x2 Throttle Controller - PC Application

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Controller Tuning

The use of this application is optional in dual throttle installations as the controller is pre-programmed with default values and the software is not required for the calibration procedure. The application allows fine tuning of various parameters if required for a particular installation or usage.

Connection: With the unit powered up(key on/engine off) and the application running on your PC, press and hold the calibration switch while connecting the USB cable to the controller. Release the calibration switch. The status box should change to "Connected." If you do not hold the calibration switch while connecting the USB cable, the unit will enter diagnostics mode and the "Diagnostics" tab will be active rather than the "Controller Tuning" tab. The controller must not be in standby mode in order to connect to the main processor. If it is, give the pedal a tap to wake it up first.

Other than control loop frequency and current limit, all values are only relative representations of actual values to give an impression of the magnitude of the changes you are making.

Once new values have been selected, click the corresponding "Set" button to download the new setting to the controller. PID values are downloaded as a group.

Clicking the "Default Values" button will reset all values on the form to factory settings. You must still click the appropriate "Set" buttons to download the values to the controller.

Primary throttle active sense is the average voltage sensed on the yellow wire connected to the primary throttle wiring. If the voltage falls below the set value, the secondary throttle will also be disabled and placed in standby mode until the sensed value again rises above the set value. This is an additional safety feature in the event that the vehicle ECU detects a throttle system fault and limits power to the primary throttle body. A value of "0" will inhibit this standby mode.

Excessive changes can result in a fault condition being present at the next power up. In some cases this may necessitate a firmware reflash in order to restore default values.

The "Fault Report" button will retrieve any stored faults that have been detected during the last 4 power up cycles. These can be cleared by pressing the Reset switch 4 times.

The "Disable Failsafes" feature is for diagnostic purposes only, when trying to isolate an issue. Individual failsafes can be disabled on the primary processor, while the supervisory processor's failsafe functions are disabled as a group. Failsafes are automatically restored after 2 power up cycles. Some of these do not apply when the controller is configured as a supercharger bypass valve controller.

Diagnostics
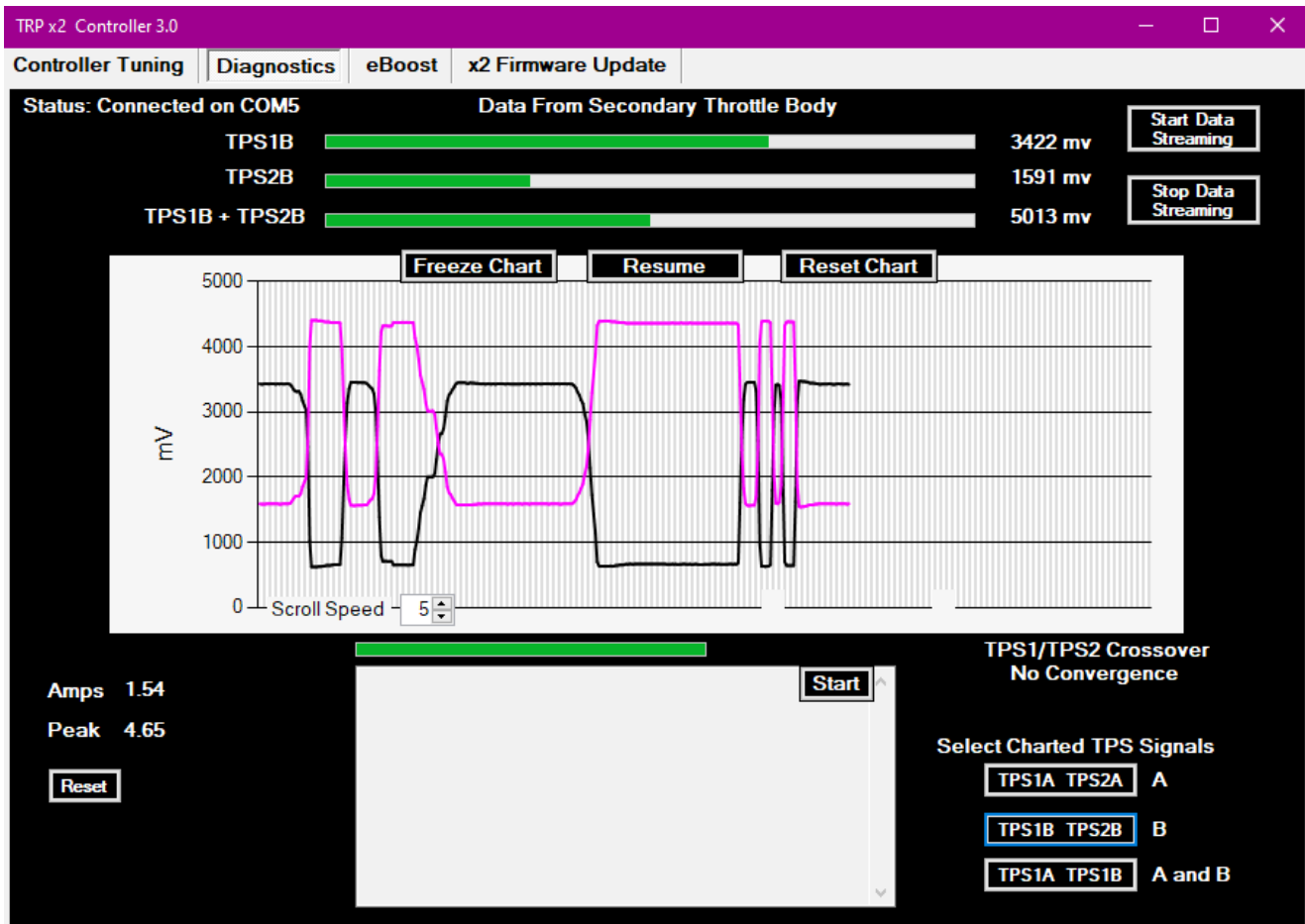
Connection: With the unit and the application running on your PC, connect the USB cable to the controller. The status box should change to "Connected" and live values from the throttle position sensors should be displayed for the throttle body connected to the secondary throttle connector.

Either the primary or secondary throttle body can be selected, but current is only reported for the throttle body driven by the x2(secondary).

To observe full range outputs the throttle blades may be moved by hand. Otherwise, the throttle bodies can be operated via the pedal.

Clicking on the "Start" button will initiate TPS range testing with recording of key values. Follow the onscreen instructions. Voltage values at key throttle positions will be reported.

Supercharger Bypass Control Settings

Initial Calibration: Power up(key on/engine off) the unit. If the unit has not been previously calibrated, or if new firmware has been loaded, the green and yellow LEDs will be flashing alternately indicating that the unit is ready to be calibrated. Calibration mode can also be initialized by holding the green LED switch while pressing and releasing the red LED reset switch, then releasing the green LED switch 2 seconds later.

Set the trigger input to the desired value and hold it there while pressing the green LED switch for 3 seconds, then releasing the switch. For example, the trigger may be a given throttle % if the trigger input is wired to the throttle position sensor. Or, if simulating a vacuum actuated bypass valve, it can be a voltage signal from the inlet MAP sensor which corresponds to a given inlet vacuum. This initial value is not critical as the trigger value can be reset to any desired value via the **x2** PC app. The **x2** also learns the ranges of the bypass actuator position sensors during calibration. Wait until all LEDs stop flashing and only the green and yellow LEDs are lit. Bypass actuator control will be active after the unit is power cycled once, or after the reset switch is pressed and released.

Additional Settings: The trigger voltage value, ramp in range and the minimum bypass valve opening can now be adjusted.

To connect for adjusting these settings, or for tuning the controller; power up the controller, press the green LED switch while connecting the USB cable, then release the switch. Select the "eBoost" tab to adjust the bypass control settings, or the "Controller Tuning" tab for other settings, although the latter will likely be adequate as preset.

Set the "Primary Trigger" to the value at which you want the bypass to close. If you wish to use a secondary trigger, so that both the primary and secondary must be met in order to close the bypass, set the "Secondary Trigger" to the desired value. Setting the secondary trigger to "0" disables it. Set "Bypass Ramp In Complete" to the value of the primary trigger source at which you want the bypass to be fully closed. Click on the "Set" button to transfer these settings to the **x2**.

Set the "Initial Bypass Position" to the position you want the bypass to first move to once the trigger voltage is reached. Click on the corresponding "Set" button. For example, 25% means that the actuator will initially rotate through 75% of it's travel in the closing direction. It will be at 25% open.

Setting the "Ramp In Complete" value <u>greater than</u> the "Bypass Trigger Voltage" will result in a linear "ramped" closure of the actuator between these two values, with it being fully closed once the input reaches the "Ramp In Complete" voltage value. The external boost reduction switch has no effect in this mode unless the initial position is set to 0%, because in that case, there is no ramp.

Setting "Bypass Ramp In Complete" to a value <u>less than</u> the "Bypass Trigger Voltage" value will cause the bypass to hold at the Initial Bypass Position," providing that it is set to a value greater than 0%, and that the boost reduction enable circuit is not grounded via a switch. There will be no ramp in and the bypass will not fully close. This will limit peak boost. Once setup this way, the external boost reduction enable switch can be used to toggle between Boost Reduction or instant full closed/full boost.

Primary trigger input filtering can be used if the trigger input, such as an inlet MAP(vacuum) sensor, requires smoothing. Otherwise, when ramped closing is configured, this instability will be reflected in some oscillation of the bypass valve during closure. Larger sample sizes will increase the ramp in time. So, if a softer ramp in is desired, select a larger sample size.

Firmware Updates
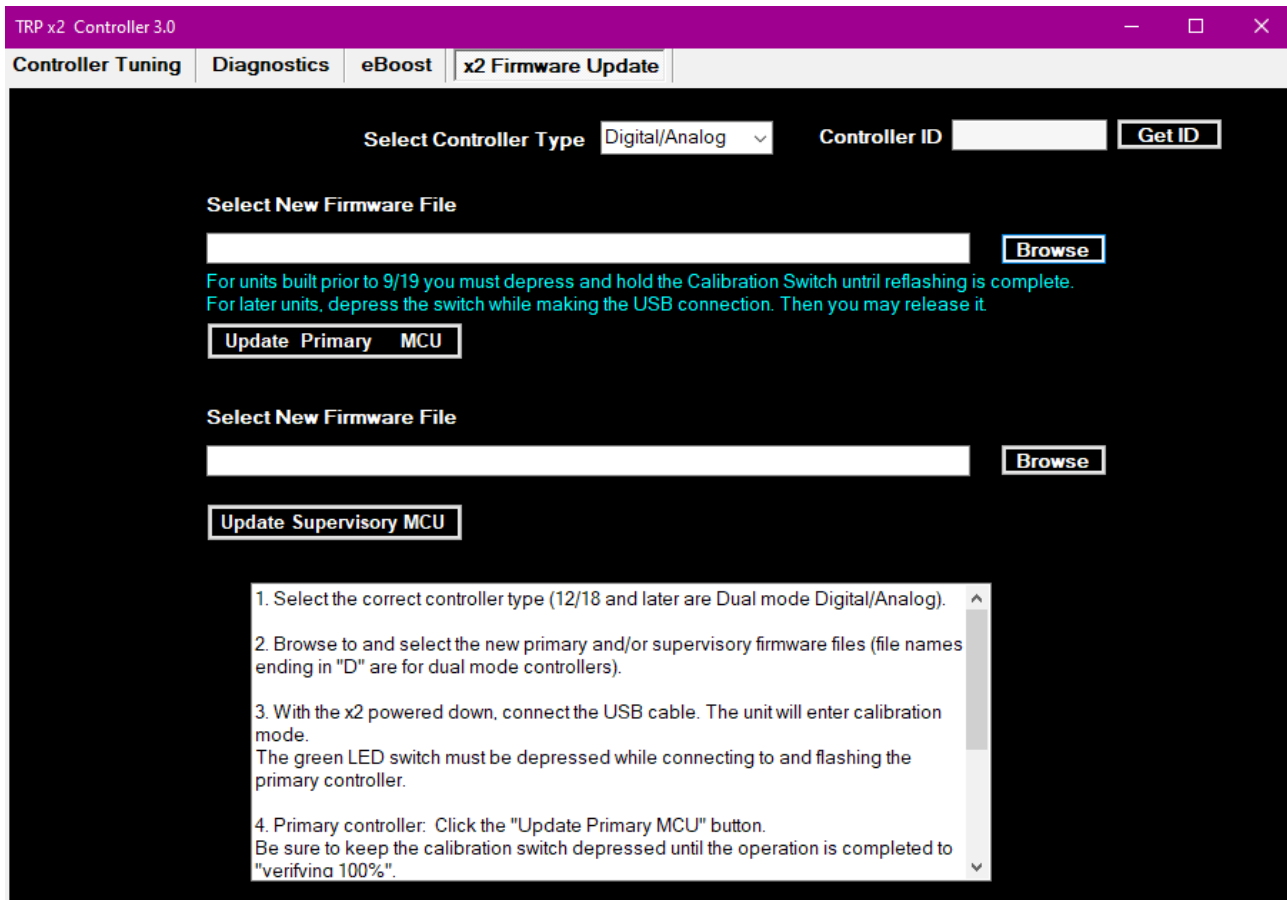
If available, firmware updates may be installed to the x2 by the following procedure.

1. Download and save the latest firmware files.

2. Open the x2 Throttle Controller PC application, click the software update tab, select the controller type (current units are digital/analog), and select the appropriate firmware files; x2_mainD.trp for the main controller and x2_superD.trp for the supervisory controller. (analog only units use firmware files without the "D" in the file name.

3. With the unit powered off, remove the rubber plug from the x2 enclosure and connect the x2 to your computer using an appropriate USB cable (A-B). Follow the instructions given in the x2 application.

4. Re-Calibrate the x2.

**Note: Updating will not proceed if the position of the green LED/calibration switch while connecting the USB cable does not match the selected update file (main vs super). For units manufactured prior to October 2019, the green switch must be held until flashing the primary MCU is complete at 100%.

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