

Shooting Range Target Control System.

Introduction:

The system controls the release of clay targets through a “counting system” and allows for individual shooters or groups of shooters to use the shooting facility without supervision. The shooter purchases a “Shoot Card” which is his “key” allowing him to use the shooting facility.

Components:

There are three parts to the system:

The Shooting Station Control Unit (SCU). This controls the release of targets. It reads the Shoot Card and allows the “Pull-Cord” (the buttons to operate the release of targets), to operate.

The Shoot Card (CARD). Purchased by the shooter allowing him to use the facility. Sold in US\$ amounts \$10, \$25, \$50, \$100.

Club House Control Unit (CHU). Issues the Shoot Card and evaluates returned Shoot Cards.

Theory Of Operation:

Although there are several options the basic feature is as follows: A shooter will go to the Club House and purchase a Shoot Card. He then enters the range and approaches a shooting station where he will locate the SCU and insert his Shoot Card. (The card will be taken inside the SCU similar to an ATM). The display on the SCU will show how many targets he has left according to the current value of the Shoot card. He can now release targets by pressing the “Pull-Cord” buttons. As each target is released the display will decrement by one. When he has finished, he presses the EJECT button on the SCU and his Shoot Card will be updated with the remaining cash value, and returned. He can now remove his card, proceed to another Shooting Station and repeat the process. When his card is “empty”, the “Pull-Cord” will cease to function and the Shoot Card will be ejected.

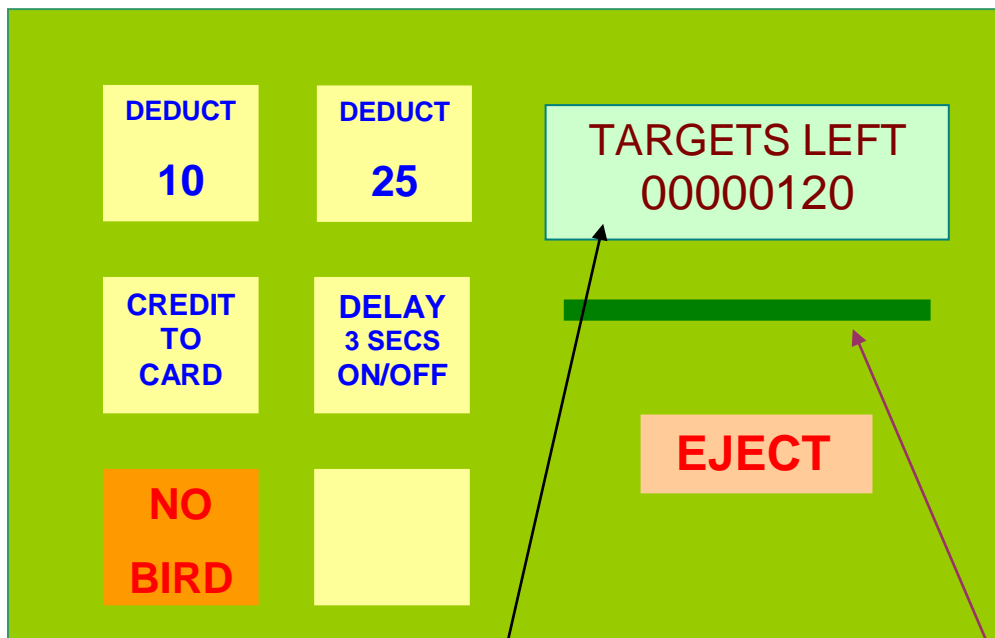
Variations:

Multiple Shooters: When the shooter inserts his Shoot Card into an SCU he can choose to “Deduct” a fixed number of targets from his card. The display will show his choice, (i.e. the number of targets allowed to be released.) The Shoot Card can then be ejected. The second shooter inserts his Shoot Card and requests a number to be deducted from his card. The display will now show the “new” total allowed to be released. This shooter now ejects his Shoot Card and a third, fourth shooter etc. repeat the process.

Target Price: As Shoot Cards are sold in US\$ amounts and not by number of targets, the Shoot Card can be used on various disciplines. If Sporting Clays are 25 cents a target, a \$10 Shoot Card inserted into an SCU on the Sporting Clay range will show 40 targets left on the display. If the Shoot Card is inserted into an SCU on the TRAP / SKEET field, where targets are only 10 cents each, the display will show 100 targets left. This allows a shooter to shoot various disciplines without having to purchase different Shoot Cards. (He can purchase a \$10 Shoot Card then start at Sporting Clays where targets are 25 cents

each and shoot 20 targets (cost \$5.00). He can then go to the Skeet Field, where targets cost 10 cents each, and use the remaining value of the Shoot Card (\$5.00), by shooting 50 targets. Because the SCU can be programmed to have different target prices, a Range Master can change the price of targets at will. i.e. an incentive to shooters could be in the form of, Sporting Clay targets on Saturday and Sunday are 25 cents, but on Monday and Tuesday they are only 15 cents. The SCUs can be changed very easily to reflect the different prices. Remember, the Shoot Cards only hold the US\$ amount not used. i.e the value of the card. Note: Each day a shooter returns to the course he must first validate his card by registering it at the clubhouse. (See later for reasons).

STATION CONTROL UNIT



The Shooter will approach the SCU and insert the SHOOT CARD into the Card Slot.

The display will show the value of his card in the form of the Number of Targets Possible at this Shooting Station.

In the above example the targets are 25 cents.

He can now start shooting and the display will show how many targets are left after each PULL (release of target). If the shooter presses the Single button, the count will decrease by one, but if he press the Double button, the display will decrement by two.

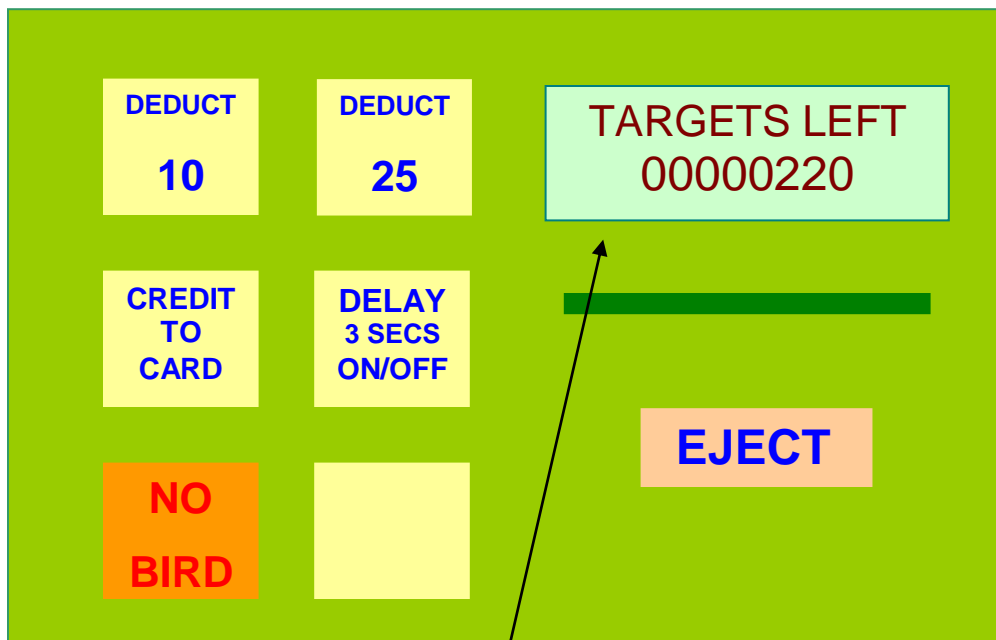
If the shooter encounters a broken target he can press the NO BIRD button and the count will increment by the number of targets thrown in the last command. i.e. one for singles and two for doubles (Even if only one bird of a double was broken, two birds will be credited.)

When the shooter has finished at the Station he presses the EJECT button and the Shoot Card will be returned with the value of the unused targets credited back to it. He can now proceed to the next station. As the value of the Shoot Card is used up, the SCU will display “FINISHED” and eject it from the card slot.* The shooter now has to insert a Fresh Shoot Card or return to the clubhouse to purchase another. (Stewards on the course will have Shoot Cards available which can be purchased by the shooter.)
 * NOTE: If there is only 1 credit remaining and the shooter presses the “double” button, he will only get the first target and not both.

MULTIPLE SHOOTERS

A group of shooters may have their individual Shoot Cards or they may have purchased one between them , as above. (One \$100 Shoot Card is cheaper than four \$25 Shoot Cards – see “Incentive”)

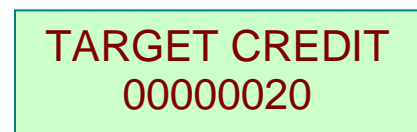
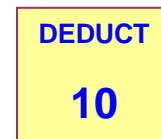
If the group has a single card they can proceed as above, but if they have multiple cards then they follow the process below.



As each shooter inserts his Shoot Card the display will show the number of targets possible using his card.

Using the DEDUCT buttons, he can request the number of targets he requires. Say he presses the “DEDUCT 10” twice, then his card will be decremented the US\$ amount equivalent to the number of targets times the target price at this station. (The card will be updated when he presses the EJECT button.)

The Display will now show the “credited” number of targets that can be released from this station.



The shooter now presses EJECT and his card will be returned.

EJECT

**TARGET CREDIT
0000020**

The CREDIT will still be displayed on the SCU.

The next shooter will insert his Shoot Card and the SCU will change display and show the TARGETS LEFT for that Shoot Card. This shooter will select the same amount, say 20 targets by pressing the "DEDUCT 10" button twice and the display will now show a TARGET CREDIT of "40".

**TARGETS LEFT
0000060**

**TARGET CREDIT
0000040**

This shooter can now EJECT his Shoot Card and a third, fourth shooter can follow the same procedure.

When all shooters have entered their required amount they can start shooting and the DISPLAY will count down through the targets available.

**TARGET CREDIT
0000220**

Start

**TARGET CREDIT
0000219**

Single Bird

**TARGET CREDIT
0000217**

Double Bird

If a 2nd, 3rd shooter inserts his Shoot Card into the SCU and does not press any of the "DEDUCT" buttons but the PULL cord is pressed, his card will be ejected and the target usage will be deducted from the previous TARGET CREDIT amount,

At any time a Shoot Card can be inserted to "Top-Up" the credited target count.

If for some reason the full credited amount is not used, (e.g. the group may want to go to the next station, a trap may stop working, too many broken birds, a single shooter may have to leave after receiving a telephone call,) --- the TARGET CREDIT can be written back to any Shoot Card. Just insert the Shoot Card and press CREDIT BACK. The target value will be added to the current value of the Shoot Card.

If there is no Shoot Card in the SCU when the CREDIT BACK button is pressed, the SCU display will request a Shoot Card to be inserted.

**INSERT CARD
FOR CREDIT**

SINGLE SHOOT CARD – SINGLE SHOOTER

A single shooter using the facility will not have a colleague to "PULL" for him. In order to facilitate this shooter the SCU has a delay built into it. The single shooter can press the "DELAY" button. A 3 second delay will be introduced between the pressing of the Pull Cord button and the release of the target. This allows the single shooter to press the Pull Cord button, then mount his gun before the target(s) are released. An audible "BEEP" will let the shooter know when the target(s) is coming. This DELAY button is an ON/OFF press button. i.e. Press once for delay, press again to remove delay, press again for delay etc.

**DELAY
3 SECS
ON/OFF**

BROKEN TARGETS – “NO BIRD”

There is a NO BIRD button on the SCU for obtaining credit for a broken or “no-bird”.

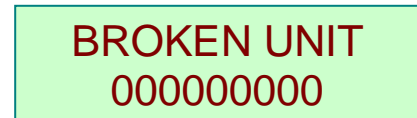


When this button is pressed the last PULL will be credited to the shooter. (1 or 2 birds)

There will be a general rule at the facility--- “If you get 3 broken birds in a row STOP using that station.”

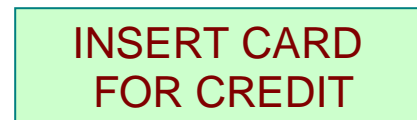
The SCU will detect 3 NO BIRD presses and close itself down.

The display will show “BROKEN” and a light on the unit will turn on to alert itself to a steward on the course.

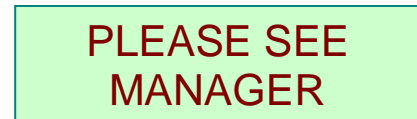


A record of the NO BIRD requests will be written to the internal memory of the SCU along with the Shoot Card number. At this time the Shoot Card will be ejected.

If the SCU is in the “Multiple Shooter” mode i.e. it displays a Target Credit, a Shoot Card must be inserted into the card slot before a NO BIRD credit is allowed, and also to allow the SCU to note the Shoot card number.



NOTE: The reason for this is to enable the range manager to obtain statistics and information as to “who” is requesting the No-Bird. If the same Shoot Card number appears at various stations, he can refer to the owner’s name and warn him of the noted “abuse” next time he attends the course. When the shooter returns to the course and registers at the range office, he will be asked to see the range manager.



After the credit is recorded and the Shoot card is removed, the PULL CORD will operate.. When the NO BIRD button is pressed for the third time in a row, the SCU will act as above and close down. However, in multiple-shooter mode, the SCU will also “update” the shoot-card with the number of targets un-used before the system closed down..

The above “detection” by the SCU will prevent shooters from “abusing” the system and Pulling continuous “FREE” birds.

NOTE: As mentioned earlier, a shooter MUST register his presence on the course by getting his Shoot Card validated before he commences shooting. This allows the manager to be aware of how many shooters are on the course. Also it enables the manager to stop shooters entering the course. (i.e. he may wish to “warn” a shooter about broken-bird abuse.

ALSO: This system could control drinking and shooting. If a shooter purchases alcohol, the bar steward will request his Shoot Card and insert it into a Unit behind the bar. This unit will put a delay onto the Shoot Card prohibiting that Shoot Card from being used on the course. As the Bar Unit is linked to the Shoot Card issuing computer, the name of the shooter (Shoot Card) owner, will be noted and new Shoot Cards will not be issued to that shooter that day.

INCENTIVES:

The beauty of this system is that Shoot Cards are sold “UP-FRONT”, i.e. the range obtains its US\$ before the shooter(s) enter the course.

To encourage shooters to purchase more targets the Shoot Cards are offered at discount prices:

Value of Shoot Card	Cost of Shoot Card
\$ 10	\$ 10
\$ 25	\$ 25
\$ 50	\$ 47
\$100	\$ 90
\$500	\$435

Remember, the Shoot Cards do not expire. Their value is always available to use for releasing targets on the range.

COST OF TARGET INCENTIVE:

At most shooting facilities Saturdays and Sundays are the most popular, while Mondays and Tuesdays hardly anyone shoots.

The SCU allows the Range Owner to change the cost of targets at any station.

He could decide that Sporting Clay targets will cost 25 cents on Saturday, 24 cents on Sunday but only 15 cents on Monday. As the shooter has a “cash value” card he will be able to shoot more on Mondays than at the week-ends. A \$50 Shoot card would give the shooter extra targets on different days.

Saturday/Sunday	Monday/Tuesday	Wednesday	Thursday	Friday
25 cents	15 cents	18 cents	20 cents	22 cents
200	334	278	250	228

If a shooter regularly buys a \$25 shoot card every Saturday, he will have spent \$1300 (52 x \$ 25), and will have shot 5200 targets. (\$1300 at 25 cent targets = 5200)

If however, he purchases \$100 shoot cards every four weeks, then shoot half his targets on Saturday and the rest on Wednesday he will have spent \$1170 (13 x \$90) and will have shot 6212 targets.

He will have saved \$130 and obtained 1000 more targets.

CHANGING THE SCU TARGET VALUE:

To change the cost of targets it is very simple: the range master connects his Laptop PC to the Station SCU and re-programs the target cost for that day. (Alternatively, he can insert a "Price Change" Shoot Card into the SCU which in turn will detect this Shoot Card as a "Control" card and update its internal memory with the price detailed on the card.

This method will be used to change the target value on the various disciplines as well.

OBTAINING STATISTICS FROM SCU:

At any time, the range master can plug his Laptop PC into a station SCU and "download" the SCU's internal memory to the PC. He can then return to the Clubhouse and extract course statistics from the information gathered from the course SCUs. Alternatively, he can insert a "Download" Shoot Card into the SCU. The SCU will detect this "special" card and dump its internal memory to the card. The card can then be read back in the clubhouse and statistics can be extracted.

He will insert the STATISTIC blank into the SCU and the SCU will "dump" all the internal information to the card.

The STATISTIC card can now be taken back to the Club House unit where its information can be read into the Control Computer.

Information will include, Total Number of Birds from Left Trap, number from Right Trap, Broken Birds, Number of birds at say, 25c, 22c, 18c etc. This will enable the range master to determine the value of targets thrown and the amount "outstanding" on issued cards. It will also enable him to see which types of shots / targets are preferred by the usage of a particular station compared to others. If a particular station has only a few targets released, it may be time to change the target presentation to encourage the shooter to come back.

MISCELLANEOUS:

Competitions: A Special Shoot Card can be inserted into the SCU allowing targets to be thrown without having a Shoot Card inserted or a Target Credit entered. The SCU would still count targets and allow unlimited broken birds. At the end of the competition the range master could obtain statistics to see how many targets were thrown and the broken bird ratio.

Visitors... A group of shooters may be attending the club while passing through the area. They only wish to shoot today and will not return maybe for several months. They wish to use the facility as much as possible but have no idea how many targets they will use. It would be senseless to sell them say a \$500 card as they may not use its full value. An option would be to issue a high value card say \$1000 and take their Credit Card Number as security deposit. The group would then use the facility throwing as many targets as they wish. At the end of the day they would return to the club house where their Shoot Card would be read to show the cash value left on the card. The group would then be charged according to the "scale" of individual cards.

E.G. If the value left on the Shoot Card was \$230 it would mean they had spent \$770. This could be matched into the normal Shoot Card Scale.

Value of Shoot Card	Cost of Shoot Card	Percentage Saving
\$ 10	\$ 10	0%
\$ 25	\$ 25	0%
\$ 50	\$ 47	6%
\$100	\$ 90	10%
\$500	\$435	12.5%
\$1000	\$850	15%

The amount requested from them would be determined by the \$500 - \$1000 range which gives a 12.5% discount. This would be $\$770 - 12.5\% = \673.75

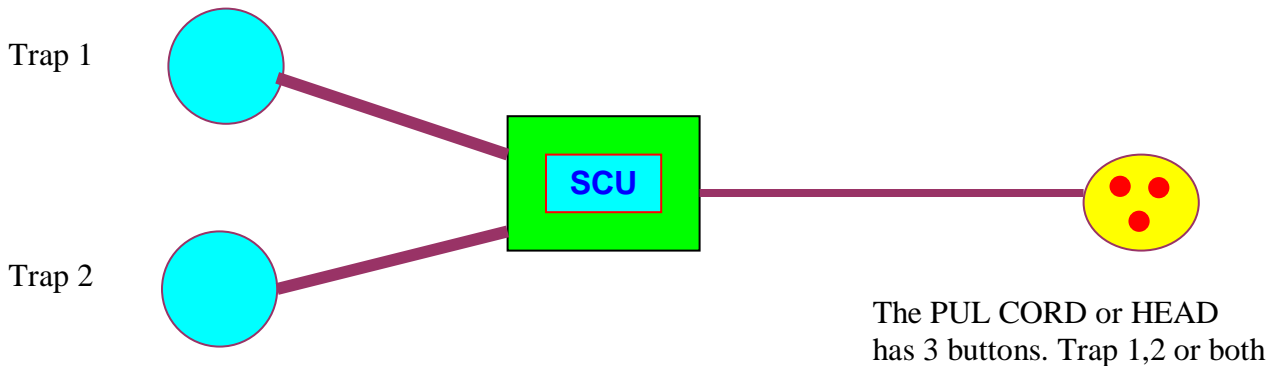
If the group left the range with the Shoot Card, their Credit Card would be charged with the full \$850.

TECHNICAL REQUIREMENTS:

The SCU is the main unit. There will be one SCU at each shooting station. On a typical Sporting Clay range there will be 12 – 30, while at a SKEET or TRAP club there may be 4 – 15.

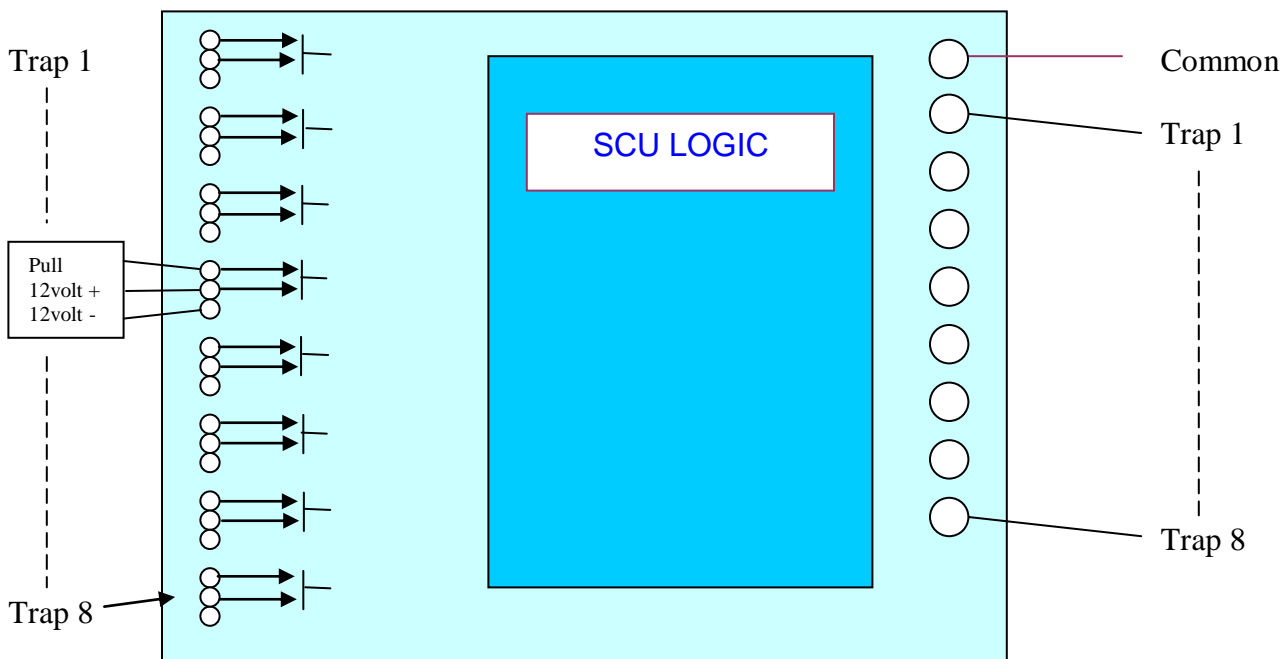
Each SCU is self-contained and may be powered by an internal battery (Alarm System 12vdc) or by external power being fed from one of the trap machines. (Typically a trap machine runs the internal power at 12vdc and supplies this power through a 3 core cable. Two cores carry the current while a third returns the “PULL” signal to the trap).

A typical example of an installation is as follows.



The SCU controls commands from the PULL CORD to the Traps. If there is CREDIT in the SCU allow the PULL CORD to work. The logic is simple. The traps fire when a +ve signal is sent down the third wire.

The INPUT/OUTPUT would be as follows. Power for the board (SCU) could come from the 12v +/-



NOTE: There should be allowance for up to 8 traps at each station. (i.e. 8 circuits)

Technical Notes: For SCU logic construction purposes.

Three wires will come from the trap control box. These are operational current and a Pull signal. Two wires will carry say, 12vdc (+ & -), while the third is a return "PULL" signal of say, the 12v (+) pos.

Various voltages are allowed for e.g 12volt ac/dc, 24volt ac/dc

Different manufacturers use a variety of control electronics for their trap operations. The "PULL" mechanism is basically the same. i.e. two wires come from the trap and must be connected to make the Trap fire. Normally there is a relay in the control box on the trap and the joining together of the two wires causes the relay to operate and fire the trap. However, some manufacturers are now installing electronic circuit boards to operate their traps. This implies that the relay has been replaced with a much lighter TRIAC or solid state relay. In designing the circuit for the firing of the trap, the SCU must be able to handle various current loads. i.e. If the trap control box has a contactor or relay to fire the trap, the current required may be 600ma, but if a solid state relay or TRIAC is used, the current may only be 20ma. The relay/TRIAC used on the SCU must be able to handle the various current requirements.

Previous experience using relays has caused problems. With a light current (20ma), the "spark" was too weak to clean the relay contacts and failures resulted. Gold Contact relays had to be used. BUT, if these gold contact relays were used to operate heavier currents (600ma), the gold contacts were burnt and failure resulted again. (Perhaps the closing circuits should be "pluggable" to suit the application?)

The length of "Contact Closure" must be ½ second. i.e. the "Pull" signal must be held for ½ second to allow the trap electronics to operate correctly.

As there can be up to 8 traps operating through a single SCU, it is possible that several buttons will be pressed at the same time. Although unlikely, it is possible that all eight buttons will be pressed and therefore the SCU must be able to handle all simultaneous requests and count them.

NOTE: Whenever a multiple request is made (on most stations this will be a Double i.e. fire two traps at the same time), the logic must evaluate the request with regards to the number of target credits available. If there is only one credit available, then only the first trap in sequence will be fired upon a double request.

Range Control System

Target Counter

The main problem a Range Manager faces is “How much help do I need to run the course?”

On a typical course or range, the manager has to provide “Pullers” to accompany shooters around the course. These “Pullers” are used for one main purpose, and that is to ensure the shooters shoot the number of targets they have paid for.

Sad to say, although true, an unaccompanied shooter will abuse the trust given to him by the range manager if allowed to “Pull” his own targets. The shooter will pay for 100 targets but undoubtedly shoot 120 – 150. Although targets only cost the range \$0.05, the lost revenue by abuse is not $20 \times \$0.05$ but $20 \times \$0.30$, the price charged to shooters per target.

Shooters have various reasons for shooting extra targets:

“Let me see a pair.”

“I’ve got a few shells left, throw me another pair.”

“I wasn’t ready for that target, throw it again.”

“I didn’t see that pair, throw them again.”

“I can’t seem to hit this target, give me a few more until I can.”

or the most common,

“Clay targets are only \$0.05, the range won’t miss a couple of dollars worth.”

The loss of income from “stolen” targets can mount up if not controlled and the easiest way is to send a “Puller” with each shooter or group of shooters.

HOWEVER, “How many Pullers do I need this week?”

Monday morning and there are three Pullers at the range standing-by at \$8.00 per hour. At 10:00 two shooters arrive and a Puller is dispatched, at 10:15 three shooters arrive and a second Puller is dispatched. At 10:35 a single shooter arrives and the third Puller takes him around.

Now what happens when a group of five shooters arrive at 11:00? The manager asks them to wait for the first Puller to return in about 30 mins.

Should the manager have requested five or six Pullers? Or does he let the group go round on trust? A group of five shooters “Stealing” 25 targets each will lose the range an income of $125 \times \$0.30 = \37.50 .

But there again, can the manager have six Pullers waiting for shooters costing him \$48 per hour, or \$384 per day?

The answer has to be Install a Target Counter Control System.....

The Cost Effectiveness of a Counter Control System.

The basic argument behind a Control System is “**You PULL it you PAY for it!**”

At every shooting station around the course there will be a Control Computer which interrupts the PULL signal given to the trap. To allow the PULL cord to work, the Control Computer must be activated. This is achieved by the insertion of a valid KEY or Shoot Card.

Once the Computer evaluates the KEY it allows the PULL cord to operate and targets can be thrown.

A single shooter or group of shooters can enter the course, pulling there own targets and the range manager knows that every target being thrown is paid for.

With the Counter Control system, the range manager knows he only has to employ one person to keep the traps full of targets.

Lets look at the costs...

Without the Counter System:

Monday – Thursday	4 Pullers at \$8.0 per hour for 10 hours	= \$320 per day x 4 = \$1280
Saturday – Sunday	6 Pullers at \$8.0 per hour for 10 hours	= \$480 per day x 2 = \$ 960

Total Cost for Pullers for the week **\$2240**

The above assumes that extra groups of shooters will wait for the Pullers to return if they are all out on the course assisting other shooters or groups of shooters.

With the Counter System:

Monday – Sunday	1 Puller at \$8.00 per hour for 10 hours	= \$80 per day x 7 = \$ 480
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Total Cost for Pullers for the week **\$ 480**

The above situation allows shooters to come on to the course at any time without having to wait for a Puller to escort them. This a tremendous advantage as shooters are happier not having to wait.

The savings on labor are obvious, and once the capital cost of the Counter System has been recouped, the course will benefit tremendously in extra profit.

The advantages of a Counter Control system are very simple,

- 1) There is a massive saving on labor.
- 2) There is TOTAL control over the payment hence release of targets.
- 3) Pre-Paid Shoot Cards are usually purchased for larger amounts than one round of 100 targets, therefore the shooter will always shoot more targets than anticipated or planned.
- 4) All targets are paid for before the shooter enters the course – better cash-flow.

The statistics collected from the Control Computers held the course manager to note the “condition” of the course and make adjustments to lightly used stations.