Si477x Programming Guide

1. Introduction

This document provides an overview of the programming requirements for the Si477x AM/FM receiver with support for an external IBOC HD demodulator. 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 Si477x part released by Silicon Labs to date. This programming guide focuses on the Si477x-A20 release.

Table 1. Si477x Programming Guide and Firmware Revisions

Part #	Part Revision	FMRX Component	AMRX Component	Programming Guide Revision
Si477x-A20	2.0	10.1.0	9.1.0	0.2

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.

The device has a slave control interface that allows the system controller to send commands to and receive responses from the device using 2-wire mode (I^2C compatible).

3. Terminology

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

4. Control Interface

The Si477x provides an I^{2}C-compatible, 2-wire control interface.

In powerdown mode, all circuitry is disabled except for the device control interface. The device comes out of powerdown mode when the POWER_UP command is written to the command register. Once in powerup mode, the device accepts additional commands such as tuning. The device will not accept commands while in powerdown mode, with the exception of the powerup command. If the system controller writes a command other than POWER_UP when in powerdown mode, the device does not respond, and the command is ignored.

Setting the RSTB pin low places the device in reset mode. In reset mode, all circuitry is disabled including the device control interface; registers are set to their default settings, and the control bus is disabled.

4.1. 2-Wire Control Interface

Figure 1 and Figure 2 show the 2-wire control interface read and write timing parameters and diagrams, respectively. Refer to the Si477x data sheet for timing parameter values.
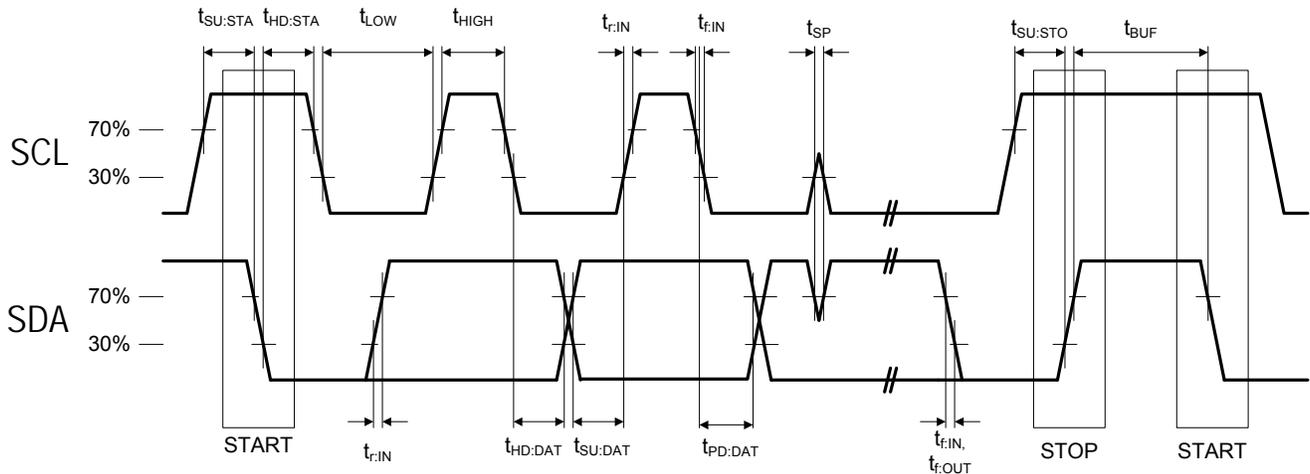
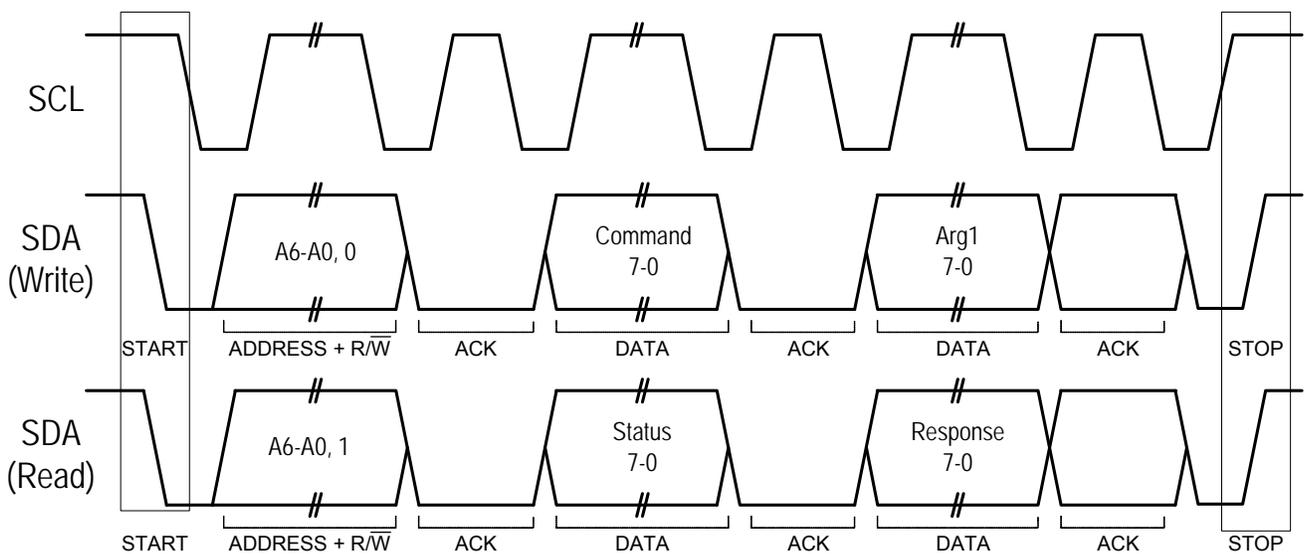**Figure 1. I^{2}C Control Interface Read and Write Timing Parameters**

Figure 2. I^{2}C Control Interface Read and Write Timing Diagram

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Two-wire bus mode uses the SCL and SDA pins for signaling. A transaction begins with the START condition, which occurs when SDA falls while SCL is high. Next, the system controller drives an 8-bit control word serially on SDA, which is captured by the device on rising edges of SCL. The control word consists of a seven-bit device address followed by a read/write bit (read = 1, write = 0). The device acknowledges the control word by driving SDA low on the next falling edge of SCL.

For write operations, the system controller next sends a data byte on SDA, which is captured by the device on rising edges of SCL. The device acknowledges each data byte by driving SDA low for one cycle on the next falling edge of SCL. For each write transaction, the first byte is a command and the following bytes are arguments.

For read operations, after the device has acknowledged the control byte, it will drive an eight-bit data byte on SDA, changing the state of SDA on the falling edges of SCL. The system controller acknowledges each data byte by driving SDA low for one cycle on the next falling edge of SCL. If a data byte is not acknowledged by the system controller, the transaction will end. For each read transaction, the first byte is the status byte and the following bytes are the response data from the receiver.

A 2-wire transaction ends with the STOP condition, which occurs when SDA rises while SCL is high.

5. Powerup and Powerdown

There are two procedures for powering up a receiver to move it from powerdown mode to the powerup mode. The first is a powerup from internal receiver memory. The second is a powerup from a firmware component patch that is stored in system controller memory. Patches can be applied to a firmware component by the system controller via a download mechanism to address field issues, errata, or adjust device behavior. Patches are encrypted and unique to a particular device firmware version, cannot be generated by customers, and can be used to replace a portion of the component (to address errata, for example) or to download an entirely new component. The user must verify that the device contains the correct base firmware to support the patch as described later in this section.

It is possible to configure the receiver for operation with a crystal or an external clock. Refer to Table 2 below.

Table 2. Clocking Options

Frequency (MHz)	Crystal	External Clock
37.209375	X	X
36.4	X	X
37.8	X	X

Powerup from device memory is described in section "5.1. Powerup from Internal Memory" using a patch is described in section "5.2. Powerup from a Patch".
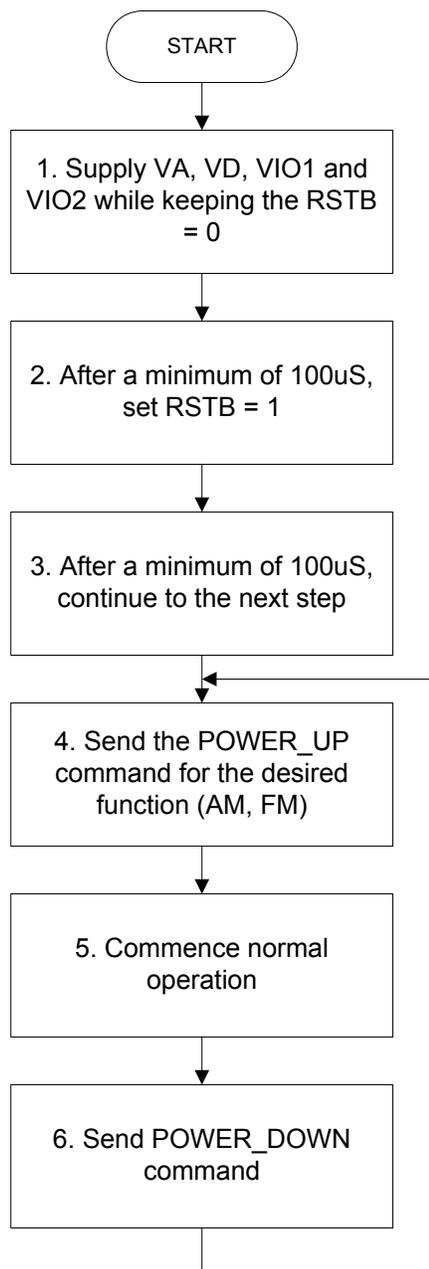
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5.1. Powerup from Internal Memory

```
                    ┌──────────────┐
                    │    START     │
                    └──────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │ 1. Supply VA, VD, VIO1 and│
              │ VIO2 while keeping the RSTB│
              │           = 0            │
              └──────────────────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │ 2. After a minimum of 100uS,│
              │        set RSTB = 1       │
              └──────────────────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │ 3. After a minimum of 100uS,│
              │   continue to the next step │
              └──────────────────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │   4. Send the POWER_UP    │
              │  command for the desired  │
              │    function (AM, FM)      │
              └──────────────────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │  5. Commence normal       │
              │       operation           │
              └──────────────────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │  6. Send POWER_DOWN       │
              │        command            │
              └──────────────────────────┘
```

1. Supply VA, VD, VIO1 and VIO2 while keeping the RSTB=0. Power supplies may be sequenced in any order.
2. After a minimum of 100 µs, set RSTB=1.
3. After a minimum of 100 µs, continue to the next step.
4. Send the POWER_UP command for the desired function (AM, FM). Example (with crystal 36.4 MHz, FM function):

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POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0xF7	Normal operation.
ARG2	0x28	Crystal load capacitance=11.08pF
ARG3	0x07	Disables CTS interrupt, crystal bias=7.
ARG4	0x12	FM function, crystal frequency 36.4 MHz.
ARG5	0x11	Crystal, receiver 1.
STATUS	→0x80	

Example (with external clock 36.4 MHz, FM function):

POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0x77	Normal operation.
ARG2	0x00	Crystal load capacitance=0pF
ARG3	0x03	Disables CTS interrupt, crystal bias = 3.
ARG4	0x12	FM function, crystal frequency 36.4 MHz.
ARG5	0x12	External clock, receiver.
STATUS	→0x80	

5. The device is ready to commence normal operation and accept additional commands. Refer to Figure 3.
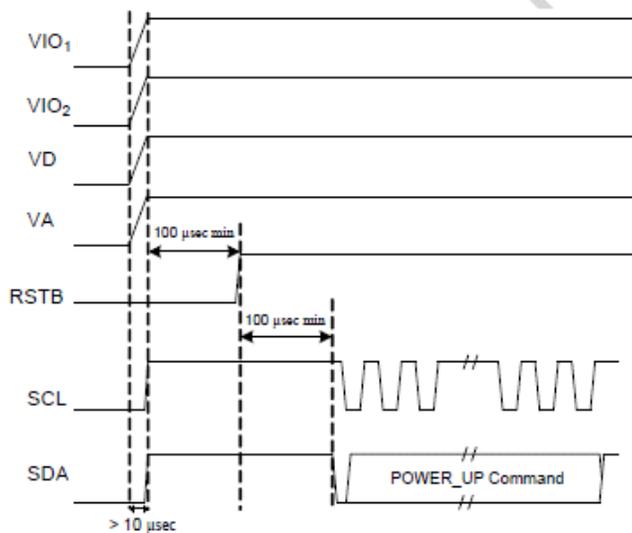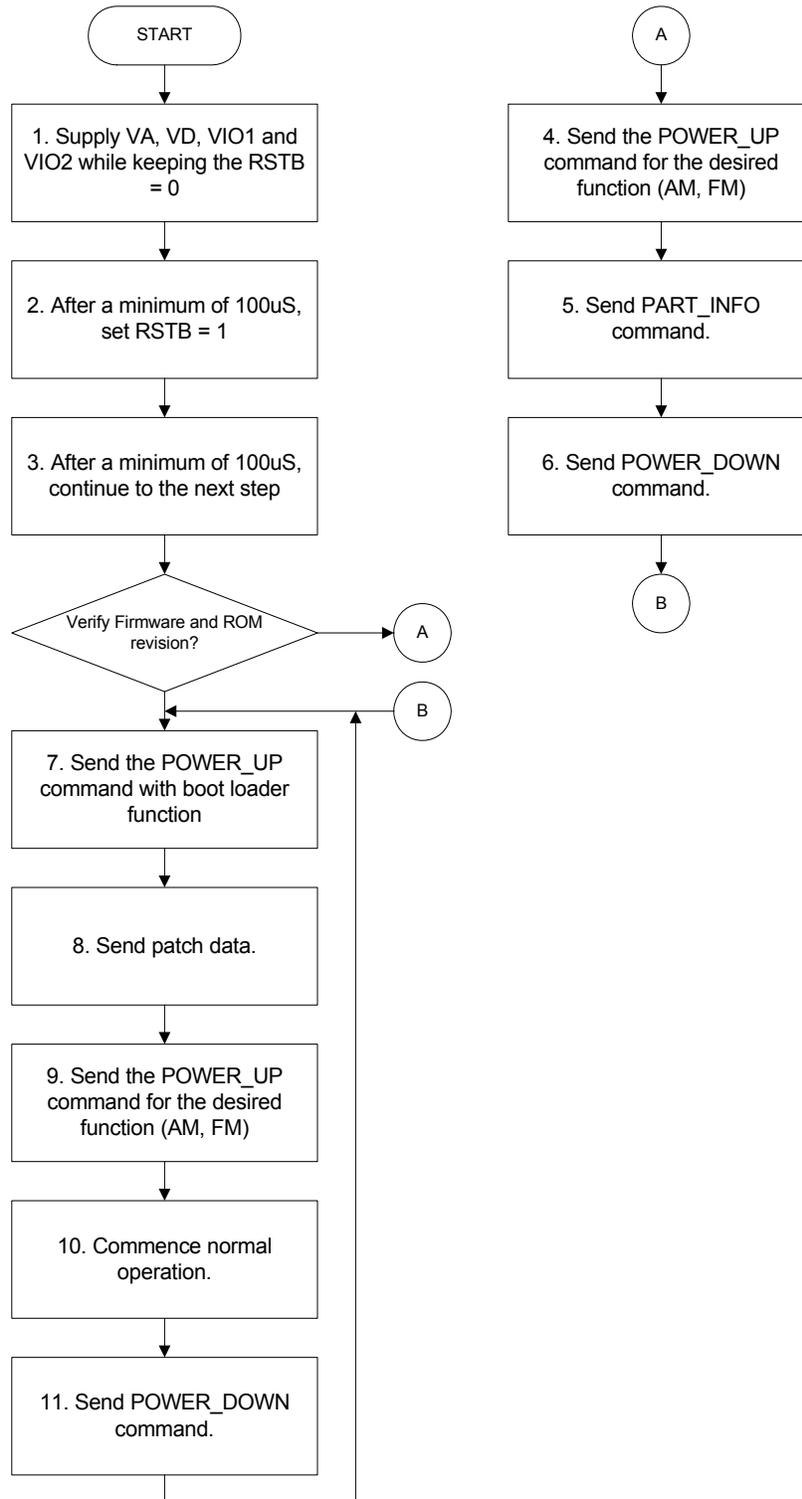

Figure 3. Powerup Timing

6. If desired, send the POWER_DOWN command.

Example:

POWER_DOWN Command		
Action	**Data**	**Description**
CMD	0x11	POWER_DOWN
ARG1	0x00	Disable oscillator (ARG1 may be omitted with the same result)
STATUS	→0x80	CTS=1

7. It is now possible to move to the powerup state by returning to step 4.

5.2. Powerup from a Patch

```
                    START                                          A
                      │                                           │
                      ▼                                           ▼
        ┌──────────────────────────┐              ┌──────────────────────────┐
        │  1. Supply VA, VD, VIO1   │              │  4. Send the POWER_UP     │
        │  and VIO2 while keeping   │              │  command for the desired  │
        │  the RSTB = 0             │              │  function (AM, FM)         │
        └──────────────────────────┘              └──────────────────────────┘
                      │                                           │
                      ▼                                           ▼
        ┌──────────────────────────┐              ┌──────────────────────────┐
        │  2. After a minimum of    │              │  5. Send PART_INFO        │
        │  100uS, set RSTB = 1      │              │  command.                 │
        └──────────────────────────┘              └──────────────────────────┘
                      │                                           │
                      ▼                                           ▼
        ┌──────────────────────────┐              ┌──────────────────────────┐
        │  3. After a minimum of    │              │  6. Send POWER_DOWN       │
        │  100uS, continue to the   │              │  command.                 │
        │  next step                │              └──────────────────────────┘
        └──────────────────────────┘                           │
                      │                                         ▼
                      ▼                                         B
              ╱─────────────╲
             ╱ Verify Firmware ╲         A
             ╲ and ROM revision?╱──────▶
              ╲─────────────╱
                      │                 B
                      ▼◀──────────────
        ┌──────────────────────────┐
        │  7. Send the POWER_UP     │
        │  command with boot        │
        │  loader function          │
        └──────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │  8. Send patch data.      │
        └──────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │  9. Send the POWER_UP     │
        │  command for the desired  │
        │  function (AM, FM)         │
        └──────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │  10. Commence normal      │
        │  operation.               │
        └──────────────────────────┘
                      │
                      ▼
        ┌──────────────────────────┐
        │  11. Send POWER_DOWN      │
        │  command.                 │
        └──────────────────────────┘
```

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1. Supply VA, VD, VI01 and VI02 while keeping the RSTB=0. Power supplies may be sequenced in any order.
2. After a minimum of 100 µs, set RSTB=1.
3. After a minimum of 100 µs, proceed to the next step.
4. (Optional – step 1 of 3 to verify part firmware revision and ROM revision.) Both part firmware revision and ROM revision must be compatible with a partial patch and ROM revision must be compatible with a full patch. Send the POWER_UP command for the desired function (AM, FM). Example (with crystal 36.4 MHz, FM function):

POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0x77	Normal operation.
ARG2	0x28	Crystal load capacitance = 11.08 pF.
ARG3	0x07	Disables CTS interrupt, crystal bias=7.
ARG4	0x12	FM function, crystal frequency 36.4 MHz.
ARG5	0x11	Crystal, receiver 1.
STATUS	→0x80	

Example (with external clock 36.4 MHz, FM function):

POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0x77	Normal operation.
ARG2	0x00	Crystal load capacitance = 0 pF.
ARG3	0x03	Disables CTS interrupt, crystal bias=3.
ARG4	0x12	FM function, clock frequency 36.4 MHz.
ARG5	0x12	External clock, receiver 1.
STATUS	→0x80	

5. (Optional—step 2 of 3 to verify part firmware revision and ROM revision). Verify part firmware revision and ROM revision. Send the PART_INFO command.

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Example:

PART_INFO Command		
Action	**Data**	**Description**
CMD	0x02	PART_INFO
STATUS	→0x80	CTS=1
RESP1	→0x06	Chip revision, 6
RESP2	→0x43	Part number, Si47+ last two digits, 0x4D=77, or Si4777
RESP3	→0x02	Firmware major revision=1
RESP4	→0x00	Firmware minor revision=0
RESP5	→0x00	Firmware build version=0
RESP6	→0x00	Reserved, values will vary.
RESP7	→0x00	Reserved, values will vary.
RSP8	→0x04	ROM ID
RESP9	→0x00	Reserved, values will vary.

In this example, the part revision is 2.0.0 and the ROM ID is 4. Ensure that partial patches received from Silicon Labs are intended for use with the part firmware revision and ROM, and that full patches are intended for use with the ROM ID as shown in Table 3. It is possible to verify the FM and AM component firmware revisions with the FUNC_INFO command, however, this is not necessary because there is always a unique mapping of component revision to part revision.

Table 3. Si477x Firmware and ROM Compatibility

Part #	Firmware Revision	ROM ID	FM Revision	AM Revision
Si477x-A20	2.0	5	10.1.0	9.1.0

6. (Optional—step 3 of 3 to verify part firmware revision and ROM revision.) Send the POWER_DOWN command. This step is required before proceeding with the patching procedure if steps 4 and 5 have been followed.

Example

POWER_DOWN Command		
Action	**Data**	**Description**
CMD	0x11	POWER_DOWN
ARG1	0x00	Disable oscillator (ARG1 may be omitted with the same result)
STATUS	→0x80	CTS=1

7. Send the POWER_UP command for boot loader function.

Example (with crystal 36.4 MHz, boot loader function):

POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0x77	Normal operation.
ARG2	0x28	Crystal load capacitance = 11.08 pF.
ARG3	0x07	Disables CTS interrupt, crystal bias=7.
ARG4	0x02	Boot loader function, crystal frequency 36.4 MHz.
ARG5	0x11	Crystal, receiver 1.
STATUS	→0x80	

Example (with external clock 36.4 MHz, boot loader function):

POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0x77	Normal operation.
ARG2	0x00	Crystal load capacitance = 0 pF.
ARG3	0x03	Disables CTS interrupt, crystal bias=3.
ARG4	0x02	Boot loader function, clock frequency 36.4 MHz.
ARG5	0x12	External clock, receiver 1.
STATUS	→0x80	

8. Send the patch data.

The patch file provided by Silicon Labs typically has a .csg extension. The system controller must send each line of 8 bytes, wait for a CTS, then send the next line of 8 bytes, etc., until the entire patch has been sent. An example showing the first few lines and final line of a patch file is shown below. Note that the "#" character indicates a comment and the patch file indicates the required ROM ID for a partial or full download. If the checksum fails, the part issues an error code, ERR (bit 6 of the STATUS byte received after each 8-byte transfer), and halts. The part must be reset to recover from this error condition.

The following is an example of a patch file:

COPYRIGHT=2011 Silicon Laboratories, Inc.

GENERATED=13:53 May 23 2011

ROMID=0x04

PATCHID=0x228C

REQUIRES=NONE

SIZE=8272

FUNCTION=FMRX

MAJOR=8

MINOR=0

BUILD=8

CRCT=0x81CF

CRCM=0x0A6C

CRCP=0xEC8D

CRCX=0x66EE

CRCY=0x6381

CRCZ=0xA805

0x04,0x11,0x81,0xCF,0x00,0x00,0x0D,0xC6

0x05,0xAE,0xE1,0xBD,0xB4,0x90,0x07,0x33

0x06,0xD9,0x3D,0x11,0xF7,0x25,0xCB,0x06

0x17,0x7A,0xF8,0xD0,0x71,0x10,0x3F,0xB7

0x1F,0xBF,0xFF,0x7E,0x42,0xE7,0x53,0x05

…

[Additional Lines]

…

0x08,0x21,0xAB,0xB5,0xF1,0x7A,0xD6,0x5A

0x08,0x10,0x0E,0x9E,0x3B,0xD1,0x01,0xF4

0x08,0xBF,0x8D,0x94,0xB0,0x2D,0xCF,0xFF

0x05,0x8D,0xB1,0x22,0xF2,0x8D,0x22,0x8C

END

Example:

First line of the patch file example		
Action	**Data**	**Description**
CMD	0x04	
ARG1	0x11	
ARG2	0x81	
ARG3	0xCF	
ARG4	0x00	
ARG5	0x00	
ARG6	0x0D	
ARG7	0xC6	
STATUS	→0x80	
Second line of the patch file example		
CMD	0x05	
ARG1	0xAE	
ARG2	0xE1	
ARG3	0xBD	
ARG4	0xB4	
ARG5	0x90	
ARG6	0x07	
ARG7	0x33	
STATUS	→0x80	

9. Send the POWER_UP command for the desired function (AM, FM).

Example (with crystal 36.4 MHz, FM function):

POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0x77	Normal operation.
ARG2	0x28	Crystal load capacitance = 11.08 pF.
ARG3	0x07	Disables CTS interrupt, crystal bias=3.
ARG4	0x12	FM function, crystal frequency 36.4 Hz.
ARG5	0x11	Crystal, receiver 1.
STATUS	→0x80	

Example (with external clock 36.4 MHz, FM function):

POWER_UP Command		
Action	**Data**	**Description**
CMD	0x01	POWER_UP
ARG1	0x77	Normal operation.
ARG2	0x00	Crystal load capacitance = 0 pF.
ARG3	0x03	Disables CTS interrupt, crystal bias=3.
ARG4	0x12	FM function, crystal frequency 36.4 MHz.
ARG5	0x12	External clock, receiver 1.
STATUS	→0x80	

10. The device is ready to commence normal operation and accept additional commands.
11. If desired, send the POWER_DOWN command.

Example:

POWER_DOWN Command		
Action	**Data**	**Description**
CMD	0x11	POWER_DOWN
ARG1	0x00	Disable oscillator (ARG1 may be omitted with the same result)
STATUS	→0x80	CTS=1

12. It is now possible to move to the powerup state by returning to step 7.

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6. Digital Audio Interface

The digital audio interface operates in slave mode and supports 5 different audio data formats:

- I^{2}S Audio
- Left-Justified Audio
- Right-Justified Audio
- DSP Audio
- DSP Left-Justified Audio

In I^{2}S mode, the MSB is captured on the second rising edge of DCLK following each DFS transition. The remaining bits of the word are sent in order down to the LSB. The Left Channel is transferred first when the DFS is low, and the Right Channel is transferred when the DFS is high.

In left-justified mode, the MSB is captured on the first rising edge of DCLK following each DFS transition. The remaining bits of the word are sent in order down to the LSB. The Left Channel is transferred first when the DFS is high, and the Right Channel is transferred when the DFS is low.

In right-justified format, by default, the LSB is captured on the last rising edge of DCLK in each valid DFS interval. The left channel is transferred first when the DFS is high, and the right channel is transferred when the DFS is low.

In DSP format, the DFS becomes a pulse with a width of one DCLK period. The left channel is transferred first, followed right away by the right channel. There are two options in transferring the digital audio data in DSP format; the MSB of the left channel can be transferred on the first rising edge of DCLK following the DFS pulse (left-justified DSP format) or on the second rising edge.

In all audio formats, depending on the word size, DCLK frequency, and sample rates, there may be unused DCLK cycles after the LSB of each word before the next DFS transition and MSB of the next word. In addition, the user can configure the MSB to be captured on the falling edge of DCLK via properties. The number of audio bits can be configured for 8, 16, 20, or 24 bits.
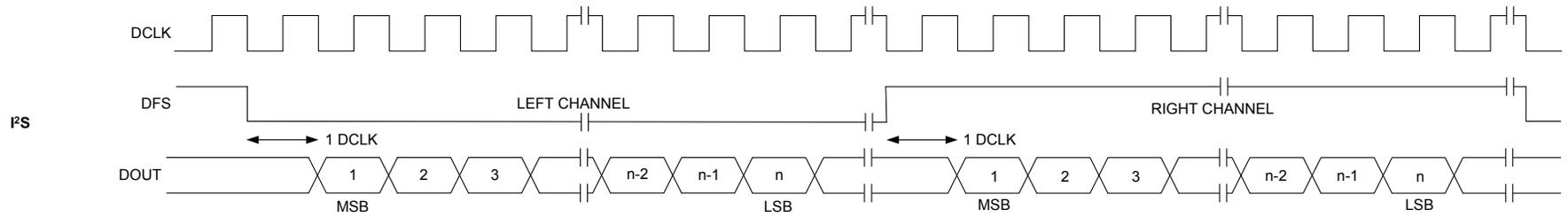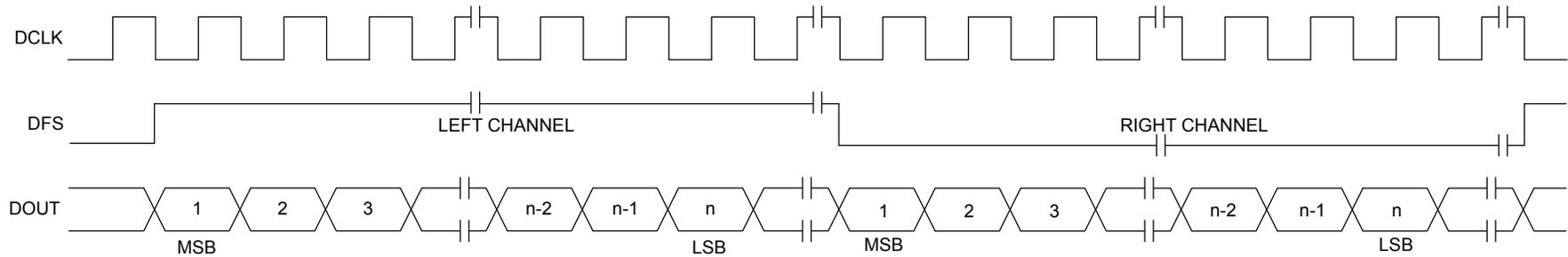
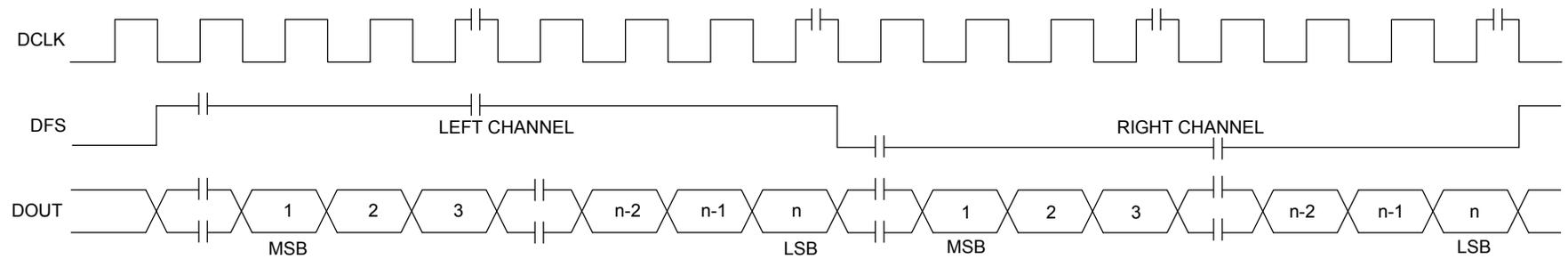**Figure 4. I²S Audio Format**

Figure 5. Left-Justified Audio Format

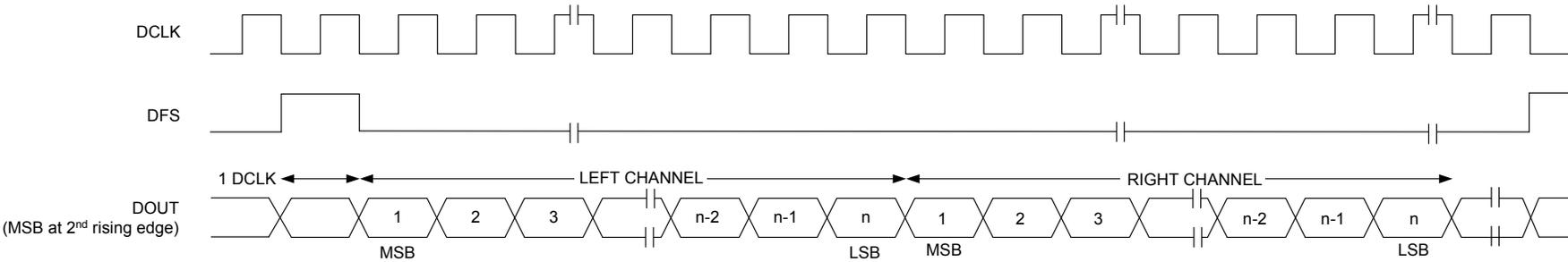**Figure 6. Right-Justified Audio Format**

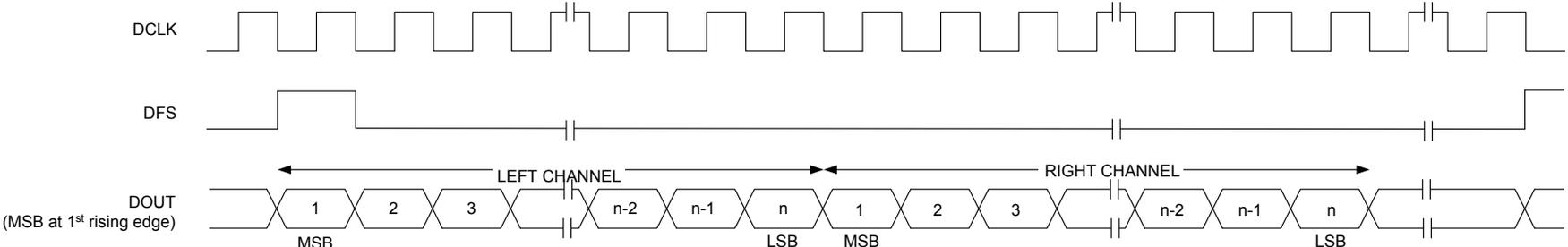**Figure 7. DSP Audio Format**

Figure 8. DSP Left-Justified Audio Format

7. Digital ZIF I/Q Interface

The digital ZIF I/Q output can provide the down converted channelized AM/FM signal at baseband to a third-party processor for AM/FM HD radio processor for IBOC signal processing (Si4777 only). The Si4777 provide a 500 kHz BW signal for FM IBOC signal processing and a 30 kHz BW signal for AM IBOC signal processing. The ZIF I/Q 4-pin interface consists of two data serial lines containing I and Q data, a bit clock, and a word frame for each data sample. The interface operates in master mode and supports five different data formats:

- I^2S ZIF
- Left-Justified ZIF
- Right-Justified ZIF
- DSP ZIF
- DSP Left-Justified ZIF

Table 4. ZIF I/Q Interface Description

Pin	Description
IOUT	16-bit baseband I word
QOUT	16-bit baseband Q word
IQFS	Word frame sync for I and Q words
IQCLK	Bit clock for I and Q data

7.1. ZIF I/Q Data Formats

In I^2S format, by default, the MSB is captured on the second rising edge of IQCLK following each IQFS transition. The remaining bits of the word are sent in order, down to the LSB.

In Left-Justified format, by default, the MSB is captured on the first rising edge of IQCLK following each IQFS transition. The remaining bits of the word are sent in order, down to the LSB.

In Right-Justified format, by default, the LSB is captured on the last rising edge of IQCLK in each valid IQFS interval.

In DSP format, the IQFS becomes a pulse with a width of 1 IQCLK period. There are two options in transferring the digital baseband I/Q data in DSP format: the MSB of I and Q data can be transferred on the first rising edge of IQCLK following the IQFS pulse (left-justified DSP format) or on the second rising edge.

In all data formats, depending on the word size, IQCLK frequency, and sample rates, there may be unused IQCLK cycles after the LSB of each word before the next IQFS transition and MSB of the next word. In addition, if preferred, the user can configure the MSB to be captured on the falling edge of IQCLK via properties. The number of baseband I/Q bits is configured for 16 bits.
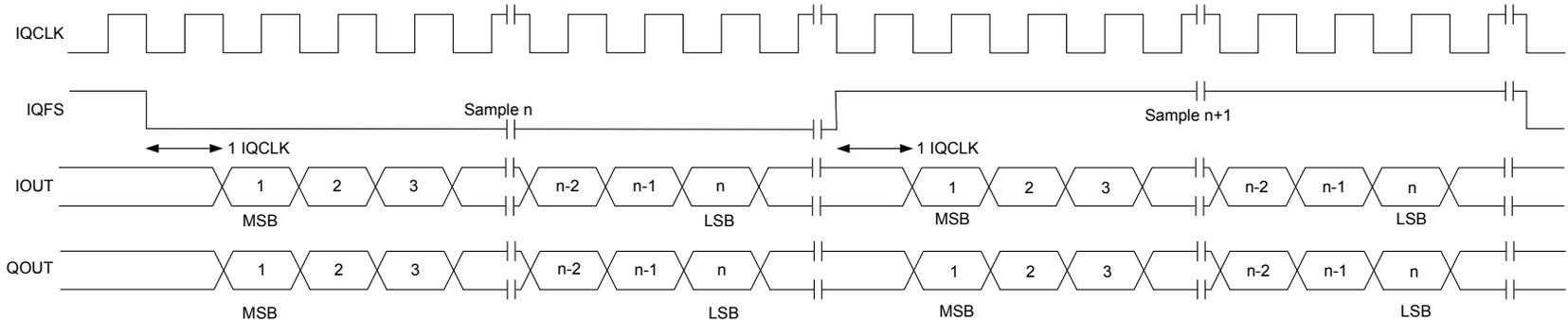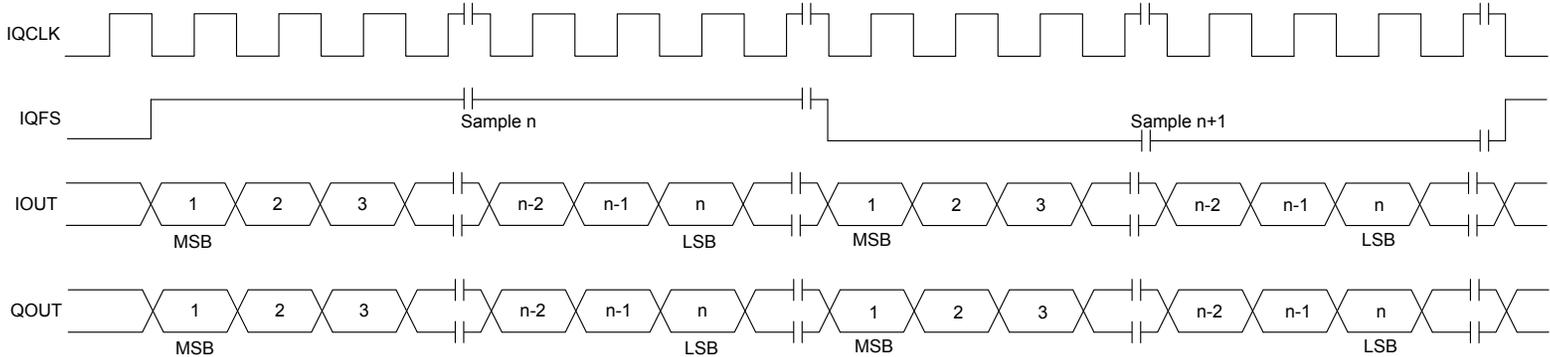
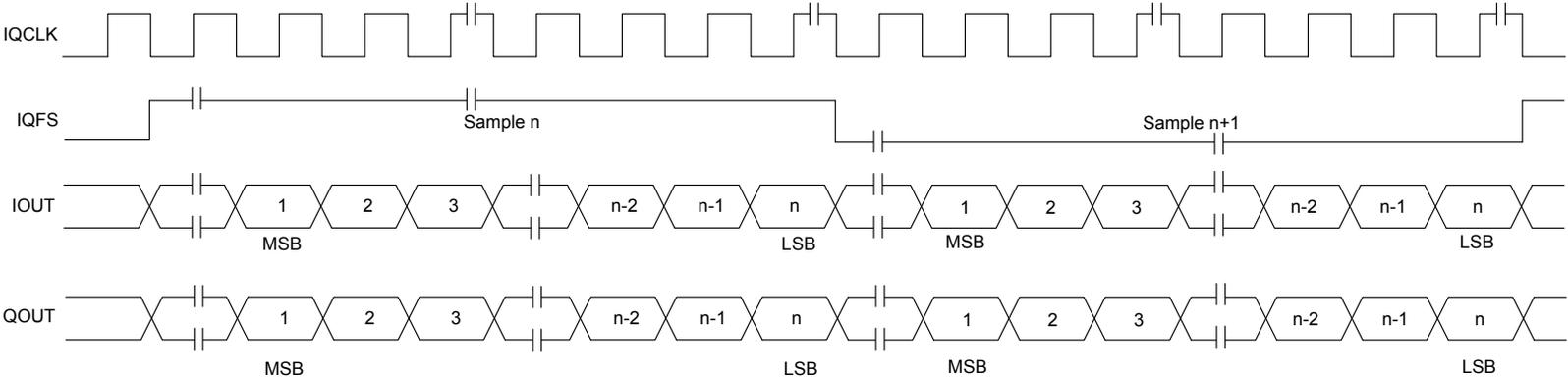**Figure 9. I²S ZIF Format**

Figure 10. Left-Justified ZIF Format

Figure 11. Right-Justified ZIF Format
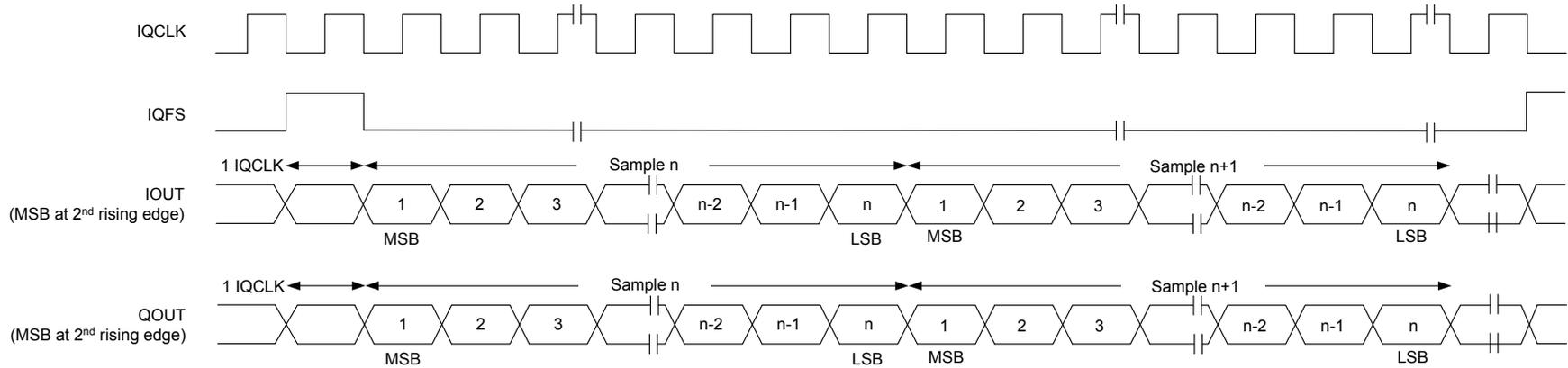
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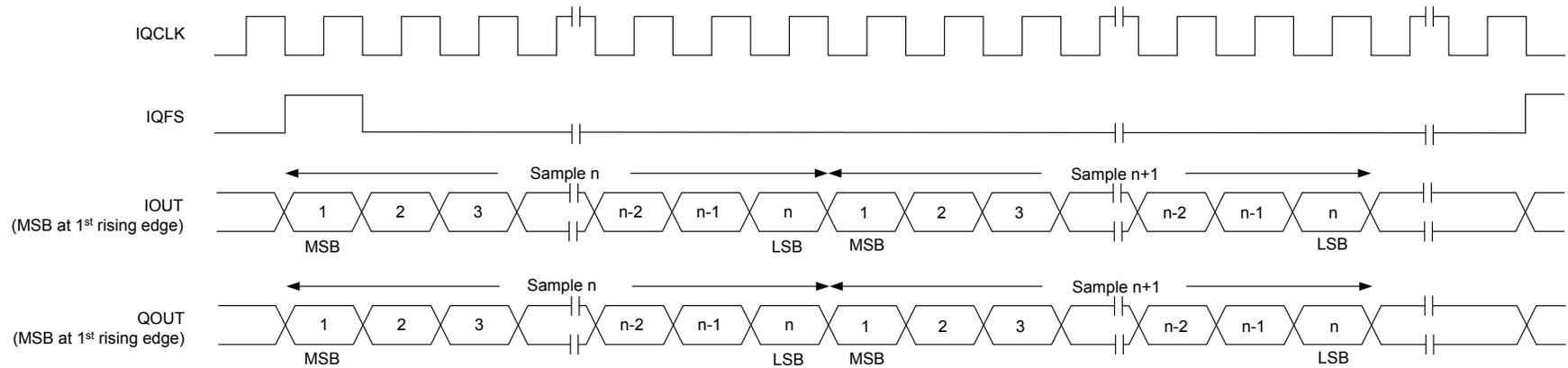
Figure 12. DSP ZIF Format

**Figure 13. DSP Left-Justified ZIF Format**

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7.2. ZIF I/Q Sample Rates and Clocking Requirements

The device supports a number of industry-standard sampling rates including 650, 675, and 744.1875 kHz.

The external crystal and/or reference clock frequency must be the following to support the following ZIF I/Q samples rates for interface to an HD radio demodulator/decoder or DSP.

Table 5. Crystal/Reference Clock Frequency Requirements for the ZIF I/Q Sample Rates and Bit Clock Rates Supported

RCLK/XTAL Frequency (MHz)	IQFS ZIF I/Q Sample Rate (kHz)	IQCLK I/Q Bit Clock (MHz)	Broadcast Reception Modes
36.4000	650.0000	10.4000	AM/FM HD-Radio
	325.0000	5.2000	FM Analog
	40.6250	2.2750	AM Analog
37.8000	675.0000	10.8000	AM/FM HD-Radio
	337.5000	5.4000	FM Analog
	42.1875	2.3625	AM Analog
37.209375	744.1875	14.88375	AM/FM HD-Radio
	372.0938	7.4419	FM Analog
	46.5117	1.8605	AM Analog
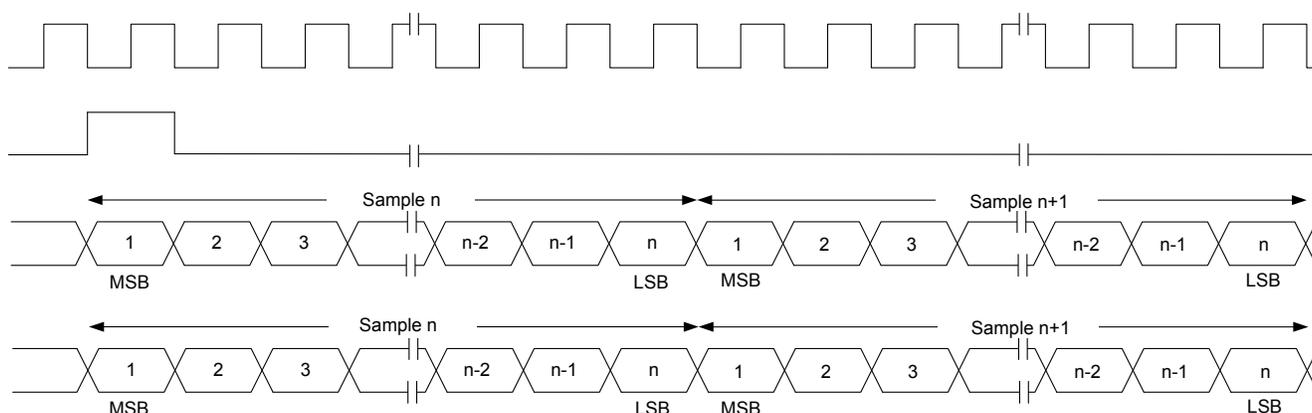
8. Timing

8.1. Command and Property Timing

When the user reads a response over the I^{2}C bus, the first 8 bits returned are the STATUS register. Bit 7 of the STATUS register is the CTS bit (Clear to Send). When CTS is 1, it indicates that the chip is ready to receive a new command. Seek and Tune commands may take longer to complete than most other commands, so they also use the STC bit (Seek/Tune Complete) to indicate they have completed. STC is bit 0 of the STATUS register.

When the user sends any command, the CTS bit will immediately reset to 0. CTS will remain 0 while the chip processes the command. When the chip is finished processing the command, the CTS bit will be set back to 1. Before sending another command, the user may poll CTS by reading the first byte of response until CTS=1. If the user has enabled the optional CTS interrupt, then the INTB pin will pulse low immediately after CTS has been set to 1, to notify the user that the previous command has completed. For information on how to enable the CTS interrupt, see the INT_CTL_ENABLE property and CTSIEN bit in the arguments for the POWER_UP command.

The commands for seek and tune (FM_TUNE_FREQ, FM_SEEK_START, etc.) will cause CTS to reset to 0 for a short time, but they will set CTS back to 1 after the seek or tune has started. The seek or tune is progressing even though CTS has been set back to 1. Although the user is free to send another command at this time, it is highly recommended to wait until the STC (Seek/Tune Complete) bit has been set to 1 before sending another command. The only exception is the AM/FM/WB_RSQ_STATUS command, which may be sent at any time because it can be used to cancel the seek/tune in progress and check the status of which station seek is currently on.

When the seek/tune completes, the STC bit will be set to 1. The user may poll STC by reading the first byte of response until STC=1. If the user has enabled the optional STC interrupt, then the INTB pin will pulse low immediately after STC has been set to 1, to notify the user that the seek or tune has completed. For information on how to enable the STC interrupt, see the INT_CTL_ENABLE property.

After the seek or tune has completed, the user may acknowledge the completion by sending the AM/FM/WB_RSQ_STATUS command with the STCACK bit set to 1. This will reset the STC bit back to 0. After this, the user may send another seek or tune command. Alternatively a new seek or tune command will also clear the STC bit when it begins.

Figure 14 shows a seek or tune command with the optional CTS and STC interrupts enabled. The timing parameters are shown in Table 6.
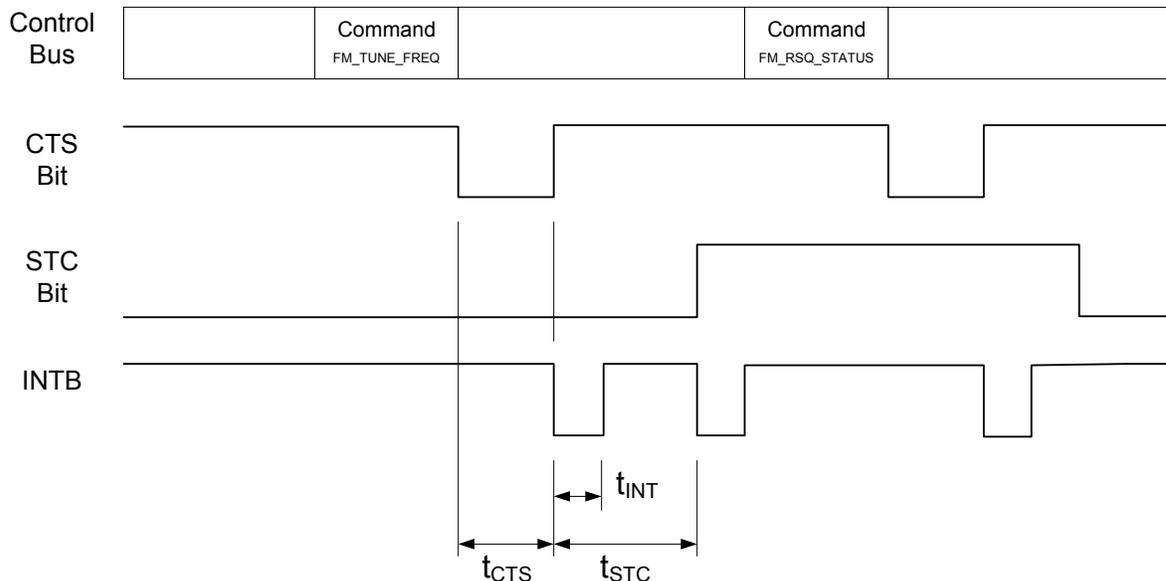
Figure 14. CTS and STC Timing Model

Table 6. Command Timing Parameters for Common Commands

Command	t_{CTS}	t_{STC}	t_{INT}
POWER_UP	100 ms	—	3 µs
POWER_DOWN	<1000 ms	—	3 µs
FUNC_INFO	<200 µs	—	3 µs
SET_PROPERTY	<200 µs	—	3 µs
GET_PROPERTY	<200 µs	—	3 µs
GET_INT_STATUS	<200 µs	—	3 µs
AGC_STATUS	<200 µs	—	3 µs
DIG_AUDIO_PIN_CFG	<200 µs	—	3 µs
ZIF_PIN_CFG	<200 µs	—	3 µs
GPIO_CTL_PIN_CFG	<200 µs	—	3 µs
ANA_AUDIO_PIN_CFG	<200 µs	—	3 µs

Table 7. Command Timing Parameters for FM Receiver

Command	t_{CTS}	t_{STC}	t_{INT}
FM_TUNE_FREQ	<200 µs	21 ms	3 µs
FM_TUNE_FREQ (fast tune)	<200 µs	5 ms	3 µs
FM_SEEK_START	<200 µs	See Note below.	3 µs
FM_RSQ_STATUS	<200 µs	—	3 µs
FM_ACF_STATUS	<200 µs	—	3 µs
FM_RDS_STATUS	<200 µs	—	3 µs
FM_RDS_BLOCKCOUNT	<200 µs	—	3 µs

*Note: t_{STC} is seek time per channel. Total seek time depends on bandwidth, channel spacing, and number of channels to next valid channel.
Worst case seek time complete for FM_SEEK_START is

$$\left(\left(\frac{FM\_SEEK\_BAND\_TOP - FM\_SEEK\_BAND\_BOTTOM}{FM\_SEEK\_FREQ\_SPACING}\right) + 1\right) \times t_{STC}$$

The seek time will require an additional 26 ms for channel spacings other than 200 kHz

Table 8. Command Timing Parameters for AM Receiver

Command	t_{CTS}	t_{STC}	t_{INT}
AM_TUNE_FREQ	100 µs	40 ms	3 µs
AM_SEEK_START	100 µs	See Note below.	3 µs
AM_RSQ_STATUS	100 µs	—	3 µs
AM_ACF_STATUS	100 µs	—	3 µs
*Note: t_{STC} is seek time per channel. Total seek time depends on bandwidth, channel spacing, and number of channels to next valid channel.			

8.2. Fast Tune Timing

The timing diagram for fast tune is shown in Figure 15.
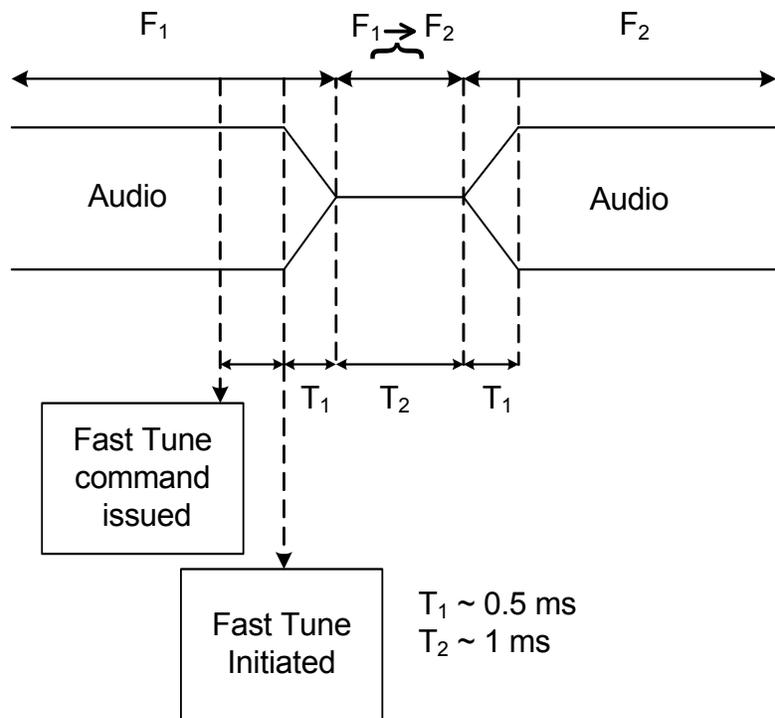
Figure 15. Fast Tune Timing Diagram

9. Commands and Properties

9.1. Common Commands and Properties

The following properties and commands are common to all receiver modes.

Table 9. Common Receiver Command Summary

Number	Name	Summary
0x01	POWER_UP	Power-up device and mode selection. Modes include operational function (AM, FM) and audio interface configuration.
0x02	PART_INFO	Returns the part information of the device.
0x11	POWER_DOWN	Power-down the device.
0x12	FUNC_INFO	Returns the firmware revision and patch revision.
0x13	SET_PROPERTY	Sets the value of a property.
0x14	GET_PROPERTY	Retrieve a property's value.
0x15	GET_INT_STATUS	Read interrupt status bits.
0x17	AGC_STATUS	Reports the status of the AGC.
0x18	DIG_AUDIO_PIN_CFG	Configures the digital audio pins.
0x19	ZIF_PIN_CFG	Configures the digital I/Q pins. (Si4777 only)
0x1A	GPIO_CTL_PIN_CFG	Configures GPIO1 and GPIO2 pins.
0x1B	ANA_AUDIO_PIN_CFG	Configures the analog audio pins.
0x1C	INTB_PIN_CFG	Configures behavior of INTB and A1 pins.

Table 10. Common Receiver Property Summary

Number	Name	Default	Summary
0x0000	INT_CTL_ENABLE	0x0000	Interrupt enable property.
		0	
0x0200	DIGITAL_IO_INPUT_SAMPLE_RATE	0xBB80	Sets the digital input sample rate in units of Hz. (Si4777 only)
		48000	
0x0201	DIGITAL_IO_INPUT_FORMAT	0x3600	Configures digital audio input format. (Si4777 only)
		13824	
0x0202	DIGITAL_IO_OUTPUT_SAMPLE_RATE	0xBB80	Sets the digital output sample rate in units of Hz.
		48000	
0x0203	DIGITAL_IO_OUTPUT_FORMAT	0x3600	Configures digital audio output format.
		13824	

Table 10. Common Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x0300	AUDIO_ANALOG_VOLUME	0x003F	Sets the analog audio volume.
		63	
0x0301	AUDIO_MUTE	0x0000	Audio mute property.
		0	
0x0600	ZIF_OUTPUT_CFG	0X0801	Enables or disables ZIF and configures ZIF interface format (Si4777only).
		2049	

Table 11. Status Response for the FM Receiver

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT

Bit	Name	Function
7	CTS	Clear to Send. 0 = Wait before sending next command. 1 = Clear to send next command.
6	ERR	Error. 0 = No error. 1 = Error.
5:4	Reserved	Values may vary.
3	RSQINT	Received Signal Quality Interrupt. 0 = Received Signal Quality measurement has not been triggered. 1 = Received Signal Quality measurement has been triggered.
2	RDSINT	Radio Data System Interrupt. 0 = Radio data system interrupt has not been triggered. 1 = Radio data system interrupt has been triggered.
1	ACFINT	Automatically Controlled Features Interrupt. 0 = ACF measurement has not been triggered. 1 = ACF measurement has been triggered.
0	STCINT	Seek/Tune Complete Interrupt. 0 = Tune complete has not been triggered. 1 = Tune complete has been triggered.

Table 12. Status Response for the AM Receiver

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	X	ACFINT	STCINT

Bit	Name	Function
7	CTS	Clear to Send. 0 = Wait before sending next command. 1 = Clear to send next command.
6	ERR	Error 0 = No error. 1 = Error.
5:4	Reserved	Values may vary.
3	RSQINT	Received Signal Quality Interrupt 0 = Received Signal Quality measurement has not been triggered. 1 = Received Signal Quality measurement has been triggered.
2	Reserved	Value may vary.
1	ACFINT	Automatically Controlled Features Interrupt. 0 = ACF measurement has not been triggered. 1 = ACF measurement has been triggered.
0	STCINT	Seek/Tune Complete Interrupt. 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.

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If the ERR bit in the STATUS response is set for a command or property, the response is redefined as follows:

Table 13. Response When ERR Bit is Set

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	1	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	ERROR							

RESP	Bit	Name	Function
1	7:0	ERROR	Error definitions. 0x10=Bad command. 0x11=Bad ARG1. 0x12=Bad ARG2. 0x13=Bad ARG3. 0x14=Bad ARG4. 0x18=Command busy. 0x20=Bad internal memory. 0x30=Bad patch. 0x31=Bad boot mode. 0x40=Bad property.

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9.1.1. Common Receiver Commands

Command 0x01 POWER_UP

The POWER_UP command initiates the boot process to move the device from powerdown to powerup mode. The boot can occur from internal device memory or a system controller downloaded patch. This command powers up the device with the specified function (FM Receive, AM Receive). Power-up is complete when the CTS bit is set. This is the only command that may be sent while the device is powered down.

Command

Bit	7	6	5	4	3	2	1	0
CMD				0x01				
ARG1	IBIAS7X	XSTART						
ARG2	00		XCLOAD[5:0]					
ARG3	CTSIEN	INTSEL	FAST-BOOT	0	XIBIASHC	XIBIAS[2:0]		
ARG4	FUNC[3:0]				FREQ[3:0]			
ARG5	00010					XMODE[2:0]		

ARG	Bit	Name	Function
1	7	IBIAS7X	Crystal 7x bias current. 0=All other configurations. 1=Receiver 1 in a two/three receiver configuration with 37.209375, 36.4, or 37.8 MHz crystal.
1	6:0	XSTART	Oscillator Startup. 0010001=Start up multiple tuner. 1110111=Normal operation.
2	7:6	Reserved	Always write 00.
2	5:0	XCLOAD[5]	Selects the amount of additional on-chip capacitance to be connected between XTAL1 and gnd and between XTAL2 and gnd. One half of the capacitance value shown here is the additional load capacitance presented to the xtal. The minimum step size is 0.277 pF. The required value will be layout-dependent. Range is 0–0x3F i.e.(0–16.33 pF) The Si477x EVB sets XCLOAD=0x28.
3	7	CTSIEN	CTS interrupt enable. 0=Disable. 1=Enable.
3	6	INTSEL	CTS interrupt pin select. 0=A1 pin. 1=INTB pin.
3	5	FASTBOOT	Speeds boot time when set. It is recommended to set this bit with all crystals.
3	3	XIBIASHC	Crystal high current. 0=Single receiver configuration. 1=Multiple receiver configuration.

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ARG	Bit	Name	Function
3	2:0	XIBIAS	Crystal bias current. 0=37.209375, 36.4, or 37.8 MHz crystal or external clock. 7=37.209375, 36.4, or 37.8 MHz crystal.
4	7:4	FUNC[3:0	Selects the boot function of the device. 0 = Boot Loader. 1 = FM Receive. 2 = AM Receive. **Note:** Values other than those listed may result in unpredictable behavior.
4	3:0	FREQ[3:0]	Selects the crystal frequency. 1 = 37.209375 MHz. 2 = 36.4 MHz. 3 = 37.8 MHz.
5	4	Reserved	Always write 00010.
5	2:0	XMODE[2:0]	Crystal mode. 1=Crystal. 2=External clock.

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Command 0x02 PART_INFO

The PART_INFO command returns the chip revision, part firmware major, minor, and build revision, and ROM ID. The command is complete when the CTS bit (and optional interrupt) is set. The command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD				0x02				

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	CHIPREV[7:0]							
RESP1	PART[7:0]							
RESP3	PMAJOR[7:0]							
RESP4	PMINOR[7:0]							
RESP5	PBUILD[7:0]							
RESP6	Reserved							
RESP7	Reserved							
RESP8	ROMID[7:0]							

RESP	Bit	Name	Function
1	7:0	CHIPPREV	Chip Revision
2	7:0	PART	Part Number, last two digits of part number
3	7:0	PMAJOR	Part Major Revision
4	7:0	PMINOR	Part Minor Revision
5	7:0	PBUILD	Part Build Version
6	7:0	Reserved	Values may vary.
7	7:0	Reserved	Values may vary.
8	7:0	ROMID	ROM ID

Command 0x11 POWER_DOWN

The POWER_DOWN command moves the device from powerup to powerdown mode. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent when in powerup mode. Note that only the POWER_UP command is accepted in powerdown mode. If the system controller writes a command other than POWER_UP when in powerdown mode, the device will not respond. The device will only respond when a POWER_UP command is written. It is possible to power down a device and leave the oscillator running. This may be desirable in multiple receiver applications in which the device driving the oscillator for other devices is to be placed in powerdown without affecting the other devices.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x11							
ARG1	0							XOSC

ARG	Bit	Name	Function
1	7:0	Reserved	Always write 0.
2	0	XOSC	0=Full powerdown. 1=Powerdown and leave oscillator running.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT

Note: The above response shows status bits for FM Receive mode (see Table 11). See Table 12 for status bits for AM Receive mode.

Command 0x12 FUNC_INFO

The FUNC_INFO command returns the firmware revision and patch revision for currently-loaded functional mode firmware (AM, FM). The command is complete when the CTS bit (and optional interrupt) is set. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD				0x12				

Bit	7	6	5	4	3	2	1	0
CMD	0x12							

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	FWMAJOR[7:0]							
RESP2	FWMINOR1[7:0]							
RESP3	FWMINOR2[7:0]							
RESP4	PATCHH[7:0]							
RESP5	PATCHL[7:0]							
RESP6	FUNC[7:0]							

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

RESP	Bit	Name	Function
1	7:0	FWMAJOR[7:0]	Firmware Major Revision.
2	7:0	FWMINOR1[7:0]	Firmware Minor1 Revision.
3	7:0	FWMINOR2[7:0]	Firmware Minor2 Revision.
4	7:0	PATCHH[7:0]	Patch ID High Byte (HEX).
5	7:0	PATCHL[7:0]	Patch ID Low Byte (HEX).
6	7:0	FUNC[7:0]	Returns the current functional mode: 1 FM Receive 2 AM Receive

Command 0x13 SET_PROPERTY

The SET_PROPERTY command sets the value of a property. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x13							
ARG1	00000000							
ARG2	PROPH[7:0]							
ARG3	PROPL[7:0]							
ARG4	PROPDH[7:0]							
ARG5	PROPDL[7:0]							

ARG	Bit	Name	Function
1	7:0	Reserved	Always write to 0.
2	7:0	PROPH [7:0]	**Property Address High Byte** This byte, in combination with PROPL, is used to specify the property to modify.
3	7:0	PROPL [7:0]	**Property Address Low Byte** This byte, in combination with PROPH, is used to specify the property to modify.
4	7:4	PROPDH [7:0]	**Property Value High Byte** This byte, in combination with PROPDL, is used to set the property value.
5	7:0	PROPDL [7:0]	**Property Value Low Byte** This byte, in combination with PROPDH, is used to set the property value.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

Command 0x14 GET_PROPERTY

The GET_PROPERTY command retrieves a property's value. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode

Command

Bit	7	6	5	4	3	2	1	0
CMD				0x14				
ARG1				00000000				
ARG2				PROPH[7:0]				
ARG3				PROPL[7:0]				

ARG	Bit	Name	Function
1	7:0	Reserved	Always write 0.
2	7:0	$PROP_H[7:0]$	**Property Address High Byte.** This byte, in combination with $PROP_L$, is used to specify the property to get.
3	7:0	$PROP_L[7:0]$	**Property Address Low Byte.** This byte, in combination with $PROP_H$, is used to specify the property to get.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1				XXXXXXXX				
RESP2				$PROPD_H[7:0]$				
RESP3				$PROPD_L[7:0]$				

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

RESP	Bit	Name	Function
1	7:0	Reserved	Response values may vary.
2	7:0	$PROPD_H[7:0]$	**Property Value High Byte.** This byte, in combination with $PROPD_L$, represents the requested property value.
3	7:0	$PROPD_L[7:0]$	**Property Value Low Byte.** This byte, in combination with $PROPD_H$, represents the requested property value.

Command 0x15 GET_INT_STATUS

The GET_INT_STATUS command updates the bits of the status byte. This command should be called after any command that sets the STCINT, ACFINT, RDSINT, ASQINT, or RSQINT bits. When polling, this command should be periodically called to monitor the STATUS byte, and, when using interrupts, this command should be called after the interrupt is set to update the STATUS byte. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be set in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x15							

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

Command 0x17 AGC_STATUS

The AGC_STATUS command reports the current status of the AGC for FM mode. The command is complete when the CTS bit (and optional interrupt) is set. This command may only be sent when in powerup mode.

Bit	7	6	5	4	3	2	1	0
CMD	0x17							

RESP	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	XX		MIXHI	MXLO	LNAHI	LNALO	X	X
RESP2	FMAGC1							
RESP3	FMAGC2							
RESP4	PGAGAIN							
RESP5	FMLNAG							

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

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RESP	Bit	Name	Function
1	7:6	Reserved	Values may vary.
1	5	MXHI	0 = FM Mixer PD high threshold is not tripped. 1 = FM Mixer PD high threshold is tripped.
1	4	MXLO	0 = FM Mixer PD low threshold is not tripped. 1 = FM Mixer PD low threshold is tripped.
1	3	LNAHI	0 = FM LNA PD high threshold is not tripped. 1 = FM LNA PD high threshold is tripped.
1	2	LNALO	0 = FM LNA PD low threshold is not tripped. 1 = FM LNA PD low threshold is tripped.
1	1:0	Reserved	Values may vary.
2	7:0	FMAGC1	The parallel combination of these resistors indicates the current FMAGC1 attenuator resistance. The total resistance value at the pin is 800/FMAGC1. 0 = 10 kΩ—no attenuation 1 = 800 Ω 2 = 400 Ω 4 = 200 Ω 8 = 100 Ω 16 = 50 Ω 32 = 25 Ω 64 = 12.5 Ω 128 = 6.25 Ω
3	7:0	FMAGC2	The parallel combination of these resistors indicates the current FMAGC2 attenuator resistance. The total resistance value at the pin is 800/FMAGC2. 0 = 10 kΩ—no attenuation 1 = 800 Ω 2 = 400 Ω 4 = 200 Ω 8 = 100 Ω 16 = 50 Ω 32 = 25 Ω 64 = 12.5 Ω 128 = 6.25 Ω
4	7:0	PGAGAIN	PGA gain in dB Range: 8–33
5	7:0	FMLNAG	FM LNA Gain in dB Range: 2–14

Command 0x18 DIG_AUDIO_PIN_CFG

The DIG_AUDIO_PIN_CFG command configures the digital audio pins. Ensure that DCLK and DFS are stable before this command is sent. Writing an argument byte to a non-zero value will change the state of a pin. Writing an argument byte to 0 will not change the state of the pin and is useful when using this command to query the state of the pins. The command is complete when the CTS bit (and optional interrupt) is set. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x18							
ARG1	0	DCLK[6:0]						
ARG2	0	DFS[6:0]						
ARG3	0	DOUT[6:0]						
ARG4	0	BLEND[6:0]						

ARG	Bit	Name	Function
1	7	Reserved	Always write 0.
1	6:0	DCLK[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 10 = Configure this pin as part of the digital audio interface in slave mode.
2	7	Reserved	Always write 0.
2	6:0	DFS[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 10 = Configure this pin as part of the digital audio interface in slave mode.
3	7	Reserved	Always write 0.
3	6:0	DOUT[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 12 = Configure this pin as digital out on I^2S port 1. 13 = Configure this pin as digital in on I^2S port 1. (Si4777 only)
4	7	Reserved	Always write 0.
4	6:0	BLEND[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 13 = Configure this pin as digital in on I^2S port 1. (Si4777 only) 23 = Configure this pin as the input that selects the mode of the I^2S audio combiner (analog or HD) (Si4777 only).

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Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	Reserved	DCLK[6:0]						
RESP2	Reserved	DFS[6:0]						
RESP3	Reserved	DOUT[6:0]						
RESP4	Reserved	BLEND[6:0]						

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

RESP	Bit	Name	Function
1	7	Reserved	Values may vary.
1	6:0	DCLK[6:0]	1 = Disabled. 10 = Configured as part of the digital audio interface in slave mode.
2	7	Reserved	Values may vary.
2	6:0	DFS[6:0]	1 = Disabled. 10 = Configured as part of the digital audio interface in slave mode.
3	7	Reserved	Values may vary.
3	6:0	DOUT[6:0]	1 = Disabled. 12 = Configured as digital out on I^{2}S port 1. 13 = Configured as digital in on I^{2}S port 1. (Si4777 only)
4	7	Reserved	Values may vary.
4	6:0	BLEND[6:0]	1 = Disabled. 13 = Configured as digital in on I^{2}S port 1. 23 = Configured as the input that selects the mode of the I^{2}S audio combiner (analog or HD). (Si4777 only)

Command 0x19 ZIF_PIN_CFG
(Si4777 Only)

The ZIF_PIN_CFG command configures the digital I/Q pins. Writing an argument byte to a non-zero value will change the state of a pin. Writing an argument byte to 0 will not change the state of the pin and is useful when using this command to query the state of the pins.The command is complete when the CTS bit (and optional interrupt) is set. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x19							
ARG1	0	IQCLK[6:0]						
ARG2	0	IQFS[6:0]						
ARG3	0	IOUT[6:0]						
ARG4	0	QOUT[6:0]						

ARG	Bit	Name	Function
1	7	Reserved	Always write 0.
1	6:0	IQCLK[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 21 = Configure this pin as part of the I/Q interface in master mode.
2	7	Reserved	Always write 0.
2	6:0	IQFS[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 21 = Configure this pin as part of the I/Q interface in master mode.
3	7	Reserved	Always write 0.
3	6:0	IOUT[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 22 = Configure this pin as I out.
4	7	Reserved	Always write 0.
4	6:0	QOUT[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down is enabled. 22 = Configure this pin as Q out.

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Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	Reserved	IQCLK[6:0]						
RESP2	Reserved	IQFS[6:0]						
RESP3	Reserved	IOUT[6:0]						
RESP4	Reserved	QOUT[6:0]						
Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.								

RESP	Bit	Name	Function
1	7	Reserved	Values may vary.
1	6:0	IQCLK[6:0]	1 = Disabled. 21 = Configured as part of the I/Q interface in master mode.
2	7	Reserved	Values may vary.
2	6:0	IQFS[6:0]	1 = Disabled. 21 = Configured as part of the I/Q interface in master mode.
3	7	Reserved	Values may vary.
3	6:0	IOUT[6:0]	1 = Disabled. 22 = Configured I out.
4	7	Reserved	Values may vary.
4	6:0	QOUT[6:0]	1 = Disabled. 22 = Configured Q out.

Command 0x1A GPIO_CTL_PIN_CFG

Configures the state (high or low) of GPO1 and GPO2 pins. The command is complete when the CTS bit (and optional interrupt) is set. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x1A							
ARG1	Reserved	ICIN [6:0]						
ARG2	Reserved	ICIP [6:0]						
ARG3	Reserved	ICON[6:0]						
ARG4	Reserved	ICOP[6:0]						

ARG	Bit	Name	Function
1	7	Reserved	Always write 0.
1	6:0	ICIN [6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down in enabled. 2 = Configure this pin as an output (GPO1) and drive it low. 3 = Configure this pin as an output (GPO1) and drive it high.
2	7	Reserved	Always write 0.
2	6:0	ICIP [6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down in enabled. 2 = Configure this pin as an output (GPO2) and drive it low. 3 = Configure this pin as an output (GPO2) and drive it high.
3	7	Reserved	Always write 0.
3	6:0	ICON[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down in enabled. 10 = Configure this pin as part of the digital audio interface in slave mode (DCLK). (Si4777 only).
4	7	Reserved	Always write 0.
4	6:0	ICOP[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive. 1 MΩ pull down in enabled. 14 = Configure this pin as part of the digital audio interface in slave mode (DOUT). (Si4777 only).

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Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	Reserved	ICIN[6:0]						
RESP2	Reserved	ICIP[6:0]						
RESP3	Reserved	ICON[6:0]						
RESP4	Reserved	ICOP[6:0]						

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

RESP	Bit	Name	Function
1	7	Reserved	Values may vary.
1	6:0	ICIN[6:0]	1 = Disabled. 2 = GPO1 output, Driving low. 3 = GPO1 output, Driving high.
2	7	Reserved	Values may vary.
2	6:0	ICIP[6:0]	1 = Disabled. 2 = GPO2 output, Driving low. 3 = GPO2 output, Driving high.
3	7	Reserved	Values may vary.
3	6:0	ICON[6:0]	1 = Disabled. 10 = Configured as part of the digital audio interface in slave mode on I^2S port 2. (DCLK). (Si4777 only)
4	7	Reserved	Values may vary.
4	6:0	ICOP[6:0]	1 = Disabled. 14 = Configured as digital out on I^2S port 2 (DOUT). (Si47777 only).

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Command 0x1B ANA_AUDIO_PIN_CFG

The ANA_AUDIO_PIN_CFG command configures the analog audio pins. Writing an argument byte to 0 will not change the state of the pin and is useful when using this command to query the state of the pins. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x1B							
ARG1	0	LROUT[6:0]						

ARG	Bit	Name	Function
1	7	Reserved	Always write 0.
1	6:0	LROUT[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable the output drivers, so the pins are completely inactive and can be left floating. 2 = Configure the LOUT/ROUT pins to output audio. 3 = Configure LOUT for MPX and disable ROUT. 4 = Configure LOUT/ROUT for HD Split mode: ROUT = Analog out; LOUT = HD out.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	X	LROUT[6:0]						

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

RESP	Bit	Name	Function
1	7	Reserved	Values may vary.
1	6:0	LROUT[6:0]	1 = The output drivers are disabled, so the pins are completely inactive and can be left floating. 2 = LOUT/ROUT pins configured to output audio. 3 = LOUT is configured for MPX out and ROUT is disabled.

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Command 0x1C INTB_PIN_CFG

The INTB_PIN_CFG command configures INTB and A1 pins. Writing an argument byte to 0 will not change the state of the pin and is useful when using this command to query the state of the pins. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x1C							
ARG1	Reserved	INTB[6:0]						
ARG2	Reserved	A1[6:0]						

ARG	Bit	Name	Function
1	7	Reserved	Always write to 0.
1	6:0	INTB[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive and can be left floating. 10 = Configure this pin as part of the digital audio interface in slave mode. 40 = Configure this pin as the interrupt.
2	7	Reserved	Always write to 0.
2	6:0	A1[6:0]	0 = Do not modify the behavior of this pin. 1 = Disable both the output and input drivers so the pin is completely inactive and can be left floating. 40 = Configure this pin as the interrupt.

Response

Bit	7	6	5	4	3	2	1	0
Status	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	Reserved	INTB[6:0]						
RESP 2	Reserved	A1[6:0]						

Note: The above response shows status bits for FM Receive mode (see Table 11 on page 26). See Table 12 on page 27 for status bits for AM Receive mode.

RESP	Bit	Name	Function
1	7	Reserved	Values may vary.
1	6:0	INTB[6:0]	1 = Disabled. 10 = Configured as part of the digital audio interface in slave mode. 40 = Configured as the interrupt.
2	7	Reserved	Values may vary.
2	6:0	A1[6:0]	1 = Disabled. 40 = Configured as the interrupt.

9.1.2. Common Receiver Properties

Property 0x0000 INT_CTL_ENABLE

The 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

INT_CTL_ENABLE													
15:13	12	11	10	9	8	7	6	5	4	3	2	1	0
000	ASQREP	RSQREP	RDSREP	ACFREP	STCREP	CTSIEN	ERRIEN	0	ASQIEN	RSQIEN	RDSIEN	ACFIEN	STCIEN
000	0	0	0	0	0	0	0	0	0	0	0	0	0

Bit	Name	Function
15:13	Reserved	Always write 0.
12	ASQREP	Repeat interrupt pulse when ASQINT is set, even if a previous interrupt was generated but not acknowledged.
11	RSQREP	Repeat interrupt pulse when RSQINT is set, even if a previous interrupt was generated but not acknowledged.
10	RDSREP	Repeat interrupt pulse when RDSINT is set, even if a previous interrupt was generated but not acknowledged.
9	ACFREP	Repeat interrupt pulse when ACFINT is set, even if a previous interrupt was generated but not acknowledged.
8	STCREP	Repeat interrupt pulse when STCIEN is set, even if a previous interrupt was generated but not acknowledged.
7	CTSIEN	Interrupt when CTS is set.
6	ERRIEN	Interrupt when ERR is set.
5	Reserved	Always write 0.
4	ASQIEN	Interrupt when ASQINT is set.
3	RSQIEN	Interrupt when RSQIEN is set.
2	RDSIEN	Interrupt when RDSINT is set.
1	ACFIEN	Interrupt when ACFINT is set.
0	STCIEN	Interrupt when STCIEN is set.

Property 0x0200 DIGITAL_IO_INPUT_SAMPLE_RATE (Si4777 only)

The DIGITAL_IO_INPUT_SAMPLE_RATE property sets the digital input sample rate in units of Hz. Set the sample rate to 0 to disable digital audio. 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

DIGITAL_IO_INPUT_SAMPLE_RATE															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
INPUT_SAMPLE_RATE[15:0]															
0xBB80															

Bit	Name	Function
15:0	INPUT_SAMPLE_RATE[15:0]	Sets the digital input sample rate in units of Hz. Default is 48000. Range is 32000–48000.

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Property 0x0201 DIGITAL_IO_INPUT_FORMAT (Si4777 only)

The DIGITAL_IO_INPUT_FORMAT property configures digital audio input format. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be sent. This property may only be set or read in powerup mode.

Default: 0x3600

DIGITAL_IO_INPUT_FORMAT															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0		SLOT_SIZE[2:0]			SAMPL_SIZE[2:0]			BITORDER	SWAP	CLKINV	FRAMING_MODE[3:0]				0

Bit	Name	Function
15:14	Reserved	Always write 0.
13:11	SLOT_SIZE[2:0]	Defines the width of the data channel. This is only used in right justified modes. 2 = 8 bits. 4 = 16 bits. 5 = 20 bits. 6 = 24 bits.
10:8	SAMPL_SIZE[2:0]	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 0. Default is 24 bits. 2 = 8 bits. 4 = 16 bits. 5 = 20 bits. 6 = 24 bits.
7	BITORDER	Determine if the MSB or LSB is transmitted first. Default is 0. 0 = Transmit MSB first. 1 = Transmit LSB first.
6	SWAP	SWAP—Swap position of the left and right channels. Default is 0. 0 = Transmit the left sample first. 1 = Transmit the right sample first.
5	CLKINV	Inverts the data clock. Default is 0. 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.
4:1	FRAMING_MODE[3:0]	Determines when the data is transmitted relative to frame sync. 0x0 = I^{2}S mode. 0x6 = DSP mode. 0x7 = Left-justified DSP mode. 0x8 = Left-justified mode. 0x9 = Right-justified mode.
0	Reserved	Always write 0.

Property 0x0202 DIGITAL_IO_OUTPUT_SAMPLE_RATE

The DIGITAL_IO_OUTPUT_SAMPLE_RATE property sets the digital output sample rate in units of Hz. 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

DIGITAL_IO_OUTPUT_SAMPLE_RATE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
OUTPUT_SAMPLE_RATE[15:0]															
0xBB80															

Bit	Name	Function
15:0	OUTPUT_SAMPLE_RATE[15:0]	Sets the digital output sample rate in units of Hz. Default is 48000. Range is 32000–48000.

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Property 0x0203 DIGITAL_IO_OUTPUT_FORMAT

The DIGITAL_IO_OUTPUT_FORMAT property configures digital audio output format. 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: 0x3600

DIGITAL_IO_OUTPUT_FORMAT															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0		SLOT_SIZE[2:0]			SAMPL_SIZE[2:0]			BITORDER	SWAP	CLKINV	FRAMING_MODE[3:0]				0

Bit	Name	Function
15:14	Reserved	Always write 0.
13:11	SLOT_SIZE[2:0]	Defines the width of the data channel. This is only used in right-justified modes. 2 = 8 bits. 4 = 16 bits. 5 = 20 bits. 6 = 24 bits.
10:8	SAMPL_SIZE[2:0]	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 0. Default is 24 bits. 2 = 8 bits. 4 = 16 bits. 5 = 20 bits. 6 = 24 bits.
7	BITORDER	Determine if the MSB or LSB is transmitted first. Default is 0. 0 = Transmit MSB first. 1 = Transmit LSB first.
6	SWAP	SWAP—Swap position of the left and right channels. Default is 0. 0 = Transmit the left sample first. 1 = Transmit the right sample first.
5	CLKINV	Inverts the data clock. Default is 0. 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.
4:1	FRAMING_MODE[3:0]	Determines when the data is transmitted relative to frame sync. 0x0 = I^{2}S mode. 0x6 = DSP mode. 0x7 = Left-justified DSP mode. 0x8 = Left-justified mode. 0x9 = Right-justified mode.
0	Reserved	Always write 0.

Property 0x0300 AUDIO_ANALOG_VOLUME

The AUDIO_ANALOG_VOLUME property 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

AUDIO_ANALOG_VOLUME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000										VOL[5:0]					
0x000										0x3F					

Bit	Name	Function
15:6	Reserved	Always write 0.
5:0	VOL[5:0]	Sets the analog audio volume. Default is 63. Range is 0–63.

Property 0x0301 AUDIO_MUTE

The AUDIO_MUTE property mutes/unmutes each audio output (analog left or analog right).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 when in the powerup mode.

Default: 0x0000

AUDIO_MUTE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0000														RIGHTMUTE	LEFTMUTE
0x0000														0	0

Bit	Name	Function
15:2	Reserved	Always write 0.
1	RIGHTMUTE	0 = Right audio is not muted. 1 = Right audio is muted.
0	LEFTMUTE	0 = Left audio is not muted. 1 = Left audio is muted.

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Property 0x0600 ZIF_OUTPUT_CFG
(Si4777 Only)

The ZIF_OUTPUT_CFG property enables/disables ZIF and configures the ZIF interface format. The ZIF data rate depends on RCLK and the radio's operational mode. Changes to this property will take effect at tune time.

The ZIF pins must also be configured, see ZIF_PIN_CFG on page 40. Refer to the Si477x data sheet for details on interface format and data rates. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This property may only be sent in power-up mode.

Default: 0x0801

ZIF_OUTPUT_CFG															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
FILL[1:0]		RESERVED[7:0]								FALL	ZIF_FORMAT[3:0]				RESERVED
0x0		0x20								0	0x0				1

Bit	Name	Function
15:14	FILL[1:0]	FILL[1:0]—Defines the fill value for unused data bits. Default 0. 0 = The unused bits are filled with 0s. 1 = The unused bits are filled with 1s. 2 = The unused bits are sign extended. 3 = The unused bits are filled with a random sequence.
13:6	RESERVED[7:0]	Always write as 0x20
5	FALL	FALL—IQCLK invert. Default 0. 0 = Output data changes concurrently with the falling edge of IQCLK. 1 = Output data changes concurrently with the rising edge of IQCLK.
4:1	ZIF_FORMAT[3:0]	Default: 0x0 0x0 = I^{2}S ZIF format (Default). 0x8 = Left-justified ZIF format. 0x9 = Right-justified ZIF format. 0xE = DSP ZIF format . 0xF = DSP Left-justified ZIF format.
0	RESERVED	Always write 1.

9.2. Commands and Properties for FM Receiver

Table 14. FM Receiver Command Summary

Number	Name	Summary
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.
0x35	FM_ACF_STATUS	Returns status information about automatically-controlled features for the tuned station.
0x36	FM_RDS_STATUS	Returns RDS information for current channel and reads an entry from the RDS FIFO.
0x37	FM_RDS_BLOCKCOUNT	Returns RDS expected, received, and uncorrectable block statistic information.

Table 15. FM Receiver Property Summary

Number	Name	Default	Summary
0x0302	AUDIO_DE_EMPHASIS	0x0000 0	Sets the FM Receive de-emphasis.
0x0400	FM_SOFT_MUTE_MAX_ATTENUATION	0x0008 8	Sets the maximum soft mute attenuation.
0x0401	FM_SOFT_MUTE_TRIGGER_ THRESHOLD	0x0008 8	Sets the SNR threshold for soft mute to start.
0x0402	FM_SOFT_MUTE_END_THRESHOLD	0x0000 0	Sets the SNR threshold where soft mute will stop attenuating.
0x0403	FM_SOFT_MUTE_RELEASE_TIME	0x01F4 500	Sets the maximum soft mute release time in ms.
0x0404	FM_SOFT_MUTE_ATTACK_TIME	0x0078 120	Sets the maximum soft mute attack time in ms.
0x0700	FM_AGC_FE_CONFIG	0x0000 0	Specified the input path for RF signal and other FE configuration options.

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Table 15. FM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x0701	FM_AGC_PD_CONFIG	0x0270 / 624	Specifies the behavior of the FM peak detectors and attenuators.
0x0702	FM_LNA_AGC_ATTACK_MS	0x0004 / 4	Sets the number of milliseconds the wideband RF high-peak detector must be exceeded before attenuating the appropriate block.
0x0703	FM_LNA_AGC_RELEASE_MS	0x0050 / 80	Sets the number of milliseconds the wideband RF low-peak detector must not be exceeded before increasing the gain of the appropriate block.
0x0704	FM_LNA_AGC_PD_THRESHOLD	0x4F05 / 20229	Sets the high threshold and hysteresis for the LNA peak detector.
0x0705	FM_MIXER_AGC_ATTACK_MS	0x0004 / 4	Sets the number of milliseconds the wideband mixer high-peak detector must be exceeded before attenuating the appropriate block.
0x0706	FM_MIXER_AGC_RELEASE_MS	0x0050 / 80	Sets the number of milliseconds the wideband mixer low-peak detector must not be exceeded before increasing the gain of the appropriate block.
0x0707	FM_MIXER_AGC_PD_THRESHOLD	0x5503 / 21763	Sets the high threshold and hysteresis for the mixer peak detector.
0x0710	FM_AGC_OVERRIDE	0x0000 / 0	Overrides the AGC setting by disabling the AGC and forcing the gain to be maximum.
0x1100	FM_SEEK_BAND_BOTTOM	0x222E / 8750	Sets the lower seek boundary of the FM band in multiples of 10 kHz.
0x1101	FM_SEEK_BAND_TOP	0x2A26 / 10790	Sets the upper seek boundary for the FM band in multiples of 10 kHz.
0x1102	FM_SEEK_FREQUENCY_SPACING	0x000A / 10	Sets the frequency spacing for the FM band in multiples of 10 kHz when performing a seek.
0x1200	FM_RSQ_INTERRUPT_SOURCE	0x0000 / 0	Configures interrupt related to Received Signal Quality metrics (FM_RSQ_STATUS).
0x1201	FM_RSQ_SNR_HIGH_THRESHOLD	0x007F / 127	Sets high threshold which triggers the RSQ interrupt if the SNR is above this threshold.
0x1202	FM_RSQ_SNR_LOW_THRESHOLD	0xFF80 / –128	Sets low threshold which triggers the RSQ interrupt if the SNR is below this threshold.

Table 15. FM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x1203	FM_RSQ_RSSI_HIGH_THRESHOLD	0x007F 127	Sets high threshold which triggers the RSQ interrupt if the RSSI is above this threshold.
0x1204	FM_RSQ_RSSI_LOW_THRESHOLD	0xFF80 –128	Sets low threshold which triggers the RSQ interrupt if the RSSI is below this threshold.
0x1207	FM_RSQ_MULTIPATH_HIGH_ THRESHOLD	0x007F 127	Sets high threshold which triggers the RSQ interrupt if Multipath is above this threshold.
0x1208	FM_RSQ_MULTIPATH_LOW_ THRESHOLD	0x0000 0	Sets low threshold which triggers the RSQ interrupt if Multipath is below this threshold.
0x1300	FM_ACF_INTERRUPT_SOURCE	0x0000 0	Enables the ACF interrupt sources.
0x1301	FM_ACF_SM_THRESHOLD	0x001F 31	Sets the softmute interrupt threshold in dB.
0x1302	FM_ACF_CHBW_THRESHOLD	0x0000 0	Sets the Channel Filter Bandwidth interrupt threshold in units of kHz.
0x1303	FM_ACF_HICUT_THRESHOLD	0x0000 0	Sets the Hi-cut interrupt threshold in units of 100 Hz.
0x1304	FM_ACF_HIBLEND_THRESHOLD	0x0000 0	Sets the Hi-blend interrupt threshold in units of 100 Hz.
0x1305	FM_ACF_BLEND_THRESHOLD	0x0000 0	Sets the Stereo Blend interrupt threshold in units of % L-R gain.
0x1306	FM_ACF_CONTROL_SOURCE	0x0001 1	Sets the controlling metric for ACF features.
0x2000	FM_VALID_MAX_TUNE_ERROR	0x004B 75	Sets the maximum frequency error in 2 ppm allowed before setting the AFCRL indicator.
0x2001	FM_VALID_RSSI_TIME	0x0006 6	Sets the amount of time in milliseconds to allow the RSSI metric to settle before evaluating.
0x2002	FM_VALID_SNR_TIME	0x0012 18	Sets the amount of time in milliseconds to allow the SNR metric to settle before evaluating.
0x2003	FM_VALID_SNR_THRESHOLD	0x0008 8	Sets the SNR threshold for a valid FM Seek/Tune.
0x2004	FM_VALID_RSSI_THRESHOLD	0x000C 12	Sets the RSSI threshold for a valid FM Seek/Tune.
0x200A	FM_VALID_ASSI_THRESHOLD	0x503C 20540	Sets the ASSI/ASSI200 threshold for a valid FM Seek/Tune.

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Table 15. FM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x2200	FM_CHBW_RSSI_MIN_MAX	0x9637 / 38455	Sets the maximum and minimum channel BW in units of kHz based on RSSI/DEV.
0x2201	FM_CHBW_SQ_HIGH_THRESHOLD	0x000C / 12	Sets the RSSI/DEV threshold for maximum channel filter bandwidth.
0x2202	FM_CHBW_SQ_LOW_THRESHOLD	0xFFFC / –4	Sets the RSSI/DEV threshold for minimum channel filter bandwidth.
0x2203	FM_CHBW_SQ_WIDENING_TIME	0x0010 / 16	Sets the channel filter bandwidth widening time based on RSSI/DEV.
0x2204	FM_CHBW_SQ_NARROWING_TIME	0x0800 / 2048	Sets the channel filter bandwidth narrowing time based on RSSI/DEV.
0x2205	FM_CHBW_ASSI_MIN_MAX	0x9623 / 38435	Sets the 100 kHz blocker delta (difference between HASSI and LASSI) for maximum and minimum channel BW in units of kHz.
0x2206	FM_CHBW_ASSI_LOW_THRESHOLD	0x0007 / 7	Sets the 100kHz blocker delta (difference between HASSI and LASSI) threshold for maximum channel filter bandwidth.
0x2207	FM_CHBW_ASSI_HIGH_THRESHOLD	0x0014 / 20	Sets the 100kHz blocker delta (difference between HASSI and LASSI) threshold for minimum channel filter bandwidth.
0x2208	FM_CHBW_ASSI_WIDENING_TIME	0x0C80 / 3200	Sets the channel filter bandwidth widening time based on the 100 kHz blocker delta (difference between HASSI and LASSI).
0x2209	FM_CHBW_ASSI_NARROWING_TIME	0x0140 / 320	Sets the channel filter bandwidth narrowing time based on the 100 kHz blocker delta (difference between HASSI and LASSI).
0x220A	FM_CHBW_ASSI200_MIN_MAX	0x9650 / 38480	Sets the 200 kHz blocker strength maximum and minimum channel BW in units of kHz.
0x220B	FM_CHBW_ASSI200_LOW_THRESHOLD	0xFFF6 / –10	Sets the 200 kHz blocker strength threshold for maximum channel filter bandwidth.
0x220C	FM_CHBW_ASSI200_HIGH_THRESHOLD	0x000A / 10	Sets the 200 kHz blocker strength threshold for minimum channel filter bandwidth.
0x220D	FM_CHBW_ASSI200_WIDENING_TIME	0x0C80 / 3200	Sets the channel filter bandwidth widening time based on 200 kHz blocker strength.
0x220E	FM_CHBW_ASSI200_NARROWING_TIME	0x140 / 320	Sets the channel filter bandwidth narrowing time based on 200 kHz blocker strength.
0x220F	FM_CHBW_WEAKSIG_THR	0x100D / 4109	Sets the hysteresis window for the weak signal channel filter bandwidth engine.

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Table 15. FM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x2210	FM_CHBW_BLOCKER_THR	0x140A	200 kHz stereo blocker threshold control
		5130	
0x3105	FM_LOWCUT_MIN_FREQ	0x0000	Sets the minimum LowCut cutoff frequency
		0	
0x3106	FM_LOWCUT_MAX_FREQ	0x0000	Sets the maximum LowCut cutoff frequency
		0	
0x3300	FM_IBOC_CONTROL	0x0000	Control property for IBOC Blend (Si4777 only).
		0	
0x3301	FM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME	0x03E8	Sets the crossfade time between full analog and full HD Digital audio in ms. (Si4777 only).
		1000	
0x3302	FM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME	0x03E8	Sets the crossfade time from full HD Digital audio to full analog audio in ms. (Si4777 only).
		1000	
0x3303	FM_IBOC_DYNAMIC_GAIN	0x007F	Sets the digital audio dynamic linear scaling factor. (Si4777 only).
		127	
0x3304	FM_IBOC_STATIC_GAIN	0x0100	Sets the digital audio static linear gain factor. (Si4777 only).
		256	
0x3400	FM_MULT_EQ_CTL	0x1401	Controls the multipath channel equalizer.
		5121	
0x3401	FM_MULT_EQ_NOISE_DISABLE	0xFC81	Sets the RSSI threshold below which the channel equalizer will use noise measurements to enable/disable the channel equalizer.
		64641	
0x3500	FM_BLEND_RSSI_THRESHOLDS	0x3719	Sets the thresholds for the RSSI metric for the stereo blend mitigation engine.
		14105	
0x3501	FM_BLEND_RSSI_STEREO_SEP	0x2D00	Set the limits for the stereo separation when driven by RSSI on the stereo blend mitigation engine.
		11520	
0x3502	FM_BLEND_RSSI_ATTACK_TIME	0x0010	Sets the stereo blend attack time in ms.
		16	
0x3503	FM_BLEND_RSSI_RELEASE_TIME	0x0FA0	Sets the stereo blend release time in ms.
		4000	
0x3508	FM_BLEND_MULTIPATH_THRESHOLDS	0x1E3C	Sets the thresholds for the multipath metric for the stereo blend mitigation engine.
		7740	
0x3509	FM_BLEND_MULTIPATH_STEREO_SEP	0x2D00	Sets the limits for the stereo separation when driven by multipath on the stereo blend mitigation engine.
		11520	

Table 15. FM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x350A	FM_BLEND_MULTIPATH_ATTACK_TIME	0x0010 / 16	Sets the stereo blend attack time in ms.
0x350B	FM_BLEND_MULTIPATH_ RELEASE_TIME	0x0FA0 / 4000	Sets the stereo blend release time in ms.
0x3510	FM_BLEND_USN_THRESHOLDS	0x341B / 13339	Set the thresholds for the USN metric for the stereo blend mitigation engine.
0x3511	FM_BLEND_USN_STEREO_SEP	0x2D00 / 11520	Sets the limits for the stereo separation when driven by USN on the stereo blend mitigation engine.
0x3512	FM_BLEND_USN_ATTACK_TIME	0x0010 / 16	Sets the stereo blend attack time in ms.
0x3513	FM_BLEND_USN_RELEASE_TIME	0x0FA0 / 4000	Sets the stereo blend release time in ms.
0x3600	FM_HICUT_RSSI_THRESHOLDS	0x230F / 8975	Sets the thresholds for the RSSI metric for the high cut mitigation engine.
0x3601	FM_HICUT_RSSI_CUTOFF_FREQ	0xB428 / 46120	Sets the limits for the cutoff frequency when driven by RSSI on the high cut mitigation engine.
0x3602	FM_HICUT_RSSI_ATTACK_TIME	0x0010 / 16	Sets the high cut attack time in ms.
0x3603	FM_HICUT_RSSI_RELEASE_TIME	0x0FA0 / 4000	Sets the high cut release time in ms.
0x3608	FM_HICUT_ MULTIPATH_THRESHOLDS	0x3250 / 12880	Sets the thresholds for the multipath metric for the high cut mitigation engine.
0x3609	FM_HICUT_ MULTIPATH_CUTOFF_FREQ	0xB428 / 46120	Set the limits for the cutoff frequency when driven by multipath on the high cut mitigation engine.
0x360A	FM_HICUT_ MULTIPATH_ATTACK_TIME	0x0010 / 16	Sets the high cut attack time in ms.
0x360B	FM_HICUT_ MULTIPATH_RELEASE_TIME	0xFA0 / 4000	Sets the high cut release time in ms.
0x3610	FM_HICUT_ USN_THRESHOLDS	0x250F / 9487	Sets the thresholds for the USN metric for the high cut mitigation engine.

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Table 15. FM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x3611	FM_HICUT_ USN_CUTOFF_FREQ	0xB428	Sets the limits for the cutoff frequency when driven by USN on the high cut mitigation engine.
		46120	
0x3612	FM_HICUT_USN_ATTACK_TIME	0x0010	Sets the high cut attack time in ms.
		16	
0x3613	FM_HICUT_USN_RELEASE_TIME	0x0FA0	Sets the high cut release time in ms.
		4000	
0x3700	FM_HIBLEND_RSSI_THRESHOLDS	0x371B	Sets the thresholds for the RSSI metric for the high blend mitigation engine.
		14107	
0x3701	FM_HIBLEND_RSSI_CUTOFF_FREQ	0xB41E	Sets the limits for the cutoff frequency when driven by RSSI on the high blend mitigation engine.
		46110	
0x3702	FM_HIBLEND_RSSI_ATTACK_TIME	0x0004	Sets the high blend attack time in ms.
		4	
0x3703	FM_HIBLEND_RSSI_RELEASE_TIME	0x1F40	Sets the high blend cut release time in ms.
		8000	
0x3708	FM_HIBLEND_MULTIPATH_ THRESHOLDS	0x193C	Sets the thresholds for the multipath metric for the high blend mitigation engine.
		6460	
0x3709	FM_HIBLEND_MULTIPATH_ CUTOFF_FREQ	0xB41E	Sets the limits for the cutoff frequency when driven by multipath on the Hi-blend mitigation engine.
		46110	
0x370A	FM_HIBLEND_MULTIPATH_ ATTACK_TIME	0x0004	Sets the high blend attack time in ms.
		4	
0x370B	FM_HIBLEND_MULTIPATH_ RELEASE_TIME	0x1F40	Sets the high blend release time in ms.
		8000	
0x3710	FM_HIBLEND_USN_ THRESHOLDS	0x371E	Sets the thresholds for the USN metric for the high blend mitigation engine.
		14110	
0x3711	FM_HIBLEND_USN_CUTOFF_FREQ	0xB41E	Sets the limits for the cutoff frequency when driven by USN on the high blend mitigation engine.
		46110	
0x3712	FM_HIBLEND_USN_ATTACK_TIME	0x0004	Sets the high blend attack time in ms.
		4	
0x3713	FM_HIBLEND_USN_RELEASE_TIME	0x1F40	Sets the high blend release time in ms.
		8000	
0x4000	FM_RDS_INTERRUPT_SOURCE	0x0000	Configures interrupt related to RDS.
		0	

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Table 15. FM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x4001	FM_RDS_INTERRUPT_FIFO_COUNT	0x0000	Sets the minimum number of RDS groups stored in the RDS FIFO before RDSRECV is set.
		0	
0x4002	FM_RDS_CONFIG	0x0000	Configures RDS settings to enable RDS processing (RDSEN) and set RDS block error thresholds.
		0	
0x4003	FM_RDS_CONFIDENCE	0x1111	Sets the confidence level requirement for each RDS block.
		4369	

9.2.1. FM Receiver Commands

Command 0x30 FM_TUNE_FREQ

The FM_TUNE_FREQ command sets the FM Receiver to tune to a frequency between 64 and 108 MHz in 10 kHz units. The CTS bit (and optional interrupt) is set when it is safe to send the next command. 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 optional STC interrupt is set when the command completes. This command may only be sent in powerup mode. The command clears the STC bit if it is already set.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x30							
ARG1	0	HD	TUNEMODE[1:0]		0	SMOOTHMETRICS	0	
ARG2	FREQH[7:0]							
ARG3	FREQL[7:0]							

ARG	Bit	Name	Function
1	7	Reserved	Always write 0.
1	6	HD	Places the part in the HD mode. 0 = Normal Bandwidth. 1 = Wide-Bandwidth/HD Mode.
1	5:4	TUNEMODE[1:0]	Sets the desired tuning mode. 0 = Validated normal tune: Unconditionally stay on the new channel after tune, tune status is valid. 1 = Invalidated fast tune: Unconditionally stay on the new channel after tune, tune status invalid.
1	3	Reserved	Always write 0.
1	2	SMOOTH-METRICS	Smoothly transition audio state after tune. 0 = Initialize audio state to match this new channel. 1 = Transition audio state from previous channel values to the new channel values.
1	1:0	Reserved	Always write 0.
2	7:0	$FREQ_H[7:0]$	**Tune Frequency High Byte.** This byte in combination with FREQL selects the tune frequency in units of 10 kHz. In FM mode the valid range is from 6400 to 10800 (64–108 MHz).
3	7:0	$FREQ_L[7:0]$	**Tune Frequency Low Byte.** This byte in combination with FREQH selects the tune frequency in units of 10 kHz. In FM mode, the valid range is from 6400 to 10800 (64–108 MHz).

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT

Command 0x31 FM_SEEK_START

The FM_SEEK_START command begins searching for a valid station. In order for a station to be considered valid, each of the following thresholds must be met: FM_VALID_SNR_THRESHOLD and FM_VALID_RSSI_THRESHOLD and FM_VALID_MAX_TUNE_ERROR. 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 CTS bit (and optional interrupt) is set when it is safe to send the next command. 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 optional STC interrupt is set when the command completes. This command may only be sent in powerup mode. The command clears the STCINT bit if it is already set.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x31							
ARG1	0000				SEEKUP	WRAP	00	

ARG	Bit	Name	Function
1	7:4	Reserved	Always write 0.
1	3	SEEKUP	**Seek Up/Down.** Determines the direction of the search, either UP = 1, or DOWN = 0.
1	2	WRAP	**Wrap/Halt.** Determines whether the seek should Wrap = 1, or Halt = 0 when it hits the band limit.
1	1:0	Reserved	Always write 0.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT

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Command 0x32 FM_RSQ_STATUS

The FM_RSQ_STATUS command returns status information about the received signal quality. This command returns the Received Signal Strength Indicator (RSSI), Signal to Noise Ratio (SNR), Adjacent Channel Strength for 200 kHz (ASSI), Adjacent Channel Strength for 100 kHz (LASSI and HASSI), frequency offset (FREQOFF), Multipath (MULT) and Ultrasonic Noise (USN) 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. 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 CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent when in powerup mode.

FM_RSQ_ STATUS Command	7	6	5	4	3	2	1	0
CMD	0x32							
ARG1	000			0	RSQACK	ATTUNE	CANCEL	STCACK

ARG	Bit	Name	Function
1	7:5	Reserved	Always write 0.
1	4	Reserved	Always write 0.
1	3	RSQACK	Clears RSQINT, SNRHINT, SNRLINT, RSSIHINT, RSSILINT, BLENDINT, MULTHINT, and MULTLINT if set.
1	2	ATTUNE	Returns the values of metrics as of tune time. When the AT_TUNE bit is set, values returned for RSQ_STATUS are the values calculated at tune and do not change unless another FM_TUNE_FREQ command is called. This feature can be used to determine why seek stopped at the current station.
1	1	CANCEL	Aborts a seek or tune currently in progress. 0 = Don't abort. 1 = Abort.
1	0	STCACK	Clears the STC interrupt status indicator if set.

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Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	MULTHINT	MULTLINT	X	X	SNRHINT	SNRLINT	RSSIHINT	RSSILINT
RESP 2	BLTF	X	SNRREADY	RSSIREADY	X	X	AFCRL	VALID
RESP 3	READFREQ[15:8]							
RESP 4	READFREQ[7:0]							
RESP 5	FREQOFF[7:0]							
RESP 6	RSSI[7:0]							
RESP 7	SNR[7:0]							
RESP 8	XXXXXXXX							
RESP 9	LASSI[7:0]							
RESP 10	HASSI[7:0]							
RESP 11	MULT[7:0]							
RESP 12	DEV[7:0]							
RESP 13	XX							
RESP 14	XX							
RESP 15	ASSI200[7:0]							
RESP 16	USN[7:0]							
RESP 17	PILOTDEV[7:0]							
RESP 18	RDSDEV[7:0]							
RESP 19	ASSI200DEV[7:0]							
RESP 20	STRONGDEV[7:0]							
RESP 21	RDSPI[15:8]							
RESP 22	RDSPI[7:0]							

RESP	Bit	Name	Function
1	7	MULTHINT	**Multipath Detect High.** 0 = Indicates that multipath value has not exceeded the Multipath high threshold set by FM_RSQ_MULTIPATH_HIGH_THRESHOLD. 1 = Indicates that multipath value has exceeded the Multipath high threshold set by FM_RSQ_MULTIPATH_HIGH_THRESHOLD.
1	6	MULTLINT	**Multipath Detect Low.** 0 = Indicates that multipath value has not fallen below the Multipath low threshold set by FM_RSQ_MULTIPATH_LOW_THRESHOLD. 1 = Indicates that multipath value has fallen below the Multipath low threshold set by FM_RSQ_MULTIPATH_LOW_THRESHOLD.
1	5:4	Reserved	Values may vary.
1	3	SNRHINT	**SNR Detect High.** 0 = Indicates that the received signal SNR has not exceeded the SNR high threshold set by FM_RSQ_SNR_HIGH_THRESHOLD 1 = Indicates that the received signal SNR has exceeded the SNR high threshold set by FM_RSQ_SNR_HIGH_THRESHOLD.
1	2	SNRLINT	**SNR Detect Low.** 0 = Indicates that the received signal SNR has not fallen below the SNR low threshold set by FM_RSQ_SNR_LOW_THRESHOLD. 1 = Indicates that the received signal SNR has fallen below the SNR low threshold set by FM_RSQ_SNR_LOW_THRESHOLD.
1	1	RSSIHINT	**RSSI Detect High.** 0 = Indicates that the received signal RSSI has not exceeded the RSSI high threshold set by FM_RSQ_RSSI_HIGH_THRESHOLD. 1 = Indicates that the received signal RSSI has exceeded the RSSI high threshold set by FM_RSQ_RSSI_HIGH_THRESHOLD.
1	0	RSSILINT	**RSSI Detect Low.** 0 = Indicates that the received signal RSSI has not fallen below the RSSI low threshold set by FM_RSQ_RSSI_LOW_THRESHOLD. 1 = Indicates that the received signal RSSI has fallen below the RSSI low threshold set by FM_RSQ_RSSI_LOW_THRESHOLD.

RESP	Bit	Name	Function
2	7	BLTF	**Band Limit.** Reports if a seek hits the band limit (WRAP = 0 in FM_START_SEEK) or wrapped to the original frequency (WRAP = 1).
2	6	Reserved	Values may vary.
2	5	SNR READY	The SNRREADY and RSSIREADY bits indicate that the RSSI/SNR have been read as a result of a tune command. If either one of these bits are 0 this indicates that either the metric is being measured (because a tune is in progress) or that the metric was not measured during tune because the station was invalidated before the metric could be measured. In the case where a metric was not measured during tune, the tune time RSQ status will read back as 0 for the unmeasured metric. The normal running time status for these metrics is not affected and will report normally. 0 = SNR measurement in progress (tune in progress) or not taken (tune completed). 1 = SNR measurement ready.
2	4	RSSIREADY	The SNRREADY and RSSIREADY bits indicate that the RSSI/SNR have been read as a result of a tune command. If either one of these bits are 0 this indicates that either the metric is being measured (because a tune is in progress) or that the metric was not measured during tune because the station was invalidated before the metric could be measured. In the case where a metric was not measured during tune, the tune time RSQ status will read back as 0 for the unmeasured metric. The normal running time status for these metrics is not affected and will report normally. 0 = RSSI measurement in progress (tune in progress) or not taken (tune completed). 1 = RSSI measurement ready.
2	3:2	Reserved	Values may vary.
2	1	AFCRL	Set if the AFC rails. AFC gets railed if FREQOFF $\geq$ MAX_TUNE_ERROR.
2	0	VALID	Reports if the channel is valid based on the settings of FM_VALID_RSSI_THRESHOLD, FM_VALID_SNR_-THRESHOLD, FM_VALID_MAX_TUNE_ERROR
3,4	15:0	READFREQ[15:0]	Returns the currently tuned frequency.
5	7:0	FREQOFF[7:0]	Signed frequency offset in units of 2 ppm (–128 to 127)
6	7:0	RSSI[7:0]	Received Signal Strength indicator in dBµV (–128 to 127)
7	7:0	SNR[7:0]	RF SNR indicator in dB (–128 to 127).
8	7:0	Reserved	Values may vary.

RESP	Bit	Name	Function
9	7:0	LASSI[7:0]	Low side Adjacent (100 kHz) Channel Strength Indicator reports the (Signal + Noise) power relative to the carrier.(–128 to 127)
10	7:0	HASSI[7:0]	High side Adjacent (100 kHz) Channel Strength Indicator reports the (Signal + Noise) power relative to the carrier.(–128 to 127)
11	7:0	MULT[7:0]	Multipath indicator (0–127%).
12	7:0	DEV[7:0]	Frequency Deviation metric in kHz.
13, 14	15:0	Reserved	Values may vary.
15	7:0	ASSI200[7:0]	Adjacent Channel (±200 kHz) Strength Indicator reports the (Signal + Noise) power relative to the carrier. This metric reports the sum of high and low adjacent channel strengths. (–128 to 127)
16	7:0	USN[7:0]	Ultrasonic Noise Indicator in –dBFS (0 to 127). 127 corresponds to 127 dB down from full scale.
17	7:0	PILOTDEV[7:0]	Pilot deviation in units of 100 Hz.
18	7:0	RDSDEV[7:0]	RDS deviation in units of 100 Hz.
19	7:0	ASSI200DEV[7:0]	Adjacent Channel (±200 kHz) Deviation in units of 1.45 kHz.
20	7:0	STRONGDEV[7:0]	Deviation of strong desired signals. This is an alternative to DEV, which can become erroneous in the presence of very strong signals. Approximately, deviation in kHz = STRONGDEV x f(mod), where f(mod) is 5.55 kHz for mono signals or 2.75 kHz for stereo signals
21, 22	15:0	RDSPI[15:0]	RDS PI code.

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Command 0x35 FM_ACF_STATUS

The FM_ACF_STATUS command returns status information about automatically-controlled features. This command returns the Soft Mute Attenuation, Channel Filter Bandwidth, Hi-cut cutoff frequency, Hi-blend cutoff frequency, and Stereo Separation associated with the desired channel. Stereo Separation will only be non-zero if the pilot indicator is set. If SMUTE bit is high, it indicates that audio is soft-muted. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x35							
ARG1	0000000							ACFACK

ARG	Bit	Name	Function
1	7:1	Reserved	Always write 0.
1	0	ACFACK	If set clears ACFINT and any ACF interrupts bits.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR		XX	RSQINT	RDSINT	ACFINT	STCINT
RESP1	XXX			BLEND_INT	HIBLEND_INT	HICUT_INT	CHBW_INT	SOFTMUTE_INT
RESP2	XXXXXXX							SMUTE
RESP3	XXX			SMATTN[4:0]				
RESP4	CHANBW[7:0]							
RESP5	HICUT[7:0]							
RESP6	HIBLEND[7:0]							
RESP7	PILOT	STBLEND[6:0]						
RESP8	LOWCUT[7:0]							

RESP	Bit	Name	Function
1	7:5	Reserved	Values may vary.
1	4	BLEND_INT	If set, indicates that stereo separation has crossed below the blend threshold set by FM_ACF_BLEND_THRESHOLD.
1	3	HIBLEND_INT	If set, indicates that the HiBlend cutoff frequency is lower than the threshold as set by FM_ACF_HIBLEND_THRESHOLD.
1	2	HICUT_INT	If set, indicates that the HiCut cutoff frequency is lower than the threshold set by FM_ACF_HICUT_THRESHOLD.
1	1	CHBW_INT	If set, indicates that the Channel Filter Bandwidth is less than the threshold set by ACF_CHBW_THRESHOLD.
1	0	SOFTMUTE_INT	If set, indicates that softmute attenuation has increased above the softmute threshold as set by ACF_SM_THRESHOLD.
2	7:1	Reserved	Values may vary.
2	0	SMUTE	0 = Audio is not soft muted. 1 = Audio is soft muted.
3	7:0	SMATTN[7:0]	Soft mute attenuation level in dB. Range: 0–31.
4	7:0	CHANBW[7:0]	Channel filter bandwidth in kHz. Range: 0–150.
5	7:0	HICUT[7:0]	HiCut cutoff frequency in units of 100 Hz. Range: 10–180.
6	7:0	HIBLEND[7:0]	HiBlend cutoff frequency in units of 100 Hz. Range: 10–180.
7	7	PILOT	0 = Stereo pilot is not present. 1 = Stereo pilot is present.
7	6:0	STBLEND[6:0]	Indicates stereo separation. STBLEND will only be non-zero if PILOT = 1. Range 0–100.
7	7:0	LOWCUT[7:0]	Lowcut cutoff frequency in units of 10 Hz. Range 1–100.

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Command 0x36 FM_RDS_STATUS

The FM_RDS_STATUS command returns RDS information for current channel and reads an entry from the RDS FIFO. RDS information includes synch status, FIFO status, group data (blocks A, B, C, and D), and block errors corrected. Maximum RDS FIFO size is 25 groups. This command clears the RDSINT interrupt bit when INTACK bit in ARG1 is set, and, if MTFIFO is set, the entire RDS receive FIFO is cleared (FIFO is always cleared during FM_TUNE_FREQ or FM_SEEK_START). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x36							
ARG1	00000					STA-TUS_ONLY	MTFIFO	INTACK

ARG	Bit	Name	Function
1	7:3	Reserved	Always write 0.
1	2	STATUS_ONLY	**Status Only.** Determines if data should be removed from the RDS FIFO. 0 = Data is removed from RDS FIFO, and RDSFIFOUSED decrements by one. Data in BLOCKA, BLOCKB, BLOCKC, BLOCKD, and BLE contain the oldest data in the RDS FIFO. 1 = Data is not removed from RDSFIFO, and the RDSFIFOUSED value stays the same. Data in BLOCKA, BLOCKB, BLOCKC, BLOCKD, BLE, PI, TP, PTY, and status contain the last valid data received for the current station.
1	1	MTFIFO	**Empty FIFO.** The FIFO will always be cleared during FM_TUNE_FREQ and FM_SEEK_START. 0 = If FIFO not empty, read and remove oldest FIFO entry. 1 = Clear RDS Receive FIFO.
1	0	INTACK	**Interrupt Acknowledge.** 0 = RDSINT status preserved. 1 = Clears RDSINT.

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Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	RDSINT	ACFINT	STCINT
RESP1	XXX			RDSTPPTYINT	RDSPIINT	X	RDSSYNCINT	RDS-FIFOINT
RESP2	XXX			TPPTYVALID	PIVALID	X	RDSSYNC	RDSFIFO-LOST
RESP3	XX		TP	PTY[4:0]				
RESP4	PI[15:8]							
RESP5	PI[7:0]							
RESP6	RDSFIFOUSED[7:0]							
RESP7	BLEA[1:0]		BLEB[1:0]		BLEC[1:0]		BLED[1:0]	
RESP8	BLOCKA[15:8]							
RESP9	BLOCKA[7:0]							
RESP10	BLOCKB[15:8]							
RESP11	BLOCKB[7:0]							
RESP12	BLOCKC[15:8]							
RESP13	BLOCKC[7:0]							
RESP14	BLOCKD[15:8]							
RESP15	BLOCKD[7:0]							

RESP	Bit	Name	Function
1	7:5	Reserved	Values may vary.
1	4	RDSTPPTYINT	1 = TP (Traffic Program) flag and/or PTY (Program Type) code has changed.
1	3	RDSPIINT	1 = PI (Program Identification) code has changed.
1	2	Reserved	Values may vary.
1	1	RDSSYNCINT	1 = RDS synchronization has changed.
1	0	RDSFIFOINT	1 = RDS was received and the RDS FIFO is full or has atleast FM_RDS_INTERRUPT_FIFO_COUNT entries.
2	7:5	Reserved	Values may vary.
2	4	TPPTYVALID	1 = Indicates that TP flag and PTY code are valid.
2	3	PIVALID	1 = Indicates that PI code is valid.
2	2	Reserved	Values may vary.
2	1	RDSSYNC	1 = RDS is currently synchronized.
2	0	RDSFIFOLOST	1 = Indicates that one or more RDS groups have been discarded due to FIFO overrun since last call to FM_RDS_STATUS.
3	7:6	Reserved	Values may vary.
3	5	TP	Current channel's TP flag if TPPTYVALID is set to 1.
3	4:0	PTY[4:0]	Current channel's PTY code if TPPTYVALID is 1.
4,5	15:0	PI[15:0]	Current channel's PI code if PIVALID is set to 1.
6	7:0	RDSFIFOUSED[7:0]	**RDS FIFO Used.** Number of groups remaining in the RDS FIFO (0 if empty). If non-zero, BLOCKA-BLOCKD contain the oldest FIFO entry and RDSFIFOUSED decrements by one on the next call to RDS_FIFO_STATUS (assuming no RDS data received in the interim).
7	7:6	BLEA[1:0]	**RDS Block A Corrected Errors.** 0 = No errors. 1 = 1–2 bit errors detected and corrected. 2 = 3–5 bit errors detected and corrected. 3 = Uncorrectable.
7	5:4	BLEB[1:0]	**RDS Block B Corrected Errors.** 0 = No errors. 1 = 1–2 bit errors detected and corrected. 2 = 3–5 bit errors detected and corrected. 3 = Uncorrectable.
7	3:2	BLEC[1:0]	**RDS Block C Corrected Errors.** 0 = No errors. 1 = 1–2 bit errors detected and corrected. 2 = 3–5 bit errors detected and corrected. 3 = Uncorrectable.

RESP	Bit	Name	Function
7	1:0	BLED[1:0]	**RDS Block D Corrected Errors.** 0 = No errors. 1 = 1–2 bit errors detected and corrected. 2 = 3–5 bit errors detected and corrected. 3 = Uncorrectable.
8,9	15:0	BLOCKA[15:0]	Block A group data from oldest FIFO entry if STATUSONLY is 0. Last valid Block A data if STATUSONLY is 1.
10,11	15:0	BLOCKB[15:0]	Block B group data from oldest FIFO entry if STATUSONLY is 0. Last valid Block A data if STATUSONLY is 1.
12,13	15:0	BLOCKC[15:0]	Block C group data from oldest FIFO entry if STATUSONLY is 0. Last valid Block A data if STATUSONLY is 1.
14,15	15:0	BLOCKC[15:0]	Block D group data from oldest FIFO entry if STATUSONLY is 0. Last valid Block A data if STATUSONLY is 1.

Command 0x37 FM_RDS_BLOCKCOUNT

The FM_RDS_BLOCKCOUNT command returns RDS expected, received, and uncorrectable block statistic information. Reset info by setting CLEAR bit or sending FM_TUNE_FREQ or FM_SEEK_START commands. Once EXPECTED saturates at 65535, all other block count statistics will be frozen until the counts are cleared. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent when in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x37
ARG1	\multicolumn{7}{c}{0000000}	CLEAR

ARG	Bit	Name	Function
1	7:1	Reserved	Always write 0.
1	0	CLEAR	Clears the block counts if set. The current block counts will be reported before they are cleared.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	\multicolumn{2}{c}{XX}	RSQINT	RDSINT	ACFINT	STCINT
RESP1	XXXXXXXX
RESP 2	EXPECTED[15:8]
RESP 3	EXPECTED[7:0]
RESP 4	RECEIVED[15:8]
RESP 5	RECEIVED[7:0]
RESP 6	UNCORRECTABLE[15:8]
RESP 7	UNCORRECTABLE[7:0]

RESP	Bit	Name	Function
1	7:0	Reserved	Values may vary.
2,3	15:0	EXPECTED[15:0]	Number of expected RDS blocks.
4,5	15:0	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.
6,7	15:0	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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9.2.2. FM Receiver Properties

Property 0x0302 AUDIO_DE_EMPHASIS

The AUDIO_DE_EMPHASIS property sets the FM Receive de-emphasis to 50 or 75 µs. 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 µs.

Default: 0

AUDIO_DE_EMPHASIS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0000															DE_EMPH
0x0000															0

Bit	Name	Function
15:1	Reserved	Always write 0.
0	DE_EMPH	Sets the FM Receive de-emphasis to 50 or 75 µs. Default is 75 µs. 0 = 75 µsec 1 = 50 µsec

Property 0x0400 FM_SOFT_MUTE_MAX_ATTENUATION

The FM_SOFT_MUTE_MAX_ATTENUATION property sets the maximum attenuation in dB that will be applied by the softmute feature. 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: dB

FM_SOFT_MUTE_MAX_ATTENUATION															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000									SMATTN[6:0]						
0x000									0x08						

Bit	Name	Function
15:5	Reserved	Always write 0.
4:0	SMATTN[6:0]	Sets the maximum attenuation in dB that will be applied by the softmute feature. Default is 8 dB. Range is 0–63 dB.

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Property 0x0401 FM_SOFT_MUTE_TRIGGER_THRESHOLD

The FM_SOFT_MUTE_TRIGGER_THRESHOLD property sets the SNR threshold in dB to engage softmute. The CTS bit (and optional interrupt) is set when it is safe to send the next command. If USE_RSSI is set in FM_ACF_CONTROL_SOURCE property, then property 0x0401 refers to RSSI threshold. This property may only be set or read in powerup mode.

Default: 8

Units: dB (dBµV if RSSI is used as the control source)

FM_SOFT_MUTE_TRIGGER_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								SMTRGTH[7:0]							
0x00								0x08							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	SMTRGTH[7:0]	Sets the SNR threshold in dB to engage softmute. Default is 8 dB. Range is –127 to 127 dB (dBµV if RSSI is used as the control source).

Property 0x0402 FM_SOFT_MUTE_END_THRESHOLD

The FM_SOFT_MUTE_END_THRESHOLD property sets the SNR threshold in dB at which softmute attenuation will be set to its maximum value. When the SNR is at this level or lower, the audio attenuation will be set to FM_SOFT_MUTE_MAX_ATTENUATION. The CTS bit (and optional interrupt) is set when it is safe to send the next command. If USE_RSSI is set in the FM_ACF_CONTROL_SOURCE property, then property 0x0402 refers to the RSSI threshold. This property may only be set or read in powerup mode.

Default: 0

Units: dB (dBµV if RSSI is used as the control source)

FM_SOFT_MUTE_END_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								SMENDTH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	SMENDTH[7:0]	Sets the SNR threshold in dB at which softmute attenuation will be set to its maximum value given by FM_SOFT_MUTE_MAX_ATTENUATION property. Default is 0 dB. Range is –127 to 127 dB (dBµV if RSSI is used as the control source).

Property 0x0403 FM_SOFT_MUTE_RELEASE_TIME

The FM_SOFT_MUTE_RELEASE_TIME property sets the maximum time in ms it takes to unmute the audio. 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

FM_SOFT_MUTE_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x01F4															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the maximum time in ms it takes to unmute the audio. Default is 500 ms. Range is 1–32767 ms. Note that there will be 16 ms of filter delay for the RSSI/SNR metric before softmute can engage/disengage.

Property 0x0404 FM_SOFT_MUTE_ATTACK_TIME

The FM_SOFT_MUTE_ATTACK_TIME property sets the maximum time in ms it takes to mute the audio. 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

FM_SOFT_MUTE_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0078															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the maximum time in ms it takes to mute the audio. Default is 120 ms. Range is 1–32767 ms. Note that there will be 16 ms of filter delay for the RSSI/SNR metric before softmute can engage/disengage.

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Property 0x0700 FM_AGC_FE_CONFIG

The FM_AGC_FE_CONFIG property specifies the input path for the RF signal and other FE configuration options. This property should only be set before the first 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. Changes to this property take effect after the next tune is completed.

Default: 0

FM_AGC_FE_CONFIG															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00							FMLNAZ	FMMIX	0x0		Reserved	INPUTSELECT[3:0]			
0x00							0	0	0x0		0	0x0			

Bit	Name	Function
15:9	Reserved	Always write 0.
8	FMLNAZ	0 = Normal LNA mode where the LNA input impedance is 50 Ω. 1 = LNA loopthru mode where LNA input impedance is 100 Ω.
7	FMMIX	0 = Mixer is differential input (FMXIP/FMXIN) 1 = Mixer is single ended (FMXIP)
6:4	Reserved	Always write 0.
3:0	INPUTSELECT[3:0]	0 = Received signal comes into FMI pin, out FMO and then the mixer pin. 1 = Received signal comes directly into the mixer.

Property 0x0701 FM_AGC_PD_CONFIG

The FM_AGC_PD_CONFIG property specifies behavior of the FM peak detectors and attenuators. This property should only be set before the first tune. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode. Changes to this property take effect after the next tune is completed.

Default: 0x0270

FM_AGC_PD_CONFIG															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0			LNA_MODE	00100					MIXER_PD[2:0]			0x00		LNA_PD[1:0]	
0x0			0	00100					0x7			0x00		0x00	

Bit	Name	Function
15:13	Reserved	Always write 0.
12	LNA_MODE	LNA_MODE default: 0 This property only used when the LNA gain and one or both of the attenuators are controlled by the same peak detector. 0 = Reduce LNA gain and then attenuate. 1 = Attenuate and then reduce LNA gain.
11:7	Reserved	Always write 00100.
6:4	MIXER_PD[2:0]	MIXER_PD[2:0] default: 0x7. 0 = Peak detector not used. 1 = Controls FMAGC1. 2 = Controls FMAGC2. 3 = Controls FMAGC1 and FMAGC2. 4 = Controls LNA gain. 5 = Controls LNA gain and FMAGC1. 6 = Controls LNA gain and FMAGC2. 7 = Controls LNA gain, FMAGC1 and FMAGC2.
3:2	Reserved	Always write 0.
1:0	LNA_PD[1:0]	LNA_PD[1:0] default: 0x0 0 = Peak detector not used 1 = Controls FMAGC1 2 = Controls FMAGC2 3 = Controls FMAGC1 and FMAGC2

Property 0x0702 FM_LNA_AGC_ATTACK_MS

The FM_LNA_AGC_ATTACK_MS property sets the number of milliseconds the wide-band RF high-peak detector must be exceeded before attenuating the appropriate block. The peak detectors are only sampled once every 3 to 5 ms. If the peak detector trips, the internal counter is incremented by 4 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: 4

Units: ms

FM_LNA_AGC_ATTACK_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RF_AGC_ATTACK_MS[15:0]															
0x04															

Bit	Name	Function
15:0	RF_AGC_ATTACK_MS[15:0]	Number of milliseconds the wideband RF high-peak detector must be exceeded before attenuating the appropriate block. Default is 4 ms. Range is 4–4096 ms.

Property 0x0703 FM_LNA_AGC_RELEASE_MS

The FM_LNA_AGC_RELEASE_MS property sets the number of milliseconds the wideband RF low-peak detector must not be exceeded before increasing the gain of the appropriate block. The peak detectors are only sampled once every 3 to 5 ms. If the peak detector trips, the internal counter is incremented by 4 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: 80

Units: ms

FM_LNA_AGC_RELEASE_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RF_AGC_RELEASE_MS[15:0]															
0x50															

Bit	Name	Function
15:0	RF_AGC_RELEASE_MS[15:0]	Number of milliseconds the wideband RF low-peak detector must not be exceeded before increasing the gain of the appropriate block. Default is 80 ms Range is 4–4096 ms.

Property 0x0704 FM_LNA_AGC_PD_THRESHOLD

The FM_LNA_AGC_PD_THRESHOLD property sets the high threshold and hysteresis for the LNA peak detector. The high threshold sets the level at which the AGC increases attenuation. The hysteresis is how many dB below the high threshold the level must drop before the AGC decreases attenuation. It is possible to decrease the likelihood of intermod break-in by decreasing the peak detector threshold from the default and it is possible to decrease the likelihood of desensitization by increasing the peak detector 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: 0x4F05

FM_LNA_AGC_PD_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
HIGH[7:0]								HYST[7:0]							
0x4F								0x05							

Bit	Name	Function
15:8	HIGH[7:0]	Sets the level in dBµV at which AGC increases attenuation HIGH[7:0] Range: 73–87 73 = 73 dBµV 75 = 75 dBµV 77 = 77 dBµV 79 = 79 dBµV 81 = 81 dBµV 83 = 83 dBµV 85 = 85 dBµV 87 = 87 dBµV
7:0	HYST[7:0]	Sets how many dB below the high threshold the level must drop before the AGC decreases attenuation. HYST[7:0] Range: 3–6 3 = 3 dB 4 = 4 dB 5 = 5 dB 6 = 6 dB

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Property 0x0705 FM_MIXER_AGC_ATTACK_MS

The FM_MIXER_AGC_ATTACK_MS property sets the number of milliseconds the wideband mixer high-peak detector must be exceeded before attenuating the appropriate block. The peak detectors are only sampled once every 3–5 ms. If the peak detector trips, the internal counter is incremented by 4 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: 4

Units: ms

FM_MIXER_AGC_ATTACK_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MIX_AGC_ATTACK_MS[15:0]															
0x04															

Bit	Name	Function
15:0	MIX_AGC_ATTACK_MS[15:0]	Number of milliseconds the wideband RF high-peak detector must be exceeded before attenuating the appropriate block. Default is 4 ms Range is 4–4096 ms.

Property 0x0706 FM_MIXER_AGC_RELEASE_MS

The FM_MIXER_AGC_RELEASE_MS property sets the number of milliseconds the wideband mixer low-peak detector must not be exceeded before increasing the gain of the appropriate block. The peak detectors are only sampled once every 3–5 ms. If the peak detector trips, the internal counter is incremented by 4 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: 80

Units: ms

FM_MIXER_AGC_RELEASE_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MIX_AGC_RELEASE_MS[15:0]															
0x50															

Bit	Name	Function
15:0	MIX_AGC_RELEASE_MS[15:0]	Number of milliseconds the wideband RF low-peak detector must not be exceeded before increasing the gain of the appropriate block. Default is 80 ms Range is 4–4096 ms.

Property 0x0707 FM_MIXER_AGC_PD_THRESHOLD

The FM_MIXER_AGC_PD_THRESHOLD property sets the high threshold and hysteresis for the mixer peak detector. The high threshold sets the level at which the AGC increases attenuation. The hysteresis is how many dB below the high threshold the level must drop before the AGC decreases 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: 0x5503

FM_MIXER_AGC_PD_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
HIGH[7:0]								HYST[7:0]							
0x55								0x03							

Bit	Name	Function
15:8	HIGH[7:0]	Sets the level in dBµV at which AGC increases attenuation. HIGH[7:0]: Range 79–93. 79 = 79 dBµV. 81 = 81 dBµV. 83 = 83 dBµV. 85 = 85 dBµV. 87 = 87 dBµV. 89 = 89 dBµV. 91 = 91 dBµV. 93 = 93 dBµV.
7:0	HYST[7:0]	Sets how many dB below the high threshold the level must drop before the AGC decreases attenuation. HYST[7:0] - Range: 3–6. 3 = 3 dB. 4 = 4 dB. 5 = 5 dB. 6 = 6 dB.

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Property 0x0710 FM_AGC_OVERRIDE

The FM_AGC_OVERRIDE property overrides the AGC setting by disabling the AGC and forcing the gain to be maximum. 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

FM_AGC_OVERRIDE															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x000										AGC_OVERRIDE[5:0]					
0x000										0					

Bit	Name	Function
15:6	Reserved	Always write 0.
5:0	AGC_OVERRIDE[5:0]	AGC_OVERRIDE selects whether the AGC is enabled or disabled. 0 = AGC is enabled. 0x3F = AGC is disabled and set to maximum gain.

Property 0x1100 FM_SEEK_BAND_BOTTOM

The FM_SEEK_BAND_BOTTOM property sets the bottom of the FM band for 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. The default is 87.5 MHz.

Default: 8750

Units: 10 kHz

FM_SEEK_BAND_BOTTOM															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
FMSKFREQL[15:0]															
0x222E															

Bit	Name	Function
15:0	FMSKFREQL[15:0]	Sets the bottom of the FM band for seek. Default is 8750. Range: 6400–10800, 64.0 MHz to 108.0 MHz. Range: 8750–10790, Worldwide FM excluding Japan. Range: 6580–7400, OIRT FM. Range: 7600–9000, Japan FM.

Property 0x1101 FM_SEEK_BAND_TOP

The FM_SEEK_BAND_TOP property sets the top of the FM band for 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. The default is 107.9 MHz

Default: 10790

Units: 10 kHz

FM_SEEK_BAND_TOP															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
FMSKFREQH[15:0]															
0x2A26															

Bit	Name	Function
15:0	FMSKFREQH[15:0]	Sets the top of the FM band for seek. Default is 10790. Range: 6400–10800, 64.0 MHz to 108.0 MHz. Range: 8750–10790, Worldwide FM excluding Japan. Range: 6580–7400, OIRT FM. Range: 7600–9000, Japan FM.

Property 0x1102 FM_SEEK_FREQUENCY_SPACING

The FM_SEEK_FREQUENCY_SPACING property selects frequency spacing for FM 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. The default is 100 kHz.

Default: 10

Units: 10 kHz

FM_SEEK_FREQUENCY_SPACING															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x000											FMSKSPACE[4:0]				
0x000											0x0A				

Bit	Name	Function
15:5	Reserved	Always write 0.
4:0	FMSKSPACE[4:0]	Selects frequency spacing for FM seek. Default is 10. Range is 1–31.

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Property 0x1200 FM_RSQ_INTERRUPT_SOURCE

The FM_RSQ_INTERRUPT_SOURCE property configures interrupt related to Received Signal Quality metrics. 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 0.

Default: 0

FM_RSQ_INTERRUPT_SOURCE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								MULTHINT	MULTLINT	0		SNRHINT	SNRLINT	RSSIHINT	RSSILINT
0x00								0	0	0		0	0	0	0

Bit	Name	Function
15:8	Reserved	Always write 0.
7	MULTHINT	0: Disable Interrupt. 1:Enable interrupt if Multipath level goes above the threshold set by FM_RSQ_-MULTIPATH_HIGH_THRESHOLD.
6	MULTLINT	0: Disable Interrupt. 1: Enable interrupt if Multipath level falls below the threshold set by FM_RSQ_-MULTIPATH_LOW_THRESHOLD.
5:4	Reserved	Always write 0.
3	SNRHINT	0: Disable Interrupt. 1: Enable interrupt if SNR goes above the threshold set by FM_RSQ_SN-R_HIGH_THRESHOLD.
2	SNRLINT	0: Disable Interrupt. 1: Enable interrupt if SNR falls below the threshold set by FM_RSQ_SN-R_LOW_THRESHOLD.
1	RSSIHINT	0: Disable Interrupt. 1: Enable interrupt if RSSI goes above the threshold set by FM_R-SQ_RSSI_HIGH_THRESHOLD.
0	RSSILINT	0: Disable Interrupt. 1: Enable interrupt if RSSI falls below the threshold set by FM_R-SQ_RSSI_LOW_THRESHOLD.

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Property 0x1201 FM_RSQ_SNR_HIGH_THRESHOLD

The FM_RSQ_SNR_HIGH_THRESHOLD property 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

FM_RSQ_SNR_HIGH_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								SNRH[7:0]							
0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values and 0xFF for (–) values.
7:0	SNRH [7:0]	Sets the high threshold, which triggers the RSQ interrupt if the SNR is above this threshold. Default is 127 dB. Range is –128 to 27 in steps of 1 dB.

Property 0x1202 FM_RSQ_SNR_LOW_THRESHOLD

The FM_RSQ_SNR_LOW_THRESHOLD property sets 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

FM_RSQ_SNR_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0xFF								SNRL[7:0]							
0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values and 0xFF for (–) values.
7:0	SNRL [7:0]	Sets low threshold, which triggers the RSQ interrupt if the SNR is below this threshold. Default is –128 dB. Range is –128 to 127 in steps of 1 dB.

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Property 0x1203 FM_RSQ_RSSI_HIGH_THRESHOLD

The FM_RSQ_RSSI_HIGH_THRESHOLD property sets the high threshold, which triggers the RSQ interrupt if 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: dBµV

FM_RSQ_RSSI_HIGH_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								RSSIH[7:0]							
0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values and 0xFF for (–) values.
7:0	RSSIH [7:0]	Sets high threshold, which triggers the RSQ interrupt if the RSSI is above this threshold. Default is 127 dBµV. Range is –128 to 127 in steps of 1 dB.

Property 0x1204 FM_RSQ_RSSI_LOW_THRESHOLD

The FM_RSQ_RSSI_LOW_THRESHOLD property sets 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: dBµV

FM_RSQ_RSSI_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0xFF								RSSIL[7:0]							
0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values and 0xFF for (–) values.
7:0	RSSIL [7:0]	Sets low threshold, which triggers the RSQ interrupt if the RSSI is below this threshold. Default is –128 dBµV. Range is –128 to 127 in steps of 1 dB.

Property 0x1207 FM_RSQ_MULTIPATH_HIGH_THRESHOLD

The FM_RSQ_MULTIPATH_HIGH_THRESHOLD property sets the high threshold, which triggers the RSQ interrupt if Multipath is above this threshold. Multipath is a measure of AM modulation and can exceed 100%. 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

FM_RSQ_MULTIPATH_HIGH_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x000									MULTH[6:0]						
0x000									0x7F						

Bit	Name	Function
15:7	Reserved	Always write 0.
6:0	MULTH [6:0]	Sets the high threshold, which triggers the RSQ interrupt if Multipath is above this threshold. Default is 127. Range is 0–127.

Property 0x1208 FM_RSQ_MULTIPATH_LOW_THRESHOLD

The FM_RSQ_MULTIPATH_LOW_THRESHOLD property sets low threshold, which triggers the RSQ interrupt if Multipath is below this threshold. Multipath is a measure of AM modulation and can exceed 100%. 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

FM_RSQ_MULTIPATH_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x000									MULTL[6:0]						
0x000									0x00						

Bit	Name	Function
15:7	Reserved	Always write 0.
6:0	MULTL[6:0]	Sets low threshold, which triggers the RSQ interrupt if Multipath is below this threshold. Default is 0. Range is 0–127.

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Property 0x1300 FM_ACF_INTERRUPT_SOURCE

The FM_ACF_INTERRUPT_SOURCE property enables the 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

FM_ACF_INTERRUPT_SOURCE																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
0x000											BLEND_INT	HIBLEND_INT	HICUT_INT	CHBW_INT	SOFTMUTE_INT	
0x000											0	0	0	0	0	

Bit	Name	Function
15:5	Reserved	Always write 0.
4	BLEND_INT	When set, enables the blend interrupt. Default is 0. 0 = The blend interrupt is disabled. 1 = The blend interrupt is enabled.
3	HIBLEND_INT	When set, enables the Hi-blend Interrupt. Default is 0. 0 = The Hi-blend interrupt is disabled. 1 = The Hi-blend interrupt is enabled.
2	HICUT_INT	When set, enables the Hi-cut interrupt. Default is 0. 0 = The Hi-cut interrupt is disabled. 1 = The Hi-cut interrupt is enabled.
1	CHBW_INT	When set, enables the Channel Filter Bandwidth Interrupt. Default is 0. 0 = The Channel Filter Bandwidth interrupt is disabled. 1 = The Channel Filter Bandwidth interrupt is enabled.
0	SOFTMUTE_INT	When set, enables the blend interrupt. Default is 0. 0 = The softmute interrupt is disabled. 1 = The softmute interrupt is enabled.

Property 0x1301 FM_ACF_SM_THRESHOLD

The FM_ACF_SM_THRESHOLD property sets the softmute interrupt threshold in dB. When softmute attenuation rises above the level set by this property and the SOFTMUTE_INT interrupt is enabled through the FM_ACF_INTERRUPT_SOURCE property, the SOFTMUTE_INT interrupt will be asserted. 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 the powerup mode.

Default: 31

Units: dB

FM_ACF_SM_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x000											SMATTN_THRESH[4:0]				
0x000											0x1F				

Bit	Name	Function
15:5	Reserved	Always write 0.
4:0	SMATTN_THRESH[4:0]	Softmute interrupt threshold in dB, which triggers the softmute interrupt when the softmute attenuation rises above this level. Default is 31 dB Range is 0–31 dB.

Property 0x1302 FM_ACF_CHBW_THRESHOLD

The FM_ACF_CHBW_THRESHOLD property sets the Channel Filter Bandwidth interrupt threshold in units of kHz. When the channel filter bandwidth falls below this threshold and the CHBW_INT interrupt is enabled through the FM_ACF_INTERRUPT_SOURCE property, the CHBW_INT interrupt will be asserted. 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: kHz

FM_ACF_CHBW_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								CHBW_THRESH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	CHBW _THRESH[7:0]	Channel Filter Bandwidth interrupt threshold in units of kHz, which triggers the Channel Filter Bandwidth Interrupt when the channel filter bandwidth falls below this threshold. Default is 0 kHz Range is 0–255 kHz.

Property 0x1303 FM_ACF_HICUT_THRESHOLD

The FM_ACF_HICUT_THRESHOLD property sets the Hi-cut interrupt threshold in units of 100 Hz. When the Hi-cut cutoff frequency falls below this threshold and the HICUT_INT interrupt is enabled through the FM_ACF_INTERRUPT_SOURCE property, the HICUT_INT interrupt will be asserted. 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: 100 Hz

FM_ACF_HICUT_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								HICUT_THRESH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	HICUT_THRESH[7:0]	Hi-cut interrupt threshold in units of 100 Hz, which triggers the Hi-cut Interrupt when the Hi-cut cutoff frequency falls below this threshold. Default is 0. Range is 0–200.

Property 0x1304 FM_ACF_HIBLEND_THRESHOLD

The FM_ACF_HIBLEND_THRESHOLD property sets the HiBlend interrupt threshold in units of 100 Hz. When the Hi-blend cutoff frequency falls below this threshold and the HIBLEND_INT interrupt is enabled through the FM_ACF_INTERRUPT_SOURCE property, the HIBLEND_INT interrupt will be asserted. 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: 100 Hz

FM_ACF_HIBLEND_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								HIBLEND_THRESH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	HIBLEND_THRESH[7:0]	Hi-blend interrupt threshold in units of 100 Hz, which triggers the Hi-blend Interrupt when the Hi-blend cutoff frequency falls below this threshold. Default is 0. Range is 0–200.

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Property 0x1305 FM_ACF_BLEND_THRESHOLD

The FM_ACF_BLEND_THRESHOLD property sets the interrupt trigger threshold for stereo blend. The threshold is expressed as a percentage in terms of L minus R (L – R) gain factor K. When the L–R gain falls below this threshold and the BLEND_INT is enabled through the FM_ACF_INTERRUPT_SOURCE property, the BLEND_INT will be asserted. 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: Stereo Separation S = (1 + K) / (1 – K), where K is the L minus R gain factor. Stereo separation of 1 implies mono mode and stereo separation of >1 implies that the part is in stereo with up to 20 log(S) dB of stereo separation. This property expresses the threshold value of K as a percentage. For example, value 0x0032 = a K of 50%, or a stereo separation of S = (1.5 / 0.5) = 3. The interrupt would then trigger at 20 log(3) = 9.5 dB of stereo separation.

Default: 0

Units: % L-R gain

FM_ACF_BLEND_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000									BLEND_THRESH[6:0]						
0x000									0x00						

Bit	Name	Function
15:7	Reserved	Always write 0.
6:0	BLEND_ THRESH [6:0]	Stereo Blend Interrupt threshold in units of % L-R gain, which triggers the Blend threshold interrupt when L-R gain falls below this threshold. Default is 0%. Range is 0–100%.

Property 0x1306 FM_ACF_CONTROL_SOURCE

The FM_ACF_CONTROL_SOURCE property determines the controlling metric for ACF features. 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

FM_ACF_CONTROL_SOURCE															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x0000													AFC_SM	0	RSSI_SM
0x0000													0	0	1

Bit	Name	Function
15:1	Reserved	Always write 0.
2	AFC_SM	default: 0. When set, softmute will be triggered by an AFC rail. 0 = Do not use AFC rail to force a softmute. 1 = Use AFC rail to force a softmute.
1	Reserved	Always write 0.
0	RSSI_SM	default: 1. When set, RSSI will be used instead of SNR as the controlling metric for softmute. 0 = Use SNR as the controlling metric for softmute. 1 = Use RSSI as the controlling metric for softmute.

Property 0x2000 FM_VALID_MAX_TUNE_ERROR

The FM_VALID_MAX_TUNE_ERROR property sets the maximum freq error allowed in units of 2 ppm before setting the AFC rail indicator (AFCRL). 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 (150 ppm)

Units: 2 ppm

FM_VALID_MAX_TUNE_ERROR															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								FMMAXTUNEERR[7:0]							
0x00								0x4B							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	FMMAXTUNEERR [7:0]	Sets the maximum freq error allowed in units of 2 ppm before setting the AFC rail indicator (AFCRL). Default is 75. Range is 0–126.

Property 0x2001 FM_VALID_RSSI_TIME

The FM_VALID_RSSI_TIME property sets the amount of time in milliseconds to allow the RSSI metric to settle before evaluating.
This parameter is valid only if TUNEMODE[1:0] (FM_TUNE_FREQ) is set to 0. The minimum RSSI settling delay is 3 milliseconds. The reliability of the valid bit for identifying valid stations relies on this parameter being set properly. 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: ms

FM_VALID_RSSI_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								SSIVALTIME[7:0]							
0x00								0x06							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	SSIVALTIME[7:0]	Validation time in milliseconds. Default is 6 ms. Range is 3–63 ms.

Property 0x2002 FM_VALID_SNR_TIME

The FM_VALID_SNR_TIME property sets the amount of time in milliseconds to allow the SNR metric to settle before evaluating.

This parameter is valid only if TUNEMODE[1:0] (FM_TUNE_FREQ) is set to 0. The minimum SNR settling delay is 4 ms. The reliability of the valid bit for identifying valid stations relies on this parameter being set properly. 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: 18

Units: ms

FM_VALID_SNR_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								SNRVALTIME[7:0]							
0x00								0x12							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	SNRVALTIME[7:0]	Validation time in milliseconds. Default is 18 ms. Range is 4–63 ms.

Property 0x2003 FM_VALID_SNR_THRESHOLD

The FM_VALID_SNR_THRESHOLD property 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: 8

Units: dB

FM_VALID_SNR_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								FMVALSNR[7:0]							
0x00								0x08							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values and 0xFF for (–) values.
7:0	FMVALSNR [7:0]	Sets the SNR threshold for a valid FM Seek/Tune. Default is 8 dB. Range is –128 to 127 in steps of 1 dB. –128 = SNR is not used as a criterion in determining the validity of a station.

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Property 0x2004 FM_VALID_RSSI_THRESHOLD

The FM_VALID_RSSI_THRESHOLD property 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: 12

Units: dBµV

FM_VALID_RSSI_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								FMVALRSSI[7:0]							
0x00								0x0C							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	FMVALRSSI[7:0]	Sets the RSSI threshold for a valid FM Seek/Tune. Default is 12 dBµV. Range is –128 to 127 in steps of 1 dB. –128 = RSSI is not used as a criterion in determining the validity of a station.

Property 0x200A FM_VALID_ASSI_THRESHOLD

The FM_VALID_ASSI_THRESHOLD property sets the ASSI threshold for valid FM Seek/Tune. If the desired channel ASSI is below 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: 0x503C

Units: ms

FM_VALID_ASSI_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
FMVALASSI200[6:0]								0	FMVALASSI100[6:0]						
0x50								0	0x3C						

Bit	Name	Function
15	Reserved	Always write 0.
14:8	FMVALASSI200[6:0]	Sets the ASSI200 threshold for valid FM Seek/Tune. Default is 80 dB. Range is 0 to 127 dB.
7	Reserved	Always write 0.
6:0	FMVALASSI100[6:0]	Sets the max(HASSI,LASSI) threshold for valid FM Seek/Tune. Default is 60 dB. Range is 0 to 127 dB.

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Property 0x2200 FM_CHBW_SQ_MIN_MAX

The FM_CHBW_SQ_MIN_MAX property sets the maximum and minimum channel filter bandwidth in kHz based on RSSI. To force a given channel filter bandwidth, set the min and max to the same 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: 0x9637

Units: kHz

FM_CHBW_SQ_MIN_MAX															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
MAX[7:0]								MIN[7:0]							
0x96								0x37							

Bit	Name	Function
15:8	MAX [7:0]	Sets the maximum channel filter bandwidth in kHz. Default is 150 kHz Range is 1–150 kHz.
7:0	MIN [7:0]	Sets the minimum channel filter bandwidth in kHz. Default is 55 kHz. Range is 1–150 kHz.

Property 0x2201 FM_CHBW_SQ_HIGH_THRESHOLD

The FM_CHBW_SQ_HIGH_THRESHOLD property sets the RSSI/deviation threshold for maximum channel filter bandwidth. This engine is only enabled when RSSI is above the FM_CHBW_WEAKSIG_THR. If the instantaneous RSSI is greater than or equal to the programmed RSSI high threshold then the channel filter bandwidth will be set to the maximum value programmed through Property 0x2200. 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: dBμV

FM_CHBW_SQ_HIGH_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
RSSIMAX[15:0]															
0x000C															

Bit	Name	Function
15:0	RSSIMAX[15:0]	Sets the RSSI threshold for maximum channel filter bandwidth. Default is 12 dBμV Range is –128 to 127 dBμV.

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Property 0x2202 FM_CHBW_SQ_LOW_THRESHOLD

The FM_CHBW_SQ_LOW_THRESHOLD property sets the RSSI threshold for minimum channel filter bandwidth. This engine is only enabled when RSSI is above the FM_CHBW_WEAKSIG_THR. If the instantaneous RSSI is less than or equal to the programmed RSSI low threshold then the channel filter bandwidth will be set to the minimum value programmed through Property 0x2200. 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: dBµV

FM_CHBW_SQ_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
RSSIMIN[15:0]															
0xFFFC															

Bit	Name	Function
15:0	RSSIMIN[15:0]	Sets the RSSI threshold for minimum channel filter bandwidth. Default is –4 dBµV Range is 128 to –127 dBµV.

Property 0x2203 FM_CHBW_SQ_WIDENING_TIME

The FM_CHBW_SQ_WIDENING_TIME property sets the channel filter bandwidth widening time based on RSSI. This engine is only enabled when RSSI is above the FM_CHBW_WEAKSIG_THR. 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

FM_CHBW_SQ_WIDENING_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
WIDENING_TIME[15:0]															
0x0010															

Bit	Name	Function
15:0	WIDENING_TIME[15:0]	Sets the RSSI based channel filter bandwidth widening time. Default is 16 ms Range is 1–32767 ms.

Property 0x2204 FM_CHBW_SQ_NARROWING_TIME

The FM_CHBW_SQ_NARROWING_TIME property sets the channel filter bandwidth narrowing time based on RSSI. This engine is only enabled when RSSI is above the FM_CHBW_WEAKSIG_THR. 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

Units: ms

FM_CHBW_SQ_NARROWING_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NARROWING_TIME[15:0]															
0x0800															

Bit	Name	Function
15:0	NARROWING_TIME[15:0]	Sets the RSSI based channel filter bandwidth narrowing time. Default is 2048 ms. Range is 1–32767 ms.

Property 0x2205 FM_CHBW_ASSI_MIN_MAX

The FM_CHBW_ASSI_MIN_MAX property sets the maximum and minimum Channel Filter Bandwidth in kHz based on 100 kHz blocker delta (difference between HASSI and LASSI). To force a given channel filter bandwidth, set the min and max to the same 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: 0x9623

Units: kHz

FM_CHBW_ASSI_MIN_MAX															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
MAX[7:0]								MIN[7:0]							
0x96								0x23							

Bit	Name	Function
15:8	MAX [7:0]	Sets the maximum channel filter bandwidth in kHz. Default is 150 kHz. Range is 1–150 kHz.
7:0	MIN [7:0]	Sets the minimum channel filter bandwidth in kHz. Default is 35 kHz. Range is 1–150 kHz.

Property 0x2206 FM_CHBW_ASSI_LOW_THRESHOLD

The FM_CHBW_ASSI_LOW_THRESHOLD property sets the 100 kHz blocker delta (difference between HASSI and LASSI) threshold for maximum channel filter bandwidth. If the 100 kHz blocker delta is less than or equal to the programmed ASSI low threshold, then the channel filter bandwidth will be set to the maximum value programmed through Property 0x2205. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: 7

Units: dB

FM_CHBW_ASSI_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ASSIMIN[15:0]															
0x0007															

Bit	Name	Function
15:0	ASSIMIN[15:0]	Sets the 100 kHz blocker delta threshold for maximum channel filter bandwidth. Default is 7 dB. Range is –128 to 127 dB.

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Property 0x2207 FM_CHBW_ASSI_HIGH_THRESHOLD

The FM_CHBW_ASSI_HIGH_THRESHOLD property sets the 100 kHz blocker delta (difference between HASSI and LASSI) threshold for minimum channel filter bandwidth. If the 100 kHz blocker delta is greater than the programmed ASSI high threshold, then the channel filter bandwidth will be set to the minimum value programmed through Property 0x2205. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: 20

Units: dB

FM_CHBW_ASSI_HIGH_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ASSIMAX[15:0]															
0x0014															

Bit	Name	Function
15:0	ASSIMAX[15:0]	Sets the 100 kHz blocker delta threshold for minimum channel filter bandwidth. Default is 20 dB. Range is –128 to 127 dB.

Property 0x2208 FM_CHBW_ASSI_WIDENING_TIME

The FM_CHBW_ASSI_WIDENING_TIME property sets the channel filter bandwidth widening time based on the 100 kHz blocker delta (difference between HASSI and LASSI). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: 3200

Units: ms

FM_CHBW_ASSI_WIDENING_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
WIDENING_TIME[15:0]															
0x0C80															

Bit	Name	Function
15:0	WIDENING_TIME[15:0]	Sets the 100 kHz blocker delta based channel filter bandwidth widening time. Default is 3200 ms. Range is 1–32767 ms.

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Property 0x2209 FM_CHBW_ASSI_NARROWING_TIME

The FM_CHBW_ASSI_NARROWING_TIME property sets the channel filter bandwidth narrowing time based on the 100 kHz blocker delta (difference between HASSI and LASSI). The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: 320

Units: ms

FM_CHBW_ASSI_NARROWING_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NARROWING_TIME[15:0]															
0x0140															

Bit	Name	Function
15:0	NARROWING_TIME[15:0]	Sets the 100 kHz blocker delta based channel filter bandwidth narrowing time. Default is 320 ms. Range is 1–32767 ms.

Property 0x220A FM_CHBW_ASSI200_MIN_MAX

The FM_CHBW_ASSI200_MIN_MAX property sets the maximum and minimum channel filter bandwidth in kHz based on 200 kHz blocker strength. To force a given channel filter bandwidth, set the min and max to the same 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: 0x9650

Units: kHz

FM_CHBW_ASSI200_MIN_MAX															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MAX[7:0]								MIN[7:0]							
0x96								0x50							

Bit	Name	Function
15:8	MAX[7:0]	Sets the maximum channel filter bandwidth in kHz. Default is 150 kHz. Range is 1–150 kHz.
7:0	MIN[7:0]	Sets the minimum channel filter bandwidth in kHz. Default is 80 kHz. Range is 1–150 kHz.

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Property 0x220B FM_CHBW_ASSI200_LOW_THRESHOLD

The FM_CHBW_ASSI200_LOW_THRESHOLD property sets the 200 kHz blocker strength threshold for maximum channel filter bandwidth. If the 200 kHz blocker strength is less than or equal to the programmed ASSI200 low threshold, then the channel filter bandwidth will be set to the maximum value programmed through Property 0x220A. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: –10

Units: dB relative to desired channel RSSI

FM_CHBW_ASSI200_LOW_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ASSI200MIN[7:0]															
0xFFF6															

Bit	Name	Function
15:0	ASSI200MIN[15:0]	Sets the 200 kHz blocker strength threshold for maximum channel filter bandwidth. Default is –10 dB (relative to desired channel RSSI) Range is –128 to 127 dBr.

Property 0x220C FM_CHBW_ASSI200_HIGH_THRESHOLD

The FMCHBW_ASSI200_HIGH_THRESHOLD property sets the 200 kHz blocker strength threshold for minimum channel filter bandwidth. If the 200 kHz blocker strength is greater than the programmed ASSI200 high threshold, then the channel filter bandwidth will be set to the minimum value programmed through Property 0x220A. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: 10

Units: dB relative to desired channel RSSI

FM_CHBW_ASSI200_HIGH_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ASSI200MAX[7:0]															
0x000A															

Bit	Name	Function
15:0	ASSI200MAX[15:0]	Sets the 200 kHz blocker strength threshold for maximum channel filter bandwidth. Default is 10 dB (relative to desired channel RSSI) Range is –128 to 127 dBr.

Property 0x220D FM_CHBW_ASSI200_WIDENING_TIME

The FM_CHBW_ASSI200_WIDENING_TIME property sets the channel filter bandwidth widening time based on the 200 kHz blocker strength. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: 3200

Units: ms

FM_CHBW_ASSI200_WIDENING_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
WIDENING_TIME[15:0]															
0x0C80															

Bit	Name	Function
15:0	WIDENING_TIME[15:0]	Sets the 200 kHz blocker strength based channel filter bandwidth widening time. Default is 3200 ms. Range is 1–32767 ms.

Property 0x220E FM_CHBW_ASSI200_NARROWING_TIME

The FM_CHBW_ASSI200_NARROWING_TIME property sets the channel filter bandwidth narrowing time based on the 200 kHz blocker strength. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Default: 320

Units: ms

FM_CHBW_ASSI200_NARROWING_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NARROWING_TIME[15:0]															
0x0140															

Bit	Name	Function
15:0	NARROWING_TIME[15:0]	Sets the 200 kHz blocker strength based channel filter bandwidth narrowing time. Default is 320 ms. Range is 1–32767 ms.

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Property 0x220F FM_CHBW_WEAKSIG_THR

The FM_CHBW_WEAKSIG_THR property sets the RSSI value at which the engine will engage (LOW) and disengage (HIGH) for the weak signal channel filter bandwidth engine.

Default: 0x100D

FM_CHBW_WEAKSIG_THR															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
HIGH[7:0]								LOW[7:0]							
0x10								0x0D							

Bit	Name	Function
15:8	HIGH[7:0]	When RSSI is above this value, the weak signal channel filter bandwidth engine disengages. Default: 0x10.
7:0	LOW[7:0]	When RSSI is below this value, the weak signal channel filter bandwidth engine engages. Default: 0x0D.

Property 0x3105 FM_LOWCUT_MIN_FREQ

The FM_LOWCUT_MIN_FREQ property sets the minimum cutoff frequency. The LowCut tracks the HICUT engine; therefore, thresholds are programmed in HICUT threshold properties (0x3600, 0x3604, 0x3608, 0x360C, 0x3610, 0x3614) and the HIBLEND threshold properties (0x3700, 0x3740, 0x3708, 0x370C, 0x3710, 0x3714). Setting the property to 0 disables LowCut. 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: Hz

FM_LOWCUT_MIN_FREQ															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
FREQ_MIN[15:0]															
0x0000															

Bit	Name	Function
15:0	FREQ_MIN[15:0]	Sets the minimum LOW-CUT cutoff frequency in Hz. Default is disabled. Range is 8–1000 Hz. 0 = Disabled.

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Property 0x3106 FM_LOWCUT_MAX_FREQ

The FM_LOWCUT_MAX_FREQ property sets the maximum cutoff frequency. The LowCut tracks the HICUT engine, therefore thresholds are programmed in HICUT threshold properties (0x3600, 0x3604, 0x3608, 0x360C, 0x3610, 0x3614) and the HIBLEND threshold properties (0x3700, 0x3740, 0x3708, 0x370C, 0x3710, 0x3714). 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: Hz

FM_LOWCUT_MIN_FREQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FREQ_MAX[15:0]															
0x0000															

Bit	Name	Function
15:0	FREQ_MAX[15:0]	Sets the maximum LOW-CUT cutoff frequency in Hz. Note that if property 0x3105 (FM_LOWCUT_MIN_FREQ) is non-zero, this property must be set to a value no less than property 0x3105. Default is 0 Hz. Range is 0–1000 Hz.

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Property 0x3300 FM_IBOC_CONTROL
(Si4777 Only)

The FM_IBOC_CONTROL property is the control property for IBOC Blend. DIGITAL_IO_INPUT_SAMPLE_RATE and DIGITAL_IO_INPUT_FORMAT must be configured before IBOC Blend will function. 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

FM_IBOC_CONTROL															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00							FORCE	0x00							ENABLE
0x00							0	0x00							0

Bit	Name	Function
15:9	Reserved	Always write 0.
8	FORCE	Forces IBOC Blend. Default is 0. 0 = Do not force IBOC blend. The audio source is determined by the IBOC control pin. 1 = Force IBOC blend. The audio is sourced from the IBOC system
7:1	Reserved	Always write 0.
0	ENABLE	ENABLE - IBOC Blend Enable. Default is 0. 0 = The IBOC Blend system is disabled. 1 = The IBOC Blend system is enabled.

Property 0x3301 FM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME
(Si4777 Only)

The FM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME property sets the crossfade time between full analog and full HD Digital audio 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: 1000

Units: ms

FM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TIME[15:0]															
0x03E8															

Bit	Name	Function
15:0	TIME[15:0]	Sets the full analog to full digital crossfade time in ms. Default is 1000 ms. Range is 0–22000 ms.

**Property 0x3302 FM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME
(Si4777 Only)**

The FM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME property sets the crossfade time from full HD Digital to full analog audio 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: 1000

Units: ms

FM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
TIME[15:0]															
0x03E8															

Bit	Name	Function
15:0	TIME[15:0]	Sets the full digital to full analog crossfade time in ms. Default is 1000 ms. Range is 0–22000 ms.

**Property 0x3303 FM_IBOC_DYNAMIC_GAIN
(Si4777 Only)**

The FM_IBOC_DYNAMIC_GAIN property sets the digital audio dynamic linear scaling factor. 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: 0x007F

FM_IBOC_DYNAMIC_GAIN															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								DGAIN[7:0]							
0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	DGAIN[7:0]	Station dependent linear scaling factor in Q7 format. Default is 0x7F. Range is 0–0x7F.

**Property 0x3304 FM_IBOC_STATIC_GAIN
(Si4777 Only)**

The FM_IBOC_STATIC_GAIN property sets the digital audio static linear gain factor. Reverse the sign of this number to obtain a 180 degree phase shift. 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 when in the powerup mode.

Default: 0x0100

FM_IBOC_STATIC_GAIN															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
SGAIN[15:0]															
0x0100															

Bit	Name	Function
15:0	SGAIN[15:0]	Static linear gain factor in Q7.8 format. Default is 0x0100. Range is 0x8000–0x7FFF.

Property 0x3400 FM_MULT_EQ_CTL

The FM_MULT_EQ_CTL property controls the multipath channel equalizer. 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: 5121

FM_MULT_EQ_CTL															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00			NUM_TAPS[4:0]					0x00						MULT_EQ_CTL[1:0]	
0x00			0x14					0x00						0x1	

Bit	Name	Function
15:13	Reserved	Always write 000.
12:8	NUM_TAPS[4:0]	Number of taps in the multipath equalizer. Range 1-20. For automatic selection, use 0.
7:2	Reserved	Always write 000000.
1:0	MULT_EQ_CTL[1:0]	Controls the Multipath channel equalizer. Default is 1 0 = Equalizer OFF 1 = Equalizer ON

Property 0x3401 FM_EQ_NOISE_DISABLE_MULT_EQ

The FM_EQ_NOISE_DISABLE_MULT_EQ property sets the RSSI threshold below which the channel equalizer will use noise measurements to enable/disable the channel equalizer. 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: 0xFC81

FM_EQ_NOISE_DISABLE_MULT_EQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MULT_EQ_ON_LEVEL[7:0]								MULT_EQ_OFF_LEVEL[7:0]							
0xFC								0x81							

Bit	Name	Function
15:8	MULT_EQ_ON_LEVEL[7:0]	RSSI level above which noise measurements will not be used to enable/disable the equalizer. Default: –4 (0xFC).
7:0	MULT_EQ_OFF_LEVEL[7:0]	RSSI level below which noise measurements will be used to enable/disable the equalizer. Set to –127 (0x81) to disable. Default:0x81 (disabled)

Property 0x3500 FM_BLEND_RSSI_THRESHOLDS

The FM_BLEND_RSSI_THRESHOLDS property sets the RSSI thresholds for maximum and minimum stereo separation (set by Property 0x3501) on the blend engine. 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: 0x3719

Units: dBμV

FM_BLEND_RSSI_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RSSIMAX[7:0]								RSSIMIN[7:0]							
0x37								0x19							

Bit	Name	Function
15:8	RSSIMAX[7:0]	Sets the RSSI Max threshold. If RSSI is above this threshold, maximum stereo separation will be achieved as set by property 0x3501. Default is 55 dBμV. Range is –20 to 120 dBμV.
7:0	RSSIMIN[7:0]	Sets the RSSI Min threshold. If RSSI is below this threshold, minimum stereo separation will be achieved as set by property 0x3501. Default is 25 dBμV. Range is –20 to 120 dBμV.

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Property 0x3501 FM_BLEND_RSSI_STEREO_SEP

The FM_BLEND_RSSI_STEREO_SEP property sets the maximum and minimum stereo separation based on RSSI (set by Property 0x3500) on the blend engine. You can force a constant stereo separation value by setting ST_SEPMAX and ST_SEPMIN to the same value. To disable the stereo blend based on RSSI, set ST_SEPMAX = ST_SEPMIN = 100 (0x64.) 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: 0x2D00

Units: dB

FM_BLEND_RSSI_STEREO_SEP															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ST_SEPMAX[7:0]								ST_SEPMIN[7:0]							
0x2D								0x00							

Bit	Name	Function
15:8	ST_SEPMAX[7:0]	Sets the maximum stereo separation. Default is 45 dB. Range is 0–64 dB.
7:0	ST_SEPMIN[7:0]	Sets the minimum stereo separation. Default is 0 dB. Range is 0–64 dB.

Property 0x3502 FM_BLEND_RSSI_ATTACK_TIME

The FM_BLEND_RSSI_ATTACK_TIME property sets the transition time for which the stereo blend mitigation engine decreases the stereo separation based on RSSI. 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

FM_BLEND_RSSI_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the stereo blend mitigation engine decreases the stereo separation based on RSSI. Default is 16 ms. Range is 1–32767 ms.

Property 0x3503 FM_BLEND_RSSI_RELEASE_TIME

The FM_BLEND_RSSI_RELEASE_TIME property sets the transition time for which the stereo blend mitigation engine increases the stereo separation based on RSSI. 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

FM_BLEND_RSSI_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the stereo blend mitigation engine increases the stereo separation based on RSSI. Default is 4000 ms. Range is 1–32767 ms.

Property 0x3508 FM_BLEND_MULTIPATH_THRESHOLDS

The FM_BLEND_MULTIPATH_THRESHOLDS property sets the Multipath thresholds for maximum and minimum stereo separation (set by Property 0x3509) on the blend engine. 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: 0x1E3C

FM_BLEND_MULTIPATH_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MULTMIN[7:0]								MULTMAX[7:0]							
0x1E								0x3C							

Bit	Name	Function
15:8	MULTMIN[7:0]	Sets the Multipath Min threshold. If Multipath is below this threshold, maximum stereo separation will be achieved as set by property 0x3509. Default is 30. Range is 0–127.
7:0	MULTMAX[7:0]	Sets the Multipath Max threshold. If Multipath is above this threshold, minimum stereo separation will be achieved as set by property 0x3509. Default is 60. Range is 0–127.

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Property 0x3509 FM_BLEND_MULTIPATH_STEREO_SEP

The FM_BLEND_MULTIPATH_STEREO_SEP property sets the maximum and minimum stereo separation based on Multipath (set by Property 0x3508) on the blend engine. You can force a constant stereo separation value by setting ST_SEPMAX and ST_SEPMIN to the same value. To disable the stereo blend based on Multipath, set ST_SEPMAX = ST_SEPMIN = 100 (0x64.) 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: 0x2D00

Units: dB

FM_BLEND_MULTIPATH_STEREO_SEP															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ST_SEPMAX[7:0]								ST_SEPMIN[7:0]							
0x2D								0x00							

Bit	Name	Function
15:8	ST_SEPMAX[7:0]	Sets the maximum stereo separation. Default is 45 dB. Range is 0–64 dB.
7:0	ST_SEPMIN[7:0]	Sets the minimum stereo separation. Default is 0 dB. Range is 0–64 dB.

Property 0x350A FM_BLEND_MULTIPATH_ATTACK_TIME

The FM_BLEND_MULTIPATH_ATTACK_TIME property sets the transition time for which the stereo blend mitigation engine decreases the stereo separation based on Multipath. 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

FM_BLEND_MULTIPATH_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the stereo blend mitigation engine decreases the stereo separation based on Multipath. Default is 16 ms. Range is 1–32767 ms.

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Property 0x350B FM_BLEND_MULTIPATH_RELEASE_TIME

The FM_BLEND_MULTIPATH_RELEASE_TIME property sets the transition time for which the stereo blend mitigation engine increases the stereo separation based on RSSI. 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

FM_BLEND_MULTIPATH_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the stereo blend mitigation engine increases the stereo separation based on Multipath. Default is 4000 ms. Range is 1–32767 ms.

Property 0x3510 FM_BLEND_USN_THRESHOLDS

The FM_BLEND_USN_THRESHOLDS property sets the USN thresholds for maximum and minimum stereo separation (set by Property 0x3511) on the blend engine. 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: 0x341B

Units: –dBFS

FM_BLEND_USN_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
USNMIN[7:0]								USNMAX[7:0]							
0x34								0x1B							

Bit	Name	Function
15:8	USNMIN[7:0]	Sets the USN Min threshold. If USN is below this threshold, maximum stereo separation will be achieved as set by property 0x3511. Default is –52 dBFS. Range is 0–127 –dBFS.
7:0	USNMAX[7:0]	Sets the USN Max threshold. If USN is above this threshold, minimum stereo separation will be achieved as set by property 0x3511. Default is –27 dBFS. Range is 0–127 –dBFS.

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Property 0x3511 FM_BLEND_USN_STEREO_SEP

The FM_BLEND_USN_STEREO_SEP property sets the maximum and minimum stereo separation based on USN (set by Property 0x3510) on the blend engine. You can force a constant stereo separation value by setting ST_SEPMAX and ST_SEPMIN to the same value. To disable the stereo blend based on USN, set ST_SEPMAX = ST_SEPMIN = 100 (0x64.) 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: 0x2D00

Units: dB

FM_BLEND_USN_STEREO_SEP															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ST_SEPMAX[7:0]								ST_SEPMIN[7:0]							
0x2D								0x00							

Bit	Name	Function
15:8	ST_SEPMAX[7:0]	Sets the maximum stereo separation. Default is 45 dB. Range is 0–100 dB.
7:0	ST_SEPMIN[7:0]	Sets the minimum stereo separation. Default is 0 dB. Range is 0–100 dB.

Property 0x3512 FM_BLEND_USN_ATTACK_TIME

The FM_BLEND_USN_ATTACK_TIME property sets the transition time for which the stereo blend mitigation engine decreases the stereo separation based on USN. 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

FM_BLEND_USN_ATTACK_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ATTACK[15:0]															
0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the stereo blend mitigation engine decreases the stereo separation based on USN. Default is 16 ms. Range is 1–32767 ms.

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Property 0x3513 FM_BLEND_USN_RELEASE_TIME

The FM_BLEND_USN_RELEASE_TIME property sets the transition time for which the stereo blend mitigation engine increases the stereo separation based on USN. 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

FM_BLEND_USN_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the stereo blend mitigation engine increases the stereo separation based on USN. Default is 4000 ms. Range is 1–32767 ms.

Property 0x3600 FM_HICUT_RSSI_THRESHOLDS

The FM_Hi-cut_RSSI_THRESHOLDS property sets the RSSI thresholds for Hi-cut to begin band limiting and reach maximum band limiting on L+R channel based on max and min cutoff frequency (set by Property 0x3601) on the Hi-cut engine. 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: 0x230F

Units: dBμV

FM_HICUT_RSSI_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RSSIMAX[7:0]								RSSIMIN[7:0]							
0x23								0x0F							

Bit	Name	Function
15:8	RSSIMAX[7:0]	Sets the RSSI level at which Hi-cut begins to band limit on the L+R channel based on cutoff frequency set by property 0x3601. Default is 35 dBμV. Range is –20–120 dBμV.
7:0	RSSIMIN[7:0]	Sets the RSSI level at which Hi-cut reaches maximum band limiting on the L+R channel based on cutoff frequency set by property 0x3601. Default is 15 dBμV. Range is –20–120 dBμV.

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Property 0x3601 FM_HICUT_RSSI_CUTOFF_FREQ

The FM_Hi-cut_RSSI_CUTOFF_FREQ property sets the maximum and minimum cutoff frequencies based on RSSI (set by Property 0x3600) on the Hi-cut engine. You can force a constant cutoff frequency value by setting FREQ_MAX and FREQ_MIN to the same value. To disable the Hi-cut based on RSSI, set FREQ_MAX = FREQ_MIN = 180 (0xB4.) 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: 0xB428

Units: 100 Hz

FM_HICUT_RSSI_CUTOFF_FREQ															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
FREQ_MAX[7:0]								FREQ_MIN[7:0]							
0xB4								0x28							

Bit	Name	Function
15:8	FREQ_MAX[7:0]	Sets the maximum cutoff frequency. Default is 18 kHz. Range is 0–18 kHz.
7:0	FREQ_MIN[7:0]	Sets the minimum stereo separation. Default is 4 kHz. Range is 0–18 kHz.

Property 0x3602 FM_HICUT_RSSI_ATTACK_TIME

The FM_HI-CUT_RSSI_ATTACK_TIME property sets the transition time for which the Hi-cut mitigation engine lowers the cutoff frequency based on RSSI. 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

FM_HICUT_RSSI_ATTACK_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ATTACK[15:0]															
0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the Hi-cut mitigation engine lowers the cutoff frequency based on RSSI. Default is 16 ms. Range is 1–32767 ms.

Property 0x3603 FM_HICUT_RSSI_RELEASE_TIME

The FM_HICUT_RSSI_RELEASE_TIME property sets the transition time for which the Hi-cut mitigation engine increases the cutoff frequency based on RSSI. 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

FM_HICUT_RSSI_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the Hi-cut mitigation engine increases the cutoff frequency based on RSSI. Default is 4000 ms. Range is 1–32767 ms.

Property 0x3608 FM_HICUT_MULTIPATH_THRESHOLDS

The FM_HICUT_MULTIPATH_THRESHOLDS property sets the Multipath thresholds for Hi-cut to begin band limiting and reach maximum band limiting on L+R channel based on max and min cutoff frequencies (set by Property 0x3609) on the Hi-cut engine. 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: 0x3250

FM_HICUT_MULTIPATH_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MULTMIN[7:0]								MULTMAX[7:0]							
0x32								0x50							

Bit	Name	Function
15:8	MULTMIN[7:0]	Sets the Multipath level at which Hi-cut reaches max band limiting on the L+R channel based on cutoff frequency set by property 0x3609. Default is 40. Range is 0–127%.
7:0	MULTMAX[7:0]	Sets the Multipath level at which Hi-cut begins to band limit on the L+R channel based on cutoff frequency set by property 0x3609. Default is 80. Range is 0–127%.

Property 0x3609 FM_HICUT_MULTIPATH_CUTOFF_FREQ

The FM_HICUT_MULTIPATH_CUTOFF_FREQ property sets the maximum and minimum cutoff frequency based on Multipath (set by Property 0x3608) on the Hi-cut engine. You can force a constant cutoff frequency value by setting FREQ_MAX and FREQ_MIN to the same value. To disable the Hi-cut based on Multipath, set FREQ_MAX = FREQ_MIN = 180 (0xB4.) 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: 0xB428

Units: 100 Hz

FM_HICUT_MULTIPATH_CUTOFF_FREQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FREQ_MAX[7:0]								FREQ_MIN[7:0]							
0xB4								0x28							

Bit	Name	Function
15:8	FREQ_MAX[7:0]	Sets the maximum cutoff frequency. Default is 18 kHz. Range is 0–18 kHz.
7:0	FREQ_MIN[7:0]	Sets the minimum stereo separation. Default is 4 kHz. Range is 0–18 kHz.

Property 0x360A FM_HICUT_MULTIPATH_ATTACK_TIME

The FM_HICUT_MULTIPATH_ATTACK_TIME property sets the transition time for which the Hi-cut mitigation engine lowers the cutoff frequency based on Multipath. 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

FM_HICUT_MULTIPATH_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the Hi-cut mitigation engine decreases the cutoff frequency based on Multipath. Default is 16 ms. Range is 1–32767 ms.

Property 0x360B FM_HICUT_MULTIPATH_RELEASE_TIME

The FM_HICUT_MULTIPATH_RELEASE_TIME property sets the transition time for which the Hi-cut mitigation engine increases the cutoff frequency based on RSSI. 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

FM_HICUT_MULTIPATH_RELEASE_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
RELEASE[15:0]															
0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the Hi-cut mitigation engine increases the cutoff frequency based on Multipath. Default is 4000 ms. Range is 1–32767 ms.

Property 0x3610 FM_HICUT_USN_THRESHOLDS

The FM_HICUT_USN_THRESHOLDS property sets the USN thresholds for Hi-cut to begin band limiting and reach maximum band limiting on L+R channel based on max and min cutoff frequencies (set by Property 0x3611) on the Hi-cut engine. 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: 0x250F

Units: –dBFS

FM_HICUT_USN_THRESHOLDS															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
USNMIN[7:0]								USNMAX[7:0]							
0x25								0x0F							

Bit	Name	Function
15:8	USNMIN[7:0]	Sets the USN level at which Hi-cut reaches max band limiting on the L+R channel based on cutoff frequency set by property 0x3611. Default is –37 dBFS. Range is 0–127 –dBFS.
7:0	USNMAX[7:0]	Sets the Multipath level at which Hi-cut begins to band limit on the L+R channel based on cutoff frequency set by property 0x3611. Default is –15 dBFS. Range is 0–127 –dBFS.

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Property 0x3611 FM_HICUT_USN_CUTOFF_FREQ

The FM_HICUT_USN_CUTOFF_FREQ property sets the maximum and minimum cutoff frequency based on USN (set by Property 0x3610) on the Hi-cut engine. You can force a constant cutoff frequency value by setting FREQ_MAX and FREQ_MIN to the same value. To disable the Hi-cut based on USN, set FREQ_MAX = FREQ_MIN = 180 (0xB4.) 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: 0xB428

Units: 100 Hz

FM_HICUT_USN_CUTOFF_FREQ															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
FREQ_MAX[7:0]								FREQ_MIN[7:0]							
0xB4								0x28							

Bit	Name	Function
15:8	FREQ_MAX[7:0]	Sets the maximum cutoff frequency. Default is 18 kHz. Range is 0–18 kHz.
7:0	FREQ_MIN[7:0]	Sets the minimum stereo separation. Default is 4 kHz. Range is 0–18 kHz.

Property 0x3612 FM_HICUT_USN_ATTACK_TIME

The FM_HICUT_USN_ATTACK_TIME property sets the transition time for which the Hi-cut mitigation engine lowers the cutoff frequency based on USN. 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

FM_HICUT_USN_ATTACK_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ATTACK[15:0]															
0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the Hi-cut mitigation engine lowers the cutoff frequency based on USN. Default is 16 ms. Range is 1–32767 ms.

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Property 0x3613 FM_HICUT_USN_RELEASE_TIME

The FM_HICUT_USN_RELEASE_TIME property sets the transition time for which the Hi-cut mitigation engine increases the cutoff frequency based on USN. 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

FM_HICUT_USN_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x0FA0															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the Hi-cut mitigation engine increases the cutoff frequency based on USN. Default is 4000 ms. Range is 1–32767 ms.

Property 0x3700 FM_HIBLEND_RSSI_THRESHOLDS

The FM_HIBLEND_RSSI_THRESHOLDS property sets the RSSI thresholds for Hi-blend to begin band limiting and reach maximum band limiting on L-R channel based on max and min cutoff frequency (set by Property 0x3701) on the Hi-blend engine. 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: 0x371B

Units: dBµV

FM_HIBLEND_RSSI_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RSSIMAX[7:0]								RSSIMIN[7:0]							
0x37								0x1B							

Bit	Name	Function
15:8	RSSIMAX[7:0]	Sets the RSSI level at which Hi-blend begins to band limit on the L-R channel based on cutoff frequency set by property 0x3701. Default is 55 dBµV. Range is –20 to 120 dBµV.
7:0	RSSIMIN[7:0]	Sets the RSSI level at which Hi-blend reaches maximum band limiting on the L-R channel based on cutoff frequency set by property 0x3701. Default is 27 dBµV. Range is –20 to 120 dBµV.

Property 0x3701 FM_HIBLEND_RSSI_CUTOFF_FREQ

The FM_HIBLEND_RSSI_CUTOFF_FREQ property sets the maximum and minimum cutoff frequencies based on RSSI (set by Property 0x3700) on the Hi-blend engine. You can force a constant cutoff frequency value by setting FREQ_MAX and FREQ_MIN to the same value. To disable the Hi-blend based on RSSI, set FREQ_MAX = FREQ_MIN = 180 (0xB4.) 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: 0xB41E

Units: 100 Hz

FM_HIBLEND_RSSI_CUTOFF_FREQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FREQ_MAX[7:0]								FREQ_MIN[7:0]							
0xB4								0x1E							

Bit	Name	Function
15:8	FREQ_MAX[7:0]	Sets the maximum cutoff frequency. Default is 18 kHz. Range is 0–18 kHz.
7:0	FREQ_MIN[7:0]	Sets the minimum stereo separation. Default is 3 kHz. Range is 0–18 kHz.

Property 0x3702 FM_HIBLEND_RSSI_ATTACK_TIME

The FM_HIBLEND_RSSI_ATTACK_TIME property sets the transition time for which the Hi-blend mitigation engine lowers the cutoff frequency based on RSSI. 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: ms

FM_HIBLEND_RSSI_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0004															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the Hi-blend mitigation engine lowers the cutoff frequency based on RSSI. Default is 4 ms. Range is 1–32767 ms.

Property 0x3703 FM_HIBLEND_RSSI_RELEASE_TIME

The FM_HIBLEND_RSSI_RELEASE_TIME property sets the transition time for which the Hi-blend mitigation engine increases the cutoff frequency based on RSSI. 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

FM_HIBLEND_RSSI_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x1F40															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the Hi-blend mitigation engine increases the cutoff frequency based on RSSI. Default is 8000 ms. Range is 1–32767 ms.

Property 0x3708 FM_HIBLEND_MULTIPATH_THRESHOLDS

The FM_HIBLEND_MULTIPATH_THRESHOLDS property sets the Multipath thresholds for Hi-blend to begin band limiting and reach maximum band limiting on L-R channel based on max and min cutoff frequencies (set by Property 0x3709) on the Hi-blend engine. 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: 0x193C

FM_HIBLEND_MULTIPATH_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MULTMIN[7:0]								MULTMAX[7:0]							
0x19								0x3C							

Bit	Name	Function
15:8	MULTMIN[7:0]	Sets the Multipath level at which Hi-cut reaches max band limiting on the L-R channel based on cutoff frequency set by property 0x3709. Default is 25. Range is 0–127%.
7:0	MULTMAX[7:0]	Sets the Multipath level at which Hi-blend begins to band limit on the L-R channel based on cutoff frequency set by property 0x3709. Default is 60. Range is 0–127%.

Property 0x3709 FM_HIBLEND_MULTIPATH_CUTOFF_FREQ

The FM_HIBLEND_MULTIPATH_CUTOFF_FREQ property sets the maximum and minimum cutoff frequency based on Multipath (set by Property 0x3708) on the Hi-blend engine. You can force a constant cutoff frequency value by setting FREQ_MAX and FREQ_MIN to the same value. To disable the Hi-blend based on Multipath, set FREQ_MAX = FREQ_MIN = 180 (0xB4.) 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: 0xB41E

Units: 100 Hz

FM_HIBLEND_MULTIPATH_CUTOFF_FREQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FREQ_MAX[7:0]								FREQ_MIN[7:0]							
0xB4								0x1E							

Bit	Name	Function
15:8	FREQ_MAX[7:0]	Sets the maximum cutoff frequency. Default is 18 kHz. Range is 0–18 kHz.
7:0	FREQ_MIN[7:0]	Sets the minimum stereo separation. Default is 3 kHz. Range is 0–18 kHz.

Property 0x370A FM_HIBLEND_MULTIPATH_ATTACK_TIME

The FM_HIBLEND_MULTIPATH_ATTACK_TIME property sets the transition time for which the Hi-blend mitigation engine lowers the cutoff frequency based on Multipath. 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: ms

FM_HIBLEND_MULTIPATH_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0004															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the Hi-blend mitigation engine decreases the cutoff frequency based on Multipath. Default is 4 ms. Range is 1–32767 ms.

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Property 0x370B FM_HIBLEND_MULTIPATH_RELEASE_TIME

The FM_HIBLEND_MULTIPATH_RELEASE_TIME property sets the transition time for which the Hi-blend mitigation engine increases the cutoff frequency based on RSSI. 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

FM_HIBLEND_MULTIPATH_RELEASE_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RELEASE[15:0]															
0x1F40															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the Hi-blend mitigation engine increases the cutoff frequency based on Multipath. Default is 8000 ms. Range is 1–32767 ms.

Property 0x3710 FM_HIBLEND_USN_THRESHOLDS

The FM_HIBLEND_USN_THRESHOLDS property sets the USN thresholds for Hi-blend to begin band limiting and reach maximum band limiting on L-R channel based on max and min cutoff frequencies (set by Property 0x3711) on the Hi-blend engine. 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: 0x371E

Units: –dBFS

FM_HIBLEND_USN_THRESHOLDS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
USNMIN[7:0]								USNMAX[7:0]							
0x37								0x1E							

Bit	Name	Function
15:8	USNMIN[7:0]	Sets the USN level at which Hi-blend reaches max band limiting on the L-R channel based on cutoff frequency set by property 0x3711. Default is –55 dBFS. Range is 0–127 –dBFS.
7:0	USNMAX[7:0]	Sets the Multipath level at which Hi-blend begins to band limit on the L-R channel based on cutoff frequency set by property 0x3711. Default is –30 dBFS. Range is 0–127 –dBFS.

Property 0x3711 FM_HIBLEND_USN_CUTOFF_FREQ

The FM_HIBLEND_USN_CUTOFF_FREQ property sets the maximum and minimum cutoff frequency based on USN (set by Property 0x3710) on the Hi-blend engine. You can force a constant cutoff frequency value by setting FREQ_MAX and FREQ_MIN to the same value. To disable the Hi-blend based on USN, set FREQ_MAX = FREQ_MIN = 180 (0xB4.) 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: 0xB41E

Units: 100 Hz

FM_HIBLEND_USN_CUTOFF_FREQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FREQ_MAX[7:0]								FREQ_MIN[7:0]							
0xB4								0x1E							

Bit	Name	Function
15:8	FREQ_MAX[7:0]	Sets the maximum cutoff frequency. Default is 18 kHz. Range is 0–18 kHz.
7:0	FREQ_MIN[7:0]	Sets the minimum stereo separation. Default is 3 kHz. Range is 0–18 kHz.

Property 0x3712 FM_HIBLEND_USN_ATTACK_TIME

The FM_HIBLEND_USN_ATTACK_TIME property sets the transition time for which the Hi-blend mitigation engine lowers the cutoff frequency based on USN. 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: ms

FM_HIBLEND_USN_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0004															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time for which the Hi-blend mitigation engine lowers the cutoff frequency based on USN. Default is 4 ms. Range is 1–32767 ms.

Property 0x3713 FM_HIBLEND_USN_RELEASE_TIME

The FM_HIBLEND_USN_RELEASE_TIME property sets the transition time for which the Hi-blend mitigation engine increases the cutoff frequency based on USN. 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

FM_HIBLEND_USN_RELEASE_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
RELEASE[15:0]															
0x1F40															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time for which the Hi-blend mitigation engine increases the cutoff frequency based on USN. Default is 8000 ms. Range is 1–32767 ms.

Property 0x4000 FM_RDS_INTERRUPT_SOURCE

The FM_RDS_INTERRUPT_SOURCE property 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.

FM_RDS_INTERRUPT_SOURCE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000											RDSTPPTY	RDSPI	0	RDSSYNC	RDSRECV
0x000											0	0	0	0	0

Bit	Name	Function
15:5	Reserved	Always write 0.
4	RDSTPPTY	If set, generates RDS Interrupt when first valid Block B data has been received or if Block B data is different from last valid Block B data. 0 = Disabled. 1 = Enabled.
3	RDSPI	If set, generates RDS Interrupt when first valid Block A data has been received or if Block A data is different from last valid Block A data. 0 = Disabled. 1 = Enabled.
2	Reserved	Always write 0.
1	RDSSYNC	If set, generates RDS interrupt when RDS Synchronization status changes. Default is 0. 0 = Disabled. 1 = Enabled.
0	RDSRECV	If set, generate an interrupt whenever the RDS FIFO has at least FM_RDS_INTERRUPT_FIFO_COUNT entries. Default is 0 0 = Disabled. 1 = Enabled.

Property 0x4001 FM_RDS_INTERRUPT_FIFO_COUNT

The FM_RDS_INTERRUPT_FIFO_COUNT property 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: 0

FM_RDS_INTERRUPT_FIFO_COUNT															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								DEPTH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
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. Default is 0. Range is 0–25

Property 0x4002 FM_RDS_CONFIG

The FM_RDS_CONFIG property 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

FM_RDS_CONFIG															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								BLETHB[1:0]		BLETHCD[1:0]		0x0			RDSEN
0x00								0x0		0x0		0x0			0

Bit	Name	Function
15:8	Reserved	Always write 0.
7:6	BLETHB[1:0]	Block Error Threshold BLOCKB. Block B is most critical because it tells what C and D contain. 0 = No 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. 0 = No errors. 1 = 1–2 bit errors detected and corrected. 2 = 3–5 bit errors detected and corrected. 3 = Uncorrectable.
3:1	Reserved	Always write 0.
0	RDSEN	Enables RDS processing. Default is 0. 0 = RDS Disabled. 1 = RDS Enabled.

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Property 0x4003 FM_RDS_CONFIDENCE

The FM_RDS_CONFIDENCE property sets the required receiver confidence level for each RDS block prior to demodulation. A higher confidence requirement will result in more block errors (higher percentage of blocks with BLE=3), but reduces the chance of decoder errors (lower percentage of blocks that contain incorrect information despite having BLE<3). Higher confidence requirements may result in a decrease in the frequency with which RDS data is stored in the FIFO. Higher block error rates will affect RDS sensitivity tests. 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 when in the powerup mode.

Default: 0x1111

FM_RDS_CONFIDENCE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CONFIDENCEA[3:0]				CONFIDENCEB[3:0]				CONFIDENCEC[3:0]				CONFIDENCED[3:0]			
0x1				0x1				0x1				0x1			

Bit	Name	Function
15:12	CONFIDENCEA[3:0]	Sets the decoder error rate threshold for BLOCK A. 0 = Reserved. 1 = Lowest confidence required. A valid and usable confidence threshold. 2–14 = Medium confidence required. High value may result in all blocks being marked as uncorrectable. 15 = Highest confidence required. This setting may result in all blocks being marked as uncorrectable.
11:8	CONFIDENCEB[3:0]	Sets the decoder error rate threshold for BLOCK B. 0 = Reserved. 1 = Lowest confidence required. A valid and usable confidence threshold. 2–14 = Medium confidence required. High value may result in all blocks being marked as uncorrectable. 15 = Highest confidence required. This setting may result in all blocks being marked as uncorrectable.
7:4	CONFIDENCEC[3:0]	Sets the decoder error rate threshold for BLOCK C. 0 = Reserved. 1 = Lowest confidence required. A valid and usable confidence threshold. 2–14 = Medium confidence required. High value may result in all blocks being marked as uncorrectable. 15 = Highest confidence required. This setting may result in all blocks being marked as uncorrectable.
3:0	CONFIDENCED[3:0]	Sets the decoder error rate threshold for BLOCK D. 0 = Reserved. 1 = Lowest confidence required. A valid and usable confidence threshold. 2–14 = Medium confidence required. High value may result in all blocks being marked as uncorrectable. 15 = Highest confidence required. This setting may result in all blocks being marked as uncorrectable.

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9.3. Commands and Properties for AM Receiver

Table 16. AM Receiver Command Summary

Number	Name	Summary
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.
0x45	AM_ACF_STATUS	Returns status information about automatically controlled features.
0x47	AM_AGC_STATUS	Reports the status of AM AGC.

Table 17. AM Receiver Property Summary

Number	Name	Default	Summary
0x0400	AM_SOFT_MUTE_MAX_ATTENUATION	0x000C	Sets the maximum soft mute attenuation.
		12	
0x0401	AM_SOFT_MUTE_TRIGGER_THRESHOLD	0x0008	Sets the SNR threshold for soft mute to start.
		8	
0x0402	AM_SOFT_MUTE_END_THRESHOLD	0x0000	Sets the SNR threshold where soft mute will stop attenuating.
		0	
0x0403	AM_SOFT_MUTE_RELEASE_TIME	0x01F4	Sets the maximum soft mute release time in ms.
		500	
0x0404	AM_SOFT_MUTE_ATTACK_TIME	0x0078	Sets the maximum soft mute attack time in ms.
		120	
0x0500	AVC_MIN_GAIN	0xF800	Sets the minimum gain for automatic volume control.
		−2048	
0x0501	AVC_MAX_GAIN	0x27EC	Sets the maximum gain for automatic volume control.
		10220	
0x0700	AM_FE_AGC_CONFIG	0xF018	Specifies the input path for the RF signal and other front-end configuration options.
		61464	
0x0708	AM_IF_AGC_ATTACK_MS	0x0050	Sets the number of milliseconds the IF high peak detector must be exceeded before attenuating the appropriate block.
		80	
0x0709	AM_IF_AGC_RELEASE_MS	0x342	Sets the number of milliseconds the IF low peak detector must not be exceeded before increasing the gain of the appropriate block
		804	

Table 17. AM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x070C	AM_RF_AGC_ATTACK_MS	0x0008	Sets the number of milliseconds the wide-band RF high-peak detector must be exceeded before attenuating the appropriate block.
		8	
0x070D	AM_RF_AGC_RELEASE_MS	0x0320	Sets the number of milliseconds the wide-band RF low-peak detector must not be exceeded before increasing the gain of the appropriate block.
		800	
0x070E	AM_LNA_PD_THRESHOLD	0x5104	Sets the high threshold and hysteresis for the LNA peak detector.
		20740	
0x1100	AM_SEEK_BAND_BOTTOM	0x0208	Sets the lower seek boundary of the AM band in multiples of 1 kHz.
		520	
0x1101	AM_SEEK_BAND_TOP	0x06AE	Sets the upper seek boundary for the AM band in multiples of 1 kHz.
		1710	
0x1102	AM_SEEK_FREQUENCY_SPACING	0x000A	Sets the frequency spacing for the AM band in multiples of 1 kHz when performing a seek.
		10	
0x1200	AM_RSQ_INTERRUPT_SOURCE	0x0000	Configures interrupt related to Received Signal Quality metrics (AM_RSQ_STATUS).
		0	
0x1201	AM_RSQ_SNR_HIGH_THRESHOLD	0x007F	Sets high threshold, which triggers the RSQ interrupt if the SNR is above this threshold.
		127	
0x1202	AM_RSQ_SNR_LOW_THRESHOLD	0xFF80	Sets low threshold, which triggers the RSQ interrupt if the SNR is below this threshold.
		−128	
0x1203	AM_RSQ_RSSI_HIGH_THRESHOLD	0x007F	Sets high threshold, which triggers the RSQ interrupt if the RSSI is above this threshold.
		127	
0x1204	AM_RSQ_RSSI_LOW_THRESHOLD	0xFF80	Sets low threshold, which triggers the RSQ interrupt if the RSSI is below this threshold.
		−128	
0x1300	AM_ACF_INTERRUPT_SOURCE	0x0000	Enables the ACF interrupt sources.
		0	
0x1301	AM_ACF_SM_THRESHOLD	0x001F	Sets the softmute interrupt threshold in dB.
		31	

Table 17. AM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x1302	AM_ACF_CHBW_THRESHOLD	0x0000	Sets the Channel Filter Bandwidth interrupt threshold in units of 100 Hz.
		0	
0x1303	AM_ACF_HICUT _THRESHOLD	0x0000	Sets the Hi-cut interrupt threshold in units of 100 Hz.
		0	
0x1306	AM_ACF_CONTROL_SOURCE	0x0000	Determines if SNR or RSSI will be used as the controlling metric for ACF features.
		0	
0x2000	AM_VALID_MAX_TUNE_ERROR	0x004B	Sets the maximum frequency error allowed before setting the AFCRL indicator.
		75	
0x2003	AM_VALID_SNR_THRESHOLD	0x0005	Sets the SNR threshold for a valid AM Seek/Tune.
		5	
0x2004	AM_VALID_RSSI_THRESHOLD	0x000A	Sets the RSSI threshold for a valid AM Seek/Tune.
		10	
0x2200	AM_CHBW_SQ_MIN_MAX	0x2314	Sets the maximum and minimum channel BW as determined by SNR/RSSI in units of 100 Hz.
		8980	
0x2201	AM_CHBW_SQ_HIGH_THRESHOLD	0x001E	Sets the SNR/RSSI threshold for maximum channel filter bandwidth.
		30	
0x2202	AM_CHBW_SQ_LOW_THRESHOLD	0x000F	Sets the SNR/RSSI threshold for minimum channel filter bandwidth.
		15	
0x2203	AM_CHBW_SQ_WIDENING_TIME	0x0800	Sets the channel filter bandwidth widening time based on SNR/RSSI in units of ms.
		2048	
0x2204	AM_CHBW_SQ_NARROWING_TIME	0x0010	Sets the channel filter bandwidth narrowing time based on SNR/RSSI in units of ms.
		16	
0x2205	AM_CHBW_ASSI_MIN_MAX	0x3232	Sets the maximum and minimum channel BW as determined by ASSI in units of 100 Hz.
		12850	
0x2206	AM_CHBW_ASSI_LOW_THRESHOLD	0x000A	Sets the ASSI threshold for maximum channel filter bandwidth.
		10	
0x2207	AM_CHBW_ASSI_HIGH_THRESHOLD	0x001E	Sets the ASSI threshold for minimum channel filter bandwidth.
		30	

Table 17. AM Receiver Property Summary (Continued)

Number	Name	Default	Summary
0x2208	AM_CHBW_ASSI_WIDENING_TIME	0x0010 / 16	Sets the channel filter bandwidth widening time based on ASSI in units of ms.
0x2209	AM_CHBW_ASSI_NARROWING_TIME	0x0010 / 16	Sets the channel filter bandwidth narrowing time based on ASSI in units of ms.
0x3100	AM_HICUT_SQ_HIGH_THRESHOLD	0x0008 / 8	Sets the SNR/RSSI based Hi-cut high SNR/RSSI threshold.
0x3101	AM_HICUT_SQ_LOW_THRESHOLD	0x0000 / 0	Sets the SNR/RSSI based Hi-cut low SNR/RSSI threshold.
0x3102	AM_HICUT_ATTACK_TIME	0x0010 / 16	Sets the Hi-cut cutoff frequency attack time in ms.
0x3103	AM_HICUT_RELEASE_TIME	0x07D0 / 2000	Sets the Hi-cut cutoff frequency release time in ms.
0x3104	AM_HICUT_CUTOFF_FREQ	0x280A / 10250	Sets the Hi-cut Cutoff Max and Min audio frequencies.
0x3105	AM_LOWCUT_MIN_FREQ	0x0000 / 0	Sets the minimum LowCut cutoff frequency.
0x3106	AM_LOWCUT_MAX_FREQ	0x0000 / 0	Sets the maximum LowCut cutoff frequency.
0x3300	AM_IBOC_CONTROL	0x0000 / 0	Control property for IBOC Blend (Si4777 only).
0x3301	AM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME	0x03E8 / 1000	Sets the crossfade time between full analog and full HD Digital audio in ms (Si4777 only).
0x3302	AM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME	0x03E8 / 1000	Sets the crossfade time from full HD Digital to full analog audio in ms (Si4777 only).
0x3303	AM_IBOC_DYNAMIC_GAIN	0x007F / 127	Sets the digital audio dynamic linear scaling factor (Si4777 only).
0x3304	AM_IBOC_STATIC_GAIN	0x0100 / 256	Sets the digital audio static linear gain factor (Si4777 only).

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9.3.1. AM Receiver Commands

Command 0x40 AM_TUNE_FREQ

The AM_TUNE_FREQ command sets the AM Receiver to tune to a frequency in 1 kHz units. The CTS bit (and optional interrupt) is set when it is safe to send the next command. 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 optional STC interrupt is set when the command completes. This command may only be sent in powerup mode. The command clears the STC bit if it is already set.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x40							
ARG1	0	ZIFSR	0					
ARG2	$FREQ_H[7:0]$							
ARG3	$FREQ_L[7:0]$							
ARG4	$ANTCAP_H[7:0]$							
ARG5	$ANTCAP_L[7:0]$							

ARG	Bit	Name	Function
1	7	Reserved	Always write 0.
1	6	ZIFSR	Sets the ZIP sample rate. ZIFSR=0, low ZIF sample rate (40.625, 42.1875, or 46.5117 kHz, depending on crystal frequency) ZIFSR=1, high ZIF sample rate (650, 675, or 744.1875 kHz, depending on crystal frequency) See section "7. Digital ZIF I/Q Interface".
1	5:0	Reserved	Always write 0.
2	7:0	FREQ$_H$[7:0]	Tune Frequency High Byte. This byte in combination with FREQL selects the tune frequency in units of 1 kHz. Valid range is from 520 to 1710 (520–1710 kHz).
3	7:0	FREQ$_L$[7:0]	Tune Frequency Low Byte. This byte in combination with FREQH selects the tune frequency in units of 1 kHz. Valid range is from 520 to 1710 (520–1710 kHz).
4	7:0	ANTCAP$_H$[7:0]	Antenna Tuning Capacitor High Byte. This byte, in combination with ANTCAP$_L$[7:0], sets the antenna tuning capacitor value in 92 fF increments. Max value is 580 pF. Range is 1-6304. Setting ANTCAP to 0 automatically determines the capacitor value.
5	7:0	ANTCAP$_L$[7:0]	Antenna Tuning Capacitor Low Byte. This byte, in combination with ANTCAP$_H$[7:0], sets the antenna tuning capacitor value in 92 fF increments. Max value is 580 pF. Range is 1-6304. Setting ANTCAP to 0 automatically determines the capacitor value.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	X	ACFINT	STCINT

Command 0x41 AM_SEEK_START

The AM_SEEK_START command begins searching for a valid frequency. 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, and AM_VALID_MAX_TUNE_ERROR. Clears any pending STCINT or RSQINT interrupt status. Seek can be cancelled through setting the CANCEL bit in the AM_RSQ_STATUS command. The CTS bit (and optional interrupt) is set when it is safe to send the next command. RSQINT status is only cleared by the AM_RSQ_STATUS command when the RSQACK bit 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 optional STC interrupt is set when the command completes. This command may only be sent in powerup mode. The command clears the STCINT bit if it is already set.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x41							
ARG1	0000				SEEKUP	WRAP	00	

ARG	Bit	Name	Function
1	7:4	Reserved	Always write 0.
1	3	WRAP	Wrap/Halt. Determines whether the seek should Wrap = 1, or Halt = 0 when it hits the band limit.
1	2	SEEKUP	Seek Up/Down. Determines the direction of the search, either UP = 1, or DOWN = 0.
1	1:0	Reserved	Always write 0.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	X	ACFINT	STCINT

Command 0x42 AM_RSQ_STATUS

The AM_RSQ_STATUS command returns status information about the received signal quality. This command returns Received Signal Strength Indicator (RSSI), Signal to Noise Ratio (SNR), High Side Adjacent Channel Strength (HASSI), Low Side Adjacent Channel Strength (LASSI), Frequency Offset (FREQOFF), and AM Modulation Index (MOD) 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.

The command clears the RSQINT, SNRHINT, SNRLINT, RSSIHINT and RSSILINT interrupt bits when RSQACK bit of ARG1 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 CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x42							
ARG1	0000				RSQACK	ATTUNE	CANCEL	STCACK

ARG	Bit	Name	Function
1	7:4	Reserved	Always write 0.
1	3	RSQACK	Clears RSQINT, SNRHINT, SNRLINT, RSSIHINT, RSSILINT if set.
1	2	ATTUNE	Returns the values of metrics as of tune time. When the AT_TUNE bit is set, values returned for RSQ_STATUS are the values calculated at tune and do not change unless another TUNE_FREQ command is called. This feature can be used to determine why seek stopped at the current station.
1	1	CANCEL	Aborts a seek or tune currently in progress 0 = Don't abort. 1 = Abort.
1	0	STCACK	Clears the STC interrupt status indicator if set.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	X	ACFINT	STCINT
RESP1	X	X	X	X	SNRHINT	SNRLINT	RSSIHINT	RSSILINT
RESP 2	BLTF	X	SNR-READY	RSSIREADY	X	X	AFCRL	VALID
RESP 3	READFREQ[15:8]							
RESP 4	READFREQ[7:0]							
RESP 5	FREQOFF[7:0]							
RESP 6	RSSI[7:0]							
RESP 7	SNR[7:0]							
RESP 8	XXXXXXXX							
RESP 9	LASSI[7:0]							
RESP 10	HASSI[7:0]							
RESP 11	XXXXXXXX							
RESP 12	MOD[7:0]							
RESP 13	$ANTCAP_H[7:0]$							
RESP 14	$ANTCAP_L[7:0]$							

RESP	Bit	Name	Function
1	7:4	Reserved	Values may vary.
1	3	SNRHINT	SNR Detect High 0 = Received SNR has not exceeded above SNR programmed using AM_RSQ_SNR_HIGH_THRESHOLD. 1 = Received SNR has exceeded above SNR threshold programmed using AM_RSQ_SNR_HIGH_THRESHOLD.
1	2	SNRLINT	SNR Detect Low 0 = Received SNR has not fallen below SNR threshold programmed using AM_RSQ_SNR_LOW_THRESHOLD. 1 = Received SNR has fallen below SNR threshold programmed using AM_RSQ_SNR_LOW_THRESHOLD.
1	1	RSSIHINT	RSSI Detect High 0 = RSSI has not exceeded above RSSI threshold programmed using AM_RSQ_RSSI_HIGH_THRESHOLD. 1 = RSSI has exceeded above RSSI threshold programmed using AM_RSQ_RSSI_HIGH_THRESHOLD.
1	0	RSSILINT	RSSI Detect Low 0 = RSSI has not fallen below RSSI threshold. programmed using AM_RSQ_RSSI_LOW_THRESHOLD. 1 = RSSI has fallen below RSSI threshold programmed using AM_RSQ_RSSI_LOW_THRESHOLD.
2	7	BLTF	Band Limit Reports if a seek hit the band limit (WRAP = 0 in AM_-SEEK_START) or wrapped to the original frequency (WRAP = 1).
2	6	Reserved	Values may vary.

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RESP	Bit	Name	Function
2	5	SNRREADY	SNR Status When set, indicates that the SNR metric was read as part of a tune. If this flag is not set once tune completes, the SNR metric was not measured. A metric not measured indicates that a tune was terminated prematurely due to an invalidating condition (i.e., RSSI did not meet the minimum threshold).In this case, tune time RSQ will report 0 for SNR. The normal running SNR is not affected by this flag. 0 = SNR measurement in progress (tune in progress). 1 = SNR measurement ready or not taken (tune completed).
2	4	RSSIREADY	RSSI Status When set, indicates that the RSSI metric was read as part of a tune. If this flag is not set once tune completes, the RSSI metric was not measured. A metric not measured indicates that a tune was terminated prematurely due to an invalidating condition (i.e., RSSI did not meet the minimum threshold).In this case, tune time RSQ will report 0 for RSSI. The normal running RSSI is not affected by this flag. 0 = RSSI measurement in progress (tune in progress). 1 = RSSI measurement ready or not taken (tune completed).
2	3:2	Reserved	Values may vary
2	1	AFCRL	Set if the AFC rails (AFC gets railed if FREQOFF $\geq$ MAX_TUNE_ERROR).
2	0	VALID	Reports if the channel is valid based on the settings of AM_VALID_RSSI_THRESHOLD, AM_VALID_SNR_-THRESHOLD, AM_VALID_MAX_TUNE_ERROR.
3,4	15:0	READFREQ[15:0]	Returns the currently tuned frequency.
5	7:0	FREQOFF[7:0]	Frequency offset in units of 2 ppm (–128 to 127).
6	7:0	RSSI[7:0]	Received Signal Strength indicator in dBµV (–128 to 127).
7	7:0	SNR[7:0]	RF SNR indicator in dB (–128 to 127).
8	7:0	Reserved	Values may vary
9	7:0	LASSI[7:0]	Low Side Adjacent Channel Strength Indicator reports the Signal + Noise power relative to the carrier. (–128 to 127).
10	7:0	HASSI[7:0]	High Side Adjacent Channel Strength Indicator reports the Signal + Noise power relative to the carrier. (–128 to 127).
11	7:0	Reserved	Values may vary.
12	7:0	MOD[7:0]	AM Modulation Index in percent range 0–100.

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RESP	Bit	Name	Function
13	7:0	$ANTCAP_H[7:0]$	Antenna Tuning Capacitor High Byte. This byte, in combination with $ANTCAP_L[7:0]$, reports the antenna tuning capacitor value in 92 fF increments. Max value is 580 pF. Range is 1-6304.
14	7:0	$ANTCAP_L[7:0]$	Antenna Tuning Capacitor High Byte. This byte, in combination with $ANTCAP_H[7:0]$, reports the antenna tuning capacitor value in 92 fF increments. Max value is 580 pF. Range is 1-6304.

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Command 0x45 AM_ACF_STATUS

The AM_ACF_STATUS command returns status information about automatically controlled features. This command returns the Soft Mute Attenuation, Channel Filter Bandwidth, and Hi-cut cutoff frequency associated with the desired channel. If SMUTE bit is high it indicates that is audio is soft muted. The CTS bit (and optional interrupt) is set when it is safe to send the next command. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD	0x45							
ARG1	0							ACFACK

ARG	Bit	Name	Function
1	7:1	Reserved	Always write 0.
1	0	ACFACK	If set to 1, clears ACFINT and any ACF interrupt bits.

Response

Bit	7	6	5	4	3	2	1	0
STATUS	CTS	ERR	XX		RSQINT	X	ACFINT	STCINT
RESP1	XXX XXXX					HICUT_INT	CHBW_INT	SOFTMUTE_INT
RESP2	XXXXXXX							SMUTE
RESP3	XXX			SMATTN[4:0]				
RESP4	CHANBW[7:0]							
RESP5	HICUT [7:0]							

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RESP	Bit	Name	Function
1	7:3	Reserved	Values may vary.
1	2	HICUT_INT	Indicates that Hi-cut cutoff frequency has crossed below the Hi-cut threshold set by AM_ACF_HICUT_THRESHOLD.
1	1	CHBW_INT	Indicates that channel filter bandwidth is less than the threshold set by ACF_CHBW_THRESHOLD.
1	0	SOFTMUTE_INT	Indicates that SM attenuation has increased above ACF_SM_THRESHOLD.
2	7:1	Reserved	Values may vary.
2	0	SMUTE	0 = Audio is not soft muted. 1 = Audio is soft muted.
3	7:5	Reserved	Values may vary.
3	4:0	SMATTN[4:0]	Soft mute attenuation level in dB. Range: 0–31.
4	7:0	CHANBW[7:0]	Channel filter bandwidth in 100 Hz. Range: 0–150.
5	7:0	HICUT [7:0]	Hi-cut cutoff frequency in units of 100 Hz. Range: 10–50.

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Command 0x47 AM_AGC_STATUS

The AM_AGC_STATUS command reports the current status of the AM AGC. The command is complete when the CTS bit (and optional interrupt) is set. This command may only be sent in powerup mode.

Command

Bit	7	6	5	4	3	2	1	0
CMD				0x47				

Response

Bit	7	6	5	4	3	2	1	0
Status	CTS	ERR	XX		RSQINT	X	ACFINT	STCINT
RESP1	XXXXXX						AMHI	AMLO
RESP 2	XX							
RESP 3	XX							
RESP 4	PGAGAIN[7:0]							
RESP 5	RFATTN[7:0]							

RESP	Bit	Name	Function
1	7:2	Reserved	Values may vary.
1	1	AMHI	0 = AM LNA PD high threshold is not tripped. 1 = AM LNA PD high threshold is tripped.
1	0	AMLO	0 = AM LNA PD low threshold is not tripped. 1 = AM LNA PD low threshold is tripped.
2	7:0	Reserved	Values may vary.
3	7:0	Reserved	Values may vary.
4	7:0	PGAGAIN[7:0]	PGA gain in dB.
5	7:0	RFATTN[7:0]	AM loop resistive attenuation index. Range: 0-63 0 = 800 Kohms ~ no attenuation $1 = 0.875 * 800\ k\Omega$ $2 = 0.875^2 * 800\ k\Omega$ $63 = 0.875^{63} * 800\ k\Omega = 177\ \Omega$

9.3.2. AM Receiver Properties

Property 0x0400 AM_SOFT_MUTE_MAX_ATTENUATION

The AM_SOFT_MUTE_MAX_ATTENUATION property sets the maximum attenuation in dB that will be applied by the softmute feature. 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: dB

AM_SOFT_MUTE_MAX_ATTENUATION															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000											SMATTN[4:0]				
0x000											0x0C				

Bit	Name	Function
15:5	Reserved	Always write 0.
4:0	SMATTN[4:0]	Sets the maximum attenuation in dB that will be applied by the softmute feature. Default is 12 dB. Range is 0–31 dB.

Property 0x0401 AM_SOFT_MUTE_TRIGGER_THRESHOLD

The AM_SOFT_MUTE_TRIGGER_THRESHOLD property sets the SNR threshold in dB to engage softmute. The CTS bit (and optional interrupt) is set when it is safe to send the next command. If USE_RSSI is set in AM_ACF_CONTROL_SOURCE property, then property 0x0401 refers to RSSI threshold. This property may only be set or read in powerup mode.

Default: 8

Units: dB

AM_SOFT_MUTE_TRIGGER_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								SMTRGTH[7:0]							
0x00								0x08							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	SMTRGTH[7:0]	Sets the SNR threshold in dB to engage softmute. Default is 8 dB. Range is –127 to 127 dB.

Property 0x0402 AM_SOFT_MUTE_END_THRESHOLD

The AM_SOFT_MUTE_END_THRESHOLD property sets the SNR threshold in dB at which softmute attenuation will be set to its maximum value. When the SNR is at this level or lower, the audio attenuation will be set to AM_SOFT_MUTE_MAX_ATTENUATION. The CTS bit (and optional interrupt) is set when it is safe to send the next command. If USE_RSSI is set in AM_ACF_CONTROL_SOURCE property, then property 0x0402 refers to RSSI threshold. This property may only be set or read in powerup mode.

Default: 0

Units: dB

AM_SOFT_MUTE_END_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								SMENDTH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	SMENDTH[7:0]	Sets the SNR threshold in dB at which softmute attenuation will be set to its maximum value given by AM_SOFT_MUTE_MAX_ATTENUATION property. Default is 0 dB. Range is –127 to 127 dB.

Property 0x0403 AM_SOFT_MUTE_RELEASE_TIME

The AM_SOFT_MUTE_RELEASE_TIME property sets the maximum time in ms it takes to unmute the audio. 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

AM_SOFT_MUTE_RELEASE_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
RELEASE[15:0]															
0x01F4															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the maximum time in ms it takes to unmute the audio. Default is 500 ms. Range is 1–32767 ms. Note that there will be 16 ms of filter delay for the RSSI/SNR metric before softmute can engage/disengage.

Property 0x0404 AM_SOFT_MUTE_ATTACK_TIME

The AM_SOFT_MUTE_ATTACK_TIME property sets the maximum time in ms it takes to mute the audio. 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

AM_SOFT_MUTE_ATTACK_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ATTACK[15:0]															
0x0078															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the maximum time in ms it takes to mute the audio. Default is 120 ms. Range is 1–32767 ms. Note that there will be 16 ms of filter delay for the RSSI/SNR metric before softmute can engage/disengage.

Property 0x0500 AVC_MIN_GAIN

The AVC_MIN_GAIN property sets the minimum gain for automatic volume control. The minimum gain value is given by MINGAIN = 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

AVC_MIN_GAIN															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MINGAIN[15:0]															
0xF800															

Bit	Name	Function
15:0	MINGAIN[15:0]	The minimum gain value for the AVC. MINGAIN = g x 170. Range for MINGAIN is –4096 to 3061. This implies that the range of g is –24 dB to +18 dB

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Property 0x0501 AVC_MAX_GAIN

The AVC_MAX_GAIN property sets the maximum gain for automatic volume control. The maximum gain value is given by MAXGAIN = g x 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

AVC_MAX_GAIN															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	MAXGAIN[14:0]														
0	0x27EC														

Bit	Name	Function
15	Reserved	Always set to 0.
14:0	MAXGAIN[14:0]	The maximum gain value for the AVC. MAXGAIN = g x 170. Range is 0–32767. This implies that the range of g is 0–193 dB

Property 0x0700 AM_FE_AGC_CONFIG

Specifies the input path for the RF signal and other front-end configuration options. The CTS bit (and optional interrupt) is set when it is safe to send the next command. The property may only be set or read when in the powerup mode. Changes to this property take effect after the next tune is completed.

Default: 0x14

AM_FE_AGC_CONFIG									
15:12	**11:8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
CCL000	0	FMMIX	NOINTRU	ATTENFM	HARMREJ	INPUTSELECT[3:0]			
0xF000	0	0	0	0	1	0x8			

Bit	Name	Function
15:12	CCL	Coupling Capacitor value at loop input. Default is 15 pF.
11:8	Reserved	Always write 0.
7	Reserved	Always write 0.
6	NOINTRU	0=In AM, external FM intrusion filter exists on AM antenna circuit. 1=In AM, FM attenuators are off.
5	ATTENFM	0=In AM, FM attenuators are turned on to improve FM intrusion. 1=In AM, FM attenuators are off.
4	HARMREJ	0=Harmonic reject is disabled. 1=Harmonic reject is enabled.
3:0	INPUTSELECT[3:0]	8=Receive signal comes into the AMIL pin (loop antenna)

Property 0x0708 AM_IF_AGC_ATTACK_MS

Sets the number of milliseconds the IF high peak detector must be exceeded before attenuating the appropriate block. The peak detectors are only sampled once every 3–5 ms. If the peak detector trips, the internal counter is incremented by 4 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 when in the powerup mode.

Default: 80

Units: ms

AM_IF_AGC_ATTACK_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IF_AGC_ATTACK_MS[15:0]															
0x0050															

Bit	Name	Function
15:0	IF_AGC_ATTACK_MS[15:0]	Number of milliseconds the IF high peak detector must be exceeded before attenuating the appropriate block. Range: 4–4096 ms.

Property 0x0709 AM_IF_AGC_RELEASE_MS

Sets the number of milliseconds the IF low peak detector must not be exceeded before increasing the gain of the appropriate block. The peak detectors are only sampled once every 3–5 ms. If the peak detector trips, the internal counter is incremented by 4 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 when in the powerup mode.

Default: 804

Units: ms

AM_IF_AGC_RELEASE_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IF_AGC_RELEASE_MS[15:0]															
0x0324															

Bit	Name	Function
15:0	IF_AGC_RELEASE_MS[15:0]	Number of milliseconds the IF low peak detector must not be exceeded before increasing the gain of the appropriate block. Range: 4–4096 ms.
Note: For best performance AM_IF_AGC_RELEASE_MS > AM_RF_AGC_RELEASE_MS and set AM_IF_AGC_RELEASE_MS to 804 ms for AM_RF_AGC_RELEASE_MS of 800 ms.		

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Property 0x070C AM_RF_AGC_ATTACK_MS

The AM_RF_AGC_ATTACK_MS property sets the number of milliseconds the wideband RF high-peak detector must be exceeded before attenuating the appropriate block. The peak detectors are only sampled once every 3–5 ms. If the peak detector trips, the internal counter is incremented by 4 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: 8

Units: ms

AM_RF_AGC_ATTACK_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RF_AGC_ATTACK_MS[15:0]															
0x0008															

Bit	Name	Function
15:0	RF_AGC_ATTACK_MS[7:0]	Number of milliseconds the wide-band RF high-peak detector must be exceeded before attenuating the appropriate block. Default is 8 ms. Range is 4–4096 ms.

Property 0x070D AM_RF_AGC_RELEASE_MS

The AM_RF_AGC_RELEASE_MS property sets the number of milliseconds the wideband RF low-peak detector must not be exceeded before increasing the gain of the appropriate block. The peak detectors are only sampled once every 3–5 ms. If the peak detector trips, the internal counter is incremented by 4 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: 800

Units: ms

AM_RF_AGC_RELEASE_MS															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RF_AGC_RELEASE_MS[15:0]															
0x0320															

Bit	Name	Function
15:0	RF_AGC_RELEASE_MS[7:0]	Number of milliseconds the wideband RF low-peak detector must not be exceeded before increasing the gain of the appropriate block. Default is 800 ms. Range is 4–4096 ms.
Note: For best performance, AM_IF_AGC_RELEASE_MS > AM_RF_AGC_RELEASE_MS		

Property 0x070E AM_LNA_PD_THRESHOLD

The AM_LNA_PD_THRESHOLD property sets the high threshold and hysteresis for the LNA peak detector. The high threshold sets the level at which the AGC increases attenuation. The hysteresis is how many dB below the high threshold the level must drop before the AGC decreases 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: 0x5104

AM_LNA_PD_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
HIGH[7:0]								HYST[7:0]							
0x51								0x04							

Bit	Name	Function
15:8	HIGH[7:0]	Sets the level in dBμV at which AGC increases attenuation. HIGH[7:0] Range: 79–93. 79 = 79 dBμV. 81 = 81 dBμV. 83 = 83 dBμV. 85 = 85 dBμV. 87 = 87 dBμV. 89 = 89 dBμV. 91 = 91 dBμV. 93 = 93 dBμV.
7:0	HYST[7:0]	Sets how many dB below the high threshold the level must drop before the AGC decreases attenuation. HYST[7:0] Range: 3–6. 3 = 3 dB. 4 = 4 dB. 5 = 5 dB. 6 = 6 dB.

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Property 0x1100 AM_SEEK_BAND_BOTTOM

The AM_SEEK_BAND_BOTTOM property sets the bottom of the AM band for 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. The default is 520 kHz.

Default: 520

Units: kHz

AM_SEEK_BAND_BOTTOM															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
AMSKFREQL[15:0]															
0x0208															

Bit	Name	Function
15:0	AMSKFREQL[15:0]	Sets the bottom of the AM band for seek. Default is 520 kHz. Range: 520–1710 (MW). 144–288 (LW). 2300–30000 (SW).

Property 0x1101 AM_SEEK_BAND_TOP

The AM_SEEK_BAND_TOP property sets the top of the AM band for 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. The default is 1710 kHz

Default: 1710

Units: kHz

AM_SEEK_BAND_TOP															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
AMSKFREQH[15:0]															
0x06AE															

Bit	Name	Function
15:0	AMSKFREQH[15:0]	Sets the top of the AM band for seek. Default is 1710 kHz. Range: 520–1710 (MW). 144–288 (LW) 2300–30000 (SW)

Property 0x1102 AM_SEEK_FREQUENCY_SPACING

The AM_SEEK_FREQUENCY_SPACING property selects frequency spacing for AM seek in multiples of 1 kHz. 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 10 kHz.

Default: 10

Units: kHz

AM_SEEK_FREQUENCY_SPACING															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000											AMSKSPACE[4:0]				
0x000											0x0A				

Bit	Name	Function
15:5	Reserved	Always write 0.
4:0	AMSKSPACE[4:0]	Selects frequency spacing for AM seek. Default is 10 kHz. Range is 1–31. 5 = SW (5 kHz). 9 = AM in Asia (9 kHz). 9 = LW (9 kHz). 10 = AM in U.S. (10 kHz).

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Property 0x1200 AM_RSQ_INTERRUPT_SOURCE

The AM_RSQ_INTERRUPT_SOURCE property configures interrupt related to Received Signal Quality metrics. 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 0.

Default: 0

AM_RSQ_INTERRUPT_SOURCE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000												SNRHINT	SNRLINT	RSSIHINT	RSSILINT
0x000												0	0	0	0

Bit	Name	Function
15:4	Reserved	Always write 0.
3	SNRHINT	0: Disable Interrupt. 1: Enable interrupt to occur if SNR goes above the threshold set by AM_RSQ_SNR_HIGH_THRESHOLD.
2	SNRLINT	0: Disable Interrupt. 1: Enable interrupt to occur if SNR goes below the threshold set by AM_RSQ_SNR_LOW_THRESHOLD.
1	RSSIHINT	0: Disable Interrupt. 1: Enable interrupt to occur if RSSI goes above the threshold set by AM_RSQ_RSSI_HIGH_THRESHOLD.
0	RSSILINT	0: Disable Interrupt. 1: Enable interrupt to occur if RSSI goes below the threshold set by AM_RSQ_RSSI_LO_THRESHOLD.

Property 0x1201 AM_RSQ_SNR_HIGH_THRESHOLD

The AM_RSQ_SNR_HIGH_THRESHOLD property 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

AM_RSQ_SNR_HIGH_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								SNRH[7:0]							
0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values, 0xFF for (–) values.
7:0	SNRH [7:0]	Sets the high threshold, which triggers the RSQ interrupt if the SNR is above this threshold. Default is 127 dB. Range is –128 to 127 dB in steps of 1 dB.

Property 0x1202 AM_RSQ_SNR_LOW_THRESHOLD

The AM_RSQ_SNR_LOW_THRESHOLD property sets 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

AM_RSQ_SNR_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0xFF								SNRL[7:0]							
0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values, 0xFF for (–) values.
7:0	SNRL [7:0]	Sets low threshold, which triggers the RSQ interrupt if the SNR is below this threshold. Default is –128 dB. Range is –128 to 127 dB in steps of 1 dB.

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Property 0x1203 AM_RSQ_RSSI_HIGH_THRESHOLD

The AM_RSQ_RSSI_HIGH_THRESHOLD property sets 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: dBµV

AM_RSQ_RSSI_HIGH_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								RSSIH[7:0]							
0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values, 0xFF for (–) values.
7:0	RSSIH [7:0]	Sets high threshold, which triggers the RSQ interrupt if the RSSI is above this threshold. Default is 127 dBµV. Range is –128 to 127 dBµV in steps of 1 dB.

Property 0x1204 AM_RSQ_RSSI_LOW_THRESHOLD

The AM_RSQ_RSSI_LOW_THRESHOLD property sets 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: dBµV

AM_RSQ_RSSI_LOW_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0xFF								RSSIL[7:0]							
0xFF								0x80							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values, 0xFF for (–) values.
7:0	RSSIL [7:0]	Sets low threshold, which triggers the RSQ interrupt if the RSSI is below this threshold. Default is –128 dBµV. Range is –128 to 127 dBµV in steps of 1 dB.

Property 0x1300 AM_ACF_INTERRUPT_SOURCE

The AM_ACF_INTERRUPT_SOURCE property enables the 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

AM_ACF_INTERRUPT_SOURCE															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x0000													HICUT_INT	CHBW_INT	SOFTMUTE_INT
0x0000													0	0	0

Bit	Name	Function
15:3	Reserved	Always write 0.
2	HICUT_INT	When set, enables the Hi-cut Interrupt. Default is 0. 0 = The Hi-cut interrupt is disabled. 1 = The Hi-cut interrupt is enabled.
1	CHBW_INT	When set, enables the Channel Filter Bandwidth Interrupt. Default is 0. 0 = The Channel Filter Bandwidth interrupt is disabled. 1 = The Channel Filter Bandwidth interrupt is enabled.
0	SOFTMUTE_INT	When set, enables the softmute interrupt. Default is 0. 0 = The softmute interrupt is disabled. 1 = The softmute interrupt is enabled.

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Property 0x1301 AM_ACF_SM_THRESHOLD

The AM_ACF_SM_THRESHOLD property sets the softmute interrupt threshold in dB. When softmute attenuation rises above the level set by this property and the SOFTMUTE_INT interrupt is enabled through the AM_ACF_INTERRUPT_SOURCE property, the SOFTMUTE_INT interrupt will be asserted. 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

AM_ACF_SM_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000											SMATTN_THRESH[4:0]				
0x000											0x1F				

Bit	Name	Function
15:5	Reserved	Always write 0.
4:0	SMATTN_THRESH[4:0]	Softmute interrupt threshold in dB which triggers the softmute interrupt when the softmute attenuation rises above this level. Default is 31 dB. Range is 0–31 dB.

Property 0x1302 AM_ACF_CHBW_THRESHOLD

The AM_ACF_CHBW_THRESHOLD property sets the Channel Filter Bandwidth interrupt threshold in units of 100 Hz. When the channel filter bandwidth falls below this threshold and the CHBW_INT interrupt is enabled through the AM_ACF_INTERRUPT_SOURCE property, the CHBW_INT interrupt will be asserted. 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: 100 Hz

AM_ACF_CHBW_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								CHBW_THRESH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	CHBW _THRESH[7:0]	Channel Filter Bandwidth interrupt threshold in units of 100 Hz, which triggers the Channel Filter Bandwidth Interrupt when the channel filter bandwidth falls below this threshold. Default is 0 kHz. Range is 0–255.

Property 0x1303 AM_ACF_HICUT_THRESHOLD

The AM_ACF_HICUT_THRESHOLD property sets the Hi-cut interrupt threshold in units of 100 Hz. When the Hi-cut cutoff frequency falls below this threshold and the Hi-cut_INT interrupt is enabled through the AM_ACF_INTERRUPT_SOURCE property, the Hi-cut_ INT interrupt will be asserted. 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: 100 Hz

AM_ACF_HICUT_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								HICUT_THRESH[7:0]							
0x00								0x00							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	HICUT_THRESH[7:0]	Hi-cut interrupt threshold in units of 100 Hz, which triggers the Hi Cut Interrupt when the Hi-cut cutoff frequency falls below this threshold. Default is 0 kHz. Range is 0–200.

Property 0x1306 AM_ACF_CONTROL_SOURCE

The AM_ACF_CONTROL_SOURCE property 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

AM_ACF_CONTROL_SOURCE															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x0000															USE_RSSI
0x0000															0

Bit	Name	Function
15:1	Reserved	Always write 0.
0	USE_RSSI	When set, RSSI will be used instead of SNR as the ACF controlling metric. 0 = Use SNR as the controlling metric. 1 = Use RSSI as the controlling metric.

Property 0x2000 AM_VALID_MAX_TUNE_ERROR

The AM_VALID_MAX_TUNE_ERROR property sets the maximum frequency error allowed in units of 2 ppm before setting the AFC rail indicator (AFCRL). 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 (150 ppm)

Units: 2 ppm

AM_VALID_MAX_TUNE_ERROR															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								AMMAXTUNEERR[7:0]							
0x00								0x4B							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	AMMAXTUNEERR [7:0]	Sets the maximum freq error allowed in units of 2 ppm before setting the AFC rail indicator (AFCRL). Default is 75. Range is 0–126.

Property 0x2003 AM_VALID_SNR_THRESHOLD

The AM_VALID_SNR_THRESHOLD property 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: 5

Units: dB

AM_VALID_SNR_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								AMVALSNR[7:0]							
0x00								0x05							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values, 0xFF for (–) values.
7:0	AMVALSNR [7:0]	Sets the SNR threshold for a valid AM Seek/Tune. Default is 5 dB. Range is –128 to 127 in steps of 1 dB. –128 = SNR is not used as a criterion in determining the validity of a station.

Property 0x2004 AM_VALID_RSSI_THRESHOLD

The AM_VALID_RSSI_THRESHOLD property 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: 10

Units: dBµV

AM_VALID_RSSI_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x00								AMVALRSSI[7:0]							
0x00								0x0A							

Bit	Name	Function
15:8	Reserved	Write 0 for (+) values, 0xFF for (–) values.
7:0	AMVALRSSI[7:0]	Sets the RSSI threshold for a valid AM Seek/Tune. Default is 10 dBµV. Range is –128 to 127 in steps of 1 dB. –128 = RSSI is not used as a criterion in determining the validity of a station.

Property 0x2200 AM_CHBW_SQ_MIN_MAX

The AM_CHBW_SQ_MIN_MAX property sets the maximum and minimum channel filter bandwidth in units of 100 Hz based on SNR or RSSI. To force a given channel filter bandwidth, set the min and max to the same 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: 0x2314

Units: 100 Hz

AM_CHBW_MIN_MAX															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
MAX[7:0]								MIN[7:0]							
0x23								0x14							

Bit	Name	Function
15:8	MAX [7:0]	Sets the maximum channel filter bandwidth in units of 100 Hz. Default is 3.5 kHz. Range is 15–50.
7:0	MIN [7:0]	Sets the minimum channel filter bandwidth in units of 100 Hz. Default is 2 kHz. Range is 15–50.

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Property 0x2201 AM_CHBW_SQ_HIGH_THRESHOLD

The AM_CHBW_SQ_HIGH_THRESHOLD property sets the SNR or RSSI threshold for maximum channel filter bandwidth. If the SNR or RSSI reported by the device is greater than the SQ High threshold programmed, then the channel filter bandwidth will be set to the maximum value programmed through Property 0x2200. 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: dB (for SNR), dBµV (for RSSI)

AM_CHBW_SQ_HIGH_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SQMAX[6:0]															
0x001E															

Bit	Name	Function
15:0	SQMAX[15:0]	Sets the SNR or RSSI threshold for maximum channel filter bandwidth. Default is 30 dB. Range is 0–127 dB (or dBµV for RSSI).

Property 0x2202 AM_CHBW_SQ_LOW_THRESHOLD

The AM_CHBW_SQ_LOW_THRESHOLD property sets the SNR or RSSI threshold for minimum channel filter bandwidth. If the SNR or RSSI reported by the device is less than the SQ Low threshold programmed, then the channel filter bandwidth will be set to the minimum value programmed through Property 0x2200. 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: dB (for SNR), dBµV (for RSSI)

AM_CHBW_SQ_LOW_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SQMIN[6:0]															
0x000F															

Bit	Name	Function
15:0	SQMIN[15:0]	Sets the SNR or RSSI threshold for minimum channel filter bandwidth. Default is 15 dB. Range is 0–127 dB (or dBµV for RSSI).

Property 0x2203 AM_CHBW_SQ_WIDENING_TIME

The AM_CHBW_SQ_WIDENING_TIME property sets the channel filter bandwidth widening time based on SNR or RSSI. 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

Units: ms

AM_CHBW_SQ_WIDENING_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
WIDENING_TIME[15:0]															
0x0800															

Bit	Name	Function
15:0	WIDENING_TIME[15:0]	Sets the SNR or RSSI based channel filter bandwidth widening time. Default is 2048 ms. Range is 1–32767 ms.

Property 0x2204 AM_CHBW_SQ_NARROWING_TIME

The AM_CHBW_SQ_NARROWING_TIME property sets the channel filter bandwidth narrowing time based on SNR or RSSI. 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

AM_CHBW_SQ_NARROWING_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NARROWING_TIME[15:0]															
0x0010															

Bit	Name	Function
15:0	NARROWING_TIME [15:0]	Sets the SNR or RSSI based channel filter bandwidth narrowing time. Default is 16 ms. Range is 1–32767 ms.

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Property 0x2205 AM_CHBW_ASSI_MIN_MAX

The AM_CHBW_ASSI_MIN_MAX property sets the maximum and minimum channel filter bandwidth in units of 100 Hz. Based on adjacent signal strength indicator (ASSI.) To force a given channel filter bandwidth, set the min and max to the same 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: 0x3232

Units: 100 Hz

AM_CHBW_ASSI_MIN_MAX															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
MAX[7:0]								MIN[7:0]							
0x32								0x32							

Bit	Name	Function
15:8	MAX[7:0]	Sets the maximum channel filter bandwidth in units of 100 Hz. Default is 5 kHz. Range is 15–100.
7:0	MIN[7:0]	Sets the minimum channel filter bandwidth in units of 100 Hz. Default is 5 kHz. Range is 15–100.

Property 0x2206 AM_CHBW_ASSI_LOW_THRESHOLD

The AM_CHBW_ASSI_LOW_THRESHOLD property sets the ASSI threshold in dB for maximum channel filter bandwidth. If the ASSI reported by the device is less than the ASSI Low threshold programmed, then the channel filter bandwidth will be set to the maximum value programmed through Property 0x2205. 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

AM_CHBW_ASSI_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ASSIMIN[15:0]															
0x000A															

Bit	Name	Function
15:0	ASSIMIN[15:0]	Sets the ASSI threshold for maximum channel filter bandwidth. Default is 10 dB. Range is –128 to 127 dB.

Property 0x2207 AM_CHBW_ASSI_HIGH_THRESHOLD

The AM_CHBW_ASSI_HIGH_THRESHOLD property sets the ASSI threshold in dB for minimum channel filter bandwidth. If the ASSI reported by the device is greater than the ASSI High threshold programmed, then the channel filter bandwidth will be set to the minimum value programmed through Property 0x2205. 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: dB

AM_CHBW_ASSI_HIGH_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ASSIMAX[15:0]															
0x001E															

Bit	Name	Function
15:0	ASSIMAX[15:0]	Sets the ASSI threshold for minimum channel filter bandwidth. Default is 30 dB. Range is –128 to 127 dB.

Property 0x2208 AM_CHBW_ASSI_WIDENING_TIME

The AM_CHBW_ASSI_WIDENING_TIME property sets the channel filter bandwidth widening time based on ASSI. 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

AM_CHBW_ASSI_WIDENING_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
WIDENING[15:0]															
0x0010															

Bit	Name	Function
15:0	WIDENING[15:0]	Sets the channel filter widening time in ms. Default is 16 ms. Range is 1–32767 ms.

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Property 0x2209 AM_CHBW_ASSI_NARROWING_TIME

The AM_CHBW_ASSI_NARROWING_TIME property sets the channel filter bandwidth narrowing time based on ASSI. 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

AM_CHBW_ASSI_NARROWING_TIME															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
NARROWING[15:0]															
0x0010															

Bit	Name	Function
15:0	NARROWING[15:0]	Sets the channel filter narrowing time in ms. Default is 16 ms. Range is 1–32767 ms.

Property 0x3100 AM_HICUT_SQ_HIGH_THRESHOLD

The AM_HICUT_SQ_HIGH_THRESHOLD property sets the SNR or RSSI level at which Hi-cut begins to band limit. 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: dB (for SNR), dBµV (for RSSI)

AM_HICUT_SQ_HIGH_THRESHOLD															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x000									SQ_HIGH[6:0]						
0x000									0x08						

Bit	Name	Function
15:7	Reserved	Always write 0.
6:0	SQ_HIGH[6:0]	Sets the SNR or RSSI level at which Hi-cut begins to band limit. Default is 8. Range is from 0–127 dB (for SNR), dBµV (for RSSI).

Property 0x3101 AM_HICUT_SQ_LOW_THRESHOLD

The AM_HICUT_SQ_LOW_THRESHOLD property sets the SNR or RSSI level at which Hi-cut reaches maximum band limiting. 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

AM_HICUT_SQ_LOW_THRESHOLD															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x000									SQ_LOW[6:0]						
0x000									0x08						

Bit	Name	Function
15:7	Reserved	Always write 0.
6:0	SQ_LOW[7:0]	Sets the SNR or RSSI level at which Hi-cut reaches maximum band limiting. Default is 0. Range is from 0–127 dB (for SNR), dBµV (for RSSI).

Property 0x3102 AM_HICUT_ATTACK_TIME

The AM_HICUT_ATTACK_TIME property sets the transition time in ms for which high cut lowers the cutoff frequency. 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

AM_HICUT_ATTACK_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
ATTACK[15:0]															
0x0010															

Bit	Name	Function
15:0	ATTACK[15:0]	Sets the transition time in ms for which high cut lowers the cutoff frequency. Default is 16 ms. Range is 16–32767 ms.

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Property 0x3103 AM_HICUT_RELEASE_TIME

The AM_HICUT_RELEASE_TIME property sets the transition time in ms for which high cut increases the cutoff frequency. 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

AM_HICUT_RELEASE_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
RELEASE[15:0]															
0x07D0															

Bit	Name	Function
15:0	RELEASE[15:0]	Sets the transition time in ms for which high cut increases the cutoff frequency. Default is 2000 ms. Range is 16–32767 ms.

Property 0x3104 AM_HICUT_CUTOFF_FREQ

The AM_HICUT_CUTOFF_FREQ property sets the maximum and minimum Hi-cut transition frequencies in units of 100 Hz. To force a given Hi-cut filter bandwidth, set the min and max to the same 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: 0x280A

Units: 100 Hz

AM_HICUT_CUTOFF_FREQ															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
MAX[7:0]								MIN[7:0]							
0x28								0x0A							

Bit	Name	Function
15:8	MAX [7:0]	Maximum Hi-cut transition frequency in units of 100 Hz. Default is 4 kHz. Range is 10–50.
7:0	MIN [7:0]	Minimum Hi-cut transition frequency in units of 100 Hz. Default is 1 kHz. Range is 10–50.

Property 0x3105 AM_LOWCUT_MIN_FREQ

The AM_LOWCUT_MIN_FREQ property sets the minimum cutoff frequency. The LowCut tracks the HICUT engine; therefore, thresholds are programmed in property 0x3100 and 0x3101. Setting the property to 0 disables LowCut. 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: 0A

Units: Hz

AM_HICUT_CUTOFF_FREQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FREQ_MIN[15:0]															
0x0000															

Bit	Name	Function
15:0	FREQ_MIN[15:0]	Sets the minimum LOW-CUT cutoff frequency in Hz. Default is disabled. Range is 0–1000 Hz. 0 = Disabled.

Property 0x3106 AM_LOWCUT_MAX_FREQ

The AM_LOWCUT_MAX_FREQ property sets the maximum cutoff frequency. The LowCut tracks the HICUT engine, therefore thresholds are programmed in property 0x3100 and 0x3101. 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: 0A

Units: Hz

AM_HICUT_CUTOFF_FREQ															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
FREQ_MAX[15:0]															
0x0000															

Bit	Name	Function
15:0	FREQ_MAX[15:0]	Sets the maximum LOW-CUT cutoff frequency in Hz. Note that if property 0x3105 (AM_LOWCUT_MIN_FREQ) is non-zero, this property must be set to a value no less than property 0x3105. Default is 0 Hz. Range is 0–1000 Hz.

Property 0x3300 AM_IBOC_CONTROL
(Si47777 Only)

The AM_IBOC_CONTROL property is the control property for IBOC Blend. DIGITAL_IO_INPUT_SAMPLE_RATE and DIGITAL_IO_INPUT_FORMAT must be configured before IBOC Blend will function. 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

AM_IBOC_CONTROL															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00							FORCE	0x00							ENABLE
0x00							0	0x00							0

Bit	Name	Function
15:9	Reserved	Always write 0.
8	Force	Forces IBOC Blend. Default is 0. 0 = Do not force IBOC blend. The audio source is determined by the IBOC control pin. 1 = Force IBOC blend. The audio comes from IBOC system.
7:1	Reserved	Always write 0.
0	Enable	IBOC Blend Enable. Default is 0. 0 = The IBOC blend system is disabled. 1 = The IBOC blend system is enabled.

Property 0x3301 AM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME
(Si4777 Only)

The AM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME property sets the crossfade time between full analog and full HD Digital audio in milliseconds. 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: 1000

Units: ms

AM_IBOC_ANALOG_TO_HD_CROSSFADE_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
TIME[15:0]															
0x03E8															

Bit	Name	Function
15:0	TIME[15:0]	Sets the full analog to full digital crossfade time in ms. Default is 1000 ms. Range is 0–22000 ms.

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**Property 0x3302 AM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME
(Si4777Only)**

The AM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME property sets the crossfade time from full HD Digital to full analog audio in milliseconds. 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: 1000

Units: ms

AM_IBOC_HD_TO_ANALOG_CROSSFADE_TIME															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
TIME[15:0]															
0x03E8															

Bit	Name	Function
15:0	TIME[15:0]	Sets the full digital to full analog crossfade time in ms. Default is 1000 ms. Range is 0–22000 ms.

**Property 0x3303 AM_IBOC_DYNAMIC_GAIN
(Si47777 Only)**

The AM_IBOC_DYNAMIC_GAIN property sets the digital audio dynamic linear scaling factor. 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: 0x007F

AM_IBOC_DYNAMIC_GAIN															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0x00								DGAIN[7:0]							
0x00								0x7F							

Bit	Name	Function
15:8	Reserved	Always write 0.
7:0	DGAIN[7:0]	Station dependent linear scaling factor in Q7 format. Range is 0–0x7F.

**Property 0x3304 AM_IBOC_STATIC_GAIN
(Si4777 Only)**

The AM_IBOC_STATIC_GAIN property sets the digital audio static linear gain factor. Reverse the sign of this number to obtain a 180 degree phase shift. 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: 0x0100

AM_IBOC_STATIC_GAIN															
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
SGAIN[15:0]															
0x0100															

Bit	Name	Function
15:0	SGAIN[15:0]	Static linear gain factor in Q7.8 format. Range is 0x8000–0x7FFF.

RESP	Bit	Name	Function
1	7:3	Reserved	Values may vary.
1	2	HICUT_INT	If set indicates that the Hi-cut cutoff frequency is below the Hi-cut threshold set by WB_ACF_HICUT_THRESHOLD.
1	1	CHBW_INT	If set indicates that the Channel Filter Bandwidth is less than the threshold set by WB_ACF_CHBW_THRESHOLD.
1	0	SOFTMUTE_INT	Is set Indicates that softmute attenuation has increased above the softmute threshold as set by WB_ACF_SM_THRESHOLD.
2	7:1	Reserved	Values may vary.
2	0	SMUTE	0 = Audio is not soft muted. 1 = Audio is soft muted.
3	7:0	SMATTN[7:0]	Soft mute attenuation level in dB. Range: 0–31.
4	7:0	CHANBW[7:0]	Channel filter bandwidth in 100 Hz. Range: 0–150.
5	7:0	HICUT [7:0]	Hi-cut cutoff frequency in units of 100 Hz. Range: 10–50.

10. Programming Examples

Table summarizes descriptions and programming examples in this section.

Table 18. Configuration and Operation Examples

	Section	Description
Configuration	10.1.1	Analog/Digital/MPX audio
	10.1.2	IBOC HD Radio
	10.1.3	AGC
	10.1.4	Interrupts
	10.1.5	Noise Blankers
	10.1.6	Channel Equalizer
	10.1.7	Pop Filter
	10.1.8	Channel Filter Bandwidth
	10.1.9	Softmute
	10.1.10	Automatic Volume Control (AVC)
	10.1.11	Blend
	10.1.12	Hi-cut
	10.1.13	Hi-blend
	10.1.14	Primary/Companion
Operation	10.2.1	Tune
	10.2.2	Seek
	10.2.3	RDS
	10.2.5	Check CTS and ERR
	10.2.6	Check STC

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10.1. Configuration

The following tables summarize the available configuration options for AM and FM functions. Refer to section "9. Commands and Properties"for detailed descriptions of commands and properties.

Table 19. FM Configuration Commands and Properties

Pin Configuration	Commands	Properties
Interrupts	0x1C	0x0000
GPIO Configuration	0x1A	
Analog/MPX audio	0x1B	
Digital audio	0x18	0x0200
ZIF	0x19	0x0600
RF/Audio Configuration	**Commands**	**Properties**
Softmute		0x0400
RF Signal routing, AGC thresholds and timing		0x0700
Channel spacing		0x1100
RSQ (RSSI, SNR) Interrupts		0x1200
ACF (Softmute, Channel Filter Bandwidth, Hi-blend, Hi-cut) Interrupts		0x1300
Tune/seek metric thresholds and timing (RSSI, SNR, frequency error)		0x2000
Channel filter bandwidth (RSSI, SNR, ASSI, ASSI200) range and timing		0x2200
Channel Equalizer		0x3400
Blend (RSSI/SNR, Multi-path, USN) range and timing		0x3500
Hi-cut (RSSI/SNR, Multi-path, USN) range and timing		0x3600
Hi-blend (RSSI/SNR, Multi-path, USN) range and timing		0x3700
IBOC Configuration	**Commands**	**Properties**
IBOC (cross-fade timing, dynamic and static gains)		0x3300
RDS Configuration	**Commands**	**Properties**
RDS Interrupts, FIFO size and management, decoder configuration		0x4000

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Table 20. AM Configuration Commands and Properties

Pin Configuration	Commands	Properties
Interrupts	0x1C	0x0000
GPIO Configuration	0x1A	
Analog audio	0x1B	
Digital audio	0x18	0x0200
ZIF	0x19	0x0600
RF/Audio Configuration	**Commands**	**Properties**
Power line filtering		0x0300
Softmute		0x0400
AVC (automatic volume control)		0x0500
RF Signal routing, AGC thresholds and timing		0x0700
Channel spacing		0x1100
RSQ (RSSI, SNR) Interrupts		0x1200
ACF (Softmute, Channel Filter Bandwidth, Hi-cut) Interrupts		0x1300
Tune/seek metric thresholds and timing (RSSI, SNR, frequency error)		0x2000
Channel filter bandwidth (RSSI, SNR, ASSI) range and timing		0x2200
Hi-cut (RSSI/SNR) range and timing		0x3100
IBOC Configuration	**Commands**	**Properties**
IBOC (cross-fade timing, dynamic and static gains)		0x3300

10.1.1. Analog/Digital/MPX audio

Analog, digital and MPX audio setup includes pin and sample rate (if applicable) configuration.

1. Complete steps up to and including 5 in section 5.1 Powerup one Receiver from Internal Memory or 10 in section 5.2 Powerup one Receiver from a Patch.

2. Send the ANA_AUDIO_PIN_CFG command to route analog left and right channel to LOUT/ROUT pins, or to route the MPX to the LOUT pin. This step may be omitted if analog audio is not required.

Example:

ANA_AUDIO_PIN_CFG Command		
Action	Data	Description
CMD	0x1B	ANA_AUDIO_PIN_CFG
ARG1	0x02	2 = LOUT/ROUT pins configured to output audio. 3 = LOUT is configured for MPX out and ROUT is disabled.
STATUS	→0x80	

1. Send the DIG_AUDIO_PIN_CFG command to configure DCLK, DFS and DOUT for digital audio in slave mode. Note that DCLK and DFS inputs should be stable before sending this command. This step may be omitted if digital audio is not required.

Example:

DIG_AUDIO_PIN_CFG Command		
Action	Data	Description
CMD	0x18	DIG_AUDIO_PIN_CFG
ARG1	0x0A	0x0A = configure DCLK pin for digital audio slave mode.
ARG2	0x0A	0x0A = configure DFS pin for digital audio slave mode.
ARG3	0x0C	0x0C = configure DOUT pin for digital out.
ARG3	0x00	0x00 = Do not modify the behavior of the BLEND pin.
STATUS	→0x80	

1. Set property 0x0202 DIGITAL_IO_OUTPUT_SAMPLE_RATE to set the sample rate and 0x0203 DIGITAL_IO_OUTPUT_FORMATS to set the bit width and justification. This step may be omitted if digital audio is not required.

2. Proceed to other examples in this section.

10.1.2. IBOC HD Radio

IBOC HD radio setup requires configuration of input and output sample rates, I2S digital audio input and blend control from the IBOC demodulator, I2S blended audio input to the system audio processor. Figure 16 shows a conceptual diagram of the hardware interconnects.
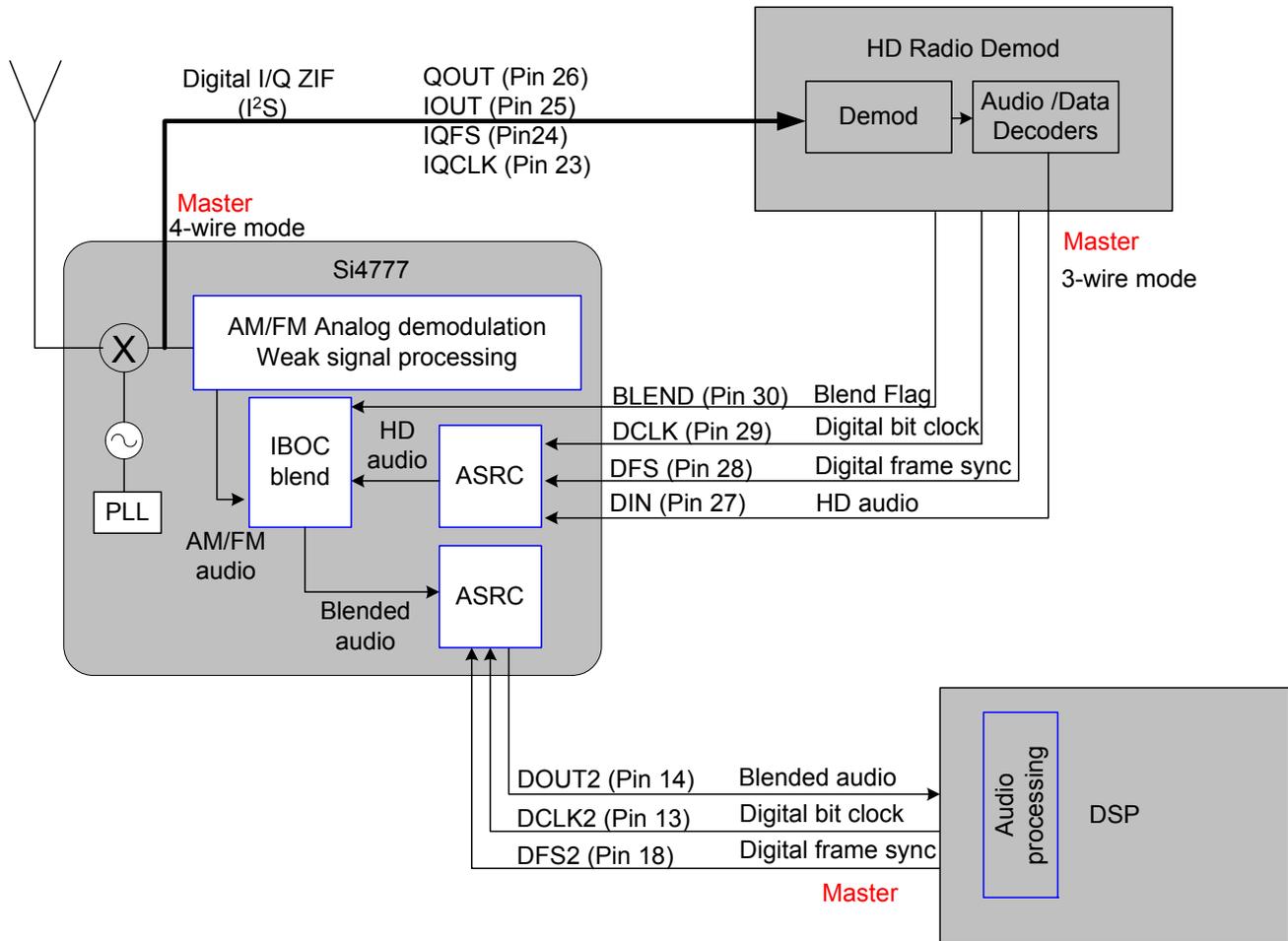
Figure 16. System Implementation of HD-Radio Reception with IBOC Blend on the Si47777

1. Complete steps up to and including 5 in section "5.1. Powerup from Internal Memory"or 10 in section "5.2. Powerup from a Patch".
2. Set property 0x0301 AUDIO_MUTE.

Example:

SET_PROPERTY Command		
Action	**Data**	**Description**
CMD	0x13	SET_PROPERTY
ARG1	0x00	
ARG2	0x03	0x0301 = AUDIO MUTE
ARG3	0x01	
ARG4	0x00	0x0003 = Mute left and right
ARG5	0x03	
STATUS	→0x80	

3. Set property 0x0200 DIGITAL_IO_INPUT_SAMPLE_RATES and 0x0202
   DIGITAL_IO_OUTPUT_SAMPLE_RATE to configure the input and output digital sample rates.

Example:

SET_PROPERTY Command		
Action	**Data**	**Description**
CMD	0x13	SET_PROPERTY
ARG1	0x00	
ARG2	0x02	0x0200 = DIGITAL_IO_IN-PUT_SAMPLE_RATES
ARG3	0x00	
ARG4	0xAC	0xAC44 = 44.1 kHz
ARG5	0x44	
STATUS	→0x80	

SET_PROPERTY Command		
Action	**Data**	**Description**
CMD	0x13	SET_PROPERTY
ARG1	0x00	
ARG2	0x02	0x0202 = DIGITAL_IO_OUT-PUT_SAMPLE_RATES
ARG3	0x02	
ARG4	0xAC	0xAC44 = 44.1 kHz
ARG5	0x44	
STATUS	→0x80	

4. Send the DIG_AUDIO_PIN_CFG command to configure DCLK, DFS and DIN for I2S audio input in slave
   mode and the BLEND pin to select the mode of the audio combiner. Note that DCLK and DFS inputs

should be stable before sending this command.

Example:

DIG_AUDIO_PIN_CFG Command

Action	Data	Description
CMD	0x18	DIG_AUDIO_PIN_CFG
ARG1	0x0A	0x0A = configure DCLK pin 29 for digital audio in slave mode.
ARG2	0x0A	0x0A = configure DFS pin 28 for digital audio in slave mode.
ARG3	0x0D	0x0D = configure DIN pin 27 for digital in.
ARG3	0x17	0x17 = configure BLEND pin 30 to select the mode of the audio combiner (analog or HD).
STATUS	→0x80	

5. Send the ZIF_PIN_CFG command to configure IOUT, QOUT, IQCLK and IQFS pins for ZIF output in I2S master mode.

Example:

ZIF_PIN_CFG Command

Action	Data	Description
CMD	0x19	ZIF_PIN_CFG
ARG1	0x15	0x15 = configure IQCLK pin 23 for I/Q output in master mode.
ARG2	0x15	0x15 = configure IQFS pin 24 for I/Q output in master mode.
ARG3	0x16	0x16 = configure IOUT pin 25 for I/Q output in master mode.
ARG3	0x16	0x16 = configure QOUT pin 26 for I/Q output in master mode.
STATUS	→0x80	

6. Send the IC_LINK_GPIO_CTL_PIN_CFG command to configure DCLK2 and DOUT2 pins in I2S slave mode. Note that the DCLK2 input should be stable before sending this command.

Example:

GPIO_CTL_PIN_CFG Command		
Action	**Data**	**Description**
CMD	0x1A	GPIO_CTL_PIN_CFG
ARG1	0x00	
ARG2	0x00	
ARG3	0x0A	0x0A = Configure ICON pin as DCLK2 in slave mode.
ARG4	0x0E	0x0E = Configure ICOP pin as DOUT2 in slave mode.
STATUS	→0x80	

7. Send the INTB_PIN_CFG command to configure DFS2 in I2S slave mode. Note that the DFS2 input should be stable before sending this command. In this example, the interrupt pin is set to the A1 pin. Note that only the A0 pin is available for I2C address selection in this mode. Note also that the interrupt pin can be moved to the A1 pin with a POWER_UP option.

Example:

INTB_PIN_CFG Command		
Action	**Data**	**Description**
CMD	0x1C	INTB_PIN_CFG
ARG1	0x0A	0x0A = Configure the DFS2 pin 18 for digital audio in slave mode.
ARG2	0x28	0x28 = Configure the A1 pin as the interrupt.
ARG3	0x00	
ARG4	0x00	
STATUS	→0x80	

8. Enable the IBOC blend system.

SET_PROPERTY Command		
Action	**Data**	**Description**
CMD	0x13	SET_PROPERTY
ARG1	0x00	
ARG2	0x33	
ARG3	0x00	
ARG4	0x00	
ARG5	0x01	0x01 = enable
STATUS	→0x80	

9. Note that tuning requires setting the HD bit for proper bandwidth configuration. See Section 9.2.1 Tune. Proceed to other examples in this section.

10.1.3. AGC

For FM mode, the AGC default configuration is generally optimal. The following section describes the settings and options. AGC settings may be over-ridden by setting property 0x0710 FM_AGC_OVERRIDE and the state of the AGC peak detectors may be monitored by sending command 0x17 AGC_STATUS.

10.1.3.1. FM

FM AGC configuration involves setting signal routing, AGC and peak detector.

The default property settings are configured for routing through the LNA input (instead of directly to the mixer) with 50 Ω LNA impedance as shown in Figure 17.
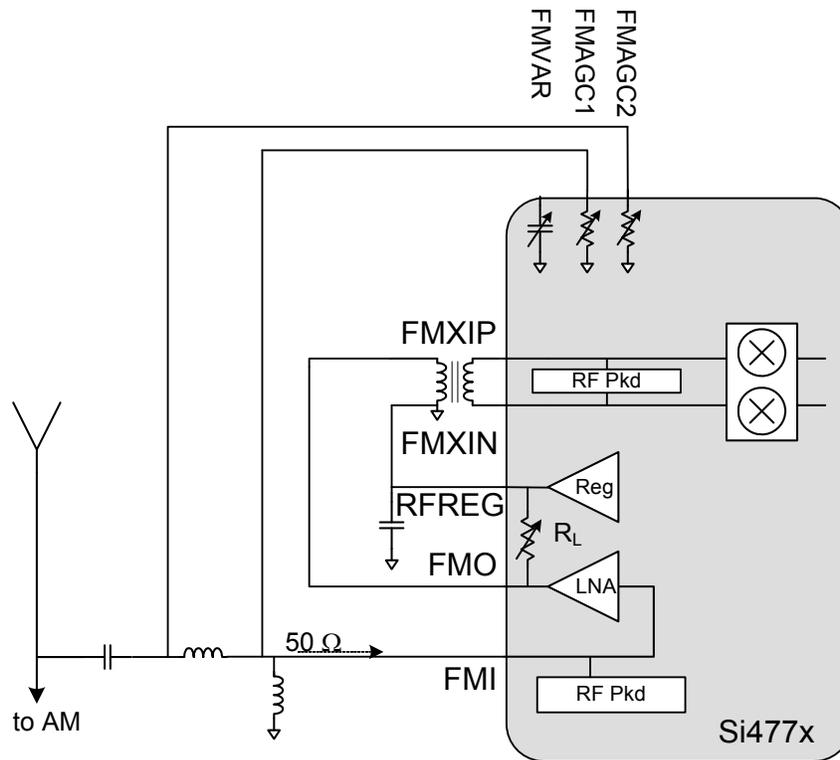
Figure 17. FM Single Receiver System Diagram

For optimal weak signal, blocker and intermodulation performance, the default property settings are configured to disable the LNA peak detector and associated attack/release time constants, and enable the mixer peak detector thresholds to 85 dBμV and 3 dB hysteresis, with an attack time of 4 ms and release time of 80 ms.

To improve weak signal performance at the expense of intermodulation performance, the mixer peak detector thresholds may be increased to as high as 93 dBμV. To improve blocker and intermodulation performance at the expense of weak signal performance, the mixer peak detector thresholds may be decreased to as low as 79 dBμV.

To improve impulsive noise desensitization (caused by engaging the AGC) at the expense of AGC response time, the mixer peak detector attack time may be increased from 4 ms to an attack time greater than the period of the impulses.

10.1.3.2. AM

AM AGC configuration involves configuring signal routing, AGC and peak detector characteristics.

The default property settings are configured for optimal performance with the harmonic rejection enabled, IF AGC attack time of 80 ms and release time of 804 ms, RF attack time of 8 ms and RF release time of 800 ms.

10.1.4. Interrupts

The interrupt status can be monitored by sending command 0x15 GET_INT_STATUS. Note that the command response varies based on FM or AM mode. Interrupt pins can be configured by sending command 0x1C INTB_PIN_CFG.

Property 0x0000 INT_CTL_ENABLE enables top-level interrupt sources and interrupt repetition characteristics. Property group 0x1200 configures RSQ (RSSI, SNR) interrupts. Property group 0x1300 configures ACF (Softmute, Channel Filter Bandwidth, Hi-blend, Hi-cut) interrupts. Note that Hi-blend only applies to FM mode operation. Property group 0x4000 configures RDS interrupts.

10.1.5. Channel Equalizer

Property 0x3400 enables and disables the FM multipath channel equalizer.

Multi-path interference results in frequency-selective and frequency-flat fading of the FM signal at the receiver.

Frequency-selective fading causes different frequencies of an input signal to be attenuated and phase shifted differently in a channel. Frequency-selective fading gives rise to notches in the frequency response of the channel. The channel equalizer performs blind equalization utilizing proprietary constant modulus algorithm (CMA) to restore the flat response of the channel.

The channel equalizer is enabled when multipath > 8% and disabled when multipath < 4% for stereo, when multipath > 30% and disabled when multipath < 25% for mono, enabled when max(LASSI, HASSI) > 30 dB and disabled when max(LASSI, HASSI) < 20 dB, enabled when ASSI200 > 50 dB and disabled when ASSI200 < 40 dB. Stereo is set if the PLL is locked or there is significant energy at the pilot. If any condition is satisfied, the channel equalizer will be enabled.

Table 21 summarizes the metric conditions that will enable the equalizer.

Table 21. Equalizer Enable Conditions

Metric	Enable Threshold	Disable Threshold
Multipath (Stereo)	> 8%	< 4%
Multipath (Mono)	> 30%	< 25%
max (LASSI, HASSI)	> 30 dB	< 20 dB
ASSI200	> 50 dB	< 40 dB

10.1.6. Channel Filter Bandwidth

10.1.6.1. FM

Property group 0x2200 configures channel filter bandwidth characteristics for FM mode.

Five independent channel filter bandwidth engines can be configured using RSSI (weak signal engine), ASSI100 (absolute value of difference between ±100 kHz channel RSSI), ASSI200 (sum of ±200 kHz channel RSSI minus desired channel RSSI), and 200 kHz blocker deviation as the metric. For RSSI, ASSI100, and ASSI200, channel filter bandwidth ranging from minimum to maximum occurs at the specified widening rate as the metric increases above the minimum threshold and reaches maximum threshold. Channel filter bandwidth ranging from maximum to minimum occurs at the specified narrowing rate as the metric decreases below the maximum threshold and reaches the minimum threshold. For 200 kHz blocker deviation, channel filter bandwidth ranging from 80 to 32 kHz occurs at 1 ms rate as the metric increases above 75 kHz and reaches 100 kHz. Channel filter bandwidth ranging from 32 to 80 kHz occurs at the 300 ms rate as the metric decreases below 100 kHz and reaches 75 kHz. The resulting channel filter bandwidth is the minimum of the result of the five blend engine calculations.

Property 0x220F FM_CHBW_WEAKSIG_THR is used to set the hysteresis window for enabling the weak signal RSSI engine. The default is to enable above 16 dBuV RSSI and disable below 14 dBµV RSSI. Note that this hysteresis range is always determined by RSSI and is not configurable with the FM_ACF_CONTROL_SOURCE property.

Property 0x2210 FM_CHBW_BLOCKER_THR is used to set the hysteresis window for engaging the 200 kHz blocker engine. The default is to enable above 20 dB ASSI200 and disable below 10 dB ASSI200. Note that 2 dB ASSI200 indicates that the sum of the energy at +200 kHz and –200 kHz is 20 dB greater than the desired channel. The 200 kHz blocker deviation engine is only enabled when sufficient pilot energy is present on the desired channel.

10.1.6.2. AM

Property group 0x2200 configures channel filter bandwidth characteristics for AM mode.

Two independent channel filter bandwidth engines can be configured using RSSI or SNR and ASSI (independent ±9/10 kHz channel RSSI relative to on-channel RSSI). Channel filter bandwidth ranging from minimum to maximum occurs at the specified widening rate as the metric increases above the minimum threshold and reaches maximum threshold. Channel filter bandwidth ranging from maximum to minimum occurs at the specified narrowing rate as the metric decreases below the maximum threshold and reaches the minimum threshold. The resulting channel filter bandwidth is the minimum of the result of the two blend engine calculations.

Property 0x1306 AM_ACF_CONTROL_SOURCE is used to select RSSI or SNR as a metric for the channel filter bandwidth.

10.1.7. Softmute

Property group 0x0400 configures softmute characteristics for FM and AM modes.

Property 0x1306 FM_ACF_CONTROL_SOURCE (or AM_ACF_CONTROL_SOURCE is used to select SNR (default) or RSSI as a metric for the softmute engine. For FM and AM modes, the property is also used to select whether an AFC rail condition will engage softmute. The most common cause for an AFC rail condition is tuning to an idle channel.

Softmute engages as SNR (or RSSI) drops below a trigger threshold and audio level reaches a maximum attenuation at the end threshold. Softmute releases as SNR (or RSSI) rises above the end threshold and audio level reaches full level at the trigger threshold. The attack and release rates are configurable along with maximum attenuation and trigger and end thresholds.

10.1.8. Automatic Volume Control (AVC)

Property group 0x0500 configures automatic volume control (AVC) for AM mode.

The AVC minimum and maximum gain can be configured. The AVC maintains a constant carrier level.

10.1.9. Mono/stereo Blend

Property group 0x3500 configures the mono/stereo blend characteristics for FM mode.

Three independent blend engines can be configured with rates using RSSI, multipath, and USN as the metric. Blend from minimum stereo to maximum stereo separation occurs at the specified attack rate as the metric increases above the minimum threshold and reaches maximum threshold. Blend from maximum stereo to minimum stereo separation occurs at the specified release rate as the metric decreases below the maximum threshold and reaches the minimum threshold. The resulting stereo separation is the minimum of the result of the six blend engine calculations.

10.1.10. Hi-cut

Hi-cut applies a lowpass filter to the L+R MPX audio.

10.1.10.1. FM

Property group 0x3600 configures the Hi-cut characteristics for FM mode.

Three independent blend engines can be configured with rates using RSSI, multipath, and USN as the metric. Hi-cut from minimum to maximum occurs at the specified attack rate as the metric increases above the minimum threshold and reaches maximum threshold. Hi-cut from maximum to minimum occurs at the specified release rate as the metric decreases below the maximum threshold and reaches the minimum threshold. The resulting Hi-cut is the minimum of the result of the six blend engine calculations.

10.1.10.2. AM

Property group 0x3100 configures the Hi-cut characteristics for AM mode.

The blend engine can be configured with RSSI or SNR as the metric. Hi-cut from minimum to maximum occurs at the specified attack rate as the metric increases above the minimum threshold and reaches maximum threshold. Hi-cut from maximum to minimum occurs at the specified release rate as the metric decreases below the maximum threshold and reaches the minimum threshold.

10.1.11. Hi-blend

Hi-blend applies a lowpass filter to the L-R MPX audio. Property group 0x3700 configures the Hi-blend characteristics for FM mode.

Three independent blend engines can be configured with rates using RSSI, multipath, and USN as the metric. Hi-blend from minimum to maximum occurs at the specified attack rate as the metric increases above the minimum threshold and reaches maximum threshold. Hi-blend from maximum to minimum occurs at the specified release rate as the metric decreases below the maximum threshold and reaches the minimum threshold. The resulting Hi-blend is the minimum of the result of the six blend engine calculations.

10.2. Operation

Operations including sending a command, checking CTS and ERR state, checking STC state, tune, seek, phase diversity receiver mode selection and RDS are possible.

10.2.1. Tune

The tune operation provides options for configuring normal FM or HD bandwidth, tuning mode (validated normal tune, unvalidated fast tune) and audio filter state management (re-initialize based on new channel, or smoothly transition from current to new channel). In the case of tuning mode, 0x2000 property group sets the tune/seek metric thresholds and timing (RSSI, SNR, frequency error). Note that references to "AFC Rail" in this manual refers to a condition in which the frequency offset of the desired channel is outside the frequency error as configured with property group 0x2000.
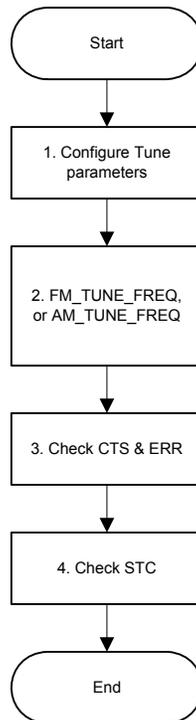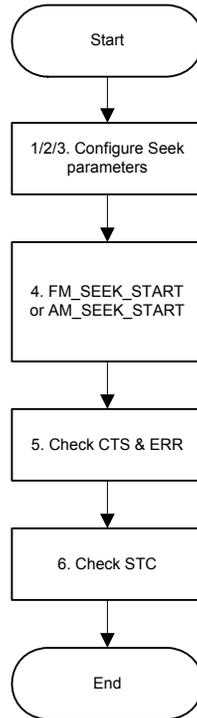

1. Complete the appropriate steps in section "10.1. Configuration".

2. Send the FM_TUNE_FREQ command to tune to a specific frequency. If the receiver has been muted (for example during IBOC HD configuration), set property 0x0301 to disable mute. Note that AM tuning is very similar. Refer to the AM_TUNE_FREQ command.

Example:

FM_TUNE_FREQ Command		
Action	**Data**	**Description**
CMD	0x30	FM_TUNE_FREQ
ARG1	0x00	Normal bandwidth (vs. HD bandwidth), unconditionally stay on channel, initialize audio state based on new channel.
ARG2	0x27	0x27A6 = tune to 101.50 MHz.
ARG3	0xA6	
ARG4	0x00	
ARG5	0x00	
STATUS	→0x80	CTS = 1

3. Check the CTS and ERR state to determine whether it is safe to send the next command. Refer to section "10.2.4. Check CTS and ERR Status".

4. Check the STC state to determine tune status. Refer to section xxx Check STC state.

5. Repeat steps 2, 3, and 4 as necessary.

10.2.2. Seek

1. Complete the appropriate steps in section "10.1. Configuration".
2. Set the 0x1100 property group to configure the seek start, stop and channel spacing.
3. Set the 0x2000 property group to set the tune/seek metric thresholds and timing (RSSI, SNR, frequency error).   Note that because every system will have unique signal gain and noise characteristics, RSSI and SNR thresholds should be carefully evaluated.
4. Send the FM_SEEK_START command to begin the seek operation.

Example:

FM_SEEK_START Command		
Action	Data	Description
CMD	0x30	FM_SEEK_START
ARG1	0x08	Seek up, don't wrap at the top of the band.
STATUS	→0x80	CTS = 1

5. Check the CTS and ERR state to determine whether it is safe to send the next command. Refer to section "10.2.4. Check CTS and ERR Status".
6. Check the STC state to determine seek status and abort if desired. Refer to Check STC state.
7. Repeat steps 4, 5, and 6 as necessary.

10.2.3. RDS

1. Complete the appropriate steps in section "10.1. Configuration"and section "10.2.1. Tune".
2. Set the 0x4000 property group to configure RDS Interrupts, FIFO size and management, and decoder configuration.
3. (Optional) Send the FM_RDS_BLOCKCOUNT command to verify RDS block error rate. The block error rate is defined as BLER = (UNCORRECTABLE + (EXPECTED-RECEIVED)) / EXPECTED.

Example:

FM_RDS_BLOCKCOUNT Command		
Action	**Data**	**Description**
CMD	0x37	FM_RDS_BLOCKCOUNT
ARG1	0x01	Clear the block count.
STATUS	→0x80	CTS = 1
RESP1	→0x00	
RESP2	→0x27	Expected 0x271F = 10015
RESP3	→0x1F	
RESP4	→0x24	Received 0x248B = 9355
RESP5	→0x8B	
RESP6	→0x00	Uncorrectable 0x001B = 27
RESP7	→0x1B	

In this example, the BLER = (27 + (10015-9355)) / 10015 = 6.8%.

4. Send the FM_RDS_STATUS in response to a configured RDS interrupt or at a set time interval. For example, an interrupt can be configured when the 25 group FIFO has any number of entries between 1 and 25. Alternatively, the command can be sent every 88 ms (time for one group to be received) to 2.2 seconds (time for 25 groups to be received). The FM_RDS_STATUS command must be called once for each entry. The FIFOUSED field can be used to monitor FIFO status. Refer to the RDS and RBDS specifications for further decoding information.

Example:

FM_RDS_STATUS Command		
Action	**Data**	**Description**
CMD	0x36	FM_RDS_STATUS
ARG1	0x01	Acknowledge the STC interrupt.
STATUS	→0x80	CTS = 1
RESP1	→0x00	
RESP2	→0x1A	TP/PTY has changed, PI has changed, synchronization has changed.
RESP3	→0x05	PTY = 5
RESP4	→0x3E	PI = 0x3E67
RESP5	→0x67	
RESP6	→0x01	FIFO used = 1 (out of a maximum of 25)
RESP7	→0x00	BLEA = 0, BLEB = 0, BLEC = 0, BLED = 0
RESP8	→0x3E	BLOCKA = 0x3E67 (PI code)
RESP9	→0x67	
RESP10	→0x20	BLOCKB = 0x20A7, group 2A (RadioText), PTY = 5, A/B flag = 0, text segment address code = 7
RESP11	→0xA7	
RESP12	→0x6C	BLOCKC = 0x6C74 (ASCII) = "lt"
RESP13	→0x74	
RESP14	→0x65	BLOCKD = 0x6572 (ASCII) = "er"
RESP15	→0x72	

5. Repeat steps 3 and 4 as necessary.

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10.2.4. Check CTS and ERR Status

After every command the CTS bit state should be checked to determine whether it is safe to send the next command and the ERR bit state should be checked to determine whether an error has occurred.
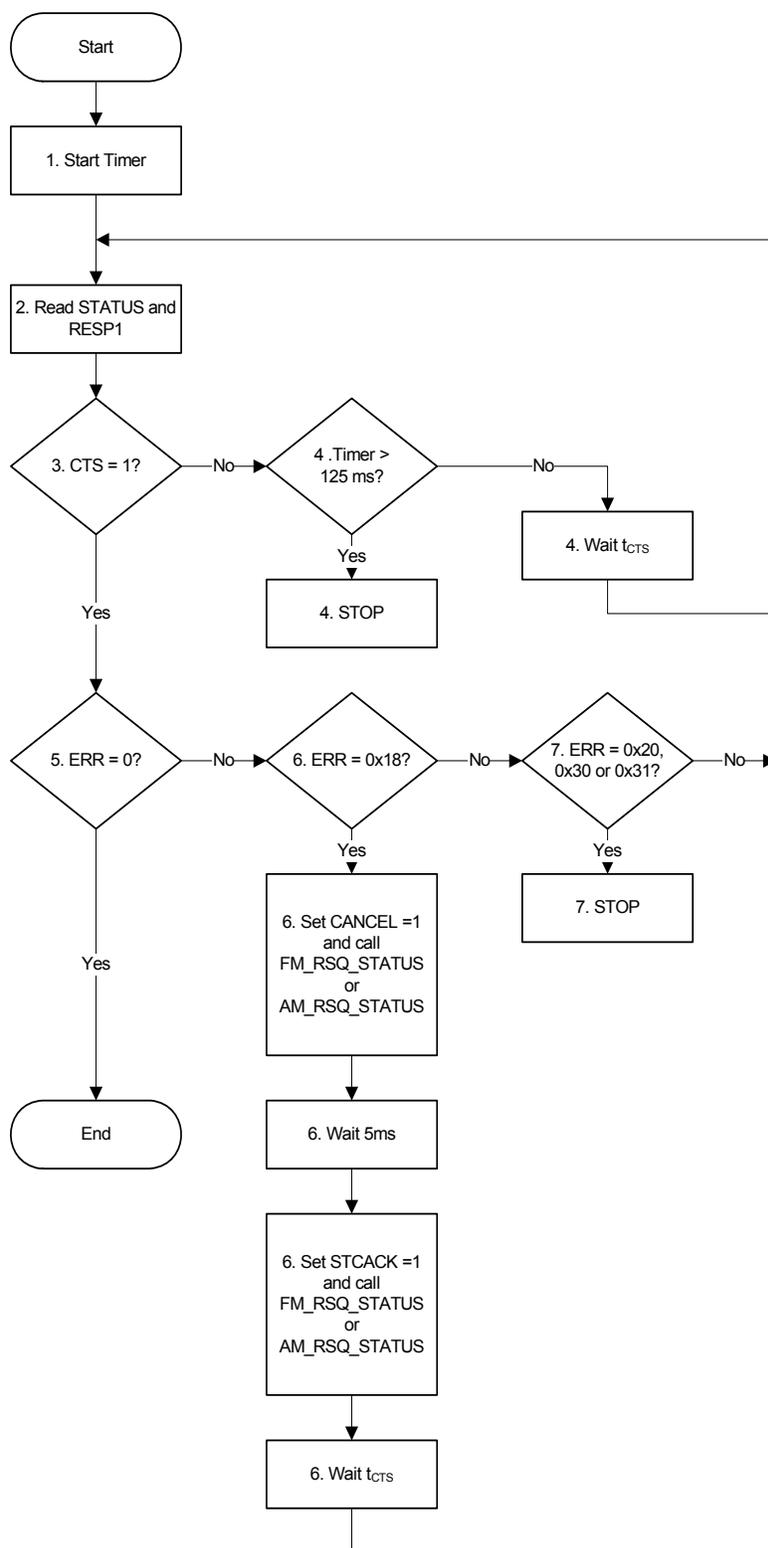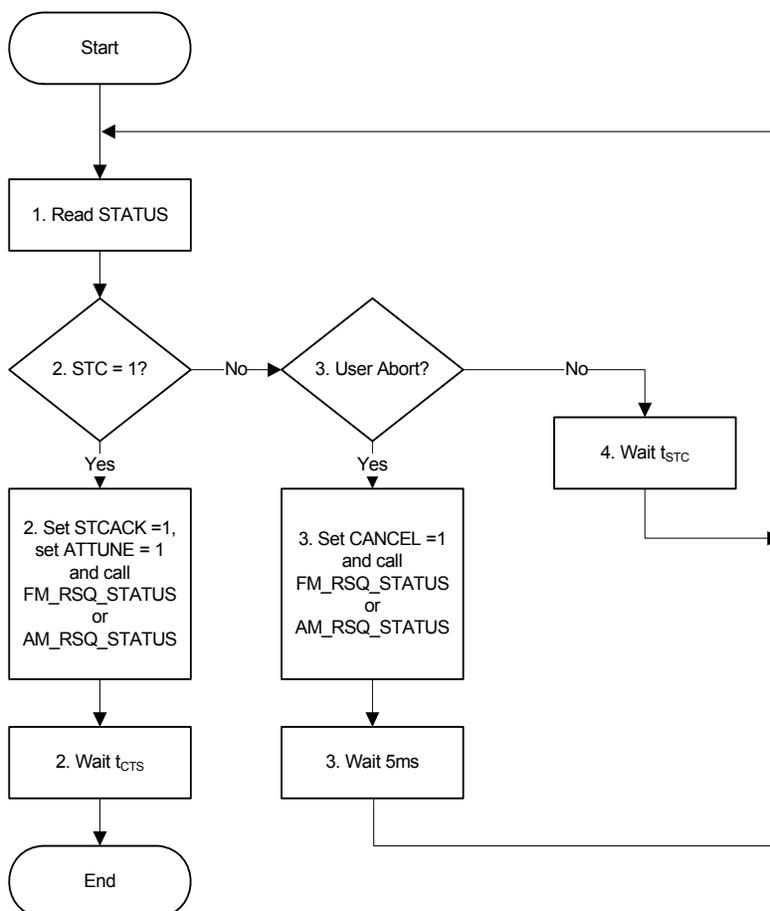
1. Start a timer capable of measuring 100 µs to 125 ms.

2. Read the STATUS byte and RESP1.

3. If CTS is set, it is safe to send the next command. Go to step 5.

4. If CTS is not set, check if the timer measures greater than 125 ms (time to execute the POWER_UP command plus 20% margin). If it does, it is likely that the receiver is not in the power up state. Refer to "5. Powerup and Powerdown" on page 4. If it doesn't, wait time t_{CTS} (100 µs). Refer to "8. Timing" on page 22.

5. If ERR (error) is set, check the specific error code reported in RESP1.

6. If the error code is 0x18, the tune or seek command is in progress and should be aborted by setting CANCEL = 1 and sending the FM_RSQ_STATUS command (or AM_RSQ_STATUS), waiting 5 ms for the seek operation to abort and set the STC bit, acknowledge and clear the STC bit by setting STCACK = 1 and sending the FM_RSQ_STATUS command (or AM_RSQ_STATUS) again, and then waiting time t_{CTS} (100 µs). Refer to "8. Timing" on page 22.

7. If the error code is 0x30 or 0x31 the boot operation failed and the powerup operation should be attempted. Refer to "5. Powerup and Powerdown" on page 4. If the error code is 0x20 contact Silicon Labs. All other errors are recoverable. and the error code reported in RESP1 will clear when the next valid command is sent. See Table 22.

Table 22. Error Codes and Remedies

RESP1	Error Code	Explanation and Remedy
0x10	Bad command	Unsupported command, possibly due to programming error or incorrect device population. For example, an Si4771 is mistakenly placed on a design instead of the Si4777 and and an attempt is made to configure the part for ZIF output.
0x11	Bad ARG1	Argument out of range or invalid mode, possibly due to programming error or incorrect device population.
0x12	Bad ARG2	
0x13	Bad ARG3	
0x14	Bad ARG4	
0x18	Command Busy	Wait for command completion, or abort tune/seek.
0x20	Bad internal memory	Internal memory corruption. Contact Silicon Labs.
0x30	Bad patch	Patch CRC is incorrect. Recover by repeating the powerup sequence with correct patch.
0x31	Bad boot mode	Mode is not supported. Recover by repeating the powerup sequence with supported mode (AM, FM).
0x40	Bad property	Unsupported property, possibly due to programming error or incorrect device population.

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10.2.5. Check STC Status

After every command the STC (seek/tune complete) bit state should be checked to determine the state of the tune or seek command and abort the operation if desired.

```
                              ┌──────────┐
                              │  Start   │
                              └────┬─────┘
                                   │
                                   │◄─────────────────────────────────────┐
                                   ▼                                       │
                           ┌───────────────┐                              │
                           │ 1. Read STATUS │                             │
                           └───────┬────────┘                             │
                                   ▼                                       │
                              ╱────────╲        No      ╱───────────╲  No  │
                             ╱ 2. STC = 1? ╲──────────►╱ 3. User Abort? ╲──┤
                             ╲            ╱             ╲             ╱     │
                              ╲────────╱                ╲───────────╱      │
                                   │ Yes                     │ Yes   ┌───────────┐
                                   ▼                         ▼       │4. Wait t_STC│
                        ┌──────────────────┐  ┌──────────────────┐  └───────────┘
                        │ 2. Set STCACK =1, │  │ 3. Set CANCEL =1 │
                        │  set ATTUNE = 1   │  │    and call      │
                        │   and call        │  │  FM_RSQ_STATUS   │
                        │  FM_RSQ_STATUS    │  │      or          │
                        │      or           │  │  AM_RSQ_STATUS   │
                        │  AM_RSQ_STATUS    │  └────────┬─────────┘
                        └────────┬─────────┘           ▼
                                 ▼                ┌──────────────┐
                        ┌──────────────┐          │ 3. Wait 5ms  │
                        │ 2. Wait t_CTS │         └──────────────┘
                        └──────┬───────┘
                               ▼
                          ┌─────────┐
                          │   End   │
                          └─────────┘
```

1. Read the STATUS byte.
2. If STC (seek/tune complete) is set, set STCACK = 1 to acknowledge and clear the STC bit and set ATTUNE = 1 to return RSQ metrics from tune time and call FM_RSQ_STATUS (or AM_RSQ_STATUS).

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Example:

FM_RSQ_STATUS Command		
Action	**Data**	**Description**
CMD	0x32	FM_RSQ_STATUS
ARG1	0x05	Return metrics from tune time, acknowledge the STC interrupt.
STATUS	→0x81	CTS = 1, STC = 1
RESP1	→0x00	
RESP2	→0x31	SNR ready, RSSI ready, valid channel.
RESP3	→0x27	Tuning frequency 0x027A6 = 101.50 MHz
RESP4	→0xA6	
RESP5	→0x10	Frequency offset = 16 ppm
RESP6	→0x25	RSSI = 37 dBμV
RESP7	→0x14	SNR = 20 dB
RESP8	→0x00	
RESP9	→0xFB	–100 kHz channel signal strength (LASSI) 0xFB = –5 dB
RESP10	→0xF4	+100 kHz channel signal strength (HASSI) 0xFB = –12 dB
RESP11	→0x0B	Multipath 0x0B = 11
RESP12	→0x0F	Reserved, values will vary.
RESP13	→0x00	0x000 = Antenna capacitance, only for tracking filter applications
RESP14	→0x00	
RESP15	→0xE5	±200 kHz channel signal strength (ASSI) 0xE5 = –27 dB
RESP16	→0x2A	Ultrasonic noise (USN) 0x2A = 42

3. If STC is not set and the user wishes to abort the tune, set CANCEL = 1 to abort and call FM_RSQ_STATUS (or AM_RSQ_STATUS). Wait 5 ms for the tune or seek to abort and set the STC bit.

4. Wait t_{STC} (21–40 ms depending AM or FM modes). Refer to "8. Timing" on page 22.

DOCUMENT CHANGE LIST

Revision 0.1 to Revision 0.2

- Removed support for STRONGDEV, and 4 MHz crystal operation.
- Added support for LowCut and ASSI-based VALID tune/seek check.

Revision 0.2 to Revision 0.3

- Updated " Property 0x2205 FM_CHBW_ASSI_MIN_MAX" on page 104.
- Updated " Property 0x220A FM_CHBW_ASSI200_MIN_MAX " on page 106.
- Updated " Command 0x32 FM_RSQ_STATUS" on page 64.
- Updated " Property 0x0403 FM_SOFT_MUTE_RELEASE_TIME" on page 78.
- Updated " Property 0x0404 FM_SOFT_MUTE_ATTACK_TIME" on page 78.
- Updated " Property 0x4003 FM_RDS_CONFIDENCE" on page 136.
- Updated " Property 0x0403 AM_SOFT_MUTE_RELEASE_TIME" on page 153.
- Updated " Property 0x0404 AM_SOFT_MUTE_ATTACK_TIME" on page 154.
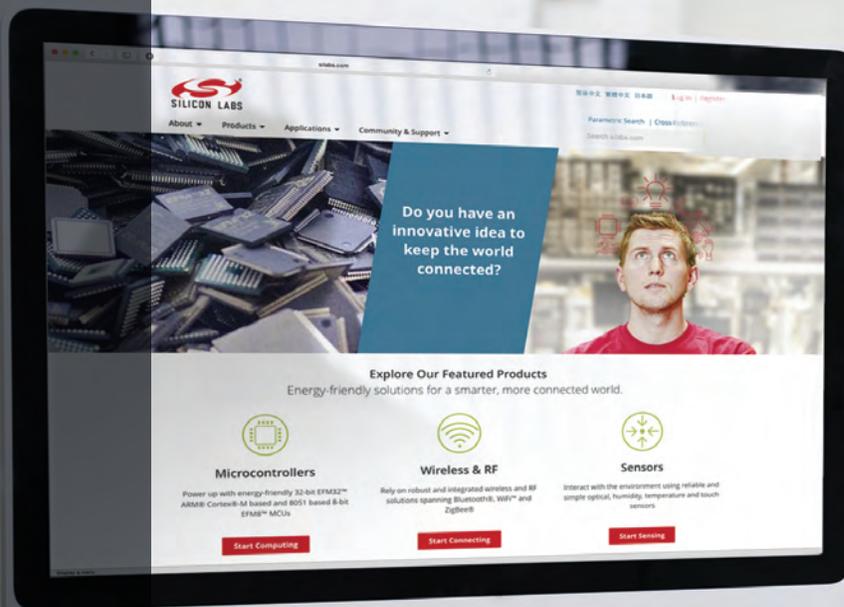
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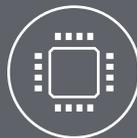
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