

**HHIS-1CH
HHIS-1CH-KEY
One Channel Hand Held Ignition System**

**Revision 2
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Owner's Manual

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Instructions

Batteries

The HHIS-1CH can use either alkaline or rechargeable AA batteries. When changing batteries, make sure the center toggle switch is set to **OFF**, the battery contacts are clean, and the new batteries are aligned with the + and – marks. Never mix types and/or brands of batteries as this can damage the batteries. Also, inserting batteries backwards will not hurt the HHIS-1CH, but may cause them to drain quickly.

Always set the center toggle switch to **OFF** when not in use. If storing for long periods of time, remove the batteries to prevent damage in the event of battery leakage. All brands/types of batteries may leak and this damage is not covered by the warranty.

Battery voltage is constantly checked in all Pyro modes, but not when using the Flashlight. When the batteries are starting to get low, the **LOW BATTERY** indicator will light up, it will begin flashing when they are almost dead. You may continue to use alkaline batteries even if the indicator is flashing, but you may not be able to charge to the full 48V. Rechargeable batteries should be recharged as soon as possible after the indicator begins to flash to prevent battery damage. Even better, recharge them when the light first comes on.

Removable Key

If your HHIS-1CH was ordered with a removable key, then the key must be fully inserted in order to use any pyro function (continuity testing, arming, firing). When the key is removed, all power to the pyro section is removed. The flashlight function bypasses the key and will work even with the key removed since it doesn't place any voltage or current on the output terminals.

Flashlight

To use the built-in flashlight, set the center switch to the **LIGHT** position. The flashlight uses very little battery power and will remain bright, even with very weak batteries. The low battery light does not work when using the flashlight so you should check the battery status from time to time by using any Pyro function.

Digital Password

If the display shows **UU** when you set the center switch to **PYRO**, this means the HHIS-1CH was ordered unlocked. All pyro-related functions are usable.

If **LL** appears, it means the HHIS-1CH is locked. You may still use the Continuity Checking function, but the HHIS-1CH will not arm or fire.

To unlock the HHIS-1CH, set the toggle switch to **OFF**, remove any wires from the terminals (not required but enhances safety), hold the right-hand toggle switch in the **FIRE** position and set the center toggle to **PYRO**. The left-hand digit of the display will now show a **P** for password and the right-hand digit will be offering possible passwords. When you see the password that was assigned to this particular unit, release the **FIRE** switch. If your selection was correct, the display will now show **UU** for about a second to let you know it is unlocked. If **LL** appears, you selected the wrong password and will have to start over.

If your HHIS-1CH is unlocked by default, you can still temporarily lock it. Simply hold the **FIRE** switch when you turn it on and release the **FIRE** switch on any display other than **P0**. It will now be locked until you turn off the power. This can be handy to make SURE you don't accidentally fire something while doing continuity tests.

The HHIS-1CH always returns to the lock state it was ordered in when you turn off the power.

Continuity Checking

Connect the e-match(es) to the output terminals using normal zip cord or blasting wire. For longer runs of wire or parallel e-matches, use heavier gauge wire.

To check continuity set the center switch to **PYRO**, the display will light up and either display **UU** or **LL** for about one second and then start displaying the resistance of the e-match(es) along with the wire connecting them. The reading will take a second or two to stabilize and may flicker up or down by one or two counts, this is normal. If the resistance is over 99 ohms, the display will show --, otherwise it will display the actual resistance from 0 to 99 ohms. During this time less than 1.5mA of current at a maximum of 3.5V is available at the terminals.

You should verify that the resistance is in the range you expect, if not there may be a short or bad connection in your wiring. You can either calculate what the resistance should be in advance or just go by previous experience (note that different brands of e-matches are often different resistances).

Arm & Fire

You will need to charge the capacitor before being able to fire, press and hold the **ARM** switch to do this. As a safety feature, if the resistance is over about 120 ohms, the **ARM** switch will not work. Assuming the resistance is low enough, the HHIS-1CH will attempt to arm. The display may flicker for about a second while the arming function checks the resistance. If the display then shows **LL**, it is locked and will not arm or fire. See the Digital Password section above to unlock it.

Assuming it is unlocked, the display will now show the capacitor voltage and the **ARMED** light will flash. It will take about 20 seconds to reach full voltage with new batteries, longer with used ones. When the voltage reaches 48, the **ARMED** light will cycle between steady and flashing as the charge is maintained. You may stay in this mode for a very long time (over 12 hours with new batteries) while waiting to fire. There is no harm in releasing the **ARM** switch without operating the **FIRE** switch; the capacitor will simply discharge over a short period of time. Pressing **ARM** again will resume charging.

You do not have to wait for the voltage to reach 48 before proceeding, in most cases a lower voltage will work just fine. The user must determine the minimum appropriate voltage for a particular application. If in doubt, wait for the full 48V.

When you are ready to fire, press the **FIRE** switch while still holding the **ARM** switch. As a safety feature, if the **ARM** switch has not been held for at least $\frac{1}{4}$ second before you press the **FIRE** switch, it will not fire and **= =** will appear on the display to indicate the error. If all is well, your shot will fire and the display will show **FF** for as long as you hold the **FIRE** switch.

If you release the **FIRE** switch while still holding the **ARM** switch, the display may go back to armed/charging or it may display **- -**, depending on the condition of the e-match and wires. If the e-match shorted after being fired, the display may go blank. Simply release **ARM** to reset.

Release both the **FIRE** and **ARM** switches to return to continuity checking or to turn off the HHIS-1CH.

If you have another cue, select it either by changing wires or using an external switch box, then press **ARM** again to prepare for the next shot. The capacitor will often have a considerable charge remaining if **ARM** hasn't been released since you fired, so the next shot may be fired sooner. This would probably require a second person to select the next cue.

The **LOW BATTERY** light may come on when armed and go off when in **SAFE** mode as there is much more current drawn from the batteries while charging the capacitor. This would be a good time to change the batteries.

Under the Hood (Geek section)

The heart of the HHIS-1CH is a Texas Instruments MSP430 microcontroller. It is programmed in C using ICC430™ Professional development software, the Salvo™ Real Time Operating System, and debugged with the NoICE™ simulator/in-circuit-emulator. Salvo tasks monitor all voltages and switches, implement the 48V switching regulator, multiplex the LED display, and perform factory calibration. A 7mS watchdog timer monitors Salvo. The firmware, digital password, and calibration data is secured from readout or tampering by unauthorized persons.

Resistance is measured by using a resistive divider (with two series resistors), this is much safer than a constant current source that could fail with high current to the e-match, but requires more calibration and calculations in software. The worst case current through the e-match in the case of a shorted resistor is less than 3mA, lower than the test current in other devices.

All analog inputs are oversampled and then filtered using digital signal processing (decimation) to reduce noise and improve accuracy. Each unit is individually calibrated to account for component accuracy and wiring resistance.

The flashlight is completely independent and consists of a switching constant current power supply that keeps the LED at the same brightness over a wide range of battery voltage.

California Proposition 65 Warning

The following information is required by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986, or Proposition 65. This California regulation does not address safe levels; therefore, even trace amounts of the chemicals included on Proposition 65's list of chemicals known to the State of California to cause cancer or reproductive toxicity must be noted with the "Safe Harbor" wording.

WARNING: This product contains chemicals known to the State of California to cause cancer and/or birth defects and/or other reproductive harm.

Federal Communications Commission

This device complies with part 15 of the FCC Rules. Operation is subject to the following conditions:

1. This device may not cause harmful interference;
2. This device must accept any interference received, including interference that may cause undesired operation.

Reduction of Hazardous Substances

All parts used in the manufacture of this device are RoHS compliant per the part manufacturer's published documentation.

Country of Origin

This device was designed and manufactured in California, USA.

Warranty

Durand Interstellar, Inc. warrants this product to be free from manufacturing defects in original material, including original parts, and workmanship under normal use and conditions (“manufacturing defect”) for a period of one (1) year from date of original purchase. A charge will be made for repairs not covered by the warranty.

Should service become necessary, contact Durand Interstellar, Inc. for return authorization and then:

- Pack the unit in a well-padded corrugated box
- Enclose a copy of your proof of purchase, if you are not the original purchaser
- Ship the unit prepaid via an insured carrier

NOTE: This warranty is void if the product is:

- Damaged through negligence, misuse, abuse, or accident
- Modified or repaired by anyone other than Durand Interstellar, Inc.
- Damaged because it is improperly connected to other equipment
- Damaged by any power source other than the approved batteries
- Damaged by battery leakage

NOTE: This warranty does not cover:

- Damage to equipment connected to the product
- Cost incurred in the shipping of the product to Durand Interstellar, Inc.
- Damage or improper operation of unit caused by customer abuse, misuse, negligence, or failure to follow operating instructions provided with the product
- Ordinary adjustments to the product which can be performed by the customer as outlined in the instruction manual
- Damage from battery leakage/terminal corrosion.

All pyrotechnic activities and devices are inherently dangerous. The user assumes full responsibility for any and all damage and/or injury while using this device, regardless of the cause of the damage and/or injury.

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UNDER NO CIRCUMSTANCES SHALL DURAND INTERSTELLAR, INC. BE LIABLE FOR ANY LOSS, DIRECT, INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL DAMAGE , OR PATENT ISSUES ARISING OUT OF OR IN CONNECTION WITH THE USE OF THIS PRODUCT.

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