Digital P-45 Firing Panel, Operating Instructions

Table of Contents

A reminder on the safe use of Electronic Pyrotechnic Firing Systems

- **Never energize Electronic firing equipment when personnel or spectators would be jeopardized by unintentional ignition.**
- ***Prevent water or conductive liquids or powders from contacting firing system components (Firing Panel, firing modules, splitters, cable ends etc.)***
- ***Never drive over or place heavy objects on firing cables***
- Do not wrap multiple wiring attached to igniters around conductive supports as the insulation can be abraded from shells yanking the wires, causing multiple shorts.
- When inserting the igniter wires into the firing module, separate the insulation and leave less than ¼" copper showing above the connector. Allowing long copper leads has caused multiple un-intentional firing or shunting.
- Always keep the internal batteries charged. All batteries have a self-discharge rate. It's much worse if the equipment is left on and put in storage. When the battery voltage drops below 10.6 volts under light loading on a Lead-Acid cell battery, **it's damaged and has become un-reliable for Pyrotechnic work. Period. End of story.**

- # Note:

For Multiple Igniter use

This system is designed to use Series Igniters Only
Any use of Parallel igniters may result in a no fire condition.

Description

The Digital P-45 firing System is a self-contained manually operated pyrotechnic initiation control panel that interfaces to external firing modules. The Digital P-45 firing system allows the use of Digital P-45 and Smartfire SM-32T firing modules and is meant to suggest a blend of the NightHawk user control surface and the Smartfire digital firing module technology combined in one system. Allowing the use of digital modules provides increased number of unique firing addresses and distance and accessibility features. Plus the option of Wireless operation.

Common Features of the Digital P-45 Panel

- Auto Power Off after 2 hours idle
- Continuity and Fired Status for each of the available firing circuits
- Digital Battery Voltage display with Low Battery warning
- 100 minute elapsed time display with pause and reset
- Detachable panel lamp with On/Off switch
- Splash proof and dust proof firing switches
- Chemical, scratch and burn resistant electrically isolated front panel
- 45 individual firing switches
- 45 pin status LED indicators
- 14 LED Group select indicators
- Show Timer accuracy to within +/- 0.5 seconds over 100 minutes

Features of the Firing Mode

- Multiple pins on the same module may be fired simultaneously
- Continuity and Fired Status for each of the 45 firing circuits
- Each selectable Firing Module has a resettable memory of what has been fired
- Retain and review history of a fired show by firing module
- 3168 discrete shots, organized as 99 firing modules of 32 shots each when using SM32 digital modules.
- 4500 discrete shot organized as 100 firing modules of 45 shots each when using FM45 digital modules.
- Both SM32 digital and FM45 digital modules can be used together.
- Total of 7668 Cues
- Multiple pins across multiple modules may be fired simultaneously
- Continuity and Fired Status for each of the 45 firing circuits
- Grouping modules together using group selects during manual fire mode.

Digital P-45 Panel Controls

Power Switch
This power Toggle switch located in the upper left-hand corner of the panel is a Momentary switch. To turn power on press switch up and system will boot up. To power down Hold switch up until LCD reads hold to turn off, Then Release power now, In the event power is accidentally left on Panel will automatically turn off after 2 hours of inactivity.

Panel Lamp On/Off Switch
This switch controls the detachable panel lamp only when the system is on.

Charge Jack
The charging jack is a P5 jack and is used to charge the internal batteries. It requires a supply that delivers 12.0 VDC at 1.5 amps. The center pin is positive. The battery charging circuit will charge the battery even when the Panel is turned on. Charging is automatic and you can not overcharge.

Charge LED
This two-color LED indicator will be active when the charger power supply is plugged into the Charge Jack. If the indicator is green, the charge cycle has completed and the battery is at its full condition. When the indicator is red the internal batteries are being charged.

ARM Key Switch
The ARM key switch is located in the upper left-hand side of the panel, to the right of the power switch. It is a two-position key lock switch, with OFF and ARM positions to the left and right. The key cannot be removed in the ARM positions. When the system is powered and the switch is turned to the ARM position, the ARM status light will go from green to red and tone will sound. The ARM switch places the system into the Module test and firing mode, which means that a firing circuit can be activated because the firing voltage supply has been enabled. Crew must always be warned and removed from the proximity of pyro effects before the ARM key is set to ARM., Digital modules may be tested as well as fired only from the ARMED condition. This control is the primary safety interlock between the operator and the firing of effects.

2-Line Text Display
The text display is a monochrome LCD, 16 characters long by 2 lines. It is backlit to allow viewing in low light conditions. It provides information on the currently selected mode of operation, access to the system menus and warnings when they occur. The top line typically displays text legends indicating the specific numeric data that appears on the bottom line directly below it, or in other cases, it may show a menu selection option. ***The LCD display cover is Plexiglas and should only be cleaned with mild soap and water. Never use alcohol or any industrial solvent to clean the front of the firing panel. The plastic face of the Text display is made from polycarbonate which will craze when cleaned with alcohol and other solvents.***

Mode Button
To the right of the text display is a vertical row of 2 pushbuttons. The top button is the Mode button. This pushbutton switch accesses a mode sensitive menu through the 2-line text display. The options displayed in the text display depend on the current mode of operation.

Select Knob
The knob at the bottom of the row is a multi-action control. It responds to rotations clockwise, counter-clockwise and pressing in. This rotary switch is mode sensitive and is used primarily to view modules by rotating and select modules by depressing while in the ARM state. Rotating the knob clockwise has the effect of increasing numbers, and counter-clockwise of decreasing numbers. It is primarily used to select modules when no menu options are showing in the text display. Depressing the select button is to act on prompted menu items in both key off and key on conditions.

Group Switch
The group switch is to the right of the top row of firing switches and is used for accessing the 14 assignable module groups, With the ARM key off it is used to select and assign modules to each group and when armed it is used to select module groups to fire. In the safe state, the switch behaves as a toggle, allowing entry to and exit from the Group edit mode. In ARM state, the switch acts as a momentary where the select group feature is active only while the switch is held. More on this later.

Fire Status (1 - 45)
The Cue status indicators show the current continuity and status of each of the 45 firing circuits of the selected Firing Module. They use two-color LED lamps for long life and to provide more information than a single color could. There are 4 basic conditions that are displayed, with additional advanced status possible. The continuity circuit is the green side of a two-color LED with a current limiting resistor. It has a $1/6^{th}$ duty cycle to conserve battery power. The two-color LED is directly controlled by the panel electronics and is used to communicate captured status of various kinds.

The 1^{st} condition for the indicator is off completely, which occurs when the system is off or if there is no igniter present in the selected firing circuit and the circuit hasn't been fired since the last show or rail memory reset.

The 2^{nd} condition for the indicator is green, showing that there is some type of electrical connection present in the firing circuit.

The 3^{rd} condition for the indicator is a red color, showing that the firing circuit for the selected Firing Module has been fired since the last module or show memory reset.

The 4^{th} condition for the indicator is both green and red, indicating that the igniter is still providing an electrical connection somehow after being fired and the status re-acquired.

The third and fourth conditions are modified by having the red color flashing, showing the last fired cue for the selected firing module in Manual Fire mode.

Firing Status definitions in Status Mode

Condition	Color	Description
1	Off	Not fired, no continuity
2	Green	Not fired, continuity
3	Red	Fired, no continuity
4	Green + Red	Fired, continuity. Possible error, shorted igniter?

Firing Status definitions in Fire Mode

Condition	Color	Description
1	Off	Not fired, no continuity
2	Green	Not fired, continuity
3	Red	Fired, no continuity
4	Green + Red	Fired, continuity. Possible error, shorted igniter?
5	Flashing Red	Last fired cue of selected module.
6	Green + Flashing Red	Last fired cue of selected module, system armed similar to condition 4.

Firing Switch (1 to 45)

There are 45 firing switches arranged in 3 rows of 15 switches. The switch locations are numbered 1 thru 45 on the panel, with the number positioned between the firing switch and the associated firing status. Each switch is connected to a firing circuit. A firing switch will only fire an igniter when the ARM key switch is turned to the ARM position.

Group Select buttons (1-14)

The module Group selector switches are the top row of firing switches 1-14 and are active when in the group select mode. When a desired group is selected, the Blue LED above the switch illuminates and the memory for what previous activations of the firing switches is recalled and displayed on the fire status LEDs. When a group is selected the number of modules in the group is shown on the right hand side of the top line of the text display while group select is active.

4 pin XLR Communications Port

The female 4 pin XLR connector is used to communicate with Smartfire and Nighthawk Digital firing module systems.

Built In Functions

Digital Voltage Display

The system battery voltage is shown as a condition under normal operation. The conditions are “FULL”, “GOOD”, “FAIR” and “LOW”. When the system voltage strays outside of these ranges, the numeric value is shown instead. This can occur when the panel is being charged. Panel system voltage is displayed from 0.0 to 30.0 volts with 0.1-volt resolution. When the voltage drops below 21.2 volts, a low voltage message will appear in the voltage display area. In the firing modes, battery voltage is superseded by

output firing voltage, which is what is applied to the +24V pin of the XLR connector or reported from a digital module.

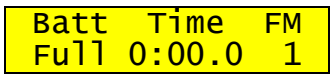
Battery/Power Status Display
The left side of the bottom line of the text display shows the battery current status when the power switch is turned on. If the battery charger is plugged into the charging jack, the battery status field will show the voltage of the batteries while charging. The statuses are "Full", "Good" "Fair" , "Low" and the current voltage when outside of these ranges.

Firing Module Memory
Each of the selectable firing modules has a memory associated with it that tracks firing history. The operator can individually reset each firing module history. The information saved is the accumulated fired shots for that module and the last fired shot. This information is retained when the panel is turned off,. This fired information is used for the red fire status indicators in the different modes of operation.

Elapsed Timer
There is an elapsed time function that is present in the panel that tracks the time from an initiating event. The initiating event is always a firing switch activation. The show timer is paused when the mode that it was running in is changed. The maximum timer value is 99 minutes 59.9 seconds with 0.1-second resolution. The timer is paused if the POWER toggle is briefly pressed while ARMED and the timer is running, and will resume upon firing the next cue.

Module Group Memory
There is a special feature available It can be described as a form of grouped module firing. Essentially it uses an entered list of module addresses assigned to one of the group buttons (1-14). When a firing switch is pressed while a Group is slelected, the same pin on each of the grouped modules will fire simultaneously.

<u>Power On/Version Display</u>
When the panel is turned on, it will display the Version number of the internal software while a LED indicator display sequence is active , and then it transitions to the Default screen,

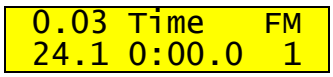


Digital P-45 Firing Panel Operational Modes

Safe Mode

This mode is when the firing system is SAFE. In this mode, the firing system displays the previously acquired module continuity status and the fired status of each of the firing switches 1- 45 circuits' for each selected Firing Modules connectors. The text display shows the battery voltage, Current elapsed time and the selected firing module or slected Group. The firing module memory for the selected display is reflected on the firing status indicators, but without the last fired information which normally is indicated by flashing red only in ARMED state.

The reset menu can be accessed in this mode only if the timer is not running.



Reset Timer –

The RESET Timer menu selection will clear the Show Timer to 0:00.0. It will not affect any other system settings or memory. No confirmation other than pressing the SELECT knob is required to perform this action. It is also allowed in the Manual Fire mode, but only while Paused.

Reset Module –

The RESET Module menu selection has the effect of wiping out the pin fired history of the currently selected Module and in addition clearing the Show Timer to 0:00.0. No confirmation other than pressing the SELECT knob is required to perform this action. This reset option is only available when a module is selected and the show timer is Paused.

Reset Group –

The RESET Group menu selection has the effect of wiping out the pin fired history of the currently selected modules assigned to the Group and in addition clearing the Show Timer to 0:00.0. No confirmation other than pressing the SELECT knob is required to perform this action. This reset option is only available when a Group is selected and the show timer is Paused.

Reset History –

The RESET History menu selection has the effect of wiping out the pin fired history of all the Modules and in addition clearing the Show Timer to 0:00.0 and show history memory. No confirmation other than pressing the SELECT knob is required to perform this action.

Group Edit mode

This Safe mode is necessary to allow the operator to assign module addresses to group select buttons. This module grouping function will fire 1 to 15 modules per group.. When one or more modules are assigned to a Group select button, rapid switching from group to

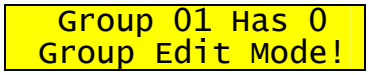
group can be accomplished by first pressing and holding the group switch and then the pressing the corresponding fire button 1-14. When multiple modules are assigned to a group, the sum of the pins on all of the grouped modules is presented for each module group.

The control used to set up the groups is the select knob, and the Fire buttons 1-14, The SELECT knob is used to set the module address to add to the current group. Depress the select knob to add the module that is showing to the group. The module address will advance to the next sequential address. If the addess is turned to a module already assigned to a group, pressing the SELECT knob will remove the module from its present assigned group. In addition, the Mode button allows a couple group clearing options.

Once the idea of module/Group association is understood, entry is fast and intuitive. Some of the constraints are: 14 Groups with a maximum of 15 modules per Group. Module addresses of 01-99 and 100-199. Any module can be assigned to a group up to a maximum of 15. The module addresses are saved in ascending order. The save process is completed when the Group Edit mode is terminated using the Group switch by actuating it until the selected group light stops flashing and then turn off the panel.

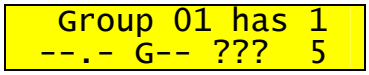
To learn module assignment, it's best to start with a clean slate. So, first the Group Edit must be entered by pressing the Group button. Then the RESET button is pressed until REMOVE GROUPS is showing. Press SELECT to clear all Group memory.

This is the display for working with groups. Hold Group Button and select group number.



Depress mode button again until it displays Select a group and one of the blue lights starts to flash.

Turn knob to desired module and press SELECT. This represents a selection of 1 module and it is Number 5, Hit mode and this will be saved.

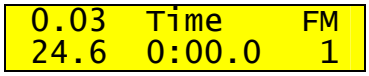


Continue in this manner to add a module to each of the 14 Groups. Removing a module is accomplished by rotating the SELECT knob counter clock wise to the module number that you wish to remove and depress select.
When done editing, exit the group edit mode by pressing the GROUP toggle switch and then turn off the panel. Turn the panel back on, Enter GROUPS mode. Verify that the groups are still present selecting each group in turn using fire switches 1-14

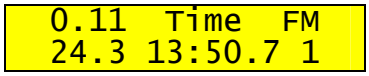
What makes this advanced feature useful and powerful is that once a group has been entered, it can be accessed by pressing the Group switch along with the desired group selector switch, collective module status can be retrieved by using the select knob,

The reasoning behind this approach is that when using the SELECT knob to reach a module in manual fire mode, a valid module will have responded to a status request at some time, while an incorrectly selected address will not have any returned status. But a module address assigned to a group is a pre-qualified address and can be fired without restraint.

ARMED Paused Mode
This is the default firing mode of the system, and is entered when the panel is on and the ARM key lock switch is set to the ARM position. If the systems' show memory has been reset the text display shows:



Otherwise the text display will show something similar to this:



In this mode, the top line display will show the load current being drawn by the XLR connector in the spot normally shown as BATT. The field below the output current number is the output voltage. The output current draw area has a resolution of 10 milliamps and the number below it is the system main power voltage that is present on the +24V pin of the XLR jack with a 0.1 volt resolution. The typical range of voltage will be between 25 to 21 volts. If the voltage field drops to 0.0, the output +supply fuse has probably tripped. In that case the output current field on the top line will display "Fuse".

The Time text area shows the elapsed time from when the first cue was fired until the timer was stopped by turning the ARM key switch to the OFF position. The timer resolution is in 0.1-second increments. The timer may be paused by briefly pressing the power switch once and will resume when the next cue is fired.

The Last text area shows the currently selected Firing Module. If there as been any cue fired from the currently selected Firing Module, the last fired cue will be flashing at a 5 times a second rate. This position of the top line will show" "FM" stands for Firing Module, and usually indicates that the panel is in the Continuity/Status Fire mode.

When entered from bumping the power switch, the elapsed time will be paused. It will start or continue as soon as a firing switch is activated, and will run until the operator turns the ARM switch to OFF or the power switch is turned off. Always try to turn the panel ARM key switch to OFF before turning the panel power off.

The Firing Module can be selected and activated by selecting the desired Firing Module with the selector switch, which will then display the status history of that Firing Module. As noted above, if any of the cues have been fired from the Firing Module, the last fired cue is flashing red to make it easier to locate quickly. Press the SELECT knob to retrieve the selected module's status.

The Firing Module can be selected and activated by pressing the desired Firing Module Using the selector switch, which will then display the status history of that Firing Module 1-199. As noted above, if any of the cues have been fired from the Firing Module, the last fired cue is flashing red to make it easier to locate quickly.

ARMED Running Mode

Module Firing

To fire in straight Manual Mode simply turn panel on Arm key and select modules with select knob and push fire buttons, You may change back and forth through the module range with the select Knob. The currently selected modules'status can be retrieved by pressing the SELECT knob. This is possible in Paused or when the timer is running.

Group Firing

This manual mode of fire allows individual modules or multiple modules to be grouped together and associated with a Group switch and indicator to fire the same pin on each module with a firing switch activation. If the group is selected by pressing the Group switch and the associated Group button 1-14.and the Group is empty it will show

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Select a Group
Firing Inhibited
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Group Firing is accomplished by pressing and holding down the group switch and then selecting the desired group 1-14 thru the firing switches 1-14. While in group select mode, any group selected will flash blue. When the group switch is released, the selected group will become active and the group indicator will stop flashing and stay on. While the group button is activated the firing mode will be locked out.

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Group -- Has 0
FIRING INHIBITED
```

Once a group is selected it will be indicated by the Blue led above the Group and you may fire from that group at this time. You may change groups in the same manner or simply turn the select knob to leave the group fire mode and manually select the desired module. The new combined status of each module assigned to the group will be retrieved when the SELECT knob is pressed while paused or during firing.

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DISCLAIMER;

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