HEDS-8937
AEAT-6600-T16 Magnetic Encoder Programmer Kit

User Manual

1. Introduction

Overview

This user manual describes the Avago HEDS-8937 programmer kit. The AEAT-6600-T16 magnetic encoder programming kit features real-time monitoring and programming of the 32-bit OTP memory within the AEAT-6600-T16 magnetic encoder IC. The HEDS-8937 kit includes the IC interface hardware that is supported by PC software. The IC interface hardware is a microcontroller system that links the AEAT-6600-T16 encoder to the PC through a USB cable. This user manual describes the hardware and PC software setup and gives instructions on PC software operation.

Features

- Bus-powered USB device
- On-board 6.5 V programming voltage
- Auto-power off when the AEAT-6600-T16 is removed from the programming socket
- Read and write the 32-bit OTP memory
- Real-time monitoring of SSI, PWM, ABI or UVW outputs
- Real-time monitoring of MAG_HI and MAG_LOW signals

2. Hardware Component

Unpacking the Unit

The typical packing of the AEAT-6600-T16 magnetic encoder programming kit is shown in Figure 1.

The kit contains:

1. USB cable
2. AEAT-6600-T16 magnetic encoder programmer
3. IC adapter socket
4. 16-pin ribbon cable
5. Installation CD

Figure 1. Inside the Programmer kit box

The programmer kit has five parts as shown in Figure 2.

Figure 2. Components of the programmer kit

The USB cable (5) connects a PC USB port to the programmer (1).

Figure 3 shows the AEAT-6600-T16 programmer. The red LED will light up when the programmer is powered by connecting the programmer kit to the PC via the USB cable. The green LED will blink when there is communication between the PC and encoder. The programmer's current consumption is less than 200 mA. The programmer incorporates a 100 mA current limiting circuit to the IC adapter socket. If the current consumption for the encoder being programmed or monitored exceeds 100 mA, the programmer will turn off the power supply to the encoder.
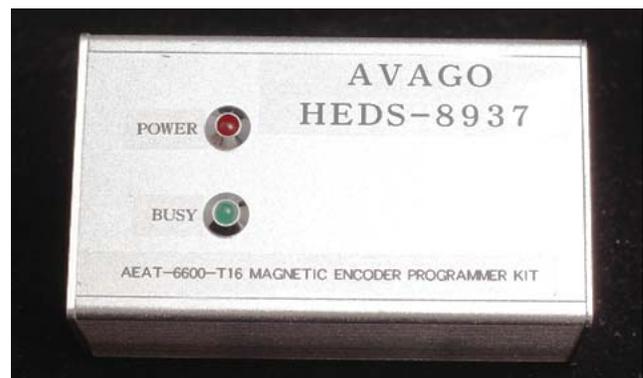
Figure 3. HEDS-8937 programmer top cover

Triangle mark on connector body

15	13	11	9	7	5	3	1
16	14	12	10	8	6	4	2
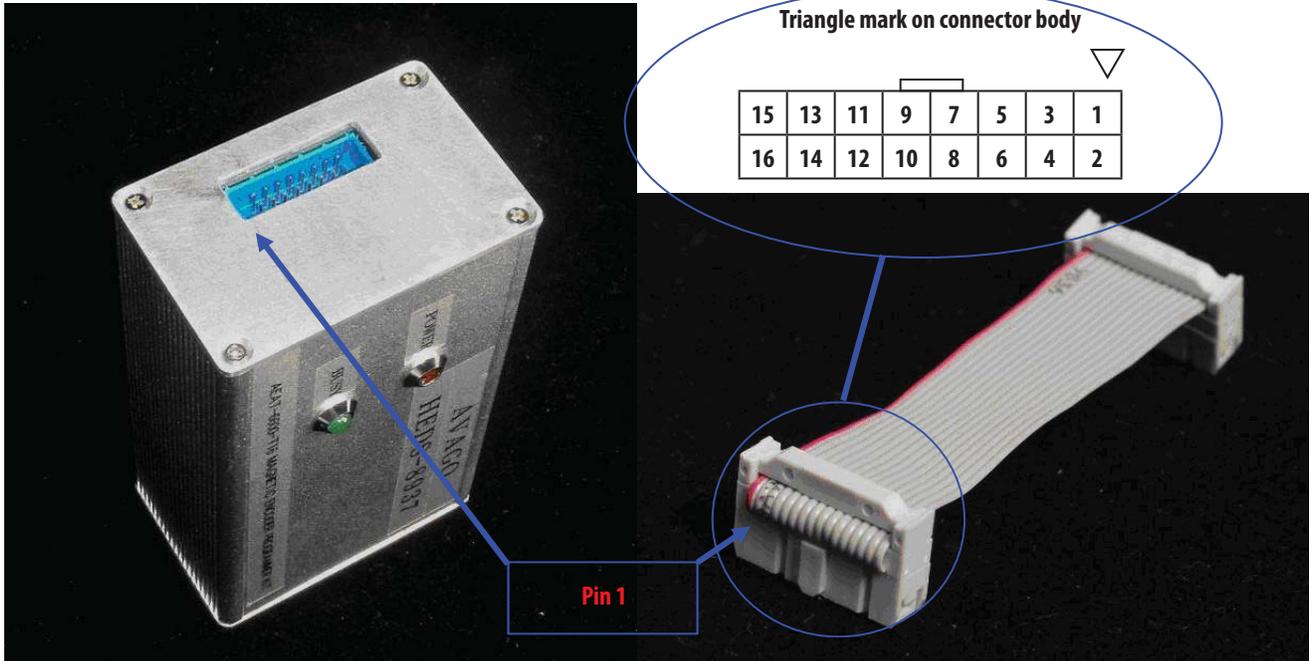
Pin 1

Figure 4. Programming connector: 16-pin rectangular header connects to the IC adapter socket

The pin functions of the programming connector are shown in Table 1.

Table 1. Programming connector pin functions

PIN	Name	Function
PIN 1	A, U	Digital Input
PIN 2	B, V	Digital Input
PIN 3	I, W	Digital Input
PIN 4	MAG_HI	Digital Input
PIN 5	MAG_LOW	Digital Input
PIN 6	GND, GNDA	IC Ground
PIN 7	ALIGN	Digital Output
PIN 8	PWM	Digital Input
PIN 9	VDD	IC Supply
PIN 10	VDD_F	Analog Input (IC regulator output measurement)
PIN 11	PWRDOWN	Digital Output
PIN 12	VPP	IC Programming Voltage
PIN 13	PROG	Digital Output
PIN 14	NCS	Digital Output
PIN 15	CLK	Digital Output
PIN 16	DO / DI	Digital Output / Input

* All logic signals are 3.3 V TTL level signals

The 16-pin ribbon cable connects the programmer kit and the IC adapter via the programming connector.

Figure 5 shows the IC adapter socket.
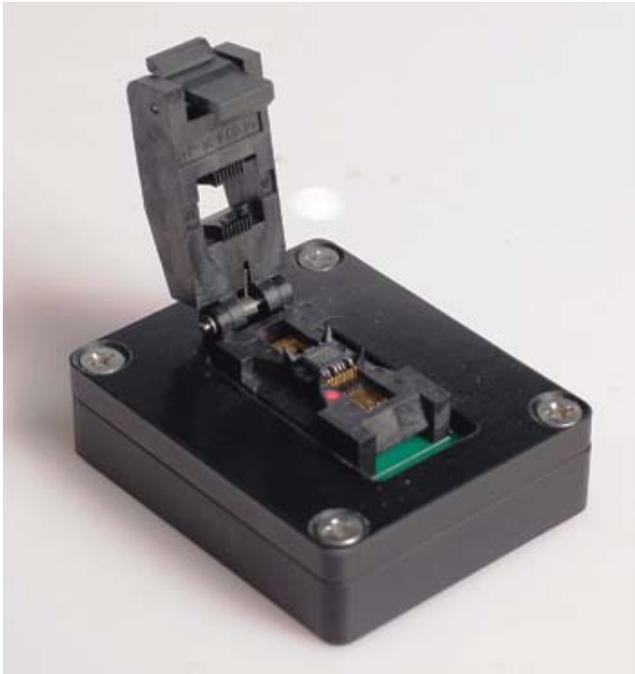
Figure 5. The IC adapter socket has a red dot that indicates pin 1 of the AEAT-6600-T16 encoder

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3. Software Installation

The installation CD contains this user manual and the programmer application software. To install the application software, browse to the software folder 'Avago Magnetic Programmer' and double-click the 'Setup.exe' icon in the folder. The installation will run automatically. Figures 6, 7 and 8 illustrate the software installation.
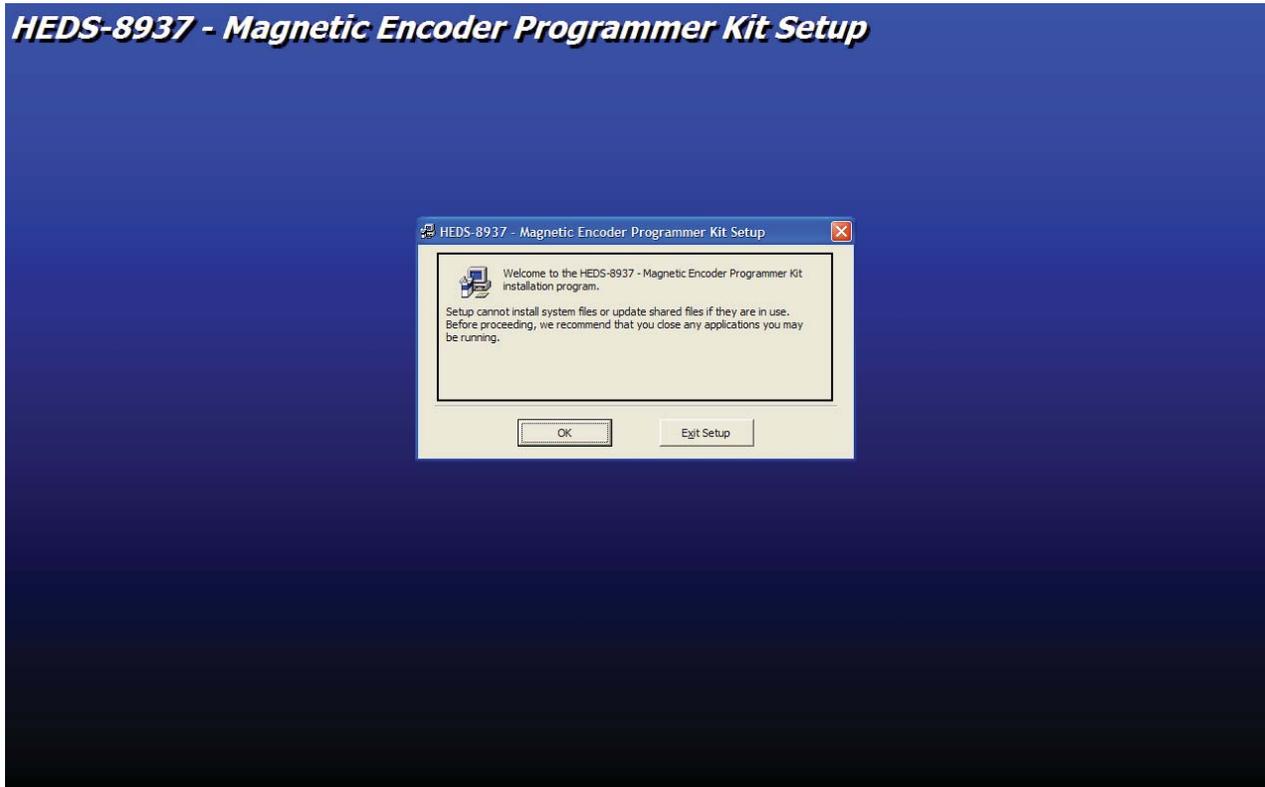
Figure 6. Software installation startup screen. Click OK to start the installation.
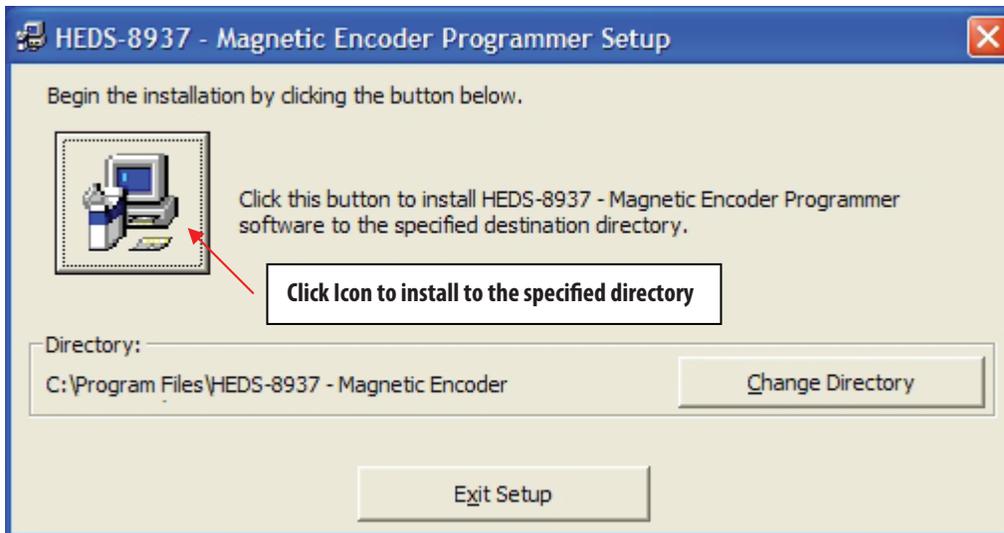
Figure 7. Installation folder selection screen. Click 'Change Directory' to change the default installation folder. Click the installation icon to continue.
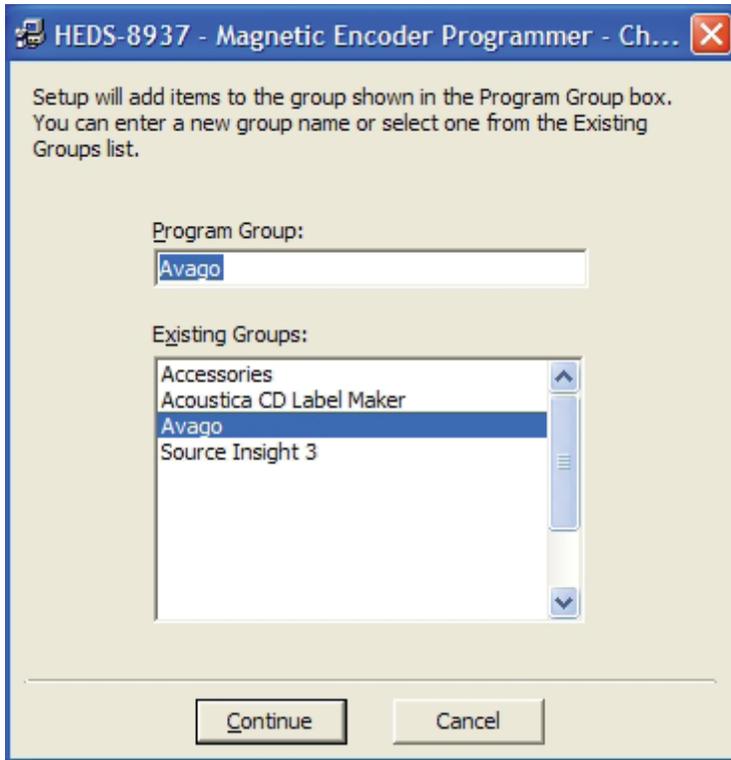
Figure 8. Click 'Continue' to add the software under the default program group

The installation process will continue after the step shown in Figure 8, and finally a 'Setup successful' pop-up message will indicate completion of the installation.

Locate the software by selecting: Start > All Program > Avago > Avago HEDS-8937 Application Kit (by default) or other Start Group specified in the step shown in Figure 8.

To uninstall the software, open the Window's Control Panel. Run 'Add or Remove Program' and locate 'Avago HEDS-8937 Application Kit'. Click 'Change / Remove", and follow the screen instructions to remove the software.

4. Software Application

4.1 OTP Programming

To run the application software, point to: Start > All Program > Avago > Avago HEDS-8937 Application Kit. After selecting the software, the screen in Figure 9 will appear.

The software has three tabs: OTP Programming, Zero Position Programming and IC Monitoring. OTP programming allows programming the OTP memory and zero position programming defines the zero position. The IC monitoring tab displays the current encoder measurement.

Figure 9 shows the OTP programming tab. In the OTP programming tab, the software guides the OTP programming step-by-step. When the 'Detect IC' button is clicked on the OTP programming tab, the software will locate the programmer and check for the presence of the AEAT-6600-T16 encoder.
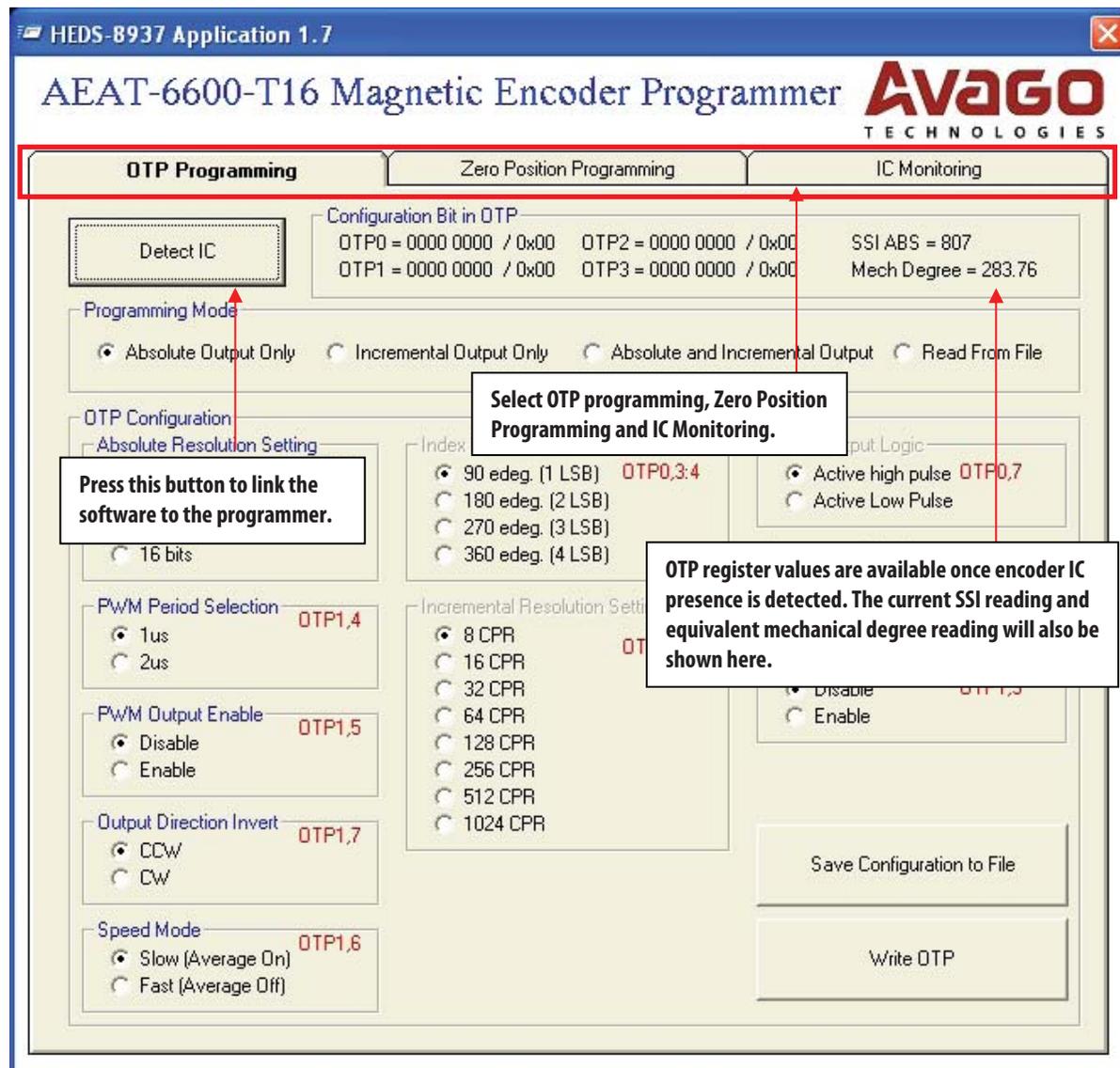
Figure 9. OTP programming tab

4.2 IC Detected

After the 'Detect IC' button is clicked and IC presence is detected, the screen in Figure 10 appears.
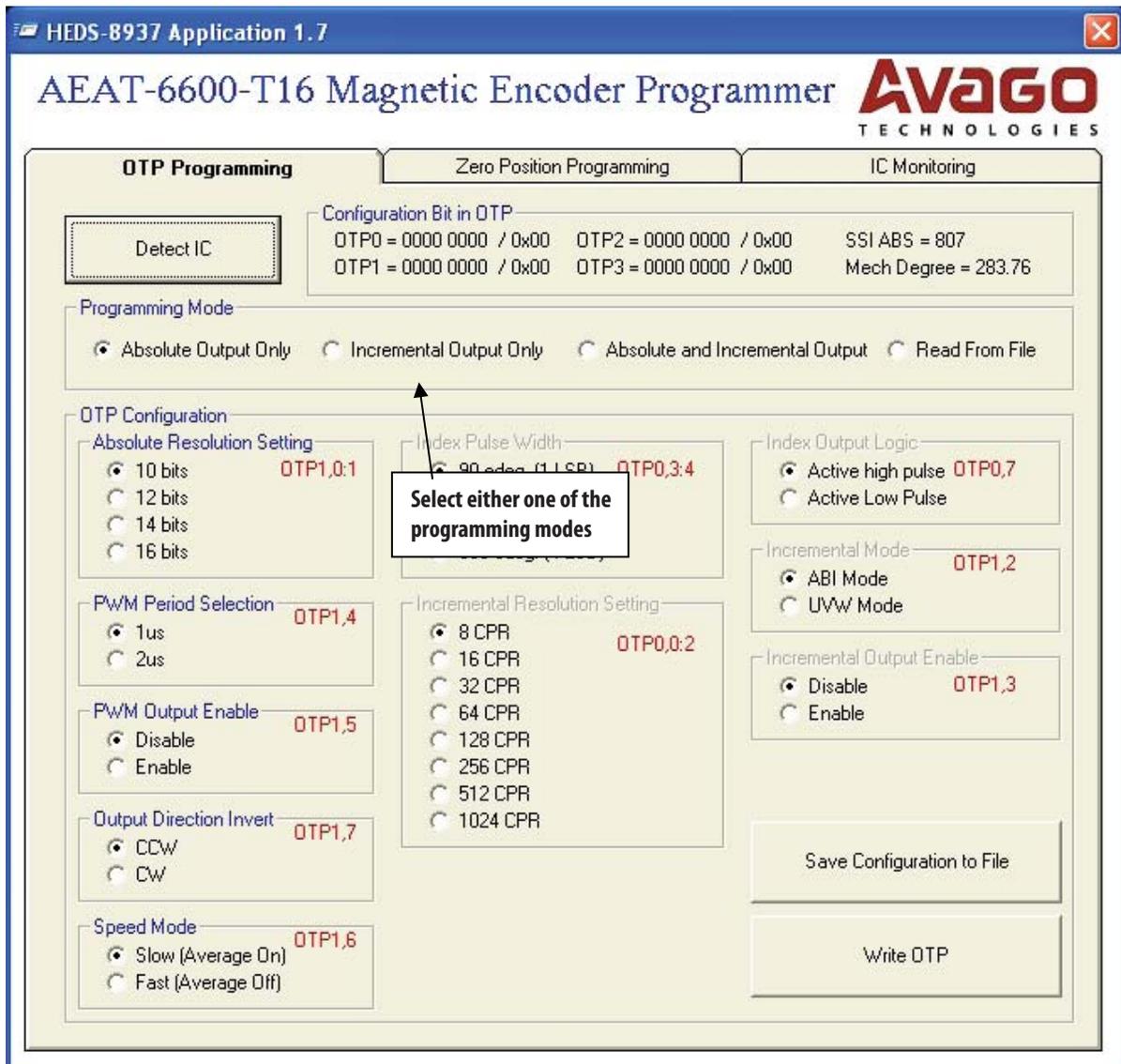
Figure 10. OTP memory configuration

The contents of the OTP memory are displayed in the 'Configuration Bit in OTP' frame. The indicated OTP memory is in binary followed by the equivalent hexadecimal value. The symbol '/' separates the binary and hexadecimal values. The SSI ABS measurement is the position value captured when the 'Detect IC' button is clicked. 'Mech Degree' indicates the equivalent mechanical angle calculated from the SSI ABS value.

If the encoder is detected, the 'Select Programming Method' frame appears. Select one of the output modes. This selection enables the OTP configuration registers to be configured.

If 'Absolute Output Only" is selected, only the 'Absolute Resolution Setting', 'PWM Period Selection', 'PWM Output Enable', 'Output Direction Invert' and 'Speed Mode' selection options are enabled. The 'Write OTP' button will be visible as well.
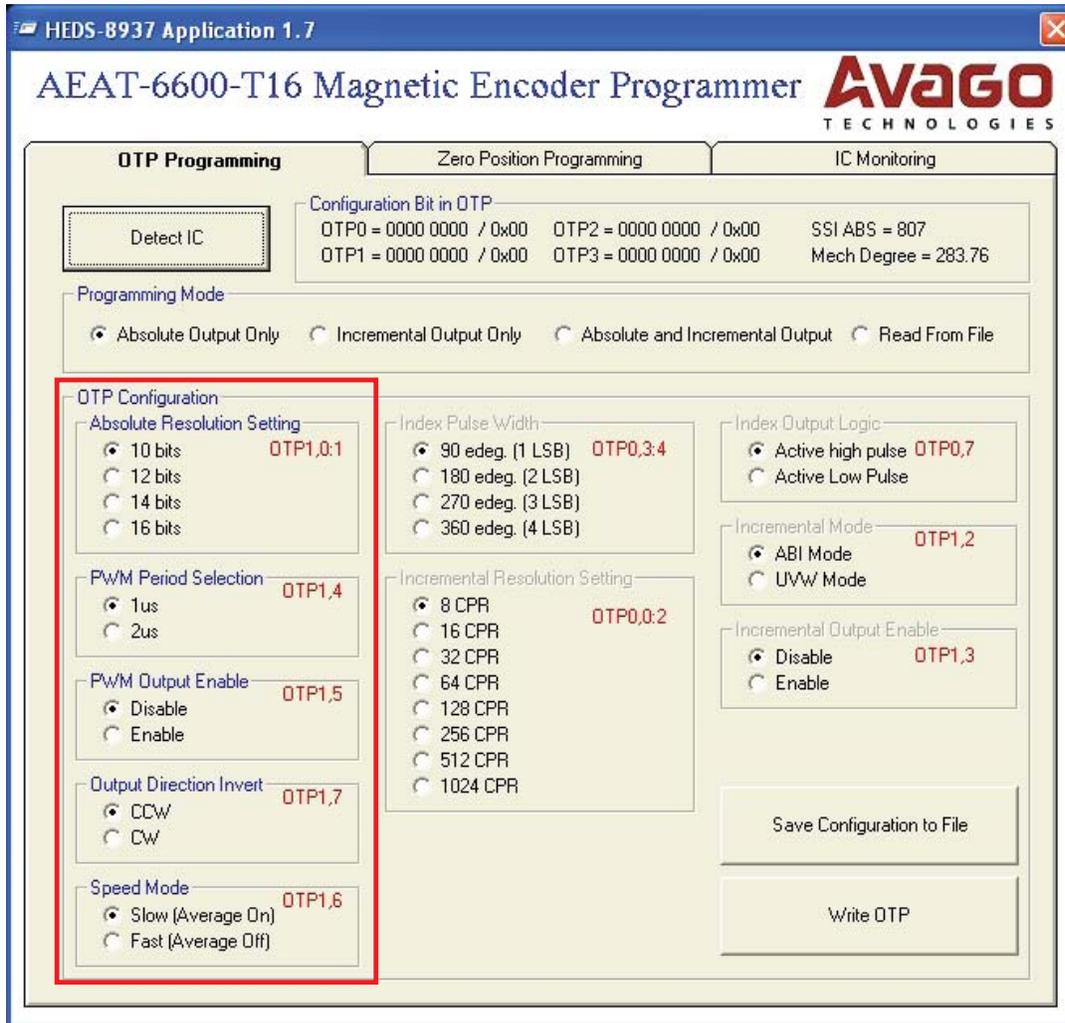
Figure 11. Absolute output only setting

If 'Incremental Output Only' is selected, the 'UVW Pole Pair Setting' / 'Index Pulse Width', 'Incremental Resolution Setting', 'Zero Position Setting', 'Index Output logic', 'Incremental Mode' and 'Incremental Output Enable' selection options are enabled. The 'Write OTP' button will be visible as well.

Figure 12.Pop up message for mandatory incremental setting when selecting 16-bit for absolute.
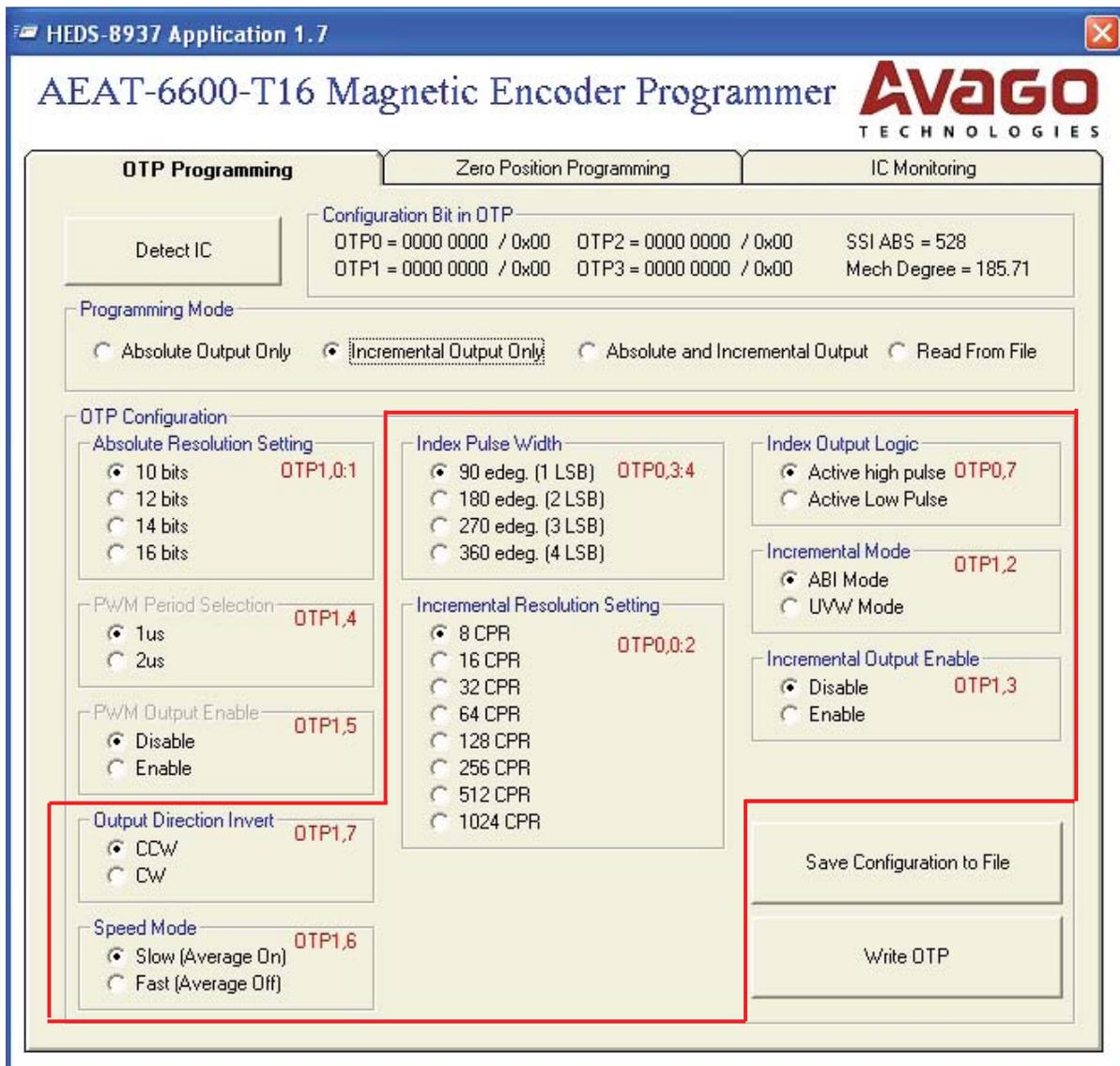
Figure 13. Incremental output only setting

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If 'Both Absolute and Incremental Output' is selected, all the OTP configuration settings will be enabled (except the Zero Position Setting). A pop-up message box, as shown in Figure 14 will appear.

Figure 14. Pop up message for mandatory incremental setting when selecting 16-bit for absolute.
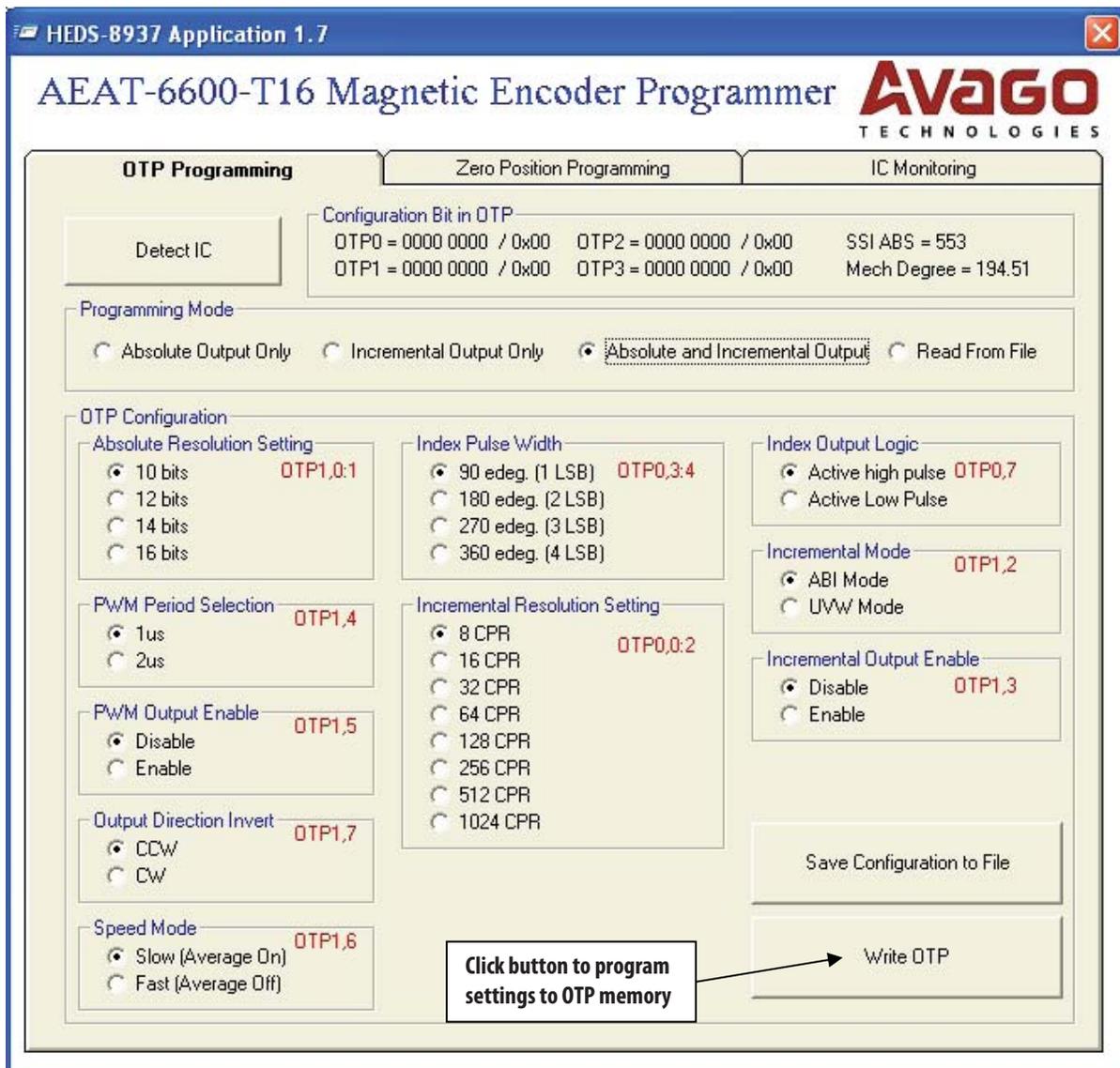
Figure 15. Programming OTP memory

After the configuration setting is complete, click the 'Write OTP' button to start OTP programming. The software will compile the data to write to the OTP memory. A confirmation pop-up message box shows the data to be written to the OTP memory, as shown in Figure 16. Click either the 'Yes' button to proceed with the programming or the 'No' button if reconfiguration is needed.
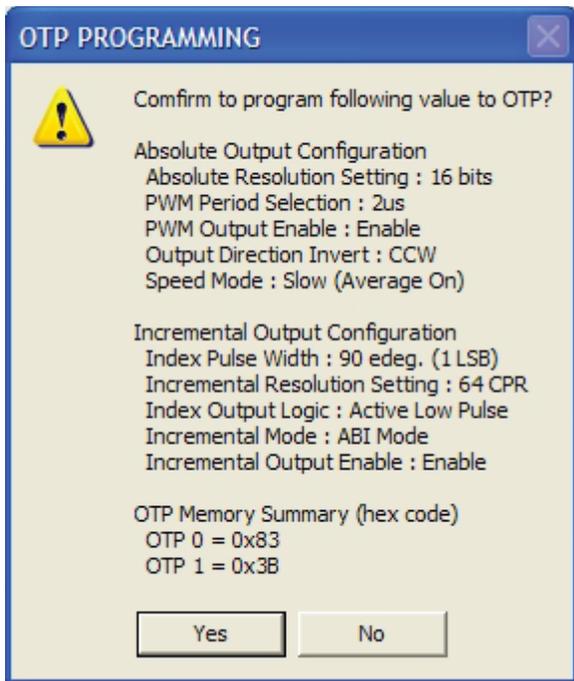
Figure 16. Pop-up confirmation message that appears before OTP programming starts

As shown in Figure 17 if the programming is successful, a pop-up 'OTP Programming Pass' message box summarizes the selected values and the programmed values.
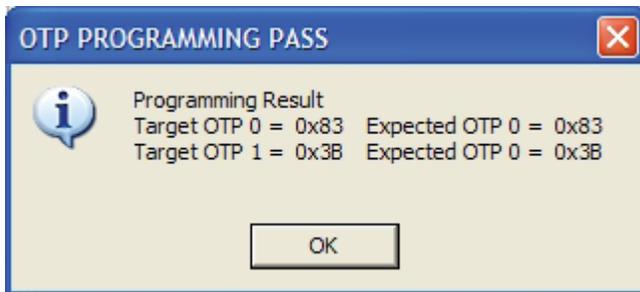
Figure 17. Programming result

If more than one encoder must be programmed with the same settings, key in the setting only once and click the "Save Configuration File" button to save the encoder settings. Select "Read From File" to recall the IC settings and then click the "Write OTP" button.
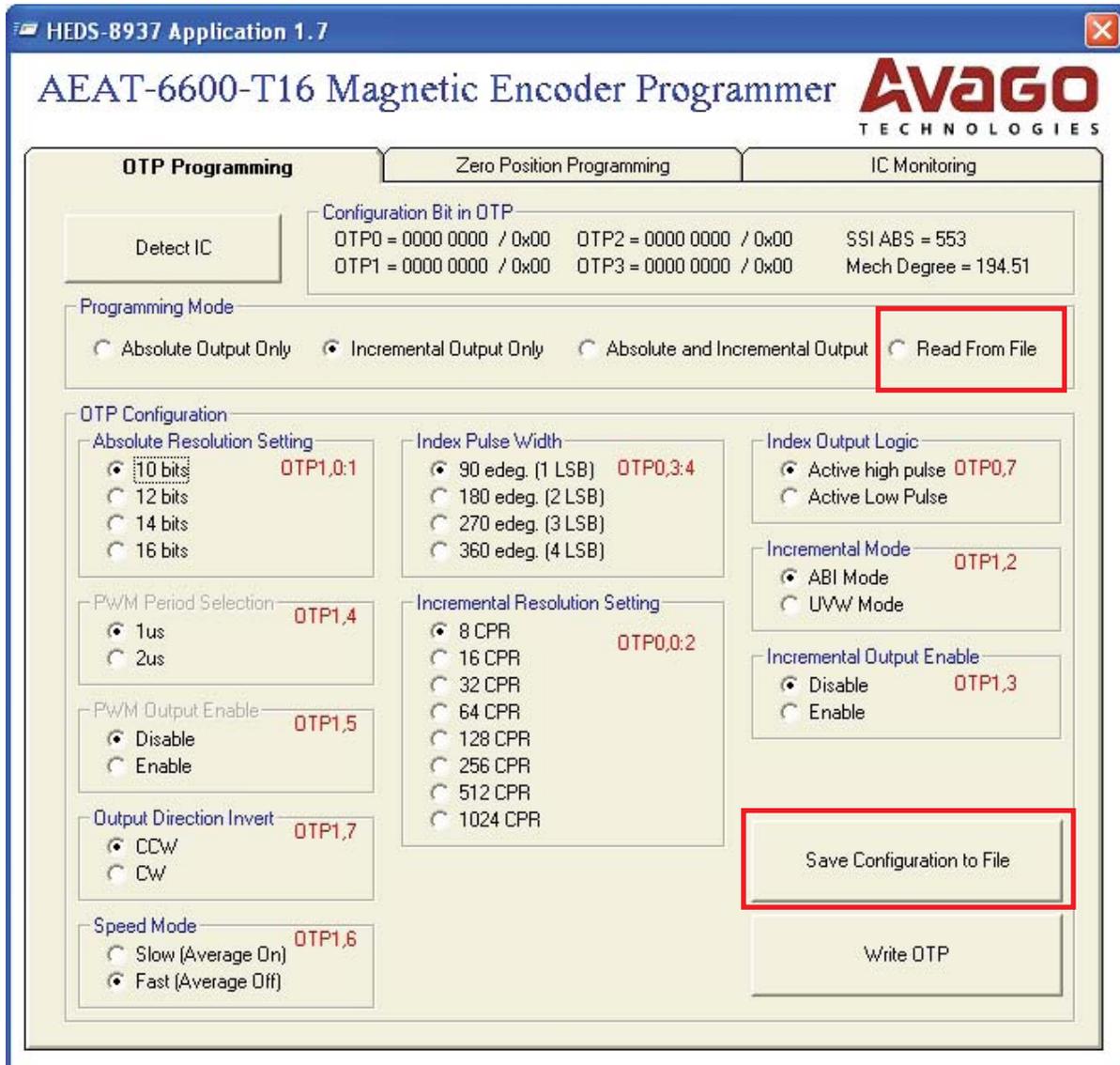
Figure 18. Save encoder settings to a file and read settings through the 'Read From File' feature

For zero position programming, select the centre tab 'Zero Position Programming' and the 'Zero Offset' frame will be enabled. Either the raw Hex code value for writing to OTP memory or the mechanical angle value can be entered. As shown in Figure 19, once the setting is completed, click the 'Write Zero Position Offset' button to program the offset value to the OTP registers.
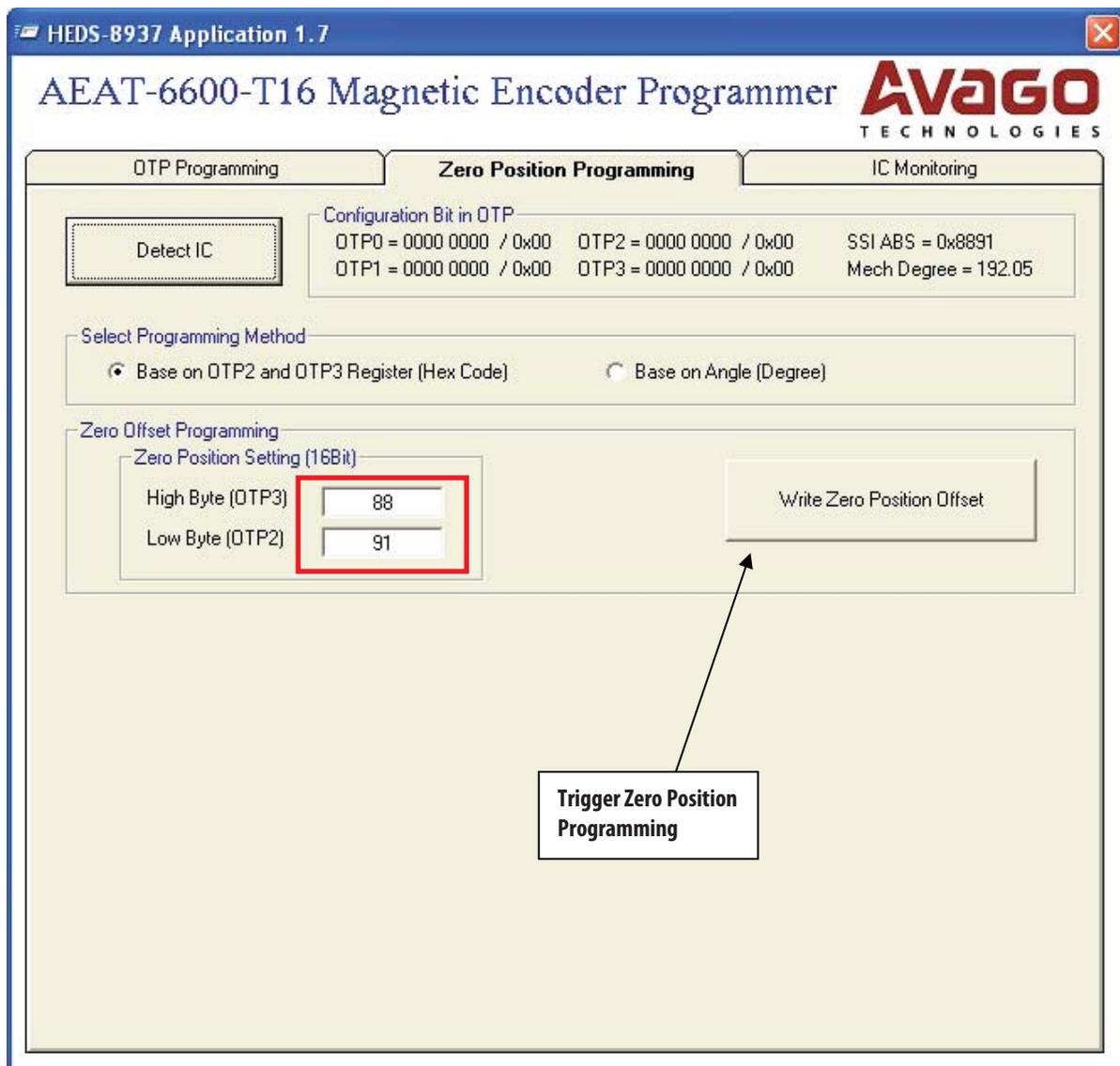
Figure 19. Programming the zero position

A confirmation pop-up message box, shown in Figure 20, will appear before programming begins. When the 'Yes' button is clicked, the programming will start.
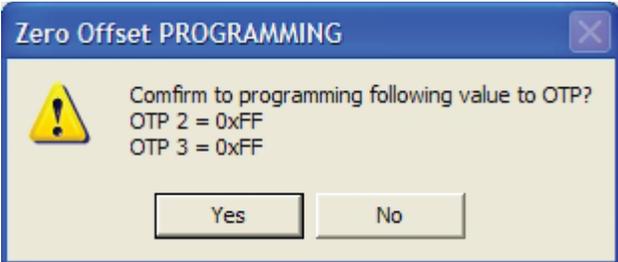
Figure 20. Programming confirmation pop-up message

After programming completes, as shown in Figure 21, the pop-up 'Zero Offset PROGRAMMING PASS' message box is displayed.

Figure 21. Programming result pop-up message

4.5 AEAT-6600-T16 Encoder Monitoring

The monitoring tab displays the real-time output of the AEAT-6600-T16, as shown in Figure 22. The software captures the position measurement at a 12 samples per second rate (update rate may slightly vary depending on the PC). The monitoring software begins automatically when the IC monitoring tab is selected, provided the programmer and encoder is present. If the programmer or encoder is not present, IC monitoring will be disabled and the active tab will automatically switch back to the OTP programming tab.
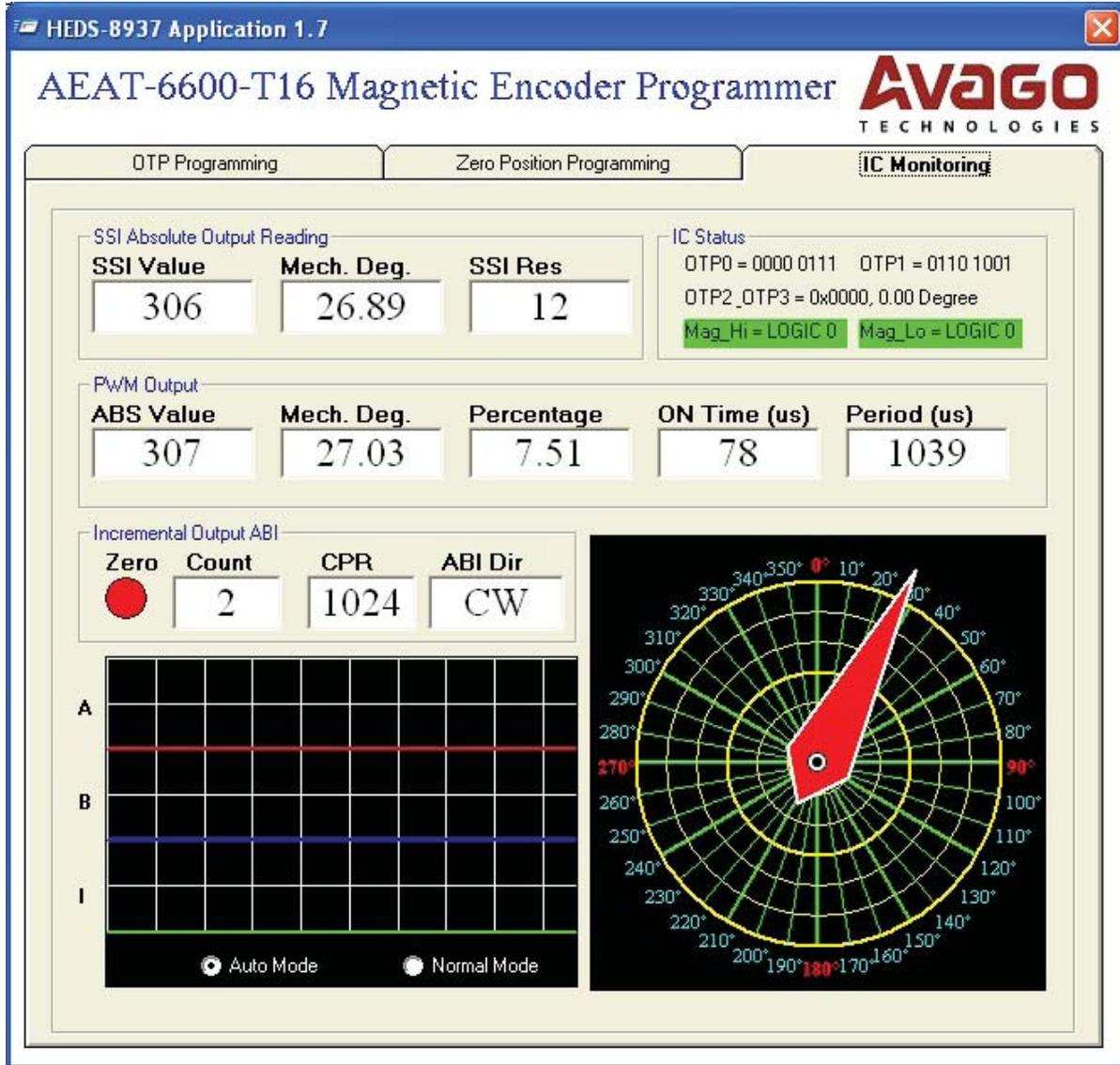
Figure 22. AEAT-6600-T16 real-time status monitoring

5. Production In-circuit Programming

The programming kit performs in-circuit OTP programming of the AEAT-6600-T16 encoder mounted on a target board. To perform in-circuit programming, connect the lines shown in Table 2 to the 16-pin programming header of the target system.

Table 2. Pins required for in-circuit programming

MAG_HI / OTP_ERR (3)
MAG_LO / OTP_STAT (3)
PWRDOWN (3)
PROG (3)
NCS (3)
CLK (3)
DO/DI (3)
VDD_F (3)
VDD (Optional)(1)
VPP (2)
GND

Refer to Table 1 for the pinout of the 16-pin rectangular header.

Once a connection is made, follow instructions described in Section 4 to perform OTP programming and zero-position programming. The IC Monitoring feature can also be used but monitoring of PWM and ABI/UVW will be disabled.

Important notes:

1. VDD is not required if the on-board IC is powered by the target system.

2. During OTP programming, the target system/host, such as micro-controller, should turn off and the programming kit will supply 6.5 V to the VPP pin and 5 V / 3.3 V to the VDD pin.

3. As pins may be shared between the programmer kit and the target host device, such as microcontroller, make sure that these pins are not driven by the host device. All pins should be kept in a high-impedance state (Hi-Z).

6. Troubleshooting Guide

6.1 Programmer Not Found

If the programmer is not found, the following message will be displayed.

Figure 23. Programmer not found message

Check the connection and ensure that the POWER LED on the programmer kit is on. If the Power LED is off, the cause is potentially due to hardware. Please contact your distributor for repair as there are no user serviceable parts in the programmer.

6.2 IC Not Present

If the AEAT-6600-T16 IC is not present in the programmer, the following message will be displayed.
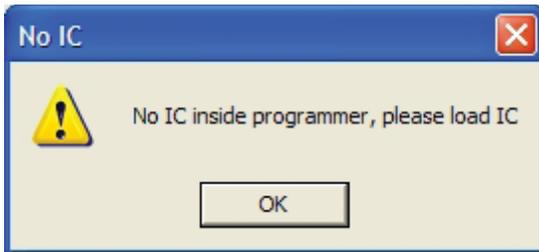
Figure 24. IC not present message

There are three possibilities for this condition:

1. The IC adapter socket is not connected to the programmer (via the programming connector). Connect the IC adapter socket to the programmer using the provided 16-pin ribbon cable.

2. Wrong orientation of the IC placed in the IC adapter socket. Check and ensure pin 1 of the encoder IC is aligned with the RED dot on the bottom side of the IC socket.

3. The encoder has not been loaded in the IC adapter socket or the loaded encoder IC is faulty. Replace with a new IC and try again.
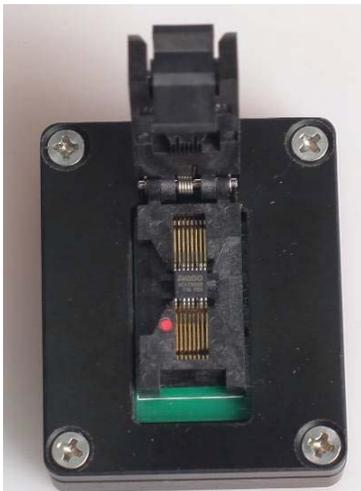
Figure 25. Ensure pin 1 of the encoder IC is aligned with the red dot

7. Updating the HEDS-8937 Application Kit Firmware

Note: To get the up to date both i-Stone iBootloader downloader and HEDS-8937 Application Software please download from Avago product webpage: (http://www.avagotech.com/pages/en/motion_control_encoder_products/) under part number HEDS-8937

To update the HEDS-8937's firmware you will need:

1. A PC running a Microsoft Windows based operating system
2. The i-Stone iBootloader downloader PC software executable
3. A new Avago HEDS-8937 firmware Hex file (*.hex)

7.1 Firmware Update Procedure

1. Start the i-Stone iBootloader downloader software. The following screen will be displayed.
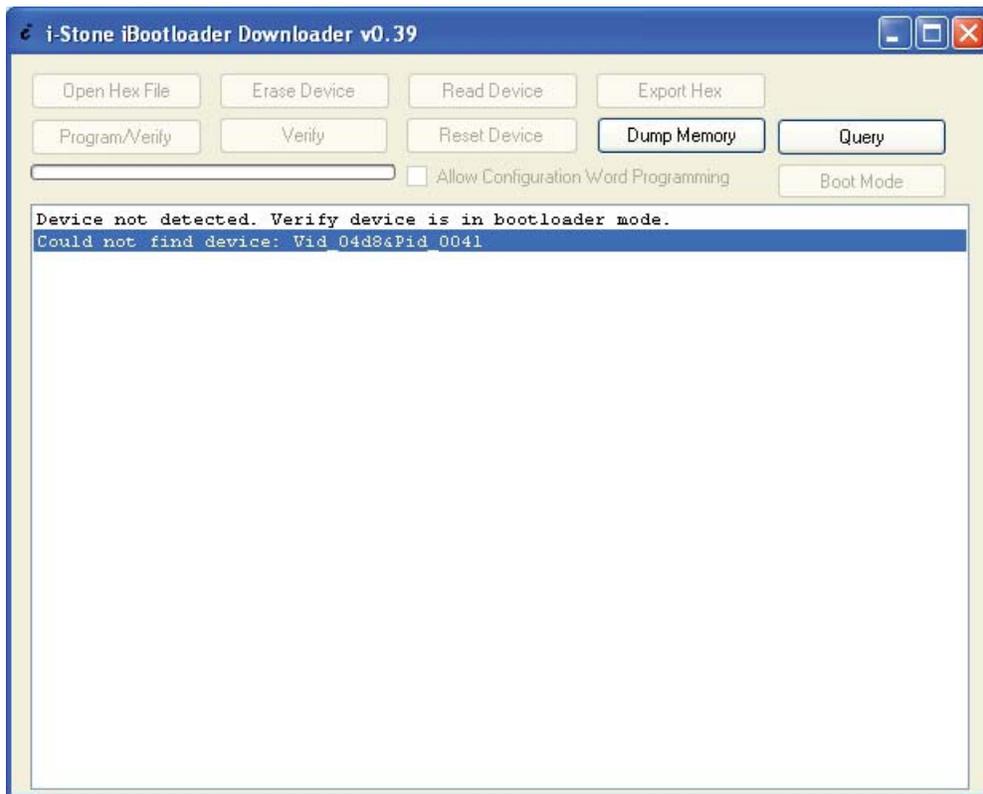
2. Connect an Avago HEDS-8937 application kit to the PC using one of the USB ports. The downloader software will detect the application kit as shown below.

3. Click the "Boot Mode" button to switch the application kit to bootloader mode.
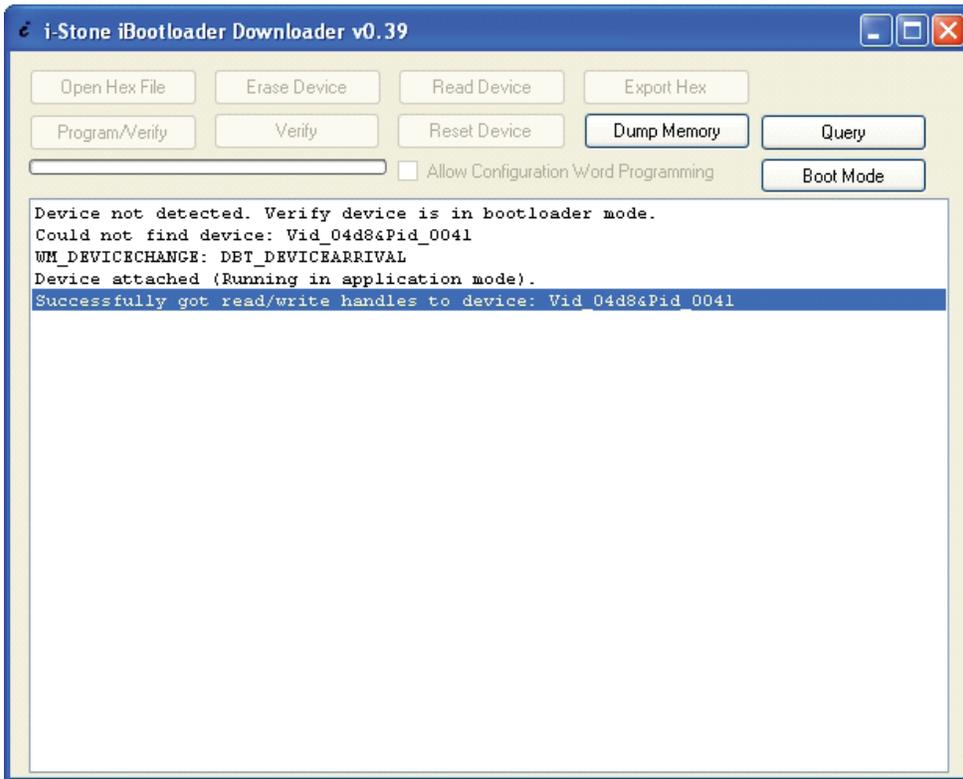
4. Once successful, the downloader software will show "Device attached" in the status box as below.
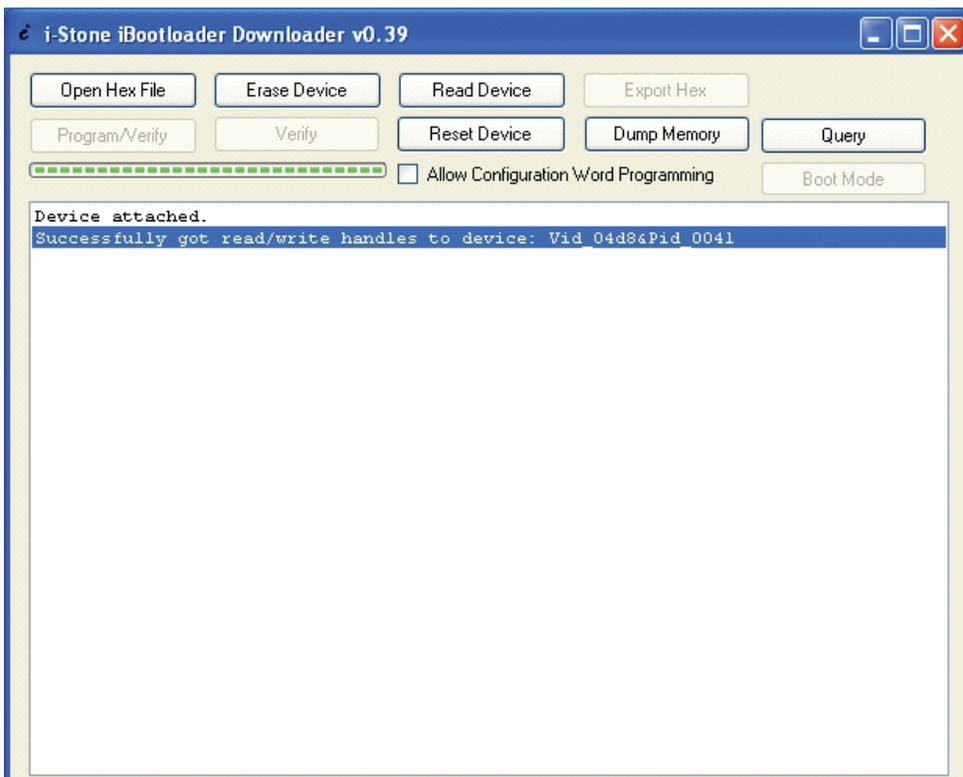
5. Click the "Open Hex File" button and a file selection dialog box will be displayed. Browse and select the new HEX file provided. After the HEX file is loaded, the "Program/Verify" button will be enabled.
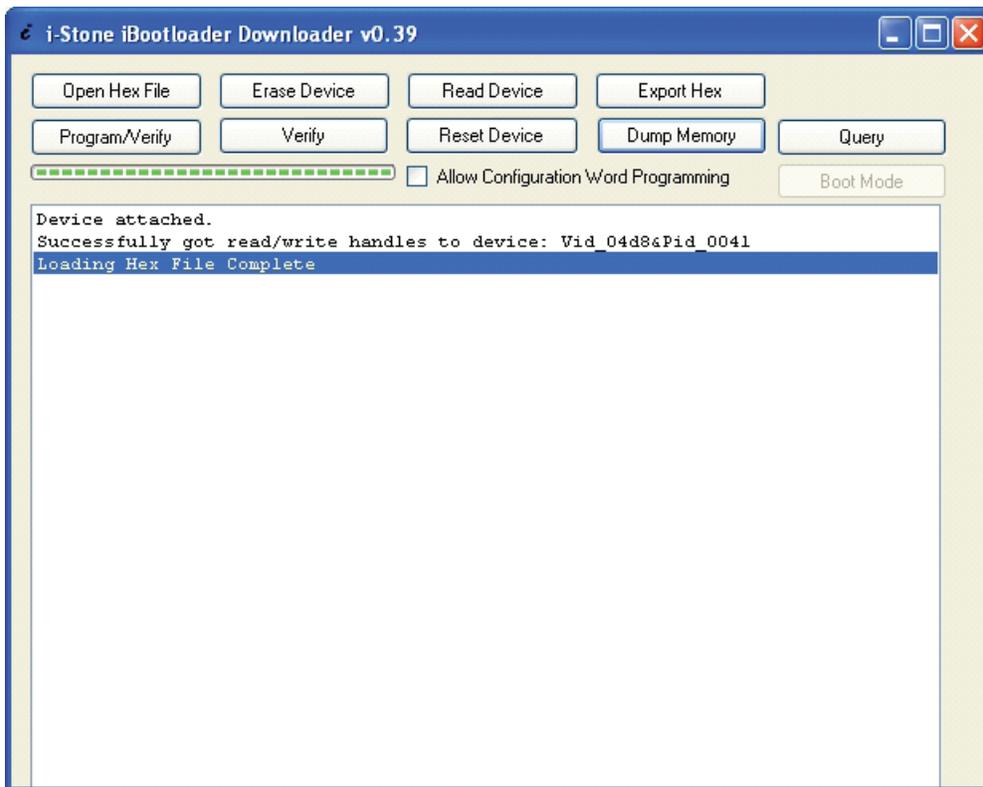
6. Click the "Program/Verify" button to start the firmware update process. Once started, the downloader software will perform an erase, program and verify cycle as shown below.
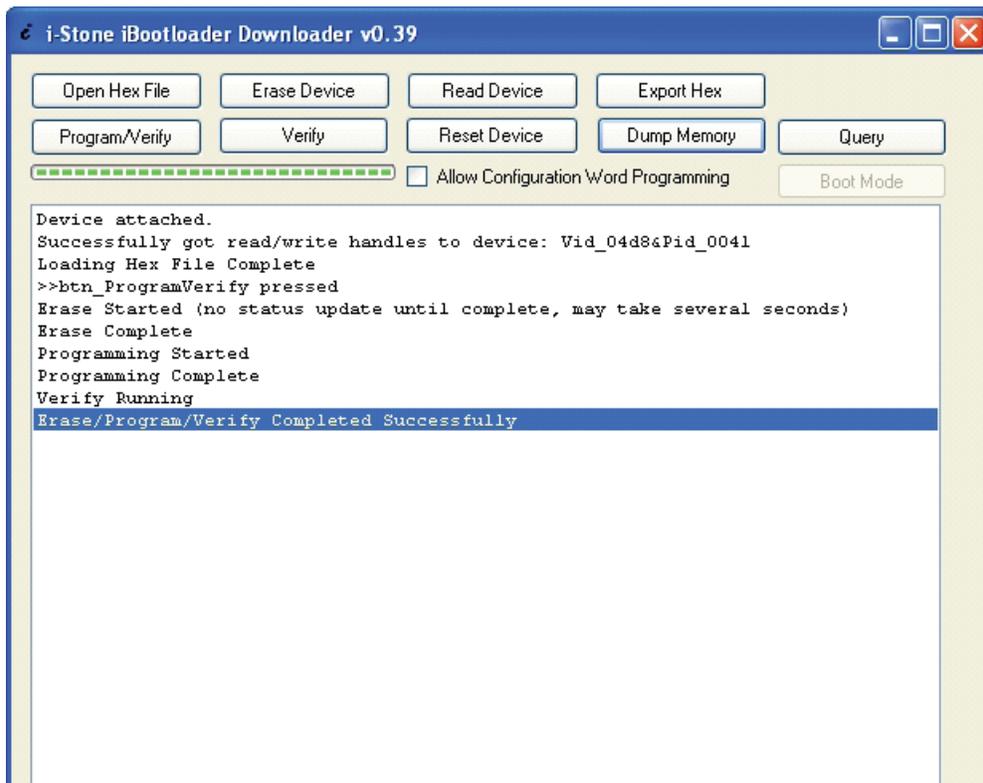
7. If successful, a status box will show "Erase/Program/Verify Completed Successfully", as shown above. Click the "Reset Device" button to reset the application kit.
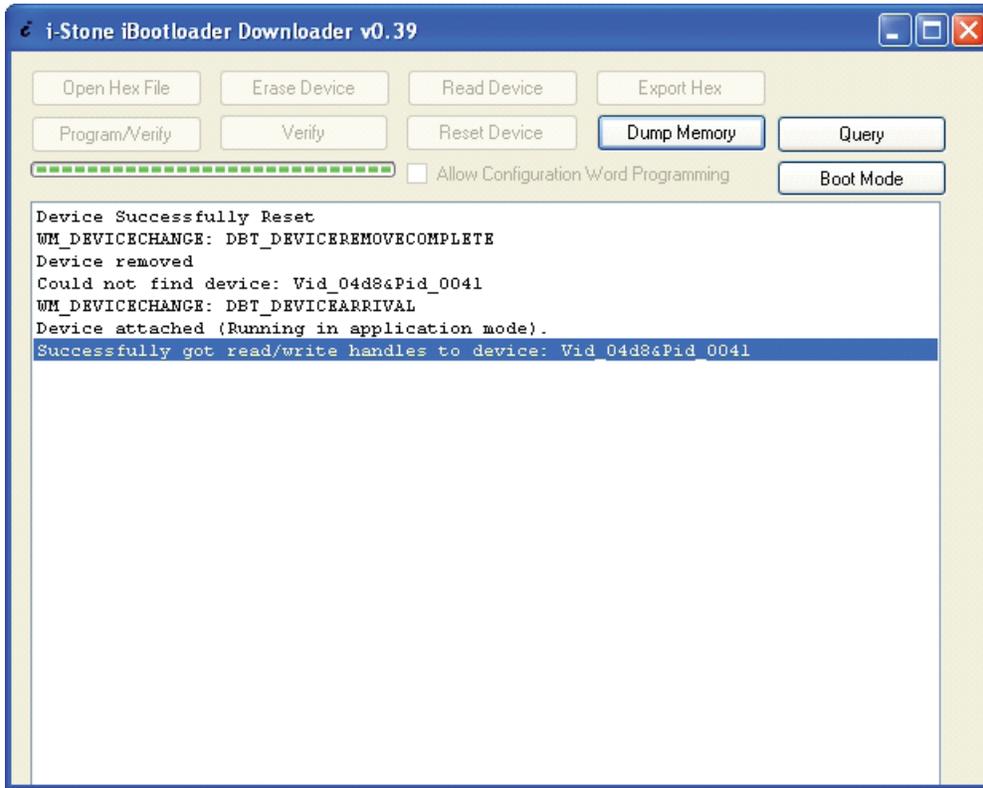
8. After the reset, the application kit will run with the updated firmware.