

Produkte
Products

Prüfbericht - Nr.: 14028138 001		Seite 1 von 13	
<i>Test Report No.:</i>		<i>Page 1 of 13</i>	
Auftraggeber: <i>Client:</i>	Scapequest Pty. Ltd. Tradingas Battlefield Sports Unit 1, 6 Graham Street Underwood, Brisbane QUEENSLAND AUSTRALIA		
Gegenstand der Prüfung: <i>Test Item:</i>	433MHz Wireless Gaming Gun (Transceiver)		
Bezeichnung: <i>Identification:</i>	COBRA-001	Serien-Nr.: <i>Serial No.:</i>	Engineering sample
Wareneingangs-Nr.: <i>Receipt No.:</i>	00111111076-001	Eingangsdatum: <i>Date of Receipt:</i>	11.11.2011
Prüfart: <i>Testing Location:</i>	Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong		
Prüfgrundlage: <i>Test Specification:</i>	FCC Part 15, Subpart C		
Prüfergebnis: <i>Test Results:</i>	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed .		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland Hong Kong Ltd. 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong		
geprüft/ tested by:		kontrolliert/ reviewed by:	
15.12.2011	Mika Chan Senior Project Engineer	15.12.2011	Sharon Li Assistant Manager
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
Sonstiges: Other Aspects		FCCID: Z93BFS	
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

Test Summary

Radiated Emission of Carrier Frequency

Result: Pass

Spurious Radiated Emissions

Result: Pass

Bandwidth Measurement

Result: Pass

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List of Test and Measurement Instruments

	Equipment used	Manufacturer	Model No.	S/N	Due Date
☒	Semi-anechoic Chamber	Frankonia	Nil	Nil	25-May-12
☒	Test Receiver	R & S	ESU40	100190	26-May-12
☒	Bi-conical Antenna	R & S	HK116	100241	05-May-13
☒	Log Periodic Antenna	R & S	HL223	841516/020	06-May-13
☒	Coaxial cable 50ohm	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 001	08-Dec-11
☒	Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	03-Oct-13
☒	High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	30-Oct-13
☒	Horn Antenna	EMCO	3115	9002-3351	11-May-13
☒	Active Loop Antenna	EMCO	6502	9107-2651	19-Apr-12
☒	FSP 30 Spectrum Analyser	R & S	FSP 30	100007	17-Sep-12
☒	LISN	R & S	ESH3-Z5	849876/026	21-Dec-12

General Product Information

Product Function and Intended Use

The equipment under test (EUT) is a transceiver for battle gaming operating at 433.30MHz. The EUT sense hit then transmits a very short packet by radio back to the shooting gaming gun.

Ratings and System Details

	Transceiver
FCCID	: Z93BFS
Operated Frequency	: 433.30 MHz
Type of antenna	: Integral antenna
Power supply	: Battery operated 7.2V (NiMH)
Ports	: none

Remark

Since the EUT is transceiver, the verification test report for receiver portion has been issued separately.

Independent Operation Modes

The basic operation modes are:

- The radio transmissions are manually triggered and are for very short duration. The system will not transmit if there is anything else on the channel, it is very friendly to other devices. The most common trigger is when a gaming gun is hit and it transmits a very short packet by radio back to the shooting gaming gun. Typically a unit only gets hit around 15 times every 30 minutes. The other trigger is a start/end radio signal from the master controller to start a game and end a game.

For further information refer to User Manual

Submitted Documents

The submitted documents are listed as follow:

- Circuit diagram
- Block diagram
- User manual
- FCC ID label

Related Submittal(s) Grants

This is a single application for certification of the transmitter.

Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Test Operation and Test Software

Test operation should refer to test methodology.

- There was no special software to exercise the device.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- none

Countermeasures to achieve EMC Compliance

- none

Test Methodology

Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.4-2003.

The equipment under test (EUT) was placed at the middle of the 80 cm height turntable, and the turntable is 3 meters far from the measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360°, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$FS = R + AF + CF + FA - PA$$

$$\text{System Factor} = CF + FA - PA.$$

Where FS = Peak Value of Field Strength in dBuV/m at 3 meters.

R = Peak Reading of Spectrum Analyzer in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

Average value of FS = FS –Average factor.

Average Factor = 20 log duty cycle.

Test Results

Disturbance Voltage on AC Mains

Section 15.207

RESULT:

Pass

The EUT does not operate during battery charging.

Radiated Emission of Carrier Frequency**Section 15.231(b)****RESULT:****Pass**

Test Specification : FCC Part 15 Section 15.231(b1 and b2)
 Test Method : ANSI 63.4-2003
 Measurement Location : Semi Anechoic Chamber
 Measurement Distance : 3m
 Measurement BW : 120 kHz
 Supply Voltage : DC 7.2V

Polarization: Vertical

Value	Frequency	Measured Field Strength at 3m (PK)	Average Factor	Net Field Strength at 3m	Limit	Delta to Limit
	(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Peak	433.274	96.60	-	96.60	100.80	-4.20
Average	433.274	66.4	-20.92	45.48	80.80	-35.00

Polarization: Horizontal

Value	Frequency	Measured Field Strength at 3m (PK)	Average Factor	Net Field Strength at 3m	Limit	Delta to Limit
	(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Peak	433.274	94.4	-	94.4	100.80	-6.40
Average	433.274	63.4	-20.92	42.48	80.80	-38.32

Remark; The calculation of average factor is shown in appendix 1 page 3-4.

Limit**Section 15.231(b)**

Frequency within the band (MHz)	Peak Emission		Average Emission	
	(microvolt/meter)	dBμV/m	(microvolt/meter)	dBμV/m
433.274	109697.64	100.80	10969.76	80.80

According to section 15.35(b), when average radiated emission measurements are specified, including emission measurement below 1000MHz, there also is limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated.

Spurious Radiated Emissions**Section 15.231(b)****RESULT:****Pass**

Test Specification : FCC Part 15 Section 15.231(b1 and b3)
 Test Method : ANSI 63.4-2003
 Measurement Location : Semi Anechoic Chamber
 Detector Function : Average
 Measurement BW : 120 kHz for frequency range of 30M-1GHz
 1MHz for frequency >1GHz
 Supply Voltage : DC 7.2V
 Measuring Frequency Range : 30-5000MHz

Frequency (MHz)	Antenna Polarization	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Delta to Limit (dB)
120.026*	Vertical	28.6	60.80	-32.2
130.002*	Vertical	23.4	60.80	-37.4
381.274	Vertical	19.9	60.80	-40.9
485.276	Vertical	19.9	60.80	-40.9
866.550	Vertical	25.9	60.80	-34.9
1300.048*	Vertical	32.3	60.80	-28.5
2166.667	Vertical	37.0	60.80	-23.8
2600.000	Vertical	32.8	60.80	-28.0
3899.50*	Vertical	36.8	60.80	-24.0
80.020	Horizontal	24.6	60.80	-36.2
120.030*	Horizontal	33.5	60.80	-27.3
866.552	Horizontal	27.0	60.80	-33.8
1300.048*	Horizontal	34.4	60.80	-26.4
2166.77	Horizontal	35.4	60.80	-25.4
3033.49	Horizontal	32.8	60.80	-28.0

Remark: (1) '*' indicates the frequency of the emissions fall into the restricted band as defined in Section 15.205(a).
 (2) There is no spurious emission found between lowest oscillating frequency to 30 MHz.

Limit**Section 15.231(b)**

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dBμV/m)	Measurement distance (meters)
433.274	1096.98	$20 \cdot \log(1096.98) = 60.80$	3

Section 15.209

Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), was also comply with the radiated emission limits specified in Section 15.209.

Frequency (MHz)	Antenna Polarization	Field Strength at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Delta to Limit (dB)
120.026*	Vertical	29.0	46 / QP	-17
130.002*	Vertical	24.4	46 / QP	-21.6
1300.048*	Vertical	32.3	54 / AV	-21.7
1300.048*	Vertical	67.4	74 / PK	-6.6
3899.50*	Vertical	36.8	54 / AV	-17.2
3899.50*	Vertical	61.6	74 / PK	-12.4
120.030*	Horizontal	33.6	46 / QP	-12.4
1300.048*	Horizontal	34.4	54 / AV	-19.6
1300.048*	Horizontal	67.7	74 / PK	-6.3

Limit for Radiated Emission under Section 15.209:

Frequency (MHz)	Field strength (microvolt/meter)	Field strength (dB μ V/m)	Measurement distance (meters)
30-88	100	$20 \cdot \log(100) = 40.00$	3
88-216	150	$20 \cdot \log(150) = 43.52$	3
216-960	200	$20 \cdot \log(200) = 46.02$	3
960-2500	500	$20 \cdot \log(500) = 53.98$	3

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector and above 1000 MHz are based on the measurements employing an average detector.

Bandwidth Measurement**Section 15.231(c)****RESULT:****Pass**

Test Specification : FCC Part 15 section 15.231(c)
Detector Function : Peak
Supply Voltage : DC 7.2V

Centre Frequency (MHz)	20dB Bandwidth (KHz)	FCC Limits * (KHz)
433.28	576	1083.2

* FCC Limit of 20dB bandwidth measurement = (0.25%) (Centre Frequency)
= (0.25%) (433.28x10⁶)
= 1083.2 KHz

For test results refer to Appendix 1, page 2.

Limit**Section 15.231(c)**

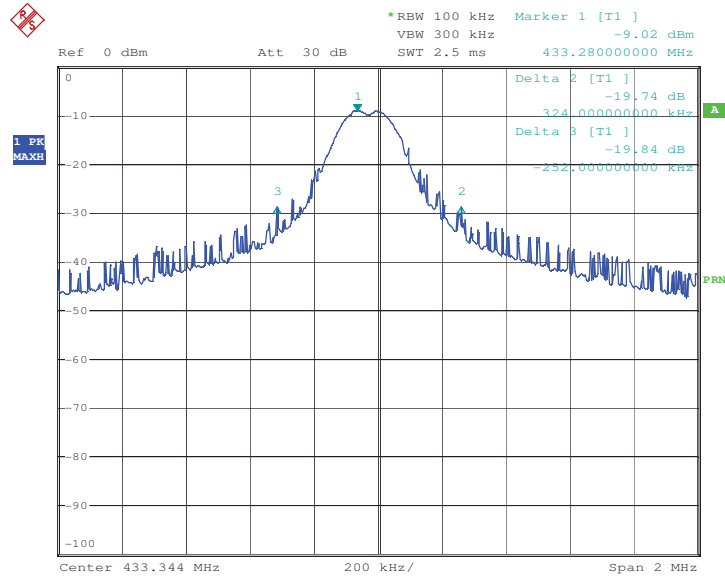
The bandwidth of the emission shall be no wider than 0.25% if the center frequency for devices operating above 70MHz and below 900MHz.

Appendix 1

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Date: 25.OCT.2011 13:19:01

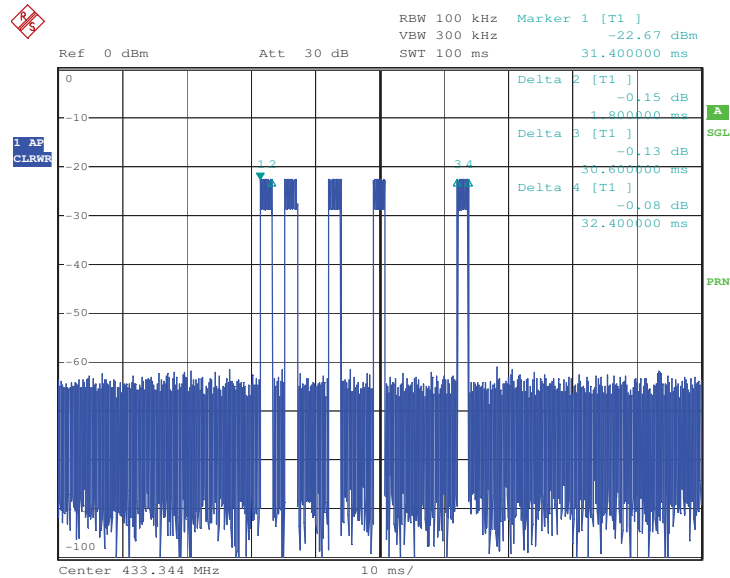
Bandwidth measurement.

Appendix 1

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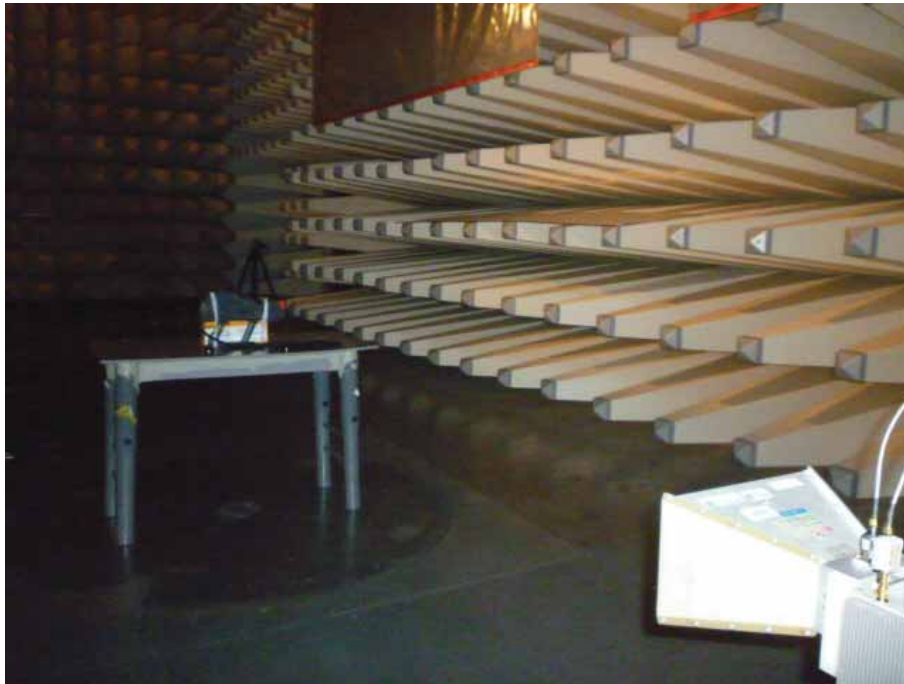
- The graph shows the pattern of coding during the signal transmission.
- The duration of one 'on' signal is 1.8ms.
- Therefore, the total signal 'on' time of one successful period is $(1.8\text{ms} \times 5) = \underline{\underline{9\text{ms}}}$.

Average factor: $20 \log (9 / 100) = \underline{\underline{-20.92\text{dB}}}$.

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Set-up for Radiation Emission (Transmitter)



Transceiver



Transceiver



Transceiver



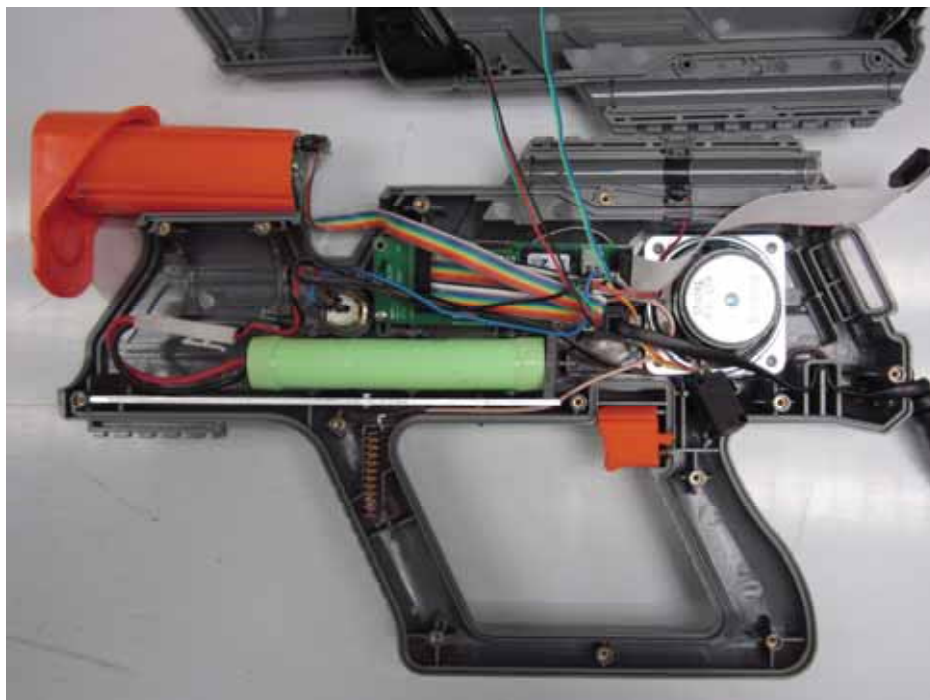
Transceiver



Transceiver



Transceiver



Transceiver



Transceiver



Transceiver



Transceiver



Transceiver



Transceiver



Transceiver



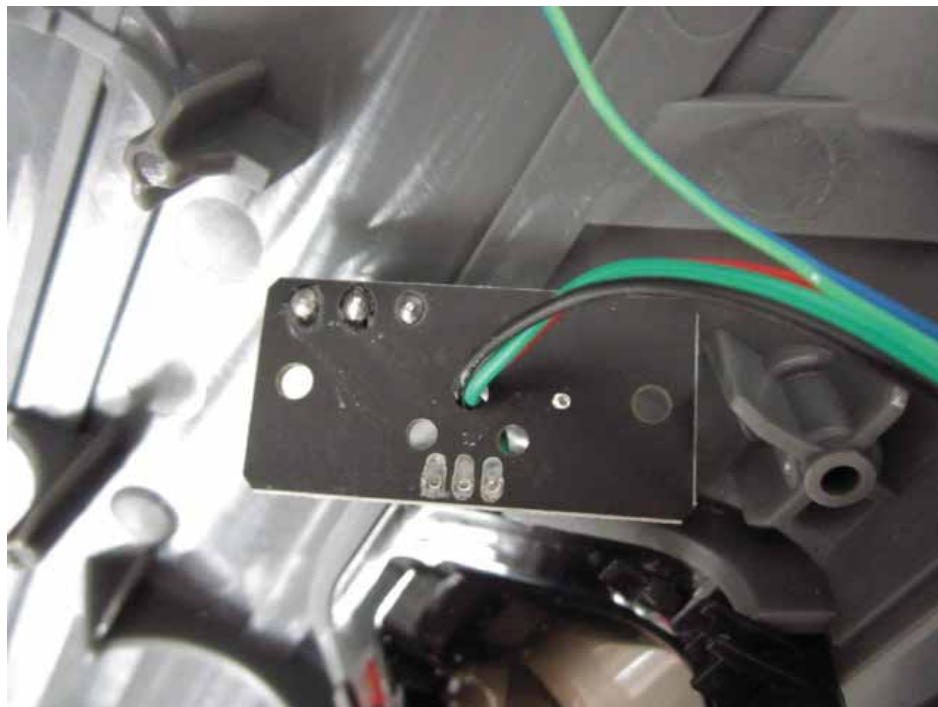
Transceiver



Transceiver



Transceiver



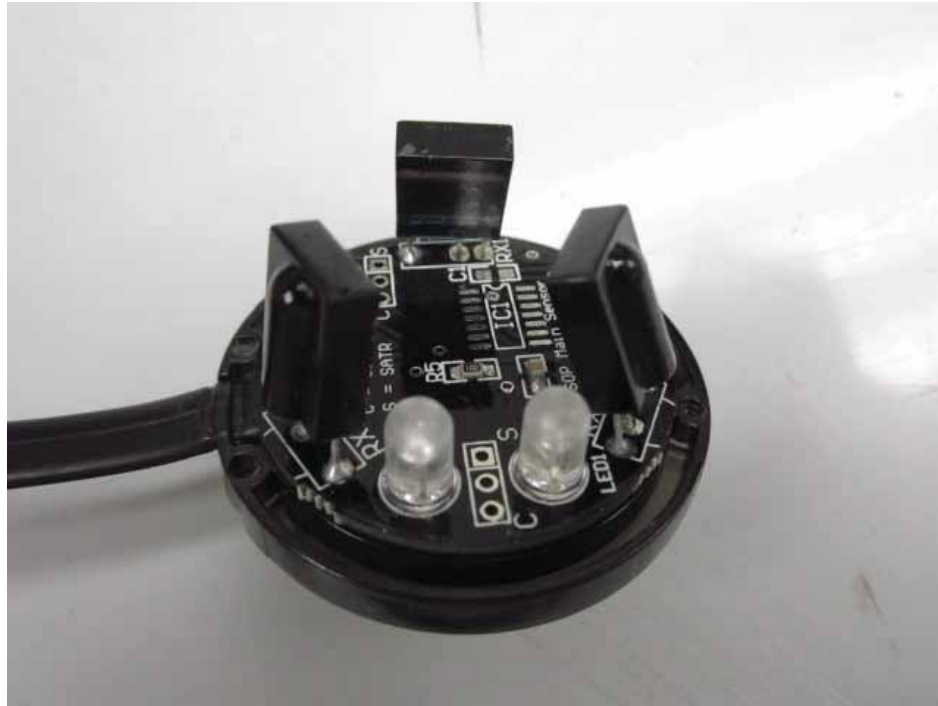
Transceiver



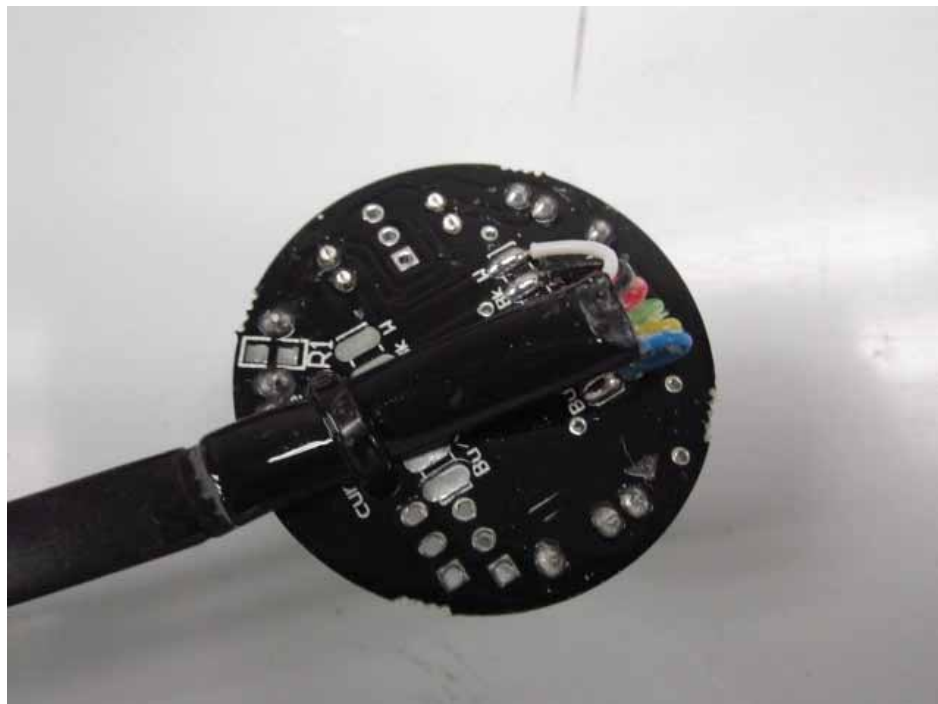
Transceiver



Transceiver



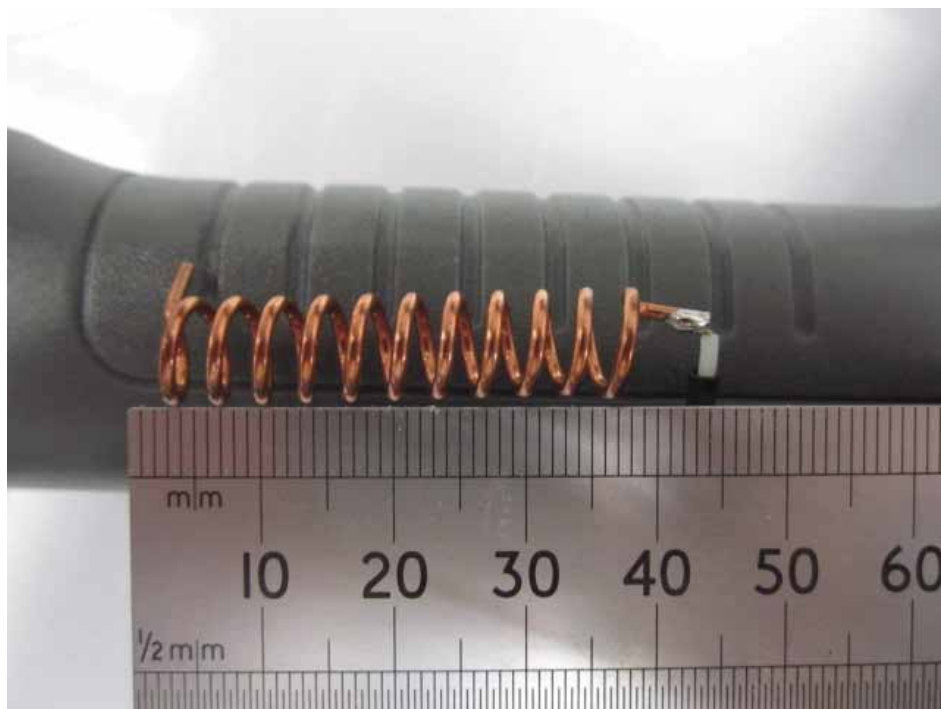
Transceiver



Transceiver



Transceiver



Transceiver

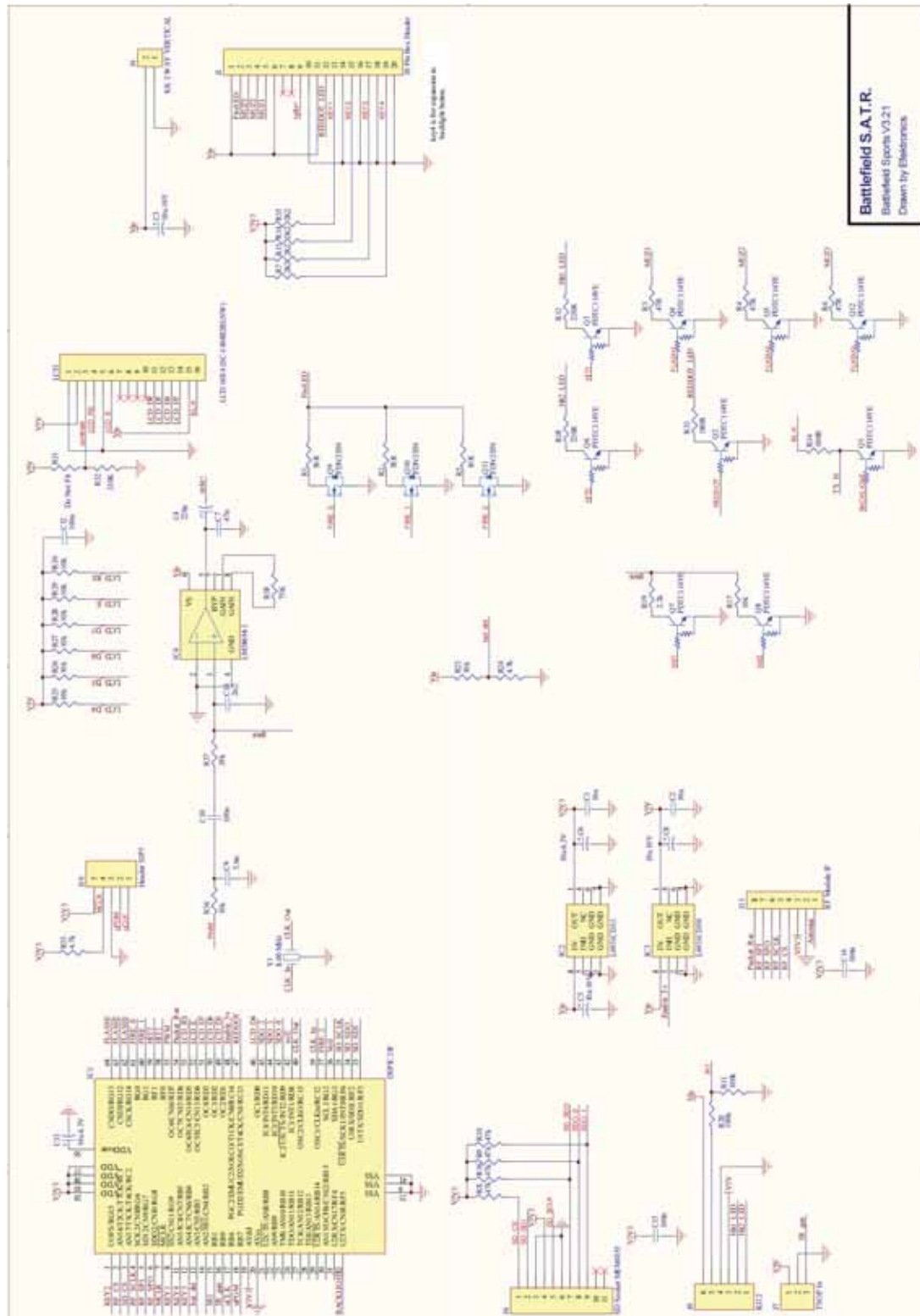
Technical Descriptions

The radio transmissions are manually triggered and are for very short duration. The system will not transmit if there is anything else on the channel, it is very friendly to other devices. The most common trigger is when a gaming gun is hit and it transmits a very short packet by radio back to the shooting gaming gun. Typically a unit only gets hit around 15 times every 30 minutes. The other trigger is a start/end radio signal from the master controller to start a game and end a game.

Ratings and System Details

		Transceiver
FCCID	:	Z93BFS
Operated Frequency	:	433.30 MHz
Type of antenna	:	Integral antenna
Power supply	:	Battery operated 7.2V (NiMH)
Ports	:	none

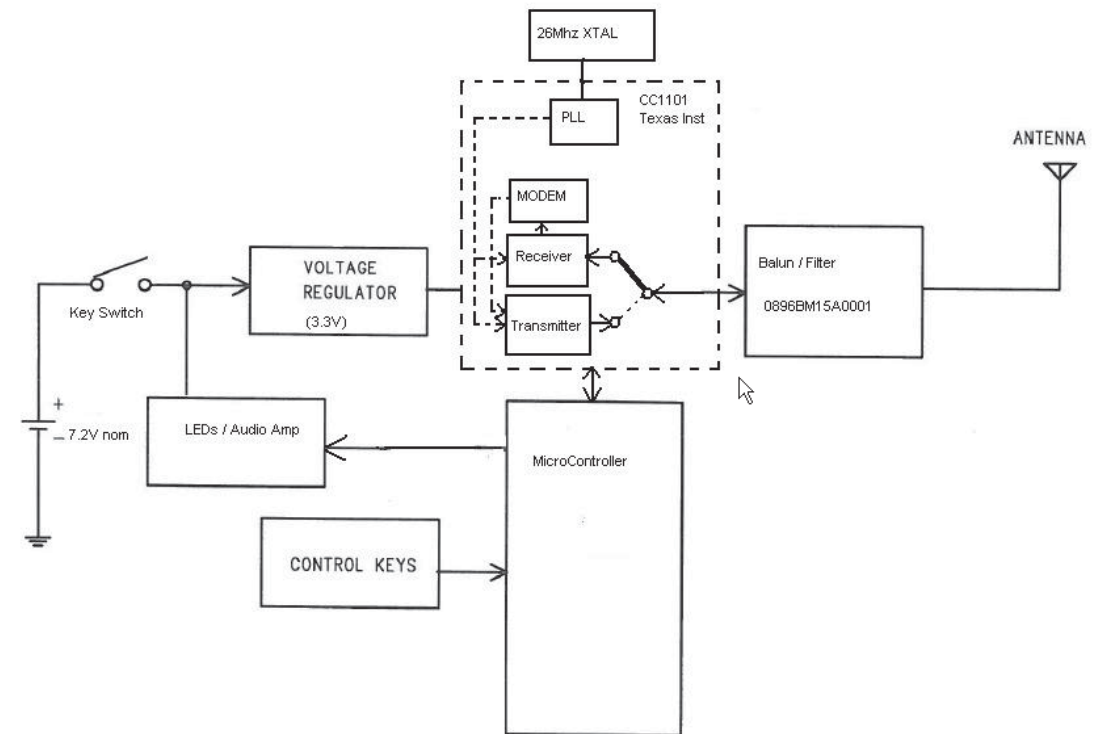
Schematics



FCCID Location



The yellow oval shows the location of the Rating Label

Block diagram

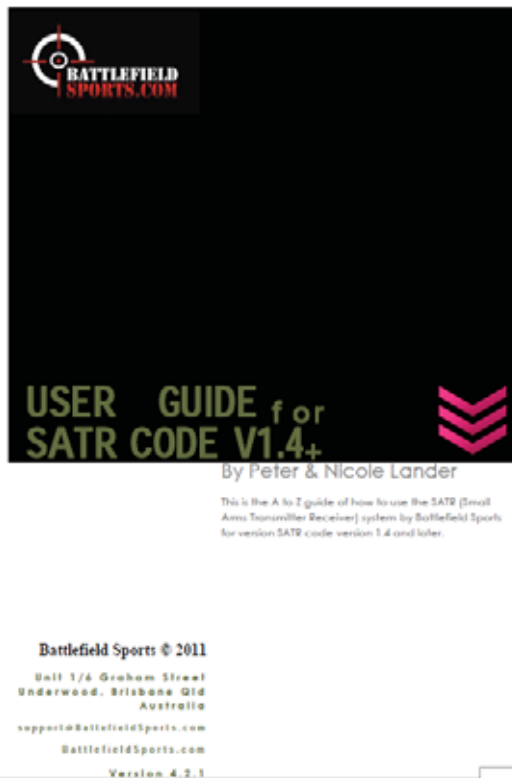
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Bill of Matrial

[illegible]

User manual

[USER GUIDE FOR SATR CODE V1.4+] Version 4.2.1

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CE Compliance

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SATR Quick Start

1.1 Getting Started FAST

Quick Start:

- To switch the gaming gun on, turn the key & TURN clockwise.
- The sensors are mounted on a headband using Velcro & elastic. The headband goes over a bandana or hat. These tell the teams.
- Once the gaming gun is on, pull trigger to commence the countdown. It takes a couple of seconds for the gaming gun to boot.
- After a few seconds your gaming gun is ready to go.
- Take the key out to play.
- Aim at the head sensors or the gun barrel sensor.
- Reload ammo by pushing left button once and let go (do not hold down).
- When you are finished turn the gun off using the key (turn & anti-clockwise).



1.2 Quick Start: Gun Settings

BOOT TO LAST CONFIGURATION

A gaming gun remembers its setting between boots. After turning the gaming gun on, wait a couple of seconds and then pull the trigger. Then you are ready to play!

BATTLE GROUPS & TEAMS

This system can play up to 4 groups simultaneously without crossfire. So, for example, you have a private group for Michael's Buck's Party and another separate group of people, for a Corporate Team Building booking, these two battle groups can play in the one area without interference. If it seems that one gaming gun cannot shoot another, doublecheck that all gaming guns are set to the same battle. If the shooting gaming gun is on battle 1 and the target is on, say, battle 2 they will not hit each other.



Within each battle group you can also set the TEAM. We recommend playing with friendly fire off, and dividing your players in half so one half is on TEAM A and the rest on TEAM B. Please note TEAM A gamers will not be able to shoot others on their own team. TEAM A gamers can only hit people from TEAM B. If you are having trouble, double-check that you are not trying to shoot someone on your own team.

5

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RE-SETTING FREQUENTLY CHANGED SETTINGS

- Turn the gaming gun on with the key.
- Push the left (red) button.
- Set the difficulty level required using the left or right button.
- Pull trigger to lock in selection.
- Select weapon from list based on current gun class.
- Select the spare ammunition measured in magazines.
- Select health in hit points.
- Select language for audio.
- You will then return to the initial boot screen.
- To enter fire state now, pull the trigger and wait a few seconds, then you are ready to play!

CHANGE RARELY USED SETTINGS

- Boot the gaming gun with the key.
- Push the right (black) button.
- Gun Reset (YES/NO) Choose yes to return to factory default settings.
- Pull the trigger to move to the next menu.
- Select device name—Choose "weapon mode" for a gaming gun.
- Select gun class (ideally consistent with the gaming gun code).
- Select FIRE MODE—Shooting a normal gameplay i.e. one hit, takes one HP off your opposition. Killing n one shot, one kill.
- Select the muzzle flash colour (white is standard, however you can also select red or green. Or if you have Cobras you can ask to swap the green for blue. This must be done when ordering).
- Select light colour (select red, green/blue, or none).
- Select range (outdoor or indoor). We recommend outdoor mode unless you are playing in a tight indoor space. Indoor mode greatly reduces the infrared range. Use Default range.
- Set voice feedback ON.
- If all gaming guns have friendly fire OFF, then all gaming guns on the same battle can hit each other. We recommend, however, using the team settings (Team A & Team B) and to turn OFF friendly fire, so only Team A gamers can hit Team B, and cannot hit members of their own team.
- Select sound volume, usually leave on HIGH.
- Set battle, recommend all gaming guns remain on battle 1.

1.3 In-Game Functions

The left button reloads the gaming gun [LEFT = LOAD].

If the weapon selected supports it, the right button changes fire mode from fully automatic or burst fire to semi automatic.

1.4 Reading the Display

This guide explains how to read the gaming gun display while in the "ready" state.

Normal Display	Laser Tag Display	Meaning
HP x/y	HP x/y	HP is short for hit points and is a measure of "Health". The digit before the "/" is the current hit points and the digit after the "/" is the hit points at game start or after a respawn.
A x/y	C x/y	A is short for ammunition. Before the "/" is the ammunition left in the current magazine and after the "/" is the

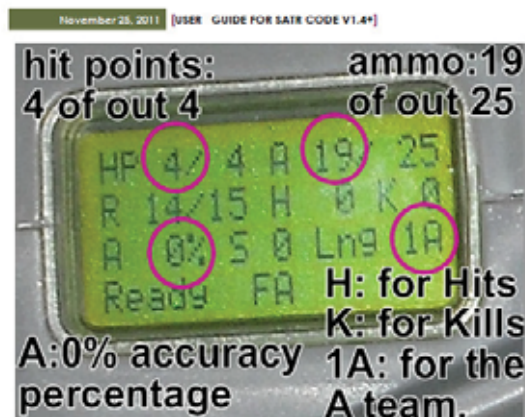
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		capacity of the magazine.
		C is short for charge . In LaserTag games the weapon is assumed to be some form of Laser unit powered by batteries.
R x/y OR R UNUM	R x/y OR R UNUM	R is short for reloads . Before the "y" is the number of reloads remaining. After the "y" is the number of reloads of game start, after receiving a reload from a master controller or ammunition box or after a re-spawn.
		R UNUM is short for unlimited reloads . When the gaming gun is set to "easy" mode, then it gives the player unlimited reloads. And the gaming gun reloads automatically.
H	T	H is short for Hits . This is the number of hits made on an opponent during this simulation that did not cause the target to "die".
		T is short for tags . The number of tags in this game on an opponent that did not cause a deactivation.
K	D	K is short for Kills . This is the number of times this gaming gun made the hit that caused the target unit to enter dead state during the simulation.
		D is short for deactivations during the simulation. This is the number of opponents the gaming gun has deactivated during this game.
A xxx%	A xxx%	A is short for Accuracy percentage . For example if you fire twice and hit once then you'll have an accuracy of 50%.
S	S	S is short for spawns . It is the number of times this unit was re-spawned or in laser tag mode, reactivated during this game.
Ind	Ind	Indoor range which is significantly shorter than short range. Used to reduce infrared bounce.
Shr	Shr	Short range
Med	Med	Medium range
Lng	Lng	Long range
IX	IX	SATR enables up to four separate groups to play simultaneously without crossfire. This stands for batlle 1 (or "game 1" in laser tag). The X indicates that is blindly fire on .
1A	1A	This stands for batlle 1 (or "game 1" in laser tag) with this gaming gun assigned to Team A . Team A gaming guns cannot shoot other Teams A units. Team A gaming guns can only shoot Team B.
2B	2B	This stands for batlle 2 (or "game 2" in laser tag) with this gaming gun assigned to Team B .
Ready	Ready	This is the current status. Ready is in a live game but not currently performing any action.

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Firing	Tagging	Shooting the infrared beam of the target.
Reload	Charging	Currently loading a new magazine or in laser tag terms loading a new battery.
Empty	Empty	In weapons using SA mode, when a round is fired, the status changes to "Empty" until the right button is used to simulate working of the bolt.
Open Bolt	Open Bolt	In SA mode, after pushing the right button once, the bolt enter into open bolt state.
Close Bolt	Close Bolt	A unit in open bolt state to fire again, must have the bolt closed; this is done by pushing the right button again.
Wound	Tagged	In normal mode, this means an enemy has recently hit this gaming gun and is close to "death". In laser tag mode this means an opponent has recently tagged this phaser and is now close to being deactivated.
Paused	Paused	This gaming gun/phaser is in paused state and will need a resume command by radio or infrared to resume.
Resume	Resume	A paused gaming gun/phaser has recently received a resume command after being in paused state.
Game Over	Game Over	This unit has received a end game signal by radio from a master controller or if out of radio range has had the game timer reach zero.
Near Miss	Near Miss	This unit has recently been hit or tagged but hit points are still high.
FA	FA	Fully automatic.
SA	SA	Semi-automatic meaning one shot per trigger pull.
BA	BA	Bolt Action meaning one shot per trigger pull and the right button must be pushed twice between each shot.
SS	SS	Single Shot must be reloaded after each shot.
BV	BV	Revolver simulation, similar to SA.
AL	AL	Automatically loading handgun similar to SA.

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1.5 The statistics explained

Take a look at the image above. On the display "H" stands for hits. Now gamers know exactly how many hits they have made. "K" stands for kills. Say a gamer has 4 hit points, the 1st time you shoot them your opponent will hear a reload sound effect, like a bullet whizzing past, the second time you hit them they will hear an "OAGH" or wound sound effect, 1st "em again and they'll hear another "OAGH" and the last time you get 'em they will hear the "AAAAAAGH" dead sound effect. On your display (see above) you will see H K K 0. Because, in this example case you used 3 bullets for 0 hits, your accuracy percentage is 0%.

Different SATR guns are allocated different amounts of ammo depending on the weapon it is currently emulating. Next "R" stands for reloads, in this case the gamer has 14 of a possible 15 reloads left. "S" stands for number of spawns (how many times you have been re-spawned). The next section represents the gaming gun's current weapon's range.

- Lng: Long (Outdoor for machine guns and most rifles)
- Med: Medium (Outdoor for carbines and the personal defence weapons)
- SHt: Short (Outdoor for sub machine guns and pistols) or
- Ind: Indoor (All units operating in a tight indoor environment or around inflatable's).

The letters "FA" stands for Fully Auto, you can also have SA for semi-auto or BA for bolt action. The word "Reloading" on the display indicates the gun is currently in the process of reloading.

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1.5.1 The Display Screen Basics (Laser Tag Theme)



HP = Health Points 5/5
 C = Charge 25/25
 R = Reloads Unlimited
 T = Tagged (counts how many they have Tagged)
 D = Deactivated (count how many they have deactivated)
 A 100% = Accuracy %
 S = Zero re-spawns/re-activations
 SHt = Short Range (this could be medium or long as well)
 1A = Game 1, Team A (this could be 1B meaning Team B)
 Ready = Status of the phaser (this can be tagging, game over, deactivated)
 SA = Semi Automatic (this could also read FA = Fully Automatic)

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2 SATR System – An Overview

SATR is short for Small Arms Transmitter/Receiver. SATR is an electronic system used for the live action combat simulation for entertainment. SATR is purposely designed to be configurable to be suitable for "Laser Tag" style games all the way up to realistic training programs for the military.

Each SATR unit is capable of acting in various modes. The options include:

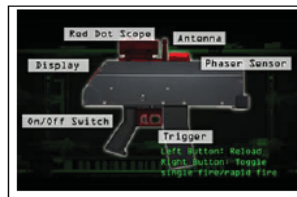
- Weapon
- master controller
- battle box (medic box, ammunition box) and
- Mine.

This manual applies only to SATR code versions 1.4 and later. A separate guide is available for earlier versions of code.

SATR supports a Laser Tag theme that can be used instead of the normal military theme. With the Laser Tag theme the terms used changes and some alternative functionality is available.

2.1 Key SATR Features

- Software support for 69 different small arms including a range of hand guns, sub machine guns, rifles and machine guns
- Real time hit feedback
- Real time on gun individual performance statistics
- Back lit LCD display (back lit controlled by a special button)
- Radio control system to help staff manage the games
- Three difficulty levels
- Automatic re-spawn counting
- Indoor support (lower infrared power)
- Removing of friendly fire (optional)
- Smart medic and ammunition boxes
- Three mine modes.
- Laser Tag settings (when the language selection is "Laser Tag")



2.2 Factory Default Settings

Unless otherwise stipulated at the time of order, the factory default settings are:

- Difficulty: Easy
- Range: Long
- Mode: Outdoor
- Battle: 1
- Friendly Fire: On (i.e. no teams)
- Muzzle flash color: White
- Voice feedback: on
- Volume: high
- Language: American Female English (unless you've specified an alternate language).

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2.3 Backward Compatibility

Version 1.4 of SATR is backwards compatible with older versions of SATR with the following limitations:

- An ammunition box must be version 1.4 to reload gaming guns with 1.4 code loaded
- An medic box must be 1.3a or later to re-spawn a gaming gun with 1.3 or later code
- A master controller must be 1.3a or later code to re-spawn gaming guns with 1.3 or later code.
- For a gaming gun to use the kill mode, the target gaming guns also require 1.4 code.
- A master controller must be 1.4 code to reload 1.4 code version gaming guns
- Gaming guns will only get the new features if they are upgraded to 1.4 code version.

2.4 Master Controller Mode

The Master Controller can perform both infrared & radio functions:

Normal Infrared (direct line of fire – target a single unit)

COMMAND	FUNCTION
Spawn	Target gaming gun is re-spawned if they were in dead state
Reload	Target gaming gun that has used at least 1 magazine of ammunition will have all their ammunition restored.
Pause	Target gaming gun enters into a pause state.
Resume	Target gaming gun in pause state returns to normal operations.
Target Reset	Reset all factory default settings except language to target gaming gun.
Kill	Target gaming gun immediately enters dead state.
New Mission	Target gaming gun starts a new game restoring all health, ammunition and resetting all statistical information. This is useful if you have send a "game start" command via RF to the entire group and one unit didn't start.
Sensor Test	Target gaming gun head sensor light flashes if the sensor system is working.
Shoot	Target gaming gun has their hit points reduced by 1.
Set Health/Ch Hth	Set the target gaming gun to a new maximum hit point level.
Set Difficulty	Updates the difficulty level of the target gaming gun including setting the hit points to the default value of the specified difficulty level
Set Game Timer	Specifies the number of minutes the battle will run for from the time the start function is used before the gaming guns automatically enter the game over state.

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Set Battle	A gaming gun will only accept radio commands, accept hits and hit others if they are all in the same battle group (or game group if you are using the Laser Tag settings). This function means separate battles can be played in close proximity to each other without them affecting other groups.
Set Team	This function allows the teams to be set to team A or team B by infrared command. Phasers on team A cannot be hit by gaming guns on their own team. Team A units can only hit team B. Do not mix friendly fire on with team settings – all gaming guns should be set to a team or all gaming guns should have friendly fire on. Generally for civilian use Battlefield Sports recommends that friendly fire is turned off by assigning gaming guns to a team.
Set/Chg Weapons	Step 1: Specify what weapon emulation in each gun class (Hand guns, Sub machine guns, Rifles and machine guns) you want to use. Step 2: Then use the Chg. Weapons command and shout the master controller towards the gaming guns to change their weapon emulation to match the one you just specified on your master controller.

Infrared functions when Laser Tag language is selected
 Please note: Instead of gaming guns use the word phasers.

COMMAND	FUNCTION
Reactivate	Function is to reactivate a phaser that is currently deactivated.
Charge	Equivalent of reload ammunition, except with a laser theme, one has power depletion that can be recharged.
Pause	Sends the target phasers into pause state.
Resume	Target phaser in pause state return to their state before the pause.
Laser Tag A	Resets the target phaser back to a working set of defaults suitable for laser tag themed games. It also sets the phaser to team A. All phasers will be configured to easy mode, Scorpion emulation and medium range.
Laser Tag B	Resets the target phaser back to a working set of defaults suitable for laser tag themed games. It also sets the phaser to team B.
Target Reset	Resets most settings back to factory default values except for language settings.
Deactivate	Sends target phaser into deactivation state regardless of health of the phaser.
New Mission	Target a phaser starts a new game. This is useful if you have send a "game start" command via RF to the entire group and one unit didn't start.

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Sensor Test	Target phaser's head sensor lights flash if the sensor system is working.
Tag	Target phaser hit points are reduce by 1.
Set Health/Ch 100	Updates the hit points of target phasers based on the value specified by the operator.
Set Difficulty/Ch 00	Updates the difficulty level of the target phasers including setting the hit points to the default value of the specified difficulty level.
Set Game/Timer	Specifies the number of minutes the game will run for from the time the start function was used before the phasers automatically enter into the game over state.
Set Game/Chg Game	Game is the equivalent of Battle. A phaser will only accept radio commands, accept tags and tag others if they are all on the same game.
Set Team/Chg to Team	This function allows the teams to be set to team A or team B by infrared command. Phasers on team A cannot be tagged by phasers on team B and vice versa. Do not mix friendly fire on with team settings – all phasers should be set to a team or all phasers should have friendly fire on.
Chg Phasers (Set Phaser)	Specify what phaser emulation in each phaser class (Tiny, Small, Medium, Large) and then use the Chg Phasers command to make that so on phasers targeted by the master controller.

Radio commands affect all SATR units configured to the same battle group (or game group).

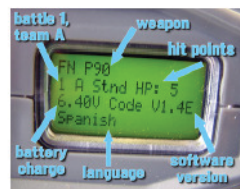
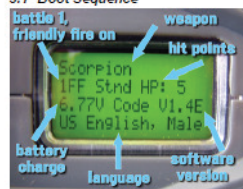
- Pause
- Resume
- End Game (disables all SATR units in this battle)
- Start Game (enables all SATR units that were disabled)

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3 SATR – Standard Playing Unit

3.1 Boot Sequence



The SATR unit is turned on and off using a switch operated by a key. Upon boot there are 3 options available to the user:

1. **Pull trigger:** Commence a few second count down to use the last configuration
2. **Push left (red) button:** Go to menu for selecting difficulty level, weapon, reloads, health, and language.
3. **Push right (black) button:** Go to menu for selecting mode (weapon, medic box, ammunition box, claymore mine, normal mine and dirty mine), gun class, muzzle flash, hit light color, battle, indoor/outdoor mode, voice feedback status, Master Controller mode on/off, volume.

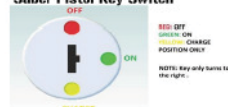
During the boot sequence the back light on the display is automatically turned on until the 3 second count down commences. The back light is also on when the SATR unit is used in controller mode. During a ready state, the back light will only come on after pressing the right button.

3.1.1 Saber Pistol Key Switch

Most gaming gun models have a standard electronic key switch, which needs to be ¼ turn clockwise to switch on (and the reverse to switch off).

The Saber Pistol has a smaller key. See below for settings.

Saber Pistol Key Switch



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3.2 Menu Scroll and Select

All menus in SATR operate in the same manner. Press the left (red) button to scroll down to the list of options. The right (black) button is used to scroll up the list of options. The trigger is used to select the current option.

3.3 Reload (left/red) Button Menus

SELECT DIFFICULTY LEVEL

On pressing the reload button, the menu to select the difficulty level comes up.

Scroll using the left or right buttons to select a difficulty level and then pull the trigger to lock in the selection.

Difficulty Level	Unlimited Reloads	Minimum Time between hits (seconds)	Automatic Reload	Default Health (hit points)	Recoil (turn off scope power)
Easy	Yes	2	Yes	5	No
Standard	No	1	No	5	Yes
Hard	No	0.5	No	3	Yes

SELECT WEAPON

After selecting the difficulty level, the selection of available weapons for the current gun class is listed. To change the gun class, press the right (black) button on initial boot must be used.



As the user scrolls through the list, a verbal description of the weapon is played explaining the weapon and its capabilities. A full description of each weapon is available in the appendix.

"Reis" is the default number of reloads

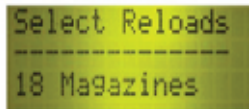
"Mag" is the magazine capacity of the weapon.

SET RELOADS

The default number of ammunition reloads is determined by the weapon selected in the previous step. But you can override this and set the number of reloads.

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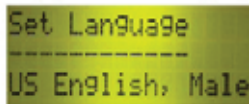
November 25, 2011 [USER GUIDE FOR SATR CODE V1.4+]

**SET HEALTH**

Health is measured by a hit point system. Each time a gamer takes a hit, the number of hit points is reduced by 1. The lower the initial health value is, the more realistic and harder the simulation is. For beginners, Battlefield Sports recommends 5 hits (hit points) and for advanced gamers, between 2 and 3 hit points works best.

**SELECT LANGUAGE**

A language can be chosen for the in game spoken sound effects.



The languages available are:

1. US English - Female (this is the factory default, unless otherwise stipulated)
2. US English - Male
3. British English - British
4. Arabic
5. Mandarin
6. Deutsche (German)
7. French
8. Italian
9. Japanese
10. Portuguese
11. Russian
12. Spanish
13. Vietnamese
14. Laser Tag US English/Female (changes voice sounds and display settings to Laser Tag)

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15. Custom (you can have your own language, you will just need to provide us certain sound files when you order, i.e. I like 8 bit mono wav file format please contact us if you would like this option).

The Laser Tag sound scheme is for those operators that need something funnier than the normal spoken sound effects. Usually the Laser Tag sound scheme is used in conjunction with the Scorpion weapon emulation. Laser Tag sound effects say "Tagged", "De-activated", "De-activated Already", "Game Start" and "Game Over" in US female English. The display also changes in ready mode to have C for charges (ammunition), T for tags (hits), and D for deactivations (kills).

Custom file name on SD card	Sound
NOAMMO.WAV	Ammunition Depleted
DEAD.WAV	Dead Already
HIT.WAV	Casualty
KILL.WAV	GI Confirmed
COMPLETE.WAV	Mission Complete
START.WAV	Mission Start
PAUSED.WAV	Paused
RELOADED	Reloaded
RESPAWN	Re-spawned
CONTINUE.WAV	Resumed

3.4 Mode (RIGHT/black) Button Menus

This series of menus is entered after initial boot with key switch and pushing the mode switch found on the right hand side of the SATR unit.

GUN RESET/PHASER RESET

To set a gaming gun back to factory default settings for the current gun class, then use this option to do so.

Push the left button and then pull the trigger to reset to default. This will not change the gun class.

DEVICE ROLE

This determines if this SATR unit should act as a Master Controller, mine, medic box, ammunition box or a standard weapon.

SELECTION	EFFECT
Weapon Mode	Means this gaming gun acts like a normal weapon for a gamer.
Ammunition Box	Unit will boot in reload mode each time the trigger is then pulled in a game, it will perform the Master Controller function of "Reload". When set to an Ammunition Box the unit can be configured to perform a specified number of reloads or reload for a specified time.
Medic Box	Unit will boot in respawn mode, if the medic box is assigned

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	to a team it will only re-spawn that team. When in ready state, the reload and mode buttons are disabled. A gamer re-spawns by pushing the main Hager button on the unit while ensuring the sensor can be hit by the infrared beam. It also resets the respawn counter on the RF "game end" and "game start" function. While in live state, the reload and mode buttons are disabled. Medic boxes can be configured to perform a specified number of spawns or spawn for a specified period of time. A RF end/start sequence will restart these counters. In timed games, with voice feedback turned on, a medic box will provide an audible warning at the 1 minute, 30 seconds and 15 seconds to go marks.
Combo Box	This mode combines the functionality of a medic box and an ammunition box. The left reload button generates a reload command and the trigger button generates a spawn. The right button remains disabled.
Controller	Standard Master Controller formerly known as a referee gun.
Claymore Mine	Designed for claymore mine case. A claymore in this mine will use the kill mode causing the target gaming gun to reduce to 0 hit points immediately.
Normal Mine	Claymore mine that only causes 1 hit per explosion
Dirty Mine	Using shoot signal from claymore but shoots continuously for 22 seconds.
Radio Repeater	This mode is designed to repeat the radio signals from a master controller. The signals repeated are pause, resume, start and end. A device configured as a radio repeater should be placed at the highest point of the field ideally in a tower with minimal amount of line of sight blocking objects.

Follow on menu if medic box option is selected

SELECTION	EFFECT
Medic Box Type	Unlimited means the medic box will perform re-spawns
- Unlimited Spawns/Unlimited ReActv - Time Limited - Limited Respawns/Unlimited ReActvs	Time limited means the operator can specify how many minutes to perform re-spawns. Best to set this, perform an radio end game to set the medic box into game over state and then start the timer with the master controller Start (radio) function.
	Limited means setting a fixed number of re-spawns the

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	medic box will perform before it will automatically stop.
Any Team	Can respawns gaming guns set to team A, Team B or Friendly fire ON.
Select Range	Outdoor is the same as long range for a weapon and indoor is the same as indoor for a weapon.
- Outdoor - Indoor	
Voice Feedback On/Off	Can be used to turn off the audible warnings when the game is close to finishing. In most cases we recommend you leave that on.
Battle Modes	With any team, the medic box will perform spawns regardless of what team the gaming gun is set to.
- Any Team - Team B - Team A	If gaming guns are assigned to a team, then it is best to assign the medic box to the same team. A medic box configured for team A can will not respawns gaming guns on team B.
Battle/Game X	It is important to assign a medic box to the same battle/game as the gaming guns and master controller that will be used for this game. The Battle/Game value is used to isolate one battle from another so they don't interfere with each other.

Follow on menu if a Mine option is chosen

SELECTION	EFFECT
Mult Mine Always Live	Mine rearms in 6 seconds automatically
Single Mine One fire only	Once fired must be reset before it can fire again. A mission end/mission start by RF will rearm the mine.
Regen Mine 2.5min Reload	Mine rearms in 150 seconds automatically
Trigger Mine Shoot to Fire	The mine can be triggered if the sensor on the claymore is hit by any gaming gun.

GUN CLASS

The gun class is used to specify the general class of weapon that this SATR unit has been installed on. It reflects the size, weight and general looks of the weapon so that only weapons from the same gun class can be selected in normal operation.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
--	--

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The machine gun class is assumed to be weapons on some sort of mounting such as a bipod or tripod or vehicle. The result is machine guns have a lower recoil value than many rifles.

There are 4 gun classes available including hand gun, rifle, sub machine gun and machine gun.

LASER TAG CLASS
 When Laser Tag sound scheme is in effect, the classes change to Tiny Phaser, Small Phaser, Medium Phaser and Large Phaser. Here are the equivalent items:

Tiny Phaser	Handgun
Small Phaser	Sub machine gun
Medium Phaser	Rifle
Large Phaser	Machinegun

RECOMMENDED GUN CLASS BY MODEL

MODEL	RECOMMEND GUN CLASS	LASER TAG EQUIVALENT
Spitfire	Submachine gun (sometimes handgun)	Small Phaser
Scorpion	Submachine gun	Small Phaser
P90	Submachine gun (P90)	Small Phaser
Commando	Rifle	Medium Phaser
Pulse Rifle	Rifle	Medium Phaser
M4	Rifle	Medium Phaser
M16	Rifle	Medium Phaser
Morita Sniper	Rifle	Medium Phaser
Morita SAW	Machinegun	Large Phaser

FIRE MODE
 SATR supports variable damage. You can select either a standard "shooting" or tagging mode; or a one-shot/one-kill mode.



Shooting/Tagging	This is the normal mode that means the target gaming gun hit points are reduced by 1 on each hit or tag.
Killing/De-Activating	In this mode a single hit or tag from the shooting gaming gun will cause the target unit to go into dead/deactivated state. Normally only used with high powered sniper rifle weapon emulations.

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MUZZLE FLASH
 The muzzle flash is the forward facing LED's that flash when a gaming gun is firing. The colour of the flash is configurable. The default white is used usually as it tends to look the most realistic. However the red and green options are sometimes used to distinguish teams at night, this is typically done in conjunction with setting the hit light to the same colour.



The default is white muzzle flash. The options are:

- White Muzzle Flash
- Red Muzzle Flash
- Green Muzzle Flash (or alternative a blue muzzle flash if you've ordered Cobras, this needs to be stipulated at time of order)
- No Muzzle Flash

Even if a muzzle flash colour is selected, a SATR unit configured as an MP5 SD will still not generate a muzzle flash.

HIT LIGHT
 The hit light is the LED that flashes in the sensor domes when a unit takes a hit and stays on while in dead state.

The default "No hit light" option results in no hit light showing when SATR is hit but does result in a red hit light when the unit is dead. Because SATR has a radio hit feedback system, the hit light is unnecessary in many circumstances.

The other options are green and red hit light.

RANGE: INDOOR/OUTDOOR
 When operating a very close quarter's games typically of an indoor environment, the indoor option should be selected. The indoor option significantly reduces the power of the infrared beam. The purpose of range reduction is to minimize the level of infrared rebound sometimes known as IR bounce. Setting indoor mode means the gaming gun will ignore the normal range for the specified weapon including range override. Indoor range is even shorter than "short range".



When operating indoors Battlefield Sports recommends that all walls are painted matt black and we recommend that friendly fire is turned off by setting the teams.

RANGE OVER RIDE
 Every individual weapon simulated by SATR has a range specified for it. However the default range associated with the weapon are designed to create fair game balance between different model gaming guns. However if required, you can specify the range independently of the weapon emulation by using the "Select Range" menu item.

If the default range is selected, then the range used is the range of the weapon selected at the time of firing unless indoor mode is selected.

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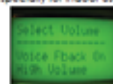
November 25, 2011 [USER GUIDE FOR SATR CODE V1.41]

If SATR is installed in a unit with a short range 25mm lens such as a Spitfire mode prior to 2009, the range override should be used to force the long range while simulating a sub machine gun. For example a Spitfire configured as an UZI would normally be short range but it is recommending that the range override be used to set it to long range otherwise the range will be ultra short (double short range, one from the SATR electronics range reduction and one from the limitations of the small 25mm lens).

SOUND VOLUME

For certain situations the volume of the SATR units needs to be reduced especially for indoor use or in public venues. There are three volume levels to choose from:

- High
- medium or
- low.

**VOICE FEEDBACK**

Some games may prefer that the voice sound effects are turned off so they can be deathier. If feedback is still provided by flashing the red dot scope twice when the gaming gun makes a hit and four times when it makes a kill. Battlefield Sports recommends that the voice feedback is set to ON for all games in all standard sessions for the public.

With a medic box, ammunition box and a master controller if the voice feedback is ON and a timed game is in operation each of these devices will make an audible warning with 1 minute, 30 seconds and 15 seconds to go.

FRIENDLY FIRE

This option allows the operator to disable friendly fire if required. This is most applicable to events where there is very high gamer to space ratio. In normal Battlefield Live games, friendly fire should be allowed.

Friendly Fire On

"Friendly fire ON" means that this SATR can accept hits from any SATR unit assigned to this battle.

"Team A" means this SATR unit will only accept hits from SATR units assigned to TEAM B and only if they are in the same battle. Therefore Team A gaming guns cannot hit this unit.

"Team B" means this SATR unit will only accept hits from SATR units assigned to TEAM A and only if they are in the same battle.

BATTLE/GAME

SATR is designed to allow one battle to be isolated from another battle so that radio and infrared messages between battles is prevented. Four separate battles are supported. In Laser Tag mode this is called "Game" instead of Battle.

If using the standard settings you will see... If using the "Laser Tag" theme you will see...

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The Battle can also be set using a SATR unit working in Master Controller mode.

3.5 Standard Playing Mode

Assuming the unit has not been configured to operate as a Master Controller, this is the mode of operation after the boot/menu selection sequence is complete.

3.5.1 Count Down/Save Configuration

Whenever SATR processes a re-spin or starts a new game, it commences a 3 second count where the gamer cannot take any action but also cannot be hit by any other SATR unit. After the 3 second count down is complete, the audio files load into memory. The result is to give a gamer approximately 4 seconds to move to a safer position. By pulling the trigger the user can bypass the 3 second count down and go to audio file load immediately.

If a gaming gun is started with a radio message, the gaming goes immediately to ready.

The countdown also displays the current battle so that gamers can check their unit will work with the other units in the same battle.

3.5.2 Ready

Upon start up or whenever SATR is alive and is not performing another function like shooting, reloading or taking a hit, it goes into ready mode.

FIRING STATISTICS

Character	Meaning
H/T	Hits/Tags: Number of hits made on another SATR unit this game that did not result in a kill.
K/D	Kills/Deactivations: The number of hits made on another SATR unit this game that resulting in a kill (dead)
A	Accuracy: The number of hits including kills compared to number of rounds fired as a percentage

MODES OF FIRE

Mode of Fire	Description
FA	Full Automatic
BF	Burst Fire - limited to 3 rounds per automatic burst
SA	Semi Automatic
BA	Bolt Action
RV	Revolver

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AL	Auto Loader (Pistol)
SS	Single Shot

3.5.3 Firing

From the ready state, a trigger pull will cause SATR to commence firing assuming there is ammunition left in the current magazine. For weapons with a SA mode of fire, the right button will need to be pushed after each shot before another shot can be fired.

Upon firing SATR will generate an infrared pulse for every round fired as well as a muzzle flash and appropriate shooting sound effect.

If the fire mode is FA, then SATR will keep firing while the trigger is pulled until it runs out of ammunition or receives an external event such as a hit.

If the fire mode is SF, SATR will fire up to 3 rounds with the trigger pulled. To continue firing the trigger must be released and then pulled again.

In all other modes of fire, after each shot the trigger must be released before another shot can be made.

If the SATR unit makes a hit on another SATR unit that does not result in a kill, the number of hits "H" is incremented by 1. If SATR unit makes a hit that causes a kill, the number of kills "K" is incremented by 1. Upon making a hit, a voice message in the selected language will be heard saying "Casualty". If a kill is made, a voice message in the selected language will be heard saying "Kill Confirmed". If the Laser Tag sound scheme is employed, then we have T for tags, D for deactivations and the sound effect for a tag is "Tagged" and for making the final tag it says "Deactivated".

If a SATR unit hits another SATR unit that is already in dead state, a voice message will be heard saying "Dead already" in the language selected. The red dot will also flash once. If the Laser Tag sound scheme is used it will say "Deactivated already".

All such voice messages are produced by the firing SATR unit.

Each time a shot is fired which misses the target, the accuracy percentage will reduce (minimum of 0%) and each time a hit is made, the accuracy percentage will go up. Accuracy is rounded to the nearest whole number.

If the gaming gun has a recoil value greater than 1, then the red dot will be powered down immediately after it fires. The power down time is 0.5 seconds for each point over 1 of recoil associated with the current weapon. Typically in the range of 0.5 to 1.5 seconds. Each shot fired re-starts the power down timer. This function does not occur on easy mode.

Because easy mode does not have the recoil simulation feature, it is the recommended mode for testing the scope.

The bolt action rifle requires manual working of the bolt after every shot. In SATR this is simulated by the operator having to push the right button twice after each shot.

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After a round is fired, the status changes to "Spent Case". After the first right button push the mode changes to "Open Bolt".

And then after the second button push the status will go back to "Ready".

3.5.4 Reload

While in the ready state, pushing and releasing the reload button (left side) will start the ammunition reload sequence assuming there are still reloads available. If the current magazine is full, the reload button is disabled.

While reloading SATR cannot shoot but can be hit by other SATR units. Taking a hit, while reloading slows down the reload process.

Once the reload process is complete, all the ammunition in the current magazine is restored to full.

3.5.5 Right Button

The right button during a live game is used to toggle between fully automatic or burst fire and semi automatic fire. This mode does not perform any action on weapons that do not have secondary mode of fire. For example some machine guns only have fully automatic fire and therefore pushing the right button will have no effect.

The current fire mode is shown on the bottom line of the LCD. For example FA means fully automatic and SA means semiautomatic.

Pushing the right button during live state will always cause the back light to come on for the LCD.

3.5.6 Hit State

When a unit is alive and it receives an infrared signal from another SATR unit in the same battle, a hit is triggered. If the hit reduces the health to 0, SATR enters into a "dead" state.

When hit, a sound effect is heard, the actual sound effect depends on the current health level

Health Level	Sound Effect
4 or more	Hear miss
2 or 3	Wound

SATR assumes that the character cannot really take 4 or more hits before being incapacitated, so when high hit points are used, early reduction in hit points are assumed to be a combination of skill and luck that the character managed to just avoid taking serious damage. For realistic games, Battlefield Sports recommends 2 or 3 hit points are used.

3.5.7 Dead/Deactivate State

The "Dead" status is reached when a SATR unit receives a hit from another SATR unit in the same battle and the receiver's health was 1 before the hit was received. Health is then reduced to 0.

In dead state, all game controlled functions are disabled. To escape from this state requires one of the following events:

- Re spawn from a Master Controller or medic box (recommended for in game spawns)

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- Game end/start radio signals
- New Game IR signal from a Master Controller
- Re-start using key switch (not recommended usually as this clears the statistics)

In Laser Tag mode, the term "Deactivated" is used instead of "Dead".

3.5.8 Pause

A SATR unit currently in live state can be stopped from taking any further gamer input by receiving a pause signal.

A pause signal can be received by radio, in which case all SATR units in the same battle will enter pause state or the signal can be received via an IR message. In the case of an IR message from a Master Controller, only the SATR unit targeted by the Master Controller will enter pause state.

When a SATR is first paused, a spoken sound effect is heard on the paused unit saying "Paused" in the language selected.

3.5.9 Resume

The resume function only works on SATR units that are currently in pause state.

When a SATR gaming gun is resumed, a spoken sound effect is heard on the resumed unit saying "Resumed" in the language selected.

3.5.10 Game Over

The "Game Over" signal comes via a radio signal from the Master Controller and impacts all SATR units in the same battle as the Master Controller is configured too.

When the signal is received a voice saying "Mission Complete" can be heard on the receiving unit in the language selected.

While all gamer controlled functions are frozen, the final game statistics can be seen on the LCD.

To exit game over you need to send a "Start" via radio, or "new mission" via infrared, or manually use of the key switch.

If a timed game is used, the time left in the game will be displayed on the LCD of the master controller and all gaming guns in weapon mode. If the gaming gun is out of RF range of a master controller at game end, it will still enter game over state based on the game timer.

3.5.11 Game Start

The game "Start" function starts a new game including resetting all statistics to 0 and restoring health and ammunition to full values assuming the target gaming guns are currently in game over state.

The game start signal can be received either via IR signal or radio signal. The radio signal only has effect if the gun is configured to the same battle as the Master Controller.

When the signal is received a voice saying "Mission Start" (or "Game Start" in Laser Tag sound scheme) can be heard on the receiving unit in the language selected.

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If a timed game is started, then a countdown time will be displayed on the master controller and all target gaming guns in weapon mode. For gaming guns already started, a new radio start command will reset the countdown timer.

3.6 Master Controller Mode

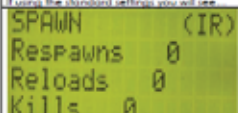
To configure a unit as a master controller on initial boot push the right button and then change the mode of operation to "Controller".

The functions of the Master Controller can be broken down into three types

Character after function name	Meaning
(IR)	Signal is sent by infrared beam and only affects the SATR unit(s) being aimed at by the Master Controller. Generally the target gaming gun hit light flashes when it receives an IR signal from a master controller.
(Radio)	The signal is sent by radio message and will be received and processed by all SATR units currently configured to the same battle as the Master Controller.
Blank	These functions do not send a signal to any SATR units. They are used to change internally values such as difficulty level, team, game times, hit points and battle.

3.6.1 Spawn/Reactivate Mode (IR)

The default function of a Master Controller is to perform spawns on SATR units that are currently in dead state and to count the number of times this has been successfully performed during the current game.

If using the standard settings you will see	If using the "Laser Tag" theme you will see
	

The first line indicates the current mode the Master Controller is operating in; in this case it is in "SPAWN" mode. The "(IR)" indicates the function is performed by the infrared emitter directed by the referee towards the target SATR unit.

Other modes are accessed by using the reload button to scroll down and the mode button to scroll up. To trigger the current function, the trigger is pulled.

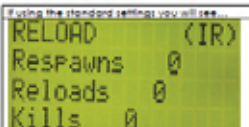
A spawn restores all the ammunition and hit points of the target SATR unit.

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3.6.2 Reload/Charge Mode (IR)

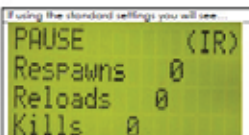
This mode restores the number of magazines on the target SATR unit to the amount specified in the initial configuration of the target SATR unit.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

On the third line of the display, it shows the number of reloads performed this game. This is a useful feature for some games where the amount of spare ammunition is limited.

3.6.3 Pause Mode (IR)

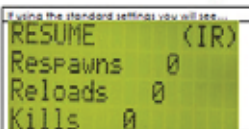
A SATR unit in live state can be paused from the Master Controller using this mode.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

Pausing prevents the gamer from performing any actions with the gun until it receives a resume signal in IR or radio form.

3.6.4 Resume Mode (IR)

This works on a SATR unit that is currently paused and resumes the target unit's operation.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

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3.6.5 Target Reset (IR)

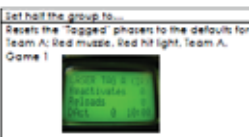
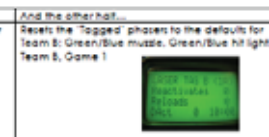
This function is available from version 1.1b or later of SATR software. A target gaming gun will have the following settings reset to factory defaults:

- Muzzle Flash: White
- Hit Light: Red
- Default weapon emulation for the gun class
- Default Range
- Outdoor mode
- Voice Feedback On
- High Volume
- Friendly Fire On
- Battle - this sets the battle to the same battle as the Master Controller.

The purpose of this function is to set the units back to a working set of defaults before then changing the settings to suit the next Live-Play.

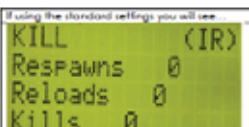
Please note the language setting is not changed by the target reset function.

If you are using the Laser Tag theme the target reset function works in a slightly different way, it enables you to automatically set half of your equipment to Team A and the other half to Team B.

Set half the group to...	And the other half...
Resets the "Tagged" phases to the defaults for Team A: Red muzzle, Red hit light, Team A, Game 1 	Resets the "Tagged" phases to the defaults for Team B: Green/Blue muzzle, Green/Blue hit light, Team B, Game 1 

3.6.6 Kill/Deactivate (IR)

The kill function is a quick way to move a target SATR unit into a dead state. This is for those times that a referee is acting in a non-gamer role of some very destructive weapon such as artillery or automated defence system. Any SATR unit currently alive that receives the infrared kill signal instantly "dies".

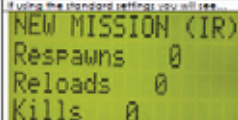
If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

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3.6.7 New Mission (IR)

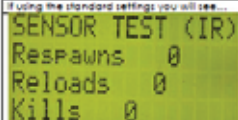
The "New Mission (IR)" function resets a target SATR unit into a live state ready for a new game using the infrared system.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

All the statistics on the target unit are reset. A new mission IR does not restart the game timer on the master controller unlike the Start (Radio) function. If a gaming gun fails to start with the initial start radio function and timed games are being used then use New Mission IR to start those gaming guns.

3.6.8 Sensor Test (IR)

The purpose of this function is to test the target unit sensors to make sure they are receiving hits and processing the radio feedback to the initiating unit.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

The head sensor on the target will flash when it receives an infrared message and the Master Controller will make a short beep sound indicating that it has received a successful radio message from the target unit.

The sensor test process can occur regardless of the state of the gaming guns except if the target unit is turned off.

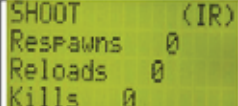
3.6.9 ShootTag (IR)

The Master Controller can shoot at a target SATR unit. The target SATR unit will process the hit exactly the same as if it was hit by another SATR unit.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
--	--

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If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

3.6.10 Pause (Radio)

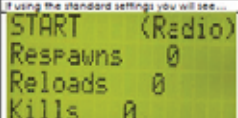
All currently active units within radio range in the battle currently configured for this Master Controller will pause upon receipt of this radio message.

3.6.11 Resume (Radio)

All currently paused SATR units within radio range in the same battle as this Master Controller will resume upon receipt of this signal.

3.6.12 Start Game (Radio)

Any SATR units within radio range, on the same battle as the Master Controller currently in "game over" state will commence 3 second count down and then go to live game status.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
	

If the master controller is set to a timed game, a start game command will start the time countdown. Gaming guns in RF range of the master controller will also start or re-start the game timer countdown which is displayed on the bottom right of the LCD.

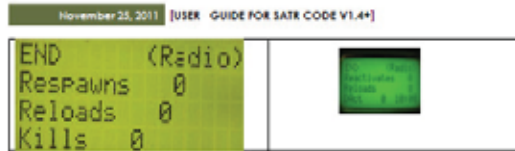
The start function needs to be confirmed by the user before taking effect.

3.6.13 End Game (Radio)

All SATR units within radio range on the same battle as the Master Controller that is currently active will go to "game over" state. Game over state continues to display the statistics on the LCD but otherwise all functions are disabled.

If using the standard settings you will see...	If using the "Laser Tag" theme you will see...
--	--

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The end function needs to be confirmed by the user before it takes effect.

3.6.14 Interrogate IR

This function is used to obtain key configuration and statistical information from the device targeted by an infrared message. This is a really useful function.

With this function you can get the stats of the player you 'Shoot' or 'Tag'. On your screen you will get their HP (1/3, Accuracy), how many people they have tagged and deactivated.

The target is determined by infrared however the statistical information is sent back to the master controller by digital radio.



3.6.15 Set Health

This function changes the hit points of the target gun using the infrared system to the value specified after 'HP'. To change the value the 'set health' function is used. The target gaming gun sensor lights will flash to indicate message received.

The sequence is 'SET HEALTH', then specify the hit points, then point the master controller at the target gaming guns and use the 'CH Hth XXXP (R)' function.

A setting of 'Invulnerable' health means the target SATR unit can take unlimited hits without dying.



3.6.16 Set Difficulty

This function uses the infrared system to change target gaming guns to the specified difficulty level. The target gaming gun sensor lights will flash to indicate message received. The difficulty level is specified using the 'Set Difficulty' function.



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Changing the difficulty level also resets the hit points to the default value for that difficulty level. If you want use the Master Controller mode to change the hit points and the difficulty level where the hit points are different from the default, then change the difficulty level first and then change the hit points.

3.6.17 Set Game Timer

SATR allows the operator the set time that a particular battle/game will run for before it automatically ends. The time starts when a Start (Radio) command is performed. At the end of the time, the master controller will automatically send an End (Radio) command. If a fixed game is used the time left in the game is displayed on the master controller and each gaming gun/phaser assigned to this battle/game.



3.6.18 Set Battle

This function allows the referee to quickly change a target SATR unit to operate in a new battle/game. The first step is to specify the battle and then use the trigger to go to the CHG BATTLE command. The CHG BATTLE command is an infrared function so it only affects those gaming guns hit.



3.6.19 Set Team

A master controller can be used to set the team value of a target gaming gun by IR.



'Set FF On' - Turns on Friendly fire so that gamers from the same team can hit each other.

'Set Team A' - All gaming guns hit with the IR beam will be set to team A. Team A gaming guns cannot hit other team A gaming guns.

'Set Team B' - Sets target gaming guns to team B.

It is very important to not mix Friendly fire ON with gaming guns set to a team.

3.6.20 Chg Weapons (IR)/Chg Phasers (IR)

The change weapons function sets the weapon on the target gaming gun based on two factors:

- 1) The Gun Class of the target gaming gun (Handgun, Sub machinegun, Rifle and Machinegun).
- 2) The weapon specified on the Master Controller in each class using the 'Set Weapons' function.



For example if the Master Controller current settings for weapons in each class was:

- Handgun: PPM M4000
- Sub machinegun: PPS-43
- Rifle: AE47/AEM
- Machinegun: RPK LMG

And the target guns current gun class is Rifle, then it will change to a AE47/AEM as the current weapon.

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If no weapons have been set since the last boot of the Master Controller, then the default settings will apply:

The target gaming gun sensor lights will flash to indicate message received.

3.6.21 Set Weapons/Set Phasers

The SATR unit configured as a Master Controller can use the infrared system to establish a specific weapon for each gun class. The principle is SATR when installed into a case will have the Gun Class configured so that the selection of weapons is consistent with the case shape. However when running a UserKey each team might be assigned a particular model of gun class, for example for a World War II Soviet force the following could be used:



- All handguns become Tokarev TH-32's
- All submachine guns become PP1 - 43's
- All rifles become Mosin-Nagant Rifles
- All machine guns become Degtyarev DP UMG's

The process is for the referee to configure on the Master Controller the weapon to be used in each gun class and then when ready "shoot" all the target gaming guns (they must be switch on) changing their statistics and sound effects to match those of the specified weapon.

Step 1: Select the function "Set Weapons" and then pull the trigger.

Step 2: Select the gun class you wish to change by using the reload/mode buttons followed by a trigger pull. The display shows the gun class and the current weapon that the unit target unit in this gun class will change to.

Step 3: Select the weapon from the list and then pull the trigger.

The trigger pull will bring up the next gun class.

Repeat steps 2 and 3 to set a weapon for each gun class. Selection of a machine gun with the trigger pull will take you back to the main menu at "Set Weapons". A left button push on the gun class selection when machine gun is currently listed will also return you to the "Set Weapons" menu option.

3.7 Battle Box (Medic Box)

After initial boot go the right menu and work through until it says "weapon mode", then change this to "medic box" and then just keep pulling the trigger.

Once in a live state the medic box, the medic box will only accept the trigger button input, causing it to transmit a respawn signal to gaming guns nearby and in direct infrared line of sight.

The reload and mode buttons are disabled so the gamers cannot access any other function, it will only perform respawns. The medic box will count the number of respawns it performs by using the radio feedback system, up to 2 people can be spawned at a time and get fairly accurate counting.

Medic box can be easily re-configured to work as an ammunition box.

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The medic box will reset the counter for number of spawns after received a radio end/start combination. A medic box allows the number of respawns to be restricted to a specific count nominated by the referee on initial boot or the referee can set it to respawn for a certain number of minutes or it can remain unrestricted like 1.2e. Any gaming gun or Master Controller can also be configured to work as a medic box.

TEAM SPECIFIC RE-SPAWNS

Assuming all gaming guns are upgraded to 1.3a or later software, the medic box can be configured to only re-spawn a specific team. If you set the medic box to team A, it will only re-spawn gaming guns also on team A. This only applies if you have friendly fire off.

CONFIGURING FIXED NUMBER OF RESPAWNS

On initial boot with key switch go to the right button menu, scroll through the list and make sure the current mode says "Medic Box" rather than something else like "weapon mode", "Controller mode", "Ammunition box", "Claymore Mine", "Homal Mine" or "Dirty Mine".

After trigger push (pull on a gaming gun) the heading will say "Medic Box Type". Scroll through list using left or right button until it says "Limited Respawn" and then push trigger button. Use the left/right buttons to specify a number of respawns. Finally keep triggering through until the unit fully boots with a heading of "MEDIC Battle x" where x is the battle this medic box is assigned to.

CONFIGURING FIXED TIME RESPAWNS

This is very similar to configuring fixed number of respawns. Go to the "Medic Box Type" and make sure it says "Time Limited", push the trigger button and then use the left/right buttons to change the value in minutes. Allowable values are:

- 1 to 99 - select individual minutes, e.g. 4 or 12 or 18 etc
- From 30 - select minutes in increments of 5, e.g. 35, 40, 45 etc
- From 60 - select minutes in increments of 10, e.g. 70, 80, 90 up to a maximum of 120.



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