RSC-4x Evaluation Manual

For FluentChip™ Technologies

SENSORY®

P/N 80-0253-F

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Introduction

Welcome to the RSC-4x Family and the world of low-cost, high-performance speech recognition! The materials in the "RSC-4x Demo/Evaluation Toolkit" and the "RSC-4x Target Board Toolkit" allow a developer to produce innovative, powerful products that combine a high level of system integration, low cost, and leading-edge speech technologies. This manual discusses the use of these toolkits for evaluation and development purposes.

Developing a product using FluentChip™ requires hardware platform development, software development, product integration, and human-interaction testing. For good speech recognition performance, each of these design areas must be error-free. Sensory encourages best performance by providing free design consultation and review. Send us your schematics, board layout, microphone placement and production prototype, and we will review them and give you our recommendations. Contact Sensory Sales (sales@sensoryinc.com) for more information.

Overview:

The RSC-4x Family of IC's provides the following technology features important for low-cost consumer products:

- Low-voltage operation from 2 alkaline batteries
- Powerdown sleep mode conserves power
- Pulse Width Modulator (PWM) to directly drive a loud speaker
- Memory sufficient for storing ten Speaker Dependent or Speaker Verification words on chip
- Integrated microphone amplifier requiring only a few additional passive components

Note: The RSC-4x Demo/Evaluation Toolkit and RSC-4x Target Board Toolkits support the RSC-4x Family only. They cannot be used to develop products for the RSC-164, 264, 364, or SVC families of chips.

This manual assumes the reader is an experienced software developer who understands assembly language programming, embedded systems development methods, relocatable object code, and similar general concepts, but who may not be familiar with the Sensory's IC's specifically.

Additional Resources:

This toolkit works in conjunction with:

- FluentChip™ Technology, which is capable of running HMM (Hidden Markov Model) and neural network speaker independent (SI), speaker dependent (SD), speaker verification, speech and music synthesis, and sound effect technologies on the RSC-4x family
- Sensory's "QuickSynthesis™ 4", which allows the developer to compress speech for low data rate synthesis
- Phyton's Assembler and C Compiler (compiler requires licensing from Phyton)
- Sensory's "Quick T2SI™ Toolkit"(sold separately), which can create HMM-based SI recognition sets by simply typing the vocabulary on a PC and downloading it to the included Demo/Eval board.

For IC specification and on-chip hardware resources information, refer to:

- RSC-4128 Datasheet (80-0206)
- RSC-464 Datasheet (80-0282)

For programming with the FluentChip™ Technology Library, refer to:

- FluentChip Reference Manual

For assembling and linking programs, refer to:

- Phyton IDE Quick Start Guide (80-0247)
- DOS Tools Quick Start Guide (80-0248)

For information on the Sensory Quick T2SI™ Toolkit (offered separately), refer to Quick T2SI Toolkit Product Brief (80-0245) or contact Sensory Sales, sales@sensoryinc.com.

The Phyton Project-SE IDE (assembler, linker and simulator) is free and may be downloaded from Phyton's website at http://www.phyton.com/downloads/project-se.exe. You can also order the optional Phyton C Compiler from the Sensory or Phyton websites.

Check for updates and the most recent versions of the technology libraries on the Sensory website at http://www.sensoryinc.com.

Included in the RSC-4x Demo/Evaluation Toolkit

- *Fluentchip™ & Quick Synthesis 4 CD*
- RSC-4x Demo/Evaluation Toolkit CD
- RSC-4x Demo/Evaluation Board
- Speaker
- Serial Cable

Included in the RSC-4x Target Board Toolkit

- *Fluentchip™ & Quick Synthesis 4 CD*
- RSC-4x Demo/Evaluation Toolkit CD
- RSC-4x Target Board
- Speaker
- Serial Cable

NOTE: The RSC-4x Target Board is similar to the RSC-4x Demo/Eval Board, but has a footer for the *Phyton In Circuit Emulator* **(PICE)** instead of an RSC-4128 chip. All documentation applies to both boards interchangeably.

WARNING: Do NOT change the jumpers on the Demo/Evaluation or Target Boards while the power is turned on. Before changing any jumpers, remove the batteries or disconnect the power supply.

Getting Started

WARNING: The RSC-4x Demo/Evaluation board (60-0208) does NOT support 0 wait-state. SXL or SXW speech will NOT run. Use the ICE (in-circuit-emulator) or fast ROM emulators.

In order to start using the RSC-4x Demo/Evaluation or RSC-4x Target Board Toolkits for evaluation and development purposes, you need to accomplish the following "startup" tasks:

- Configure the Demo/Evaluation or Target Board hardware for your needs.
- Set up the software development environment including the Phyton Assembler (or Compiler).
- Become familiar with the application development cycle including the tools used to build an RSC-4x application using FluentChip™ Technology software.
- Become familiar with the capabilities of the various RSC-4x technologies offered in FluentChip™ Technology

Sensory hardware options are designed to allow developers to quickly grasp how Sensory technologies work with the included demo programs, and also how to integrate specific technologies into your project with sample code. Where necessary, we offer guidance in configuring the hardware for specific needs. Demo programs are included in the "RSC-4x Demo/Evaluation CD", and can also be downloaded from Sensory's website. Sample

programs are found in the "*Fluentchip™ & Quick Synthesis 4 CD*", and complete source code samples are also provided emphasizing the use of one specific technology.

Running Demo Programs

Before you install software, you can run the demo programs provided on the "RSC-4x Demo/Evaluation CD". You can also download the latest demo programs from Sensory's website: www.sensoryinc.com. For more information, refer to "RSC-4x Demo Manual" in the "RSC-4x Demo/Evaluation CD".

The section below, "Software Installation", is a step-by-step guide to installing the software and setting up the development environment according to Sensory's recommended configuration.

Software Installation

Insert the "*Fluentchip™ & Quick Synthesis 4 CD*" into your CD-ROM reader, and the installation should run automatically. If not, please run the "autorun.exe" in the root directory of the CD.

Follow the setup instructions, and install:

- Fluentchip™ Technology Library
- SensoryLoader4
- Sensory Quick Synthesis 4™ Tool
- Phyton Assembler and Linker Tools (will need to be downloaded from www.phyton.com).

Setting up the Environment

You can change the default installation directory (C:\Sensory), but keep in mind that the directory name MUST be in the 8.3 DOS format.

You may also edit the MSDOS.PIF file to change the environment size. In DOS-only development environment, the environment size can be enlarged to 1024 by adding the following line to your CONFIG.SYS file:

- shell=command.com /e:1024 /p

Note: This also works for windows 95/98

Building and Running a Sample Program

Building a Sample Program

After you installed "FluentChip™ Library" and "Phyton™ Project-SE", let's confirm everything is configured and connected correctly.

FluentChip™ Technology Library is organized into the following categories:

- Source code, to define the application flow, which designated by a file extension of "**.MCA**".
- Library code, to implement recognition and other Sensory proprietary technologies. This is usually in RSC relocatable object form, designated by a file extension of "**.MCO**".
- Command files for assembler and linker are designated by file extensions of "**.CFA**" and "**.CFL**" respectively.
- Tools code, to build applications. These are typically PC programs of extension "**.EXE**" or batch files of ".BAT" extension.

Make your project folder and copy a sample folder from FluentChip™ Technology Library. Assemble and link the sample source, and download the hex file to the RSC-4x Demo/Evaluation Board, and then run the sample program.

The following is an example of accomplishing such a task. This example uses a sample program which provides speaker independent recognition using Sensory's Text to Speaker Independent (T2SI™) recognition technology. (For more information on T2SI™, refer to the "FluentChip_Reference" on the "*Fluentchip™ & Quick Synthesis 4 CD"* ™ manual.)

Example:
Install the library and tools, and make the project folders in the following paths. If you use different folder names or path, you should edit the example batch files accordingly.

Folder for FluentChip™	C:\Sensory\FC2_0_12
Folder for Phyton™ tools	C:\Phyton
Folder for projects	C:\sensory\proj\sampleTest

Copy the '`t2si`' sample folder to your project fol

Sample Folder in library	C:\Sensory\FC2_0_12\asamples
Sample Folder in your projects	C:\sensory\proj\sampleTest\t2si

Using any text editor, edit two files in your `t2si` folder in your project folder.

Original '`t2si.cfa`'

```
-cm
-I ..\..\include
# assemble sources for all configurations
t2si
t2sids
hmm_h
config                  # demo unit (DE4)
config464
```

New '`t2si.cfa`' in your project folder

```
-cm
-I C:\Sensory\FC2_0_12\include
# assemble sources for all configurations
t2si                    # assemble t2si
# t2sids
hmm_h
config
# config464
```

Original '`t2si.cfl`'

```
-O ..\..\lib
-FI
-m -M60
-E t2si

t2si
hmm_h
config

#speech data
```

```
speech\t2sisample

#include the desired grammar files here...
t2si\trig_rscgram_sample
t2si\comm_rscgram_sample

#include the acoustic model net
t2si\rscNet_sample

fc4128
```

New 't2si.cfl' in your project folder

```
-O C:\sensory\FC2_0_12\lib
-FI
-m -M60
-E t2si

t2si
hmm_h
config

#speech data
speech\t2sisample

#include the desired grammar files here...
t2si\trig_rscgram_sample
t2si\comm_rscgram_sample

#include the acoustic model net
t2si\rscNet_sample

fc4128
```

Using any text editor, create the batch file in your "t2si" folder in your project folder.

'make.bat'

```
SET PATH=C:\Sensory\FC2_0_12\bin;%PATH%
SET PATH=C:\Phyton\Proj-se\1_10_09\MCCSE\BIN;%PATH%
echo **BUILDING
@echo off
mcase @t2si.cfa
rem @if errorlevel 1 pause
mclink @t2si.cfl
rem @if errorlevel 1 pause
```

To build the sample program, just double click the 'allIt.bat' icon. This should make the file, 't2si.hex'.

Hardware Configuration

Setting Up the RSC-4x Demo/Evaluation or RSC-4x Target Board

One of the functions of Sensory's development environments is to provide sufficient hardware features - such as memories, buttons, LEDs, etc - to allow an application developer to create hardware mockups of their final product, download prototype code and execute it.

This chapter contains the description of the hardware on the RSC-4x Demo/Evaluation Board, and the parts locator drawings. For a schematic of the Demo/Eval Board, ***refer to the PDF file "70-0058"***.

NOTE: The RSC-4x Target Board is similar to the RSC-4x Demo/Eval Board, but has a footer for the Phyton In Circuit Emulator (ICE) instead of an RSC-4128 chip. The following instructions apply to both boards interchangeably.

WARNING: Do NOT change the jumpers while the power is turned on. Before changing any jumpers, remove the batteries or disconnect the power supply.

(1) Put three AA batteries in the battery holder, or connect a wall mount power supply rated @ 9VDC to the board.
(2) Connect the speaker to the board.
(3) Connect the serial cable between the board and your PC.
(4) Turn on the power by rotating the round dial to the clockwise.

Note: The first time you use the board, confirm all jumper blocks are installed for the default setting.

Refer to

- ***Table: Jumper Settings - Audio Output - Default***
- ***Table: Jumper Settings - RS232 - Default***
- ***Table: Jumper Settings - Memory Configuration – Standard***

Downloading the T2SI™ Sample Program from your PC to the board

(1) Double click the 'pcLoad.bat' icon.
(2) Press the PROGRAM button on the board. When the sample program is successfully being downloaded, you will see the message in the windows, "Downloading …". When it finishes downloading, you will be prompted with the message.

Running the T2SI™ Sample Program

(1) Press RESET button on the board. When you press the RESET button, you should hear the BEEP followed by the voice prompt.
(2) Say the trigger word, and wait for the beep, and then say the command word.

- Trigger Word "Place"
- Command Word (1) "Call"
- Command Word (2) "Erase"
- Command Word (3) "Modify"
- Command Word (4) "Password"
- Command Word (5) "Play"
- Command Word (6) "Record"

For more details how the sample program works, refer to the sample source code.

For more information on how to develop applications with Sensory's technologies, please refer to the FluentChip_Reference on the "*Fluentchip™ & Quick Synthesis 4 CD".*

Downloading and Running Code

In the standard configuration, there are two codes on the board. One is the bootloader program in U6 (512Kbits OTP), and the other is the application program stored in U7 (8Mbits flash). For other memory configurations refer to ***Memory Configurations*** in this chapter.

- To download the program, press PROGRAM button.
- To run the program, press RESET button.

Note that U7 will be configured to run at power up, so the application program will run when the power is turned on.

Loader Program

The bootloader program lets you download an application code from

- PC via the serial port - up to 8Mbits, or
- MediaStick™ inserted in J4 socket - up to 4Mbits.

It also lets you copy and store the 4Mbits of code to MediaStick™ from U7.

To download the program from the PC, connect a serial cable between the PC's serial port and P1 on the demo board. To download or copy to MediaStick™, insert the MediaStick™ in J4.

If MediaStick™ is NOT inserted in J4, the LEDs on top of button A, B, and D will turn on.

- It will try to do the handshake with the PC, and when the handshake is successful, it will start downloading the code to U7. The handshake is made when you run 'sensoryloader4' on the PC. Once it starts downloading the code from the PC, the LED's will turn off
- If you do not run 'sensoryloader4' on the PC, and if you press A-Button, it will copy the program from Flash Stick.
- If you do not run 'sensoryloader4' on the PC, and if you press and hold B-Button for more than 2 sec, it will copy 4Mbit from U7 to Flash Stick.
- If you press D-Button before the handshake, it will put the board in the power down mode.

If MediaStick™ is inserted in J4, all LEDs will flash.

- Press A-Button to copy the program from Flash Stick
- Press and hold B-Button for more than 2 sec to copy 4Mbits from U7 to Flash Stick.
- Press C-Button to download from PC.
- Press D-Button for power down.

Karaoke/Audio Input Peak Indicator – Microphone Gain

The bootloader program has an additional useful feature called, Karaoke/Audio Input Peak Indicator. You can activate it by:

- press and hold A-Button, and
- press and release PROGRAM-Button, and then
- release A-Button.

The Audio Input Peak Indicator program does two functions simultaneously.

One is a Karaoke-like function. As you talk to the microphone, you hear what you say (or what RSC-4x chips hears) from the speaker. It is a useful way to test if there is any excessive noise in the system.

The other is the audio input peak indicator. It is **very useful when you evaluate the microphone gain and sensitivity**. While the program is running, press C-Button, and try talking to the microphone from about a half to 2 feet away. In the nominal distance, you should see the green and two yellow LED's turn on when you imitate a person who talks loud.

You should point the speaker away from the microphone and place it far enough to avoid a positive feedback effect.

Microphone

Selecting a proper microphone and its source resistor are essential for achieving good recognition results. Placement of the microphone will also affect recognition performance. For designing the optimal microphone subsystem, refer to Sensory's design notes on the "*Fluentchip™ & Quick Synthesis 4 CD"*

On-board Microphone
There is an on-board microphone. When no microphone is connected the microphone jack (J3) on the board, the on-board microphone is automatically connected to the circuit. Sensory boards are shipped with the jumper pre-selected to match the on-board microphone for the optimal system gain.

External Microphone
A stereo audio jack is provided for the external microphone. You can connect Sensory's pen-style microphone or an off-the-shelf microphone. If the Sensory's pen-style microphone is used, place the jumper at LOW or JP24.

Microphone Gain Jumpers
For your custom microphones, you can select the microphone gain to match the microphone's sensitivity by selecting the jumper block at MIC GAIN SELECT, LOW (JP24), MED (JP25), or HI (JP26) to achieve the optimal system gain.

When the range provided with LOW, MED, and HI setting is not enough, you can choose your own resistor value. A location for the through hole resistor is provided at R52 for this purpose. To use custom gain, you can solder a resistor at R52, and select the jumper block at MIC GAIN SELECT, CUST (JP27).

Power Supply, LED's, and Switches

Power Inputs
There is a battery holder that holds 3 AA batteries. You can use the batteries or, connect a wall mount power supply rated at 9VDC to J1 connector. When the power supply is connected to J1 connector, the batteries will automatically be disconnected from the circuit. When the batteries are used, the batteries are connected to the voltage regulator U2, which regulates VDD to 3VDC. When a wall mount power supply is used, Q2 and D9 pre-regulate the power supply input voltage to 5VDC. The emitter of Q2 is then connected to the voltage regulator U2.

Power On/Off Switch with Volume Control
When you turn the on/off switch's dial to clockwise, it will turn on the power, and the audio output volume is set at the maximum level. As you turn the dial further to clockwise, the volume will get quieter.

Note that the volume control is only available when the audio output is configured for DAC output. For configuring audio output, refer to ***Audio Outputs*** in this chapter.

Power On/Off LED
A green LED is connected to the PDN (power down) output of RSC-4x chip via a 74HC08 gate. The LED turns off when the board is in the power down mode or when the power is disconnected.

Application LED's
There are four LED's for applications on the board that are connected to I/O ports. They are a green, a red, and two yellow LED's.

Application Switches
There are four switches for applications on the board that are connected to I/O ports, and they are labeled, 'A', 'B', 'C', and 'D'.

For the port connections for the LED's and switches, refer to ***Table: Port Information***.

RS232 Serial Port

RS232 serial port is provided for downloading application codes and for the applications' use. It can also be used for FluentChip™ Technology standard debug output, which allows verifying overall system gain, background noise levels, etc during real world testing of the application. For the standard debug output details, refer to "FluentChip_Reference" on the "*Fluentchip™ & Quick Synthesis 4 CD."* To make a connection to a PC, connect a standard serial cable from P1 to the PC's serial port. (one is provided in the Toolkit)

RS232 Automatic Shutdown
MAX218 IC is used for the RS232 interface, and its voltage doublers circuit generates some electrical noise, which might get coupled into the microphone input signal. To minimize the noise, we provided the feature, which the firmware can disable MAX218 while the recognizer is listening. To enable this feature, the jumper blocks for RS232 interface must be placed on the default setting. Refer to ***Table: Jumper Settings - RS232 - Default***.

P0.2 port is used to control MAX218. When P0.2 goes low, MAX218 is put into the shutdown mode. You can put MAX218 in shutdown mode before you do recognition routines, and then enable it back after you are done.

Macros are provided for this purpose. To enable, use 'Init232'. For shutdown, use 'Idle232'. You can find these macros in file, 'rs232.inc'. You can find this file in the FluentChip™ Technology library. For more details, refer to "FluentChip_Reference."

RS232 Manual Shutdown
We also provide the manual shutdown feature. To manually shutdown MAX218 place the jumper block at JP8 between pin2 and pin3.

Power Down Signal and RS232
The power down signal from RSC-4x is gated at the inputs of MAX218 for shutting it down. When the power down signal is active, regardless of the jumper setting of JP8, MAX218 will be in the shutdown mode.

Freeing Port Pins Used in RS232 for Applications
If you need to free up the port pins used for the RS232 interface for your application, you can place the jumper blocks at

- JP6 between pin2 and pin3
- JP7 between pin2 and pin3
- JP8 between pin2 and pin3

Note that when these ports are disconnected from MAX218, the PC download function will not be operable. You can download the application code first, and turn off the power, and then replace the jumpers.

I/O Ports and Custom Memory Interface Connectors

Through holes are provided for all I/O ports for the custom wiring at J5 and for the custom memory interface at J6. The through holes are 0.1" spaced so that you can solder standard headers/connectors for ribbon cables to create a custom extended prototyping space. Both J5 and J6 are labeled for easier signal identification. Refer to ***Table: J5 - I/O*** and ***Table: J6 - Address, Data, and Enabling Signals***.

When you interface memory IC devices, make the cable or wiring as short as possible to minimize the capacitance on address, data bus, or enable signals. For the timing specification, refer to ***RSC-4128 Data Sheet***.

Audio Outputs

A stereo audio jack (J2) is provided for the included speaker.
You can select either DAC or PWM or for the audio output.

For DAC,
- place shorting block between JP3 pin1 and pin2
- place shorting block between JP4 pin1 and pin2

For PWM,
- place shorting block between JP3 pin2 and pin3
- place shorting block between JP4 pin2 and pin3

The DAC output of the RSC-4x is amplified with a TPA301D audio power amplifier IC, which can drive an 8-Ohm speaker. For more details on TPA301, refer to the Texas Instruments Website.

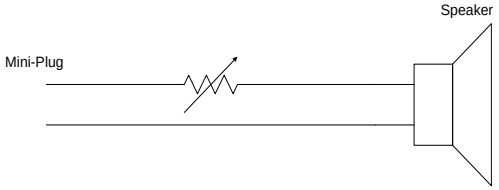
The PWM output of RSC-4x can directly drive an 8-Ohm speaker. For PWM output specification, refer to ***RSC-4128 Data Sheet***.

Optional Through Holes for Speaker
A pair of through-holes (JP23), which is essentially the same as J2, is provided for soldering the wires for your custom speaker. When an audio plug is not in J2, JP23 is automatically connected – when an audio plug is in J2, JP23 is automatically disconnected.

Optional Through Holes for un-buffered DAC Signal
A pair of through-holes (JP28) for un-buffered DAC signal is provided for using custom amplifier. CAUTION: This output is directly connected to RSC-4x without an AC coupling capacitor.

Adding Volume Control for PWM
Adding a volume control to the PWM output of the boards can be easily accomplished with the following procedure:

- Disconnect the speaker cord from the mini-plug jack on the Motherboard.
- Cut into one side of the cord and insert a 200 Ohms potentiometer in series with the wire.



Memory IC for Storing Data

Memory IC's are provided for storing the data. They could be used for storing the recognition template data, Record & Playback voice data, or the applications' specific data such as phone numbers, etc.

Serial EEPROM

We provided 128Kbit Serial EEPROM, U14, 24LC128 for storing the recognition template data or the applications' specific data. It is installed in a DIP socket, so you can replace it with different sizes of Serial EEPROM. 2-wire SEEPROMS from 24C01 through 24LC128 are supported in FluentChip™ Technology. For more details, refer to "FluentChip_Reference."

2Mbit Flash

We also provided 2Mbit Flash, U10, SST29VE020. With U10, you can store the Voice Record & Playback data in addition to the recognition template data and the applications' specific data. For more details, refer to "FluentChip_Reference".

Memory Configurations

Memory Configuration - Standard

When it is configured for Standard Memory Configuration, you can download an application code from a PC or MediaStick™. For the jumper settings, refer to ***Table: Jumper Settings - Memory Configuration – Standard***.

Although the standard memory configuration should satisfy prototyping or proof of concept stage of product development, in some cases different types of memory configurations might become necessary. For such cases, we provided two other configurations: DIP and Custom/External configurations.

Memory Configuration - DIP

When it is configured for DIP Memory Configuration, you can use an EPROM or ROM emulator, and placed it in the 32-pin DIP socket at U5. The application code will be executed from it at power up as well as when you press RESET button instead of U7. For the jumper settings, refer to ***Table: Jumper Settings - Memory Configuration – DIP***.

Memory Configuration – Custom/External

When it is configured for custom/external memory configuration, you can completely customize all memory configurations.

To prevent bus contention, remove jumpers as shown in ***Table: Jumper Settings - Memory Configuration - Custom/External***.

For custom/external memory configuration, you should bypass the memory control circuit – U4B, U4C, U8, U9, and U12B, replacing it with your custom memory control circuit.

All necessary address and data bus as well as enabling signals are brought to J6. Refer to ***Table: J6 - Address, Data, and Enabling Signals***.

Appendix

WARNING: Do NOT change the jumpers while the power is turned on. Before changing any jumpers, remove the batteries or disconnect the power supply.

Table: Jumper Settings - Microphone Gain

JP24	GAIN-LOW	-**	JP25	GAIN-MED	-**
JP26	GAIN-HIGH	-**	JP27	GAIN-CUST	-**

Note**: The jumper has been pre-installed in factory to match the on-board microphone.

Table: Jumper Settings - Audio Output - Default

JP3	DAC	Installed 2-3	JP4	DAC	Installed 2-3
JP3	PWM	None 1-2	JP4	PWM	None 1-2

Table: Jumper Settings - RS232 - Default

JP6	RXD	Installed 1-2	JP7	TXD	Installed 1-2
JP8	Power Down	Installed 1-2			

To disable the RS232 interface IC (U13), place the jumpers between 2-3.

Table: Jumper Settings - Memory Configuration - Standard

JP18	-*	None	JP20	Code Flash	Installed 1-2
JP11	DIP –CE	Installed	JP14	DIP –OE	Installed
JP10	OTP –CE	Installed	JP13	OTP –OE	Installed
JP9	8M –RST	Installed	JP12	8M –CE	Installed
JP16	8M –OE	Installed	JP17	8M –WE	Installed
JP19	2M –CE	Installed	JP21	2M –OE	Installed
JP22	2M –WE	Installed			

Note*: Leave it open.

Table: Jumper Settings - Memory Configuration - DIP

JP18	-*	None	JP20	DIP	Install 2-3
JP11	DIP –CE	Installed	JP14	DIP –OE	Installed
JP10	OTP –CE	Installed	JP13	OTP –OE	Installed
JP9	8M –RST	Installed	JP12	8M –CE	Installed
JP16	8M –OE	Installed	JP17	8M –WE	Installed
JP19	2M –CE	Installed	JP21	2M –OE	Installed
JP22	2M –WE	Installed			

Note*: Leave it open.

Table: Jumper Settings - Memory Configuration - Custom/External

JP18	-*	None	JP20	Code Flash	Installed 1-2
			JP20	DIP	None 2-3
JP11	DIP –CE	Remove	JP14	DIP –OE	Remove
JP10	OTP –CE	Remove	JP13	OTP –OE	Remove
JP9	8M –RST	Remove	JP12	8M –CE	Remove
JP16	8M –OE	Remove	JP17	8M –WE	Remove
JP19	2M –CE	Remove	JP21	2M –OE	Remove
JP22	2M –WE	Remove			

Note*: Leave it open.

Table: Port Information

P0.0	RS232	RX	Input
P0.1	RS232	TX	Output
P0.2	RS232	Enable	Output
P0.3	NexFlash(Flash Stick)	CS	Output
P0.4	NexFlash(Flash Stick) Serial EEPROM	SCK SCL	Output Output
P0.5	NexFlash(Flash Stick)	SO	Output
P0.6	NexFlash(Flash Stick)	SI	Input
P0.7	Serial EEPROM Data Flash Select***	SDA DF Select	Input Output

P1.0	LED	LED-Green	Output
P1.1	LED	LED-Yellow	Output
P1.2	LED	LED-Yellow	Output
P1.3	LED	LED-Red	Output
P1.4	Switch	SW-A	Input
P1.5	Switch	SW-B	Input
P1.6	Switch	SW-C	Input
P1.7	Switch	SW-D	Input

P2.0	Allocated for app use	-	I/O / Analog Input
P2.1	Allocated for app use	-	I/O / Analog Input
P2.2	Allocated for app use	-	I/O / Analog Input
P2.3	Allocated for app use	-	I/O / Analog Input
P2.4	Allocated for app use	-	I/O
P2.5	Allocated for app use	-	I/O
P2.6	Allocated for app use	-	I/O
P2.7	Allocated for app use	-	I/O

Note***: Only used in PROGRAM mode.

Table: J5 - I/O

01	Ground	02	Ground		19	P12	20	P13
03	Not used	04	Not used		21	P10	22	P11
05	PDN	06	-RST		23	P06	24	P07
07	P26	08	P27		25	P04	26	P05
09	P24	10	P25		27	P02	28	P03
11	P22	12	P23		29	P00	30	P01
13	P20	14	P21		31	3V Out	32	3V Out
15	P16	16	P17		33	Ground	34	Ground
17	P14	18	P15					

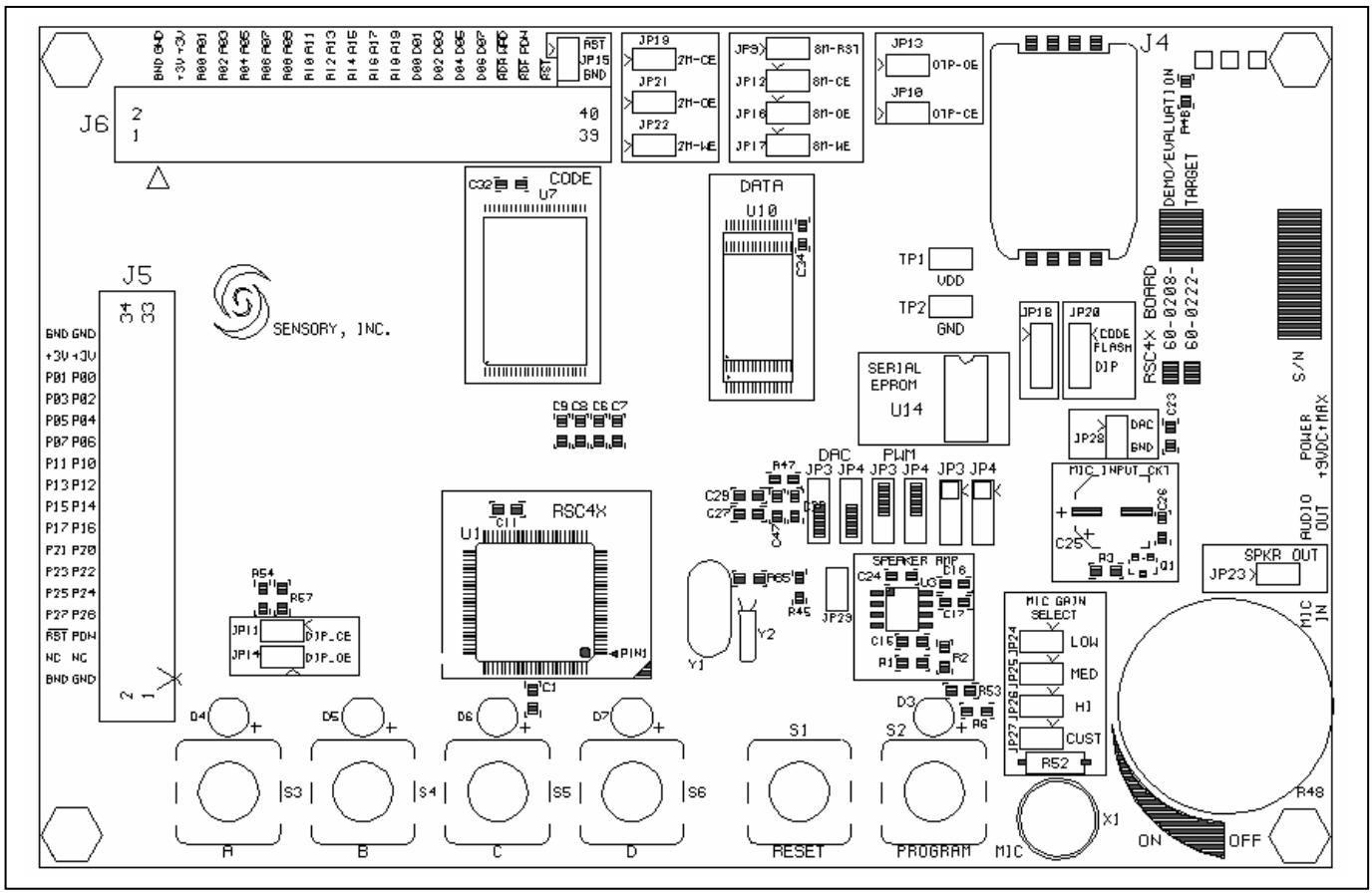
Notes:
-RST is connected at the RESET button.
PDN is buffered.
All port pins have a 100 Ohms in series.

Table: J6 - Address, Data, and Enabling Signals

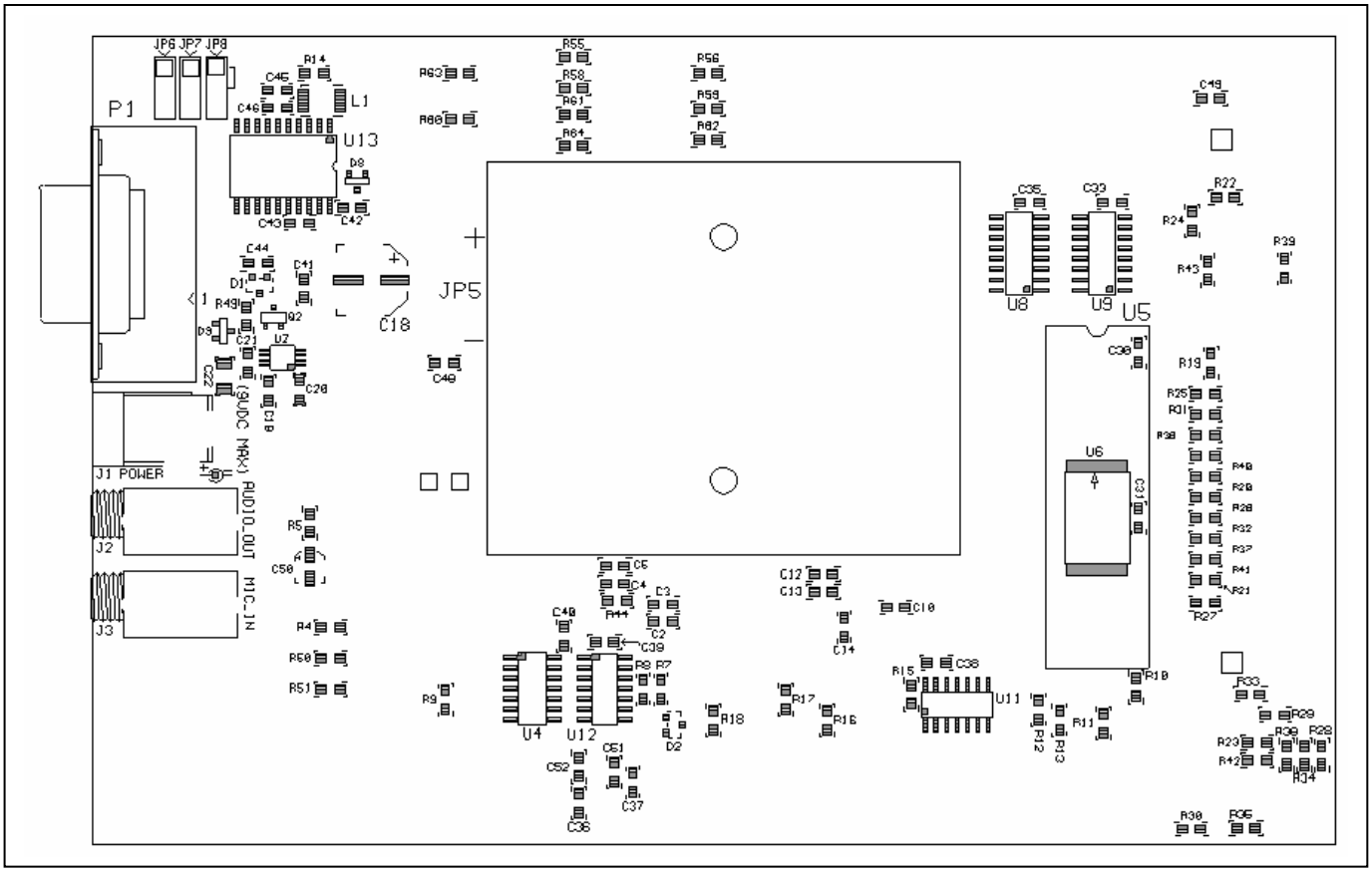
01	Ground	02	Ground		21	A16	22	A14
03	3V Out	04	3V Out		23	A18	24	A19
05	A00	06	A01		25	D00	26	D01
07	A02	08	A03		27	D02	28	D03
09	A04	10	A00		29	D04	30	D05
11	A06	12	A05		31	D06	32	D07
13	A08	14	A07		33	-RDR	34	-WRD
15	A10	16	A09		35	-RDF	36	PDN
17	A12	18	A11		37	-RST	38	Not used
19	A14	20	A13		39	Ground	40	Ground

RSC-4x Demo/Evaluation Board Parts Locator

Top View



Bottom View



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