# EZECU® - EzSpark® TI ECU Standalone 3D Programmable Transistorized / Inductive Ignition Computer for EFI and Carburetor Engines



## User's Manual

February, 2012

Printed in Taiwan 2012.



IC Leader Technology Corporation
No. 6, Nanning Rd.
Jhudong Township, Hsinchu County 31063
Taiwan

E-mail:
support@icleader.com
URL:
www.EZECU.com

# Contents

# List of Figures

# List of Tables

# Revision History

| Date | Revision | Description |
|---|---|---|
| 28, April 2010 | 0.10 | Initial draft |
| 25, June 2010 | 0.11 | Add descriptions for newly supported flywheel types |
| 12, July 2010 | 0.12 | Add base 3D ignition maps for YAMAHA Cygnus and KYMCO Racing |
| 08, September 2010 | 0.13 | Modify the maximum characteristic angle to 70 degree for single tooth flywheel |
| 29, April 2011 | 1.00 | Update for EzSpark® TI ECU Rev.A ans software snapshots |
| 01, July 2011 | 1.10 | Update for EzSpark® TI v1.6.0 software |
| 15, July 2011 | 1.11 | Correct for typo errors |
| 02, January 2012 | 2.00 | Update for EzSpark® TI ECU Rev.B |
| 17, January 2012 | 2.10 | Add password functions for EzSpark® TI ECU Rev.B |
| 04, February 2012 | 2.20 | Add cautions for ground signals |
| 19, February 2012 | 2.30 | Add 36-2 crankshaft flywheel |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

# 1 Introduction

With the gradually increasing trend of electronic fuel injection engines, the EZECU® – EzSpark® TI (Transistorized/Inductive Ignition) ECU (Engine Control Unit) developed by IC Leader Technology Corporation in Taiwan is announced for replacing the transistorized/inductive ignition portion of the factory ECU to program ignition advance angles from 0° through 60° BTDC (Note: TDC can be set to any degree within 0° through 359° if a multi-teeth crankshaft flywheel is adopted). This product is a standalone transistorized/inductive ignition computer which can work well with or without the factory ECU. For carburetor engines, this product can also be applied if the CDI coil is replaced by the transistorized/inductive ignition coil.

## 1.1 Product Package List of the EzSpark® TI ECU

Thank you for purchasing the EzSpark® TI ECU designed and manufactured by our company in Taiwan. When you open the product package, all contained accessories are listed below.

- 1 × EzSpark® TI ECU
- 1 × Aluminum housed power resistor heat sink wire (required only when the factory ECU exists)
- 1 × main wiring harness
- 1 × USB A-type male to B-type male cable
- 1 × CD containing the USB driver and the application software

## 1.2 Product Features

EzSpark® TI ECU is a high-technology after-market product for both electronic fuel injection and carburetor engines with features as listed below:

- Standalone ignition ECU dedicated for transistorized/inductive coils
- High energy ignition output design
- Remove fire-cut revolution limit of factory ECUs
- Supports 12-1/18-1/24-1/12-2/12-3/1/24/36-2 teeth crankshaft flywheel types
- Support up to 15,000 RPM
- Programmable 0 ~ 60 degree BTDC ignition advance angles with 1 degree resolution
- Programmable 0 ~ 359 degree TDC setting with 1 degree resolution
- Ignition advance angle 3D table with 60x10 cells and 250/500/1,000 RPM resolutions
- Solenoid on/off 3D table with 60x10 cells for output driving control
- PWM/servo motor 3D table with 60x10 cells for output driving control
- Support one fuel pump driving output
- Up to 10 customizable throttle position voltage levels
- Semi-auto detection for both fully-closed and fully-opened TPS calibration voltages
- Table uploading and downloading while engine is running
- Dynamic tracking of referenced cell within ignition advance angle 3D table
- Graphical 2D curve for displaying ignition advance angles
- Graphical gauges and meters for real-time engine status monitoring via standard USB interface
- Fast table uploading within 2 seconds
- Password locking for all 3D tables
- Adopt water-proof metal case sealed by epoxy/silicon or equivalent
- Support languages: Traditional Chinese and English
- Support Microsoft Windows 2000/XP/Server 2003/Vista/7 32-/64-bit Operating Systems

## 1.3 Product Specifications

- Power supply input
  - 8 ~ 20VDC
  - 40VDC Max. reverse protection

- Sensor inputs
  - TPS (Throttle Position Sensor) signal with an analog voltage ranging from 0 to 5VDC
  - CPS (Crankshaft Position Sensor) signal with an analog voltage ranging from ±3 to ±120VAC with 18-1/12-1/24-1/12-2/12-3/24/36-2/1 teeth per revolution

- Dummy coil circuit
  - Connects to the transistorized/inductive ignition driver output of the factory ECU
  - Built-in circuits to eliminate the error/warning code of coil malfunction of the factory ECU
  - External heat sink aluminum housed power resistor

- Transistorized/inductive ignition driving output
  - Direct driving of the transistorized/inductive ignition coil with resistance greater than 2Ω
  - Suggested transistorized/inductive coil: YAMAHA 1P500 or equivalent
  - DO NOT connect to a CDI coil or the warranty is void
  - Make sure all grounds (wiring harness, coil, spark plug, engine, and frame) are well-connected with the battery ground or the warranty is void
  - Max. transient voltage: 400VDC
  - Max. current: 20ADC
  - Programmable TDC angle: 0° ~ 359° (multi-teeth crankshaft flywheel) / 0° ~ 60° (single-teeth crankshaft flywheel)
  - Programmable 0°BTDC ~ 60°BTDC ignition advance angles

- Fuel pump driving output
  - Open-collector direct driving of the fuel pump with resistance greater than 4Ω
  - Max. voltage: 20VDC
  - Max. current: 6ADC

- Solenoid on/off driving output
  - Open-collector direct driving of the solenoid with resistance greater than 4Ω
  - 3D programmable table control with 60×10 cells
  - Max. voltage: 20VDC
  - Max. current: 6ADC

- PWM/servo motor driving output
  - Open-collector direct driving output with the loading resistance greater than 4Ω
  - PWM cycle: 1ms ~ 100ms with 1 ms step
  - PWM duty: 0% ~ 100% with 1% step (0% and 100% can be used to emulate this output as the second solenoid output)
  - Servo motor: 0 ~ 100 position steps (50: middle; 0: leftmost; 100: rightmost)
  - 3D programmable table control with 60×10 cells
  - Max. voltage: 20VDC
  - Max. current: 6ADC

- Indication LED
  - 1× blue LED for power good indication

- USB interface
  - Standard USB B type female connector

- Form factor of EzSpark® TI ECU
  - Length: 79 mm (without including the connectors)
  - Width: 69 mm
  - Height: 22 mm
  - Net weight (without including wiring harness): 230±10 gram

# 2 Wiring Diagrams

## 2.1 Connectors and LED

There are three connectors on the EzSpark® TI ECU. The first one is a 8-pin main connector. The second one is a 2-pin connector for the external aluminum housed power resistor heat sink wire. This 2-pin connector is used for emulating a dummy coil for the factory ECU of an EFI engine to prevent the FI error light from being turned on caused by the absence of the original ignition coil. For carburetor engines, this 2-pin connector can be left empty. The third one is a B-type USB connector. The EzSpark® TI ECU also provides one power good indication LED.

## 2.2 Wiring Diagram

The 10-pin main connector shown in Figure 2-1 is used for connecting the EzSpark® TI ECU with your EFI/carburetor engine. Please connect each wire with CARE AND PATIENCE. Any fault can cause either the product or any part of the bike/scooter to be damaged permanently. If you are not familiar with this procedure, you should ask expert engine technicians for wiring these signals.

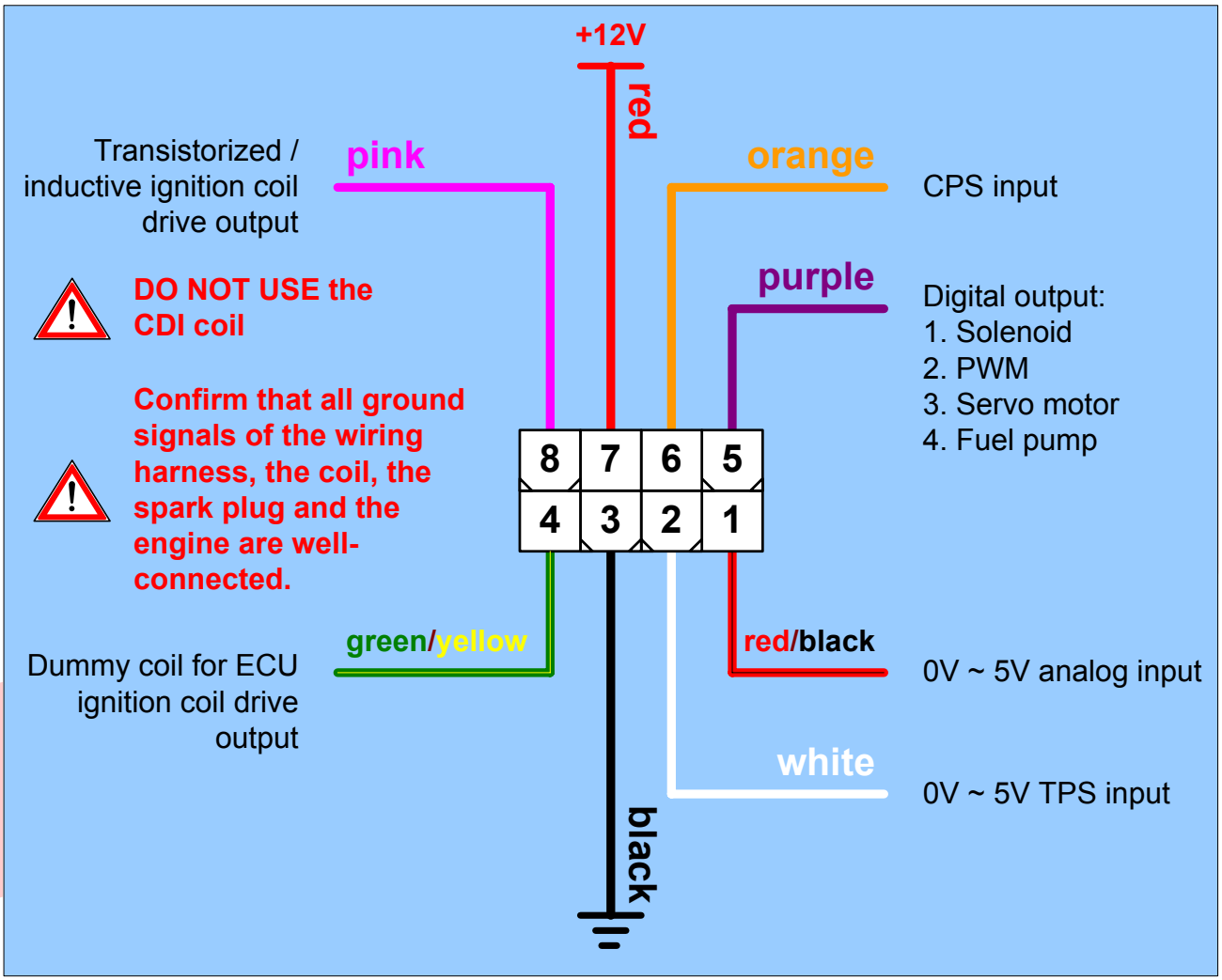


Figure 2-1 Wiring Diagram of the EzSpark® TI ECU

The ignition output of EzSpark® TI ECU is of the transistorized/inductive type which is different from the CDI (Capacitor Discharge Ignition) type. Please make sure the Pin 8 output is connected to the transistorized/inductive ignition coil instead of the CDI coil. Wrong coil type will cause PERMANENT DAMAGE to the EzSpark® TI ECU and the warranty is void. Furthermore, three wires should be connected for the transistorized/inductive ignition coil instead of two wires used in CDI coil. You must confirm that all ground signals including the wiring harness, the transistorized/inductive ignition coil, the spark plug, the engine and the frame are well-connected with the battery ground. Before turn on the power, please use the multi-meter or equivalents to measure the resistance between each ground signal and the battery ground. Make sure all resistance values are less than 1Ω (the lower the better). Improper grounding will cause PERMANENT DAMAGE to the EzSpark® TI ECU and the warranty is void. Please refer to Figure 2-2 to see the wiring diagram for connecting with the transistorized/inductive ignition coil.

Note that removing the starter motor for racing purpose removes the ground connection between the engine and the battery ground also! Please use wires with 14 AWG or higher current capability to connect between the battery ground and the engine/the frame. Improper grounding will cause PERMANENT DAMAGE to the EzSpark® TI ECU and the warranty is void.



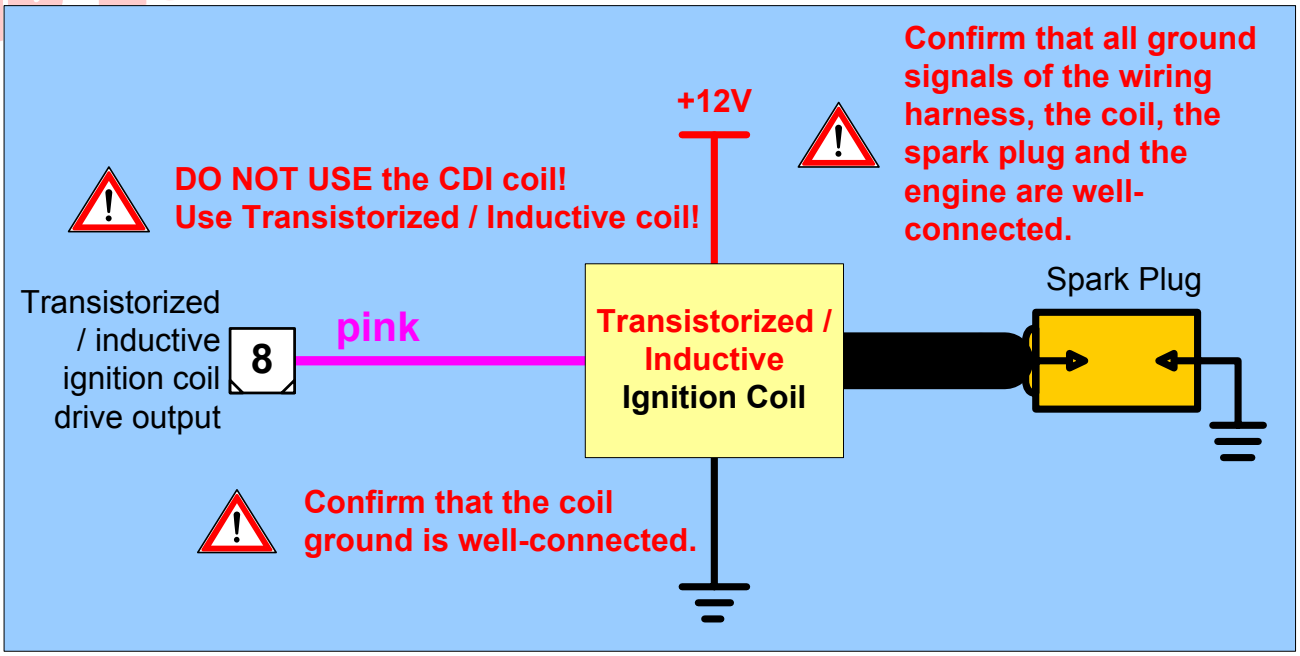


Figure 2-2 Transistorized/Inductive Ignition Coil Wiring Diagram of the EzSpark® TI ECU

For the open-collector output to drive one of the fuel pump, PWM / the servo motor, and the solenoid, please refer to Figure 2-3 for wiring connections. Note that each inductive or resistive loading (shown in dashed boxes) should meet the electrical specification aforementioned in Section 1.3.

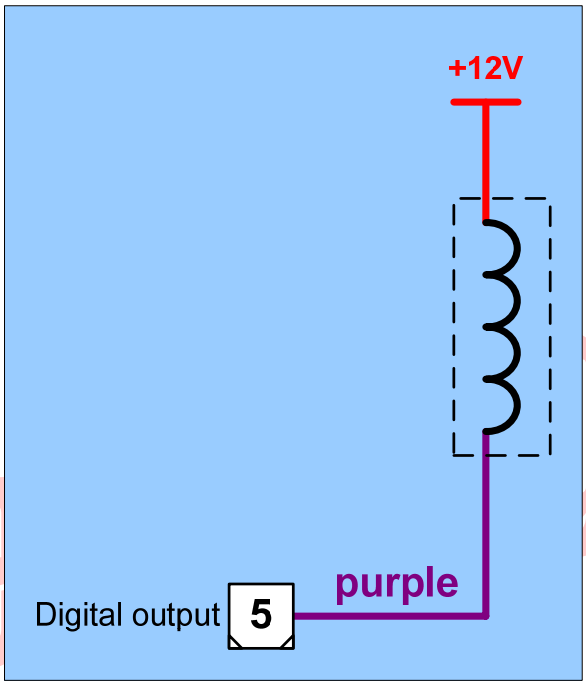


Figure 2-3 Open-Collector Output Wiring Diagram of the EzSpark® TI ECU

## 2.3 Replacing CDI Systems for Carburetor and Other Engines

For carburetor and other engines using CDI (Capacitor Discharge Ignition) systems, you must replace the CDI coil by a TI (Transistorized/Inductive Ignition) coil for the EzSpark® TI ECU. The suggested TI coil is YAMAHA 1P500 or equivalent. Note that all ground signals including the wiring harness, the transistorized/inductive ignition coil, the spark plug, the engine and the frame should be well-connected with the battery ground as shown in Figure 2-2. Before turn on the power, please use the multi-meter or equivalents to measure the resistance between each ground signal and the battery ground. Make sure all resistance values are less than 1Ω (the lower the better). Either adopting wrong coil type or improper grounding will cause PERMANENT DAMAGE to the EzSpark® TI ECU and the warranty is void.

# 3 Application Software

The application software can be installed on Intel 80x86 compatible computers with Microsoft Windows 2000/XP/Server 2003/Vista/7 32-/64-bit operating systems. At least one USB 1.1/2.0 compatible interface port is required to communicate with the EzSpark® TI ECU. The screen resolution requirement is at least 1024 × 768 and the memory requirement is at least 1,024 MB.

## 3.1 Overview

The first screen of the application software is shown in Figure 3-1. Buttons on the left top corner are responsible of semi-detection of TPS (Throttle Position Sensor) voltages. Buttons on the middle-bottom are responsible for ignition map and firmware file open, save, save as, upload and download operations. On the right half portion, three sub-pages are used for setting ignition advance angles, solenoid on/off control, and PWM/servo motor control.



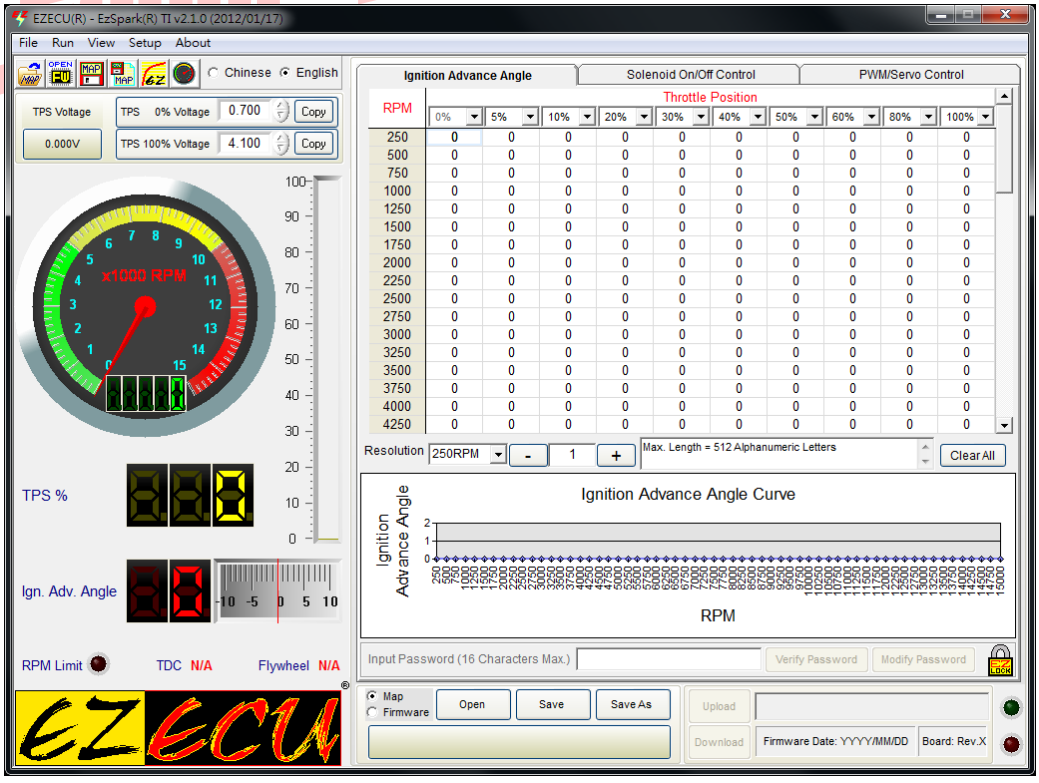


Figure 3-1 Overview of EzSpark® TI ECU Application Software (Unconnected)

If the EzSpark® TI ECU without password protection is powered on and connected to PC, the engine status gauges on the left side of the software will be updated as shown in Figure 3-2. Besides, the green LED on the right-bottom corner will be activated to indicate that the connection is ready and corresponding firmware date and EzSpark® TI ECU board version will be shown. Since there is no password in the EzSpark® TI ECU, both "Upload" and "Download" buttons will be activated.

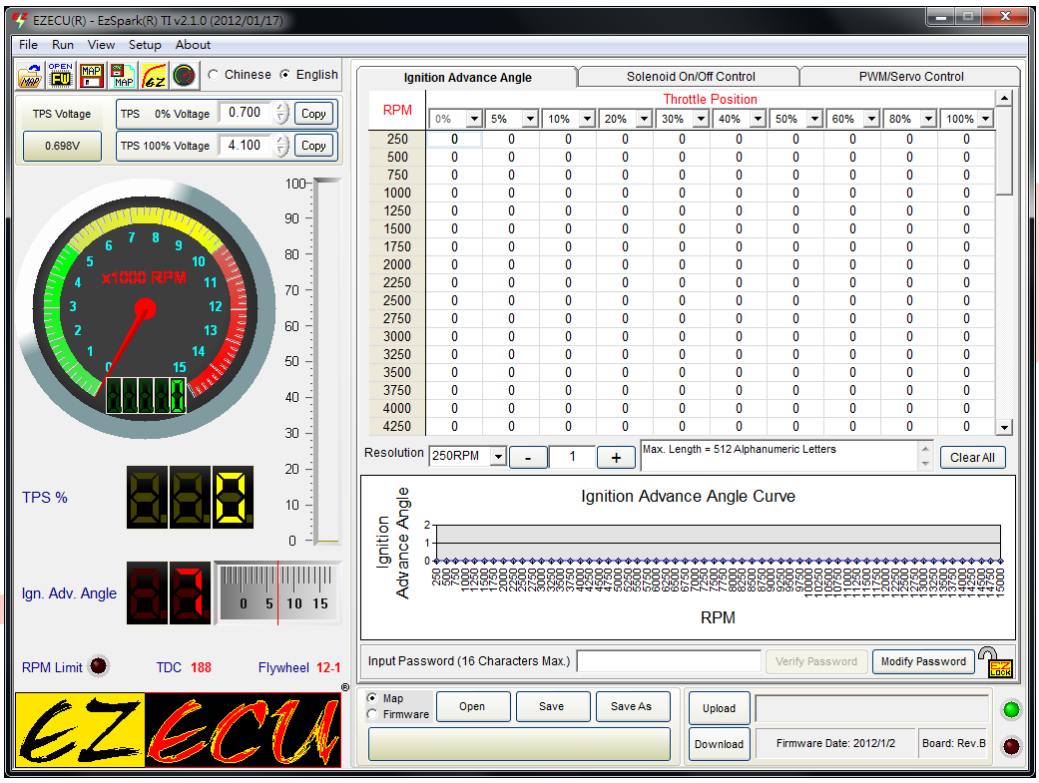


Figure 3-2 Overview of EzSpark® TI ECU Application Software (Connected without Password Protection)

If the EzSpark® TI ECU with password protection is powered on and connected to PC, the engine status gauges on the left side of the software will be updated as shown in Figure 3-3. Besides, the green LED on the right-bottom corner will be activated to indicate that the connection is ready and corresponding firmware date and EzSpark® TI ECU board version will be shown. Since the password is enabled in the EzSpark® TI ECU, both "Upload" and "Download" buttons will be disabled.

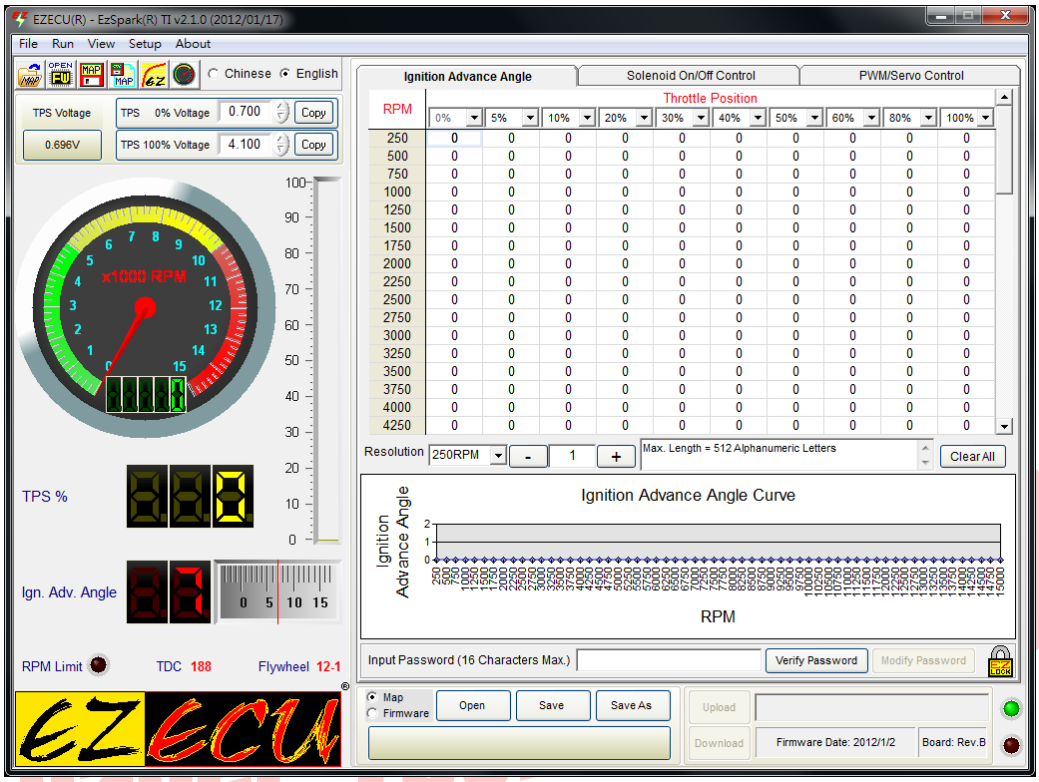


Figure 3-3 Overview of EzSpark® TI ECU Application Software (Connected with Password Protection)

## 3.2 Password Operations

As shown in Figure 3-4, the password operation buttons of the EzSpark® TI ECU without password protection include a password input field, a verify password button, a modify password button, and a lock/unlock status:


Figure 3-4 Password Operation Buttons without Password Protection

In Figure 3-4, the factory default password protection is disabled for the EzSpark® TI ECU. Users may key-in up to 16 characters (including letters and numbers) as the desired password and then press the "Modify Password" button. The software will prompt to confirm again. The password protection will be activated once you power off the EzSpark® TI ECU and power on again. Please note that YOU MUST REMEMBER YOUR PASSWORD! If you forget the password, you may send the EzSpark® TI ECU back to company for clearing the password with USD35 handling fee excluding the freight fee.




Figure 3-5 Password Operation Buttons with Password Protection

As shown in Figure 3-5, since the password protection is activated, you must enter the correct password and the press the "Verify Password" button. If the password is correct, functions including upload and download 3D tables, and "modify password" will be enabled.

## 3.3 Ignition Map and Firmware Operations

As shown in Figure 3-6 and Figure 3-7, file operations for the ignition map and the firmware are slightly different. The ignition map file can be opened, saved, and saved as another file name. However, the firmware file can be opened only.


Figure 3-6 Ignition Map Operation Buttons

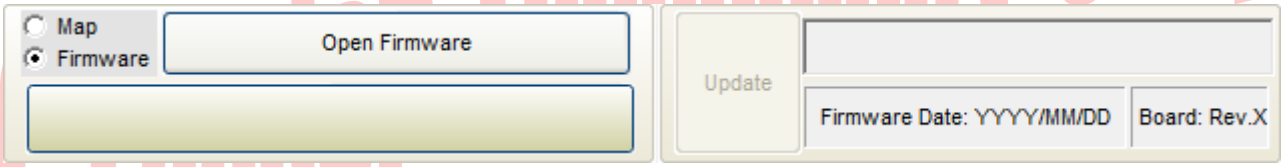


Figure 3-7 Firmware Operation Buttons

Before pressing the upload/download button, please make sure that the USB cable is correctly connected between your computer and the EzSpark® TI ECU. Finally, please confirm the power good LED is turned on. You can press either the “Upload” or the “Download” button even if the engine is running still. However, you must stop engine before pressing the “Update” button. When programming is in progress, the application software will show current programming progress. After uploading, downloading or updating, the application software will have a pop up window to indicate that the operation is completed.

## 3.4 TPS Voltage Calibration

The voltage values of TPS for each bike/scooter should be calibrated before operating correctly because the fully-closed and fully-opened throttle may be mapped to different voltages for different TPS models. For example, some TPS outputs 0V through 3.1V to represent the fully-closed through the fully-opened throttle, while some TPS outputs 0.7V through 4.1V to represent the fully-closed through the fully-opened throttle. Consequently, the application software provides semi-auto detection and manual input for the TPS calibration values.

As shown in Figure 3-8, there are two "Copy" buttons and two fields for inputting the voltage values corresponding to fully-closed (0%) and fully-opened (100%) throttle, wherein two "Copy" buttons are responsible for the semi-auto input function and two fields are responsible for the manual input function.

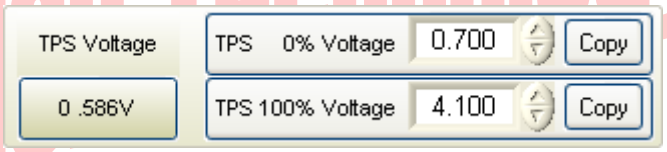


Figure 3-8 TPS Calibration Buttons



At first, the semi-auto input function is introduced as the following steps:

Step 1 Connect the EzSpark® TI ECU with your bike/scooter;
Step 2 Connect the USB cable between the EzSpark® TI ECU and your computer;
Step 3 Execute the application software;
Step 4 Turn one the bike/scooter power but do not start the engine and confirm the blue power LED on the EzSpark® TI ECU is lighted;
Step 5 Press the upper "Copy" button to copy TPS voltage of 0% (fully-closed) throttle;
Step 6 Rotate the bike/scooter's throttle to 100% (fully-opened) and hold, press the lower "Copy" button to copy TPS voltage of 100% throttle; and
Step 7 Close the bike/scooter's throttle.

Since the TPS is made of resistor, the voltage output may vary according to different working temperatures. Consequently, we suggest to *increase the fully-closed TPS voltage by 0.1V* and to *decrease the fully-opened TPS voltage by 0.1V*.

In this manner, the TPS mapping range for your bike/scooter can be detected. Both TPS setting values can be saved into the ignition map file. If user wants to update the ignition map again, the TPS calibration process can be skipped by reloading the saved TPS setting values.

Finally, user may also use a precise voltage meter to measure TPS voltage values corresponding to 0% and 100% throttle and then fill the measured voltage values into the TPS calibration fields.

## 3.5 Real-Time Engine Status

As shown in Figure 3-9, real-time engine status includes a RPM gauge, a TPS % display and a corresponding meter, an ignition advance angle display and a corresponding meter, a RPM limit indication LED, a TDC (Top Dead Center) angle display, and a magnet flywheel type display.

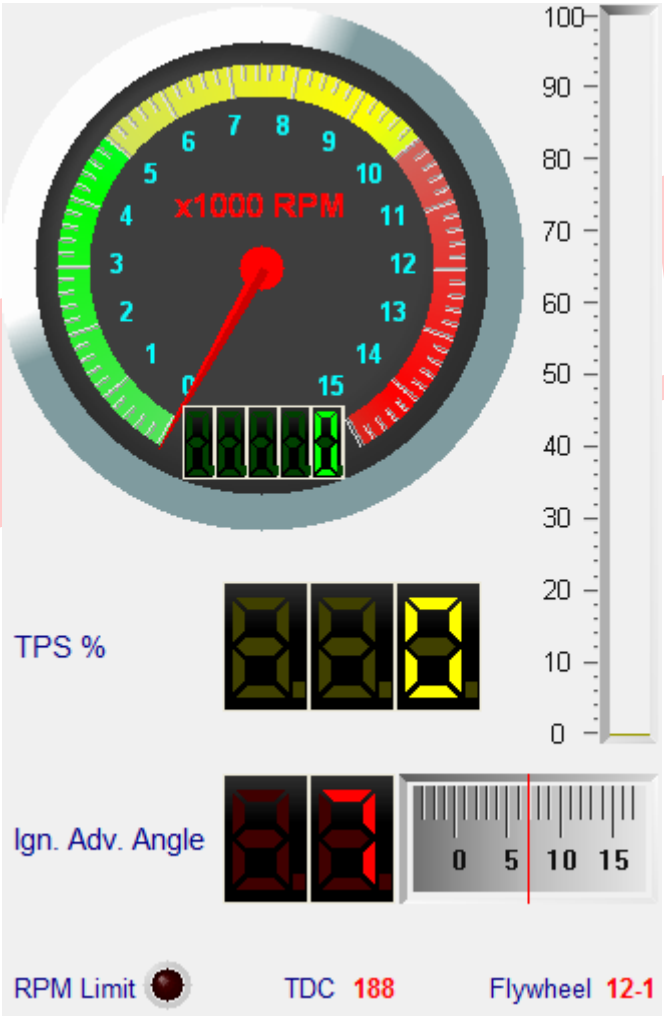


Figure 3-9 Real-Time Engine Status

The "RPM Limit" indication LED will be lighted when the engine RPM exceeds 15,000 RPM. The TDC shows the programmed angle for TDC. The crankshaft flywheel type shows one of 18-1, 12-1, 24-1, 12-2, 12-3, 24, 36-2 and 1 tooth/notch.

## 3.6 Crankshaft Flywheel Type and TDC Angle Setting

The crankshaft flywheel type and TDC angle setting window can be activated by pressing the "Setup" on top-left menu as shown in Figure 3-10.

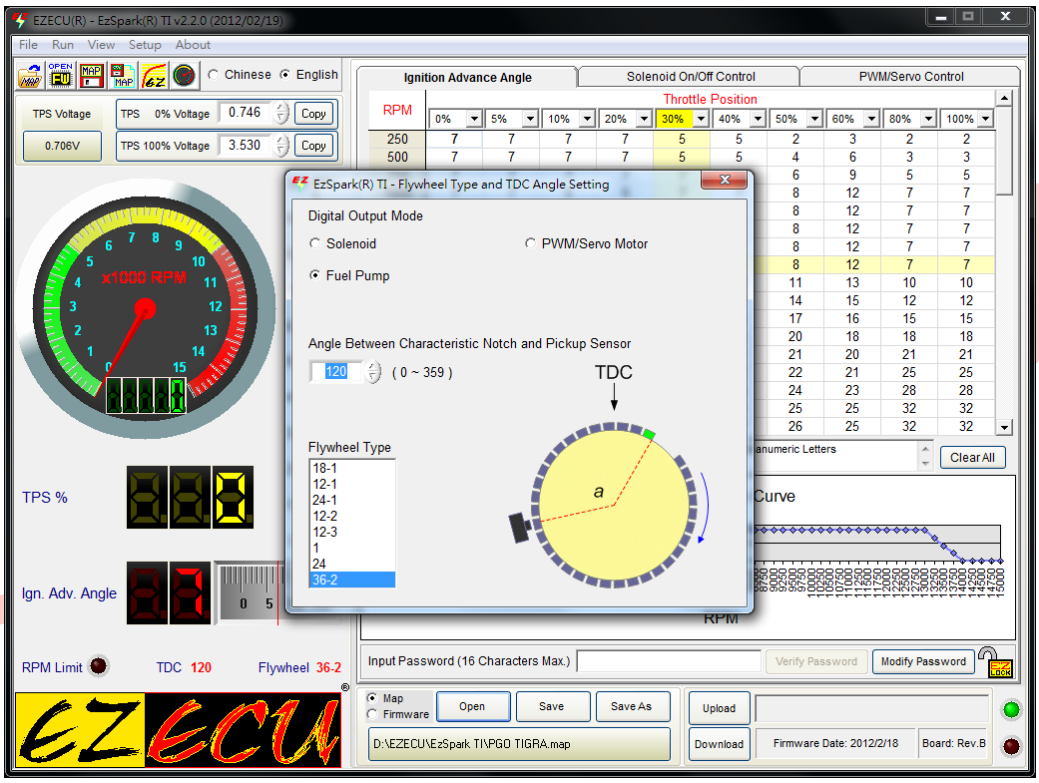


Figure 3-10 Crankshaft Flywheel Type and TDC Angle Setting

In the setting window, users can program the digital output mode for one of the solenoid, the PWM/Stepper Motor, and the Fuel Pump.

Currently, the EzSpark® TI ECU supports seven different crankshaft flywheel types as shown in Figure 3-11 through Figure 3-18.

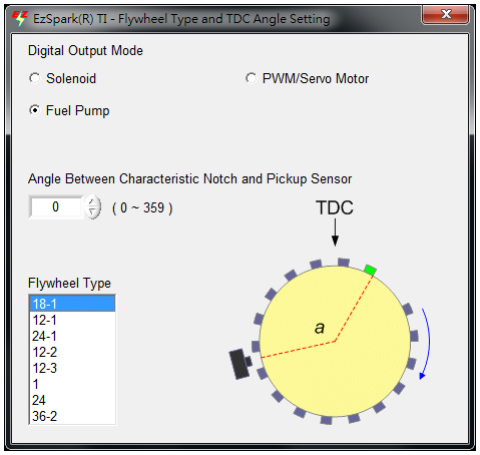


Figure 3-11 18-1 Teeth/Notches Crankshaft Flywheel Type

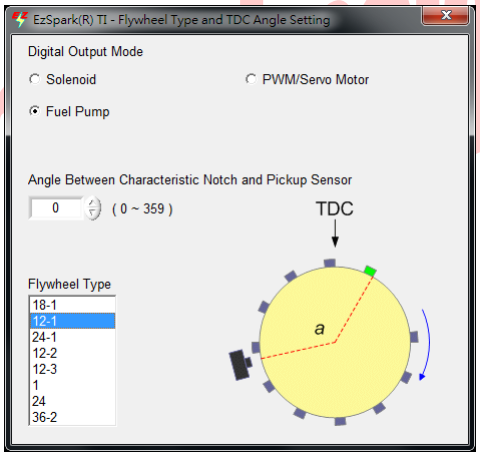


Figure 3-12 12-1 Teeth/Notches Crankshaft Flywheel Type

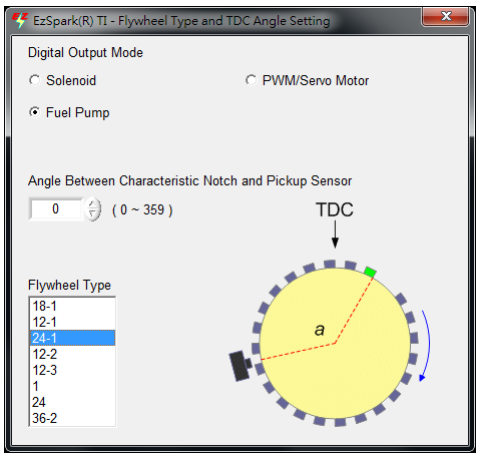


Figure 3-13 24-1 Teeth/Notches Crankshaft Flywheel Type

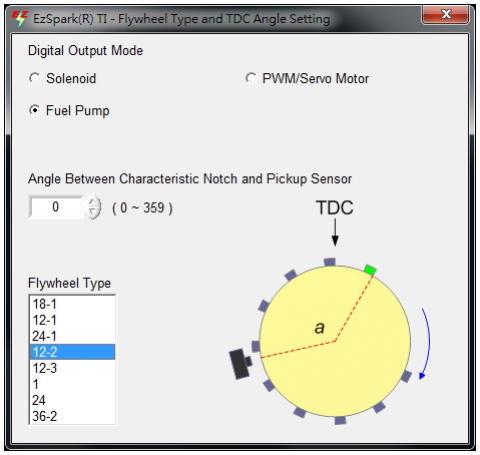


Figure 3-14 12-2 Teeth/Notches Crankshaft Flywheel Type

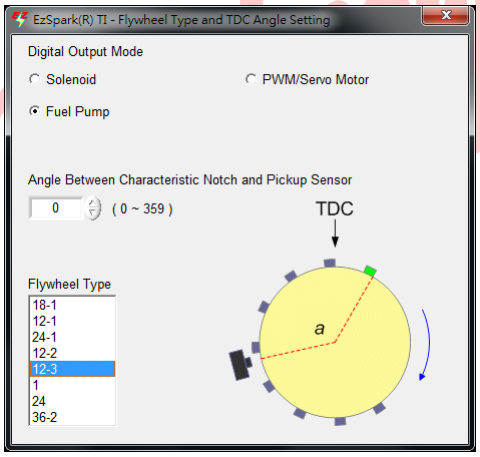


Figure 3-15 12-3 Teeth/Notches Crankshaft Flywheel Type

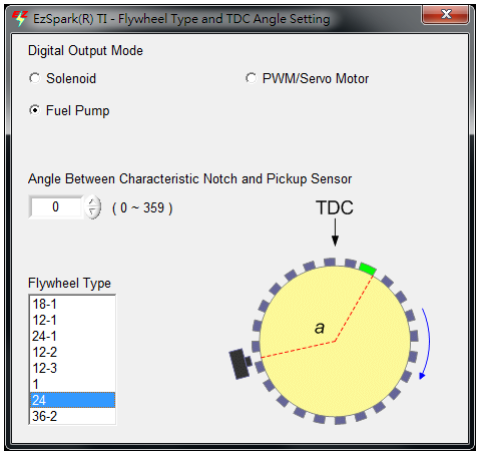


Figure 3-16 24 Teeth/Notches Crankshaft Flywheel Type

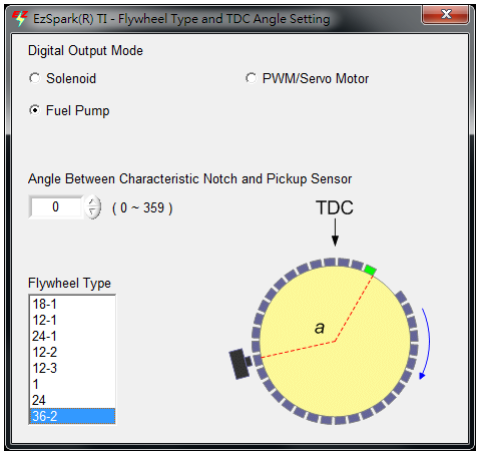


Figure 3-17 36-2 Teeth/Notches Crankshaft Flywheel Type

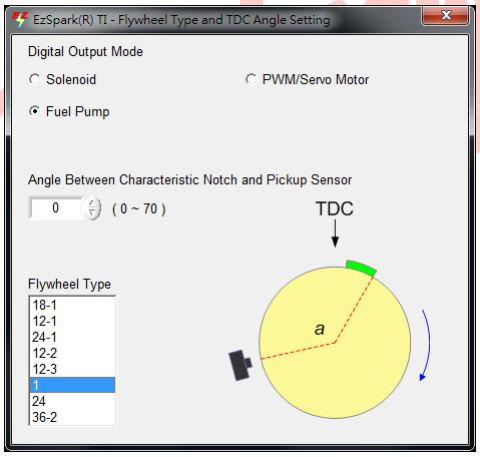


Figure 3-18 1 Tooth/Notch Crankshaft Flywheel Type

Some crankshaft flywheel types and corresponding scooter/bike brands and models are listed in Table 3-1. If your brands/models are not included in this table, please contact your dealer or professional technicians to find out the correct magnet flywheel type.

Table 3-1 Crankshaft Flywheel Types for Scooter/Bike Brands and Models

| Crankshaft Flywheel Types | Brands | Models |
|---|---|---|
| 12-1 | YAMAHA | T-MAX 500<br>V-Ixion 150<br>Majesty 125/250<br>New Cygnus X 125<br>Cygnus X 125 |

| Crankshaft Flywheel Types | Brands | Models |
|---|---|---|
| | | BW'S 125 |
| | | GTR Aero 125 |
| | | Jog Chao 115 |
| | | Jog CUXI 100 |
| | | RS-Z 100 |
| | | Vino 50 |
| 24-1 | KYMCO | NIKITA 300 |
| | | Xciting 250/500 |
| | | Dink 180 |
| | | KTR 150 |
| | | Quannon 150 |
| | | G5 125/150 |
| | | Racing 125/150 |
| | | GP125 |
| | | VJR 50/100/110 |
| | | Many 50/110 |
| 24-1 | SYM | RV 180/250 |
| | | T1 150 |
| | | Fighter 125/150 |
| | | Jet Power 125 |
| | | tini 100 |
| | | GR 125 |
| | | GT 125 |
| 24-1 | AEON | CO-iN 125 |
| 24-1 | HARTFORD | Mini 125 FI |
| 12-2 | SUZUKI | Address V125G |
| | | Address Z125 |
| | | Address V125S / Tekken |
| 12-3 | HONDA | CBR 250 |
| 24-2 | KAWASAKI | Ninja 250R EFI |
| 18 | KAWASAKI | KLX 250 |
| 18-1 | KYMCO | Racing King 180 |
| 18-1 | SYM | iRX 115 |
| 24 | KYMCO | Xciting 250/500 |

| Crankshaft Flywheel Types | Brands | Models |
|---|---|---|
| 24 | SUZUKI | NEX 125<br>GSR 125 |
| 24 | SYM | T2 250 |
| 24 | PGO | G-MAX 220 |
| 36-2 | PGO | TIGRA 125 |
| 1 | CPI | SM 250 |
| 1 | SUZUKI | Address V125 |
| 1 | HONDA | GY6 (Carburetor) |

The TDC (Top Dead Center) angle is defined as “the angle between the characteristic tooth/notch (the green tooth shown in figures) and the pickup sensor when the piston is moved to the topmost position”. For multi-teeth crankshaft flywheels, the TDC angle can be set to any degree from 0° through 359°. For the single notch/tooth crankshaft flywheel, the TDC angle can be set to any degree from 0° through 70°.

## 3.7 Ignition Advance Angle Table

The ignition advance angle table with 250 RPM resolution is shown in Figure 3-19.

Ignition Advance Angle | Solenoid On/Off Control | PWM/Servo Control

| RPM | Throttle Position 0% | 5% | 10% | 20% | 30% | 40% | 50% | 60% | 80% | 100% |
|---|---|---|---|---|---|---|---|---|---|---|
| 250 | 7 | 7 | 7 | 7 | 5 | 5 | 2 | 3 | 2 | 2 |
| 500 | 7 | 7 | 7 | 7 | 5 | 5 | 4 | 6 | 3 | 3 |
| 750 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 9 | 5 | 5 |
| 1000 | 7 | 7 | 5 | 6 | 7 | 7 | 8 | 12 | 7 | 7 |
| 1250 | 7 | 7 | 5 | 6 | 7 | 7 | 8 | 12 | 7 | 7 |
| 1500 | 7 | 7 | 5 | 6 | 7 | 7 | 8 | 12 | 7 | 7 |
| 1750 | 7 | 7 | 5 | 6 | 7 | 7 | 8 | 12 | 7 | 7 |
| 2000 | 7 | 7 | 5 | 6 | 7 | 7 | 8 | 12 | 7 | 7 |
| 2250 | 10 | 10 | 5 | 6 | 10 | 10 | 11 | 13 | 10 | 10 |
| 2500 | 10 | 10 | 5 | 6 | 10 | 10 | 14 | 15 | 12 | 12 |
| 2750 | 12 | 12 | 8 | 12 | 12 | 12 | 17 | 16 | 15 | 15 |
| 3000 | 15 | 15 | 15 | 18 | 15 | 15 | 20 | 18 | 18 | 18 |
| 3250 | 21 | 21 | 21 | 28 | 28 | 21 | 21 | 20 | 21 | 21 |
| 3500 | 25 | 25 | 25 | 32 | 32 | 22 | 22 | 21 | 25 | 25 |
| 3750 | 28 | 28 | 28 | 35 | 35 | 24 | 24 | 23 | 28 | 28 |
| 4000 | 32 | 32 | 32 | 39 | 39 | 25 | 25 | 25 | 32 | 32 |
| 4250 | 32 | 32 | 32 | 40 | 40 | 27 | 26 | 25 | 32 | 32 |

Resolution 250RPM - 1° + YAMAHA Cygnus X Clear All

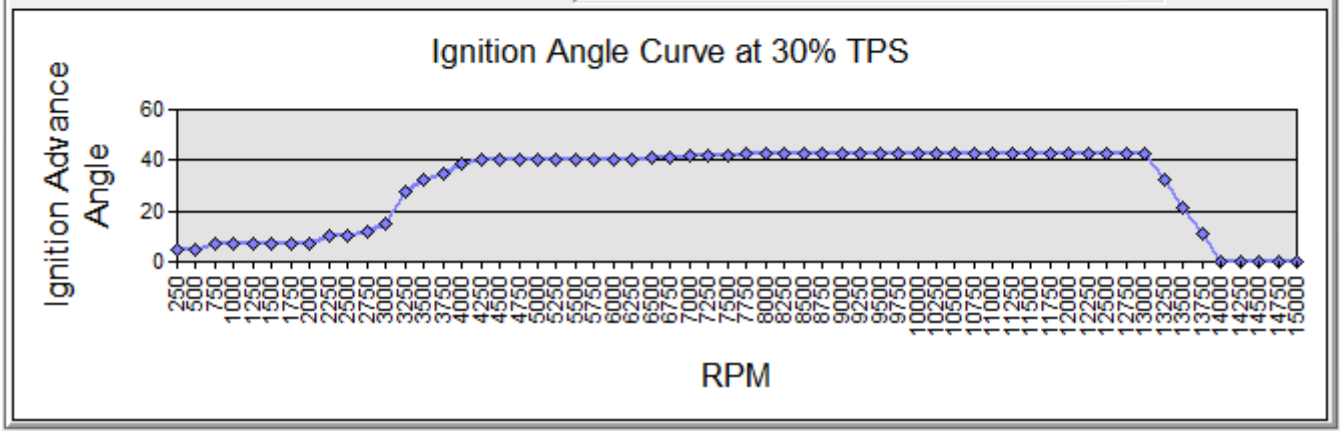


Figure 3-19 Ignition Advance Angle Table with 250 RPM Resolution

The EzSpark® TI ECU provides an ignition advance angle table with 250 RPM through 15,000 RPM by programmable 10-level TPS resolutions with 1% step (the default TPS levels are 0%, 5%, 10%, 20%, 30%, 40%, 50%, 60%, 80%, and 100%). The 250 RPM through 15,000 RPM can be set by selecting the RPM resolution as one of 250 RPM, 500 RPM and 1,000 RPM. Ignition advance angle tables with 500 RPM and 1,000 RPM resolutions are shown in Figure 3-20 and Figure 3-21, respectively.

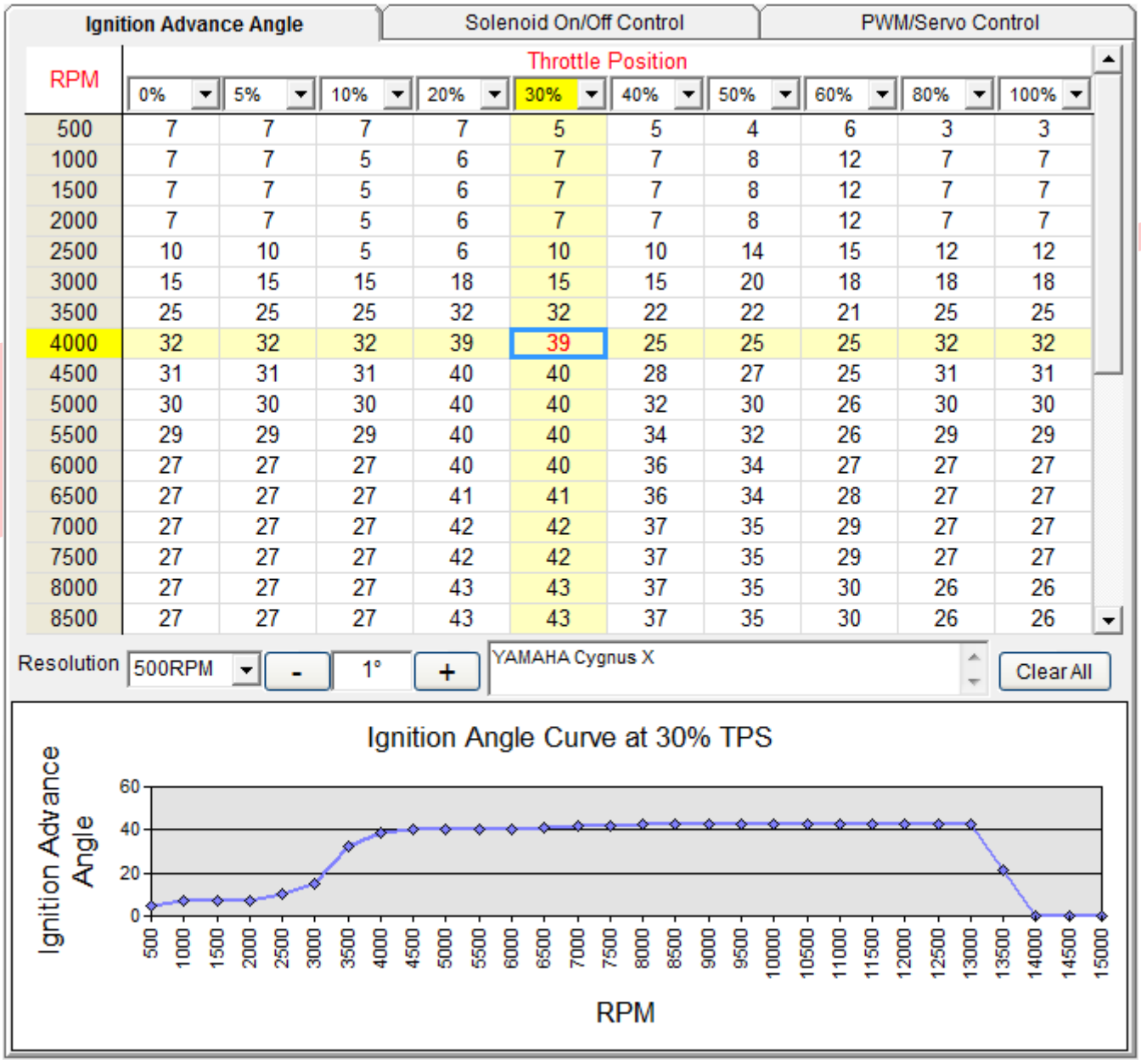


Figure 3-20 Ignition Advance Angle Table with 500 RPM Resolution

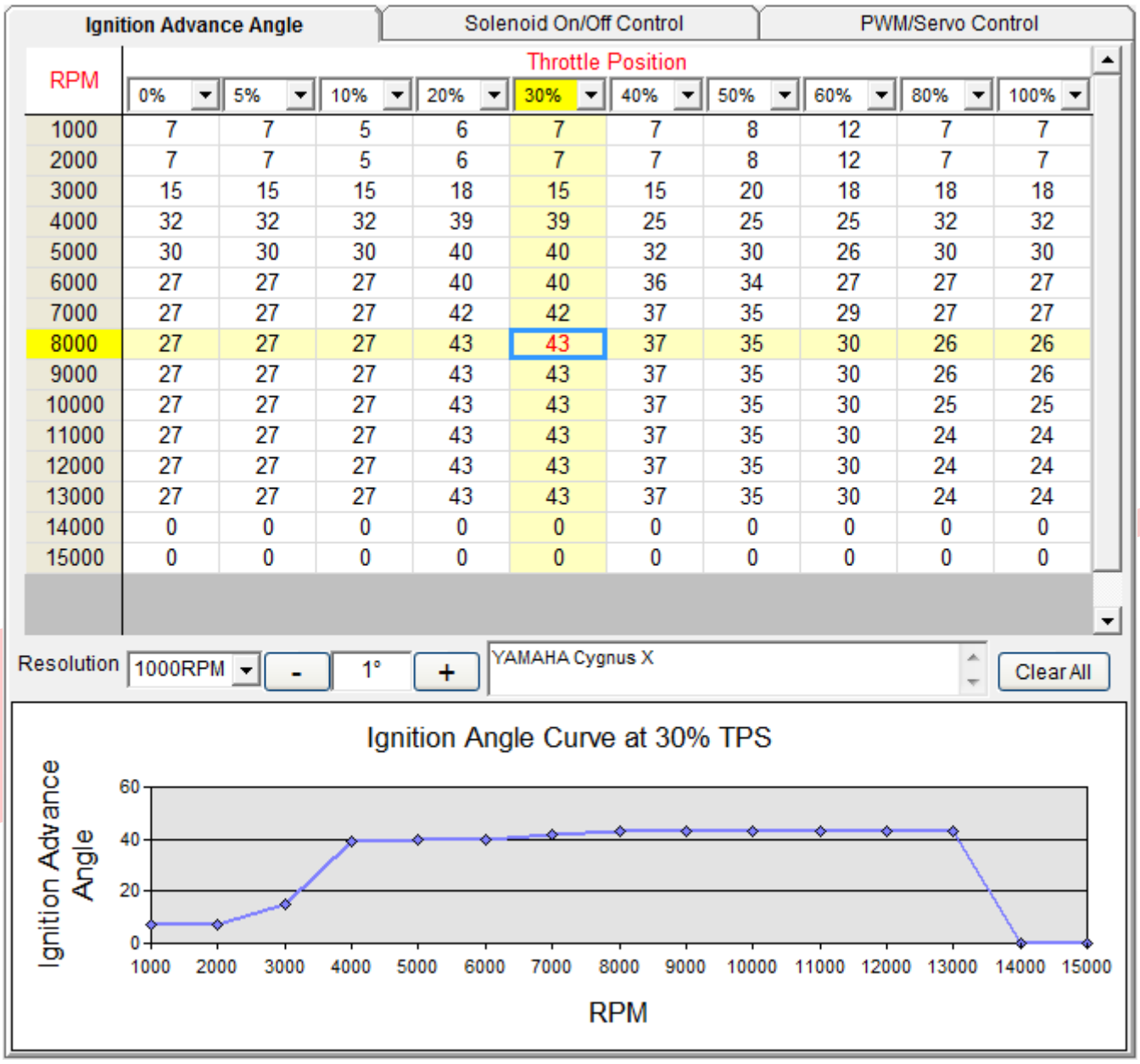


Figure 3-21 Ignition Advance Angle Table with 1,000 RPM Resolution

In general, the 1,000 RPM resolution is recommended as a startup basis. The ignition advance angle table with 1,000 RPM resolution is formed as a 15 by 10 table. Since there are fewer cells, it is easier for roughly tuning the ignition table. The application software will average and interpolate the ignition advance angles into each cell of the 250 RPM ignition advance angle table. User does not need to worry about losing control precision due to selecting the 1,000 RPM resolution.

If user wants to increase resolution for the ignition advance angle table, the 500 RPM resolution can be selected. The ignition advance angle table with 500 RPM resolution is formed as a 30 by 10 array. Since there are double cells as compared to the 1,000 RPM resolution, user may tune the ignition advance angle in a more detailed order. The application software will average and interpolate the ignition advance angles into each cell of the 250 RPM ignition advance angle table. User does not need to worry about losing control precision due to selecting the 500 RPM resolution.

The maximum resolution is to set as the 250 RPM resolution. The ignition advance angle table with 250 RPM resolution is formed as one 60 by 10 array. Since there are double cells as compared to the 500 RPM resolution, user may tune the ignition advance angle in a most detailed order.

When editing the ignition advance angle table, user may mark an area to perform addition/subtraction/clear all by pressing corresponding buttons below the ignition advance angle table. The addition/subtraction button will add/subtract each cell inside the marked area by the value of the addition/subtraction value field. The clear all button will reset each cell of the ignition advance angle table to 0.

## 3.8 Mini Bar

On the left-top corner of the application software, there is a mini bar shown in Figure 3-22 to provide quick accesses to functions.


Figure 3-22 Mini Bar of EzSpark® TI ECU Application Software

Functions for buttons on the mini-bar from left to right are listed below:

1. Open Ignition Map
2. Open Firmware
3. Save Ignition Map
4. Save As Ignition Map
5. Dynamic Track Mode
6. Full-Screen Engine Status Monitoring

The first four buttons have same functions as aforementioned in Section 3.3. The dynamic track mode and the full-screen engine status monitoring are described in Section 3.9 and Section 3.10, respectively. The display language options are also shown on the mini bar.

## 3.9 Dynamic Track Mode

When the "Dynamic Track Mode" button on the mini bar is pressed as shown in Figure 3-23, the EzSpark® TI ECU will report which cell inside the ignition advance angle table has been referenced. This will be helpful for technicians who are tuning engines.


Figure 3-23 Dynamic Track Mode on the Mini Bar of EzSpark® TI ECU Application Software

## 3.10 Full-Screen Engine Status Monitoring

When the "Full-Screen Engine Status Monitoring" button on the mini bar is pressed, the application software of EzSpark® TI ECU will switch to the screen as shown in Figure 3-24. This may be helpful for longer distance observing. Press the same button on the mini bar again will switch back to the original screen.



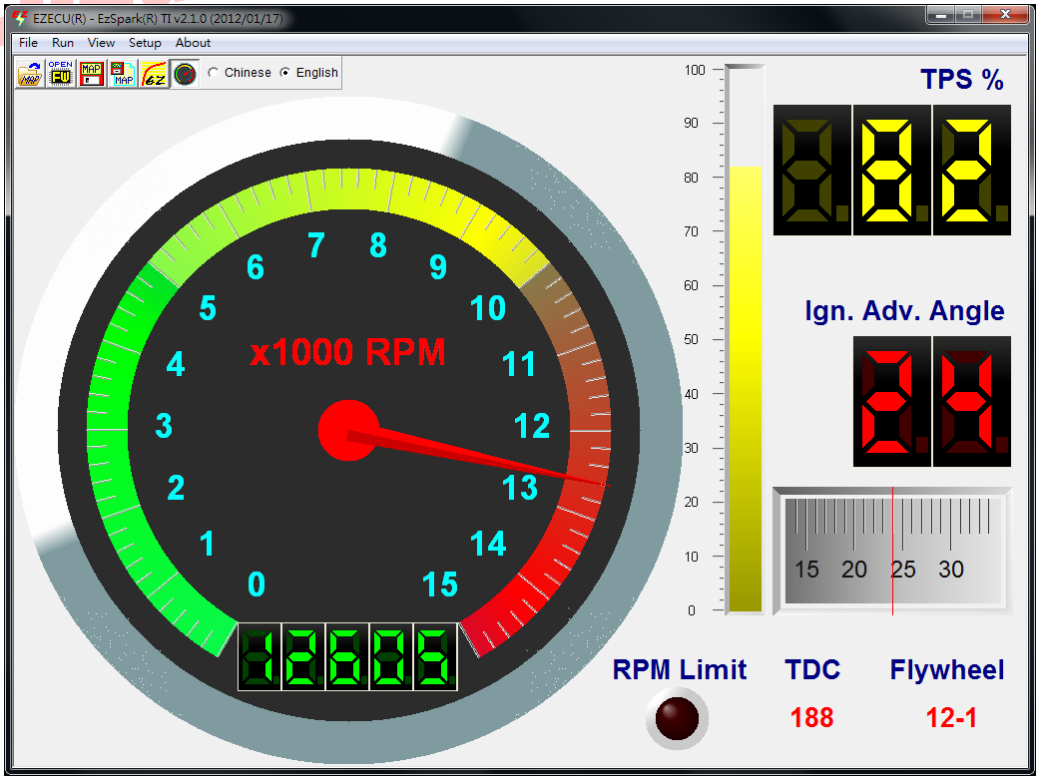


Figure 3-24 Full-Screen Engine Status Monitoring of EzSpark® TI ECU Application Software

## 3.11 Solenoid On/Off Control Table

The second page of 3D tables is the solenoid on/off control table as shown in Figure 3-25. Users can use this 3D table to control the NOS, intake valve, exhaust valve, etc. The resolution of this 3D table is the same as the ignition advance angle table with 60×10 cells. The programmable 10-levels for TPS can be modified only on the ignition advance angle page. Users may mark any area of editable cells and use buttons below to achieve the on/off control. Output inversion for all cells is also provided by simply check the inversion box below the table. The color definition for on/off will be changed and displayed also once the inversion box is checked or unchecked.

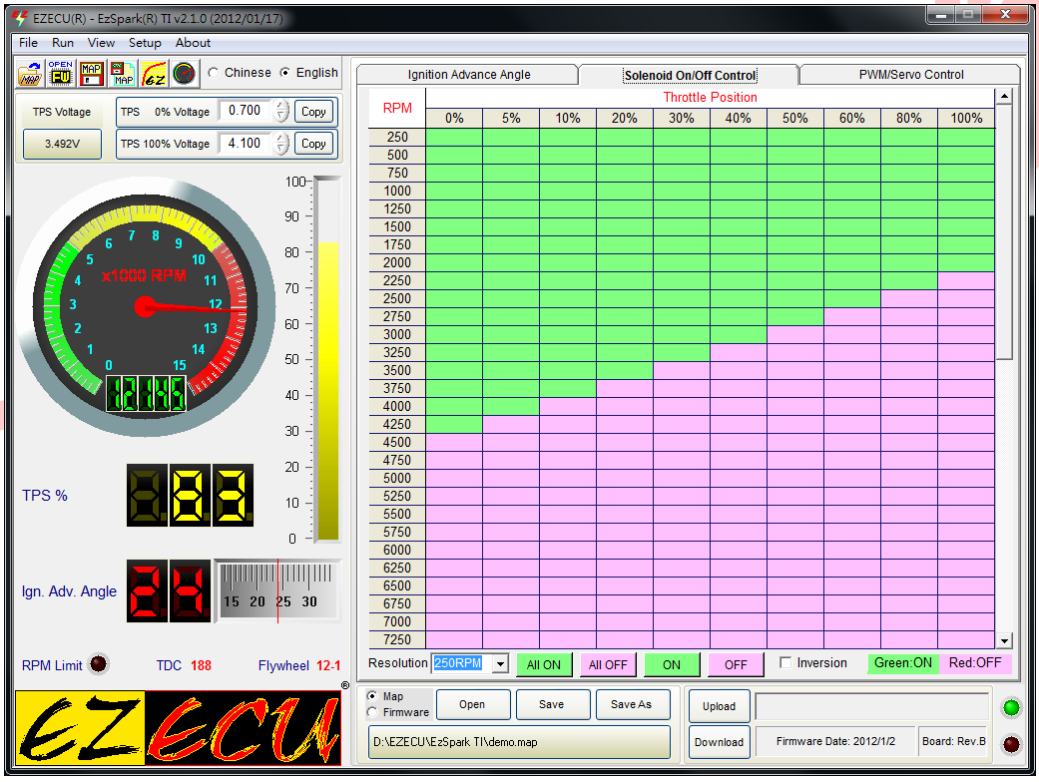


Figure 3-25 Solenoid On/Off Control Table of EzSpark® TI ECU Application Software

## 3.12 PWM/Servo Motor Control Table

The third page of 3D tables is the PWM (Pulse Width Modulation) / servo motor control as shown in Figure 3-26. Users can use the PWM mode of the 3D table to control the NOS, intake valve, exhaust valve, etc. The resolution of this 3D table is the same as the ignition advance angle table with 60×10 cells. The programmable 10-levels for TPS can be modified only on the ignition advance angle page. Users may mark any area of editable cells and use buttons below to add/subtract the percentage. Output inversion for all cells is also provided by simply check the inversion box above the table.

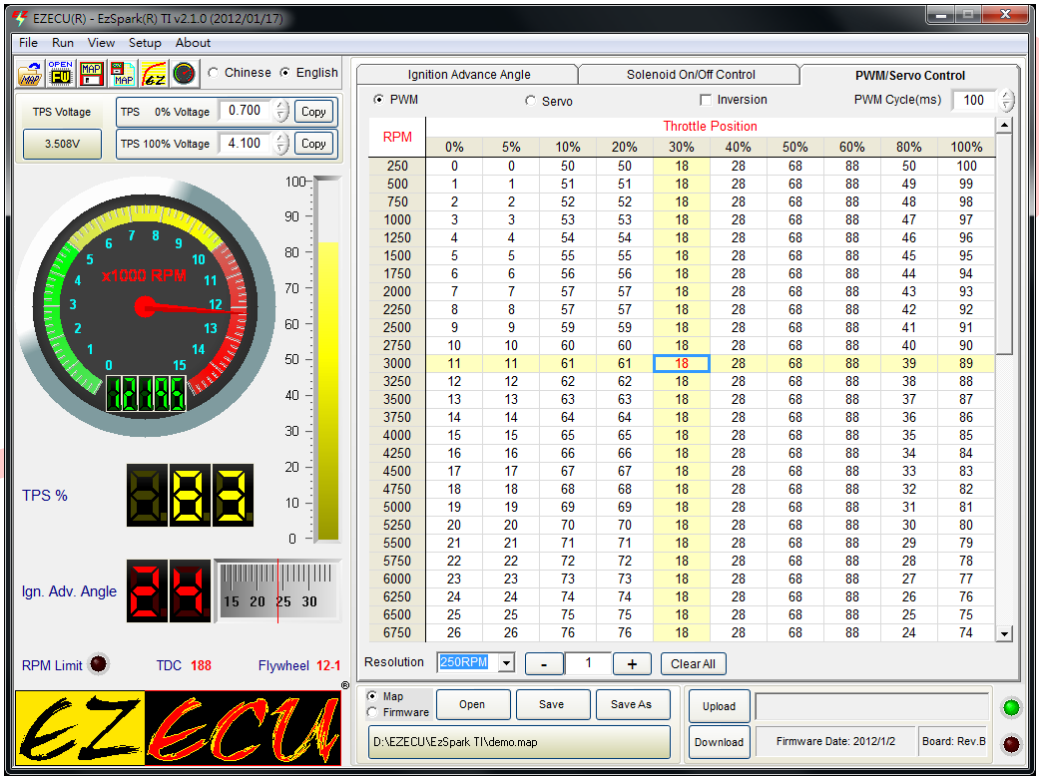


Figure 3-26 3D PWM/Servo Motor Control of EzSpark® TI ECU Application Software

For the PWM mode, the valid range for the PWM cycle starts from 1ms through 100ms with 1ms step. The valid PWM percentages are from 0% through 100% with 1% step. 0% means that the PWM output is turned off at all time. 100% means that the PWM output is turned on at all time. 50% means that the PWM output is turned on half-time and turned off half-time within the PWM cycle. If users need a second solenoid output, fill the tables with either 0% or 100% to achieve off or on control, respectively.

For the Servo mode, this output can be connected to a general PWM controlled servo motor. The value inside the 3D table will control the rotation direction and position of the servo motor. Values from 0 through 49 will let the servo motor to rotate left with 0 being the leftmost position. Value 50 will hold the servo motor at the center position. Values from 51 through 100 will let the servo motor to rotate right with 100 being the rightmost position. The Servo mode can be used for controlling the variable intake valve, variable exhaust valve, etc.

## 3.13 Base Ignition Maps

While installing EzSpark® TI application software by using the CD, four base ignition maps for YAMAHA Cygnus and V-Ixion 150, KYMCO Racing, SUZUKI NEX/GSR, PGO TIGRA/X-HOT, and HONDA CBR 250 will be installed also. The file names are listed in the following table:

Table 3-2 File Names for Referenced Base Ignition Maps

| Brand | Model | File Name |
|---|---|---|
| YAMAHA | Cygnus | YAMAHA Cygnus.map |
| YAMAHA | V-Ixion 150 | YAMAHA V-Ixion 150.map |
| PGO | TIGRA | PGO TIGRA.map |
| PGO | X-HOT | PGO X-HOT.map |
| SUZUKI | NEX/GSR | SUZUKI NEX.map |
| HONDA | CBR 250 | HONDA CBR 250.map |
| KYMCO | Racing | KYMCO Racing.map |



It should be noted that the TPS (Throttle Position Sensor) voltage should be re-calibrated while loading the base map. Please refer to Section 3.4 for the TPS voltage calibration procedures.

## 3.14 About EZECU®

The information about EZECU® series products and our company can be found by clicking the "About" menu. The following window with trademarks and URL will appear.


Figure 3-27 EZECU® Product Information Window

# Appendix Main Connector Signals

Table A-1 Main Connector Pin Numbers

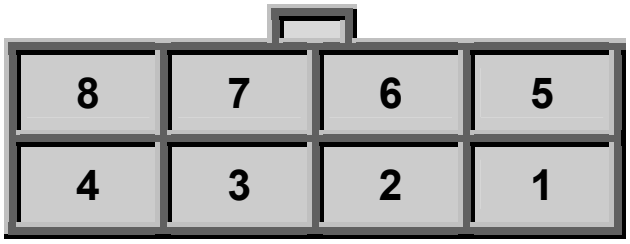


Table A-2 Main Connector Signals

| Pin No. | Signal Description | Wire Color |
|---|---|---|
| 1 | 0V ~ 5V Analog Input | Red/Black |
| 2 | TPS (Throttle Position Sensor) Input | White |
| 3 | Power Ground | Black |
| 4 | Dummy Coil Output (to Factory ECU) | Green/Yellow |
| 5 | Digital Drive Output | Purple |
| 6 | CPS (Crankshaft Position Sensor) Input | Orange |
| 7 | +12V Power | Red |
| 8 | Transistorized/Inductive Ignition Output | Pink |