

INSTRUCTIONS FOR 60 SHOT BOX

LED version with 60 commons and shunts

(Box numbers 170 and up)

The box has the following features:

- A. Uses 12 to 24 volts D.C. for power. (36 or 48 CANNOT be used)
- B. Will fire 8 squibs per output.
- C. Will do either one shot per trigger input or has automatic counting for rapid fire, with speed control.
- D. Outputs are shunted when not armed or in galv mode.

See Diagram #1

POWER

Power required is 12 to 24 volts DC, usually supplied from batteries. Under 12 volts will not work correctly and over 24 volts will damage parts inside the box. 36 volt or higher battery packs must NOT be used, damage will occur. Make sure the battery will supply enough power to fire the squibs. Trying to fire 8 squibs at once will take at least 12 AMPS of current. Use 18 - 24 volts if long wiring is used to the squibs.

The battery must be connected with the correct polarity or the box won't work. No damage will occur from a reverse connection, the box just won't work. Do not connect or unhook the battery with the power switch on; the count position may jump to a different output than where it was or other unpredictable results may take place.

Specifically: At input voltages under 9 volts the relays inside the box will drop out. Over 28 volts input will cause the regulators to turn off the box to protect parts inside and over 33 volts will damage surge protectors. Capacitors inside the box allow for momentary voltages above and below these limits without problems.

The power should not be disconnected and reconnected while the box is turned on. No damage will result, but the count position may jump to a different output than where it was.

CONNECTIONS

There are 60 outputs and 60 commons. All squibs have one lead to an output and the other to common. Up to 8 squibs may be connected to the same output (in parallel). The input (fire) terminals are for a normally open push button switch that closes to fire squibs. Grouped commons must go to the RED terminals – getting this wrong will fire all the squibs at once!

A note on the XLR jack connections.... 3 pin XLR jacks are used for the power input and the firing button; and I have discovered a possible safety concern when using extension cables with these jacks. Many pre-made XLR cables have the shield connected to pin 1 of the jack, pin 1 is used as the common in the audio cables. Using a XLR cable with pin 1 connected to the outer shell of the jack creates a safety hazard.

Using such a cable on the firing button jack would connect the firing line to the case of the box. Using one on the power cable side would connect the battery positive to the case. Neither of these conditions would cause an immediate problem, but could cause problems with further short circuits or noise pickup.

All pre-made cables should be checked with an ohm meter for continuity between pin 1 and the metal connector shell. If there is a connection, that cable must NOT be used until the connection is removed. Any extension cables made by the user must keep the pins isolated from the metal shell.

Historical Note:

Long ago, when I first made these boxes, I chose pin 2 as the common for the circuits. This was before I discovered that the audio cables used pin 1 as the common. There are too many of my Klunker boxes in the field to change now. Changing now would cause a backwards compatibility problem.

CONTROLS

FUSE:

Use a 20 amp automotive type. It should never blow under normal conditions. Even shorting an output will normally burn out that output before the fuse goes.

POWER SW.:

Turns on the box, the green power LED will come on. When turned off the box count goes to the home/safe position.

RESET button:

Resets the count to home beginning position.

SAFE/HOME light:

LED illuminates at the home position.

ARM SW.:

Arms the box. The red armed LED will come on. This switch has a safety feature. When the power is first turned on, this switch should be off. It is then turned on to arm the box. If it is left on when the power is turned on, the box will not arm. The switch must be turned off, then back on to arm the box. Allow 1.5 seconds after arming before firing for the outputs to un-shunt.

CLOCK SW.:

In the “one” position the box counts to the next shot each time the fire button is pushed. In the “rapid” position the box counts automatically for as long as the fire button is pushed. The speed of counting is controlled by the SPEED KNOB.

SPEED KNOB :

This is a 10 turn pot used to set the speed in rapid fire. The numbers on the dial are for reference only so that you can go back to a certain speed, they have no relationship to an exact speed (as in counts per second). Maximum speed is about 40 counts per second.

LED BRIGHTNESS:

Turn the potentiometer shaft to adjust the brightness of the panel LEDs. They can be turned up to a high brightness level when the box is used outside and sunlight makes it hard to see the lights.

GALV / SHUNT SWITCH:

Normally this switch is left in the SHUNTED position. This keeps the outputs shunted until the box is armed. When switched to the GALV position the outputs are un-shunted and a small current is output to check for continuity across the outputs. In the shunted position no current or voltage appears at the outputs.

PROPER USE:

1. Power and Arming switches are off before connecting batteries.
2. Connect a firing button if not using the front panel button.
3. Set Clock switch to desired function.
4. Turn on power.
5. Make sure box is at home (safe) position (light on).
6. Test triggering and clock speed.
7. Reset to Home.
8. Power off box. Power should be off with batteries unconnected if accidental firing of squibs could hurt someone.
9. Connect squib wires as needed. Only connect squibs if people are out of harm's way.
10. Turn box back on when the time is right.

WHEN READY TO FIRE:

1. Box is on and reset to safe position, unless starting in middle of count. In which case box is counted to output pin before the first output that is to be fired (Arm Switch off).
2. Arming switch is turned on. DO NOT arm until safe to do so. Wait 1.5 seconds.
3. Fire the squibs as needed.
4. Arm switch is turned off when done.
5. Reset and power box down when done.

NOTES:

There is one common mistake made when using this box. This is connecting grouped together common squib leads to the Black terminals instead of the RED terminals. Repeated – **the box is common positive**, not negative. The negative (ground) side of the circuit is switched. Individual wire runs may be connected to the red / black output pairs without regard to polarity. But, a common wire to more than one squib must be connected to a red terminal.

A shorted output will not stop the box from counting to the next output. The only exception to this is if the battery is too small or almost dead. If the battery can't supply at least 15 Amps of current a short circuit will cause its' voltage to drop to zero

and the box will run out of power. However, a short should not be left on for more than 1 second or burnout damage may occur.

In boxes from number 170 onward the output boards use surface mount parts and repair of individual components is not possible. The box should be returned for testing and repair as usually the entire output board is replaced.

SAFETY NOTES:

The user should assure that the box works correctly and will fire the squibs as intended. If the squibs are a long distance away you should use 24 volts and conduct a test firing. The desired numbers of squibs (electric matches) are hooked to the length of wire needed and then test fired. See the attached chart for recommended wire size verses distance, voltage, and number of squibs. Using 12 volts for just one squib and short wire runs will reduce electrical stress on the box and the size of short circuit currents.

Be careful of power wiring near the squib wiring; a short to voltages above 50 volts may result in firing of all squibs. Do not connect a battery to any terminals except the power input. Do not apply over 24 volts to any terminal of the box.

If used in a car or truck:

Do not run the squib wires near spark plug wires.

Do not use the car's battery for power; there may be voltage surges. Use a separate battery.

The user assumes all responsibility for determining the fitness of this device for the intended purpose.

GALV LIGHT:

The blue LED on the box performs the function of a galvanometer to test the external squib circuits. This feature works only when the box is not armed and the Shunted/Galv switch is in the Galv position. As the box counts through its outputs the LED will come on if the external circuit from an output is complete (with a resistance of under 300 ohms).

Remember - this tests for circuit continuity, the test can't tell the difference between a complete circuit through a squib and a short circuit.

Be careful - do not turn on the Arming Switch if the blue light is on. Reset to Home before arming.

This test is quite safe. The box outputs .002 amps to make the test. Maximum safe current is considered to be .050 amps. The blaster's galvanometer outputs .015 amps. There is a safety factor of 25 with a test current of .002 amps.

If for some reason the user wishes to turn off this feature it can be done.:

A. Leave the switch on the front panel in the shunted position.

If you want to never have the Galv function work then:

A. Remove the cover of the box.

- B. There is a small switch mounted on the power circuit board. Turn it off and no test current flows and the blue LED stays off.
- C. Replace the cover.

Because the galvanometer test outputs power, an output will read 11 volts even when the box is not armed. This is normal and is not dangerous. If LEDs are used to test the outputs this voltage and the 2ma test current is sufficient to light them.

OUTPUTS:

The outputs of the box are rated to supply 3 Amps of current continuously and 12 Amps momentarily. If larger voltages or currents are needed run the box on 12 volts and put 12 volt relays on the output. Also, the common terminals are the RED posts and are the positive side of the circuit. This is due to the way electronic circuits switch. (All red posts tied together).

Be careful when combining a group of wires into 1 common lead. A grouped common must go to a **RED** terminal and the individual hits to **BLACK** terminals. Reversing this (grouped wires to black) will fire all grouped hits when the count reaches the first one.

Relays or solenoid valves may be connected to the outputs as needed. They should be 12 or 24 volts to match the battery voltage. If latching relays are needed, there are 2 ways to do this. A mechanical latching relay can be used or a pilot relay operating a relay that is wired to latch may be used; (careful wiring is required) [See fig. #2]. It is also possible to use a specialized latch / time delay relay box that I build to hold certain outputs on for a specified time.

The Galv function should be turned off (put switch in shunt position) if using relays on the outputs. The small Galv test current may cause certain relays, especially solid state type, to turn on unexpectedly or not turn off once turned on.

Remember - the output terminals have power on them if the arm light is on and the fire button is pushed. The outputs are powered only when the firing button is pressed and go off when it is released.

SHUNTED OUTPUTS:

These boxes (#170 and up) now have shunted outputs. This feature increases the safety of the setup, but should NOT be assumed to protect against all possible conditions that could inadvertently fire the squibs. Sufficiently large induced voltages, large static electricity discharges, or direct battery power shorts to the squib wires will fire the squibs even with a shunt on the line.

When the Klunker box is not Armed or in the Galv mode, the outputs are shunted. This shunt is through a relay with a 2 Amp rating. As such, there is a limit to the power the shunt can protect against.

The outputs also have a reverse diode across them which protects against the induced voltage if relays or solenoid valves are used as loads.

Allow 1.5 seconds after arming before firing for the outputs to un-shunt.

CASCADING BOXES:

A cable can be plugged between the 4 pin XLR jacks to cascade the boxes. It is plugged from the output jack of the 1st box to the input jack of the 2nd box. The 2nd box should be set for single shot clocking (one). The 1st box is set as needed for the shot. Each box is powered, reset, and armed separately; the cable only carries the clock signals between the boxes.

The same or different batteries may be used to power the boxes, 12 or 24 volts may be used as needed. Only one condition needs to be watched for – DO NOT common the commons (red terminals) between two different boxes, this will cause feed-back through the arming circuits and cause an unsafe condition.

When the newest boxes (#160 and up) are cascaded there is a slight change. The 2nd box is automatically put into the single shot mode and its fire button and fire terminals are disconnected. Only the cascade cable connection will fire the 2nd box when the 1st box reaches the end of its count.

Also, some of the oldest boxes may not cascade with the newest boxes. This is correctable by changing a capacitor internally if desired.

NOTE: The following layout / connection diagrams may not reflect the latest changes to the front panel control layout.

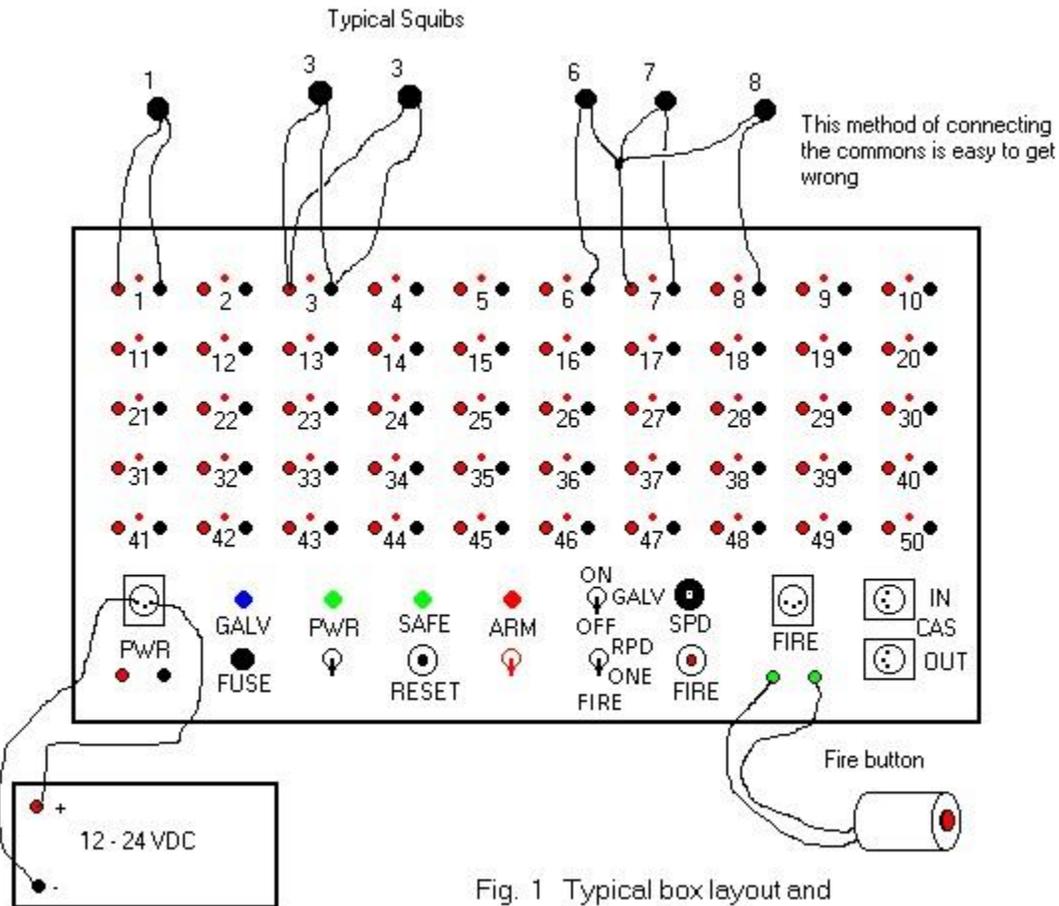


Fig. 1 Typical box layout and connections - 50 commons

Two different methods of adding latching relays to the outputs. Both require testing before use. The galv function should be turned off. There are other possible choices including using time delay relays to keep the outputs on for only a certain amount of time.

Fig. 2 Output latching methods
care must be used with these circuits
testing is required before use

