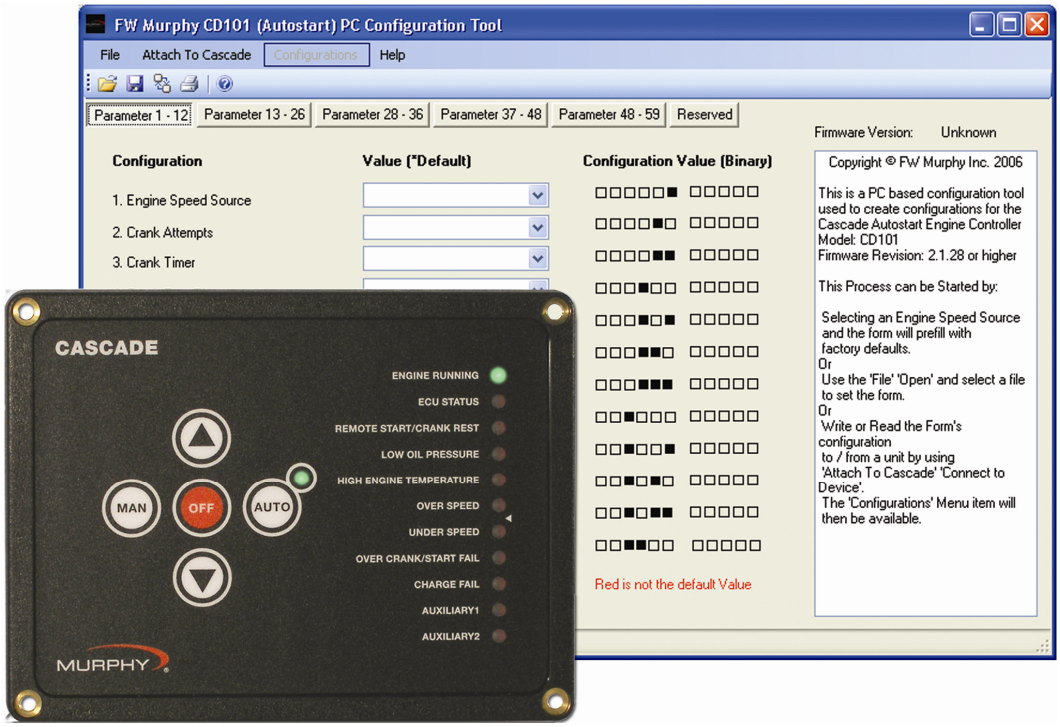
MURPHY®



Cascade Configuration Tool

Version 1.0.10

Installation and Operations Manual

00-02-0724
01-25-11
Section 40

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time.

Please read the following information before installing.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- Read and follow all installation instructions.
- Please contact FW MURPHY if you have any questions.

Table of Contents

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Introduction

Cascade Configuration Tool is a PC-based configuration software for the Cascade controller. The easy-to-use interface enables you to modify the parameters of the Cascade as shown in Table 1.

File transfer utilities for configuration and firmware upgrades are provided so that once the configuration is set, it may be downloaded from your PC to the Cascade via a serial or USB connection.

Installation

System Requirements

A RS485/232 to USB adapter is required for transferring the configuration from the Configuration Tool to the Cascade.

While the Configuration software will function on any PC or laptop running Windows, it will not perform transfers using the USB driver unless the operating system supports USB. USB supported operating systems include Win98SE, NT, XP, Vista and Windows7.

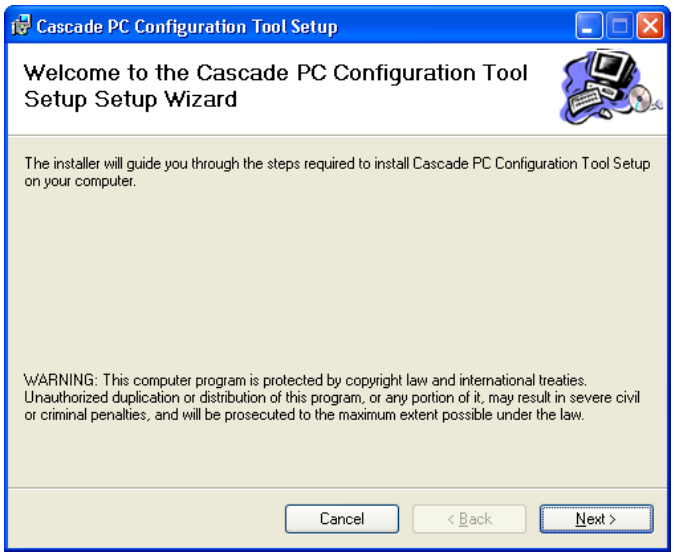
Serial transfers using standard communication ports (COM1, COM2) should be possible on all Windows platforms.

The Cascade Configuration Tool software and USB driver provide efficient use of your hard drive, using only 3-5 MB of disk space after installation.

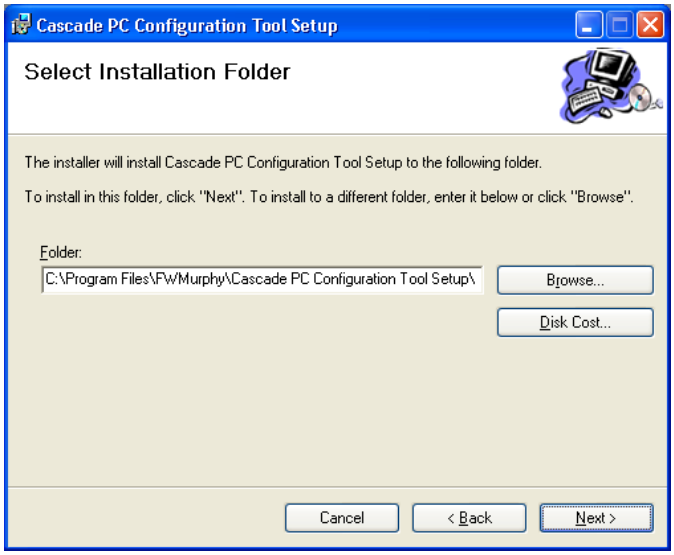
Installation Instructions

Follow the steps below to install the Cascade Configuration Tool software on a PC or laptop.

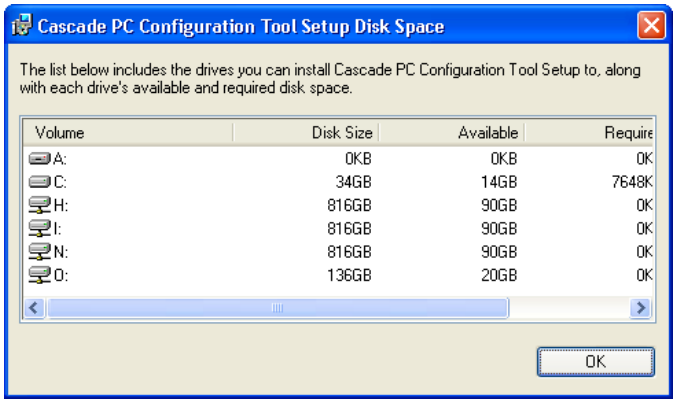
1. Insert the CD101 CD into your computer CD drive. The installation menu is displayed. Click [Next] to continue.



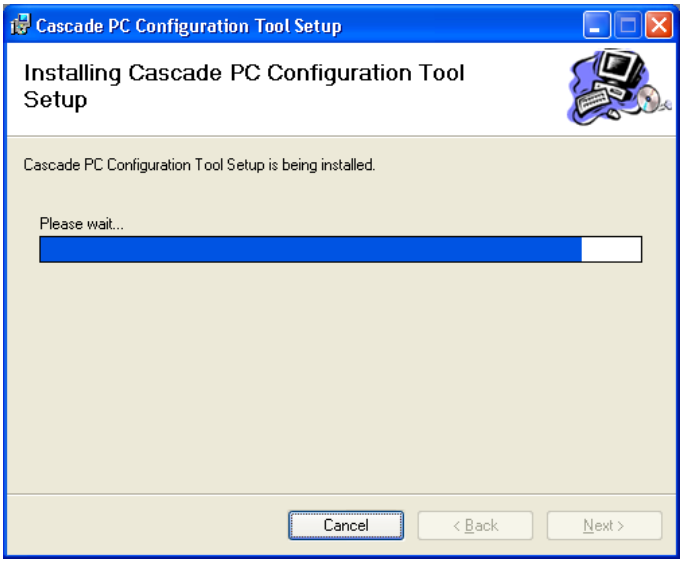
2. You will be asked for a destination folder for the program. You can accept the suggested directory or you can select a different directory by clicking [Browse] and browsing to the destination folder. Once the destination folder is determined, click [Next] to continue. (Note: click [Disk Cost…] to check disk space).



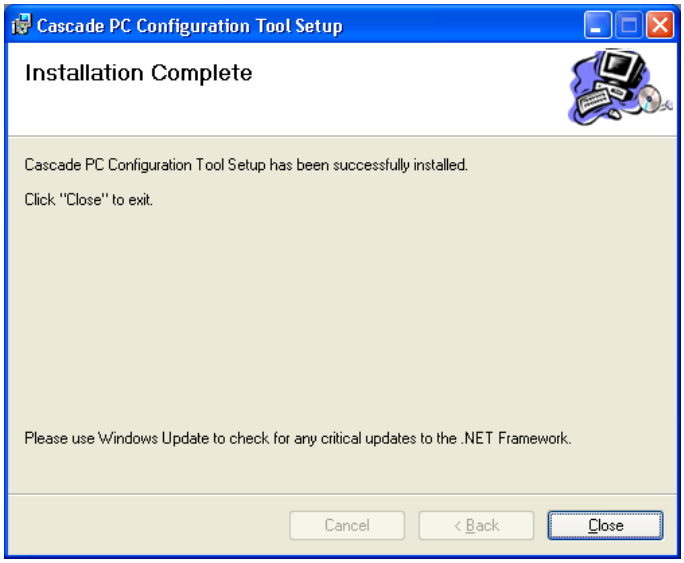
3. To check to see your available disk drive space, click [Disk Cost…]. The following screen is displayed. When finished, click [OK]. This will return you to the previous screen. Click [Next] to continue.



4. The Wizard will now install the program. This may take several minutes. The following screen is displayed during the installation.

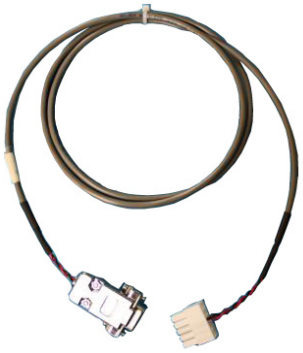


5. When the installation is complete, the following screen is displayed. Click [Close].



Installing USB Driver

Tools Needed

USB to RS485 Converter 	USB Cable 
Programming Cable 	Cascade Controller 
PC 	Power Supply (9-32 V, 24mA) 

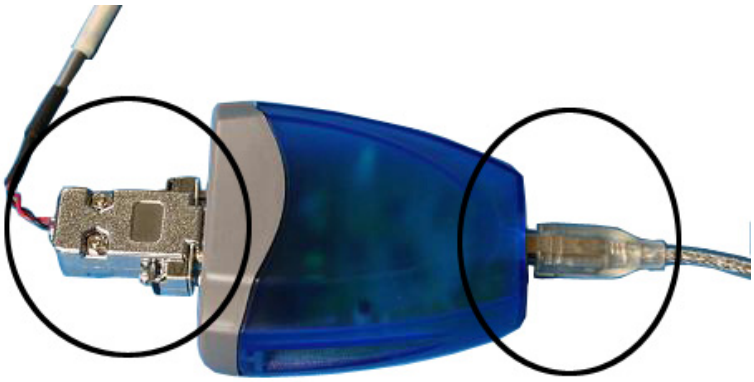
Installation

To use the USB connection device to download the configuration into the Cascade controller, you will need to use the Murphy installation kit. Follow the instructions listed below to connect the computer and device:

> NOTE: The installation kit provides everything needed to connect the Cascade to your PC.

1. Connect the programming cable end with the db9 connect to the RS485 to USB converter.

2. Connect the USB cable to the USB to RS485 converter.



3. Connect the opposite end of the programming cable to the Cascade 10 position connector.

4. Connect the opposite end of the USB cable to the PC.

5. Connect Battery (+) to position 1 on the 15 position terminal block.

6. Connect Battery (-) to position 2 on the16 position terminal block.

Programming Mode

Flip dip switch number 1 to the closed position (up) on the rear of the Cascade. This will allow the controller to power up in the programming mode. Once all programming cables and power are connected to the Cascade, initiate power. The controller should now be in programming mode.

The Cascade's green LED to the right of AUTO will flash very quickly. This LED turns off briefly while the right-hand bank of LEDs flash "on" for proper bulb verification. Once the bank of LEDs flash and remain off, the green light to the right of AUTO will have a slower steady flash. In the first bank of LEDs labeled "OVER SPEED", the bottom red LED remains on. This is the first parameter and indicates you are now in Programming Mode.

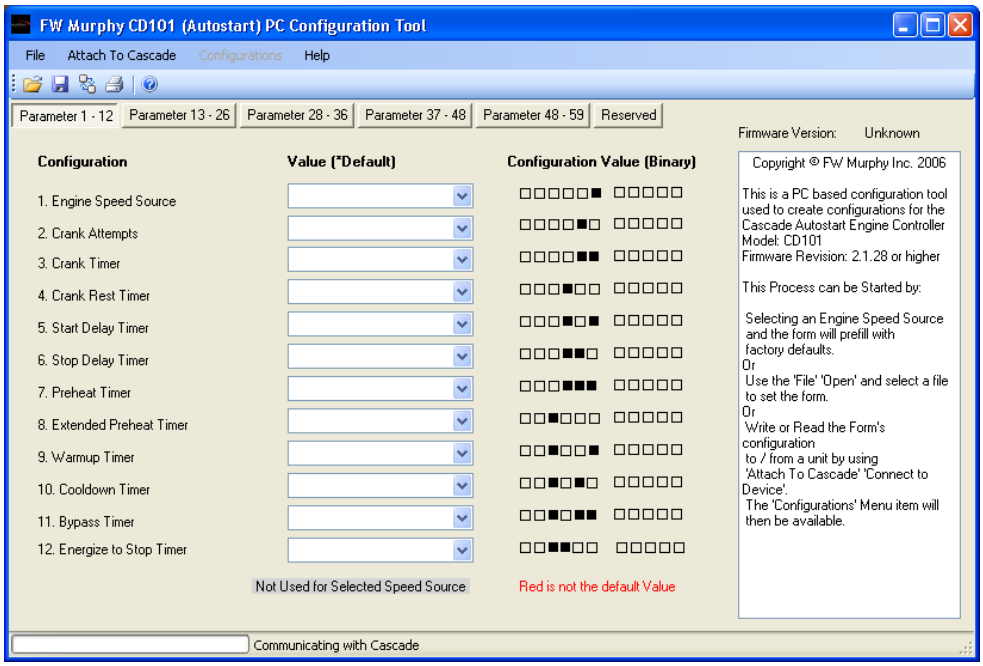
Once the program is loaded successfully, flip the number 1 dip switch to the open position and remove power from the controller.

Application GUI Overview

This section provides instructions for launching the Cascade Configuration Tool, identifies the application features that are accessible through the menu bar, and defines general navigation.

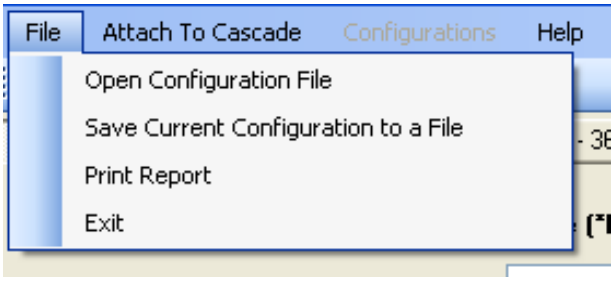
Launching the Application

To launch the application you either double-click the Cascade Configuration Tool application icon  located on your desktop, or select “Cascade Configuration Tool Design” from the list of programs under your “Start” menu. The following dialog box is displayed.

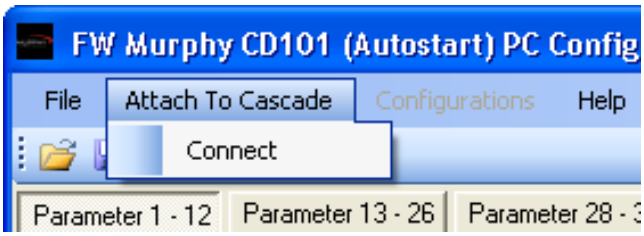


Menus and Tool Bars

The tool bar provides one-click access to opening an existing file and saving the currently displayed file. These same functions are available from the “File” drop-down menu. The “File” menu also provides the ability to print a report. (Note: The Report selection will only print a report of the current configuration to a printer connected to the PC and will not display the report.)



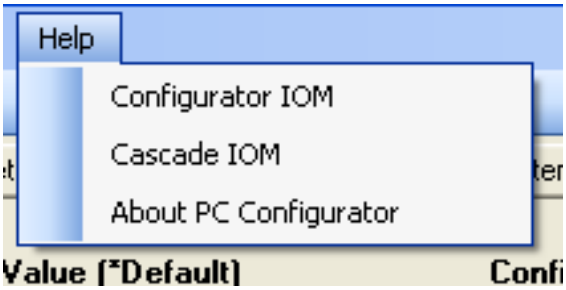
Selecting “Attach to Cascade” provides the ability to connect to an existing Cascade once all cabling is connected and power is initiated on the controller. Once connected, the configuration from the Cascade can be downloaded and viewed.



Selecting “Configurations” allows you to write to a device, read from a device, restore the initial configuration or set to the factory defaults. The Configurations menu item is grayed out and unavailable when not directly connected to a device.

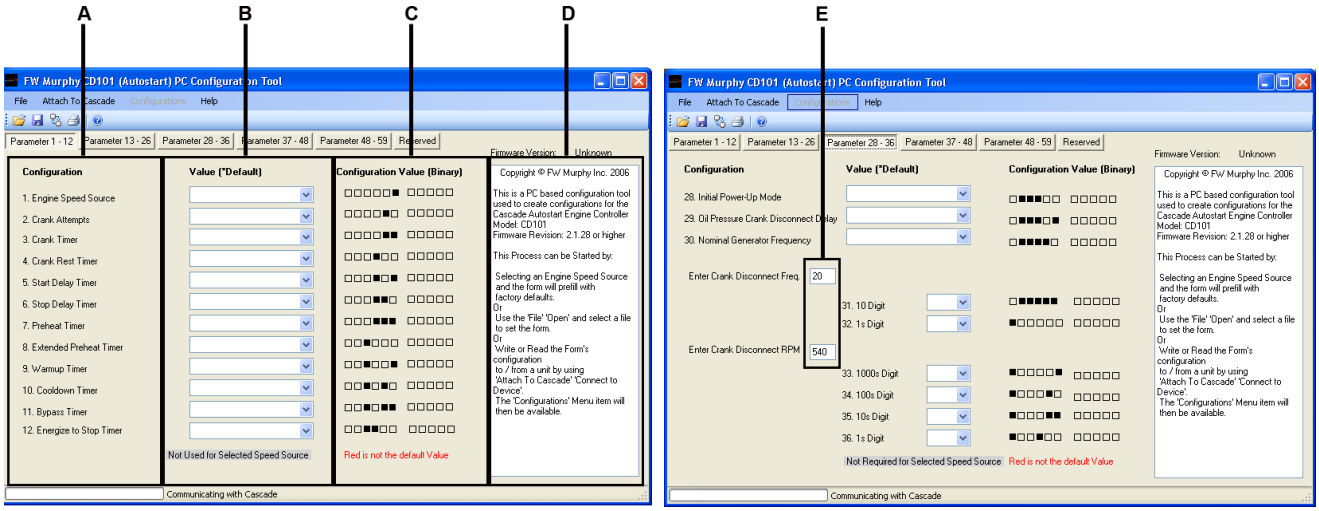
> NOTE: The PC and device must be linked in order to have access to the Configurations menu item.

Selecting “Help” provides access to the Instruction and Operations manual, information about the PC Configuration Tool and the User’s Manual.



Navigating Cascade Configuration Tool

Navigating the Cascade Configuration Tool application interface is versatile and easy. It contains one window and it has four sections of information for each tab. Each tab contains a similar format although not identical. See the illustration below.



Here is what each section contains:

(A)The configuration section a list of items that can be configured.

(B) The Value (*Default) section contains drop-down boxes from which the user can select a value.

(C) The Configuration Value (Binary) section contains the binary value for what is selected in section (B).

> **NOTE:** This section will indicate to the user when the default value has been altered by turning the binary values to the right red.

(D) The Help section provides context sensitive help for each of the values to be entered.

> **NOTE:** The Help is displayed when the box is selected.

(E) This section is displayed on screens requiring additional user input.

> **NOTE:** Sections (B) and (E) are the only sections to which the user can make changes.

Guidelines for Configuring the Cascade Configuration Tool

This section provides guidelines for setting up common configuration items in Cascade Configuration Tool.

There is a logical sequence to follow when configuring the Cascade. These sequences will be explained in four separate topics. They are:

- Defining the System
- System of Operation
- System of Interface

Defining the System

The first step in defining the system is to gather information for setting up your analog and/or digital devices and control outputs. For your convenience, you may want to make a checklist of this information for entering into the Cascade Configuration Tool. Once this information has been entered, it will be available for subsequent configuration options.

The following items from the Main Menu List allow you to define the system. Refer to the context sensitive help contained in the product for information on field options you will be entering.

Parameters

Below is a list of the parameters that the Cascade will ask you to define.

Parameter 1-12	Parameter 13-26	Parameter 28-36	Parameter 37-48	Parameter 48-59	Reserved
1. Engine Speed Source	13. Aux input Bypass Timer	28. Initial Power-up Mode	37. Overspeed Setpoint	Flywheel Tooth Count	20. Reserved
2. Crank Attempts	14. Cranking Abutment Delay	29. Oil Pressure Crank Disconnect Delay	38. Underspeed Setpoint	48. 100's Digit	21. Reserved
3. Crank Timer	15. Remote Start Signal Type	30. Nominal Generator Frequency	39. Underspeed Response	49. 10's Digit	27. Reserved
4. Crank Rest Timer	16. Low Oil Pressure	Enter Crank Disconnect Freq.	40. Low Press Shutdown Setpoint	50. 1's Digit	45. Reserved
5. Start Delay Timer	17. High Engine Temp.	31. 10's Digit	41. Hi Eng Temp. Shutdown Setpoint	Run Speed	46. Reserved
6. Stop Delay Timer	18. Digital Input 3 (Aux Input 1)	32. 1's Digit	42. Lo Batt Voltage Setpoint	51. 1000's Digit	47. Reserved
7. Preheat Timer	19. Digital Input 4 (Aux input 2)	Enter Crank Disconnect RPM	43. Hi Batt Voltage Setpoint	52. 100's Digit	55. Reserved
8. Extended Preheat Timer	22. Fuel Relay Control	33. 1000's Digit	44. Weak Battery Voltage Setpoint	53. 10's Digit	56. Reserved
9. Warm-up Timer	23. Auxiliary Output 1	34. 100's Digit		54. 1's Digit	57. Reserved
10. Cool-down Timer	24. Auxiliary Output 2	35. 10's Digit		59. Fault Code SPN Conversion Method	58. Reserved
11. Bypass Timer	25. Auxiliary Output 3	36. 1's Digit			60. Reserved
12. Energize to Stop Timer	26. Auxiliary Output 4				61-63. Reserved

NOTE: For further information on the parameters, see Appendix A - Tables in this document.

System of Operation

The sequences to be defined for system of operation determine the day-to-day, normal operation of your equipment. The following items from the Main Menu List allow you to define the system of operation. Refer to the chapter titled “Main Menu List - Screen Definitions” for information on field options you will be entering.

File

Open Configuration Item

This feature allows the user to open a saved configuration from a location on the PC.

Save Current Configuration to a File

This feature allows the user to save a configuration into a file on the PC. This will allow the use of configuration at a later date.

Print Report

This feature prints a report of all the parameters in the configuration using the default printer of the PC.

Exit

This closes the configuration tool.

Attach to Cascade

Connect

This allows the configuration tool to communicate to the Cascade once all the cabling is connected and power is initiated on the controller.

Configurations

Write to Device

To download a configuration to the Cascade controller, first make sure the PC is connected to the controller via USB to RS45 converter and the controller is in programming mode. In the “Configurations” menu, click “Write to Device”. You will now see a text box with a message that states “Successful Write to Device.”

After downloading the configuration, remove the USB to RS485 converter cable from the Cascade, take the controller out of programming mode and cycle the power. The controller will now power up with the new configuration installed.

Read from Device

To upload a configuration from the Cascade controller, first make sure the PC is connected to the controller via USB to RS45 converter and the controller is in programming mode. Click on “Configurations” then click “Read from Device”. After uploading the configuration, the parameters will be shown in the configuration value row. To distinguish if the parameter I not a default parameter, the small configuration value boxes will be red.

Restore Initial Configuration

This feature allows the user to restore the Cascade’s configuration to the configuration software from when the initial “Read from Device” was selected. This allows the user to make changes to a configuration originally pulled from the Cascade, then go back to view, compare, or load the original configuration before changes were made.

Set to Factory Defaults

This feature enables the user to reset the factory defaults of the Cascade without having to manually do so.

Help

Configurator IOM

Click this menu item to obtain an Installation and Operations Manual for the Cascade Configuration Tool.

Cascade IOM

Click this menu item to access the Installation and Operations Manual for the Cascade. This will open a window browser and redirect the user to the Cascade product home page on the FW Murphy web site. Under the Literature Tab of this page, the current IOM is listed and provided in a PDF format. This feature is only available on a PC that is connected to the internet.

About PC Configurator Tool

This identifies the software version of the configuration tool.

Appendix A - Tables

Table 1. Parameter Values and Corresponding LED Indication

LEDs shown here form a binary code indicating the configuration value. Shown from Top to bottom the LEDs read from Left to Right (see Fig.1). A filled dot means LED is ON.

Parameter #	Description	LED Bank 1	Value (*= default)	LED Bank 2
1	Engine Speed Source	○○○○○●	Magnetic Pickup*	○○○○○
			Generator AC	○○○○●
			J1939 (ECU)	○○○●○
2	Crank Attempts	○○○○●○	3*	○○○○○
			5	○○○○●
			10	○○○●○
			Continuous	○○○●●
3	Crank Timer	○○○○●●	5 Sec	○○○○○
			10 Sec	○○○○●
			15 Sec*	○○○●○
			20 Sec	○○○●●
			25 Sec	○○●○○
			30 Sec	○○●○●
			45 Sec	○○●●○
			60 Sec	○○●●●
4	Crank Rest Timer	○○○●○○	5 Sec	○○○○○
			10 Sec	○○○○●
			15 Sec*	○○○●○
			20 Sec	○○○●●
			25 Sec	○○●○○
			30 Sec	○○●○●
			45 Sec	○○●●○
			60 Sec	○○●●●
5	Start Delay Timer (auto mode only)	○○○●○●	0 Sec*	○○○○○
			5 Sec	○○○○●
			10 Sec	○○○●○
			15 Sec	○○○●●
			30 Sec	○○●○○
			60 Sec	○○●○●
6	Stop Delay Timer (auto mode only)	○○○●●○	0 Sec*	○○○○○
			5 Sec	○○○○●
			10 Sec	○○○●○
			15 Sec	○○○●●
			30 Sec	○○●○○
			60 Sec	○○●○●
7	Preheat Timer	○○○●●●	0 Sec*	○○○○○
			5 Sec	○○○○●
			10 Sec	○○○●○
			15 Sec	○○○●●
			20 Sec	○○●○○
			25 Sec	○○●○●
			30 Sec	○○●●○
			45 Sec	○○●●●
			60 Sec	○●○○○
8	Extended Preheat during Crank (only used if preheat timer is also set to a non-zero value) (must be less than or equal to crank timer)	○○●○○○	0 Sec*	○○○○○
			5 Sec	○○○○●
			10 Sec	○○○●○
			15 Sec	○○○●●
			20 Sec	○○●○○
			25 Sec	○○●○●
			30 Sec	○○●●○
			45 Sec	○○●●●
			60 Sec	○●○○○
9	Warmup Timer	○○●○○●	0 min.*	○○○○○
			1 min.	○○○○●
			5 min.	○○○●○
			10 min.	○○○●●
10	Cooldown Timer	○○●○●○	0 min.*	○○○○○
			1 min.	○○○○●
			5 min.	○○○●○
			10 min.	○○○●●
11	Bypass Timer	○○●○●●	0 Sec	○○○○○
			5 Sec	○○○○●
			10 Sec*	○○○●○
			15 Sec	○○○●●
			20 Sec	○○●○○
			25 Sec	○○●○●
			30 Sec	○○●●○
12	Energize to Stop Timer	○○●●○○	15 Sec*	○○○○○
			30 Sec	○○○○●

Parameter #	Description	LED Bank 1	Value (*= default)	LED Bank 2
13	Aux Input Bypass Timer	○○●●○●	30 Sec*	○○○○○
			1 Min	○○○○●
			2 Min	○○○●○
			3 Min	○○○●●
			4 Min	○○●○○
			5 Min	○○●○●
			6 Min	○○●●○
			7 Min	○○●●●
			8 Min	○●○○○
			9 Min	○●○○●
			10 Min	○●○●○
			15 Min	○●○●●
			20 Min	○●●○○
			25 Min	○●●○●
			30 Min	○●●●○
			35 Min	○●●●●
			40 Min	●○○○○
			45 Min	●○○○●
			50 Min	●○○●○
			55 Min	●○○●●
			1 Hr	●○●○○
14	Cranking Motor Abutment Protection Delay (Current crank attempt is aborted if an RPM greater than 10 is not detected after this delay from start of crank has expired) (MPU and J1939 speed source only)	○○●●●○	Disabled*	○○○○○
			1.00 s	○○○○●
			1.25 s	○○○●○
			1.50 s	○○○●●
			1.75 s	○○●○○
			2.00 s	○○●○●
			2.25 s	○○●●○
			2.50 s	○○●●●
			2.75 s	○●○○○
			3.00 s	○●○○●
			3.25 s	○●○●○
			3.50 s	○●○●●
			3.75 s	○●●○○
			4.00 s	○●●○●
			4.25 s	○●●●○
			4.50 s	○●●●●
			4.75 s	●○○○○
			5.00 s	●○○○●
15	Remote Start Signal Type	○○●●●●	Maintained*	○○○○○
			Momentary	○○○○●
16	Digital Input 1	○●○○○○	Lo Oil Press (Open/Fault)	○○○○○
			Lo Oil Press (Close/Fault)*	○○○○●
17	Digital Input 2	○●○○○●	Hi Eng Temp (Open/Fault)	○○○○○
			Hi Eng Temp (Close/Fault)*	○○○○●
18	Digital Input 3 (Auxiliary Input 1)	○●○○●○	Not Used*	○○○○○
			Winter/Summer	○○○○●
			Momentary Stop	○○○●○
			Immediate Warning	○○○●●
			Delayed Warning	○○●○○
			Immediate Shutdown	○○●○●
			Delayed Shutdown	○○●●○
			Delayed Aux Input Shtdwn	○○●●●
			Run/Idle (Line Fill)	○●○○○
			Auxiliary Crank Disconnect	○●○○●
			Remote Reset (Clear Faults)	○●○●○
19	Digital Input 4 (Auxiliary Input 2)	○●○○●●	Not Used*	○○○○○
			Winter/Summer	○○○○●
			Momentary Stop	○○○●○
			Immediate Warning	○○○●●
			Delayed Warning	○○●○○
			Immediate Shutdown	○○●○●
			Delayed Shutdown	○○●●○
			Delayed Aux Input Shtdwn	○○●●●
			Run/Idle (Line Fill)	○●○○○
			Auxiliary Crank Disconnect	○●○○●
			Remote Reset (Clear Faults)	○●○●○
22	Fuel Relay Control (non ECU Engines) Note: On ECU engines, fuel relay is used for ECU power	○●○●●○	Energized to Run*	○○○○○
			Energized to Stop	○○○○●

Table 1. Parameter Values and Corresponding LED Indication *(continued)*

LEDs shown here form a binary code indicating the configuration value. Shown from Top to bottom the LEDs read from Left to Right (see Fig.1). A filled dot means LED is ON.

Parameter # Description	LED Bank 1	Value (*= default)	LED Bank 2
23 Auxiliary Output 1	○●○●●●	Not Used*	○○○○○
		Warmup	○○○○●
		Cooldown	○○○●○
		Warmup/Cooldown	○○○●●
		Preheat	○○●○○
		Engine Running	○○●○●
		At Load	○○●●○
		Lo Oil Press Shutdown	○○●●●
		Hi Eng Temp. Shutdown	○●○○○
		Overspeed Shutdown	○●○○●
		Overcrank Shutdown	○●○●○
		Alternator Fail/Battery High/Low/Weak	○●○●●
		Engine Speed Up	○●●○○
		Engine Speed Down	○●●○●
		Common Alarm	○●●●○
		Controller in AUTO mode	○●●●●
		Shutdown Loss of Speed Signal Fault	●○○○●
		Underspeed Fault	●○○●○
24 Auxiliary Output 2	○●●○○○	Not Used*	○○○○○
		Warmup	○○○○●
		Cooldown	○○○●○
		Warmup/Cooldown	○○○●●
		Preheat	○○●○○
		Engine Running	○○●○●
		At Load	○○●●○
		Lo Oil Press Shutdown	○○●●●
		Hi Eng Temp. Shutdown	○●○○○
		Overspeed Shutdown	○●○○●
		Overcrank Shutdown	○●○●○
		Alternator Fail/Battery High/Low/Weak	○●○●●
		Engine Speed Up	○●●○○
		Engine Speed Down	○●●○●
		Common Alarm	○●●●○
		Controller in AUTO mode	○●●●●
		Shutdown Loss of Speed Signal Fault	●○○○●
		Underspeed Fault	●○○●○
25 Auxiliary Output 3	○●●○○●	Not Used*	○○○○○
		Warmup	○○○○●
		Cooldown	○○○●○
		Warmup/Cooldown	○○○●●
		Preheat	○○●○○
		Engine Running	○○●○●
		At Load	○○●●○
		Lo Oil Press Shutdown	○○●●●
		Hi Eng Temp. Shutdown	○●○○○
		Overspeed Shutdown	○●○○●
		Overcrank Shutdown	○●○●○
		Alternator Fail/Battery High/Low/Weak	○●○●●
		Engine Speed Up	○●●○○
		Engine Speed Down	○●●○●
		Common Alarm	○●●●○
		Controller in AUTO mode	○●●●●
		Shutdown Loss of Speed Signal Fault	●○○○●
		Underspeed Fault	●○○●○
26 Auxiliary Output 4	○●●○●○	Not Used*	○○○○○
		Warmup	○○○○●
		Cooldown	○○○●○
		Warmup/Cooldown	○○○●●
		Preheat	○○●○○
		Engine Running	○○●○●
		At Load	○○●●○

Parameter # Description	LED Bank 1	Value (*= default)	LED Bank 2
		Lo Oil Press Shutdown	○○●●●
		Hi Eng Temp. Shutdown	○●○○○
		Overspeed Shutdown	○●○○●
		Overcrank Shutdown	○●○●○
		Alternator Fail/Battery High/Low/Weak	○●○●●
		Engine Speed Up	○●●○○
		Engine Speed Down	○●●○●
		Common Alarm	○●●●○
		Controller in AUTO mode	○●●●●
		Shutdown Loss of Speed Signal Fault	●○○○●
		Underspeed Fault	●○○●○
28 Initial Power-Up Mode	○●●●○○	Power-Up in Manual*	○○○○○
		Power-Up in Automatic	○○○○●
29 Oil Pressure Crank Disconnect Delay (non-ECU engines only)	○●●●○●	Not Used*	○○○○○
		0 s	○○○○●
		0.25 s	○○○●○
		0.50 s	○○○●●
		0.75 s	○○●○○
		1.00 s	○○●○●
		1.25 s	○○●●○
		1.50 s	○○●●●
		1.75 s	○●○○○
		2.00 s	○●○○●
		2.25 s	○●○●○
		2.50 s	○●○●●
		2.75 s	○●●○○
		3.00 s	○●●○●
		3.25 s	○●●●○
		3.50 s	○●●●●
		3.75 s	●○○○○
		4.00 s	●○○○●
		4.25 s	●○○●○
		4.50 s	●○○●●
		4.75 s	●○●○○
		5.00 s	●○●○●
30 Nominal Generator Frequency (genset only)	○●●●●○	50 Hz	○○○○○
		60 Hz*	○○○○●
31 Crank Disconnect Freq (Generator AC speed source only) (10's digit)	○●●●●●	0	○○○○○
		1	○○○○●
		2*	○○○●○
		3	○○○●●
		4	○○●○○
		5	○○●○●
		6	○○●●○
32 Crank Disconnect Freq. (Generator AC speed source only) (1's digit)	●○○○○○	0*	○○○○○
		1	○○○○●
		2	○○○●○
		3	○○○●●
		4	○○●○○
		5	○○●○●
		6	○○●●○
		7	○○●●●
		8	○●○○○
		9	○●○○●
33 Crank Disconnect RPM (ECU or MPU speed source only) (1000's digit)	●○○○○●	0*	○○○○○
		1	○○○○●
		2	○○○●○
		3	○○○●●
		4	○○●○○
		5	○○●○●
		6	○○●●○
		7	○○●●●
		8	○●○○○
		9	○●○○●
34 Crank Disconnect RPM (ECU or MPU speed source only)	●○○○●○	0	○○○○○
		1	○○○○●
		2	○○○●○

Table 1. Parameter Values and Corresponding LED Indication *(continued)*

LEDs shown here form a binary code indicating the configuration value. Shown from Top to bottom the LEDs read from Left to Right (see Fig.1). A filled dot means LED is ON.

Parameter # Description	LED Bank 1	Value (*= default)	LED Bank 2
(100's digit)		3	○○○●●
		4	○○●○○
		5*	○○●○●
		6	○○●●○
		7	○○●●●
		8	○●○○○
		9	○●○○●
35 Crank Disconnect RPM (ECU or MPU speed source only) (10's digit)	●○○○●●	0	○○○○○
		1	○○○○●
		2	○○○●○
		3	○○○●●
		4*	○○●○○
		5	○○●○●
		6	○○●●○
		7	○○●●●
		8	○●○○○
		9	○●○○●
36 Crank Disconnect RPM (ECU or MPU speed source only) (1's digit)	●○○●○○	0*	○○○○○
		1	○○○○●
		2	○○○●○
		3	○○○●●
		4	○○●○○
		5	○○●○●
		6	○○●●○
		7	○○●●●
		8	○●○○○
		9	○●○○●
37 Overspeed Setpoint (% above run speed)	●○○●○●	5%	○○○○○
		10%*	○○○○●
		15%	○○○●○
		20%	○○○●●
		25%	○○●○○
		30%	○○●○●
		35%	○○●●○
		40%	○○●●●
		45%	○●○○○
		50%	○●○○●
38 Underspeed Setpoint (% below run speed	●○○●●○	5%	○○○○○
		10%	○○○○●
		15%	○○○●○
		20%*	○○○●●
		25%	○○●○○
		30%	○○●○●
		35%	○○●●○
		40%	○○●●●
		45%	○●○○○
		50%	○●○○●
39 Underspeed Response	●○○●●●	None	○○○○○
		Warning*	○○○○●
		Shutdown	○○○●○
40 Lo Oil Press Shutdown Setpoint (ECU eng. only)	●○●○○○	Disabled (no shutdown)	○○○○○
		0 PSI	○○○○●
		5 PSI	○○○●○
		10 PSI	○○○●●
		15 PSI	○○●○○
		20 PSI	○○●○●
		25 PSI	○○●●○
		30 PSI*	○○●●●
		35 PSI	○●○○○
		40 PSI	○●○○●
		45 PSI	○●○●○
		50 PSI	○●○●●
		55 PSI	○●●○○
		60 PSI	○●●○●
41 Hi Eng Temp. Shutdown Setpoint (ECU engines only)	●○●○○●	Disabled (no shutdown)	○○○○○
		190 deg F	○○○○●
		195 deg F	○○○●○
		200 deg F	○○○●●
		205 deg F	○○●○○
		210 deg F	○○●○●
		215 deg F	○○●●○
		220 deg F	○○●●●
		225 deg F	○●○○○
		230 deg F*	○●○○●
		235 deg F	○●○●○
		240 deg F	○●○●●
		245 deg F	○●●○○
		250 deg F	○●●○●
42 Lo Batt Voltage Setpoint.	●○●○●○	Warning Disabled	○○○○○
		8.5V	○○○○●
		9.0V	○○○●○
		9.5V	○○○●●
		10.0V	○○●○○
		10.5V*	○○●○●
		11.0V	○○●●○
		11.5V	○○●●●
		18.0V	○●○○○
		19.0V	○●○○●
		20.0V	○●○●○
		21.0V	○●○●●
		22.0V	○●●○○
		22.5V	○●●○●
		23.0V	○●●●○
		23.5V	○●●●●
43 Hi Batt Voltage Setpoint.	●○●○●●	Warning Disabled	○○○○○
		12.5V	○○○○●
		13.0V	○○○●○
		13.5V	○○○●●
		14.0V	○○●○○
		14.5V*	○○●○●
		15.0V	○○●●○
		16.0V	○○●●●
		24.5V	○●○○○
		25.0V	○●○○●
		25.5V	○●○●○
		26.0V	○●○●●
		26.5V	○●●○○
		27.0V	○●●○●
		28.0V	○●●●○
		29.0V	○●●●●
		30.0V	●○○○○
		31.0V	●○○○●
44 Weak Battery Voltage Setpoint	●○●●○○	Warning disabled	○○○○○
		6.0 V	○○○○●
		6.5 V	○○○●○
		7.0 V	○○○●●
		7.5 V	○○●○○
		8.0 V	○○●○●
		8.5 V	○○●●○
		9.0 V	○○●●●
		9.5 V	○●○○○
		12.0 V	○●○○●
		13.0 V	○●○●○
		14.0 V	○●○●●
		15.0 V	○●●○○
		16.0 V	○●●○●
		17.0 V	○●●●○
		18.0 V	○●●●●
		19.0 V	●○○○○
		20.0 V	●○○○●
48 Flywheel Tooth Count (MPU speed source only) (100's digit)	●●○○○○	0	○○○○○
		1*	○○○○●
		2	○○○●○
		3	○○○●●
49 Flywheel Tooth Count (MPU speed source only) (10's digit)	●●○○○●	0	○○○○○
		1	○○○○●
		2	○○○●○
		3	○○○●●
		4	○○●○○
		5	○○●○●
		6*	○○●●○
		7	○○●●●
		8	○●○○○
		9	○●○○●

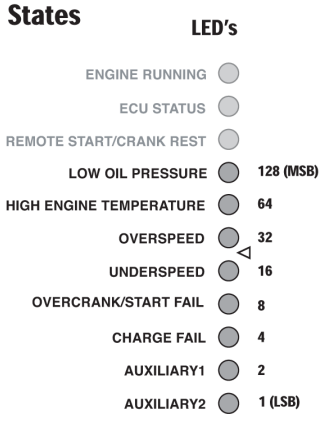
Parameter #	Description	LED Bank 1	Value (*= default)	LED Bank 2
50	Flywheel Tooth Count (MPU speed source only) (1's digit)	●●○○●○	0 1 2 3 4 5 6 7 8* 9	○○○○○ ○○○○● ○○○●○ ○○○●● ○○●○○ ○○●○● ○○●●○ ○○●●● ○●○○○ ○●○○●
51	Run Speed (ECU or MPU speed source only) (1000's digit)	●●○○●●	0 1* 2 3 4	○○○○○ ○○○○● ○○○●○ ○○○●● ○○●○○
52	Run Speed (ECU or MPU speed source only) (100's digit)	●●○●○○	0 1 2 3 4 5 6 7 8* 9	○○○○○ ○○○○● ○○○●○ ○○○●● ○○●○○ ○○●○● ○○●●○ ○○●●● ○●○○○ ○●○○●
53	Run Speed (ECU or MPU speed source only) (10's digit)	●●○●○●	0* 1 2 3 4 5 6 7 8 9	○○○○○ ○○○○● ○○○●○ ○○○●● ○○●○○ ○○●○● ○○●●○ ○○●●● ○●○○○ ○●○○●
54	Run Speed (ECU or MPU speed source only) (1's digit)	●●○●●○	0* 1 2 3 4 5 6 7 8 9	○○○○○ ○○○○● ○○○●○ ○○○●● ○○●○○ ○○●○● ○○●●○ ○○●●● ○●○○○ ○●○○●
59	Fault Code SPN Conversion Method (ECU Eng. only) **Note:** if the ECU is using version 4, any of these options will work.	●●●○●●	Version 1 & 4 * Version 2 & 4 Version 3 & 4	○○○○○ ○○○○● ○○○●○

NOTE: Not all configuration parameters are used. Some are skipped because they are reserved for future expansion.

Table 2. LED States for Normal Operating Mode

LED	OFF	ON	Slow Blink	Fast Blink
AUTO	Manual Start Mode	Auto Start Mode		
Engine Running	Engine is not Running	Engine is Running	Engine is cranking	
ECU Status	Non-ECU configuration	Valid CAN Activity (no errors, Error Active state)	Wait-to-Start	Bus Off/Error Passive/Failed Address Claim
Remote Start/Crank Rest	Remote start input is inactive and manual start has not been initiated	Remote Start active	In Crank Rest or one of the prestart states (startdelay, preheat, waitecu, wait rpm)	No J1939 data when ECU is on
Low Oil Pressure	Pressure is above setpoint or low oil pressure input is inactive	Pressure is below setpoint or low oil pressure input active	Fault code SPN 100 received AND ECU warning/shutdown active	No pressure data (ECU only)
High Engine Temperature	Temperature is below setpoint or high engine temperature input is inactive	Temperature is above setpoint or high engine temperature input is active	Fault code SPN 110 received AND ECU warning/shutdown active	No temperature data (ECU only)
Overspeed	Engine speed below overspeed setpoint	Engine speed above overspeed setpoint		No speed data (ECU) or loss of speed (non-ECU)
Underspeed	Engine speed above underspeed setpoint	Engine speed below underspeed setpoint		No speed data (ECU) or loss of speed (non-ECU)
Overcrank/Start Fail	Failure to start has not occurred	Overcrank start failure (crank attempts exceeded)	Start Condition Failure (RPM not below 10 or crank disconnect input is on before attempting crank)	Start Condition Failure (ECU-related) CAN Hw Bus Error preventing start
Charge Fail	Alternator warning lamp terminal voltage is above threshold or charge fail input is inactive	Alternator warning lamp terminal voltage is below threshold or charge fail input is active	Battery Voltage is below low voltage warning setpoint	Battery Voltage is above high voltage warning setpoint
Auxiliary 1	Auxiliary input 1 is inactive	Auxiliary input 1 is active	ECU Warning (malfunction or Amber lamps on)	ECU Shutdown (Red Stop or Protect lamps on)
Auxiliary 2	Auxiliary input 2 is inactive	Auxiliary input 2 is active	Weak Battery	

Table 3. Error Codes LED States



Obtain the error code parameter by adding all lit LED'S. See Table 1 for the corresponding parameter.

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