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PowerPROview

Power Analyzer Pro

ESC Control
How to Guide

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TABLE OF CONTENTS

PowerPROview

Power Analyzer PRO ESC Control How To Guide

Introduction

This manual deals with a Power Analyzer Pro connected to the PowerPROview software. For information on operating the PowerPROview software see the PowerPROview Users Manual.

Toolbars

The toolbars and menu options for the Power Analyzer Pro will not appear until PowerPROview connects to a Pro device. When disconnected the toolbars and menu options will disappear.

Power Analyzer PRO Toolbars

The Power Analyzer Pro, when connected, will have two (2) toolbars displayed. One for the Pro's data control and one for the Pro's ESC control.

Power Analyzer PRO Data Toolbar

The Pro Data Toolbar gives you control over data streaming, recording, configuration, and other misc. functions of the Pro.

Pro Data Toolbar


Start Data Streaming


Stop Data Streaming


Zero AmpHrs & WattHrs Values


Enable Timed Record


Disable Timed Record


Start Recording


Stop Recording


Pause Recording


Continue Recording


Save Recording

Elapsed Recording Time


Tare Amps Reading


Pro Configuration

Pro Data Streaming

Data will only be displayed in the data objects in the data views when data streaming is on. While data streaming is on the Pro sends data to the computer. If data streaming is off then data is not transmitted from the Pro to the computer.

Zero AmpHrs & WattHrs Values
This function zeros the AmpHrs and WattHrs accumulators. This function can be automatically executed when recording starts if the system option “Auto Clear” is enable.

Time Limited Recording
Under system options you can set a maximum limit that recording will continue. With Timed recording enabled, recording will stop once that limit is reached.

Recording Pro Data
You need to record data to be able to use it on a graph. The graph object on a data view is a special object that only displays recorded data. It will display the data as it is recorded. You can also load and display previously recorded data into the graph for comparisons. Once you have recorded data, save it to disk. Once the data has been saved to disk it can then be loaded into a graph for analysis and comparison. During recording the elapsed time is displayed in the toolbar recording time indicator. You can pause and resume recording at any time. Pausing a recording does not remove any data previously recorded. Resuming recording will append new data to the previously record data.

Tare Amps Reading
This function will zero out any current reading offset due to quiescent currents from the load. This should only be used when you are not running a motor or load on the Pro. If you are seeing a small current reading while there is no load or the load is off, then execute this function to zero out that current.

PowerPROview

Power Analyzer PRO ESC Control How To Guide

Power Analyzer PRO ESC Toolbar

The Pro ESC Toolbar allows you to control an ESC connected to the Pro's ESC port. This gives you the ability to run repeatable tests controlled by the computer and your settings. When using an ESC to run data analysis tests it is best to use one that has as many throttle steps as possible. Consider an ESC with only 64 throttle steps versus one that has 128 steps. With 128 steps you get finer control and better test results.

Pro ESC Toolbar

 New Waveform

 Open Waveform

 Edit Waveform

 Save Waveform

 Start Waveform  Stop Waveform

Note: Pressing the Escape key acts as an emergency stop and will stop a waveform that is running and set the throttle to zero.

 Current Waveform Type (hover over for waveform description)
Display an image of the current waveform type

 Open Real-Time Control  Close Real-Time Control

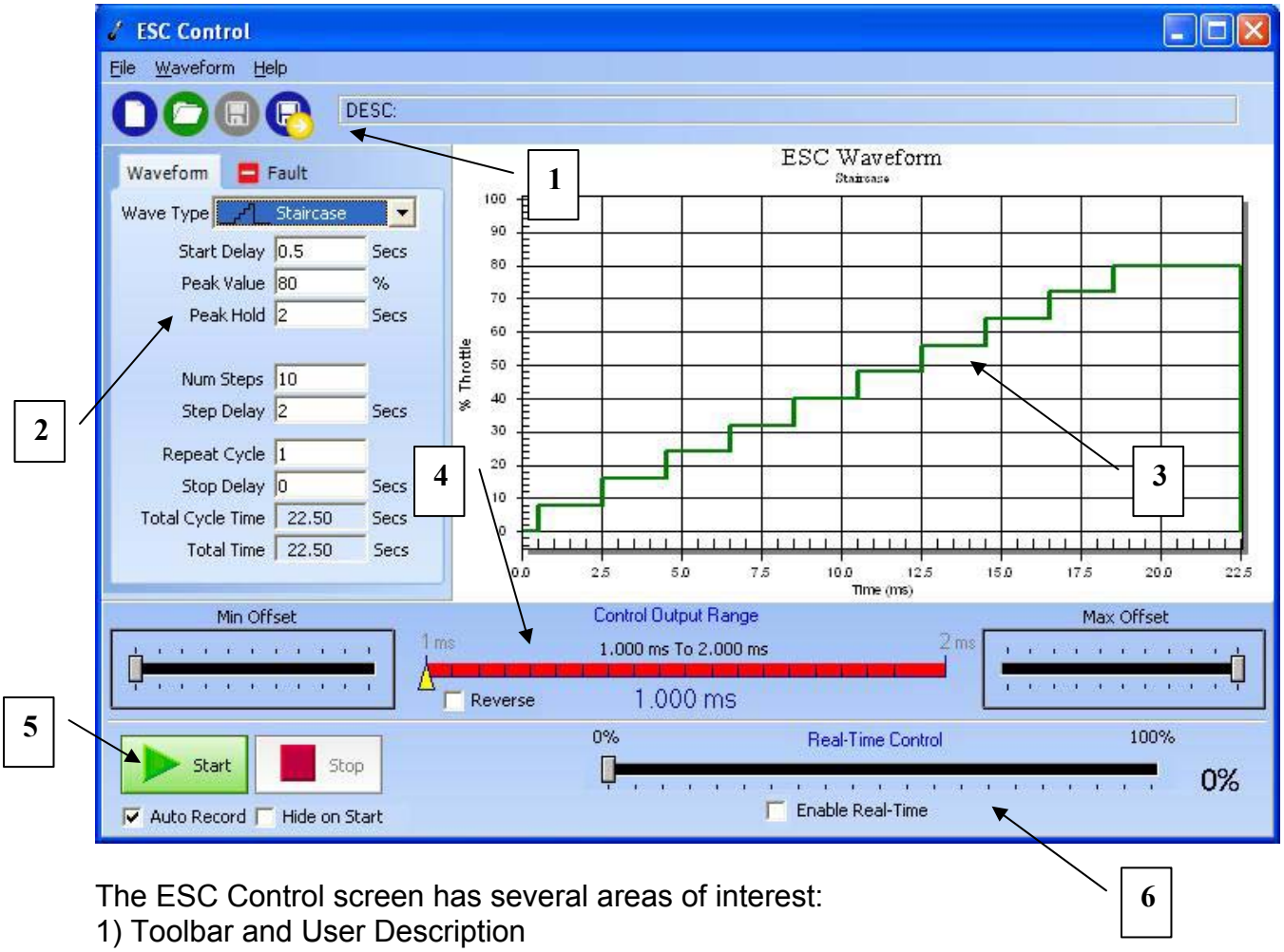
 Waveform Repeat Count. Shows the number of times a waveform has played.

PowerPROview

Power Analyzer PRO ESC Control How To Guide

ESC Waveform

An ESC waveform is just a pattern that the throttle position will follow. You can define various parameters for different waveform types to customize a waveform for your testing. Clicking on the New or Edit toolbar item will open the ESC Waveform Control and Editor:



The ESC Control screen has several areas of interest:

1) Toolbar and User Description
2) Waveform/Fault Settings
3) Waveform
4) Throttle Settings
5) Waveform Control
6) Manual Throttle Control

PowerPROview

Power Analyzer PRO ESC Control How To Guide

ESC Toolbar and User Description

New Waveform

Open Waveform

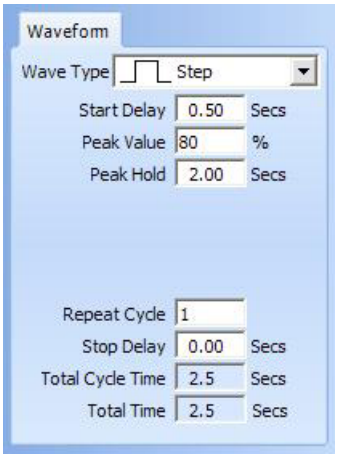
Save Waveform

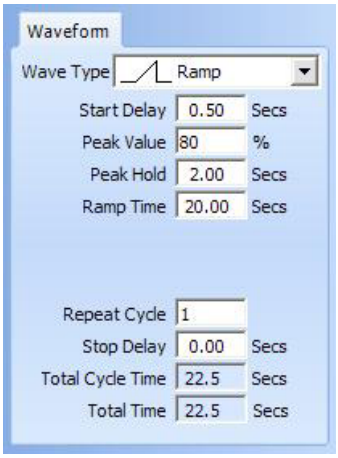
Save Waveform As

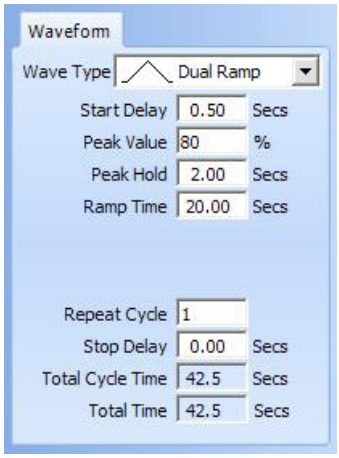
User Description for the waveform. Double click to edit.

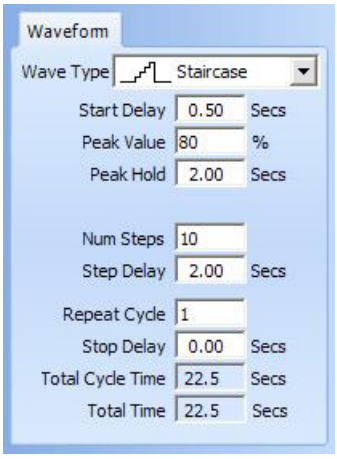
ESC Waveform Settings

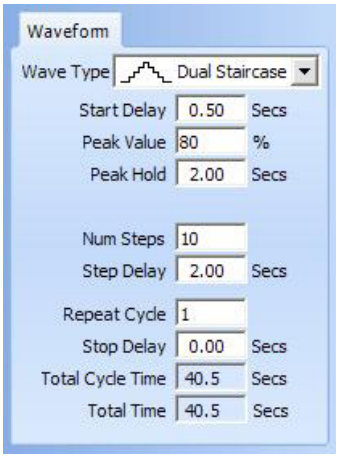
You can select a waveform type of Step, Ramp, Dual Ramp, Staircase, or Dual Staircase. For each type of waveform there will be different parameters available to configure that waveform.











PowerPROview

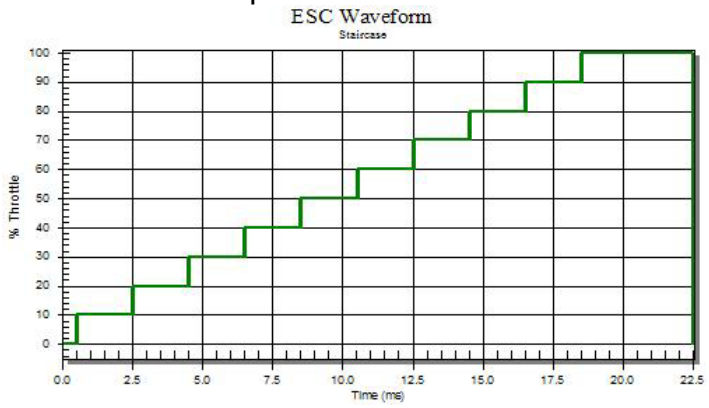
Power Analyzer PRO ESC Control How To Guide

ESC Waveform Parameters

Start Delay	Delay after the starting before the actual waveform begins.
Peak Value	Max value the throttle will achieve.
Peak Hold	Delay after waveform reaches its peak before continuing.
Ramp Time	Time for throttle to go from 0 to peak value.
Num Steps	Number of step between 0 and peak value.
Step Delay	Time that each step holds until next step.
Repeat Cycle	Number of times to repeat the waveform.
Stop Delay	Delay after waveform is done before recording stops.
Total Cycle time	Total time for one waveform.
Total Time	total time for all waveform repeats and delays.

ESC Waveform

This is a visual representation of the waveform.



ESC Fault Settings

While a waveform is running there can be several conditions that arise that you would want to stop the waveform from continuing. This could be the current to high for the ESC, the battery voltage getting too low, or even too high an RPM. The ESC Fault settings allow you to check for conditions that would stop the waveform to prevent damage or unsafe conditions.

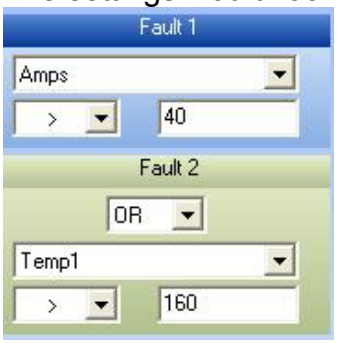
There are Three (3) main conditions that can be set that when met will stop a waveform that is currently running. Each fault condition has three parameters: data channel, test, and value. Select the parameters for each condition that will define the fault condition that you desire. A fourth test (AND/OR) is used to further define a more complex condition. This can be used to specify three separate conditions (OR) where any one of them will stop a waveform or a combination of conditions where two conditions or all three conditions have to be met to stop the waveform.

The check box at the top of the faults will enable and disable the fault checking.

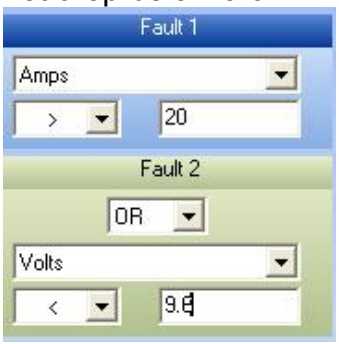
The fault settings will be saved with the waveform settings when you save a waveform.

Example 1:
An ESC has a max rating of 40 Amps.
The motor has a max temp of 160 degrees.

The settings would look like this:



Example 2:
In doing a battery test the current should not exceed 20A and the min voltage should not drop below 9.6V.



Example 3:

When using the AND/OR keep in mind that when the AND is used it always refers to the condition above it.

Here are the possible combinations:

(Fault 1) OR (Fault 2)
(Fault 1) AND (Fault 2)
(Fault 1) OR (Fault 2) OR (Fault 3)
(Fault 1) AND (Fault 2) OR (Fault 3)
(Fault 1) OR (Fault 2) AND (Fault 3)
(Fault 1) AND (Fault 2) AND (Fault 3)

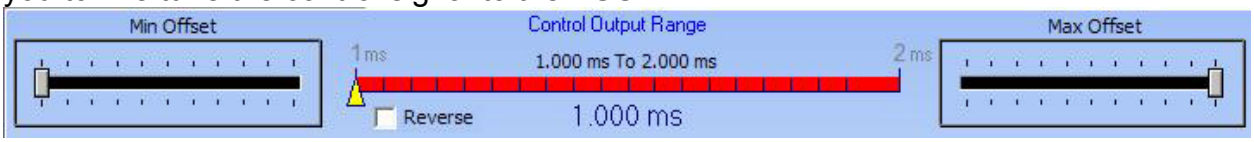
Of course not all faults have to be defined. Select the ???? channel to disable that fault.

PowerPROview

Power Analyzer PRO ESC Control How To Guide

ESC Throttle Settings

Not all ESC's respond to the same range of control signal. The Min and Max offset allow you to fine tune the control signal to the ESC.



Using the manual real time throttle control set to zero, increase the Min offset until the output starts to change, then back it off a little bit. Next, set the throttle to full on and decrease the max offset until the output starts reducing, then increase it a little bit. You now have the control output range calibrated for the ESC. Remember that if you change ESC's you will probably have to recalibrate the control signal.

NOTE: With some ESC's you will need to bring the throttle up about 1/4 to 1/3 to activate the ESC and then return it to zero before calibrating the control signal.

NOTE: The Power Analyzer output to the ESC will shut off after a few seconds if it does not receive a throttle command from the computer. While in manual real time throttle control mode the throttle position is continually sent to the ESC. When off, throttle commands are only sent while a waveform is playing.

ESC Waveform Control

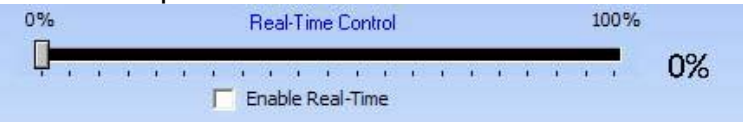
You can start (i.e. play) a waveform from the toolbar, the ESC waveform window or from the real time control window. On you start a waveform you can stop it by click on the stop button on the toolbar, the waveform window, or on the real time control window.

Auto Record — If checked, recording will start when the waveform starts.

Hide on Start — If checked, the waveform window will hide while the waveform is playing.

ESC Manual Throttle Control

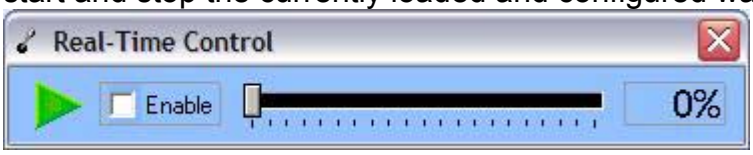
The real time control provides manual throttle control. When enabled the slider controls the throttle position.



Enable Real-Time — When checked, enables manual throttle control.

ESC Real-Time Control Window

The Real-Time Control window allows you to manually control the throttle as well as start and stop the currently loaded and configured waveform.



Start Waveform

Stop waveform

Enable When checked, enables manual throttle control using the slider.