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1014-CTC

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Crossover Plus with Complete Throttle Control

Part # 1014-CTC

Instructions

Digital Delay, the company that invented and patented the Crossover, designed and manufactured the *Crossover Plus with Complete Throttle Control* to simply be the best and most advanced multi-function delay box on the market. Combining ease of use and reliability with the most features of any delay box made, has led to the development of a truly state of the art piece of electronic drag racing equipment.

Some of the special and exclusive features of the *Crossover Plus with Complete Throttle Control* are, the ability to, bump the delay up or down, bump the stage timer down, enter a programmable starting line enhancer time, and to select one or two push buttons to start the delay times.

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Features:

- Microprocessor controlled timing
- Discrete solid state I/O (input - output) construction
- Retains all numbers even with power disconnected from unit
- Large illuminated displays for easy reading of information day or night
- Self-test mode on all display functions
- Dust & splash-proof display lenses & key pad with detent (positive feel)
- Easy and fast selection or entry of all information even with gloves
- Low voltage warning and full status indication
- Very high current output (20 Amps)
- By-pass for backing up without running through a timing cycle
- Instant timing cycle reset
- Selectable 1 or 2 push button mode to start the delay times
- Programmable push button interrupt time
- Programmable bump up or down for the delay
- Programmable Throttle Stop Override for the 4-Stage Timer
- Programmable Starting Line Enhancer

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Applications:

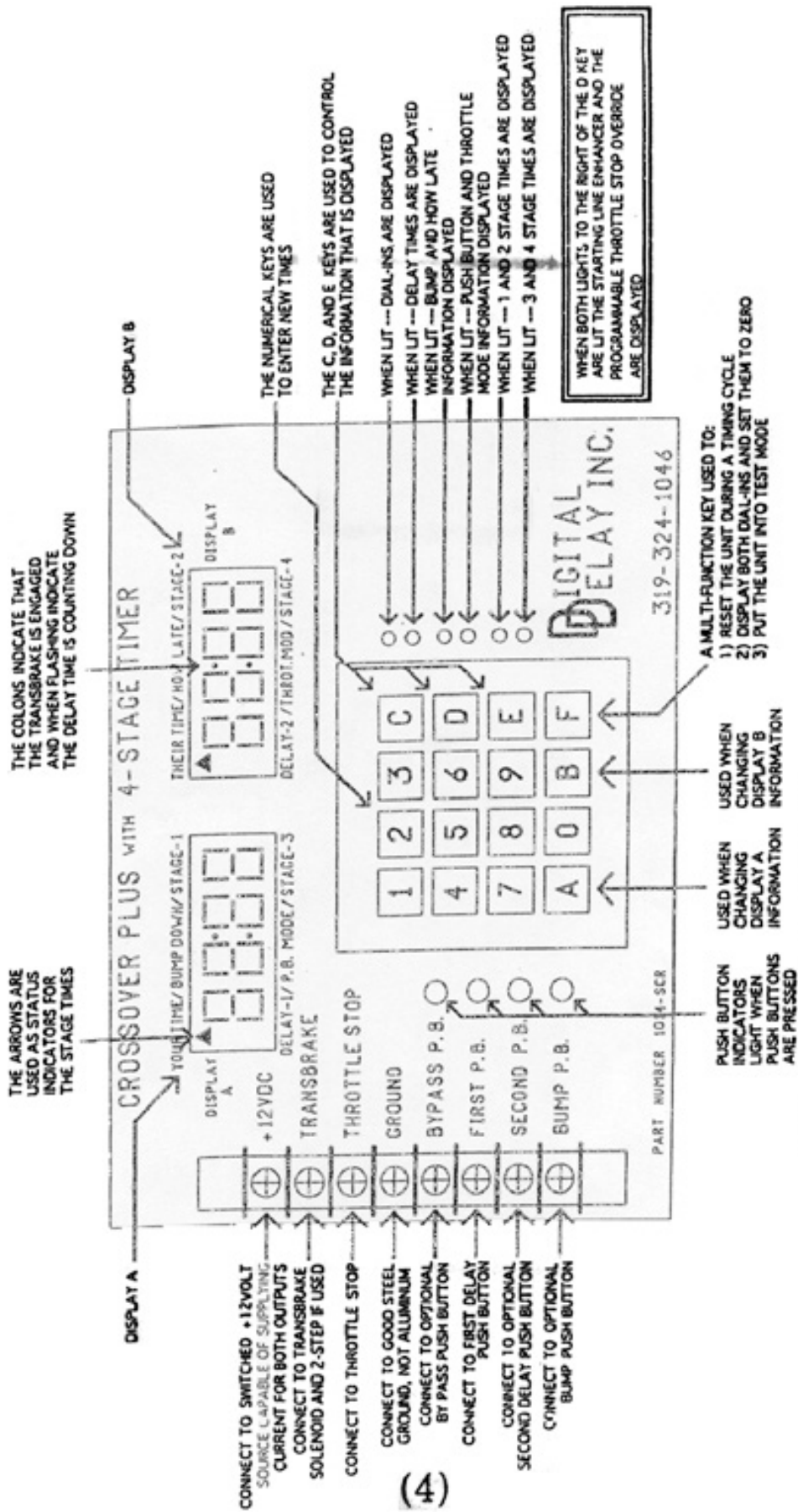
- Controls Transbrake Solenoids
- Controls Starting Line Throttle Stops
- Controls Throttle Stops
- Controls Nitrous Solenoids
- Controls 2-Steps

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Specifications:

- Input Voltage Range: 10 to 16 Volts DC
- Dial-In Time Range: 00.00 to 99.99 seconds in .01 increments
- Delay Time Range: 0.000 to 9.999 seconds in .001 increments
- Stage 1 and 2 Time Range: 0.000 to 9.999 seconds in .001 increments
- Stage 3 and 4 Time Range: 00.00 to 99.99 seconds in .01 increments
- Throttle Output Current: 20 Amps.
- Operating Temperature Range: 0 to 150 degrees F.

Quick Reference Diagram



NOTE: FOR MORE COMPLETE DETAILS REFER TO THE TABLE OF CONTENTS ON PAGE 2

The Terminal Strip

+12VDC Terminal: Connect the +12VDC terminal to a switched +12 Volt source with enough amperage capable of driving both the Transbrake and the throttle stop at the same time.

Transbrake Terminal: Connect the Transbrake terminal to the Transbrake solenoid. Connect the low side of the 2-Step here, if used.

C.T.C. Terminal: Connect the C.T.C. (Complete Throttle Control) terminal to any device that you want controlled by the C.T.C

Ground Terminal: Connect the Ground terminal to the Neg. terminal on the battery or to a good steel ground, not aluminum.

Bypass Terminal: Connect the Bypass terminal to an optional push button. This allows you to activate any device that is connected to the Transbrake terminal without running a timing cycle. An example of this is, vehicles that require the Transbrake solenoid to be engaged when backing the vehicle up. The bypass terminal can also be used as an override if you flinch in single Push Button Mode at the starting line. Simply press and hold the bypass push button and go off your bottom bulb, avoiding the red light due to flinching.

Button-1 Terminal: In single Push Button Mode the push button connected to Button-1 terminal is used to control the primary delay and the secondary delay in sequence. In dual Push Button Mode the push button connected to Button-1 terminal is used to control the primary delay only.

Button-2 Terminal: In single Push Button Mode this terminal is disabled and has no affect on the operation of the unit. In dual Push Button Mode the push button connected to Button-2 terminal is used to control the secondary delay only.

Bump Terminal: Connect to the Bump terminal an optional push button. This button can control three different operations.

- 1) If the Starting Line Enhancer is on and before the Transbrake is applied, if the bump push button is pressed the throttle will close allowing the car to be staged at a pre-set throttle level.
- 2) After a Transbrake Push Button has been released, every time the Bump Push Button is depressed a programmable amount of time is either added to or subtracted from the first delay time started until the Transbrake is released.
- 3) Quarter of a second after the Transbrake releases, every time the Bump Push Button is depressed a programmable amount of time is subtracted from the second or fourth stage time.

The Displays

There are two displays, A and B, that are used to show all relative information about the *Crossover Plus with Complete Throttle Control*. Each display can display up to seven different times or mode settings.

Display A: The seven shown on Display A are, Your Time, Delay 1 Time, Number of Bumps, P.B. mode, Starting Line Enhancer, Stage 1 Time, and Stage 3 Time.

Display B: The seven shown on Display B are, Their Time, Delay 2 Time, How Late Time, Throttle Mode, Programmable Throttle Stop Override Time, Stage 2 Time, and Stage 4 Time.

The Six Small Red L.E.D.s: The text that is to the right of the lit small red L.E.D. corresponds to the information being displayed. An example of this is if the L.E.D. next to the text “Dial-In’s” was lit, Display A would be showing Your Dial In and Display B would be showing Their Dial-In.

One Exception: If both L.E.D.s to the right of the “D” key are lit, the Starting Line Enhancer Time (shown in display A) and the Programmable Throttle Stop Override Time (shown in display B) are displayed.

Other Special Functions of the Displays

Low Voltage Indication (Flashing Displays): The numbers on both displays will flash indicating the voltage to the unit is below the recommended 11.5 Volts.

Transbrake-Colons: When the transbrake is engaged both colons will turn on and when the delay timer starts counting down both colons will flash.

Stage Time-Arrows: When stages 1 and 2 are being displayed both arrows will turn on. When stages 3 and 4 are being displayed both arrows will flash. If stage 1 or 2 is counting down, the arrow for that stage will turn on. If stage 3 or 4 is counting down, the arrow for that stage will flash.

Bump Arrow: When the Delay Bump information is being displayed and the arrow in Display A is on, the unit is set in bump up mode. If there is no arrow, the unit is in bump down mode.

The Keypad

The keypad is made up of numerical and function keys that are used to control the information that is either entered or shown on the displays. The numerical keys 0-9 are used only to enter new times. The function keys A-F are used to control different functions of the unit.

Function Keys A and B

The function keys A and B correspond to Displays A and B respectively and are used with the numerical keys when entering new times.

Example:

- 1) Select the Dial-In's using the C key.
- 2) Press the A key on the keypad, Display A will blank out indicating it is ready to accept a new time.
- 3) Use the numerical keys to enter Your Dial-In, leading zeros do not have to be entered. As the numbers are entered they will appear on the display indicating that the number was accepted and stored into memory.

Note: If an error is made while entering, press the appropriate A or B key to erase the last digit. This can be repeated as many times as necessary until the display is blank.

Function Keys C, D, and E

The function keys C, D, and E are used to select what information is shown on the displays. The corresponding six red L.E.D.s, two for each key, indicate when lit, what information is being displayed. For example, if the Dial-In's are wanted and the First and Second Stage Times are being displayed, the C key would be pressed to display the Dial-In's. If the C key was then pressed again the Delay-1 time and Delay-2 time would replace the Dial-In's.

Function Key F

The function key F controls three separate functions.

- 1) If pressed during a timing cycle, the timing cycle will be cancelled and the unit will be reset. This constitutes a master reset for the timing cycle.
- 2) If pressed when the unit is not running a timing cycle, the Dial-In's will be displayed and set to all zeros, making it ready for new Dial-In's before next run.
- 3) If the F key is held down while the power is being turned on, the unit will go into a special test mode. This is described in Testing of the Unit.

Setting Dial-In Times

To set a new Dial-In time into either Your Time or Their Time press the C key. The small red L.E.D. next to the text Dial In's will light. To enter a new number press the corresponding letter key (A or B) to the display containing the Dial-In time to be changed. The selected display will go blank indicating the unit is ready to accept the new Dial-In time. Enter the new Dial-In time using the numerical keys, leading zeros do not have to be entered. For example if 9.90 for a Dial-In time is desired 990 would be entered on the keypad. As the numbers are entered they are shown on the display, indicating the numbers are accepted and entered into memory. If a mistake is made while entering the number, depressing the corresponding letter key (A or B) for the display again will erase the last digit entered. This can be repeated as many times as necessary until the display is blank.

Setting Delay Times

To set a new delay time into either Delay 1 or 2, repeatedly press the C key until the small red L.E.D. next to the text Delay Times is lit. Then follow the same procedure for entering a new number as instructed in setting new Dial-In times.

How Late

To display the How Late information, repeatedly press the D key until the small red L.E.D. next to the text Bump & How Late is lit. The How Late information is shown on Display B. If the Transbrake is released on Delay-2 (4-Digit) the left most digit will display an "8", if not, it will be blank. The remaining digits display the How Late time. For example if the number displayed is "8.012" and your reaction time was .510 on the time slip, add the How Late time to the .510 for a total reaction time of .522 on the crossover delay.

Setting and Displaying the Delay Bump Information

To display the Bump information, repeatedly press the D key until the small red L.E.D. next to the text Bump & How Late is lit. The Bump information is shown on Display A. The left most digit shows the programmable time (1 to 9 hundredths of a second) to be added to or subtracted from the delay time every time the Bump push button is pressed. To change the number, press the A key and enter the new number (1-9). To switch between the two bump modes press the A key followed by the B key, then the number desired (Arrow on means bump up, no arrow means bump down). The two right digits show the number of times the Bump push button was pressed. The Bump time will only affect the first delay time started.

NOTE: Both How Late and Bump information are stored in memory until either a new How Late or Bump number replaces the old one or the B key is pressed while the Bump and How Late information is displayed, they will then both be cleared to all zeros.

Setting Stage Times

To set a new stage time into any of the four stages, repeatedly press the E key until the small red L.E.D. next to the text containing the stage to be changed is lit. Then follow the same procedure for entering a new number as instructed in setting new Dial-In times.

Setting Throttle Mode

To set the Throttle Mode, repeatedly press the D key until the small red L.E.D. next to the text P.B. & Throttle Mode is lit. Display B will show a “0101” or “1010”, to switch to the opposite setting press the B key once. A “0” means zero Volts out and a “1” means 12 Volts out. In racing terms this is also referred to as “0” normally open, “1” normally closed. (“0101” means off/on/off/on)

Setting the Programmable Throttle Stop Override

To enter a new Programmable Throttle Stop Override amount, repeatedly press the D key until both of the small red L.E.D.s to the right of the D key are lit. The Programmable Throttle Stop Override information is shown on Display B. Next press the B key, Display B will go blank indicating the unit is ready to accept the new number. Enter the new Programmable Throttle Stop Override amount using the numerical keys, leading zeros do not have to be entered. If all zeros (00.00) are entered the Programmable Throttle Stop Override is turned off.

How the Programmable Throttle Stop Override works

The Programmable Throttle Stop Override allows a programmable amount of time to be subtracted from either or both Stages 2 and 4 by pressing the Bump Push Button. After the Transbrake releases there is a quarter of second disable time before the Programmable Throttle Stop Override is enabled. This is to insure that a late Delay Bump is not registered as a Programmable Throttle Stop Override. If the Programmable Throttle Stop Override is turned on and after the Programmable Throttle Stop Override is enabled, every time the Bump Push Button is pressed while in either Stage 1 or 2 the Programmable Throttle Stop Override amount will be subtracted from Stage 2 and every time the Bump Push Button is pressed while in either Stage 3 or 4 the Programmable Throttle Stop Override amount will be subtracted from Stage 4.

Setting Push Button Mode and the Push Button Interrupt Time

To set the Push Button Mode, repeatedly press the D key until the small red L.E.D. next to the text P.B. & Throttle Mode is lit. The Push Button Mode is shown on Display A. The left most digit shows “1” or “2” to indicate which Push Button Mode the unit is in, when in 1 Push Button Mode, the *First P.B.* starts both the primary and secondary delays. When in 2 Push Button Mode, one or both push buttons can be used in any sequence, the *First P.B.* starts the primary and *Second P.B.* starts the secondary delay. The two right digits show the programmable amount of time (00 to 99 seconds) that after the Transbrake releases, Button 1 and Button 2 push button inputs are disabled. To change either the Button Mode or the Interrupt Time first press the A key, then enter a “1” or “2” for the Push Button Mode followed by a two digit number representing the Push Button Interrupt Time. For example “1 10” would indicate single Button Mode with a 10 second Interrupt Time. If no Push Button Interrupt Time is wanted enter “00” after pressing a “1” or “2” for the Push Button Mode.

Setting Starting Line Enhancer Time

To set the Starting Line Enhancer Time, repeatedly press the D key until both of the red L.E.D.s to the right of the D key are lit. The Starting Line Enhancer Time is shown in Display A. The four digits show the amount of time that the throttle will open up before the **TRANSBRAKE RELEASES**, while the arrow is used to indicate whether the Starting Line Enhancer is on or off. If the arrow is being displayed the Starting Line Enhancer is turned on. While the Starting Line Enhancer information is being displayed, to turn the Starting Line Enhancer on or off and/or enter a new time do the following.

- 1) Press the A key, the four digits in Display A will go blank.
- 2) If you wish to turn the Starting Line Enhancer on or off press the A key while the four digits are blank, if the arrow was off it will now be on and if the arrow was on it will now be off.
- 3) Use the numerical keys to enter a new Starting Line Enhancer Time.

All number from 00.00 to 99.99 can be entered, except for 11.11 which is described below. If the Starting Line Enhancer Time is greater than the delay time, the throttle will open as soon as a **Transbrake Push Button is released**. If this is desired simply enter all nines (99.99). If all zeros (00.00) are entered the throttle will open up when the Transbrake releases.

Using all ones (11.11) will pre-set the release of the throttle at eight tenths of a second before the Transbrake releases. This means that two tenths of a second after your top yellow the throttle will open up. The benefit of this is the throttle opening up will not be a distraction when using your top yellow to start a second delay over having the throttle open up at the same time your top yellow comes on.

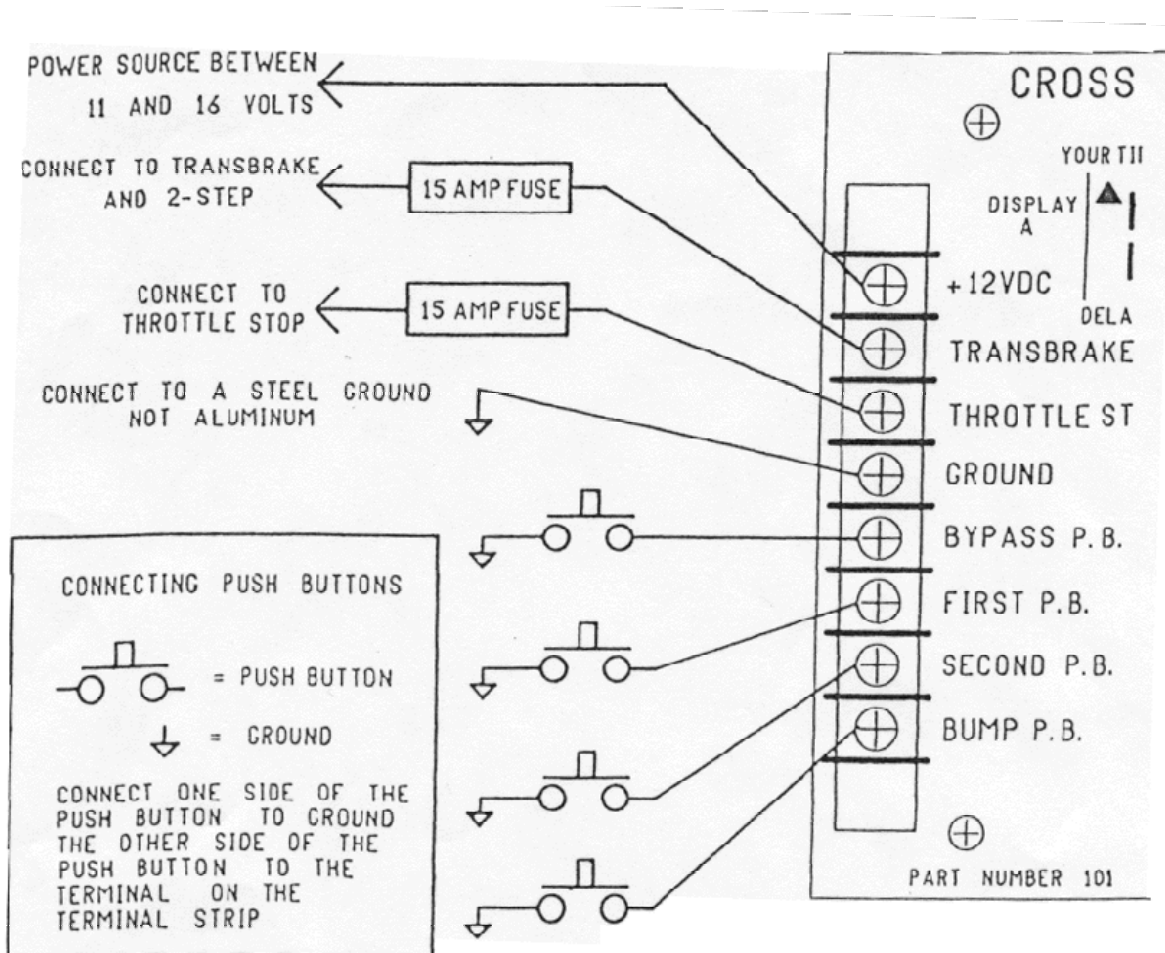
Testing and Wiring the Unit

To test the four push button inputs and the four orange L.E.D.s, disconnect all wires going to the four push button inputs. Next take a piece of wire, connect one end to ground, then touch the other end to each of the four push button inputs. As the inputs are touched by the wire the corresponding yellow L.E.D. should light.

The *Crossover Plus with Complete Throttle Control* has a built-in test mode for the displays and the red L.E.D.s. The function key F is held down while the power is being turned on, after one second, release the F key and the unit will go into a test mode and stay in the test mode until any key is pressed.

While in test mode:

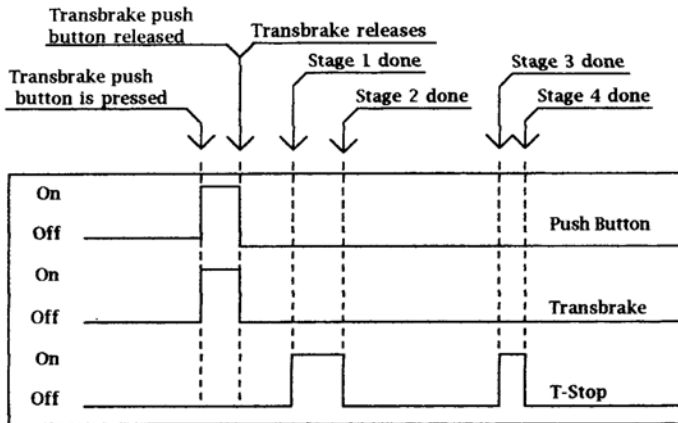
- 1) The displays will start at "0000" and count up, adding "1111" to the number shown on both displays every half second.
- 2) While the numbers are counting up, the decimal points will switch back and forth between "00.00" and "0.000" while both the arrows and colons will flash.
- 3) The six red L.E.D.s will flash back and forth every half second.
- 4) Both the transbrake and throttle outputs will be off during the test.



Understanding the 4-Stage Timer

This is to help the racer understand the 4-Stage Timer when controlling a throttle stop. The 4-Stage Timer can also be used to control other timed devices, nitrous, or timing retarders.

Stage 1 represents when the throttle stop turns on. Stage 2 represents the amount of time (duration) the throttle stop will stay on. Stage 3 represents when the throttle stop will turn on the second time during the run. Stage 4 represents the amount of time (or duration) the throttle stays on the second time. Both Stage 1 and Stage 3 start counting from the release of the Transbrake. Stage 2 starts counting after the amount of time set in Stage 1 is completed. Stage 4 starts counting after the amount of time set in Stage 3 is completed.

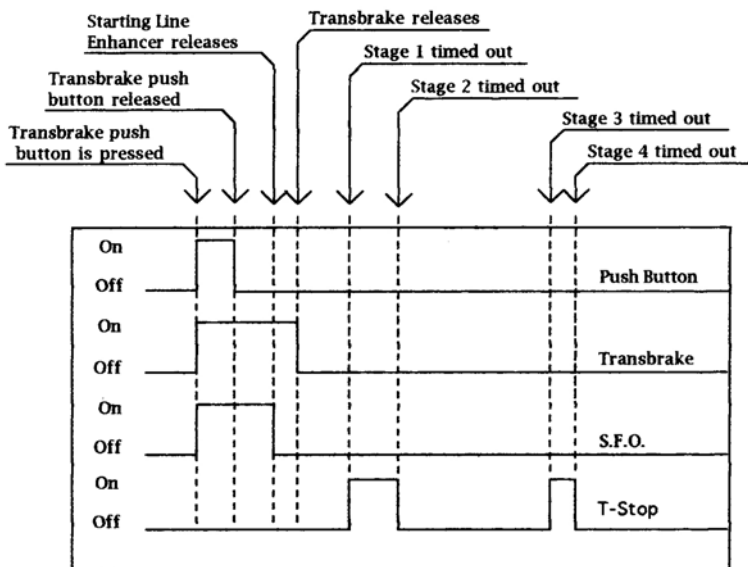


Possible 8.90 S/C pass

- Timer 1 = 1.000
- Timer 2 = 2.000
- Timer 3 = 08.00
- Timer 4 = 00.50

Understanding the Starting Line Enhancer

This is to help the racer understand how the Starting Line Enhancer works. When turned on, the Starting Line Enhancer will close the throttle under two different conditions, first if the Bump push-button is pressed before a Transbrake button and second when the Transbrake Push Button is pressed. After the throttle has been closed the Starting Line Enhancer will open the throttle at the programmed amount of time before the Transbrake is released.



- Crossover Delay = 01.35
- Starting Line Enhancer = 00.40
- Timer 1 = 1.000
- Timer 2 = 2.000
- Timer 3 = 08.00
- Timer 4 = 00.50