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Inductive Position Sensor Pro Evaluation Kit User's Guide

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Preface

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Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics, to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the Inductive Position Sensor Pro Evaluation Kit. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the Inductive Position Sensor Pro Evaluation Kit as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – This chapter contains important information about the Inductive Position Sensor Pro Evaluation Kit.
- **Chapter 2. "Installation"** – This chapter describes how to use the Inductive Position Sensor Pro Evaluation Kit.

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CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

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RECOMMENDED READING

This user's guide describes how to use the Inductive Position Sensor Pro Evaluation Kit. Other useful and supplemental documents will be listed here when it becomes available.

THE MICROCHIP WEBSITE

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
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- Field Application Engineer (FAE)
- Technical Support

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Technical support is available through the website at:
http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (February 2021)

- Initial release of this document.

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Chapter 1. Product Overview

1.1 INTRODUCTION

The LX3302AQPW and LX3301AQPW ICs are a low-cost, high-accuracy and superior magnetic noise immune position sensor integrated circuits (ICs). The sensor system consists of the inductive position sensor ICs, its printed circuit board sensor and the target. A target metal is attached to the moving mechanical housing, which provides position relative to the fixed position of sensor Printed Circuit Board (PCB).

The inductive PCBs are constructed using printed circuit board material.

The sensor assembly is connected to the USB IPCE programmer interface through a four-wire cable carrying +5V, GND, IO2 (DOUT) and IO3 (AOUT). The IPCE programmer allows programming of LX3302AQPW and LX3301AQPW internal configuration EEPROM.

1.2 FEATURES

1.2.1 Inductive Position Sensor Pro Evaluation Kit Contents

The Evaluation Kit contains the following items:

- Inductive position sensor PCB with target assembly
- IPCE interface programmer
- 4-pin cable
- USB power cable
- The IPCE software can be downloaded from www.microchip.com

Figure 1-1 shows an example of the LX3302A Pro Sensor Kit.

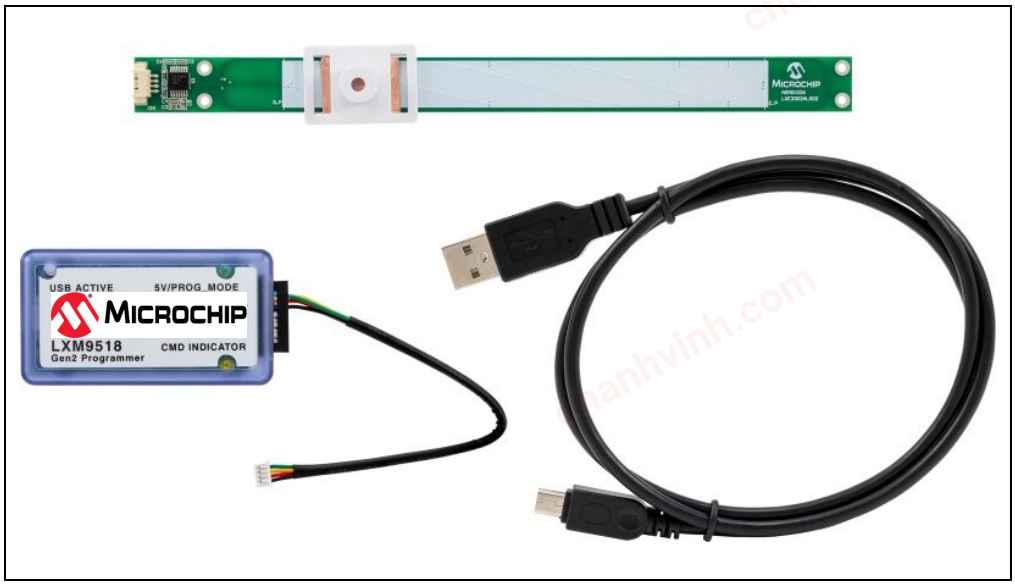


FIGURE 1-1: *LX3302A Pro Sensor Kit Example (LXK3302AL002).*

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1.3 SYSTEM OPERATION

The Inductive Position Sensor Pro Evaluation Kit has been factory calibrated and is ready to use. The default operation requires a +5V DC power source which can be supplied either by an external DC power supply or the ICPE programmer connected to PC via USB.

The evaluation kit constitutes a main sensor board and a movable target PCB. The main sensor board contains two oscillator coils (OSC1 and OSC2) and two pickup coils (CL1 and CL2). The IC energizes the two oscillator coils. The position of the target varies the reception of the two pickup coils relative to each other. The IC demodulates the two received signals and generates an output signal representative of the relative difference between the CL1 and CL2 signals, see Figure 1-2.

The values of the two OSC1 and OSC2 capacitors vary depending on the characteristics of the OSC1 and OSC2 printed circuit board layout pattern. The combination L/C impedance of the printed circuit board layout is matched to the LX3302AQPW and LX3301AWPW oscillation requirement. Refer to the *LX3302A* (DS20006306) and *LX3301A* (DS20006387) *Data Sheets* for more design parameters.

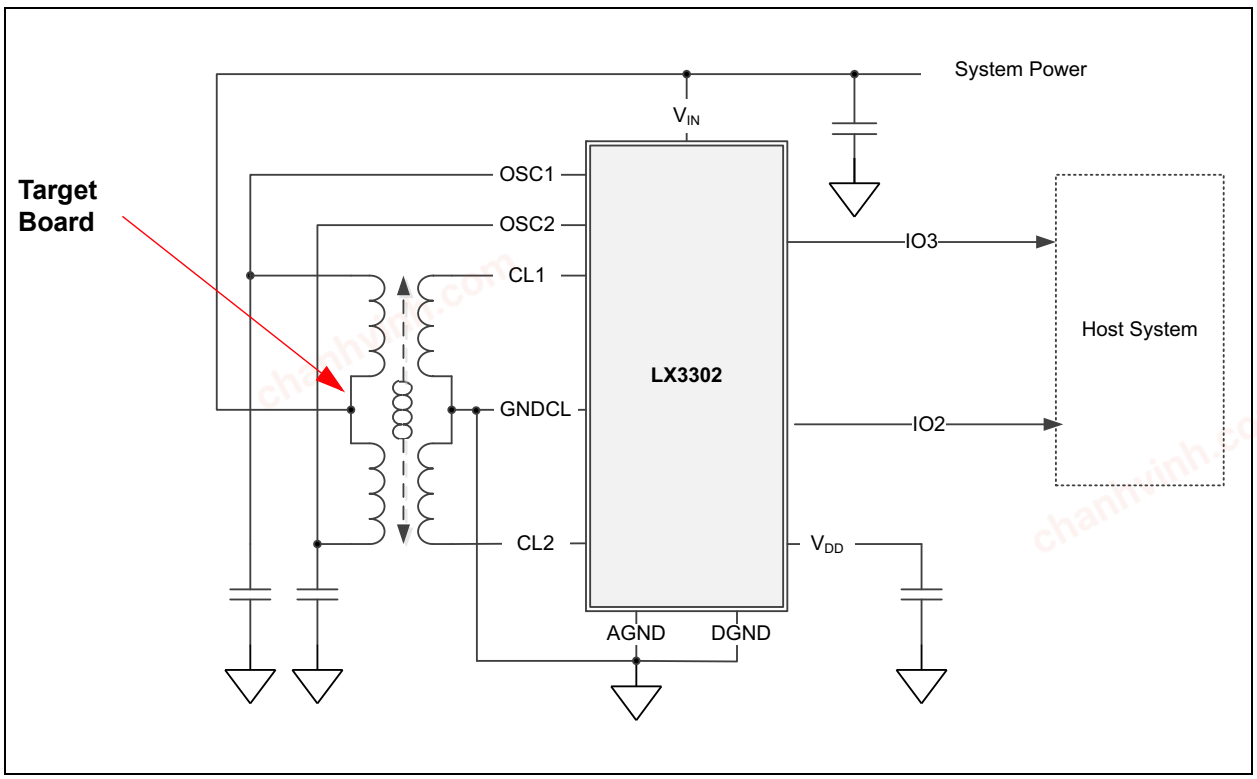


FIGURE 1-2: *Inductive Sensor Operation Principle.*

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Chapter 2. Installation

2.1 4-PIN TO 10-PIN CONNECTOR BETWEEN SENSOR BOARD AND PROGRAMMER



FIGURE 2-1: *4-Pin to 10-Pin Connector.*

Figure 2-1 shows the required external system equipment and their respective connections to the LX3302A Evaluation Board. The sensor assembly comes with a 4-pin (CN1) to 10-pin (CN2) connector to connect the sensor to the IPCE programmer. Table 2-1 and Table 2-2 show the pinout of this connector.

TABLE 2-1: CN1 PINOUT CONNECTOR (MOLEX PART NUMBER: 151340400)

Pin#	Pin Name	Functional Description
1	GND	Ground
2	V_{IN}	+5V Supply/Internal EEPROM programming. Refer to either *LX3302A Data Sheet* or *LX3301A Data Sheet* for details.
3	IO3 (AOUT)	LX3302AQPW IO3 output can be programmed to analog/PWM/SENT/PSI5/TD output. Refer to the *LX3302AQPW Data Sheet*. (LX3301AQPW AOUT output is the Analog/PWM/TD) Refer to the *LX3301AQPW Data Sheet*.
4	IO2 (DOUT)	LX3302AQPW IO2 output can be programmed to PWM/SENT. (LX3301AQPW DOUT output is the PWM/TD)

TABLE 2-2: CN2 CONNECTOR PINOUT (3M M1DXA-1036J)

Pin#	Pin Name	Functional Description
1	IO2 (DOUT)	LX3302AQPW IO2 output can be programmed to PWM/SENT. (LX3301AQPW DOUT output is the PWM/TD)
2	IO3 (AOUT)	LX3302AQPW IO3 output can be programmed to analog/PWM/SENT/PSI5/TD output. Refer to the *LX3302AQPW Data Sheet*. (LX3301AQPW AOUT output is the Analog/PWM/TD) Refer to the *LX3301AQPW Data Sheet*.
3	V_{IN}	+5V Supply/Internal EEPROM programming. Refer to either *LX3302A Data Sheet* or *LX3301A Data Sheet* for details.

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TABLE 2-2: CN2 CONNECTOR PINOUT (3M M1DXA-1036J) (CONTINUED)

Pin#	Pin Name	Functional Description
4	GND	Ground
5	SDA	I^2C serial data (Internal purpose only, not for external use) Reserved
6	SCL	I^2C serial clock (Internal purpose only not for external use) Reserved
7	IO1 (ICSPCLK)	Only used for digital programming mode. (Clock for programming internal microcontroller)
8	IO4 (ICSPDAT)	Only used for digital programming mode. (Data line for programming internal microcontroller)
9	MCLR	Master Clear (used for programming internal microcontroller)
10	V_{DD}	Internal device supply

2.2 INDUCTIVE SENSOR BOARD TYPICAL CHARACTERISTICS

The plot in Figure 2-2 displays an example of linearity achievable with the inductive sensor with an analog output. Other output formats will have the same accuracy.

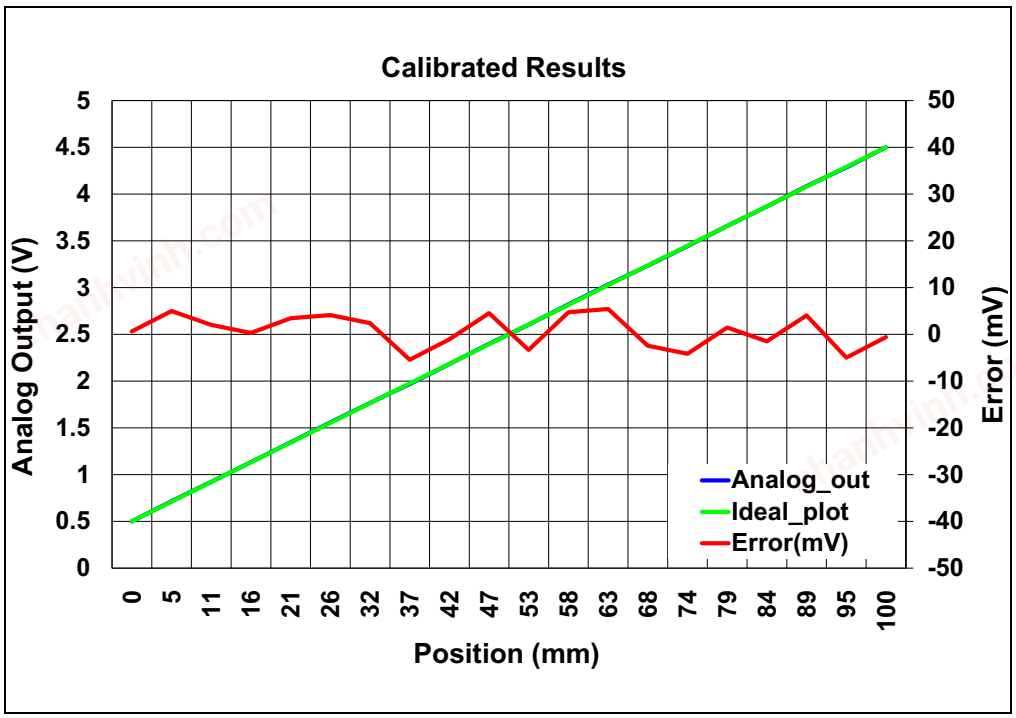


FIGURE 2-2: *An Example of Typical Inductive Sensor Board Linearity (Calibrated).*

2.3 CONFIGURATION EEPROM

The measurement IC contains an internal EEPROM for storing Calibration and Configuration parameters. The Calibration parameters enable the production sensor assembly to be factory calibrated ensuring consistent unit-to-unit performance.

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2.4 KIT EEPROM PROGRAMMING IPCE

The sensor kit includes an Integrated Programming and Calibration Environment (IPCE) to facilitate system Calibration and Configuration. The integrated programming environment contains an EEPROM programming tool and data measuring system.

2.4.1 IPCE Installation and Startup

1. To download the IPCE software, acess the *Sensor Evaluation and Calibration Software (2.x)* from the LX3301A or LX3302A product page.
2. Install the program.
3. Once connected, the dongle status will indicate that the port is open and detects the Evaluation Board (EVB).
4. The voltages or digital signals from each output are displayed in the live update section of the IPCE tool.

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