

TCON

Target Control System

Overview

TCON is a complete system for programmatic control of turning targets on a firing range. Its design is based on a unique combination of wireless technology in conjunction with a downrange microprocessor controller and the TCON editor software. It comprises a computer running the TCON Scenario Editor program, a downrange target control unit, a wireless link between the computer and the control unit, and a wireless hand-held remote control device for operation of the system by the range officer.

Features

- Wireless interface between computer control point and targets. A fixed control point is not required.
- Range can be operated using only the hand-held remote, not requiring a computer to be present on the range. Or the system can be controlled wirelessly from the computer as desired.
- Face or edge targets on demand with the hand-held remote.
- Execute scenarios on demand with the hand-held remote.
- Create, edit and store an unlimited number of scenarios on a Windows PC.
- Up to ten scenarios can be downloaded from the computer into the control unit on the range and are available for execution independent of the computer. These are stored in a non-volatile fashion and remain in place until they are overwritten by the TCON program.

System Components

- Down-range control unit (the brain). This contains a programmed microprocessor unit and two radio receivers. One radio links with the hand-held remote. The other radio links with the TCON program running on a Windows computer. All target control commands execute in the microprocessor in the control unit.
- Hand-held remote. The four buttons are used to control the range.
- TCON Scenario Editor Program running on a Windows PC. Here you can create scenarios, preview their execution on the computer, and download them to any one of the storage “slots” in the control unit so that they can be executed on the range.
- USB radio transmitter for interfacing the TCON program with the control unit.
- All components are commercial off the shelf (COTS). Radios are FCC Part 15 approved.

Theory Of Operation

Modes

The system will operate in one of two modes.

- It can face or edge all targets with a press of the green button 1.
- It can select and execute a scenario which has been downloaded to a storage slot.

Direct Control (face/edge) Mode

This is the simplest possible use. The system powers up in this mode and does not need the computer to be present on the range at all for this functionality. In this mode, button 1 will toggle all targets between face and edge, placing direct control in the operator's hand.

Scenario Mode

If one or more scenarios have been downloaded from the computer and one of them has been selected for execution, then button 1 starts execution of the scenario. If a scenario is running, button 1 will pause it. If paused, button 1 will restart it. Button 2 will immediately cancel execution. Cancel is the only function for button 2 and it is always available for that. You may start, pause and restart a scenario any number of times during its execution. In addition, Pause commands may be embedded in the scenario (covered below). When restarting after a pause, the scenario resumes at the next row. If a scenario is cancelled and restarted, it will execute from the beginning.

Radio interface

To either download scenarios or control the range from the computer, a pair of radio transceivers is used. One is inside the downrange control unit, the other attaches to the computer by means of a USB connection. The TCON program uses this wireless link to send scenario data and operational commands to the control unit. When a scenario is executing, the control unit returns status data to the TCON program so that scenario progress can be monitored on screen. Keep in mind that the scenario is executing in the downrange control unit and does not rely on the presence of the computer in any way during execution. In fact, the computer can be switched off during scenario execution and the scenario will continue under control of the hand-held remote. The radio used by the computer is powered by the USB connection and does not require additional power.

To repeat: Scenarios, once downloaded, execute in the control unit and do not require the presence of the computer. Scenario control commands can be issued using the hand-held remote.

Downloading scenarios

If a scenario has been created on the computer, it must be downloaded to a slot in the control unit before it can be executed. You must choose one to download into. The downloading and storing away process takes about five seconds, during which time the system will not respond to commands. On the computer, a “Please wait” screen displays. Downrange, the target which by number corresponds to the chosen slot will face for the few seconds of the download as confirmation of the slot number and as a visual signal that the download is in process. As soon as the download completes, the target edges, the computer screen is ready and available, and the scenario can be selected and executed.

Selecting a scenario

If one or more scenarios have been downloaded to the control unit, the procedure for assigning one for execution using the hand-held remote is as follows. Selection is done with the hand-held remote, using buttons 3 and 4. Button 3 is used to enter and exit selection mode, button 4 is used to “step” up to the desired slot number. Each button press (of button 4) increments the selected slot number by one and provides a visual confirmation by means of facing the targets.

The process has three parts.

- **Enter selection mode** – Press button 3. All targets will face for 1.5 seconds as confirmation, then all edge. The system is now in selection mode.
- **Choose a slot** – Press button 4. With the first press, target 1 will face. Slot 1 is selected to be chosen. Press button 4 as many times as needed to make your selection. The number of active targets is the slot number that you have selected so far. If you go past the slot you want, exit selection mode and enter again.
- **Exit selection mode** – Press button 3 again. The system will confirm by edging and facing the selected number of targets two times in quick succession. The system now is ready to execute the scenario you just selected.

To leave scenario mode

To leave scenario mode and return to direct control, enter selection mode as described above and, without selecting a slot, exit selection mode. Think of direct control as slot zero. Press button 3 and the targets will face for 1.5 seconds. Wait for them to edge then press button 3 again. You are now in direct control and button 1 will face/edge all targets.

Which scenario is selected

To determine which slot is currently selected in the controller, press button 4 while the system is at rest. The number of targets corresponding to the selected slot will face for 1.5 second.



(Depending on the range requirements, different remote units may be used and yours may look different from this. However, the button functions are the same.)

Button Map

Button 1: Face/Edge, Start/Pause

Button 2: Cancel

Button 3: Enter/Exit Program selection mode

Button 4: Select Program

TCON Software

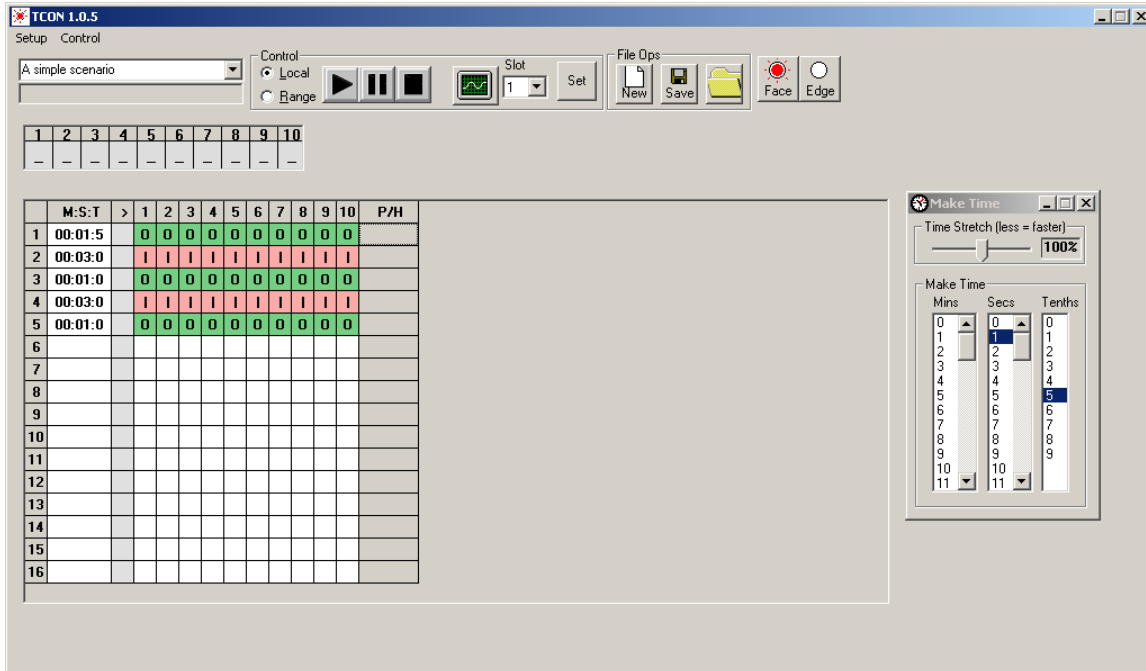
- Design, create and edit scenarios for download and execution in the controller. The controller has a number of “slots” for non-volatile storage of scenarios.
- Store and maintain an unlimited library of scenarios.
- Preview the execution of scenarios away from the range.
- Control the targetry over a wireless link from anywhere on the range.

Every function (except naming the scenarios) can be done with the mouse using just the left click. Right-click is not used.

Below is a screen-shot of a simple scenario, “My Scenario”, in which

- 1) all targets face for 3.0 seconds
- 2) edge for 2.0 seconds
- 3) face for 1.5 seconds
- 4) edge for 1.0 second
- 5) face for 1.0 second

At that point the scenario is complete and all targets will edge. The scenario is ready to send to slot number 1.



Overview

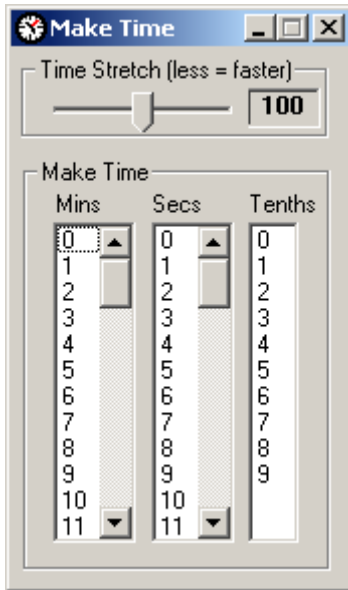
The columns 1 through 10 designate targets. The scenario executes in time by stepping down the rows, each step having the duration specified in the M:S:T column (Minutes:Seconds:Tenths). Each cell in the grid may contain the symbol for either face (O) or edge (I) or remain blank.

The scenario execution command buttons at the top of the screen are for Run, Pause and Cancel. They are standard symbols, just like your DVD player.

Detail

- The “Local / Range” radio button control determines whether the scenario is running in the on-screen editor (locally) or whether commands are being issued to the on-range target controller. If set to Local, you can preview a scenario by executing on the computer with no commands being sent to the range. If set to range, the Run / Pause / Cancel buttons send commands to the controller and will execute and control a scenario stored in the slot by the Send button. Remember – the scenario must first be downloaded.
- The Run / Pause / Cancel buttons apply per the Local/Range setting.
- “Slot” is a 1 through 10 drop down list that assigns a controller slot to the scenario prior to download. Also, if the range is being controlled by the TCON program, it designates the slot chosen for execution.

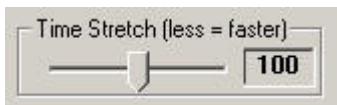
- “Send” is the button to transmit a scenario to a slot in the controller. Create a scenario, give it a name, assign the slot you wish to store it in, click Send and a copy of it is sent to and stored in the controller.
- Face / Edge controls all targets
- Individual targets can be controlled (Face/Edge) by clicking on them in the row of target icons at the top of the screen.
- “New” clears the screen to create a new scenario.
- “Save” writes the scenario to disk using the name you enter. Each scenario is saved in a separate file much like a document and a name is required.
- A scenario can have up to 16 steps. They are numbered in the left column.
- The M:S:T column of the scenario grid denotes the duration of that step in minutes, seconds and tenths of seconds. Use the “Make Time” panel of listboxes to set the time you wish to enter, then just click on a M:S:T cell. The time will be entered in that cell for you. You cannot type into a M:S:T cell. The maximum time per step is 59 minutes, 59.9 seconds.
- Pause and Hold will assign either pause or hold to a row and designate such in the right hand P/H column. Pause will pause execution after executing the designated row and default all targets, waiting for an execute command. Hold also stops execution after the row completes but leaves all targets as they were.
- Face and Edge are designated in the target cells by the circle (for face) and the vertical bar (for edge). Just click on a cell and the appropriate one will appear.
- To fill in an action for an entire row, just set the action for target one and click on the grey column to the left of column one. The value of column one will be copied to all other targets on that row that are blank.



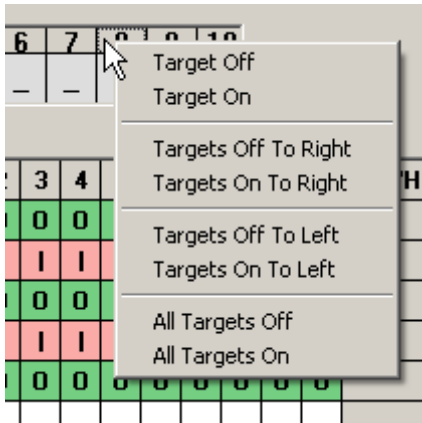
The “Make Time” control activates any time you click on an M:S:T cell. It lets you build a time value using the mouse and then assign it to any number of M:S:T cells. If a particular time value repeats in the scenario, just click on each cell which uses that time, then reset the control to the next time value you need.

Pause and Hold

Pause will halt execution at completion of the row, defaulting all targets and waiting for a restart command. Hold is similar but the targets do not default. They remain as they were. To assign or remove Pause or Hold, click in the P/H cell for the intended row. The cell will toggle through the possible choices.

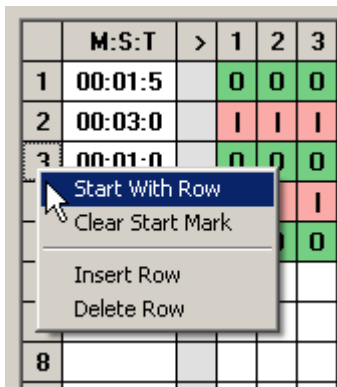


Time Stretch lets you speed up or slow down a scenario without changing the M:S:T values. At 100, execution time scale is at 100% and everything is normal. Drag it to the left (as far as 50) and the times will be less, scaled to a percentage of the M:S:T, and execution will be faster. Move to the right (as much as 150%) and times will increase and execution will be slower. This Time Stretch value saves with the scenario and downloads with the scenario. One use is to develop multiple versions of an exercise using increasing speeds (smaller times).



Individual Target Control and Target Control Popup menu

To activate or default an individual target, click on the target indicator icon.
 To turn targets off, thereby making them unresponsive to commands, click on the target number in the target indicator window. A popup menu will appear. You can turn off individual targets or groups of targets. Any setting you make here “sticks” until reset on until the control system is powered off.



Starting scenarios at a selected row (alibis)

Click on the row number for the step at which you wish to start. A popup menu will let you mark the row. When the scenario is started, it will begin at that point.

Editing scenarios

The green “O” symbols are target activation or face commands. The red “|” symbols are default or edge commands. Just click on a cell and TCON will fill in the command which is logical at that point. It will not, for example, face a target which is already faced. At times it may be handy to set a command for target 1, click on the “>” cell to its left and the rest of the row will fill in. You cannot type these values in. Just click on the cell.

	M:S:T	>	1	2	3	4	5	6
1	00:00:8		O	O	O	O	O	O
2	00:00:8							
3	00:00:8			O		O		
4	00:00:8		O		O		O	
5	00:00:8							
6	00:00:8		O					
7	00:00:8			O			O	
8	00:00:8				O			O

Start With Row

Clear Start Mark

Insert Row

Delete Row

To insert or delete a row while editing, click on the row number. A popup menu will appear. You can then insert a row just above the one you clicked, shuffling everything down or delete the row, moving everything below up one row.

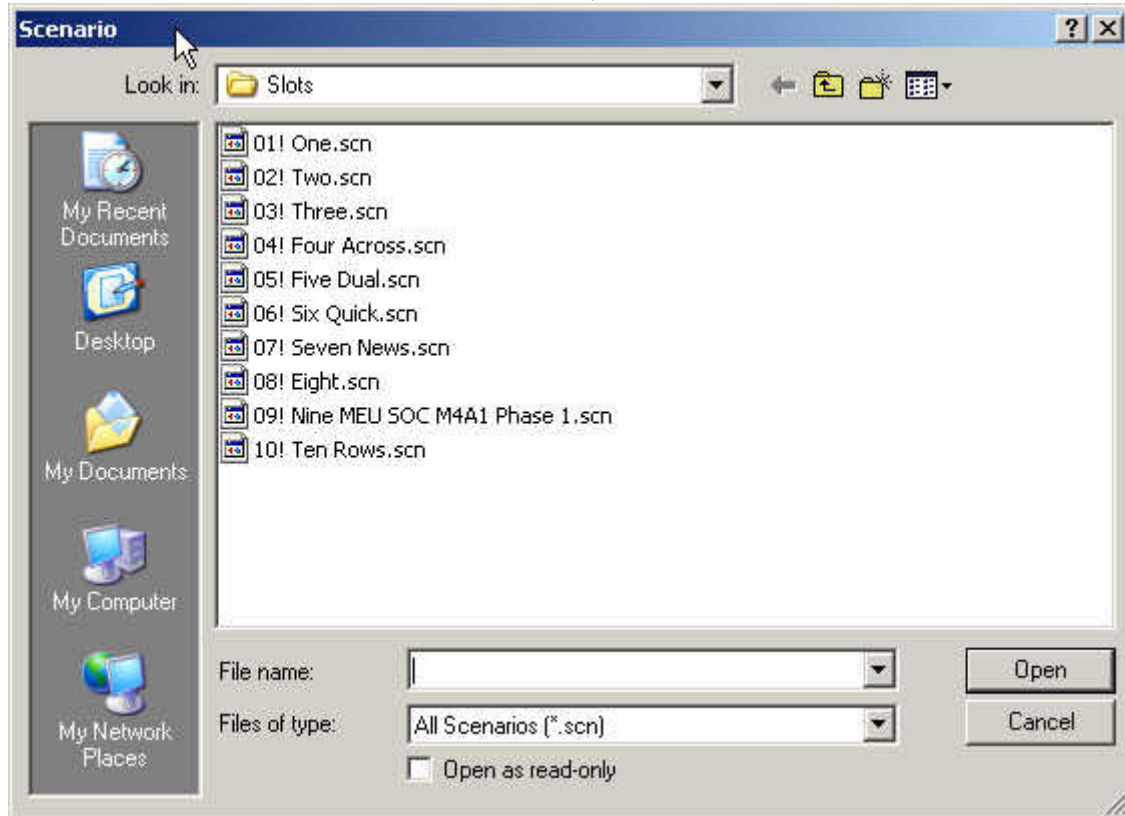
Tracking what has been downloaded.

To help you keep up with which scenarios are downloaded to which slots, the system saves a record of each download. As a part of the send process, it makes a copy of the scenario in a “Slots” folder using the name of the scenario with the slot number added to the left edge of the name. Where the slot number is 1 digit, it adds a zero in front and additionally separates the now 2 digit slot number from the rest of the name with a “!” character. For example, “My Scenario” when downloaded to slot 3 would be saved in the Slots list as “03! My Scenario”. You can then refer to the Slots folder at any time to see what is now downloaded to the controller.



The standard “Open folder” button opens the Slots folder as shown below.

(By default, TCON installs in a C:\TCON folder. It creates a Scenario folder in the TCON folder and the Slots folder inside of it.)



Setup

Settings available in the Setup screen.

- **Targets:** select the number of targets on your range. *If you change this value, close the program and restart it for the change to take effect.*
- **Comm Port:** This is the comm. Port for the radio interface between the computer and the controller. It must be set in the setup screen after the radio has been installed. The radio installation will create a new comm. Port which will then be available in the list on the setup screen. It will usually be the highest numbered port shown there. To download scenarios or control the range with the computer, this must be properly set.

If it should be necessary to install TCON on another computer, install the radio first, following the one page Quick Start Guide which accompanies it. Then install TCON and select the new port. You can copy scenarios as needed just as you would any other file or document. TCON expects the scenario files to be in the C:\TCON\Scenario folder.