

INSTALLATION AND OPERATING MANUAL FOR
MODELS XBC-100 and XTC-200 WITH *BUMP-DOWN*™

INTRODUCTION

The XBC-100 and XTC-200 units have been designed to give you ultimate control of your reaction time and ET with guaranteed accuracy and repeatability. The versatility of these units allows them to be configured a number of different ways depending on individual driver preference and racing situation.

For launching your car there are two independent transbrake delay timers with automatic cross-over capability. When bracket racing, these two timers allow you to take two shots at the tree, with the quicker reaction releasing the brake and launching your vehicle. Reaction time difference is automatically displayed after the run to indicate which timer you launched on and how consistent you are under actual race conditions. The two timers can be activated either by separate switches or with a single switch. In addition, a powerful *Bump-Down*™ feature allows you to correct for late reactions by subtracting delay time AFTER releasing the trigger switch. You can program the amount of time to subtract, you can hit the bump-down switch multiple times, and you can use it on either or both transbrake delay timers. Each time you tap the bump-down switch the preset amount of time is subtracted from the delay.

For controlling elapsed time, the standard XTC-200 includes a four-stage timer that allows you to operate a throttle stop, nitrous system, or other equipment anywhere down the track based on preset on/off times. The unit is compatible with both pneumatic and electric throttle stops, and is designed to protect against battery drain and overheating of the high current electrically operated type. If you need more capability, a dual timer option is available which replaces the single four-stage output with two two-stage outputs. This option is ideal for controlling a dual solenoid throttle stop system, a two stage nitrous system, or the extra output can simply be reserved as a built-in spare.

An optional output for controlling the throttle during the staging process is also available. Developed by Frank Hawley, the **PRO-STAGE**™ system simplifies the staging process on both full and Pro trees. The benefits are better driver concentration, improved consistency, and reduced stress and heat in the engine and converter. The system consists of an in-line pneumatic throttle stop which is activated by pressing a switch before you stage. (The same switch also performs the Bump-Down capability as described above.) You can then stage the car with your foot held to the floor. The PRO-STAGE throttle stop will hold the engine to near idle. On a Pro tree the throttle stop will release for wide open throttle as soon as you press the transbrake switch. On a full tree, release of the throttle stop is delayed until the top of your tree. This minimizes high engine RPM and torque converter stress and heating during long cross-over periods and provides consistent full throttle launch.

Safety was given top priority in the design of this unit. Extensive Built-In Test (BIT) is performed each time power is applied or the unit is reset. Any problems are reported to you immediately with a fault code for easy diagnosis. The combined safety factors and fail-safe design make it virtually impossible for the unit to activate the transbrake output without an externally supplied trigger signal. Furthermore, an antireengagement feature is included to ignore any trigger signals for a preset period of time after launch. The unit will automatically re-arm when the programmed delay has completed.

Note: **PRO-STAGE**™ is patent pending by Sports Science and licensed to K&R Performance Engineering.

INSTALLATION

! Important

IN ORDER TO DAMPEN VIBRATION, THE UNIT MUST BE MOUNTED USING THE FOUR RUBBER ISOLATORS LOCATED ON THE SIDES. AT LEAST 1/2" CLEARANCE SHOULD BE MAINTAINED ALL AROUND THE UNIT TO ALLOW IT TO BE COMPLETELY SUSPENDED AND FREE TO MOVE WITHOUT TOUCHING ANY SURROUNDING METAL. SHIM AS REQUIRED SO THAT THE UNIT FITS SNUGGLY BETWEEN THE MOUNTING BRACKETS. THIS WILL PREVENT STRETCHING AND DAMAGING THE RUBBER ISOLATORS. YOU SHOULD INSPECT THE UNIT AFTER A FEW RUNS TO MAKE SURE IT HAS NOT BEEN VIBRATING AGAINST ANY NEARBY OBJECT. PROPER MOUNTING IS CRITICAL FOR DURABILITY. VIBRATION DAMAGE DUE TO SEVERE CONTACT WITH CASE IS NOT COVERED UNDER WARRANTY.

SOLID CORE IGNITION (SPARK PLUG) WIRES MAY CAUSE ERRATIC OPERATION WHEN THE ENGINE IS RUNNING. FOR RELIABLE OPERATION, WE RECOMMEND A QUALITY SPIRAL CORE WIRE SET DESIGNED TO REDUCE ELECTRICAL INTERFERENCE.

ALWAYS DISCONNECT AND REMOVE THE UNIT BEFORE ANY WELDING IS PERFORMED ON THE CHASSIS.

Electrical Connections:

Good connections and proper wire size are very important for trouble-free operation. Most electrical problems are caused by incorrect or poor connections. Take care to ensure every connection is secure. Crimp connectors and a quality crimping tool are highly recommended. It is also recommended that you color code or label each wire to ensure proper hookup and tracability.

Refer to wiring diagrams for making the necessary electrical connections. Connect the **GND** terminal to a nearby clean steel frame ground. Grounding the unit to sheet metal or aluminum is **not** recommended. Note that the wiring diagrams illustrate typical installations only. Refer to manufacturer's wiring recommendations for connecting your specific equipment.

Fuse rating and wire size will depend on the electrical requirements of the equipment connected to the outputs - see manufacturer's specifications. Each wire must be able to carry the full rated current of the fuse. Below is a table of recommended fuse ratings for various wire sizes.

WIRE SIZE (AWG)	FUSE RATING (AMP)
No. 20	3
No. 18	5
No. 16	10
No. 14	20
No. 12	30

! Warning

NEVER CONNECT ELECTRICAL EQUIPMENT DIRECTLY TO THE BATTERY OR POWER SOURCE WITHOUT A FUSE, AND DO NOT USE MORE THAN A 30 AMP FUSE WHEN WIRING THIS UNIT.

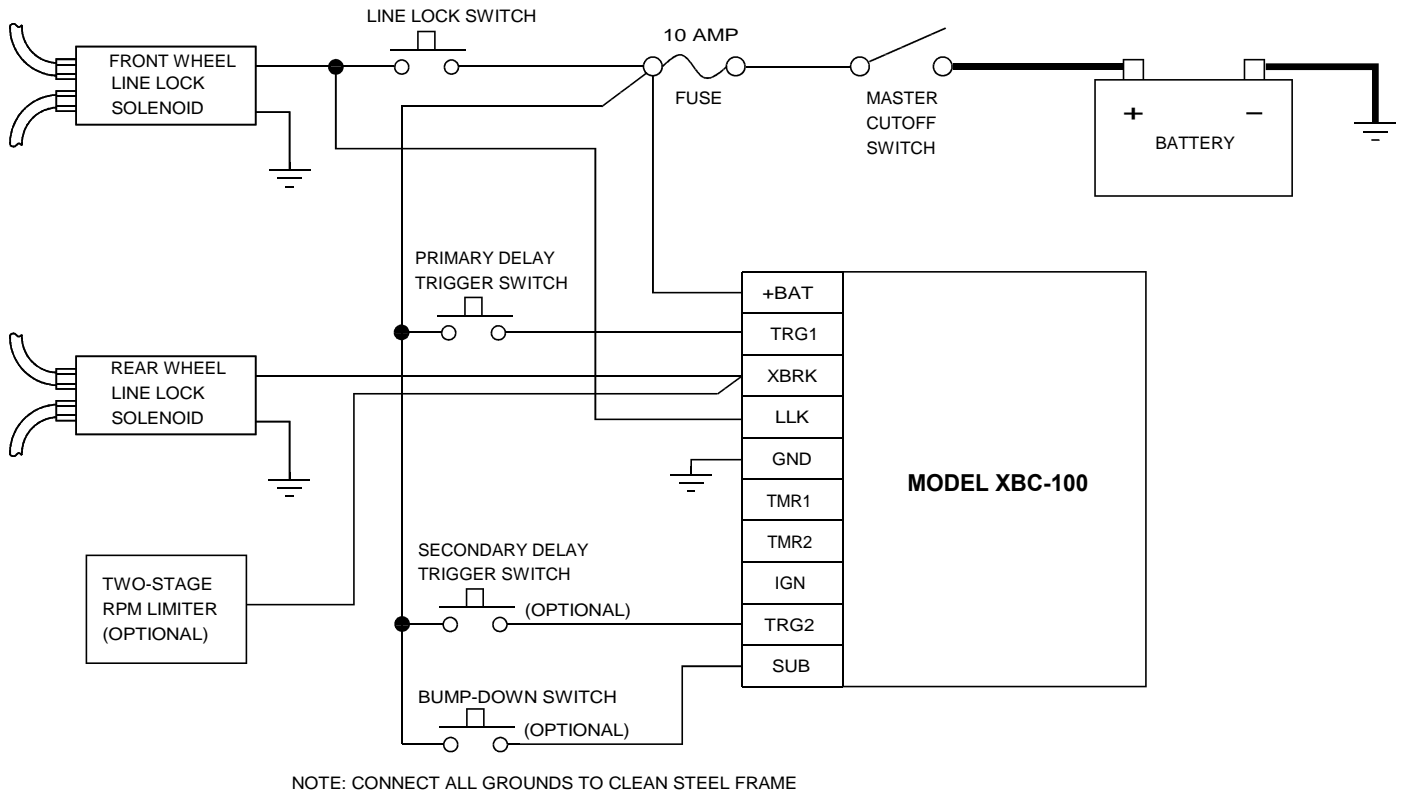


Figure 1 - Four Wheel Line Lock Application

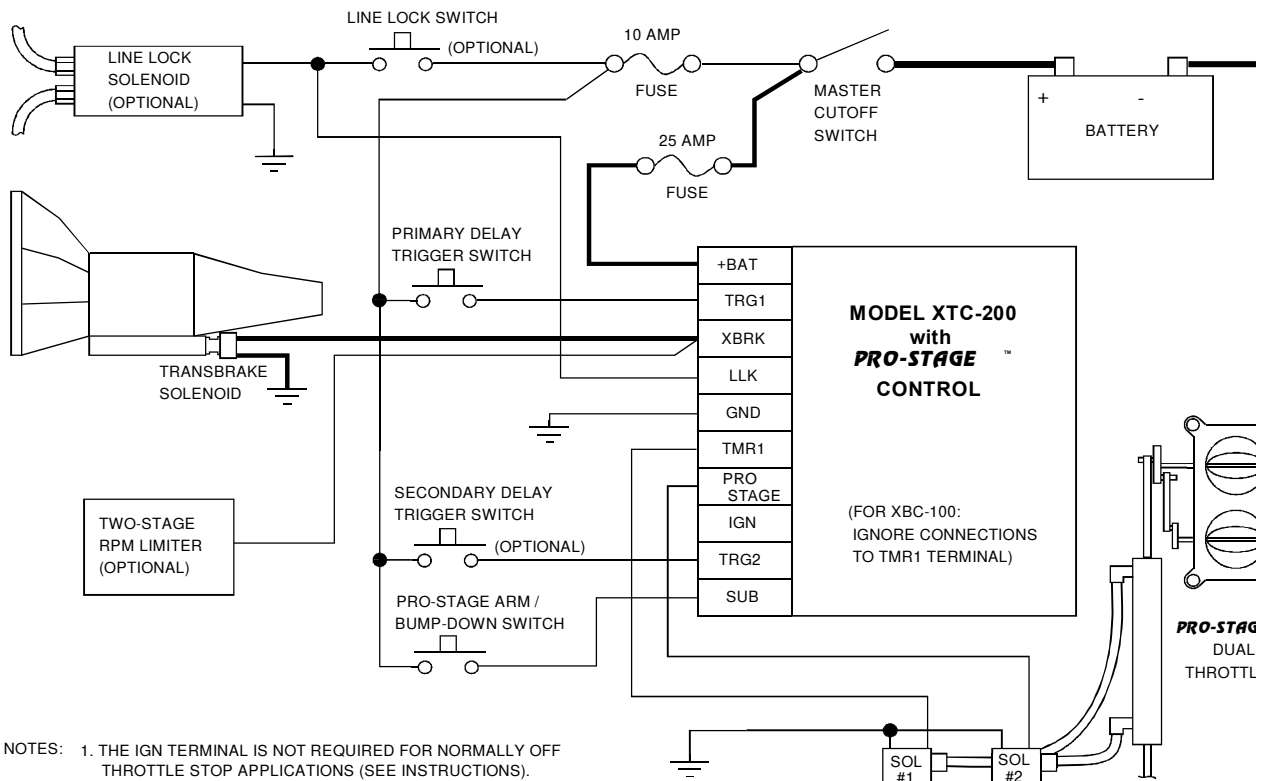
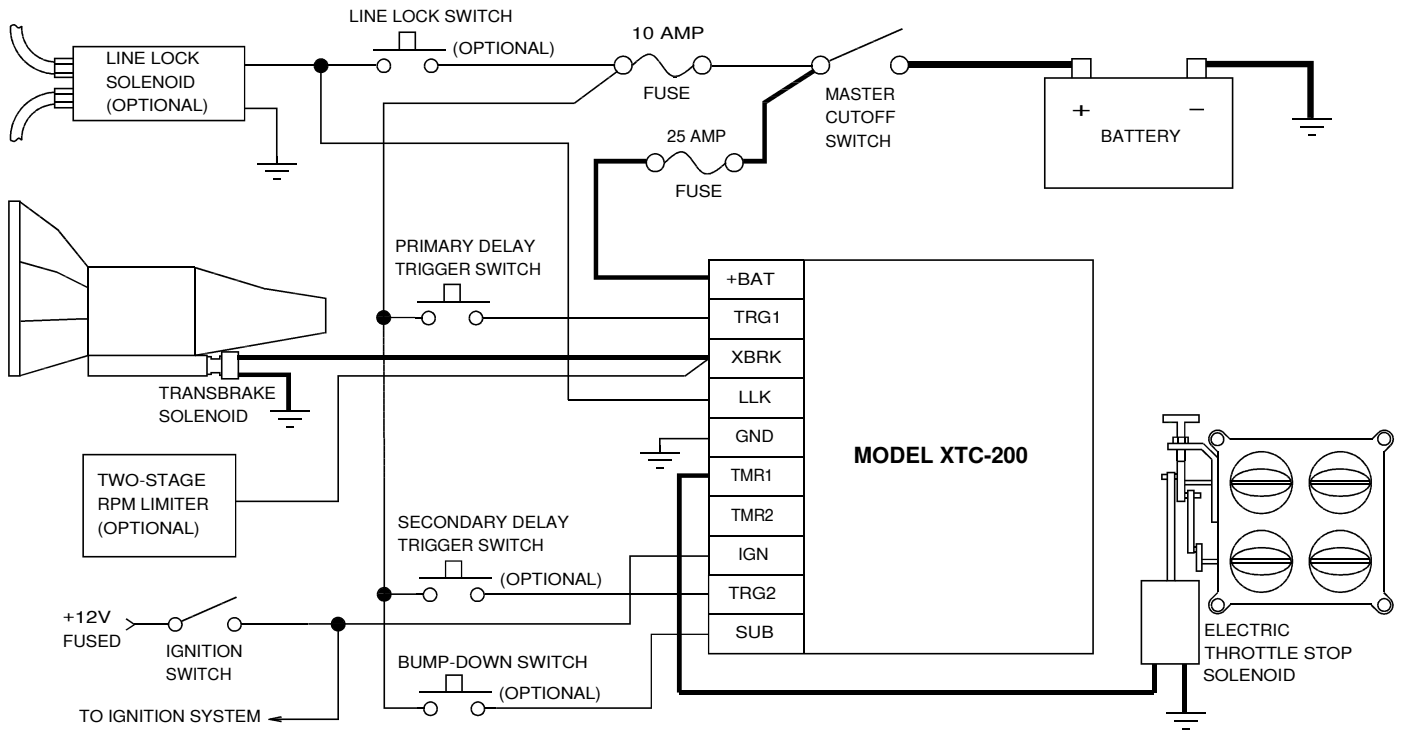


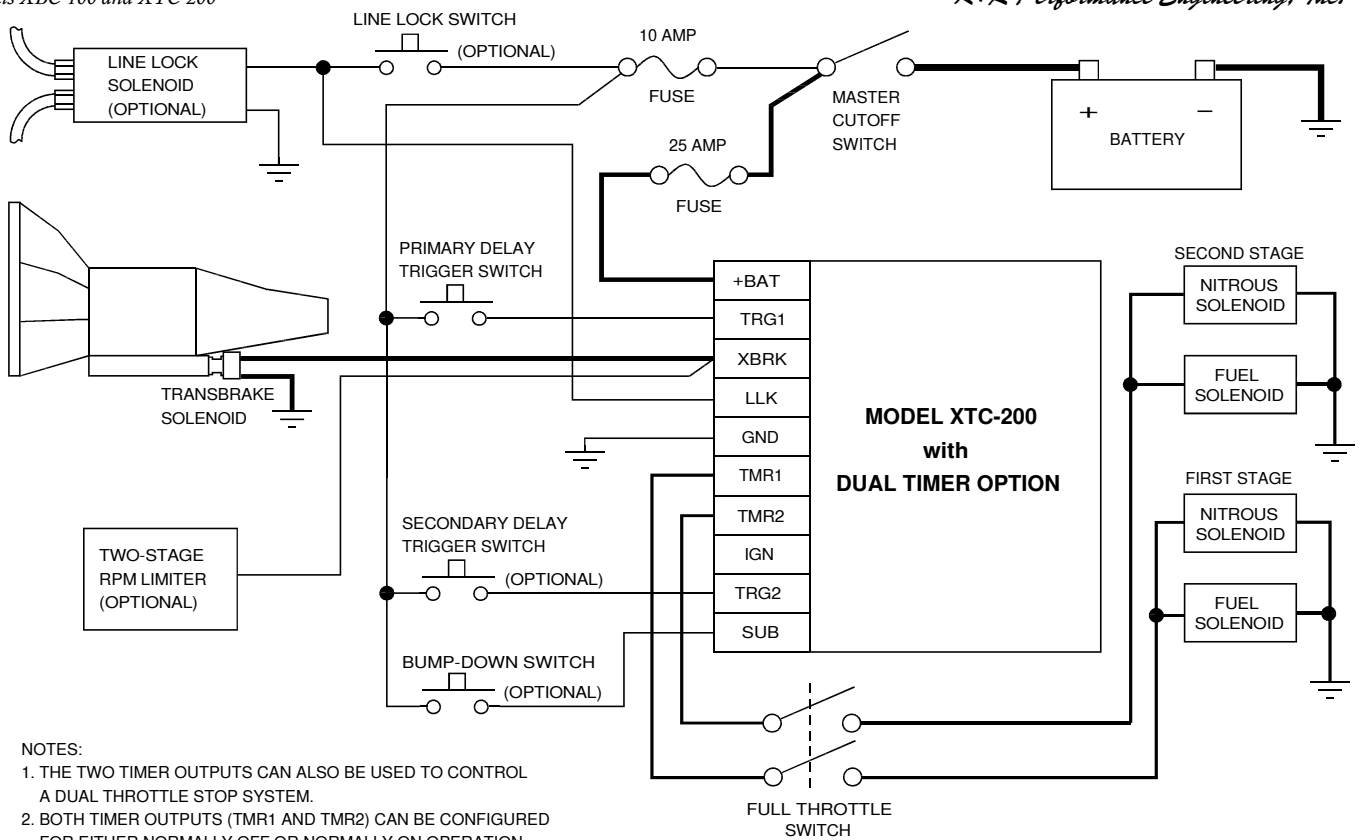
Figure 2 - Throttle Stop Application with Optional *PRO-STAGE*™ Feature



NOTES:

1. THE IGNITION CONNECTION AT TERMINAL IGN IS REQUIRED FOR NORMALLY ON CONFIGURATION OF THE TMR1 OUTPUT.
2. CONNECT ALL GROUNDS TO CLEAN STEEL FRAME.

Figure 3 - Electric Solenoid (Normally On) Throttle Stop Application



NOTES:

1. THE TWO TIMER OUTPUTS CAN ALSO BE USED TO CONTROL A DUAL THROTTLE STOP SYSTEM.
2. BOTH TIMER OUTPUTS (TMR1 AND TMR2) CAN BE CONFIGURED FOR EITHER NORMALLY OFF OR NORMALLY ON OPERATION. IGN MUST BE CONNECTION TO IGNITION SWITCH IF EITHER OUTPUT IS CONFIGURED FOR NORMALLY ON.
3. CONNECT ALL GROUNDS TO CLEAN STEEL FRAME.

Figure 4 - Two Stage Nitrous System Application Using Dual Timer Option

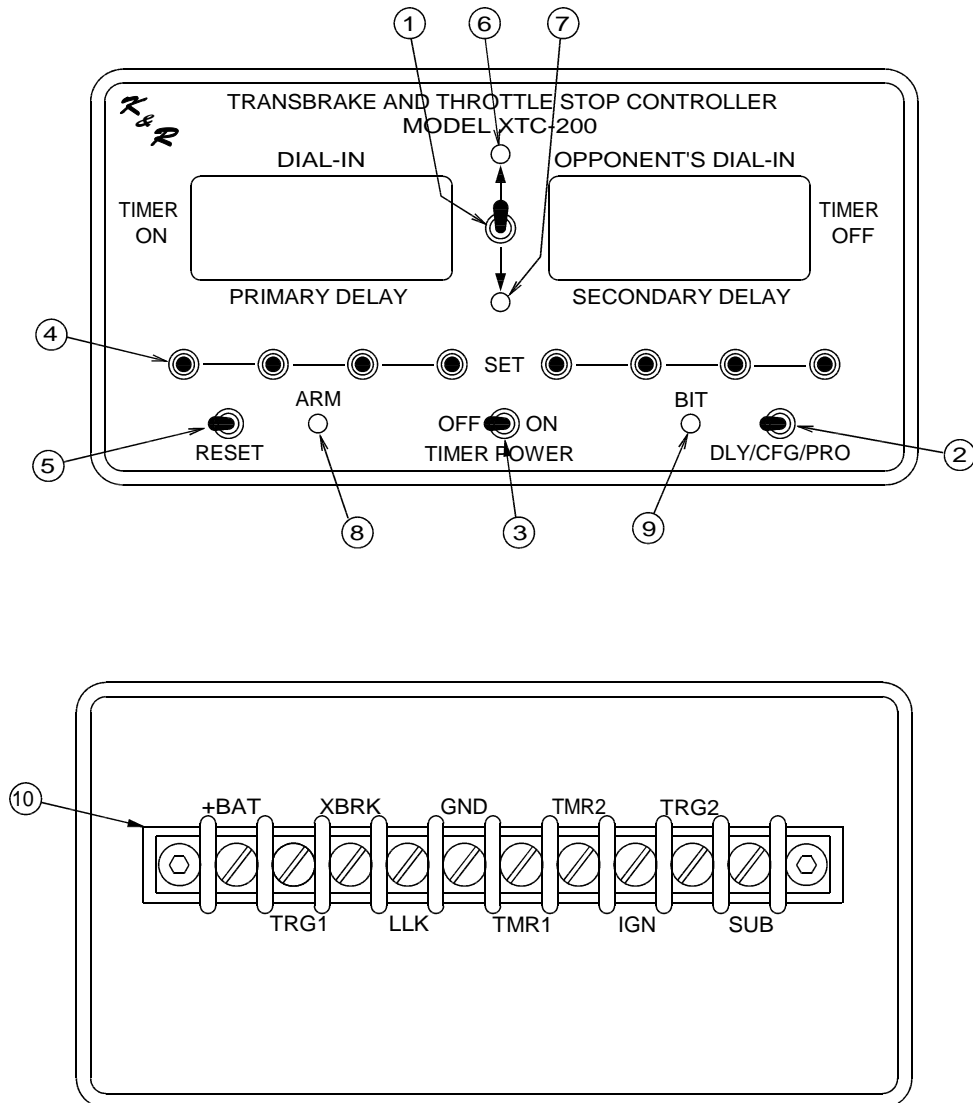


Figure 5 - Front/Rear Panel Layout

1. Display Select Switch
2. Delay/Configure/Pro Mode Select Switch
3. Timer Power Control Switch (XTC-200 only)
4. Set Switches (8)
5. Reset Switch
6. Dial-In Time Indicator (red LED)
7. Delay Time Indicator (red LED)
8. Transbrake Arm Status Indicator (red LED)
9. Built-In Test (BIT) Status Indicator (green LED)
10. Terminal Strip for electrical connections

QUICK SETUP CHART

TRANSBRAKE RELATED FUNCTIONS (All Units)	DISPLAY SELECT SWITCH (Between Windows)	DLY/CFG/PRO SWITCH (Bottom Right)	TIMER POWER SWITCH (Bottom Middle, XTC-200 Unit Only)	LEFT/RIGHT WINDOW AND RANGE OF SETTING	FACTORY SETTING
Interface Mode (for hitting the tree twice with one or two switches)	Up	CFG (Center)	-	Right window - Toggle for 'SngL' or 'DUAL'	DUAL
Bump-Down Time (for improving a late reaction)	Down	CFG (Center)	-	Left window (0.000-0.099)	0.010
Antireengagement (Safety) Delay	Down	CFG (Center)	-	Right window (0-3999)	120
Your Dial-In	Up	DLY (Left)	-	Left window (0.00-39.99)	10.00
Opponent's Dial-In	Up	DLY (Left)	-	Right window (0.00-39.99)	12.00
Primary Delay (first hit on the tree)	Down	DLY (Left)	-	Left window (0.000-3.999)	1.000
Secondary Delay (second hit on the tree)	Down	DLY (Left)	-	Right window (0.000-3.999)	1.000
Pro Tree Delay	Down	PRO (Right)	-	Left window (0.000-3.999)	0.000
SINGLE 4-STAGE TIMER SETUP (XTC-200 Unit Only)					
TMR1 Output Mode (normally off or normally on)	Center	CFG (Center)	-	Left window - Toggle for 'nOFF' or 'n On'	nOFF
TMR1 - Stage 1 Timer On	Center	DLY (Left)	ON (Right)	Left window (0.000-9.999)	1.000
TMR1 - Stage 2 Timer Off	Center	DLY (Left)	ON (Right)	Right window (0.000-9.999)	2.000
TMR1 - Stage 3 Timer On	Center	PRO (Right)	ON (Right)	Left window (0.00-39.99)	3.00
TMR1 - Stage 4 Timer Off	Center	PRO (Right)	ON (Right)	Right window (0.00-39.99)	4.00
DUAL TIMER SETUP (XTC-200 Option)					
TMR1 Output Mode (normally off or normally on)	Center	CFG (Center)	-	Left window - Toggle for 'nOFF' or 'n On'	nOFF
TMR2 Output Mode (normally off or normally on)	Center	CFG (Center)	-	Right window - Toggle for 'nOFF' or 'n On'	nOFF
TMR1 - Stage 1 Timer On	Center	DLY (Left)	ON (Right)	Left window (0.000-9.999)	1.000
TMR1 - Stage 2 Timer Off	Center	DLY (Left)	ON (Right)	Right window (0.000-9.999)	2.000
TMR2 - Stage 1 Timer On	Center	PRO (Right)	ON (Right)	Left window (0.00-39.99)	3.00
TMR2 - Stage 2 Timer Off	Center	PRO (Right)	ON (Right)	Right window (0.00-39.99)	4.00

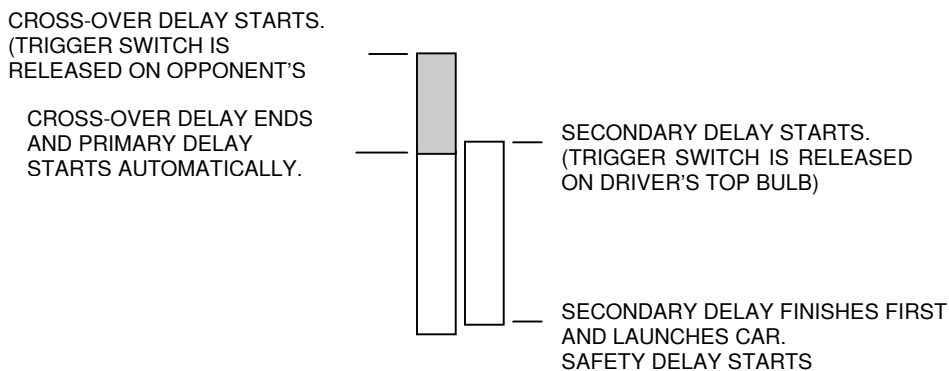
OPERATION

Adjustments to displayed settings are made using the **SET** switches located just below each window. All settings are permanently stored in memory so you don't have to reprogram the unit each time power is turned on.

! Note

The unit will accept any changes you make instantly but requires approximately four seconds before they are permanently saved. When saving your settings, the decimal points in both displays will blink. If power is turned off or the unit is reset within four seconds after making a change, those changes will not be saved.

When you enter a slower opponent's dial-in, it is assumed that you want to "cross-over" and trigger off of your opponent's top bulb. If you do not want to cross-over, simply set the opponent's dial-in to 0.00 (or any number less than or equal to your dial-in). The diagram below illustrates a typical cross-over application in which both the **PRIMARY** and **SECONDARY DELAYS** are activated.



The secondary delay is used only if you "hit" the tree a second time. The primary and secondary delays can be activated with either a single trigger switch or two separate switches depending on the Interface Mode (**SngL** or **DUAL**) you have selected. In single trigger mode just press the trigger switch and release it to start the primary delay, press and release it again to start the secondary delay.

If you do not plan to hit the tree twice, it is recommended that you use dual trigger mode with a single switch connected to terminal **TRG1**. Dual trigger mode provides better flinch protection by resetting the delay each time the trigger switch is depressed.

Another powerful feature, **Bump-Down™**, allows you to correct for late reactions by subtracting delay time **after** releasing the trigger switch. You can program the amount of time to subtract and you can hit the bump-down switch more than once. Each time you **Bump-Down™**, the programmed amount of time is subtracted from either the primary or secondary delay, whichever was activated last.

For Pro tree racing, change to Pro mode by setting the **DLY/CFG/PRO** switch to the **PRO** position. In Pro mode, only one delay can be entered and the dial-in and delay times used for Delay mode are ignored. All throttle stop timer settings are valid in both modes. All settings are saved, so you can easily change back and forth between Delay and Pro modes without reprogramming the unit.

To prevent accidental reengagement of the transbrake after launch, a safety feature is built-in to disarm the unit for a period of time after you launch. The factory setting is 120 seconds, but you can program it to any value within the specified range. The reset switch can be used to temporarily override this delay and instantly rearm the unit (following a burnout, for example).

Launch Information:

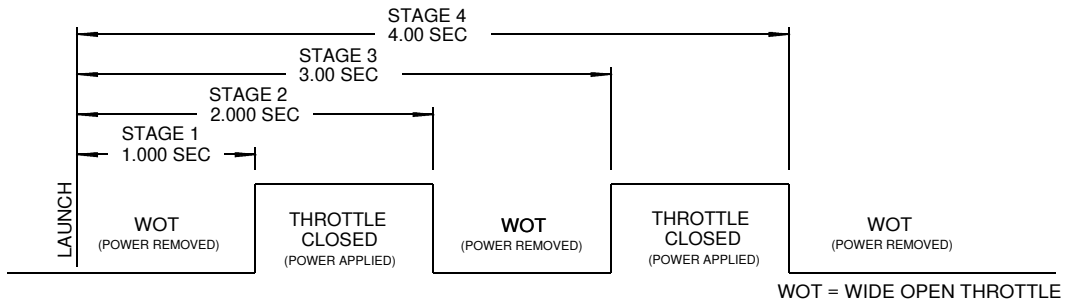
If you hit the tree twice or use the *Bump-Down*TM feature, reaction time information and bump-down counts will be automatically displayed 15 seconds after you launch. The reaction time display will indicate which side of the tree you launched on as well as the difference in your reaction times. The bump-down display simply indicates how many times you bumped down the primary and secondary timers. The reaction and bump-down information displays alternate every four seconds until you clear it by toggling one of the front panel switches. Since the information is not saved, you may want to record it for future reference.

As an example, if you crossed-over but were quicker on your side of the tree, 0.000 would be shown in the left display. The right display would indicate how much slower your cross-over reaction was compared to your quicker reaction (on your side of the tree). If you had been quicker on your opponent's side, 0.000 will be shown in the right display.

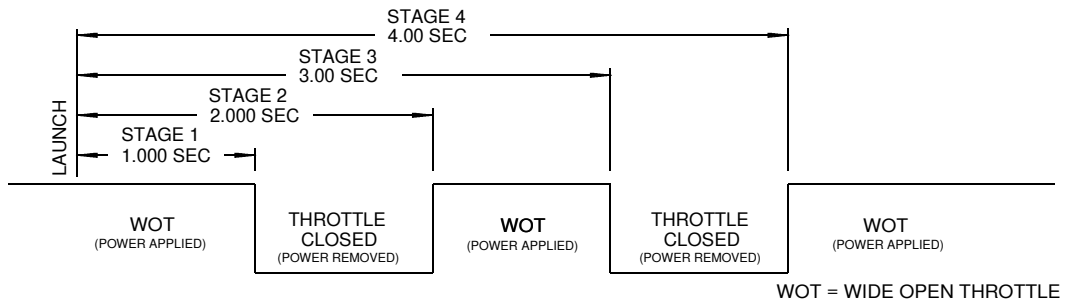
In another example, if you crossed-over, felt late, hit the bump-down switch twice and did not trigger on your tree, 0.000 will be shown in the right display and dashes (---) will be shown in the left display. The dashes simply indicate that you did not activate the secondary timer. The bump-down display would show 0 on the left and 2 on the right, indicating you bumped-down twice on your opponent's tree.

Timer Operation (XTC-200 Unit):

The diagram below illustrates a four stage pneumatic throttle stop application using “normally off” operating mode and factory settings for each stage. Note that the setting for each stage represents time into the run, measured from launch. If you want to cycle the throttle stop on and off just once you can use either the stage 1-2 pair or the stage 3-4 pair and set the other pair to 0. The output can be conveniently turned off using the front panel **TIMER POWER** switch to make a full throttle pass.



In the following diagram, the output has been reconfigured to operate in reverse (“normally on” mode) for compatibility with throttle stops that require power applied to hold the throttle open.



Whenever normally on mode is used, you must connect the Ignition signal to the rear panel terminal **IGN** as shown in the Figure 3 wiring diagram. The XTC-200 monitors the Ignition signal in normally on mode and automatically turns off power to the timer output(s) when the Ignition switch is turned off. This prevents unnecessary battery drain and the possibility of equipment overheating. Note that for normally on electric throttle stops, when power is removed, the throttle plates close. So, to make a full throttle pass, the **TIMER POWER** switch must be turned on and all throttle stop time settings must be set to 0.

If your unit is equipped with the Dual Timer option you have two outputs, **TMR1** and **TMR2** for controlling two different accessories. The **TMR1** output in this case is programmed in 0.001 second increments and has a range of 0-9.999 seconds, while the **TMR2** output is programmed in 0.01 second increments and has a range of 0-39.99 seconds. Each of these outputs can be programmed for only one on/off cycle each, but can be jumpered together in normally off mode to get the equivalent of a standard 4-stage output.

The **PRO-STAGE**™ Option:

The **PRO-STAGE**™ system was developed to simplify the staging process and thereby improve driver concentration and consistency on both Pro and full trees. It also provides the additional benefit of reducing heat in the engine and converter by holding the engine at idle during long cross-over delays when bracket racing.

The Figure 2 wiring diagram shows a typical installation using the XTC-200 to control two separate throttle stop solenoids, one for **PRO-STAGE**™ and the other for ET control. Though it is possible to use a single throttle stop solenoid for both, the recommended approach is to use two separate throttle stops. This allows you to setup for two different engine RPMs, one for near idle on the starting line and the other for higher RPM down track throttle control.

The solenoid is activated by pressing the Bump-Down switch connected to the terminal labelled **SUB**. The normal Bump-Down function still applies when the transbrake is engaged. In Pro Tree mode (**DLY/CFG/PRO** switch in the **PRO** position), the throttle solenoid will release as soon as the transbrake trigger switch is **pressed**, bringing the engine to full throttle. When crossing over on a full tree in **DLY** mode, the engine will be held at low RPM by the **PRO-STAGE**™ system until the top of your tree. If you're not crossing over, it will release as soon as you **release** the trigger switch. In either case, you will have approximately one second of full throttle before launch. If the unit is set in **DLY** mode and the primary delay is set for less than 0.5 seconds, the throttle solenoid will release just as in Pro mode. The **TIMER POWER** switch does not affect the **PRO-STAGE** output.

EXAMPLES

Example 1:

Your dial-in is 9.30, your opponent's dial-in is 10.92. Your delay time is 1.035 seconds and you're using two trigger switches (**DUAL** trigger mode). Enter 9.30 for your dial-in, 10.92 for your opponent's dial-in, and 1.035 for both primary and secondary delays. The difference between the dial-in's (cross-over delay) will be automatically calculated and added to the 1.035 primary delay. Stage your car and depress both trigger switches to lock the transbrake. Release the primary trigger switch (**TRG1**) when the opponent's tree starts. Release the secondary trigger switch (**TRG2**) when your tree starts. You will launch on the quicker reaction. If your reaction time was quicker on your tree by 0.009 seconds the display will show 0.000 in the left window, and 0.009 in the right window for

reaction time information. A bump-down count of 0 will appear in each window of the alternate display.

Your time slip indicates your reaction time was 0.515. This was your reaction time to your tree. Your reaction to your opponent's tree was 0.515 + 0.009, or 0.524. Toggle the Display Select switch to cancel the information display.

Example 2:

You're using **DUAL** trigger interface mode. After staging, the starter takes longer than usual to start the tree and you flinch, releasing the trigger switch too soon. Don't panic! Just depress the switch again and release it when the tree starts. If you're late, use the bump-down switch to correct for it.

Note that in **DUAL** trigger mode, the primary and secondary delay timers are automatically reset to their starting value whenever the trigger switches are depressed. **TRG1** controls the primary and **TRG2** controls the secondary timer.

Example 3:

You're using single (**SngL**) trigger interface mode. You hit the cross-over bulb, depress the same switch again to hit your top bulb but your hand slips off the button. The slip causes the second delay timer to start too soon and you know you're going to red-light. **In single trigger interface mode, however, the unit will not release the transbrake if the trigger switch is depressed.** So depress and hold the switch until the bottom of your tree to override the secondary timer. Release it for instant launch. Note that it was necessary in this case to "throw away" the good cross-over reaction in order to overcome what would have been a red-light.

Example 4:

You're using the 4-stage timer of the XTC-200 to control an electric solenoid Throttle Stop. The Throttle Stop requires that power be applied to the solenoid for wide open throttle. In this case, the unit must be configured for normally on operation and the Ignition switch should be connected to the **IGN** terminal. You want the Throttle Stop to close at 0.300 second, return to full throttle at 2.150 seconds, closed again at 8.00 seconds, and return to full throttle at 9.10 seconds into the run. With the **DLY/CFG/PRO** switch in the **DLY** position, set the **TIMER ON** time for 0.300 and **TIMER OFF** time for 2.150, then switch to **PRO** and set the **TIMER ON** time for 8.00 and **TIMER OFF** time for 9.10. Switch the **DLY/CFG/PRO** switch back to **DLY** if you're not using the Pro delay.

SPECIFICATIONS

Overall Dimensions (H x W x D):	2.8" x 6.3" x 9.5"
Weight:	3 lbs
Power Supply Voltage:	10 - 18 Vdc
Power Supply Input Current (unit armed):	0.25 Amps
Output Current, XBRK, TMR1, TMR2, and PRO-STAGE Terminals:	30 Amps
Output Current, Line Lock (LLK) Terminal:	8 Amps
Time Delay Accuracy:	+/- 50 µsec, or +/- 50 µsec/second of delay, whichever is greater

TROUBLESHOOTING GUIDE

The following table includes all correctable faults reported by Built-In Test along with probable cause and corrective action. In the event of a BIT-detected failure, "**FAIL**" will appear in the left display window and a fault code in the right. In addition, the green **BIT** status indicator will be off, the red **ARM** indicator will flash rapidly.

The unit has been designed to continue operating in the event of failure of one of the outputs. For units that are equipped with a single 4-stage timer output (**TMR1**), dual timer outputs (**TMR1** and **TMR2**), and/or **PRO-STAGE**[™], if one or more of the outputs should fail (including **XBRK** output), all remaining good outputs will still operate normally.

FAULT CODE	PROBABLE CAUSE	CORRECTION
EC01	Low battery voltage (less than 10 volts).	Check battery and connections.
EC03	Incorrect voltage at XBRK or LLK terminal.	Correct wiring error. (See wiring diagrams)
EC05	<ol style="list-style-type: none"> 1. XBRK output is overloaded or shorted to ground. 2. LLK output is overloaded or shorted to ground. 3. Wire connecting +BAT terminal to power source is too small or connection is weak. 	<ol style="list-style-type: none"> 1. Remove all wires connecting to XBRK and LLK terminals and try again. If the fault does not repeat check XBRK and LLK output wiring for shorts. Also check wire size and connection from +BAT terminal to power source. If wiring is good, equipment connected to XBRK or LLK is defective. 2. If fault occurs with wiring disconnected, unit is defective. Call tech support for repair.
EC06	TMR1 output is overloaded or shorted to ground.	<ol style="list-style-type: none"> 1. Remove all wires connecting to TMR1 terminal and try again. If the fault does not repeat check TMR1 output wiring for shorts. Also check wire size and connection from +BAT terminal to power source. If wiring is good, equipment connected to TMR1 is defective. 2. If fault occurs with wiring disconnected, unit is defective. Call tech support for repair.
EC07	TMR2 output is overloaded or shorted to ground.	Follow the procedure described above, substituting TMR2 for TMR1 .
EC08	PRO-STAGE output is overloaded or shorted to ground.	Follow the procedure described above, substituting PRO-STAGE for TMR1 .

TECHNICAL SUPPORT

Contact: *K+R Performance Engineering, Inc.*
 Telephone: 321-267-2393

WARRANTY

We at K&R Performance Engineering are doing our part to restore quality and pride in American made products. It is with this goal in mind that we proudly offer a full two year parts and labor warranty against design, defective materials, and workmanship under normal service use conditions. Any defect affecting operation of the unit will be repaired free of charge and promptly returned. Damage caused by severe vibration and metal-to-case contact or restricted movement due to improper mounting is **NOT** covered.

K&R PERFORMANCE ENGINEERING SHALL NOT BE LIABLE FOR INJURY, CONSEQUENTIAL, OR ANY OTHER DAMAGE RESULTING FROM USE OR MISUSE OF THIS PRODUCT. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED.