AKD4120
AK4120 Evaluation Board Rev.A

GENERAL DESCRIPTION

The AKD4120 is an evaluation board for the AK4120, digital sample rate converter with mixer and volume. The AKD4120 has the interface with AKM's D/A and A/D converter to evaluation boards. Therefore, it is easy to evaluate the AK4120 via analog output. This has also optical connector to interface with other digital audio equipment.

■ **Ordering guide**

AKD4120 --- AK4120 Evaluation Board
(Cable for connecting with printer port of IBM-AT compatible PC and control software are packed with this.)

FUNCTION

- **Compatible with 2 types of interface**
  - **Optical interface by AK4112B (DIR) and AK4114 (DIT & DIR)**
  - **Direct interface with AKM's DAC & ADC evaluation boards by 10pin headers.**
- **BNC connectors for an external clock input**
- **10pin headers for the serial control data interface**

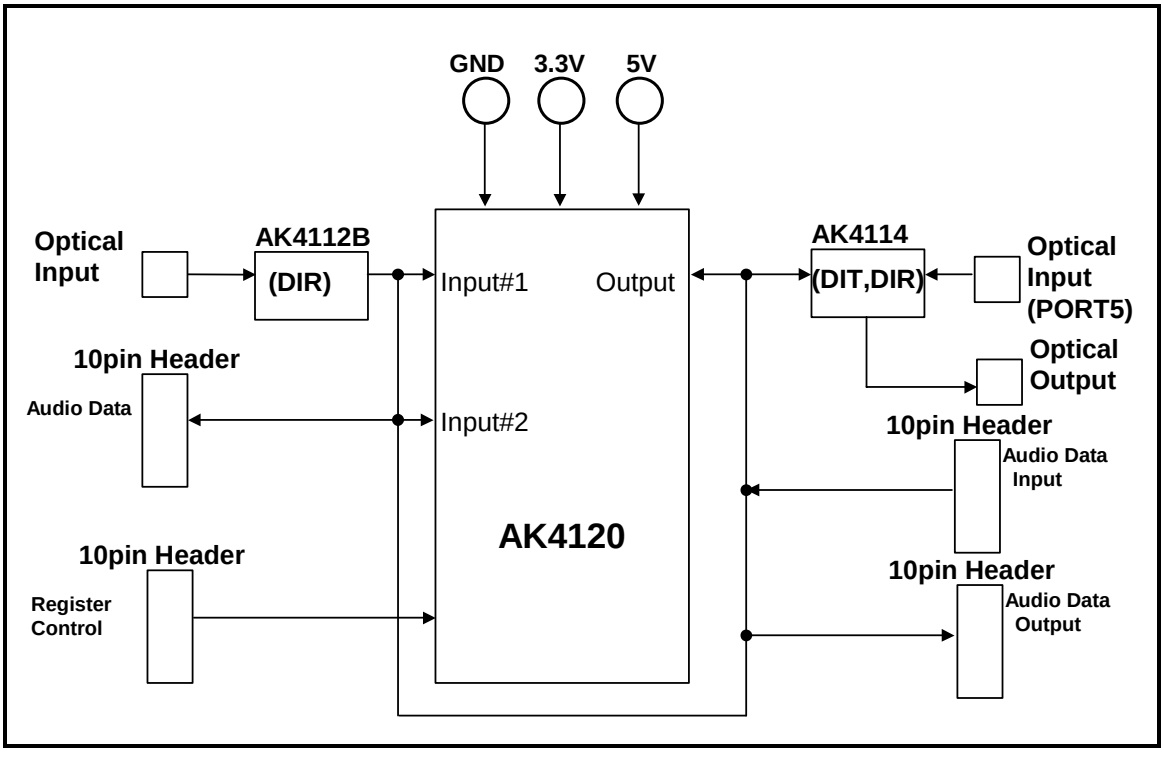


Figure 1. AKD4120 Block Diagram

* Circuit diagram and PCB layout are attached at the end of this manual.

EVALUATION BOARD MANUAL

■ Operation sequence

1.Set up the jumper for power supply

[JP11 (D3V)] Select power supply for VDD pin of the AK4120
Short : 3.3V is supplied from 3V-1 jack (Default)
Notihg should be connected to VCC-3V.
Open : 3.3V is supplied from VCC-3V.

2.Set up power supply lines

VCC= 5V : Power supply for TVDD of the AK4112B and AK4114, and for logic circuit.
VCC-3V= 3.3V : This jack is used when VDD of the AK4120 is supply from this.
In this case, JP11 should be open.
3V-1= 3.3V : Power supply for logic, the AK4112B and the AK4114.
In this case, JP11 should be short and notihg should be connected to VCC-3V.

GND= 0V : This is ground for all regions in this board.

3. Set up the evaluation modes by jumper pins and DIP switches. (See the next section.)

4. Power on.

The AK4120 should be reset once by bringing SW2 “L” upon power-up.
The AK4120 is reset at SW2= “L” and exits resetting at SW2= “H”.
When SW2 = “L”, the internal registers cannot be written.

■ Evaluation mode

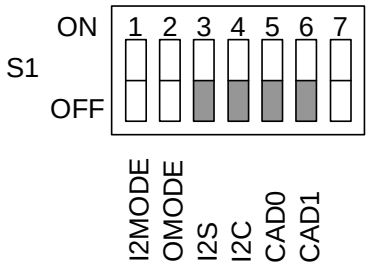
The AK4120 has four path modes that interface between two input ports and one output port. Four audio data formats can be selected independently for each port. Input#1 port supports only slave mode. Input#2 port and output port support slave mode and master mode. This evaluation board, AKD4120 has a standard optical interface via DIR/DIT and AKM original 10pin interface for AKM's AD/DA evaluation board. The AKD4120 can select either optical interface or 10pin interface for each port.
Set the evaluation mode by the following operation sequence.

1) Control I/F mode
2) Path mode and Clock mode
3) Audio data format

1. Control I/F mode

Control I/F mode is set by JP14 and S1. Attached control software is written for using 3-wire serial and Chip Address CAD1, CAD0 (CAD1, CAD0 = "10"). See the section of **"DIP switch setup"** and **"Jumper list"**. Set-up of JP14 and S1 is shown below.

Jumper No. DIP switch No.	Set-up
JP14	CSN
S1: No.4	OFF
S1: No.5	OFF

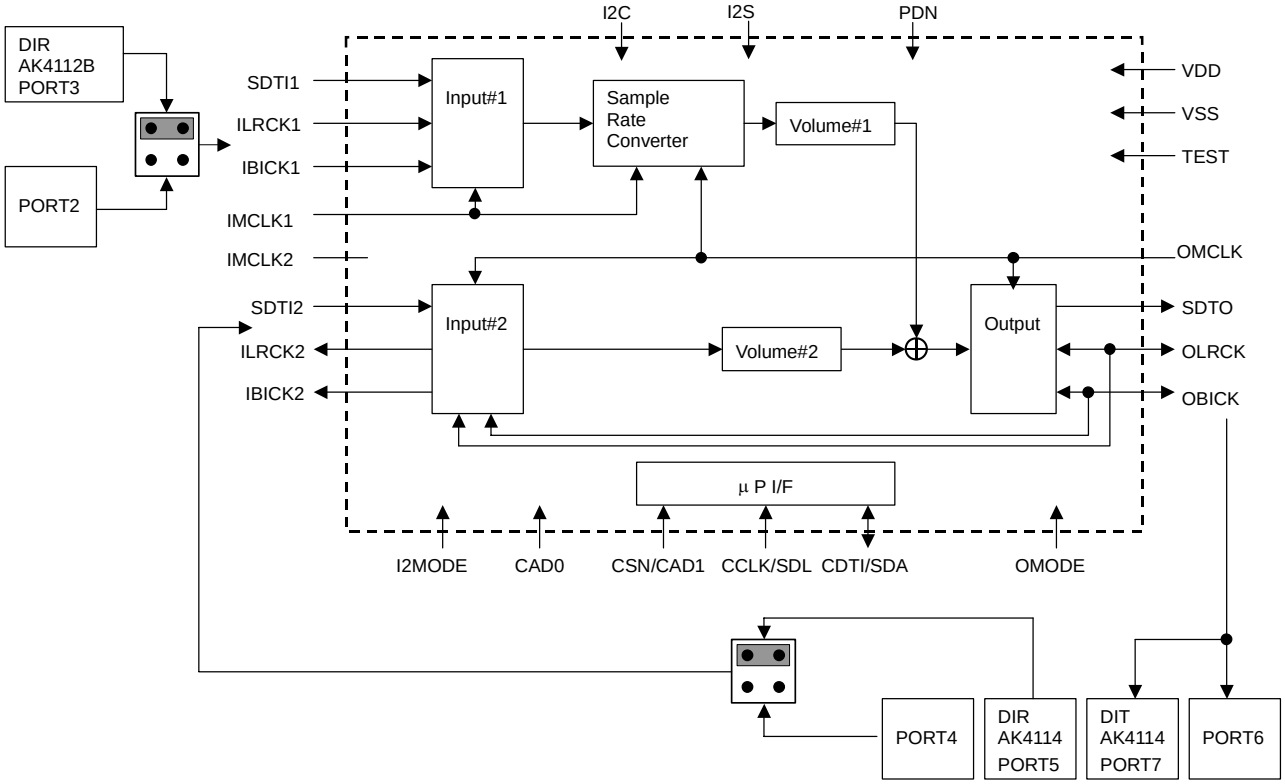


S1 (AK4120) set-up: Audio data format: 24bit, MSB justified (Default)

* In case of 3-wire serial (I2C = "OFF"), lower bit is set up by CAD0 pin, but upper bit is fixed to "1". Therefore, it is not needed to set up CAD1 pin.

2. Path mode and Clock mode

2-1. Path Mode 0 (Default)



2-1-1 Input#1 signal set-up

When Input#1 is connected to external equipment through DIR, PORT3 is used. When the audio data comes from AKM's ADC board, PORT2 is used.

[Input#1]
PORT3 (DIR): DIR (Optical link)
PORT2 (ADC): Connect to ADC board by 10pin Port

(1) PORT select
Input#1 Slave Mode

Jumper NO.		PORT3 (DIR) (Default)	PORT2 (ADC)
JP21	BCK12	short	short
	PORT	open	short
JP22	SDTO12	short	open
	PORT	open	short
JP23	LRCK12	short	short
	PORT	open	short
JP2	MCK12	short	short
	MCK14	open	open
JP4	SDTO12	short	short
	SDTO14	open	open
JP6	BCK12	short	short
	BCK14	open	open
JP8	LRCK12	short	short
	LRCK14	open	open
JP15	IN	open	open
	OUT	open	short
JP16		open	open
JP19		open	short

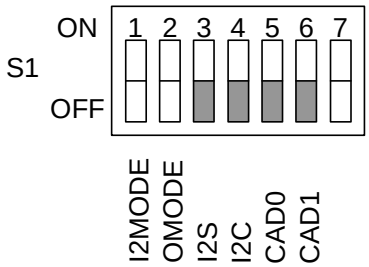
(2) Input#1, Master Clock select

Jumper NO.	256fs (Default)	512fs
JP20	MCKO2	MCKO1
X1 frequency	512fs	512fs

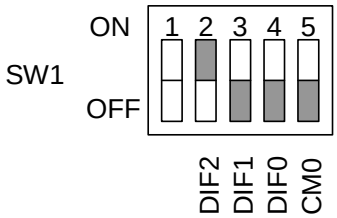
JP/X/SW	PORT3 (DIR) (Default)	PORT2 (ADC)	
		X'tal (X1)	Ex. Clock (J1)
JP18	short	short	open
JP17	open	open	short
X1 (X'tal)	don't care	use	remove
SW1: NO.5	OFF	ON	ON

When using PORT2, the setting of X'tal or Ex. Clock is used. 512fs (Default: 24.576MHz on board) should be used as X'tal frequency.

(3) The AK4120 and DIR (AK4112B) set-up



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#1: Slave Mode



SW1 (AK4112B) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode
(*) AK4112B should always be used in Master Mode.

2-1-2. Input#2 and Output signal set-up

When Input#2 is connected to external equipment through DIR, PORT5 is used. When the audio data comes from AKM's ADC board, PORT4 is used.

[Input#2]
PORT5 (DIR) : DIR(Optical link)
PORT4 (ADC): Connect to ADC board by 10pin Port

When Output is connected to external equipment through DIT, PORT7 is used. When the audio data goes to AKM's DAC board, PORT6 is used.

[Output]
PORT7 (DIT): DIT (Optical link)
PORT6 (DAC): Connect to DAC board by 10pin Port

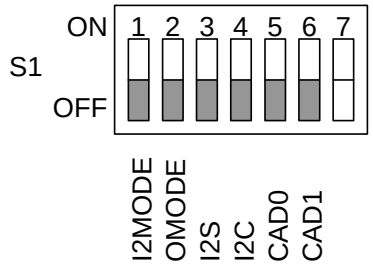
(1) PORT select

(a) Input#2: Slave Mode, Output: Slave Mode

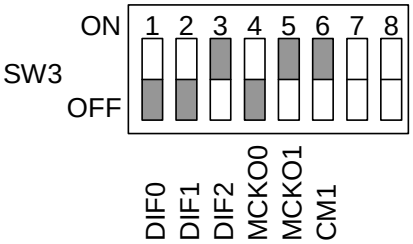
Input#2			
JP/SW		PORT5 (DIR) (Default)	PORT4 (ADC)
JP32	SDTO14	short	open
	PORT	open	short
JP1		open	open
JP3 **(*)**	SDTO14	short	short
	SDTO12	open	open
JP5		open	open
JP7		open	open
JP24	IN	open	open
	OUT	open	short
JP25		open	open
JP26		short	short
S1: NO.1		OFF	OFF

(*) Input#1 and Input#2 are mixed. When Input#2 is not mixed to Input#1, JP3 should be open.

Output			
JP/SW		PORT7 (DIT) (Default)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	short
JP31	BICK14	short	short
	PORT	short	short
JP33	LRCK14	short	short
	PORT	open	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		OFF	OFF



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Slave Mode

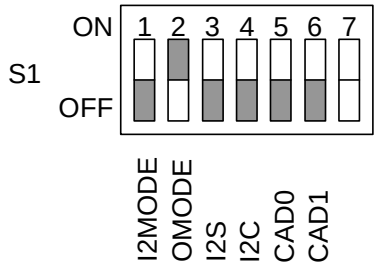


SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode
(*) The AK4114 should be used in Master Mode.

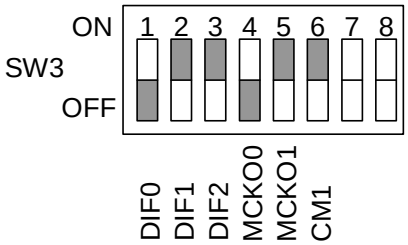
(b) Input#2: Slave Mode, Output: Master Mode

Input#2			
JP/SW		PORT5 (DIR)	PORT4 (ADC)
JP32	SDTO14	short	open
	PORT	open	short
JP1		open	open
JP3	SDTO14	short	short
	SDTO12	open	open
JP5		open	open
JP7		open	open
JP24	IN	open	open
	OUT	open	short
JP25		open	open
JP26		short	short
S1: NO.1		OFF	OFF

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	short
JP31	BCK14	short	open
	PORT	open	short
JP33	LRCK14	short	open
	PORT	open	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		ON	ON



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Master Mode

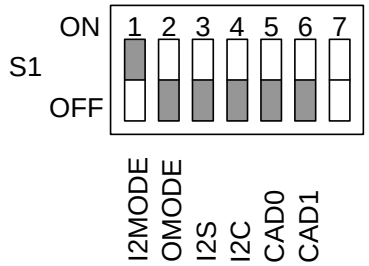


SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Slave Mode
(*) AK4114 should be used in Slave Mode.

(c) Input#2: Master Mode, Output: Slave Mode

Input#2			
JP/SW		PORT5 (DIR)	PORT4 (ADC)
JP32	SDTO14	short	open
	PORT	open	short
JP1		open	open
JP3	SDTO14	short	short
	SDTO12	open	open
JP5		open	open
JP7		open	open
JP24	IN	open	open
	OUT	open	short
JP25		open	open
JP26		short	short
S1 : NO.1		ON	ON

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	short
JP31	BCK14	short	open
	PORT	open	short
JP33	LRCK14	short	open
	PORT	open	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		OFF	OFF



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Master Mode, Output: Slave Mode

SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Slave Mode
(*) AK4114 should be used in Slave Mode.

(d) Input#2: Master Mode, Output: Master Mode

Input#2			
JP/SW		PORT5 (DIR)	PORT4 (ADC)
JP32	SDTO14	short	open
	PORT	open	short
JP1		open	open
JP3	SDTO14	short	short
	SDTO12	open	open
JP5	BCK14	open	open
	BCK12	open	open
JP7	LRCK14	open	open
	LRCK12	open	open
JP24	IN	open	open
	OUT	open	short
JP25		open	open
JP26		short	short
S1: NO.1		ON	ON

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	Short
JP31	BCK14	short	short
	PORT	short	short
JP33	LRCK14	short	short
	PORT	short	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		ON	ON

S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Master Mode, Output: Master Mode

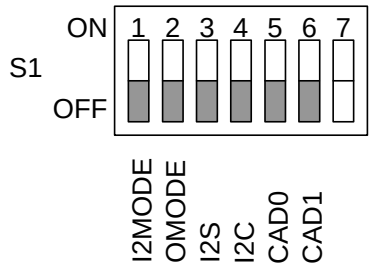
SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Slave Mode
(*) AK4114 should be used in Slave Mode.

(2) Output Master Clock select

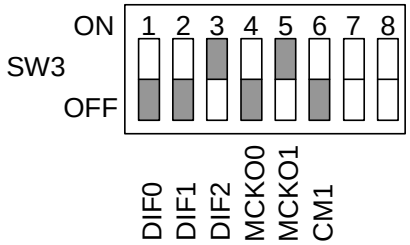
Jumper NO.	256fs(2) (Default)	512fs
JP27	MCKO2	MCKO1
X2 frequency	512fs	512fs
SW3: NO.4	OFF	OFF
SW3: NO.5	ON	ON

JP/X/SW	DIR (PORT5)	PORT4	
		X'tal (X2) (Default)	Ex. Clock (J2)
JP28	short	short	open
JP29	open	open	short
X2	don't care	use	removed
SW3: NO.6	OFF	ON	ON

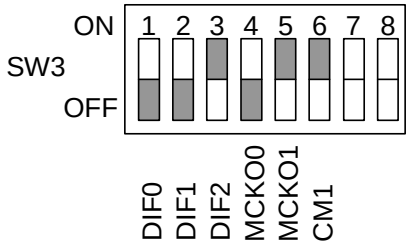
When using PORT4, the setting of X'tal or Ex. Clock is used. 512fs (Default: 24.576MHz on board) should be used as X'tal frequency.



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Slave Mode

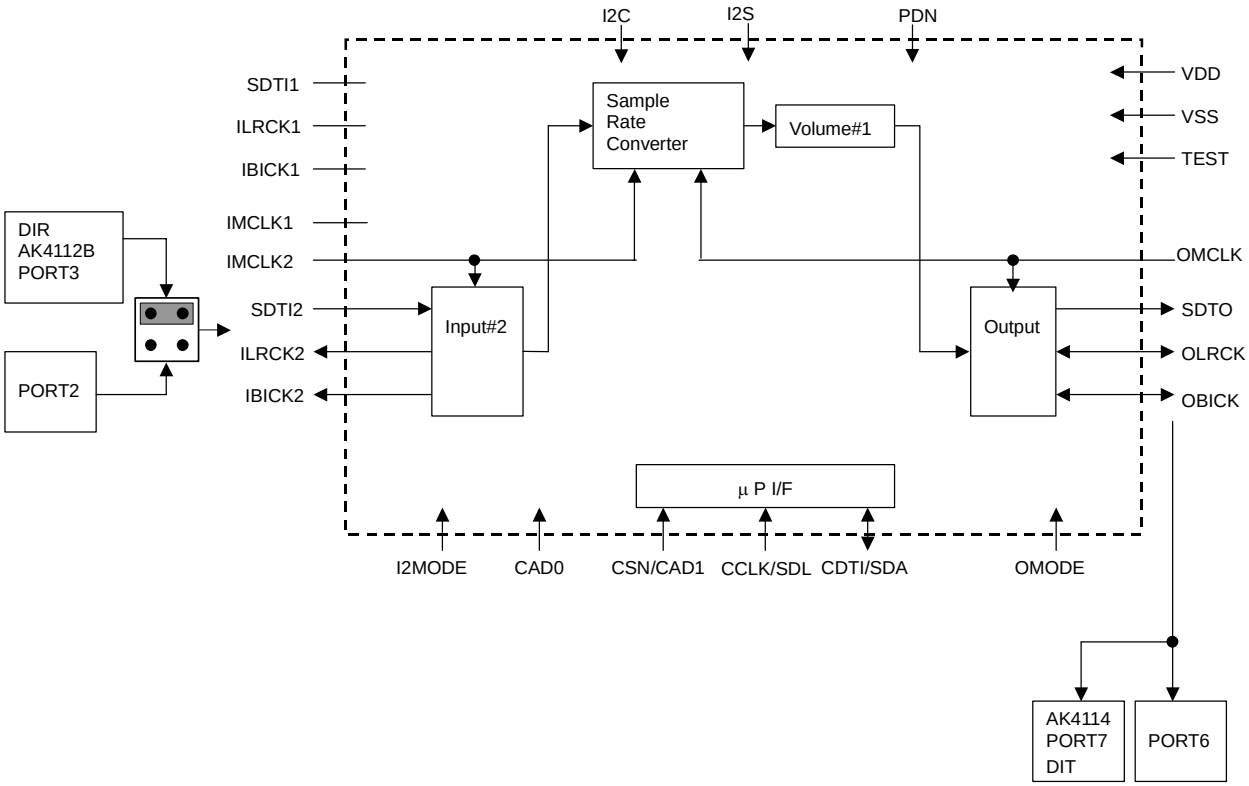


SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode, DIR



SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode, X'tal / Ex. Clock

2-2. Path Mode 1



2-2-1. Input#2 signal set-up

When Input#2 is connected to external equipment through DIR, PORT3 is used. When the audio data comes from AKM's ADC board, PORT2 is used.

[Input#2]
PORT3 (DIR): DIR (Optical link)
PORT2 (ADC): Connect to ADC board with 10pin Port

(1) PORT select
Input#2: Slave Mode

Jumper NO.		PORT3 (DIR)	PORT2 (ADC)
JP21	BCK12	short	short
	PORT	open	short
JP22	SDTO12	short	open
	PORT	open	short
JP23	LRCK12	short	short
	PORT	open	short
JP2		open	open
JP4		open	open
JP6		open	open
JP8		open	open
JP1	MCK12	short	short
	MCK14	open	open
JP3	SDTO12	short	short
	SDTO14	open	open
JP5	BCK12	short	short
	BCK14	open	open
JP7	LRCK12	short	short
	LRCK14	open	open
JP15	IN	open	open
	OUT	open	short
JP16		open	open
JP19		open	short

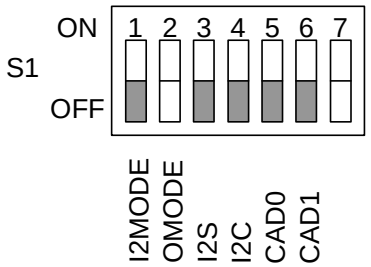
(2) Master Clock select

Jumper NO.	256fs (Default)	512fs
JP20	MCKO2	MCKO1
X1 frequency	512fs	512fs

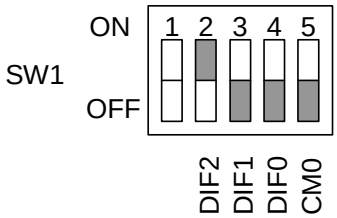
JP/X/SW	PORT3 (DIR)	PORT2 (ADC)	
		X'tal (X1) (Default)	Ex. Clock (J1)
JP18	short	short	open
JP17	open	open	short
X1 (X'tal)	don't care	use	remove
SW1: NO.5	OFF	ON	ON

When using PORT2, the setting of X'tal or Ex. Clock is used. 512fs (Default: 24.576MHz on board) should be used as X'tal frequency.

(3) The AK4120 and DIR (AK4112B) set-up



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode



SW1 (AK4112B) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode
(*) AK4112B should always be used in Master Mode.

2-2-2. Output signal set-up

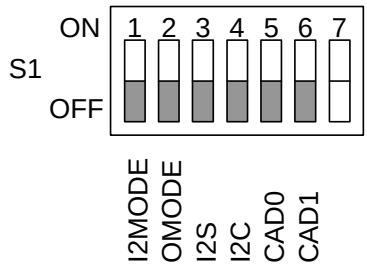
When Output is connected to external equipment through DIT, PORT7 is used. When the audio data goes to AKM's DAC board, PORT6 is used.

[Output]
PORT7 (DIT): DIT (Optical link)
PORT6 (DAC): Connect to DAC board with 10pin Port

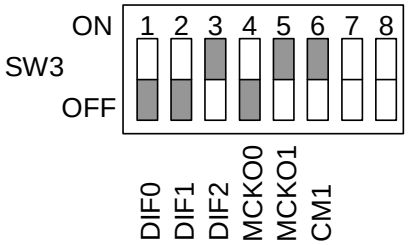
(1) PORT select

(a) Output: Slave Mode (OMODE="L")

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	short
JP31	BICK14	short	short
	PORT	short	short
JP33	LRCK14	short	short
	PORT	open	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		OFF	OFF



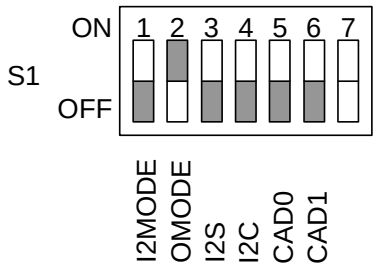
S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Slave Mode



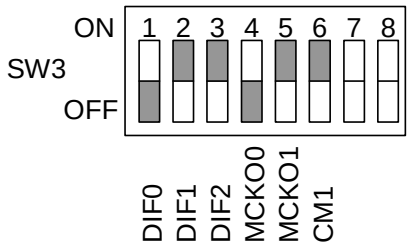
SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode
(*) AK4114 should be used in Master Mode.

(b) Output: Master Mode (OMODE="H")

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	short
JP31	BCK14	short	open
	PORT	open	short
JP33	LRCK14	short	open
	PORT	open	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		ON	ON



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, output: Master Mode



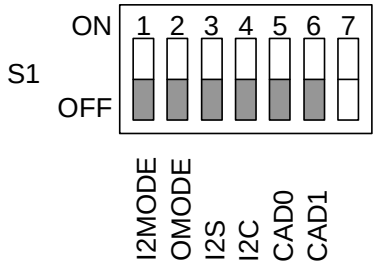
SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Slave Mode
(*) AK4114 should be used in Slave Mode.

(2) Master Clock select

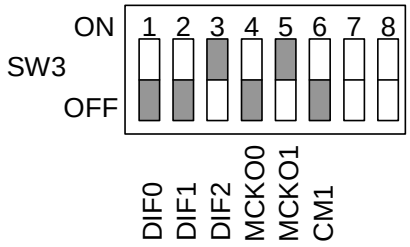
Jumper NO.	256fs(2) (Default)	512fs
JP27	MCKO2	MCKO1
X2 frequency	512fs	512fs
SW3: NO.4	OFF	OFF
SW3: NO.5	ON	ON

JP/X/SW	DIR (PORT5)	PORT4	
		X'tal (X2) (Default)	Ex. Clock (J2)
JP28	short	short	open
JP29	open	open	short
X2	don't care	use	removed
SW3: NO.6	OFF	ON	ON

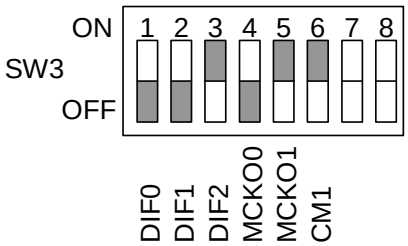
When using PORT4, the setting of X'tal or Ex clock is used. 512fs (Default: 24.576MHz on board) should be used as X'tal frequency.



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Slave Mode

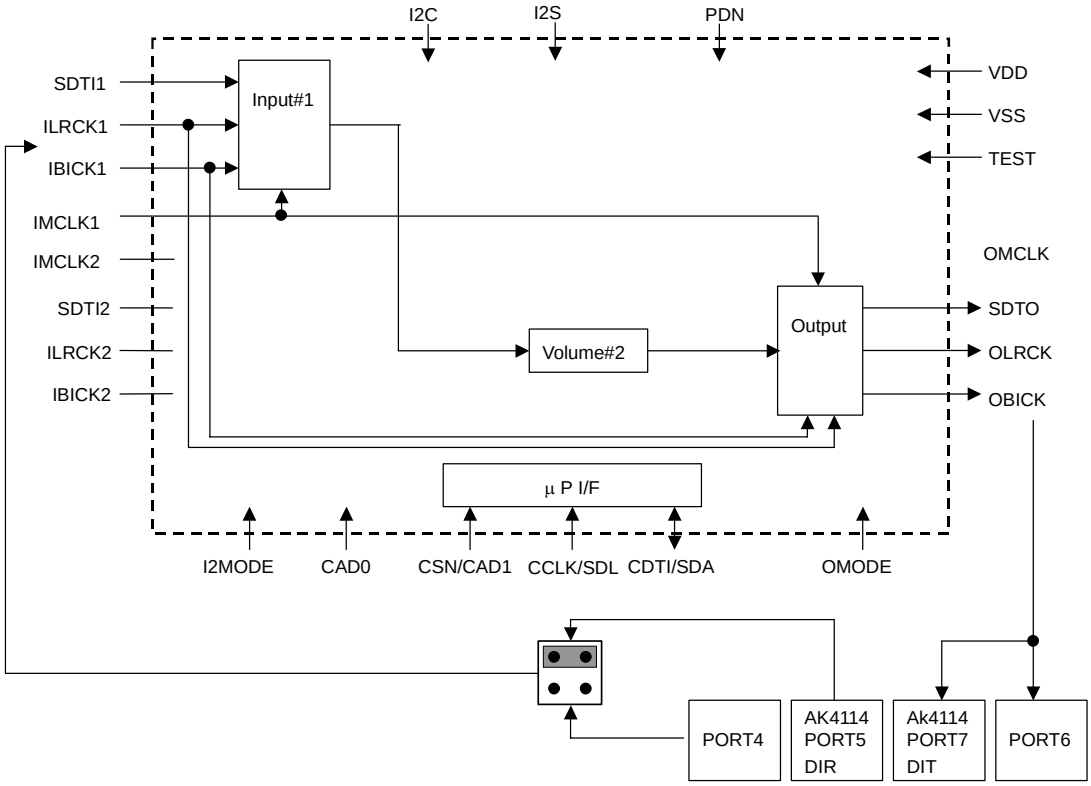


SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode, DIR



SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode, X'tal / Ex. Clock

2-3. Path Mode 2



2-3-1. Input#1 signal set-up

When Input#1 interfaces external equipment through DIR, PORT5 is used. When the audio data comes from AKM's ADC board, PORT4 is used.

[Input#1]
PORT5 (DIR): DIR (Optical link)
PORT4 (ADC): Connect to ADC board with 10pin Port

(1) PORT select
Input#1: Slave Mode

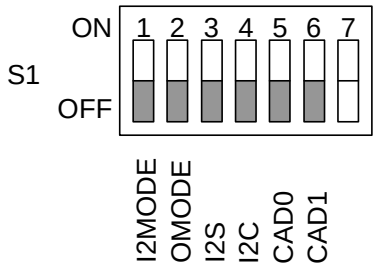
Input#1			
Jumper NO.		PORT3 (DIR)	PORT2 (ADC)
JP21	BCK12	open	open
	PORT	open	open
JP22	SDTO12	open	open
	PORT	open	open
JP23	LRCK12	open	open
	PORT	open	open
JP2	MCK14	short	short
	MCK12	open	open
JP4	SDTO14	short	short
	SDTO12	open	open
JP6	BCK14	short	short
	BCK12	open	open
JP8	LRCK14	short	short
	LRCK12	open	open
JP32	SDTO14	short	open
	PORT	open	short
JP1	MCK12	open	open
	MCK14	open	open
JP3	SDTO12	open	open
	SDTO14	open	open
JP5	BCK12	open	open
	BCK14	open	open
JP7	LRCK12	open	open
	LRCK14	open	open
JP15	IN	open	open
	OUT	open	open
JP16		open	open
JP19		open	open
JP24	IN	open	open
	OUT	open	short
JP25		open	open
JP26		short	short

(2) Input#1 Master Clock select

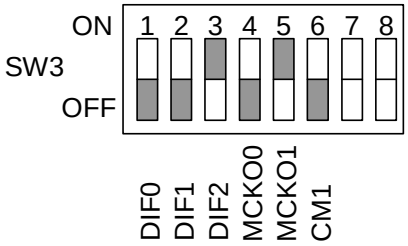
Jumper NO.	256fs(2) (Default)	512fs
JP27	MCKO2	MCKO1
X2 frequency	512fs	512fs
SW3: NO.4	OFF	OFF
SW3: NO.5	ON	ON

JP/X/SW	DIR(PORT5)	PORT4	
		X'tal (X2) (Default)	Ex. Clock (J2)
JP28	short	short	open
JP29	open	open	short
X2	use	use	removed
SW3: NO.6	OFF	ON	ON

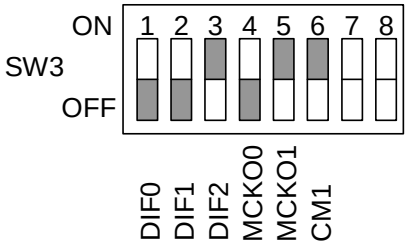
When using PORT4, the setting of X'tal or Ex. Clock is used. 512fs (Default: 24.576MHz on board) should be used as X'tal frequency.



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#1: Slave Mode



SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode, DIR



SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode, X'tal / Ex. Clock

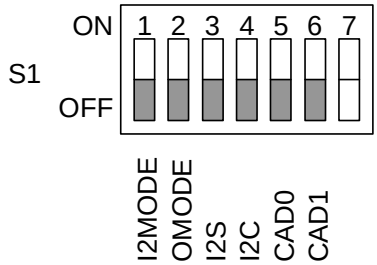
2-3-2. Output signal set-up

When Output is connected to external equipment through DIT, PORT7 is used. When the audio data goes to AKM's DAC board, PORT6 is used.

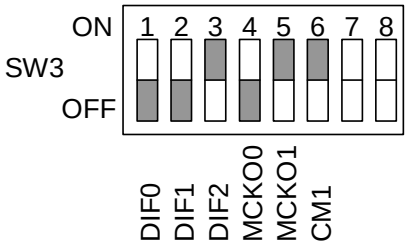
[Output]
PORT7 (DIT): DIT (Optical link)
PORT6 (DAC): Connect to DAC board with 10pin Port

(1) PORT select
Output: Slave Mode

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTO14	short	open
	PORT	open	short
JP31	BCK14	short	short
	PORT	open	short
JP33	LRCK14	short	short
	PORT	open	short
JP10		open	open
JP12		open	open
JP13		open	open
JP26		short	short
S1: NO.2		ON	ON

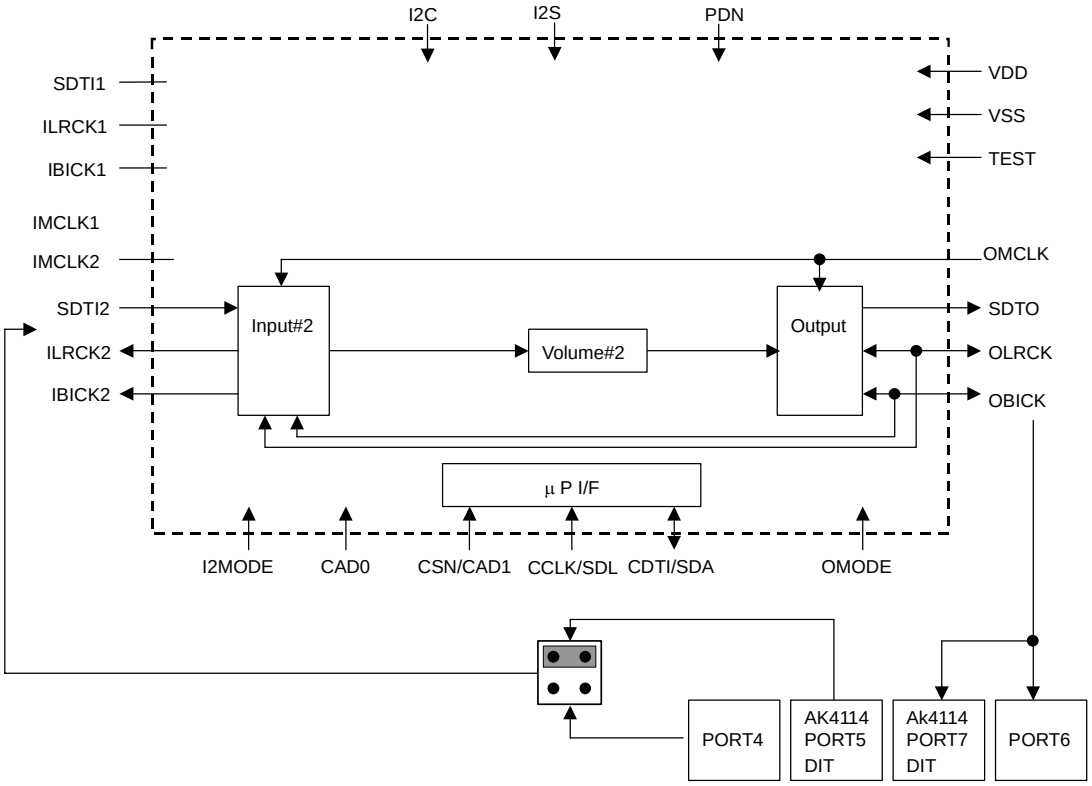


S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Output: Slave Mode



SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode
(*) The AK4114 should be used in Master Mode.

2-4.Path Mode 3



2-4-1. Input#2 signal set-up

When Input#2 interfaces external equipment through DIR, PORT5 is used. When the audio data comes from AKM's ADC board, PORT4 is used.

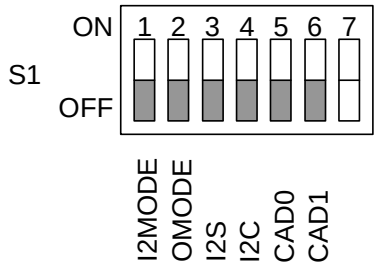
[Input#2]
PORT5 (DIR): DIR (Optical link)
PORT4 (ADC): Connect to ADC board with 10pin Port

(1) PORT select

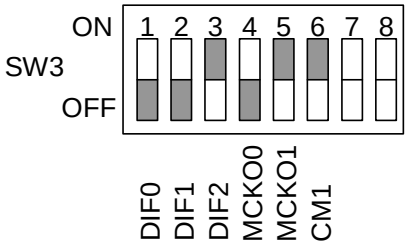
Input#2			
Jumper NO.		PORT3 (DIR)	PORT2 (ADC)
JP21	BCK12	open	open
	PORT	open	open
JP22	SDTO12	open	open
	PORT	open	open
JP23	LRCK12	open	open
	PORT	open	open
JP2	MCK14	open	open
	MCK12	open	open
JP4	SDTO14	open	open
	SDTO12	open	open
JP6	BCK14	open	open
	BCK12	open	open
JP8	LRCK14	open	open
	LRCK12	open	open
JP32	SDTO14	short	open
	PORT	open	short
JP1	MCK12	open	open
	MCK14	open	open
JP3	SDTO12	open	open
	SDTO14	short	short
JP15	IN	open	open
	OUT	open	open
JP12		open	open
JP13		open	open
JP16		open	open
JP19		open	open
JP24	IN	open	open
	OUT	open	short
JP25		open	open
JP26		short	short

(a) Input#2: Slave Mode, Output: Slave Mode

Jumper NO.	PORT5 (DIR)	PORT4 (ADC)
JP5	open	open
JP7	open	open
S1: NO1	OFF	OFF



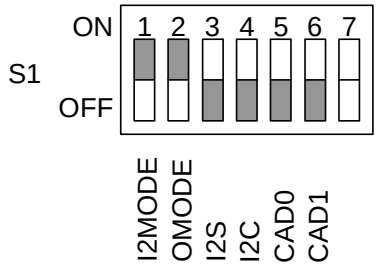
S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Slave Mode



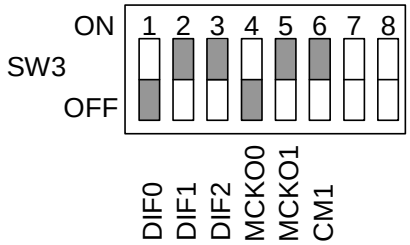
SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode
(*) AK4114 should be used in Master Mode.

(b) Input#2: Master Mode, Output: Master Mode

NO.		PORT5 (DIR)	PORT4 (ADC)
JP5	BCK14	short	short
	BCK12	open	open
JP7	LRCK14	short	short
	LRCK12	open	open
S1: NO.1		ON	ON



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Master Mode, Output: Master Mode



SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Slave Mode
(*) AK4114 should be used in Slave Mode.

2-4-2. Output signal set-up

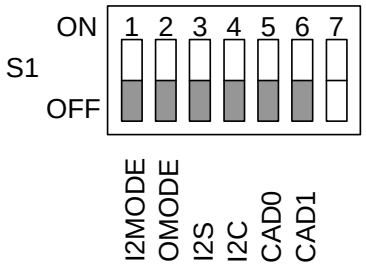
When Output is connected to external equipment through DIT, PORT7 is used. When the audio data goes to AKM's DAC board, PORT6 is used.

[Output]
PORT7 (DIT): DIT (Optical link)
PORT6 (DAC): Connect to DAC board with 10pin Port

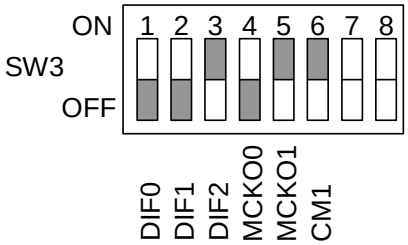
(1) PORT select

(a) Output: Slave Mode (OMODE="L")

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	short
JP31	BICK14	short	short
	PORT	open	short
JP33	LRCK14	short	short
	PORT	open	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		OFF	OFF



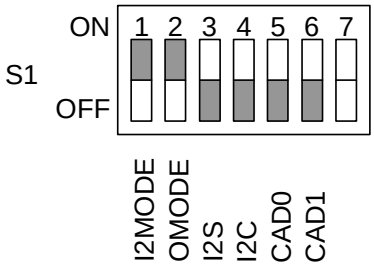
S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Slave Mode



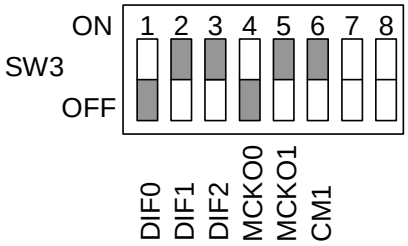
SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Master Mode
(*) AK4114 should be used in Master Mode.

(b) Output: Master Mode (OMODE="H")

Output			
JP/SW		PORT7 (DIT)	PORT6 (DAC)
JP30	SDTI14	short	open
	PORT	open	short
JP31	BICK14	short	open
	PORT	open	short
JP33	LRCK14	short	open
	PORT	open	short
JP10		short	short
JP12		short	short
JP13		short	short
JP26		short	short
S1: NO.2		ON	ON



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Master Mode, Output: Master Mode



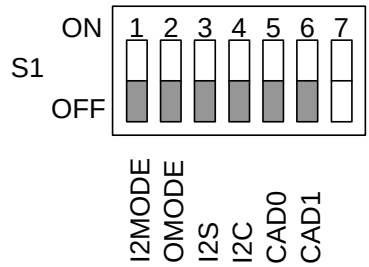
SW3 (AK4114) set-up, Audio data format: 24bit, MSB justified (Default), Slave Mode
(*) AK4114 should be used in Slave Mode.

(2) Output Master Clock select

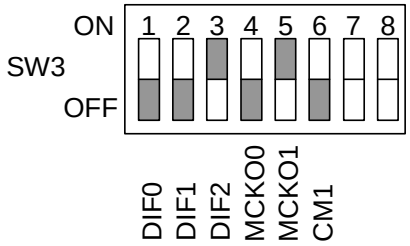
Jumper NO.	256fs(2) (Default)	512fs
JP27	MCKO2	MCKO1
X2 frequency	512fs	512fs
SW3: NO.4	OFF	OFF
SW3: NO.5	ON	ON

JP/X/SW	DIR (PORT5)	PORT4	
		X'tal (X2) (Default)	Ex. Clock (J2)
JP28	short	short	open
JP29	open	open	short
X2	don't care	use	removed
SW3: NO.6	OFF	ON	ON

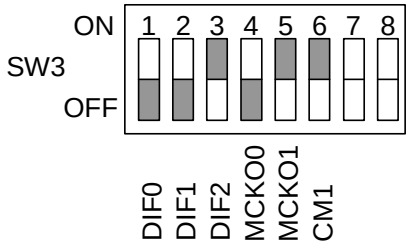
When using PORT4, the setting of X'tal or Ex. Clock is used. 512fs (Default: 24.576MHz on board) should be used as X'tal frequency.



S1 (AK4120) set-up, Audio data format: 24bit, MSB justified (Default), Input#2: Slave Mode, Output: Slave Mode



SW3 (AK4114) set-up (Default), Audio data format: 24bit, MSB justified (Default), Master Mode, DIR



SW3 (AK4114) set-up (Default), Audio data format: 24bit, MSB justified (Default), Master Mode, X'tal / Ex. Clock

3. Audio data format of AK4120

Audio data format and master clock frequency between the AK4120 and AK4112B/AK4114 should be the same condition.

S1: NO.3	00H: D1	00H: D0	SDTI1	LRCK	
L	0	0	20bit, MSB justified	H/L	Default
L	0	1	20bit, I^2S	L/H	
L	1	0	20bit, LSB justified	H/L	
L	1	1	16bit, LSB justified	H/L	
H	X	X	20bit, I^2S	L/H	

Table 4. Audio data formats of SDTI1 in serial control mode

S1: NO.3	00H: D3	00H: D2	SDTI2	LRCK	
L	0	0	20bit, MSB justified	H/L	Default
L	0	1	20bit, I^2S	L/H	
L	1	0	20bit, LSB justified	H/L	
L	1	1	16bit, LSB justified	H/L	
H	X	X	20bit, I^2S	L/H	

Table 5. Audio data formats of SDTI2 in serial control mode

S1: NO3	00H: D5	00H: D4	SDTO	LRCK	
L	0	0	20bit, MSB justified	H/L	Default
L	0	1	20bit, I^2S	L/H	
L	1	0	20bit, LSB justified	H/L	
L	1	1	16bit, LSB justified	H/L	
H	X	X	20bit, I^2S	L/H	

Table 6. Audio data formats of SDTO in serial control mode

Note) When the Audio data format is changed, the AK4120 should be powered down using “PW” bit.

■ Jumper pins and DIP switches setup

1. AK4120 set-up

(1) Jumper

JP9	open (Default)

(2) S1

No	Pin	OFF (Default)	ON
1	I2MIODE	Slave	Master
2	OMODE	Slave	Master
3	I2S	Set-up by Register	I2S
4	I2C	3 wire serial	I2C
5	CAD0	0	1
6	CAD1	0	1

2. AK4112B set-up

(1) Audio I/F select (SW1)

Audio I/F	I/O	No.2 DIF2	No.3 DIF1	No.4 DIF0	
24bit, MSB justified	O	1	0	0	Default
24bit, I2S	O	1	0	1	
24bit, LSB justified	O	0	1	0	
16bit, LSB justified	O	0	0	0	
24bit, MSB justified	I	1	1	0	
24bit, I2S	I	1	1	1	

(2) Master Clock (SW1)

Clock	No.5	
PLL (DIR)	0	Default
X'tal (External)	1	

3. AK4114 set-up

(1) Audio I/F select (SW3)

SDTI	SDTO	I/O	No.3 DIF2	No.2 DIF1	No.1 DIF0	
24bit, MSB justified	16bit, LSB justified	O	0	0	0	
24bit, MSB justified	20bit, LSB justified	O	0	1	0	
24bit, MSB justified	24bit, MSB justified	O	1	0	0	Default
24bit, I2S	24bit, I2S	O	1	0	1	
24bit, MSB justified	24bit, MSB justified	I	1	1	0	
24bit, I2S	24bit, I2S	I	1	1	1	

(2) Master Clock Speed (SW3)

MCKO1	MCKO2	No.5 OCKS1	No.4 OCKS0	
256fs	256fs	0	0	
512fs	256fs	1	0	Default

(3) Master Mode (SW3)

Clock source	NO.6
	CM0
PLL	0
X'tal	1

Default

■ Jumper list

JP No.	Jumper Name	Function
1,2		IMCLK1 and IMCLK2 input device set-up. MCK12: AK4112B (Default) MCK14: AK4114
3,4		SDTI1 and SDTI2 input device set-up SDTO12: AK4112B (Default) SDTO14: AK4114
5,6		IBICK1 and IBICK2 input device set-up BCK12: AK4112B (Default) BCK14: AK4114
7,8		ILRCK1 and ILRCK2 input device set-up LRCK12: AK4112B (Default) LRCK14: AK4114
9	TEST	This jumper is connected GND.
10	OMCLK	Connection of OMCLK (AK4120) and MCKO1 or MCKO2 (AK4114) Short: Connect (Default) Open: Separate
11	D3V	Power supply source set-up for VDD of AK4120. Short: Supply from 3V-1V Jack (Default) Open: Supply from VCC-3V Jack
12	OBICK	Connection of OBICK (AK4120) and BICK (AK4114) Short: Connect (Default) Open: Separate
13	OLRCK	Connection of OLRCK (AK4120) and LRCK (AK4114) Short: Connect (Default) Open: Separate
14		Serial control I/F set-up for AK4120 CAD1: 3 wire Serial (Default) CSN: I2C
15		Connection of PORT2 and 74LVC541 input pin/ output pin IN: Connect input pin OUT: Connect output pin Open: NC (Default)
16	LRCKP1N	Connection of 74LVC541 and JP23 Open: Separate (Default) Short: Connect
17	EX-CLK1	Connection of J1 (BNC) and XTI (AK4112B 5pin) Open: Separate (Default) Short: Connect

JP No.	Jumper Name	Function
18	EXT	Connection of BNC line (J1) and GND Short: Connect (Default) Open: Separate
19	MCKPORT1	Connection of PORT2 and MCK12 (JP20) Short: Connect (Default) Open: Separate
20	MCK12	Selection of MCKO1 (AK4112B) or MCKO2 (AK4112B) MCKO1: MCKO1 (AK4112B) MCKO2: MCKO2 (AK4112B) (Default)
21		Connection of BICK (AK4112B) or PORT2 PORT: PORT2 BCK12: BICK (AK4112B) (Default)
22		Connection of SDTO (AK4112B) or PORT2 PORT: PORT2 SDTO12: SDTO (AK4112B) (Default)
23		Connection of LRCK (AK4112B) or PORT2 PORT: PORT2 LRCK12: LRCK (AK4112B) (Default)
24		Connection of PORT4 and 74LVC541 input pin/output pin IN: Connect input pin OUT: Connect output pin Open: NC (Default)
25	LRCKP2IN	Connection of 74LVC541 and JP33 Open: Separate (Default) Short: Connect
26	MCKPORT2	Connection of PORT4 and JP27 Short: Connect (Default) Open: Separate
27		Selection of MCKO1 (AK4114) or MCKO2 (AK4114) MCKO1: MCKO1 (AK4114) MCKO2: MCKO2 (AK4114) (Default)
28		Connection of BNC line (J2) and GND Short: Connect (Default) Open: Separate
29	EX_CLK2	Connection of J2 (BNC) and XTI (AK4114 30pin) Open: Separate (Default) Short: Connect
30		Connection of DAUX (AK4114) or PORT4 PORT: PORT4 SDTI14: DAUX (AK4114) (Default)
31		Connection of BICK (AK4114) or PORT4 PORT: PORT4 BCK14: BICK (AK4114) (Default)
32		Connection of SDTO (AK4114) or PORT4 PORT: PORT4 SDTO14: SDTO (AK4114) (Default)
33		Connection of LRCK (AK4114) or PORT4 PORT: PORT4 LRCK14: LRCK (AK4114) (Default)

■ **Toggle switch set-up**

SW2		Reset switch for AK4120, AK41112B and AK4114. Set to “H” during operation. Bring to “L” once after the power is supplied.

■ **LED indication**

1		Bright when ERF pin goes to “H”.

■ Serial Control

The AK4120 can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT1 (CTRL) with PC by 10-wire flat cable packed with the AKD4120.

Be careful connector direction. Flat cable should be connected 10-pin header, red line put on 10pin header 5 and 6 pin.

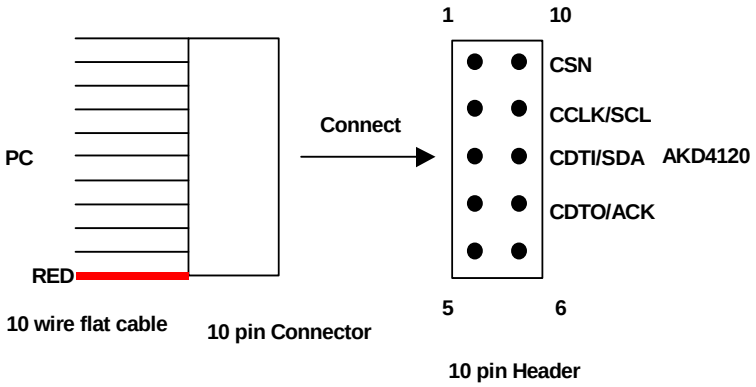


Figure 6. Connection of 10-pin flat cable

CONTROL SOFTWARE MANUAL

■ Set-up of evaluation board and control software

1. Set up the AKD4120 according to previous term.

2. Connect IBM-AT compatible PC with AKD4120 by 10-line type flat cable (packed with AKD4120). Take care of the direction of 10pin header. (Please install the driver in the CD-ROM when this control software is used on Windows 2000/XP. Please refer “Installation Manual of Control Software Driver by AKM device control software”. In case of Windows95/98/ME, this installation is not needed. This control software does not operate on Windows NT.)

3. Insert the CD-ROM labeled “AKD4120 Evaluation Kit” into the CD-ROM drive.

4. Access the CD-ROM drive and double-click the icon of “akd4120.exe” to set up the control program.

5. Then please evaluate according to the follows.

■ Operation flow

Keep the following flow.

1. Set up the control program according to explanation above.
2. Click “Port Reset” button.
3. Click “Write default” button

■ Explanation of each buttons

1. [Port Reset]: Set up the USB interface board (AKDUSBIF-A) when using the board.
2. [Write default]: Initialize the register of the AK4120.
3. [All Write]: Write all registers that are currently displayed.
4. [Function1]: Dialog to write data by keyboard operation.
5. [Function2]: Dialog to write data by keyboard operation.
6. [Function3]: The sequence of register setting can be set and executed.
7. [Function4]: The sequence that is created on [Function3] can be assigned to buttons and executed.
8. [Function5]: The register setting that is created by [SAVE] function on main window can be assigned to buttons and executed.
9. [SAVE]: Save the current register setting.
10. [OPEN]: Write the saved values to all register.
11. [Write]: Dialog to write data by mouse operation.

■ Indication of data

Input data is indicated on the register map. Red letter indicates “H” or “1” and blue one indicates “L” or “0”. Blank is the part that is not defined in the datasheet.

■ Explanation of each dialog

1. [Write Dialog]: Dialog to write data by mouse operation

There are dialogs corresponding to each register.

Click the [Write] button corresponding to each register to set up the dialog. If you check the check box, data becomes "H" or "1". If not, "L" or "0".

If you want to write the input data to the AK4120, click [OK] button. If not, click [Cancel] button.

2. [Function1 Dialog]: Dialog to write data by keyboard operation

Address Box: Input registers address in 2 figures of hexadecimal.
Data Box: Input registers data in 2 figures of hexadecimal.

If you want to write the input data to the AK4120, click [OK] button. If not, click [Cancel] button.

3. [Function2 Dialog]: Dialog to evaluate DATT

There are dialogs corresponding to register of 03H, 04H, 05H and 06H

Address Box: Input registers address in 2 figures of hexadecimal.
Start Data Box: Input starts data in 2 figures of hexadecimal.
End Data Box: Input end data in 2 figures of hexadecimal.
Interval Box: Data is written to the AK4120 by this interval.
Step Box: Data changes by this step.
Mode Select Box:

If you check this check box, data reaches end data, and returns to start data.
[Example] Start Data = 00, End Data = 09
Data flow: 00 01 02 03 04 05 06 07 08 09 09 08 07 06 05 04 03 02 01 00

If you do not check this check box, data reaches end data, but does not return to start data.
[Example] Start Data = 00, End Data = 09
Data flow: 00 01 02 03 04 05 06 07 08 09

If you want to write the input data to the AK4120, click [OK] button. If not, click [Cancel] button.

4. [SAVE] and [OPEN]

4-1. [SAVE]

All of current register setting values displayed on the main window are saved to the file. The extension of file name is “akr”.

<Operation flow>
(1) Click [SAVE] Button.
(2) Set the file name and click [SAVE] Button. The extension of file name is “akr”.

4-2. [OPEN]

The register setting values saved by [SAVE] are written to the AK4120. The file type is the same as [SAVE].

<Operation flow>
(1) Click [OPEN] Button.
(2) Select the file (*.akr) and Click [OPEN] Button.

5. [Function3 Dialog]

The sequence of register setting can be set and executed.

(1) Click [F3] Button.

(2) Set the control sequence.
Set the address, Data and Interval time. Set "-1" to the address of the step where the sequence should be paused.

(3) Click [START] button. Then this sequence is executed.

The sequence is paused at the step of Interval= "-1". Click [START] button, the sequence restarts from the paused step.

This sequence can be saved and opened by [SAVE] and [OPEN] button on the Function3 window. The extension of file name is "aks".

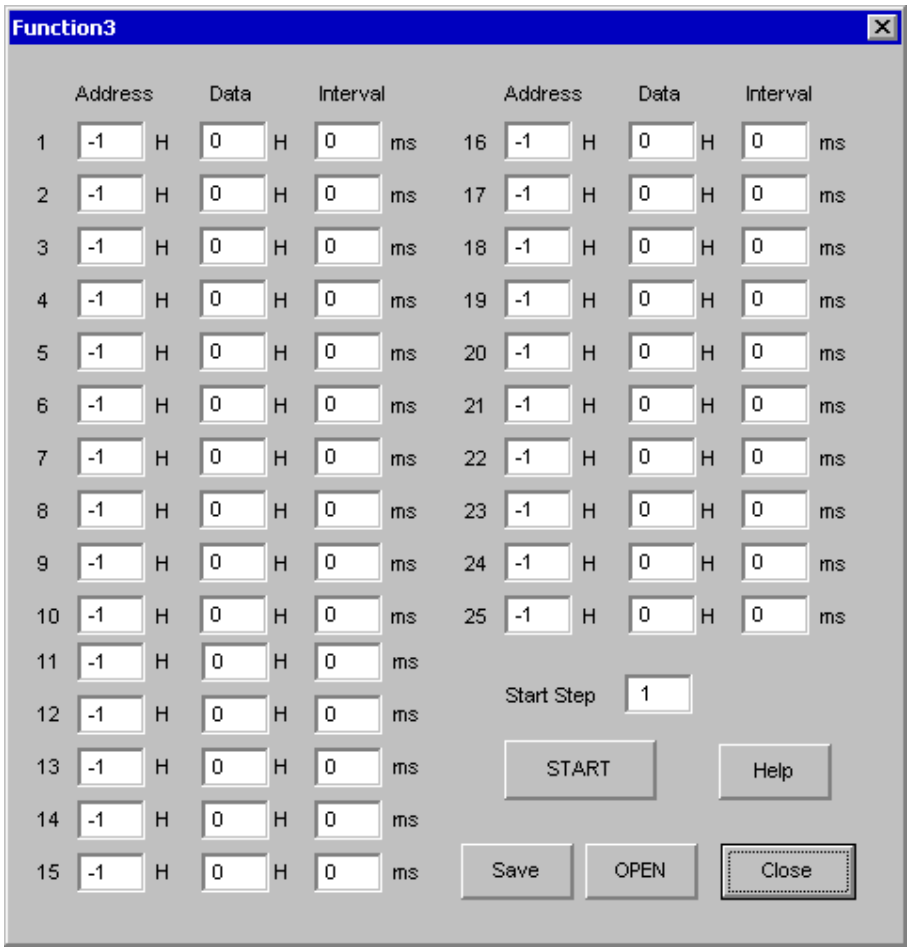


Figure 1. Window of [F3]

6. [Function4 Dialog]

The sequence file (*.aks) saved by [Function3] can be listed up to 10 files, assigned to buttons and then executed. When [F4] button is clicked, the window as shown in Figure 2 opens.

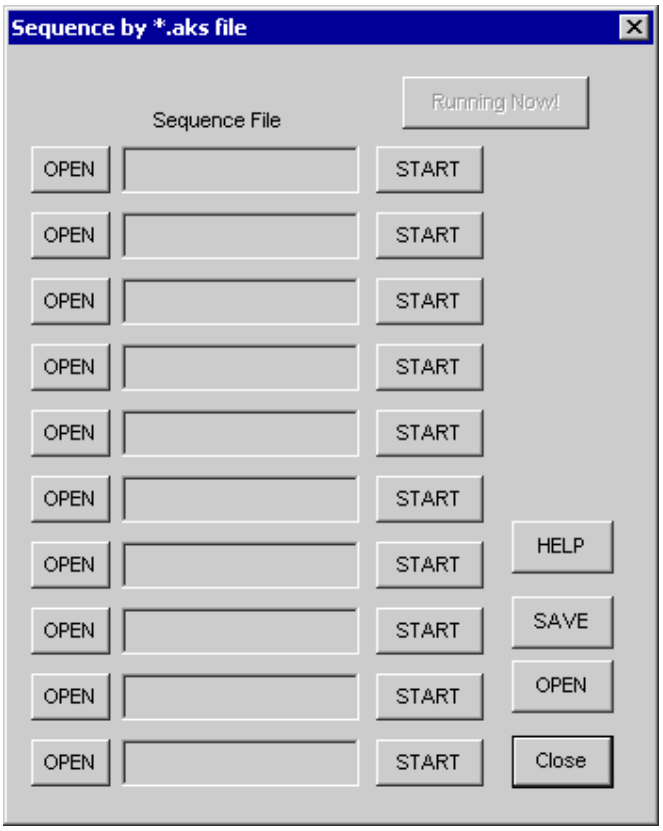


Figure 2. [F4] window

6-1. [OPEN] buttons on left side and [START] buttons

(1) Click [OPEN] button and select the sequence file (*.aks) saved by [Function3].

The sequence file name is displayed as shown in Figure 3. (In case that the selected sequence file name is "DAC_Stereo_ON.aks")

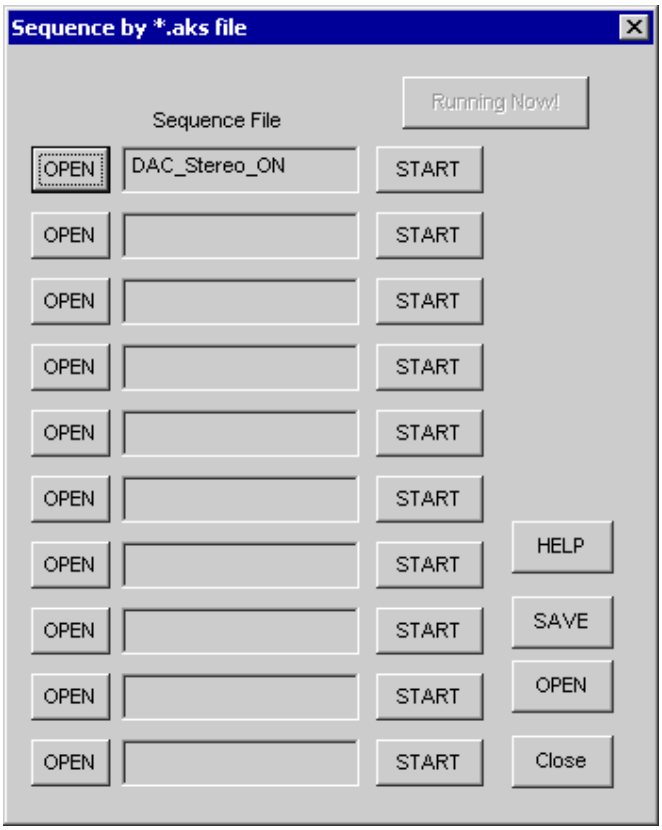


Figure 3. [F4] window(2)

(2) Click [START] button, then the sequence is executed.

6-2. [SAVE] and [OPEN] buttons on right side

[SAVE]: The name assign of sequence file displayed on [Function4] window can be saved to the file. The file name is "*.ak4".

[OPEN]: The name assign of sequence file (*.ak4) saved by [SAVE] is loaded.

6-3. Note

(1) This function doesn't support the pause function of sequence function.

(2) All files used by [SAVE] and [OPEN] function on right side need to be in the same folder.

(3) When the sequence is changed in [Function3], the sequence file (*.aks) should be loaded again in order to reflect the change.

7. [Function5 Dialog]

The register setting file(*.akr) saved by [SAVE] function on main window can be listed up to 10 files, assigned to buttons and then executed. When [F5] button is clicked, the window as shown in Figure 4 opens.

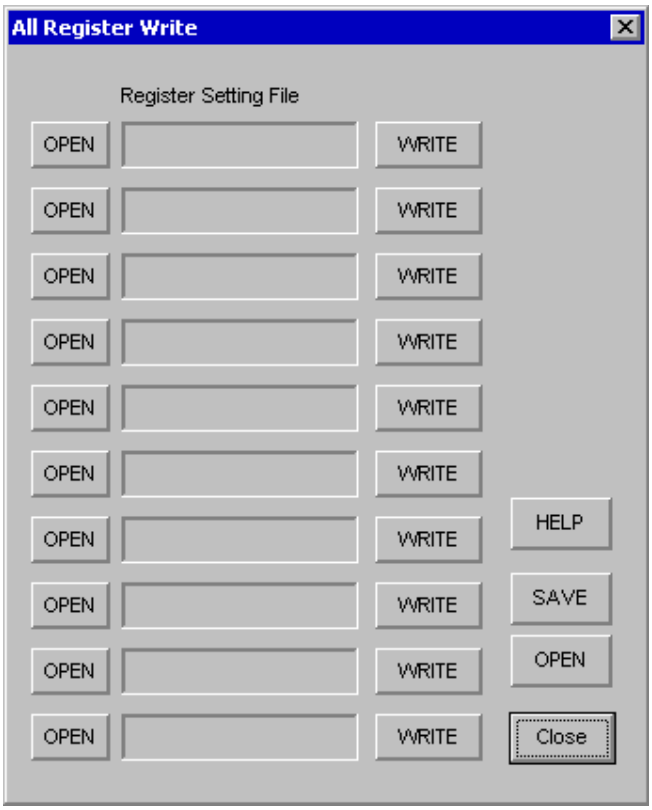


Figure 4. [F5] window

7-1. [OPEN] buttons on left side and [WRITE] button

(1) Click [OPEN] button and select the register setting file (*.akr).

(2) Click [WRITE] button, then the register setting is executed.

7-2. [SAVE] and [OPEN] buttons on right side

[SAVE]: The name assign of register setting file displayed on [Function5] window can be saved to the file. The file name is "*.ak5".
[OPEN]: The name assign of register setting file (*.ak5) saved by [SAVE] is loaded.

7-3. Note

(1) All files used by [SAVE] and [OPEN] function on right side need to be in the same folder.

(2) When the register setting is changed by [SAVE] Button on the main window, the register setting file (*.akr) should be loaded again in order to reflect the change.

MEASUREMENT RESULTS

[Measurement condition]

- Measurement unit: Audio Precision System two Cascade
- MCLK : 256fs
- BICK : 64fs
- fs : fsin=44.1kHz, fsout=48kHz
- BW : 20Hz~20kHz
- Resolution : 20bit
- Power Supply : VDD=3.3V
- Interface : DIR, DIT
- Temperature : Room

fsin=44.1kHz, fsout=48kHz

Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, 0dB	20kLPF	113dB	113dB
DR	1kHz, -60dB	20kLPF, A-weighted	115dB	115dB

■ Plots

[Measurement condition]

- Measurement unit: Audio Precision System two Cascade
- MCLK : 256fs
- BICK : 64fs
- fs : 44.1kHz, 48kHz
- BW : 20Hz~20kHz (fsin=44.1kHz, fsout=48kHz)
- Resolution : 20bit
- Power Supply : VDD=3.3V
- Interface : DIR, DIT
- Temperature : Room

Figure 7. FFT (1kHz, 0dBFS input)

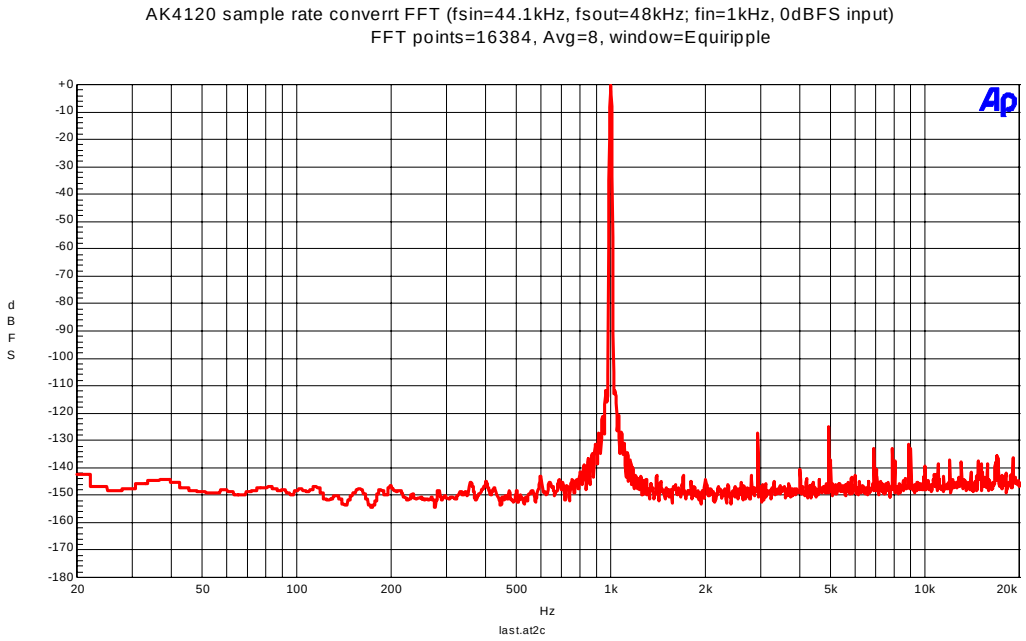
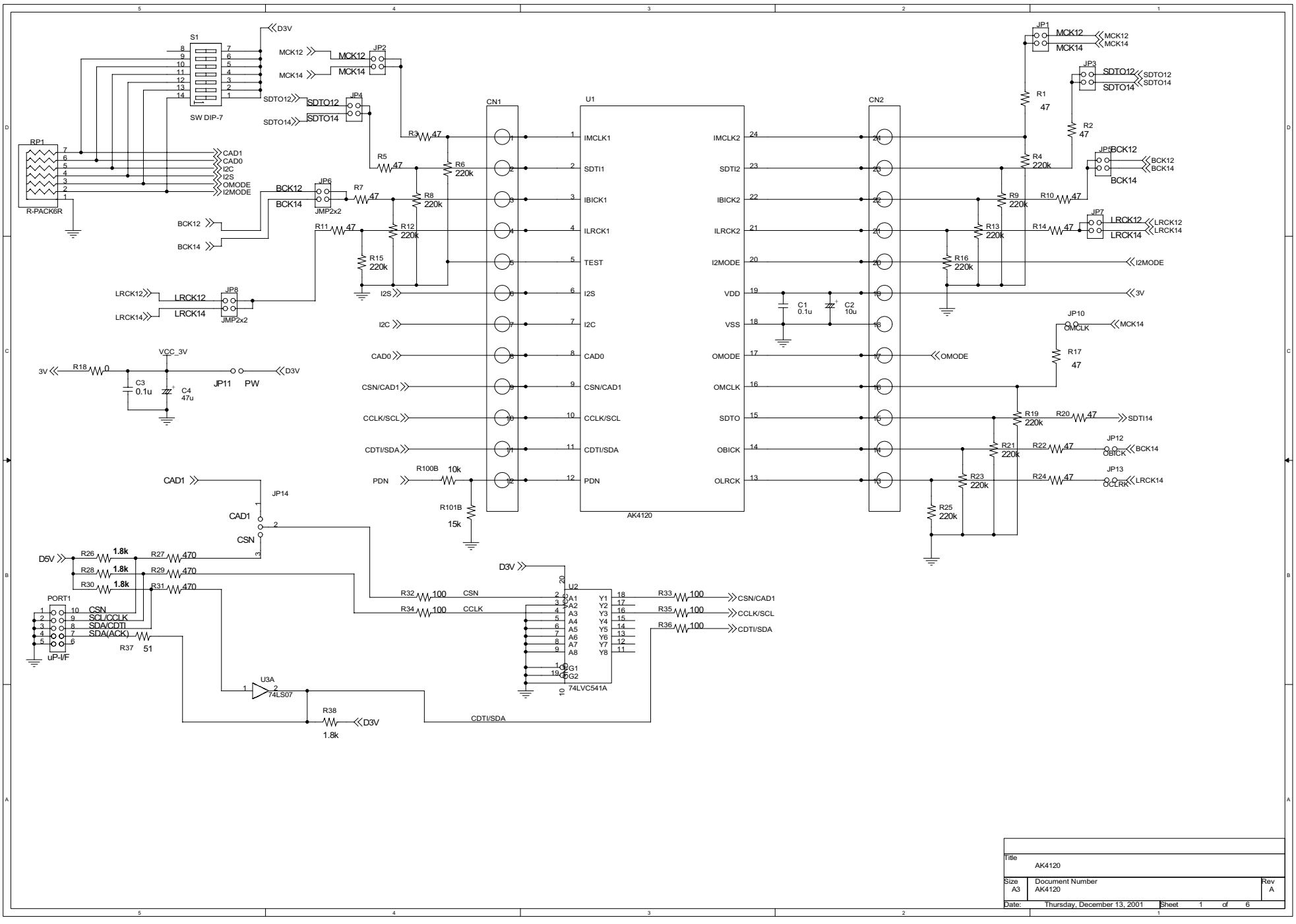
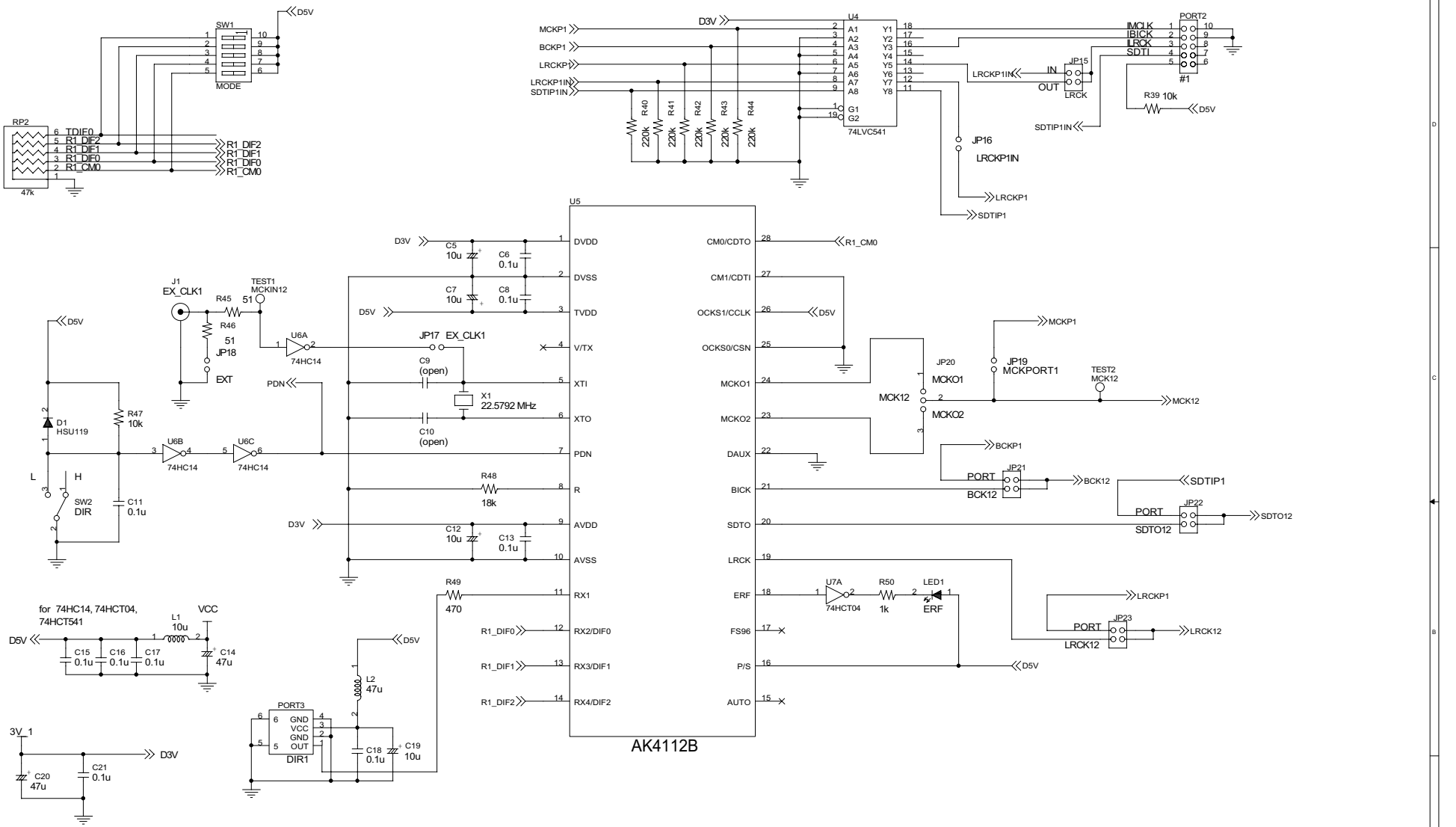


Figure.7. FFT(fsin=44.1kHz, fsout=48kHz; fin=1kHz, 0dBFS input)

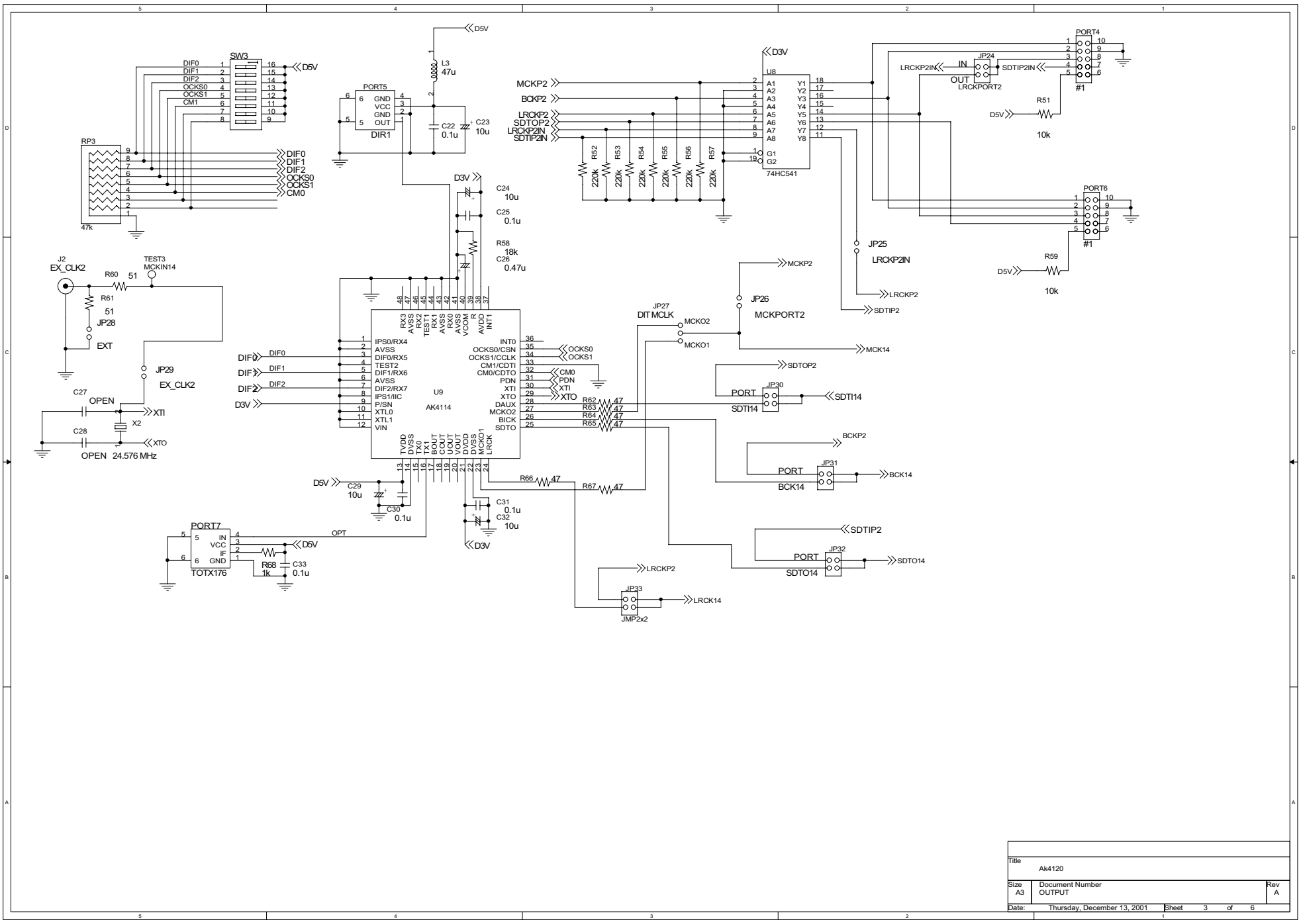
Revision History

Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
01/09/28	KM066800	0	First Edition	
01/12/26	KM066801	1	Circuit Change	X'tal Frequency Change X1: 24.576MHz→22.5792MHz X2: 11.2896MHz→24.576MHz
06/12/11	KM066802	1	Control Software Manual Change	Control Software Change: Ver.1.0→2.0
			Evaluation Board Manual Correct	Jumper pins and DIP switches set up correct


S1
SW DIP-7
D3V
MCK12
MCK14
JP2
SDTO12
SDTO14
JP4
RP1
R-PACK6R
CAD1
CAD0
I2C
I2S
OMODE
I2MODE
BCK12
BCK14
JP6
JMP2x2
LRCK12
LRCK14
JP8
JMP2x2
R3 47
R5 47
R6 220k
R7 47
R8 220k
R11 47
R12 220k
R15 220k
CN1
U1
IMCLK1
SDTI1
IBICK1
ILRCK1
TEST
I2S
I2C
CAD0
CSN/CAD1
CCLK/SCL
CDTI/SDA
PDN
AK4120
IMCLK2
SDTI2
IBICK2
ILRCK2
I2MODE
VDD
VSS
OMODE
OMCLK
SDTO
OBICK
OLRCK
CN2
C1 0.1u
C2 10u
JP1
JP3
JP5
JP7
R1 47
R2 47
R4 220k
R9 220k
R10 47
R13 220k
R14 47
R16 220k
JP10
OMCLK
R17 47
R19 220k
R20 47
SDTI14
R21 220k
R22 47
JP12
OBICK
BCK14
R23 220k
R24 47
JP13
OLRCK
LRCK14
R25 220k
VCC_3V
3V
R18 0
C3 0.1u
C4 47u
JP11 PW
R100B 10k
R101B 15k
CAD1
JP14
CSN
D5V
R26 1.8k
R27 470
R28 1.8k
R29 470
R30 1.8k
R31 470
PORT1
uP-I/F
SCL/CCLK
SDA(CDTI
SDA(ACK)
R37 51
R32 100
R34 100
U2
74LVC541A
R33 100
R35 100
R36 100
U3A
74LS07
R38 1.8k
Title
AK4120
Size A3
Document Number AK4120
Rev A
Date: Thursday, December 13, 2001
Sheet 1 of 6

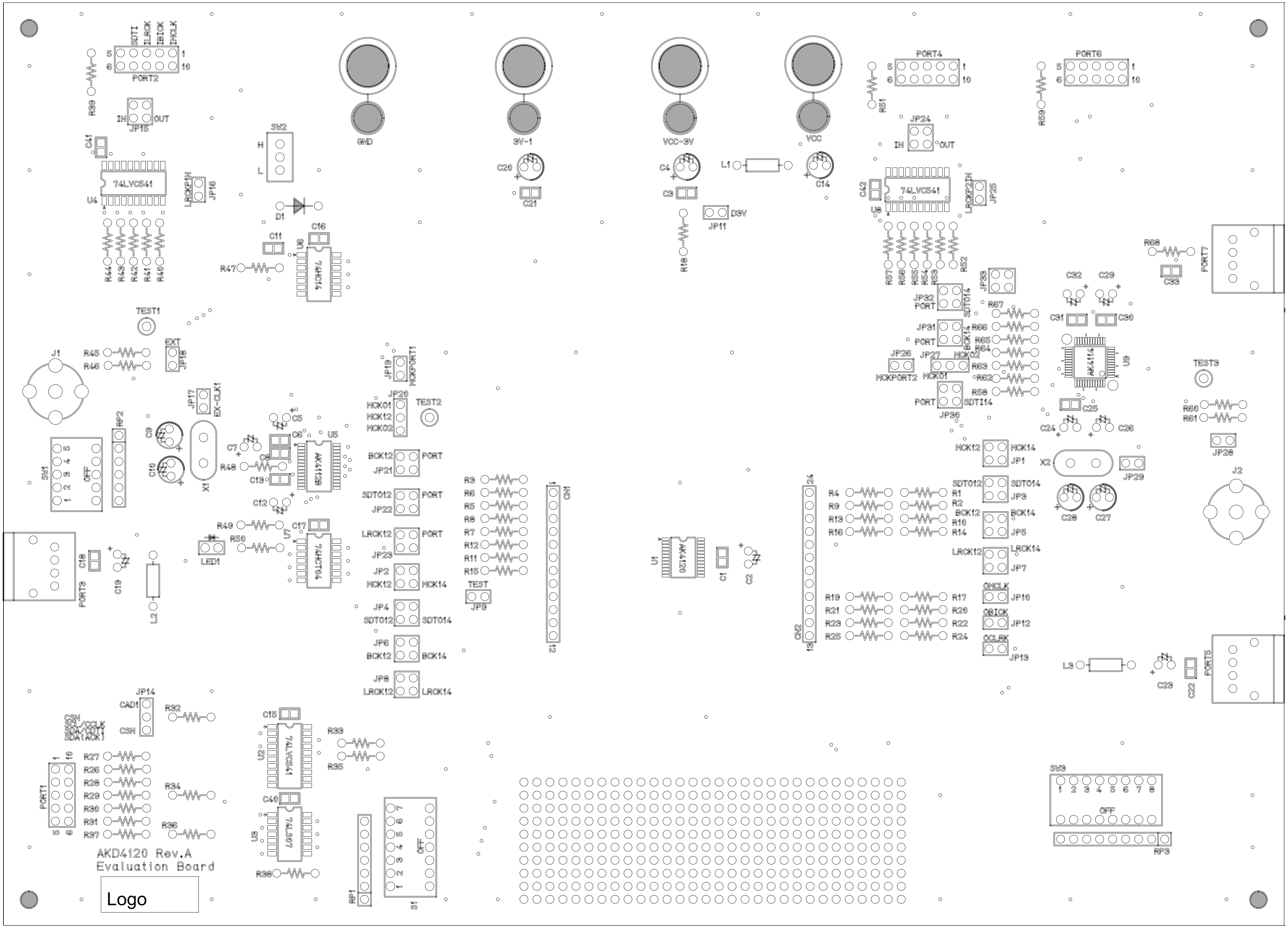


Title	AK4120	
Size A3	Document Number INPUT1	Rev A
Date: Thursday, December 13, 2001	Sheet 2 of 6	

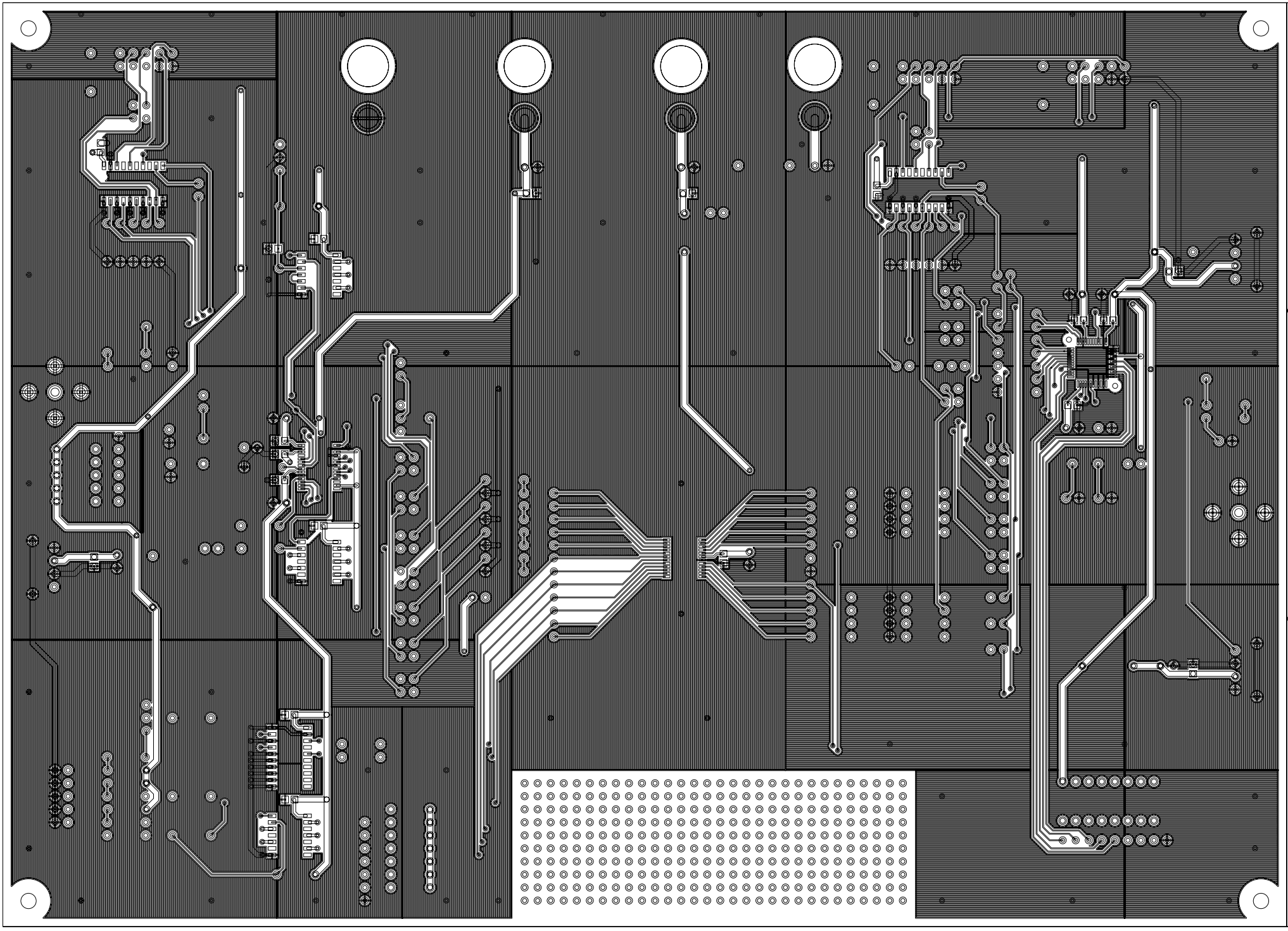


Title	Ak4120	
Size A3	Document Number OUTPUT	Rev A
Date: Thursday, December 13, 2001	Sheet 3 of 6	

L1 Silk


AKD4120 Rev.A
Evaluation Board
Logo
GND
5V-1
VCC-3V
VCC
PORT2
PORT4
PORT6
PORT7
PORT3
PORT5
PORT1
74LVC541
74HC14
74HCT04
74LS07
AK4125
AK4120
AK4114
SW1
SW2
SW3
J1
J2
X1
X2
TEST1
TEST2
TEST3
CN1
CN2

L1 Pattern



L2 Pattern