0F represents a list of up to 12 services sharing the same country ID and same 8 least significant bits. 0 : The service IDs in this linkage set represent a single service. 1 : The service IDs in this linkage set represent up to 12 services.
LINK_TYPE[5:4]	Indicates the link type for all links in linkage set segment 0. Note: If a linkage set contains multiple link types and the LINKTYPEEN bit of the ENABLE parameter is cleared multiple linkage set segments may be returned (up to 4) for a given linkage set. If LINKTYPEEN is set only one linkage set segment is returned for each LSN which corresponds to the link type selected in the LINKTYPE field of the SELECT parameter. 0 : Link IDs are a DAB/DMB service IDs. 1 : Link IDs are a RDS PI-codes. 2 : Link IDs are a AM or FM services (currently not used). 3 : Link IDs are a DRM or AMSS services.
RSVD2	Reserved OE currently always 0.
RSVD1	Reserved P/D
HARD	Indicates if the links in linkage set segment 0 are soft or hard links. 0 : Links in this linkage set segment are soft links. This type of link carries service information that are related to SERVICEID. 1 : Links in this linkage set segment are hard links. This type of link carries the same primary service as SERVICEID.
ILS	Indicates if the links in linkage set segment 0 are national or international. 0 : Link is a national link. 1 : Link is an international link.
NUM_LINKS_0[7:0]	The number of links returned in linkage set segment 0.
LINKID_0_0[31:0]	The first link ID of linkage set segment 0. This field gets repeated NUM_LINKS_0 times for each link in the linkage set segment.

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## Command 0xB8. DAB\_SET\_FREQ\_LIST

DAB\_SET\_FREQ\_LIST command sets the DAB frequency table. The frequencies are in units of 1 kHz. The table can be populated with a single entry or a regional list (for example 5 or 6 entries). It is recommended to make the list regional to increase scanning speed. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB8							
ARG1	NUM_FREQS[7:0]							
ARG2	0x00							
ARG3	0x00							
ARG4	FREQ_0[7:0]							
ARG5	FREQ_0[15:8]							
ARG6	FREQ_0[23:16]							
ARG7	FREQ_0[31:24]							
ARG8	FREQ_1[7:0]							
ARG9	FREQ_1[15:8]							
ARG10	FREQ_1[23:16]							
ARG11	FREQ_1[31:24]							
ARG12	FREQ_N[7:0]							
ARG13	FREQ_N[15:8]							
ARG14	FREQ_N[23:16]							
ARG15	FREQ_N[31:24]							

Name	Function
NUM_FREQS[7:0]	The number of frequencies in the table. Range: 1-48
FREQ_0[31:0]	The first frequency in the table of NUM_FREQS entries.
FREQ_1[31:0]	The second frequency in the table.
FREQ_N[31:0]	The last frequency in the table (N=NUM_FREQS-1).

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

**Command 0xB9. DAB\_GET\_FREQ\_LIST**

DAB\_GET\_FREQ\_LIST gets the DAB frequency table. All frequencies are in units of 1 kHz. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xB9							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	NUM_FREQS[7:0]							
RESP5	X							
RESP6	X							
RESP7	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP8	FREQ_0[7:0]							
RESP9	FREQ_0[15:8]							
RESP10	FREQ_0[23:16]							
RESP11	FREQ_0[31:24]							

Name	Function
NUM_FREQS[7:0]	The number of frequencies in the table.
FREQ_0[31:0]	The first frequency in the table.

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## Command 0xBB. DAB\_GET\_COMPONENT\_INFO

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DAB\_GET\_COMPONENT\_INFO gets information about components within the ensemble if available. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xBB							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICEID[7:0]							
ARG5	SERVICEID[15:8]							
ARG6	SERVICEID[23:16]							
ARG7	SERVICEID[31:24]							
ARG8	COMPID[7:0]							
ARG9	COMPID[15:8]							
ARG10	COMPID[23:16]							
ARG11	COMPID[31:24]							

Name	Function
SERVICEID[31:0]	The service ID
COMPID[31:0]	The component ID.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	GLOBAL_ID[7:0]							
RESP5	X							
RESP6	X	X	LANG[5:0]					
RESP7	X	X	CHARSETID[5:0]					
RESP8	LABEL0[7:0]							
RESP9	LABEL1[7:0]							
RESP10	LABEL2[7:0]							
RESP11	LABEL3[7:0]							
RESP12	LABEL4[7:0]							
RESP13	LABEL5[7:0]							
RESP14	LABEL6[7:0]							
RESP15	LABEL7[7:0]							
RESP16	LABEL8[7:0]							
RESP17	LABEL9[7:0]							
RESP18	LABEL10[7:0]							
RESP19	LABEL11[7:0]							
RESP20	LABEL12[7:0]							
RESP21	LABEL13[7:0]							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP22	LABEL14[7:0]							
RESP23	LABEL15[7:0]							
RESP24	CHAR_ABREV[7:0]							
RESP25	CHAR_ABREV[15:8]							
RESP26	NUMUA[7:0]							
RESP27	LENUA[7:0]							
RESP28	UATYPE[7:0]							
RESP29	UATYPE[15:8]							
RESP30	UADATALEN[7:0]							
RESP31	UADATA0[7:0]							
RESP32	UADATAN[7:0]							

Name	Function
GLOBAL_ID[7:0]	The global reference for the component. See clause 6.3.5 of 300-401. This field gets concatenated with the Service ID of the service list to form the unique global component ID.
LANG[5:0]	The language of the component. See tables 9 and 10 of ETSI TS 101-756.
CHARSETID[5:0]	The character set for the component label. See tables 1 of ETSI TS 101-756.
LABEL0[7:0]	The first of 16 characters of the component label.
LABEL1[7:0]	The second of 16 characters of the component label.
LABEL2[7:0]	The third of 16 characters of the component label.
LABEL3[7:0]	The fourth of 16 characters of the component label.
LABEL4[7:0]	The fifth of 16 characters of the component label.
LABEL5[7:0]	The sixth of 16 characters of the component label.
LABEL6[7:0]	The seventh of 16 characters of the component label.
LABEL7[7:0]	The eighth of 16 characters of the component label.
LABEL8[7:0]	The ninth of 16 characters of the component label.
LABEL9[7:0]	The tenth of 16 characters of the component label.
LABEL10[7:0]	The eleventh of 16 characters of the component label.
LABEL11[7:0]	The twelfth of 16 characters of the component label.
LABEL12[7:0]	The thirteenth of 16 characters of the component label.

Name	Function
LABEL13[7:0]	The fourteenth of 16 characters of the component label.
LABEL14[7:0]	The fifteenth of 16 characters of the component label.
LABEL15[7:0]	The sixteenth of 16 characters of the component label.
CHAR_ABREV[15:0]	The component label abbreviation mask. Used to indicate which characters in the label are use to create the abbreviated label.
NUMUA[7:0]	The number of user application types.
LENUEA[7:0]	The total length (in byte) of the UATYPE, UADALEN and UADATA fields, including the padding bytes which is described in UADATAN field.
UATYPE[15:0]	The user application type. If multiple UA Types exist, all UATYPE fields will be aligned on a 16-bit (2 byte) boundary.
UADALEN[7:0]	The UADATA field length, excluding the padding byte which is described in UADATAN field.
UADATA0[7:0]	This is the first byte of the UADATA field. This UADATA field contains both "X-PAD data" and "User Application Data" field as shown in ETSI EN 300 401 V1.4.1 clause 8.1.20, Figure 68.
UADATAN[7:0]	This is the last byte of the UADATA field. If the user application data field length (UADALEN) is odd, this byte will be a valid UADATA byte. If the user application data field length (UADALEN) is even, this byte will be a padding byte. The content of the padding byte is 0x00. By adding a padding byte, each UATYPE field will be aligned on a 16-bit (2 byte) boundary. The padding byte will not be counted in the UADALEN field, but will be counted in the LENUEA field.

### Command 0xBC. DAB\_GET\_TIME

DAB\_GET\_TIME gets the ensemble time adjusted for the local time offset. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xBC							
ARG1	TIME_TYPE[7:0]							

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Name	Function
TIME_TYPE[7:0]	"Indicate the type of the time" 0 : local time 1 : UTC

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	YEAR[7:0]							
RESP5	YEAR[15:8]							
RESP6	MONTHS[7:0]							
RESP7	DAYS[7:0]							
RESP8	HOURS[7:0]							
RESP9	MINUTES[7:0]							
RESP10	SECONDS[7:0]							

Name	Function
YEAR[15:0]	The year as reported by the ensemble.
MONTHS[7:0]	The month as reported by the ensemble.
DAYS[7:0]	The current day reported by the ensemble.
HOURS[7:0]	The current hour reported by the ensemble.
MINUTES[7:0]	The current minute reported by the ensemble.
SECONDS[7:0]	The current second reported by the ensemble.



**Command 0xBD. DAB\_GET\_AUDIO\_INFO**

DAB\_GET\_AUDIO\_INFO gets information about the current audio service (decoder bps, audio mode). The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xBD							
ARG1	0	0	0	0	0	0	0	0

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	AUDIO_BIT_RATE[7:0]							
RESP5	AUDIO_BIT_RATE[15:8]							
RESP6	AUDIO_SAMPLE_RATE[7:0]							
RESP7	AUDIO_SAMPLE_RATE[15:8]							
RESP8	X	X	X	X	AUDIO_ PS_ FLAG	AUDIO_ SBR_ FLAG	AUDIO_MODE[1:0]	
RESP9	AUDIO_DRC_GAIN[7:0]							
RESP10	X							
RESP11	X							
RESP12	X							
RESP13	X							
RESP14	X							
RESP15	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP16	X							
RESP17	X							
RESP18	X							
RESP19	X							

Name	Function
AUDIO_BIT_RATE[15:0]	Audio bit rate of the current audio service (kbps).
AUDIO_SAMPLE_RATE[15:0]	Sample rate of the current audio service (Hz).
AUDIO_PS_FLAG	Audio PS flag. only applicable to DAB+. Set to 0 for DAB 0 : SBR is not used 1 : SBR is used
AUDIO_SBR_FLAG	Audio SBR flag. only applicable to DAB+. Set to 0 for DAB 0 : SBR is not used 1 : SBR is used
AUDIO_MODE[1:0]	Audio mode 0 : dual 1 : mono 2 : stereo 3 : joint stereo
AUDIO_DRC_GAIN[7:0]	The dynamic range control (DRC) gain that is applied to the current audio service. The range of this field is from 0 to 63, representing 0 to 15.75dB in increment of 0.25dB.

## Command 0xBE. DAB\_GET\_SUBCHAN\_INFO

DAB\_GET\_SUBCHAN\_INFO gets information about the sub-channel (service mode, protection, subchannel bps). The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xBE							
ARG1	0x00							
ARG2	0x00							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG3	0x00							
ARG4	SERVICEID[7:0]							
ARG5	SERVICEID[15:8]							
ARG6	SERVICEID[23:16]							
ARG7	SERVICEID[31:24]							
ARG8	COMPID[7:0]							
ARG9	COMPID[15:8]							
ARG10	COMPID[23:16]							
ARG11	COMPID[31:24]							

Name	Function
SERVICEID[31:0]	The service ID
COMPID[31:0]	The component ID.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	SERVICE_MODE[7:0]							
RESP5	PROTECTION_INFO[7:0]							
RESP6	SUBCHAN_BIT_RATE[7:0]							
RESP7	SUBCHAN_BIT_RATE[15:8]							
RESP8	NUM_CU[7:0]							
RESP9	NUM_CU[15:8]							
RESP10	CU_ADDRESS[7:0]							
RESP11	CU_ADDRESS[15:8]							

Name	Function
SERVICE_MODE[7:0]	<p>Indicates the service mode of the sub-channel.</p> <p>0 : AUDIO STREAM SERVICE  1 : DATA STREAM SERVICE  2 : FIDC SERVICE  3 : MSC DATA PACKET SERVICE  4 : DAB+  5 : DAB  6 : FIC SERVICE  7 : XPAD DATA  8 : NO MEDIA</p>
PROTECTION_INFO[7:0]	<p>Indicates the protection profile of the sub-channel. Two error protection profiles can be employed: Unequal Error Protection (UEP) and Equal Error Protection (EEP). For each profile, the protection level indicates the associated convolutional coding rate. Please refer to ETSI EN 300 401 V1.4.1 clause 6.2.1.</p> <p>1 : Protection mode is UEP. Protection level is 1  2 : Protection mode is UEP. Protection level is 2  3 : Protection mode is UEP. Protection level is 3  4 : Protection mode is UEP. Protection level is 4  5 : Protection mode is UEP. Protection level is 5  6 : Protection mode is EEP. Protection level is A-1  7 : Protection mode is EEP. Protection level is A-2  8 : Protection mode is EEP. Protection level is A-3  9 : Protection mode is EEP. Protection level is A-4  10 : Protection mode is EEP. Protection level is B-1  11 : Protection mode is EEP. Protection level is B-2  12 : Protection mode is EEP. Protection level is B-3  13 : Protection mode is EEP. Protection level is B-4</p>
SUB-CHAN_BIT_RATE[15:0]	Sub-channel bit rate (kpbs).
NUM_CU[15:0]	The number of Capacity units assigned to this service component.
CU_ADDRESS[15:0]	The CU starting address of this subchannel within the CIF.

**Command 0xBF. DAB\_GET\_FREQ\_INFO**

DAB\_GET\_FREQ\_INFO gets radio Frequency Information (FI) about the ensemble. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xBF							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	LENGTH_FI_LIST[7:0]							
RESP5	LENGTH_FI_LIST[15:8]							
RESP6	LENGTH_FI_LIST[23:16]							
RESP7	LENGTH_FI_LIST[31:24]							
RESP8	FI_ID_0[7:0]							
RESP9	FI_ID_0[15:8]							
RESP10	FI_ID_0[23:16]							
RESP11	FI_ID_0[31:24]							
RESP12	FI_FREQ_0[7:0]							
RESP13	FI_FREQ_0[15:8]							
RESP14	FI_FREQ_0[23:16]							
RESP15	FI_FREQ_0[31:24]							
RESP16	FI_FREQ_INDEX_0[7:0]							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP17	FI_RNM_0[7:0]							
RESP18	FI_CONTINUITY_0[7:0]							
RESP19	FI_CONTROL_0[7:0]							

Name	Function
LENGTH_FI_LIST[31:0]	The length of frequency information (FI) list.
FI_ID_0[31:0]	This is the first ID in the frequency information list. The FI_ID_0 field depends on the FI_RNM_0 field. Please see clause 8.1.8 of ETSI 300-401 for further details. This field is repeated for each frequency information.
FI_FREQ_0[31:0]	This is the first frequency (unit: Hz) in the frequency information list. This field is repeated for each frequency information.
FI_FREQ_INDEX_0[7:0]	This is the index of FI_FREQ_0 in the current frequency table defined through DAB_SET_FREQ_LIST. The index starts from 0, and 0xFF represents non-existent frequency. This field is repeated for each frequency information.
FI_RNM_0[7:0]	This is the first Range and Modulation (RNM) field in the frequency information list. Please see clause 8.1.8 of ETSI 300-401 for further details. This field is repeated for each frequency information.
FI_CONTINUITY_0[7:0]	This is the first Continuity flag field in the frequency information list. This flag depends on the RNM field. Please see clause 8.1.8 of ETSI 300-401 for further details. This field is repeated for each frequency information.
FI_CONTROL_0[7:0]	This is the first Control field in the frequency information list. This field only applies when RNM = 0x00 or 0x01 (DAB ensemble). Set to 0 for other cases. Please see clause 8.1.8 of ETSI 300-401 for further details. This field is repeated for each frequency information.

## Command 0xC0. DAB\_GET\_SERVICE\_INFO

DAB\_GET\_SERVICE\_INFO gets information about a service. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xC0							
ARG1	0x00							
ARG2	0x00							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG3	0x00							
ARG4	SERVICEID[7:0]							
ARG5	SERVICEID[15:8]							
ARG6	SERVICEID[23:16]							
ARG7	SERVICEID[31:24]							

Name	Function
SERVICEID[31:0]	The Service ID

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	SRV_LIN KING_IN FO	PTY[4:0]					PD_- FLAG
RESP5	LOCAL	CAID[2:0]			NUM_COMP[3:0]			
RESP6	X	X	X	X	SICHARSET[3:0]			
RESP7	SRV_ECC[7:0]							
RESP8	LABEL0[7:0]							
RESP9	LABEL1[7:0]							
RESP10	LABEL2[7:0]							
RESP11	LABEL3[7:0]							
RESP12	LABEL4[7:0]							
RESP13	LABEL5[7:0]							
RESP14	LABEL6[7:0]							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP15	LABEL7[7:0]							
RESP16	LABEL8[7:0]							
RESP17	LABEL9[7:0]							
RESP18	LABEL10[7:0]							
RESP19	LABEL11[7:0]							
RESP20	LABEL12[7:0]							
RESP21	LABEL13[7:0]							
RESP22	LABEL14[7:0]							
RESP23	LABEL15[7:0]							
RESP24	CHAR_ABREV[7:0]							
RESP25	CHAR_ABREV[15:8]							

Name	Function
SRV_LINKING_INFO	This bit is set to 1 if service linking info is available for this service.
PTY[5:1]	Indicates the service program type.
PD_FLAG	This bit is set to 0 for a program (audio) service and 1 for a data service. See clause 5.2.2.1 of ETSI 300-401.
LOCAL	Indicates if the service is available over the entire (0) or part (1) of the ensemble service area. See clause 6.3.1 of ETSI 300-401.
CAID[6:4]	Identifies the access control used. See clause 6.3.1 of ETSI 300-401.
NUM_COMP[3:0]	Indicates number of components in this service.
SICHARSET[3:0]	Indicates char set. See ETSI TS 101 756, clause 5.3.
SRV_ECC[7:0]	Indicates service Extended Country Code (ECC). For a program (audio) service, if the service has a different ECC from the ensemble, this field reports the alternative service ECC. Otherwise this field is 0. For a data service, this field is the service ECC.
LABEL0[7:0]	The first of 16 characters for the service label.
LABEL1[7:0]	The second of 16 characters of the service label.
LABEL2[7:0]	The third of 16 characters of the service label.
LABEL3[7:0]	The fourth of 16 characters of the service label.
LABEL4[7:0]	The fifth of 16 characters of the service label.
LABEL5[7:0]	The sixth of 16 characters of the service label.



Name	Function
LABEL6[7:0]	The seventh of 16 characters of the service label.
LABEL7[7:0]	The eighth of 16 characters of the service label.
LABEL8[7:0]	The ninth of 16 characters of the service label.
LABEL9[7:0]	The tenth of 16 characters of the service label.
LABEL10[7:0]	The eleventh of 16 characters of the service label.
LABEL11[7:0]	The twelfth of 16 characters of the service label.
LABEL12[7:0]	The thirteenth of 16 characters of the service label.
LABEL13[7:0]	The fourteenth of 16 characters of the service label.
LABEL14[7:0]	The fifteenth of 16 characters of the service label.
LABEL15[7:0]	The sixteenth of 16 characters of the service label.
CHAR_ABREV[15:0]	The service label abbreviation mask. Used to indicate which characters in the label are used to create the abbreviated label.

#### Command 0xC1. DAB\_GET\_OE\_SERVICES\_INFO

DAB\_GET\_OE\_SERVICES\_INFO provides the (FIG 0/24) other ensemble (OE) other services information for the passed in service ID. It provides the ensemble ID(s) in which the passed in service ID will reside. The passed in service IDs can be any service ID found in the current ensemble or a service ID from another ensemble. In general the passed in service ID is obtained using the DAB\_GET\_SERVICE\_LINKING\_INFO command with the DAB SID option or can be any service ID in the current ensemble. Please see ETSI TS 103-176 for full details regarding OE Services and service linking. This command is intended to be used in conjunction with the DAB\_GET\_SERVICE\_LINKING\_INFO and DAB\_GET\_FREQ\_INFO commands to paint a complete service linking picture. Note: this command may be used alone to determine if an other ensemble is carrying exactly the same service as one existing in the current ensemble. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xC1							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICEID[7:0]							
ARG5	SERVICEID[15:8]							
ARG6	SERVICEID[23:16]							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG7	SERVICEID[31:24]							

Name	Function
SERVICEID[31:0]	The service ID for which the OE EIDs are needed. This service ID can be an ID from the current ensemble (find exactly the same service) or one returned by DAB_GET_SERVICE_LINKING_INFO command.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	SIZE[7:0]							
RESP5	SIZE[15:8]							
RESP6	NUM_EIDS[7:0]							
RESP7	X							
RESP8	EID_0[7:0]							
RESP9	EID_0[15:8]							

Name	Function
SIZE[15:0]	The total number of bytes returned in the service linking information payload.
NUM_EIDS[7:0]	The total number of ensemble IDs returned in the response payload.
EID_0[15:0]	The first EID returned. This field gets repeated NUM_EIDS times.

**Command 0xC2. DAB\_ACF\_STATUS**

DAB\_TEST\_GET\_BER\_INFO reads the current BER rate using debug information that was sent to the test port. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xC2							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	RFU1[7:0]							
RESP5	RFU2[7:0]							
RESP6	AUDIO_LEVEL[7:0]							
RESP7	AUDIO_LEVEL[15:8]							
RESP8	CMFT_NOISE_LEVEL[7:0]							
RESP9	CMFT_NOISE_LEVEL[15:8]							
RESP10	X							
RESP11	X							

Name	Function
RFU1[7:0]	RFU
RFU2[7:0]	RFU

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Name	Function
AUDIO_LEVEL[15:0]	Returns the audio level. When soft mute engages, the audio level is a fractional number between 0 and 1. Where 0 is mute and 0x3FFF is 0dBFS. The actual level can be calculated from $N = 20\log(\text{AUDIO\_LEVEL}/16383)$ , where N will be in dBFS. This level excludes DRC gain.
CMFT_NOISE_LEVEL[15:0]	Returns the comfort noise level. When comfort noise engages, the noise level is a fractional number between 0 and 1. Where 0 is mute and 0x3FFF is 0dBFS. The actual level can be calculated from $N = 20\log(\text{AUDIO\_LEVEL}/131072)$ , where N will be in dBFS.

## Command 0xE5. TEST\_GET\_RSSI

TEST\_GET\_RSSI returns the reported RSSI in 8.8 format. This command is used to help calibrate the frontend tracking circuit. It returns the RSSI value in dBuV to 1/256 of a dB. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: TEST\_GET\_RSSI command is not supported in firmware revision A0A or A0B.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xE5							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	DACQINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVNTINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_ERR	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	RSSI_HIGHRES[7:0]							
RESP5	RSSI_HIGHRES[15:8]							

Name	Function
RSSI_HIGHRES[15:0]	The RSSI measurement in dBuV to 1/256 of a dB.

**Command 0xE8. DAB\_TEST\_GET\_BER\_INFO**

DAB\_TEST\_GET\_BER\_INFO reads the current BER rate using debug information that was sent to the test port. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Please refer to section (BER Test Setup and Procedure) of this document for more details on BER measurement.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xE8							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	X	X	X	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RFFE_E RR	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	ERR_BITS[7:0]							
RESP5	ERR_BITS[15:8]							
RESP6	ERR_BITS[23:16]							
RESP7	ERR_BITS[31:24]							
RESP8	TOTAL_BITS[7:0]							
RESP9	TOTAL_BITS[15:8]							
RESP10	TOTAL_BITS[23:16]							
RESP11	TOTAL_BITS[31:24]							

Name	Function
ERR_BITS[31:0]	The number of bits received with errors.
TOTAL_BITS[31:0]	The total number of bits received.

## 4.4. Properties Summary—DAB

**Table 6. Properties Summary—DAB**

Prop	Name	Description	Default
0x0000	INT_CTL_ENABLE	Interrupt enable property	0x0000
0x0001	INT_CTL_REPEAT	Interrupt repeat property	0x0000
0x0200	DIGITAL_IO_OUTPUT_SELECT	Selects digital audio Master or Slave.	0
0x0201	DIGITAL_IO_OUTPUT_SAMPLE_RATE	Sets output sample audio rate in units of 1Hz.	48000
0x0202	DIGITAL_IO_OUTPUT_FORMAT	Configure digital output format.	0x1800
0x0203	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_1	Deviations from the standard framing mode	0
0x0204	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_2	Deviations from the standard framing mode	0
0x0205	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_3	Deviations from the standard framing mode	0
0x0206	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_4	Deviations from the standard framing mode	0
0x0300	AUDIO_ANALOG_VOLUME	Sets the audio analog volume.	63
0x0301	AUDIO_MUTE	AUDIO_MUTE property mutes/unmutes each audio output independently.	0x0000
0x0302	AUDIO_OUTPUT_CONFIG	AUDIO_OUTPUT_CONFIG is used to configure various settings of the audio output.	0x0000
0x0800	PIN_CONFIG_ENABLE	Pin configuration property	0x8001
0x0900	WAKE_TONE_ENABLE	Enables the wake tone feature.	0
0x0901	WAKE_TONE_PERIOD	Sets the wake tone duty cycle.	250
0x0902	WAKE_TONE_FREQ	Sets the wake tone frequency.	750
0x0903	WAKE_TONE_AMPLITUDE	Sets the wake tone amplitude.	8
0x1710	DAB_TUNE_FE_VARM	DAB/DMB Front End Varactor configuration slope	0
0x1711	DAB_TUNE_FE_VARB	DAB/DMB Front End Varactor configuration intercept	0
0x1712	DAB_TUNE_FE_CFG	Additional configuration options for the front end.	0x0001
0x8100	DIGITAL_SERVICE_INT_SOURCE	Configures the interrupt sources for digital services	0x0000
0x8101	DIGITAL_SERVICE_RESTART_DELAY	sets the delay time (in milliseconds) to restart digital service when recovering from acquisition loss	200
0xB000	DAB_DIGRAD_INTERRUPT_SOURCE	Configures interrupts related to digital receiver.	0

Table 6. Properties Summary—DAB (Continued)

Prop	Name	Description	Default
0xB001	DAB_DIGRAD_RSSI_HIGH_THRESHOLD	DAB_DIGRAD_RSSI_HIGH_THRESHOLD sets the high threshold, which triggers the DIGRAD interrupt if the RSSI is above this threshold.	127
0xB002	DAB_DIGRAD_RSSI_LOW_THRESHOLD	DAB_DIGRAD_RSSI_LOW_THRESHOLD sets the low threshold, which triggers the DIGRAD interrupt if the RSSI is below this threshold.	-128
0xB200	DAB_VALID_RSSI_TIME	Sets the time to allow the RSSI metric to settle before evaluating.	30
0xB201	DAB_VALID_RSSI_THRESHOLD	Sets the RSSI threshold for a valid DAB Seek/Tune	12
0xB202	DAB_VALID_ACQ_TIME	Set the time to wait for acquisition before evaluating	2000
0xB203	DAB_VALID_SYNC_TIME	Sets the time to wait for ensemble synchronization.	1200
0xB204	DAB_VALID_DETECT_TIME	Sets the time to wait for ensemble fast signal detection.	35
0xB300	DAB_EVENT_INTERRUPT_SOURCE	Configures which dab events will set the DEVENTINT status bit.	0
0xB301	DAB_EVENT_MIN_SVRLIST_PERIOD	Configures how often service list notifications can occur.	10
0xB302	DAB_EVENT_MIN_SVRLIST_PERIOD_RECONFIG	Configures how often service list notifications can occur during reconfiguration events.	10
0xB303	DAB_EVENT_MIN_FREQINFO_PERIOD	Configures how often frequency information notifications can occur.	5
0xB400	DAB_XPAD_ENABLE	Selects which XPAD data will forwarded to the host.	1
0xB401	DAB_DRC_OPTION	DAB_DRC_OPTION defines option to apply DRC (dynamic range control) gain.	0
0xB500	DAB_ACF_ENABLE	enables the feature of soft mute and comfort noise when signal level is low.	3
0xB501	DAB_ACF_MUTE_SIGLOSS_THRESHOLD	Set the signal RSSI threshold to mute audio. RSSI below this threshold indicates that signal is lost. In this case, audio will be muted.	6
0xB503	DAB_ACF_SOFTMUTE_BER_LIMITS	Sets the BER limits when softmute engages.	0xe2a6
0xB504	DAB_ACF_SOFTMUTE_ATTENUATION_LEVEL	Sets audio attenuation level.	80
0xB505	DAB_ACF_SOFTMUTE_ATTACK_TIME	Sets mute time in ms.	100

**Table 6. Properties Summary—DAB (Continued)**

Prop	Name	Description	Default
0xB506	DAB_ACF_SOFTMUTE_RELEASE_TIME	Sets unmute time in ms.	4000
0xB507	DAB_ACF_CMFTNOISE_BER_LIMITS	Sets the BER limits when comfort noise engages.	0xe2a6
0xB508	DAB_ACF_CMFTNOISE_LEVEL	Sets the comfort noise level.	0x200
0xB509	DAB_ACF_CMFTNOISE_ATTACK_TIME	Sets comfort noise attack time in ms.	100
0xB50A	DAB_ACF_CMFTNOISE_RELEASE_TIME	Sets comfort noise release time in ms.	4000
0xB700	DAB_ANNOUNCEMENT_ENABLE	commoncontext	0x07FF
0xE800	DAB_TEST_BER_CONFIG	Sets up and enables the DAB BER test	0



## 4.4.1. DAB Properties

**Property 0x0000. INT\_CTL\_ENABLE**

INT\_CTL\_ENABLE property enables top-level interrupt sources. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved		DEVNTIEN	Reserved					CTSIEN	ERR_CMDIEN	DACQIEN	DSRVIE N	Reserved			STCIEN
<b>Default</b>	0x0		0	0x00					0	0	0	0	0x0			0

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	DEVNTIEN	Interrupt when DEVNTINT is set
12:8	Reserved	Always write to 0x00.
7	CTSIEN	Interrupt when CTS is set. Note: The default will be 0x1 if POWER_UP:CTSIEN was set.
6	ERR_CMDIEN	Interrupt when ERR_CMD is set
5	DACQIEN	Interrupt when DACQINT is set
4	DSRVIE N	Interrupt when DSRVINT is set
3:1	Reserved	Always write to 0x0.
0	STCIEN	Interrupt when STCINT is set

**Property 0x0001. INT\_CTL\_REPEAT**

INT\_CTL\_REPEAT is used to set repeat interrupt pulses for a given interrupt even if this particular interrupt was previously generated but not acknowledged. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved		DEVNTR EP	Reserved							DACQREP	DSRVREP	Reserved			STCREP
<b>Default</b>	0x0		0	0x00							0	0	0x0			0

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Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	DEVNTREP	Repeat interrupt pulse when DEVNTINT is set, even if a previous interrupt was generated but not acknowledged.
12:6	Reserved	Always write to 0x00.
5	DACQREP	Repeat interrupt pulse when DACQINT is set, even if a previous interrupt was generated but not acknowledged.
4	DSRVREP	Repeat interrupt pulse when DSRVINT is set, even if a previous interrupt was generated but not acknowledged.
3:1	Reserved	Always write to 0x0.
0	STCREP	Repeat interrupt pulse when STCINT is set, even if a previous interrupt was generated but not acknowledged.

---

## Property 0x0200. DIGITAL\_IO\_OUTPUT\_SELECT

---

DIGITAL\_IO\_OUTPUT\_SELECT configures the digital audio output to be I2S Master or Slave. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MAS TER	Reserved														
Default	0	0x0000														

Bit	Name	Function
15	MASTER	0 : Slave mode selected 1 : Master mode selected
14:0	Reserved	Always write to 0x0000.

---

## Property 0x0201. DIGITAL\_IO\_OUTPUT\_SAMPLE\_RATE

---

DIGITAL\_IO\_OUTPUT\_SAMPLE\_RATE sets output sample audio rate in units of 1Hz. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 48000

Units: Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	OUTPUT_SAMPLE_RATE[15:0]															
<b>Default</b>	0xBB80															

Bit	Name	Function
15:0	OUTPUT_SAMPLE_RATE[15:0]	DIGITAL_IO_OUTPUT_SAMPLE_RATE sets output sample audio rate in units of 1Hz. Range: 32000-48000 32000 : The minimum output sample rate in Hz. 48000 : The minimum output sample rate in Hz.

### Property 0x0202. DIGITAL\_IO\_OUTPUT\_FORMAT

DIGITAL\_IO\_OUTPUT\_FORMAT configures the digital audio output format. This property may only be written before the first tune. Writes after first tune will return error. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x1800

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		SAMPL_SIZE[5:0]						SLOT_SIZE[3:0]				FRAMING_FORMAT[3:0]			
Default	0x0		0x18						0x0				0x0			

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Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:8	SAMPL_SIZE[5:0]	Determines the number of bits in a sample. Only the specified number of bits per sample are used. The value of any bits sent over the sample size will be determined by the FILL field of the DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_2 property. Sample sizes of less than 8 are not supported. Range: 8-24
7:4	SLOT_SIZE[3:0]	Determines slot size; must be larger than or equal to SAMPL_SIZE. 0x0 : Matches Sample Size 0x2 : 8 bits 0x4 : 16 bits 0x5 : 20 bits 0x6 : 24 bits 0x7 : 32 bits
3:0	FRAMING_FORMAT[3:0]	Determines when the data is transmitted relative to frame sync. 0x0 : I2S mode 0x6 : DSP mode 0x7 : Left justified dsp mode 0x8 : Left justified mode 0x9 : Right justified mode

## Property 0x0203. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_1

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_1 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		FSL ATE _EN	FSIN V_E N	RJU ST_ EN	CLK- INV_ EN	SWA P_E N	BIT ORD ER_ EN	Reserved		FSL ATE	FSIN V	RJU ST	CLK- INV	SWA P	BIT ORD ER
Default	0x0		0	0	0	0	0	0	0x0		0	0	0	0	0	0

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	FSLATE_EN	Enable the FSLATE override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
12	FSINV_EN	Enable the FSINV override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
11	RJUST_EN	Enable the RJUST override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
10	CLKINV_EN	Enable the CLKINV override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
9	SWAP_EN	Enable the SWAP override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
8	BITORDER_EN	Enable the BITORDER override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
7:6	Reserved	Always write to 0x0.
5	FSLATE	0 : Sample data on the rising edge of the 2nd clock after DFS 1 : Sample data on the rising edge of the 1st clock after DFS
4	FSINV	0 : Use the DFS signal as is 1 : Invert the DFS signal
3	RJUST	0 : Left Justified 1 : Right Justified
2	CLKINV	Inverts the data clock 0 : The bit clock is not inverted. DFS will be captured on rising edge of DCLK. 1 : The bit clock is inverted. DFS will be captured on falling edge of DCLK.
1	SWAP	Swap position of the left and right channels. 0 : Transmit the left sample first 1 : Transmit the right sample first
0	BITORDER	Determine if the MSB or LSB is transmitted first. 0 : Transmit MSB first 1 : Transmit LSB first

## Property 0x0204. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_2

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_2 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved	FILL_EN	Reserved				SEQEN_EN	FSE DGE_EN	FILL[1:0]		Reserved				SEQEN	FSE DGE
Default	0	0	0x0				0	0	0x0		0x0				0	0

Bit	Name	Function
15	Reserved	Always write to 0.
14	FILL_EN	Enable the FILL override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
13:10	Reserved	Always write to 0x0.
9	SEQEN_EN	Enable the SEQEN override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
8	FSE DGE_EN	Enable the FSE DGE override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
7:6	FILL[1:0]	Defines the fill value for unused data bits. 0 : The unused bits are filled with 0's 1 : The unused bits are filled with 1's 2 : The unused bits are sign extended 3 : The unused bits are filled with a random sequence
5:2	Reserved	Always write to 0x0.
1	SEQEN	0 : Only one mono sample is sent per trigger of DFS 1 : Both mono samples are sent sequentially after each trigger from DFS
0	FSE DGE	0 : One mono sample is sent on only one edge of DFS 1 : One mono sample is sent every edge (rising and falling) of DFS

**Property 0x0205. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_3**

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_3 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	FSH_EN	FSH[14:0]														
<b>Default</b>	0	0x0000														

Bit	Name	Function
15	FSH_EN	Enable the FSH override value to take effect. 0 : Use the default value for the specified framing format 1 : Use the value specified in this property
14:0	FSH[14:0]	Number of samples FS will remain high. Range: 0-32767

**Property 0x0206. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_4**

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_4 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	FSL_EN	FSL[14:0]														
<b>Default</b>	0	0x0000														

Bit	Name	Function
15	FSL_EN	Enable the FSH override value to take effect. 0 : Use the default value for the specified framing format 1 : Use the value specified in this property
14:0	FSL[14:0]	Number of samples FS will remain low. Range: 0-32767

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## Property 0x0300. AUDIO\_ANALOG\_VOLUME

---

AUDIO\_ANALOG\_VOLUME sets the analog audio volume. A value of 0 will mute the audio; a value of 1 applies 62 dB of attenuation, and a value of 63 applies no attenuation. Each step accounts for 1 dB of change in the output. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 63

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										VOL[5:0]					
Default	0x000										0x3F					

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	VOL[5:0]	Controls the analog volume level. Range: 0-63 0 : The minimum audio level. 63 : The maximum audio level.

---

## Property 0x0301. AUDIO\_MUTE

---

AUDIO\_MUTE property mutes/unmutes each audio output independently. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														MUTE[1:0]	
Default	0x0000														0x0	

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1:0	MUTE[1:0]	Controls the audio mute on each audio output 0 : Do not mute audio outputs 1 : Mute Left Audio Out. 2 : Mute Right Audio Out. 3 : Mute both Left and Right Audio Out



**Property 0x0302. AUDIO\_OUTPUT\_CONFIG**

AUDIO\_OUTPUT\_CONFIG is used to configure various settings of the audio output. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															MONO
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	MONO	Puts the analog (DAC) output into mono mode. 0 : Audio outputs render normal, stereo audio will be in stereo. 1 : Both analog and digital outputs are in mono.

**Property 0x0800. PIN\_CONFIG\_ENABLE**

PIN\_CONFIG is used to enable and disable the various I/O features of the device. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x8001

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	INTBOU TEN	Reserved													I2SO UTE N	DAC OUT EN
Default	1	0x0000													0	1

Bit	Name	Function
15	INTBOUTEN	When set enables the INTB output.
14:2	Reserved	Always write to 0x0000.
1	I2SOUTEN	When set enables the I2S the digital audio output. A change to this bit will take effect on the next tune or seek. On automotive parts, only I2SOUTEN or DACOUTEN can be enabled at a time. If both enabled, only analog audio output is enabled.
0	DACOUTEN	When set enables the analog audio output. A change to this bit will take effect on the next tune or seek. On automotive parts, only I2SOUTEN or DACOUTEN can be enabled at a time. If both enabled, only analog audio output is enabled.

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---

## Property 0x0900. WAKE\_TONE\_ENABLE

---

WAKE\_TONE\_ENABLE is used to enable the wake tone feature. The wake tone feature is a simple alert tone that can be used for various audible alarms such as a wake alarm. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables the wake tone feature, the wake tone will be played instead of normal audio content.

---

## Property 0x0901. WAKE\_TONE\_PERIOD

---

WAKE\_TONE\_PERIOD is used to configure the wake tone feature's on/off period. This property sets the on and off time periods in units of ms. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 250

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	PERIOD[15:0]															
Default	0x00FA															

Bit	Name	Function
15:0	PERIOD[15:0]	The amount of time the wake tone will be on for each alarm cycle in units of ms. Set to 0 for a continuous tone. Range: 50-2000

**Property 0x0902. WAKE\_TONE\_FREQ**

WAKE\_TONE\_FREQ is the frequency of the wake tone in Hz. The wake tone is a simple square wave whose frequency is defined by this property. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 750

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FREQ[15:0]															
Default	0x02EE															

Bit	Name	Function
15:0	FREQ[15:0]	WAKE_TONE_FREQ is the frequency of the wake tone in Hz. The wake tone is a simple square wave whose frequency is defined by this property. Range: 100-2000

**Property 0x0903. WAKE\_TONE\_AMPLITUDE**

WAKE\_TONE\_AMPLITUDE sets the wake tone's output amplitude. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 8

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											AMP[4:0]				
Default	0x000											0x08				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	AMP[4:0]	The linear wake tone amplitude. Range: 0-31

---

## Property 0x1710. DAB\_TUNE\_FE\_VARM

---

DAB\_TUNE\_FE\_VARM DAB/DMB Front End Varactor configuration slope (x 1000) which has been calculated for a particular board design. Both DAB\_TUNE\_FE\_VARB and DAB\_TUNE\_FE\_VARM must be configured. This takes effect upon DAB\_TUNE\_FREQ. This is a signed value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FE_VARM[15:0]															
Default	0x0000															

Bit	Name	Function
15:0	FE_VARM[15:0]	DAB/DMB Front End Varactor configuration slope (x 1000) which has been calculated for a particular board design. Both DAB_TUNE_FE_VARB and DAB_TUNE_FE_VARM must be configured. This takes effect upon DAB_TUNE_FREQ. This is a signed value.

---

## Property 0x1711. DAB\_TUNE\_FE\_VARB

---

DAB\_TUNE\_FE\_VARB DAB/DMB Front End Varactor configuration intercept which has been calculated for a particular board design. Both DAB\_TUNE\_FE\_VARB and DAB\_TUNE\_FE\_VARM must be configured. This takes effect upon DAB\_TUNE\_FREQ. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FE_VARB[15:0]															
Default	0x0000															

Bit	Name	Function
15:0	FE_VARB[15:0]	DAB/DMB Front End Varactor configuration intercept which has been calculated for a particular board design. Both DAB_TUNE_FE_VARB and DAB_TUNE_FE_VARM must be configured. This takes effect upon DAB_TUNE_FREQ.

**Property 0x1712. DAB\_TUNE\_FE\_CFG**

Additional configuration options for the front end. These take effect upon DAB\_TUNE\_FREQ. See DAB\_TUNE\_FE\_VARB and DAB\_TUNE\_FE\_VARM The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0001

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														VHF CAP S	VHF SW
Default	0x0000														0	1

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	VHFCAPS	Configure Varactor matching for changes in the AGC's capacitive attenuators 0 : Varactor will compensate for changes in the CATT 1 : Varactor is decoupled from the CATT
0	VHFSW	VHFSW sets the open or closed state for the front end switch. 0 : Switch Open 1 : Switch Closed

**Property 0x8100. DIGITAL\_SERVICE\_INT\_SOURCE**

DIGITAL\_SERVICE\_INT\_SOURCE configures which digital service events will set the DSRVINT status bit. When one of the bits described below is set, the corresponding event will cause the DSRVINT bit of the status word to be set. To clear the DSRVINT bit the GET\_DIGITAL\_SERVICE\_DATA command must be executed with the ack option. If the DSRVIEN interrupt is enabled, a host interrupt will also be generated. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														DSR VOV FLIN T	DSR VPC KTIN T
Default	0x0000														0	0

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Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	DSRVOVFLINT	Configures the data service overflow interrupt. When this interrupt occurs data service data has been lost and indicates that the host is not retrieving the data service data in a timely fashion. 0 : Interrupt disabled 1 : Interrupt enabled
0	DSRVPCKTINT	Enables the DSRVPCKTINT interrupt of the GET_DIGITAL_SERVICE_DATA command. 0 : Interrupt disabled 1 : Interrupt enabled

## Property 0x8101. DIGITAL\_SERVICE\_RESTART\_DELAY

DIGITAL\_SERVICE\_RESTART\_DELAY sets the delay time (in milliseconds) to restart digital service. When the system recovers from an acquisition loss, the service that had previously been started will be restarted after this delay. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 200

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RESTART_DELAY[15:0]															
Default	0x00C8															

Bit	Name	Function
15:0	RESTART_DELAY[15:0]	DIGITAL_SERVICE_RESTART_DELAY sets the delay time (in milliseconds) to restart digital service. When the system recovers from an acquisition loss, the service that had previously been started will be restarted after this delay. Range: 100-65535

**Property 0xB000. DAB\_DIGRAD\_INTERRUPT\_SOURCE**

DAB\_DIGRAD\_INTERRUPT\_SOURCE configures interrupts related to digital receiver (DAB\_DIGRAD\_STATUS). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												FICERRIEN	ACQIEN	RSSIHIEN	RSSILIEN
Default	0x000												0	0	0	0

Bit	Name	Function
15:4	Reserved	Always write to 0x000.
3	FICERRIEN	Ensemble FIC error interrupt enable. 0 : Disable the FIC error interrupt. 1 : Enable interrupt to occur whenever a new FIC error is detected changes.
2	ACQIEN	Acquisition state change interrupt enable. 0 : Disable the acquisition change interrupt. 1 : Enable interrupt to occur whenever the acquisition state changes.
1	RSSIHIEN	RSSI above DAB_DIGRAD_RSSI_HIGH_THRESHOLD interrupt enable. 0 : Disable the RSSI above DAB_DIGRAD_RSSI_HIGH_THRESHOLD interrupt. 1 : Enable interrupt to occur whenever RSSI is above DAB_DIGRAD_RSSI_HIGH_THRESHOLD interrupt.
0	RSSILIEN	RSSI below DAB_DIGRAD_RSSI_LOW_THRESHOLD interrupt enable. 0 : Disable the RSSI below DAB_DIGRAD_RSSI_LOW_THRESHOLD interrupt. 1 : Enable interrupt to occur whenever RSSI is below DAB_DIGRAD_RSSI_LOW_THRESHOLD interrupt.

**Property 0xB001. DAB\_DIGRAD\_RSSI\_HIGH\_THRESHOLD**

DAB\_DIGRAD\_RSSI\_HIGH\_THRESHOLD sets the high threshold, which triggers the DIGRAD interrupt if the RSSI is above this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 127

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved									HIGH_THRESHOLD[7:0]						
Default	0x00									0x7F						

# AN649

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HIGH_THRESH-OLD[7:0]	Rssi Offset dB. Range: -128-127 - sets sets the high threshold, which triggers the RSSIH interrupt if the RSSI is above this threshold.

---

## Property 0xB002. DAB\_DIGRAD\_RSSI\_LOW\_THRESHOLD

---

DAB\_DIGRAD\_RSSI\_LOW\_THRESHOLD sets the low threshold, which triggers the DIGRAD interrupt if the RSSI is below this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: -128

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								LOW_THRESHOLD[7:0]							
Default	0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Always write to 0xFF.
7:0	LOW_THRESH-OLD[7:0]	Rssi Offset dB. Range: -128-127 - sets sets the low threshold, which triggers the RSSIL interrupt if the RSSI is below this threshold.

---

## Property 0xB200. DAB\_VALID\_RSSI\_TIME

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DAB\_VALID\_RSSI\_TIME sets the time in ms to allow the RSSI metric to settle before evaluating its validity during tune. If RSSI does not exceed DAB\_VALID\_RSSI\_THRESHOLD by this time the tune will be aborted, and STC will be set, and the tune will be flagged as invalid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 30

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										MS[5:0]					
Default	0x000										0x1E					



Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	MS[5:0]	validation time in ms. If set to 0, then RSSI is not considered when determining a channel's validity. Range: 0-63

#### Property 0xB201. DAB\_VALID\_RSSI\_THRESHOLD

DAB\_VALID\_RSSI\_THRESHOLD sets the RSSI threshold for a valid DAB Seek/Tune. If the desired channel RSSI is above this threshold, then it is considered valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 12

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								LEVEL[7:0]							
Default	0x00								0x0C							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	LEVEL[7:0]	Range: -128-127

#### Property 0xB202. DAB\_VALID\_ACQ\_TIME

DAB\_VALID\_ACQ\_TIME sets the time in ms to wait for acquisition before evaluating acquisition validity during tune. If system has not fully acquired by this time the tune will be aborted, STC will be set, and the tune will be flagged as invalid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 2000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved					MS[10:0]										
Default	0x00					0x7D0										

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Bit	Name	Function
15:11	Reserved	Always write to 0x00.
10:0	MS[10:0]	validation time in ms. If 0, then acquisition is not considered when determining a channel's validity. Range: 0-2047

---

## Property 0xB203. DAB\_VALID\_SYNC\_TIME

---

DAB\_VALID\_SYNC\_TIME sets the time in ms to wait for synchronization during tune. If the system has not synchronized by this time the tune will be aborted, STC will be set, and the tune will be flagged as invalid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1200

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved					MS[10:0]										
Default	0x00					0x4B0										

Bit	Name	Function
15:11	Reserved	Always write to 0x00.
10:0	MS[10:0]	validation time in ms. If set to 0, then synchronization is not considered when determining a channel's validity. Range: 0-2047

---

## Property 0xB204. DAB\_VALID\_DETECT\_TIME

---

DAB\_VALID\_DETECT\_TIME sets the time in ms to wait for fast detect during tune. If the system has not detected by this time the tune will be aborted, STC will be set, and the tune will be flagged as invalid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 35

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved					MS[10:0]										
Default	0x00					0x023										

Bit	Name	Function
15:11	Reserved	Always write to 0x00.
10:0	MS[10:0]	validation time in ms. If set to 0, then fast detect is not considered when determining a channel's validity. Range: 0-2047

#### Property 0xB300. DAB\_EVENT\_INTERRUPT\_SOURCE

DAB\_EVENT\_INTERRUPT\_SOURCE configures which dab events will set the DEVENTINT status bit. When one of the bits described below is set, the corresponding event will cause the DEVENTINT bit of the status word will be set. To clear the DEVENTINT bit in the status word the DAB\_GET\_EVENT\_STATUS command must be executed with EVENT\_ACK set. If the DEVENTINT interrupt is enabled, a host interrupt will also be generated. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								REC FG_I NTE N	REC FG WR N_IN TEN	Res erve d	ANN O_I NTE N	OES ERV _INT EN	SER VLIN K_IN TEN	FRE QIN- FO_I NTE N	SRV LIST _INT EN
Default	0x00								0	0	0	0	0	0	0	0

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7	RECFG_INTEN	Enables the ensemble reconfiguration event interrupt. This interrupt indicates that the ensemble reconfiguration has occurred. 0 : Disables the ensemble reconfiguration interrupt. 1 : Enable the interrupt to occur whenever the ensemble reconfiguration occurs.
6	RECFG-WRN_INTEN	Enables the ensemble reconfiguration warning event interrupt. This interrupt indicates that an ensemble reconfiguration will occur in 6 seconds. All following service list updates pertain to the new ensemble configuration. 0 : Disables the ensemble reconfiguration warning interrupt. 1 : Enable the interrupt to occur whenever the ensemble reconfiguration warning occurs.
5	Reserved	Always write to 0.
4	ANNO_INTEN	Enables the announcement event interrupt. 0 : Disables the announcement event interrupt. 1 : Enable interrupt to occur whenever an announcement event occurs.
3	OESERV_INTEN	Enables Other Ensemble (OE) Services interrupt. 0 : Disable Other Ensemble (OE) Services update interrupt. 1 : Enable Other Ensemble (OE) Services update interrupt.
2	SERVLINK_INTEN	Enables the service linking event interrupt. 0 : Disables the service linking update interrupt. 1 : Enable interrupt to occur whenever a service linking update occurs.
1	FREQINFO_INTEN	Enables the frequency information event interrupt. 0 : Disables the frequency information update interrupt. 1 : Enable interrupt to occur whenever a frequency information update occurs.
0	SRVLIST_INTEN	Enables the digital service list event interrupt. 0 : Disables the service list update interrupt. 1 : Enable interrupt to occur whenever a service list update occurs.

---

## Property 0xB301. DAB\_EVENT\_MIN\_SVRLIST\_PERIOD

---

DAB\_EVENT\_MIN\_SVRLIST\_PERIOD configures how often service list notifications can occur in units of 100ms. This property is used to reduce the number of service list update notifications received at initial tune when the service list is updated very frequently. With this property a trade off can be made between getting partial information quickly or waiting longer and getting a complete list. Note that the service list is a dynamic object and it will be updated periodically. Therefore it is good practice to update the host's service data base whenever tuning to an ensemble. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 10

Units: 100ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	MIN_SVRLIST_PERIOD[15:0]															
<b>Default</b>	0x000A															

Bit	Name	Function
15:0	MIN_SVRLIST_PERIOD[15:0]	DAB_EVENT_MIN_SVRLIST_PERIOD configures how often service list notifications can occur in units of 100ms. This property is used to reduce the number of service list update notifications received at initial tune when the service list is updated very frequently. With this property a trade off can be made between getting partial information quickly or waiting longer and getting a complete list. Note that the service list is a dynamic object and it will be updated periodically. Therefore it is good practice to update the host's service data base whenever tuning to an ensemble.

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**Property 0xB302. DAB\_EVENT\_MIN\_SVRLIST\_PERIOD\_RECONFIG**


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DAB\_EVENT\_MIN\_SVRLIST\_PERIOD\_RECONFIG configures how often service list notifications can occur in units of 100ms during reconfiguration. This property is used to reduce the number of service list update notifications received at initial tune when the service list is updated very frequently. With this property a trade off can be made between getting partial information quickly or waiting longer and getting a complete list. Setting this to a smaller period than DAB\_EVENT\_MIN\_SVRLIST\_PERIOD will reduce the amount of time required to update the service list during a reconfiguration event. Setting this to a larger period than DAB\_EVENT\_MIN\_SVRLIST\_PERIOD will have no effect. Note that the service list is a dynamic object and it will be updated periodically. Therefore it is good practice to update the host's service data base whenever tuning to an ensemble. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 10

Units: 100ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	MIN_SVRLIST_PERIOD_RECONFIG[15:0]															
<b>Default</b>	0x000A															

Bit	Name	Function
15:0	MIN_SVRLIST_PERIOD_RECONFIG[15:0]	DAB_EVENT_MIN_SVRLIST_PERIOD_RECONFIG configures how often service list notifications can occur in units of 100ms during reconfiguration. This property is used to reduce the number of service list update notifications received at initial tune when the service list is updated very frequently. With this property a trade off can be made between getting partial information quickly or waiting longer and getting a complete list. Setting this to a smaller period than DAB_EVENT_MIN_SVRLIST_PERIOD will reduce the amount of time required to update the service list during a reconfiguration event. Setting this to a larger period than DAB_EVENT_MIN_SVRLIST_PERIOD will have no effect. Note that the service list is a dynamic object and it will be updated periodically. Therefore it is good practice to update the host's service data base whenever tuning to an ensemble.

## Property 0xB303. DAB\_EVENT\_MIN\_FREQINFO\_PERIOD

DAB\_EVENT\_MIN\_FREQINFO\_PERIOD configures how often frequency info notifications can occur in units of 100ms. This property is used to reduce the number of frequency info update notifications received at initial tune when frequency info is updated very frequently. With this property a trade off can be made between getting partial information quickly or waiting longer and getting a complete list. Note that frequency info is dynamic and it may be updated periodically. Therefore it is good practice to update the host's frequency info data base whenever tuning to an ensemble. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 5

Units: 100ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MIN_FREQINFO_PERIOD[15:0]															
Default	0x0005															

Bit	Name	Function
15:0	MIN_FREQINFO_PERIOD[15:0]	DAB_EVENT_MIN_FREQINFO_PERIOD configures how often frequency info notifications can occur in units of 100ms. This property is used to reduce the number of frequency info update notifications received at initial tune when frequency info is updated very frequently. With this property a trade off can be made between getting partial information quickly or waiting longer and getting a complete list. Note that frequency info is dynamic and it may be updated periodically. Therefore it is good practice to update the host's frequency info data base whenever tuning to an ensemble.

**Property 0xB400. DAB\_XPAD\_ENABLE**

DAB\_PAD\_ENABLE selects which PAD application data will be forwarded to the host when available. When an audio service is playing one of it's audio components this property is used to select which PAD services are forwarded to the host for decoding. Note that not all audio services will carry all XPAD applications so only those that are available and enabled will be forwarded. To determine which PAD services are provided use the DAB\_GET\_COMPONENT\_INFO command. The host must have the proper user application(s) and decoders to use this feature such as MOT Slide Show or BWS. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	ALL_OTHER_ENABLE	Reserved	JOURNALINE_ENABLE	MIDDLEWARE_ENABLE	VOICE_ENABLE	IPDC_ENABLE	DMB_ENABLE	DABJAVA_ENABLE	EPG_ENABLE	TMC_ENABLE	DGPS_ENABLE	TPEG_ENABLE	MOT_BWS_ENABLE	MOT_SLS_ENABLE	RFU	DLS_ENABLE
<b>Default</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Bit	Name	Function
15	ALL_OTHER_ENABLE	Enables all other user application types.
14	Reserved	Always write to 0.
13	JOURNALINE_ENABLE	Enables Journaline.
12	MIDDLEWARE_ENABLE	Enables Middleware.
11	VOICE_ENABLE	Enables Voice applications
10	IPDC_ENABLE	Enables IPDC services.
9	DMB_ENABLE	Enables DMB.
8	DABJAVA_ENABLE	Enables DAB JAVA.
7	EPG_ENABLE	Enables EPG.
6	TMC_ENABLE	Enables TMC.
5	DGPS_ENABLE	Enables DGPS.
4	TPEG_ENABLE	Enables TPEG.
3	MOT_BWS_ENABLE	Enables MOT Broadcast Web Site.
2	MOT_SLS_ENABLE	Enables MOT slideshow.
1	RFU	RFU.
0	DLS_ENABLE	Enables PAD delivered DLS packets.

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## Property 0xB401. DAB\_DRC\_OPTION

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DAB\_DRC\_OPTION defines option to apply DRC (dynamic range control) gain. DRC is a dynamic range control method defined for DAB. It applies additional transmitter specified gain to the audio. This gain is provided in the audio's PAD data. The level can vary from 0 to 15.75dB in steps of 0.25dB. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														DRC_OPTION[1:0]	
Default	0x0000														0x0	

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1:0	DRC_OPTION[1:0]	Select DRC (dynamic range control) option. 0 : DRC is off. Do not apply additional gain to the audio. 1 : Apply 1/2 gain value specified by the PAD data to the audio. 2 : Apply full gain value specified by the PAD data to the audio. 3 : RESERVED. Do not use.

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## Property 0xB500. DAB\_ACF\_ENABLE

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Enables the audio processing (soft mute, comfort noise) when signal level is low. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Units: value

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														COMF_NOISE_ENABLE	SOFTMUTE_ENABLE
Default	0x0000														1	1



Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	COMF_NOISE_ENABLE	Enable the comfort noise feature when signal level is low. 0 : disable comfort noise feature. 1 : enable comfort noise feature.
0	SOFTMUTE_ENABLE	Enable the soft mute feature when signal level is low. 0 : disable soft mute. 1 : enable soft mute.

### Property 0xB501. DAB\_ACF\_MUTE\_SIGLOSS\_THRESHOLD

Sets the threshold to mute audio when signal is loss. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 6

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MUTE_SIGLOSS_THRESHOLD[15:0]															
Default	0x0006															

Bit	Name	Function
15:0	MUTE_SIGLOSS_THRESHOLD[15:0]	Sets the threshold to mute audio when signal is loss. If signal is lost, which means RSSI is below this threshold, audio soft mute will engage and audio attenuation level is maximum.

### Property 0xB503. DAB\_ACF\_SOFTMUTE\_BER\_LIMITS

Sets the BER limits when softmute engages. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0xe2a6

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SOFTMUTE_BER_MAX[7:0]								SOFTMUTE_BER_MIN[7:0]							
Default	0xE2								0xA6							

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Bit	Name	Function
15:8	SOFT-MUTE_BER_MAX[7:0]	When estimated sub-channel BER is over this value, audio softmute attenuation is maximum. Range: -127-0
7:0	SOFT-MUTE_BER_MIN[7:0]	When estimated sub-channel BER is over this value, audio softmute begins to engage. Range: -127-0

## Property 0xB504. DAB\_ACF\_SOFTMUTE\_ATTENUATION\_LEVEL

Sets audio attenuation level. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 80

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								ATTN_LEVEL[7:0]							
Default	0x00								0x50							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	ATTN_LEVEL[7:0]	Softmute attenuation level in units of dB. Range: 0-90

## Property 0xB505. DAB\_ACF\_SOFTMUTE\_ATTACK\_TIME

Sets mute time in ms. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 100

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK_TIME[15:0]															
Default	0x0064															

Bit	Name	Function
15:0	ATTACK_TIME[15:0]	Softmute ramp up time in units of ms.

**Property 0xB506. DAB\_ACF\_SOFTMUTE\_RELEASE\_TIME**

Sets unmute time in ms. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RELEASE_TIME[15:0]															
<b>Default</b>	0x0FA0															

Bit	Name	Function
15:0	RELEASE_- TIME[15:0]	Softmute ramp down time in units of ms.

**Property 0xB507. DAB\_ACF\_CMFTNOISE\_BER\_LIMITS**

Sets the BER limits when comfort noise engages. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0xe2a6

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	CMFTNOISE_BER_MAX[7:0]								CMFTNOISE_BER_MIN[7:0]							
<b>Default</b>	0xE2								0xA6							

Bit	Name	Function
15:8	CMFT- NOISE_BER_- MAX[7:0]	When estimated sub-channel BER is over this value, comfort noise level is maximum. Range: -127-0
7:0	CMFT- NOISE_BER_MIN[7: :0]	When estimated sub-channel BER is over this value, comfort noise will engage. Range: -127-0

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## Property 0xB508. DAB\_ACF\_CMFTNOISE\_LEVEL

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Sets the comfort noise level. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x200

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	CMFTNOISE_LEVEL[15:0]															
Default	0x0200															

Bit	Name	Function
15:0	CMFT- NOISE_LEVEL[15:0]	comfort noise level as a fractional number between 0 and 1. Range: 0-4000

---

## Property 0xB509. DAB\_ACF\_CMFTNOISE\_ATTACK\_TIME

---

Sets comfort noise attack time in ms. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 100

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK_TIME[15:0]															
Default	0x0064															

Bit	Name	Function
15:0	ATTACK_ TIME[15:0]	comfort noise ramp up time in units of ms.

**Property 0xB50A. DAB\_ACF\_CMFTNOISE\_RELEASE\_TIME**

Sets comfort noise release time in ms. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RELEASE_TIME[15:0]															
<b>Default</b>	0x0FA0															

Bit	Name	Function
15:0	RELEASE_- TIME[15:0]	comfort noise ramp down time in units of ms.

**Property 0xB700. DAB\_ANNOUNCEMENT\_ENABLE**

DAB\_ANNOUNCEMENT\_ENABLE enables announcement types. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x07FF

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RES ERV ED5	RES ERV ED4	RES ERV ED3	RES ERV ED2	RES ERV ED1	FINA NCI AL	SPO RT	PRO GRA M	SPE CIAL	EVE NT	WEA THE R	NE WS	WA RNI NG	TRA NSP ORT	TRA FFIC	ALA RM
<b>Default</b>	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1

Bit	Name	Function
15	RESERVED5	RESERVED.
14	RESERVED4	RESERVED.
13	RESERVED3	RESERVED.
12	RESERVED2	RESERVED.
11	RESERVED1	RESERVED.
10	FINANCIAL	Enable or disable Financial Report Announcement. 0 : disable Financial Report Announcement. 1 : enable Financial Report Announcement.
9	SPORT	Enable or disable Sport Report Announcement. 0 : disable Sport Report Announcement. 1 : enable Sport Report Announcement.
8	PROGRAM	Enable or disable Programme Information Announcement. 0 : disable Programme Information Announcement. 1 : enable Programme Information Announcement.
7	SPECIAL	Enable or disable Special Event Announcement. 0 : disable Special Event Announcement. 1 : enable Special Event Announcement.
6	EVENT	Enable or disable Event Announcement. 0 : disable Event Announcement. 1 : enable Event Announcement.
5	WEATHER	Enable or disable Area Weather Flash Announcement. 0 : disable Area Weather Flash Announcement. 1 : enable Area Weather Flash Announcement.
4	NEWS	Enable or disable News Flash Announcement. 0 : disable News Flash Announcement. 1 : enable News Flash Announcement.
3	WARNING	Enable or disable Warning Service Announcement. 0 : disable Warning Service Announcement. 1 : enable Warning Service Announcement.
2	TRANSPORT	Enable or disable Transport Flash Announcement. 0 : disable Transport Flash Announcement. 1 : enable Transport Flash Announcement.
1	TRAFFIC	Enable or disable Road Traffic Flash Announcement. 0 : disable Road Traffic Flash Announcement. 1 : enable Road Traffic Flash Announcement.
0	ALARM	Enable or disable Alarm Announcement. 0 : disable Alarm Announcement. 1 : enable Alarm Announcement.

**Property 0xE800. DAB\_TEST\_BER\_CONFIG**

DAB\_TEST\_BER\_CONFIG sets up and enables the DAB BER test. The test is enabled by transitioning the ENABLE bit from 0 to 1. To restart the test the host must first write the enable bit to 0 and then back to 1. This test requires an ensemble test vector with the test pattern in one of the subchannels. The firmware must be built for a specific mode of this test. The default behavior is that this test will operate on packet mode data. Therefore the test vector must contain the test pattern in a packet mode service. The TMID for this service must be set to 3 and the data group flag must be 0, no data groups. By default subchannels defined for stream mode data, audio or FIDC will not work as the test pattern channel. Special versions of the software will be required if BER testing on one of the mentioned transmission modes is required. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved							ENABLE	PATTERN[7:0]							
Default	0x00							0	0x00							

Bit	Name	Function
15:9	Reserved	Always write to 0x00.
8	ENABLE	Enables the BER test. Once enabled the BER information can be collected using the DAB_TEST_GET_BER_INFO command. To start or restart the BER test this bit must transition from 0 to 1.
7:0	PATTERN[7:0]	Sets the BER test pattern character. This must match the character written into the test ETI file. Note that you must enable the audio service that contains this pattern in it.

## 4.5. Commands Summary—AMHD

**Table 7. Commands Summary—AMHD**

Cmd	Name	Description
0x00	RD_REPLY	Returns the status byte and data for the last command sent to the device.
0x01	POWER_UP	Power-up the device and set system settings.
0x04	HOST_LOAD	Loads an image from HOST over command interface
0x05	FLASH_LOAD	Loads an image from external FLASH over secondary SPI bus
0x06	LOAD_INIT	Prepares the bootloader to receive a new image.
0x07	BOOT	Boots the image currently loaded in RAM.
0x08	GET_PART_INFO	Reports basic information about the device.
0x09	GET_SYS_STATE	Reports system state information.
0x0A	GET_POWER_UP_ARGS	Reports basic information about the device such as arguments used during POWER_UP.
0x10	READ_OFFSET	Reads a portion of response buffer from an offset.
0x12	GET_FUNC_INFO	Returns the Function revision information of the device.
0x13	SET_PROPERTY	Sets the value of a property.
0x14	GET_PROPERTY	Retrieve the value of a property.
0x17	GET_AGC_STATUS	Reports the status of the AGC.
0x40	AM_TUNE_FREQ	Tunes the AM receiver to a frequency in 1 kHz steps.
0x41	AM_SEEK_START	Initiates a seek for a channel that meets the validation criteria for AM.
0x42	AM_RSQ_STATUS	Returns status information about the received signal quality.
0x43	AM_ACF_STATUS	Returns status information about automatically controlled features.
0x80	GET_DIGITAL_SERVICE_LIST	Gets a service list of the ensemble.
0x81	START_DIGITAL_SERVICE	Starts an audio or data service.
0x82	STOP_DIGITAL_SERVICE	Stops an audio or data service.
0x84	GET_DIGITAL_SERVICE_DATA	Gets a block of data associated with one of the enabled data components of a digital services.
0x92	HD_DIGRAD_STATUS	Returns status information about the digital radio and ensemble.
0x93	HD_GET_EVENT_STATUS	Gets information about the various events related to the HD services.
0x94	HD_GET_STATION_INFO	Retrieves information about the ensemble broadcaster.
0x95	HD_GET_PSD_DECODE	Retrieves PSD information.
0x96	HD_GET_ALERT_MSG	Retrieves the HD Alert message.
0x97	HD_PLAY_ALERT_TONE	Plays the HD Alert Tone.
0x98	HD_TEST_GET_BER_INFO	Reads the current BER information.



Table 7. Commands Summary—AMHD

Cmd	Name	Description
0x99	HD_SET_ENABLED_PORTS	Sets default ports retrieved after acquisition.
0x9A	HD_GET_ENABLED_PORTS	Gets default ports retrieved after acquisition.
0x9C	HD_ACF_STATUS	This command Returns status information about HD automatically controlled features.
0xE5	TEST_GET_RSSI	Returns the reported RSSI in 8.8 format.

## 4.5.1. AMHD Commands

### Command 0x00. RD\_REPLY

RD\_REPLY command must be called to return the status byte and data for the last command sent to the device. This command is also used to poll the status byte as needed. To poll the status byte, send the RD\_REPLY command and read the status byte. This can be done regardless of the state of the CTS bit in the status register. Please refer to individual command descriptions for the format of returned data. RD\_REPLY is a hardware command and can be issued while device is powered down. For commands where the size of the response is returned, the user should send the RD\_REPLY command to read the SIZE first. Each time the RD\_REPLY command is sent, the STAUS bytes will still be returned.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x00							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	DAC-QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	DATA_0[7:0]							
RESP5	DATA_N[7:0]							

Name	Function
CTS	Clear to Send. 0 : Wait before sending next command. 1 : Clear to send next command. The next command may be sent.
ERR_CMD	Command Error. 0 : No error 1 : Error. The previous command failed. Read byte 5 of the reply to get the error code. The next successfully executed command will clear the error.

Name	Function
DACQINT	Digital radio link change interrupt indicator. Indicates that something in the digital radio ensemble acquisition status has changed. Service via the HD_DIGRAD_STATUS commands.
DSRVINT	Indicates that an enabled data component of one of the digital services requires attention. Service using the GET_DIGITAL_SERVICE_DATA command.
RSQINT	Received Signal Quality interrupt indicator. Indicates that a received signal metric is above or below a threshold defined by threshold properties. Service via AM_RSQ_STATUS command.
ACFINT	Automatically controlled features interrupt indicator. Indicates the one of the dynamically system modifiers has crossed a programmed threshold. Service via AM_ACF_STATUS command.
STCINT	Seek/Tune complete. 0 : Tune complete has not been triggered. Do not send a new TUNE/SEEK command. 1 : Tune complete has been triggered. It is safe to send a new TUNE/SEEK command.
DEVNTINT	Digital radio event change interrupt indicator. Indicates that a new event related to the digital radio has occurred. Service via the HD_DIGRAD_STATUS commands.
DACFINT	HD radio ACF status change interrupt indicator. Indicates that a new interrupt related to the HD radio ACF feature has occurred. Service via the [ref HD_ACF_STATUS] command.
PUP_STATE[7:6]	Indicates the powerup state of the system. 0 : The system has been reset but no POWER_UP command has been issued. The system is currently waiting on the POWER_UP command. 1 : Reserved 2 : The bootloader is currently running. 3 : An application was successfully booted and is currently running.
DSPERR	The DSP has encountered a frame overrun. This is a fatal error.
REPOFERR	When set the control interface has dropped data during a reply read, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the given data arbiter and memory speed.
CMDOFERR	When set the control interface has dropped data during a command write, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the data arbiter and memory speed.
ARBERR	When set an arbiter error has occurred.
ERRNR	When set a non-recoverable error has occurred. The system keep alive timer has expired.

Name	Function
DATA_0[7:0]	First Data byte. If ERR_CMD bit is set, this byte returns the error code. Possible command error codes are: 0x01 : unspecified 0x02 : reply overflow 0x03 : not available 0x04 : not supported 0x05 : bad frequency 0x10 : command not found 0x11 : bad arg1 0x12 : bad arg2 0x13 : bad arg3 0x14 : bad arg4 0x15 : bad arg5 0x16 : bad arg6 0x17 : bad arg7 0x18 : command busy 0x19 : at band limit, or cannot further seek. 0x20 : bad NVM 0x30 : bad patch 0x31 : bad bootmode 0x40 : bad property 0x50 : not acquired 0xff : APP not supported
DATA_N[7:0]	Nth Data byte.

## Command 0x01. POWER\_UP

The POWER\_UP initiates the boot process to move the device from power down to power up mode. There are two possible boot scenarios: Host image load and FLASH image load. When the host is loading the image the host first executes the POWER\_UP command to set the system settings (REF\_CLK, etc). A LOAD\_INIT command then prepares the bootloader to receive a new image. After the LOAD\_INIT command, using the HOST\_LOAD command loads the image into the device RAM. After the RAM is loaded the host issues the BOOT command. When booting a FLASH image the host issues the POWER\_UP command to set the system settings. Then issues the FLASH\_LOAD command to select and load the image from FLASH. Once the image is loaded the host sends the BOOT command to boot the application. Power-up is complete when the CTS bit is set. This command may only be sent while the device is powered down. Note: FLASH\_LOAD is not supported in A0A or A0B revisions.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x01							
ARG1	CTSIEN	0	0	0	0	0	0	0
ARG2	0	0	CLK_MODE[1:0]		TR_SIZE[3:0]			

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG3	0	IBIAS[6:0]						
ARG4	XTAL_FREQ[7:0]							
ARG5	XTAL_FREQ[15:8]							
ARG6	XTAL_FREQ[23:16]							
ARG7	XTAL_FREQ[31:24]							
ARG8	0	0	CTUN[5:0]					
ARG9	0	0	0	1	0	0	0	0
ARG10	0							
ARG11	0	0	0		0	0		
ARG12	0				0	0		
ARG13	0	IBIAS_RUN[6:0]						
ARG14	0							
ARG15	0							

Name	Function
CTSIE	The bootloader will toggle a host interrupt line when CTS is available. 0 : Disable toggling host interrupt line. 1 : Enable toggling host interrupt line.
CLK_MODE[5:4]	Choose clock mode. See refclk spec sheet for more information 0 : Oscillator and buffer are powered down. 1 : Reference clock generator is in crystal mode. 2 : Oscillator is off and circuit acts as single ended buffer. 3 : Oscillator is off and circuit acts as differential buffer.
TR_SIZE[3:0]	XOSC TR_SIZE. See refclk spec sheet for more information. Range: 0-15
IBIAS[6:0]	XTAL IBIAS current at startup. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. 10 uA steps, 0 to 1270 uA. Range: 0-127
XTAL_FREQ[31:0]	XTAL Frequency in Hz. The supported crystal frequencies are: [5.4 MHz - 6.6 MHz] [10.8 MHz - 13.2 MHz] [16.8 MHz - 19.8 MHz] [21.6 MHz - 26.4 MHz] [27 MHz - 46.2 MHz]. The system designer should consult the part specific data sheet for information regarding tested/recommended xtal frequency ranges before choosing a xtal.
CTUN[5:0]	CTUN. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. Range: 0-63

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Name	Function
IBIAS_RUN[6:0]	XTAL IBIAS current at runtime, after the XTAL oscillator has stabilized. See refclk spec sheet for more information. This parameter is only required if using the crystal oscillator. 10 uA steps, 10 to 1270 uA. If set to 0, will use the same value as IBIAS. Range: 0-127

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]	RSVD_STAT[1:0]		REPO-FERR	CMDO-FERR	ARBERR	ERRNR	

Name	Function
CTS	Clear to Send. 0 : Wait before sending next command. 1 : Clear to send next command. The next command may be sent.
ERR_CMD	Error. 0 : No error 1 : Error. The previous command failed. If STATUS1 is non-zero, it provides an indication of the cause of the error.
PUP_STATE[7:6]	Indicates the powerup state of the system. 0 : The system has been reset but no POWER_UP + command has been issued. The system is currently waiting on the POWER_UP command. 1 : Reserved 2 : The bootloader is currently running. 3 : An application was successfully booted and is currently running.
RSVD_STAT[5:4]	RFU (Reserved For Future Use).
REPOFERR	When set the control interface has dropped data during a reply read, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the given data arbiter and memory speed.
CMDOFERR	When set the control interface has dropped data during a command write, which is a fatal error. This is generally caused by running at a SPI clock rate that is too fast for the data arbiter and memory speed.
ARBERR	When set an arbiter error has occurred.

Name	Function
ERRNR	When set a non-recoverable error has occurred. The system keep alive timer has expired.

### Command 0x04. HOST\_LOAD

HOST\_LOAD loads an image from HOST over command interface. It sends up to 4096 bytes of application image to the bootloader. Note: This command is much more efficient when the image is sent as multiples of 4 bytes. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x04							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	IMAGE_DATA0[7:0]							
ARG5	IMAGE_DATA1[7:0]							
ARG6	IMAGE_DATA2[7:0]							
ARG7	IMAGE_DATA3[7:0]							
ARG8	IMAGE_DATA_N[7:0]							

Name	Function
IMAGE_DATA0[7:0]	First byte of data stream from boot_img.
IMAGE_DATA1[7:0]	Second byte of data stream from boot_img.
IMAGE_DATA2[7:0]	Third byte of data stream from boot_img.
IMAGE_DATA3[7:0]	Fourth byte of data stream from boot_img.
IMAGE_DATA_N[7:0]	Nth byte of data stream. Maximum of 4096 bytes of data per HOST_LOAD command. For best results, N should be a multiple of 4.

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## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

---

## Command 0x05. FLASH\_LOAD

---

FLASH\_LOAD loads the firmware image from an externally attached SPI flash over the secondary SPI bus. The image must be contiguous on the flash. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: FLASH\_LOAD is only supported after patching the bootloader.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x05							
ARG1	0x00							
ARG2	0x00							
ARG3	0x00							
ARG4	FLASH_START_ADDR[7:0]							
ARG5	FLASH_START_ADDR[15:8]							
ARG6	FLASH_START_ADDR[23:16]							
ARG7	FLASH_START_ADDR[31:24]							
ARG8	0							
ARG9	0							
ARG10	0							
ARG11	0							



Name	Function
FLASH_START_ADDR[31:0]	Flash byte starting address of image to load

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

**Command 0x06. LOAD\_INIT**

LOAD\_INIT prepares the bootloader to receive a new image. It will force the bootloader state to waiting for a new LOAD command (HOST\_LOAD or FLASH\_LOAD.) LOAD\_INIT command must always be sent prior to a HOST\_LOAD or a FLASH\_LOAD command. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x06							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

# AN649

---

## Command 0x07. BOOT

---

BOOT command boots the image currently loaded in RAM. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x07							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR

---

## Command 0x08. GET\_PART\_INFO

---

GET\_PART\_INFO reports basic information about the device such as Part Number, Part Version, ROM ID, etc. This command will hold CTS until the reply is available. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: GET\_PART\_INFO command is not supported in firmware revision A0A.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x08							
ARG1	0							

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	CHIPREV[7:0]							
RESP5	ROMID[7:0]							
RESP6	X							
RESP7	X							
RESP8	PART[7:0]							
RESP9	PART[15:8]							
RESP10	X							
RESP11	X							
RESP12	X							
RESP13	X							
RESP14	X							
RESP15	X							
RESP16	X							
RESP17	X							
RESP18	X							
RESP19	X							
RESP20	X							
RESP21	X							
RESP22	X							

Name	Function
CHIPREV[7:0]	Chip Mask Revision
ROMID[7:0]	ROM Id

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Name	Function
PART[15:0]	Part Number (decimal)

## Command 0x09. GET\_SYS\_STATE

GET\_SYS\_STATE reports basic system state information such as which mode is active; FM, DAB, etc. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: GET\_SYS\_STATE command is not supported in firmware revision A0A.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x09							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPOFERR	CMDOFERR	ARBERR	ERRNR
RESP4	IMAGE[7:0]							
RESP5	X							

Name	Function
IMAGE[7:0]	This field indicates which firmware image processed this command. 0 : Bootloader is active 1 : FMHD is active 2 : DAB is active 3 : TDMB or data only DAB image is active 4 : FMHD Demod is active 5 : AMHD is active 6 : AMHD Demod is active 7 : DAB Demod is active 16 : RESERVED

**Command 0x0A. GET\_POWER\_UP\_ARGS**

GET\_POWER\_UP\_ARGS reports basic information about the device such as which parameters were used during power up. This command will hold CTS until the reply is available. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x0A							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CMD	X	X	X	X	X	X
STATUS1	X							
STATUS2	X							
STATUS3	PUP_STATE[1:0]		RSVD_STAT[1:0]		REPOFERR	CMDOFERR	ARBERR	ERRNR
RESP4	X							
RESP5	X	X	X	X	X	X	X	X
RESP6	X	X	CLK_MODE[1:0]		TR_SIZE[3:0]			
RESP7	X	IBIAS[6:0]						
RESP8	XTAL_FREQ[7:0]							
RESP9	XTAL_FREQ[15:8]							
RESP10	XTAL_FREQ[23:16]							
RESP11	XTAL_FREQ[31:24]							
RESP12	X	X	CTUN[5:0]					
RESP13	X	X	X	X	X	X	X	X
RESP14	X							
RESP15	X	X	X		X	X		
RESP16	X				X	X		
RESP17	X	IBIAS_RUN[6:0]						

Name	Function
CLK_MODE[5:4]	See POWER_UP command
TR_SIZE[3:0]	See POWER_UP command
IBIAS[6:0]	See POWER_UP command
XTAL_FREQ[31:0]	See POWER_UP command
CTUN[5:0]	See POWER_UP command
IBIAS_RUN[6:0]	See POWER_UP command

---

## Command 0x10. READ\_OFFSET

---

READ\_OFFSET is used for applications that cannot read the entire response buffer. This type of application can use this command to read the response buffer in segments. The host must pass in an offset from the beginning of the response buffer to indicate the starting point from which to read. This offset must be modulo 4. The response buffer remains intact as in the READ\_REPLY command so that the response can be read again if needed. This function is available for both I2C and SPI mode. This is a software command, therefore it is best to read as much data in each calling as possible. This will reduce the overhead associated with using this command. It is recommended that the minimum reply size be on the order of 512 bytes. This means that for APIs that return less the 512 bytes the standard READ\_REPLY should be used. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x10							
ARG1	0x00							
ARG2	OFFSET[7:0]							
ARG3	OFFSET[15:8]							

Name	Function
OFFSET[15:0]	The offset from the beginning of the response buffer from where to begin reading. The OFFSET parameter must be modulo four. An error is returned otherwise. For example to read a 1024 byte response in two chunks the host can call the READ_MORE command twice. The first call would have OFFSET set to 0 and the second call would have OFFSET set to 512. In both cases the host will clock out 516 bytes of data. The first chunk will include 4 bytes for the status word plus 512 bytes of response. The second chunk will include 4 bytes of status word plus the remaining 512 bytes of response. The response sections will be concatenated to form the entire response.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	DATA0[7:0]							

Name	Function
DATA0[7:0]	The first byte of the data chunk.

### Command 0x12. GET\_FUNC\_INFO

GET\_FUNC\_INFO returns the function revision number for currently loaded firmware (FMHD, AM etc.) as opposed to GET\_PART\_INFO command that provides the revision number for the combo firmware. For example, GET\_PART\_INFO would return A0B is the firmware revision while GET\_FUNC\_INFO would return 1.0.4 for FM function revision if the currently running firmware function is FM. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

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## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x12							
ARG1	0							

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	REEXT[7:0]							
RESP5	REVBRANCH[7:0]							
RESP6	REVINT[7:0]							
RESP7	NOSVN	X	LOCATION[1:0]		X	X	MIXE- DREV	LOCALM OD
RESP8	SVNID[7:0]							
RESP9	SVNID[15:8]							
RESP10	SVNID[23:16]							
RESP11	SVNID[31:24]							

Name	Function
REEXT[7:0]	Major revision number (first part of 1.2.3).
REVBANCH[7:0]	Minor revision number (second part of 1.2.3).
REVINT[7:0]	Build revision number (third part of 1.2.3).
NOSVN	If set the build was created with no SVN info. This image cannot be tracked back to the SVN repo.



Name	Function
LOCATION[5:4]	The location from which the image was built (Trunk, Branch or Tag). 0x0 : The image was built from an SVN tag. Revision numbers are valid. 0x1 : The image was built from an SVN branch. Revision numbers will be 0. 0x2 : The image was built from the trunk. Revision number will be 0.
MIXEDREV	If set, the image was built with mixed revisions.
LOCALMOD	If set, the image has local modifications.
SVNID[31:0]	SVN ID from which the image was built.

### Command 0x13. SET\_PROPERTY

SET\_PROPERTY sets the value of a property. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x13							
ARG1	0x00							
ARG2	PROPID[7:0]							
ARG3	PROPID[15:8]							
ARG4	DATA0[7:0]							
ARG5	DATA0[15:8]							

Name	Function
PROPID[15:0]	The property ID of the property to set.
DATA0[15:0]	Value for the written property.

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR

---

## Command 0x14. GET\_PROPERTY

---

GET\_PROPERTY retrieves the value of a property or properties. The host may read as many properties as desired up to the end of a given property group. An attempt to read passed the end of the property group will result in zeros being read. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x14							
ARG1	COUNT[7:0]							
ARG2	PROPID[7:0]							
ARG3	PROPID[15:8]							

Name	Function
COUNT[7:0]	The number of properties to read.
PROPID[15:0]	The id of the property to retrieve.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	DATA0[7:0]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP5	DATA0[15:8]							

Name	Function
DATA0[15:0]	Value of the first property.

### Command 0x17. GET\_AGC\_STATUS

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x17							
ARG1	WRITE_AS_0[7:0]							

Name	Function
WRITE_AS_0[7:0]	Reserved parameter, always write as 0.

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X							
RESP5	X							
RESP6	X							
RESP7	X							
RESP8	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP9	X							
RESP10	X							
RESP11	X							
RESP12	X							
RESP13	X							
RESP14	X							
RESP15	X							
RESP16	X							
RESP17	X							
RESP18	LMHFRTANK[7:0]							
RESP19	LMHFRTANK[15:8]							
RESP20	X							
RESP21	RFINDEX[7:0]							
RESP22	X							
RESP23	X							
RESP24	LMHFCATT[7:0]							

Name	Function
LMHFRTANK[15:0]	LMHF RTANK setting
RFINDEX[7:0]	RF AGC table index Range: 0-60
LMHFCATT[7:0]	LMHF CATT setting

**Command 0x40. AM\_TUNE\_FREQ**

AM\_TUNE\_FREQ tunes the AM receiver to a frequency in 1 kHz steps. The optional STC interrupt is set when the command completes the tune. Sending this command clears any pending STCINT or RSQINT bit in STATUS. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x40							
ARG1	0	0	0	0	TUNE_MODE[1:0]		INJECTION[1:0]	
ARG2	FREQ[7:0]							
ARG3	FREQ[15:8]							
ARG4	ANTCAP[7:0]							
ARG5	ANTCAP[15:8]							

Name	Function
TUNE_MODE[3:2]	Set the desired tuning mode. 0 : Tune and render analog audio as fast as possible, do not attempt to acquire HD. 1 : Reserved 2 : Tune and render analog audio as fast as possible, try to acquire HD and cross-fade to HD if acquired. Always selects the Main Program Service. To select an SPS use the START_DIGITAL_SERVICE command after the HD has been acquired. 3 : Tune and attempt to acquire HD and render audio if successful. The Main Program Service (MPS) will be rendered. To select an SPS use the START_DIGITAL_SERVICE command after the HD has been acquired.
INJECTION[1:0]	Injection selection 0 : Automatic injection selection. 1 : Low-side injection. 2 : High-side injection.
FREQ[15:0]	Frequency in multiples of 1.0 kHz added to a starting frequency of 0 Hz
ANTCAP[15:0]	When non-zero this parameter sets the antenna tuning capacitor value to (ANTCAP-1)*142 fF (581.49 pF Max). Range: 0-4096 0 : Automatically determines the cap setting.

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## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

## Command 0x41. AM\_SEEK\_START

AM\_SEEK\_START begins searching for a valid station. The search starts at AM\_RSQ\_STATUS:READFREQ + AM\_SEEK\_FREQUENCY\_SPACING in the specified direction. In order for a station to be considered valid, each of the following thresholds must be met: AM\_VALID\_SNR\_THRESHOLD, AM\_VALID\_RSSI\_THRESHOLD, AM\_VALID\_MAX\_TUNE\_ERROR, and AM\_VALID\_HDLEVEL\_THRESHOLD (if the value is non-zero, which indicates an HD seek). Clears any pending STCINT or RSQINT interrupt status. Seek can be cancelled through setting the CANCEL bit in the AM\_RSQ\_STATUS command. The optional STC interrupt is set when the command completes. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: This command is not implemented in Si46xx-A0A or Si46xx-A0B releases. Note: The OPEN\_LOOP, FORCE\_WB, TUNE\_MODE, INJECTION, and ANTCAP parameters will not be functional until the Si46xx-A0C release.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x41							
ARG1	0	0	0	FORCE_ WB	TUNE_MODE[1:0]		INJECTION[1:0]	
ARG2	0	0	0	0	0	0	SEEKUP	WRAP
ARG3	0x00							
ARG4	ANTCAP[7:0]							
ARG5	ANTCAP[15:8]							

Name	Function
FORCE_WB	Forces the DFE into wideband mode. 0 : Normal operation. 1 : Force Wide bandwidth
TUNE_MODE[3:2]	Set the desired tuning mode. 0 : Tune and render analog audio as fast as possible, do not attempt to acquire HD. 1 : Reserved 2 : Tune and render analog audio as fast as possible, try to acquire HD and cross-fade to HD if acquired. Always selects the Main Program Service. 3 : Tune and attempt to acquire HD and render audio if successful. After the station has been acquired, use START_DIGITAL_SERVICE to select services.
INJECTION[1:0]	Injection selection 0 : Automatic injection selection. 1 : Low-side injection. 2 : High-side injection.
SEEKUP	determines direction of seek and band limit. 0 : Seek down. Band limit is AM_SEEK_BAND_BOTTOM. 1 : Seek up. Band limit is AM_SEEK_BAND_TOP.
WRAP	determines seek behavior upon reaching a band limit. 0 : Halt seek at band limit. 1 : When band limit is hit, continue seek from opposite band limit.
ANTCAP[15:0]	When non-zero this parameter sets the antenna tuning capacitor value to (ANT-CAP-1)*142 fF (581.49 pF Max). Range: 0-4096 0 : Automatically determines the cap setting.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

## Command 0x42. AM\_RSQ\_STATUS

AM\_RSQ\_STATUS returns status information about the received signal quality. This command returns the Received Signal Strength Indicator (RSSI), Signal to Noise Ratio (SNR), frequency offset (FREQOFF), and Multipath (MULT) associated with the desired channel. It also indicates valid channel (VALID) and AFC rail status (AFCRL). This command can be used to check if the received signal is above the RSSI high threshold as reported by RSSIHINT or below the RSSI low threshold as reported by RSSILINT. It can also be used to check if the signal is above the SNR high threshold as reported by SNRHINT or below the SNR low threshold as reported by SNRLINT. It can be used to check if the detected multipath is above the Multipath high threshold as reported by MULTHINT or below the Multipath low threshold as reported by MULTLINT. The command clears the RSQINT, BLENDINT, SNRHINT, SNRLINT, RSSIHINT, RSSILINT, MULTHINT, and MULTLINT interrupt bits when the RSQACK bit of ARG1 is set. These are sticky meaning they will remain set until RSQACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire assuming that bit is enabled in AM\_RSQ\_INTERRUPT\_SOURCE. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Multipath metric and related interrupts/thresholds are not implemented in Si46xx-A0A or Si46xx-A0B releases.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x42							
ARG1	0	0	0	0	RSQACK	ATTUNE	CANCEL	STCACK

Name	Function
RSQACK	Clears RSQINT, SNRHINT, SNRLINT, RSSIHINT, RSSILINT if set.
ATTUNE	Return the values as of AM_VALID_SNR_TIME after tune. Only the signal quality metrics RSSI, SNR, ISSI, ASSI and the status bits INJECT, AFCL, and VALID are affected by setting this bit. 0 : Return the current status 1 : Return the snapshot taken at AM_VALID_SNR_TIME
CANCEL	Aborts a seek currently in progress. 0 : Don't abort 1 : Abort
STCACK	Clears the STC interrupt status indicator if set.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT



Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS1	X	X	DEVN-TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	X	X	HDLEV-ELHINT	HDLEV-ELLINT	SNRHINT	SNRLINT	RSSI-HINT	RSSILINT
RESP5	BLTF	X	HDDETECTED	FLT_HD-DETECTED	X	X	AFCRL	VALID
RESP6	READFREQ[7:0]							
RESP7	READFREQ[15:8]							
RESP8	FREQOFF[7:0]							
RESP9	RSSI[7:0]							
RESP10	SNR[7:0]							
RESP11	MOD[7:0]							
RESP12	READANTCAP[7:0]							
RESP13	READANTCAP[15:8]							
RESP14	X							
RESP15	HDLEVEL[7:0]							
RESP16	FILTERED_HDLEVEL[7:0]							

Name	Function
HDLEVELHINT	Indicates FILTERED_HDLEVEL above AM_RSQ_HDLEVEL_HIGH_THRESHOLD.
HDLEVELLINT	Indicates FILTERED_HDLEVEL below AM_RSQ_HDLEVEL_LOW_THRESHOLD.
SNRHINT	Indicates SNR above AM_RSQ_SNR_HIGH_THRESHOLD.
SNRLINT	Indicates SNR below AM_RSQ_SNR_LOW_THRESHOLD.
RSSIHINT	Indicates RSSI above AM_RSQ_RSSI_HIGH_THRESHOLD.
RSSILINT	Indicates RSSI below AM_RSQ_RSSI_LOW_THRESHOLD.

Name	Function
BLTF	Band Limit after AM_SEEK_START. Reports if a seek hit the band limit or wrapped to the original frequency. This does not indicate that the seek failed, only that further seeks from the current location would be unproductive. Tune Failed after AM_TUNE_FREQ tuning with CONDITIONALRETURN bit set, reports '1' if the current station failed to meet the associated criteria and the original frequency was returned to.
HDDETECTED	Reports if HDLEVEL metric is above a threshold. 0 : HDLEVEL metric is below the threshold. Configure AM_RSQ_HDDETECTED_THD to set the threshold. 1 : HDLEVEL metric is above the threshold. Configure AM_RSQ_HDDETECTED_THD to set the threshold.
FLT_HDDETECTED	Reports if filtered HDLEVEL metric is above a threshold. 0 : Filtered HDLEVEL metric is below the threshold. Configure AM_RSQ_HDDETECTED_THD to set the threshold. 1 : Filtered HDLEVEL metric is above the threshold. Configure AM_RSQ_HDDETECTED_THD to set the threshold.
AFCRL	AFC rail indicator.
VALID	Reports if the channel is valid based on the settings of AM_VALID_RSSI_THRESHOLD, AM_VALID_SNR_THRESHOLD, AM_VALID_HDLEVEL_THRESHOLD, AM_VALID_MAX_TUNE_ERROR
READFREQ[15:0]	Returns the currently tuned frequency. If the ATTUNE option is used, returns the frequency of the last completed tune. Applies during a normal tune and during seek.
FREQOFF[7:0]	Signed frequency offset in BPPM (2 PPM) Range: -128-127
RSSI[7:0]	Received signal strength indicator in dBuV. Range: -128-127
SNR[7:0]	RF SNR indicator in dB. Range: -128-127
MOD[7:0]	AM modulation index in percent. Range: 0-100
READANTCAP[15:0]	Returns the antenna tuning cap value.
HDLEVEL[7:0]	Reports a HD availability confidence factor that is normalized to the number of symbols periods examined. The HD detection algorithm looks at both the upper and lower side bands to determine this number. A value higher than 20 generally means that there is a high likelihood of HD presence. Please see AM_RSQ_HD_DETECTION to configure this metric. Range: 0-100

Name	Function
FILTERED_H-DLEVEL[7:0]	Reports a filtered version of the HD availability confidence factor that is normalized to the number of symbols periods examined. The HD detection algorithm looks at both the upper and lower side bands to determine this number. A value higher than 20 generally means that there is a high likelihood of HD presence. Please see AM_RSQ_HD_DETECTION and AM_RSQ_HD_LEVEL_TIME_CONST to configure this metric. Range: 0-100

### Command 0x43. AM\_ACF\_STATUS

AM\_ACF\_STATUS returns status information about automatically controlled features of the device. The automatically controlled features include blend, high cut, and softmute. The bits BLEND\_INT, HIGHCUT\_INT, and SMUTE\_INT are sticky meaning they will remain set until ACFACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire. See the AM\_ACF\_INTERRUPT\_SOURCE property for information on enabling the ACFINT. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x43							
ARG1	0	0	0	0	0	0	0	ACFACK

Name	Function
ACFACK	Clears ACFINT and any ACF interrupt bits if set.

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP4	X	X	X	X	X	X	HIGH-CUT_INT	SMUTE_INT
RESP5	X	X	HIGH-CUT_CONV	SMUTE_CONV	X	X	HIGH-CUT_STATE	SMUTE_STATE
RESP6	X	X	X	ATTN[4:0]				
RESP7	HIGHCUT[7:0]							
RESP8	LOWCUT[7:0]							

Name	Function
HIGHCUT_INT	Indicates that the highcut cutoff frequency has crossed below the highcut threshold as set by AM_ACF_HIGHCUT_THRESHOLD.
SMUTE_INT	Indicates that softmute attenuation has increased above the softmute threshold as set by AM_ACF_SOFTMUTE_THRESHOLD.
HIGHCUT_CONV	High Cut convergence indicator. 0 : The high cut filter is in transition. 1 : The high cut filter is not in transition and is within the tolerance set by AM_ACF_HIGHCUT_TOLERANCE.
SMUTE_CONV	Softmute convergence indicator. 0 : Softmute is in transition. 1 : Softmute is not in transition and is within the tolerance set by AM_ACF_SOFTMUTE_TOLERANCE.
HIGHCUT_STATE	High Cut indicator. 0 : Audio is not frequency limited 1 : Audio is frequency limited.
SMUTE_STATE	Soft Mute indicator. 0 : Audio is not soft muted. 1 : Audio is soft muted.
ATTN[4:0]	Soft mute attenuation level in dB. Range: 0-31
HIGHCUT[7:0]	Hicut cutoff frequency in units 100Hz. Range: 10-50
LOWCUT[7:0]	am low cut.

**Command 0x80. GET\_DIGITAL\_SERVICE\_LIST**

GET\_DIGITAL\_SERVICE\_LIST gets a service list of the ensemble. This command should be issued each time an audio or data service list is updated as indicated by the ASRVLISTINT or DSRVLISTINT bit of the HD\_GET\_EVENT\_STATUS command. This occurs shortly after tune time when a digital radio tuning mode is selected and the ensemble has been acquired. Please refer to iBiquity document: RX\_IDD\_2206 Appendix L (Get\_All\_Data\_Services\_Info and Get\_All\_Audio\_Services\_Info) for the format of the HD Radio Service List. In the case of HD this command also retrieves the audio or data service info when the appropriate service type option is selected. This service info is available whenever the AINFO or DINFO bit(s) are set in the HD\_GET\_EVENT\_STATUS response. This audio and data information provides a quick look at the services in the ensemble and can be used to reduce scan time as this information is ready for parsing well before the service lists. The payload of these responses are defined in Table 5-4 of the RX\_IDD\_2206 main document. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x80							
ARG1	0	0	0	0	0	0	SERTYPE[1:0]	

Name	Function
SERTYPE[1:0]	Sets the type of service list to retrieve. 0 : Get the audio(HD) service list. 1 : Get the data(HD) service list. 2 : Get the HD audio info. 3 : Get the HD data info.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	SIZE[7:0]							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP5	SIZE[15:8]							
RESP6	DATA_0[7:0]							
RESP7	DATA_N[7:0]							

Name	Function
SIZE[15:0]	The size of the service list in bytes.
DATA_0[7:0]	A max of 2047 bytes of service information. Please see the supplemental Digital Services User's Guide.
DATA_N[7:0]	A max of 2047 bytes of service information. Please see the supplemental Digital Services User's Guide. N(max) = SIZE-2.

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## Command 0x81. START\_DIGITAL\_SERVICE

---

START\_DIGITAL\_SERVICE starts an audio or data service. This command is used for HD audio and data services. To determine what services exist in an ensemble please use the GET\_DIGITAL\_SERVICE\_LIST command. In HD radio applications the broadcaster does not always transmit this service information. In this case no data services are available but there may be multiple audio programs available. To view which audio services are available use the HD\_DIGRAD\_STATUS command's AUDIO\_PROG\_AVAIL field to see which audio programs can be selected. In addition the SERVICE\_ID (service number) is not required when selecting an audio or data service. In this case please set the SERVICE\_ID parameter to 0. In the case of starting an audio service, it is not required to stop a currently running audio service/program before starting a new one. The currently running audio service will be stopped automatically when the new service is requested. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x81							
ARG1	0	0	0	0	0	0	0	SER- TYPE
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICE_ID[7:0]							
ARG5	SERVICE_ID[15:8]							
ARG6	SERVICE_ID[23:16]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
ARG7	SERVICE_ID[31:24]							
ARG8	COMP_ID[7:0]							
ARG9	COMP_ID[15:8]							
ARG10	COMP_ID[23:16]							
ARG11	COMP_ID[31:24]							

Name	Function
SERTYPE	Sets the type of service to start for HD applications. 0 : Select an audio service. 1 : Select a data service.
SERVICE_ID[31:0]	The service's Service Number (HD). This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command. NOTE: For HD applications the is referred to as the service number and not the global service ID that is provided as part of the component information.
COMP_ID[31:0]	The service's Port/Program Number (HD). This ID is found in the component section of the service list returned by the GET_DIGITAL_SERVICE_LIST command. Note: COMP_ID will only accept 0 as a value for A0A release.

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

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## Command 0x82. STOP\_DIGITAL\_SERVICE

STOP\_DIGITAL\_SERVICE stops an audio or data service. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x82							
ARG1	0	0	0	0	0	0	0	SER- TYPE
ARG2	0x00							
ARG3	0x00							
ARG4	SERVICE_ID[7:0]							
ARG5	SERVICE_ID[15:8]							
ARG6	SERVICE_ID[23:16]							
ARG7	SERVICE_ID[31:24]							
ARG8	COMP_ID[7:0]							
ARG9	COMP_ID[15:8]							
ARG10	COMP_ID[23:16]							
ARG11	COMP_ID[31:24]							

Name	Function
SERTYPE	Sets the type of service list to start. 0 : Select an audio service. 1 : Select a data service.
SERVICE_ID[31:0]	The service's service ID. This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command.
COMP_ID[31:0]	The service's Component ID or Port Number of the service to stop. This ID is found in the service list returned by the GET_DIGITAL_SERVICE_LIST command. Note: COMP_ID will only accept 0 as a value for A0A release.



## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

## Command 0x84. GET\_DIGITAL\_SERVICE\_DATA

GET\_DIGITAL\_SERVICE\_DATA gets a block of data associated with one of the enabled data components of a digital service. Information about this block of data is found in the data header that is returned at the beginning of the data block. In order to determine the ideal number of PAYLOAD bytes to read, the header information can be read first followed by a second read of the full (header + PAYLOAD) length - it is unnecessary to call GET\_DIGITAL\_SERVICE\_DATA twice to use this method. The data associated with this transaction will be discarded at the receipt of a next GET\_DIGITAL\_SERVICE\_DATA command if STATUS\_ONLY = 0. Reading past the end of the buffer will result in zeros for the invalid bytes. Please refer to iBiquity document: SY\_IDD\_1019s Rev F (sections 5 and 6) for the format of the HD Radio data service data. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

## Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x84							
ARG1	0	0	0	STA- TUS_ON LY	0	0	0	ACK

Name	Function
STATUS_ONLY	Returns only the interrupt source and available buffers information. No digital service data is removed from the service queue. This option should be used when polling for available data.

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Name	Function
ACK	<p>Acknowledge the reading of a data buffer or acknowledge one of the error interrupts. Whenever the ACK bit is set the DSRVINT bit in the status register will be cleared before CTS is released unless there are more data blocks to be read. All interrupt source bits associated with this command will also be cleared.</p> <p>0 : Don't acknowledge the interrupt 1 : Acknowledging the interrupt will clear the DSRVINT bit and the interrupt source bits.</p>

## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	X	X	X	DSR- VOV- FLINT	DSRVP- CKTINT
RESP5	BUFF_COUNT[7:0]							
RESP6	SRV_STATE[7:0]							
RESP7	DATA_SRC[1:0]		DSCTy[5:0]					
RESP8	SERVICE_ID[7:0]							
RESP9	SERVICE_ID[15:8]							
RESP10	SERVICE_ID[23:16]							
RESP11	SERVICE_ID[31:24]							
RESP12	COMP_ID[7:0]							
RESP13	COMP_ID[15:8]							
RESP14	COMP_ID[23:16]							
RESP15	COMP_ID[31:24]							
RESP16	RFU[7:0]							
RESP17	RFU[15:8]							
RESP18	BYTE_COUNT[7:0]							
RESP19	BYTE_COUNT[15:8]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP20	SEG_NUM[7:0]							
RESP21	SEG_NUM[15:8]							
RESP22	NUM_SEGS[7:0]							
RESP23	NUM_SEGS[15:8]							
RESP24	PAYLOAD0[7:0]							
RESP25	PAYLOADN[7:0]							

Name	Function
DSRVOVFLINT	The data services system has overflowed. This indicates that the host processor is not reading the services data out of the device fast enough. At most 8 outstanding data blocks can be queued in the device.
DSRVPCKTINT	Data for an enabled data service is ready for transfer to the host.
BUFF_COUNT[7:0]	Indicates the remaining number of buffers in the data service buffer queue.
SRV_STATE[7:0]	The status indicator for the associated service component. 0 : Indicates that the service is playing out normally. 1 : Indicates that the data service has stopped and that this is the last data block associated with the service. 2 : Indicates that the system was not able to forward a packet due to a memory overflow. If this status is present the host is not reading the packet data fast enough. 3 : Indicates the this data packet represents the beginning of a new data object. 4 : Indicates the this data packet was received with errors.
DATA_SRC[7:6]	For DAB indicates the payload source. Not used in HD modes of operation. 0 : Indicates that the payload is from a standard data service and DATA_TYPE is DSCTy. 1 : Indicates that the payload is non-DLS PAD and DATA_TYPE is DSCTy. 2 : Indicates that the payload is DLS PAD and DATA_TYPE is 0. 3 : Reserved for future use.
DSCTy[5:0]	Used for DAB only. Returns 0 or the DSCTy depending on the DATA_SRC field. See DATA_SRC for details.
SERVICE_ID[31:0]	The Service ID this data is associated with.
COMP_ID[31:0]	The Component ID or Port Number this data is associated with.
RFU[15:0]	Reserved for future use.
BYTE_COUNT[15:0]	The length of this data block in bytes excluding the DSRV header.
SEG_NUM[15:0]	The segment number for this data block. If the data is associated with a stream this value represents a sequence number. Note that segment numbers can be returned out of order. Therefore the host must store and reassemble the data as needed.

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Name	Function
NUM_SEGS[15:0]	The total number of segments to be returned for this data object. If NUM_SEGS=0 then no object length information is known or the associated service is a stream.
PAYLOAD0[7:0]	The first payload byte.
PAYLOADN[7:0]	The Nth payload byte where N = BYTE_COUNT-1.

## Command 0x92. HD\_DIGRAD\_STATUS

HD\_DIGRAD\_STATUS returns status information about the digital radio and ensemble. The bits AERRHINT, AEERLINT, CDNRHINT, CDNRLINT, and ACQINT are sticky meaning they will remain set until DIGRAD\_ACK is set. If the condition is still true after the interrupt is cleared another interrupt will fire assuming that bit is enabled in HD\_DIGRAD\_INTERRUPT\_SOURCE. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x92							
ARG1	0	0	0	0	0	0	0	DIGRAD_ACK

Name	Function
DIGRAD_ACK	Clears all pending digital radio interrupts.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	HDLO- GOINT	SRCA- NAINT	SRC- DIGINT	X	AUDAC- QINT	ACQINT	CDN- RHINT	CDN- RLINT

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP5	HDLOGO	SRCANA	SRCDIG	X	AUDACQ	ACQ	CDNRH	CDNRL
RESP6	BCTL[1:0]		DAAI[5:0]					
RESP7	CDNR[7:0]							
RESP8	X	X	X	TX_GAIN[4:0]				
RESP9	AUDIO_PROG_AVAIL[7:0]							
RESP10	AUDIO_PROG_PLAYING[7:0]							
RESP11	AUDIO_CA[7:0]							
RESP12	CORE_AUDIO_ERR[7:0]							
RESP13	CORE_AUDIO_ERR[15:8]							
RESP14	CORE_AUDIO_ERR[23:16]							
RESP15	CORE_AUDIO_ERR[31:24]							
RESP16	ENH_AUDIO_ERR[7:0]							
RESP17	ENH_AUDIO_ERR[15:8]							
RESP18	ENH_AUDIO_ERR[23:16]							
RESP19	ENH_AUDIO_ERR[31:24]							
RESP20	PTY[7:0]							
RESP21	PS_MODE[7:0]							
RESP22	CODEC_MODE[7:0]							

Name	Function
HDLOGOINT	Indicates a change in the HD Logo display state.
SRCANAINT	Indicates a change in the Analog Audio Source state. Setting of this bit will only occur when the blend state of the analog audio changes.
SRCDIGINT	Indicates a change in the Digital Audio Source state. Setting of this bit will only occur when the blend state of the digital audio changes.
AUDACQINT	Indicates a change in the audio acquisition state. This could be a change to audio acquisition status or a change to the number of available programs as indicated in the AUDIO_PROG_AVAIL field of the HD_DIGRAD_STATUS command.
ACQINT	Indicates a change in the ensembles acquisition state. Setting of this bit will only occur when the acquisition state of the ensemble changes.
CDNRHINT	Indicates that CDNR has risen above the CDNR high threshold. This threshold is set in the HD_DIGRAD_CDNR_HIGH_THRESHOLD property.

Name	Function
CDNRLINT	Indicates that CDNR has dropped below the CDNR low threshold. This threshold is set in the HD_DIGRAD_CDNR_LOW_THRESHOLD property.
HDLOGO	HD Logo display 0 : Consumer radio should not display HD Logo 1 : Consumer radio should display HD Logo
SRCANA	Audio source is analog. If both SRCANA and SRCDIG are set, the audio is blending. 0 : Audio source is not analog 1 : Audio source is analog
SRCDIG	Audio source is digital. If both SRCDIG and SRCANA are set, the audio is blending. 0 : Audio source is not digital 1 : Audio source is digital
AUDACQ	When set the HD demod has acquired digital audio and it is now available to render. See the AUDIO_PROG_AVAIL field of this command to determine which programs are available. 0 : HD audio has not been acquired. 1 : HD audio has been acquired.
ACQ	The ensemble has been acquired.
CDNRH	Indicates that CDNR is currently above the CDNR high threshold. This threshold is set in the HD_DIGRAD_CDNR_HIGH_THRESHOLD property.
CDNRL	Indicates that CDNR is currently below the CDNR low threshold. This threshold is set in the HD_DIGRAD_CDNR_LOW_THRESHOLD property.
BCTL[7:6]	Reflects the state of the TX blend control bits communicated by the broadcast system..
DAAI[5:0]	Digital Audio quality indicator, Indicates the current estimate of the audio quality of the currently selected audio service. lower numbers indicate poorer quality. The number is unitless and provided in 4.2 format.
CDNR[7:0]	Indicates the current estimate of the carrier to noise ratio as seen by the digital radio subsystem.
TX_GAIN[4:0]	Indicates the amount of gain the receiver must apply to the digital audio signal relative to analog audio. In 5-bit two's complement format.
AUDIO_PROG_AVAIL[7:0]	Indicates which of the 8 audio programs are available. This field is a bit field where bit 0 represents the MPS and bits 1-7 represent the SPS. For example if this field is set to 0x83 then SPS7, SPS1, and the MPS are available. To select one of these services use the START_DIGITAL_SERVICE command.
AUDIO_PROG_PLAYING[7:0]	Indicates which of the audio programs is currently playing.
AUDIO_CA[7:0]	Indicates which of the audio programs have CA associated with them.
CORE_AUDIO_ERR[31:0]	Indicates the total number of core audio frames received in error.

Name	Function
ENH_AUDIO_ERR[31:0]	Indicates the total number of enhanced audio frames received in error.
PTY[7:0]	Indicates the current audio program type PTy.
PS_MODE[7:0]	Indicates the primary service mode for the currently tuned ensemble.
CODEC_MODE[7:0]	Indicates the audio codec configuration for the currently selected audio program. 0 : FM Hybrid single-stream on P1 Channel 1 : FM All Digital dual-stream w/ mono core 2 : AM Hybrid/All Digital dual-stream 3 : FM All Digital dual-stream w/ stereo core 10 : FM dual-stream on SPS 13 : FM Hybrid/All Digital single-stream on P3 Channel

### Command 0x93. HD\_GET\_EVENT\_STATUS

HD\_GET\_EVENT\_STATUS retrieves the status of HD related events. This includes items such as new alarms available, new PSD, New station info, etc. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x93							
ARG1	0	0	0	0	0	0	0	EVENT_ACK

Name	Function
EVENT_ACK	Clears all pending digital radio event interrupts.

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	DIN-FOINT	AIN-FOINT	X	ALERTINT	PSDINT	SISINT	DSRVLISTINT	ASRVLISTINT
RESP5	DINFO	AINFO	X	X	PSD	SIS	DSRVLISTINT	ASRVLISTINT
RESP6	ASRVLISTVER[7:0]							
RESP7	ASRVLISTVER[15:8]							
RESP8	DSRVLISTVER[7:0]							
RESP9	DSRVLISTVER[15:8]							
RESP10	X	X	X	SIS_LOCATION	X	SIS_LONG_NAME	SIS_SHORT_NAME	SIS_ID
RESP11	X	X	SIS_SLOGAN	SIS_BASIC_SIS	SIS_UNIV_SHORT_NAME	SIS_LEAP_SEC	SIS_TIMEZONE	SIS_MESSAGE
RESP12	X	TEXT	SHORT	LANG	GENRE	ALBUM	ARTIST	TITLE
RESP13	ID	OWNER	DESC	NAME	RECV	URL	VALID	PRICE
RESP14	X	X	X	X	X	ARMS-GAVAIL	ARFRM0	ARFRM
RESP15	ARFRAMECNT[7:0]							
RESP16	ARMSGID[7:0]							
RESP17	ARCRC7[7:0]							

Name	Function
DINFOINT	New Data Info. Indicates that the data service info has been updated. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
AINFOINT	New Audio Info. Indicates that the audio service info has been updated. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
ALERTINT	New Alert interrupt. Indicates that a new alert has been issued by the broadcaster. Retrieve the event info with the HD_GET_ALERT_MSG command.
PSDINT	New Program Service Data interrupt. Indicates that new program service data on the currently playing audio service is available. Retrieve the PSD with the HD_GET_PSD_DECODE command.



Name	Function
SISINT	New station information interrupt. Indicates that the station information service data has changed. The updated information is retrieved with the HD_GET_STATION_INFO command.
DSRVLISTINT	New data service list interrupt. Indicates that a new digital data service list is available. The new service list is retrieved with the GET_DIGITAL_SERVICE_LIST command.
ASRVLISTINT	New audio service list interrupt. Indicates that a new digital audio service list is available. The new service list is retrieved with the GET_DIGITAL_SERVICE_LIST command.
DINFO	Data Service Info is available. Indicates data service info is available. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
AINFO	Audio Service Info is available. Indicates audio service info is available. Retrieve the this data with the GET_DIGITAL_SERVICE_LIST command.
PSD	Program Service Data is available. Indicates program service data on the currently playing audio service is available. Retrieve the PSD with the HD_GET_PSD_DECODE command.
SIS	Station information is available. Indicates that station information service data is available. The station information service data is retrieved with the HD_GET_STATION_INFO command.
DSRVLIST	Data Service list available. Indicates that a digital data service list is available.
ASRVLIST	Audio Service list available. Indicates that a digital audio service list is available.
ASRVLISTVER[15:0]	Indicates the current version of the audio service list. This field is incremented by 1 each time the audio service list is updated. The host can use this field to help determine if a new audio service list needs to be collected.
DSRVLISTVER[15:0]	Indicates the current version of the data service list. This field is incremented by 1 each time the data service list is updated. The host can use this field to help determine if a new data service list needs to be collected.
SIS_LOCATION	station location is available.
SIS_LONG_NAME	station long name is available.
SIS_SHORT_NAME	station short name is available.
SIS_ID	station ID is available.
SIS_SLOGAN	station slogan is available.
SIS_BASIC_SIS	the logical OR of bits SIS_LOCATION, SIS_LONG_NAME, SIS_SHORT_NAME and SIS_ID.
SIS_UNI-V_SHORT_NAME	station universal short name is available.
SIS_LEAP_SEC	station leap seconds is available.
SIS_TIMEZONE	station time zone is available.

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Name	Function
SIS_MESSAGE	station message is available.
TEXT	PSD Comment:The actual text is available
SHORT	PSD Comment:Short Content Description is available
LANG	PSD Comment:Language is available
GENRE	PSD Genre is available
ALBUM	PSD Album is available
ARTIST	PSD Artist is available
TITLE	PSD Title is available
ID	PSD UFID:Owner ID is available
OWNER	PSD UFID:Owner is available
DESC	PSD Commercial:Description is available
NAME	PSD Commercial:Name of Seller is available
RECV	PSD Commercial:Received As is available
URL	PSD Commercial:Contact URL is available
VALID	PSD Commercial:Valid Until is available
PRICE	PSD Commercial:Price is available
ARMSGAVAIL	Complete AR MSG is available
ARFRM0	AR Frame 0 has been received
ARFRM	AR Frame (any) has been received
ARFRAMECNT[7:0]	The Alert message frame counter.
ARMSGID[7:0]	A complete alert message is available. The message can be retrieved with the HD_GET_ALERT_MSG command.
ARCRC7[7:0]	The alert message CRC7 value extracted from frame 0.

**Command 0x94. HD\_GET\_STATION\_INFO**

HD\_GET\_STATION\_INFO retrieves information about the ensemble broadcaster. The station information is defined in the 2206 standard. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x94							
ARG1	INFO_SELECT[7:0]							

Name	Function
INFO_SELECT[7:0]	<p>Selects which information returned by this command.</p> <p>0 : RSVD Do not use</p> <p>1 : Returns a station message. An arbitrary text message such as telephone number, URL, etc. High-priority messages should take precedence over all other SIS data and PSD. For the station message, a maximum length of 190 bytes is currently supported. The Station Message is only returned when updates have been received OTA. A LENGTH of 0 will be returned if no update has been received since the last request.</p> <p>2 : Returns the Local time zone and daylight savings time (DST) information, allowing receivers to automatically calculate and display time of day.</p> <p>3 : Returns a leap-second correction factor occasionally adjusts UTC by one second to keep it synchronized with astronomical time. Since GPS time does not apply this correction, the two standards have diverged slightly over the years.</p> <p>4 : Provides an alternative to basic short station name, for countries where different text-encoding schemes may be required. The Append Byte indicates whether "-FM" should be appended to the short station name by the HC. The maximum length for the name is 12 bytes. For US markets, the Station Name (short form) should be retrieved using then BASICSIS option.</p> <p>5 : Returns basic SIS data. See the 2206 documentation for full details. Basically this includes items such as the station ID and station location. The information returned by this option is controlled by the HD_EVENT_SIS_CONFIG property.</p> <p>6 : Returns the station slogan. This field supersedes the long station name returned by the BASIC SIS option 5. For the slogan, a maximum length of 95 bytes is currently supported.</p>

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## Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	LENGTH[7:0]							
RESP5	LENGTH[15:8]							
RESP6	DATA0[7:0]							

Name	Function
LENGTH[15:0]	The number of data bytes returned by this command.
DATA0[7:0]	The first of LENGTH data bytes returned by this command. Please see the 2206 SIS documentation for details about then returned data.

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## Command 0x95. HD\_GET\_PSD\_DECODE

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Retrieves PSD information.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x95							
ARG1	PROGRAM[7:0]							
ARG2	FIELD[7:0]							

Name	Function
PROGRAM[7:0]	Program Number 0 : MPS 1 : SPS 1 2 : SPS 2 3 : SPS 3 4 : SPS 4 5 : SPS 5 6 : SPS 6 7 : SPS 7 0xFF : Currently playing audio service
FIELD[7:0]	PSD Field 0 : Title 1 : Artist 2 : Album 3 : Genre 4 : Comment: Language 5 : Comment: Short Content Description 6 : Comment: The actual text 8 : Commercial: Price 9 : Commercial: Valid Until 10 : Commercial: Contact URL 11 : Commercial: Received As 12 : Commercial: Name of Seller 13 : Commercial: Description 14 : UFID: Owner 15 : UFID: Owner ID

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X							
RESP5	X							
RESP6	DATATYPE[7:0]							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP7	LENGTH[7:0]							
RESP8	DATA0[7:0]							

Name	Function
DATATYPE[7:0]	0 : 8 bit character: ISO/IEC 8859-1:1998 1 : 16 bit character: ISO/IEC 10646-1:2000
LENGTH[7:0]	The number of data bytes returned by this command.
DATA0[7:0]	The first of LENGTH data bytes returned by this command. Please see the 2206 SIS documentation for details about then returned data.

## Command 0x96. HD\_GET\_ALERT\_MSG

HD\_GET\_ALERT\_MSG retrieves alert message. Alerts are special messages provided by the broadcaster that may signal important information about emergencies or events. Full details about Alerts can be found in the 2206 standard. This API is used to collect the alert data and is used in response to an alert event. See the HD\_GET\_EVENT\_STATUS command for details on the alert event. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x96							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP4	LENGTH[7:0]							
RESP5	LENGTH[15:8]							
RESP6	DATA0[7:0]							

Name	Function
LENGTH[15:0]	The number of data bytes returned in the alert payload. The length of the alert message will not exceed 395 bytes.
DATA0[7:0]	The first of LENGTH data bytes returned by this command. Please see the 2206 Alert documentation for details about then returned data.

### Command 0x97. HD\_PLAY\_ALERT\_TONE

HD\_PLAY\_ALERT\_TONE plays the alert tone. Alerts are special messages provided by the broadcaster that may signal important information about emergencies or events. Full details about Alerts can be found in the 2206 standard. This API is used to play an alert tone at the host's discretion. It is recommended that the host play this tone for each unique alert message it receives. If the host chooses it can also have these tones played automatically on every alert message. See the HD\_EVENT\_ALERT\_CONFIG property for details on playing alert tones automatically. Also see the HD\_GET\_EVENT\_STATUS command for details on the alert event. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

#### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x97							
ARG1	0							

#### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							

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Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR

## Command 0x98. HD\_TEST\_GET\_BER\_INFO

HD\_TEST\_GET\_BER\_INFO reads the current BER information for the HD digital demod. The information returned by this command is only meaningful if the BER test vector (IB\_FMr208c\_e1wfc204 for FMHD, IB\_AMr208a\_e1awfb00 for AMHD) is being received. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x98							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO-FERR	CMDO-FERR	ARBERR	ERRNR
RESP4	PIDS_BLOCK_ERRORS[7:0]							
RESP5	PIDS_BLOCK_ERRORS[15:8]							
RESP6	PIDS_BLOCK_ERRORS[23:16]							
RESP7	PIDS_BLOCK_ERRORS[31:24]							
RESP8	PIDS_BLOCKS_TESTED[7:0]							
RESP9	PIDS_BLOCKS_TESTED[15:8]							
RESP10	PIDS_BLOCKS_TESTED[23:16]							
RESP11	PIDS_BLOCKS_TESTED[31:24]							
RESP12	PIDS_BIT_ERRORS[7:0]							



Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP13	PIDS_BIT_ERRORS[15:8]							
RESP14	PIDS_BIT_ERRORS[23:16]							
RESP15	PIDS_BIT_ERRORS[31:24]							
RESP16	PIDS_BITS_TESTED[7:0]							
RESP17	PIDS_BITS_TESTED[15:8]							
RESP18	PIDS_BITS_TESTED[23:16]							
RESP19	PIDS_BITS_TESTED[31:24]							
RESP20	P3_BIT_ERRORS[7:0]							
RESP21	P3_BIT_ERRORS[15:8]							
RESP22	P3_BIT_ERRORS[23:16]							
RESP23	P3_BIT_ERRORS[31:24]							
RESP24	P3_BITS_TESTED[7:0]							
RESP25	P3_BITS_TESTED[15:8]							
RESP26	P3_BITS_TESTED[23:16]							
RESP27	P3_BITS_TESTED[31:24]							
RESP28	P2_BIT_ERRORS[7:0]							
RESP29	P2_BIT_ERRORS[15:8]							
RESP30	P2_BIT_ERRORS[23:16]							
RESP31	P2_BIT_ERRORS[31:24]							
RESP32	P2_BITS_TESTED[7:0]							
RESP33	P2_BITS_TESTED[15:8]							
RESP34	P2_BITS_TESTED[23:16]							
RESP35	P2_BITS_TESTED[31:24]							
RESP36	P1_BIT_ERRORS[7:0]							
RESP37	P1_BIT_ERRORS[15:8]							
RESP38	P1_BIT_ERRORS[23:16]							
RESP39	P1_BIT_ERRORS[31:24]							
RESP40	P1_BITS_TESTED[7:0]							
RESP41	P1_BITS_TESTED[15:8]							
RESP42	P1_BITS_TESTED[23:16]							
RESP43	P1_BITS_TESTED[31:24]							

Name	Function
PIDS_BLOCK_ERRORS[31:0]	The number of PIDS blocks received with errors.
PIDS_BLOCKS_TESTED[31:0]	The total number of PIDS blocks received.
PIDS_BIT_ERRORS[31:0]	The number of PIDS bits received with errors.
PIDS_BITS_TESTED[31:0]	The total number of PIDS bits received.
P3_BIT_ERRORS[31:0]	The number of P3 bits received with errors.
P3_BITS_TESTED[31:0]	The total number of P3 bits received.
P2_BIT_ERRORS[31:0]	The number of P2 bits received with errors.
P2_BITS_TESTED[31:0]	The total number of P2 bits received.
P1_BIT_ERRORS[31:0]	The number of P1 bits received with errors.
P1_BITS_TESTED[31:0]	The total number of P1 bits received.

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## Command 0x99. HD\_SET\_ENABLED\_PORTS

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HD\_SET\_ENABLED\_PORTS sets the default HD ports retrieved/enabled when HD has been acquired. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x99							
ARG1	LENGTH[7:0]							
ARG2	DATA_0[7:0]							
ARG3	DATA_0[15:8]							

Name	Function
LENGTH[7:0]	The numbers of ports included in this command. Maximum 64.
DATA_0[15:0]	The first port address of LENGTH addresses.

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR

**Command 0x9A. HD\_GET\_ENABLED\_PORTS**

HD\_GET\_ENABLED\_PORTS gets the default HD ports retrieved when HD has been acquired. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode.

**Command**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x9A							
ARG1	0							

**Response**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	LENGTH[7:0]							
RESP5	X							
RESP6	DATA_0[7:0]							
RESP7	DATA_0[15:8]							

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Name	Function
LENGTH[7:0]	The numbers of ports previously set. Maximum 64.
DATA_0[15:0]	If set, the first port byte.

## Command 0x9C. HD\_ACF\_STATUS

This command Returns status information about HD automatically controlled features.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0x9C							
ARG1	0	0	0	0	0	0	0	ACFACK

Name	Function
ACFACK	Clears ACFINT and any ACF interrupt bits if set.

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	X	X	X	X	X	STE- REO_SE P_INT	AUDIO_ BW_INT	COM- F_NOISE _INT
RESP5	X	STE- REO_SE P_CONV	AUDIO_ BW_ _CONV	COM- F_NOISE _CONV	X	STE- REO_SE P_STATE	AUDIO_ BW_STA TE	COM- F_NOISE _STATE
RESP6	COMFORT_NOISE_LEVEL[7:0]							
RESP7	COMFORT_NOISE_LEVEL[15:8]							

Bit	D7	D6	D5	D4	D3	D2	D1	D0
RESP8	AUDIO_BW[7:0]							
RESP9	STEREO_SEP[7:0]							

Name	Function
STEREO_SEP_INT	Indicates that HD audio stereo separation has increased above the audio stereo separation threshold as set by HD_ACF_STEREO_SEP_THRESHOLD.
AUDIO_BW_INT	Indicates that HD audio bandwidth has increased above the audio bandwidth threshold as set by HD_ACF_AUDIO_BW_THRESHOLD.
COMF_NOISE_INT	Indicates that comfort noise level has increased above the noise level threshold as set by HD_ACF_COMF_NOISE_THRESHOLD.
STEREO_SEP_CONV	HD audio stereo separation convergence indicator. 0 : HD audio stereo separation is in transition. 1 : HD audio stereo separation is not in transition and is within the tolerance set by HD_ACF_STEREO_SEP_TOLERANCE.
AUDIO_BW_CONV	HD audio bandwidth management convergence indicator. 0 : HD audio bandwidth is in transition. 1 : HD audio bandwidth is not in transition and is within the tolerance set by HD_ACF_AUDIO_BW_TOLERANCE.
COMF_NOISE_CONV	Comfort noise level convergence indicator. 0 : Comfort noise level is in transition. 1 : Comfort noise level is not in transition and is within the tolerance set by HD_ACF_COMF_NOISE_TOLERANCE.
STEREO_SEP_STATE	HD audio stereo separation indicator. 0 : Digital audio mono to stereo blending transition is not engaged. 1 : Digital audio mono to stereo blending transition is engaged.
AUDIO_BW_STATE	HD audio bandwidth indicator. 0 : HD audio bandwidth management is not engaged. 1 : HD audio bandwidth management is engaged.
COMF_NOISE_STATE	Comfort noise indicator. 0 : Comfort noise is not present. 1 : Comfort noise is present.
COMFORT_NOISE_LEVEL[15:0]	Comfort noise level as a fractional number between 0 and 1. Where 0 is off and 0x3FFF is 0dBFS. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property.
AUDIO_BW[7:0]	bandwidth of digital audio in 100Hz. .
STEREO_SEP[7:0]	digital audio stereo separation in dB.

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## Command 0xE5. TEST\_GET\_RSSI

TEST\_GET\_RSSI returns the reported RSSI in 8.8 format. This command is used to help calibrate the frontend tracking circuit. It returns the RSSI value in dBuV to 1/256 of a dB. The command is complete when the CTS bit (and optional interrupt) is set. The ERR bit (and optional interrupt) is set if an invalid argument is sent. Note that only a single interrupt occurs if both the CTS and ERR bits are set. The command may only be sent in powerup mode. Note: TEST\_GET\_RSSI command is not supported in firmware revision A0A or A0B.

### Command

Bit	D7	D6	D5	D4	D3	D2	D1	D0
CMD	0xE5							
ARG1	0							

### Response

Bit	D7	D6	D5	D4	D3	D2	D1	D0
STATUS0	CTS	ERR_CM D	DAC- QINT	DSRVINT	RSQINT	X	ACFINT	STCINT
STATUS1	X	X	DEVN- TINT	X	X	X	X	DACFINT
STATUS2	X							
STATUS3	PUP_STATE[1:0]		X	DSPERR	REPO- FERR	CMDO- FERR	ARBERR	ERRNR
RESP4	RSSI_HIGHRES[7:0]							
RESP5	RSSI_HIGHRES[15:8]							

Name	Function
RSSI_HIGHRES[15:0]	The RSSI measurement in dBuV to 1/256 of a dB.

## 4.6. Properties Summary—AMHD

**Table 8. Properties Summary—AMHD**

Prop	Name	Description	Default
0x0000	INT_CTL_ENABLE	Interrupt enable property	0x0000
0x0001	INT_CTL_REPEAT	Interrupt repeat property	0x0000
0x0200	DIGITAL_IO_OUTPUT_SELECT	Selects digital audio Master or Slave.	0
0x0201	DIGITAL_IO_OUTPUT_SAMPLE_RATE	Sets output sample audio rate in units of 1Hz.	48000
0x0202	DIGITAL_IO_OUTPUT_FORMAT	Configure digital output format.	0x1800
0x0203	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_1	Deviations from the standard framing mode	0
0x0204	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_2	Deviations from the standard framing mode	0
0x0205	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_3	Deviations from the standard framing mode	0
0x0206	DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_4	Deviations from the standard framing mode	0
0x0300	AUDIO_ANALOG_VOLUME	Sets the audio analog volume.	63
0x0301	AUDIO_MUTE	AUDIO_MUTE property mutes/unmutes each audio output independently.	0x0000
0x0302	AUDIO_OUTPUT_CONFIG	AUDIO_OUTPUT_CONFIG is used to configure various settings of the audio output.	0x0000
0x0500	AM_AVC_MIN_GAIN	Sets the minimum gain for automatic volume control.	-2048
0x0501	AM_AVC_MAX_GAIN	Sets the maximum gain for automatic volume control.	10220
0x0800	PIN_CONFIG_ENABLE	Pin configuration property	0x8001
0x0900	WAKE_TONE_ENABLE	Enables the wake tone feature.	0
0x0901	WAKE_TONE_PERIOD	Sets the wake tone duty cycle.	250
0x0902	WAKE_TONE_FREQ	Sets the wake tone frequency.	750
0x0903	WAKE_TONE_AMPLITUDE	Sets the wake tone amplitude.	8
0x170C	AGC_RF_THRESHOLD	Adjusts the midpoint of threshold for the RF Threshold Detector.	0
0x2200	AM_CHBW_SQ_LIMITS	The SNR/RSSI threshold for maximum and minimum channel filter bandwidth	0x1E0F
0x2201	AM_CHBW_SQ_CHBW	The maximum and minimum channel filter bandwidth.	0x2314
0x2202	AM_CHBW_SQ_WIDENING_TIME	SNR/RSSI based channel filter bandwidth widening time	2048

Table 8. Properties Summary—AMHD

Prop	Name	Description	Default
0x2203	AM_CHBW_SQ_NARROWING_TIME	SNR/RSSI based channel filter bandwidth narrowing time	16
0x2204	AM_CHBW_OVERRIDE_BW	Overrides the automatically controlled channel filter setting.	0
0x4100	AM_SEEK_BAND_BOTTOM	Sets the lower seek boundary of the AM band in multiples of 1kHz.	520
0x4101	AM_SEEK_BAND_TOP	Sets the upper seek boundary for the AM band in multiples of 1kHz.	1710
0x4102	AM_SEEK_FREQUENCY_SPACING	Sets the frequency spacing for the AM band in multiples of 1kHz when performing a seek.	10
0x4200	AM_VALID_MAX_TUNE_ERROR	Sets the maximum frequency error allowed before setting the AFCRL indicator.	75
0x4201	AM_VALID_RSSI_TIME	Sets the amount of time in ms to allow the RSSI/ISSI metrics to settle before evaluating.	8
0x4202	AM_VALID_RSSI_THRESHOLD	Sets the RSSI threshold for a valid AM Seek/Tune.	35
0x4203	AM_VALID_SNR_TIME	Sets the amount of time in ms to allow the SNR metric to settle before evaluating.	40
0x4204	AM_VALID_SNR_THRESHOLD	Sets the SNR threshold for a valid AM Seek/Tune.	4
0x4205	AM_VALID_HDLEVEL_THRESHOLD	Sets the HDLEVEL threshold for a valid AM Seek/Tune.	0
0x4300	AM_RSQ_INTERRUPT_SOURCE	Configures interrupt related to Received Signal Quality metrics.	0
0x4301	AM_RSQ_SNR_HIGH_THRESHOLD	AM_RSQ_SNR_HIGH_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the SNR is above this threshold.	127
0x4302	AM_RSQ_SNR_LOW_THRESHOLD	AM_RSQ_SNR_LOW_THRESHOLD sets the low threshold, which triggers the RSQ interrupt if the SNR is below this threshold.	-128
0x4303	AM_RSQ_RSSI_HIGH_THRESHOLD	AM_RSQ_RSSI_HIGH_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the RSSI is above this threshold.	127
0x4304	AM_RSQ_RSSI_LOW_THRESHOLD	Sets low threshold which triggers the RSQ interrupt if the RSSI is below this threshold.	-128



Table 8. Properties Summary—AMHD

Prop	Name	Description	Default
0x4305	AM_RSQ_HD_DETECTION	Configures the Fast HD Detection routine.	48
0x4306	AM_RSQ_HD_LEVEL_TIME_CONST	Configures the Fast HD Detection Level Metric Filtering Time Constant.	32
0x4307	AM_RSQ_HDDETECTED_THD	Configures the HD Level Detected Threshold.	0x1E1E
0x4308	AM_RSQ_HDLEVEL_HIGH_THRESHOLD	Sets high threshold which triggers the RSQ interrupt if FILTERED_HDLEVEL is above this threshold.	100
0x4309	AM_RSQ_HDLEVEL_LOW_THRESHOLD	Sets low threshold which triggers the RSQ interrupt if FILTERED_HDLEVEL is below this threshold.	0
0x4400	AM_ACF_INTERRUPT_SOURCE	Enables the ACF interrupt sources.	0
0x4401	AM_ACF_SOFTMUTE_THRESHOLD	Sets the softmute interrupt threshold in dB attenuation.	31
0x4402	AM_ACF_HIGHCUT_THRESHOLD	Sets the high cut interrupt threshold.	0
0x4403	AM_ACF_SOFTMUTE_TOLERANCE	Sets the distance from the final softmute value that triggers softmute convergence flag.	2
0x4404	AM_ACF_HIGHCUT_TOLERANCE	Sets the distance from the final high cut frequency that triggers the high cut convergence flag.	20
0x4405	AM_ACF_CONTROL_SOURCE	Determines what metrics control various ACF features.	0
0x4500	AM_SOFTMUTE_SQ_LIMITS	Sets the SNR limits for soft mute attenuation.	0x0800
0x4501	AM_SOFTMUTE_SQ_ATTENUATION	Sets the SNR based softmute attenuation limits.	0x000C
0x4502	AM_SOFTMUTE_SQ_ATTACK_TIME	Sets the soft mute attack time.	120
0x4503	AM_SOFTMUTE_SQ_RELEASE_TIME	Sets the soft mute release time.	500
0x4600	AM_HIGHCUT_SQ_LIMITS	SQ based high cut high threshold.	0x0a06
0x4601	AM_HIGHCUT_SQ_CUTOFF_FREQ	Max and Min audio frequencies	0x280A
0x4602	AM_HIGHCUT_SQ_ATTACK_TIME	Hi-cut cutoff frequency attack time in ms.	16
0x4603	AM_HIGHCUT_SQ_RELEASE_TIME	Hi-cut cutoff frequency release time in ms.	2000
0x4800	AM_DEMOD_AFC_RANGE	Specify the AFC range	0x0000
0x8100	DIGITAL_SERVICE_INT_SOURCE	Configures the interrupt sources for digital services	0x0000

Table 8. Properties Summary—AMHD

Prop	Name	Description	Default
0x8101	DIGITAL_SERVICE_RESTART_DELAY	sets the delay time (in milliseconds) to restart digital service when recovering from acquisition loss	8000
0x9101	HD_BLEND_OPTIONS	This property provides options to control HD/analog audio blend behavior. This property is only valid for Hybrid (non-All-Digital HD) Broadcasts.	0x000A
0x9102	HD_BLEND_ANALOG_TO_HD_TRANSITION_TIME	This property sets the amount of time it takes in ms to blend from analog to HD. This property only applies to primary service channel.	750
0x9103	HD_BLEND_HD_TO_ANALOG_TRANSITION_TIME	This property sets the amount of time it takes in ms to blend from HD to analog. This property only applies to primary service channel.	100
0x9106	HD_BLEND_DYNAMIC_GAIN	This property sets the digital audio dynamic linear scaling factor. Setting DGAIN_OVERRIDE bit to 1 will override the broadcaster specified digital gain. The DGAIN field is a signed 8 bit fractional number where the linear gain is equal to DGAIN/128.	0
0x9109	HD_BLEND_DECISION_ANA_TO_DIG_THRESHOLD	This property defines the analog to digital blend threshold.	67
0x910A	HD_BLEND_DECISION_ANA_TO_DIG_DELAY	This property defines the analog to digital blend delay.	5000
0x910B	HD_BLEND_SERV_LOSS_RAMP_UP_TIME	Sets the service re-acquisition unmute time in ms.	750
0x910C	HD_BLEND_SERV_LOSS_RAMP_DOWN_TIME	Sets the service switching mute time in ms.	250
0x910D	HD_BLEND_SERV_LOSS_NOISE_RAMP_UP_TIME	Sets the comfort noise unmute time in ms.	1000
0x910E	HD_BLEND_SERV_LOSS_NOISE_RAMP_DOWN_TIME	Sets the comfort noise mute time in ms.	250
0x910F	HD_BLEND_SERV_LOSS_NOISE_LEVEL	Sets the service loss noise level.	512
0x9110	HD_BLEND_SERV_LOSS_NOISE_DAAI_THRESHOLD	Sets the DAAI threshold below which comfort noise will engage.	30
0x9111	HD_BLEND_SERV_LOSS_NOISE_AUDIO_START_DELAY	Sets the audio restart delay used by the comfort noise ramping algorithm.	4
0x9120	HD_BLEND_BWM_CTRL_THRES	Sets the DAAI/CDNO level at which digital audio bandwidth management begins to engage.	0x003C

Table 8. Properties Summary—AMHD

Prop	Name	Description	Default
0x9121	HD_BLEND_BWM_CTRL_LEVEL	Sets the blend starting point and the maximum bandwidth of digital audio signal in 100Hz.	0x9628
0x9122	HD_BLEND_BWM_CTRL_RAMP_UP_TIME	Bandwidth management cutoff frequency ramp up time in ms.	5000
0x9123	HD_BLEND_BWM_CTRL_RAMP_DOWN_TIME	Bandwidth management cutoff frequency ramp down time in ms.	200
0x9124	HD_BLEND_BWM_BLEND_THRES	Sets the bandwidth level at which digital audio mono stereo transition begins to engage.	0x0032
0x9125	HD_BLEND_BWM_BLEND_LEVEL	Sets the min and max stereo separation value in dB at which the blend starts to engage.	0x7F00
0x9126	HD_BLEND_BWM_BLEND_RAMP_UP_TIME	Bandwidth management mono stereo transition ramp up time in ms.	400
0x9127	HD_BLEND_BWM_BLEND_RAMP_DOWN_TIME	Bandwidth management mono stereo transition ramp down time in ms.	16
0x9200	HD_DIGRAD_INTERRUPT_SOURCE	Configures interrupts related to digital receivers HD_DIGRAD_STATUS command.	0
0x9201	HD_DIGRAD_CDNR_LOW_THRESHOLD	Configures CDNR LOW interrupt interrupt threshold.	0
0x9202	HD_DIGRAD_CDNR_HIGH_THRESHOLD	Configures CDNR HIGH interrupt interrupt threshold.	127
0x9300	HD_EVENT_INTERRUPT_SOURCE	Configures interrupts related to digital receiver (HD_GET_EVENT_STATUS).	0
0x9301	HD_EVENT_SIS_CONFIG	This property configures which basic SIS information is returned by the HD_GET_STATION_INFO command BASICSIS option.	0x0017
0x9302	HD_EVENT_ALERT_CONFIG	This property configures HD alerts. Alert information is returned by the HD_GET_ALERT_MSG command.	0x0001
0x9400	HD_ACF_INTERRUPT_SOURCE	Enables the HD ACF interrupt sources.	0
0x9401	HD_ACF_COMF_NOISE_THRESHOLD	Sets the comfort noise interrupt threshold.	512
0x9402	HD_ACF_AUDIO_BW_THRESHOLD	Sets the HD audio bandwidth interrupt threshold.	40
0x9403	HD_ACF_STEREO_SEP_THRESHOLD	Sets the HD audio stereo separation interrupt threshold.	0
0x9404	HD_ACF_COMF_NOISE_TOLERANCE	Sets the distance from the final comfort noise level that triggers the comfort noise convergence flag.	5

**Table 8. Properties Summary—AMHD**

Prop	Name	Description	Default
0x9405	HD_ACF_AUDIO_BW_TOLERANCE	Sets the distance from the final HD audio bandwidth that triggers the hd audio bandwidth convergence flag.	2
0x9406	HD_ACF_STEREO_SEP_TOLERANCE	Sets the distance from the final HD audio stereo separation that triggers the hd audio stereo separation convergence flag.	5
0x9500	HD_PSD_ENABLE	Sets which audio services will provide program service data.	0
0x9501	HD_PSD_FIELD_MASK	Sets which PSD fields will be decoded.	0xFFFF
0x9700	HD_AUDIO_CTRL_FRAME_DELAY	Controls the value of the delay of decoded digital audio samples relative to the output of the audio quality indicator.	6
0x9701	HD_AUDIO_CTRL_PROGRAM_LOSS_THRESHOLD	Controls the duration before reverting to MPS audio after an SPS audio program is removed or lost.	0
0x9702	HD_AUDIO_CTRL_BALL_GAME_ENABLE	Selects the audio output for hybrid waveforms when the TX Blend Control Status (BCTL) bits are set to 01.	1
0x9900	HD_CODEC_MODE_0_BLEND_THRESHOLD	Blend threshold for Codec Mode 0	3
0x9901	HD_CODEC_MODE_0_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 0	0
0x9902	HD_CODEC_MODE_0_BLEND_RATE	Blend Rate for Codec Mode 0	1
0x9903	HD_CODEC_MODE_2_BLEND_THRESHOLD	Blend threshold for Codec Mode 2	3
0x9904	HD_CODEC_MODE_2_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 2	7376
0x9905	HD_CODEC_MODE_2_BLEND_RATE	Blend Rate for Codec Mode 2	1
0x9906	HD_CODEC_MODE_10_BLEND_THRESHOLD	Blend threshold for Codec Mode 10	3
0x9907	HD_CODEC_MODE_10_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 10	0
0x9908	HD_CODEC_MODE_10_BLEND_RATE	Blend Rate for Codec Mode 10	1
0x9909	HD_CODEC_MODE_13_BLEND_THRESHOLD	Blend threshold for Codec Mode 13	3
0x990A	HD_CODEC_MODE_13_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 13	0
0x990B	HD_CODEC_MODE_13_BLEND_RATE	Blend Rate for Codec Mode 13	1
0x990C	HD_CODEC_MODE_1_BLEND_THRESHOLD	Blend threshold for Codec Mode 1	3
0x990D	HD_CODEC_MODE_1_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 1	0
0x990E	HD_CODEC_MODE_1_BLEND_RATE	Blend Rate for Codec Mode 1	1
0x990F	HD_CODEC_MODE_3_BLEND_THRESHOLD	Blend threshold for Codec Mode 3	3
0x9910	HD_CODEC_MODE_3_SAMPLES_DELAY	Digital Audio Delay for Codec Mode 3	0
0x9911	HD_CODEC_MODE_3_BLEND_RATE	Blend Rate for Codec Mode 3	1
0x9B00	HD_EZBLEND_ENABLE	This property enables and disables HD EZ blend.	0

Table 8. Properties Summary—AMHD

Prop	Name	Description	Default
0x9B01	HD_EZBLEND_MPS_BLEND_THRESHOLD	This property sets the threshold for determining when to blend between digital audio and analog audio for Hybrid MPS.	3
0x9B02	HD_EZBLEND_MPS_BLEND_RATE	This property configures the hysteresis in the blending process for Hybrid MPS.	3
0x9B03	HD_EZBLEND_MPS_SAMPLES_DELAY	This property is used to perform audio alignment between analog and Hybrid MPS digital audio.	7376
0x9B04	HD_EZBLEND_SPS_BLEND_THRESHOLD	This property sets the threshold for determining when to blend between digital audio and mute for SPS programs as well as All Digital MPS programs.	3
0x9B05	HD_EZBLEND_SPS_BLEND_RATE	This property configures the hysteresis in the blending process for SPS programs and All Digital MPS programs.	1
0x9F00	HD_ENHANCED_STREAM_HOLDOFF_CONFIG	Configures AM enhanced stream holdoff.	0
0x9F01	HD_ENHANCED_STREAM_HOLDOFF_THRESHOLDS	Sets the enhanced stream holdoff thresholds.	0x2F2F
0xE800	HD_TEST_BER_CONFIG	Enables the HD BER test.	0

# AN649

## 4.6.1. AMHD Properties

### Property 0x0000. INT\_CTL\_ENABLE

INT\_CTL\_ENABLE property enables top-level interrupt sources. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		DEVNTIEN	Reserved					CTSIEN	ERR_CMDIEN	DACQIEN	DSRVIE N	RSQIEN	Reserved	ACFIEN	STCIEN
Default	0x0		0	0x00					0	0	0	0	0	0	0	0

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	DEVNTIEN	Interrupt when DEVNTINT is set
12:8	Reserved	Always write to 0x00.
7	CTSIEN	Interrupt when CTS is set. Note: The default will be 0x1 if POWER_UP:CTSIEN was set.
6	ERR_CMDIEN	Interrupt when ERR_CMD is set
5	DACQIEN	Interrupt when DACQINT is set
4	DSRVIE N	Interrupt when DSRVINT is set
3	RSQIEN	Interrupt when RSQINT is set
2	Reserved	Always write to 0.
1	ACFIEN	Interrupt when ACFINT is set
0	STCIEN	Interrupt when STCINT is set

### Property 0x0001. INT\_CTL\_REPEAT

INT\_CTL\_REPEAT is used to set repeat interrupt pulses for a given interrupt even if this particular interrupt was previously generated but not acknowledged. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		DEVNTR EP	Reserved							DACQREP	DSRVREP	RSQREP	Reserved	ACFREP	STCREP
Default	0x0		0	0x00							0	0	0	0	0	0

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	DEVNTREP	Repeat interrupt pulse when DEVNTINT is set, even if a previous interrupt was generated but not acknowledged.
12:6	Reserved	Always write to 0x00.
5	DACQREP	Repeat interrupt pulse when DACQINT is set, even if a previous interrupt was generated but not acknowledged.
4	DSRVREP	Repeat interrupt pulse when DSRVINT is set, even if a previous interrupt was generated but not acknowledged.
3	RSQREP	Repeat interrupt pulse when RSQINT is set, even if a previous interrupt was generated but not acknowledged.
2	Reserved	Always write to 0.
1	ACFREP	Repeat interrupt pulse when AFCINT is set, even if a previous interrupt was generated but not acknowledged.
0	STCREP	Repeat interrupt pulse when STCINT is set, even if a previous interrupt was generated but not acknowledged.

#### Property 0x0200. DIGITAL\_IO\_OUTPUT\_SELECT

DIGITAL\_IO\_OUTPUT\_SELECT configures the digital audio output to be I2S Master or Slave. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MAS TER	Reserved														
Default	0	0x0000														

Bit	Name	Function
15	MASTER	0 : Slave mode selected 1 : Master mode selected
14:0	Reserved	Always write to 0x0000.

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## Property 0x0201. DIGITAL\_IO\_OUTPUT\_SAMPLE\_RATE

---

DIGITAL\_IO\_OUTPUT\_SAMPLE\_RATE sets output sample audio rate in units of 1Hz. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 48000

Units: Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	OUTPUT_SAMPLE_RATE[15:0]															
Default	0xBB80															

Bit	Name	Function
15:0	OUTPUT_SAMPLE_RATE[15:0]	DIGITAL_IO_OUTPUT_SAMPLE_RATE sets output sample audio rate in units of 1Hz. Range: 32000-48000 32000 : The minimum output sample rate in Hz. 48000 : The minimum output sample rate in Hz.

---

## Property 0x0202. DIGITAL\_IO\_OUTPUT\_FORMAT

---

DIGITAL\_IO\_OUTPUT\_FORMAT configures the digital audio output format. This property may only be written before the first tune. Writes after first tune will return error. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x1800

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		SAMPL_SIZE[5:0]						SLOT_SIZE[3:0]				FRAMING_FORMAT[3:0]			
Default	0x0		0x18						0x0				0x0			



Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:8	SAMPL_SIZE[5:0]	Determines the number of bits in a sample. Only the specified number of bits per sample are used. The value of any bits sent over the sample size will be determined by the FILL field of the DIGITAL_IO_OUTPUT_FORMAT_OVERRIDES_2 property. Sample sizes of less than 8 are not supported. Range: 8-24
7:4	SLOT_SIZE[3:0]	Determines slot size; must be larger than or equal to SAMPL_SIZE. 0x0 : Matches Sample Size 0x2 : 8 bits 0x4 : 16 bits 0x5 : 20 bits 0x6 : 24 bits 0x7 : 32 bits
3:0	FRAMING_FORMAT[3:0]	Determines when the data is transmitted relative to frame sync. 0x0 : I2S mode 0x6 : DSP mode 0x7 : Left justified dsp mode 0x8 : Left justified mode 0x9 : Right justified mode

#### Property 0x0203. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_1

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_1 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		FSL ATE _EN	FSIN V_E N	RJU ST_ EN	CLK- INV_ EN	SWA P_E N	BIT ORD ER_ EN	Reserved		FSL ATE	FSIN V	RJU ST	CLK- INV	SWA P	BIT ORD ER
Default	0x0		0	0	0	0	0	0	0x0		0	0	0	0	0	0

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13	FSLATE_EN	Enable the FSLATE override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
12	FSINV_EN	Enable the FSINV override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
11	RJUST_EN	Enable the RJUST override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
10	CLKINV_EN	Enable the CLKINV override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
9	SWAP_EN	Enable the SWAP override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
8	BITORDER_EN	Enable the BITORDER override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
7:6	Reserved	Always write to 0x0.
5	FSLATE	0 : Sample data on the rising edge of the 2nd clock after DFS 1 : Sample data on the rising edge of the 1st clock after DFS
4	FSINV	0 : Use the DFS signal as is 1 : Invert the DFS signal
3	RJUST	0 : Left Justified 1 : Right Justified
2	CLKINV	Inverts the data clock 0 : The bit clock is not inverted. DFS will be captured on rising edge of DCLK. 1 : The bit clock is inverted. DFS will be captured on falling edge of DCLK.
1	SWAP	Swap position of the left and right channels. 0 : Transmit the left sample first 1 : Transmit the right sample first
0	BITORDER	Determine if the MSB or LSB is transmitted first. 0 : Transmit MSB first 1 : Transmit LSB first

**Property 0x0204. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_2**

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_2 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved	FILL_EN	Reserved				SEQEN_EN	FSE DGE_EN	FILL[1:0]		Reserved				SEQEN	FSE DGE
<b>Default</b>	0	0	0x0				0	0	0x0		0x0				0	0

Bit	Name	Function
15	Reserved	Always write to 0.
14	FILL_EN	Enable the FILL override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
13:10	Reserved	Always write to 0x0.
9	SEQEN_EN	Enable the SEQEN override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
8	FSE DGE_EN	Enable the FSE DGE override value to take effect. 0 : Use the default value for the specified framing format 1 : use the value specified in this property
7:6	FILL[1:0]	Defines the fill value for unused data bits. 0 : The unused bits are filled with 0's 1 : The unused bits are filled with 1's 2 : The unused bits are sign extended 3 : The unused bits are filled with a random sequence
5:2	Reserved	Always write to 0x0.
1	SEQEN	0 : Only one mono sample is sent per trigger of DFS 1 : Both mono samples are sent sequentially after each trigger from DFS
0	FSE DGE	0 : One mono sample is sent on only one edge of DFS 1 : One mono sample is sent every edge (rising and falling) of DFS

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## Property 0x0205. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_3

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DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_3 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FSH_EN	FSH[14:0]														
Default	0	0x0000														

Bit	Name	Function
15	FSH_EN	Enable the FSH override value to take effect. 0 : Use the default value for the specified framing format 1 : Use the value specified in this property
14:0	FSH[14:0]	Number of samples FS will remain high. Range: 0-32767

---

## Property 0x0206. DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_4

---

DIGITAL\_IO\_OUTPUT\_FORMAT\_OVERRIDES\_4 sets alternate I2S format settings from the standard framing mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FSL_EN	FSL[14:0]														
Default	0	0x0000														

Bit	Name	Function
15	FSL_EN	Enable the FSH override value to take effect. 0 : Use the default value for the specified framing format 1 : Use the value specified in this property
14:0	FSL[14:0]	Number of samples FS will remain low. Range: 0-32767

**Property 0x0300. AUDIO\_ANALOG\_VOLUME**

AUDIO\_ANALOG\_VOLUME sets the analog audio volume. A value of 0 will mute the audio; a value of 1 applies 62 dB of attenuation, and a value of 63 applies no attenuation. Each step accounts for 1 dB of change in the output. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 63

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved										VOL[5:0]					
<b>Default</b>	0x000										0x3F					

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	VOL[5:0]	Controls the analog volume level. Range: 0-63 0 : The minimum audio level. 63 : The maximum audio level.

**Property 0x0301. AUDIO\_MUTE**

AUDIO\_MUTE property mutes/unmutes each audio output independently. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved														MUTE[1:0]	
<b>Default</b>	0x0000														0x0	

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1:0	MUTE[1:0]	Controls the audio mute on each audio output 0 : Do not mute audio outputs 1 : Mute Left Audio Out. 2 : Mute Right Audio Out. 3 : Mute both Left and Right Audio Out

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## Property 0x0302. AUDIO\_OUTPUT\_CONFIG

---

AUDIO\_OUTPUT\_CONFIG is used to configure various settings of the audio output. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															MONO
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	MONO	Puts the analog (DAC) output into mono mode. 0 : Audio outputs render normal, stereo audio will be in stereo. 1 : Both analog and digital outputs are in mono.

---

## Property 0x0500. AM\_AVC\_MIN\_GAIN

---

AM\_AVC\_MIN\_GAIN Sets the minimum gain the AVC can have. The minimum gain value is given by  $MIN\_GAIN = g * 1024/6.02$  or  $MIN\_GAIN = g * 170$  where  $g$  is the desired minimum AVC gain in dB. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: -2048

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MINGAIN[15:0]															
Default	0xF800															

Bit	Name	Function
15:0	MINGAIN[15:0]	The minimum gain value for the AVC. Range: -4096-3061 - -24dB to +18dB

**Property 0x0501. AM\_AVC\_MAX\_GAIN**

AM\_AVC\_MAX\_GAIN sets the maximum gain the AVC can have. The max gain value is given by  $MAXGAIN = g * 1024/6.02$  or  $MAXGAIN = g * 170$  where  $g$  is the desired maximum AVC gain in dB. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 10220

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved	MAXGAIN[14:0]														
Default	0	0x27EC														

Bit	Name	Function
15	Reserved	Always write to 0.
14:0	MAXGAIN[14:0]	The maximum gain value for the AVC. Range: 0-32767 - 0 to 193dB

**Property 0x0800. PIN\_CONFIG\_ENABLE**

PIN\_CONFIG is used to enable and disable the various I/O features of the device. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x8001

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	INTBOUTEN	Reserved													I2SOUTEN	DACOUTEN
Default	1	0x0000													0	1

Bit	Name	Function
15	INTBOUTEN	When set enables the INTB output.
14:2	Reserved	Always write to 0x0000.
1	I2SOUTEN	When set enables the I2S the digital audio output. A change to this bit will take effect on the next tune or seek. On automotive parts, only I2SOUTEN or DACOUTEN can be enabled at a time. If both enabled, only analog audio output is enabled.
0	DACOUTEN	When set enables the analog audio output. A change to this bit will take effect on the next tune or seek. On automotive parts, only I2SOUTEN or DACOUTEN can be enabled at a time. If both enabled, only analog audio output is enabled.

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## Property 0x0900. WAKE\_TONE\_ENABLE

---

WAKE\_TONE\_ENABLE is used to enable the wake tone feature. The wake tone feature is a simple alert tone that can be used for various audible alarms such as a wake alarm. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables the wake tone feature, the wake tone will be played instead of normal audio content.

---

## Property 0x0901. WAKE\_TONE\_PERIOD

---

WAKE\_TONE\_PERIOD is used to configure the wake tone feature's on/off period. This property sets the on and off time periods in units of ms. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 250

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	PERIOD[15:0]															
Default	0x00FA															

Bit	Name	Function
15:0	PERIOD[15:0]	The amount of time the wake tone will be on for each alarm cycle in units of ms. Set to 0 for a continuous tone. Range: 50-2000



**Property 0x0902. WAKE\_TONE\_FREQ**

WAKE\_TONE\_FREQ is the frequency of the wake tone in Hz. The wake tone is a simple square wave whose frequency is defined by this property. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 750

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	FREQ[15:0]															
Default	0x02EE															

Bit	Name	Function
15:0	FREQ[15:0]	WAKE_TONE_FREQ is the frequency of the wake tone in Hz. The wake tone is a simple square wave whose frequency is defined by this property. Range: 100-2000

**Property 0x0903. WAKE\_TONE\_AMPLITUDE**

WAKE\_TONE\_AMPLITUDE sets the wake tone's output amplitude. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 8

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											AMP[4:0]				
Default	0x000											0x08				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	AMP[4:0]	The linear wake tone amplitude. Range: 0-31

**Property 0x170C. AGC\_RF\_THRESHOLD**

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RF_THRESHOLD[15:0]															
Default	0x0000															

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Bit	Name	Function
15:0	RF_THRESH-OLD[15:0]	Adjusts the midpoint of threshold for the RF Threshold Detector. Signed Q15.1 format. Each index unit is 0.5 dB Range: -28-29

---

## Property 0x2200. AM\_CHBW\_SQ\_LIMITS

---

Sets the SNR/RSSI level in dB at which the maximum and minimum channel bandwidth will be applied. The maximum and minimum bandwidth is defined in the AM\_CHBW\_SQ\_CHBW property.

Default: 0x1E0F

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SQ_MAX[7:0]								SQ_MIN[7:0]							
Default	0x1E								0x0F							

Bit	Name	Function
15:8	SQ_MAX[7:0]	Sets the SNR/RSSI level in dB at which the maximum channel bandwidth will be applied. Range: -128-127
7:0	SQ_MIN[7:0]	Sets the SNR/RSSI level in dB at which the minimum channel bandwidth will be applied. Range: -128-127

---

## Property 0x2201. AM\_CHBW\_SQ\_CHBW

---

Sets the SNR/RSSI controled maximum and minimum channel bandwidth in units of 100Hz. NOTE: To force the channel filter bandwidth to a set value, set the min and max to the same value

Default: 0x2314

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MAX[7:0]								MIN[7:0]							
Default	0x23								0x14							

Bit	Name	Function
15:8	MAX[7:0]	Range: 15-100
7:0	MIN[7:0]	Range: 15-100

**Property 0x2202. AM\_CHBW\_SQ\_WIDENING\_TIME**

AM\_CHBW\_SQ\_WIDENING\_TIME sets the time required in ms for the channel filter to go from minimum bandwidth to maximum bandwidth. The minimum and maximum bandwidths are defined in the AM\_CHBW\_SQ\_CHBW property.

Default: 2048

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	WIDENING_TIME[15:0]															
<b>Default</b>	0x0800															

Bit	Name	Function
15:0	WIDENING_- TIME[15:0]	Range: 16-32767

**Property 0x2203. AM\_CHBW\_SQ\_NARROWING\_TIME**

AM\_CHBW\_SQ\_NARROWING\_TIME sets the time required in ms for the channel filter to go from maximum bandwidth to minimum bandwidth. The minimum and maximum bandwidths are defined in the AM\_CHBW\_SQ\_CHBW property.

Default: 16

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	NARROWING_TIME[15:0]															
<b>Default</b>	0x0010															

Bit	Name	Function
15:0	NARROWING_- TIME[15:0]	Range: 16-32767

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## Property 0x2204. AM\_CHBW\_OVERRIDE\_BW

---

AM\_CHBW\_OVERRIDE\_BW is used to override the automatically controlled channel filter setting. Setting the property to a non-zero value will cause the override to take effect.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								OVERRIDE_BW[7:0]							
Default	0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	OVER-RIDE_BW[7:0]	Range: 0-55

---

## Property 0x4100. AM\_SEEK\_BAND\_BOTTOM

---

AM\_SEEK\_BAND\_BOTTOM sets the lower seek boundary of the AM band in multiples of 1kHz. See AM\_SEEK\_START. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 520

Units: 1kHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	AMSKFREQ[15:0]															
Default	0x0208															

Bit	Name	Function
15:0	AMSKFREQ[15:0]	AM Seek Band Bottom. Range: 520-1710 - AM

**Property 0x4101. AM\_SEEK\_BAND\_TOP**

AM\_SEEK\_BAND\_TOP sets the upper seek boundary of the AM band in multiples of 1kHz. See AM\_SEEK\_START. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1710

Units: 1kHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	AMSKFREQH[15:0]															
<b>Default</b>	0x06AE															

Bit	Name	Function
15:0	AMSKFREQH[15:0]	AM Seek Band Top. Range: 520-1710 - AM

**Property 0x4102. AM\_SEEK\_FREQUENCY\_SPACING**

AM\_SEEK\_FREQUENCY\_SPACING sets the frequency spacing for the AM band in multiples of 1kHz when performing a seek. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 10

Units: 1kHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved											AMSKSPACE[4:0]				
<b>Default</b>	0x000											0x0A				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	AMSKSPACE[4:0]	AM Seek Frequency Spacing. Range: 1-31 9 : AM in Asia (9kHz) 10 : AM in US (10kHz)

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## Property 0x4200. AM\_VALID\_MAX\_TUNE\_ERROR

---

AM\_VALID\_MAX\_TUNE\_ERROR sets the maximum freq error allowed in units of bppm before setting the AFC rail indicator (AFCRL). This will take effect on the next tune. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 75

Units: bppm

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								AMMAXTUNEERR[7:0]							
Default	0x00								0x4B							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	AMMAX-TUNEERR[7:0]	Frequency error in bppm (2 ppm). Range: 0-126

---

## Property 0x4201. AM\_VALID\_RSSI\_TIME

---

AM\_VALID\_RSSI\_TIME sets the amount of time in ms to allow the RSSI/ISSI metrics to settle before evaluating. The reliability of the valid bit for identifying valid stations relies on this parameter being set properly. NOTE: Setting this property to a value lower than 3 will result in the metric not being measured correctly at tune time. To disable metric as a tune qualifier set the validation time to 0 and set the validation threshold to the minimum value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 8

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										SSIVALTIME[5:0]					
Default	0x000										0x08					

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	SSIVALTIME[5:0]	Validation time in ms Range: 0-63 - Specified in units ms.

**Property 0x4202. AM\_VALID\_RSSI\_THRESHOLD**

Sets the RSSI threshold for a valid AM Seek/Tune. If the desired channel RSSI is above this threshold, then it is considered valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 35

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								AMVALRSSI[7:0]							
<b>Default</b>	0x00								0x23							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	AMVALRSSI[7:0]	AM Seek/Tune Received Signal Strength Threshold. Range: -128-127 - Specified in units of dBuV in 1 dBuV steps. -128 : RSSI is not used as a criterion in determining the validity of a station.

**Property 0x4203. AM\_VALID\_SNR\_TIME**

AM\_VALID\_SNR\_TIME sets the amount of time in ms to allow the SNR metric to settle before evaluating. The reliability of the valid bit for identifying valid stations relies on this parameter being set properly. NOTE: Setting this property to a value lower than 20 will result in the metric not being measured correctly at tune time. To disable metric as a tune qualifier set the validation time to 0 and set the validation threshold to the minimum value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 40

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved										SNRVALTIME[5:0]					
<b>Default</b>	0x000										0x28					

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5:0	SNRVALTIME[5:0]	Validation time in ms Range: 17-63 - Specified in units ms.

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## Property 0x4204. AM\_VALID\_SNR\_THRESHOLD

---

AM\_VALID\_SNR\_THRESHOLD sets the SNR threshold for a valid AM Seek/Tune. If the desired channel SNR is above this threshold, then it is considered valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 4

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								AMVALSNR[7:0]							
Default	0x00								0x04							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	AMVALSNR[7:0]	AM Seek/Tune SNR Threshold. Range: -128-127 - Specified in units of dB in 1 dB steps. -128 : SNR is not used as a criterion in determining the validity of a station.

---

## Property 0x4205. AM\_VALID\_HDLEVEL\_THRESHOLD

---

Sets the HDLEVEL threshold for AM Seek stop. If the desired channel HDLEVEL threshold is above this threshold, then it is considered valid. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								AMVALHDLEVEL[7:0]							
Default	0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	AMVALH-DLEVEL[7:0]	AM Seek/Tune Received Signal HDLevel Threshold. Range: 0-100 - Specified in units of % in 1 % steps.



**Property 0x4300. AM\_RSQ\_INTERRUPT\_SOURCE**

AM\_RSQ\_INTERRUPT\_SOURCE configures interrupt related to Received Signal Quality metrics. See AM\_RSQ\_STATUS. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved										HDL EVE LHIN T	HDL EVE LLIN T	SNR HIN T	SNR LINT	RSS IHIN T	RSS ILIN T
Default	0x000										0	0	0	0	0	0

Bit	Name	Function
15:6	Reserved	Always write to 0x000.
5	HDLEVELHINT	Enables the interrupt for HD Level High. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if FILTERED_HDLEVEL goes above AM_RSQ_H-DLEVEL_HIGH_THRESHOLD.
4	HDLEVELLINT	Enables the interrupt for HD Level Low. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if FILTERED_HDLEVEL goes below AM_RSQ_H-DLEVEL_LOW_THRESHOLD.
3	SNRHINT	Enables the interrupt for SNR High. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if SNR goes above AM_RSQ_SNR_HIGH_THRESHOLD.
2	SNRLINT	Enables the interrupt for SNR Low. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if SNR goes below AM_RSQ_SNR_LOW_THRESHOLD.
1	RSSIHINT	Enables the interrupt for RSSI High. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if RSSI goes above AM_RSQ_RSSI_HIGH_THRESHOLD.
0	RSSILINT	Enables the interrupt for RSSI Low. 0 : Disables this interrupt source. 1 : Enable interrupt to occur if RSSI goes below AM_RSQ_RSSI_LOW_THRESHOLD.

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## Property 0x4301. AM\_RSQ\_SNR\_HIGH\_THRESHOLD

---

AM\_RSQ\_SNR\_HIGH\_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the SNR is above this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 127

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								SNRH[7:0]							
Default	0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SNRH[7:0]	AM RSQ SNR High Threshold. Range: -128-127 - Specified in units of dB in 1 dB steps.

---

## Property 0x4302. AM\_RSQ\_SNR\_LOW\_THRESHOLD

---

AM\_RSQ\_SNR\_LOW\_THRESHOLD sets the low threshold, which triggers the RSQ interrupt if the SNR is below this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: -128

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								SNRL[7:0]							
Default	0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Always write to 0xFF.
7:0	SNRL[7:0]	Low threshold for SNR interrupt in dB. Range: -128-127 - Specified in units of dB in 1 dB steps.

**Property 0x4303. AM\_RSQ\_RSSI\_HIGH\_THRESHOLD**

AM\_RSQ\_RSSI\_HIGH\_THRESHOLD sets the high threshold, which triggers the RSQ interrupt if the RSSI is above this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 127

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								RSSIH[7:0]							
<b>Default</b>	0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	RSSI[7:0]	High threshold for RSSI interrupt in dBuV. Range: -128-127 - Specified in units of dBuV in 1 dBuV steps.

**Property 0x4304. AM\_RSQ\_RSSI\_LOW\_THRESHOLD**

AM\_RSQ\_RSSI\_LOW\_THRESHOLD sets the low threshold, which triggers the RSQ interrupt if the RSSI is below this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: -128

Units: dBuV

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								RSSIL[7:0]							
<b>Default</b>	0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Always write to 0xFF.
7:0	RSSIL[7:0]	Low threshold for RSSI interrupt in dBuV. Range: -128-127 - Specified in units of dBuV in 1 dBuV steps.

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## Property 0x4305. AM\_RSQ\_HD\_DETECTION

---

Default: 48

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								SAMPLES[7:0]							
Default	0x00								0x30							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SAMPLES[7:0]	Sets the number of HD OFDM symbols to look at during HD Detection. Each HD OFDM symbol is ~5.8ms so the detection time is about 5.8 times this number. Enabling this feature will extend the tune time by this amount minus the SNR and RSSI validation times. Setting this field to 0 disables Fast HD Detect. If HD is enabled, the detection period will be larger of the RSSI or SNR validation times or SAMPLES*6ms. Range: 20-64

---

## Property 0x4306. AM\_RSQ\_HD\_LEVEL\_TIME\_CONST

---

Default: 32

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								FILTER_TIME_CONSTANT[7:0]							
Default	0x00								0x20							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	FILTER_TIME_CONSTANT[7:0]	Sets the HDLEVEL filter time constant to achieve desired HDLEVEL detection moving average. Range: 1-255

---

## Property 0x4307. AM\_RSQ\_HDDETECTED\_THD

---

Default: 0x1E1E

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	HDDETECTED_THD[7:0]								FLT_HDDETECTED_THD[7:0]							
Default	0x1E								0x1E							

Bit	Name	Function
15:8	HDDETECT-ED_THD[7:0]	Sets the HDLEVEL metric detected threshold. If HDLEVEL metric is above this threshold, HDDETECTED bit will be set. Range: 1-100
7:0	FLT_HDDETECT-ED_THD[7:0]	Sets the filtered HDLEVEL metric detected threshold. If FILTERED_HDLEVEL metric is above this threshold, FLT_HDDETECTED bit will be set. Range: 1-100

#### Property 0x4308. AM\_RSQ\_HDLEVEL\_HIGH\_THRESHOLD

AM\_RSQ\_HDLEVEL\_HIGH\_THRESHOLD sets the filtered HDLEVEL metric high threshold, which triggers the RSQ interrupt if FILTERED\_HDLEVEL is above this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 100

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HDLEVELH[7:0]							
Default	0x00								0x64							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HDLEVELH[7:0]	High threshold for FILTERED_HDLEVEL interrupt in %. Range: 0-100 - Specified in units of % in 1 % steps.

#### Property 0x4309. AM\_RSQ\_HDLEVEL\_LOW\_THRESHOLD

AM\_RSQ\_HDLEVEL\_LOW\_THRESHOLD sets the filtered HDLEVEL metric low threshold, which triggers the RSQ interrupt if FILTERED\_HDLEVEL is below this threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HDLEVELL[7:0]							
Default	0x00								0x00							

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Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HDLEVELL[7:0]	Low threshold for FILTERED_HDLEVEL interrupt in %. Range: 0-100 - Specified in units of % in 1 % steps.

---

## Property 0x4400. AM\_ACF\_INTERRUPT\_SOURCE

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AM\_ACF\_INTERRUPT\_SOURCE Enables the ACF interrupt sources. When one of the interrupts is enabled, the ACFINT bit of the status word will be set when the controlling indicator crosses the threshold set its ACF threshold property. If the interrupt is acknowledged and the condition persists, the interrupt will immediately repeat. If the ACFINT hardware interrupt is enabled by setting the ACFIEN bit of the INT\_CTL\_ENABLE, the interrupt line will toggle. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														HIGHCUT_INTEN	SMUTE_INTEN
Default	0x0000														0	0

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	HIGHCUT_INTEN	Enables the Hicut Interrupt 0 : The Hicut interrupt is disabled 1 : The Hicut interrupt is enabled
0	SMUTE_INTEN	Enables the softmute interrupt 0 : The softmute interrupt is disabled 1 : The softmute interrupt is enabled

---

## Property 0x4401. AM\_ACF\_SOFTMUTE\_THRESHOLD

---

AM\_ACF\_SOFTMUTE\_THRESHOLD sets the softmute interrupt threshold. When softmute attenuation rises above the level set by this property the SMUTE\_INT bit of the AM\_ACF\_STATUS command will be set. If the SMUTE\_INTEN bit of the AM\_ACF\_INTERRUPT\_SOURCE property is set the ACFINT interrupt will be asserted in the status word. See AM\_ACF\_INTERRUPT\_SOURCE for details. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 31

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											SMATTN_THRESH[4:0]				
Default	0x000											0x1F				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	SMATTN - THRESH[4:0]	Sets the softmute interrupt threshold in dB. Range: 0-31

#### Property 0x4402. AM\_ACF\_HIGHCUT\_THRESHOLD

AM\_ACF\_HIGHCUT\_THRESHOLD sets the high cut interrupt threshold. When the cutoff frequency falls below this threshold, the HIGHCUT\_INT bit of AM\_ACF\_STATUS command will be asserted. If the high cut interrupt is enabled, the ACFINT bit in the status word will also be asserted. See AM\_ACF\_INTERRUPT\_SOURCE for details. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved									HIGHCUT_THRESH[7:0]						
Default	0x00									0x00						

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HIGHCUT - THRESH[7:0]	High cut interrupt threshold in units of 100Hz Range: 0-200

#### Property 0x4403. AM\_ACF\_SOFTMUTE\_TOLERANCE

AM\_ACF\_SOFTMUTE\_TOLERANCE sets the distance from the final softmute value that triggers the softmute convergence flag. Convergence is indicated by setting the SMUTE\_CONV flag in the AM\_ACF\_STATUS command reply. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 2

Units: dB

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Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											SMUTE_TOL[4:0]				
Default	0x000											0x02				

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4:0	SMUTE_TOL[4:0]	When the softmute value is this many dB away from its final value the SMUTE_CONV flag will be set. Range: 0-31

---

## Property 0x4404. AM\_ACF\_HIGHCUT\_TOLERANCE

---

AM\_ACF\_HIGHCUT\_TOLERANCE Sets the distance from the final high cut freq that triggers the high cut convergence flag. Convergence is indicated by a setting HIGHCUT\_CONV flag of AM\_ACF\_STATUS command reply. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 20

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HIGHCUT_TOL[7:0]							
Default	0x00								0x14							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HIGH-CUT_TOL[7:0]	When the high cut state is N*100Hz away from its final value the HIGHCUT_CONV flag will be set. Range: 0-200



**Property 0x4405. AM\_ACF\_CONTROL\_SOURCE**

Determines if SNR or RSSI will be used as the controlling metric for ACF features. This will affect all automatically controlled features that are controlled by SNR. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												AFC_DIS	AFC_SM	Reserved	USE_RSSI
Default	0x000												0	0	0	0

Bit	Name	Function
15:4	Reserved	Always write to 0x000.
3	AFC_DIS	When set, disables the use of AFC in tune validation. 0 : Use AFC in the tune validation processes set by AM_VALID_MAX_TUNE_ERROR 1 : Disable the use of AFC for tune validation
2	AFC_SM	When set, softmute will be triggered by an AFC rail and force maximum AM_SOFTMUTE_SQ_ATTENUATION. 0 : Do not use AFC rail to force a softmute. 1 : Use AFC rail to force a softmute.
1	Reserved	Always write to 0.
0	USE_RSSI	When set, RSSI will be used instead of SNR as the controlling metric. 0 : Use SNR as the controlling metric. 1 : Use RSSI as the controlling metric.

**Property 0x4500. AM\_SOFTMUTE\_SQ\_LIMITS**

AM\_SOFTMUTE\_SQ\_LIMITS sets the SNR limits for soft mute attenuation. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0800

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	XMAX[7:0]								XMIN[7:0]							
Default	0x08								0x00							

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Bit	Name	Function
15:8	XMAX[7:0]	Value of SNR in dB which causes the minimum audio attenuation. Range: -20-64
7:0	XMIN[7:0]	Value of SNR in dB which causes the maximum audio attenuation. Range: -20-64

---

## Property 0x4501. AM\_SOFTMUTE\_SQ\_ATTENUATION

---

AM\_SOFTMUTE\_SQ\_ATTENUATION sets the softmute attenuation limits. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x000C

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTENMIN[7:0]								ATTENMAX[7:0]							
Default	0x00								0x0C							

Bit	Name	Function
15:8	ATTENMIN[7:0]	Sets the minimum attenuation amount in dB for SNR/RSSI based softmute. Range: 0-31
7:0	ATTENMAX[7:0]	Sets the maximum attenuation amount in dB for SNR/RSSI based softmute. Range: 0-31

---

## Property 0x4502. AM\_SOFTMUTE\_SQ\_ATTACK\_TIME

---

AM\_SOFTMUTE\_SQ\_ATTACK\_TIME sets the attack time to mute the audio. The attack time is the time it takes the softmute attenuation to go from YMIM to YMAX if the SNR made a step change from XMAX to XMIN. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 120

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK[15:0]															
Default	0x0078															

Bit	Name	Function
15:0	ATTACK[15:0]	The softmute attack time in ms for SNR based softmute. Range: 16-65535

---

**Property 0x4503. AM\_SOFTMUTE\_SQ\_RELEASE\_TIME**


---

AM\_SOFTMUTE\_SQ\_RELEASE\_TIME Sets the release time to unmute the audio. The release time is the time it takes the softmute attenuation to go from YMAX to YMIN if the SNR made a step change from XMIN to XMAX. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 500

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RELEASE[15:0]															
Default	0x01F4															

Bit	Name	Function
15:0	RELEASE[15:0]	The softmute release time in ms for SNR based softmute. Range: 16-65535

---

**Property 0x4600. AM\_HIGHCUT\_SQ\_LIMITS**


---

Sets the SNR/RSSI level at which hi-cut begins to band limit.

Default: 0x0a06

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SQ_MAX[7:0]								SQ_MIN[7:0]							
Default	0x0A								0x06							

Bit	Name	Function
15:8	SQ_MAX[7:0]	Value of SNR in Hz which causes the minimum audio attenuation. Range: -20-64
7:0	SQ_MIN[7:0]	Value of SNR in Hz which causes the maximum audio attenuation. Range: -20-64

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## Property 0x4601. AM\_HIGHCUT\_SQ\_CUTOFF\_FREQ

---

Sets the minimum and maximum high cut transition frequencies in units of 100Hz. When hi-cut is not engaged, the audio will be band limited to MAX. When hi-cut is fully engaged, the audio will be band limited to MIN

Default: 0x280A

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MAX[7:0]								MIN[7:0]							
Default	0x28								0x0A							

Bit	Name	Function
15:8	MAX[7:0]	Range: 10-50
7:0	MIN[7:0]	Range: 10-50

---

## Property 0x4602. AM\_HIGHCUT\_SQ\_ATTACK\_TIME

---

Sets the transition time for which high cut lowers the cutoff frequency.

Default: 16

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ATTACK[15:0]															
Default	0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Range: 1-32767

---

## Property 0x4603. AM\_HIGHCUT\_SQ\_RELEASE\_TIME

---

Sets the transition time for which high cut increases the cutoff frequency.

Default: 2000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RELEASE[15:0]															
Default	0x07D0															

Bit	Name	Function
15:0	RELEASE[15:0]	Range: 1-32767

**Property 0x4800. AM\_DEMOD\_AFC\_RANGE**

Allows the host to specify the range of the AM AFC in Hz. This allows for wideband AM. Only takes effect after a new tune.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	RANGE[15:0]															
<b>Default</b>	0x0000															

Bit	Name	Function
15:0	RANGE[15:0]	Range: 0-6000 0 : The AFC range is determined by AM_VALID_MAX_TUNE_ERROR

**Property 0x8100. DIGITAL\_SERVICE\_INT\_SOURCE**

DIGITAL\_SERVICE\_INT\_SOURCE configures which digital service events will set the DSRVINT status bit. When one of the bits described below is set, the corresponding event will cause the DSRVINT bit of the status word to be set. To clear the DSRVINT bit the GET\_DIGITAL\_SERVICE\_DATA command must be executed with the ack option. If the DSRVIEN interrupt is enabled, a host interrupt will also be generated. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0000

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved														DSR VOV FLIN T	DSR VPC KTIN T
<b>Default</b>	0x0000														0	0

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	DSRVOVFLINT	Configures the data service overflow interrupt. When this interrupt occurs data service data has been lost and indicates that the host is not retrieving the data service data in a timely fashion. 0 : Interrupt disabled 1 : Interrupt enabled
0	DSRVPCKTINT	Enables the DSRVPCKTINT interrupt of the GET_DIGITAL_SERVICE_DATA command. 0 : Interrupt disabled 1 : Interrupt enabled

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## Property 0x8101. DIGITAL\_SERVICE\_RESTART\_DELAY

DIGITAL\_SERVICE\_RESTART\_DELAY sets the delay time (in milliseconds) to restart digital service. When the system recovers from an acquisition loss, the service that had previously been started will be restarted after this delay. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 8000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	RESTART_DELAY[15:0]															
Default	0x1F40															

Bit	Name	Function
15:0	RESTART_DELAY[15:0]	DIGITAL_SERVICE_RESTART_DELAY sets the delay time (in milliseconds) to restart digital service. When the system recovers from an acquisition loss, the service that had previously been started will be restarted after this delay. Range: 100-65535

## Property 0x9101. HD\_BLEND\_OPTIONS

HD\_BLEND\_OPTIONS provides options to control HD/analog audio blend behavior. This property is only valid for Hybrid (non-All-Digital HD) Broadcasts. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x000A

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved						BANDWIDTH_MARGIN_ENABLE	MONOSTEREO_TRANSMISSION_ENABLE	BANDWIDTH_MARGIN_ENABLE	Reserved	SERVO_LOSS_NOISE_ENABLE	SERVO_LOSS_RAMP_ENABLE	BLEND_DECISION_ENABLE	BLEND_PIN_CONTROL	ACQ_LOSS[1:0]	
Default	0x00						0	0	0	0	0	0	1	0	0x2	

Bit	Name	Function
15:10	Reserved	Always write to 0x00.
9	BAND-WIDTH_MANAGEMENT_CTRL	Bandwidth management control. This option is for host to control the drive source of digital audio bandwidth management. Changes take effect upon HD_ACQUIRE. 0 : Use DAAI metric as the SQ threshold to drive the digital audio bandwidth management. 1 : Use CDNO metric as the SQ threshold to drive the digital audio bandwidth management.
8	MONO_STEREO_TRANSITION_ENABLE	This field is used to enable the audio to transition from mono to stereo, based on the audio bandwidth 0 : Disables audio to transition from mono to stereo. 1 : Enables audio to transition from mono to stereo.
7	BAND-WIDTH_MANAGEMENT_ENABLE	This field is used to enable the audio bandwidth management operation. 0 : Disables audio bandwidth management operation. 1 : Enables audio bandwidth management operation.
6	Reserved	Always write to 0.
5	SERV_LOSS_NOISE_ENABLE	This field is used to enable the comfort noise associated with a service loss. This noise is applied to the audio when audio services are lost and the service is an either SPS or MPS all-digital. The ramp transition times for the noise are programmed by the HD_BLEND_SERV_NOISE_RAMP_UP_TIME and HD_BLEND_SERV_NOISE_RAMP_DOWN_TIME properties. 0 : Disables audio ramping during a service switch. 1 : Enables audio ramping during a service switch.
4	SERV_LOSS_RAMP_ENABLE	This field is used to enable the service loss audio transition ramp. This ramp is applied to the audio when a service is lost and or reacquired. When enabled the audio will ramp to silence or comfort noise when noise is enabled using SERV_LOSS_NOISE_ENABLE. The ramp transition times are programmed by the HD_BLEND_SERV_LOSS_RAMP_UP_TIME and HD_BLEND_SERV_LOSS_RAMP_DOWN_TIME properties. 0 : Disables audio ramping during a service loss. 1 : Enables audio ramping during a service loss.
3	BLEND_DECISION_ENABLE	Enables and disables blend decision. Blend decision avoids frequent blends and allows a transition to digital only when the signal conditions exceed the preset threshold. In marginal coverage areas, Blend Decision improves the consumer experience. Changes to this bit take effect at tune time. 0 : Disables blend decision. The Blending functionality is the same as prior software releases. 1 : Enables blend decision.

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Bit	Name	Function
2	BLEND_PIN_CTRL	Blend pin control. This option is to control the state of the blend pin. Changes take effect upon HD_ACQUIRE. 0 : Automatically determine the state of the blend pin based on HD quality (normal HD operation). 1 : Force the blend pin to low (force analog blend mode).
1:0	ACQ_LOSS[1:0]	Upon digital acquisition loss, blend to silence or analog. This option only takes effect if using hybrid tune mode. 0 : Always blend to analog: Acq. loss, blend to analog, reacquire, blend to previously selected service. 1 : Always blend to silence: Acq. loss, blend to silence, reacquire, blend to previously selected service. 2 : Service dependent blend: MPS Selected: Acq. loss, blend to analog, reacquire, blend to MPS. SPSn Selected: Acq. loss, blend to silence, reacquire, blend to previous SPSn.

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## Property 0x9102. HD\_BLEND\_ANALOG\_TO\_HD\_TRANSITION\_TIME

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HD\_BLEND\_ANALOG\_TO\_HD\_TRANSITION\_TIME sets the amount of time it takes in ms to blend from analog to HD. This property only applies to primary service channel. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 750

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	BLEND_TIME[15:0]															
Default	0x02EE															

Bit	Name	Function
15:0	BLEND_TIME[15:0]	The amount of time in ms it takes blend from analog reception to HD reception.



**Property 0x9103. HD\_BLEND\_HD\_TO\_ANALOG\_TRANSITION\_TIME**

HD\_BLEND\_HD\_TO\_ANALOG\_TRANSITION\_TIME sets the amount of time it takes in ms to blend from HD to analog. This property only applies to primary service channel. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 100

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	BLEND_TIME[15:0]															
<b>Default</b>	0x0064															

Bit	Name	Function
15:0	BLEND_TIME[15:0]	The amount of time in ms it takes blend from analog reception to HD reception.

**Property 0x9106. HD\_BLEND\_DYNAMIC\_GAIN**

HD\_BLEND\_DYNAMIC\_GAIN sets the digital audio dynamic linear scaling factor. Setting DGAIN\_OVERRIDE bit to 1 will override the broadcaster specified digital gain. The DGAIN field is a signed 8 bit fractional number where the linear gain is equal to DGAIN/128. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: Q0.7

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved							DGAIN_OVERRIDE	DGAIN[7:0]							
<b>Default</b>	0x00							0	0x00							

Bit	Name	Function
15:9	Reserved	Always write to 0x00.
8	DGAIN_OVERRIDE	override the broadcaster specified digital gain. 0 : Do not override the broadcaster specified digital gain. 1 : Override the broadcaster specified digital gain with gain specified in DGAIN field.
7:0	DGAIN[7:0]	HD audio linear scaling factor (Q0.7) format. Range: -128-127

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## Property 0x9109. HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_THRESHOLD

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This property defines the analog to digital blend threshold. When Cd/No exceeds this threshold for HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_DELAY milliseconds, blend to digital.

Default: 67

Units: dBHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								A2D_THRESHOLD[7:0]							
Default	0x00								0x43							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	A2D_THRESHOLD[7:0]	defines the analog to digital blend threshold.

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## Property 0x910A. HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_DELAY

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This property defines the analog to digital blend delay. When Cd/No exceeds HD\_BLEND\_DECISION\_ANA\_TO\_DIG\_THRESHOLD for the given period of milliseconds, blend to digital.

Default: 5000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	A2D_DELAY[15:0]															
Default	0x1388															

Bit	Name	Function
15:0	A2D_DELAY[15:0]	defines the analog to digital blend delay.

**Property 0x910B. HD\_BLEND\_SERV\_LOSS\_RAMP\_UP\_TIME**

HD\_BLEND\_SERV\_LOSS\_RAMP\_UP\_TIME sets the audio service re-acquisition unmute time in ms. When audio is acquired the audio will ramp up to full level in the time programmed. Service loss ramping is enabled via the HD\_BLEND\_OPTIONS property.

Default: 750

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	SERV_LOSS_RAMP_UP_TIME[15:0]															
<b>Default</b>	0x02EE															

Bit	Name	Function
15:0	SERV_LOSS_RAMP_UP_TIME[15:0]	HD_BLEND_SERV_LOSS_RAMP_UP_TIME sets the audio service re-acquisition unmute time in ms. When audio is acquired the audio will ramp up to full level in the time programmed. Service loss ramping is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 50-2000

**Property 0x910C. HD\_BLEND\_SERV\_LOSS\_RAMP\_DOWN\_TIME**

HD\_BLEND\_SERV\_LOSS\_RAMP\_DOWN\_TIME sets the audio service lost mute time in ms. When audio is lost the audio will ramp down to mute in the time programmed. Service loss ramping is enabled via the HD\_BLEND\_OPTIONS property.

Default: 250

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	SERV_LOSS_RAMP_DOWN_TIME[15:0]															
<b>Default</b>	0x00FA															

Bit	Name	Function
15:0	SERV_LOSS_RAMP_DOWN_TIME[15:0]	HD_BLEND_SERV_LOSS_RAMP_DOWN_TIME sets the audio service lost mute time in ms. When audio is lost the audio will ramp down to mute in the time programmed. Service loss ramping is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 50-2000

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**Property 0x910D. HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_UP\_TIME**

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HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_UP\_TIME sets the comfort noise unmute time in ms. When audio is lost and the comfort noise is enabled the noise will ramp up to the level specified HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL in the time programmed. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 1000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_RAMP_UP_TIME[15:0]															
Default	0x03E8															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_RAMP_UP_TIME[15:0]	HD_BLEND_SERV_LOSS_NOISE_RAMP_UP_TIME sets the comfort noise unmute time in ms. When audio is lost and the comfort noise is enabled the noise will ramp up to the level specified HD_BLEND_SERV_LOSS_NOISE_LEVEL in the time programmed. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 50-2000

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**Property 0x910E. HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_DOWN\_TIME**

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HD\_BLEND\_SERV\_LOSS\_NOISE\_RAMP\_DOWN\_TIME sets the comfort noise mute time in ms. When audio is acquired and comfort noise is enabled the noise will ramp down to 0 in the time programmed. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 250

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_RAMP_DOWN_TIME[15:0]															
Default	0x00FA															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_RAMP_DOWN_TIME[15:0]	HD_BLEND_SERV_LOSS_NOISE_RAMP_DOWN_TIME sets the comfort noise mute time in ms. When audio is acquired and comfort noise is enabled the noise will ramp down to 0 in the time programmed. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 50-2000

**Property 0x910F. HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL**

HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL sets the unmuted comfort noise level as a fractional number between 0 and 1. Where 0 is off and 0x3FFF is 0dBFS. The actual level can be calculated from  $N = 20\log(\text{HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL}/131072)$ , where N will be in dBFS. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 512

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_LEVEL[15:0]															
Default	0x0200															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_LEVEL[15:0]	HD_BLEND_SERV_LOSS_NOISE_LEVEL sets the unmuted comfort noise level as a fractional number between 0 and 1. Where 0 is off and 0x3FFF is 0dBFS. The actual level can be calculated from $N = 20\log(\text{HD\_BLEND\_SERV\_LOSS\_NOISE\_LEVEL}/131072)$ , where N will be in dBFS. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Changes to this property will take effect at tune/acquisition time. Range: 0-16383

**Property 0x9110. HD\_BLEND\_SERV\_LOSS\_NOISE\_DAAI\_THRESHOLD**

HD\_BLEND\_SERV\_LOSS\_NOISE\_DAAI\_THRESHOLD sets the DAAI level below which comfort noise will engage and audio will ramp down (if loss ramping is enabled). A lower setting of this property will result more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove the DAAI metric from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 only the availability of digital audio will control the noise state. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 30

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_DAAI_THRESHOLD[15:0]															
Default	0x001E															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_DAAI_THRESHOLD[15:0]	HD_BLEND_SERV_LOSS_NOISE_DAAI_THRESHOLD sets the DAAI level below which comfort noise will engage and audio will ramp down (if loss ramping is enabled). A lower setting of this property will result more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove the DAAI metric from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 only the availability of digital audio will control the noise state. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Range: 0-60

## Property 0x9111. HD\_BLEND\_SERV\_LOSS\_NOISE\_AUDIO\_START\_DELAY

HD\_BLEND\_SERV\_LOSS\_NOISE\_AUDIO\_START\_DELAY sets the amount of time in 40ms increments to delay the audio once audio is available and DAAI is greater then the value set by HD\_BLEND\_SERV\_LOSS\_NOISE\_DAAI\_THRESHOLD. A lower setting of this property will result more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove audio start delay from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 no audio holdoff delay will be applied. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD\_BLEND\_OPTIONS property.

Default: 4

Units: 40ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	SERV_LOSS_NOISE_AUDIO_START_DELAY[15:0]															
Default	0x0004															

Bit	Name	Function
15:0	SERV_LOSS_NOISE_AUDIO_START_DELAY[15:0]	HD_BLEND_SERV_LOSS_NOISE_AUDIO_START_DELAY sets the amount of time in 40ms increments to delay the audio once audio is available and DAAI is greater then the value set by HD_BLEND_SERV_LOSS_NOISE_DAAI_THRESHOLD. A lower setting of this property will result more thrashing between audio and noise in poor signal conditions. Setting this property to 0 will remove audio start delay from consideration by the comfort noise decision algorithm. In the case where this property is set to 0 no audio holdoff delay will be applied. This will result in more noise-to-audio and audio-to-noise transitions which may not be desired. Service loss comfort noise is enabled via the HD_BLEND_OPTIONS property. Range: 0-200

**Property 0x9120. HD\_BLEND\_BWM\_CTRL\_THRES**

HD\_BLEND\_BWM\_CTRL\_THRES sets the signal quality threshold at which bandwidth management begins to engage.

Default: 0x003C

Units: dBHz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	BWM_CTRL_THRES[15:0]															
<b>Default</b>	0x003C															

Bit	Name	Function
15:0	BWM_CTRL_THRES[15:0]	HD_BLEND_BWM_CTRL_THRES sets the signal quality threshold at which bandwidth management begins to engage. Range: 0-100

**Property 0x9121. HD\_BLEND\_BWM\_CTRL\_LEVEL**

HD\_BLEND\_CTRL\_LEVEL sets the minimum and maximum bandwidth of digital audio signal in 100Hz. When the signal conditions are above the bandwidth step threshold the audio bandwidth will increment to full level in the attack time programmed. The minimum setting is the blend starting point bandwidth of digital audio signal, which is the the bandwidth at the transition blend point of analog to the digital signal.

Default: 0x9628

Units: Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	MAX[7:0]								MIN[7:0]							
<b>Default</b>	0x96								0x28							

Bit	Name	Function
15:8	MAX[7:0]	Range: 10-200
7:0	MIN[7:0]	Range: 10-200

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## Property 0x9122. HD\_BLEND\_BWM\_CTRL\_RAMP\_UP\_TIME

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HD\_BLEND\_BWM\_CTRL\_RAMP\_UP\_TIME Sets the transition time for which bandwidth management increases the cutoff frequency

Default: 5000

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	BWM_CTRL_RAMP_UP_TIME[15:0]															
Default	0x1388															

Bit	Name	Function
15:0	BWM_C- TRL_RAMP_UP_ TIME[15:0]	HD_BLEND_BWM_CTRL_RAMP_UP_TIME Sets the transition time for which bandwidth management increases the cutoff frequency Range: 1-32767

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## Property 0x9123. HD\_BLEND\_BWM\_CTRL\_RAMP\_DOWN\_TIME

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HD\_BLEND\_BWM\_CTRL\_RAMP\_DOWN\_TIME Sets the transition time for which bandwidth management lowers the cutoff frequency

Default: 200

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	BWM_CTRL_RAMP_DOWN_TIME[15:0]															
Default	0x00C8															

Bit	Name	Function
15:0	BWM_C- TRL_RAMP_DOW N_TIME[15:0]	HD_BLEND_BWM_CTRL_RAMP_DOWN_TIME Sets the transition time for which bandwidth management lowers the cutoff frequency Range: 1-32767



**Property 0x9124. HD\_BLEND\_BWM\_BLEND\_THRES**

HD\_BLEND\_BWM\_BLEND\_THRES sets the bandwidth threshold in 100Hz at which digital audio mono to stereo blending transition begins to engage.

Default: 0x0032

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	BWM_BLEND_THRES[15:0]															
<b>Default</b>	0x0032															

Bit	Name	Function
15:0	BWM_BLEND_THRES[15:0]	HD_BLEND_BWM_BLEND_THRES sets the bandwidth threshold in 100Hz at which digital audio mono to stereo blending transition begins to engage. Range: 0-200

**Property 0x9125. HD\_BLEND\_BWM\_BLEND\_LEVEL**

HD\_BLEND\_BWM\_BLEND\_LEVEL sets minimum and maximum digital audio stereo separation in dB.

Default: 0x7F00

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	MAX[7:0]								MIN[7:0]							
<b>Default</b>	0x7F								0x00							

Bit	Name	Function
15:8	MAX[7:0]	Range: 0-127
7:0	MIN[7:0]	Range: 0-127

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## Property 0x9126. HD\_BLEND\_BWM\_BLEND\_RAMP\_UP\_TIME

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HD\_BLEND\_BWM\_BLEND\_RAMP\_UP\_TIME Sets the transition time for which digital audio is forced to mono form stereo

Default: 400

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	BWM_BLEND_RAMP_UP_TIME[15:0]															
Default	0x0190															

Bit	Name	Function
15:0	BWM_BLEND_RAMP_UP_TIME[15:0]	HD_BLEND_BWM_BLEND_RAMP_UP_TIME Sets the transition time for which digital audio is forced to mono form stereo Range: 1-32767

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## Property 0x9127. HD\_BLEND\_BWM\_BLEND\_RAMP\_DOWN\_TIME

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HD\_BLEND\_BWM\_BLEND\_RAMP\_DOWN\_TIME Sets the transition time for which digital audio is blended into stereo from mono

Default: 16

Units: ms

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	BWM_BLEND_RAMP_DOWN_TIME[15:0]															
Default	0x0010															

Bit	Name	Function
15:0	BWM_BLEND_RAMP_DOWN_TIME[15:0]	HD_BLEND_BWM_BLEND_RAMP_DOWN_TIME Sets the transition time for which digital audio is blended into stereo from mono Range: 1-32767

**Property 0x9200. HD\_DIGRAD\_INTERRUPT\_SOURCE**

HD\_DIGRAD\_INTERRUPT\_SOURCE configures interrupts related to digital receiver (HD\_DIGRAD\_STATUS). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								HDL OG OIN TEN	SRC ANA INTE N	SRC DIGI NTE N	Res erve d	AUD ACQ INTE N	ACQ INTE N	CDN RHI NTE N	CDN RLIN TEN
<b>Default</b>	0x00								0	0	0	0	0	0	0	0

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7	HDLOGOINTEN	Enables the HD logo interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
6	SRCANAINTE	Enables the analog audio source interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
5	SRCDIGINTEN	Enables the digital audio source interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
4	Reserved	Always write to 0.
3	AUDACQINTEN	Enables the audio acquire interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
2	ACQINTEN	Ensemble acquisition change interrupt enable. 0 : Interrupt disabled 1 : Interrupt enabled
1	CDNRHINTEN	Enables the CDNR high interrupt. 0 : Interrupt disabled 1 : Interrupt enabled
0	CDNRLINTEN	Enables the CDNR low interrupt. 0 : Interrupt disabled 1 : Interrupt enabled

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**Property 0x9201. HD\_DIGRAD\_CDNR\_LOW\_THRESHOLD**

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HD\_DIGRAD\_CDNR\_LOW\_THRESHOLD sets the CDNR level (in dB) below which the CDNRLINT interrupt will occur. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	CDNR_LOW_THRESHOLD[15:0]															
Default	0x0000															

Bit	Name	Function
15:0	CDNR_LOW_THRESHOLD[15:0]	This property sets the CDNR level (in dB) below which the CDNRLINT interrupt will occur. To make this interrupt set the DACQINT in the status word the CDN-RLINTEN bit must be set in the HD_DIGRAD_INTERRUPT_SOURCE property.

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**Property 0x9202. HD\_DIGRAD\_CDNR\_HIGH\_THRESHOLD**

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HD\_DIGRAD\_CDNR\_HIGH\_THRESHOLD sets the CDNR level (in dB) above which the CDNRHINT interrupt will occur. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 127

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	CDNR_HIGH_THRESHOLD[15:0]															
Default	0x007F															

Bit	Name	Function
15:0	CDNR_HIGH_THRESHOLD[15:0]	This property sets the CDNR level (in dB) above which the CDNRHINT interrupt will occur. To make this interrupt set the DACQINT in the status word the CDN-RHINTEN bit must be set in the HD_DIGRAD_INTERRUPT_SOURCE property.

**Property 0x9300. HD\_EVENT\_INTERRUPT\_SOURCE**

HD\_EVENT\_INTERRUPT\_SOURCE property configures interrupts related to HD Events (see DEVENTINT status bit). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								DIN- FO_I NTE N	AIN- FO_I NTE N	Res erve d	ALE RT_I NTE N	PSD _INT EN	SIS _INT EN	DSR VLIS T_IN TEN	ASR VLIS T_IN TEN
<b>Default</b>	0x00								0	0	0	0	0	0	0	0

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7	DINFO_INTEN	Enables the Data Info interrupt. 0 : Disables the Data Info interrupt. 1 : Enable interrupt to occur whenever a updated data info is availabe.
6	AINFO_INTEN	Enables the Audio Info interrupt. 0 : Disables the Audio Info interrupt. 1 : Enable interrupt to occur whenever a updated audio info is availabe.
5	Reserved	Always write to 0.
4	ALERT_INTEN	Enables the Alert interrupt. 0 : Disables the Alert interrupt. 1 : Enable interrupt to occur whenever a new Alert occurs.
3	PSD_INTEN	Enables the Program Service Data (PSD) interrupt. 0 : Disables the PSD interrupt. 1 : Enable interrupt to occur whenever PSD is available.
2	SIS_INTEN	Enables the Station Information (SIS) interrupt. 0 : Disables the SIS interrupt. 1 : Enable interrupt to occur whenever SIS is availabe.
1	DSRVLIST_INTEN	Enables the data service list event interrupt. 0 : Disables the service list update interrupt. 1 : Enable interrupt to occur whenever a data service list update occurs.
0	ASRVLIST_INTEN	Enables the audio service list event interrupt. 0 : Disables the audio service list update interrupt. 1 : Enable interrupt to occur whenever an audio service list update occurs.

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## Property 0x9301. HD\_EVENT\_SIS\_CONFIG

HD\_EVENT\_SIS\_CONFIG configures which basic SIS information is returned by the HD\_GET\_STATION\_INFO command BASICSIS option. Takes effect at tune time. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0017

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved											LOCATION	RSVD	NAME_LF	NAME_SF	ID
Default	0x000											1	0	1	1	1

Bit	Name	Function
15:5	Reserved	Always write to 0x000.
4	LOCATION	When set the station location will be returned when BASICSIS option is used in the HD_GET_STATION_INFO command.
3	RSVD	Reserved
2	NAME_LF	When set the long form station name will be returned when BASICSIS option is used with the HD_GET_STATION_INFO command.
1	NAME_SF	When set the short form station name will be returned when BASICSIS option is used with the HD_GET_STATION_INFO command.
0	ID	When set the station ID will be returned when BASICSIS option is used in the HD_GET_STATION_INFO command.

## Property 0x9302. HD\_EVENT\_ALERT\_CONFIG

HD\_EVENT\_ALERT\_CONFIG configures HD alerts. Alert information is returned by the HD\_GET\_ALERT\_MSG command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x0001

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved														PLAY_TONE	ENABLE
Default	0x0000														0	1

Bit	Name	Function
15:2	Reserved	Always write to 0x0000.
1	PLAY_TONE	When set the HD radio will automatically insert a 2 second tone into the audio every time an alert is sent by the broadcaster. This can be quite often so it is recommended that the host use the HD_PLAY_ALERT_TONE command to play a tone each time a unique alert message is received.
0	ENABLE	When set the Alert system is enabled. Please see the HD_GET_ALERT_MSG command and the HD_GET_EVENT_STATUS commands for more details about alerts.

### Property 0x9400. HD\_ACF\_INTERRUPT\_SOURCE

HD\_ACF\_COMF\_NOISE\_THRESHOLD Enables the HD ACF interrupt sources. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved													STE- REO_ SEP_ INTEN	AUD IO_B W_ INTEN	COMF_ NOISE_ INTEN
Default	0x0000													0	0	0

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2	STE- REO_SEP_INTEN	Enables the HD ACF stereo separation interrupt 0 : The HD ACF stereo separation interrupt is disabled 1 : The HD ACF stereo separation interrupt is enabled
1	AUDIO_BW_INTEN	Enables the HD ACF audio bandwidth interrupt 0 : The HD ACF audio bandwidth interrupt is disabled 1 : The HD ACF audio bandwidth interrupt is enabled
0	COM- F_NOISE_INTEN	Enables the HD ACF comfort noise level interrupt 0 : The HD ACF comfort noise level interrupt is disabled 1 : The HD ACF comfort noise level interrupt is enabled

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## Property 0x9401. HD\_ACF\_COMF\_NOISE\_THRESHOLD

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HD\_ACF\_COMF\_NOISE\_THRESHOLD Sets the comfort noise interrupt threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 512

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	COMF_NOISE_THRESH[15:0]															
Default	0x0200															

Bit	Name	Function
15:0	COMF_NOISE_-THRESH[15:0]	Sets the comfort noise interrupt threshold. Range: 0-16383

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## Property 0x9402. HD\_ACF\_AUDIO\_BW\_THRESHOLD

---

HD\_ACF\_AUDIO\_BW\_THRESHOLD Sets the HD audio bandwidth interrupt threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 40

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								AUDIO_BW_THRESH[7:0]							
Default	0x00								0x28							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	AUDIO_BW_-THRESH[7:0]	Sets the HD audio bandwidth interrupt threshold in 100Hz. Range: 0-150



**Property 0x9403. HD\_ACF\_STEREO\_SEP\_THRESHOLD**

HD\_ACF\_STEREO\_SEP\_THRESHOLD Sets the HD audio stereo separation interrupt threshold. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: dB

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								STEREO_SEP_THRESH[7:0]							
<b>Default</b>	0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	STEREO_SEP_THRESH[7:0]	Sets the HD audio stereo separation interrupt threshold in dB. Range: 0-127

**Property 0x9404. HD\_ACF\_COMF\_NOISE\_TOLERANCE**

HD\_ACF\_COMF\_NOISE\_TOLERANCE Sets the distance from the final comfort noise level that triggers the comfort noise convergence flag. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 5

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	COMF_NOISE_TOL[15:0]															
<b>Default</b>	0x0005															

Bit	Name	Function
15:0	COM-F_NOISE_TOL[15:0]	When the comfort noise level is this many away from its maximum value the COM-F_NOISE_CONV flag will get set. Range: 0-100

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## Property 0x9405. HD\_ACF\_AUDIO\_BW\_TOLERANCE

---

HD\_ACF\_AUDIO\_BW\_TOLERANCE Sets the distance from the final HD audio bandwidth that triggers the hd audio bandwidth convergence flag. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 2

Units: 100Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								BW_TOL[7:0]							
Default	0x00								0x02							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	BW_TOL[7:0]	When the HD audio bandwidth is this many 100Hz away from its minimum value the AUDIO_BW_TOLERANCE flag will get set. Range: 0-100

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## Property 0x9406. HD\_ACF\_STEREO\_SEP\_TOLERANCE

---

HD\_ACF\_STEREO\_SEP\_TOLERANCE Sets the distance from the final HD audio stereo separation that triggers the hd audio stereo separation convergence flag. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 5

Units: %

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								STEREO_SEP_TOL[7:0]							
Default	0x00								0x05							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	STEREO_SEP_TOL[7:0]	When the HD audio stereo separation is this many % away from its minimum value the STEREO_SEP_TOLERANCE flag will get set. Range: 0-100

**Property 0x9500. HD\_PSD\_ENABLE**

HD\_PSD\_ENABLE sets which audio services will provide program service data. The PSD data is forwarded through the data service DSRV interface. Once PSD data is available it is forwarded automatically for each service that is enabled. The PSD data packet is formatted as a collection of ID3 tags that must be decoded by the host. Please refer to the DSRV Users guide and the iBiquity Advanced Applications Services Guide for more information on using the DSRV and PSD information. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ASP S7	ASP S6	ASP S5	ASP S4	ASP S3	ASP S2	ASP S1	AMP S	SPS 7	SPS 6	SPS 5	SPS 4	SPS 3	SPS 2	SPS 1	MPS
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Bit	Name	Function
15	ASPS7	Always enable program services data for Secondary Program Service 7. This PSD will be forwarded with a CID of 0x5207.
14	ASPS6	Always enable program services data for Secondary Program Service 6. This PSD will be forwarded with a CID of 0x5206.
13	ASPS5	Always enable program services data for Secondary Program Service 5. This PSD will be forwarded with a CID of 0x5205.
12	ASPS4	Always enable program services data for Secondary Program Service 4. This PSD will be forwarded with a CID of 0x5204.
11	ASPS3	Always enable program services data for Secondary Program Service 3. This PSD will be forwarded with a CID of 0x5203.
10	ASPS2	Always enable program services data for Secondary Program Service 2. This PSD will be forwarded with a CID of 0x5202.
9	ASPS1	Always enable program services data for Secondary Program Service 1. This PSD will be forwarded with a CID of 0x5201.
8	AMPS	Always enable program services data for Main Program Service. This PSD will be forwarded with a CID of 0x5100.
7	SPS7	Enable program services data for Secondary Program Service 7 when tuned to this service. This PSD will be forwarded with a CID of 0x5207.
6	SPS6	Enable program services data for Secondary Program Service 6 when tuned to this service. This PSD will be forwarded with a CID of 0x5206.
5	SPS5	Enable program services data for Secondary Program Service 5 when tuned to this service. This PSD will be forwarded with a CID of 0x5205.
4	SPS4	Enable program services data for Secondary Program Service 4 when tuned to this service. This PSD will be forwarded with a CID of 0x5204.
3	SPS3	Enable program services data for Secondary Program Service 3 when tuned to this service. This PSD will be forwarded with a CID of 0x5203.
2	SPS2	Enable program services data for Secondary Program Service 2 when tuned to this service. This PSD will be forwarded with a CID of 0x5202.

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Bit	Name	Function
1	SPS1	Enable program services data for Secondary Program Service 1 when tuned to this service. This PSD will be forwarded with a CID of 0x5201.
0	MPS	Enable program services data for the Main Program Service when tuned to this service. This PSD will be forwarded with a CID of 0x5100.

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## Property 0x9501. HD\_PSD\_FIELD\_MASK

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This property sets which PSD fields will be decoded and available via HD\_GET\_PSD\_DECODE.

Default: 0xFFFF

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ID	OWNER	DESC	NAME	RECV	URL	VALID	PRICE	Reserved	TEXT	SHORT	LANG	GENRE	ALBUM	ARTIST	TITLE
Default	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Bit	Name	Function
15	ID	UFID: Owner ID
14	OWNER	UFID: Owner
13	DESC	Commercial: Description
12	NAME	Commercial: Name of Seller
11	RECV	Commercial: Received As
10	URL	Commercial: Contact URL
9	VALID	Commercial: Valid Until
8	PRICE	Commercial: Price
7	Reserved	Always write to 1.
6	TEXT	Comment: The actual text
5	SHORT	Comment: Short Content Description
4	LANG	Comment: Language
3	GENRE	Genre
2	ALBUM	Album
1	ARTIST	Artist
0	TITLE	Title

**Property 0x9700. HD\_AUDIO\_CTRL\_FRAME\_DELAY**

HD\_AUDIO\_CTRL\_FRAME\_DELAY controls the value of the delay of decoded digital audio samples relative to the output of the audio quality indicator. For CODEC modes 0 and 2, the actual delay value is a sum of this parameter and the Digital Audio Delay for a given codec mode, see HD\_CODEC properties. The maximum hold-off for HD is 18 audio frames (0x12). Any value exceeding this maximum is limited to 0x12. This parameter is applicable in hybrid service modes only. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 6

Units: frames

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												DELAY[3:0]			
Default	0x000												0x6			

Bit	Name	Function
15:4	Reserved	Always write to 0x000.
3:0	DELAY[3:0]	The number of audio frames to delay the audio. Range: 4-21

**Property 0x9701. HD\_AUDIO\_CTRL\_PROGRAM\_LOSS\_THRESHOLD**

HD\_AUDIO\_CTRL\_PROGRAM\_LOSS\_THRESHOLD controls the duration before reverting to MPS audio after an SPS audio program is removed or lost. The same value applies to all SPS audio programs. The timeout is calculated as follows: Timeout = Value X 1.486 seconds. To hold the SPS audio program indefinitely, a value of 0 should be used. In this case, if the SPS audio program is lost or terminated, the system will not automatically revert to MPS and the SPS audio output will be muted and will continue to dwell on the selected supplemental program until commanded otherwise by the HC/listener. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: frames

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												TRESH[3:0]			
Default	0x000												0x0			

Bit	Name	Function
15:4	Reserved	Always write to 0x000.
3:0	TRESH[3:0]	The delay before reverting to MPS audio. Range: 0-14

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## Property 0x9702. HD\_AUDIO\_CTRL\_BALL\_GAME\_ENABLE

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HD\_AUDIO\_CTRL\_BALL\_GAME\_ENABLE selects the audio output for hybrid waveforms when the TX Blend Control Status (BCTL\_EN of HD\_DIGRAD\_STATUS) bits are set to 01 (i.e., ballgame mode). Since analog diversity delay is not applied by the transmitter in this state, the receiver must disable audio blending and force either analog or digital audio to avoid audible discontinuities. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															MODE
Default	0x0000															1

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	MODE	When 1 selects Ball Game mode. Range: 0-1

---

## Property 0x9900. HD\_CODEC\_MODE\_0\_BLEND\_THRESHOLD

---

HD\_CODEC\_MODE\_0\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 0. The same threshold applies to all audio programs that utilize codec mode 0. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												LEVEL[2:0]			
Default	0x0000												0x3			

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

**Property 0x9901. HD\_CODEC\_MODE\_0\_SAMPLES\_DELAY**

HD\_CODEC\_MODE\_0\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved		COUNT[13:0]													
<b>Default</b>	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

**Property 0x9902. HD\_CODEC\_MODE\_0\_BLEND\_RATE**

HD\_CODEC\_MODE\_0\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								HOLD[7:0]							
<b>Default</b>	0x00								0x01							

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Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

---

## Property 0x9903. HD\_CODEC\_MODE\_2\_BLEND\_THRESHOLD

---

HD\_CODEC\_MODE\_2\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 2. The same threshold applies to all audio programs that utilize codec mode 2. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved													LEVEL[2:0]		
Default	0x0000													0x3		

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

## Property 0x9904. HD\_CODEC\_MODE\_2\_SAMPLES\_DELAY

---

HD\_CODEC\_MODE\_2\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 7376

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x1CD0													



Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

**Property 0x9905. HD\_CODEC\_MODE\_2\_BLEND\_RATE**


---

HD\_CODEC\_MODE\_2\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

---

**Property 0x9906. HD\_CODEC\_MODE\_10\_BLEND\_THRESHOLD**


---

HD\_CODEC\_MODE\_10\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 10. The same threshold applies to all audio programs that utilize codec mode 10. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												LEVEL[2:0]			
Default	0x0000												0x3			

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Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

## Property 0x9907. HD\_CODEC\_MODE\_10\_SAMPLES\_DELAY

---

HD\_CODEC\_MODE\_10\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

## Property 0x9908. HD\_CODEC\_MODE\_10\_BLEND\_RATE

---

HD\_CODEC\_MODE\_10\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved								HOLD[7:0]							
<b>Default</b>	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

#### Property 0x9909. HD\_CODEC\_MODE\_13\_BLEND\_THRESHOLD

HD\_CODEC\_MODE\_13\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 13. The same threshold applies to all audio programs that utilize codec mode 13. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
<b>Name</b>	Reserved												LEVEL[2:0]			
<b>Default</b>	0x0000												0x3			

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

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---

## Property 0x990A. HD\_CODEC\_MODE\_13\_SAMPLES\_DELAY

---

HD\_CODEC\_MODE\_13\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

## Property 0x990B. HD\_CODEC\_MODE\_13\_BLEND\_RATE

---

HD\_CODEC\_MODE\_13\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

---

**Property 0x990C. HD\_CODEC\_MODE\_1\_BLEND\_THRESHOLD**


---

HD\_CODEC\_MODE\_1\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 1. The same threshold applies to all audio programs that utilize codec mode 1. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved													LEVEL[2:0]		
Default	0x0000													0x3		

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

**Property 0x990D. HD\_CODEC\_MODE\_1\_SAMPLES\_DELAY**


---

HD\_CODEC\_MODE\_1\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

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Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

## Property 0x990E. HD\_CODEC\_MODE\_1\_BLEND\_RATE

HD\_CODEC\_MODE\_1\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

## Property 0x990F. HD\_CODEC\_MODE\_3\_BLEND\_THRESHOLD

HD\_CODEC\_MODE\_3\_BLEND\_THRESHOLD sets the threshold for determining when to blend between the digital HD stream and the analog stream for codec mode 3. The same threshold applies to all audio programs that utilize codec mode 3. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved												LEVEL[2:0]			
Default	0x0000												0x3			

Bit	Name	Function
15:3	Reserved	Always write to 0x0000.
2:0	LEVEL[2:0]	0 : No blending. Always output analog audio 1 : Blend to analog the earliest 2 : Blend to analog the second earliest 3 : Blend to analog the third earliest 4 : Stay in digital the longest 7 : No blending - always output digital audio

---

**Property 0x9910. HD\_CODEC\_MODE\_3\_SAMPLES\_DELAY**


---

HD\_CODEC\_MODE\_3\_SAMPLES\_DELAY property is used to perform fine time alignment between the HD digital audio and analog audio to ensure phase aligned blending. Each unit of sample delay represents approximately 22.7us and this delay is applied to the HD audio. Note: Changes take effect upon hd\_acquire or tune command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Units: audio samples

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved		COUNT[13:0]													
Default	0x0		0x0000													

Bit	Name	Function
15:14	Reserved	Always write to 0x0.
13:0	COUNT[13:0]	The amount to delay the digital audio stream playback in audio samples.

---

**Property 0x9911. HD\_CODEC\_MODE\_3\_BLEND\_RATE**


---

HD\_CODEC\_MODE\_3\_BLEND\_RATE configures the hysteresis in the blending process. Blend hysteresis has two main components affected by this property; a step size for the analog hold duration, and the digital duration required for state reset. Each time the system blends to analog, the amount of time the system will hold in analog mode in s is incremented by one step (HOLD). The system will remain in analog mode for this analog hold duration regardless of the return of digital demodulation success. For example: with a step size (HOLD) of 5, the analog hold duration steps would be 1.1 s, 6.1 s, 11.1 s, with a maximum hold duration of (1.1 + 5 \* HOLD). The analog hold duration will be reset to its lowest value (1.1 s) whenever the system remains in digital mode longer than HOLD s. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 1

Units: s

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Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								HOLD[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	HOLD[7:0]	Both the step size for the analog hold duration and the digital duration required for state reset, both in s. Range: 1-8

---

## Property 0x9B00. HD\_EZBLEND\_ENABLE

---

This property enables and disables HD EZ blend.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables and disables HD EZ blend. 0 : Use codec mode blend parameters. 1 : Use HD EZ blend parameters.

---

## Property 0x9B01. HD\_EZBLEND\_MPS\_BLEND\_THRESHOLD

---

This property sets the threshold for determining when to blend between digital audio and analog audio for Hybrid MPS.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								MPS_BLEND_THRESHOLD[7:0]							
Default	0x00								0x03							



Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	MPS_BLEND_THRESHOLD[7:0]	sets the threshold for determining when to blend between digital audio and analog audio for Hybrid MPS. Range: 0-7

---

**Property 0x9B02. HD\_EZBLEND\_MPS\_BLEND\_RATE**


---

This property configures the hysteresis in the blending process for Hybrid MPS.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								MPS_BLEND_RATE[7:0]							
Default	0x00								0x03							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	MPS_BLEND_RATE[7:0]	This property configures the hysteresis in the blending process for Hybrid MPS. Range: 1-8

---

**Property 0x9B03. HD\_EZBLEND\_MPS\_SAMPLES\_DELAY**


---

This property is used to perform audio alignment between analog and Hybrid MPS digital audio.

Default: 7376

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	MPS_SAMPLES_DELAY[15:0]															
Default	0x1CD0															

Bit	Name	Function
15:0	MPS_SAMPLES_DELAY[15:0]	This property is used to perform audio alignment between analog and Hybrid MPS digital audio.

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---

## Property 0x9B04. HD\_EZBLEND\_SPS\_BLEND\_THRESHOLD

---

This property sets the threshold for determining when to blend between digital audio and mute for SPS programs as well as All Digital MPS programs.

Default: 3

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								SPS_BLEND_THRESHOLD[7:0]							
Default	0x00								0x03							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SPS_BLEND_THRESHOLD[7:0]	sets the threshold for determining when to blend between digital audio and mute for SPS programs as well as All Digital MPS programs. Range: 0-7

---

## Property 0x9B05. HD\_EZBLEND\_SPS\_BLEND\_RATE

---

This property configures the hysteresis in the blending process for SPS programs and All Digital MPS programs.

Default: 1

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved								SPS_BLEND_RATE[7:0]							
Default	0x00								0x01							

Bit	Name	Function
15:8	Reserved	Always write to 0x00.
7:0	SPS_BLEND_RATE[7:0]	configures the hysteresis in the blending process for SPS programs and All Digital MPS programs. Range: 1-8

**Property 0x9F00. HD\_ENHANCED\_STREAM\_HOLDOFF\_CONFIG**

When the ENABLE bit of HD\_ENHANCED\_STREAM\_HOLDOFF\_CONFIG is set to 1, then under weak signal conditions, a hold-off is applied to enhanced audio until the signal quality exceeds certain thresholds. These thresholds are set by property HD\_ENHANCED\_STREAM\_HOLDOFF\_THRESHOLDS. Note: When this property is changed, it will not take effect until after the next tune or acquisition command is issued. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables the audio service list event interrupt. 0 : Enhanced stream holdoff is not enabled. 1 : Enhanced stream holdoff is enabled.

**Property 0x9F01. HD\_ENHANCED\_STREAM\_HOLDOFF\_THRESHOLDS**

HD\_ENHANCED\_STREAM\_HOLDOFF\_THRESHOLDS sets the C/No thresholds for both hybrid mode and all digital mode enhanced stream hold-off as described in HD\_ENHANCED\_STREAM\_HOLDOFF\_CONFIG. Note: When this property is changed, it will not take effect until after the next tune or acquisition command is issued. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

Default: 0x2F2F

Units: dB-Hz

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	ALLDIG[7:0]								HYBRID[7:0]							
Default	0x2F								0x2F							

Bit	Name	Function
15:8	ALLDIG[7:0]	Set the all digital mode enhanced stream hold-off threshold. Range: 47-80
7:0	HYBRID[7:0]	Set the hybrid mode enhanced stream hold-off threshold. Range: 47-80

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---

## Property 0xE800. HD\_TEST\_BER\_CONFIG

---

HD\_TEST\_BER\_CONFIG Enables the HD BER test. The HD BER test requires a special test vector (IB\_FMr208c\_e1wfc204 for FMHD, IB\_AMr208a\_e1awfb00 for AMHD). To run this test start the vector signal generator with the BER test vector, tune to the frequency indicated on the generator, and enable the test using this property. Once the test is running collect the BER information using the HD\_TEST\_GET\_BER\_INFO command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be set or read in powerup mode.

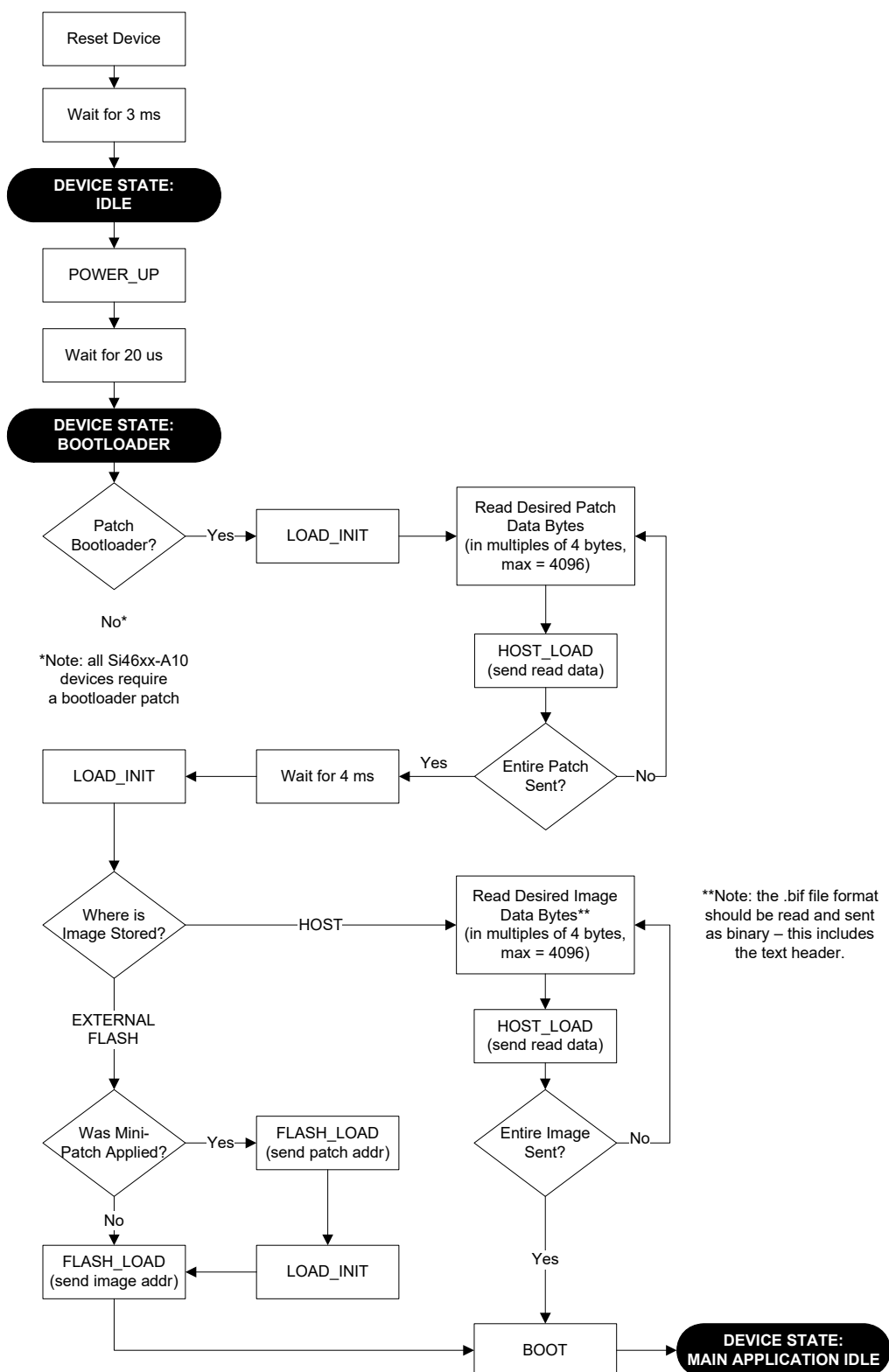
Default: 0

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Name	Reserved															ENABLE
Default	0x0000															0

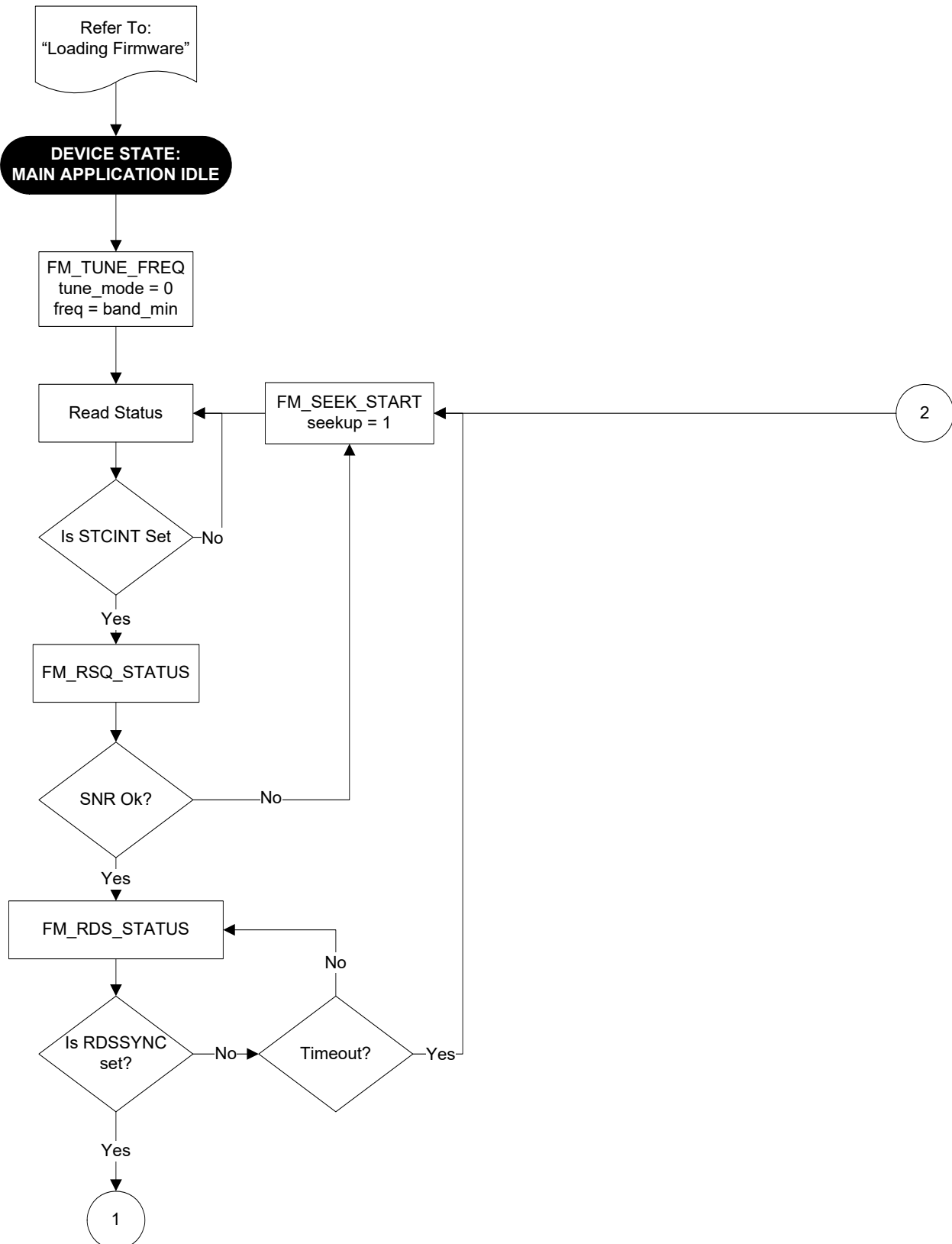
Bit	Name	Function
15:1	Reserved	Always write to 0x0000.
0	ENABLE	Enables the BER test. Once enabled the BER information can be collected using the HD_TEST_GET_BER_INFO command.

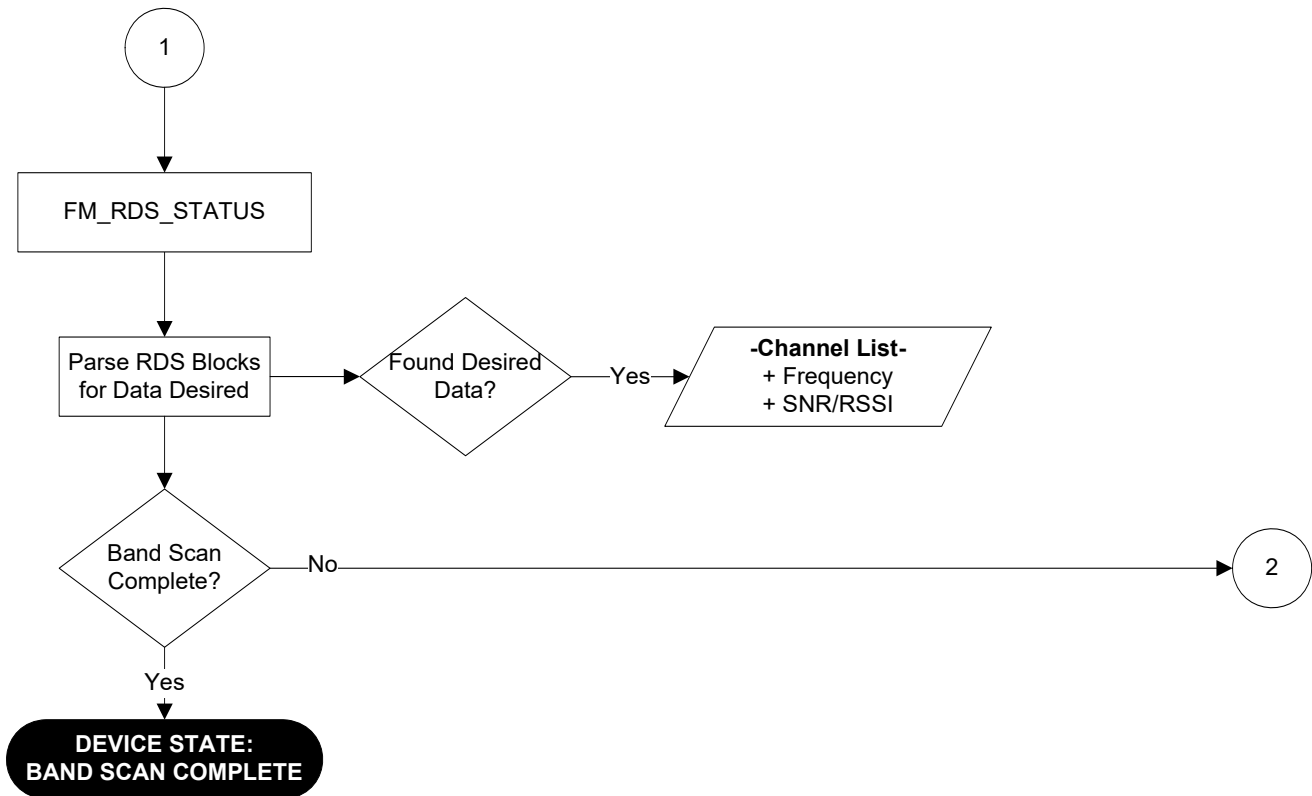
## 5. Flowcharts

### 5.1. Loading Firmware

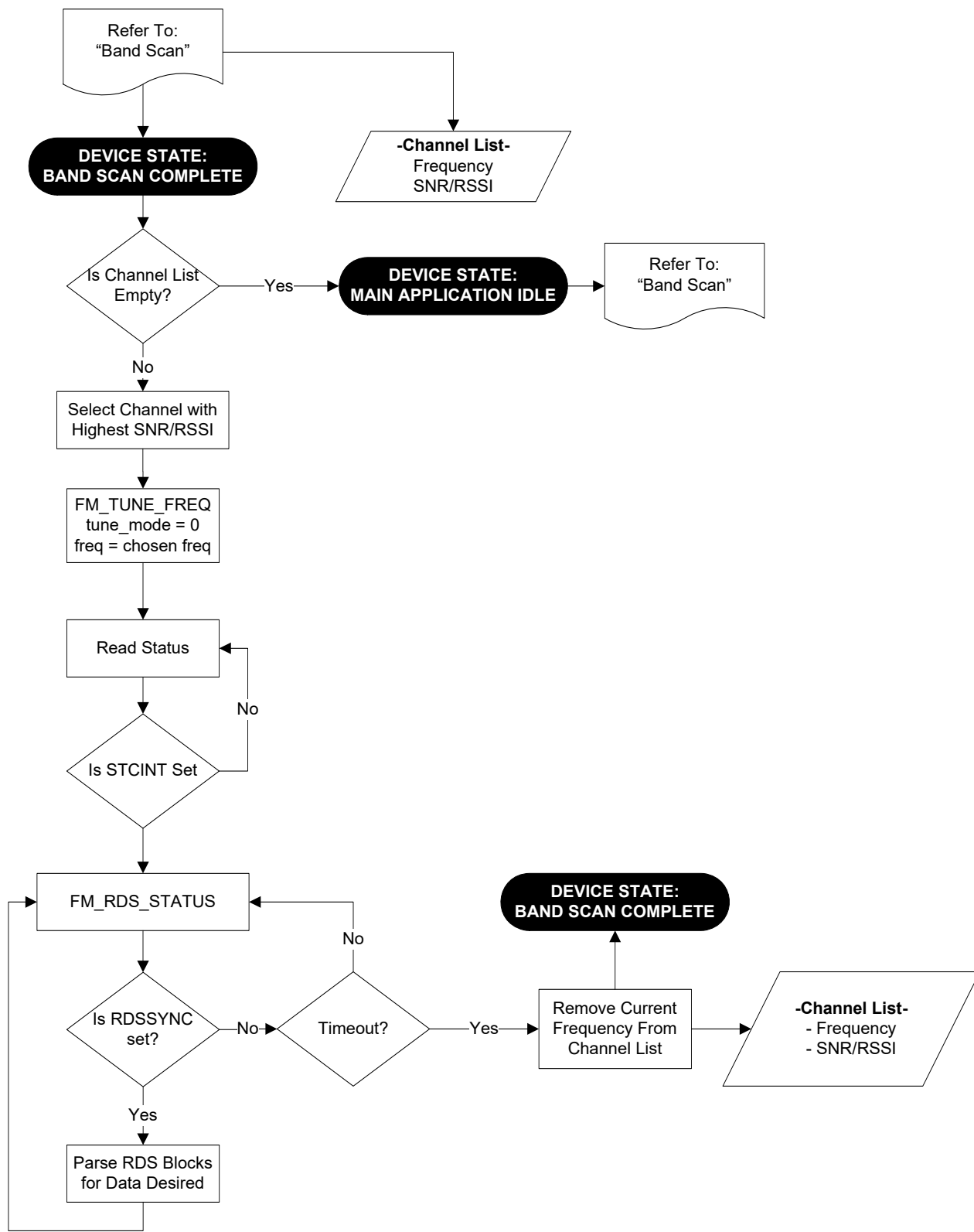


## 5.2. Data Service Receiver—FM-Band Scan



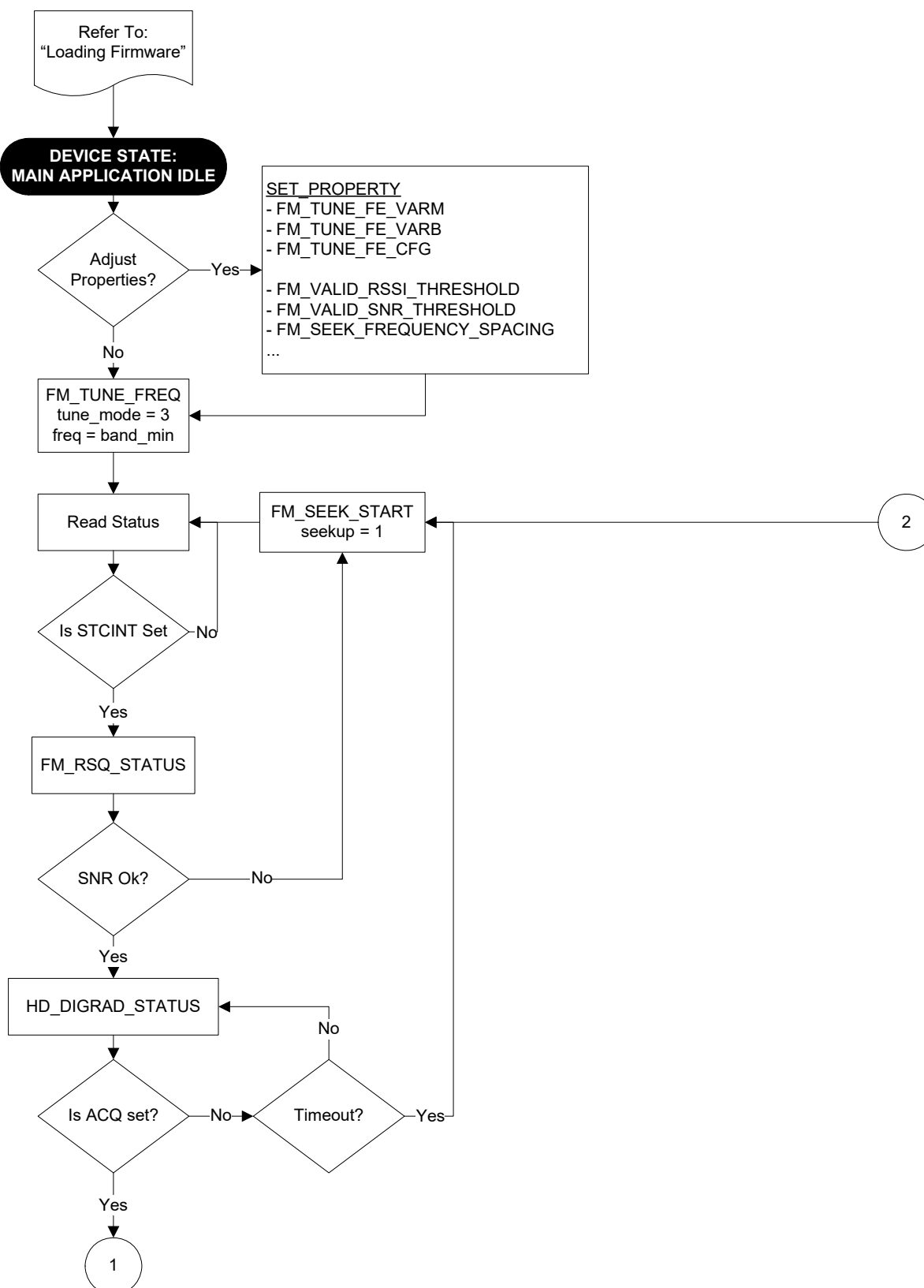


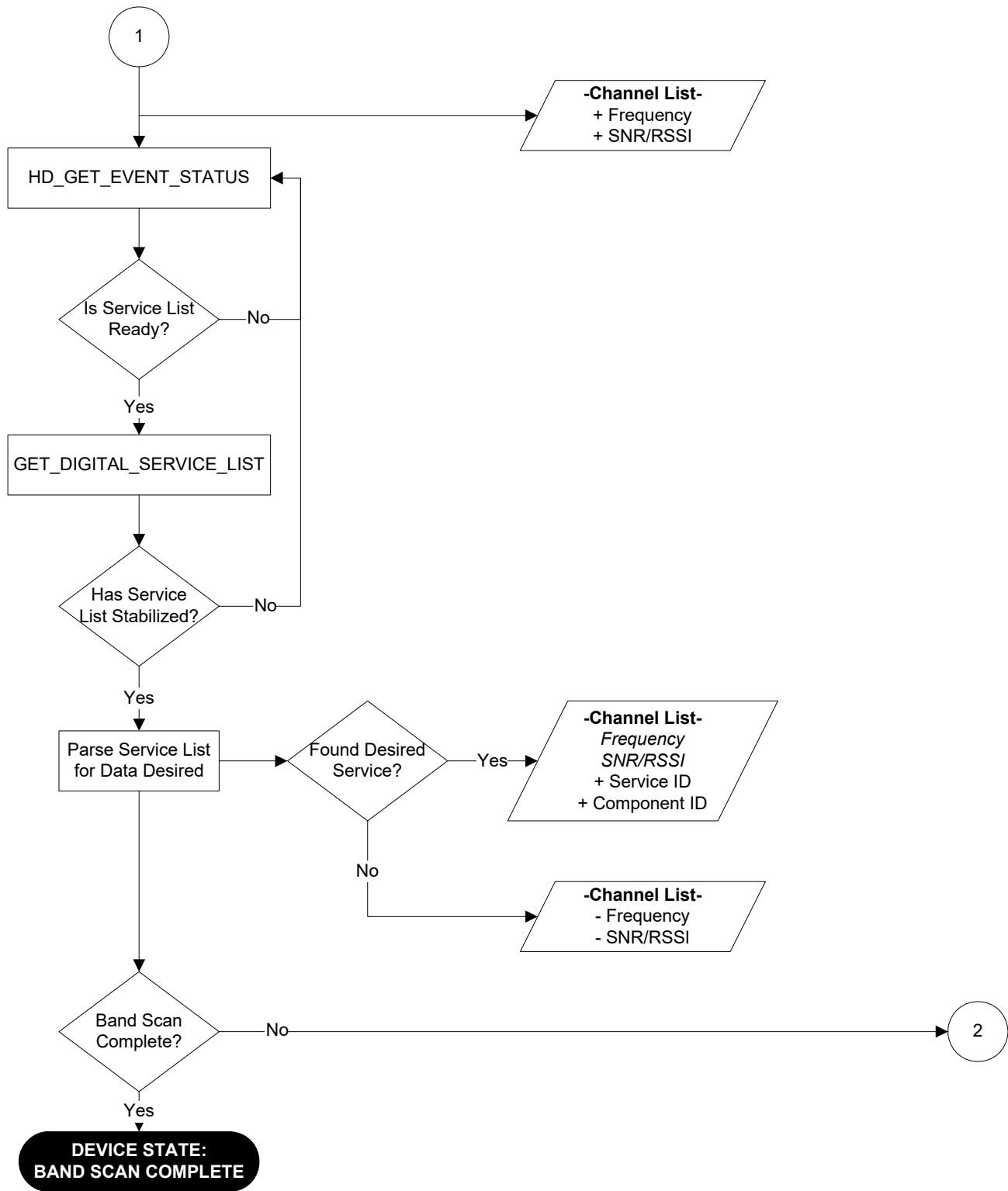
## 5.3. Data Service Receiver—FM—RDS Data Service



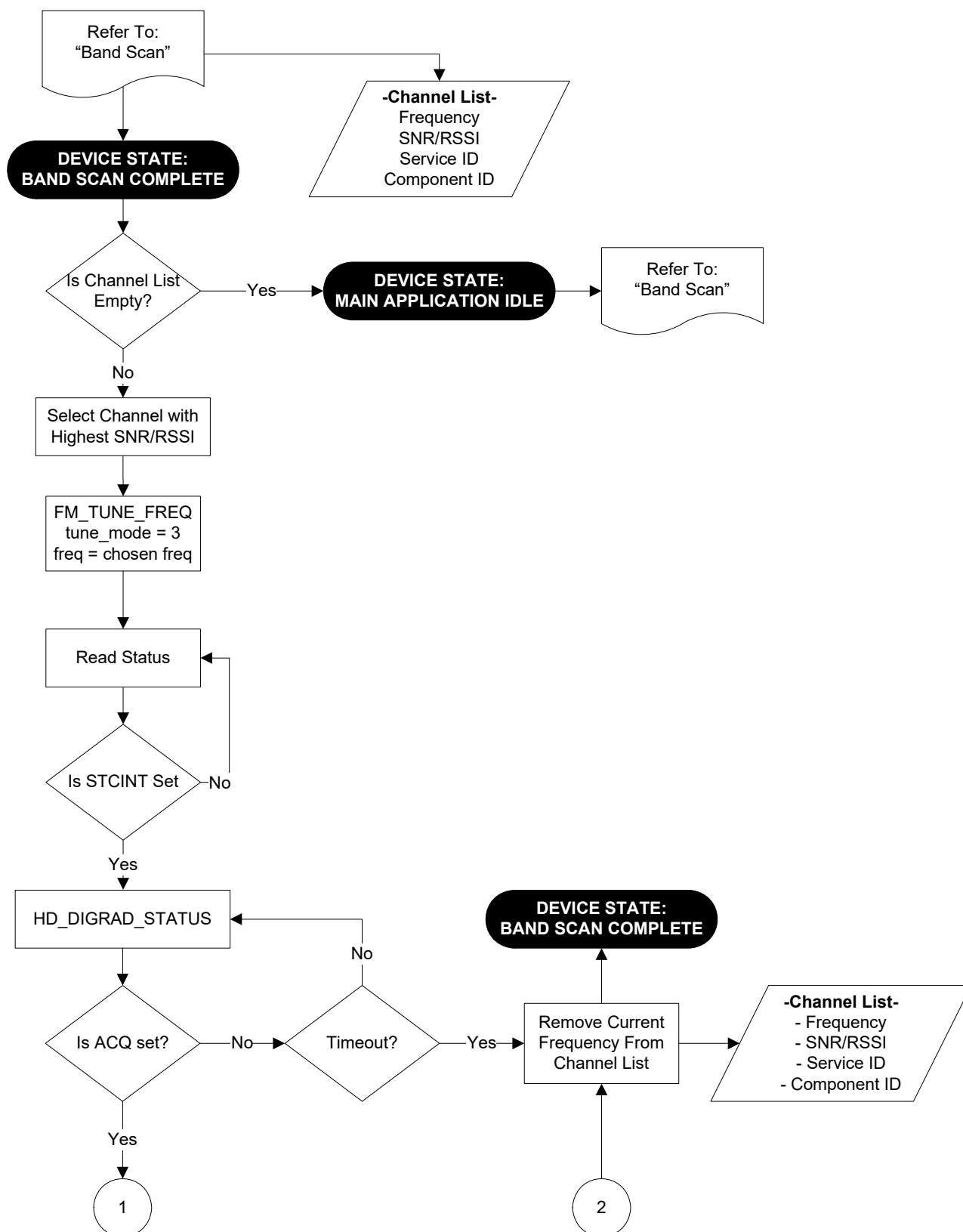


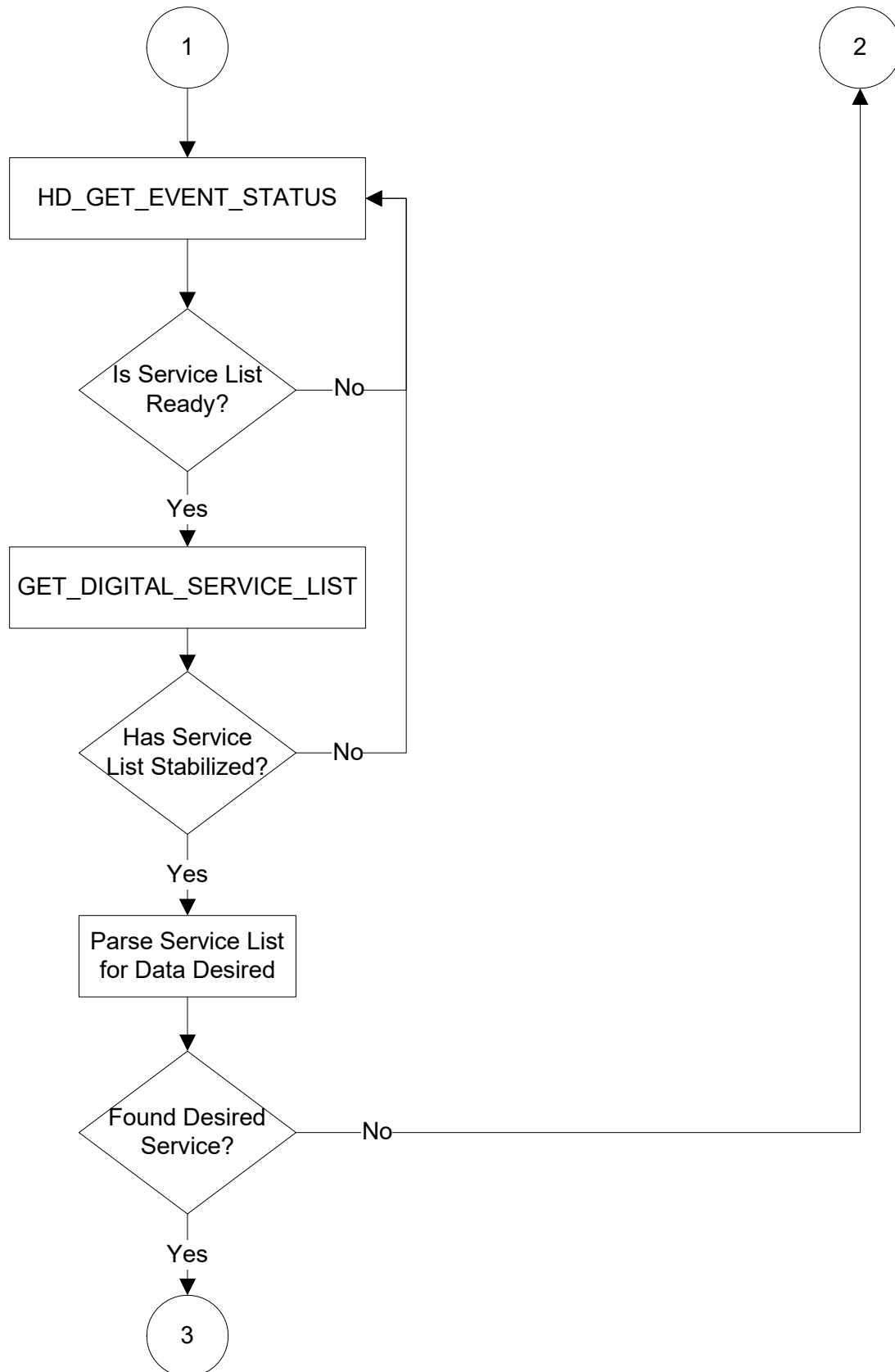
## 5.4. Data Service Receiver—FMHD—Band Scan

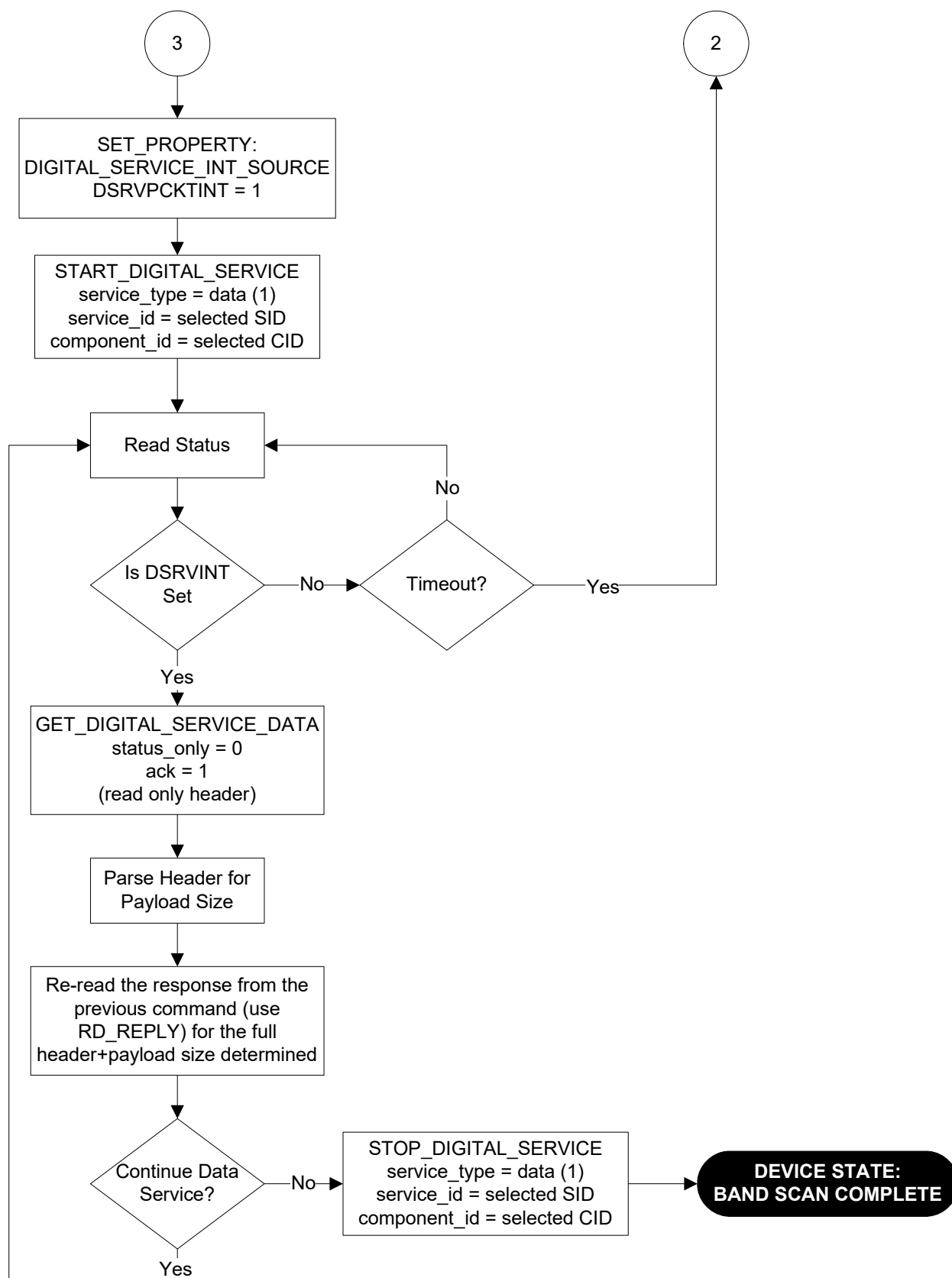




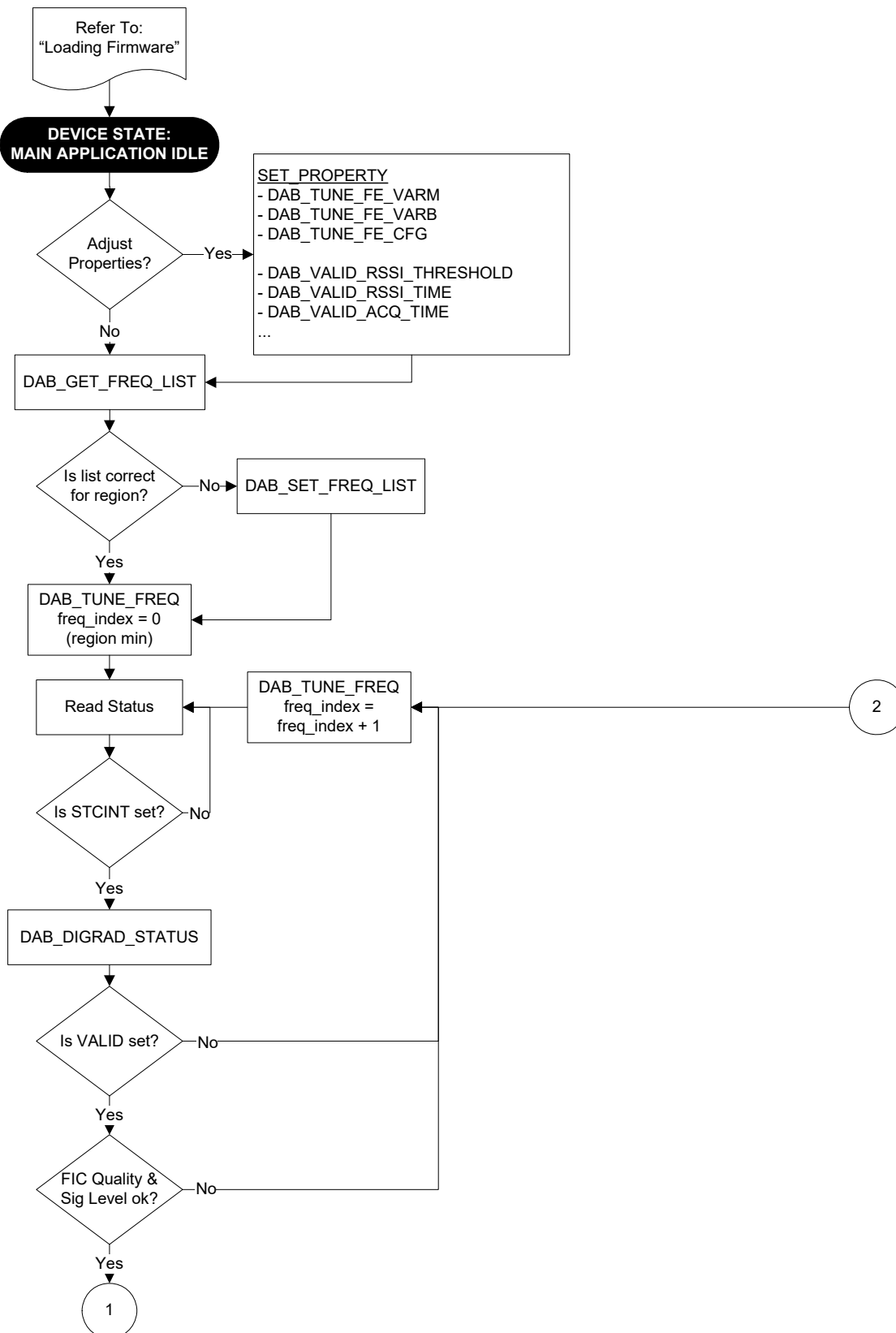
## 5.5. Data Service Receiver—FMHD—Data Services

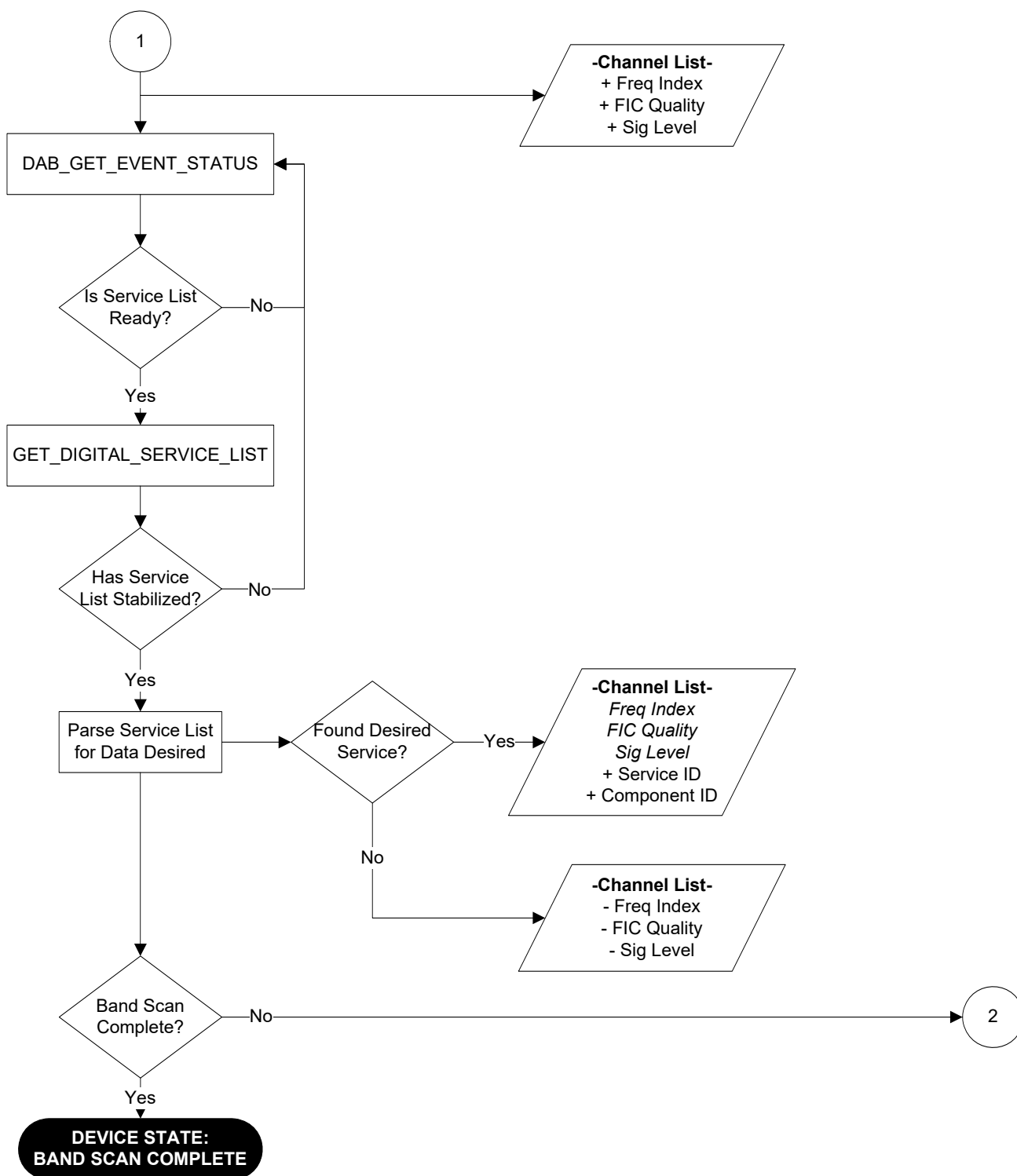




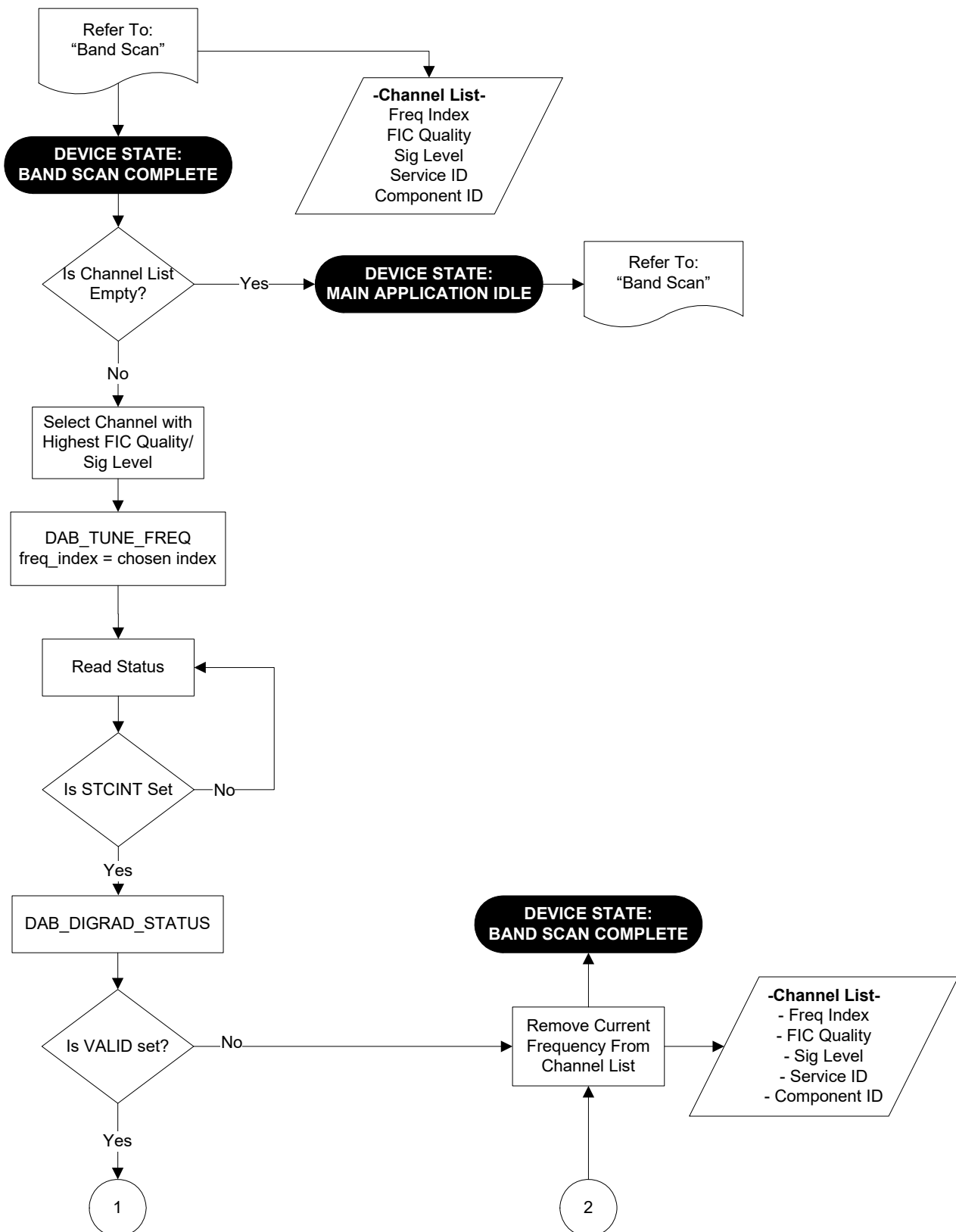


## 5.6. Data Service Receiver—DAB—Band Scan

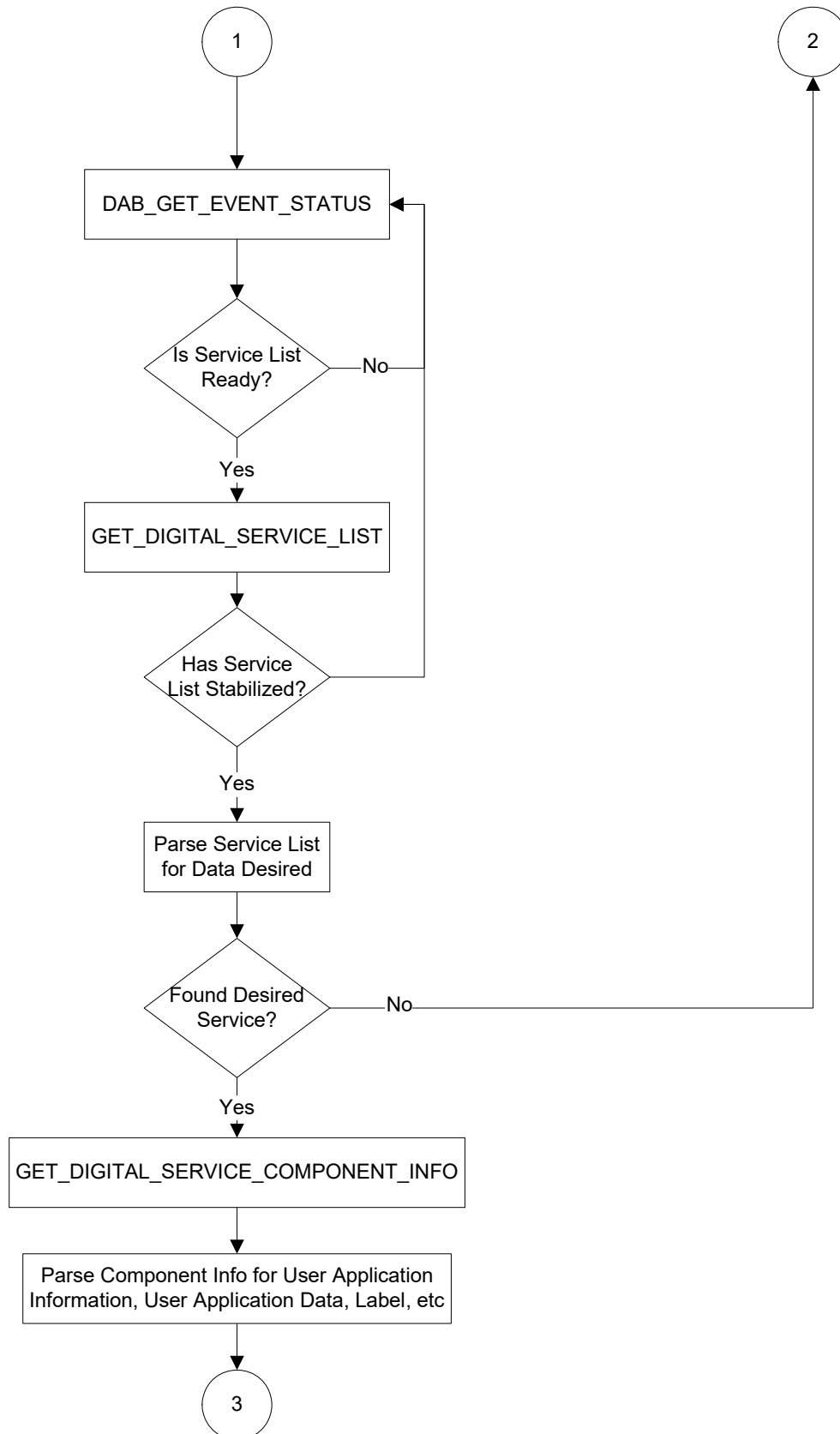


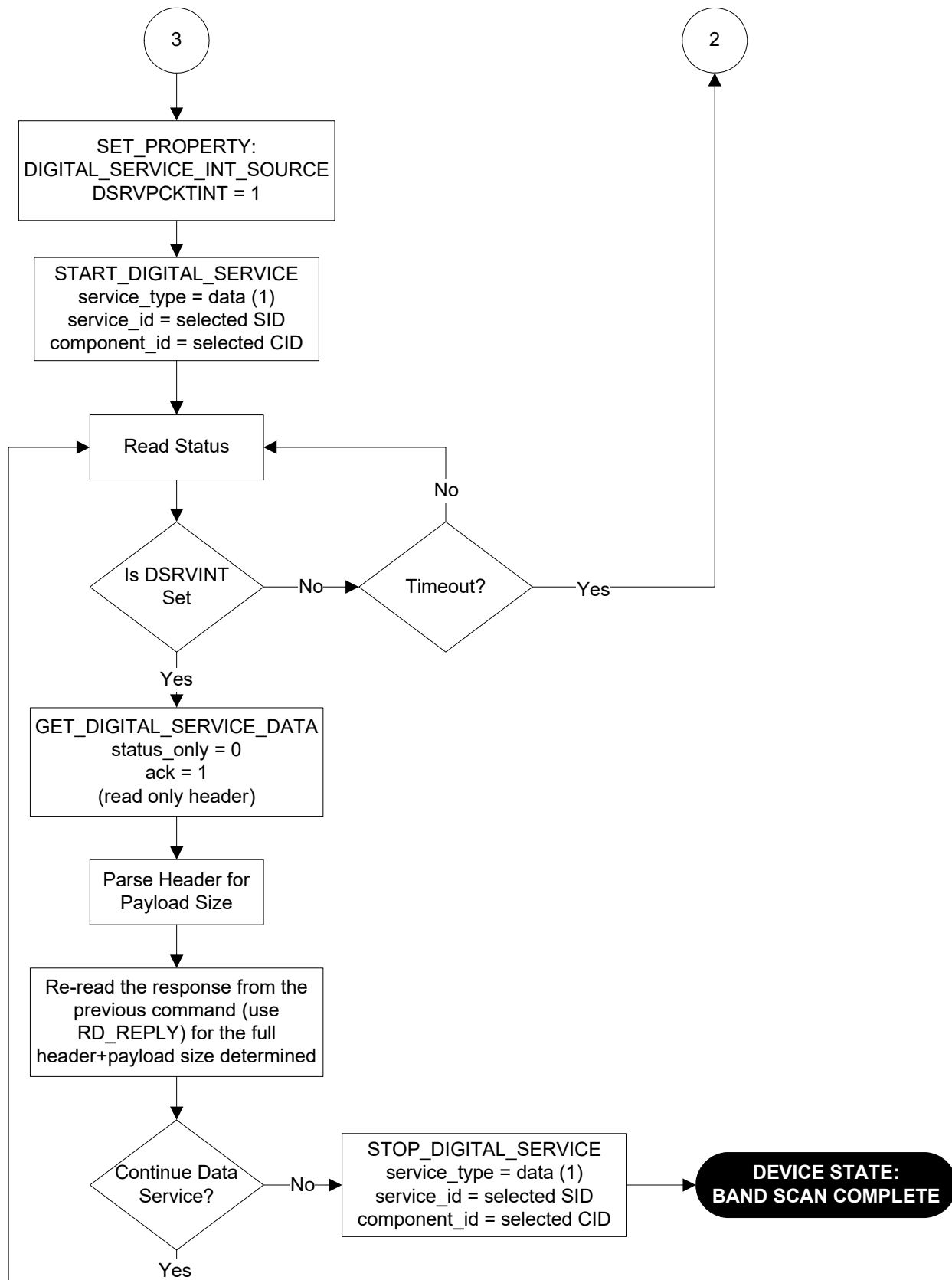


## 5.7. Data Service Receiver—DAB—Data Services

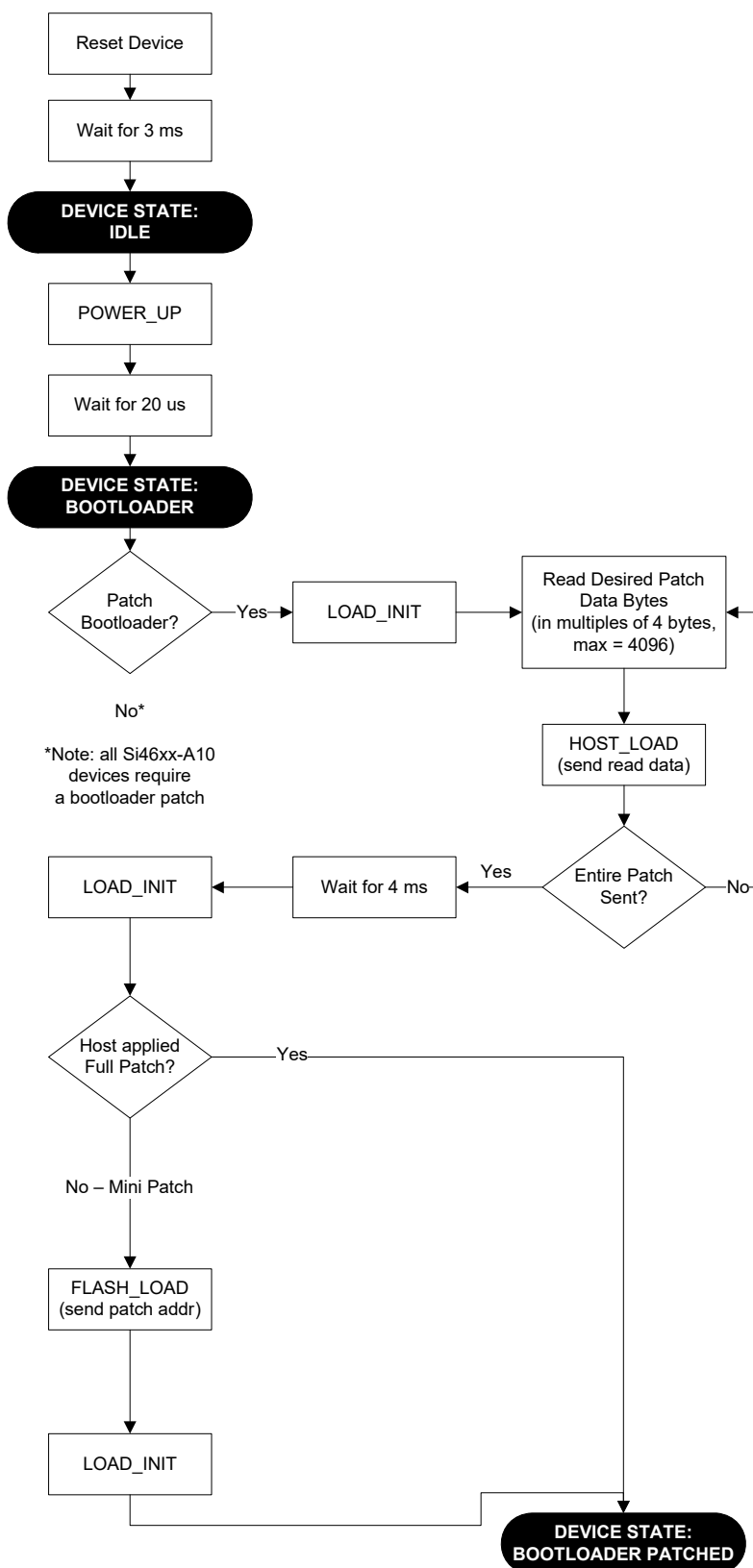


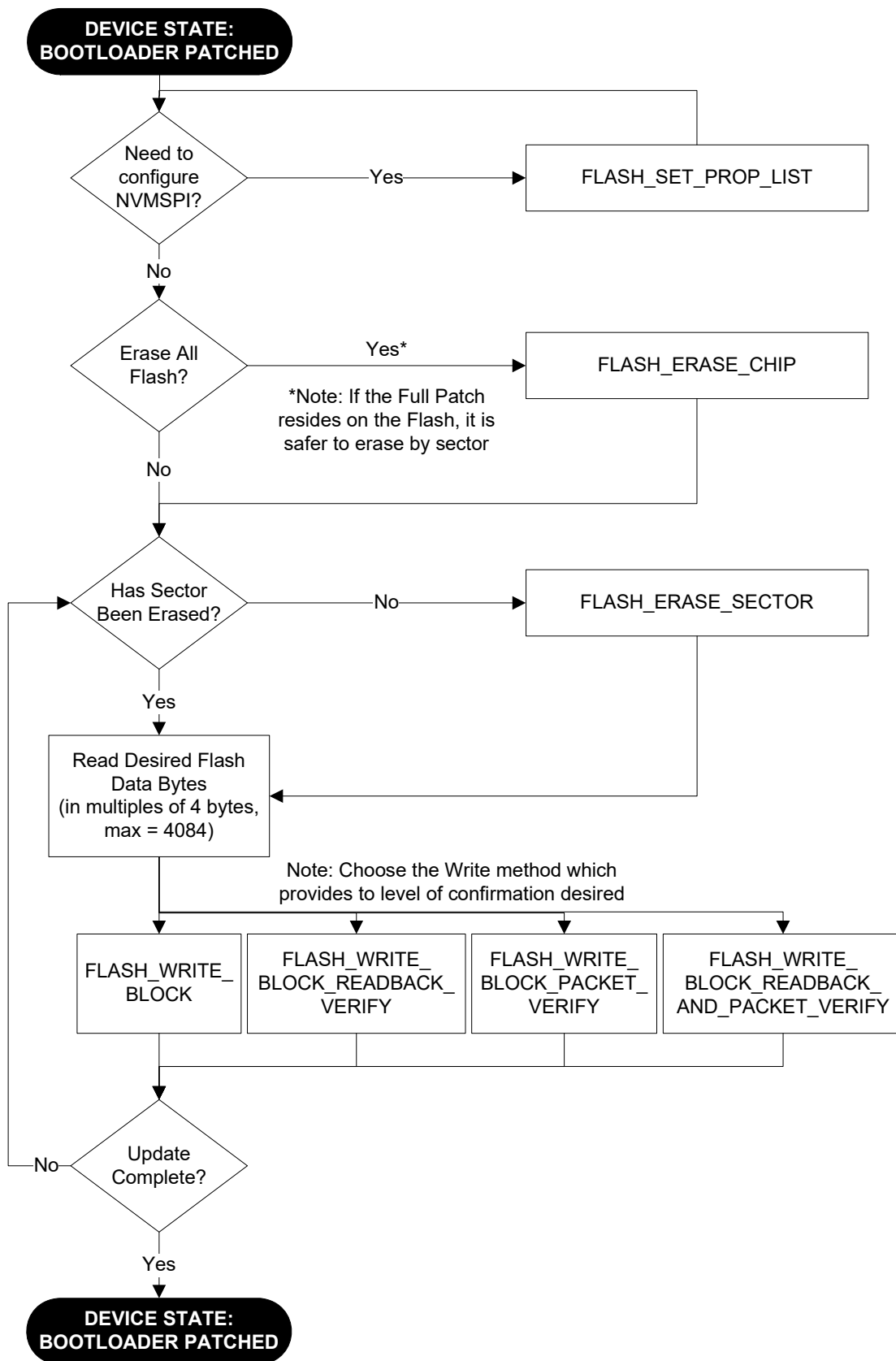






## 5.8. Updating the Boot Flash





## 6. Managing Firmware

The Si468x is RAM based which requires the Host Controller to load any patch or firmware files before us. This section describes the system architecture options surrounding loading the necessary firmware files.

### 6.1. Firmware Components

There are multiple types of firmware which need to be loaded onto the Si468x. In general, it is necessary to first load a small bootloader patch and a matched firmware image which corresponds to the desired mode of operation. When planning resource allocation for your system, you should expect to carry both a Patch and Firmware Image for each mode. The space requirements are outlined below.

**Table 9. Firmware Component Image Sizes**

Firmware Component Name	Expected Max Size
MiniPatch (Required for Certain Architectures)	1 kB
FullPatch per Mode	8 kB / mode
Firmware Image per Mode	512 kB / mode

For example: For a device which supports FM radio and DAB radio modes, the total firmware size would be 8 kB + 8 kB + 512 kB + 512 kB = 1040 kB. If the system architecture uses flash memory, it would be necessary to use a 2 MB flash (16 Mb). If less modes are supported the flash requirements would downsize accordingly.

Below is a sample flash layout for the example of a device which will support two modes of operation. If more modes are desired, it is recommended to follow the trend of grouping FullPatches then grouping Firmware Images. If this general model is followed, the flash spacing will accommodate future image upgrades without having to change start addresses and will provide easy sector boundaries for erasing.

**Table 10. Example Flash Layout for Accommodating Sector Boundaries and Future Updates**

Component Name	Start Address	Max Size
Customer Specific Items ■Content Description ■Versioning ■Etc	0x00000000	8 kB
FullPatch Mode 1	0x00002000	8 kB
FullPatch Mode 2	0x00004000	8 kB
Firmware Image Mode 1	0x00006000	512 kB
Firmware Image Mode 2	0x00008000	512 kB

6.2. System Architecture Options

The following tables provide an architectural representation of the Host Controller and Si468x and the associated relation to any external flash. The location for Si468x firmware components are specified for each architecture to aid in understanding the boot process.

**Note:** Components grayed out with diagonal fill are not required for that architecture, but are shown for consistency between the diagrams.

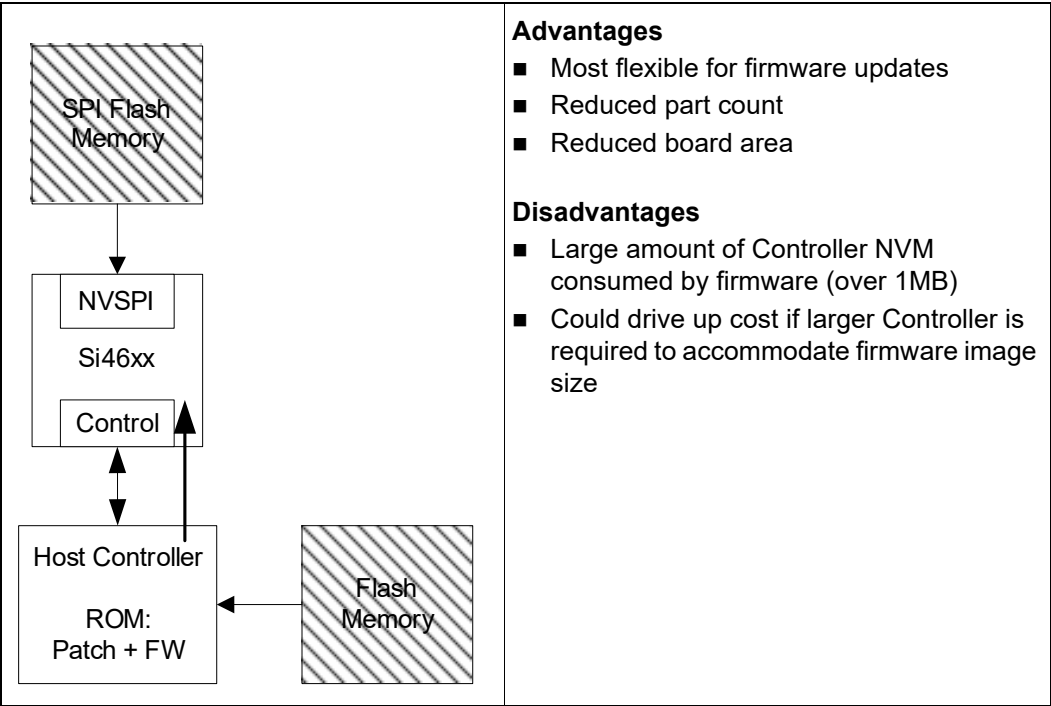


Figure 1. HostLoad Large Controller

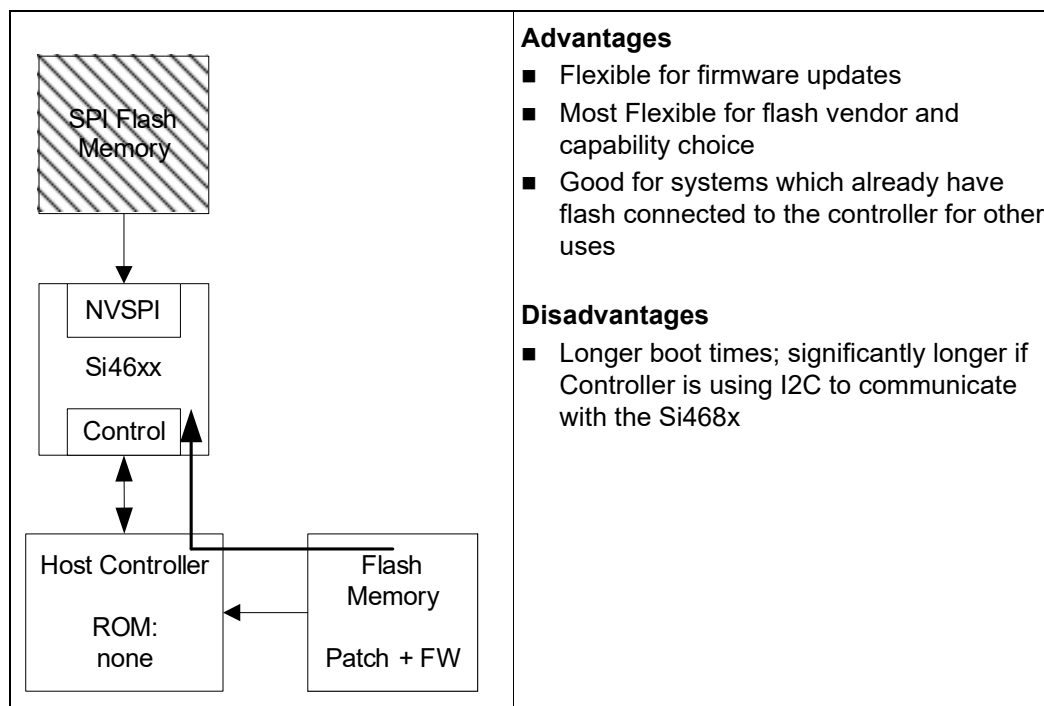


Figure 2. HostLoad Small Controller

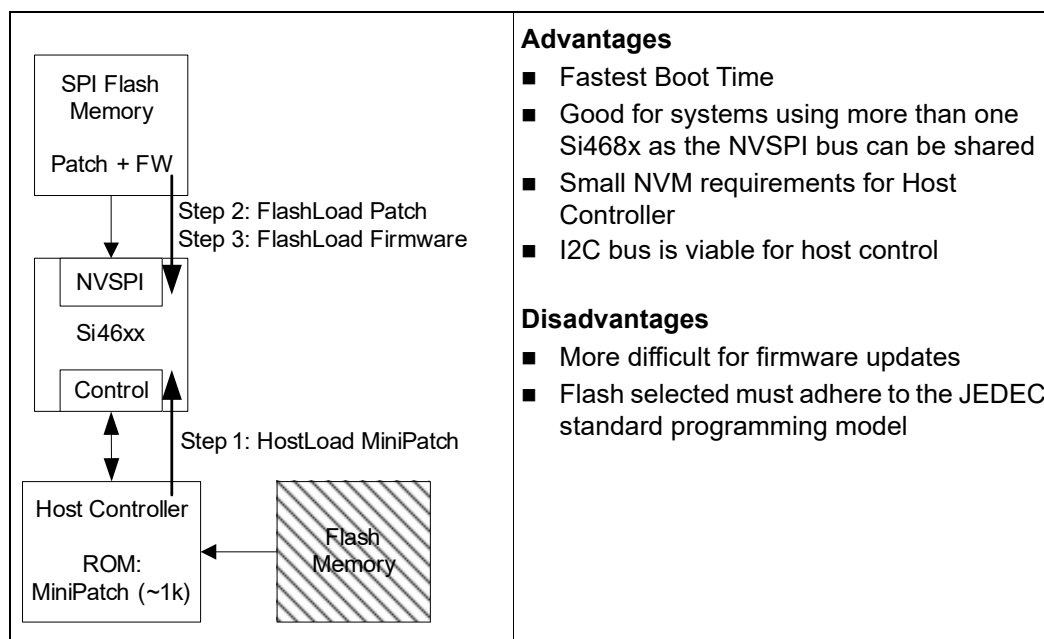
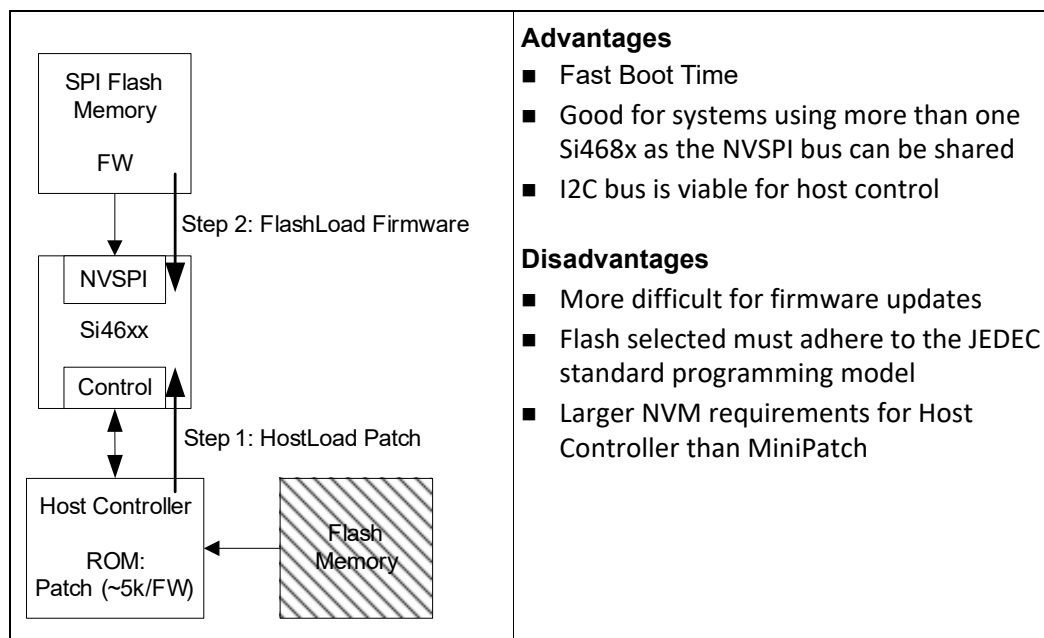


Figure 3. FlashLoad SmallController Mini Patch



**Figure 4. FlashLoad LargeController Full Patch**



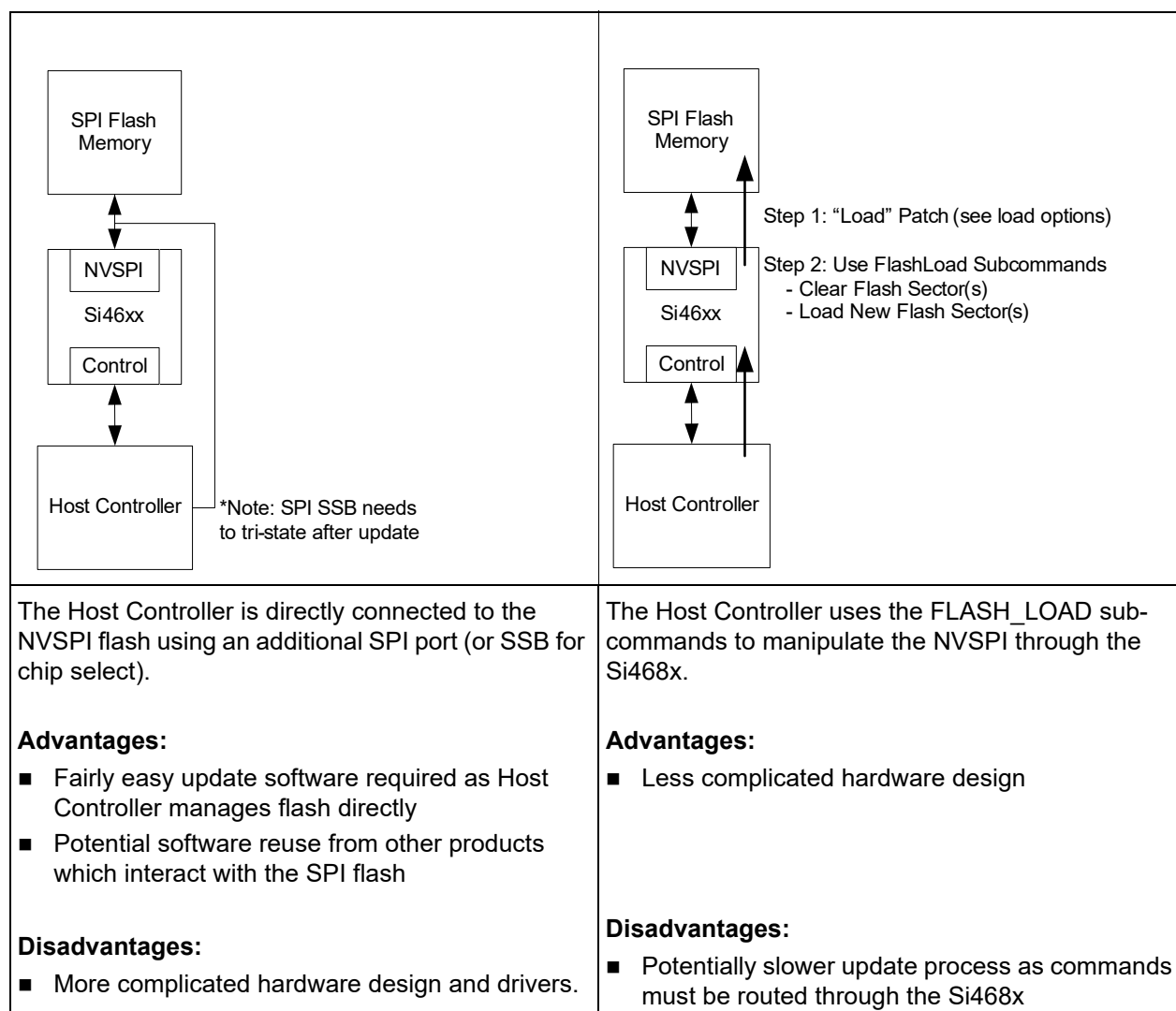
### 6.3. System Architecture Recommendations

Below are some general recommendations based upon certain existing system requirements prior to integrating the Si468x. Note: any recommendations here should be evaluated for your own design to ensure it meets the goals for cost, PCB space, desired boot speed, etc.

System Requirement	Recommended Architecture
Host Control Interface is I <sup>2</sup> C OR Fastest boot time is desired	FlashLoad SmallController MiniPatch
Host Controller already has flash memory attached AND Host Controller is using a SPI interface to the Si468x	HostLoad SmallController

### 6.4. Updating NVSPI Flash

When the desired architecture calls for attaching a SPI flash to the Si468x, there are two methods for supporting a “field update” scenario.



**Figure 5. Supporting Firmware Update to NVSPI Flash**

## 6.5. Managing Firmware Subcommands

### 6.5.1. NVSPI Flash Pass-Through

The following supplemental commands and properties are provided in order to provide host access to the NVSPI connected flash through the Si468x command interface.

In order to use these commands the A10 bootloader should be patched to ROM0.016. This can be accomplished using HOST\_LOAD of the FullPatch ROM0.016 or by using HOST\_LOAD of the MiniPatch.003, then loading the FullPatch ROM0.016 from flash using FLASH\_LOAD.

#### 6.5.1.1. Flash Pass-Through Commands

**Table 11. Flash Pass-through Command Summary**

Flash Pass-Through Commands – 0x05 <SubCmd>		
SubCmd	Name	Summary
0x02	FLASH_CHECK_CRC32	Check CRC32 of a sequence of blocks on flash
0xFF	FLASH_ERASE_CHIP	Erase the entire flash
0xFE	FLASH_ERASE_SECTOR	Erase a single sector of flash
0x11	FLASH_GET_PROPERTY	Get the value of a single property
0x00	FLASH_LOAD_IMG	Load a boot_img from flash
0x01	FLASH_LOAD_IMG_CHECK_CRC32	Load a boot_img from flash. Check the CRC32 of the boot_img as the boot_img is loaded
0x10	FLASH_SET_PROP_LIST	Set the value of a list of properties
0xF0	FLASH_WRITE_BLOCK	Write a block of bytes to the flash
0xF1	FLASH_WRITE_BLOCK_READBACK_VERIFY	Write a block of bytes to the flash. Reads back the block after write to verify the block was written correctly by comparing the CRC32
0xF2	FLASH_WRITE_BLOCK_PACKET_VERIFY	Write a block of data to the flash. Compares the CRC32 of the block of data received by the command.
0xF3	FLASH_WRITE_BLOCK_READBACK_AND_PACKET_VERIFY	Write a block of data to the flash. Reads back the block after write to verify the block was written correctly by comparing the CRC32. Also compares the CRC32 of the block of data received by the command.

Unless otherwise specified, the commands provide only the status bits to reflect the commands success. The common status bit definition is outlined below.

## Response

Bit	7	6	5	4	3	2	1	0
<b>STATUS0</b>	CTS	ERR_CMD	DACQINT	DSRVINT	RSQINT	RDSINT	x	STCINT
<b>STATUS1</b>	X	X	DEVENTINT	X	X	X	X	X
<b>STATUS2</b>	XX							
<b>STATUS3</b>	PUP_STATE[1:0]	XX		REPOFERR		CMDOFERR	ARBERR	ERRNR

## Command 0x05 0x02 – FLASH\_CHECK\_CRC32

Check CRC32 of a sequence of blocks on flash. If the CRC32 of the sequence of blocks on flash does not match, sets the status ERR bit. Use LOAD\_INIT to clear the status ERR bit.

## Parameters

- CRC32\_CORRECT [31:0]—Correct CRC32 for the binary file.
- FLASH\_ADDR [31:0]—Starting byte address of the block on flash.
- SIZE [31:0]—Size of the block in bytes on the flash.

## Command

Bit	7	6	5	4	3	2	1	0
<b>CMD</b>	0x05							
<b>SUBCMD1</b>	0x02							
<b>SUBCMD2</b>	0x00							
<b>SUBCMD3</b>	0x00							
<b>ARG0</b>	CRC32_CORRECT [7:0]							
<b>ARG1</b>	CRC32_CORRECT [15:8]							
<b>ARG2</b>	CRC32_CORRECT [23:16]							
<b>ARG3</b>	CRC32_CORRECT [31:24]							
<b>ARG4</b>	FLASH_ADDR [7:0]							
<b>ARG5</b>	FLASH_ADDR [15:8]							
<b>ARG6</b>	FLASH_ADDR [23:16]							
<b>ARG7</b>	FLASH_ADDR [31:24]							
<b>ARG8</b>	SIZE [7:0]							
<b>ARG9</b>	SIZE [15:8]							
<b>ARG10</b>	SIZE [23:16]							
<b>ARG11</b>	SIZE [31:24]							

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## Command 0x05 0xFF – FLASH\_ERASE\_CHIP

---

Erase the entire flash.

### Parameters

None

### Command

Bit	7	6	5	4	3	2	1	0
CMD	0x05							
SUBCMD1	0xFF							
SUBCMD2	0xDE							
SUBCMD3	0xC0							

---

## Command 0x05 0xFE – FLASH\_ERASE\_SECTOR

---

Erase a single sector of flash.

### Parameters

- SECTOR\_ADDR [31:0]—Starting address on flash of the sector to erase, byte offset from the start of flash.  
Note: sector\_addr[23..0] are used, sector\_addr[31..24] are ignored. The least significant bits that would be masked by the sector boundary are ignored.

### Command

Bit	7	6	5	4	3	2	1	0
CMD	0x05							
SUBCMD1	0xFE							
SUBCMD2	0xC0							
SUBCMD3	0xDE							
ARG0	SECTOR_ADDR [7:0]							
ARG1	SECTOR_ADDR [15:8]							
ARG2	SECTOR_ADDR [23:16]							
ARG3	SECTOR_ADDR [31:24]							

**Command 0x05 0x11 – FLASH\_GET\_PROPERTY**

Get the value of a single property.

**Parameters**

- PROPERTY\_ID [15:0]—ID of the property to get.

**Command**

Bit	7	6	5	4	3	2	1	0
<b>CMD</b>	0x05							
<b>SUBCMD1</b>	0x11							
<b>ARG0</b>	PROPERTY_ID [7:0]							
<b>ARG1</b>	PROPERTY_ID [15:8]							

**Response**

Bit	7	6	5	4	3	2	1	0
STATUS0	CTS	ERR_CMD	DACQINT	DSRVINT	RSQINT	RDSINT	x	STCINT
STATUS1	X	X	DEVENTINT	X	X	X	X	X
STATUS2	XX							
STATUS3	PUP_STATE[1:0]		XX		REPO-FERR	CMDOFERR	ARBERR	ERRNR
RESP0	PROPERTY_VALUE[7:0]							
RESP1	PROPERTY_VALUE[15:8]							

- PROPERTY\_VALUE [15:0]—Property value associated with property ID.

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---

## Command 0x05 0x00 – FLASH\_LOAD\_IMG – (FLASH\_LOAD)

---

Load a firmware image or patch from flash. This is the same as the FLASH\_LOAD command but is represented here following the flash subcommand format.

### Parameters

- FLASH\_ADDR [31:0]—Starting byte address of the block on flash.

### Command

Bit	7	6	5	4	3	2	1	0
CMD	0x05							
SUBCMD1	0x00							
SUBCMD2	0x00							
SUBCMD3	0x00							
ARG0	FLASH_ADDR [7:0]							
ARG1	FLASH_ADDR [15:8]							
ARG2	FLASH_ADDR [23:16]							
ARG3	FLASH_ADDR [31:24]							

---

## Command 0x05 0x01 – FLASH\_LOAD\_IMG\_CHECK\_CRC32

---

Load a firmware image or patch from flash. Check the CRC32 of the boot\_img as the boot\_img is loaded. If the CRC32 of the boot\_img does not match CRC32\_CORRECT, the status ERR bit is set.

### Parameters

- CRC32\_CORRECT [31:0]—Correct CRC32 for the binary file.
- FLASH\_ADDR [31:0]—Starting byte address of the block on flash.
- SIZE [31:0]—Size of the block in bytes on the flash.

### Command

Bit	7	6	5	4	3	2	1	0
CMD	0x05							
SUBCMD1	0x01							
SUBCMD2	0x00							
SUBCMD3	0x00							
ARG0	CRC32_CORRECT [7:0]							
ARG1	CRC32_CORRECT [15:8]							
ARG2	CRC32_CORRECT [23:16]							
ARG3	CRC32_CORRECT [31:24]							

<b>ARG4</b>	FLASH_ADDR [7:0]
<b>ARG5</b>	FLASH_ADDR [15:8]
<b>ARG6</b>	FLASH_ADDR [23:16]
<b>ARG7</b>	FLASH_ADDR [31:24]
<b>ARG8</b>	SIZE [7:0]
<b>ARG9</b>	SIZE [15:8]
<b>ARG10</b>	SIZE [23:16]
<b>ARG11</b>	SIZE [31:24]

## Command 0x05 0x10 – FLASH\_SET\_PROP\_LIST

Set the value of a list of properties to configure the parameters used in communicating with the NVSPI flash.

### Parameters

- PROPERTY\_ID [15:0]—ID of the property to get.
- PROPERTY\_VALUE [15:0]—Property value associated with property ID.

### Command

Bit	7	6	5	4	3	2	1	0
<b>CMD</b>	0x05							
<b>SUBCMD1</b>	0x10							
<b>SUBCMD2</b>	0x00							
<b>SUBCMD3</b>	0x00							
<b>ARG0</b>	PROPERTY_ID_0 [7:0]							
<b>ARG1</b>	PROPERTY_ID_0 [15:8]							
<b>ARG2</b>	PROPERTY_VALUE_0 [7:0]							
<b>ARG3</b>	PROPERTY_VALUE_0 [15:8]							
<b>ARG4</b>	PROPERTY_ID_1 [7:0]							
<b>ARG5</b>	PROPERTY_ID_1 [15:8]							
<b>ARG6</b>	PROPERTY_VALUE_1 [7:0]							
<b>ARG7</b>	PROPERTY_VALUE_1 [15:8]							
...	...							
<b>ARG_N-3</b>	PROPERTY_ID_N [7:0]							
<b>ARG_N-2</b>	PROPERTY_ID_N [15:8]							
<b>ARG_N-1</b>	PROPERTY_VALUE_N [7:0]							
<b>ARG_N</b>	PROPERTY_VALUE_N [15:8]							



**Command 0x05 0xF0 – FLASH\_WRITE\_BLOCK**

Write a block of bytes to the flash. All the bytes on flash that are written must have been previously erased to 0xFF with the FLASH\_ERASE\_CHIP or FLASH\_ERASE\_SECTOR subcommands.

**Parameters**

FLASH\_ADDR [31:0]—Starting address on flash of the block to write, byte offset from the start of flash.

SIZE [31:0]—Size of the block to write in bytes.

BLOCK\_DATA [7:0]—Sequence of bytes to write to flash. Maximum number of bytes is 4084.

**Command**

Bit	7	6	5	4	3	2	1	0
<b>CMD</b>	0x05							
<b>SUBCMD1</b>	0xF0							
<b>SUBCMD2</b>	0x0C							
<b>SUBCMD3</b>	0xED							
<b>ARG0</b>	0x00							
<b>ARG1</b>	0x00							
<b>ARG2</b>	0x00							
<b>ARG3</b>	0x00							
<b>ARG4</b>	FLASH_ADDR [7:0]							
<b>ARG5</b>	FLASH_ADDR [15:8]							
<b>ARG6</b>	FLASH_ADDR [23:16]							
<b>ARG7</b>	FLASH_ADDR [31:24]							
<b>ARG8</b>	SIZE [7:0]							
<b>ARG9</b>	SIZE [15:8]							
<b>ARG10</b>	SIZE [23:16]							
<b>ARG11</b>	SIZE [31:24]							
<b>ARG12</b>	BLOCK_DATA_0							
<b>ARG13</b>	BLOCK_DATA_1							
...	...							
<b>ARG_N</b>	BLOCK_DATA_N							

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## Command 0x05 0xF1 – FLASH\_WRITE\_BLOCK\_READBACK\_VERIFY

Write a block of bytes to the flash. All the bytes on flash that are written must have been previously erased to 0xFF with the FLASH\_ERASE\_CHIP or FLASH\_ERASE\_SECTOR subcommands. Reads back the block after write to verify the block was written correctly by comparing the CRC32 of the block read back with crc32\_correct. If there is not a match, the status ERR bit is set.

### Parameters

- CRC32\_CORRECT [31:0]—CRC32 of the block of data written.
- FLASH\_ADDR [31:0]—Starting address on flash of the block to write, byte offset from the start of flash.
- SIZE [31:0]—Size of the block to write in bytes.
- BLOCK\_DATA [7:0]—Sequence of bytes to write to flash. Maximum number of bytes is 4084

### Command

Bit	7	6	5	4	3	2	1	0
CMD	0x05							
SUBCMD1	0xF1							
SUBCMD2	0x0C							
SUBCMD3	0xED							
ARG0	CRC32_CORRECT [7:0]							
ARG1	CRC32_CORRECT [15:8]							
ARG2	CRC32_CORRECT [23:16]							
ARG3	CRC32_CORRECT [31:24]							
ARG4	FLASH_ADDR [7:0]							
ARG5	FLASH_ADDR [15:8]							
ARG6	FLASH_ADDR [23:16]							
ARG7	FLASH_ADDR [31:24]							
ARG8	SIZE [7:0]							
ARG9	SIZE [15:8]							
ARG10	SIZE [23:16]							
ARG11	SIZE [31:24]							
ARG12	BLOCK_DATA_0							
ARG13	BLOCK_DATA_1							
...	...							
ARG_N	BLOCK_DATA_N							

**Command 0x05 0xF2 – FLASH\_WRITE\_BLOCK\_PACKET\_VERIFY**

Write a block of data to the flash. All the bytes on flash that are written must have been previously erased to 0xFF with the FLASH\_ERASE\_CHIP or FLASH\_ERASE\_SECTOR subcommands. Compares the CRC32 of the block of data received by the command with CRC32\_CORRECT. If there is not a match, the status ERR bit is set.

**Parameters**

- CRC32\_CORRECT [31:0]—CRC32 of the block of data written.
- FLASH\_ADDR [31:0]—Starting address on flash of the block to write, byte offset from the start of flash.
- SIZE [31:0]—Size of the block to write in bytes.
- BLOCK\_DATA [7:0]—Sequence of bytes to write to flash. Maximum number of bytes is 4084

**Command**

Bit	7	6	5	4	3	2	1	0
<b>CMD</b>	0x05							
<b>SUBCMD1</b>	0xF2							
<b>SUBCMD2</b>	0x0C							
<b>SUBCMD3</b>	0xED							
<b>ARG0</b>	CRC32_CORRECT [7:0]							
<b>ARG1</b>	CRC32_CORRECT [15:8]							
<b>ARG2</b>	CRC32_CORRECT [23:16]							
<b>ARG3</b>	CRC32_CORRECT [31:24]							
<b>ARG4</b>	FLASH_ADDR [7:0]							
<b>ARG5</b>	FLASH_ADDR [15:8]							
<b>ARG6</b>	FLASH_ADDR [23:16]							
<b>ARG7</b>	FLASH_ADDR [31:24]							
<b>ARG8</b>	SIZE [7:0]							
<b>ARG9</b>	SIZE [15:8]							
<b>ARG10</b>	SIZE [23:16]							
<b>ARG11</b>	SIZE [31:24]							
<b>ARG12</b>	BLOCK_DATA_0							
<b>ARG13</b>	BLOCK_DATA_1							
...	...							
<b>ARG_N</b>	BLOCK_DATA_N							

## Command 0x05 0xF3 – FLASH\_WRITE\_BLOCK\_READBACK\_AND\_PACKET\_VERIFY

Write a block of data to the flash. All the bytes on flash that are written must have been previously erased to 0xFF with the FLASH\_ERASE\_CHIP or FLASH\_ERASE\_SECTOR subcommands. Reads back the block after write to verify the block was written correctly by comparing the CRC32 of the block read back with crc32\_correct. Also compares the CRC32 of the block of data received by the command with CRC32\_CORRECT. If either of the compares does not match, the status ERR bit is set.

### Parameters

- CRC32\_CORRECT [31:0]—CRC32 of the block of data written.
- FLASH\_ADDR [31:0]—Starting address on flash of the block to write, byte offset from the start of flash.
- SIZE [31:0]—Size of the block to write in bytes.
- BLOCK\_DATA [7:0]—Sequence of bytes to write to flash. Maximum number of bytes is 4084

### Command

Bit	7	6	5	4	3	2	1	0
CMD	0x05							
SUBCMD1	0xF3							
SUBCMD2	0x0C							
SUBCMD3	0xED							
ARG0	CRC32_CORRECT [7:0]							
ARG1	CRC32_CORRECT [15:8]							
ARG2	CRC32_CORRECT [23:16]							
ARG3	CRC32_CORRECT [31:24]							
ARG4	FLASH_ADDR [7:0]							
ARG5	FLASH_ADDR [15:8]							
ARG6	FLASH_ADDR [23:16]							
ARG7	FLASH_ADDR [31:24]							
ARG8	SIZE [7:0]							
ARG9	SIZE [15:8]							
ARG10	SIZE [23:16]							
ARG11	SIZE [31:24]							
ARG12	BLOCK_DATA_0							
ARG13	BLOCK_DATA_1							
...	...							
ARG_N	BLOCK_DATA_N							

## 6.6. Flash Pass-Through Properties

Table 12. Common Property Summary

Common Properties			
Number	Name	Default	Summary
0x0001	SPI_CLOCK_FREQ_KHZ	0x61A8 (25000)	The SPI master clock frequency driving the external SPI flash in kHz
0x0002	SPI_MODE	0x03	SPI master mode
0x0101	READ_CMD	0x03	Flash read command
0x0102	HIGH_SPEED_READ_CMD	0x0B	Flash fast or high speed read command
0x0103	HIGH_SPEED_READ_MAX_FREQ_MHZ	0x00	Maximum SPI clock frequency in MHz for the fast or high speed read command
0x0201	WRITE_CMD	0x02	Flash write command
0x0202	ERASE_SECTOR_CMD	0x20	Flash erase sector command
0x0204	ERASE_CHIP_CMD	0xC7	Flash bulk/entire chip erase command

### Property 0x0001 SPI\_CLOCK\_FREQ\_KHZ

The SPI master clock frequency driving the external SPI flash.

**Default:** 0x61A8 (25000)

SPI_CLOCK_FREQ_KHZ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SPI_CLOCK_FREQ_KHZ [15:0]															
0x61A8															

Bit	Name	Function
15:0	SPI_CLOCK_FREQ_KHZ [15:0]	The SPI master clock frequency driving the external SPI flash Default: 0x61A8. Range: 3000 to 40000

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## Property 0x0002 SPI\_MODE

---

SPI master mode.

**Default:** 0x03

SPI_MODE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SPI_MODE [15:0]															
0x03															

Bit	Name	Function
15:0	spi_mode [15:0]	SPI master mode 0 = SPICFG1.CKPOL = 0, SPICFG1.CKPHA = 0. 1 = SPICFG1.CKPOL = 0, SPICFG1.CKPHA = 1. 2 = SPICFG1.CKPOL = 1, SPICFG1.CKPHA = 0. 3 = SPICFG1.CKPOL = 1, SPICFG1.CKPHA = 1. Default: 0x03. Range: 0 to 3

---

## Property 0x0101 READ\_CMD

---

Flash read command.

**Default:** 0x03

READ_CMD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
READ_CMD [15:0]															
0x03															

Bit	Name	Function
15:0	READ_CMD [15:0]	Flash read command Default: 0x03. Range: 0x00 to 0xFF

**Property 0x0102 HIGH\_SPEED\_READ\_CMD**

Flash fast or high speed read command.

**Default:** 0x0B

high_speed_read_cmd															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
HIGH_SPEED_READ_CMD [15:0]															
0X0B															

Bit	Name	Function
15:0	HIGH_SPEED_READ_CMD [15:0]	Flash fast or high speed read command. If set to 0x00, high speed read command will not be used. Default: 0x0B. Range: 0x00 to 0xFF

**Property 0x0103 HIGH\_SPEED\_READ\_MAX\_FREQ\_MHZ**

Maximum SPI clock frequency in MHz for the fast or high speed read command.

**Default:** 0x00

HIGH_SPEED_READ_MAX_FREQ_MHZ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
HIGH_SPEED_READ_MAX_FREQ_MHZ [15:0]															
0x00															

Bit	Name	Function
15:0	HIGH_SPEED_READ_MAX_FREQ_MHZ [15:0]	Maximum SPI clock frequency in MHz for the fast or high speed read command. If set to 0x00, command is unavailable Default: 0x00. Range: 0 to 127

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## Property 0x0201 WRITE\_CMD

---

Flash write command.

Default: 0x02

WRITE_CMD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
WRITE_CMD [15:0]															
0x02															

Bit	Name	Function
15:0	WRITE_CMD [15:0]	Flash write command. If set to 0x00, write command is unavailable Default: 0x02. Range: 0x00 to 0xFF

---

## Property 0x0202 ERASE\_SECTOR\_CMD

---

Flash erase sector command.

Default: 0x20

ERASE_SECTOR_CMD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ERASE_SECTOR_CMD [15:0]															
0x20															

Bit	Name	Function
15:0	ERASE_SECTOR_CMD [15:0]	Flash erase sector command  Micron M25P16—0xD8 for 64 kB sector SST25VF032B—0x20 for 4 kB sector SST25VF032B—0x52 for 32 kB sector SST25VF032B—0xD8 for 64 kB sector  Default: 0x20. Range: 0x00 to 0xFF



**Property 0x0204 ERASE\_CHIP\_CMD**

Flash bulk/entire chip erase command.

Default: 0xC7

ERASE_CHIP_CMD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ERASE_CHIP_CMD [15:0]															
0xC7															

Bit	Name	Function
15:0	ERASE_CHIP_CMD [15:0]	Flash bulk/entire chip erase command. Not available if set to 0x00.  Micron M25P16—0xC7 SSTVF032B—0x60 or 0xC7  Default: 0xC7. Range: 0x00 to 0xFF

## 7. Digital Services User's Guide

This section describes how to use the digital services interface of the Si468x device. Both the DAB and HD data services are addressed. The following topics are covered.

- Finding a service in the ensemble
- Starting a digital service
- Using the digital service interface to collect digital service data
- Error handling and recovery
- Formats of the digital service data

### 7.1. Reference Material

The following references are cited throughout this document.

1. ETSI EN 300 401 (1.4.1): "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".
2. ETSI TS 101 756 (1.4.1): "Digital Audio Broadcasting (DAB); Registered Tables".
3. ETSI EN 301 234: "Digital Audio Broadcasting (DAB); Multimedia Object Transfer (MOT) protocol".
4. ETSI TS 102 368: "Digital Audio Broadcasting (DAB); DAB-TMC (Traffic Message Channel)".
5. ETSI TS 102 427: "Digital Audio Broadcasting (DAB); Data Broadcasting—MPEG-2 TS streaming".
6. ETSI TS 102 563: "Digital Audio Broadcasting (DAB); Data Broadcasting—Transport of Advanced Audio Coding (AAC) audio".
7. Biquity RX\_IDD\_2206: "HD Radio Commercial Receiver Baseband Processor Command and Data Interface Definition".
8. Biquity RX\_IDD\_2206 Appendix K: "HD Radio Commercial Receiver Baseband Processor Command and Data Interface Definition, Appendix K, Advanced Application Services".
9. Biquity RX\_IDD\_2206 Appendix L: "HD Radio Commercial Receiver Baseband Processor

### 7.2. Definition of Terms

- **Component ID**—A numerical identifier for a digital service component. In the HD Radio context this term is used synonymously with Port Number or Program Number.
- **Digital Service**—A service that is provided by a digital radio ensemble. This could be a data or audio service.
- **Digital Service Data**—The data associated with a digital service. In the context of this document this generally refers to data services.
- **DSCType**—Data Service Component Type. This is defined in [2] Table 2: DSCTy Types.
- **DSRV Interface**—The Digital Service Data Interface of the Si468x.
- **Service ID**—A numerical identifier for a digital service. In the HD Radio context this term is used synonymously with Service Number.
- **STATUS\_WORD**—The STATUS\_WORD is the first 32 bits of all command responses of the Si468x. It contains the STATUS bits as well as system state and error information. Please see the Host Command API documentation for details.
- **STATUS\_BITS**—The first 16 bits (LSBs) of the STATUS\_WORD. These bits are used to signal events on the Si468x device.
- **UI**—A generic user interface. Generally associated with an end product.

### 7.3. Basics of the Si468x Digital Services Interface

The Si468x Digital Service (DSRV) data interface has been designed to help make common the method of access to the various data services available in both the DAB and HD Radio broadcasting systems. This interface is generic and is used in both the DAB and HD Radio modes of operation. That is, it is not specific to either the DAB or HD Radio standards. Its purpose is to help ease the task of integrating and managing the various data services available (such as a traffic or news service) in the given standards. This interface adds a DSRV header to each data packet (or payload) returned by the digital demodulator. The intent is not to redefine the payload sections but to provide a common data services management layer for the host. In general the payload sections are unaltered from what has been defined for a given standard. The DSRV header is used by the host to determine the following:

- Identification of the Service and Component IDs of a data packet for routing to the appropriate decoder. For the HD Radio standard, the Service ID and Component ID are the same as the Service Number and Port Number respectively as defined in [9].
- The current status of the data service. The status is used to signal the following types of information.
  - The service has encountered an error or has stopped
  - The service is running normally
- The packet's sequence number, if applicable.
- The packet's service type.
- The size of the packet data.
- The number of data packets remaining in the DSRV queue.

**Note:** The production release of the Si468x firmware may provide the option of removing the DSRV header.

### 7.4. Basic Operation

Both the DAB and HD Radio standards provide a means for a broadcaster to include data based services as part of a broadcast. Before one of these services can be enabled it is necessary for the host application to identify and select a service of interest. It is also necessary for the host application to have the appropriate data decoder to support a given service. Once a service has been identified it is started by the host and the data for that service begins to flow through the DSRV interface.

The DSRV interface is designed to be an event driven interface. Whenever a new block of data is available for an enabled data service the host is notified via a status bit or interrupt. The host may then retrieve the data block through a host command. The DSRV interface can also be used in a polling mode if desired. The various interface methods for using this interface are described below.

The DSRV interface uses a queuing mechanism to hold the data packets until the host is able to collect them. This queue relaxes the timing requirements placed on the host by allowing it to collect all packets in the queue at one time when it is convenient (within reason). The maximum number of packets stored before the packet queue overflows is eight.

There are five steps required to start and render a digital service. Each of these steps is explored in more detail in the sections that follow. Each of the steps is briefly outlined here.

1. Collect and parse the digital service list using the GET\_DIGITAL\_SERVICE\_LIST host command.
2. Determine which services and service components look appealing (Generally this is a user requested selection from a UI).
3. Start a service using the START\_DIGITAL\_SERVICE host command.
4. Collect the service data using the GET\_DIGITAL\_SERVICE\_DATA host command.
5. Decode and render the service using the appropriate data decoder. Note that, with few exceptions, all service decoding is done by the host.

## 7.5. Finding a Digital Service

Before starting a data service the host must collect information about the services that exist in the ensemble. This is done using the GET\_DIGITAL\_SERVICE\_LIST host command. The service list definitions for both HD Radio and DAB are described in “7.5.1. HD Radio Service List” and “7.5.2. DAB/DMB Radio Service List”. Table 13 shows the format of the GET\_DIGITAL\_SERVICE\_LIST host command.

**Table 13. GET\_DIGITAL\_SERVICE\_LIST Command**

GET_DIGITAL_SERVICE_LIST Command	7	6	5	4	3	2	1	0
<b>CMD</b>	0x80							
<b>ARG1</b>	000000						0	SERTYPE

The argument SERTYPE is used to select between audio and data service lists in HD Radio applications. This argument should be set to 0 when running the DAB application.

The service list may be updated periodically by the broadcaster. Therefore the host must keep track of the current service list and update the UI information as appropriate. Notification that a new service list is available is handled by the service list update notifications of the HD\_GET\_EVENT\_STATUS or DAB\_GET\_EVENT\_STATUS host commands. Please review the API documentation of these commands for details regarding the service list update notifications. Each service list has a version associated with it so that host can easily determine if their service list is out of date.

Additionally, in DAB mode at tune time and during reconfiguration the service list gets updated frequently as the ensemble configuration becomes known. To deal with periods when the service list is changing frequently a debounce timer is employed to limit the number of service list update events received by the host. This timer works by blocking service list update events until the service list is stable for a period of time. See the property DAB\_EVENT\_MIN\_SVRLIST\_PERIOD for details on setting up the service list event debounce timer.

### 7.5.1. HD Radio Service List

In HD Radio mode there is a separate service list for data services and for audio services. The type of service list returned is determined by the SERTYPE command argument of the GET\_DIGITAL\_SERVICE\_LIST host command. The service lists for HD Radio mode conform to the HD 2206 specification. The definitions of these service lists are found in [9]. The format of the returned service lists is defined by the GET\_ALL\_AUDIO\_SERVICES\_INFO and GET\_ALL\_DATA\_SERVICES\_INFO functions defined in L-1 of [9]. In both cases Byte 0 as defined in the L-1 is not needed and is omitted.

#### Notes:

1. It is important to note that for the purposes of this document Service ID is synonymous with the HD Radio "Service Number" and Component ID is synonymous with the HD Radio "Program Number" (audio) or "Port Number" (data). This means that when starting a data service the Service Number is used as the Service ID and Port Number is used as the Component ID.
2. For HD Radio the START\_DIGITAL\_SERVICE and STOP\_DIGITAL\_SERVICE host commands do not require the Service ID and it may be omitted. In this case a 0 must be used in place of the Service ID.

### 7.5.2. DAB/DMB Radio Service List

Unlike HD Radio the DAB/DMB application has a single service list for both data and audio services. This list is returned by the GET\_DIGITAL\_SERVICE\_LIST host command. The SERTYPE argument is not used and should be set to 0. The DAB/DMB service list is shown in Table 2 below. The list was designed with the FIG formats defined in [1] in mind. Therefore most of the fields map closely to the FIG configurations. Additionally the service list is designed to be small but complete enough for the host to make decisions about the services. This made it necessary to combine certain FIG fields into a single table entry in the table.

To support extensibility and the promote completeness of information, additional Host Command APIs are needed to collect the additional information from the Si468x device.

Table 14. DAB/DMB Digital Service List Definition

Table Entry		Definition					Size (Bytes)
List Size		Indicates the number of bytes in the digital service list (Max = 2694 Bytes, not including List Size)					2
Version		Version of this service list. The version number increments by 1 each time the list changes.					2
Number of Services		Indicates the number of services defined in the list (N; $N \leq 32$ ).					1
Align Pad		RFU					3
Service 1							
Service ID (See clause 6.3.1 of EN 300 401)	P/D = 0	RFU[31:16]	CountryID[15:12]		SRV_REF[11:0]		4
	P/D = 1	ECC[31:24]	CountryID[23:20]		SRV_REF[19:0]		
Service Info 1		RFU[7]	SrvLinking Info Flag[6]	Pty[5:1]		P/D Flag[0]	1
Service Info 2 (See clause 6.3.1 of EN 300 401 for actual max components)		LOCAL[7]		CAId[6:4]		NUM_COMP[3:0] ( $M \leq 15$ )	1
Service Info 3		RFU[4:8]			SICharset[3:0] (See ETSI TS 101 756, clause 5.3)		1
Align Pad							1
Service Label		The name of this service					16
Service 1 Component 1							
Component ID (See clause 6.3.1 of EN 300 401)	TMID = 0	TMID[15:14]	Rfu[13:6]			SubChId[5:0]	2
	TMID = 1	TMID[15:14]	Rfu[13:6]			SubChId[5:0]	
	TMID = 2	TMID[15:14]	Rfu[13:6]			FIDCId[5:0]	
	TMID = 3	TMID[15:14]	DGFlag[13]	Rfu[12]	SCId[11:0]		
Component Info		ASCTy[7:2]/ DSCTy[7:2]			P/S[1]	CA Flag[0]	1
Valid Flags		RFU[7:1]				$\mu$ A Info Valid[0]	1
The component field is repeated M-1 times for each service component in the service.							
Service 2							
The service field is repeated N-1 times for each service in the ensemble.							

Each of the fields in the service list that are not directly defined in the table above are defined here.

- **Align Pad**—Alignment pads are added to the list to insure that table entries that are larger the 8 bits will be properly aligned when received by the host. In other words 16 bit entries will fall on even address boundaries and so on. To take advantage of this the host must align reply buffers on a 32 bit boundary.
- **RFU**—Entries reserved for future use.
- **Pty**—The service program type. See Annex A. of [2].
- **SrvLinkingInfo Flag**—This bit is set to 1 if service linking info is available for this service.
- **P/D Flag**—This bit is set to 0 for a program (audio) service and 1 for a data service.  
See clause 5.2.2.1 of [1].
- **LOCAL Flag**—Indicates if the service is available over the entire (0) or part (1) of the ensemble service area.  
See clause 6.3.1 of [1].
- **CAId**—Identifies the access control used. See clause 6.3.1 of [1].
- **CA Flag**—If set to 1 this flag indicates that access control applies. See 6.3.1 of [1].
- **DGFlag**—Indicates that the data service is transmitted in data groups. See clause 5.3 of [1].
- **ASCTy**—Audio Service Component Type. See clause 6.3.1 of [1].
- **DSCTy**—Data Service Component Type. See clause 6.3.1 of [1].
- **P/S Flag**—Indicates if a component is the primary (0) or a secondary (1) component of a given service.

In general, the host will also want to collect the component information for services that look interesting. This is done with the DAB\_GET\_COMPONENT\_INFO command shown below. This command returns the following information.

- Component Label from Fig 0/5
- Component Language
- Component Global Service Identifier.
- Component User Application Information from Fig 0/1

**Table 15. DAB\_GET\_COMPONENT\_INFO Command**

DAB_GET_COMPONENT_INFO Command	7	6	5	4	3	2	1	0
<b>CMD</b>	0xBB							
<b>ARG1</b>	00000000							

Table 16. DAB\_GET\_COMPONENT\_INFO Response

Function	Description		Size (Bytes)
<b>Global ID (SCIdS)</b>	The global reference for the component. See clause 6.3.5, Fig 0/8 of [1]. The SCIdS gets concatenated with the Service ID of the service list to form the full global component ID.		1
<b>Align Pad</b>			1
<b>Language</b>	The language the component is in. See tables 9 and 10 of [2]		1
<b>Component Label Character Set</b>	The character set for the component label. Note: Component Label information may be changed in a future rev to support long component labels.		1
<b>Component Label</b>	The textual label for the service component. If the first byte of the label is 0, this implies that the label does not exist. In this case the entire label will be 0 and the character set and abbreviation mask will also be zero. <b>Note:</b> Component Label information may be changed in a future rev to support long component labels.		16
<b>Component Label Abbreviation Mask</b>	Each bit set in this 16 bit field represents a character that should be used in the label above when abbreviating the label. <b>Note:</b> Component Label information may be changed in a future rev to support long component labels.		2
<b>Num <math>\mu</math>A</b>	This number of user applications supported for this component.		1
<b>Align Pad</b>			1
<b>User Application Information</b>	RFU[15:11]	UAType[10:0]	2
	RFU[7:5]	Length[4:0]	1
	$\mu$ A DATA (See Fig 0/13 definition in [1], clause 8.1.20)		Length
<b>Align Pad</b>	If needed. Add 1 byte if the value of length is even.		1 (If Needed)
	The User Application information field is repeated up to 5 times for each user application supported. This number of $\mu$ A Types is given in the NUM $\mu$ A field of this table. This is only applicable for application data transported over XPAD.		

## 7.6. Starting a Digital Service

Once a data service has been identified in the service list the host starts the service using the START\_DIGITAL\_SERVICE command. This command is depicted below in Table 17. In the command the host provides the service ID and the component ID as shown. Both the service ID and component ID are returned in the service list described previously. When stating a data service the service type (SERTYPE) field should always be written as 1.

**Note:** The SERTYPE argument is not needed for DAB applications and should be written as 0.

**Table 17. Start Digital Service Command**

START_DIGITAL_SERVICE Command	7	6	5	4	3	2	1	0
<b>CMD</b>	0x81							
<b>ARG1</b>	0000000							SERTYPE
<b>ARG2</b>	00000000							
<b>ARG3</b>	00000000							
<b>ARG4</b>	SERVICE_ID[7:0]							
<b>ARG5</b>	SERVICE_ID[15:8]							
<b>ARG6</b>	SERVICE_ID[23:16]							
<b>ARG7</b>	SERVICE_ID[31:24]							
<b>ARG8</b>	COMP_ID[7:0]							
<b>ARG9</b>	COMP_ID[15:8]							
<b>ARG10</b>	COMP_ID[23:16]							
<b>ARG11</b>	COMP_ID[31:24]							

Once a service is started, data packets for the service will begin appearing at the DSRV interface. If an attempt is made to start a service that does not exist, the error bit (bit 6) of the STATUS\_WORD is returned along with reason code 0x03 (Not available) in the 5th byte of the START\_DIGITAL\_SERVICE response. Note that in all cases byte 5 only acts as an error code when the ERR\_CMD bit is set in the STATUS\_WORD.



## 7.7. Getting the Digital Service Data

Data service packets are collected using the GET\_DIGITAL\_SERVICE\_DATA host command. All data service data is returned using this interface. This includes both PAD and PSD data for the DAB and HD radio applications respectively. This command is shown in Table 18.

**Table 18. Get Data Service Data Command**

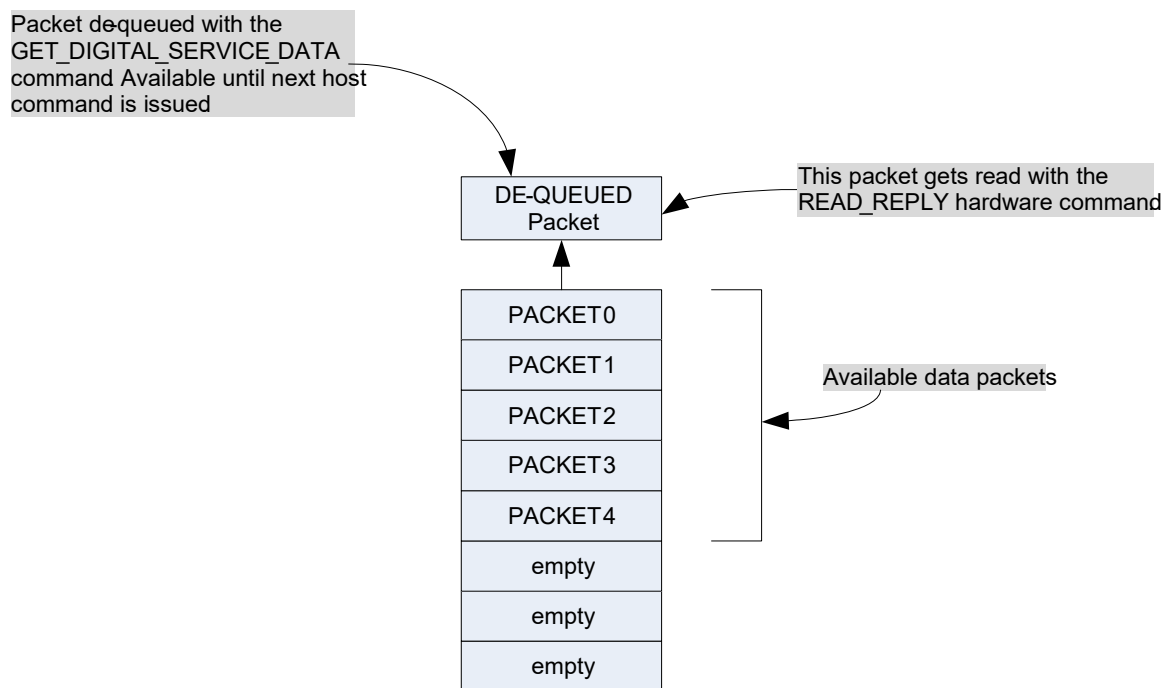
GET_DIGITAL_SERVICE_DATA Command	7	6	5	4	3	2	1	0
<b>CMD</b>	0x84							
<b>ARG1</b>	000		STATUS_ONLY		000		ACK	

When data service packets are ready for consumption they are placed into a holding (DSRV) queue until collected. This queue gives the host some flexibility in terms of when the data is collected but the data must be collected before the queue overflows. When the GET\_DATA\_SERVICE\_DATA command is issued the next packet in the DSRV queue is de-queued and placed in the command interface. This data packet will remain available to the host until the next host command is issued.

The host may issue the READ\_REPLY command as many times as needed without losing the packet data. This gives the host the option of reading the header first with one READ\_REPLY transaction then reading the entire packet with payload with a second READ\_REPLY transaction.

Instead of issuing multiple READ\_REPLY commands the host may instead issue the READ\_MORE command to first read out the DSRV packet header to determine the size of the payload and then read the remaining bytes of the payload using the READ\_REPLY command.

Both of the methods for retrieving the packet data described above require no overhead from the Si468x software and are therefore very efficient. The diagram below depicts the DSRV queuing mechanism.



**Figure 6. DSRV Queuing Mechanism**

# AN649

The following command options are available.

- **ACK:** When this bit is set all interrupts associated with the GET\_DATA\_SERVICE\_DATA command and the DSRVINT bit of the STATUS\_WORD are cleared on the next reading of the service data.
- **STATUS\_ONLY:** This option lets host determine the status of the DSRV interface and also determine the number of packets available for consumption.

The response for this command is shown in Table 19. The fields in this response are discussed throughout the remainder of this section.

**Table 19. Get Data Service Data Response**

GET_DIGITAL_SERVICE_DATA Reply	7	6	5	4	3	2	1	0
STATUS0	CTS	ERR_CMD	DACQINT	DSRVINT	RSQINT	RDSINT	ACFINT	STCINT
STATUS1	DBGINT	RSVDINT_14	DEVNTINT	RSVDINT_12	RSVDINT_11	RSVDINT_10	RSVDINT_9	RSVDINT_8
STATUS2	RSVD_STAT0[7:0]							
STATUS3	PUP_STATE[1:0]		RSVD_STAT1[1:0]		REPOFERR	CMDOFERR	ARBERR	ERRNR
DATA4	XXXXX					DSRVER-RINT	DSRVOV-FLINT	DSRVINT
DATA5	BUFF_COUNT[7:0]							
DATA6	SRV_STATE[7:0]							
DATA7	DATA_TYPE[7:0]							
DATA8	SERVICE_ID[7:0]							
DATA9	SERVICE_ID[15:8]							
DATA10	SERVICE_ID[23:16]							
DATA11	SERVICE_ID[31:24]							
DATA12	COMP_ID[7:0]							
DATA13	COMP_ID[15:8]							
DATA14	COMP_ID[23:16]							
DATA15	COMP_ID[31:24]							
DATA16	RFU[7:0]							
DATA17	RFU[15:8]							
DATA18	BYTE_COUNT[7:0]							
DATA19	BYTE_COUNT[15:8]							
DATA20	SEG_NUM[7:0]							
DATA21	SEG_NUM[15:8]							
DATA22	NUM_SEGS[7:0]							
DATA23	NUM_SEGS[15:8]							
DATA24	PAYLOAD0[7:0]							
DATA25	PAYLOADN[7:0]							

### 7.7.1. GET\_DIGITAL\_SERVICE\_DATA Configuration Parameters

The DSRV interface can be configured to control the DSRVINT bit of the STATUS\_WORD and generate hardware interrupts to the host. There are three interrupt sources available for this purpose. These sources are as follows.

1. DRSPCKTVINT: This interrupt source indicates that a new data packet has been forwarded to the DSRV queue by the digital radio module. The host should respond to this interrupt by reading a packet(s) from the DSRV interface with the GET\_DIGITAL\_SERVICE\_DATA command. This bit will remain set as long as there are buffers (packets) available in the DSRV queue.
2. DSRVOVFLINT: This interrupt source indicates that the DSRV queue has overflowed. This indicates that the host is not pulling data service data from the Si468x as fast as it is being produced. The host must take corrective action. The most recent data remains in the queue under this condition. Older is discarded.
3. DSRVERRINT: This interrupt source indicates that there was an error associated with one of the enabled data services at the physical layer (channel/demod). This could be due to a signal fade or some other problem in the channel. The affected service will report an error in the status indicator of the DSRV header. This interrupt is not available in HD Radio mode.

In all cases these indicators will appear in the INTSRC response of the GET\_DIGITAL\_SERVICE\_DATA command if they occur. Use the command's ACK option to clear the indicators described above. If the host wishes to have one or all of these interrupt sources set the DSVRINT bit of the STATUS\_WORD and or generate a hardware interrupt, the DIGITAL\_SERVICE\_INT\_SOURCE property (0x8100) is used. Simply set the appropriate enable bit in the property.

### 7.7.2. Interrupt Method (Most Efficient)

Having the host react to interrupts from the Si468x device is generally the most efficient way to deal with data services. This eliminates the need for polling and the overhead associated with it. To generate a DSRV hardware interrupt the host must set the DSRVIEN bit of the INT\_CONTROL\_ENABLE property (0x0000) in addition to setting the appropriate bits of the DIGITAL\_SERVICE\_INT\_SOURCE property. Please see the descriptions of the DIGITAL\_SERVICE\_INT\_SOURCE and the INT\_CONTROL\_ENABLE properties in the host command API documentation for more details on enabling these interrupts.

A basic interrupt service routine for dealing with Si468x events is shown in the code snippet below. The interrupt handler simply schedules a Si468x maintenance task and returns; this accomplishes three things.

1. It keeps the Si468x maintenance loop from running when it does not need to.
2. It reduces the overhead that would normally be required on the Si468x to deal with the commands used to poll the device.
3. Helps aligns the timing of the maintenance task to the needs of the Si468x.

```
void Si46xx_interrupt_handler(void)
{
    /*
        On interrupt schedule the Si46xx maintenance task and
        return from the interrupt.
    */
    schedule_dsrv_handler();
    return;
}
```

#### Code Snippet 1. Si468x Interrupt Service Routine

## 7.7.3. Status Polling Method

Status polling is the second most efficient method for getting data service data off of the Si468x. In the status polling method the host must set the appropriate bits of the DIGITAL\_SERVICE\_INT\_SOURCE property and poll the STATUS\_WORD at a reasonable rate. When the DSRVINT bit is set, the host then executes a data service maintenance routine to collect and dispatch the DSRV data.

Depending on the rate at which data is produced by the Si468x the host must poll the STATUS\_WORD at a given rate. As an example if it is known that data is produced at a fixed 64 kbps rate and that the minimum packet payload size returned by the Si468x is 1024 bytes and the desired maximum queue depth is 4 (the maximum DSRV queue depth on the Si468x is 8 deep), then the poll rate is given by:

$$\text{Rate}_{\text{poll}} = \frac{Q_{\text{Max}} \times N_{\text{min}}}{K_{\text{max}}}$$

### Equation 2. Poll Rate Assuming a Uniform Distribution of Packet Delivery

Where  $\text{Rate}_{\text{poll}}$  is the rate at which the system should be polled.  $Q_{\text{Max}}$  is the desired queue depth;  $N_{\text{min}}$  is the expected minimum number of bits per packet, and  $K_{\text{max}}$  is the expected maximum data rate. For the example cited, this equates to a poll rate of about 0.5 s. When running in HD Radio mode it is recommended that the poll rate be on the order of one HD audio frame which is 46ms.

A typical polling routine might look something like the following.

```
void Si46xx_status_poll(void)
{
    uint32_t status_word;
    uint16_t status_bits;

    status_word = get_Si46xx_status();

    /* Mask off the status bits and handle each as needed. */
    status_bits = status_word & 0x0000FFFF;

    if (status_bits & dsrv_mask) {
        handle_dsrv();
    }

    if (status_bits & other_stuff_mask) {
        handle_other_stuff();
    }
    .
    .
    .
    return;
}
```

### Code Snippet 2. Si468x Polling Function

The `get_Si468x_status()` function simply reads 4 bytes from the command interface and returns those four bytes as an unsigned 32 bit word. The function `handle_dsrv()` should look something like the following.

```
#define DSRV_INTSRC_OFFSET      (4)
#define DSRV_DATA_READY_MASK   (1)
#define DSRV_OVERFLOW_ERR_MASK (2)
#define DSRV_PHYERR_MASK       (4)
void handle_dsrv(void)
{
    uint8_t *p_reply_buffer;
    uint8_t dsrv_int_source;
    uint8_t packets_available;

    /* Read the dsrv data using the GET_DIGITAL_SERVICE_DATA
       command. In this example the reply buffer is pointed
       to by p_reply_buffer. This buffer is assumed to be
       controlled by a buffer management scheme not shown
       but is assumed to remain valid past the scope of this
       function.
    */
    get_dsrv_data(&p_reply_buffer);

    dsrv_int_source = p_reply_buffer[DSRV_INTSRC_OFFSET];

    /* If DSRV data is ready, dispatch it to the appropriate decoder */
    if (dsrv_int_source & DSRV_DATA_READY_MASK) {
        dispatch_dsrv_data(p_reply_buffer);
    }

    /*
       A DSRV packet overflow has occurred. This indicates that the host
       is not collecting the data packets fast enough. If polling the
       poll rate must be increased, if interrupt driven the queue depth
       property is set to deep.
    */
    if (dsrv_int_source & DSRV_OVERFLOW_ERR_MASK) {
        handle_dsrv_overflow();
    }

    /* Phy error, except packets with errors or missing packets. */
    if (dsrv_int_source & DSRV_PHYERR_MASK) {
        handle_dsrv_phy_err();
    }

    return;
}
```

### Code Snippet 3. Si468x DSRV Handling Function

7.7.4. DSRV Polling Method (Least Efficient)

The least efficient way to use the DSRV interface is to simply poll the DSRV interface using the GET\_DIGITAL\_SERVICE\_DATA command. If doing this the poll rate defined in equation 1 above should be used.

7.8. DSRV Error Handling

In general there is nothing that can be done when errors occur due to signal loss or other impairments. Both the DAB and HD Radio systems employ some form of repetitive transmission of service data to deal with these types of issues. However, if an DSRV overflow condition is detected the host system is not servicing the DSRV queue quickly enough. In this case the host must poll the DSRV interface and collect the data service data at a faster rate. If the overflow condition does occur the data in the queue will always be the most recent data received.

7.9. Data Service Formats

This section describes the format in which data is returned from the Si468x device for the HD Radio and DAB modes of operation.

7.10. DAB

The service data for data services is returned in three possible modes. The format in which the data is returned depends on the transmission mode of the data. The following modes are possible.

- 1. Stream Mode: Data is transmitted in a single DMB sub channel. The packetization of this data depends on the DSCType. Data transmitted in stream mode will have a TMId of 1 in the data service list. In general this will include DSCType of TDC and MPEG-II Transport Stream. Please see the details below for these data service component types.
- 2. Packet Mode/No Data Groups: Data transmitted in Packet Mode without data groups will be passed to the host as packets from a logical frame with CRC. A data service that is transmitted in Packet Mode/No Data Groups will have a TMId of 3 and the DG flag will not be asserted in the service list.
- 3. Packet Mode/With Data Group: Data is transmitted in Packet Mode with Data Groups. A data service that is transmitted in Packet Mode with Data Groups will have a TMId of 3 and the DG flag will be asserted in the service list. Data that is transmitted in mode will have it's data presented at the data group layer as defined in clause 5.3.3 of [1]. Data group packets will be up to 8191 bytes in length.

Figure 7 shows the level at which data is forwarded to the host for Packet mode based on the state of the data group flag.

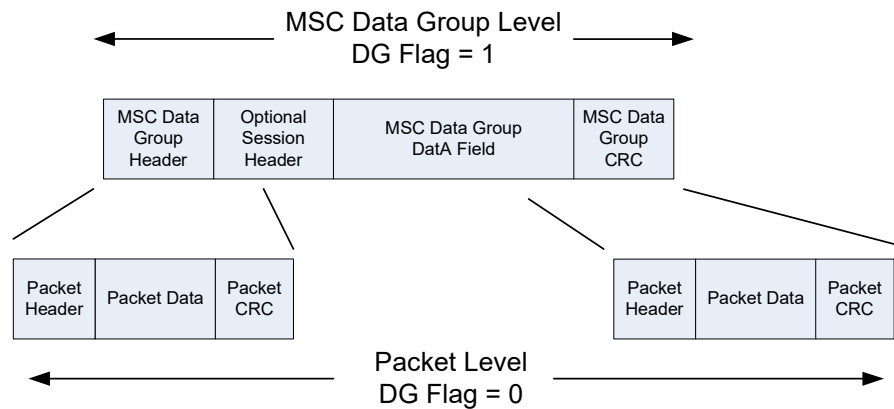


Figure 7. Packet Mode Payload Definitions

The following subsections outline the format of the returned data for each data service component type.

7.10.1. Unspecified Data

Since this data format is unspecified the Si468x does not provided any special forwarding capabilities for data services transporting using the data service component type.

### 7.10.2. Traffic Message Channel

DAB transports TMC messages using the Fast Information Data channel (FIDC). TMC-user and TMC-system messages are encoded according to ISO 14819-1 (TTI).

The TMC messages will be passed as one or more 37 bit messages with a maximum payload of 6 messages or 28 bytes. Unused bits located at the end of the payload and will be set to 0.

The TMC system will be passed as one or more 16 bit messages with a maximum payload of 14 messages or 28 bytes. Unused bits located at the end of the payload and will be set to 0.

User Application Information will be passed in the DAB\_GET\_COMPONENT\_INFO command.

Please see reference [4] for full details of TMC for DAB

Note: We are still working out some details of this DSCTy. Complete information will be included in a future revision of this document.

### 7.10.3. Emergency Warning System

**Note:** We are still working out the issues and details of this DSCTy. Complete information will be included in a future revision of this document, but the implementation will be similar to TMC.

### 7.10.4. Interactive Text Transmission

This data service component type appears to be obsolete and is currently not supported.

### 7.10.5. Paging

**Note:** We are still working out the issues and details of this DSCTy. Complete information will be included in a future revision of this document, but the implementation will be similar to TMC.

### 7.10.6. Transparent Data Channel

TDC data can be provided in all data transport mode described above. Please refer to the user application definition for applications transported using the TDC to determine the transport mode used. Based on the transport mode the data will be presented as follows.

- Stream Mode: Presented as a stream of bytes in chunks of reasonable size (about 1k). No special framing or CRC is provided.
- Packet Mode / no Data Groups: Passed to the host as one or more packets from a logical frame with CRC. The format of these packets is entirely defined by the application type. The Si468x firmware performs no repackaging of this data. See Figure 7 for details.
- Packet Mode / with Data Groups: Passed to the host at the MSC data group level as defined in 5.3.3 of [1]. See the specification for specific applications to determine the contents of the data group payload. Please see figure 2 for details.

### 7.10.7. MPEG-2 Transport Stream

The MPEG-2 Transport Format is defined in [5]. This data is transported in steam mode as defined above. Data for this type is DSCType is presented to host as complete TS packets.

The number of packets returned in a single payload can vary but is nominally on the order of 8 packets. Assuming the standard 188 byte TS packet this equates to payload size of 1504 bytes nominally. Figure 8 shows the format of the data returned when the DSCType is MPEG-2 Transport Stream. Also see reference [5] for details on DAB MPEG-2 TS Streaming.



**Figure 8. MPEG-2 Packet Definition**

### 7.10.8. Embedded IP Packets

IP Packets are presented in packet mode with data groups. Therefore the data is presented at the data group level as defined in clause 5.3.3 of [1]. The payload in the data group packet will be a single IP packet. See Figure 7 on page 430 for details.

## 7.11. MOT

MOT is transmitted as MOT segments at the data group level. Therefore the MOT data will be presented as defined in 5.3.3 of [1] as segmented MOT objects. Please also see the definition of MOT transport for DAB in [3].

The Si468x shall forward MOT data groups in the order of arrival. The assembly of MOT data groups into MOT segments shall not be done by the Si468x, and left to the MOT decoder software on the host.

The DAB MSC can carry more than one MOT object at the same time. In order to assemble MOT segments, the host needs to join only MOT applications messages associated with the service identified by the service ID and component ID.

### 7.11.1. Proprietary Service: no DSCTy Signaled

Not well defined. The Si468x does not provide special forwarding of this data service component type.

## 7.12. HD Radio Data Services

In HD Radio mode the format for the data payload returned by the GET\_DIGITAL\_SERVICE\_DATA command is defined in reference [8]. Please refer to this document for the details of the HD Radio payloads. The Skyworks Solutions GET\_DIGITAL\_SERVICE\_DATA command returns the payload as defined by the GET\_PORT\_DATA function code that is defined in table K-5 of reference [8]. Only the AAS Data Packet portion of the GET\_PORT\_DATA response is returned in the GET\_DIGITAL\_SERVICE\_DATA command's payload. The remaining information associated with this command is returned in the DSRV header. Exceptions are the function code and the Num\_Pkts\_Avail. The Num\_Pkts\_Avail field is not required because every packet associated with an enabled port is forward to the host through the DSRV interface as soon as it becomes available (i.e., Num\_Pkts\_Avail should never exceed 1). Specific payload formats for a given service type should be available from the service provider. For example information about traffic data payloads from NavTeq should be available from the Navteq service provider and a Navteq decoder is required on the host before this service can be used. Please review the information of references [7,8], "7.5.1. HD Radio Service List" on page 420, and digital service APIs for complete details on HD Radio Data services.

### 7.12.1. A Note About LOT

LOT is the HD Radio protocol that is used for transferring large files over the air. LOT stands for Large Object Transfer. The LOT standard includes methods for object reassembly and retrieval. The Si4680 does not support the reassembly of large data objects and therefore the host must have a LOT decoder if LOT is to be supported. The Si4680 device does support LOT data services just like any other data service but it is incumbent upon the host to decode and reassemble LOT encoded objects. Services that are transferred using the LOT protocol can be identified by the Processing Field of the component in the service list. Refer to [8] and [9] for more details regarding LOT. Please also contact iBiquity Digital Corporation for information on obtaining LOT a decoder for a host system.

## 7.13. Audio Related Data Services

Both the DAB and HD Radio standards support data services that are closely coupled with the audio content. In DAB this is referred to as Program Associated Data (PAD) and in the HD Radio standard this is referred to as Program Service Data or PSD. The Si4680 device supports the transport of both of these meta data services through the DSRV interface. The following subsections describe how this data is retrieved from the Si4680 device. In both case a host decoder is required to decode the PAD/PSD payloads.

## 7.14. DAB Program Associated Data (PAD)

PAD is closely coupled to the audio content. In fact, PAD is transported along with the audio data in an audio subchannel. Please see [1] Section 7.4 and [6] Section 5.4 for more details regarding the transport of PAD. This data must be extracted from the audio stream before it can be used. The Si4680 device performs the task of extracting the PAD and forwards it automatically to the host when a audio program is playing. The PAD data is forward with a service ID and Component ID that match the audio program.

PAD can support multiple types of data services including DSL, DLS Plus, and MOT. See the [1] for full details on which service types are supported.



### 7.14.1. The GET\_DIGITAL\_SERVICE\_DATA Command DATA\_TYPE Field

The data type field will be used in cases where a service component can forward multiple types of data. Right now the only service components that can do this are the DAB/DAB+ DL message, DL+ tags and Audio services PAD. The case of DAB, the DATA\_TYPE field is defined in Table 20 below.

**Table 20. Definition of the DATA\_TYPE Field of the DSRV Header (DAB Mode)**

Data/PAD/AUDIO[7:6]	TYPE[5:0]
---------------------	-----------

The Data/PAD/Audio and TYPE sub-fields shown in figure 4 are used to convey the type of data transported in the DSRV payload. The meaning of these fields is shown in the list below.

- Data/PAD/Audio = 00: Standard data channel for data services not related to audio.
  - TYPE = 0, RFU.
- Data/PAD/Audio = 01: Data over PAD , Non-DLS, DLS+
- TYPE: conforms to Table 2: DSCTy types found in [2], selected values are
  - TYPE = 0: unspecified data
  - TYPE = 1: TMC
  - TYPE = 5: TDC/TPEG
  - TYPE =60: MOT
- Data/PAD/Audio = 10: DLS/DL+ over PAD for DLS services
  - For now Type = 0, RFU
- Data/PAD/Audio = 11: Audio (RFU; Audio Currently not transported over the DSRV interface)
  - Type = 0 for MPEG I or II foreground
  - Type = 1 for MPEG I or II Background
  - Type = 2 for multichannel MPEG II

**Note:** This field will always be set to 0 for FMHD (DATA).

### 7.14.2. DLS/DLS+

When Data/PAD/Audio is equal to binary 10 the data packet is PAD-DLS or DLS+. The Si4680 device will completely reconstruct all DLS messages and commands and forward them to the host. In this case the payload will contain an additional payload header that indicates needed information about the payload. The following subsections define this addition payload header and describe how the host should use this information. It is expected that the reader is familiar with the DLS specification as defined in [1] and ETSI TS 102 980.

#### 7.14.2.1. The Prefix (Payload Header) for DLS/DLS+

For DLS and DLS+ a two byte prefix is added to the payload. This prefix conforms to the DL+ spec (ETSI TS 102 980) in conjunction with the XPAD DLS definition as defined in [1] Section 7.4.5.2 and is defined in Table 21 below. Since the Si4680 reconstructs the DLS messages and commands not all elements of the prefix and commands as defined in [1] are required so elements used for message reconstruction are not included in the header. Only those elements of the commands and messages needed for display and message parsing are include a prefix as required by the spec.

**Table 21. Definition of the Payload Header (Prefix) when DLS/DLS+ is transported in the DSRV**

Toggle[7]	RFU[6:5]	C[4]	(Field 1) C=1, Command[3:0]/ C=0, 0
(Field 2) C=1, Link[4]/C=0 Charset[7:4]			RFU[3:0]

The first two bytes of the header shall match the definition of the XPAD DLS prefix. Only elements relating to the entire payload are included. Elements use to reconstruct the payload are not needed and thus omitted.

**Note:** There are only two valid values for the command filed. They are 0001 (remove label from display) and 0010 the DL Plus command. In all other cases the command filed should be written as 0000.

## 7.14.2.2. The Payload for DLS/DLS+

The DLS/DLS+ payload shall consist of either a reassembled message or reassembled command body as defined in [1] Section 7.4.5.2.

When a DL message is indicated by a value of 0 in the C field of the prefix, the messages follows immediately after the prefix. In this case, field 1 is zero and field two contains the character set.

**Table 22. A DLS Message**

Toggle[7]	RFU[6:5]	C[4]	(Field 1) C=0, 0
(Field 2) C=0 Charset[7:4]			RFU[3:0]
Msg (variable length)			

When a DL Plus Command is indicated value of 1 in the C field and by a value of 0010 in the command field of the prefix, the DL Plus command follows the prefix. The structure of the DL Plus command is defined in clause 7.2 of ETSI TS 102 980.

**Table 23. DLS Tags Command with Prefix**

Toggle[7]	RFU[6:5]	C[4]	(Field 1) C=1, Command[3:0]
(Field 2) C=1, Link[4]			RFU[3:0]
CID[7:4] (currently only 0000, DL Plus TAGS command)			CB (For Tags Command it is IT[3], IR[2], NT[1:0])
tags (variable length)			

## 7.15. HD Radio PSD

For HD Radio PSD is supported through the DSRV interface. The PSD payload is transferred to host in the format defined in [7] and an ID3 decoder is required to render the PSD information. Unlike DAB, PSD forwarding is not enabled by default and must be enabled using the HD\_PSD\_ENABLE property. Additionally PSD can be enabled for any audio program that exists in the ensemble even if it is not being listened to. Please review the HD\_ENABLE\_PSD property for details.

When PSD data is forward to the host it is identified by unique port numbers (component IDs) in the DSRV header. The MPS is identified by Component ID equal to 0x5100 and SPS1-SPS7 are identified by a component ID of 0x5201-0x5207 respectively.

### 7.15.1. Simple PSD interface

If the host wishes to view only the PSD information for the currently playing audio service and simplified PSD interface is provided. When the simplified interface is used no ID3 parser is required but not all PSD information is available. Please see the HD\_GET\_PSD\_DECODE command and the HD\_PSD\_FIELD\_MASK for full details on using this interface and the limitations of using it.

## 7.16. How to Use FMHD Fast Detect in FMHD P2

Traditional FMHD tuner requires HD decoder to detect the presence of HD station, which can take about 1 sec. The Si468x can detect HD in 96 ms without the HD decoder. This is represented in the HD level metric. The metric is only calculated during a Tune/Seek command and reported from the RSQ status attune command after STC. This document describes Skyworks Solutions recommendations on how to use the HD level metric.

HD metric returns a value ranging from 0 to 100. A reported value greater than 30 indicates that there is HD signal at the present FM station. To enable HD level metric calculation function, the following conditions must be met:

- An HD tune mode is enabled during FM\_TUNE\_FREQ command (0x08 or 0x0C)
- In property FM\_RSQ\_HD\_DETECTION (0x3307)
  - The Samples[7:0] are not set to zero value
  - The SNR attune metric is same or greater than the SNRThresh[7:0]

Property FM\_RSQ\_HD\_DETECTION (0x3307) controls two parameters:

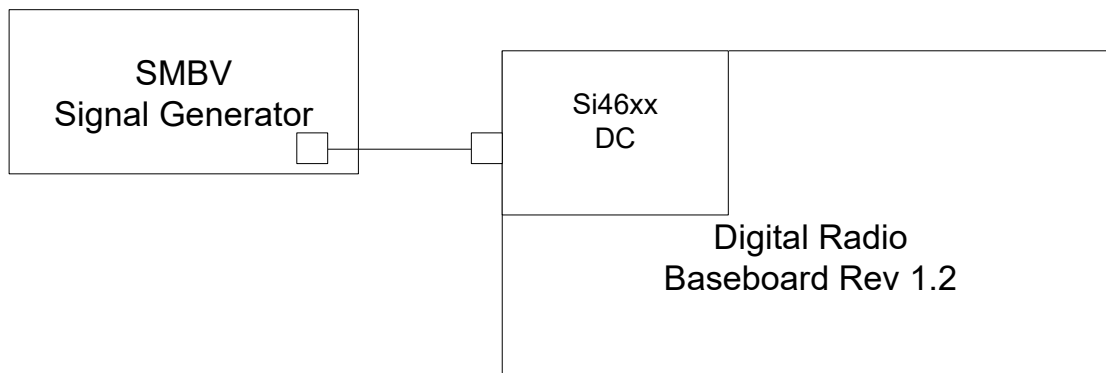
- Samples—Represents the HD detection calculation window in unit of 2.9 ms. Default is 0, which means HD level metric calculation is turned off. It is recommended to set this value to 32 to reliably detect the signal, which is 96ms for Tune/Seek time.
- SNR threshold—Sets the SNR threshold less than which the HD metric calculation is turned off. If the SNR RSQ attune value is below this threshold, and the RSSI RSQ attune value is below the SEEK\_VALID\_RSSI\_THRESHOLD (property 0x3202) then the HD level detection will not run and the HD level metric will report as 0. This is helpful for Tune/Seek by not waiting extra time on an FM Frequency that doesn't have a valid RSSI or SNR, which will produce a normal Tune/Seek time for the given channel. The default value is 12, which is 2dB above the default of SEEK\_VALID\_SNR\_THRESHOLD (property 0x3204). To always enable calculation of the HD level metric, set the HD detection SNR threshold to -128 and the SEEK\_VALID\_RSSI\_THRESHOLD (property 0x3202) to -128.

### 7.16.1. Steps to Use HD Level Metric

1. Set Property FM\_RSQ\_HD\_DETECTION (0x3307) for a valid SNR threshold and number of Samples. Skyworks Solutions recommends SNR threshold of 12 and number of samples or 32 (0x0C20).
2. Set Property SEEK\_VALID\_RSSI\_THRESHOLD (property 0x3202) to a for a valid SNR threshold. Skyworks Solutions recommends SNR threshold of 17.
3. When Tuning, make sure to select a valid tune mode for FMHD (0x08 or 0x0C)
4. Call Tune/Seek command. If the SNR Threshold is met then Si468x part will run the HD Level Calculation for the number of samples. For 64 samples this time is 186mS.
5. At STC, call the FM\_RSQ\_STATUS Attune command (0x4) to retrieve the HD Level Metric
6. A value greater than 30 is suggested as a good HD station.

## 8. BER Test Setup and Procedure

### 8.1. BER Test Setup



Setup the radio with a signal generator. An example with Si468x EVB is shown in figure above. Signal generator is a SMBV from Rohde&Schwarz in this setup. Connect the RF out from signal generator to J1 (RF in) on the Si468x Daughter card. You can use the GUI to test BER on the EVB setup. To validate another design, follow the steps outlined in the next two sections.

### 8.2. DAB BER Test

#### RF generator setup:

1. Test vector: BER\_NullPattern\_test2.eti

The content of this ETI file is shown below:

ServiceID	BitRate	Protection	Mode	Pattern
0xE1C00000	576 kbps	EEP-3A	Packet	0b00000000
0xE1C00001	384 kbps	EEP-3A	Packet	0b00000000
0xE1C00002	96 kbps	UEP-5	Packet	0b00000000
0xE1C00003	32 kbps	EEP-2A	Packet	0b00000000

2. Setup to desired testing frequency, RF level.

#### Si468x Setup:

1. Power up the part.
2. Tune to the desired frequency.
3. Use GET\_DIGITAL\_SERVICE\_LIST to confirm the vector content.
4. Use START\_DIGITAL\_SERVICE to start a service
  - a. 0xE1C00000 for DMB image
  - b. 0xE1C00001 for DAB image
5. Set property DAB\_TEST\_BER\_CONFIG to enable the BER testing with a known pattern (e.g., Pattern 0x00).
6. Use DAB\_TEST\_GET\_BER\_INFO to get BER\_ERR\_BITS and TOTAL\_BITS info. BER = ERR\_BITS/TOTAL\_BITS.

It is good practice to acquire more than 1 million bits for bits accumulation purpose.

### 8.3. FMHD BER Test

#### RF generator setup:

1. Test vector: Use the BER testing vector provided by iBiquity Co.  
Example: IB\_FMr208c\_e1wfc204.

The content of this file is shown below:

Service Mode	Station Short Name	Station Long Name
MP1	N/A	N/A
Analog Audio Source	Digital Data	Channel Conditions
Music	BER Test Pattern	Clean Channel

2. Setup to desired testing frequency, RF level.

#### Si468x setup:

1. Power up the part.
2. Tune to the desired frequency.
3. Set property FMHD\_TEST\_BER\_CONFIG to enable the BER testing.
4. Use FMHD\_TEST\_GET\_BER\_INFO to get BITS\_ERRORS and BITS\_TESTED info. BER = BITS\_ERROR/BITS\_TESTED.

It is good practice to acquire more than 1 million bits for bits accumulation purpose.

## 9. POWER\_UP—How to Determine Crystal-Related Parameters for Your Design

### 9.1. TR\_SIZE and IBIAS settings

The crystal oscillator core gain is controlled by both **TR\_SIZE** and **IBIAS** parameters. Each crystal design has different gain requirements to achieve successful startup. The following calculations are needed for each PCB design as they require adjustment for the board capacitance.

Five crystals have been characterized as reference. To achieve the startup requirements, an optimal **TR\_SIZE** value is provided for each crystal frequency. These values are reflected in the table below:

Crystal Frequency (MHz)	TR_SIZE
37.2	0xF
27.0	0xA
19.2	0x7
12.288	0x5
6.0	0x4

If choosing a crystal frequency that is not in the table, the corresponding **TR\_SIZE** can be extrapolated linearly. This calculation will be demonstrated later in this section.

For the above **TR\_SIZE settings**, biasing current ranges (**IBIAS**) are then determined by the following:

- The **startup** ESR (typically, startup ESR should be 5x the specified Resr) values.
- Loading capacitance CL, **which includes the addition of internal tuning load capacitance (using CTUN), external load capacitance (if any) and board and IC equivalent load parasitic capacitance.**

The **IBIAS** selection process will also be demonstrated later in this section.

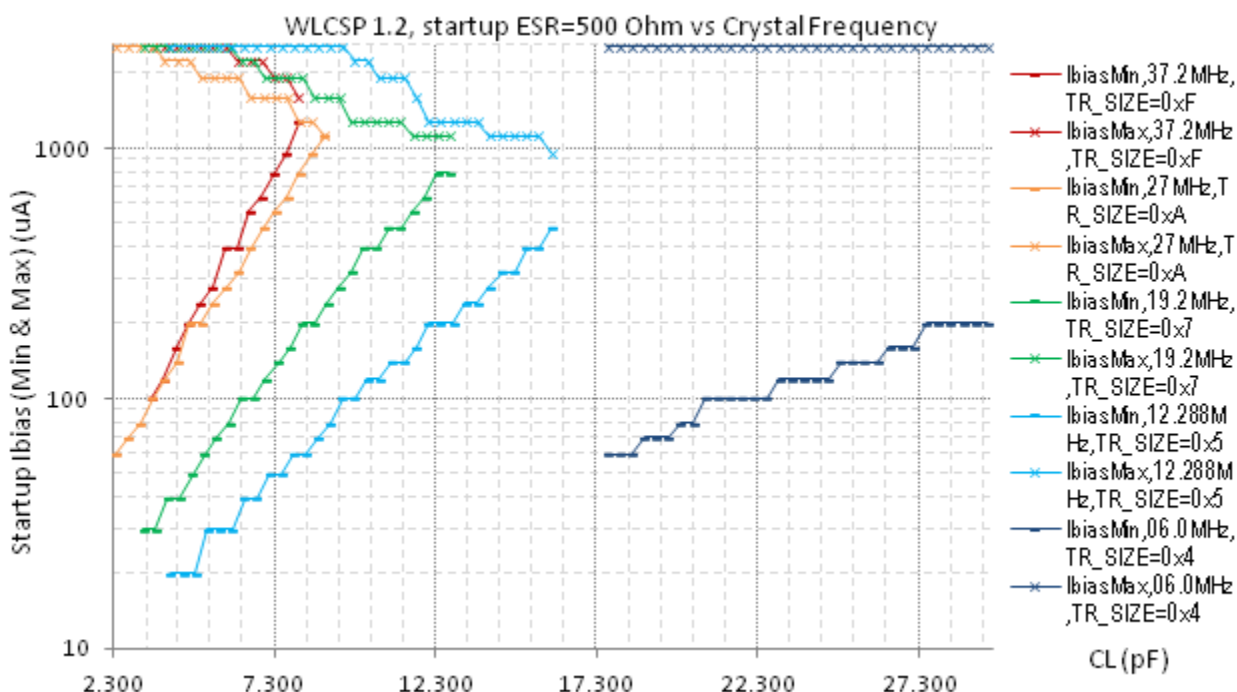
The following table depicts the biasing current programming. The biasing current is programmed linearly in 10  $\mu$ A steps starting at 10  $\mu$ A for **IBIAS** = 0x01 up to 1270  $\mu$ A for **IBIAS** = 0x7F.

IBIAS [6:0]	Ibias ( $\mu$ A)
0x00	0
0x01	10
0x02	20
...	...
0x7E	1260
0x7F	1270

### 9.1.1. IBIAS and TR\_SIZE for a 500 $\Omega$ Startup ESR Crystal

To select the appropriate IBIAS value, a set of two curves is determined for each startup ESR. These curves represent the minimum and maximum bias current that may be safely used versus the total load capacitance, given the startup ESR.

The bias current should be chosen between the minimum and maximum. The closer IBIAS is selected to the curves, the less safety margin has the startup conditions.



**Figure 9. Safe Range of Operation for a 500  $\Omega$  Startup ESR Crystal**

For different crystal frequencies, a linear interpolation from the two closest crystal frequencies may be used to determine TR\_SIZE and IBIAS.

For the crystals depicted in the plot, the maximum  $C_L$  recommended is the x axis value that still has a safe range of operation.

The maximum recommended  $C_L$  for an arbitrary frequency crystal is not to exceed the maximum  $C_L$  of the reference crystal with frequency immediately above the desired frequency.

Maximum  $C_L$  may be increased using additional external  $C_x$  if the Ibias range hasn't disappeared for maximum plotted  $C_L$ . This is the case for the 6 MHz crystal, and the 19.2 MHz crystal for startup ESR = 250  $\Omega$  in the next plot.

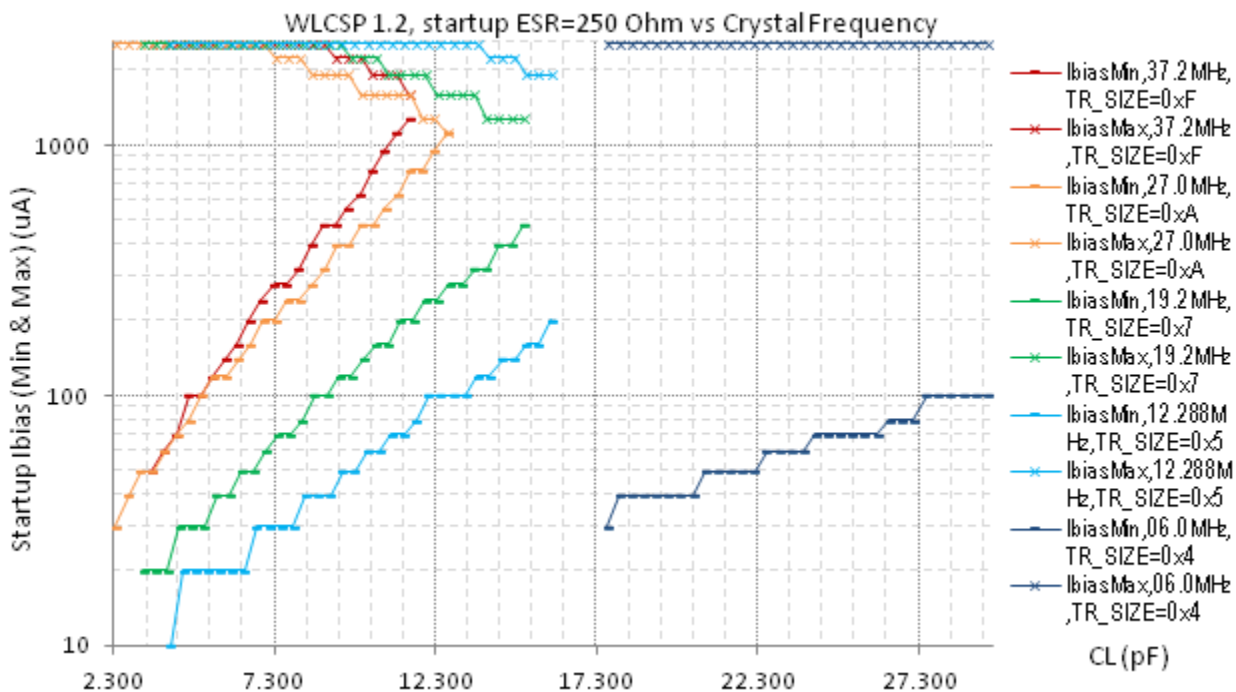
9.1.2. IBIAS and TR\_SIZE for a 250  $\Omega$  startup ESR CrystalFigure 10. Safe Range of Operation for a 250  $\Omega$  Startup ESR Crystal

Illustration example for a chosen crystal of 24 MHz with  $R_{esr} = 50 \Omega$  and  $C_L = 10$  pF:

1. **Maximum  $C_L$ :** Looking at the safe operation range for the plotted frequency immediately above the desired frequency (27 MHz) and a startup ESR equal to  $5 \times R_{esr}$  (startup ESR = 250  $\Omega$ —Figure 10), one extracts the  $C_L = 12.5$  pF as the maximum  $C_L$  with safe operating range.  $C_L = 10$  pF in this example is in the safe operation range.
2. **TR\_SIZE:** For the chosen  $C_L = 10$  pF (x axis value), the recommended setting is obtained by linear interpolation between the TR\_SIZE of plotted crystals with frequency immediately lower and higher. The calculation results in TR\_SIZE = 0x9 (9), from  $7 + (10 - 7) \times (24 - 19.2)/(27 - 19)$ .
3. **IBIAS:** For the chosen crystal frequency of 24 MHz and startup ESR of 250  $\Omega$  (Figure 10), the recommended IBIAS is determined by the linear interpolation between the IBIAS twice above the minimum or centered in the safe Ibias range, whichever lower, for the plotted crystals with frequency immediately lower and higher for the chosen  $C_L = 10$  pF (x axis).

The calculation results in a bias current of 700  $\mu$ A (IBIAS = 70 = 0x46), which is  $300 + (950-300) \times (24 - 19.2)/(27 - 19.2)$ .



### 9.1.3. IBIAS and TR\_SIZE 37.2 MHz Crystal

The following plots are generated for customer's understanding of how ESR and CL affect IBIAS selection for a given XTAL frequency.

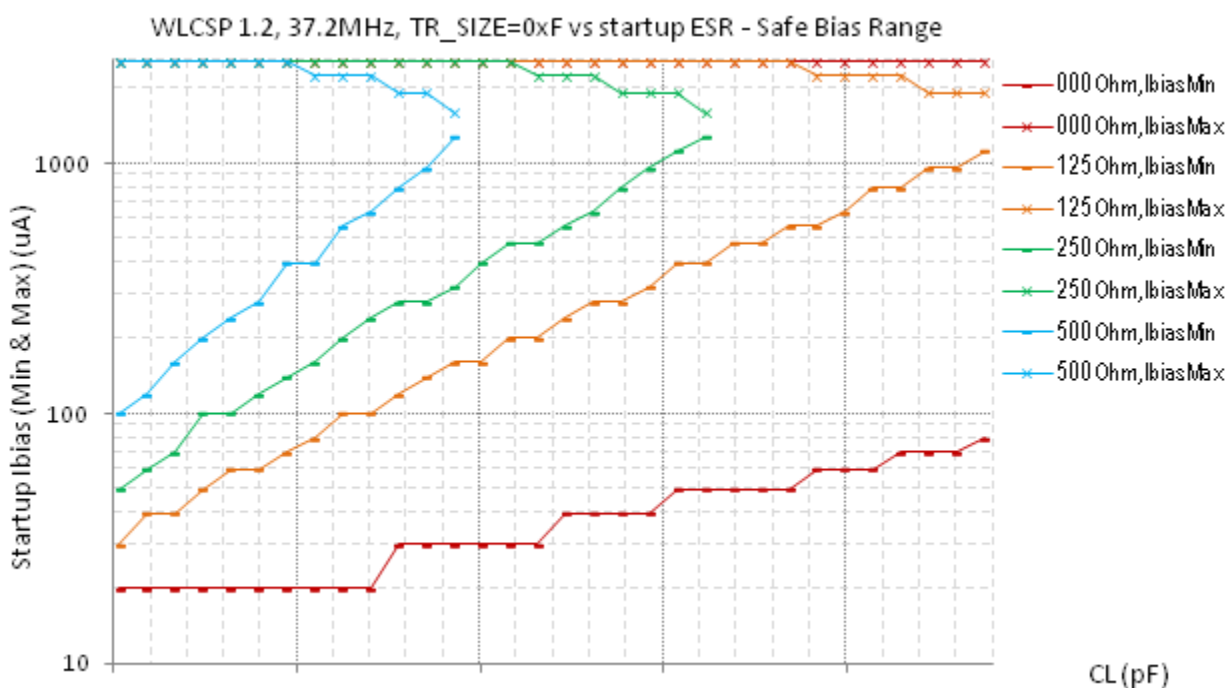


Figure 11. Safe Range of Operation for a 37.2 MHz Crystal

### 9.1.4. BIAS and TR\_SIZE 27.0 MHz Crystal

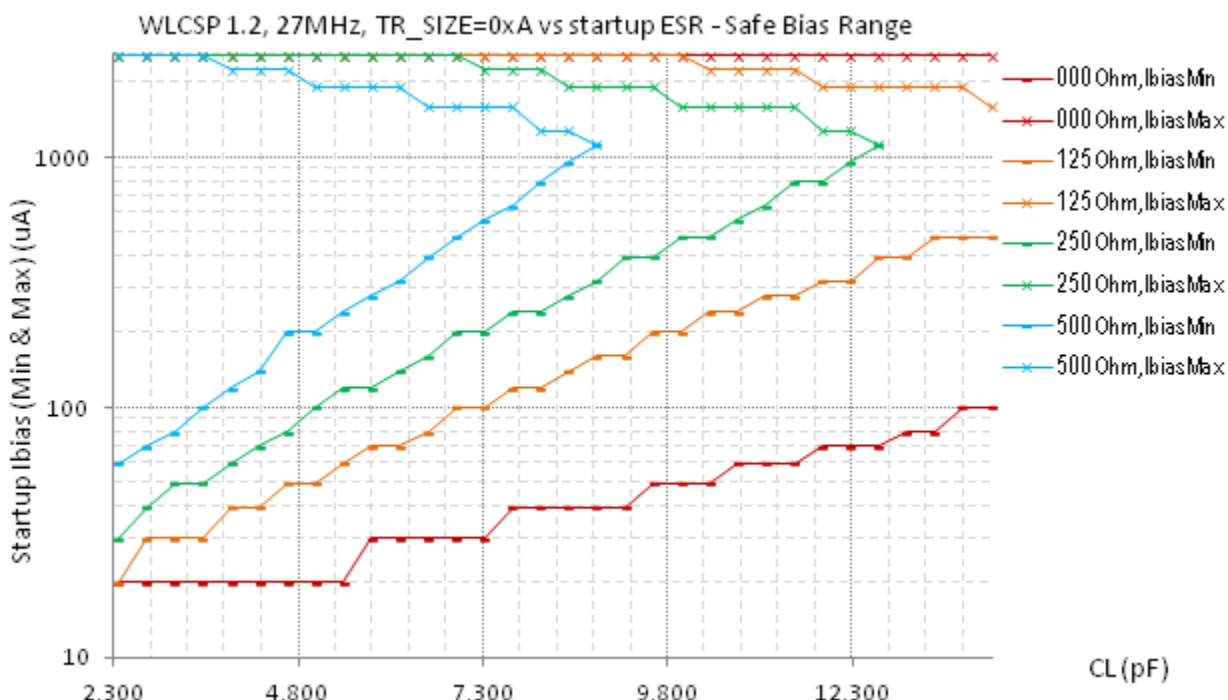


Figure 12. Safe Range of Operation for a 27.0 MHz Crystal

## 9.1.5. IBIAS and TR\_SIZE 19.2 MHz Crystal

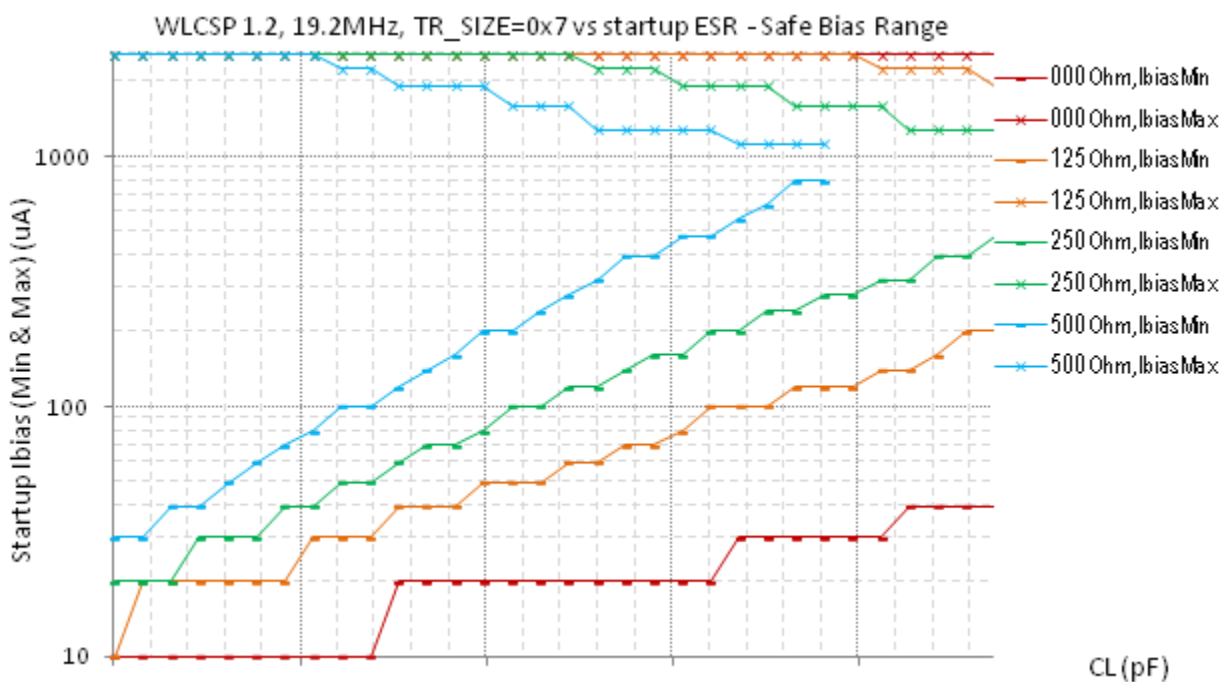


Figure 13. Safe Range of Operation for a 19.2 MHz Crystal

## 9.1.6. IBIAS and TR\_SIZE 12.288 MHz Crystal

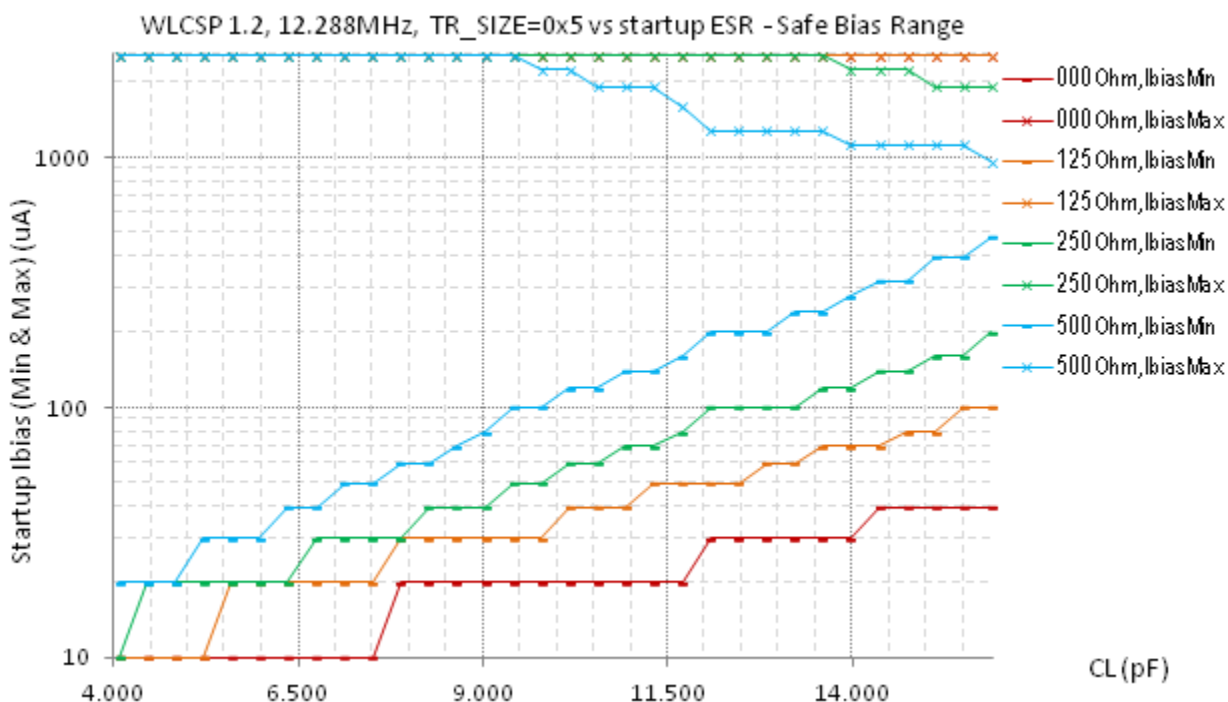


Figure 14. Safe Range of Operation for a 12.288 MHz Crystal

### 9.1.7. IBIAS and TR\_SIZE 6.0 MHz Crystal

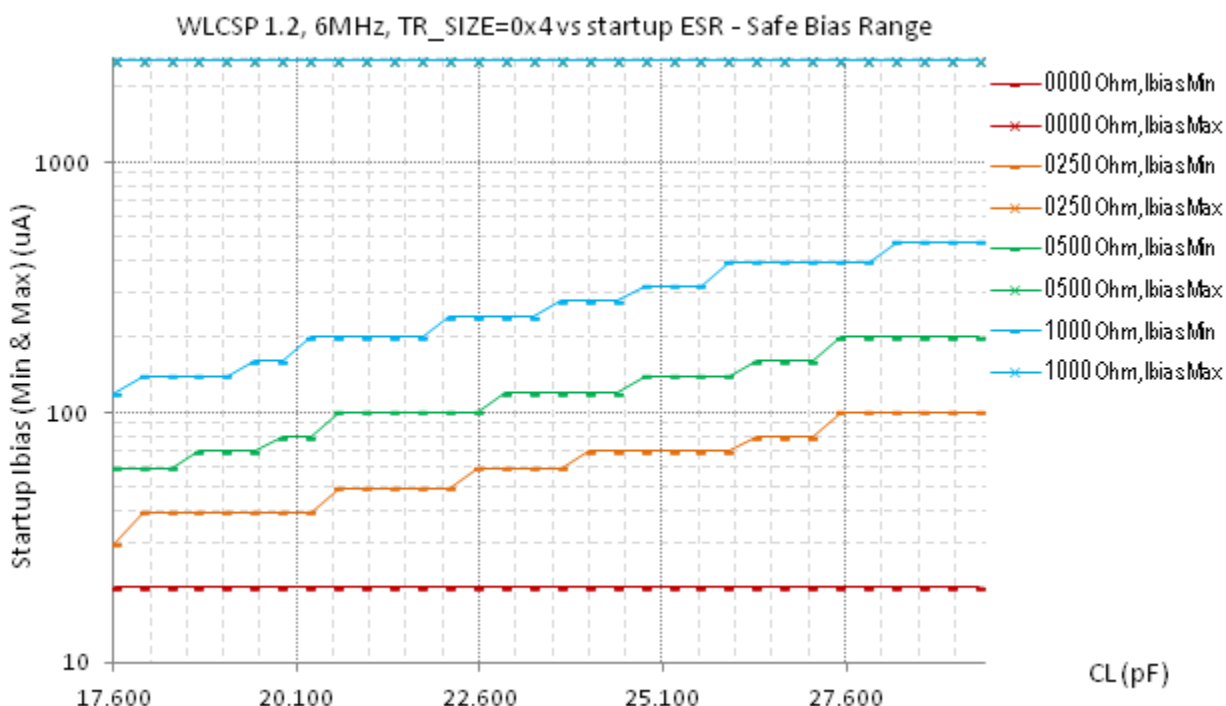


Figure 15. Safe Range of Operation for a 6.0 MHz Crystal

## 9.2. IBIAS Reduction in Steady State

Once the crystal oscillator completes the startup phase the model of the crystal resonator changes. The ESR resistor significantly decreases and the startup bias current is larger than needed to maintain safe oscillation conditions.

Furthermore, besides wasting current consumption, the crystal oscillator operation is deeper into nonlinear regime, generating stronger harmonic components which causes the appearance of unwanted spurs in tuner chain for specific tuning frequencies.

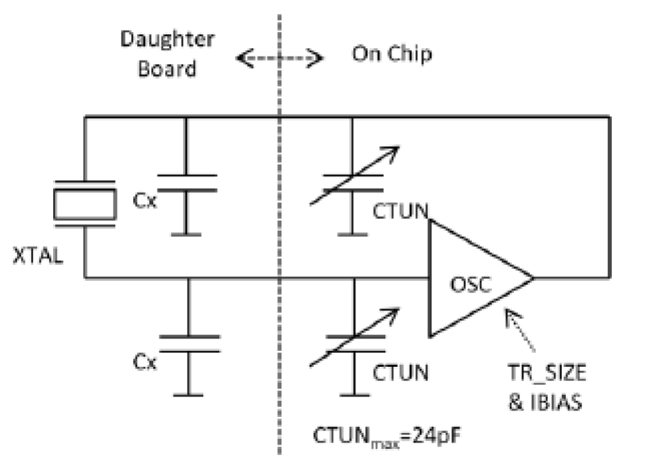
To reduce the impact of these issues, it is recommended to reduce the biasing current by 2x.

The model of the crystal and the safe operation areas may be interpreted by the increase of the safe operation area in the charts above when the startup ESR = 0  $\Omega$ , corresponding to the red lines.

9.3. CTUN settings

CTUN programs a pair of internal tuning capacitances inside the IC connected between each of the crystal pins and ground.

The equivalent contribution to  $C_L$  is half of its value.



The tuning capacitances value is programmed linearly between 0 and 24 pF in 63 steps for CTUN starting at 0x00 up to 0x3F, respectively.

CTUN [5:0]	CT (pF)	$\Delta CL$ (pF)
0x00	0	0
0x01	0.381	0.190
0x02	0.762	0.381
...	...	...
0x3E	23.619	11.810
0x3F	24.000	12.000

CTUN should be determined by the equation below:

$$CTUN = 2 \cdot (CL - CL_{par}) - Cx$$

- $C_L$  = XTAL load capacitance from the manufacturer's data sheet.
- $CL_{par}$  = equivalent parasitic load capacitance in pF.
- $Cx$  = the value of the external discrete capacitances between each of the crystal terminals and ground (if any).  
 $Cx$  is only required for crystals with  $C_L$  larger than about 14 pF.

CTUN should be trimmed by measuring the crystal oscillator frequency for typical conditions.

## 9.4. External Clock Source

The Si468x may use an external clock source and bypass its internal crystal oscillator. To use this mode of operation, the crystal and any external load capacitances should be removed from the XTALI and XTALO pins.

The clock source should be connected to the XTALI pin directly in dc coupling mode (not ac coupling), a sine wave is recommended to avoid harmonic interference with the tuner. Signal wave levels should be  $1.0\text{ V} \leq V_H \leq 1.4\text{ V}$  and  $0 \leq V_L \leq 0.3\text{ V}$ .

The following settings for the POWER\_UP command should be used.

- CLK\_MODE = 2
- TR\_SIZE = 0
- IBIAS = 0
- IBIAS\_RUN = 0

## DOCUMENT CHANGE LIST

### Revision 0.5 to Revision 0.6

- Updated Si46xx Programming Guide and Firmware Revisions table for release 120731.
- Updated flowchart for initialization to describe FLASH\_LOAD process.
- Minor updates to BER Test procedure to highlight differences between DMB and DAB.
- Description clarifications in Command and Property Tables.

### Revision 0.6 to Revision 0.7

- Updated Si46xx Programming Guide and Firmware Revisions table for release 120914.
- Description clarifications in Command and Property tables.
- FMHD\_CODEEC\_MODE family of properties added.
- FMHD\_DIGRAD\_STATUS: added response—CODEEC\_MODE.
- DAB\_DIGRAD\_STATUS: removed command input—CANCEL.
- DAB\_DIGRAD\_STATUS: added response—CU\_LEVEL.
- DAB\_GET\_SERVICE\_LINKING\_INFO: added response—LINK\_BYTES.
- FMHD\_BLEND\_OPTIONS: increased field size with new options—ACQ\_LOSS.
- FMHD\_BLEND\_ANALOG\_TO\_HD\_TRANSITION\_TIME: property default value changed.
- FMHD\_BLEND\_HD\_TO\_ANALOG\_TRANSITION\_TIME: property default value changed.
- FMHD\_PSD\_ENABLE: property added to documentation.
- DAB\_CTRL\_DAB\_MUTE\_SNR\_THRESHOLD: property added.
- DAB\_CTRL\_DAB\_UNMUTE\_SNR\_THRESHOLD: property added.

### Revision 0.7 to Revision 0.8

- Updated Table 1, “Si468x Programming Guide and Firmware Revisions<sup>1,2</sup>,” on page 1.
- Updated Si46xx Programming Guide and Firmware Revisions table for release 121120.
- Updated initialization flowchart to include mini-patch.
- Separated command/property summaries for the DAB release.
- Added description for how to process PAD/XPAD data streams through the data service interface.
- Added APIs in DAB:
  - write\_storage
  - read\_storage
  - dab\_get\_audio\_info
  - dab\_get\_subchan\_info

### Revision 0.8 to Revision 0.9

- Updated Si46xx Programming Guide and Firmware Revisions table for release 130215.
- Removed Digital Radio Demodulator parts from this guide—a separate Application Note is available for those parts
- Updated FMHD APIs
  - Added WRITE\_STORAGE and READ\_STORAGE commands
  - Added HDDET, READANTCAP, HDLEVEL to FM\_RSQ\_STATUS
  - Added additional options to SERTYPE for GET\_DIGITAL\_SERVICE\_LIST
  - Renamed commands with FMHD\_... to HD\_...
  - Added CDNRL, CDNRLH, CODEC\_MODE to HD\_DIGRAD\_STATUS
  - Added DINFOINT, DINFO, AINFOINT, AINFO, ALERTINT, PSDINT, PSD as well as individual indicators for available SIS and PSD content to HD\_GET\_EVENT\_STATUS
  - Added HD\_GET\_PSD\_DECODE to provide decoded PSD strings, rather than requiring ID3 decoding of PSD received through data service interface.

- Added HD\_GET\_ALERT\_MSG to provide support for HD Radio alerts.
- Updated several parameters in DAB\_DIGRAD\_STATUS
- Added properties related to HD Detection
- Added additional interrupt sources to HD\_EVENT\_INTERRUPT\_SOURCE
- Added HD\_TEST\_BER\_CONFIG
- Optimized property defaults for better performance
- Updated DAB APIs.
  - Optimized property defaults for better performance
- Updated flowcharts for FMHD to include renamed "HD\_" commands.
- Added "6. Managing Firmware" on page 397, which explains the available system architecture options for loading firmware onto the Si46xx.
- Updated "7. Digital Services User's Guide" on page 418 to include more information about HD Radio

## Revision 0.9 to Revision 1.0

- Updated Si46xx Programming Guide and Firmware Revisions table for release 130524.
- Updated FMHD APIs
  - Added HD\_PLAY\_ALERT\_TONE command
  - Changed FM\_RSQ\_HD\_DETECTION property default and field definition
  - Changed HD\_EVENT\_ALERT\_CONFIG property default
  - Changed HD\_AUDIO\_CTRL\_BALL\_GAME\_ENABLE property default
  - Changed HD\_DIGRAD\_STATUS command to provide HDLOGO indication and interrupt bits
- Updated DAB APIs
  - Added DAB\_DIGRAD\_RSSI\_HIGH\_THRESHOLD property, added interrupts related to the threshold
  - Added DAB\_DIGRAD\_RSSI\_LOW\_THRESHOLD property, added interrupts related to the threshold
  - Added DAB\_CTRL\_DAB\_MUTE\_SIGLOW\_THRESHOLD property
  - Changed DAB\_TUNE\_FE\_CFG property default, added additional fields to this property
  - Changed the SERTYPE field in GET\_DIGITAL\_SERVICE\_LIST command
  - Changed the DATA\_TYPE field in GET\_DIGITAL\_SERVICE\_DATA command—now DATA\_SRC and DSCTy
  - Changed some value ranges in DAB\_DIGRAD\_STATUS command
  - Added DAB\_GET\_FREQ\_INFO command, added event indicators related to this information being updated
  - Added additional info to the DAB\_GET\_COMPONENT\_INFO command
  - Added DAB\_EVENT\_MIN\_SVRLIST\_PERIOD\_RECONFIG property
  - Changed DIGITAL\_IO\_OUTPUT\_FORMAT property fields—added SLOT\_SIZE

## Revision 1.0 to Revision 1.1

- Changed "Si46xx" to "Si468x" throughout.
- Updated Si468x Programming Guide and Firmware Revisions table for release 130927.
- Updated FMHD APIs.
  - Added HD\_CODEC\_MODE\_0\_SAMPLES\_DELAY property. Note this was added to allow host software to override the default time alignment for the FMHD\_RADIO 3.0.16 firmware.
  - Added HD\_CODEC\_MODE\_2\_SAMPLES\_DELAY property.
  - Added HD\_CODEC\_MODE\_10\_SAMPLES\_DELAY property.
  - Added HD\_CODEC\_MODE\_13\_SAMPLES\_DELAY property.
  - Added HD\_TEST\_DEBUG\_AUDIO property.

## Revision 1.1 to Revision 1.2

- Updated value for ARG9 in POWER\_UP command for all firmware modes.

## Revision 1.2 to Revision 1.3

- Updated single-byte commands to include the necessary pad "0" byte, making them two-byte commands.

## Revision 1.3 to Revision 1.4

- Updated Table 1, “Si468x Programming Guide and Firmware Revisions<sup>1,2</sup>,” on page 1 for release 131209.

## Revision 1.4 to Revision 1.6

- Updated Table 1, “Si468x Programming Guide and Firmware Revisions<sup>1,2</sup>,” on page 1 for Release 131213.
- Updated Table 2, “Product Family Function,” on page 2 for new products supporting AM/AMHD.
- Added AMHD API.

## Revision 1.6 to Revision 1.7

- Updated Si46xx Programming Guide and Firmware Revisions table for release 140210.
- Updated DIGITAL\_IO\_OUTPUT\_FORMAT property in FMHD API section.
  - Added SLOT\_SIZE field.
  - Changed range on SAMPL\_SIZE field.
- Corrected SUBCMD bytes for the following commands in “6.5.1.1. Flash Pass-Through Commands” :
  - FLASH\_ERASE\_SECTOR
  - FLASH\_WRITE\_BLOCK
  - FLASH\_WRITE\_BLOCK\_READBACK\_VERIFY
  - FLASH\_WRITE\_BLOCK\_PACKET\_VERIFY
  - FLASH\_WRITE\_BLOCK\_READBACK\_AND\_PACKET\_VERIFY

## Revision 1.7 to Revision 1.8

- Updated Si468x Programming Guide(AN649Rev1.7) and Firmware Revisions table for release 140610.
- Added a new property AM\_VALID\_HDLEVEL\_THRESHOLD(0x4205), AM\_CHBW\_SQ\_LIMITS(0x2200)
- Updated the default value of the property AM\_RSQ\_HD\_DETECTION(0x4305), AM\_VALID\_RSSI\_TIME(0x4201), AM\_VALID\_RSSI\_THRESHOLD(0x4202), AM\_VALID\_SNR\_TIME(0x4203), AM\_VALID\_SNR\_THRESHOLD(0x4204), AM\_CHBW\_SQ\_LIMITS(0x2200), HD\_CODEC\_MODE\_2\_SAMPLES\_DELAY(0x9904)
- Changed the property name of AM\_CHBW\_SQ\_MIN\_MAX(0x2200) to AM\_CHBW\_SQ\_CHBW(0x2201)
- Deleted command HD\_ACQUIRE and properties AM\_CHBW\_SQ\_HIGH\_THRESHOLD(0x2201), AM\_CHBW\_SQ\_LOW\_THRESHOLD(0x2202)
- Added “5.8. Updating the Boot Flash” (flowchart for updating the boot flash using the bootloader commands)

## Revision 1.8 to Revision 1.9

### Updated Sections 4.1 and 4.2

- Removed commands WRITE\_STORAGE and READ\_STORAGE
- Updated Rd\_REPLY command. The ERR\_CMD response field of the RD\_REPLY command has been modified.
- Updated Power\_up command. The XTAL\_FREQ argument description has been modified.
- Updated FM\_RSQ\_STATUS command. Added a new response field- HDDETECTED & FLT\_HDDETECTED. And, response field –VALID and HDLEVEL is updated.
- Updated FM\_ACF\_STATUS command
- Updated property 0x1712
- Updated HD\_DIGRAD\_STATUS command
- Updated FM\_TUNE\_FREQ command
- Updated FM\_SEEK\_START command



- Updated GET\_DIGITAL\_SERVICE\_LIST command summary description
- Updated START\_DIGITAL\_SERVICE command description
- Update description of FM\_SEEK\_START command
- Updated property 0x3307 default value from 0x800d to 0x000d
- Updated property 0x9101 default value from 0x0002 to 0x00A. Addition of extra fields.
- Updated property 0x9106 default value from 0x7F to 0 and changed in description & fields.
- Updated property 0x9901 default value from 3700 to 3693
- Updated property 0x3201,0x3203,0x description
- Added property  
0x3308,0x3309,0x3206,0x9109,0x910A,0x910B,0x910C,0x910D,0x910E,0x910F,0x9110,0x9111,0x9112,0x9113,0x990C,0x990D,0x990E,0x990F,0x9910,0x9911,0x9A00,0x9B00,0x9B01,0x9B02,0x9B03,0x9B04,0x9B05,0x0302,0x8101,0x09700,0x0900,0x00901,0x0902,0x0903

#### Updated Sections 4.3 and 4.4

- Updated the DAB\_DIGRAD\_STATUS command. New response field- FAST\_DETECT is added.
- Updated the DAB\_GET\_AUDIO\_INFO command. New field response field- AUDIO\_DRC\_GAIN is added.
- Updated the DAB\_GET\_ENSEMBLE\_INFO command. New response fields- ENSEMBLE\_ECC & CHAR\_ABBREV are added.
- New command DAB\_GET\_SERVICE\_INFO is added.
- Updated default value for property 0xB202 and 0xB203
- Added property 0xB204,0x0900,0x0901,0x0902 and 0x0903

#### Updated Sections 4.5 and 4.6

- Removed commands WRITE\_STORAGE and READ\_STORAGE
- Updated property 0x4305 default value from 0x8020 to 48
- Added property 0x4306 and 0x4307
- Updated property 0x4204 default value from 10 to 4
- Updated property 0x9101 default value from 0x0002 to 0x000A.
- Updated description for property 0x9106
- Added property  
0x9109,0x910A,0x910B,0x910C,0x910D,0x910E,0x910F,0x9110,0x9111,0x9120,0x9121,0x9122,0x9123,0x9124,0x9125,0x9126,0x9127,0x9700,0x990C,0x990D,0x990E,0x990F,0x9910,0x9911,0x9B00,0x9B01,0x9B02,0x9B03,0x9B04,0x9B05,0x0302,0x8101,0x9F00,0x9F01,0x9F02 and 0x9F03
- Updated property 0x9904 default value from 7398 to 7379.
- Updated Rd\_REPLY command. The ERR\_CMD response field of the RD\_REPLY command has been modified.
- Updated Power\_up command. The XTAL\_FREQ argument description has been modified.
- Updated AM\_RSQ\_STATUS command. Added a new response field- HDDETECTED & FLT\_HDDETECTED. And, response field –VALID and HDLEVEL is updated.
- Updated HD\_DIGRAD\_STATUS command. Added new response field- AUDACQINT & AUDACQ. And, response field CODEC\_MODE is updated.
- Updated property 0x4201, 0x4203, 0x4205 and 0x9701 description.
- Updated property 0x9901,0x9904,0x9907 and 0x990A description.

## Revision 1.9 to Revision 2.0

- Updated Si46xx Programming Guide and Firmware Revisions table for release 161212.

### Updated Sections 4.1 and 4.2 (FMHD API)

- Added status bit RFFE\_ERR in the status register (Status Register 3, bit 5) indicating the state of the RF Front End.

### Updated Sections 4.3 and 4.4 (DAB API)

- Added new API command –DAB\_GET\_OE\_SERVICES\_INFO
- Modified existing API command –DAB\_GET\_SERVICE\_LINKING\_INFO
- Modified DAB\_XPAD\_ENABLE property 0xB400
- Added DAB Soft Mute and Comfort Noise API
- Modified DAB\_GET\_ENSEMBLE\_INFO and DAB\_GET\_COMPONENT\_INFO
- Add status bit RFFE\_ERR in the status register (Status Register 3, bit 5) indicating the state of the RF Front End.
- Modified the description of the response field Audio\_DRC\_gain within the command DAB\_GET\_AUDIO\_INFO

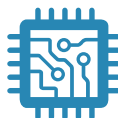


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