



OPERATING INSTRUCTIONS

PYRODIGITAL[®]

Field Controller Model E Raptor

OPERATING INSTRUCTIONS

This document applies to the
Pyrodigital[®] Field Controller Model E
Software Version 1.0
(April 2019).

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Innovative Pyrotechnik GmbH

Steinwerkstr.2

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!!! IMPORTANT !!!

Before operating the Pyrodigital[®] Field Controller Model E, the owner **MUST send a notification** to Innovative Pyrotechnik GmbH that these operating instructions have been received. Please fill out and sign the following form and send a photograph or photo to:

pd@pyrodigital.com

Notification about Receipt of the Pyrodigital[®] Field Controller Model E Operating Instructions.

Herewith, I confirm that a copy of the Operating Instructions for the Pyrodigital[®] Field Controller Model E has been received by our company, either printed or in electronic form.

Device Serial Number:

Receiver (Company):

Date (mm/dd/yyyy):

Signer (Surname, Forename):

Signature:

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Visit us on pyrodigital.com
or contact by email pd@pyrodigital.com.

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Chapter 1

Feature Overview

The Pyrodigital[®] Field Controller Model E is a robust, versatile and powerful Firing Computer for digitally choreographed fireworks displays and special effect shows. The device provides the following features:

- Isolated Phase III Network Output, with powerful driver electronics and thermal circuit breaker
- Full backwards-compatibility with prior Pyrodigital[®] devices (Firing Modules as well as Field Controllers)
- Intuitive design: No extensive training required to learn the new device.
- 2 years warranty
- USB connection for script table download and upload
- Direct script editing
- 2 tables with 640 script lines each
- Manual firing with semi-automatic marco sequences of up to 9.9 seconds length.
- Fully automated firing synchronous to internal clock.

- Fully automated firing synchronous to external timecode (additional accessory needed)
- Ultra-stable internal clock
- Manual, semi-automatic and full-automatic continuity testing
- 3-way safety key: OFF - Check - Fire
- Integrated safety key warning system
- Simplified Manual Fire Mode
- Included charger
- Integrated battery status indicator
- Valve Regulated Lead-Acid (VRLA) batteries for reliable and safe performance and easy transportation. No lithium batteries.
- Optional password protection
- Device temperature monitoring
- Included deadman pickle with fire trigger

Chapter 2

Technical Data

Type:	Field Controller Model E (FC-E Raptor)
Manufacturer:	Innovative Pyrotechnik GmbH Steinwerkstr. 2, 71139 Ehningen Germany
Software Version:	1.0
Internal Battery Type:	Valve Regulated Lead-Acid (VRLA) Battery
Internal Battery Voltage:	24 VDC (2x 12 VDC in series)
Total Internal Battery Capacity:	2.1 Ah
Maximum Charge Current:	0.56 Ah @ <29.4 VDC
Amount of Phase III Network Outputs:	1
Phase III Network Output Voltage:	24 VDC (only if Safety Key is armed)
Maximum Constant Current (resp. Power) at Phase III Network Output:	3A (resp. 72 W)
Internal Clock Precision:	$\pm 20\text{ppm} = 0.002\%$ (ppm: parts per million)
Operating Temperature:	-20°C to +85°C Electronics -20°C to +55°C Batteries

Chapter 3

Introduction and Requirements

!!! ATTENTION !!!

ALWAYS ENSURE TO HAVE THE LATEST VERSION OF THIS DOCUMENT!

(You can find all documents on pyrodigital.com.)

3.1 The Field Controller Model E Raptor

Pyrodigital[®] Field Controller Model E is a Professional Level Tool. This tool, when combined with the Pyrodigital[®] Phase III Firing System Network, becomes an integrated hardware system which provides means to fire industry standard pyrotechnic electric matches.

The Pyrodigital[®] Field Controller Model E as a Professional Level Tool is designed, intended, and only to be used by Professional Pyrotechnic Operators in a controlled Professional Environment for the use with Pyrotechnical Products and Devices, Fireworks

and Special Effects. The USER must ensure compliance with all relevant national and international laws and regulations, such as explosive law, fire protection regulations and safety clearances in force. *(For the United States of America: The surrounding area needs to be permitted by the Fire Authority having jurisdiction, in conjunction with UN 1.4S / UN 1.4G (Class C) or UN 1.3G (Class B) ONLY explosives that have been examined and have been issued Federal EX numbers by the US Department of Transportation. The Pyrodigital[®] Field Controller Model E is not designed nor shall be used to ignite any Class A explosive or “High” Explosives.)*

If you do not understand this usage of the Pyrodigital[®] Field Controller Model E and the Pyrodigital[®] Phase III Firing System Network, or intend to use the Pyrodigital[®] Field Controller Model E and Pyrodigital[®] Phase III Firing System Network for any other purpose - STOP - do not proceed any further. Consult Innovative Pyrotechnik GmbH about cancellation of your order or a repurchase of your Pyrodigital[®] Field Controller Model E.

3.2 Definitions - System Controller and System Network

For purposes of identification, and in these Operating Instructions, the Phase III System can be divided into two major components, The SYSTEM CONTROLLER and the SYSTEM NETWORK. For the purpose of these Operating Instructions, the FIELD CONTROLLER IS CALLED THE SYSTEM CONTROLLER.

The Pyrodigital[®] FIELD CONTROLLER (the FIELD CONTROLLER / SYSTEM CONTROLLER / FIRING COMPUTER) is what Controls the operation of the Pyrodigital[®] Phase III Firing System Network. The Pyrodigital[®] FIELD CONTROLLER is located at the Control Location, at the place where the operator or user controls the Fireworks Display, Special Effects or other Pyrotechnical Products or Devices. The Pyrodigital[®] Phase III Firing System Network could also be controlled by another type of Pyrodigital

Phase III Controller than the Pyrodigital[®] Field Controller Model E.

The standard SYSTEM NETWORK composes the Firing Modules, the Interconnecting Cables, and the Splitter Boxes. The Network connects to the Field Controller via the main Interconnecting Cable. This main Interconnecting Cable then leads to the Splitter Box(es) which subsequently are connected with additional Interconnecting Cables to the Firing Modules.

The SYSTEM NETWORK may also be composed of other types of Pyrodigital[®] Phase III Output Devices, Firing Modules (as described above), or a combination of any of these. The System Network may be also referred to as the Firing Network or simply the Network in these Operating Instructions. Likewise, the Pyrodigital[®] Field Controller Model E may sometimes be referred to simply as the Controller, or generally as the System Controller. The Field Controller together with the System Network may be referred to simply as the (Pyrodigital[®]) Firing System.

THESE OPERATING INSTRUCTIONS ONLY DESCRIBE THE HANDLING OF THE PYRODIGITAL[®] FIELD CONTROLLER MODEL E RAPTOR.

FOR OPERATION OF THE SYSTEM NETWORK PLEASE REFER TO THE OPERATING INSTRUCTIONS FOR THE PYRODIGITAL[®] SYSTEM NETWORK. THE USER MAY ADDITIONALLY NEED TO REFER TO OPERATING INSTRUCTIONS FOR ANY OTHER PYRODIGITAL[®] OUTPUT DEVICES WHICH ARE IN USE IN THE SYSTEM NETWORK.

There are separate Operating Instructions:

- 1) for the System Network (composed of Firing Modules),
- 2) for other Phase III Firing Output Devices, and
- 3) for any other Pyrodigital System Devices

3.3 General Disclaimer

The Pyrodigital[®] Field Controller Model E and associated Pyrodigital[®] Phase III Firing System Network is intended for use by bonafide professional organizations only. You must have the expertise and background in professional pyrotechnics necessary to administer all aspects of Pyrotechnics Display, Pyrotechnical Products or Special Effects. This includes an understanding of the necessity of proper training and supervision of all employees handling the complex tasks relating to the use of the Pyrodigital Field Controller which is operating the Pyrodigital[®] System Network. Critical and unforeseeable factors beyond the control of the designers, authors, manufacturers, and distributors of this Firing System prevent them from eliminating all risks in conjunction with the use of the Pyrodigital[®] Firing System. Such risks include, but are not limited to: severe personal injury or death from unintentional and erratic electric ignition, failure of execution of a display or performance due to system failures. Such risks exist even though the Pyrodigital[®] Firing System is fit for use as stated in all advertising, brochures, and documentation, and even though all the instructions are followed. By proceeding with the use of the Pyrodigital[®] Field Controller Model E operating the Pyrodigital[®] Phase III Firing System Network you hereby assume all risks and liability resulting from the use thereof.

The Pyrodigital[®] Field Controller Model E is a device only to be used in professional pyrotechnics, to fire suitable electric matches as part of fireworks displays or special effects or other pyrotechnical products and devices. The Pyrodigital[®] Field Controller Model E is intended and designed exclusively for the purpose of firing pyrotechnic products and devices, special effects and fireworks, and may only be used for this purpose. The Pyrodigital[®] Field Controller Model E is part of a Pyrodigital[®] Phase III Firing System Network, and may only be used with other original Pyrodigital[®] equipment recommended by Pyrodigital[®] (Innovative Pyrotechnik GmbH). Pyrodigital[®] Phase III Firing System Network is interconnected using Phase III network cables recommended by Pyrodigital[®] (Innovative Pyrotechnik GmbH). The user must have specialist knowledge of the Pyrodigital[®] Phase III network and the Pyrodigital[®] field controller used. This is required to set up Phase

III networks and to operate the Pyrodigital[®] Field Controller Model E. The Pyrodigital[®] Field Controller Model E is designed and intended solely for professional use by trained and authorized pyrotechnicians, and may only be operated by such personnel. The Pyrodigital[®] Field Controller Model E may only be used by professional and authorized pyrotechnicians in conditions and environments that are approved by the authorities having jurisdiction. The designers, engineers, authors, manufacturer and sales partners of the Pyrodigital[®] FM-A firing module assume no liability for critical and unforeseeable factors outside their control related to the handling of the Pyrodigital[®] Field Controller Model E and the resulting risks. These risks include but are not limited to severe personal injury or death due to unintentional or incorrect firing of electric matches, operating errors and incorrect execution due to system errors during a fireworks display or performance or generally the usage of pyrotechnical products. Such risks exist even though the Pyrodigital[®] Field Controller Model E are suitable within reason for all applications indicated in advertising material, brochures and documentation. This is also the case even when all instructions and guidelines for use, including those for the Pyrodigital[®] Field Controller Model E, are observed. ENSURING SAFETY IS YOUR RESPONSIBILITY, and is outside of the control of Innovative Pyrotechnik GmbH (Pyrodigital[®]). By purchasing and/or using the Pyrodigital[®] FM-A firing modules, both the buyer and user assume full responsibility for all risks and liabilities resulting from the use of the Pyrodigital[®] Field Controller Model E. Furthermore, they also agree to indemnify Innovative Pyrotechnik GmbH (Pyrodigital[®]) and its sales partners against any claims resulting from injuries, loss and any damages caused directly or indirectly through the use of Pyrodigital[®] Field Controller Model E, as well as damages caused by failure. Innovative Pyrotechnik GmbH (Pyrodigital[®]) assumes no guarantee or liability for repairs or modifications to the device that are not performed or authorized by Innovative Pyrotechnik GmbH (Pyrodigital[®]), as well as for the resulting risks. Each sales partner is also bound to the conditions described here for the purposes of sales.

WARNING - EXTREME DANGER

Specific Procedures pertaining to the Use and Operation of the Pyrodigital® Field Controller Model E are outlined in these Operating Instructions. Deviation from any of the Procedures outlined in these Operating Instructions are specifically forbidden and absolutely not recommended by Innovative Pyrotechnik GmbH. Injury or Death to yourself and others, as well as property damage, could result from deviations to the Procedures as outlined in the Operating Instructions. Any deviation from the Procedures as outlined in these Operating Instructions are clearly at your own risk.

3.4 About the Operating Instructions Document

WARNING - CAUTION

IT IS INTENDED AND REQUIRED THAT EACH AND EVERY OPERATOR RESPONSIBLE FOR THE USE OF THE PYRODIGITAL® FIELD CONTROLLER MODEL E SHALL HAVE THEIR OWN COPY OF THESE OPERATING INSTRUCTIONS. EACH OPERATOR'S OPERATING INSTRUCTIONS SHOULD BE WITH EACH OPERATOR WHILE OPERATIONS INVOLVING THE USE OF THE PYRODIGITAL® FIELD CONTROLLER MODEL E ARE ONGOING.

To request additional copies of these Operating Instructions contact Innovative Pyrotechnik GmbH. There is a nominal charge to cover printing costs. These Operating Instructions, in its entirety, are a technical reference for the operation of the Pyrodigital® Field Controller Model E.

No part of the Operating Instructions is in any sense a tutorial, instruction guide, or educational text for learning about Display Fireworks Operations, Pyrotechnic Special Effects Operations, or the subject of safely handling explosives or pyrotechnical materials. It is assumed and required that you bring this experience and prior knowledge with you BEFORE you attempt to read or understand the subject matter of these Operating Instructions.

Like all technical references on a specific advanced subject, these Operating Instructions immediately concerns itself with the subject matter and may dispense with or not include explanations of foundations or basic knowledge regarding the subject. It is assumed that the reader is already familiar with such foundations and background, and additionally it is assumed that the reader is familiar with A UNIQUE TECHNICAL LEXICON, OR TERMINOLOGY, THAT IS GENERALLY ACCEPTED IN THE INDUSTRY.

If you find yourself at a loss to understand the technical terms used in these Operating Instructions, or you are unclear as to the general subject matter, then this should be your clue that you DO NOT have the necessary background or qualifications to proceed.

In this case STOP! PROCEED NO FURTHER! Show your supervisor this paragraph and explain your doubts about your prior knowledge and abilities. If you have no Supervisor, then contact Innovative Pyrotechnik GmbH directly and obtain clarification or further assistance before proceeding.

3.5 Customer Support

If you are having difficulty in operating the Pyrodigital[®] Field Controller Model E, please:

1. Re-read the sections of these Operating Instructions, or other supporting User Guides and Operating Instructions, concerning the area you are having difficulty with.
2. Assuming that you are in an inert Test Environment, try some other actions to try and work through your difficulty. Since you are in an inert Test Environment, do not worry about making mistakes, you can't break anything or fire any live material. We

all learn from mistakes and if you are not practicing with the Pyrodigital® Phase III Firing System in an inert Test Environment, then you are not learning as intended.

3. You may wish to consult with your Supervisor or other Experienced Users of Pyrodigital® Equipment.
4. Contact us at Innovative Pyrotechnik GmbH: pd@pyrodigital.com

3.6 Operator and Site Requirements

The procedures, functions, and all information outlined and described in these Operating Instructions assume certain requirements concerning the 1) Operator in Charge, or user, who is operating the Pyrodigital® Firing System or directly responsible for the System Operator if he/she is not the System Operator, or user, and 2) the physical site at which the Firing Operations take place. It is, assumed that in all cases, the System Operator, or user, is a working member of a professional team that prepares for, sets up, and executes Display Fireworks or Special Effects. It is assumed that these operations, including the Operation of the Pyrodigital® Field Controller Model E are supervised and controlled in a Top Down fashion by a Master or Journeyman Pyrotechnician who has substantial qualifications and experience in these operations. The Pyrodigital® Field Controller Model E and all components relating thereto are Professional Level Tools, designed for and intended to be used by working, fully qualified, and extensively experienced Master Pyrotechnicians.

These Operating Instructions will only cover the operation of the Pyrodigital® Field Controller Model E. The user MUST also refer to the Operating Instructions for Pyrodigital® Phase III Firing System Network composed of Pyrodigital® Firing Modules. Additionally the user may need to refer to Operating Instructions for other Pyrodigital® output devices, if such devices are used.

These Operating Instructions will NOT cover specific information relating to general Safety related background material in handling explosive products including pyrotechnic materials. These Operating Instructions assume that the user has prior knowledge and

experience and that the user brings that knowledge and experience with him/her as he/she reads these Operating Instructions and gains understanding of how to use the Pyrodigital[®] Field Controller Model E. If you do not have this prior experience you should stop here. Proceed no further. Explain to your supervisor or to Innovative Pyrotechnik GmbH that you do not have the necessary qualifications to proceed with operation of the Pyrodigital[®] Firing System.

This prior knowledge and experience are assumed to exist and remain up to date regarding the person responsible for use of the Pyrodigital[®] Firing System. This person will hereafter be called “the Operator” or “the Operator in Charge” or “the System Operator”, or simply “the User”. It will be your responsibility, as the Operator in Charge, to continuously monitor and insure that at every site at which the Pyrodigital[®] Firing System may be in use, this set of assumed conditions exists, and further that it does not change or deteriorate over time.

WARNING - EXTREME DANGER

IT WILL NOT BE POSSIBLE TO SAFELY OPERATE AT ANY SITE ON WHICH THE INITIAL SET OF ASSUMPTIONS, OR CONDITIONS IS NOT IN PLACE. SEVERE BODILY HARM, INJURY OR DEATH TO YOURSELF, YOUR CO-WORKERS, AND INNOCENT BYSTANDERS MAY OCCUR FROM IRRESPONSIBLE OPERATIONS WITH LIVE PROFESSIONAL DISPLAY FIREWORKS AND SPECIAL EFFECTS PYROTECHNICS.

Make sure that you are qualified as explained in the following and preceding paragraphs. If you do not feel to possess the proper qualifications as outlined above and below you should not proceed with attempting operation of the Pyrodigital[®] Field Controller Model E or the Pyrodigital[®] Firing System. Contact your Supervisor or Innovative Pyrotechnik GmbH and let clarify any questions that you may have before taking it upon yourself to

proceed. General Safety knowledge is gained through familiarity with applicable laws and regulations, as well as field experience under the supervision of a competent Pyrotechnics Operator.

Electrical Firing Safety is considered as part of General Safety Knowledge. Safety is a conscious effort to prevent accidents through intelligent understanding of the hazards involved. Anyone responsible for operating the Pyrodigital[®] Firing System must have at least the following prior qualifications:

1. A valid license/allowance for operating pyrotechnics from the authorities having jurisdiction. *(For the United States of America: A state Explosives, Pyrotechnician, or Special Effects License.)*
2. A minimum of two years prior experience under the direct supervision of Professional Operators or an adequate education.

For the United States of America:

The physical site at which any operations take place must have at least:

1. *Have been permitted by the local authority having jurisdiction.*
2. *Be covered by a general liability insurance policy that names the display operator and the system operator.*
3. *The display items must be UN 1.4S / UN 1.4G (Class C) or UN 1.3G (Class B) Display Pyrotechnics ONLY, and these items must have been examined by the US Department of Transportation and have been issued Federal EX Numbers.*

3.7 Safety and General Guidelines

WARNING - EXTREME DANGER

The Purpose of the Pyrodigital[®] Phase III Firing System is to cause initiation of industry standard pyrotechnic electric matches to ignite Firework Products and Pyrotechnical Products in Displays or Pyrotechnic Special Effects. If you do not understand this usage or intend to use the Pyrodigital[®] Phase III System for any other purpose do not use the Pyrodigital[®] Phase III Firing System.

WARNING - EXTREME DANGER

Fireworks, Pyrotechnical Products and Special Effects Materials are Explosives which can and may cause personal injuries or death to yourself and other people including spectators or innocent bystanders, in addition to property damage. The use of the Pyrodigital[®] Phase III Firing System in no way alleviates any safety, legal, or moral responsibilities including but not limited to the use, loading, transportation, storage, or discharge of Fireworks, Pyrotechnical Products or Special Effects. The user must be fully competent and assumes all responsibility and liability in both the use of pyrotechnic devices and the use of the Pyrodigital[®] Phase III Field Controller operating the Pyrodigital[®] Phase III Firing System Network. If you are not qualified, or have any doubt as to your qualification, do not use any part of the Pyrodigital[®] Phase III System. Seek professional assistance and be aware of and follow all safety procedures including compliance with all international, national and federal authorities, state, and Local Laws and/or Laws in the Country in which you are using the Pyrodigital[®] Phase III Firing System.

SAFETY IS YOUR RESPONSIBILITY and is beyond the control of the designer, manufacturer, seller, or their agents.

3.8 Safety

It is beyond the scope of these instructions or these Operating Instructions to give general safety instructions pertaining to the use of Pyrotechnical Products and Devices, Fireworks and Special Effects, including but not limited to storage, handling, transportation, discharge, disposal, and compliance with all applicable laws. General safety knowledge is gained through familiarity with applicable Laws and field experience under the supervision of a competent pyrotechnic operator.

ELECTRICAL FIRING SAFETY IS CONSIDERED AS GENERAL SAFETY KNOWLEDGE.

Specific Safety procedures applicable to the use of Phase III Firing System are highlighted throughout these Operating Instructions. These Safety related warnings or procedures are indicated as:

WARNING - CAUTION

WARNING - DANGER

WARNING - EXTREME DANGER

OBEY THESE SAFETY PROCEDURES. These specific procedures cannot guarantee Safety. Safety is a conscious effort to prevent accidents through intelligent and thorough understanding of the hazards involved. If you do not know what you are doing and the consequences of your actions do not proceed.

3.9 Additional General Safety Guidelines

WARNING - EXTREME DANGER

These Additional General Safety Guidelines cannot, in any way, be considered as complete and are only presented here to remind the user of the potential hazards and precautions, of which the user should already be intimately aware.

Having the Pyrodigital[®] Field Controller Model E or the Pyrodigital[®] Phase III Firing System in a safe or non armed condition does not mean that anything is SAFE.

- Electric matches are very sensitive devices and can ignite when subjected to friction, external impact, and sufficient electrical energy. Some potential sources of electrical energy are static discharges (human, dust, snow, & electrical storms) and radio frequency energy from TV, microwave, and radio transmitters, as well as the applied electrical energy used to initiate the electric match.
- Keep your electric matches shunted (leg wires (shorted) twisted together) until actual connection into the circuit.
- Do not pull on the leg wires of an electric match - separation of the match head from the leg wires can cause initiation of the electric match.

For the United States of America:

- *Keep your electric matches stored in a sealed METAL container located remote from all other pyrotechnic material (the METAL of the container provides radio frequency shielding).*
- *Don't allow Radio transmitters (police, fire, communications, etc.) within 50 feet as a standard safety procedure. Consult IME (Institute of Makers of Explosives)*

publication # 20 “Safety Guide for the Prevention of Radio Frequency Radiation Hazards” for safe distances at known transmitter power and frequencies.

If one assumes that any one of the electric matches may ignite at any time for whatever reasons, then one can plan safe handling and deployment procedures which will minimize injuries and eliminate any possible fatality should any such ignition occur.

3.10 General Overview, the Field Controller

The Pyrodigital[®] Field Controller Model E controls the Pyrodigital[®] Phase III System. The Pyrodigital[®] Phase III system is built around the modular concept. Pyrodigital[®] Phase III Firing Modules form the basic building blocks of the Pyrodigital[®] Phase III Firing System Network and may be added as needed (with associated interconnecting Cables and Splitter Boxes). This approach allows for maximum flexibility in both physical Layout of the System Network and the overall size (or capacity) of the entire system. See the Operating Instructions for the System Network for description, layout, and operation of the System Network. The Pyrodigital[®] Field Controller Model E is a self powered, portable Unit. The Pyrodigital[®] Field Controller Model E operates the Pyrodigital[®] Phase III Firing System Network via connection to the three wire Main Interconnecting Cable. This Main Interconnecting Cable then goes to the System Network. The System Network contains Pyrodigital[®] Output Devices (e.g Pyrodigital[®] Phase III Firing Modules) to which the pyrotechnic electric matches are connected. The output devices serve to decode information on the Interconnecting Cable and direct Firing Power to the appropriate electric match for Firing. The output devices also transmit electric match continuity status information back to the Field Controller, via the Interconnecting Cable. These Pyrodigital[®] Phase III Output Devices (Pyrodigital[®] Phase III Firing Modules or other original Pyrodigital[®] devices) have an electrical communication address. The address is selectable and must be unique for each output device. This address is what uniquely distinguishes each output device. Thus two way communications are possible between each

and every output device and the Pyrodigital[®] Field Controller Model E. The Pyrodigital[®] Field Controller Model E, then, individually controls the operation of each Firing Circuit on every output device. The Pyrodigital[®] Field Controller Model E operates in several Operating Modes. These Operating Modes all essentially provide a means for the user to define when and where (at what address on the specific output device) the specific pyrotechnic device is to be fired. A set of instructions is created by the user which directs the firing operation of the Pyrodigital[®] Field Controller Model E. This set of instructions is called the Data Table. The Pyrodigital[®] Field Controller Model E has provisions for two user selectable Data Tables. The five Operating Modes are grouped in one logical area with their corresponding selector keys below their indicator LEDs (Light Emitting Diode). Pressing Mode and one of these keys at the same time selects that corresponding Operating Mode, and the associated green LED illuminates. There is a 6th Operating Mode, called the STOP MODE. The STOP MODE is selected whenever the Stop Key is depressed or when the Pyrodigital[®] Field Controller Model E is first switched ON (by the main power switch). Thus the Pyrodigital[®] Field Controller Model E provides the means for the user to define the Firing Instructions (the Data Table(s)) and then execute (FIRE) those instructions.

3.11 Practice and Inert Testing

It is required that the user gain total familiarity with the complete Pyrodigital[®] Phase III Firing System BEFORE ANY LIVE PYROTECHNICS ARE FIRED OR EVEN PRESENTED.

WARNING - EXTREME DANGER

DO NOT OPERATE THE FIELD CONTROLLER OR THE PHASE III FIRING SYSTEM IN A LIVE FIRING ENVIRONMENT UNLESS YOU ARE COMPLETELY FAMILIAR WITH ALL OPERATING PROCEDURES AND WARNINGS IN THESE OPERATING INSTRUCTIONS, PLUS THE OPERATING INSTRUCTIONS FOR THE PYRODIGITAL® PHASE III SYSTEM NETWORK, PLUS THE OPERATING INSTRUCTIONS FOR ANY OTHER PYRODIGITAL® OUTPUT DEVICES THAT YOU ARE USING (other than standard Firing Modules which are covered in the Pyrodigital® Phase III System Network Operating Instructions mentioned above). DEATH, INJURY, AND PROPERTY DAMAGE MAY OCCUR IF YOU DO NOT KNOW EXACTLY HOW TO OPERATE THE PHASE III FIRING SYSTEM.

The user is expected and encouraged to operate the complete Pyrodigital® Phase III Firing System in an inert Test Environment in which no Pyrotechnic Material is present.

At first, the user may gain familiarity with the Pyrodigital® Field Controller Model E by operating the Field Controller by itself, with no external connections. Soon however, the user must connect at least one Firing Module (or other Pyrodigital® Output Device) to the Field Controller. This will allow the user to gain familiarity with the many functions of the Field Controller that pertain to, or directly communicate to, the System Network. Many functions of the Field Controller may not be clearly understood without connection to the System Network.

Your System originally came with test lamps that are to be used as simulated electric matches so that you may practice Firing repeatedly without actually igniting any Pyrotechnic Material. **Test lamps are available from Innovative Pyrotechnik GmbH. Additional or replacement test lamps may be obtained from Innovative Pyrotechnik GmbH.** Many options are available for inert Testing with simulated electric match test lamps. Initially the user may be comfortable inert testing (with test lamps)

with only one Firing Module connected to the Field Controller. At some point the user should layout and connect the full Phase III Firing System to become familiar with all aspects of the complete System. The user should inert test and simulate every procedure and function as outlined in these Operating Instructions PLUS the Operating Instructions for the System Network and the Operating Instruction for any other Phase III Output Devices which are used.

You should create data tables (directly on the Pyrodigital[®] Field Controller Model E or using Computer Scripting Software) and PRACTICE all the procedures outlined in these Operating Instructions. Data tables may be specially created to simulate Firings in your Inert Test System Layout. Firing Module addressing may be done to facilitate your inert test lamp setup.

Additionally, all procedures with Time Code and other procedures requiring external connections to the Pyrodigital[®] Field Controller Model E should all be PRACTICED and fully understood.

IF YOU HAVE ANY QUESTIONS, OR DO NOT UNDERSTAND ANYTHING WHATSOEVER RELATING TO THE OPERATION OF THE PYRODIGITAL[®] FIRING SYSTEM; PLEASE CONTACT PYRODIGITAL IMMEDIATELY FOR CLARIFICATION.

Innovative Pyrotechnik GmbH is available at: pd@pyrodigital.com

3.12 Further Documents

To operate Phase III Networks, it is also mandatory to be familiar with the Phase III System Network User's Guide and the operating instructions and/or user's guides of all equipment in use, e.g. the operating instructions of the Firing Modules Model A (FM-A). (You can find all documents on pyrodigital.com.)

Chapter 4

Device Overview

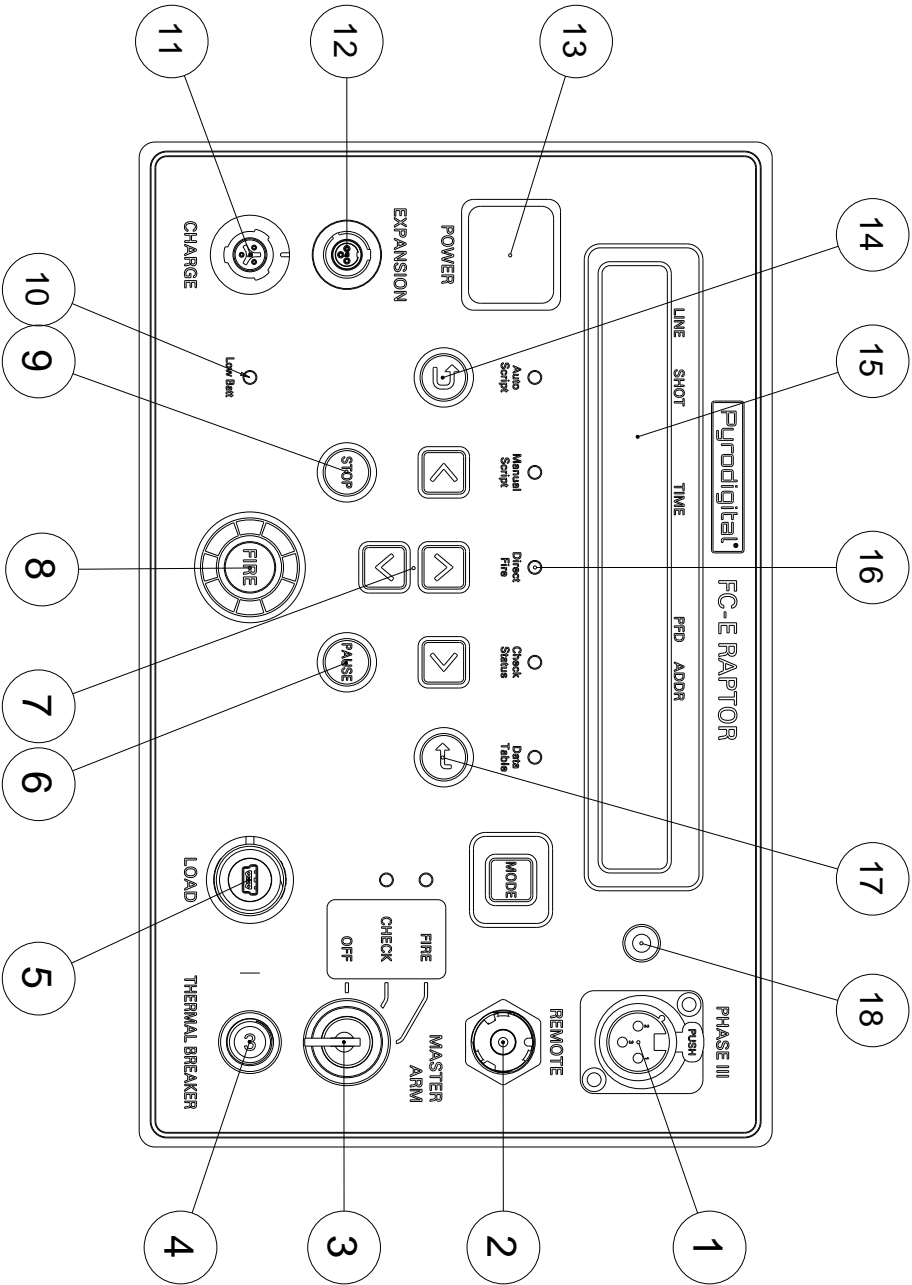
4.1 Device Top View



4.2 Front Panel

1. Phase III Network Output Plug

2. **Remote** - Connector for the Deadman Remote Pickle to control the Enable Interlock and to fire using the Fire Trigger of the Deadman Remote Pickle
3. **Safety Key Switch** - Arm the Phase III Network Output
4. **Thermal Circuit Breaker** - Protects the Phase III Network Output
5. **Load Table** - Download script tables from PC to the Field Controller and upload script tables from Field Controller to PC
6. **Pause** - Pauses running Marcos and Automatic Firing
7. **Arrow Keys** - Function depends on menu, keep them pressed to scroll
8. **Fire Button** - Release a fire command in Manual Script Mode and start a script in Auto Script Mode
9. **Stop** - Abort any ongoing action of the Field Controller and go to Stop Mode (the idle state of the Field Controller)
10. **Batterie Indicator** -
11. **Charge Plug** - Connect endorsed battery charger here
12. **Expansion** - Connect Pyrodigital FC-E Expansion Accessory here
13. **Power Switch** - Turn the device on and off
14. **Back** - Function depends on menu
15. **LCD Display**
16. **Operating Mode Indicator Lights** - Indicate the current Operating Mode)
17. **Enter** - Various purposes in the menu
18. **Phase III Network Monitor Indicator** - Gives information about hte Phase III Network Output



4.3 Side Plates

- 19. Type Plate with Serial Number
- 20. Battery Plate

19



20



4.4 Deadman Pickle

- 21. **Enable Button** - Closes Enable Interlock
- 22. **Fire Trigger** - Triggers a Fire Command
- 23. **Connector Plug**



If you require a left-handed Deadman Pickle please contact us at Innovative Pyrotechnik GmbH: pd@pyrodigital.com.

Chapter 5

Basic Operation Overview

5.1 Operating Modes

The Basic Operation of the Field Controller is:

1. Turn the Main Power Switch ON.
2. Wait until the message “CHECKING SYSTEM EEPROM” disappears
3. SELECT AN OPERATING MODE

Which Operating Mode to select and what to do in these modes is the essence of these Operating Instructions. To IMMEDIATELY be able to FIRE, see BASIC DIRECT FIRE - Example; which follows in a few pages within this Section of the Operating Instructions. The six Operating Modes are:

1. STOP MODE: This is the idle state of the Field Controller. The Field Controller will start-up in this mode and goes back to this mode whenever the Stop button is depressed.
2. DATA TABLE MODE: In this mode Script Tables can be loaded, sent, selected and edited. Also, you can enter the device options in this mode.

3. CHECK STATUS MODE: In this mode you can check the continuity status of all e-match terminals of all connected Firing Modules in the Pyrodigital® Phase III Firing System Network.
4. DIRECT FIRE MODE: Enter any address on the fly and fire it manually.
5. MANUAL SCRIPT MODE: In this mode you can fire scripted events manually. These events can be single shots or semi-automatic sequences, called Macros.
6. AUTO FIRE MODE: This mode allows you to run a fully automated script, synchronized to an internal clock or to an external timecode using the Pyrodigital Timecode Expansion.

You can think of the Operating Modes like a top menu that allows you to select the different functions of the Field Controller. To enter an Operating Mode, press the "MODE" key and the corresponding key below its Operating Mode Indicator LED at the same time. When the "MODE" key gets held down, the Operating Mode Indicator LEDs light up. The LED of the selected Operating Mode begins to blink, when its corresponding key gets depressed. To enter the Operating Mode release the "MODE" key now. When one of the Operating Modes is selected its Indicator LED is illuminated in green. In STOP MODE non of the five Operating Mode Indicator LEDs are illuminated.

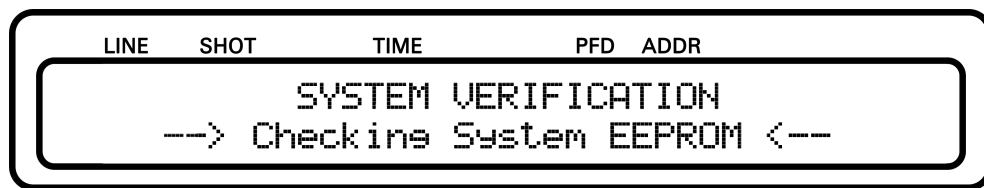
Whenever you enter the Operation Modes "CHECK STATUS", "DIRECT FIRE", "MANUAL SCRIPT" and "AUTO SCRIPT" the Safety Key Warning System will tell you that it is necessary to power-up the Phase III Network Outputs to operate.

WARNING - EXTREME DANGER It is your responsibility to ensure safety before turning the Safety Key to the "CHECK" or to the "FIRE" position.

Whenever you return from one of these Operating Modes the Safety Key Warning System will urge you to power down the Phase III Network Output by turning the Safety Key to the "OFF" position.

5.2 EEPROM Memory Check

Whenever the Field Controller is turned ON via the main Power Switch, the data stored in the EEPROM Memory (Electrically Erasable Programmable Read Only Memory) is checked for integrity. This is a diagnostic check to be sure that all settings and script data is consistent and uncorrupted.



After the check is passed, the Field Controller initializes itself and will show the start-up screen of the Stop Operating Mode, as shown below:



THIS IS THE STOP OPERATING MODE, OR TOP, OPENING MENU. THE LOWER RIGHT CORNER OF THE DISPLAY SHOWS THE OPERATING SYSTEM SOFTWARE VERSION NUMBER.

IN THE EVENT OF AN EEPROM CHECK FAILURE: The Data EEPROM Memory does have a data retention of over 200 years. However, the EEPROM Memory Check is provided as a diagnostic tool for additional assurance that the stored data is consistent and not corrupted. If the EEPROM Memory Chip has become corrupt, an Error Message will be issued on the Display. If this happens you can reset the EEPROM using the factory reset as described in [10.2](#). After the factor reset the Field Controller will restart completely erased and reconfigured. If the factory reset does not solve the problem, immediately stop using the Field Controller and contact your reseller or Pyrodigital directly at pd@pyrodigital.com for repair. Switch to a backup Field Controller, if available.

5.3 Stop Mode

Whenever the STOP Key is depressed (Safety Key OFF), or after the initial Power On (and after the EEPROM check), the Field Controller is in the STOP MODE. The STOP MODE can also be regarded as the TOP MENU, or the OPENING MENU. The Display will show the following:



The STOP MODE is indicated by the presence of the above Display. In the STOP MODE all five Operating Mode Indicator LEDs are off.

The STOP MODE may be selected by depressing the STOP KEY at any time. In the Stop Mode all functions of the Field Controller are halted, aborted or STOPPED. If the Safety Key has been previously armed, the Safety Key Warning System will alert the user to Turn Off the Safety Key and Remove the Key from the Lock. When the Safety Key is turned OFF the field controller will go to the STOP MODE and the display will also show the corresponding start-up message.

DEPRESSING THE STOP KEY WILL STOP FIRING: Depressing the Stop Key halts all functions of the Field Controller and an Operating Mode must be re-selected to continue.

In contrast to previous versions of the Field Controller, the Pyrodigital[®] Field Controller Model E will not lose the information about last fired script lines (the so-called Asterisks: *). You can check the Asterisks after returning from firing by viewing the script in the Data Table Operating Mode.

5.4 Deadman

The Pyrodigital[®] Field Controller Model E is equipped with a remote port. This remote port is basically an interlock. If the interlock circuit is not closed the CPU is not allowed to send fire commands to the Phase III Output Drivers additionally the Phase III Output Drivers are not allowed to react to any fire commands. CPU and each Output Driver checks for the interlock circuit individually.

WITHOUT CLOSING THE REMOTE INTERLOCK IT IS NOT POSSIBLE TO SEND FIRE COMMANDS TO THE NETWORK! IF YOU WANT TO FIRE YOUR SHOW, THE INTERLOCK NEEDS TO BE CLOSED USING THE DEADMAN PICKLE!

Connect the Deadman-Pickle to the REMOTE port and press the ENABLE button with your thumb. If you are in DIRECT FIRE, MANUAL SCRIPT MODE or in AUTO SCRIPT MODE you will recognize that the Phase III Output Indicator LEDs next to the Output Plug will stop blinking and turn static green. This indicates that the transmission of Fire Commands is ENABLED. The Deadman also has another button for your index finger. This is the Deadman Pickle Fire Button which works like the "FIRE" button on the keyboard.

WARNING - EXTREME DANGER

IT IS THE OPERATOR'S RESPONSIBILITY TO APPROPRIATELY USE THE REMOTE INTERLOCK.

5.5 Basics Direct Fire Mode

After the Field Controller is booted and in STOP MODE, select the DIRECT FIRE MODE as Operating Mode. Arm the safety Key IF IT IS SAFE TO PROCEED (such as with no external connections to the Field Controller or in an inert test environment). The LCD will appear as follows:

LINE	SHOT	TIME	PFD	ADDR
Direct Firing -> Next Address: ADD				
Last Fired: ADD				

You are now in the "Direct Fire" Operating Mode.

The only Option for firing with no Data Table is Direct Fire by specifying addresses. A three character hex address must now be entered manually. This specifies a starting point from which firing is proceeded.

Choose 010 using the arrow keys. It will show up as Next Address. Up and down keys advance the address by one, left and right keys are used to jump to the next module. Keeping them pressed enables the scrollfunction.

LINE	SHOT	TIME	PFD	ADDR
Direct Firing -> Next Address: 010				
Last Fired:				

Press FIRE (assuming you are in an INERT TEST ENVIRONMENT AND IT IS SAFE TO DO SO). You will hear a beeping sound and nothing else happens. Now depress and hold the Enable button on the deadman and press Fire again. Each time fire is depressed, while the Deadman button is held down, the unit shown as Next Address will advance sequentially to the next logical hexadecimal address. Simultaneously the fired address will be displayed as Last Fired Address. Choose other addresses using the arrow keys at any time.

LINE	SHOT	TIME	PFD	ADDR
Direct Firing -> Next Address: 011				
Last Fired: 010				

5.6 Basics Manual Script Mode

If a Script Table for Manual Firing is loaded to the Field Controller and is selected (in the DATA TABLE MODE) the Field Controller will set you to the beginning of the script after the MANUAL SCRIPT Operating Mode is selected and the Key is turned to "Fire". You are now in the so-called "Manual Script Mode". Here the script will be shot linearly from the first to the last line. Besides firing single shots you can also script semi-automatic sequences of shots for manual firing in Manual Script Mode. If this option is enabled withing the Settings. These semi-automatic sequences are called a MACRO. When you fire a macro the whole sequence is initiated and runs automatically(max. duration 9.9 seconds).

5.7 Basics Auto Script Mode

Before using the AUTO SCRIPT MODE you need to have selected a Script Table with at least one script line with a show time unequal to 00:00:00:00 (hh:mm:ss:ff).

To fire a prepared Auto Script Table first go to the "DATA TABLE MODE". Then select "Script Table" and choose the script you want to fire using the "Select Script" option. Ensure the displayed letter corresponds to the Script Table you like to use. You can change the selected Script Table by pressing the "up" or "down" arrow key. Now choose "AUTO SCRIPT MODE".

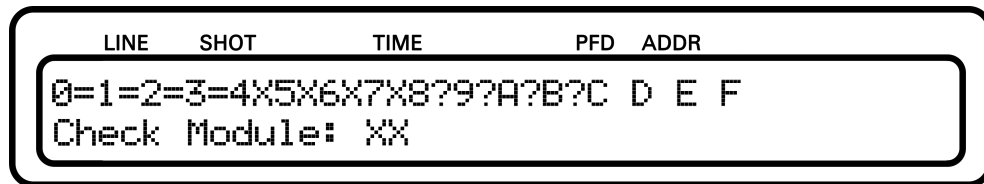
LINE	SHOT	TIME	PFD	ADDR
0	1	00:01:00:00	1	010
Fire=Run, Table: A				

If you now press the "FIRE" button, the Script will run. When the last Script Line has been fired the Field Controller will return to the STOP MODE automatically and the Safety Key Warning System will urge you to turn the Safety Key back to the "OFF" position.

5.8 Basics Check Status Mode

To check continuity of the electric matches connected to your Firing Modules, choose the "CHECK STATUS OPERATING MODE". Then turn the Safety Key to "CHECK" and select the option "MANUAL CHECK". The "up" and "down" arrow buttons are used to select between the different Firing Module Addresses one by one (00 to 7F in hexadecimal). Keep them pressed for scrolling. Using the "left" and "right" arrow buttons you can navigate through the addresses jumping 16 modules with each button press.

The display will show a Symbol for each of the electric match clamps:



- **=** this clamp address is present in the selected script table AND was found on the firing module to have continuity: FINE
- **X** this clamp address is present in the selected script table BUT was found on the firing module to have NO continuity: THIS E-MATCH IS MISSING
- **?** this clamp address is NOT present in the selected script table BUT was found on the firing module to have continuity: SHOULD NOT BE THERE
- **blank** this clamp address is NOT present in the selected script table AND was found on the firing module to have NO continuity: FINE

Note that, of course, you will only see "?" or "blanks" if you have selected an empty Script Table.

Chapter 6

Safety Arm Key and Warning System

6.1 Introduction

The Pyrodigital[®] Field Controller Model E is equipped with a 3-position Safety Arm Key Switch that allows to arm the Phase III Network Outputs. The Safety Arm Key Switch enables the user to control the supply of voltage to the Phase III Networks connected to the Phase III Network Outputs of the Field Controller. When the Key is removed or the Key Switch is set to the first position "OFF", the Phase III Network Outputs are disconnected from power. In the positions "CHECK" and "FIRE" the supply voltage of 24 VDC is applied to the Phase III Network Outputs and, therewith, to the connected Phase III Networks.

The integrated audible warning system (in the following also called the Safety Arm Key Warning System) and appropriate display messages signal the user when turning the key is required. Even more important, the audible Warning Buzzer System warns the user in case the Phase III Network Outputs is unnecessarily powered up. The corresponding display messages urge the user to turn the Key to the "OFF" Position to power down the

connected Phase III Networks. The purpose of the Buzzer Warning System is to WARN THE USER, and anyone in close proximity to the Field Controller, to the fact that THE FIRING SYSTEM IS ABOUT TO BE OR IS ARMED. Turning the Safety Arm Key to the "CHECK" or "FIRE" position imposes Extreme Safety Hazards because voltages capable of Firing the electric matches (to which the pyrotechnic devices are connected) are now intentionally present at all points in the Firing System Network.

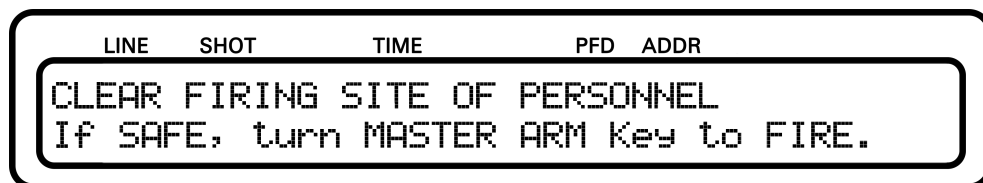
The buzzer volume can not be adjusted, though the user can disable the buzzer temporarily in the device settings. If the buzzer is disabled a display message warns you during start up and gives you the opportunity to re-enable all warning signals. For more details on disabling the buzzer please read [11.3.3](#).

WARNING - CAUTION

BE AWARE THAT THE AUDIBLE FEEDBACK OF THE WARNING SYSTEM IS A SAFETY FEATURE THAT IS SUPPOSED TO HELP THE USER TO ENSURE A SAFE ENVIRONMENT. IT IS THE USER'S DECISION WHEN DEACTIVATING THE BUZZER AND, GENERALLY, THE USER'S RESPONSIBILITY TO ENSURE A SAFE ENVIRONMENT WHEN USING THE FIELD CONTROLLER MODEL E.

6.2 Arming with the Safety Arm Key to "FIRE"

When the Operating Mode of the Field Controller is set to "AUTO SCRIPT", "MANUAL SCRIPT" or "DIRECT FIRE" the display prompts the message:



Also the audible Warning System warns you.

BEFORE YOU PROCEED TO TURN THE KEY TO THE "FIRE" POSITION, IT IS YOUR RESPONSIBILITY TO ENSURE THAT IT IS SAFE TO POWER UP THE PHASE III NETWORK!

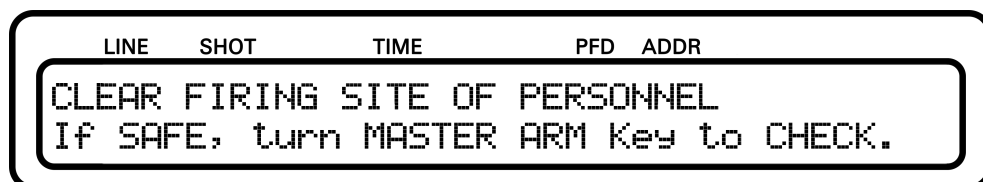
When the key is turned to "FIRE" the FC-A proceeds and the audible Warning System falls silent.

WARNING - EXTREME DANGER

NEVER ARM THE FIELD CONTROLLER BY TURNING ON THE SAFETY KEY UNLESS IT IS SAFE TO DO SO. MAKE ABSOLUTELY SURE THAT THE FIRING AREA IS CLEAR OF ALL PERSONNEL AND THAT IT IS SAFE TO PROCEED BEFORE APPLYING POWER TO THE SYSTEM NETWORK BY ARMING THE SAFETY KEY. ALSO DO NOT ARM THE SAFETY KEY UNLESS INSTRUCTED TO DO SO BY THE DISPLAY.

6.3 Arming with the Safety Arm Key to "CHECK"

When the Operating Mode of the Field Controller is set to "CHECK STATUS" the display prompts the message:



Also the audible Warning System warns you. BEFORE YOU PROCEED TO TURN THE KEY TO THE "CHECK" or "FIRE" POSITION, IT IS YOUR RESPONSIBILITY TO ENSURE THAT IT IS SAFE TO POWER UP THE PHASE III NETWORK! When the key is turned to "CHECK" or "FIRE" the FC-A proceeds and the audible Warning System

falls silent.

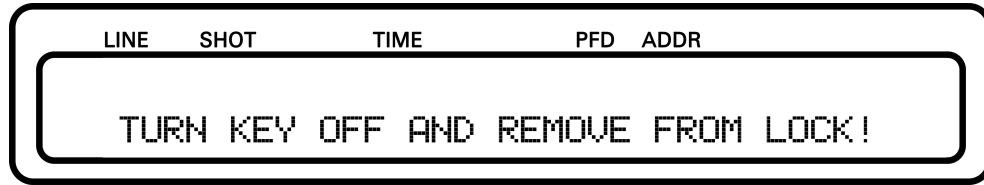
WARNING - EXTREME DANGER

NEVER ARM THE FIELD CONTROLLER BY TURNING ON THE SAFETY KEY UNLESS IT IS SAFE TO DO SO. MAKE ABSOLUTELY SURE THAT THE FIRING AREA IS CLEAR OF ALL PERSONNEL AND THAT IT IS SAFE TO PROCEED BEFORE APPLYING POWER TO THE SYSTEM NETWORK BY ARMING THE SAFETY KEY. ALSO DO NOT ARM THE SAFETY KEY UNLESS INSTRUCTED TO DO SO BY THE DISPLAY.

In the "CHECK" and the "FIRE" Position the Phase III Network Outputs get connected to the supply voltage and, thus, the connected Phase III Networks get powered up. In the "FIRE" Position the central processing unit (CPU) of the Field Controller is allowed to send fire commands to the Phase III Output Driver and is allowed to request the status information from the Firing Modules via the Phase III Network. The Phase III Output Driver is wired to the corresponding network plug. However, when the Safety Arm Key Switch is in the "CHECK" Position, the CPU is allowed to request status information from the Output Drivers but is not permitted to send any firing commands to the Phase III Output Drivers. THEREFORE, IT IS RECOMMENDED TO ONLY TURN THE SAFETY KEY TO THE "FIRE" POSITION WHEN ENTERING AUTO FIRE MODE, MANUAL FIRE MODE AND DIRECT FIRE. IN CHECK STATUS MODE IT IS RECOMMENDED TO ONLY USE THE "CHECK" POSITION OF THE SAFETY KEY.

6.4 Disarming with the Safety Arm Key

Whenever the Field Controller is not in an Operating Mode that requires the Phase III Networks to be powered up, the display will show the message



and the audible Warning System will urge you to turn the Safety Arm Key to the "OFF" Position. The audible warning signals and the displayed warning message continue indefinitely until the user turns the Safety Arm Key to the "OFF" position. As soon as the Key is in "OFF" position, the FC-A proceeds and the audible Warning System falls silent.

WARNING - CAUTION

NORMALLY ONLY DISARM THE SAFETY KEY WHEN INSTRUCTED TO DO SO BY THE LCD DISPLAY.

For example, DO NOT quit Checking Status by simply turning Off the Safety Arm Key. EXIT CHECK STATUS BY DEPRESSING STOP (or select another Operating Mode) AND THEN TURN OFF THE SAFETY KEY WHEN INSTRUCTED TO DO SO BY THE LCD DISPLAY.

OBVIOUSLY, IN AN EMERGENCY, TURN OFF (DISARM) THE SAFETY KEY TO STOP FIRING. Turning OFF the Safety Arm Key removes all Firing Voltages from the System Network.

6.5 Operational Notes

IF THE SAFETY KEY IS ARMED (TURNED TO "CHECK" OR "FIRE" POSITION) AND THE DISPLAY AS WELL AS THE AUDIBLE BEEPS ALERT THE USER TO TURN OFF THE SAFETY KEY, THEN the user may also select an Operating Mode which requires that power be applied to the System Network (Check Status, Direct Fire, Manual Script, Auto Script).

IF THE SAFETY KEY IS ARMED AND THE FIELD CONTROLLER IS ALREADY IN A POWERED MODE (Check Status, Direct Fire, Manual Script, Auto Script); THEN the user may also select between the four powered Operating Modes without incurring any additional Warnings by the Safety Arm Key Warning System (the Safety Arm Key is already ARMED). This for example allows the user to proceed directly from Check Status to one of the Fire Modes (and vice versa) without having to Re-ARM the Safety Arm Key. Thus, the Safety Arm Key Warning System serves to Alert and Warn the user, and anyone else in proximity to the Field Controller, that:

1. The user is about to apply Power to the System Network.
2. The user has applied Power to the System Network.
3. The user should remove power from the System Network.

The Safety Arm Key Warning System, of course, is only a part of a machine which cannot think or make judgment decisions, and is subject to error or failure. Clearly, the Safety Arm Key Warning System cannot, in any way, ensure Safety or imply Safe actions under all possible conditions. The responsibility for operation of the Field Controller clearly rests with the user, regardless of the action directed by the Field Controller.

Chapter 7

Phase III Network Outputs

7.1 Introduction

The Pyrodigital[®] Field Controller Model E is equipped with one Phase III Network Output Driver. The Phase III Network Output Driver is a separate electronic device integrated into the Pyrodigital[®] Field Controller Model E.

7.2 Output Monitor and Circuit Breaker

The Phase III Network Output Driver has got a secondary micro-controller that monitors the connected Pyrodigital[®] Phase III Firing System Network. This Monitor meters the drawn current, keeps track of the Operating Mode, the supply voltage applied by the Safety Key and the state of the ENABLE Interlock (closed = enabled). The Monitor has got a indicator LED (red - green - yellow) to give the operator a visual feedback about the state of the Phase III Network Output Driver.

Whenever the Phase III Network Output is powered up, the Output Monitor Indicator is illuminated in GREEN. When a too high current is drawn (higher than it can be for a full Pyrodigital[®] Phase III Firing System Network but lower than the limit of the thermal circuit breaker) the color turns to RED. This indicates the operator that there is

a too high current drawn on the network. In this event it is up to the operator to react correspondingly. If the current is even higher than the thermal circuit breaker limit, the thermal circuit breaker pops and the Phase III Network Output gets disconnected from power. When the power is disconnected the Output Monitor Indicator turns OFF.

NOTICE: IF THE THERMAL CIRCUIT BREAKER POPS IT TAKES SOME TIME UNTIL IT IS COOLED DOWN ENOUGH TO BE SWITCHED ON AGAIN BY PRESSING IT IN. This can take up to a minute.

Besides the color, the Output Monitor Indicator can be either statically on or blinking. The Output Monitor Indicator will blink if the Operating Mode of the Field Controller is set to "AUTO SCRIPT MODE", "MANUAL SCRIPT MODE" or "DIRECT FIRE" but the ENABLE Interlock is not detected to be closed. As soon as the ENABLE Interlock gets closed the Output Monitor Indicators become static. This shall help the Operator to keep track of whether the Enable Button is pressed or not.

Further the Monitors also flash yellow whenever a fire command or check status request from the CPU is received and accepted. This is very helpful during firing. Also, when performing a Manual Status Check (CHECK STATUS MODE → MANUAL CHECK) the Output Monitor Indicator will turn static yellow when a Firing Module with the requested Address is found.

The Monitor also implement an redundant Overcurrent Protection: In an event of a too high current (e.g. due to a hard short in a network cable close to the Field Controller) and the extremely unlikely event of a failing thermal circuit breaker, the Monitor will disconnect its corresponding Network Output from power. This "Software Fuse" will be reset after turning the Safety Arming Key off and on again.

During the booting of the Field Controller, the Output Monitor Indicator first turn red, then turn green. This sequence indicates you that the Phase III Network Output Drivers are working correctly and that they are ready for operation. In case the Safety Key is unintentionally not in the "OFF" position during booting the initiation sequence is skipped, the Output Monitor Indicator turns static green and the Safety Key Warning System urges you to turn the Safety Key to the "OFF" position.

7.3 Shorts in the Phase III Network

If the thermal circuit breaker pops, there is a short in your network that had drawn a too high current on the Phase III Network Output. High enough to pop the thermal circuit breaker, which protects the Field Controller. But you could also have shorts in your network that draw less current, e.g. when those shorts are at the very end of a network with long cable runs. The Monitor would then see an atypically high current, even though it is not high enough to harm the FC-E in any way. If such an atypically high current is measured, the Output Monitor Indicator turns red (as explained above). If the Output Monitor Indicator is red, large parts of the connected network might still work correctly. However, this network state must of course be avoided.

Finding a shorted cable(s) or component(s) is a simple matter of logically isolating the fault by a progression of disconnecting (unplugging) the Phase III Network at various points. Start your search on from the Field Controller. Divide the Phase III Network that is connected to the Phase III Network Output into smaller networks and see on which of those subnetworks the fault is present. If you have found the faulty part of the network, you can proceed to further subdivide the faulty subnetwork into smaller and smaller parts. Do this as follows:

1. Go back to STOP MODE, turn the Safety Key to "OFF", disconnect the field cable from the Phase III Network output position and ensure all Firing Modules are turned to OFF respectively SHUNT (Please check the Operating Instructions of the corresponding devices to ensure safe operation).
2. Divide your network to a smaller subnetwork respectively try the next subnetwork.
3. In case the thermal circuit breaker has popped wait until you can press it in again. It can take up to approximately a minute until it cooled down enough to be restarted.
4. Unshunt/turn ON all required Firing Modules, reconnect the network cable to the Phase III Output plug.

5. Select Check Status, BRIEFLY AND ONLY FOR A VERY SHORT PERIOD OF TIME, ARM the PHASE III OUTPUTS BY TURNING THE SAFETY KEY TO "CHECK" POSITION. Check if the Monitor Indicator get red after a second. Turn back the Safety Key to "OFF" position if this is the case.
6. Re-check to be sure the Circuit Breaker has not been tripped.
7. Depending on the result check the next subnetwork or further divide the faulty network part, restarting at Step 1.

WARNING - EXTREME DANGER

Do not unplug or plug any PHASE III Network Components during the Network is powered up. Always go back to STOP MODE and turn the Safety Key to the "OFF" Position and shunt all firing modules before you unplug or plug anything in the Phase III Network.

Chapter 8

Remote Interlock

The Pyrodigital[®] Field Controller Model E has got an Remote Input (REMOTE) on the right side of the front panel. The Remote Input is connected to the Enable Interlock Circuitry. This Enable Interlock needs to be closed if Fire Commands shall be conducted in AUTO SCRIPT MODE, MANUAL SCRIPT MODE or DIRECT FIRE MODE. If the Enable Interlock is not closed (e.g. by not keeping the Deadman Pickel Enable Button depressed) the CPU will not send out any Firing Commands to the Phase III Output Driver. Also the Phase III Output Driver will not accept any Firing Commands while the Enable Interlock is not closed. Thus it will not fire without holding the Enable Button pressed on the Deadman Pickle.

Further the Remote Plug can trigger an Fire Button Press Event, e.g. by depressing the FIRE TRIGGER Button of the Deadman Pickle.

WARNING - EXTREME DANGER

Do only plug and unplug the Deadman Pickle to the Remote Input of the Field Controller when the device is switched off or in "Stop Mode". Do not plug/unplug the Deadman Pickle while operating a Field Controller.

Chapter 9

Battery, Power and Fuses

9.1 General Information

WARNING - LIABILITY AND WARRANTY RELEVANT

THIS CHAPTER DESCRIBES THE PROCEDURE TO EXCHANGE THE BATTERIES AND TO REPLACE THE FUSES. THE USER MUST STRICTLY FOLLOW THE GIVEN INSTRUCTIONS. NOT FOLLOWING THE INSTRUCTIONS, USING NON-ORIGINAL PARTS, MANIPULATION OF NON-USER-SERVICEABLE PARTS OR NOT PERFORMING SERVICING AS REQUIRED, WILL RENDER THE WARRANTY VOID AND THE LIABILITY WILL BE EXCLUDED. THE ONLY USER-SERVICEABLE PARTS ARE THE BATTERIES, THE MAIN FUSE, THE EXPANSION FUSE AND THE CHARGER FUSE.

The Pyrodigital[®] Field Controller Model E is powered by two 12V Valve Regulated Lead-Acid (VRLA) Batteries. This battery type provides high reliability and the power required to drive the Pyrodigital[®] Phase III Network. This battery is very robust and is accepted for flight transportation. The Pyrodigital[®] Field Controller Model E does have NO LITHIUM BATTERIES OR LITHIUM-ION BATTERIES INSIDE. The two batteries

are in series and provide 24 VDC to the Field Controller.

IMPORTANT: The VRLA Batteries need to be replaced every 2 years. This is a natural property of the batteries. The replacement of batteries is excluded from the warranty for the Pyrodigital® Field Controller Model E given by Innovative Pyrotechnik GmbH. The lifetime of the batteries strongly depend on the handling by the user and do have a restricted lifetime.

The Pyrodigital® Field Controller Model E has three internal fuses besides the externally accessible thermal circuit breakers. The main and battery fuse (Mini Blade Fuse 20A 32V slow type) that secure the overall circuitry. The charger fuse (Cartridge Fuse 0.75A 250V 5x15mm slow type) that secures the CHARGE plug. And the Expansion Fuse (Mini Blade Fuse 2A 32V slow type) that secures the Expansion socket.

To replace the batteries and/or the fuses please follow the instructions in the corresponding following sections of this chapter.

9.2 Charge State Indicator

The Pyrodigital® Field Controller Model E is equipped with a Charge State Monitoring System that monitors the battery voltage, the drawn current from the battery, as well as the battery temperature. Using all these parameters the Charge State Monitoring System calculates the charge state of the battery. The charge state is indicated during bootup by the LOW BATT LED. The count of flashes indicates the charge state of the batteries. During Operation the charge state of the batteries is not indicated. Still the Charge State Monitoring System is active. If the charge state drops below 10% during Operation the LOW BATT Warning LED lights up.

The Count the LED is blinking represents the charge state of the batteries as follows:

- 4 times: 100% to 75%
- 3 times: 74% to 50%
- 2 times: 50% to 25%

- 1 times: 24% to 10%
- constantly on: 10% to 0%

WARNING - DANGER

If the batteries are too low, correct functioning of the Field Controller can not be assured. If the Indicator LED is illuminated, charge the device (less than 10% charge state).

Note: When the charge state is lower than 0% this means that the battery is discharged below the operating range of the battery. A too deep discharge harms the batteries, shortens their lifetime and lowers their capacity irreversibly.

9.3 Charging the Battery

The integrated batteries need to be charged using an appropriate charging device for 24 VDC Valve Regulated Lead-Acid (VRLA) Batteries. This charger needs to get plugged into the "CHARGE" plug on the bottom left of the Field Controllers front panel. The maximum charge current for the Pyrodigital® Field Controller Model E is 0.56 Ampere. Only use charging devices endorsed by Innovative Pyrotechnik GmbH. Our Pyrodigital® Field Controller Model E comes with an appropriate charging device that provides a universal input voltage range (100-240 VAC, 50-60 Hz). Contact us at Innovative Pyrotechnik GmbH or our sales partners if you require another than the delivered mains cable to connect your charger to the mains or if you require additional chargers.

It is not permitted to charge the batteries while operating the Field Controller. In general, chargers cannot detect a fully charged battery when at the same time current is drawn from the battery. As the battery will never be detected as being fully charged, chargers will not stop to sink current into the battery, even though the batteries are already full.

This will drastically reduce the lifetime of the batteries! For less robust battery types than the integrated and very robust VRLA Batteries, overcharging can be extremely dangerous. However, even though the VRLA Batteries are appropriately sized to be harmless even for overcharging, any Overcharging MUST be prevented.

WARNING - CAUTION

Do not charge the Pyrodigital® Field Controller Model E while the device is powered up!

9.4 Open the Field Controller

WARNING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO OPEN THE PYRODIGITAL® FIELD CONTROLLER MODEL E. THE USER MUST STRICTLY FOLLOW THE GIVEN INSTRUCTIONS. NOT FOLLOWING THE INSTRUCTIONS, USING NON-ORIGINAL PARTS, MANIPULATION OF NON-USER-SERVICEABLE PARTS OR NOT PERFORMING SERVICING AS REQUIRED, WILL RENDER THE WARRANTY VOID AND THE LIABILITY WILL BE EXCLUDED.

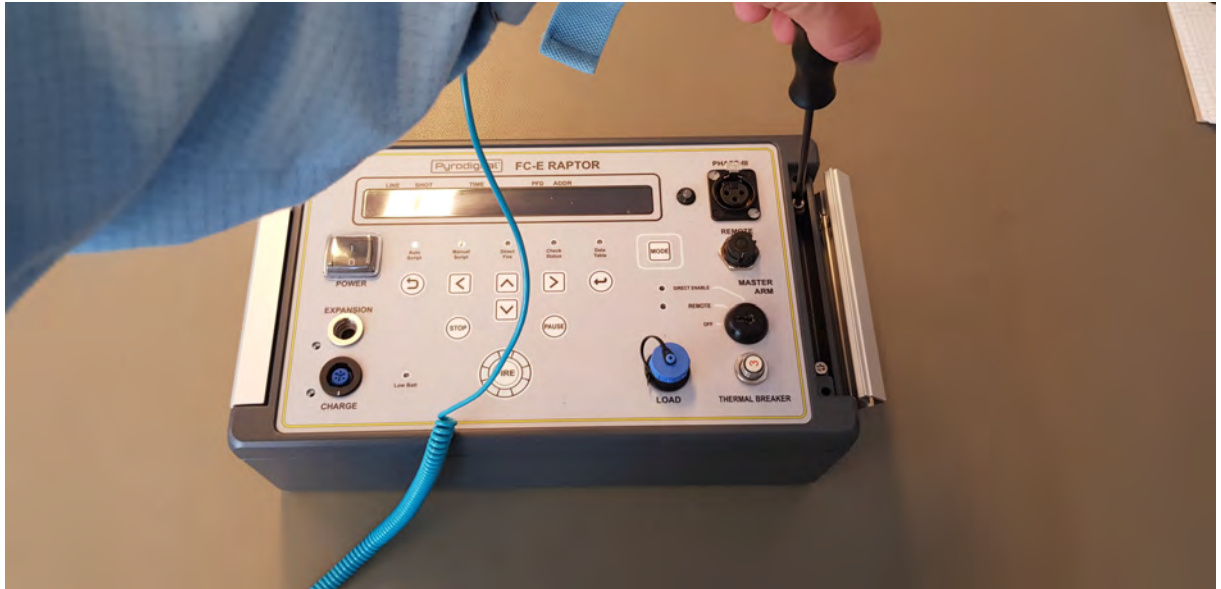


Always ensure to work in an ESD safe environment whenever the Pyrodigital[®] Field Controller Model E needs to be opened or is open! Properly ground yourself and the ESD mat underneath the device. Never open the Pyrodigital[®] Field Controller Model E outside of an ESD safe environment. Please ask Innovative Pyrotechnik GmbH or your local vendor for advice, if you are unsure about ESD safe environments. Place the Field Controller on an ESD safe underground, e.g. an ESD mat. Ensure the ESD mat has a proper 1 MOhm connection to earth ground.

First, flip the right cover to the side, to access the two screws beneath. Like shown in the picture



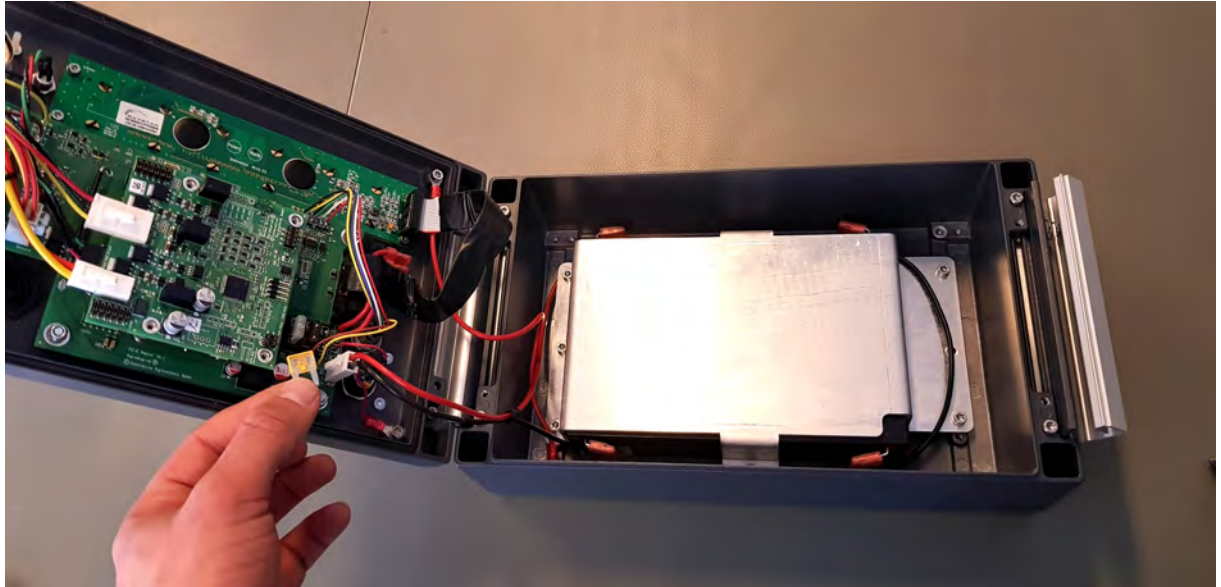
Unscrew the two screws that secure the lid.



Flip the lid open.



Detach the main fuse. You can easily identify the main fuse by its yellow color.



You successfully opened the Field Controller.

9.5 Replacing the Batteries

WARNING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE BATTERIES OF THE PYRODIGITAL[®] FIELD CONTROLLER MODEL E. THE USER MUST STRICTLY FOLLOW THE GIVEN INSTRUCTIONS. NOT FOLLOWING THE INSTRUCTIONS, USING NON-ORIGINAL PARTS, MANIPULATION OF NON-USER-SERVICEABLE PARTS OR NOT PERFORMING SERVICING AS REQUIRED, WILL RENDER THE WARRANTY VOID AND THE LIABILITY WILL BE EXCLUDED. THE ONLY USER-SERVICEABLE PARTS ARE THE BATTERIES, THE MAIN FUSE, THE CHARGER FUSE AND THE EXPANSION FUSE.

IMPORTANT: As mentioned above, the VRLA Batteries need to be replaced every 2

years. This is a natural property of this battery type. The replacement of batteries is excluded from the warranty of the Pyrodigital® Field Controller Model E given by Innovative Pyrotechnik GmbH. The lifetime of the batteries is naturally restricted and strongly depends on the handling by the user.

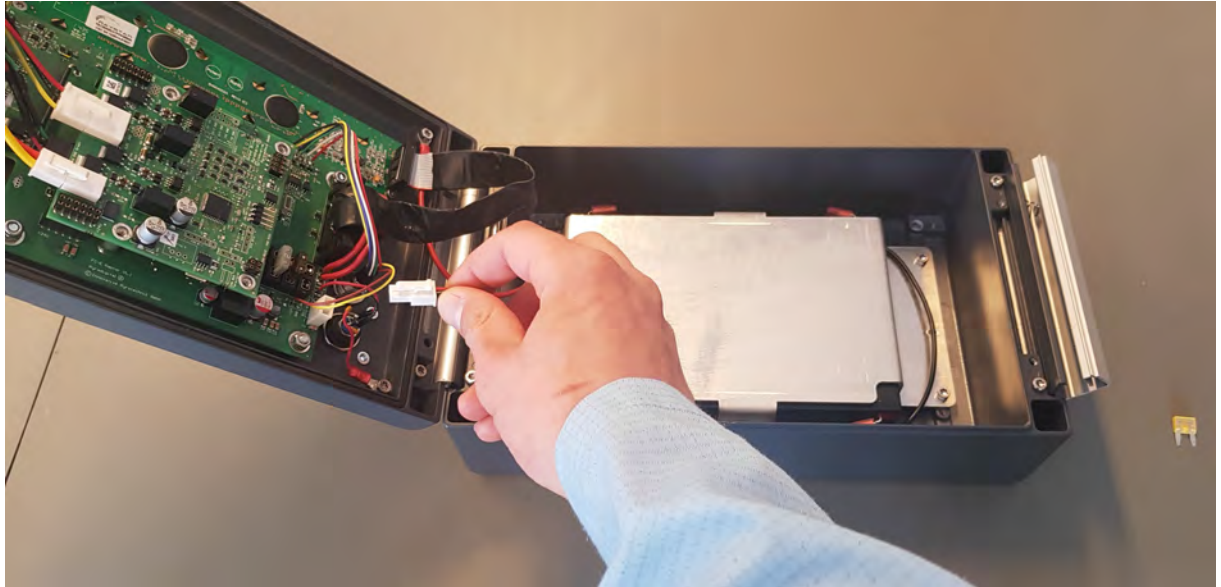
IMPORTANT: ONLY USE BATTERY ENDORSED BY INNOVATIVE PYROTECHNIK GMBH FOR BATTERY REPLACEMENT.

For information about endorsed batteries contact our local sales partners or us directly at Innovative Pyrotechnik GmbH: pd@pyrodigital.com.

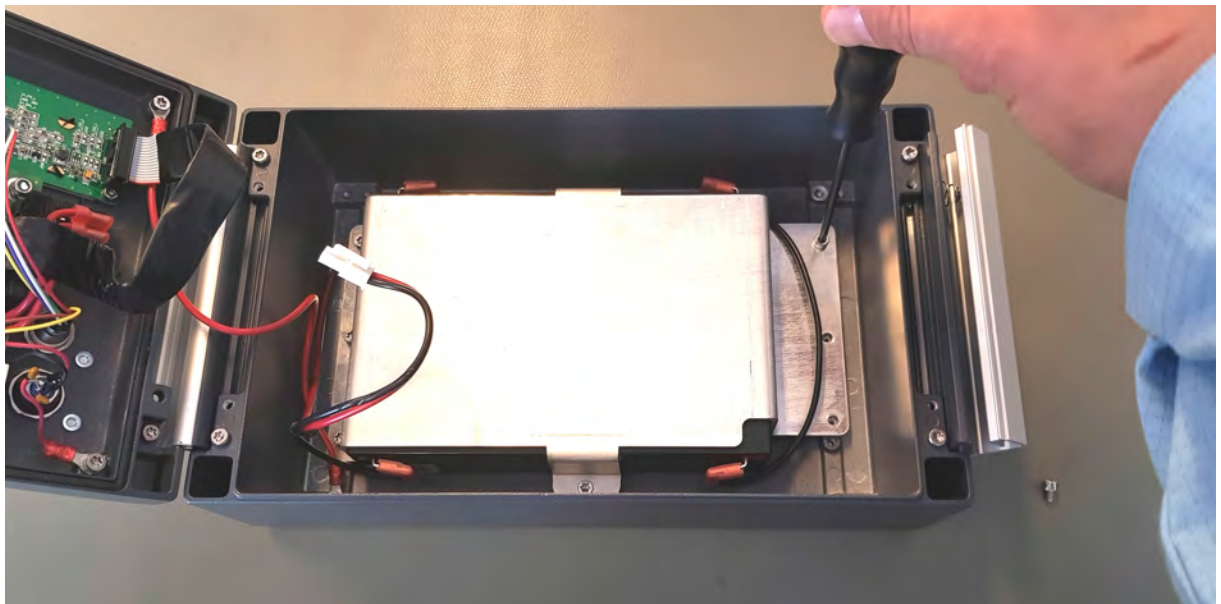
WARNING - DANGER / CAUTION If you do not feel confident replacing the batteries or if you have any doubts, immediately contact us at Innovative Pyrotechnik GmbH: pd@pyrodigital.com. We will assist you, conduct or arrange the battery replacement for you.

To replace the batteries first follow the instruction to open the Pyrodigital® Field Controller Model E in the previous section [Open the Field Controller](#). Then strictly follow the procedure described in this section and finally close the device like described in the following section [Closing the Field Controller](#).

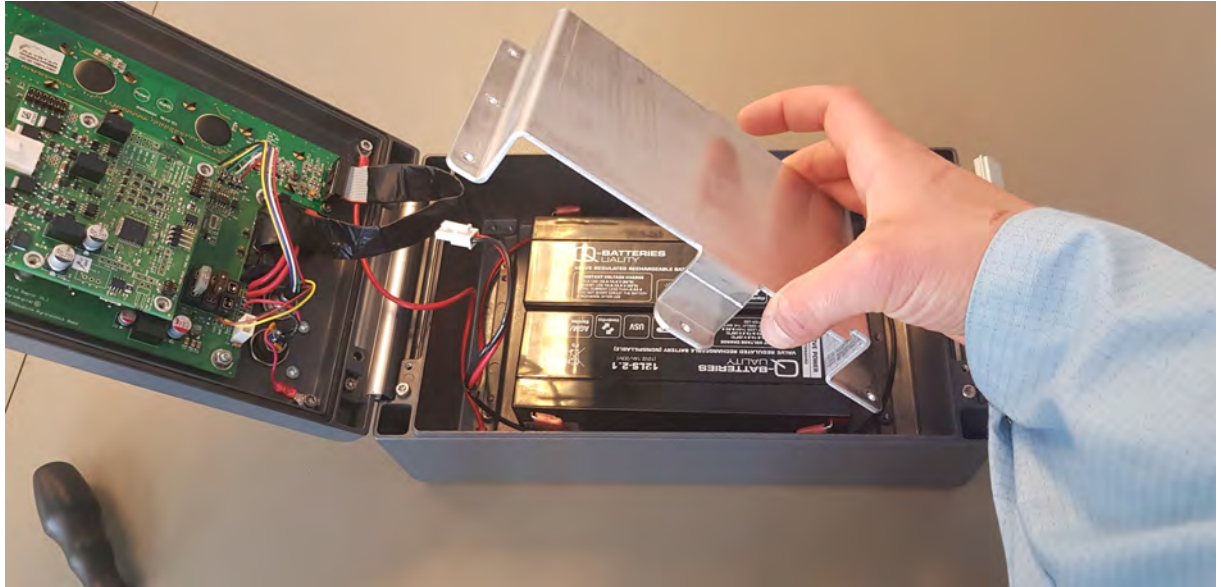
Unplug the batteriepack from the main PCB.



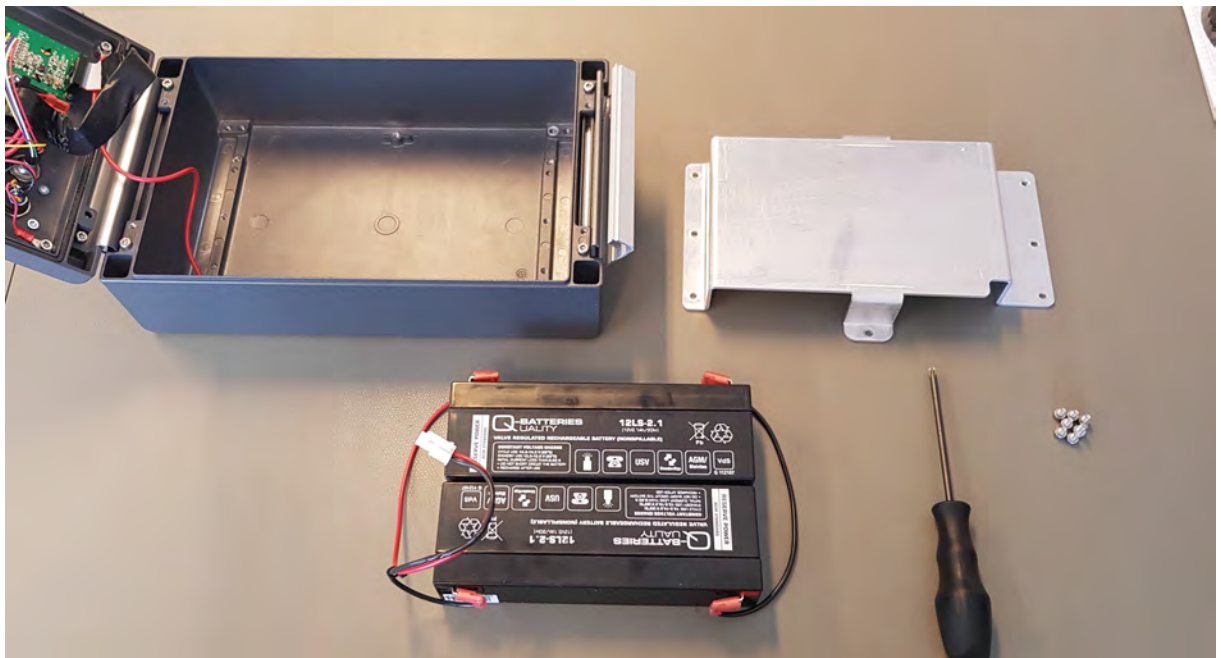
Unscrew the batteryholder with a TX20 screwdriver.



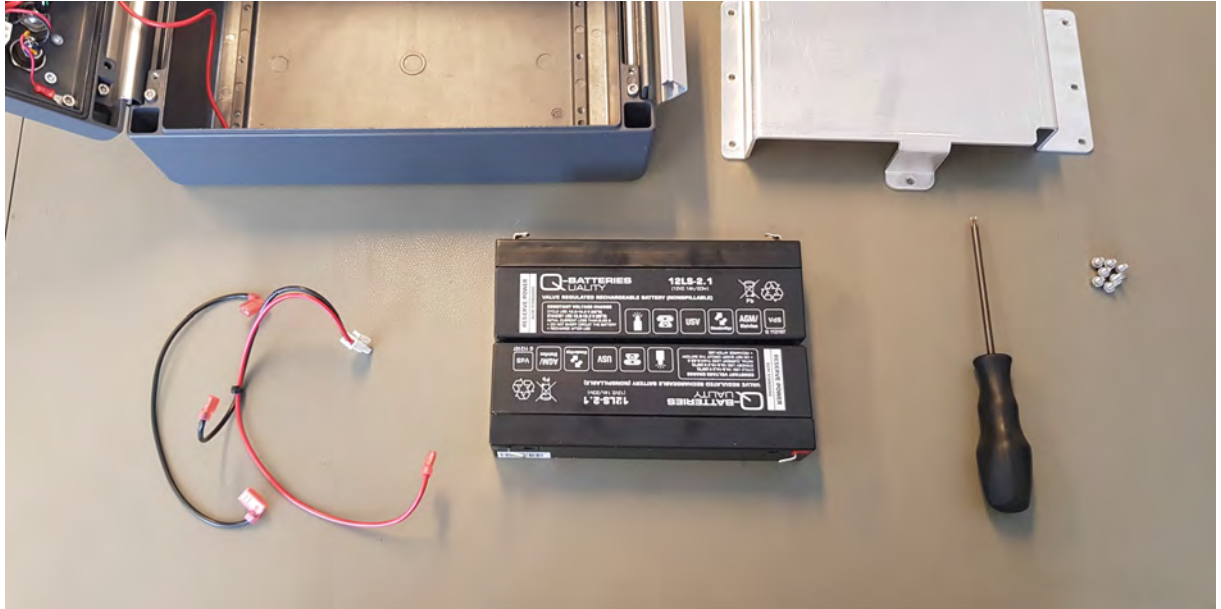
Take out the batteryholder.



Now, take out the batterypack with its cables still attached.



Unplug the Battery Interconnection Cable. Afterwards detach the Main Battery Cable.



Replace the old batteries for endorsed ones by Innovative Pyrotechnik GmbH (Always endorsed: Q-Batteries 12LS-2.1). Use self-adhesive EPDM Sponge Rubber Foam to fill the small gap inbetween the batteries and holder to secure pressure to the holder.

To connect the replaced batteries

1. Plug in the Battery Interconnection Cable to the positive pole on the right hand side of the battery in front.
2. Plug in the Battery Interconnection Cable to the negative pole on the right hand side of the rear battery.
3. Plug in the red Battery Main Cable to the positive pole on the left hand side of the rear battery.
4. Plug in the black Battery Main Cable to the negative pole of the left hand side battery in front.

Now reverse the actions. Put the battery pack back in the device. Place the holder on top and secure it with M4x8 TX20 screws. Then connect the Battery Main Cable to the socket on the electronics.

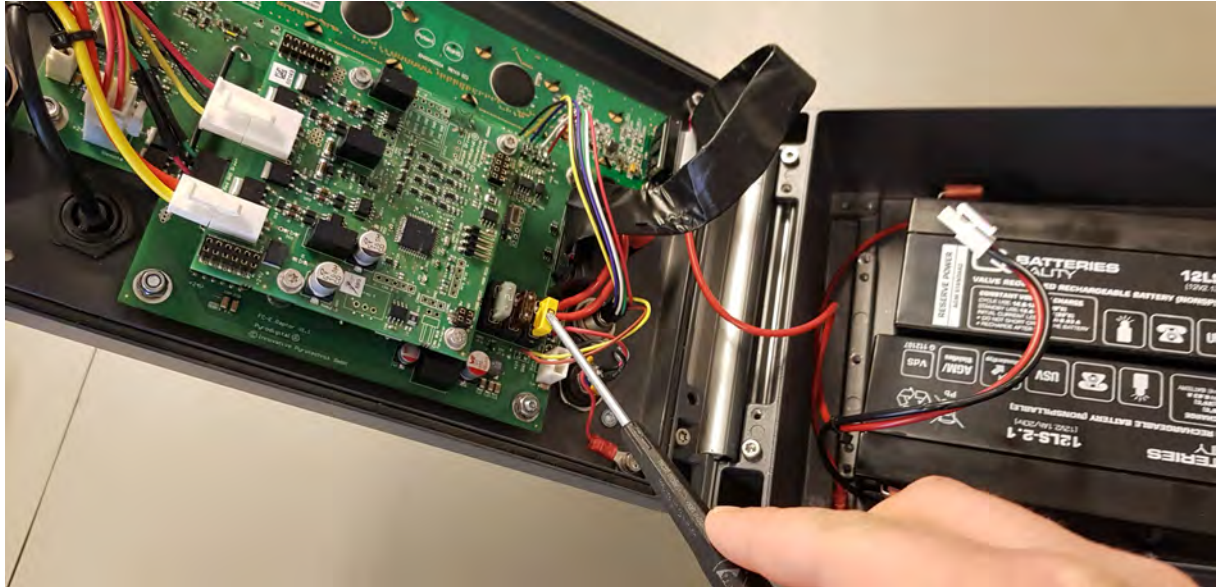
You successfully replaced the batteries. Now close the device following the instructions in section [Closing the Field Controller](#).

9.6 Replacing the Main Fuse

WARNING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE MAIN FUSE OF THE PYRODIGITAL[®] FIELD CONTROLLER MODEL E. THE USER MUST STRICTLY FOLLOW THE GIVEN INSTRUCTIONS. NOT FOLLOWING THE INSTRUCTION, USING NON-ORIGINAL PARTS, MANIPULATION OF NON-USER-SERVICEABLE PARTS OR NOT PERFORMING SERVICING AS REQUIRED, WILL RENDER THE WARRANTY VOID AND THE LIABILITY WILL BE EXCLUDED. THE ONLY USER-SERVICEABLE PARTS ARE THE BATTERIES, THE MAIN FUSE, THE CHARGER FUSE AND THE EXPANSION FUSE.

To replace the Main Fuse first follow the instruction to open the Pyrodigital[®] Field Controller Model E in the previous section [Open the Field Controller](#). Then strictly follow the procedure described in this section and finally close the device like described in the following section [Closing the Field Controller](#).



This is the location of the Main Fuse. If you strictly followed instructions, the Main Fuse is already unplugged. Replace it for a new fuse (Mini Blade Fuse 20A 32V slow type). If you are not sure whether the Main Fuse is gone or not, use a common multimeter to test the fuse for continuity. If you cannot find continuity, the fuse is gone and needs to be replaced. You find one Replacement Fuse in the case of your Field Controller (in case you ordered the case directly from Innovative Pyrotechnik GmbH). Take this fuse and put it into the holder of the Main Fuse. Do not forget to refill the SPARE FUSES, so you always have a spare with you.

Proceed with the procedure to close the device like described in section [9.9 'Closing the Field Controller'](#).

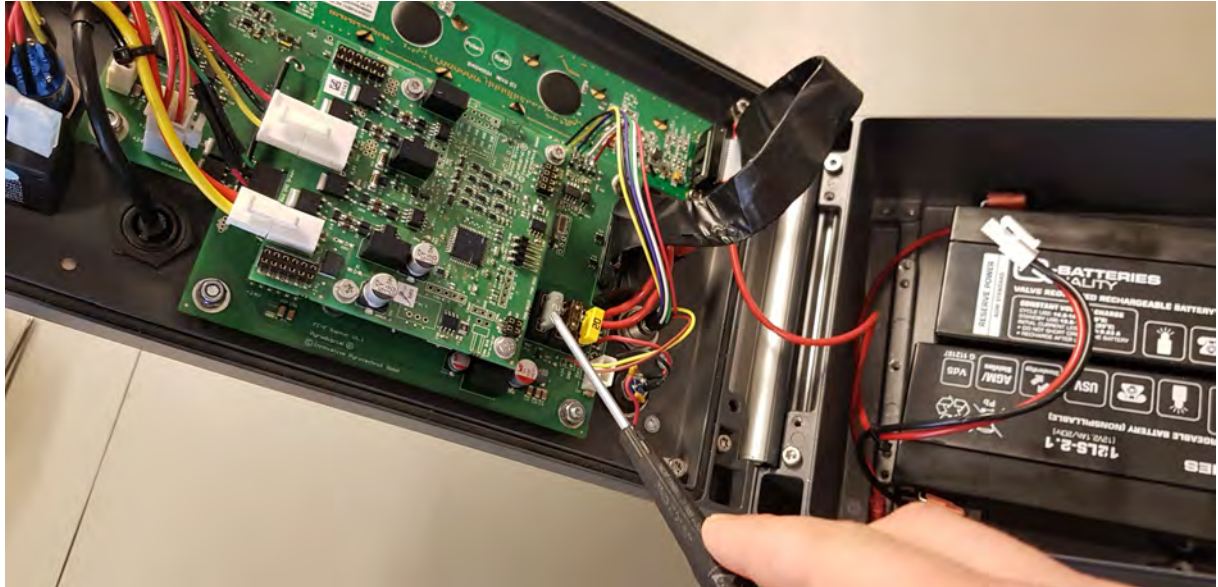
If you need spare fuses, please contact us at Innovative Pyrotechnik GmbH.

9.7 Replacing the Charger Fuse

WARNING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE CHARGER FUSE OF THE PYRODIGITAL[®] FIELD CONTROLLER MODEL E. THE USER MUST STRICTLY FOLLOW THE GIVEN INSTRUCTIONS. NOT FOLLOWING THE INSTRUCTIONS, USING NON-ORIGINAL PARTS, MANIPULATION OF NON-USER-SERVICEABLE PARTS OR NOT PERFORMING SERVICING AS REQUIRED, WILL RENDER THE WARRANTY VOID AND THE LIABILITY WILL BE EXCLUDED. THE ONLY USER-SERVICEABLE PARTS ARE THE BATTERIES, THE MAIN FUSE, THE CHARGER FUSE AND THE EXPANSION FUSE.

To replace the Charger Fuse first follow the instruction to open the Pyrodigital[®] Field Controller Model E in the previous section [Open the Field Controller](#). Then strictly follow the procedure described in this section and finally close the device like described in the following section [Closing the Field Controller](#).



This is the location of the Battery Fuse. Gently lift the fuse using a non-scratching tool, e.g. a wooden pencil. Do not use metal tools! You could harm the Printed Circuit Board (PCB) underneath the fuse. Replace it for a new fuse (Fine Wire Fuse 750mA 250V 5mm x 15mm slow type). If you are not sure whether the Battery Fuse is gone or not, use a common multimeter to test the fuse for continuity. If you cannot find continuity, the fuse is gone and needs to be replaced. You find a Replacement Fuse in the case of your Field Controller (in case you ordered the case directly from Innovative Pyrotechnik GmbH). Take this fuse and put it into the holder of the charger Fuse. Do not forget to refill the SPARE FUSES, so you always have a spare with you.

Proceed with the procedure to close the device like described in section [9.9 'Closing the Field Controller'](#).

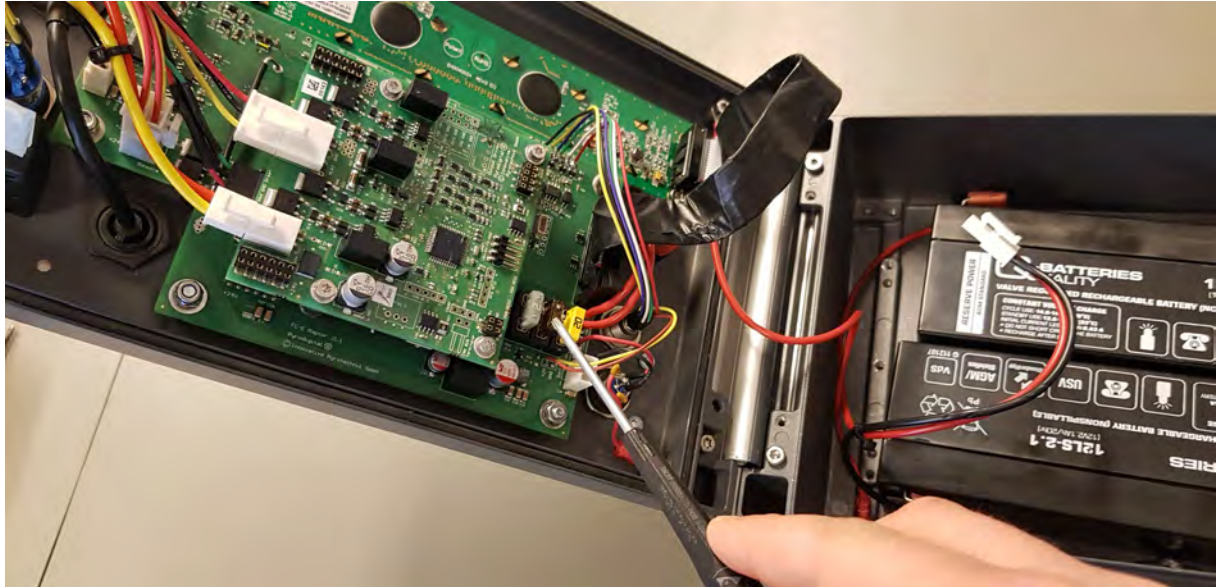
If you need spare fuses, please contact us at Innovative Pyrotechnik GmbH.

9.8 Replacing the Expansion Fuse

WARNING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE EXPANSION FUSE OF THE PYRODIGITAL[®] FIELD CONTROLLER MODEL E. THE USER MUST STRICTLY FOLLOW THE GIVEN INSTRUCTIONS. NOT FOLLOWING THE INSTRUCTIONS, USING NON-ORIGINAL PARTS, MANIPULATION OF NON-USER-SERVICEABLE PARTS OR NOT PERFORMING SERVICING AS REQUIRED, WILL RENDER THE WARRANTY VOID AND THE LIABILITY WILL BE EXCLUDED. THE ONLY USER-SERVICEABLE PARTS ARE THE BATTERIES, THE MAIN FUSE, THE BATTERY FUSE AND THE CHARGER FUSE.

To replace the Expansion Fuse first follow the instruction to open the Pyrodigital[®] Field Controller Model E in the previous section [Open the Field Controller](#). Then strictly follow the procedure described in this section and finally close the device like described in the following section [Closing the Field Controller](#).



This is the location of the Expansion Fuse. If the fuse is gone, replace it (Mini Blade Fuse 2A 32V slow type). If you are not sure whether the Charger Fuse is gone or not, use a common multimeter to test the fuse for continuity. If you cannot find continuity, the fuse is gone and needs to be replaced.

In case you need a fuse to replace the Expansion Fuse, you can find a spare fuse in the flightcase of your Field Controller (in case you ordered the flightcase directly from Innovative Pyrotechnik GmbH). Take this fuse and put it into the holder of the Expansion Fuse. Do not forget to refill the SPARE FUSES, so you always have a spare with you.

Proceed with the procedure to close the device like described in section [Closing the Field Controller](#).

If you need spare fuses, please contact us at Innovative Pyrotechnik GmbH.

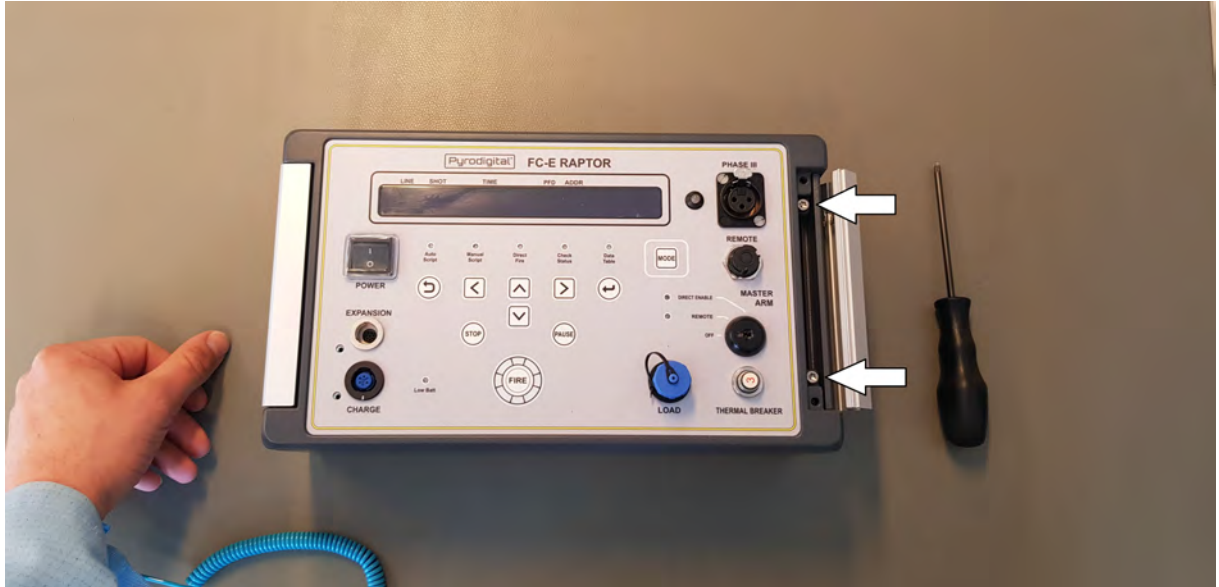
9.9 Closing the Field Controller

WARNING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO CLOSE THE PYRODIGITAL[®] FIELD CONTROLLER MODEL E. THE USER MUST STRICTLY FOLLOW THE GIVEN INSTRUCTIONS. NOT FOLLOWING THE INSTRUCTIONS, USING NON-ORIGINAL PARTS, MANIPULATION OF NON-USER-SERVICEABLE PARTS OR NOT PERFORMING SERVICING AS REQUIRED, WILL RENDER THE WARRANTY VOID AND THE LIABILITY WILL BE EXCLUDED. THE ONLY USER-SERVICEABLE PARTS ARE THE BATTERIES, THE MAIN FUSE, THE CHARGER FUSE AND THE EXPANSION FUSE.



Plug in the Main Fuse before closing the device. Now close the lid. Make sure, that no cables are getting caught and pinched in between the lid and the bottom part of the housing, while closing the lid.



Tighten the two screws on the right and close the cover.

You successfully closed the Field Controller.

Chapter 10

Boot Menu

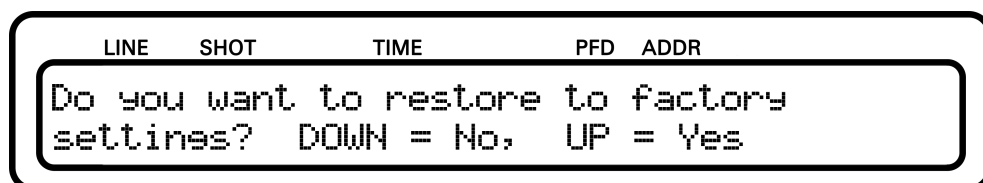
10.1 Enter the Boot Menu

The Boot Menu will allow you to reset the Pyrodigital® Field Controller Model E to the factory settings and/or to enable/disable the password protection.

To enter the Boot Menu you first need the Pyrodigital® Field Controller Model E to be switched off. Now keep the buttons "BACK" and "ENTER" depressed simultaneously and switch ON the device by flipping the ON/OFF switch (while keeping "BACK" and "ENTER" depressed).

10.2 Factory Reset

When entering the Boot Menu you will see the following message on the display



Press "ARROW UP" to reset the Pyrodigital® Field Controller Model E to the factory

settings. All script tables and option parameters will be cleared and reset to the initial factory settings. This process takes 20 seconds. Meanwhile, the display shows:



When the device finished the Factory Reset, the display will ask you for the Password Protection (see next section).

Press "ARROW DOWN" to skip the Factory Reset and directly go to the Password Protection (see next section).

10.3 Password Protection

The Password Protection protects your controller settings and Script Tables from being changed accidentally or unauthorized. Using this feature you can assure that an operator can not modify the settings and scripts but still can operate the show. Password Protection does not affect the firing (in AUTO SCRIPT MODE, MANUAL SCRIPT MODE and DIRECT FIRE MODE) or checking (in CHECK STATUS MODE).

If Password Protection is enabled all settings of the controller as well as the Script Tables are protected. You can only modify the script tables and settings after entering the correct password. However, you can still read the Script Tables even without knowing the password using the option "View Script"

To enable or disable the Password Protection you need to enter the Boot Menu (see section [Enter the Boot Menu](#)).

After the Factory Reset (whether performed or skipped) the Field Controller asks if a password should be set:

LINE	SHOT	TIME	PFD	ADDR
Do you want to use Password Protection?				
DOWN = No, UP = Yes				

Press "ARRO DOWN" if you want to disable Password Protection, the Pyrodigital[®] Field Controller Model E will now boot and perform the EEPROM check.

Press "ARROW UP" if you want to enable Password Protection. You now see the following screen:

LINE	SHOT	TIME	PFD	ADDR
Enter four digit Password: ****				
Press "Enter" to proceed.				

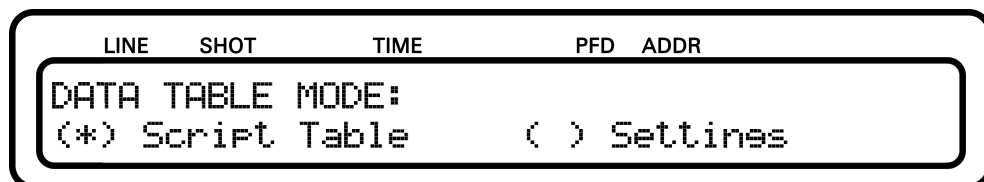
Now enter four Keys of your choice to set up the password. You can choose from all available Keys except "STOP", "FIRE" and "MODE". Then press "Enter" to confirm. The Pyrodigital[®] Field Controller Model E will now boot and perform the EEPROM check. If Password Protection is already enabled and you want to deactivate it, simply enter the Boot Menu and choose to not use the Password Protection.

Chapter 11

Data Table Operating Mode

11.1 Introduction

The Data Table Operation Mode is a versatile Mode within the Pyrodigital[®] Field Controller Model E. It contains options regarding the Script Tables as well as the Device Settings:

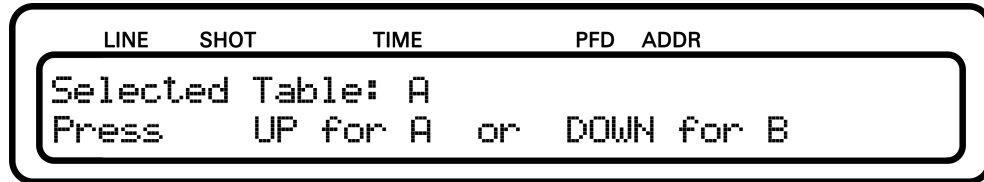


11.2 Script Table

11.2.1 Select Script

The Pyrodigital[®] Field Controller Model E has two Script Tables in its Memory (Script Table A and B). Each of the two Script Tables contains 640 Script Lines.

To change the SCRIPT TABLE, choose "SELECT SCRIPT" from the SCRIPT TABLE menu. The display will appear as follows:



The display indicates that the current Script Table selected is "X". Depress the corresponding Arrow Key "UP" or "DOWN" for the wanted Script Table. The Field Controller will automatically switch to that Script Table, and show your selection in the top line of the display. Note that intentionally, the Script Table selected remains in place, so that the User can verify the desired Script Table.

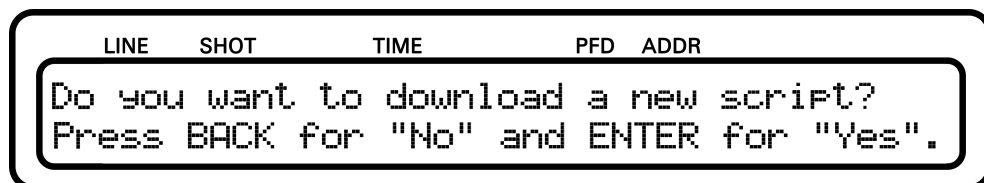
NOTE: SELECT TABLE IS NEVER PASSWORD PROTECTED

11.2.2 Download Script

DOWNLOAD SCRIPT is for importing a Script Table into the Field Controller from an external source via a Scripting Software.

The primary function of DOWNLOAD SCRIPT is to allow you to transfer your choreography, or scripting, from a personal computer to the Field Controller. The Field Controller is then used to execute, or FIRE, your Choreography. The Scripting may be loaded directly onto the Field Controller via an USB mini cable connected to "LOAD" plug on the front panel of the Pyrodigital® Field Controller Model E.

When "DOWNLOAD SCRIPT" is selected in SCRIPT TABLE menu, the display appears as follows;



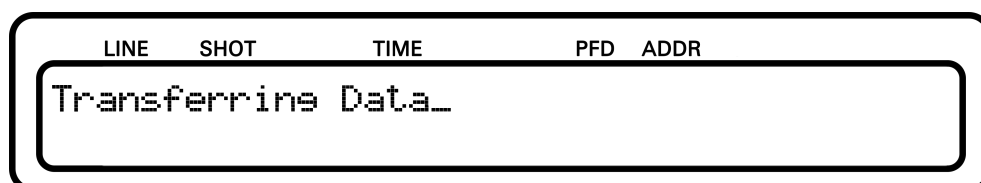
Choose "YES" to proceed. The current Script Table will be erased and the Field Controller will be ready to download a script table. Choose "NO" to abort and return to SCRIPT

TABLE Menu.

Make sure the Pyrodigital® Field Controller Model E is already connected to your computer before choosing "YES". After the Script Table is cleared the Field Controller is ready to receive script files. You can also abort here by pressing the "STOP" Button.



Prepare your Scripting Computer to send the Script Table. As soon as the file transfer starts the display will indicate the ongoing data transfer showing the following screen.



After transferring data successfully, the Pyrodigital® Field Controller Model E jumps back to the Script Table Menu.

In case an error occurred during the download the Pyrodigital® Field Controller Model E will take all necessary actions automatically. After the error message disappeared the Controller is ready to receive script tables again.

YOU FIND ALL DRIVERS FOR THE USB-CONNECTION AS WELL AS A TUTORIAL TO SET THE COM-PORT NUMBER ON OUR WEBSITE WWW.PYRODIGITAL.COM

11.2.3 Send Script

If "SEND SCRIPT" is selected from the SCRIPT TABLE menu, the selected Script Table is sent via the mini USB-Port (LOAD) to a Computer. Innovative Pyrotechnik GmbH is currently working on a simple software that will allow you to transfer the Script Tables

from the Field Controller to a Computer and back from the Computer to another Field Controller without the need of a scripting software. Please check pyrodigital.com for updates.

YOU FIND ALL DRIVERS FOR THE USB-CONNECTION AS WELL AS A TUTORIAL TO SET THE COM-PORT NUMBER ON OUR WEBSITE WWW.PYRODIGITAL.COM

11.2.4 Erase Script

To erase the selected script table, choose "ERASE SCRIPT" from the SCRIPT TABLE menu.

When "ERASE SCRIPT" is selected, the display appears as follows;

LINE	SHOT	TIME	PFD	ADDR
Do you want to erase the current table? Press BACK for "No" and ENTER for "Yes".				

Choose "YES" to proceed. The current Script Table will be erased. Choose "NO" to abort and return to SCRIPT TABLE Menu.

11.2.5 View Script

Choose "VIEW SCRIPT" to display the selected script line by line. Navigate through the script lines using the arrow "UP" and "DOWN" keys. To jump to a specific script line press "ENTER".

LINE	SHOT	TIME	PFD	ADDR
12	12	00:01:10:15	1	03C
Go to Table Line: XXX				ENTER=Select

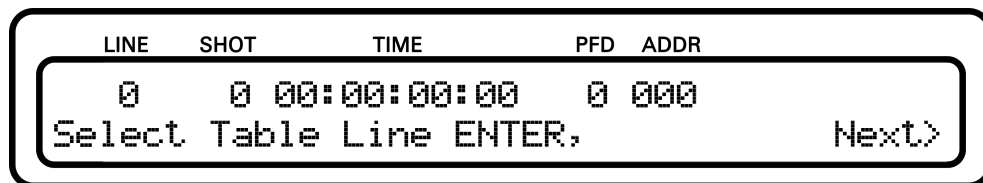
Enter line number using the arrow "UP" and "DOWN" keys. "LEFT" and "RIGHT" keys

are used to select unit place in order to directly enter tens and hundreds. Press "ENTER" to display the entered script Line.

11.2.6 Edit Script

"EDIT SCRIPT" is used to change values of the script table. It is useful to make adjustments to your show on site without the need of a scripting software. This section gives you an Overview about the Script Table and its structure and parameters. It explains you how to modify it.

Choose "EDIT SCRIPT" from the SCRIPT TABLE menu to edit the Script Table. The Script Table is the set of instructions which tells the Field Controller what to Fire. The interpretation of the Script Table depends on the Firing Mode it is used in. Therefore, Script Tables are either created for MANUAL SCRIPT MODE or AUTO SCRIPT MODE. Select "EDIT SCRIPT" from the Script Table menu:



The display shows the first Script Line of the Script Table on the top line of the display. Each Script Line defines a Firing Event with the parameters:

- Shot - the Shot Number
- Time - the Show Time (or Event Time)
- PFD - the Prefire Delay, or Prefire Time
- ADDR - Firing Address

The very first parameter shown is the **Line Number** that runs from 0 to 639. This is the index number of the Script Lines of the Script Table. Note: The very first Line Number is

the 0.

The **Shot Number** can be used as a label in scripting. The Shot Number can have any value between 0 and 9999.

The **Show Time** is the time at which the effect actually occurs. It is given in hours, minutes, seconds and frames:

hh:mm:ss:ff

Each frame is 1/30 of a second. Often the Show Time is not equal to the Firing Time, as most effects require to be fired earlier. E.g. a shell that first needs to rise to the sky before its bouquet unfolds. Therefore, you can give each effect a so-called **Prefire Time** between 0 to 9.9 seconds (in 100 ms steps). The Prefire Time is given in 1/10 of a second.

However, this Prefire Time only makes sense for automated firing (AUTO SCRIPT MODE). In manual firing (MANUAL SCRIPT MODE) the Field Controller is simply not able to predict when it should have fired the Script Line before the Fire Trigger even has been pressed. Therefore, in MANUAL FIRE MODE this parameter is used (interpreted) differently. In the MANUAL FIRE MODE you have the Opportunity to use semi-automatically fired sequences consisting of several Script Lines. This is called a MACRO. To combine several Script Lines to a MACRO you have to give them the same Show Time. This identifies them as belonging together. With the parameter of the PFT you can now define at what time within the MACRO sequence the individual Script Lines shall be fired. You can define this time between 0.0 and 9.9 seconds in 100 ms steps using the Prefire Time Parameter given in 1/10 of a second. For more detail regarding MACROS please read section [14.3.1](#).

WARNING - EXTREME DANGER

PERSONAL INJURY, DEATH, OR PROPERTY DAMAGE CAN RESULT FROM OPERATING THE FIELD CONTROLLER IN A FIRING MODE OF OPERATION DIFFERENT FROM THAT FOR WHICH THE SCRIPT TABLE WAS INTENDED, DUE TO UNEXPECTED FIRINGS. NEVER LIVE FIRE IN MIXED FIRING MODES ABSOLUTELY INERT TEST FIRE ALL EVENTS IN THE INTENDED MODE OF OPERATION(S) TO VERIFY INTENDED BEHAVIOR OF THE FIELD CONTROLLER. THE USE OF SIMULATED ELECTRIC MATCH TEST LIGHTS CONNECTED TO FIRING MODULES IN AN INERT TEST ENVIRONMENT IS CONSIDERED AS A ROUTINE TEST.

The **Firing Address** addresses the electric match in the Pyrodigital® Phase III Firing System Network that shall be fired. The Firing Address composed by two sub addresses. The first two digits of the Firing Address are the Firing Module Address and the third digit stands for the clamp on the corresponding Firing Module. E.g. the Firing Address 128 corresponds to firing the Clamp 8 on the Firing Module that is set to the Module Address 12. The Firing Address (and of course therewith the Module Address and the Clamp Number) are given in HEXADECIMAL NUMBERS.

Excursion - What is hexadecimal?

Let's start with decimal first. Decimal means that you count on the basis of 10. So you need 10 different symbols for that, literally: "0" for zero, "1" for one, "2" for two, "3" for three,... , "8" for eight and "9" for nine. If you want to note a number bigger than nine (e.g. twelve) you need two digits: 12. This can be understood as $12 = 1 \times 10 + 2 \times 1$. As another example 20 can be understood as $20 = 2 \times 10 + 0 \times 1$.

Hexadecimal simply is essentially the same but on the basis of 16 and therefore requires 16 different numbers. Hexadecimal became very popular as it is very helpful when working with computers. However, the computer scientists of the old days still needed six additional symbols to use the hexadecimal notation. To keep it simple they decided to use the first six letters of the alphabet. So besides the decimal symbols there are now also: "A" for ten, "B" for eleven, "C" for twelve, "D" for thirteen, "E" for fourteen and "F" for fifteen.

If you are interested in more detail regarding hexadecimal please visit the following links:

<https://en.wikipedia.org/wiki/Hexadecimal>

<https://www.youtube.com/watch?v=ZL-LhaaMTTE>

For the Pyrodigital Users the math about Hexadecimal is not important. The only thing important to understand is that the Module Address 09 is followed by the Module Address 0A, then 0B, 0C, 0D, 0E, 0F and then 10, 11, 12 and so on. And of course that the clamp is also addressed from 0 to 9 and from A to F.

The bottom line, of the display, shows a command line for editing the Script Table. In this Edit Mode you can edit each single line of the Script Table.

Note: Notice that directly above the display there are written permanent abbreviations relating to the DATA FIELDS on the displays below.

Command Line

The second line of the display is called the COMMAND LINE. When first entering "EDIT SCRIPT", the display shows "Select table line ENTER,.". By pressing the "LEFT" and "RIGHT" Arrow Key you can switch between the Data Fields you want to edit. Use the "UP" and "DOWN" arrow key to enter the required value.

Data Entry

After pressing "ENTER", the particular command on the Command Line is waiting for you to enter that particular data. When you enter data, via the arrow keys, it is displayed in the cursor position of the command line. When you then depress ENTER, the data is saved to the corresponding Data Field of the Script Line. The only exception is the line number. If you enter a new line number, the corresponding Script Table Line will be displayed. You can use this to navigate through the Script Table.

11.2.7 Moving to Different Script Lines

Moving from the currently displayed Script Line to another Script Line can be done in different ways:

- Use the UP ARROW or DOWN ARROW to move up or down within the Script Table, one Event line per depression. Or keep it pressed to scroll through the script.
- Use the LINE Number, to locate a Script Line within the Script Table. You can use this as a approximate quick locator, for example by advancing plus 100 lines from the current line number, by adding 100 lines to the current line number and entering this new line number.

11.2.8 Asterisks *

If a Script Table was fired in MANUAL SCRIPT or AUTO SCRIPT mode, the Pyrodigital® Field Controller Model E marks which of the Script Lines were fired during the last session and which ones were not. If a Script Line was fired in the last session, you see an Asterisks Symbol * behind the Firing Address of the Script Line in the "VIEW SCRIPT" and "EDIT SCRIPT" option of the SCRIPT TABLE menu. This allows you to keep track of unfired Script Lines. E.g. in AUTO SCRIPT one of the Script Lines could have been skipped because the Enable Interlock was not pressed. Or e.g. in MANUAL SCRIPT one of the cues got skipped by the Operator or a Script Line within an MARCO is invalid and thus not conducted. The Asterisks allow you to analyze your last session in one of the Firing Mode.

If you re-enter one of the Firing Modes (AUTO SCRIPT or MANUAL SCRIPT) the Asterisks get reset. Also the Asterisks get reset if another Script Table is selected (see [11.2.1](#)).

THE ASTERISKS ARE A VERY POWERFUL FEATURE TO ANALYZE YOUR LAST FIRED SHOW AND TO PRACTICE WITH THE FIELD CONTROLLER!

11.2.9 Generate Chase

The Pyrodigital® Field Controller Model E is equipped with an integrated Script Generator to generate Chase Sequences directly on the device without the need of a PC or scripting Software.

In order to generate a Chase the Pyrodigital® Field Controller Model E guides you through an automated menu. One after another you have to enter the following three parameter.

1. Speed - Amount of shots per second.
2. Amount of shots - Determines the total amount of shots the chase consists of.
3. Shots per Firing Module - Select how many shots should be addressed to each Firing Module.

After these parameters are entered the display shows a summary of the chase and calculates its length as well as the needed amount of firing modules.

Speed

LINE	SHOT	TIME	PFD	ADDR
CHASE SEQUENCE SCRIPT GENERATOR				
Select Speed: XX.XX shots per second				

After entering the Chase Generator the first parameter to be entered is speed. Choose a value between 1 and 30 using the "up" and "down" arrow keys. This determines how many shots per second will be fired. Press enter to proceed.

Amount of Shots

The next parameter is the amount of shots. It defines the total amount of shots or script lines to be generated. Choose any value between 1 and 640 using the "up" and "down" arrow key. The "right" and "left" arrow key allows you to enter tens and hundreds directly. Press enter to confirm.

LINE	SHOT	TIME	PFD	ADDR
CHASE SEQUENCE SCRIPT GENERATOR				
Amount of Shots: XXX				

Shots per Firing Module

Now enter the amount of shots per firing module. This defines how many clamps per firing module will be in use starting from clamp 0. For example, if the chase consists of 10 shots and the shots per firing module is set to 2, 5 firing modules will be in use. Starting from

Module address 010 and 011 on the first module, to 020 and 021 on the second and so on, till the last module. In this case 050 and 051.

LINE	SHOT	TIME	PFD	ADDR
CHASE SEQUENCE SCRIPT GENERATOR				
Shots per Firing Module: 2				

Displaying the Result

After these three parameters are set the Pyrodigital® Field Controller Model E calculates the chase and displays the duration.

LINE	SHOT	TIME	PFD	ADDR
Check and press ENTER or Back:				
100 Shots at 3.00 --> duration 33.00s				

As well as the amount of firing modules needed.

LINE	SHOT	TIME	PFD	ADDR
Check and press ENTER or Back:				
100 Shots with 10 Shots/FM --> 10 FMs				

After pressing enter again a warning appears, that by proceeding the current script table will be overwritten and the chase gets stored as the new script table.

LINE	SHOT	TIME	PFD	ADDR
Press ENTER to generate the sequence.				
(This will overwrite the current script)				

After generating a chase, always check the timing and addresses line by line by choosing

"VIEW SCRIPT" withing the Script Table Menu.

11.3 Settings

The SETTINGS menu allows the user to change Operational Parameters of the Field Controller. DO NOT Change these Parameters unless YOU ARE SURE what you are doing.

WARNING - DANGER

DO NOT CHANGE THE FACTORY SETTINGS OF THE SETTINGS PARAMETERS OF THE DATA TABLE OPERATING MODE UNLESS YOU ARE ABSOLUTELY AWARE OF THE CONSEQUENCES. CHANGING THE FACTORY SETTINGS CAN MAKE THE FIELD CONTROLLER APPEAR TO NOT FUNCTION UNDER NORMAL CIRCUMSTANCES.

You can find the following options in the SETTINGS menu:

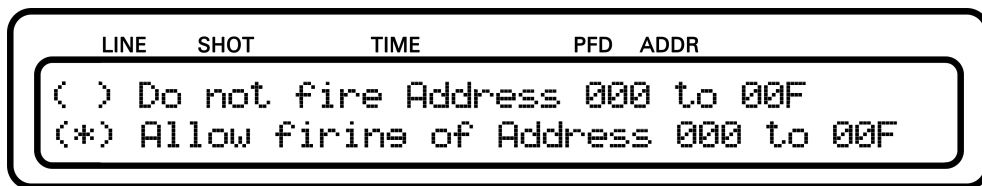
LINE	SHOT	TIME	PFD	ADDR
(*)	00X	Suppression	()	Buzzer
()		Timecode Switch-over	()	Macros

11.3.1 00X-Suppression

Script Lines with Firing Address 000 are often used as markers. Those markers are scripting information (e.g. start of the next song) but are not intended to fire an effect. However, those Script Lines are interpreted as valid lines and get executed (fired). If the 00X-Suppression is enabled, the Pyrodigital® Field Controller Model E does not send

out any fire commands to Module Address 00. This suppresses any firing on the Firing Addresses 000 to 00F.

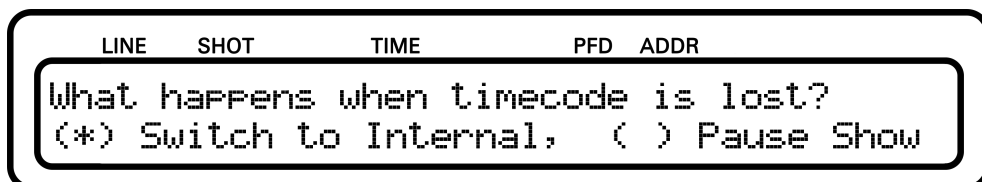
To enable/disable the 00X-Suppressing choose the corresponding menu point using the "UP" and "DOWN" arrow keys.



11.3.2 Timecode Switch-over

In AUTO SCRIPT MODE the Pyrodigital[®] Field Controller Model E can run on a highly precise internal clock based on a quartz oscillator or synchronised to the external Pyrodigital Timecode Modem, that can be connected to the Expansion plug.

When running synchronous to the external Pyrodigital Timecode Modem and the Timecode suddenly stops or becomes invalid the Pyrodigital[®] Field Controller Model E can either switch over to the internal clock (until the external Timecode resumes) or the Pyrodigital[®] Field Controller Model E can simply stop the running script and wait for the Timecode to resume. This behavior can be set in the Timecode Switch-over Option of the Settings.



Press "Left" or "Right" Arrow to select the intended Option.

Press "Enter" or "Back" to return to the Settings menu.

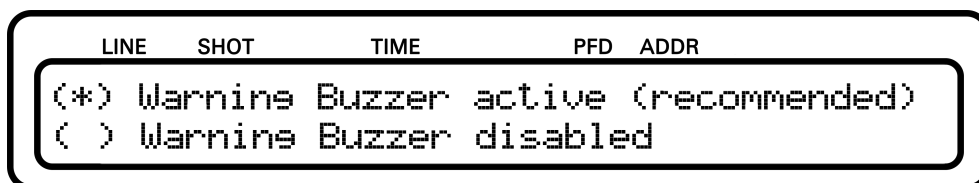
WARNING - CAUTION

When Switch to Internal is not activated, be aware that in the event of lost Timecode the Field Controller will stop shooting the show and will wait for the Timecode to resume before the Field Controller goes on shooting the show.

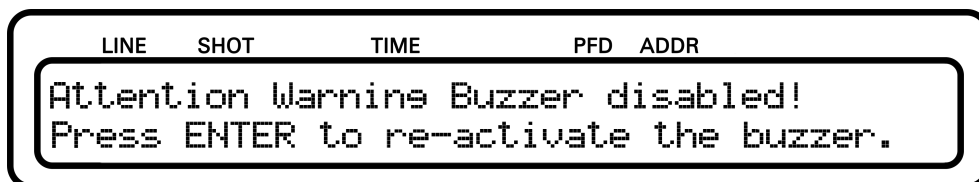
11.3.3 Disabling the Buzzer

The buzzer is an important part of the Safety Key Warning System. Under normal operating conditions, the buzzer should never be disabled. If the operator decides intentionally to disable the buzzer, it is his own responsibility.

To activate/disable the buzzer choose the corresponding menu point using the "UP" and "DOWN" arrow keys.



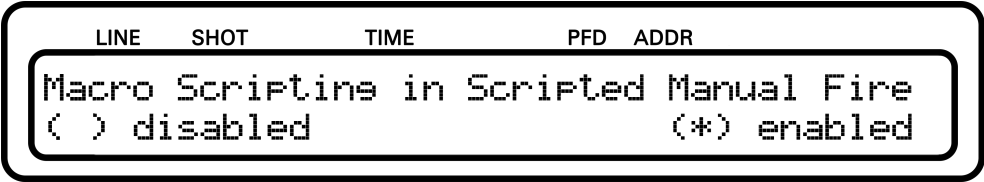
Whenever the Pyrodigital[®] Field Controller Model E is started up a warning is displayed, if the warning buzzer is disabled. Press "ENTER" while it is displayed to re-activate the buzzer.



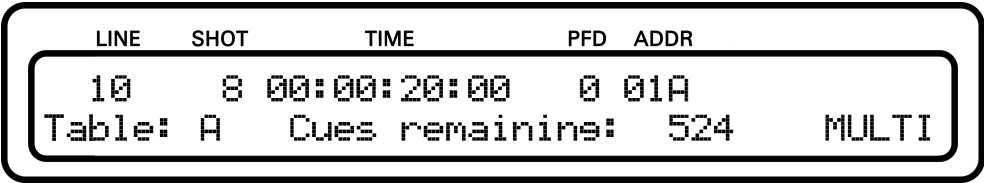
11.3.4 Macros

In MANUAL SCRIPT MODE the Pyrodigital[®] Field Controller Model E is able to fire semiautomated Sequences, comprising several Script Lines. These sequences are called

MACROS. Please refer to section [14.2](#) and following for more detailed information on how to script and fire Macros.



These semiautomated sequences can be disabled. If Macros are disabled the Prefiretime parameter is completely ignored in Manual Script Mode. Subsequent Scriptlines scripted to the same showtime, will now be fired at once as a so called Zipper Fire. If multiple script lines will be executed at the same time, the Pyrodigital[®] Field Controller Model E shows "MULTI" in the lower right corner of its display.



Note: This Option affects the way the Prefiretime Parameter is interpreted in Manual Script Operating Mode. It ONLY affects Macro Scripting in Manual Script Operating Mode and has no impact on Auto Script Operating Mode.

Chapter 12

Check Status Operating Mode

WARNING - EXTREME DANGER

THE SAFETY KEY MUST BE ARMED IN ORDER TO ACCESS THE CHECK STATUS OPERATING MODE, THE MANUAL SCRIPT OPERATING MODE, OR THE AUTO SCRIPT OPERATING MODE. BE ABSOLUTELY SURE IT IS SAFE TO APPLY POWER TO THE PHASE III SYSTEM NETWORK. THESE OPERATING INSTRUCTIONS ONLY DESCRIBE DIRECT OPERATION OF THE FIELD CONTROLLER AND DO NOT INCLUDE INFORMATION ON THE SAFE OPERATING PROCEDURES OF THE PHASE III SYSTEM NETWORK WHEN CONNECTED TO THE FIELD CONTROLLER. ALL PROCEDURES FOR THE SAFE OPERATION OF THE PHASE III NETWORK ARE INCLUDED IN THE PHASE III SYSTEM NETWORK USER'S GUIDE. ALSO READ THE OPERATING INSTRUCTION OF THE FIRING MODULE MODEL A. (You can find all documents on pyrodigital.com.) THE USER MUST ABSOLUTELY BECOME FAMILIAR WITH ALL PROCEDURES IN THE PHASE III SYSTEM NETWORK USER'S GUIDE BEFORE THE SAFETY KEY OF THE FIELD CONTROLLER IS EVER ARMED.

In order to access the CHECK STATUS Operating Mode, the Safety Key must be ARMED. Besides turning the Safety Key to the CHECK position, the operator can also turn the Safety Key to the FIRE position. This allows to proceed to AUTO SCRIPT or MANUAL SCRIPT directly after the Status Check has been conducted, without the need of re-powering the Pyrodigital® Phase III Firing System Network by turning the Safety Key back to OFF and then to FIRE again. However, if it is not required to turn the Safety Key directly to FIRE, it is strongly recommended to turn the Safety Key to the CHECK position only! This is the Operator's responsibility. Also read chapter 6 to ensure to understand how the Safety Key and its Warning System operates. If it is safe to proceed, per the above Warning, and all Warnings and Safety Procedures outlined in the Phase III System Network User's Guide, the user may then ARM the Safety Key. (You can find all documents on pyrodigital.com.)

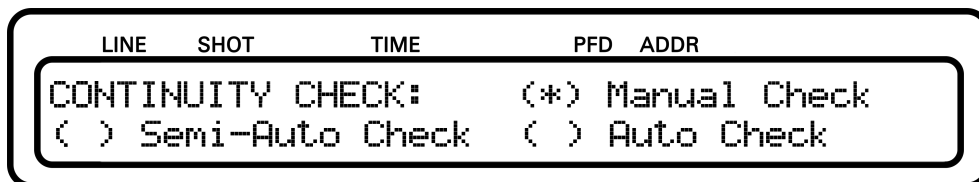
WARNING - EXTREME DANGER

USE THE ACTIVE PHASE III NETWORK OUTPUT INDICATOR TO CHECK FOR SHORTS. Check Status should be used to find any Shorts in the System Network first. Also, read chapter 7 'Phase III Network Outputs' to understand how the Phase III Network Output and the Phase III Network Output Indicator operate. ABSOLUTELY FIND AND ELIMINATE ANY SHORTS BEFORE PROCEEDING

12.1 Introduction

It is required that the user PRACTICES using the CHECK STATUS Operating Mode in an INERT TEST ENVIRONMENT. Read 3.11 for information on Inert Testing and Practice with Test Lamps.

When the CHECK STATUS OPERATING MODE is entered, and the Safety Key is armed, the display appears as follows:



The user may then select any of the three options (MANUAL CHECK, SEMI-AUTO CHECK and AUTO CHECK) using the arrows and pressing "ENTER"

12.1.1 Purpose of Check Status

The purpose of the CHECK STATUS Operating Mode is to:

1. Verify the System Network is operating correctly before any Pyrotechnic Material is connected to the Phase III Firing System. SEE THE PHASE III SYSTEM NETWORK USER'S GUIDE, 'INERT SYSTEM CHECK-OUT'. (You can find all documents on pyrodigital.com.) Read also chapter 7 'Phase III Network Outputs.'
2. Provide a means to check the electrical connections of the Pyrotechnic electric matches to the Phase III Firing System Network. SEE THE PHASE III SYSTEM NETWORK USER'S GUIDE, 'OPERATION WITH LIVE PYROTECHNICS'. ALSO READ THE OPERATING INSTRUCTION OF THE FM-A FIRING MODULE. (You can find all documents on pyrodigital.com.)

In Check Status, continuity status information of each and every circuit in the System Network is sent back to the Field Controller. This information consists of whether continuity is found on each of the single electronic match clamps of a Firing Module. Thus the Phase III System can only detect if a electric match is connected to a particular clamp. (Phase III, obviously, cannot tell if this is the correct Pyrotechnic Device.)

12.1.2 Continuity Status and Script Table

The way Continuity Status Information is displayed depends on the Script Table content. During the check always one specific Module Address is checked. The Continuity Status Information for this Module Address gets compared to the Script Table. Therefore, the Script Table is searched for Script Lines with Firing Addresses pointing to the currently checked Module Address. Remember: The Fire Address is a 3 digit hexadecimal Number. The first 2 digits are the Module Address. The third digit represents the Electric Match Clamp of the Firing Module. For each Electronic Match Clamp continuity is either found or not and it is either addressed by one of the Script Lines or not. This leads to four possible states for each of the Clamps. Those four states are represented by the Symbols "=", "?", "X", and " " (blank) as follows:

LINE	SHOT	TIME	PFD	ADDR											
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Check module: XX															

The symbols 0 to 9 and A to F represent the corresponding 16 Electric Match Clamps on the Firing Module. The State Symbols represent the following information:

- = this clamp address is present in the selected script table AND was found on the firing module to have continuity: FINE
- X this clamp address is present in the selected script table BUT was found on the firing module to have NO continuity: THIS E-MATCH IS MISSING
- ? this clamp address is NOT present in the selected script table BUT was found on the firing module to have continuity: SHOULD NOT BE THERE
- **blank** this clamp address is NOT present in the selected script table AND was found on the firing module to have NO continuity: FINE

The State Symbols will appear right next to the corresponding clamp number.

The "XX" on the bottom left is a placeholder for the selected Module Address.

In all Status Checking Options of the CHECK STATUS Operating Mode, the actual electric match continuity information from the System Network is COMPARED against the Firing Addresses specified in the selected Script Table.

Note: If the Script Table is empty, THEN NO ADDRESSES EXIST THAT THE ACTUAL STATUS INFORMATION CAN BE COMPARED TO. Consequently, each found continuity will then be indicated by an "?".

Another Status Check Information Example:

LINE	SHOT	TIME	PFD	ADDR
0=1=2=3=4	X	5	X	6
X	7	X	8	?
9	?	A	?	B
?	C	D	E	F
Check module: 01				

This shows complete STATUS information for Module Addresses 01. Clamp 0 through 3 have an electric match connected which should be connected, this is OK. Clamp 4 through 7 do NOT have an electric match connected but should have an electric match connected. On these clamps something is wrong. The Clamps 8 through B have an electric match connected, but nothing is supposed to be connected. Thus, on these clamps something is wrong too. Clamp C through F do not have anything connected and nothing is supposed to be connected, these addresses are OK.

If, in the above example, the Connections on 018 through 01B were moved to Addresses 014 through 017, then THE DISPLAY would show 014 through 017 with equals signs, AS OK, and Addresses 018 through 01B would show blanks, also as OK. In reality, of course, you would NOT physically change these connections unless these were the actual mistakes made when the electric matches were originally connected. In all four cases, you would have to Verify that the correct Pyrotechnic Device is connected to the correct Address, or the Firing Sequence would be wrong. Carrying the above example one step further, suppose that in fact these four Pyrotechnic Devices needed to be moved, as per above,

from 018 through 01B to 014 through 017. Instead of physically moving them, you could also enter the EDIT Mode and change the four Addresses instead.

12.1.3 Status Check Display - Common Faults

If the following message is displayed, this means that the corresponding Module Address has not been found:



Various reasons are possible:

- The device with this Module Address is not connected to the Pyrodigital® Phase III Firing System Network.
- The device that is supposed to be set to this Module Address is accidentally set to a wrong Module Address.
- The network is not connected to the Phase III Network Output.

Another typical Response:



If you find all Clamps to be indicated as "X" (except of those that are blanks " "), two reasons are possible:

- None of the clamps that are found to be fired in the Script Table do have an Electric Match connected.

- The ON/OFF-Switch (respectively the Arm/Shunt-Switch for Firing Module versions older than the FM-A Firing Modules) is set to OFF (resp. Shunt). In this case the Firing Modules will always reply that all Clamps are open (no continuity).

DOUBLE ADDRESSING:

If two Firing Modules are set to the same Module Address, the Firing Modules will both answer to the same Check Status Request. The replies then compete against each other on the Pyrodigital® Phase III Firing System Network. This might result in a FLICKERING CHECK STATUS RESPONSE on the display. Therefore, if such a flickering appears, it is most likely due to unintended Double Addressing. Simply correct the Double Addressing.

12.2 Manual Check

MANUAL CHECK will display the status information for the Module Address selected by the User. The Module Address (the first two hex characters of the complete Firing Address) can be selected either by using the Arrow Keys.

Notice that in MANUAL STATUS the "UP" / "DOWN" arrow keys may be used to step, in logical hexadecimal sequence, to any Module Address from 00 to 7F. If you go beyond 7F (DOWN arrow key) or 00 (UP arrow key), the next Module Address will be 00 respectively 7F. Keep them pressed to scroll through the script.

Use the "LEFT" and "RIGHT" Arrow Keys to jump 16 modules at once.

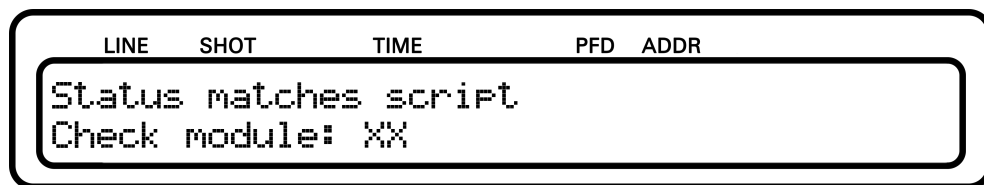
12.3 Semi-Auto Check

SEMI-AUTO Status Check behaves very similarly to MANUAL CHECK. BUT, ONLY MODULE ADDRESSES SPECIFIED IN THE SELECTED SCRIPT TABLE ARE CHECKED FOR STATUS. The "UP" / "DOWN" ARROW Keys are used to select between these Module Addresses, in a circular manner. This means that you will jump from Status at the highest Module Address back to Status of the lowest Module Address, and vice versa, like in a loop.

SEMI-AUTO is very useful as it ONLY shows Status Information for Module Addresses that are supposed to have electric match connections (in correspondence to the selected Script Table). Thus you do NOT have to look at all 128 possible Box Addresses (00 through 7F) to check Status. SEMI-AUTO will NOT show the continuity status for any Module Addresses which are NOT specified in the selected Script Table.

12.4 Auto Check

AUTO CHECK is provided as an AUTOMATIC Status Check, which operates similarly to MANUAL CHECK, only in an automatic fashion. The Primary indicator is the audible “beep” warning. If you hear a beep, an error occurred at the currently checked Module Address. In AUTO CHECK a correctly connected Module Address will appear on THE DISPLAY as follows:



The above display indicates that Module Address “XX” is connected correctly in accordance with the Firing Addresses specified in the selected Script Table. In AUTO CHECK the Field Controller will continue to rapidly cycle through all Addresses in the selected Script Table, beeping and temporarily showing the STATUS of any Addresses which are not correctly connected. Thus for a perfectly connected System Network, the above display is all that will appear in AUTO CHECK and no “beeps” will be heard. If you hear beeps and see anything on the display other than “Status matches script” there are possible errors in the electric match connections. AUTO CHECK ALWAYS CHECKS ALL POSSIBLE 128 Module ADDRESSES AND REPORTS ON EVERY MODULE ADDRESS WHICH IS CONNECTED TO THE SYSTEM NETWORK. Thus Module Addresses which are NOT specified in the selected Script Table will show up in AUTO CHECK. Additionally,

if a Module Address is found which is NOT specified in the Data Table, and nothing is connected to it, then it is reported as “Status matches script”.

Chapter 13

Direct Fire Operating Mode

13.1 Direct Firing

As already explained in section [5.5](#) Direct Fire Mode' you can freely fire any address in DIRECT FIRE mode.

Here you can simply enter the Firing Addresses using the arrow keys. You can use the "UP" and "DOWN" Arrow Key to decrease/increase the Firing Address by 1 or keep them pressed to scroll. The "LEFT" and "RIGHT" Arrow Key can be used to move to the previous/next Module Address (e.g. from 030 -> 040).

Enter a 3 digit Firing Address and press the FIRE Key on the keyboard or the FIRE TRIGGER of the Deadman Pickle.

After a Firing Command is executed, the Firing Address for the next FIRE press is automatically increased by one. While the executed Address is displayed as "Last Fired" below.

Chapter 14

Manual Script Operating Mode

WARNING - EXTREME DANGER

THE SAFETY KEY MUST BE ARMED IN ORDER TO ACCESS THE CHECK STATUS OPERATING MODE, THE MANUAL SCRIPT OPERATING MODE, OR THE AUTO SCRIPT OPERATING MODE. BE ABSOLUTELY SURE IT IS SAFE TO APPLY POWER TO THE PHASE III SYSTEM NETWORK. THESE OPERATING INSTRUCTIONS ONLY DESCRIBE DIRECT OPERATION OF THE FIELD CONTROLLER AND DO NOT INCLUDE INFORMATION ON THE SAFE OPERATING PROCEDURES OF THE PHASE III SYSTEM NETWORK WHEN CONNECTED TO THE FIELD CONTROLLER. ALL PROCEDURES FOR THE SAFE OPERATION OF THE PHASE III NETWORK ARE INCLUDED IN THE PHASE III SYSTEM NETWORK USER'S GUIDE. ALSO READ THE OPERATING INSTRUCTIONS OF THE FIRING MODULE MODEL A. (You can find all documents on pyrodigital.com.) THE USER MUST ABSOLUTELY BECOME FAMILIAR WITH ALL PROCEDURES IN THE PHASE III SYSTEM NETWORK USER'S GUIDE BEFORE THE SAFETY KEY OF THE FIELD CONTROLLER IS EVER ARMED.

14.1 Introduction

In order to access the MANUAL SCRIPT Operating Mode, the Safety Key Must be armed to the FIRE position. Also read chapter 6 to ensure to understand how the Safety Key and its Warning System operates. If it is safe to proceed, per the above Warning, and all Warnings and Safety Procedures outlined in the Phase III System Network User's Guide, the user may then arm the Safety Key to FIRE position. It is required that the user PRACTICES using the MANUAL SCRIPT Operating Mode in an INERT TEST ENVIRONMENT. Read 3.11 'Practice and Inert Testing' for information on Inert Testing and Practice with Test Lamps.

In comparison to the old Field Controller Model 3, the MANUAL SCRIPT Mode as well as the concept of MACROS have been tremendously simplified for the Pyrodigital® Field Controller Model E. Thus, it is way easier for operators to learn the MANUAL SCRIPT mode. Nevertheless, the MANUAL SCRIPT mode still is fully backward compatible, meaning that a Script Table written for the old Field Controller Model 3 also runs equivalently on the Pyrodigital® Field Controller Model E and Model A.

MANUAL SCRIPT can make use of a Script Table to predefine sequences (also timed sequences) of pyrotechnic effects. The Script Table tremendously enhances the firing capabilities of the Field Controller.

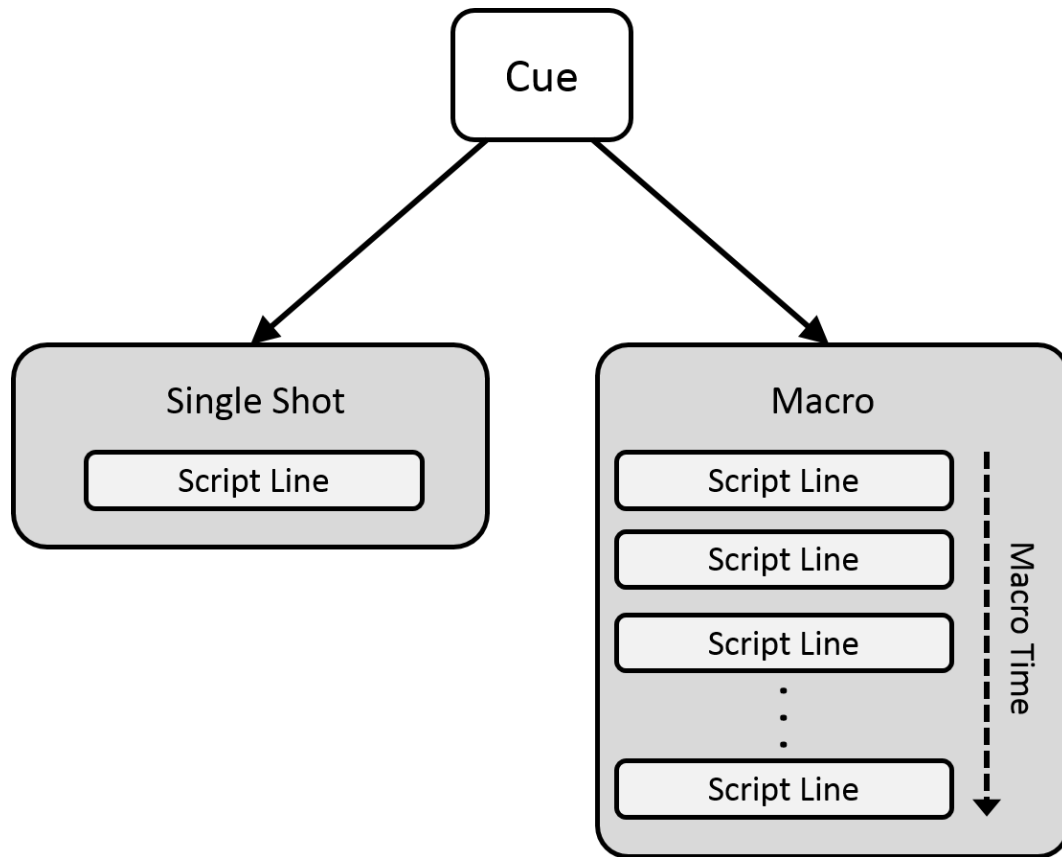
DURING FIRING IN MANUAL SCRIPT MODE, THE DEADMAN ENABLE INTER-LOCK BUTTON MUST BE DEPRESSED IN ORDER FOR A FIRING COMMAND TO BE ISSUED TO THE PHASE III SYSTEM NETWORK. The Field Controller will “beep” whenever the FIRE Key or the FIRE TRIGGER of the DEADMAN PICKLE is depressed and the DEADMAN is not held down. This notifies the user that the FIRING Command has NOT been issued. Note that it is most convenient in MANUAL SCRIPT, to FIRE with the DEADMAN TRIGGER (Hold the Deadman Enable Interlock Button with the Thumb and Fire the Trigger button with your index finger). However, the operator can

also fire using the FIRE Key on the Keyboard.

If you require a left-handed Deadman Pickle please contact us at Innovative Pyrotechnik GmbH: pd@pyrodigital.com.

14.2 Encapsulated Cues

When entering the MANUAL SCRIPT MODE the Pyrodigital® Field Controller Model E reads the information in the Script Table and interprets it to a MANUAL FIRE TABLE. In MANUAL SCRIPT MODE every Fire Trigger releases a so-called CUE. As illustrated in the diagram below, a Cue can be a single shot defined by a single Script Line or it can be a so-called MACRO Sequence comprising several Script Lines. The MANUAL FIRE TABLE comprises all valid CUES and is the basis of information for the MANUAL SCRIPT MODE. In MANUAL SCRIPT mode the CUES are sequentially ordered and can be fired one by one. The operator can navigate through the list using the "UP" and "DOWN" Arrow Keys.



IMPORTANT: Each CUE is encapsulated, meaning that you can not accidentally go into the middle of a MACRO. If you are at the start of a MACRO and press the "DOWN" Arrow Key to skip to the next CUE, the Field Controller will skip the whole MACRO and not just the first MACRO Script Line! THIS IS AN IMPORTANT DIFFERENCE TO THE OLDER FIELD CONTROLLER MODEL 3! On this older Field Controller Version you can get lost somewhere within a Macro. The Pyrodigital® Field Controller Model E and Model A overcome this issue by providing the encapsulated Cues to the users. This new feature dramatically enhances the clarity in MANUAL SCRIPT mode and therewith the self-assurance of the Operator.

14.3 Scripting

Macro Fires are scripted timed sequences comprising several Script Lines. Macro Fires can be used in the MANUAL SCRIPT mode only. Macro Fires are fired in a semi-automatic fashion. Once a Macro is started (by pressing the Fire Key or the Fire Trigger of the Deadman Pickle), the Macro runs until its last Script Line got fired. The Field Controller then halts at the subsequent Cue. A Macro Fire can have a maximum length of 9.9 second. The Prefire Time Field is used to define the Macro Time in tenths of seconds. Note: In MANUAL SCRIPT, the Prefire Time is used differently than in AUTO SCRIPT. The Prefire Time is handled as the Macro Time. Running Macros can be paused, resumed and aborted.

14.3.1 Macro Fire

A MACRO Fire can be scripted anywhere within the Script Table. To create a Macro the following conditions have to be met:

1. Each Script Line must have the same Show Time that has to differ from zero (\neq 00:00:00:00)
2. The Script Lines must be in sequential order
3. The first Script Line must have the Macro Time (Prefire Time) set to 0
4. Each subsequent Script Line must have a Macro Time (Prefire Time) that is greater or equal to the Macro Time (Prefire Time) of the previous Script Line.

The Show Time of a Macro can have any non-zero value. You can also give two different Macros the same Show Time as long as they are not directly followed by each other. In Manual Script the Show Time Parameter is only used to define the boundaries between Cues. Theoretically, you could toggle between only two Show Times values (e.g. 00:00:10:00 and 00:00:11:00) to define as many Macros and Single Shots as you like. However, for clearness we recommend to increase the Show Time value with every Cue.

Note: If a Script Line within a Macro does have a Macro Time (Prefire Time) smaller than the Macro Time of the previous Script Line of the Macro, this Script Line will simply be ignored.

14.3.2 Single Shot

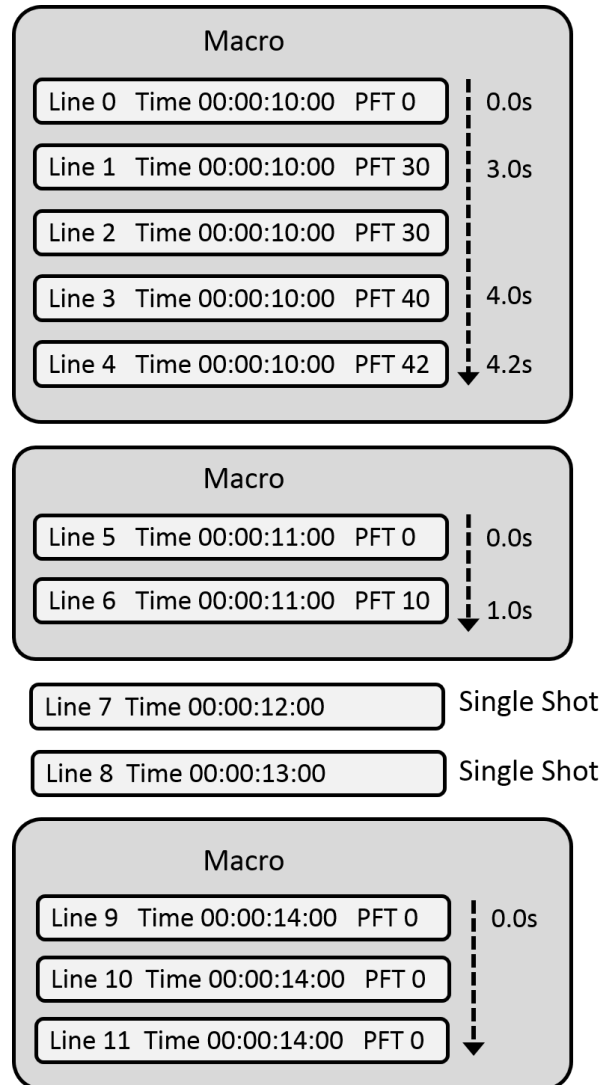
A single Script Line with a Show Time value different from the values of its previous and subsequent Script Line will be interpreted as a Single Shot. Further, every Script Line with Show Time zero (00:00:00:00) will be interpreted as a Single Shot if there is at least one other Script Line parameter unequal to zero (or in other words the line is not empty). Therefore, also two subsequent Script Lines with a Show Time of zero (with at least one other Script Line parameter unequal to zero) will be interpreted as two separate Single Shots.

WARNING - CAUTION

With the Show Time set to zero (00:00:00:00) and at least one other Script Line parameter that is unequal to zero, a Script Line will always be interpreted as a Single Shot, even if the subsequent Script Line also has a Show Time of zero.

14.3.3 Example

The figure below shows an example Script Table with 12 Script Lines (0 to 11):



The first five Script Lines do have the same Show Time and are in sequential order. The very first Script Line has a Macro Time (Prefire Time) of 0 and all subsequent Lines have rising (or equal) Macro Time (Prefire Time).

→ These five Script Lines are detected as MACRO in MANUAL SCRIPT mode.

When this Macro is triggered, Line 0 will be fired instantaneously as its Macro Time (Prefire Time) is 0. The Macro Time will then run on (driven by the highly precise internal clock of the Field Controller) until the last Script Line of the Macro is executed. You can see the Macro Time running on the display and hear a audible ticking that indicates

the running Macro. When the clock reaches 3 seconds, Line 1 and Line 2 are fired. At 4 seconds the Field Controller fires Line 3 and at 4.2 seconds Line 4.

Then the Field Controller halts, as it reached the end of the Macro and the beginning of the next Cue. This Cue is again a Macro consisting of two Script Lines. Note that the two Script Lines do have a different Show Time than the Macro before. When Fire is pressed again, Line 5, and 1 second later Line 6 get executed.

The Field Controller halts again at the next Cue. This time the Cue is a Single Shot. After this Single Shot is executed, the next Cue is a Single Shot as well.

The following Macro consists of three Script Lines, all with a Macro Time (Prefire Time) of 0. Thus, as soon as the Macro gets triggered, all three Script Line get executed.

14.4 Pause, Resume and Abort Macro Fire

A Macro is started either by depressing the FIRE button on the Keyboard or by depressing the FIRE TRIGGER of the Deadman Pickle. If a Macro is running it can be paused by depressing the "PAUSE" key. A paused Macro can either be resumed by pressing again the FIRE Key or the FIRE TRIGGER or it can be aborted. To abort a paused Macro press the "DOWN" arrow key.

WARNING - CAUTION

If you want to abort a running Macro Fire, you first need to pause it using the "PAUSE" Key. Then press the "DOWN" arrow key to abort the paused Macro Fire.

14.5 Simplified: Zipper Fire are now also Macros

A Zipper Fire simply means a synchronous firing of several effect. Or in other words: Several Firing Addresses are set to the same Show Time and the same Prefire Time. Zipper Fire is a term known from the old Field Controller Model 3. The old Field Controller Model 3 distinguishes between Zipper Fires and MACRO Fires. In the new Pyrodigital® Field Controller Model E and Model A those two concepts are simplified to one unified concept: Zipper Fires are now also covered by MACROS. Compare the third Macro of the example given in [14.3.3](#).

Technical History

The old Field Controller Model 3 (FC-3) had several technical limitations regarding Zipper Firing. The Zipper Fire was limiting the capabilities of the old Field Controller Model 3 in MANUAL SCRIPT as well as in AUTO SCRIPT mode. When a Zipper Fire (a synchronous firing of several effect) was conducted, the FC-3 filled up a buffer with all Fire Commands that belonged to that Zipper Fire. That buffer was limited in size and speed and, thus, was limiting the performance of the FC-3. The Pyrodigital® Field Controller Model E uses another technique to overcome these limitations and does not have a need for such a buffer anymore. As a consequence, the Pyrodigital® Field Controller Model E does not have those technical limitations associated with Zipper Firing. You can simply script synchronous effects the way you like and do not need to think about Zipper Fires. You can now script as many effects to the same time as you like.

Notice for MANUAL FIRE mode:

In the terminology of the old FC-3 (for those Operators who are very familiar with the FC-3): Now MACRO sequences can also start with a Zipper Fire at Prefire Time 0. Therefore, a MACRO could consist of only a Zipper Fire at the Prefire Time 0. So there

is no particular difference anymore between a Zipper and a MACRO. A Zipper Fire is now just a very simple MACRO.

In other word (for those Operators who are not as much familiar with the FC-3): If you script several effects to the same time, this will be recognized as a MACRO (even though it is a very short one lasting some milliseconds) in MANUAL FIRE mode.

In the following chapters the word Zipper Fire will not be used as Zipper Fires are covered by MACROS.

14.6 Operating the Manual Script mode

In Manual Script mode all Cues can be shot in subsequent manner and in the order the Cues are scripted in the Script Table.

Entering Sequential Firing:

First, after entering the Manual Script mode, the Field Controller calculates a Firing Table for the selected Script. The following display TEMPORARILY appears:

LINE	SHOT	TIME	PFD	ADDR
Please wait, preparing firing table_				

You are now in MANUAL SCRIPT mode.

LINE	SHOT	TIME	PFD	ADDR
LINE	SHOT	hh:mm:ss:ff	PFD	ADD
Table:	B	Cues remaining:	XXX	

At this point, the Field Controller is ready to actually FIRE a Pyrotechnic Device.

WARNING - EXTREME DANGER

FIRING OF THE PYROTECHNIC DEVICE(S) WILL OCCUR WHEN THE FIRE KEY OR REMOTE DEADMAN PICKLE FIRE TRIGGER IS DEPRESSED.

BE ABSOLUTELY SURE THAT IT IS SAFE TO FIRE.

The first Line of the display shows the first Script Line. Here, placeholder values are displayed to give a general overview. Besides the Script Line parameters the display shows the selected Script Table and a counter displaying the remaining cues to be fired.

If the Fire Key is now depressed, the first Cue is fired. Subsequently, the first Script Line of the next Cue will be displayed. Again: A Cue can be a single Script Line or several Script Lines that form a MACRO Sequence.

NOTE: IF THE DEADMAN SWITCH IS NOT HELD DOWN, THE FIELD CONTROLLER WILL NOT FIRE, WILL NOT ADVANCE TO THE NEXT CUE, AND WILL "BEEP".

14.6.1 Navigate through the Cues

Use the "UP" and the "DOWN" arrow keys to move through the Cues or hold them pressed to scroll through the script. Press the "DOWN" arrow key if you like to skip a Cue and the "UP" arrow key if you want to go back to the previous Cue.

Use the "LEFT" arrow key to jump to the first Cue of the Script.

Use the "RIGHT" arrow key to jump to the last Cue of the Script.

14.6.2 Skip Cue

To skip a Cue first press the "DOWN" arrow Key. This gets you to the subsequent Cue.

14.6.3 Macro Indicator

If the current Cue is a Macro, this is indicated on the display on the bottom right corner by the word "MACRO". If "MACRO" is not indicated, the current Cue is a single shot.

14.7 Asterisks *

A Cue can only get executed once (each time you enter the firing mode). If a Cue was already executed, you will find an Asterisks * next to the Firing Address of the displayed Script Line. If a line is indicated by an Asterisks *, you CANNOT fire it again. Firing of this Cue will simply get you to the next Cue as if you would have pressed the "DOWN" arrow key.

You can also analyze all Asterisks in the VIEW SCRIPT option (DATA TABLE -> SCRIPT SETTINGS -> VIEW SCRIPT) after you exited the MANUAL SCRIPT mode.

Chapter 15

Auto Script Operating Mode

15.1 Introduction

WARNING - EXTREME DANGER

THE SAFETY KEY MUST BE ARMED IN ORDER TO ACCESS THE CHECK STATUS, DIRECT FIRE, MANUAL SCRIPT, OR THE AUTO SCRIPT OPERATING MODE. BE ABSOLUTELY SURE IT IS SAFE TO APPLY POWER TO THE PHASE III SYSTEM NETWORK. THESE OPERATING INSTRUCTIONS ONLY DESCRIBE DIRECT OPERATION OF THE FIELD CONTROLLER AND DO NOT INCLUDE INFORMATION ON THE SAFE OPERATING PROCEDURES OF THE PHASE III SYSTEM NETWORK WHEN CONNECTED TO THE FIELD CONTROLLER. ALL PROCEDURES FOR THE SAFE OPERATION OF THE PHASE III NETWORK ARE INCLUDED IN THE PHASE III SYSTEM NETWORK USER'S GUIDE. ALSO READ THE OPERATING INSTRUCTION OF THE FIRING MODULE MODEL A. (You can find all documents on pyrodigital.com.) THE USER MUST ABSOLUTELY BECOME FAMILIAR WITH ALL PROCEDURES IN THE PHASE III SYSTEM NETWORK USER'S GUIDE BEFORE THE SAFETY KEY OF THE FIELD CONTROLLER IS EVER ARMED.

In order to access the AUTO FIRE Operating Mode, the Safety Key Must be armed to the FIRE position. Also read chapter 6 to ensure to understand how the Safety Key and its Warning System operates. If it is safe to proceed, per the above Warning, and all Warnings and Safety Procedures outlined in the Phase III System Network User's Guide, the user may then turn the Safety Key to FIRE position. It is required that the user PRACTICES using the AUTO FIRE Operating Mode in an INERT TEST ENVIRONMENT. Read [3.11 'Practice and Inert Testing'](#) for information on Inert Testing and Practice with Test Lamps.

To enter the AUTO SCRIPT Operating Mode depress the "MODE" key and the "BACK" key below the AUTO SCRIPT indicator LED simultaneously. The Pyrodigital® Field Controller Model E will then request the Operator to turn the Safety Key to the FIRE position. ONLY TURN THE KEY, IF IT IS SAFE TO DO SO. Subsequent, the Field Controller calculates the Auto Fire Table that holds the firing order and timings for the automated firing. The Pyrodigital® Field Controller Model E can run automated scripts on an highly precise internal clock or synchronous to the external Pyrodigital Timecode Modem connected to the Expansion socket. During the calculation the display will show:



After the Calculation the first line of the AUTO SCRIPT firing table gets displayed:



You are now in the AUTO SCRIPT Operating mode.

15.2 Scripting Auto Scripts

For Scripting in general, please refer to section [11.2.6 'Edit Script'](#). For AUTO SCRIPT mode, it is important to understand how the Prefire Time ("PFT", or Prefire Delay "PFD") works. As mentioned earlier, each Script Line has two parameter Show Time and Prefire Time. The Show Time is the time when the pyrotechnical event happens (e.g. the bouquet of a shell unfolds). The Prefire Time is the time the pyrotechnical effect needs from ignition to the event (e.g. the duration a shell needs to rise). From those two parameters of the Script Table the Field Controller calculates and sorts the Auto Script Table. The Auto Script Table lists the Script Lines ordered for the Fire Time. The Fire Time is calculated:

$$\text{Fire Time} = \text{Show Time} - \text{Prefire Time}$$

The Fire Time and the Show Time is given in hours, minutes, seconds and frames (hh:mm:ss:ff). A frame is 1/30 of a second. The Prefire Time is given in 1/10 of seconds and can be maximum 9.9 seconds.

Here an example:

Table 15.1: Script Table

Line Number	Show Time	Prefire Time	Fire Time
0	00:00:10:00	0	00:00:10:00
1	00:00:10:00	10	00:00:09:00
2	00:00:11:00	10	00:00:10:00
3	00:00:12:00	80	00:00:04:00

This Script Table has four Script Lines. Notice the resulting Fire Times for the individual Script Lines. These Script Lines are rearranged in the Auto Script Table. In the Script

Table the Script Lines are (naturally) sorted by the Script Line Number. As required for automated firing, the Auto Script Table sorts the Script Lines by their Fire Times:

Table 15.2: Auto Fire Table

Line Number	Show Time	Prefire Time	Fire Time
3	00:00:12:00	80	00:00:04:00
1	00:00:10:00	10	00:00:09:00
0	00:00:10:00	0	00:00:10:00
2	00:00:11:00	10	00:00:10:00

When automated firing is running, the Field Controller fires the Auto Fire Table row by row. However, the information shown on the display to the User are the Script Line parameters. Therefore, in the example above, Script Line Number 3 is display first as it is the first to be fired.

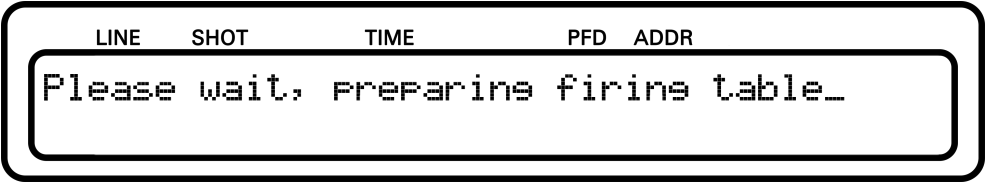
Attention: The Field Controller only accepts positive Fire Times that are greater than zero (Fire Time > 00:00:00:00). Any Script Lines with Fire Times smaller or equal to zero will be ignored in the Auto Fire Table.

Note: If the Show Time is 00:00:00:00, this Script Line will of course always be ignored as the resulting Fire Time is either equal or less than zero.

15.3 Operating Auto Script Mode

To enter the AUTO SCRIPT Operating Mode depress the "MODE" key and the "BACK" key below the AUTO SCRIPT indicator LED simultaneously. The Pyrodigital® Field Controller Model E will then request the Operator to turn the Safety Key to the FIRE position. ONLY TURN THE KEY, IF IT IS SAFE TO DO SO. Subsequent, the Field Controller calculates the Auto Fire Table that holds the firing order and timings for the automated firing. The Pyrodigital® Field Controller Model E can run automated scripts

on an highly precise internal clock or synchronous to the external Pyrodigital Timecode Modem connected to the Expansion socket. During the calculation the display will show:



After the Calculation the first line of the AUTO SCRIPT firing table gets displayed:



You are now in the AUTO SCRIPT Operating mode.

The first line of the firing table, as well as the selected table is indicated on the display. To start the clock (on from 00:00:00:00) press the FIRE key on the keyboard or the FIRE TRIGGER of the Deadman Pickle.



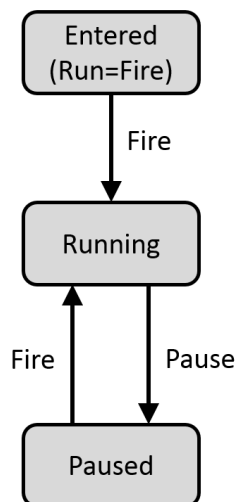
As soon as the clock matches the Fire Time of the displayed Script Line, this Script Line gets executed and the next Script Line in the order of the Fire Table is loaded.

WARNING - DANGER

Firing may instantaneous begin the moment the FIRE key (or FIRE TRIGGER of the Deadman Pickle) is depressed to start or resume the Internal Drive in AUTO FIRE mode.

REMEMBER: The time displayed is the Show Time and is unequal to the Fire Time.
 $\text{Fire Time} = \text{Show Time} - \text{Prefire Time}.$

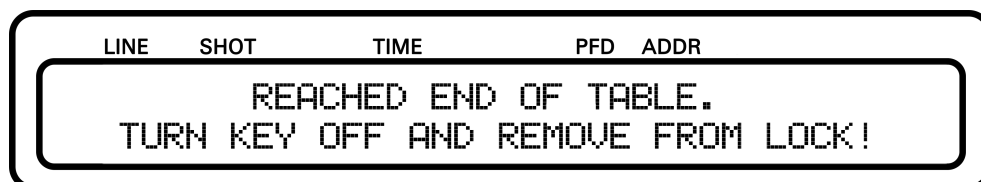
The clock can be paused by pressing the "PAUSE" Key. The clock can be resumed by pressing the FIRE key on the keyboard or the FIRE TRIGGER of the Deadman Pickle again. The following diagram gives an overview of the relation between clock states and key actions.



WARNING - CAUTION

If the Enable Interlock (Remote) is not closed, firing will be denied! Ensure to have the Deadman Pickle connected and the Enable button depressed.

When the end of the Fire Table is reached, the Pyrodigital® Field Controller Model E leaves the FIRE MODE to the STOP MODE. The user is then asked to return the Safety Key back to the OFF position:



15.3.1 Skipping Lines

When the Internal Drive is paused, Script Lines can be skipped using the Arrow Down Key. Pressing the Arrow Down key once sets the resume time to the fire time of the displayed Script Line. If the Arrow Down key is pressed again, the next Script Line gets loaded and displayed. You can also use the Arrow Up key to go back to previous Script Lines. In any case, if you used the Arrow Up or Arrow Down Key, the displayed Script Line is fired as soon as the clock is resumed by pressing the FIRE key on the keyboard or the FIRE TRIGGER of the Deadman Pickle.

15.4 External Pyrodigital Timecode Modem

Besides the Internal Drive option, the Pyrodigital® Field Controller Model E also allows to run synchronous to an external timecode, using the Pyrodigital External Timecode Accessory. For more Information see the Operating Instructions of the Pyrodigital External Timecode Modem.

15.5 Timecode Switch-over

The option derives from a music tape that plays the show music and sources the timecode and then suddenly stops. In practice, this raises an issue for the Field Controller, as the

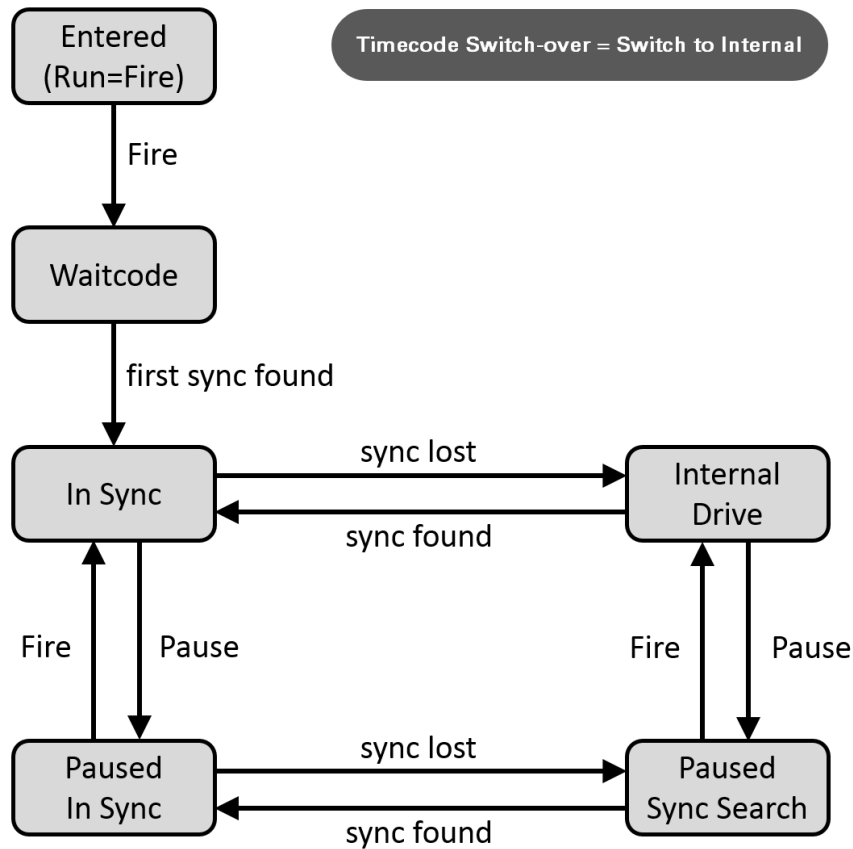
Field Controller does not know if either the connection to the timecode source got lost (and thus the Field Controller shall proceed firing), or the music stopped (and thus the Field Controller shall pause firing until the timecode resumes).

This behavior can be configured with the Timecode Switch-over Option. There are two options 'Switch to Internal' and 'Pause Show' that are both described in the following subsections.

'Switch to Internal' is the standard factory setting (as it has been for the older Field Controller Version, Field Controller Model 3). In most cases 'Switch to Internal' is preferable as it guarantees an ongoing show. However, this decision can only be made by the Operator.

15.5.1 Auto Switch-over

The figure below illustrates the behavior in Timecode Drive when the Timecode Switch-over option is set to 'SWITCH TO INTERNAL'. This means that the Pyrodigital® Field Controller Model E automatically switches over to the internal clock when the timecode signal gets lost.



First the Operator has to depress FIRE to proceed to the 'Waitcode' state. Then, after the first valid timecode frame is received, the clock is 'In Sync' to the timecode. If the timecode gets lost or invalid ('sync lost'), the clock switches over to the internal clock source 'Internal Drive'. When the timecode resumes (and is valid), the clock is resynchronized and again 'In Sync'.

The clock can also be pause by depressing the 'PAUSE' key. When paused, the clock can still be synchronous to the timecode ('Paused In Sync'), or the timecode can be lost and the device searches again for synchronization 'Paused Sync Search'. The behavior when resuming from pausing depends on the pause state the clock halts in.

- The clock is in the 'Paused In Sync' state (timecode present) and the FIRE key on the keyboard or the FIRE TRIGGER of the Deadman Pickle gets pressed:

When resuming from 'Paused In Sync', the clock will be directly 'In Sync' to the incoming timecode.

- The clock is in the 'Paused Sync Search' state (timecode absent) and the FIRE key on the keyboard or the FIRE TRIGGER of the Deadman Pickle gets pressed:

When resuming from 'Paused Sync Search', no valid timecode is present. The clock will resume on from the displayed time at which the clock has been paused.

Note that when the clock is paused, the clock state can change between 'Paused In Sync' and 'Paused Sync Search', depending on losing or resuming the timecode.

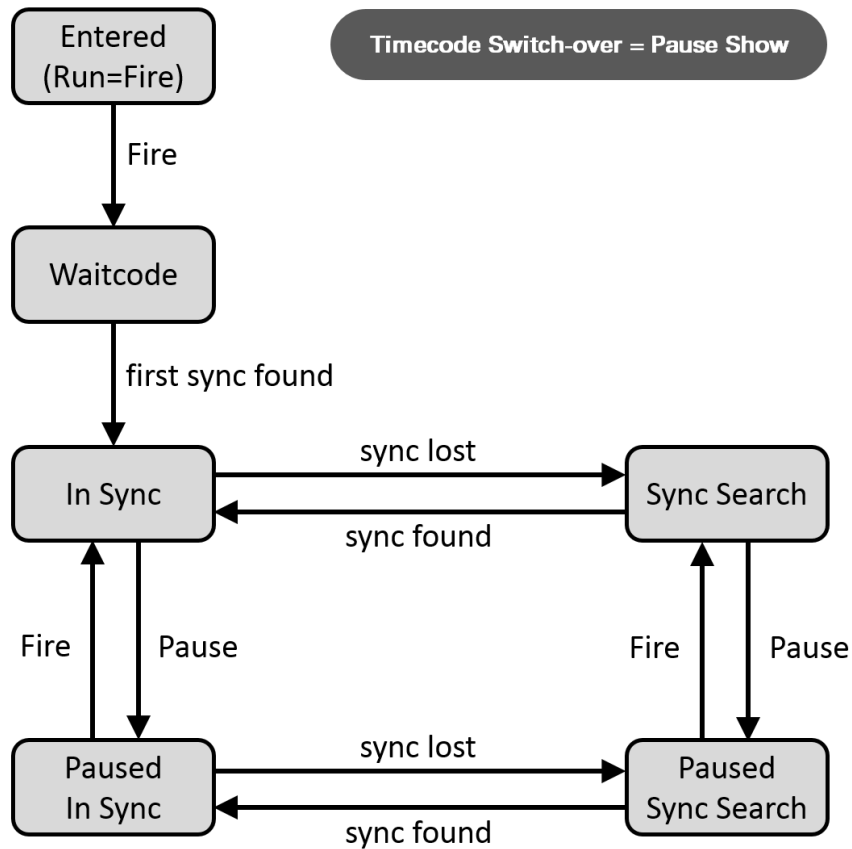
WARNING - DANGER

Once timecode has been received, the clock is running and firing will continue until stopped by the user, or the end of the script table is reached. Also see the Phase III System Network User's Guide, section 'Auto Time Switch-over', for ramifications and procedures concerning the fact that firing will continue even if the timecode signal is stopped or lost. (You can find all documents on pyrodigital.com.)

15.5.2 Pause Show

In contrast to the 'Switch to Internal' option, the clock does NOT switch over to 'Internal Drive' but halts in 'Sync Search' when the timecode gets lost. The clock waits in 'Sync Search' until the timecode resumes ('sync found'). The clock then re-synchronizes and runs on 'In Sync'.

When resuming from 'Paused Sync Search' by pressing the FIRE key on the keyboard or the FIRE TRIGGER of the Deadman Pickle, the clock still halts in 'Sync Search' until the timecode resumes.



15.6 Empty Fire Table

In case the selected Script Table is empty or does not have any valid Script Lines (compare section [15.2 'Scripting Auto Scripts'](#)) and AUTO SCRIPT is selected, the Field Controller will directly return to STOP mode and display the following message:

