

Predator-Morlock

NOTE TO MORLOCK USERS:

The Predator-Morlock programming is significantly changed from the original. It is pin-for-pin compatible so you can plug it directly into an exiting Morlock plug, BUT there is no longer an add/subtract/exact setting for the registers. The registers have also changed. Please read the programming instructions carefully before proceeding.

This electronics package is built for no paintball gun in particular. The Morlock board will run any electro-pneumatic paintball gun, from a simple single-solenoid open bolt, to a double-solenoid closed-bolt with breech-sensor. From any commercial gun currently on the market, to any garage-built prototype. It should be noted that this board is very powerful, and because of that will allow you to "shoot yourself in the foot" if you try.

More so than most products, it is of the utmost importance that you read and understand these directions.

What you get

A prefabricated project board, pre-crimped wiring harness, eye hardware and trigger switch. The Morlock is not for the beginner, it is designed for the hobbyist/player who is used to reading (and referring to) the instructions, is comfortable with a soldering iron and does not mind taking a little extra time to make sure things are done right.

You will have to wire the Morlock up yourself, at a minimum this will mean the power supply (9v battery recommended), trigger switch, and one solenoid.

Every effort was made to keep the size of the Morlock to an absolute minimum. Don't let the size fool you, however, the power-circuitry (utilizing HEXFET technology) can handle huge power spikes, running even the beefiest solenoids with long duty cycles.

The Morlock is completely programmable, allowing the entire play-by-play of a fire cycle to be tweaked down to the last millisecond.

Included is a pre-wired plug accepting a trigger switch (provided) a power plug (provided) and a single solenoid connection. Pre-crimped wires are also included for you to add an additional solenoid/intellifeed, and eye harness of either a reflective or through-breech variety (components provided).

Installation

As mentioned above, the Morlock needs to be wired per gun. The critical wires are:

Power (Red/Black, pins 9/10) can be **any voltage from 6 to 30 Red(+) Black(-)**

Trigger (Grey/Black, pins 11/12) any normally-open switch will work, polarity is irrelevant

Solenoid 1 (Red/Blue, pins 7/8) any coil-type device, polarity is irrelevant.

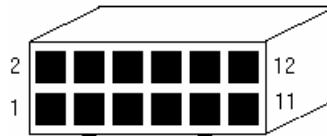
Additionally Solenoid 2 can be wired, as well as the eye components (included) according to the diagram below

| Wire Pair | Function | Polarity |
|-------------------------|----------------|-------------------------------|
| Blue/Red pins 7 / 8 | Solenoid 1 | N/A |
| Yellow/Red pins 5 / 6 | Solenoid 2 | N/A |
| Grey/Black pins 11 / 12 | Trigger switch | N/A |
| Red/Black pins 9 / 10 | Battery | Black ground (-) |
| White/Green pins 1 / 2 | Eye Detector | Green signal, white reference |
| Black/Orange pins 3 / 4 | Eye LED | Black cathode (-) |

NOTE 1: There are three Red and Three Black wires, which are Power (battery) and Ground, respectively, and may be used interchangeably, as they are the same physical connection, they are provided for ease of wiring

NOTE 2: The regulated +5 (respect to ground) is available from the white wire, but can only run a load of 150ma.

Connect Layout



2 4 6 8 10 12
1 3 5 7 9 11

Front, Writing Down (HKS) (wires pointing away)

| | |
|----|---|
| 1 | White (NOT ATTACHED) (eye +5) short lead |
| 2 | Green (NOT ATTACHED) (eye sig) |
| 3 | Black (NOT ATTACHED) (emitter -) short lead |
| 4 | Orange (NOT ATTACHED) (emitter +) |
| 5 | Red (NOT ATTACHED) (solenoid 2) |
| 6 | Yellow (NOT ATTACHED) (solenoid 2) |
| 7 | Red (solenoid 1) |
| 8 | Blue (solenoid 1) |
| 9 | Black (batt -) |
| 10 | Red (batt +) |
| 11 | Black (trig -) |
| 12 | Grey (trig +) |

The plug is *NOT* well polarized, it can be easily plugged in upside-down. Be sure to plug it in with the two notches (and the HKS writing) toward the *bottom* of the board. It is also crudely color-keyed with a white marker.

Included with the board are four external components and plenty of wire. You are going to have to connect them yourself, since it is impossible to predict beforehand how much/through what the wires will need.

Operation

The microcontroller used is a Microchip® PIC 12F629. This chip has on-board EEPROM, which is used to store configuration information. This memory is maintained even with the battery disconnected, for 40+ years.

The logic runs on a 5v regulator which is independent of the power circuitry. The two transistors switch power directly from the battery to the solenoids, bypassing the regulator. This allows for tremendous drive power, limited only by the capacity of your battery. According to published specs, the Morlock can switch 30V @ 4.6A (138 watts) with an on resistance of only .031Ω. This translates into very little heat buildup, and tremendous efficiency.

The Morlock consumes 15ma when idling, more than half of that is consumed by the LED.

The eye validates itself every shot in both single and double solenoid mode. If it detect stuck-on or stuck-off faults it will put the gun into 9-bps and blink the light continuously to indicate trouble. This ensures that if the eye is damaged or inoperable during a game, the gun will continue to cycle.

Not show above is the Eye Holdoff value (factory default of 10ms) This is the interval after the eye sensor is seen on that the Morlock waits, to be sure the ball is fully seated.

Programming

To program the Morlock, first the tourney lock must be off (both DIP switches in the OFF position) then hold the trigger switch on, turn the power on (or connect the battery) and release the trigger.

The light will flash and turn off. Now you are expected to select a register; click the trigger an appropriate number of times, then wait, the light will flash once. Register selections are:

*AFA level is the BPS at which the AFA ramping will 'kick in'. If set to '1' (default) it is *disabled*

If you select Register 1, you are expected to enter a fire mode, again in trigger clicks. After you have made a selection, the light will flash and *remain on*. The gun is now prepared to fire. Fire modes are:

Tourney Locks

There are two DIP switches on the Morlock, they both serve the same function, and are wired in parallel. If *either* switch is turned on, the Morlock is tournament locked, and will not accept programming of any kind, further it will be locked in semi-auto mode.

Intellifeed

If the Morlock is in single-solenoid mode, the second solenoid will act as an intellifeed. It will run a hopper from the same supply the solenoids are running from. Wire the hopper motor directly to the Solenoid 2 output.