OFFICIAL PUBLICATION

FM-500

FIELD MANUAL

MULTI-WEAPON SIMULATION SYSTEM (MWSS)

MilesTag™
Electronic Tactical Infrared Combat Systems

Revision 08
Firmware Version 5.20 build 10

WARRANTY INFORMATION

No warranty or guarantee exists beyond that provided with the product at the time of purchase. Usually this warranty will cover defects in materials and workmanship of the purchased item for a limited period of time. Any system or component failures due to physical abuse (intentional or accidental), improper use/connection, improper handling, improper soldering techniques, etc. will not be covered. Determination of the cause of failure is at the sole discretion of the seller. All repair- or replacement-related shipping costs, including insurance, are the responsibility of the buyer. Non-warranty items, and partially assembled kits returned for testing or repair may be subject to labor fees of $40/hr. This is in addition to the cost of any parts required. Repair fees will be pre-approved by the buyer before any repairs are performed. Items covered by warranty may be repaired or replaced at the discretion of the seller. If you have questions, please contact us.

TECHNICAL SUPPORT

Please feel free to email us if you have problems, questions, comments or suggestions. However, our ability to provide technical assistance via email is very limited. Please be patient as we cannot answer all requests for support immediately. Priority is given to individuals who have purchased pre-assembled modules.

We can not provide technical support or troubleshooting assistance related to the PicBasic Pro compiler or any specific PIC programming devices and related software (including the Tiny Bootloader). Please contact the manufacturers or authors directly. Some PicBasic Pro assistance may be found here:

http://www.picbasic.co.uk/forum/

For the fastest technical assistance on the MilesTag system, please post your questions and/or comments on the MilesTag sub-forum at **LaserForums**.

http://www.laserforums.com

CONTACT INFORMATION

Email: milestag@lasertagparts.com

Website: http://www.lasertagparts.com

OVERVIEW OF SYSTEM FEATURES

- Supports up to 32 Players
  - Each player is identified by a 5-character "handle" (e.g. "Rambo", "Ghost", "Viper").
  - Scores and other game statistics can be tracked for each player.
- Supports up to 7 Teams
  - Friendly Fire hits can be enabled or disabled.
  - Teams are identified by a Color. This allows use of colored armbands during play.
- 10 Peset Weapon Configurations
  - Easily edit and save your own "Custom Weapon" configuration.
- 8 Preset Game Configurations
  - Easily edit and save your own "Custom Game".
- Transmit Custom Weapon or Game Configurations to any other gun with the "Cloning" feature
- Over 40 editable parameters – Editing is done ON THE GUN! No PC or master controller required.
  Easy menu navigation
- Simulated Muzzle Flash
  - Super-bright LED.
  - Can be disabled in Game Configuration for stealth games.
- Hit LEDs incorporated into sensors
  - Provides visual confirmation that you are landing your shots.
  - LEDs stay on when player is "tagged out".
  - Power-save feature automatically shuts LEDs off after 3 minutes
- Digital sound support (optional but highly recommended)
  - Connections provided for ISD2560-based add-on Sound Module
  - Create your own sounds using standard .wav files
  - Auto-detection of Sound Module
    - Defaults to Piezo Buzzer sounds if Sound Module is not installed
- Adjustable IR Carrier Frequency (38KHz, 40KHz, 56KHz) allows you to use various IR receivers
- Gun Priority feature: Trigger and Reload are active from any of the main display screens
- Full Source Code and Schematics provided
  - Uses highly-readable PicBasic Pro™ language (www.melabs.com)
  - * Allows you to freely customize, hack, personalize, tweak and experiment with the code.
  - * Add your own functions, edit the LCD messages, modify presets and Player Handles
  - Educational – study the source code to "see how it works"
    * Requires PicBasicPro Compiler
- Free Firmware Updates
  - Download latest Firmware Version directly from the website

Master Controller (God Gun) Features:

- Pre-game functions to quickly assign teams and set up games
- Remotely reconfigure any 5.XX gun
- Referee can remotely Start, Stop, Pause or Kill players during the game
- Post-game functions to award points, Reset Players, etc
- Diagnostic functions

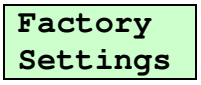
Boot Loader

- Allows Firmware Updates directly from PC Serial Port (Serial Adaptor required)
  - Serial Adaptor is built from readily-available components (schematic provided)
- No disassembly of gun is required - processor is updated in-circuit.
- Uses third-party freeware PC application
- No costly programming hardware or software required

BASIC OPERATION

Restore Factory Settings: (default configuration)

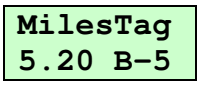
1. Turn system OFF.
2. Turn Config Key ON.
3. Press and Hold the MODE Button while turning system ON.
4. You will briefly see the following message in the LCD:



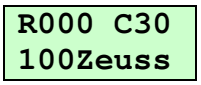
5. The system will then proceed with normal power up…

Power Up:

1. Ensure Config Key is OFF.
2. Turn system ON.
3. You will briefly see the **Version Screen** in the LCD (*version number may be different*):



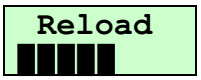
4. There will be a short beep from the Piezo and the Hit LED will flash. If the ISD sound board is installed, you will also hear the power-up sound.
5. After about 1 second, the **Main Firing Display** is displayed.



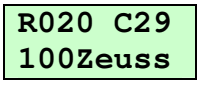
6. The top line of the display indicates that you currently have zero rounds in the gun (R000), but you are carrying 30 full clips (C30). The bottom line of the display indicates that you have 100% health, and your Player Handle is "Zeuss". When you are hit (tagged) by an opponent, the LCD will show the handle of the player that hit you.

Loading and Firing:

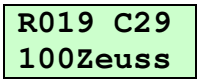
1. Press the RELOAD button. There is a short delay while the gun is "reloaded". This delay simulates the time required to change clips. The LCD shows reloading progress:



2. When the reload completes, you are returned to the **Main Firing Display**. You now have a full 20-round clip in the gun and 29 Clips available:



3. Press the TRIGGER button. You will hear the firing sound and see the muzzle flash. The LCD is updated to show the remaining rounds.



4. You can continue firing until the clip is empty. Once the clip is empty, you will hear the "hammer click" sound when pressing the TRIGGER button.
5. Press the RELOAD button again to insert a fresh clip. You can also reload before a clip is empty. Partial clips are not lost. They are retained by the system and automatically recombined into full clips if possible.

Factory Default Settings:

These are the default settings of the MilesTag 5.XX system. For purposes of clarity, not all of the parameters are shown here. There are a number of more advanced features available in each category. The purpose of the Factory Default Settings is to provide an "instant gratification" mode. In this configuration, the guns can be used immediately in a "free-for-all, 10-hits-you're-out" type game. This will enable demonstration of the basic system functions.

SYSTEM

Game ID	= A	
Team_ID	= Red	
Player_ID	= 00	(recommend selecting a unique ID for each gun)
Protocol	= MilesTag	
IR Carrier Freq	= 40KHz	(**must** be changed if not using 40KHz sensors)
IR Carrier Duty	= 30%	

WEAPON

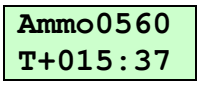
Hit Points	= 10	
Rounds per Clip	= 20	
Clips	= 30	
Firing Mode	= Semi-Auto	
Reload Time	= 2 seconds	

GAME

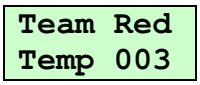
Sounds	= ON	
Muzzle Flash	= ON	
Hit LEDs	= ON	
Friendly Fire	= ON	(recommend turning this OFF for Team Games)
Live Power Up	= ON	(recommend turning this OFF for anti-cheat protection)
Unlimited Clips	= OFF	
Player Handles	= ON	
Infrared Boost	= ON	(recommend Disabling this for Indoor Games)
Barrel Overheat	= ON	

Status Displays:

1. From the Main Firing Screen, press and release the MODE button to view **Status Display 1**:



2. The top line of the display shows your Total Ammo remaining. This is the total number of rounds you are carrying, not including any rounds in the active clip. The bottom line of the display shows the Elapsed Time since the system was powered up, or a Start Game command was received (Minutes : Seconds).
3. Press and release the MODE button again to view **Status Display 2**:



4. The top line of the display shows the Team you are currently assigned to. The bottom line of the display shows the Barrel Temperature. As the gun is fired continuously, the barrel temperature will increase. A barrel temperature of 100 will force the gun into an "overheat" condition. This is only a concern under rapid sustained firing. (The barrel overheat function can be disabled).

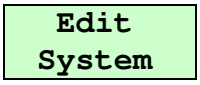
LCD Backlight:

1. The LCD Backlight can be turned ON or OFF by pressing and holding the MODE button for 1 second.
2. The LCD Backlight is automatically turned OFF while firing.
3. The LCD Backlight is automatically turned ON while accessing the Configuration Menus.

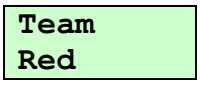
BASIC GAME SETUP

Before starting a game, you will at least want to set each gun to a different **Team ID** and **Player ID**. This is done in Configuration Mode.

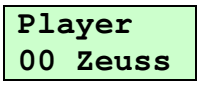
1. Turn the Config Key ON to access the Configuration Mode.
2. The LCD should display the **Edit System** option:



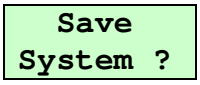
3. Turn the Config Key OFF.
4. Press the TRIGGER button to enter the System Menu.
5. Press and release the MODE button repeatedly until the LCD shows the **Team** option:



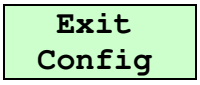
6. Press the TRIGGER button repeatedly to select the desired Team ID. (Disregard if you are not setting up a team-based game).
7. Press and release the MODE button once to select the **Player** option:



8. Press the TRIGGER button repeatedly to select the desired Player ID. Note that the Player Handle is also displayed. Each player must be assigned to a unique Player ID to allow individual scoring.
9. Press and release the MODE button repeatedly until the LCD shows the **Save System ?** option:



10. Press the TRIGGER button to save the current settings and exit the System Sub-menu.
11. Press and release the MODE button repeatedly until the LCD shows the **Exit Config** option:



12. Press the TRIGGER button to exit the Configuration Menu and initialize the system.
13. Ensure the Config Key is OFF.

ANTI-CHEATING FEATURES

The MilesTag 5.XX system provides a number of features to help prevent "cheating" during games. Of course, the best prevention is to not play with Cheaters.

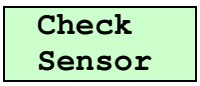
Hit LED and Tone:
When a player is "Tagged Out", a loud steady tone will sound for about 4 seconds and their Hit LEDs will stay ON for a few minutes. This will make it clear to everyone in earshot and eyesight that they are "out".

Game Timer:
By checking the Elapsed Time on each player's gun, it will be apparent if a player has restarted his or her gun at some point during the game.

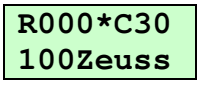
Disable "Live Power Up": `[Config Menu]→[Edit Game]→[LivPwrUp]`
When the Live Power Up feature is DISABLED, the system is "dead" (Game Over) when it is first turned ON. This prevents players from restarting their gun by cycling power off and on. They can only be restarted (respawned) using the Configuration Key (key-operated switch).

Electronic Configuration Key:
Using the Electronic Key enhances security over a physical key, since the key is re-programmable to any one of 255 codes. The security code can be instantly changed for each game if desired.

Sensor Disconnect / Fail Detection:
If the sensors are disconnected (or fail) during a game, an audible alarm will sound and each occurrence is logged to internal EEPROM memory. Reconnecting the sensors will stop the audible alarm, but an asterisk indication will appear on the LCD between the Rounds and Clips (main firing screen). This indicates to the game official that the player is cheating, or the sensors are defective.



This display, accompanied by an audible alarm, indicates that the sensors are disconnected or inoperative.



The **asterisk** between the Rounds and Clips indicates that the sensors were disconnected, or a failure occurred.

Event Logging:
Many events are logged to internal EEPROM (the logs are not reset during power off). Most log items are also downloaded to the God Gun during score transfers to allow game officials to review possible cheating indications.

PLAYER HANDLES

Each Player ID (0 to 31) is assigned a 5–character “Handle” (e.g. “Rambo”, “Ghost”, “Viper” etc). The handles are similar to radio “call signs” used by the military and are helpful in differentiating between players during the game without having to remember, for example, who “Player 10” is. Each time you are Hit (tagged) by an opponent, their Handle will appear in your LCD display. Each player can choose one of the preset handles at the beginning of the game by simply setting their gun to the corresponding Player ID: [Config Menu]→[Edit System]→[PlayerID]

Player 00	Zeuss	Player 16	Razor
Player 01	Eagle	Player 17	Viper
Player 02	P.Dog	Player 18	Gecko
Player 03	Gonzo	Player 19	Pinky
Player 04	Elvis	Player 20	Snake
Player 05	Lucky	Player 21	Vader
Player 06	Rambo	Player 22	Joker
Player 07	Homer	Player 23	Recon
Player 08	Buzzz	Player 24	Pappy
Player 09	Ghost	Player 25	Goose
Player 10	Munky	Player 26	Laser
Player 11	Angel	Player 27	Flash
Player 12	Radar	Player 28	Dozer
Player 13	Spawn	Player 29	Venus
Player 14	Sarge	Player 30	Kronk
Player 15	Zeena	Player 31	Romeo

Player Handles are not editable in the configuration menus -- they can only be modified in the source code. All players in a game should have the same version of Firmware to ensure that the list of handles is identical in all guns. This is required because only the Player ID is transmitted as part of each “shot”, not the handle.

If you do not want to use the Player Handles, they can be disabled. When the Player Handles are disabled, the LCD display will still show Team ID and Player ID. For example “Red05” represents Red Team / Player 05.

[Config Menu]→[Edit Game]→[Handles]

MENU NAVIGATION

The MilesTag 5.XX system contains a large number of user-programmable features and an extensive Configuration Menu System to access and edit those features. To help you learn your way around the Menus, we have provided "Navigation Aids" throughout this manual to guide you to particular features. Often, when a programmable feature is discussed, there will also be a Navigation Aid there to show you how to find it. For example, if we are discussing the "**Player ID**" feature, then the following Navigation Aid might appear…

`[Config Menu]→[Edit System]→[PlayerID]`

This shows you that in order to change (edit) the Player ID, you must first go to the **Config Menu** (the Config Key is required to access this menu). From the Config Menu, you must select **Edit System**. From the Edit System menu you will locate the **PlayerID** option. You can now view and edit the current Player ID value.

OPERATION NOTES

Configuration Menus:
You can modify nearly every feature of the MilesTag system right on the gun itself by using the built-in Configuration Menus. Settings can be changed "on the fly" between games. Endless variations of game play can be achieved by altering the various parameters and all settings are saved to non-volatile memory - so the next time you power up, the system will still have all of its previous settings intact. A cloning function is also available from within the Configuration Menus. The configuration menus can only be accessed while the Config Switch is ON.

Player IDs: `[Config Menu]→[Edit System]→[PlayerID]`
Before starting a game**,** set all guns to a unique Player ID.

Team IDs: `[Config Menu]→[Edit System]→[TeamID]`
For Team Games, make sure all team members are set to the same Team ID. Also make sure that Friendly Fire is turned OFF to prevent accidentally tagging your own team members. This also prevents hits from reflected shots when team members are in close quarters.

Cloning: `[Config Menu]→[Edit System]→([Clone Weapon]/[Clone Game])`
In many games, all of the guns will be configured identically. You can use the Clone feature to quickly set up multiple guns. Cloning does not affect the Player ID, Team ID and Game ID settings.

Kevlar: `[Config Menu]→[Edit Game]→[Kevlar]`
The Kevlar value sets how many "hits" your virtual "Kevlar Vest" can take before it loses effectiveness. The Kevlar value is reduced by "1" after each hit. When it reaches "0", it is automatically disabled. If enabled (value>0) the Kevlar cuts the damage (hit points) in half. So, a hit from a weapon set to 10 hit points would only take 5 points from your health value.

Friendly Fire: `[Config Menu]→[Edit Game]→[FrndFire]`
You can choose whether to allow Friendly Fire (FF) hits in your game. If FF is turned ON, any player can "tag" any other player regardless of their Team ID assignments. If FF is turned OFF, Team IDs are recognized by the system and accidental "tags" against players on your team members will not be counted.

GLADIATOR MODE

Gladiator Mode is a very unique “tags-based” game mode. Rather than deducting damage (hit points) from a starting health value, you define the number of tags (G-Tags) required to tag a player out (2 to 50 tags).

Suppose we set the G-Tags to “4”. In order to be “tagged out”, a player must be hit 4 times by the SAME OPPONENT. This is unique in that tags from various opponents are NOT CUMULATIVE. A player can not be “weakened” by one opponent, and then “finished off” by another.

Basically, every player’s gun uses the Player ID feature to keep track of how many tags it receives from each opponent. If a player is tagged 1 time each by 10 different opponents (10 tags total), he will still only show “1 Tag”. One of those opponents must land 4 tags (or whatever number of G-Tags is selected) in order to tag the player out. Tags from each opponent do NOT have to be consecutive. Each players gun will “remember” the previous tags from every opponent.

The advantage to Gladiator Mode is that each time you “tag out” an opponent, any tags that were landed on you by that opponent no longer matter. You will start on “even ground” with every opponent you encounter.

Gladiator Mode provides a unique gaming experience that can help the best players stand out. It eliminates the threat of being "weakened" by a sacrificial opponent, and discourages players from "laying low" to keep their own health up so they can tag out weak/wounded opponents at the end of the game. You can still use teamwork and tactics for flanking, etc., but in most cases, you must engage every opponent as an individual.

The idea is similar to Roman Gladiators doing battle with their opponents one after another until one is deemed the champion.

GLADIATOR MODE SETUP:

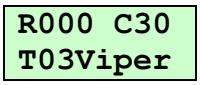
1. Enable Gladiator Mode (**G-Mode**).

   `[Config Menu]→[Edit Game]→[G-Mode]→[On]`

2. Set the desired number of Tags (**G-Tags**).

   `[Config Menu]→[Edit Game]→[G-Tags]→[##]`

3. Note changes to **Main Firing Display**: When you are in Gladiator Mode, the bottom line of the display will now indicate the number of Tags Received (T##) rather than a Health percentage. The handle of the last opponent to tag you is also displayed. The number of Tags displayed is only for the “current opponent” (the opponent that landed the most recent tag). It is not a total of all tags. In the example below, the most recent tag was landed by “Viper”. A total of 3 Tags has been landed by “Viper”.



INFRARED LED FAIL DETECTION

The MilesTag V5.XX System will automatically detect if the infrared LED circuit fails. This can be caused by a broken wire, disconnection, or if the LED simply burns out.

When an IR LED failure occurs, the gun is immediately disabled and the following display will appear, along with an audible alarm:

```
IR LED
FAIL
```

Once the IR LED is replaced or repaired, the gun will return to normal operation.

LED FAILURES:
Contrary to popular belief, LEDs *don't* last forever.

In most outdoor Laser Tag systems, it is common to drive the Infrared LED beyond its normal/recommended operating limits. This enables the system to achieve much greater range, but it usually comes at the expense of shortened LED lifespan. An LED that would last thousands of hours when operated at its nominal current can be reduced to an operating life of only hundreds or tens of hours (or less). It really depends on how hard the LED is pushed.

The lifespan of the Infrared LED is directly affected by the following factors:

- Drive Current
- Rate of Fire
- Carrier Duty Cycle

By changing any of these parameters you will directly affect the amount of power that must be dissipated by the LED in the form of heat. At higher currents, the LED dissipates more heat. And at higher rates of fire, there is less time for the LED to "cool off" between shots. So all of these factors must be "balanced" carefully to achieve an acceptable range *and* LED lifespan.

With a hobbyist system like MilesTag, all of these parameters are directly under the control of the user. So it is very likely that the user will try pushing the limits of the LED at some point in order to maximize system performance. It's good to have this level of control over the system, but if you are not careful you can easily overdrive the LED and destroy it. (Luckily the industry-standard TSAL6100 Infrared LED costs less than $0.25 so it's not a big deal to replace it.)

The biggest problem is that it's nearly impossible to tell if the IR LED is really working because the light that is emitted is invisible. Without active Fail Detection, if your IR LED burned out during a game you would have no way of knowing that you were essentially "shooting blanks". Opponents could still hit you, but you wouldn't be able to hit them. You might *suspect* a problem because you are not landing any shots on your opponents, but there would be no way to tell for sure. And by the time you do realize it, it's probably too late. This is why having IR LED Fail Detection is so important. If you are pushing your system to the edge for maximum performance, then it is critical.

MAIN LCD DIPLAYS

Trigger Button – Fires the currently selected weapon (Main Weapon or RPG). The LCD Backlight is automatically turned OFF while firing. Pulling the trigger while on the Game Status or Respawn Opponent displays will still fire the Main Weapon and return automatically to the Main Firing Display.
Mode Select Button – Press and Release to step through the available LCD displays. Press and Hold for two seconds to toggle the LCD backlight ON / OFF.
Reload Button – Initiates reload (change clip). Reloads can be performed even if the clip is not empty. The partial clip is exchanged for a full one and any remaining rounds in the partial clip are automatically saved. Use Game Status Display 1 to check Total Ammo remaining.

Main Firing Display

R020 C29 **085Snake**	Rounds = 20 Clips = 29 Health = 85% Last Hit by: "Snake" (each Player has a unique "handle")

Alt Display -- Player Handles Disabled [Config Menu]→[Edit Game]→[Handles]

R040 C10 **085Red05**	Rounds = 40 Clips = 10 Health = 85% Last Hit by: Team = Red Player = 05

Alt Display -- Gladiator Mode [Config Menu]→[Edit Game]→[G-mode]

R200 C22 **T02Viper**	Rounds = 200 Clips = 22 Tags Received = 2 Last Hit by: "Viper"

LTTO compatibility is DISABLED on production systems.

Alt Display -- LTTO Mode [Config Menu]→[Edit System]→[Protocol]

R200 C10 **075 LTTO**	Rounds = 200 Clips = 10 Health = 75% No Team or Player IDs (LTAG mode Only)

Status Display 1

Ammo0590 **T+007:53**	Total Ammo Remaining = 590 Rounds Elapsed Time = 7 minutes 53 seconds (since start of game)

Status Display 2

Team Red **Temp 007**	Your assigned Team ID = Red Barrel temperature = 7% (100% = overheat)

Not available when remaining RPG rounds = 0.

RPG Firing Display [Config Menu]→[Edit Weapon]→[RPG Rnds]

RPG **3**	Remaining RPG rounds = 3 (Returns to Main Weapon after firing)

Not available if the Respawn function is disabled, or if Friendly Fire is enabled.

Respawn Opponent Display [Config Menu]→[Edit Game]→[RspwnOpp]

Respawn **Opponent**	Hold RELOAD and Press TRIGGER to send respawn command. Will not work if Friendly Fire is enabled.

Reload In Progress Display

Reload **▉▉▉▉**	The bar shows reload progress. Only available if there are remaining clips.

Mode Select Button – Advance to next screen.
Trigger Button – Enter Menu / Change Parameter / Perform Action

System Menu: Backlight is always ON in the Config Menus.	
Edit System	Press TRIGGER to edit System settings.
Game Menu:	
Edit Game	Press TRIGGER to edit the currently selected Game.
Weapon Menu:	
Edit Weapon	Press TRIGGER to edit the currently selected Weapon.
Advanced Menu:	
Edit Advanced	Press TRIGGER to edit Advanced System Settings.
Clone Game:	
Clone Weapon	Press TRIGGER to transmit Weapon Parameters to another system.
Clone Weapon:	
Clone Game	Press TRIGGER to transmit Game Parameters to another system.
Exit Configuration:	
Exit Config?	Press TRIGGER to exit the Configuration Menus and restart the system.

System Menu:

Edit System	Press TRIGGER to enter menu.

Team ID:

TeamID Red	Red, Blu, Yel, Grn, Blk, Wht, Pur Change Team ID.

Player ID:

PlayerID 01 Eagle	0 to 31 Change Player ID.

Select Preset Game:

Game Sel Mil-Sim1	(see games reference for current list) Select Preset or Custom game.

Select Preset Weapon:

Weap Sel M1919 A4	(see weapons reference for current list) Select Preset or Custom weapon.

Save System Settings:

Save System ?	Press TRIGGER to save System settings and exit submenu.

Game Menu

Edit Game	Press TRIGGER to edit the currently selected Game.

Sound:

Sound On	On - Off Turns all sounds on or off.

Muzzle Flash:

Muzzle On	On - Off

Hit LED:

Hit LED On	On - Off

Friendly Fire:

FrndFire Off	On - Off On = Player can be tagged by other players with the same TeamID

Live Power Up Mode:

LivPwrUp Off	On - Off On = Player is “Live” at power-up Off = Player must be started by Referee or Key

Unlimited Clips:

UnlimClp Off	On - Off On = Unlimited reloads Off = Limited Reloads

Proportional Hit Delay:

ProHtDly On	On - Off This parameter is not active.

Medics:

Medics On	On - Off On = Medics can heal players.

Barrel Overheat:

Overheat On	On - Off On = Sustained automatic firing will cause barrel to overheat (depends on rate of fire).

Reload Hit Interrupt:

Rel Hit On	On - Off

Gladiator Mode:

G-Mode On	On - Off On = Gladiator Mode enabled. Tags-based game. Tags not cumulative between players.

Gladiator Tags:

G-Tags 004	2 to 50 tags Number of tags required to tag player out in Gladiator Mode.

Realistic Bleeding:

Bleeding On	On - Off This parameter is not active.

Bleed Time:

BleedTme 000	5 to 100 seconds This parameter is not active.

Initial Health Value:

Health 100	5 to 250 Normal setting is 100 (100%).

Maximum Healing Value:

Max Heal 050	5 to 100 Highest health value to which player can be restored (healed) by a medic.

Kevlar (Shield) Value:

Kevlar 000	0 to 30 hits Number of hits your "Kevlar Vest" can withstand. Kevlar reduces damage by 50%.

Hit Delay:

HitDelay 002	0 to 30 seconds Delay after receiving a hit (or tag). Player cannot fire or be hit during this delay.

Respawn Opponent:

RespwnOpp On	On – Off Off = Respawn Opponent display is not available.

Player Handles:

Handles On	On – Off

Infrared Output Level: (could be used as indoor/outdoor setting)

IR Boost On	On – Off On = full output current, Off = < 80mA drive current (approx)

Auto Respawn:

AutoResp 000	0 to 100 (seconds x 5) 12 = Player will automatically respawn 60 seconds after being killed (tagged out).

Respawn Ammo:

RespAmmo On	On – Off

Game Start Delay:

StartDly 000	0 to 240 seconds

Death Delay:

DeathDly 000	0 to 240 seconds

Save Game:

Save Game ?	Press TRIGGER to save Game settings and exit submenu.

Weapon Menu

Edit Weapon	Press TRIGGER to edit the currently selected Weapon.

Primary Weapon (Gun) Hit Points:

Gun HP 019	1 to 100 Sets the Damage inflicted by the Primary Weapon (Gun).

Rounds per Clip:

Rounds 030	1 to 251 (251 = unlimited) Number of rounds in each clip.

Number of Clips:

Clips 010	1 to 200 Number of clips available for the Primary Weapon (Gun).

Select Firing Mode:

Fire Sel FullAuto	SemiAuto, Burst, FullAuto, Bolt Act

Burst Rounds:

Burst X 030	3 to 6 rounds

Cyclic Delay: (rate of fire)

Cyclic 050	10 - 200 mS **Increasing** the cyclic delay **Decreases** the rate of fire.

Reload Time:

Reload 005	1 to 30 seconds Sets delay for reload cycle (clip change).

RPG Hit Points:

RPG HP 030	5 to 200 Sets the Damage inflicted by the Secondary Weapon (RPG/M203).

RPG/M203 Rounds:

RPGs 003	0 to 30 Available Rounds for Secondary Weapon (RPG/M203).

Save Weapon:

Save Weapon ?	Press TRIGGER to save Weapon settings and exit submenu.

Advanced Settings Menu:

Special Function	Press TRIGGER to enter this menu.

Game ID:

GameID A	A or B All players in a game must be assigned to the same Game ID. This feature is useful if separate games are being played in adjacent fields to prevent "cross game" hits.

Encryption Key A:

EncryptA 000	0 to 255 This parameter is not active.

Encryption Key B:

EncryptB 000	0 to 255 This parameter is not active.

Sound Set:

SoundSet Normal	Normal, Alt (Used to select the ISD sound set, i.e. Realistic or Sci-Fi sounds) This parameter is not active.

Protocol:

Protocol MTag 40K	MTag 40K, MTag 56K, WoW 56K The WoW protocol is not supported in this release.

Configuration Security Code:

Cfg Code 170	0 to 100 Default value is "170" Security Code for Electronic Configuration Key (I2C EEPROM, address $A0).

Infrared Carrier Duty Cycle:

PWM Duty 20 %	10 %, 20 %, 30 %, 40%, 50 % PWM Duty Cycle. Allows adjustment of the infrared carrier's RMS power. This parameter should be balanced with the IR LED current to achieve the desired range.

Select Boot Mode:

BootMode Normal	Normal, God Gun, Medic

Exit Special Functions:

Save Advanced	Press TRIGGER to save advanced settings and exit submenu.

GAME OVER MENUS (Master Controller)

Once you are Tagged Out (or receive an End Game command from the Master Controller) the Game Over menus become accessible. This allows you to review some game statistics while you wait for the next game. Primarily, you can see which players (opponents or trigger-happy teammates) hit you and the number of times you were hit by each of them. You can also see who got that last hit in and tagged you out. However, you will NOT be able to see how many hits you landed on your opponents (this is only available after all scores are downloaded and tallied by the God Gun / PC).

Game Over Menu:

GAME OVER	Press MODE to scroll through available displays.

Game Time:

GameTime T+000:00	Elapsed Time MIN:SEC

Hits Received:

Hits By Zeena 04	Only Players that hit you will be displayed. Press Mode to continue scrolling through Players.

Last Hit:

Last Hit Rambo	Shows the Handle (or ID) of the Player that tagged you out.

Respawns: LOG ITEM

Respawns 002	Number of times you were "respawned" during the game. *(Log Items carry over across games unless the Log is cleared)*

Tag Outs: LOG ITEM

Tag Outs 003	Number of times you were "tagged out" during the game. *(Log Items carry over across games unless the Log is cleared)*

Medical Assists Received: LOG ITEM

Med Help 004	Number of times you received assistance from a Medic during the game. *(Log Items carry over across games unless the Log is cleared)*

Rounds Fired:

RndFired 0362	Number of rounds you fired.

Mode Select Button – Advance to next screen.
Trigger Button – Enter Menu / Change Parameter / Perform Action

PRESET WEAPONS REFERENCE

	Hit Pts	Rnds/Clip	Clips	Fire Sel	Burst	Cyclic	Reload	RPG HP	RPGs
MP5 9mm	8	30	10	FullAuto		40	3		
M16/M203	10	30	10	Burst	3	40	4	30	6
M249 SAW	10	200	3	FullAuto		35	8		
M-60	15	100	4	FullAuto		74	8		
M1919A4	20	250	4	FullAuto		80	10		
M-40A1	40	5	10	Bolt Act		200	4		
M2 50cal	25	100	6	FullAuto		74	10		
12gaPump	35	6	10	Bolt Act		200	4		
Blaster	15	100	6	FullAuto		50	10	60	4
Bazooka	75	1	8	SemiAuto		200	5		
Custom	1 – 100	1 – 251	1 – 200	S/F/B/Blt	3 – 6	10 – 200	1 – 30	5 to 200	1 – 30

WEAPON MODE					
FUNCTION	**TRANSMITTED**		**RECOGNIZED**		**NOTE**
	BYTE 1	**BYTE 2**	**BYTE 1**	**BYTE 2**	
Weapon Hit	32 to 255 (TID|PID)	1 to 200 (Damage)	32 to 255 (TID|PID)	1 to 100 (Damage)	*1
Resurrect	32 to 255 (TID|PID)	0	32 to 255 (TID|PID)	0	*2
undefined					Ignore
Add Health			1	1 to 98	
Add Rounds			2	1 to 98	
Add Clips			3	1 to 98	
Add RPGs			4	1 to 98	
NP Hit			5	0 to 255	
Disable Gun					Ignore
Sec Code A					Ignore
Sec Code B					Ignore
God Gun	**(See Below)**				
Col. Damage			10	1 to 100	
Select Game			11	0 to 4	*3
Select Gun			12	0 to 10	*3
Set Team ID			22	1 to 7	
Set Player ID			23	0 to 31	
God Gun Functions					
Admin Kill			9	0	
Admin Pause			9	1	
Resp Base			9	2	Ignore
Start Game			9	3	
Resp Player			9	4	
Initialize Player			9	5	
Full Ammo			9	6	
End Game			9	7	
undefined			9	8	Ignore
Config Gun			9	9	
Config Snsr			9	10	Ignore
Config Base			9	11	Ignore
Config Mine			9	12	Ignore
Reset Mine			9	13	Ignore
Test Target			9	14	Ignore
Boresight			9	15	Ignore
Point			9	16	Add to Log
Medal			9	17	Add to Log
Penalty			9	18	Add to Log
Clear Log			9	19	
Clear Scores			9	20	
Test Sensor			9	21	

FIRMWARE UPDATES

Download latest firmware at http://www.lasertagparts.com

Firmware Update Procedure:

Required Items:

- MilesTag V5.XX Gun
- MilesTag Serial Adapter (TTL to RS232)
- 9-pin serial cable, male to female, straight-thru wiring (not a null-modem cable)
- Windows PC with freeware Tiny PIC Bootloader Application
  http://www.etc.ugal.ro/cchiculita/software/picbootloader.htm

1. Connect Serial Adapter to Serial Port on MilesTag V5.XX gun.
2. Connect Serial Cable from Serial Adapter to the PC's serial port.
3. Start Tiny Bootloader application.
4. Click Browse to select latest firmware file "*filename*.hex".
5. Select Comm Baud Rate "19200".
6. Select Comm Port (as required by your PC).
7. Click on "Write Flash".
8. Turn MilesTag gun ON (must be done within a few seconds of Step 7).
9. Observe progress bar at bottom left of Tiny Bootloader window.
10. Gun will "reboot" after update is completed.
11. Disconnect adapter and cables.
12. Recommend restoring "Factory Settings" after any Firmware updates (see page 4).

FREQUENTLY ASKED QUESTIONS

Can I edit the Player Handles (names)? This can only be changed in the source code.

Can I edit the Preset Weapons and Games? This can only be changed in the source code.

What is the purpose of the IR LED on the sensors? These are for some planned features that will be available in a future firmware update. Basically it allows low-power signals to be transmitted from the head sensors.

Can I change the current-limit resistor on the IR LED to increase range? Yes, but caution must be exercised. Too much current can significantly shorten the LED lifespan. The IR LED current must also be balanced with modulation duty cycle and rate-of-fire.

Is the MilesTag system compatible with FragTag gear? This has not been tested yet, but it's reasonable to expect that both systems should at least be able to shoot and receive hits from each other. However, MilesTag gear will not be compatible with many of FragTag's scoring and control features. The MilesTag Data Protocol is still undergoing some adjustments and clarifications.

Is the MilesTag system compatible with Lazer Tag Team Ops™ gear? No. We did build some prototype systems that are LTTO compatible, but this functionality is disabled in the public code release to avoid potential patent infringements.

What do I need to edit the Source Code? The source code is written using the PICBasicPro language from MicroEngineering Labs. It can be viewed and edited using any text editor (i.e. Notepad), but the PICBasicPro Compiler is required to compile the source into a .hex file. The compiler is available from www.melabs.com for approx USD$250.00.

Do I need the PicBasic Pro compiler to install new Firmware Updates? No. The firmware updates are provided as a pre-compiled .hex file. You only need your Windows PC, a 9-pin serial cable, and a serial adapter that can be built for under $10.

Do I need the PicBasic Pro compiler to customize my weapon and game settings? No. Most of the parameters you will ever need (or want) to customize are available right on the gun, using the Configuration Menus. We don't want you spending hours in front of your PC trying to edit the source code. That's our job! Everything you need to modify can be done in-the-field, on-the-gun.

Where can I buy the battery pack and charger? In the US, Tower Hobbies' online store is a good place to start. Or you can try any hobby store that carries Radio Control cars. We recommend using a 7.2 volt NiCad or NiMH battery with a capacity between 1000mAH and 3000mAH. These are commonly used in RC cars and are usually available from $10 to $30. Using a good quality "smart charger" will extend the life of your battery pack.

TROUBLESHOOTING

System will not power on:

- Remove power IMMEDIATELY. Check for any hot components (carefully).
  *Hot components are bad, smoke is worse. This indicates a short somewhere.
- Carefully inspect PC board and all wiring.
- Ensure nothing is inserted into the charging jack.
- Ensure battery pack is fully charged.
- Check the fuse.
- Inspect wiring between battery pack and the Main Board.

Infrared LED isn't working or IR LED Fail Alarm:

- Inspect wiring from the main board to the Infrared LED.
- Ensure current limit resistor is installed (if not you may have burned out the LED)
- Check LED polarity
- Replace the Infrared LED.

ISD Sounds are not working:

- Ensure Sounds are "Enabled". [Config Menu]→[Edit Game]→[Sounds]
- Check volume adjustment on ISD Sound board.
- Inspect wiring between ISD Board and Main Board.
- Inspect wiring between ISD Board and Speaker.

LCD Display is blank or shows ■■■■ :

- Check LCD Contrast adjustment on Main Board (R2).
- Inspect wiring between LCD and Main Board.
- Ensure correct orientation of LCD cable connector.

Muzzle Flash is not working:

- Ensure Muzzle Flash is "Enabled". [Config Menu]→[Edit Game]→[Muzzle]
- Inspect wiring between LED and Main Board.
- Check LED polarity.
- Replace LED. (Use any LED to test).

Hit LEDs are not working:

- Ensure Hit LEDs are "Enabled". [Config Menu]→[Edit Game]→[Hit LED]
- Inspect wiring between Hit LEDs and Main Board.

Cannot receive Health from the Medic Box:

- Ensure Medics are "Enabled". [Config Menu]→[Edit Game]→[Medics]

GLOSSARY

AC	alternating current
ASR	assault rifle
BFG	big friggin' gun
DC	direct current
DPDT	double-pole, double-throw
EEPROM	electronically-erasable programmable read-only memory
EU	European Union
FET	field-effect transistor
HMG	heavy machinegun
IC	integrated circuit
IR	infrared
KHz	kilohertz
LCD	liquid crystal display
LED	light emitting diode
LT	laser tag
LTTO	Lazer Tag Team Ops™
mA	milliamps
MOSFET	metal oxide silicon field-effect transistor
mS	milliseconds
MT	MilesTag™
NC	normally closed
NiCad	nickel cadmium
NiMH	nickel metal hydride
NO	normally open
PC	personal computer
PCB	printed circuit board
PIC	programmable integrated circuit
PID	player ID
PWM	pulse width modulation
RoHS	Reduction of Hazardous Substances
RPG	rocket-propelled grenade
SAW	squad automatic weapon
SMG	sub-machinegun
SPST	single-pole, single-throw
SPDT	single-pole, double-throw
TID	team ID
TSOP	a small 3-pin integrated circuit with built-in infrared demodulator
TTL	transistor-transistor logic
uS	microseconds
VDC	volts direct current
WEEE	Waste Electrical and Electronic Equipment

MILITARY PHONETIC ALPHABET

Alpha
Bravo
Charlie
Delta
Echo
Foxtrot
Golf
Hotel
India
Juliet
Kilo
Lima
Mike
November
Oscar
Papa
Quebec
Romeo
Sierra
Tango
Uniform
Victor
Whiskey
X-ray
Yankee
Zulu