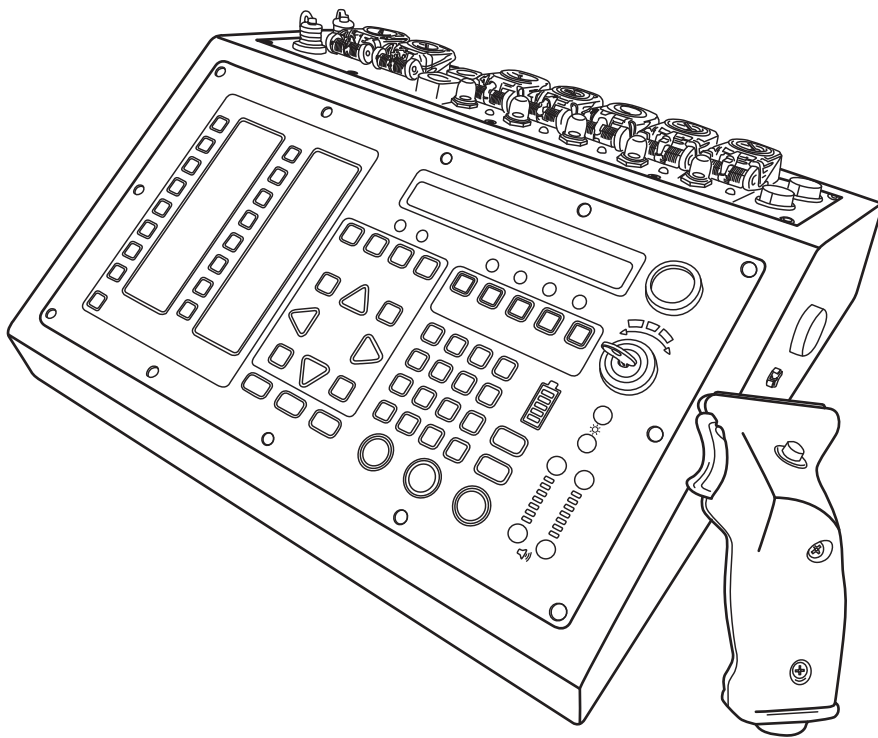# Pyrodigital®

CONTROL & RELIABILITY

THE NEW FC-A FIELD CONTROLLER

OPERATING INSTRUCTIONS

PYRODIGITAL®
FIELD CONTROLLER MODEL A
OPERATING INSTRUCTIONS

This document applies to the

Pyrodigital® Field Controller Model A

Software Version 1.1

(September 2017).

Pyrodigital®

CONTROL & RELIABILITY

iP INNOVATIVE PYROTECHNIK GMBH

RoHS Compliant ✓   C E

!!! IMPORTANT !!!

Before operating the Pyrodigital® Field Controller Model A, 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:

Notification about Receipt of the Pyrodigital® Field Controller Model A Operating Instructions.

Herewith, I confirm that a copy of the Operating Instructions for the Pyrodigital® Field Controller Model A 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:
_____

WELCOME TO
PYRODIGITAL®

Visit us on pyrodigital.com

or contact by email pd@pyrodigital.com.

Contents

Chapter 1

Feature Overview

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

- Five independent and isolated Phase III Network Output, each with its own driver electronics and own thermal circuit breaker

- Enhanced firing speed: Up to five time faster than the previous field controller (FC3) with up to 500 ignitions per second (when all five Phase III Network Outputs are used in parallel)

- Full backwards-compatibility with prior Pyrodigital® devices (Firing Modules as well as Field Controllers)

- Familiar design: No extensive training required to learn the new device.

- 2 years warranty

- USB connection for script table download and upload

- Direct script editing

- 4 tables with 2500 script lines each

- Manual firing with semi-automatic marco sequences of up to 9.9 seconds length.

- Fully automated synchronous to external timecode or internal clock.

- Ultra-stable internal clock and advanced timecode capabilities for PD-FSK and SMPTE. Automatic internal conversion of all SMPTE formats

- PD-FSK timecode generation during internal run to synchronize a subsequent field controller

- Integrated timecode modem - Synchronize Showdirector to your show.

- Timecode monitoring mode

- Manual, semi-automatic and full-automatic continuity testing

- New assignment table feature

- Full-color LED illuminated Keyboard, brightness and preset adjustable.

- 16 Caliber groups and hazard lockouts to give you control during the show. Audible and visual indication assist you to keep track.

- 3-way safety key: Check - Off - Fire

- Integrated safety key warning system

- Simplified Manual Fire Mode

- Included charger

- Waterproof housing and highly reliable terminal components

- Integrated battery status indicator

- Valve Regulated Lead-Acid (VRLA) batteries for reliable and safe performance and easy transportation. No lithium batteries.

- New safety features: 00X-Suppression, Hazard lockout preset and a Buzzer disabling option

- Optional password protection

- Device temperature monitoring

- Adjustable volume

- Included deadman pickle with fire trigger

- Link option to control subsequent field controller with the same deadman pickle. Link cable is available for purchase.

- External power Supply for 100-240 VAC, 50-60 Hz available for purchase.

Chapter 2

Technical Data

Type:	Field Controller Model A (FC-A)
Manufacturer:	Innovative Pyrotechnik GmbH
	Steinwerkstr. 2, 71139 Ehningen
	Germany
Software Version:	1.1
Internal Battery Type:	Valve Regulated Lead-Acid
	(VRLA) Battery
Internal Battery Voltage:	24 VDC (2x 12 VDC in series)
Total Internal Battery Capacity:	7.2 Ah
Maximum Charge Current:	1.2 Ah @ <29.5 VDC
Amount of Phase III Network Outputs:	5
Phase III Network Output Voltage:	28.5 VDC (only if Safety Key
	is armed)
Maximum Constant Current (resp. Power)	
per Phase III Network Output:	3A (resp. 85.5 W)
Internal Clock Precision:	± 20ppm $= 0.002\%$
	(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 A

Pyrodigital® Field Controller Model A 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 A 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 A 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 A and the Pyrodigital® Phase III Firing System Network, or intend to use the Pyrodigital® Field Controller Model A 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 A.

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 purspose 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 A.

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 A 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 A.

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 Disclamer

The Pyrodigital® Field Controller Model A 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 A 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 A 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 A 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 A 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 A. The Pyrodigital®
Field Controller Model A 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 A 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 A 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 A 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 A, 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 A.
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 A, 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 A 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 RE-SPONSIBLE FOR THE USE OF THE PYRODIGITAL® FIELD CONTROLLER MODEL A 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 A 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 A.

No part of the Operating Instructions is an 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 A, 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 A 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 A 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 A. 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 A. 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 posses the proper qualifications as outlined above and below you should not proceed with attempting operation of the Pyrodigital® Field Controller Model A 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 Pyrotechnial 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 A 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 A 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 A is a self powered, portable Unit. The Pyrodigital® Field Controller Model A 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 A. The Pyrodigital® Field Controller Model A, then, individually controls the operation of each Firing Circuit on every output device. The Pyrodigital® Field Controller Model A 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 A. This set of instructions is called the Data Table. The Pyrodigital® Field Controller Model A has provisions for several user selectable Data Tables. The Pyrodigital® Field Controller Model A top panel is grouped into logical control areas. The five Operating Modes are grouped in one logical area with their corresponding selector keys. Pressing one of these keys selects that corresponding Operating Mode, and the associated green LED (Light Emitting Diode) 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 A is first switched ON (by the main power switch). Thus the Pyrodigital® Field Controller Model A 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 FIR-
ING SYSTEM IN A LIVE FIRING ENVIRONMENT UNLESS YOU ARE COM-
PLETELY FAMILIAR WITH ALL OPERATING PROCEDURES AND WARN-
INGS IN THESE OPERATING INSTRUCTIONS, PLUS THE OPERATING IN-
STRUCTIONS 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 Mod-
ules 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 A 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 Pyrotech-
nic Material. **Test lamps are available from Innovative Pyrotechnik GmbH.
Additional or replacement test lamps may be obtained from Innovative Py-
rotechnik 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 A 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 A 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 CONSULTANTS 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 Front View

4.2   Device Rear View

4.3   Front Panel

1. **Power Switch** - Turn the device on and off

2. **Safety Key Switch** - Arm the Phase III Network Outputs

3. **Charge State Indicator** - The indicator displays the charge state of the internal battery

4. **Brightness Control Buttons** - Adjust the brightness of the keyboard illumination and the amount of illuminated buttons

5. **Refire** - 'Refire' (fire again) the last fired Phase III address in Manual Fire Mode

6. **AF/Pause MF/Skip** - Pauses running Marcos and Automatic Firing

7. **Timecode Volume Buttons** - Adjust the replay volume of incoming time code

8. **Script Beep Volume Buttons** - Adjust the volume of the warning, event and action beeps of the speaker

9. **Fire Button** - Release a fire command in Manual Fire Mode and start a script in Auto Fire Mode

10. **Enter** - Various purposes in the menu

11. **Hexadecimal Number Pad (Hex-NumPad)** - Various purposes in the menu

12. **Stop** - Abort any ongoing action of the Field Controller and go to Stop Mode (the idle state of the Field Controller)

13. **Return to Sequential** - used in Manual Fire Mode

14. **Go to Shot** - locate by Shot Number

15. **Go to Address** - locate by Address Number

16. a) **Caliber Group (Manual Fire Mode) / Hazard Lockout Buttons (Auto Fire Mode)**,
    b) **Description Field** - Operator can note some information here using Tape,
    c) **"Press to Display Shots Remaining"** Display additional information dependent on the Operating Mode

17. **Edit Function Keys:**
    Arrows Up/Down/Left/Right - Function depends on menu
    Delete (DEL) - Delete a script line in Edit Mode
    Insert (INS) - Insert a script line in Edit Mode
    Home - View the first script line
    End - View the last script line
    View - Change between displaying the script table, the manual fire table and the auto fire table

Locate (LOC) - Locate script line by parameter **Undo Entry** - Clear current entry **Quick Entry** - Contains some basic auto-fill functions for script editing

18. **Timecode Indicators:**

    SMPTE - LED turns magenta when a valid SMPTE time code is detected.

    PD-FSK - LED turns cyan-blue when a valid Pyrodigital® FSK time code is received. If the Field Controller sends a self-generated Pyrodigital® FSK time code on the Time Code Output this LED turns green.

19. **LCD Display**

20. **Status Indicator Lights:**

    Key On - Indicates if the Safety Key Switch is armed. (key "OFF" - indicator off, key turned to "CHECK" - indicator yellow, key turned to "FIRE" - indicator red)

    Short - Indicates if a Short is present on one of the five Phase III Outputs (indicator is red if short is present, indicator is off if no short is present).

    Hold Fire - Indicates if the Enable Interlock Circuit is closed, e.g. by depressing the Enable Button of the Deadman Pickle. (Indicator is yellow if interlock is not closed, indicator is off if interlock is closed)

    External Battery (Ext Bat) - Indicates if an external supply voltage is present. (off - no external voltage present, yellow - external voltage too low, green - external voltage supply active, red - external voltage too high)

21. **Operating Mode**

    Auto Fire - Enter Auto Fire Mode

    Manual Fire - Enter the Manual Fire Mode

    Timecode - Enter the Time Code Mode

    Check Status - Enter the Check Status Mode

    Data Table - Enter the Data Table Mode

Field Controller Model A

LINE   SHOT   TIME   PFD ADDR CAL

OPERATING MODES

EDIT FUNCTION KEYS

CALIBER GROUP SELECT

PRESS TO DISPLAY SHOTS REMAINING
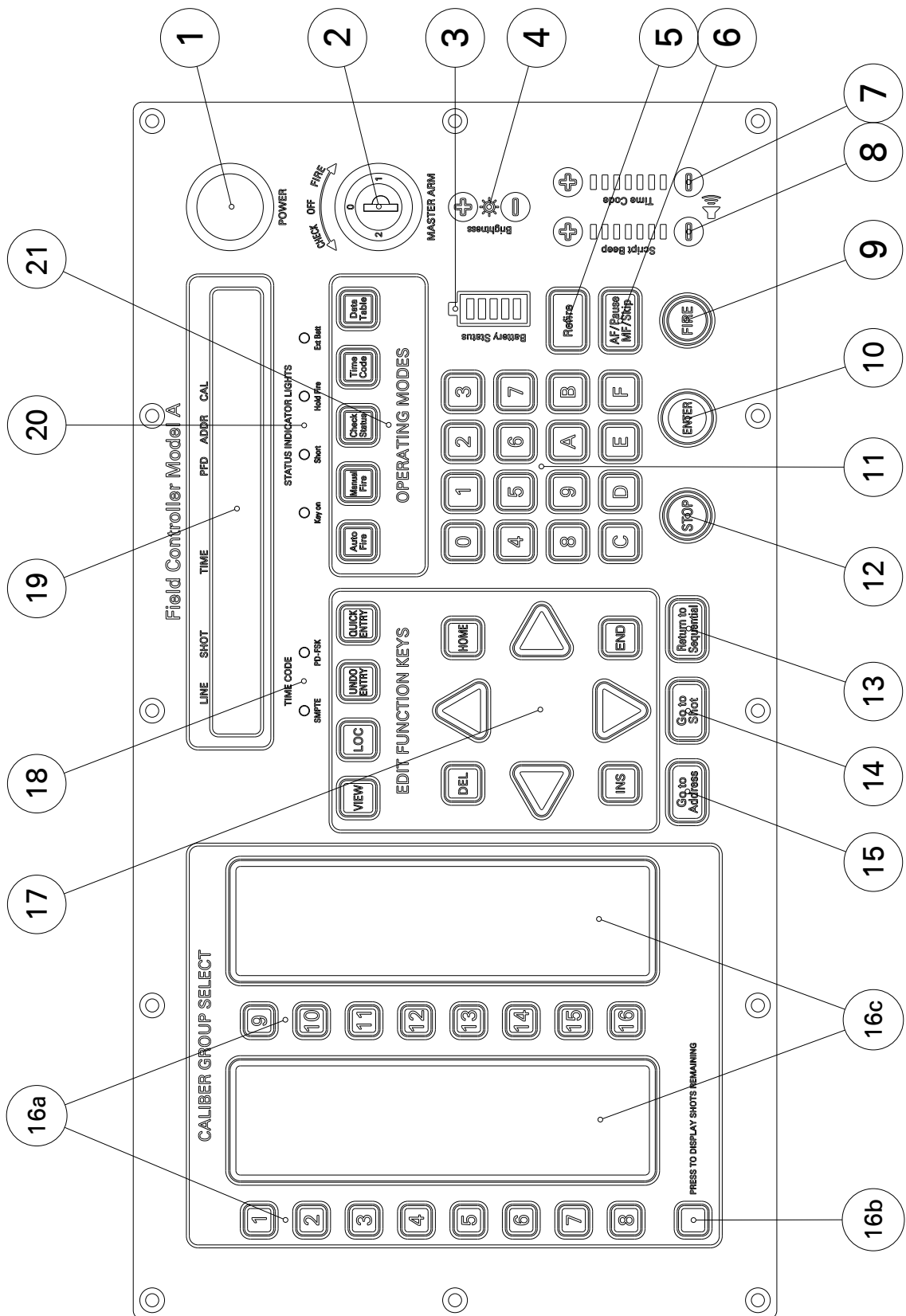
4.4   Rear Panel

22. **External Battery Plug (Ext Bat)** - Connect endorsed external supply here

23. **Timecode IN Plug** - Audio input for linear timecode (SMPTE and PD-FSK)

24. **Timecode OUT Plug** - Audio output for linear timecode

25. **General Purpose Input/Output (GPIO)** - USB 1 and USB2 for future applications

26. **Five independent Phase III Network Outputs**

    a) **Thermal Circuit Breaker** - Protects the corresponding Phase III Network Output

    b) **Phase III Network Output Plug** (Number 1 to 5 from left to right)

    c) **Monitor Indicator** - gives information about the corresponding Phase III Network Output

27. **Remote Out** - Loop through the Remote Control of the current Field Controller to another Field Controller

28. **Remote In** - Connector for the Deadman Pickle to control the Enable Interlock and to fire using the Fire Trigger of the Deadman Pickle

29. **Load Table / TCM - Multifunction USB-Connetor:**
    Download script tables from PC to the Field Controller
    Upload script tables from the Field Controller to a PC
    Functions as Time Code Modem to synchronize Scripting Software during a running show.

30. **Charge Plug** - Connect endorsed battery charger here
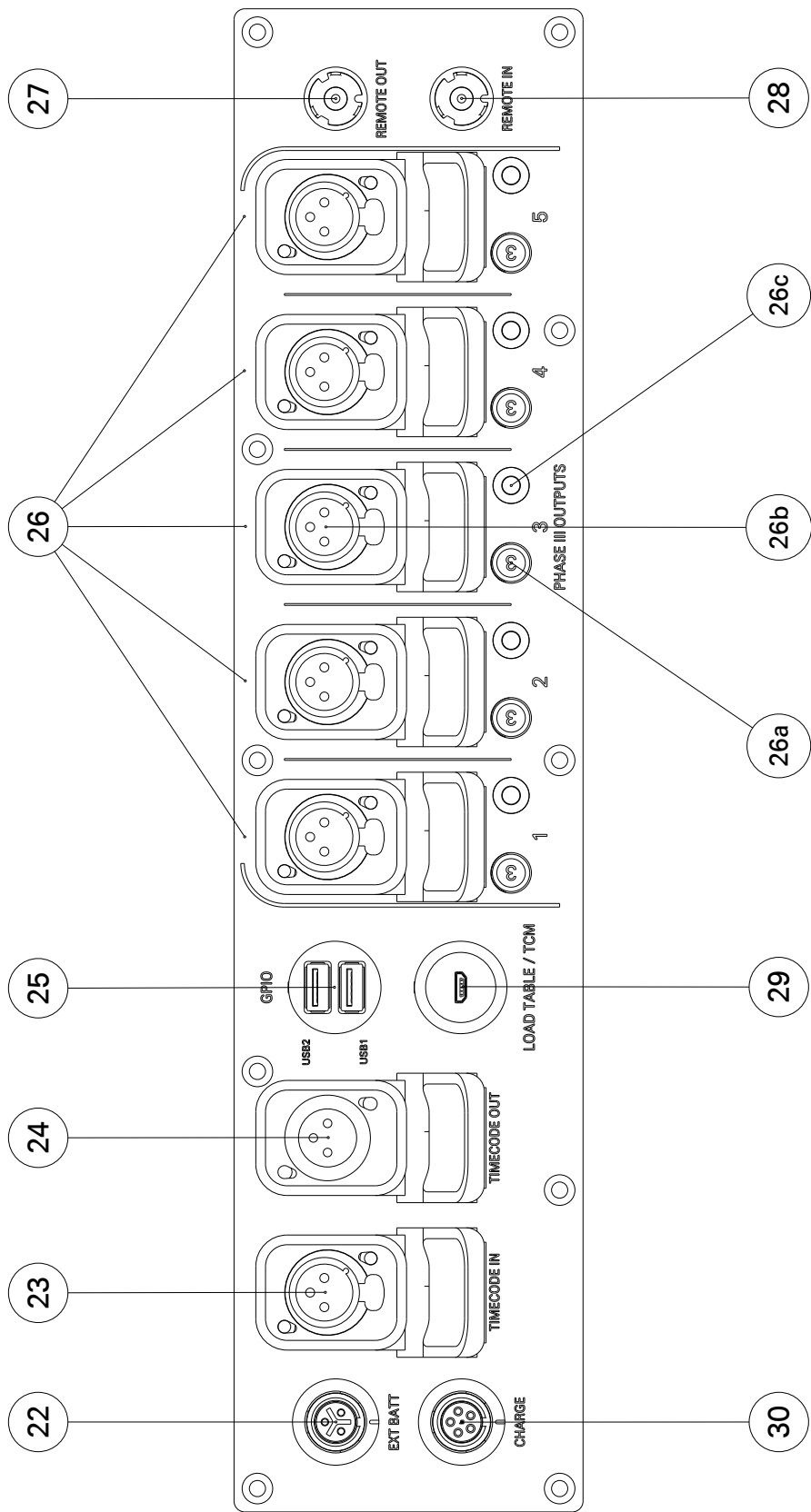
4.5   Bottom View

31. Rating Plate

32. Serial Number

33. Information Sign
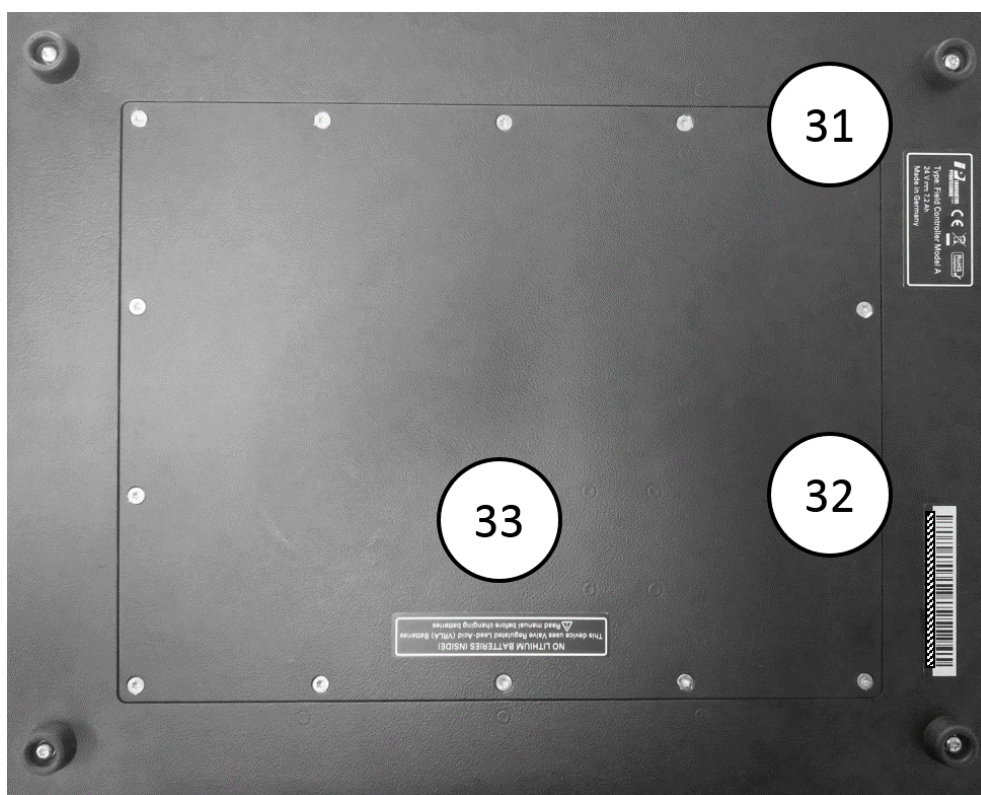
4.6   Deadman Pickle

34. **Enable Button** - Closes Enable Interlock

35. **Fire Trigger** - Triggers a Fire Command

36. **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 MANUAL 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 the device options in this mode. *In case the Controller Mode is set to Advanced you can also edit and view the Assignment Table here.*

3. TIME CODE MODE: This mode allows you to monitor incoming SMPTE and PD-FSK Timecode to verify the transmission quality and the format.

4. 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. *In case the Controller Mode is set to Advanced, you can also command the Field Controller to automatically generate the Assignment Table from the devices present in the network.*

5. MANUAL FIRE MODE: In this mode you can fire manually. You can either shoot totally free or scripted events. These events can be single shots or semi-automatic sequences, called Macros. You can also subdivide a script in a scene related manner using the so called Caliber Groups.

6. AUTO FIRE MODE: This mode allows you to run a fully automated script, synchronized to an internal clock or to an external timecode (SMPTE or PD-FSK).

You can think of the Operating Modes like a top menu that allows you to select the different functions of the Field Controller. When one of the Operating Modes is selected the corresponding Button is illuminated in green. In STOP MODE non of the five Operating Mode buttons is illuminated in green.

Whenever you enter the Operation Modes "CHECK STATUS", "MANUAL FIRE MODE" and "AUTO FIRE MODE" 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 Outputs by turning the Safety Key to the "OFF" position.

5.2   Controller Mode: Legacy or Advanced

The Pyrodigital® Field Controller Model A provides two different so called CONTROLLER
MODE SETTINGS in general. In contrast to the Operating Mode the Controller Mode is
unlike a menu. You can think of the Controller Mode as an option that you can enable or
disable. The Controller Mode allows you to decide if you like to enable more advanced
features on the Pyrodigital® Field Controller Model A (called ADVANCED) or if you
like to stick to the basic functionality (called LEGACY). If the Controller Mode is set
to LEGACY, the Field Controller Model A provides basically the same functionality as
the previous model, the Field Controller Model 3.0 (containing only marginal differences).
If the Controller Mode is set to the second option ADVANCED additional features are
enabled. With these features enabled the Field Controller Model A allows you to optimize
your scripts to gain more rapid firing. To do so the Field Controller makes use of its five
Phase III network outputs. You can gain up to five times faster firing. This allows you to
fire up to 15 positions in one frame (1/30 second). If reseted to the factory settings the
Pyrodigital® Field Controller Model A will be set to LEGACY. You can easily distinguish
to which Controller Mode your Field Controller is currently set to by the color of the
OPERATING MODES and STOP BUTTONS. However, remember the Operating Mode
is like the top menu you choose and the Controller Mode corresponds to the enabled
functionality. If the Field Controller is set to LEGACY the unselected Operating Mode
Buttons are illuminated in white. If the Field Controller is set to ADVANCED the
unselected Operating Mode buttons are illuminated in yellow. Independently of this a
green illuminated Operating Mode button always tells you which Operating Mode is
activated.

Please read chapter 14 'Controller Mode' for more details.

5.3 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. The check is done by computing so called CRC
Checksums from the Memory Content, storing the computed Checksums in memory
(which is a permanent record in the EEPROM Memory), re-computing the Checksums
again during booting and finally comparing the two Checksums. During the procedure the
Field Controller displays the screen:

```
┌─────────────────────────────────────────────────┐
│  LINE    SHOT         TIME        PFD   ADDR   CAL │
│ ┌───────────────────────────────────────────────┐ │
│ │           SYSTEM VERIFICATION                 │ │
│ │       --> Checking System EEPROM <--          │ │
│ └───────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────┘
```

If the CRC Checksums are all correct, the Field Controller initializes itself and will show
the start-up screen of the Stop Operating Mode, as shown below:

```
┌─────────────────────────────────────────────────┐
│  LINE    SHOT         TIME        PFD   ADDR   CAL │
│ ┌───────────────────────────────────────────────┐ │
│ │      Pyrodigital(R) Field Controller A        │ │
│ │         Software Version X.X - 20XX           │ │
│ └───────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────┘
```

THIS IS THE STOP OPERATING MODE, OR TOP, OPENING MENU. THE LOWER
RIGHT CORNER OF THE DISPLAY SHOWS THE OPERATING SYSTEM SOFT-
WARE 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 and the calculated
CRC Checksum does not agree with the permanent CRC Checksum, an Error Message

will be issued on the Display. If this happens you can reset the EEPROM using the factory
reset as described in 12.2. 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 ship it to Innovative Pyrotechnik GmbH for repair. Switch
to a backup Field Controller, if available.

5.4   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:

```
  LINE     SHOT          TIME          PFD   ADDR   CAL

     Pyrodigital(R) Field Controller A
         Software Version X.X - 20XX
```

The STOP MODE is indicated by the presence of the above Display. In the STOP MODE
all five Operating Mode buttons are illuminated in white (as none of them is selected).
*In the case the CONTROLLER MODE is set to ADVANCED instead of LEGACY the
Operating Mode Buttons are illuminated in yellow.*
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. Field Controller functions from the STOP MODE
must then be re-selected by depressing the appropriate Operating Mode.

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 A will not loose the information about last fired script lines (the so-called Asterisks: *). You can check the Asterisks after returning from firing to the EDIT MODE.

5.5   Deadman

The Pyrodigital® Field Controller Model A 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 IN port and press the ENABLE button with your thumb. If the ENABLE button is depressed the "HOLD FIRE" indicator below the display will turn OFF. Whenever the Interlock is unclosed the "HOLD FIRE" indicator will be turned ON and firing will not be permitted. If you are in MANUAL FIRE MODE or in AUTO FIRE MODE you will also recognize that the Phase III Output Indicator LEDs next to the Output Plugs will stop blinking and turn static green. This also 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.

The Pyrodigital® Field Controller Model A also allows you to loop through the Deadman
to the next Field Controller using the REMOTE OUT plug. Using this you can control
several Field Controllers with only one Deadman Pickle. To purchase a Remote Link
Cable please contact Innovative Pyrotechnik GmbH (pd@pyrodigital.com).

5.6   Basics Manual Fire Mode

After the Field Controller is booted and in STOP MODE, select the MANUAL 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). When
there is NO DATA TABLE in the memory (or selected memory) of the Field Controller,
then the LCD will appear as follows:

```
    LINE    SHOT         TIME            PFD   ADDR   CAL

  Direct Firing -> Next Address: ADD
  No Table          Last Fired: ADD
```

You are now in the "Direct Manual Firing".

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

Depress 010, from the hex keypad, one character at a time. It will show up as Next
Address.

```
     LINE    SHOT        TIME        PFD  ADDR  CAL
 ┌─────────────────────────────────────────────────┐
 │ Direct Firing -> Next Address: 010              │
 │ No Table        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 Deadman button 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. Also direct keyboard entry of a new address between 000 and 7FF to fire is permitted.

```
     LINE    SHOT        TIME        PFD  ADDR  CAL
 ┌─────────────────────────────────────────────────┐
 │ Direct Firing -> Next Address: 011              │
 │ No Table        Last Fired: 010                 │
 └─────────────────────────────────────────────────┘
```

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 FIRE button is pressed and the Key is turned. You are now in the so-called "Sequential Manual Firing". Here the script will be shot linearly from the first to the last line regardless of the associated Caliber Groups of the lines. Each script line can be associated with one of the 16 Caliber Groups. If you enter the so-called "Caliber Group Manual Firing" only script lines with this Caliber Group number will be processed. You can think of these Caliber Groups like a sublist generated from the script. You can enter the individual Caliber Groups by pressing the corresponding Caliber Group button. E.g. the Caliber Groups can be used to generate several subscripts that relate to different scenes like different songs in a concert. Being in one of the Caliber Groups ensures you not to shot into the next scene. Jumping between the sixteen Caliber Group is possible

and you will always return to the same position in your subscript when returning to
the Caliber Groups. You can also display how many shots are remaining in each of the
Caliber Groups by pressing the "Display shots remaining" button on the bottom left of
the keyboard. Return to the "Sequential Manual Firing" by pressing again the already
selected Caliber Group button or by pressing "Return to Sequential". If you like to fire
freely any address in the network press "Go to Address". This will get you to the "Direct
Manual Firing" similar to having an empty Script Table. To return to the "Sequential
Manual Firing" press "Return to Sequential". Besides firing single shots you can also script
semi-automatic sequences of shots for manual firing in "Sequential Manual Firing" and
"Caliber Group Manual Firing". This semi-automatic sequences is called a MACRO. When
you fire a macro the whole sequence is initiated and runs automatically(max. duration
9.9 seconds). In contrast to earlier versions of the Field Controller the Pyrodigital® Field
Controller Model A allows you to script as many MARCOS as you like and use as many
MACROS and single shot in the single Caliber Groups as you like.

5.7   Basics Auto Fire Mode

Before using the AUTO FIRE 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). After having
selected such a Script Table you will be proceeded to the selection menu for the clock
source (after pressing the AUTO FIRE MODE button and turning the Safety Key to
'FIRE'). If not the Field Controller will automatically go back to STOP MODE as there is
no point of entering the AUTO FIRE MODE. The Safety Key Warning System will then
ask you to turn back the Key to the "OFF" position.
The clock source you can be either the Internal Quartz Crystal Clock or one of the
linear Timecode Formats. You can choose between the very robust Pyrodigital® FSK
Timecode (PD-FSK) that also can be transmitted via Walkie-Talkie or the common
SMPTE Timecode. The Pyrodigital® Field Controller Model A supports all SMPTE
formats. There is the option to use the Internal Quartz Crystal Clock and let the Field

Controller generate an own PD-FSK Timecode to synchronize another Field Controller to the Internal Run.

To fire a prepared Auto Fire Script Table first go to the "DATA TABLE MODE". Then press option "Select" and ensure the displayed number corresponds to the Script Table you like to use. You can change the selected Script Table by pressing the numbers "0", "1", "2" or "3". Now press "AUTO FIRE MODE" and choose the Option "Internal" for the Internal Quartz Crystal Clock as clock source. 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, press the "CHECK STATUS MODE" button. 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 (00 to 7F in hexadecimal). Using the LEFT and RIGHT Arrow buttons you can select between the five Phase III Network Outputs in case you have a response on more than one of the Network Outputs. The display will show a Symbol for each of the electric match clamps:
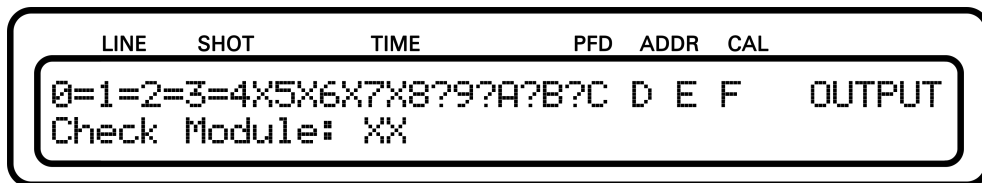
- = this clamp address is present in the selected script table AND was found on the firing module to have continuity: FINE

- **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 A 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 middle position "OFF", the Phase III Network Outputs are disconnected from power. In the positions "CHECK" and "FIRE" the supply voltage of 28.5 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

43

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 audible Warning System uses an integrated buzzer that is solely reserved for warning the user. Additionally, the audible Safety key warning signals are also present on the speaker of the Field Controller. The volume of the audible Safety key warning signals on the speaker can be adjusted using the "Script Beep Volume" buttons. The buzzer volume can not be adjusted. When Password Protection is activated on the Field Controller, the user can disable the buzzer temporarily until the device is restarted. If the Password Protection is deactivated, this option is not present. The correct Password is required to be allowed to disable the buzzer. For more details on disabling the buzzer please read 8.3 and on how to set up and use Password Protection please read 12.3. The buzzer will always be enabled, respectively re-enabled, when starting up the device.

WARING - 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 A.

6.2   Arming with the Safety Arm Key to "FIRE"

When the Operating Mode of the Field Controller is set to "AUTO FIRE" or "MANUAL FIRE" by pressing the corresponding Operating Mode Buttons the display prompts the message:

```
   LINE    SHOT          TIME          PFD   ADDR   CAL
  CLEAR FIRING SITE OF PERSONNEL
  If SAFE, turn ARM KEY to FIRE.
```
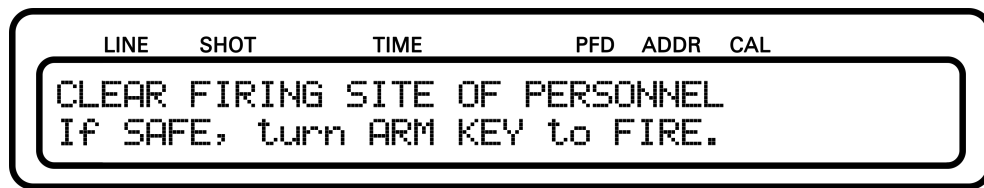
Also the audible Warning System warns you. BEFORE YOU PROCEED TO TURN THE KEY TO THE "FIRE" POSITION, IT IS YOUR RESPONSIBILITY TO ENSURE THAT IT IS SAFE TO POWER UP THE PHASE III NETWORK! When the key is turned to "FIRE" the FC-A proceeds and the audible Waring System falls silent.

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" by pressing the corresponding Operating Mode Button the display prompts the message:

```
        LINE    SHOT        TIME        PFD   ADDR   CAL
  CLEAR FIRING SITE OF PERSONNEL
  If SAFE, turn ARM KEY to CHECK or FIRE.
```
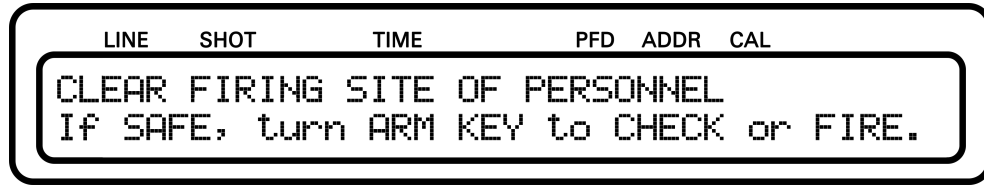
Also the audible Warning System warns you. BEFORE YOU PROCEED TO TURN THE KEY TO THE "CHECK" or "FIRE" POSITION, IT IS YOUR RESPONSIBILITY TO ENSURE THAT IT IS SAFE TO POWER UP THE PHASE III NETWORK! When the key is turned to "CHECK" or "FIRE" the FC-A proceeds and the audible Waring System falls silent.

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 five individual Phase III Output Drivers and is allowed to request the status information from the Firing Modules via the Phase III Network. The Phase III Output Drivers are wired to the corresponding network plugs. 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 AND MANUAL FIRE MODE. 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

```
  LINE    SHOT          TIME          PFD   ADDR   CAL

   TURN KEY OFF AND REMOVE FROM LOCK!
```

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 Waring 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 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, Manual Fire, Auto Fire).

IF THE SAFETY KEY IS ARMED AND THE FIELD CONTROLLER IS ALREADY IN A POWERED MODE (Auto Fire, Manual Fire, or Check Status); THEN the user may also select between the three 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 visa 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.

6.6   Over-Temperature Warning System

The Pyrodigital® Field Controller Model A is equipped with temperature sensors.There is one sensor to check the battery temperature and another sensor to check the main board

temperature. If the system detects a battery temperature that is too high (higher than +55°C) the illuminated frames of the Keyboard turn yellow. In case the system detects a too high temperature on the main board (higher than +85°C) the illuminated frames of the Keyboard turn red. In both cases the Field Controller warns the user with a Warning Beep that the temperature is detected to be too high to operate. The Beep will repeat in longer distances until the temperature is back within the operating range.

> **WARNING - EXTREME DANGER**
>
> If over-temperature is detected a reliable operation of the Pyrodigital® Field Controller Model A cannot be guaranteed! STOP immediately to operate with the Pyrodigital® Field Controller Model A and ensure the device cools down until the over-temperature alarm is not indicated anymore before you proceed to operate the device.

Chapter 7

Phase III Network Outputs

7.1 Introduction

The Pyrodigital® Field Controller Model A is equipped with five individual and independent Phase III Network Output Drivers each siting behind one of the Phase III Network Output Connectors. Each Phase III Network Output Driver is a separate electronic device integrated into the Pyrodigital® Field Controller Model A. The presents of five independent Phase III Network Outputs gives the Operator a TREMENDOUS INCREASE IN REDUNDANCY! E.g. if one Phase III Network Output Driver is down due to an short circuit in its network, all other four Phase III Network Output Drivers stay fully operational and carry on the show. With the five separate Phase III Outputs the operator can subdivide a show into several subnetworks to achieve higher redundancy.

Further, when the Controller Mode is set to ADVANCED the five independent Phase III Network Outputs allow the Pyrodigital® Field Controller Model A to TREMENDOUSLY INCREASE THE FIRING SPEED! To do so the Field Controller will only send out firing commands to Firing Modules that are present on the Phase III Network Outputs. For more details please see chapter 14 'Controller Mode'.

7.2 Output Monitors and Circuit Breakers

Each of the five Phase III Network Output Drivers 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 of each Phase III Network Output Driver has got a indicator LED (red - green - yellow) to give the operator a visual feedback about the state of each individual Phase III Network Output Driver.

Whenever the Phase III Network Output are powered up, the Output Monitor Indicators are illuminated in GREEN. When a too high current is draw (high that 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 draw on this 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 corresponding Phase III Network Output gets disconnected from power. ALL OTHER PHASE III NETWORK OUTPUTS STAY FULLY OPERATIONAL! THIS IS A VERY POWERFUL FEATURE OF THE PYRODIGITAL® FIELD CONTROLLER MODEL A. When the power is disconnected the corresponding Output Monitor Indicators turns OFF.

NOTICE: IF THE THERMAL CIRCUIT BREAKER POPS IT TAKES SOME TIME UNTIL 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 Indicators can be either statically on or blinking. The Output Monitor Indicators will blink if the Operating Mode of the Field Controller is set to "AUTO FIRE MODE" or "MANUAL FIRE MODE" 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 (respectively the Lazy Deadman is plugged) or not.

Further the Monitors also indicate with an yellow flash whenever a fire commands and check status requests from the CPU is received and accepted. This is very helpful during firing (especially when using the ADVANCED MODE features). Also, when performing a Manual Status Check (CHECK STATUS MODE –> MANUAL CHECK) the corresponding Output Monitor Indicators will turn static yellow when a Firing Module with the requested Address is found on its Output.

The Monitors 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 unlikely event of a failing thermal circuit breakers, the Monitor will disconnect its corresponding Network Output from power. This "Software Fuse" will be reset after restarting the Field Controller.

During the booting of the Field Controller, the Output Monitor Indicators first all turn red, then show a chaser light from Output 1 to Output 5 in red and finally a chaser light back from Output 5 to Output 1 in 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 Indicators turn static 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 one of the thermal circuit breakers pops, there is a short in your network that had drawn a too high current on the corresponding Phase III Network Output. So much, that it made 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 a atypically high current, even though it is not high enough to harm the FC-A in any way. If such an atypically high current the corresponding 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. HOWEVER, ALTHOUGH THE THERMAL CIRCUIT BREAKER OF ONE OF THE PHASE III OUTPUTS POPS OR ONE OF THE MONITORS INDICATES A "SOFT" SHORT BY A RED LED, ALL THE OTHER PHASE III OUTPUT DRIVERS ARE UNAFFECTED AND RUN ON INDEPENDENTLY.

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 that indicates the problem 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 the 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

Safety Settings

The Pyrodigital® Field Controller Model A supports three novel safety settings. The Option "Buzzer Off" to disable the Buzzer of the Safety Key Warning System is only available if Password Protection is activated. To enter the Safety Settings go to:

DATA TABLE –> DEVICE OPTIONS –>SAFETY SETTINGS

```
        LINE    SHOT        TIME        PFD   ADDR   CAL
   SAFETY SETTINGS:           0 00X-Suppression,
                             1 Hazard Lockout Preset
```

8.1   00X-Suppression

In scripting on computers Script Lines with Firing Address 000 are often used as marks. Those marks 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 A does not send out any fire commands to Module Address 00. This suppresses any firing on the

Firing Addresses 001 to 00F.

To enable/disable the 00X-Suppressing choose the corresponding menu point from the Safety Settings Menu

```
     LINE    SHOT              TIME              PFD   ADDR   CAL
    Suppress any Firing on Module 00? X
    Press "0"(NO), "1"(YES)
```
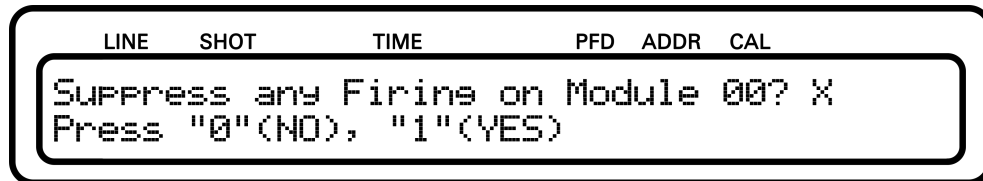
To enable the 00X-Suppression press "1"; to disable it press "0".

8.2   Hazard Lockout Preset

The Hazard Lockout Preset allows you to decide which of the Hazard Lockouts are activated/deactivated when entering the AUTO FIRE MODE. This Preset only defines the initial state of the Hazard Lockouts. Of course, during operation in AUTO FIRE MODE the operator can still enable/disable the Hazard Lockouts as required. The Preset only defines which of the Hazard Lockouts are enabled initially. With factory settings, the Hazard Lockout Preset is completely empty, meaning no Hazard Lockouts will initially be enabled, when entering the AUTO FIRE MODE. The Hazard Lockout Presets are individual for each script table. Therefore, e.g. script table 1 can have another Hazard Lockout Preset than e.g. table 2. If a script table gets erased, its corresponding Hazard Lockout Presets get reset as well.

REMEMBER: If a Hazard Lockout is enabled (in AUTO FIRE MODE), this corresponds to NOT firing Script Lines with this Hazard Lockout Number (CG/HZ Number - Caliber Group / Hazard Lockout Number). If that Script Line shall be fired, the Hazard Lockout has to be disabled.

```
        LINE    SHOT        TIME        PFD  ADDR  CAL
    ┌─────────────────────────────────────────────────┐
    │ HAZARD    1    2                               8 │
    │ LOCKOUT   9                 12   13           16 │
    └─────────────────────────────────────────────────┘
```

In the example above, in the Hazard Lockout Preset the CG/HZ Number 1, 2, 8, 9, 12, 13 and 16 are enabled (as their corresponding number is visible). Thus, those Hazard Lockouts will initially be enabled when entering AUTO FIRE MODE (yellow illuminated button). For the remaining CG/HZ Numbers (3, 4, 5, 6, 7, 10, 11, 14 and 15) the Hazard Lockout will initially be disabled (red illuminated buttons) and Script Lines with these CG/HZ Numbers will be fired. THE OPERATOR IS STILL ABLE TO DISABLE/ENABLE DURING OPERATION.

To enable/disable a CG/HZ Number in the Hazard Lockout Preset simply press the corresponding CG/HZ button. Press Enter to return to the menu.

REMEMBER: If you want all CG/HZ Number to be fired in AUTO FIRE MODE, all Hazard Lockouts have to be DISABLED! So, if you want all CG/HZ Number to initially be DISABLED, <u>NO</u> CG/HZ Number should be displayed in the Hazard Lockout Preset Menu.

8.3 Disabling the Buzzer

The buzzer is part of the Safety Key Warning System. Under normal operating conditions, the buzzer should never be disabled. However, if the operator decides intentionally and on his own responsibility to disable the buzzer, he can do this as follows:

1. Enable the Password Protection as described in section 12.3.

2. Select "DATA TABLE" Mode

3. Select "Device Setup"

4. Enter the 4-digit password and press "Enter" to proceed.

5. Select "Safety Settings"

6. Select "Buzzer Off"

7. Press "1" to acknowledge that you want to disable the buzzer

The buzzer is now disabled and will automatically be re-enabled after the next reboot. Whenever the Pyrodigital® Field Controller Model A is started up the buzzer is always initially enabled. The operator can only disable the buzzer for a single session. The option to disable the buzzer is only present when the Password Protection is enabled (see section 12.3).

Chapter 9

Remote Interlock

The Pyrodigital® Field Controller Model A has got an Remote Input (REMOTE IN) on the top right of the rear panel as well as an Remote output (REMOTE OUT). 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 FIRE MODE or MANUAL 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 Drivers. Also the Phase III Output Drivers will not accept any Firing Commands while the Enable Interlock is not closed.

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

Using the Remote Output, the Enable Interlock Signal as well as the Fire Button Press Events can be forwarded to another subsequent Field Controller. Therewith, the Remote Output allows to control several Field Controller with only one Deadman Pickle.

WARNING - EXTREME DANGER

Do only plug and unplug Link Cables from the Remote Output of one Field Controller
to the Remote Input of another Field Controller when both devices are switched off.
Do not plug/unplug the Link Cables while operating a Field Controller.

Chapter 10

Battery, Power and Fuses

10.1 General Information

> **WARING - 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 BATTERY FUSE AND THE CHARGER FUSE.

The Pyrodigital® Field Controller Model A is powered by two 12V Valve Regulated Lead-Acid (VRLA) Batteries. This battery type provides high reliability and the power required to drive up to five full Pyrodigital® Phase III Networks (one on each Phase III Output). This battery is very robust and is accepted for flight transportation. The Pyrodigital® Field Controller Model A does have NO LITHIUM BATTERIES OR LITHIUM-ION

BATTERIES INSIDE. The two batteries are in series and provide 24 VDC to the Field Controller. In order to provide a constant and decent voltage level for the Phase III Network Outputs, the Pyrodigital® Field Controller Model A is equipped with a powerful 350 W booster unit that ensures a constant 28.5 VDC output voltage at the Phase III Network Outputs. THE BOOSTER TREMENDOUSLY ENHANCES THE PERFORMANCE OF PHASE III NETWORK in comparison to the older Field Controller versions.

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 A 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 A has two internal fuses (besides the externally accessible thermal circuit breakers). The charger fuse (G 1.6A 250V 5x20mm slow type) that secures the CHARGE plug and the main fuse (Mini Blade Fuse 20A 32V slow type) that secures the overall circuitry.

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

10.2   Charge State Indicator

The Pyrodigital® Field Controller Model A 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 calculated the charge state of the battery. The charge state will be displayed directly on the Keyboard at the battery-shaped Charge State Indicator. The figure below shows this Charge State Indicator that consists of a frame and five bars.
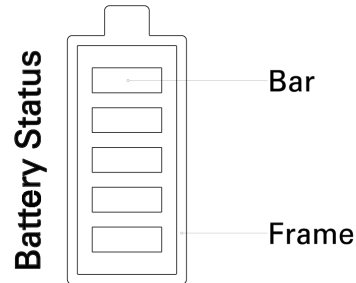
The Charge State Indicator represents the charge state of the batteries as follows:

- 5 green bars and green frame: 100% to 80%

- 4 green bars and green frame: 79% to 60%

- 3 green bars and green frame: 59% to 40%

- 2 yellow bars and yellow frame: 39% to 20%

- 1 red bars and red frame: 19% to 10%

- 0 bars and red frame: 9% to 0%

- 0 bars and blinking red frame: less then 0%

WARING - DANGER

If the batteries are too low, correct functioning of the Field Controller can not be assured. If the Indicator shows a red blinking frame (less than 0% charge state), go directly to STOP MODE, return the Safety Key to the "OFF" Position and turn Off the device.

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.

When starting up the Field Controller the Charge State Monitoring System will take around 30 seconds to analyze the batteries. During this time the whole Charge State Indicator is illuminated in cyan blue.

10.3   Charging the Battery

The integrated batteries needed to be charged using an appropriate charging device for 24 VDC Valve Regulated (VRLA) Lead-Acid Batteries. This charger needs to get plugged into the "CHARGE" plug on the top left of the Field Controllers back panel. The maximum charge current for the Pyrodigital® Field Controller Model A is 1.2 Ampere. Only use charging devices endorsed by Innovative Pyrotechnik GmbH. Our Pyrodigital® Field Controller Model A comes with an appropriate charging device that provides a universal input voltage range (90-264 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, charges 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 appropriately sized to be harmless even for overcharging, any Overcharging MUST be prevented.

WARNING - CAUTION

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

The current sensing of the Charge State Monitoring System can also detect if current flows into the battery (charging). If charging is detected the Charge State Indicator turns magenta and blinks to indicate to the user that the charger MUST be disconnected during operation of the Pyrodigital® Field Controller Model A.

If you require to extend the battery lifetime or you run shows in permanent installation with the Pyrodigital® Field Controller Model A, then use an external supply device recommended by Innovative Pyrotechnik GmbH. For further information see section 10.10.

10.4 Open the Field Controller

WARING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO OPEN THE PYRODIGITAL® FIELD CONTROLLER MODEL A. 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 A needs to be opened or is open! Properly ground yourself and the ESD mat underneath the device. Never open the Pyrodigital® Field Controller Model A outside of an EDS safe environment. Please ask Innovative Pyrotechnik GmbH or your local vendor for advice, if you are unsure about EDS safe environments.
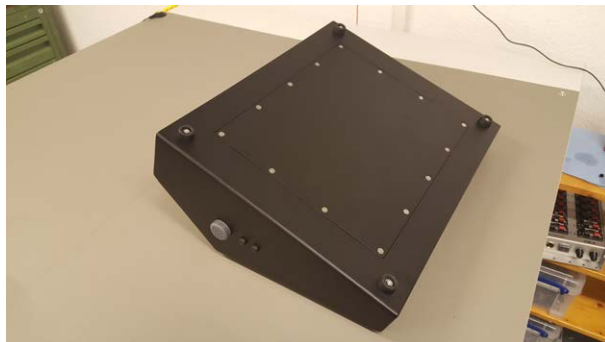
Place the Field Controller bottom up on an ESD safe underground, e.g. an ESD mat. Ensure the ESD mat has a proper 1 MOhm connection to earth ground. Now,unscrew all 14 bottom screws.
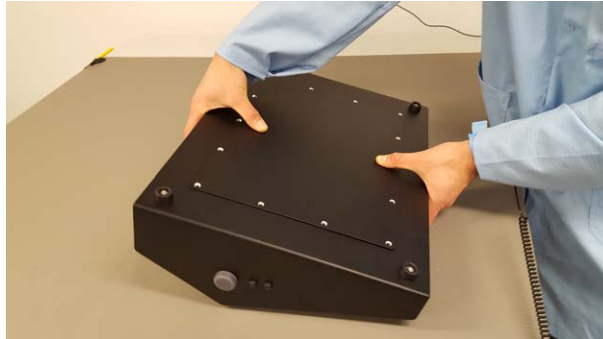
Hold the device with both hands.

Put the device horizontal like shown in the image above. Ensure you strongly press the bottom plat with the thumbs.

Reduce the pressure of your thumbs and let softly glide down the bottom plate towards the table.

Now, put one hand on top of the device and support the bottom plate with the other hand.

Now, slightly tilt the device like shown in the images above. You can now gently lower the bottom plate toward the table.

Make sure the cabling is loose enough so you can proceed to lay down also the housing itself. The cables might be hidden in the compartment in front of the main board.

Lay down the housing next to the bottom plate as shown in the image above.
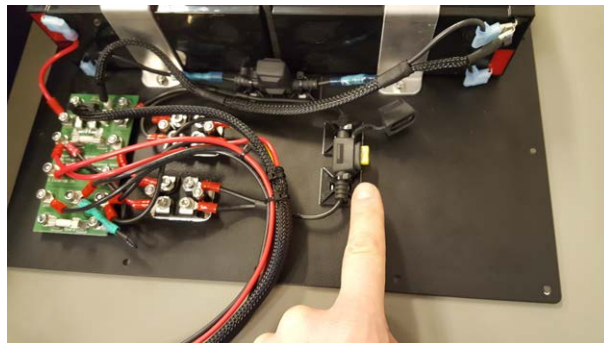
This is the location of the Main Fuse.

IMPORTANT: Before proceeding any further disconnect the Main Fuse!!!

This is the location of the Battery Fuse.
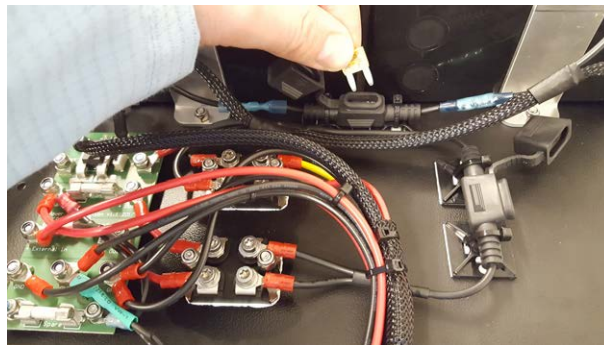
IMPORTANT: Before proceeding any further disconnect the Battery Fuse!!!

You successfully opened the Field Controller.

10.5 Replacing the Batteries

WARING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE BATTERIES OF THE PYRODIGITAL® FIELD CONTROLLER MODEL A. 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.

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 A 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.

Endorsed Batteries are the Panasonic LC-R127R2PG1.

WARING - 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, or conduct or arrange the battery replacement for you.

To replace the batteries first follow the instruction to open the Pyrodigital® Field Controller Model A 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 Battery Minus Cable from the negative pole of the right hand side battery. Be
very careful unplugging this connector as it includes also the temperature sensor of the
battery. DO UNPLUG THE WHOLE PART INCLUDING THE SENSOR FROM THE
BATTERY.

Unplug the Battery Plus Cable from the positive pole of the left hand side battery.
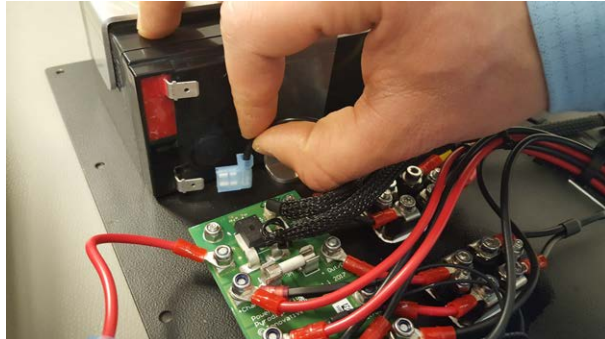
Unplug the fused Battery Interconnection Cable from the negative pole of the left hand side battery. Be careful to not harm the PCB board next to it and the cables connected to it.

Unplug the fused Battery Interconnection Cable from the positive pole of the right hand side battery.

Unscrew the battery holder. Use a socket SW 7mm to open the M4 nuts.
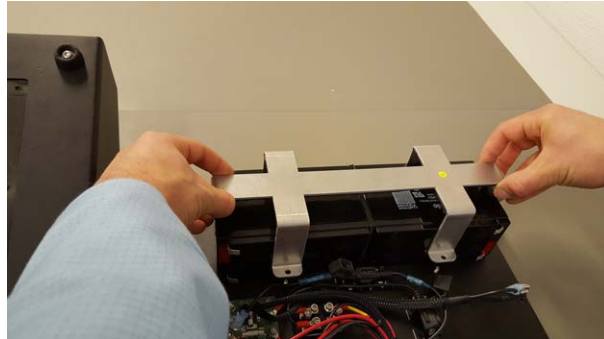
Lift off the holder. The batteries are free now.

Replace the old batteries for batteries endorsed by Innovative Pyrotechnik GmbH (Always endorsed: Panasonic LC-R127R2PG1).

Now reverse the actions. Put the holder back on the new batteries, fasten the holder with the M4 nuts and then reconnect the battery in the following order:

1. Plug in the Battery fused Interconnection Cable to the positive pole of the right hand side battery.

2. Plug in the Battery fused Interconnection Cable to the negative pole of the left hand side battery.

3. Plug in the Battery Plus Cable to the positive pole of the left hand side battery.

4. Plug in the Battery Minus Cable to the negative pole of the right hand side battery. Be careful to not harm the temperature sensor.

You successfully replaced the batteries. Now close the device following the instructions in section Closing the Field Controller.

10.6 Replacing the Main Fuse

WARING - LIABILITY AND WARRANTY RELEVANT

THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE MAIN FUSE OF THE PYRODIGITAL® FIELD CONTROLLER MODEL A. 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 Main Fuse first follow the instruction to open the Pyrodigital® Field Controller Model A 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.
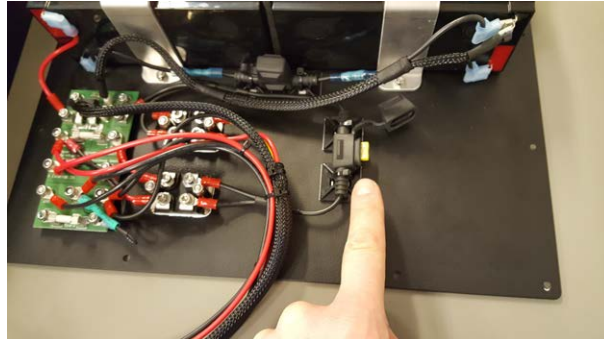
This is the location of the Main Fuse. If you strictly followed instructions, the Main Fuse is already unplugged. Replace it for a new fuse (Mini Blade Fuse 20A 32V slow type). If you are not sure whether the Main Fuse is gone or not, use a common multimeter to test the fuse for continuity. If you cannot 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).

Proceed with the procedure to close the device like described in section 10.9 'Closing the Field Controller'.

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

10.7 Replacing the Battery Fuse

> **WARING - LIABILITY AND WARRANTY RELEVANT**
>
> THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE BATTERY FUSE OF THE PYRODIGITAL® FIELD CONTROLLER MODEL A. 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 Battery Fuse first follow the instruction to open the Pyrodigital® Field Controller Model A 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. If you strictly followed instructions, the Battery Fuse is already unplugged. Replace it for a new fuse (Mini Blade Fuse 20A 32V 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 one Replacement Fuse in the case of your Field Controller (in case you ordered the case directly from Innovative Pyrotechnik GmbH).

Proceed with the procedure to close the device like described in section 10.9 'Closing the Field Controller'.

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

10.8 Replacing the Charger Fuse

> **WARING - LIABILITY AND WARRANTY RELEVANT**
>
> THIS SECTION DESCRIBES THE PROCEDURE TO REPLACE THE CHARGER FUSE OF THE PYRODIGITAL® FIELD CONTROLLER MODEL A. 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 Charger Fuse first follow the instruction to open the Pyrodigital® Field Controller Model A 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.
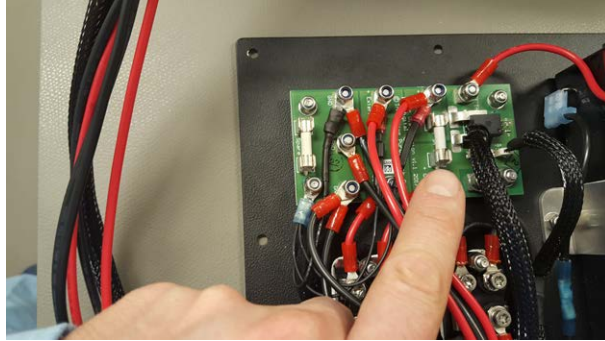
This is the location of the Charger Fuse. Gently lift the fuse using a non-scratching tool, e.g. a wooden pencil. Do not use metal tools! You could harm the Printed Circuit Board (PCB) underneath the fuse. If the fuse is gone, replace it (G 1.6A 250V 5x20mm slow type). If you are not sure whether the 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.
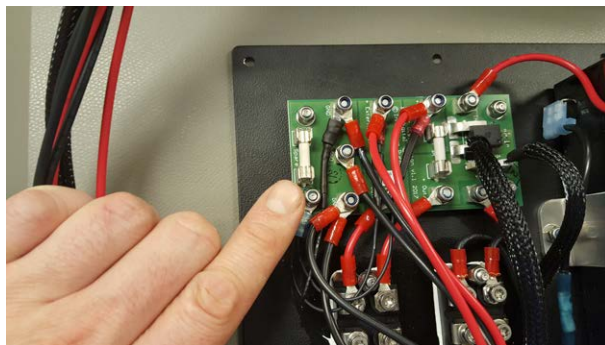
In case you need a fuse to replace the Charger fuse, you can find a SPARE FUSE at this position on the PCB. Take this fuse and put it into the holder of the Charger Fuse. Do not forget to refill the SPARE FUSE holder, so you always have a spare with you. Note: The fuse in the spare holder is only a spare part. It is not connected to any circuitry. It is only purpose is to provide a spare fuse when needed urgently.

Proceed with the procedure to close the decive like described in section Closing the Field Controller.

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

10.9   Closing the Field Controller

> **WARING - LIABILITY AND WARRANTY RELEVANT**
>
> THIS SECTION DESCRIBES THE PROCEDURE TO CLOSE THE PYRODIGITAL® FIELD CONTROLLER MODEL A. 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.

In order to seal the threads of the screws, you need to refresh the PTFE Thread Seal Tape on the screws. The PFTE Thread Seal Tape (also know as Teflon Seal Tape) can be purchased in every usual hardware store. Prepare the screws as you will need them in the following steps.

Plug in the Main Fuse before closing the device.
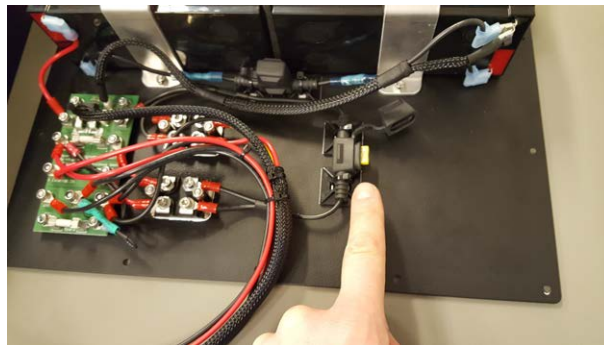
Plug in the Main Fuse before closing the device.

Place the bottom part with its edge horizontally on the lower edge of the frame of the bottom opening of the device, like shown in this image.
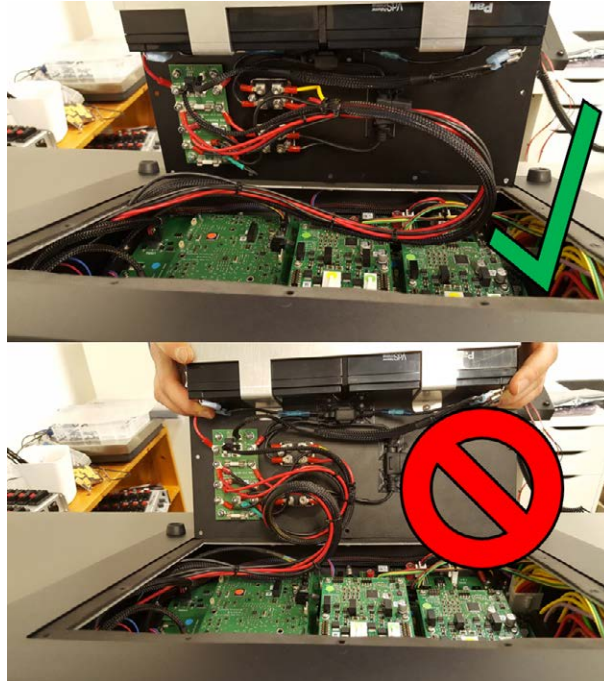
Ensure the cable harness is not twisted! The cable harness must lay like in the upper part of this figure and must not be curled up like in the lower part of this figure.
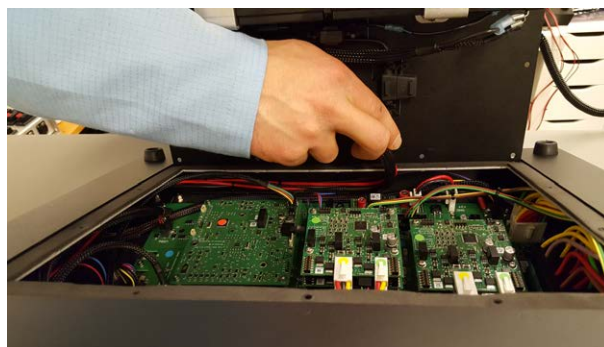
Ensure that the cables connecting the bottom plate and the main housing are safely stored in the compartment in front of the mainboard. Ensure the cabling does not press on the circuit boards when closing and that no cables are jammed between bottom plate and main housing when closing the Field Controller.

Now slowly lower the bottom plate towards the main housing. Use one hand to support the bottom plate on its edge. This prevents that the bottom plate slips off. Ensure you do not jam any cables during closing.

Now pick up the prepared screws with the <u>fresh</u> PTFE tape.
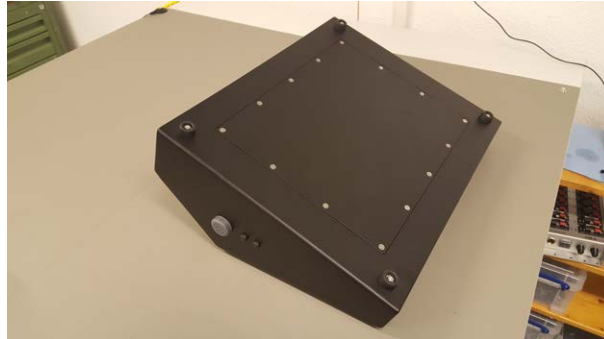
Use the prepared screws wrapped with PTFE Thread Seal Tape to close the Field Controller. ATTENTION: Not using the PTFE Seal Tape will render the warranty void and the liability will be exclude

You successfully closed the Field Controller.

10.10 External Battery Supply

The Pyrodigital® Field Controller Model A provides the "EXT BAT" External Battery plug on the top left of the backpanel. This plug can be used to connect an external power source to the Pyrodigital® Field Controller Model A. Universal power supplies (100-240 VAC, 50-60 Hz) for the FC-A are available at Innovative Pyrotechnik GmbH. Please contact us or our sales partner for more information.

IMPORTANT: The External Power Supply supplies the complete Field Controller and all connected devices of the Pyrodigital® Phase III Firing System Network. Only for short high peak current (e.g. during firing) the internal battery will spare in. However, the energy drawn during these short current peaks is very few and can almost be neglected. Using the External Power Supply provides a hybrid-supply of the Pyrodigital® Field Controller Model A. In the event of a power shortage for the mains, the Field Controller automatically turns over to the internal battery. Therefore, even if you use the External Power Supply keep the internal batteries charged. The self-discharge rate of the VRLA battery technology is roughly 3% per month. So even if you do not make use of the battery,

you need to recharge it from time to time (like every battery).

Chapter 11

Illumination and Sound

11.1 Overview

The Pyrodigital® Field Controller Model A provides a full-colored LED-illuminated Keyboard. The illumination allows the operator to securely control the Field Controller even in dark environments. Further, it indicates important information to the operator. The illumination can be adjusted to the operators needs, as explained in more detail in the following.

Also, the Pyrodigital® Field Controller Model A has got an speaker to replay the incoming timecode signals for audible monitoring and to signal actions, events, and warnings with acoustic beeps. The volume of the beeps and the timecode signal can be adjusted by the operators.

11.2 Brightness and Illumination Mode

Using the Brightness button the user can lower(BRIGHTNESS DOWN button)and rise the brightness (BRIGHTNESS UP button) of the keyboard illumination. Further, the user can change the amount of illuminated buttons by pressing both brightness button. To do so, the user needs to keep one of the two brightness buttons depressed and click

the second brightness button. With every click the so-called ILLUMINATION MODE is changed in a cycling way. There are three different Illumination Modes to choose from:

1. Minimal Illumination: The minimal amount of buttons is illuminated.

2. Basic Illumination: All essential buttons are illuminated.

3. Full Illumination: All buttons and the frames are illuminated.

The Pyrodigital® Field Controller Model A will remember the illumination settings after re-start.

Note: The lower you chose the illumination, the longer the battery will last. However even on full illumination and with the max. amount of Firing Modules connected and powered fully charged battery will last for at least 3 hours. On the lowest illumination settings and in STOP MODE or EDIT MODE fully charged batteries will last up to 12 hours.

11.3   Volume Control

Using the TIMECODE Volume Buttons (UP and DOWN) the operator controls the replay volume of incoming timecodes.

With the SCRIPT BEEP Volume Buttons (UP and DOWN) the operator controls the volume of the warning, event and action beeps. However, this volume control does only control the warning signals on the speaker not the redundant warning signals on the buzzer. The warning signals are always pusillanimously on present on both, on the buzzer and on the speaker. If you require to deactivate the buzzer please read the following section.

The Pyrodigital® Field Controller Model A will remember the volume settings after re-start.

Remember: Besides the Speaker, the Pyrodigital® Field Controller Model A also has an additional Buzzer (as a part of the Safety Key Waring System). Please see section 8.3 'Disabling the Buzzer' for information about how to control the Buzzer.

Chapter 12

Boot Menu

12.1   Enter the Boot Menu

The Boot Menu will allow you to reset the Pyrodigital® Field Controller Model A 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 A to be switched of. Now keep the buttons "AUTO FIRE" and "DATA TABLE" of the Operating Mode buttons simultaneously depressed and switch ON the device by pressing the ON/OFF button (while keeping AUTO FIRE and DATA TABLE depressed).

12.2   Factory Reset

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

```
        LINE     SHOT          TIME          PFD   ADDR   CAL
   Do you want to restore to factory
   settings? Press "0"(NO), "1"(YES)
```
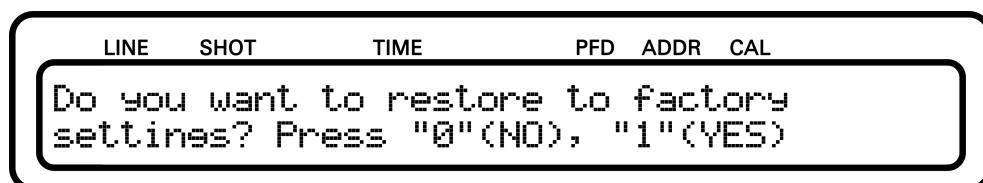
Press "1" to reset the Pyrodigital® Field Controller Model A to the factory settings. All

script tables and option parameters will be cleared and reset to the initial factory settings. This process takes 1 or 2 minutes. Meanwhile, the display shows:

```
  LINE    SHOT        TIME            PFD   ADDR   CAL
 Reconfiguring EEPROM:_
```

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

Press "0" to skip the Factory Reset and directly go to the Password Protection (see next section).

12.3   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 FIRE MODE and MANUAL FIRE MODE) or checking (in CHECK STATUS MODE and TIMECODE MODE).

If Password Protection is enabled all settings of the controller as well as the Script Tables (and in case the Controller Mode is set to ADVANCED also the Assignment Table) are protected. You can only modify the tables and settings after entering the correct password. However, you can still read the Script Tables and the Assignment Tables, even without knowing the password. Just enter a random password in this case (e.g. 0000) and you will get read permission.

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   CAL
  Do you want to use Password Protection?
  Press "0"(NO), "1"(YES)
```
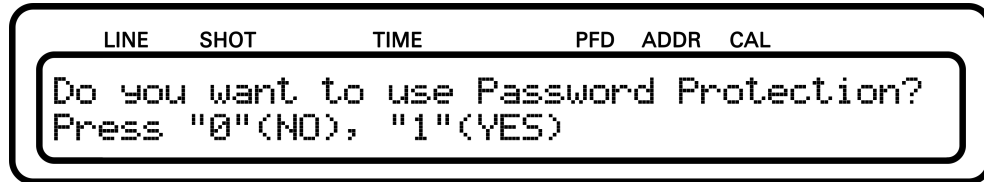
Press "0" if you want to disable Password Protection, the Pyrodigital® Field Controller Model A will now boot and perform the EEPROM check.

Press "1" if you want to enable Password Protection. You now see the following screen:

```
    LINE    SHOT         TIME        PFD   ADDR   CAL
  Enter four digit Password:  ****
  Press "Enter" to proceed.
```
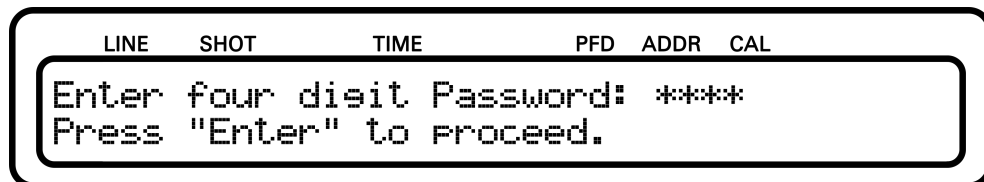
Now enter four Keys of your choice to set up the password. You can choose from all available Keys except of the Operating Mode buttons, the Brightness buttons and the Volume buttons. Then press "Enter" to confirm. The Pyrodigital® Field Controller Model A will now boot and perform the EEPROM check.

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 13

Timecode

The Pyrodigital® Field Controller Model A can run on an highly precise internal clock based on a quartz oscillator or on external linear Timecodes. These Timecodes can be transmitted via (uncompressed) audio channels. SMPTE Timecode is the standard widely used in the show, movie and television industries. Pyrodigital® FSK (PD-FSK) is a more robust Timecode that even can be transmitted via a professional Walkie-Talkie.

13.1   PD-FSK

FSK stands for the very robust and reliable analog transmission technology Frequency Shift Keying. The PD-FSK format transmits time stamps and calculated CRC check sums. These CRC check sums are double checked for each received time stamp to check for validity. The PD-FSK timecode is very narrow-banded and can even be transmitted by professional Walkie-Talkies. The PD-FSK timecode runs up to 1 hour and 49 minutes. The frame rate of the PD-FSK is 10 fps (frames per seconds)

Besides receiving the PD-FSK the Pyrodigital® Field Controller Model A can also generate PD-FSK timecode synchronous to Internal Run (on the internal clock). This allows to synchronize a subsequent Field Controller. You can use the Timecode Out Plug on the Back Panel of the Pyrodigital® Field Controller Model A to send the generated PD-FSK

Timecode.

Refer to the Phase III System Network User's Guide for more detailed information on the actual structure of Pyrodigital Timecode. (You can find all documents on pyrodigital.com.)

13.2   SMPTE

There exist several different SMPTE Timecode Format:

- SMPTE 23.976 fps

- SMPTE 24 fps

- SMPTE 25 fps

- SMPTE 30 fps

- SMPTE 29.97 fps ndf (non drop frame)

- SMPTE 29.97 fps df (drop frame) (sometimes also referred to as 30 fps drop frame)

Note: fps = frames per seconds

The Pyrodigital® Field Controller Model A is able to receive all of these format and to automatically convert these to it internal frame rate. Therewith, the Pyrodigital® Field Controller Model A totally overcomes the issues of dropped frames or fading synchronization for SMPTE that had been a great issue on the older Field Controller Model 3.

Please refer to the following links for more details regarding SMPTE Timecode:

https://en.wikipedia.org/wiki/SMPTE_timecode

http://www.philrees.co.uk/articles/timecode.htm

13.3   Timecode Audio In and Out

The analog timecode audio is input to the Timecode IN plug on the Back Panel of the Field Controller. Ensure an adequate volume of the audio signal.

WARNING - CAUTION

Make use of the TIMECODE OPERATING MODE (see chapter 16)to verify the quality of the incoming Timecode Signal.

On the Timecode OUT plug on the Back Panel the Pyrodigital® Field Controller Model A forwards the re-amplified signal received on the Timecode IN plug.

WARNING - CAUTION

The Timecode Signal is only forwarded from the Timecode IN plug to the Timecode OUT plug if the Pyrodigital® Field Controller Model A is switched ON. If the device is OFF, no signal will be forwarded on the Timecode Out plug, as this output is actively amplified.

When the Pyrodigital® Field Controller Model A is generating an PD-FSK than this signal is also send on the Timecode OUT plug. Of course, in this condition, the signal on the Timecode IN plug does not get forwarded. The generated PD-FSK is sent at a level of -3dBm.

13.4   Timecode Indicator

The two Timecode Indicators on the Keyboard show if valid Timecode is received (or sent). The indicators are only active if the corresponding Synchronization Mode in AUTO FIRE MODE or TIMECODE MODE is entered.

If valid SMPTE timecode is received, the SMPTE Timecode indicator turns magenta.

If valid PD-FSK timecode is received, the PD-FSK Timecode indicator turns cyan blue.

If valid PD-FSK timecode is sent, the PD-FSK Timecode indicator turns green.

13.5 Integrated Timecode Modem

The Pyrodigital® Field Controller Model A comes equipped with an integrated Timecode Modem that allows to synchronize Infinity Visions Showdirector to the Field Controller. Simply connect the "LOAD TABLE/TCM" USB port on the Back Panel of the Field Controller to your Computer. Ensure the Field Controller is recognized as serial COM-Port with an accessible COM-Port Number for Show Director. You can then select the corresponding COM-Port in Show Director as PD-FSK Timecode Modem. As soon as your scripts runs in AUTO FIRE MODE Showdirector receives the synchronization. IMPORTANT: The Pyrodigital® Field Controller Model A send the synchronization for Showdirector regardless of the chosen clock/timecode source (Internal Run, PD-FSK, or SMPTE). However, the Timecode Modem in Showdirector has to be set to PD-FSK regardless of the clock/timecode source in AUTO FIRE MODE. Note: The integrated Timecode Modem forwards the time to the Computer in PD-FSK format. Therefore, the maximum time for the synchronization with Show Director is 1 hour and 49 minutes.

YOU FIND ALL DRIVERS FOR THE USB-CONNECTION AS WELL AS A TUTORIAL TO SET THE COM-PORT NUMBER ON THE USB-DRIVE DELIVERED WITH OUR FIELD CONTROLLER!

13.6 Timecode Settings

To enter the Timecode Settings go to:

DATA TABLE –> DEVICE OPTIONS –> TIMECODE SETTINGS

```
          LINE    SHOT         TIME          PFD   ADDR   CAL
         ┌────────────────────────────────────────────────────┐
         │ TIMECODE SETTINGS:    0 Tape Clock Mode,            │
         │                       1 SMPTE Offset               │
         └────────────────────────────────────────────────────┘
```
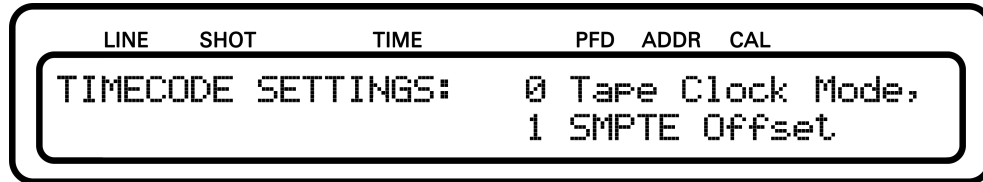
13.6.1   Tape Clock Mode

In AUTO FIRE MODE the Script can either run synchronous to an internal clock or to an external Timecode (PD-FSK or SMPTE). When running synchronous to an external Timecode and this Timecode suddenly stops or becomes invalid the Pyrodigital® Field Controller Model A can either switch over to the internal clock (until the external Timecode resumes) or the Pyrodigital® Field Controller Model A can simply stop the running script and wait for the Timecode to resume. This behavior can be set in the Tape Clock Mode Option of the Timecode Settings.

```
          LINE    SHOT         TIME          PFD   ADDR   CAL
         ┌────────────────────────────────────────────────────┐
         │ Auto Timecode Switch-over Mode: X                  │
         │ "0" Auto Switch, "1" Stops with tape               │
         └────────────────────────────────────────────────────┘
```

Press "0" on the Hex-KeyPad to select the Auto Switch-over to the internal Clock in the event that the incoming Timecode gets lost.

Press "1" on the Hex-KeyPad if the Field Controller shall pause until the Timecode resumes in case the Timecode gets lost.

Press "Enter" to return to the menu.

This setting will affect PD-FSK as well as SMPTE.

WARNING - CAUTION

When Auto Switch-over 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.

13.6.2 SMPTE Offset

Quite commonly SMPTE Timecode is not started at time 00:00:00:00, but e.g. at
01:00:00:00 (1 hour). If the Script Table is writen run synchronously to e.g. a music track
that starts at 00:00:00:00, then you can use the SMPTE Offset to adjust the incoming
SMPTE timecode (starting at 01:00:00:00) to your scripted timing. The Field Controller
subtracts the SMPTE Offset from the incoming SMPTE time. The incoming SMPTE
time represents the absolute time. If the SMPTE Offset is zero (00:00:00:00) the Field
Controller runs the scripts directly on this absolute time. If the SMPTE Offset is bigger
that zero (e.g. 1 hour; 01:00:00:00) then the Field Controller runs on the relative time:

relative SMPTE time = absolute SMPTE time - SMPTE Offset

Note: In case the Offset is bigger than the absolute SMPTE time, this would (theoretically)
result in a negative relative SMPTE time. In this case the Field Controller will simply
ignore the time (the display will constantly show 00:00:00:00) until the relative SMPTE
time becomes positive. However, the SMPTE LED will still indicate (magenta color) the
presents of an valid incoming SMPTE timecode.

```
    LINE    SHOT        TIME        PFD   ADDR   CAL

 SMPTE Timecode Offset: hh:mm:ss:ff
 Offsets (decreases) incoming SMPTE time.
```
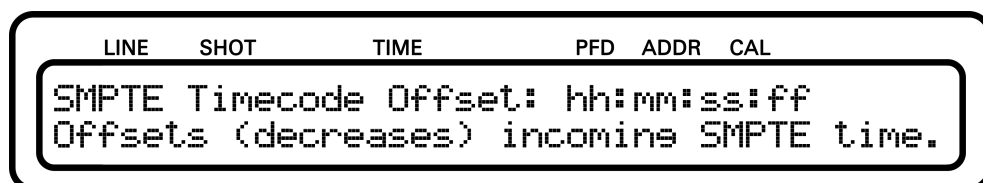
You can set the hours, minutes and even the second of the SMPTE Offset to any time you require.

WARNING - CAUTION

ANY SMPTE OFFSET ENTERED IS STORED IN MEMORY AND WILL RE-MAIN IN EFFECT UNTIL CHANGED BY THE USER, EVEN WHEN THE FIELD MACHINE IS POWERED OFF. For normal use, be sure that the SMPTE Offset is set to 00:00:00:00 (ZERO HOURS OFFSET). AN INCORRECT SMPTE OFFSET WILL CAUSE YOUR DISPLAY TO BE FIRED AT THE WRONG TIME, OR NOT AT ALL WITH A LARGE OFFSET ROUTINELY CHECK THE SMPTE OFFSET IN MEMORY TO BE SURE THAT IT IS SET TO 00:00:00:00.

Chapter 14

Controller Mode

14.1 Advanced and Legacy

The Pyrodigital® Field Controller Model A is backwards compatible with previous Field Controller versions. The Pyrodigital® Field Controller Model A can run the same Script Table as earlier Field Controller Version, e.g the Field Controller Model 3. At the same time, the Pyrodigital® Field Controller Model A has got some very powerful and helpful new features that allow more rapid firing (up to five times faster than the Field Controller Model 3).The operator can decide if he wants to use those new features or if he likes to stay with the more basic options only. The new features can be enabled or disabled by setting the so-called CONTROLLER MODE. This Controller Mode can either be set to LEGACY or to ADVANCED.

If the Controller Mode is set to ADVANCED the Pyrodigital® Field Controller Model A can optimize its five Phase III Network Outputs to gain more rapid firing. To understand this process let's have a closer look to how a Field Controller works:

When entering MANUAL FIRE MODE or AUTO FIRE MODE the Field Controller (always) calculates the so-called Fire Table from the selected Script Table. Dependent on the chosen fire mode (AUTO FIRE MODE or MANUAL FIRE MODE), the information in the Script Table has a different meaning to the Field Controller. Therefore, the way a

Script Table is interpreted by the Field Controller depends on the selected firing mode. Think of it the following: With the Script Table (and the choice of the firing mode) you tell the Field Controller what it shall do. With the Fire Table the Field Controller "notes" down what this means to it and how to perform the instructions in the Script Table. E.g. if you enter the AUTO FIRE MODE, the Field Controller will calculate the actual Fire Time from the Show Time and the Prefire Time of the Script Table Lines (Fire Time = Show Time - Prefire Time). In MANUAL FIRE MODE the Prefire time is interpreted differently as it represents the Fire Time within a Macro: Fire Time = Prefire Time (counted on from the start of the Macro Sequence).

The Fire Table also notes what addresses shall be fired on what line and at what time. If the Controller Mode is set to LEGACY, the Field Controller simply notes down to fire all shoots on all the five Phase III Network Outputs. If the given Controller Mode is set to ADVANCED, the Field Controller first compares the information with the so-called ASSIGNMENT TABLE. The Assignment Table lists which Module Addresses shall be served on which of the Phase III Outputs. (The Assignment Table is only present if the Controller Mode is set to ADVANCED.) When entering a firing mode (with Controller Mode set to ADVANCED), the Pyrodigital® Field Controller Model A considers that only Firing Module Addresses listed in the Assignment Table shall be served on the corresponding Phase III Network Outputs. E.g. if in total 15 Addresses are programmed to fire simultaneously and the Controller Mode is set to LEGACY, the Field Controller sends out all 15 Fire Commands on all 5 Phase III Network Outputs. As each Fire Command transmission takes 10 ms that sums up to a total of 150 ms until the all 15 Fire Commands are sent. This delay is clearly visible and known by experienced Operators that worked with the old Field Controller Model 3. In general, the boundary condition for the human eye to recognize motion is around 40 ms (which corresponds to a boundary picture rate of 24 to 25 Frames per second). With the Controller Mode set to ADVANCED and having 3 the Firing Modules connected to each of the 5 Phase III Network Outputs, the Pyrodigital® Field Controller Model A only need to transmit 3 Fire Commands per Phase III Network Output. As all the 5 Phase III Network Outputs run simultaneously,

the Field Controller is able to transmit (and of course shot) all 15 Fire Commands in only 30 ms. Therefore, there is no recognizable delay. The way how the Pyrodigital® Field Controller Model A splits the Fire Commands is determined by the Assignment Table. In the Assignment Table you can tell the Field Controller which Module Addresses shall be fired on which of the Phase III Network Outputs.

14.2 Select Controller Mode

To select the Controller Mode go to:

DATA TABLE MODE –> DEVICE OPTIONS –> ADVANCED SETTINGS –> CONTROLLER MODE

LINE	SHOT	TIME	PFD	ADDR	CAL

```
Current Controller Mode: X
"0" Legazy Mode, "1" Advanced Mode
```

- Press "0" to set the Controller Mode to LEGACY.

- Press "1" to set the Controller Mode to ADVANCED.

- Press "Enter" to return.

14.3 Controller Mode Indication

When the Controller Mode is set to LEGACY the Operating Mode buttons as well as the Stop Button are illuminated WHITE (except of the active Operating Mode which is illuminated green).

When the Controller Mode is set to ADVANCED the Operating Mode buttons as well as the Stop button are illuminated YELLOW (except of the active Operating Mode which is illuminated green).

This allows the Operator to always directly identify to what option the Operating Mode is set.

14.4   The Assignment Table

The Assignment Table can either be edited by hand or can be generated from an automated scan on all five Phase III Network Outputs. (Of course, the Controller Mode has to be set to ADVANCED first.)

> WARNING - CAUTION
>
> Module Addresses that are assigned to no Phase III Network Output will correspondingly not fired on any of the five Phase III Network Outputs.

14.4.1   Edit Assignments

To edit the Assignment Table by hand go to:

DATA TABLE MODE –> Assignments

```
    LINE    SHOT         TIME        PFD   ADDR   CAL
  Address: XX        Assigned Outputs:OUTPUT
  Press "0" to "5" to edit assignments.
```
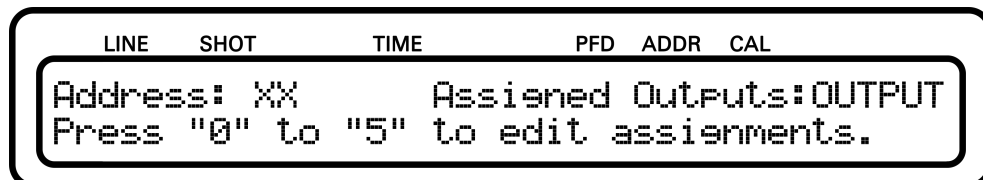
The display shows you the Assignments for Module Address 01. In this case, the Module Address is fired on Phase III Network Outputs Number 1, 3, 4 and 5. Use the "1" to "5"

from the Hex-Keypad to enable and disable single Phase III Network Outputs. Press "0" to enable/disable all Phase III Network Outputs at once. You can use the "Quick Entry" Button to enable an Phase III Network Output for all Module Addresses at once.

You can use the "Up" and "Down" arrow buttons to go from one Module Address to the next or the "Left" and "Right" arrow buttons to jump for several Module Addresses. Further, you can press "Go to Address" to type in the Module Address directly.

14.4.2 Auto Assignment Scan

The Pyrodigital® Field Controller Model A also allows to scan the fire Phase III Network Outputs and automatically generate the Assignment Table from that scan. To conduct a line scan:

CHECK STATUS MODE –> Auto Assignment Scan

WARNING - EXTREME DANGER

To enter the CHECK STATUS MODE and conduct the Auto Assignment Scan it is required to power up to Phase III Network Outputs using the Safety Key. It is the operators responsibility to ensure safety before turning the Safety Key.

The Phase III Network Output Indicator blink while the scan is performed. After the scan is finished the Field Controller returns to the CHECK STATUS menu.

WARNING - CAUTION

To ensure your network is set up entirely and correctly, it is recommended to double check the assignments generated by the Auto Assignment Scan as described in section 14.4.1.

14.5   Optimizing for Rapid Firing

After pressing the MANAUL FIRE or AUTO FIRE mode button, the optimization for rapid firing is conducted adjacent to the calculation of the Fire Table (if the Controller Mode is set to ADVANCED). The operator does not have to do any additional action.

However, the operator can enable (and of course disable) some optional check back questions that get prompted before the Fire Table gets calculated.

14.5.1   Optional Check Back Questions

The operator can decide whether he likes to be asked if the Optimization for Rapid Firing shall be used or not. This question is asked after entering one of the firing modes and before the calculation of the Fire Table.

```
   LINE     SHOT        TIME         PFD   ADDR   CAL
Do you want to optimize rapid cues?
Press "0"(NO), "1"(YES)
```

If you answer with "YES", the optimization will be performed. If you answer with "NO", than no optimization will be performed and the Assignment Table Information will be neglected. In this case, the Pyrodigital® Field Controller Model A will perform exactly the same as if the Controller Mode would be set to LEGACY.

To enable/disable this Check Back Question go to:

DATA TABLE MODE –> DEVICE OPTIONS –> ADVANCED SETTINGS –> OPTI-MIZE OPTION

```
    LINE    SHOT        TIME        PFD   ADDR   CAL
 ┌─────────────────────────────────────────────────┐
 │ Ask for Optimization? X                          │
 │ Press "0"(NO), "1"(YES)                          │
 └─────────────────────────────────────────────────┘
```

The second optional Check Back Question that can be enabled asks the operator if he likes to perform a complete rescan of all Phase III Network Outputs.

```
    LINE    SHOT        TIME        PFD   ADDR   CAL
 ┌─────────────────────────────────────────────────┐
 │ Do you want to rescan the networks?             │
 │ Press "0"(NO), "1"(YES)                          │
 └─────────────────────────────────────────────────┘
```

If the question is answered with "YES", the Field Controller conducts a completely new Auto Assignment Scan and will overwrite the previous information in the Assignment Table. If the question is answered with "NO", the Field Controller will proceed with the present Assignment Table to the optimization.

To enable/disable this Check Back Question go to:

DATA TABLE MODE –> DEVICE OPTIONS –> ADVANCED SETTINGS –> RES-CAN OPTION

```
    LINE    SHOT        TIME        PFD   ADDR   CAL
 ┌─────────────────────────────────────────────────┐
 │ Ask for Line Rescan? X                           │
 │ Press "0"(NO), "1"(YES)                          │
 └─────────────────────────────────────────────────┘
```

It is also possible to enable both of these optional Check Back Questions at the same time.

14.6   Displayed Assignments on the Script Lines

When the Controller Mode is set to ADVANCED, the Script Lines in the EDIT mode
(DATA TABLE –> EDIT) as well as in the firing modes (AUTO FIRE and MANUAL
FIRE) will indicate the Assignments of their Module Address on the upper right corner
of the display. With the Controller Mode set to LEGACY this information will not be
displayed.

Chapter 15

Data Table Operating Mode

15.1   Introduction

The Data Table Operation Mode is a versatile Mode within the Pyrodigital® Field Controller Model A. It contains Options to Edit, Load, Send and Select Script Tables as well as the Device Setup:

```
      LINE      SHOT           TIME              PFD    ADDR    CAL
 ┌──────────────────────────────────────────────────────────────┐
 │ DATA TABLE:          0 Edit, 1 Load, 2 Send                   │
 │                  3 Select, 4 Device Setup                     │
 └──────────────────────────────────────────────────────────────┘
```

If the Controller Mode is set to Advanced it also allows you to edit the Assignments in the Assignment Table (this option is not present when the Controller Mode is set to LEGACY):

```
      LINE      SHOT           TIME              PFD    ADDR    CAL
 ┌──────────────────────────────────────────────────────────────┐
 │ DATA TABLE:          0 Edit, 1 Load, 2 Send,                  │
 │   3 Select, 4 Assignments, 5 Device Setup                     │
 └──────────────────────────────────────────────────────────────┘
```

For more information regarding the Assignment Table please refer to chapter 14 'Controller

Mode'.

15.2   Edit the Script Table

This section gives you an Overview about the Script Table and its structure and parameters and explains you how to modify it.

AT THE END OF THIS EDIT SECTION IS AN EXERCISE FOR YOU TO CREATE AN EXAMPLE DATA TABLE, Example 1 Script Table. THIS EXAMPLE MAY HELP YOU TO BETTER UNDERSTAND THE FUNCTIONS OF THE VARIOUS KEYS ON THE FIELD CONTROLLER.

Choose EDIT from the DATA TABLE MODE to enter the Script Table editing. EDIT stands for editing of the Script Table. The Script Table is the set of instructions which tell 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 FIRE MODE or AUTO FIRE MODE.

Select edit from the Script Table menu:

```
     LINE    SHOT        TIME        PFD   ADDR   CAL
       0       0  00:00:00:00     0  000    0
     New Line Number:        _
```

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

- CAL - the Caliber Group respectively Hazard Lockout (CG/HZ)

The very first parameter shown is the **Line Number** that runs from 0 to 2499. 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 2499.

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

hh:mm:ss:ff

Each frame is 1/30 of a second. The Show Time can but does not have to be the Firing Time as some effects (actually most of them) require to be fired earlier. E.g. a shall 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 FIRE MODE). In manual firing (MANUAL FIRE MODE) the Field Controller can simply not know that 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 18.4.1.

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 to digits: 12. This can be understand as 12 = 1x10 + 2x1. As another example 20 can be understand as 20 = 2x10 + 0x1.

Hexadecimal simply is essentially the same but on the basis of 16 and therefor requires 16 different Numbers. Hexadecimal became very popular as it is very helpful when working with computers. However, the computer scientist of the old day 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 beside 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 <u>math about Hexadecimal is not important</u>. 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 are also addressed from 0 to 9 and from A to F.

The **Caliber Group - CAL** is an optional, user defined Field, that allows you to control firing permission for groups of Script Lines during a running show. Depending on the

firing mode (MANUAL FIRE or AUTO FIRE) these groups are called Caliber Groups or
Hazard Lockouts. The Caliber Group / Hazard Lockout CGHZ Numbers can be 0 (not
associated with a Caliber Group / Hazard Lockout) or between 1 and 16 (associated with a
Caliber Group / Hazard Lockout). Caliber Groups can be used with Caliber Group Firing
in MANUAL FIRE, to subdivide Shows in separate Scenes or Songs. The Caliber Group
parameter is also used as Hazard Lockout in AUTO FIRE. The Hazard Lockouts allow
you to block the Script Lines associated to the corresponding Hazard Lockout Number
during the Show. The Operator can select the Caliber Groups / Hazard Lockouts by the
Caliber Group Select Field on the left hand side of the keyboard.

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 display first line directly below.*

Command Line

In the Script Table Operating Mode EDIT, the second line of the display is called the
COMMAND LINE. When first entering EDIT, the display shows "New Line Number:"
with the cursor blinking for an entry over the underlining. By pressing the Left and Right
Arrow Key you can switch between the Data Fields you want to edit. Use the Hex Keypad
to enter any required value.

Data Entry

The particular command on the Command Line is waiting for you to enter that particular
data. When you enter data, via the hex keypad, it is displayed in the cursor position
of the command line. When you then depress ENTER, the data is transferred into 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.

If you enter an UNACCEPTABLE VALUE, the Field Controller will "beep", erase the

entered data, and allow you to re-enter the correct data. If you make a mistake, you can also reset the entry by depress the UNDO ENTRY key.

15.2.1 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.

- Use the HOME key to move to the top Event line of the Script Table.

- Use the END key to move to the last Script Line in the Script Table. The last Event line is the last line which contains any non zero information in any of the Data Fields, excluding the line number.

- Use the LINE Number, to locate an Script Line within the Script Table (enter a line number when the command line shows "New Line Number:"). 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.

- Use the LOC, or LOCATE Key; See explanation under LOC, or LOCATE below.

- Use the GO TO ADDRESS Key; See explanation under GO TO ADDRESS below.

- Use the GO TO SHOT Number Key; See explanation under GO TO SHOT below.

15.2.2 Loc Key

The LOC or LOCATE Key is used to locate a specific item within the Data Fields of the Script Table. You can Locate by any Data Field. Data Fields can be switched, using the

LEFT and RIGHT ARROW KEYS. As seen below, for example by SHOT NUMBER.

```
   LINE    SHOT           TIME          PFD   ADDR   CAL

        Locate by Parameter Value
        Shot Number:        _
```

To use Locate Function, simply enter the desired data to be located and depress ENTER. The next Eventline subsequent the present one, that matches the value, will be shown. Locating is for exact matches only. If the data you enter in response to the Locate command line cannot be found, a beeping sound can be heard and the Script Line remains unchanged. The function only searches for matches subsequent to the current Script Line. If you want to search in the whole Script Table, you can use the Home button to get to the very first Script Line before you start the search.

15.2.3   Go to Address

The GO TO ADDRESS Key functions similarly to the LOC Key except that this Key directly sets the search to the Firing Address Parameter. In other words, you do not have to be in the Address Field to locate by address.

15.2.4   Go to Shot Key

The GO TO SHOT Key functions exactly the same as the Go to Address Key, except that it locates by SHOT NUMBER instead of by Address.

15.2.5   Cabliber Group Keys

If you press one of the Caliber Group (respectively Hazard Lockout) Keys on the left hand side of the Keyboard the corresponding Caliber Group is directly set in the current Script Line.

15.2.6 Delete and Insert Script Lines

The INSERT and DELETE Keys are used to insert or delete a Script Line within the Script Table. When you depress either one of these Keys you will be asked to Verify the requested action by depressing ENTER. This will prevent you from accidentally removing (or adding) an undesired line by mistake. If you want to abort one of these functions, simply press the "UP" or "DOWN" Arrow. INSERT will insert a blank (all data fields equal zero) directly at the currently displayed event line and shift the display Display down one line to the new blank line. The Line Numbers of all subsequent lines will be increased by 1 because of your newly added line. (Attention: The old Line 2498 will become new Line 2499 and old Line 2499 will get lost as Line 2499 is the last Line in the Script Table. This is only from importance if you really use all 2500 lines.) DELETE will permanently remove the entire currently displayed Script Line from memory. The display Display will now show the next line following the line just removed. Be sure you want to remove that event before depressing ENTER. The sequence numbers of all subsequent lines will be decreased by 1 because all subsequent lines will move up one position in the Script Table.

15.2.7 View Key

Depress the VIEW key and the display shows the following menu. The VIEW key allows you to see how the Script Table gets interpreted in the Firing Modes (AUTO FIRE MODE and MANUAL FIRE MODE).

```
   LINE    SHOT       TIME        PFD  ADDR  CAL
┌─────────────────────────────────────────────────┐
│ VIEW MODE              0 Script Table            │
│   1 Manual Fire Table, 2 Auto Fire Table         │
└─────────────────────────────────────────────────┘
```
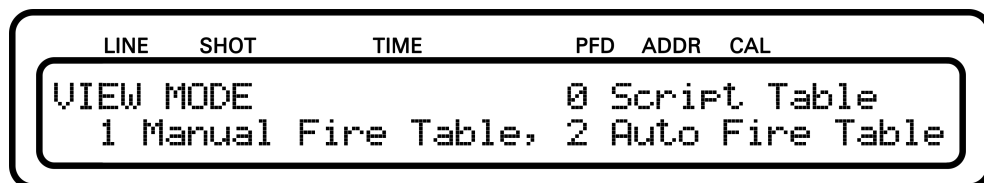
You can chose from the following options:

1. SCRIPT TABLE - This IS the order of the DATA TABLE AS IT CURRENTLY EXISTS IN MEMORY. THIS IS THE DEFAULT AND NORMALLY DISPLAYED

SORT ORDER, or the order always seen when first entering the EDIT Mode. The Script Lines are ALWAYS in this order, UNLESS they are VIEWED in a different order by use of the View Key.

2. MANUAL FIRE TABLE - This option allows you to see how the Script Table is interpreted in MANUAL FIRE MODE. This interpretation is called the MANUAL FIRE TABLE. This option is a very powerful feature if you need to verify programmed MACROS! This View Mode also indicates you where a MACRO starts and ends. The order you view the Script Lines are as they will be shot in "SEQUENTIAL FIRING" in MANUAL FIRE MODE. Note: Invalid Macro Lines and empty Script Lines will not be shown in this View Mode.

3. AUTO FIRE TABLE - This option allows you to see how the Script Table is interpreted in AUTO FIRE MODE. This interpretation is called the AUTO FIRE TABLE. The Auto Fire Table is sorted by the Fire Time.
   Fire Time = Show Time - Prefire Time.
   Note: Invalid or empty Script Lines will not be shown in this View Mode. Show Time 00:00:00:00 or negative Fire Times are always ignored.

If you watch a Fire Table you can use the "UP" and "DOWN" Arrow Key to go through the Fire Table line by line or you can use the "LEFT" and "RIGHT" Arrows to jump for 50 lines at once.

NOTE: The display Line number refers to the original Script Table, NOT to the Fire Table!

15.2.8   Undo Entry Key

The UNDO ENTRY Key is like a CLEAR Key. It provides a means to UNDO your data entry MISTAKES and re-enter them correctly. The UNDO ENTRY Key will not clear the actual Data Fields themselves, but it will clear the data which you are trying to enter into the Data Field. The UNDO ENTRY Key may be used to remove the entered data

and clear the Entry Field, BEFORE THE ENTER KEY IS DEPRESSED. In other cases where completion of the entry of data automatically enters the data, the UNDO ENTRY Key may be depressed to clear the Entry Field before the last character of the data entry is made.

15.2.9 Quick Entry Key

The QUICK ENTRY provides 3 options for functions which assist the user to rapidly make entries into the Data Fields.

```
    LINE    SHOT         TIME         PFD   ADDR   CAL
  Go Next Line:    "0" Manual, "1" Automatic
  Auto Fill:       "2" Conduct Auto Fill
```

While Manual and Automatic Option controls whether or not the next subsequent Script Line will be shown after entering any value to the current Script Line, Auto Fill helps to set entries to many Script Lines of the Script Table at once.

Manual

MANUAL is the standard setting. You will stay in the current Script Line after entering a value to any Data Field.

Automatic

This creates a special automatic Data Entry procedure to quickly assist the user in Filling the SELECTED DATA FIELD. If Automatic is selected, and any value is entered to a Data Field, Script Table automatically advances to the next, or following, EVENT LINE waiting for you to now enter more data in the next line of the same Data Field. Thus essentially, AUTOMATIC automatically depresses DOWN ARROW. This allows you to easily enter data from written lists without having to look at the display screen after each entry. AUTOMATIC WILL REMAIN IN EFFECT UNTIL SOME OTHER FUNCTION

IS SELECTED. AUTOMATIC is very useful for quickly ADDRESSING a Script Table in the Field, as well as many other functions where a block of data is to be entered into consecutive Script Lines of one Data Field.

Auto Fill

The Purpose of AUTO FILL IS TO QUICKLY CREATE SPECIAL DATA TABLES FOR INERT TESTING AND PRACTICE. AUTO FILL instructs the Field Controller to automatically fill in the selected Data Field FOR EACH AND EVERY EVENT LINE of your Script Table in a very specialized manner. AUTO FILL will function for the SHOT NUMBER, TIME, PREFIRE, ADDRESS and CALIBER GROUP Data Fields.
When AUTO FILL is selected, you will hear a beeping sound as a warning. To conduct AUTO FILL, you have to confirm your decision by pressing again. AUTO FILL will now be conducted and the selected Data Field of every valid Script Line will be changed accordingly. BE SURE YOU WISH TO PERMANENTLY CHANGE ALL DATA IN THE ENTIRE DATA TABLE OF THE SELECTED DATA FIELD BEFORE CONFIRMING.
When the AUTO FILL Option, is used the function checks for the last Script Table Line and fills out automatically the corresponding parameter for all Script Lines up to this last Script Line.
TIP: Create one entry at the END LENGTH, or desired length of the Script Table (locate to line / line number 100, for example, move cursor and enter shot number 100) and use AUTO FILL to fill in all entries between the Top of the Script Table and the false End of the Script Table you just created.

- SHOT NUMBER; If the SHOT NUMBER was selected, confirmation will sequentially renumber the entire Script Table, starting with 0 (zero) to the end of the Script Table. The Shot Number will then be identical to the Line Number. This is very useful for renumbering your Script Table when Creating or Designing the Pyrotechnic Performance.

- PREFIRE TIME; If the cursor was in PFT while Auto Fill was confirmed, Prefire

Time in every Script Line in the entire Script Table will be cleared an set to zero. This is very useful to Specifically and Purposefully clear all Prefire Times.

- ADDRESS; If the ADDRESS was selected, confirmation will sequentially, in logical hexadecimal sequence, re-address the entire Script Table, starting with 000 to the end of the Script Table. This may or may not be acceptable, SO BE CAREFUL. You would only address the Script Table in this manner for testing or practice purposes, for the deliberate and very special case where the Firing Output Devices are laid out and set up to Fire with Test Lights in a logical, hexadecimal sequence.

- CALIBER GROUP; accordingly to PREFIRE TIME, Auto Fill in Caliber Group will clear every Prefire Time in every Script Line and set to zero.

- SHOW TIME; The very first Script Line gets set to 00:00:00:00 and every subsequent Script Line will be delayed by one frame

15.2.10 Asterisks *

If a Script Table was fired in MANUAL FIRE or AUTO FIRE mode, the Pyrodigital® Field Controller Model A 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 EDIT mode of the DATA TABLE menu. This allows you to keep track of unfired Script Lines. E.g. in AUTO FIRE one of the Script Line could have been skipped because the Enable Interlock was not pressed. Or e.g. in MANUAL FIRE 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 Mode (AUTO FIRE or MANUAL FIRE) the Asterisks get reset. Also the Asterisks get reset if another Script Table is selected (see 15.5) or the Controller Mode is changed (14).

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

15.2.11   Example Script Table

In the below example 1 you will create a 10 shot Script Table.

Choose a blank Script Table and get into EDIT MODE: Let's now enter a simple table.
Advance to the Time Field by depressing the RIGHT ARROW Key twice. You now see
the Option to enter a new Show Time in the Command Line. Enter the time 00:00:10:00
(0 hours, 0 minutes, 10 seconds, 0 frames) in Script Line 0. Depress DOWN ARROW
and make a new time entry for 00:00:12:00 You should have entered 0 frames, 12 seconds,
0 minutes, 0 hours under line number 1. Depress DOWN ARROW and enter 3rd time
00:00:14:00. Continue on to make ten entries from line number zero to line number 9 on 2
second spacing. Line number 9 should have a time entry of 28 seconds. If you make a
mistake, the Field Controller may "beep" at you and clear the entry so you can try again.
Also you can use the UNDO ENTRY Key to clear the entry to try again.

Now we will look at an more advanced feature. Use LEFT ARROW to "New SHOT
NUMBER:" and depress QUICK ENTRY. Press option AUTO FILL twice to confirm.
Now look at the shot numbers for each event by using Up and Down Arrow Keys and try
the HOME and END keys. Notice that the SHOT NUMBERS have been sequentially
numbered.

Next step is to set addresses. Depress "HOME" to move to the top of the table. Depress
QUICK ENTRY and choose AUTOMATIC. Now navigate to "New ADDRESS?". Enter
address 100 via the hex keypad and depress ENTER. The Pyrodigital® Field Controller
Model A advances down one line, waiting for the next address. Type in 101 for the next
address, similarly to fill up our table to address 109. Notice that if you make a mistake,
the 4th entry clears the data and you can start over. Use the UP and DOWN ARROW to
move up and down if you forgot where you were. Notice HOME and END usage to move
to top and bottom of the table. Try inserting a line and deleting it INS / DEL.

Let's sequentially assign all Script Lines to CALIBER GROUPS in the table from 0 to
9. It is possible to do so by entering via Hex Keypad or by pushing the corresponding
CALIBER GROUP SELECT Button directly. Now Let's try the LOC key. Can you
locate address 106? Can you locate line number 2? Can you locate shot number 8? Can
you locate caliber group number 3? Can you locate the event line at time = 14 seconds?
Change Show Times and Prefire Times, then try VIEW again. Try Go To Address or Go
To Shot. Notice Go To is the same as the corresponding LOCATE, only you can use the
Go To function directly.

15.3   Load (and Erase)

LOAD is for importing a Script Table into the Field Controller from an external source
via a Scripting Software, e.g. Show Director. LOAD IS ALSO USED TO CLEAR, OR
ERASE, THE CURRENTLY SELECTED DATA TABLE. All Script Tables can also be
cleared at once by a Factory Reset (see section 12.2). The primary function of LOADING
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 into the Field Controller via an USB
mini cable connection "LOAD TABLE/TCM" on the Back Panel of the Field Controller.
When the LOAD is selected in DATA TABLE Operating Mode, the display appears as
follows;
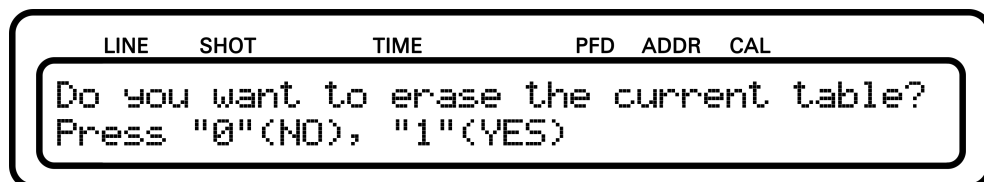
Choose "YES" to proceed. The current Script Table will be erased, or choose "NO" to return
to DATA TABLE Operating Mode Menu. Make sure the Pyrodigital® Field Controller
Model A is already connected to your computer before choosing "YES". While clearing

the Script Table the following message will appear.

```
    LINE      SHOT              TIME              PFD   ADDR    CAL
 ┌─────────────────────────────────────────────────────────┐
 │ Ensure the USB is already plugged in. │
 │ Erasing table_                        │
 └─────────────────────────────────────────────────────────┘
```

The native Scripting Software for Pyrodigital is Infinity Visions SHOW DIRECTOR. For more information see Show Director User's Guide.

After the Script Table is cleared the Field Controller is ready to receive script files. You can also abort here, if you simply wanted to erase this table.

```
    LINE      SHOT              TIME              PFD   ADDR    CAL
 ┌─────────────────────────────────────────────────────────┐
 │ Transferring Data_                    │
 │                                       │
 └─────────────────────────────────────────────────────────┘
```
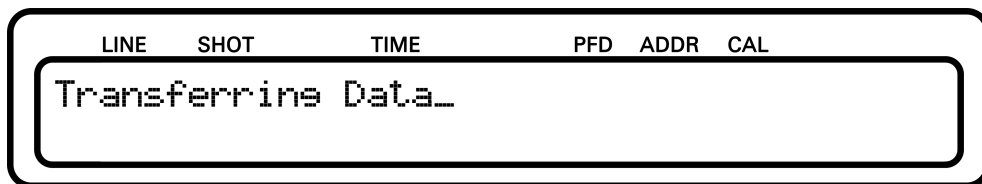
Prepare your Scripting Computer to send the Script Table. As soon as the file transfer starts the display will indicate the ongoing data transfer showing the following screen.

```
    LINE      SHOT              TIME              PFD   ADDR    CAL
 ┌─────────────────────────────────────────────────────────┐
 │ Transferring Data_                    │
 │                                       │
 └─────────────────────────────────────────────────────────┘
```
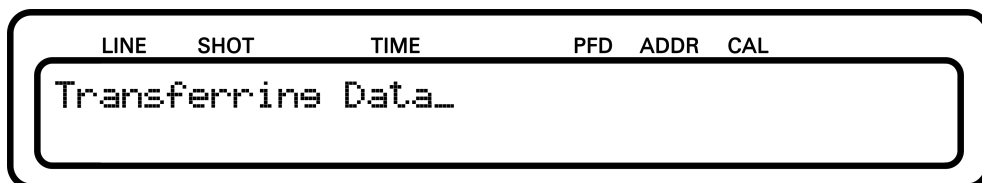
After transferring data successfully, the Pyrodigital® Field Controller Model A jumps back to Script Table Operating Mode Menu.

In case an Error occurred during the download the Pyrodigital® Field Controller Model A will give you feedback on the display and advice you.

YOU FIND ALL DRIVERS FOR THE USB-CONNECTION AS WELL AS A TUTORIAL TO SET THE COM-PORT NUMBER ON THE USB-DRIVE DELIVERED WITH OUR FIELD CONTROLLER!

Note: When a Script Table gets erased or loaded, the corresponding Hazard Lockout Preset

we be reset as well (See chapter 8.2 'Hazard Lockout Preset'. Further, erasing or reloading of script tables will reset the Assignment Table. There is only one global Assignment Table that get reset by any Script Table loading or erasing. For more information regarding the Assignment Table please refer to chapter 14 'Controller Mode'.

15.4 Send

If SEND is selected from the DATA TABLE menu, the selected Script Table is sent via the mini USB-Port (LOAD TABLE/TCM) 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. 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 THE USB-DRIVE DELIVERED WITH OUR FIELD CONTROLLER!

15.5 Select

The Pyrodigital® Field Controller Model A has four Script Tables in its Memory (Script Table 0, 1, 2 and 3). Each of the four Script Table contain 2500 Script Lines.

To change TABLE, choose SELECT from the DATA TABLE OPERATING MODE. The display will appear as follows:

```
    LINE    SHOT        TIME        PFD   ADDR   CAL

  Selected Table: X
  Press "0" to "3" to select table.
```
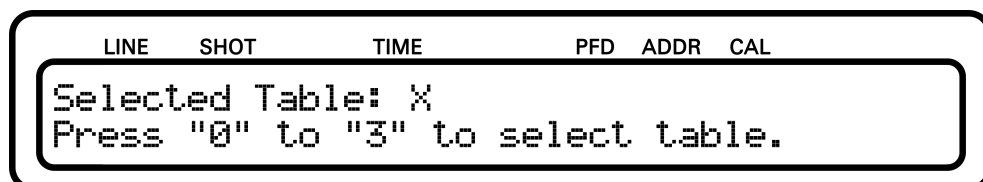
The display indicates that the current Script Table selected is number "X". Depress the corresponding number Key (on the hex keypad) for the desired Script Table. The Field

Controller will automatically switch to that Selected Script Table, and show your selection as number "X". 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

15.6   Assignment

Please refer to chapter 14 'Controller Mode'.

15.7   Device Setup

The DEVICE SETUP options allows the user to Change some 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 DEVICE SETUP 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.

When entering the DEVICE SETUP menu, you will see the following options:

```
    LINE    SHOT         TIME        PFD   ADDR   CAL
 DEVICE SETUP:       0 Timecode Settings,
  1 Safety Settings, 2 Advanced Settings
```

15.7.1   Time Code Settings

Please refer to section 13.6 'Timecode Settings'.

15.7.2   Safety Setting

Please refer to chapter 8 'Safety Settings'.

15.7.3   Advanced Settings

Please refer to section 14 'Controller Mode'.

Chapter 16

Timecode Operating Mode

16.1   Introduction

The purpose of the TIMECODE OPERATING MODE is to verify the integrity of the received timecode by the Field Controller. Use the TIMECODE OPERATING MODE to MONITOR the Timecode Signal to ensure a correct and valid signal. You can watch the Timecode Frames running in on the display and listen to the audio signal on the speaker (see 14.4 'The Assignment Table').

The Pyrodigital® Field Controller Model A allows to monitor PD-FSK Timecode (see 13.1 'PD-FSK') and all formats of SMPTE Timecode (see 13.2 'SMPTE'). In the TIMECODE OPERATING MODE the incoming frames are displayed directly and are not converted. The displayed frames are exactly the received frames. This allows you to analyze the incoming Timecode itself. (In AUTO FIRE OPERATING MODE the received Timecode gets converted to the internal Frame Rate).

When entering the TIMECODE OPERATING MODE the following menu is displayed:

```
       LINE    SHOT        TIME        PFD   ADDR   CAL
     ┌─────────────────────────────────────────────────┐
     │ TIMECODE MONITOR:          0 PD-FSK, 1 SMPTE     │
     │                                                  │
     └─────────────────────────────────────────────────┘
```
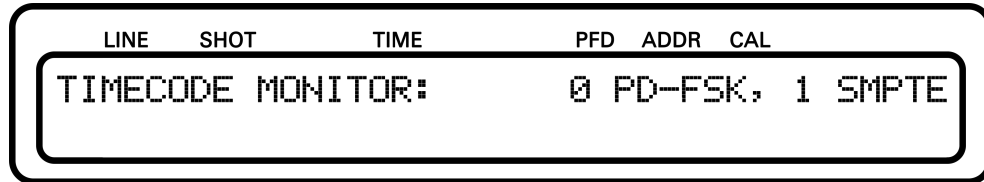
16.2   PD-FSK

Select "PD-FSK" to monitor PD-FSK Timecode (Pyrodigital Frequency Shift Keying).
The LCD shows as follows:

```
       LINE    SHOT        TIME        PFD   ADDR   CAL
     ┌─────────────────────────────────────────────────┐
     │ PD-FSK                                           │
     │ ERROR FRAMES:  00000      TIME:  --:--:--:--     │
     └─────────────────────────────────────────────────┘
```
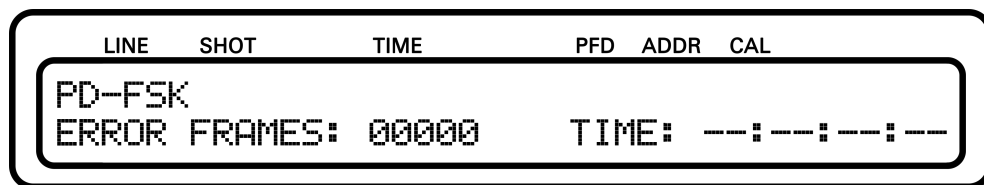
"TIME: –:–:–:–" displays the last Frame received of the Timecode. The PD-FSK Timecode
has 10 fps (frames per second). The error counter on the bottom right of the display shows
the number of errors occurred since entering the PD-FSK monitoring function. If one of
the timecode frames is detected to be invalid, the error frame counter will be increased by
one. The error frame counter is reset to zero each time the PD-FSK Timecode monitoring
is selected. Use the PD-FSK Timecode monitoring function to check the integrity of the
timecode transmission. IT IS VERY IMPORTANT TO VERIFY THE INTEGRITY
OF THE TIMECODE TRANSMISSION. Be sure to look at all 3 indicators to make a
qualitative judgment about the incoming timecode (Audio, running Time, and Errors).
The PD-FSK Timecode Indicator LED also shows you if Timecode is currently received.
See also 13.1 'PD-FSK' for more detail regarding PD-FSK.

16.3   SMPTE

Select "SMPTE" to monitor SMPTE Timecode. The display looks as follows:

```
    LINE    SHOT        TIME         PFD   ADDR   CAL

  SMPTE:                    OFFSET:  00:00:00:00
  ERROR FRAMES:  00000 ABSTIME:  --:--:--:--
```
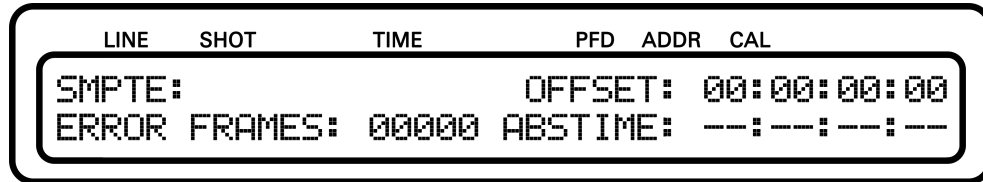
The display shows the currently set SMPTE Offset (see 13.6.2 'SMPTE Offset'). If the SMPTE Offset is zero (00:00:00:00), like in the image shown above, the absolute Time (= the incoming time) is displayed. This is indicated by the word "ABSTIME:". In the case the SMPTE Offset is not zero, the display will show the relative time instead:

relative SMTPE time = absolute SMTPE time - SMPTE Offset

This is indicated by the word "RELTIME". If the relative time is (theoretically) negative (so SMPTE Offset is bigger than the absolute SMPTE time), the RELTIME will show: -00:00:00:00 to indicate this event. This value will be displayed until the relative time gets positive.

As for PD-FSK, the error frame counter on the bottom left of the display counts invalid frames received within the current monitoring session.

When the first Timecode frames are received, the detected format is shown on the top left of the display:

- '24/23.976' - The detected format is either 24 fps or 23.976 fps

- '25' - The detected format is 25 fps

- '30/29.97ndf - The detected format is either 30 fps or 29.97 fps non drop frame'

- '29.97df' - The detected format is 29.97 fps drop frame (also called 30 fps drop frame)

The monitoring itself cannot distinguish between (24 fps / 23.976 fps) and between (30 fps / 29.97 fps ndf). It has to be ensured by the Operator that the respective format is

entered. (In AUTO FIRE MODE the Operator tells the Pyrodigital® Field Controller Model A which of the formats is used.)

See also 13.2 'SMPTE' for more detail regarding SMPTE.

Chapter 17

Check Status Operating Mode

WARNING - EXTREME DANGER

THE SAFETY KEY MUST BE ARMED IN ORDER TO ACCESS THE CHECK STATUS OPERATING MODE, THE MANUAL FIRE OPERATING MODE, OR THE AUTO FIRE 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 FIRE or MANUAL FIRE 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 INDICATORS 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 Outputs and the Phase III Network Output Indicator operate. ABSOLUTELY FIND AND ELIMINATE ANY SHORTS BEFORE PROCEEDING

17.1   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 depressed, and the Safety Key is armed, the display appears as follows:

```
   LINE     SHOT          TIME        PFD   ADDR   CAL
CHECK STATUS:              0 Manual Check
          1 Semi-Auto Check, 2 Auto Check
```

The user may then select any of the three options (MANUAL CHECK, SEMI-AUTO CHECK and AUTO CHECK) by depressing the corresponding Key on the hex Keypad. If the Controller Mode is set to ADVANCED, the user finds one more option in the CHECK STATUS menu, called AUTO ASSIGNEMNT SCAN.

```
   LINE     SHOT          TIME        PFD   ADDR   CAL
0 Manual Check,   1 Semi-Auto Check
2 Auto Check,     3 Auto Assignment Scan
```
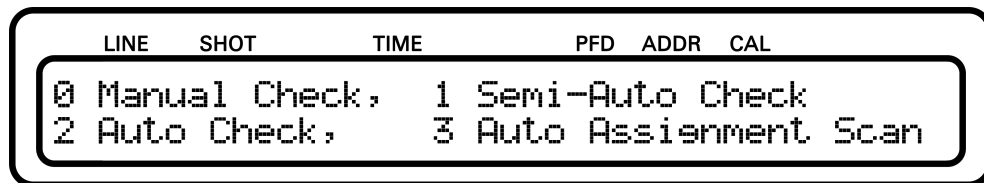
This option allows you to generate an Assignment Table by scanning for present Firing Modules in the connected Pyrodigital® Phase III Networks. Please refer to the corresponding sections of the chapter 14 'Controller Mode' for more details regarding this function.

17.1.1 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.)

17.1.2   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   CAL
0 1 2 3 4 5 6 7 8 9 A B C D E F      OUTPUT
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 word "OUTPUT" on the top right of the display is a placeholder. Here the information on which of the outputs the Module Address is found gets display. Learn more about this feature in the following section.

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   CAL

0=1=2=3=4X5X6X7X8?9?A?B?C D E F        1
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.

17.1.3 Checking all five Phase III Network Outputs

The Pyrodigital® Field Controller Model A has five Phase III Network Outputs. The Check Status Display tells you on which of those outputs the Check Status Reply was found. The following example shows the same Module Address found on Phase III Network Output 1 and 4:

```
   LINE    SHOT       TIME        PFD   ADDR   CAL
 0=1=2=3=4=5=6=7=8=9=A=B=C=D=E=F=     1    4
 Check module: 01                         ^
```
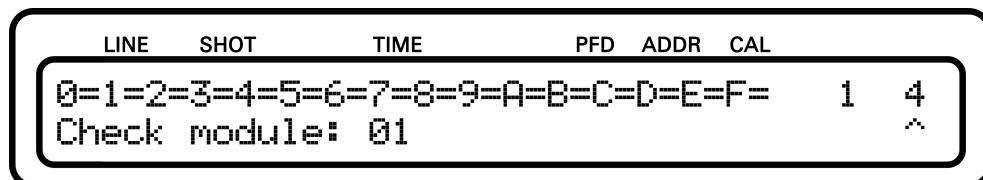
Note the little up-pointing arrow on the right hand side of the display. This arrow indicates the response of which Phase III Network Output is currently displayed. You can simply switch between the Phase III Network Outputs by pressing the "LEFT" and "RIGHT"

Arrow Keys.

Note that if an reply is present on a Phase III Network Output the corresponding Phase III Network Output Indicator stays statically yellow. This gives the Operator a better optical feedback.

17.1.4 Status Check Display - Common Faults

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

```
    LINE    SHOT        TIME        PFD   ADDR   CAL
GET NO RESPONSE AT THIS ADDRESS!
Check Module: XX
```

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 Outputs.

Another typical Response:

```
    LINE    SHOT        TIME        PFD   ADDR   CAL
0X1X2X3X4X5X6X7X8X9XAXBXCXDXEXFX   OUTPUT
Check Module: XX
```
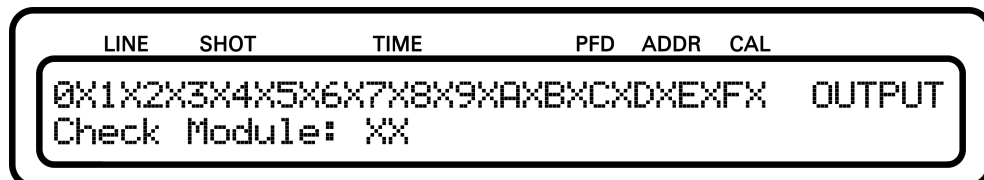
If you find all Clamps to be indicated as "X" (except of those that are blanks " "), two reasons are possible:

- 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 and are connected to the same Phase III Network Output, 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.

17.2   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 "UP" and "DOWN" Arrow Keys or entering a Module Address from the Hex-Keypad (and then depressing ENTER).

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.

Us the "LEFT" and "RIGHT" Arrow Keys to navigate between the Phase III Network Outputs. Phase III Network Outputs are displayed only when a response is present on the corresponding Phase III Network Outputs.

17.3   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. Note that the direct address input using the Hex-KeyPad is not available in SEMI-AUTO CHECK.

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.

17.4   Auto Check

AUTO CHECK is provided as an AUTOMATIC Status Check, which operates similarly to SEMI-AUTO, 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:

```
   LINE    SHOT       TIME        PFD   ADDR   CAL

 Status matches script                 OUTPUT
 Check Module: XX
```

The above display indicates that Module Address "XX" is connect 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 18

Manual Fire Operating Mode

WARNING - EXTREME DANGER

THE SAFETY KEY MUST BE ARMED IN ORDER TO ACCESS THE CHECK STATUS OPERATING MODE, THE MANUAL FIRE OPERATING MODE, OR THE AUTO FIRE 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.

18.1 Introduction

In order to access the MANUAL 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 arm the Safety Key to FIRE position. It is required that the user PRACTICES using the MANUAL 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.

In comparison to the old Field Controller Model 3, the MANUAL FIRE Mode as well as the concept of MACROS have been tremendously simplified for the Pyrodigital® Field Controller Model A. Thus, it is way easier for operators to learn the MANUAL FIRE mode. Nevertheless, the MANUAL FIRE 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 A.

Basic MANUAL FIRE without Script Table (Direct Firing) was previously covered in these Operating Instructions in the section 5.6 'Basics Manual Fire Mode'. Also, MANUAL FIRE 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 FIRE MODE, THE DEADMAN ENABLE INTERLOCK BUTTON MUST BE DEPRESSED (THIS IS ALSO INDICATED BY THE ABSENCE OF THE YELLOW "HOLD FIRE" INDICATOR LED) 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 FIRE, 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.

18.2   Mode Overview

Within the MANUAL FIRE MODE you can alternate between three different types of firing control:

- Direct Firing - Freely fire any Addresses

- Sequential Firing - Simple scripted Firing

- Caliber Group Firing - Scripted Firing, Script subdivided to several Caliber Groups

The following diagram provides an overview on the relation and pathway between these different types of firing control:
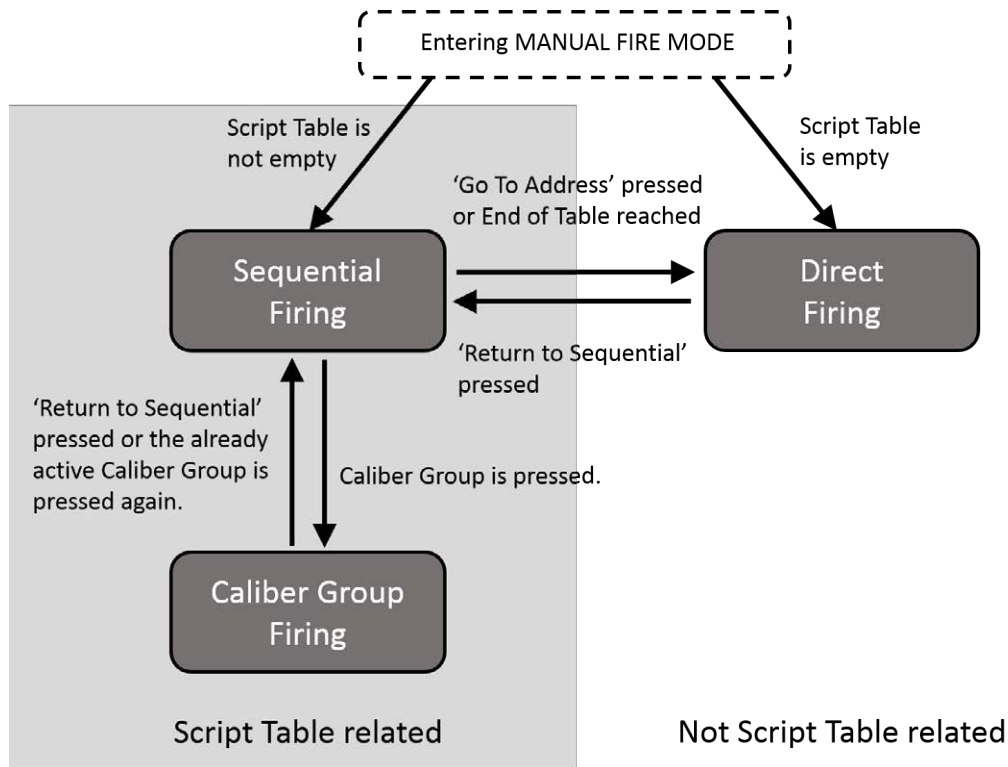
After entering the MANUAL FIRE MODE the Field Controller checks if the selected Script Table is empty. If so, the Field Controller enters Direct Firing. In case the Script Table is not empty, the Field Controller enters Sequential Firing.

To get from Sequential Firing to Direct Firing simply press the 'Go to Address' Key. To return to Sequential Firing press the 'Return to Sequential' Key. Also, the Field Controller switches automatically to Direct Firing when the End of the Script Table is reached. You can still return to Sequential Firing using the 'Return to Sequential' Key.

To get from Sequential Firing to 'Caliber Group Firing' simply press the Caliber Group Number Key of the Caliber Group you like to enter. To return to Sequential Firing press the 'Return to Sequential' Key or press again the already active Caliber Group Number Key. If you select an inactive Caliber Group Number Key the Field Controller stays in 'Caliber Group Firing' but select another Caliber Group to be active.

In the 'Caliber Group Firing' only the Key of the active Caliber Group is highlighted in red, the others are illuminated yellow. Since in Sequential Firing all cues will be fired,

regardless of the Caliber Groups, the Caliber Group Keys are highlighted in red to indicate that they all are armed at the same time in Sequential Firing.

As the diagram points out Sequential Firing and 'Caliber Group Firing' are both related to the information given in the Script Table. In contrast, Direct Firing is independent of the Script Table.

<div style="border: 2px solid black; padding: 10px;">

WARNING - CAUTION

The way to navigate between the different Manual Firing Modes (Sequential Firing, 'Caliber Group Firing' and Direct Firing) slightly differs from the Field Controller Model 3. Ensure you get familiar with the new Pyrodigital® Field Controller Model A before using it.

</div>

18.3   Encapsulated Cues

When entering the MANUAL FIRE MODE the Pyrodigital® Field Controller Model A reads the information in the Script Table and interprets it to a MANUAL FIRE TABLE. In MANUAL FIRE 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 FIRE MODE. In Sequential Firing the CUES are sequentially ordered and can be fired one by one. In 'Caliber Group Firing' for each of the Caliber Group only the related CUES are listed sequentially. In other words, the Caliber Group hold sublists from the global list (the MANUAL FIRE TABLE) of the Sequential Firing. The operator can navigate through these lists using the "UP" and "DOWN" Arrow Keys.

```
                          ┌─────────┐
                          │   Cue   │
                          └─────────┘
                         ╱           ╲
                        ╱             ╲
            ┌──────────────┐      ┌──────────────────────────┐
            │ Single Shot  │      │         Macro            │
            │ ┌──────────┐ │      │ ┌──────────┐             │
            │ │Script Line│ │      │ │Script Line│      ▲     │
            │ └──────────┘ │      │ └──────────┘      │     │
            └──────────────┘      │ ┌──────────┐      │  M  │
                                  │ │Script Line│      │  a  │
                                  │ └──────────┘      │  c  │
                                  │ ┌──────────┐      │  r  │
                                  │ │Script Line│      │  o  │
                                  │ └──────────┘      │  T  │
                                  │      ⋮            │  i  │
                                  │ ┌──────────┐      │  m  │
                                  │ │Script Line│      │  e  │
                                  │ └──────────┘      ▼     │
                                  └──────────────────────────┘
```
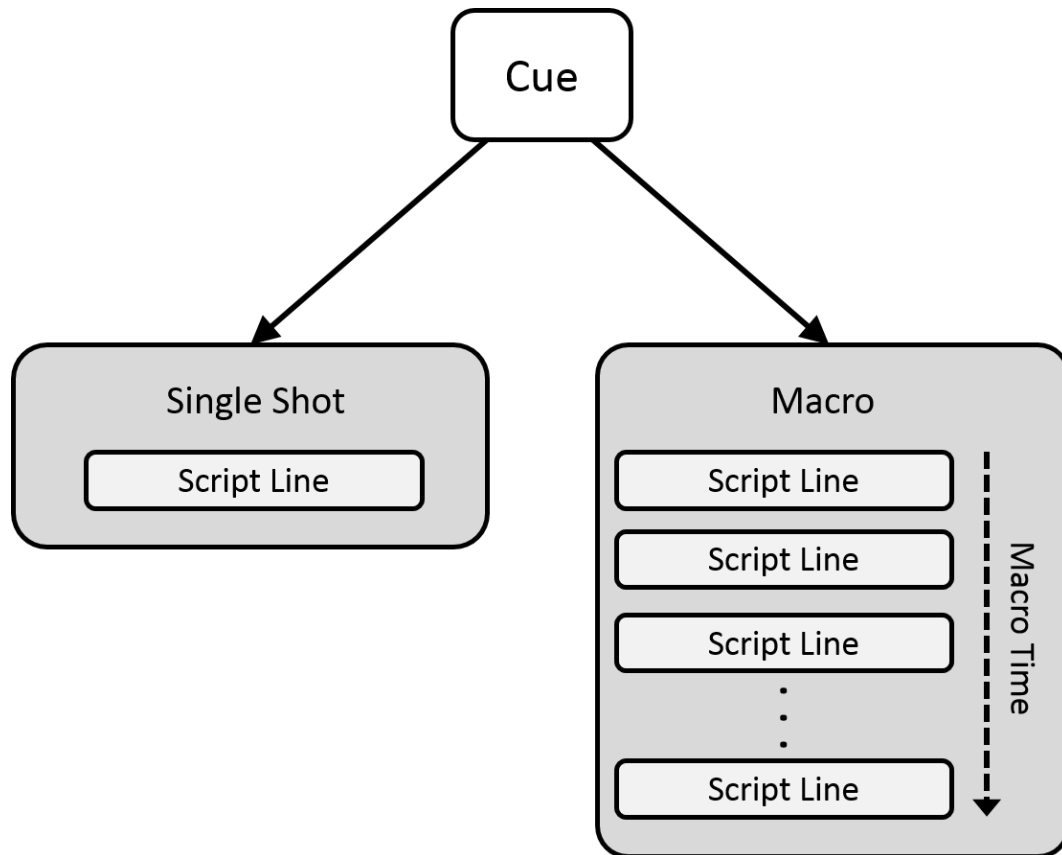
IMPORTANT: Each CUE is encapsulated, meaning that you can not accidentally go into the middle of a MACRO. If you are at the start of a MACRO and press the "DOWN" Arrow Key to skip to the next CUE, the Field Controller will skip the whole MACRO and not just the first MACRO Script Line! THIS IS AN IMPORTANT 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 A overcomes this issue by providing the encapsulated Cues to the users. This new feature dramatically enhances the clarity in Sequential Firing and 'Caliber Group Firing' and therewith the self-assurance of the Operator.

18.4   Scripting

Macro Fires are scripted timed sequences comprising several Script Lines. Macro Fires can be used in the MANUAL FIRE 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 FIRE, the Prefire Time is used differently than in AUTO FIRE. The Prefire Time is handled as the Macro Time. Running Macros can be paused, resumed and aborted. The Script Editing mode (DATA TABLE –> EDIT) also allows to have a look into the resulting Cues using the VIEW options. For more detailed information, please refer to section 15.2.7 'View Key'.

18.4.1   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 Fire 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.

18.4.2   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.

18.4.3   Example

The figure below shows an example Script Table with 12 Script Lines (0 to 11):
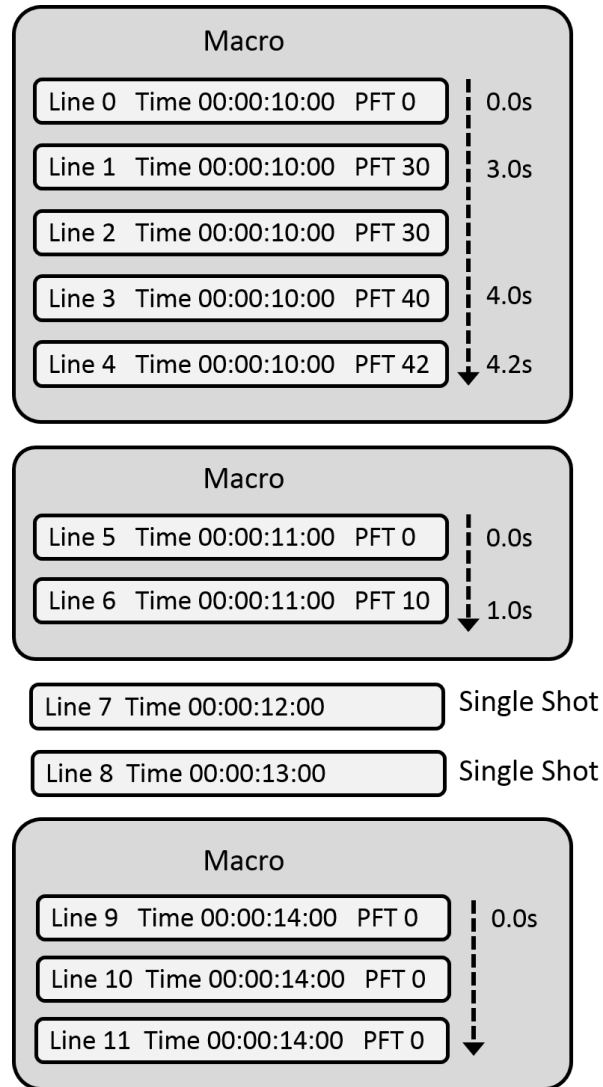
The first five Script Lines do have the same Show Time and are in sequential order. The very first Script Line has a Macro Time (Prefire Time) of 0 and all subsequent Lines have rising (or equal) Macro Time (Prefire Time).

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

18.5   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 "AF/Pause MF/Skip" 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.
This procedure is the same in Sequential Firing as in 'Caliber Group Firing'.

WARNING - CAUTION

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

18.6 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 distinguishs between Zipper Fires and MACRO Fires. In the new Pyrodigital® Field Controller 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 18.4.3.

Technical History

The old Field Controller Model 3 (FC-3) had several technical limitations regarding Zipper Firing. The Zipper Fire was limiting the capabilites of the old Field Controller Model 3 in MANUAL FIRE as well as in AUTO FIRE 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 A 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 A 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.

NOTE: THE SPEED OF FIRE COMMAND TRANSMISSION ON THE PHASE III NETWORK REMAINS THE SAME (10 ms per command), ALSO FOR THE FIELD CONTROLLER MODEL A. HOWEVER, THE FIELD CONTROLLER MODEL A HAS FIVE PHASE III NETWORK OUTPUTS. THEREFORE, WHEN THE CONTROLLER

MODE IS SET TO ADVANCED, THE NEW CONTROLLER SHOOTS UP TO FIVE TIMES FASTER THAN THE OLDER FIELD CONTROLLER MODEL 3 (five commands within 10 ms). Please refer to chapter 14 'Controller Mode' for more detailed information. 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.

18.7 Sequential Firing

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

Entering Sequential Firing:

If there is a Script Table (a Script Table that has any non zero Data Fields), when the MANUAL FIRE Operating Mode Key is depressed, and the Safety Key is armed to FIRE, the following display will TEMPORARILY appear:

LINE	SHOT	TIME	PFD	ADDR	CAL
Please wait, preparing firing table_					
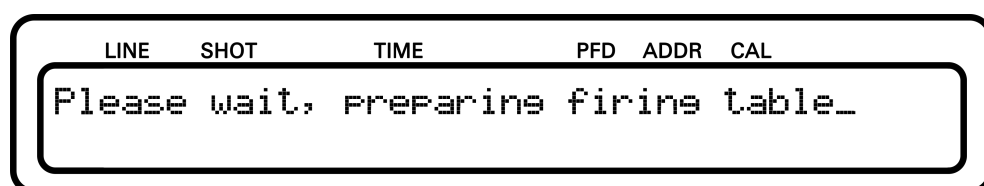
After a few moments, the display appears similar to as follows:

```
        LINE    SHOT         TIME         PFD   ADDR   CAL
   ┌─────────────────────────────────────────────────────┐
   │ LINE SHOT hh:mm:ss:ff   PFD ADD CG OUTPUT │
   │ Table: X          Last Fired: ADD         │
   └─────────────────────────────────────────────────────┘
```

You are now in Sequential Firing. 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 the last executed Firing Address. Further, if the Controller Mode is set to ADVANCED, the display will tell you on the top right hand side to which of the Phase III Network Outputs the displayed Script Line is assigned to (indicated with "OUTPUT" in the image).

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 CON-TROLLER WILL NOT FIRE, WILL NOT ADVANCE TO THE NEXT CUE, AND

WILL "BEEP".

18.7.1 Navigate through the Cues

Use the "UP" and the "DOWN" arrow keys to move through the Cues. 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 HOME Key to jump to the first Cue of the Script.

Use the "END" Key to jump to the last Cue of the Script. (This can take a few seconds to be executed.)

The "GO TO SHOT" Key can also be used to allocate a specific Shot Number. After you pressed this key, you can enter the desired Shot Number and start the search with the Enter key. Note: If you search a Macro by Shot Number, you need to allocate it with the Shot Number of the first Script Line of the Macro, as this is also the Shot Number of the Macro. You cannot search for Shot Numbers of Script Lines within a Macro. The search always starts on from the current Cue. If you want to search for a Cue that is previous to the current Cue, first use the HOME Key to get to the very first Script Line and then search using the "GO TO SHOT" Key. If a Shot Number could not be found, you will stay at the current Cue. Note that you can also give the same Shot Number to several Cues. Say you have scripted several Cues with the same Shot Number. If you go now to the first Cue and then start your search by Shot Number, you will get to the first of these Cues. If you search again, you will get to the second of the Cues and so on.

18.7.2 Skip Cue

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

18.7.3 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.

18.8   Direct Firing

As already explained in section 5.6 'Basics Manual Fire Mode' you can also freely fire any address in MANUAL FIRE mode. If the selected Script Table is empty, the Field Controller directly put you to this mode.

You can also enter Direct Firing from Sequential Firing by pressing the 'Go to Address' key. You can return from Direct Firing to Sequential Firing by pressing the 'Return to Sequential' key.

Here you can simply enter the Firing Addresses using the Hex-Numkeys. Type in the 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.

You can use the "UP" and "DOWN" Arrow Key to decrease/increase the Firing Address by 1. Or you can use the "LEFT" and "RIGHT" Arrow Key to move to the previous/next Module Address (e.g. from 030 –> 040).

18.9   Caliber Group Firing

Caliber Groups are a very helpful feature if you want to subdivide your Script to several sub-Script, e.g. for different scenes in a theater or songs at a concert. Give each scene or song its own Caliber Group. This allows you to safely separate the Cues of the different scenes and songs from each other.

'Caliber Group Firing' is very similar to Sequential Firing, only that you work with a subset of the total script. The Pyrodigital® Field Controller Model A provides 16 Caliber Groups. Each Script Line can be associated to one Caliber Group by setting the CGHZ (Caliber Group / Hazard Lockout) parameter of the Script Line to the corresponding Caliber Group Number. Please refer to section 15.2 'Edit the Script Table' for more detailed information regarding Script Table editing.

Each Cue can get associated to a Caliber Group (CGHZ = 1..16) or kept unassociated (CGHZ = 0).

The 16 corresponding Caliber Group Number keys are on the right hand side of the Keyboard. If you enter the 'Caliber Group Firing' by pressing the corresponding Caliber Group Number key, the first Cue of this Caliber Group is displayed.

```
      LINE     SHOT          TIME          PFD   ADDR   CAL
  ┌────────────────────────────────────────────────────────┐
  │ LINE SHOT hh:mm:ss:ff  PFD ADD CG OUTPUT │
  │ CG#: XX        Cues remaining: XXXX      │
  └────────────────────────────────────────────────────────┘
```

The Script Line is shown (like in Sequential Firing) in the top line of the display. The bottom line shows you on the left hand side in which of the 16 Caliber Groups you are in. On the right hand side of the bottom line, the display shows you how many Cues are remaining (meaning associated to this Caliber Group and not shot yet).

After the first Cue is shot, the next Cue of this Caliber Group is displayed.

You can think of the Caliber Groups as Cue lists, only listing those Cues that are associated to it. The Cues are in rising order, correspondingly to the Script Table.

If all Cues are executed within a Caliber Group (or no Cues had been associated to it), you will see the following display:

```
      LINE     SHOT          TIME          PFD   ADDR   CAL
  ┌────────────────────────────────────────────────────────┐
  │ No Cues remaining in this Caliber Group. │
  │ CG#: XX        Cues remaining: 0         │
  └────────────────────────────────────────────────────────┘
```

Jump between the different Caliber Groups without loosing your position within it. Each Caliber Group does have an individual pointer that remains at the last position within the Caliber Group. So, when you return to a Caliber Group, the pointer will still be on the same Cue as it was when you have left the Caliber Group.

18.9.1   Navigate through the Cues

Use the "UP" and the "DOWN" arrow key to move through the Cues. 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 HOME Key to go to the first Cue of the Script.

The "GO TO SHOT" search option is not available in 'Caliber Group Firing'.

18.9.2   Skip Cue

To skip a Cue first press the "AF/PAUSE MF/SKIP" Key followed by the "DOWN" arrow Key. This gets you to the subsequent Cue.

18.9.3   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.

18.9.4   Display Cues Remaining

Keep the "PRESS TO DISPLAY SHOTS REMAINING" Key depressed to display an overview of all Cues that remain (have not yet been fired) of the 16 Caliber Groups.

While the "PRESS TO DISPLAY SHOTS REMAINING" Key is depressed, you will see the display shown above. Each XXXX block will show the corresponding number of remaining Cues for its associated Caliber Group. The number ranges from 0 to 2500.

The XXXX blocks in the top line are associated to Caliber Group 1 to 8 (from left to right). The XXXX blocks in the bottom line are associated to Caliber Group 9 to 16

(from left to right).

Here an example:

```
 ┌──────────────────────────────────────────────────┐
 │   LINE    SHOT       TIME       PFD  ADDR   CAL    │
 │  ┌─────────────────────────────────────────────┐  │
 │  │  7     3     5     6     1     4     6     6  │  │
 │  │  1     1     0     0     0     0     0     0  │  │
 │  └─────────────────────────────────────────────┘  │
 └──────────────────────────────────────────────────┘
```

This display shows:

- Caliber Group 1 - 7 Cues remaining

- Caliber Group 2 - 3 Cues remaining

- Caliber Group 3 - 5 Cues remaining

- Caliber Group 4 - 6 Cues remaining

- Caliber Group 5 - 1 Cues remaining

- Caliber Group 6 - 4 Cues remaining

- Caliber Group 7 - 6 Cues remaining

- Caliber Group 8 - 6 Cues remaining

- Caliber Group 9 - 1 Cues remaining

- Caliber Group 10 - 1 Cues remaining

- Caliber Group 11 - 0 Cues remaining

- Caliber Group 12 - 0 Cues remaining

- Caliber Group 13 - 0 Cues remaining

- Caliber Group 14 - 0 Cues remaining

- Caliber Group 15 - 0 Cues remaining

- Caliber Group 16 - 0 Cues remaining

Besides in 'Caliber Group Firing', this function is also available in Sequential Firing but not in Direct Firing.

18.10   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 Script Editing (DATA TABLE –> EDIT) after you finished in the MANUAL FIRE mode.

18.11   Re-Fire

Whenever a Firing Address is fired, that Firing Address is transferred to the "Last Fired". Simply press the 'REFIRE' button to conduct a re-firing of the Firing Address displayed as "Last Fired". Re-firing is available in Sequential Firing, 'Caliber Group Firing' and Direct Firing. Attention: In 'Caliber Group Firing' the "Last Fired" information is not displayed.

18.12   Optimize for Rapid Firing

The Pyrodigital® Field Controller Model A allows to optimize for rapid firing using its five independent Phase III Network Outputs. Please refer to chapter 14 'Controller Mode' for more information.

Chapter 19

Auto Fire Operating Mode

19.1 Introduction

WARNING - EXTREME DANGER

THE SAFETY KEY MUST BE ARMED IN ORDER TO ACCESS THE CHECK STATUS OPERATING MODE, THE MANUAL FIRE OPERATING MODE, OR THE AUTO FIRE 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 FIRE Operating Mode depress the AUTO FIRE key. The Pyrodigital® Field Controller Model A 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 calculated the Auto Fire Table that holds the firing order and timings for the automated firing. During the calculation the display will show:

```
LINE    SHOT         TIME        PFD   ADDR   CAL
Please wait, preparing firing table_
```
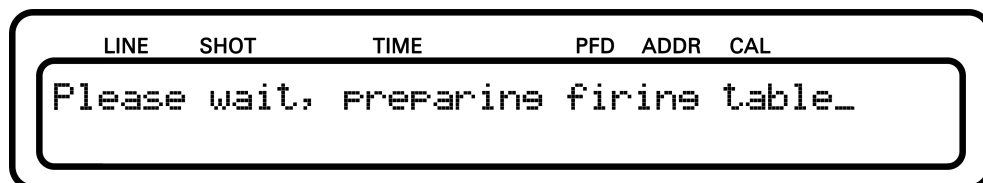
After that message disappeared, the display shows the AUTO FIRE menu:

```
LINE    SHOT         TIME        PFD   ADDR   CAL
AUTO FIRE:      0 Internal, 1 FSK Slave,
 2 SMPTE Slave, 3 Internal + FSK Master
```
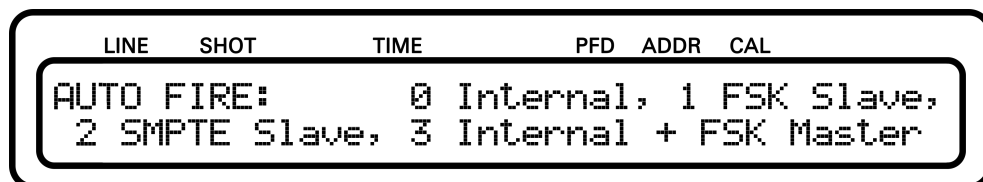
The Pyrodigital® Field Controller Model A can run automated scripts on an highly precise internal clock or synchronous to external linear timecode (PD-FSK and SMPTE). From the menu you have the following options:

- **Internal** - Run the Script on the Internal Clock

- **FSK Slave** - Run the Script synchronous to PD-FSK Timecode

- **SMPTE Slave** - Run the Script synchronous to SMPTE Timecode. This selection gets you to a sub-menu to select the SMPTE format.

- **Internal + FSK Master** - Run the Script on the Internal Clock and generate an PD-FSK timecode signal to synchronize subsequent Field Controllers.

For more detailed information regarding timecode and formats, please refer to chapter 13 'Timecode'.

19.2   Scripting Auto Fire

For Scripting in general, please refer to section 15.2 'Edit the Script Table'. For AUTO FIRE mode, it is important to understand how the Prefire Time (PFT, or Prefire Delay PFD) works. As mentioned earlier, each Script Line has the 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 rise time the shell). From those two parameters of the Script Table the Field Controller calculates and sorts the Auto Fire Table. The Auto Fire Table lists the Script Lines ordered for the Fire Time. The Fire Time is calculated:

Fire Time = Show Time - 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 19.1: 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 Fire Table. In the Script Table the Script Lines are (naturally) sorted by the Script Line Number. As required for automated firing, the Auto Fire Table sorts the Script Lines for their Fire Times:

Table 19.2: 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.

19.3   Internal Drive

Choose 'Internal' from the AUTO FIRE menu to enter the Internal Drive. In this Auto Firing mode the script runs synchronous to the highly precise internal clock. The following screen is displayed:

```
    LINE    SHOT        TIME          PFD   ADDR   CAL
  ┌─────────────────────────────────────────────────────┐
  │ LINE SHOT hh:mm:ss:ff   PFD ADD CG OUTPUT            │
  │ RUN=Fire, Table: X                                  │
  └─────────────────────────────────────────────────────┘
```

The display show you which Table is currently selected. 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.

```
    LINE    SHOT        TIME          PFD   ADDR   CAL
  ┌─────────────────────────────────────────────────────┐
  │ LINE SHOT hh:mm:ss:ff   PFD ADD CG OUTPUT            │
  │ RUNNING   hh:mm:ss:ff                               │
  └─────────────────────────────────────────────────────┘
```

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.

Fire Time = Show Time - Prefire Time.

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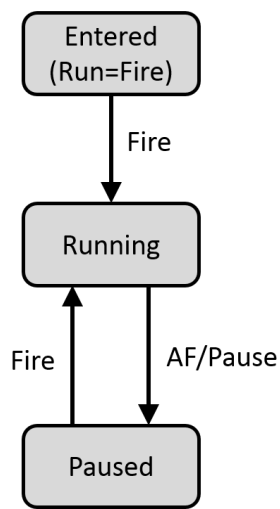
WARNING - CAUTION

If the Enable Interlock (Remote IN) 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 A leaves the FIRE MODE to the STOP MODE. The user is then asked to return the Safety Key back to the OFF position:
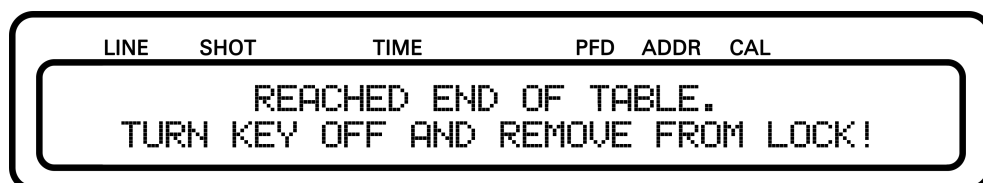
19.3.1   Internal Drive + FSK Timecode Master

Alternatively, the Operator can also choose the Option 'INTERNAL + FSK MASTER'. This mode is essentially the same as the usual Internal Drive, but the Pyrodigital® Field Controller Model A will additionally generate a PD-FSK timecode signal to synchronize subsequent Field Controllers. The PD-FSK Master Signal is sent on the Timecode OUT plug on the left hand side of the Back Panel.

19.3.2   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 the previous Script Line. 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.

19.4   Timecode Drive

Besides the Internal Drive options, the Pyrodigital® Field Controller Model A also allows to run synchronous to an external timecode. The timecode formats can be selected from the AUTO FIRE menu (you find more details in the following subsections).

WARNING - CAUTION

Use the TIMECODE operating mode to check the integrity of the chosen timecode before applying the timecode to the AUTO FIRE mode.

If a timecode format is selected, you are asked to release the clock:

```
      LINE    SHOT          TIME        PFD   ADDR   CAL
   LINE SHOT hh:mm:ss:ff   PFD ADD CG OUTPUT
   RUN=Fire, Table: X
```

To release the clock depress the FIRE key on the keyboard or the FIRE TRIGGER of the Deadman Pickle:

```
      LINE    SHOT          TIME        PFD   ADDR   CAL
   LINE SHOT hh:mm:ss:ff   PFD ADD CG OUTPUT
   WAITCODE
```

The Field Controller now entered the 'Waitcode' state. The Field Controller will halt in this state until the first valid timecode frame has been received. Then the clock synchronizes and starts running, and the display indicates you that you are "In Sync" to the timecode.

```
      LINE    SHOT          TIME        PFD   ADDR   CAL
   LINE SHOT hh:mm:ss:ff   PFD ADD CG OUTPUT
   IN SYNC   HH:MM:SS:FF
```

NOTE: Valid incoming timecode is also indicated by the corresponding Timecode Indicator on the keyboard. See also 13.4 'Timecode Indicator'.

WARNING - DANGER

Firing may instantly begin upon depression of the FIRE key (or FIRE TRIGGER of the Deadman Pickle) if the Field controller is already receiving time code.

REMEMBER: The time displayed is the Show Time and is unequal to the Fire Time.

Fire Time = Show Time - Prefire Time.

In the event of a timecode loss, the Pyrodigital® Field Controller Model A can be configured for different behaviors. Please proceed to read the following section regarding the Tape Clock Mode for more details.

WARNING - CAUTION

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

19.5   Tape Clock Mode

The term Tape Clock Mode 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 Tape Clock Mode. There are two options 'Auto Switch-over' and 'Stop with Tape' that are both described in the following subsections. The factory setting is on 'Auto Switch-over' (as it has been for the older Field Controller Verison, Field Controller Model 3). In most cases 'Auto Switch-over' is preferable as it guarantees an ongoing show. However, this decision can only be made by the Operator. The Tape Clock Mode settings apply to both, PD-FSK and SMPTE synchronization.

19.5.1   Auto Switch-over

The figure below illustrated the behavior in Timecode Drive when the Tape Clock Mode is set to 'AUTO SWITCH'. This means that the Pyrodigital® Field Controller Model A automatically switches over to the internal clock when the timecode signal gets lost.
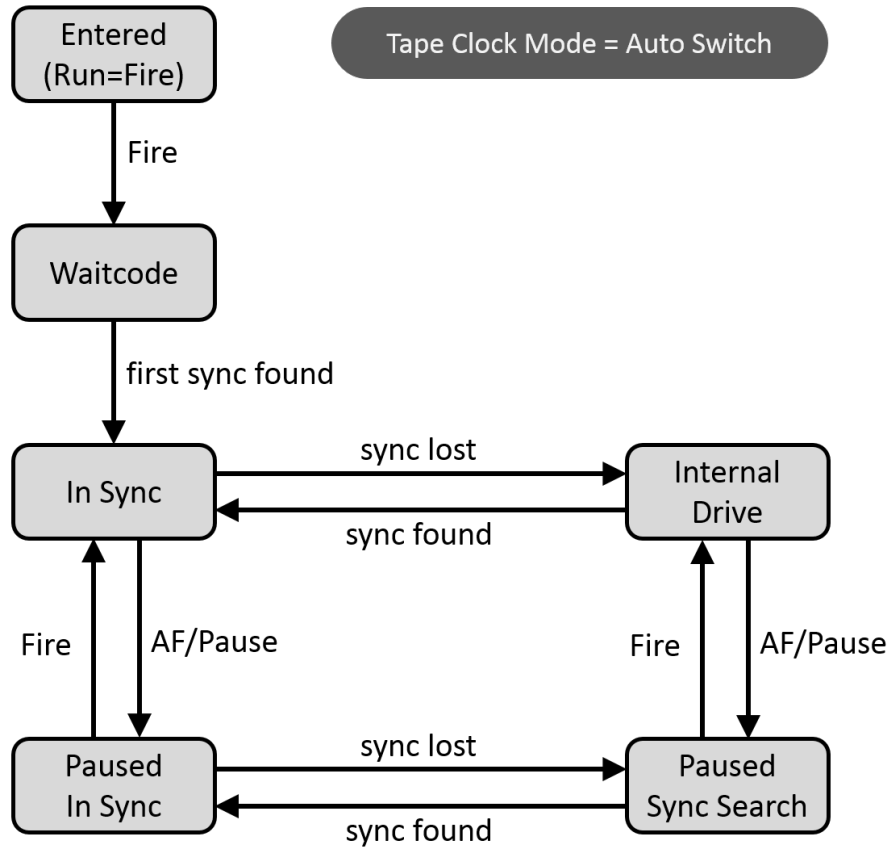
First the Operator has to depress FIRE to proceed to the 'Waitcode' state. Then, after the first valid timecode frame is received, the clock is 'In Sync' to the timecode. If the timecode gets lost or invalid ('sync lost'), the clock switches over to the internal clock source 'Internal Drive'. When the timecode resumes (and is valid), the clock is resynchronized and again 'In Sync'.

The clock can also be pause by depressing the 'AF/PAUSE MF/SKIP' key. When paused, the clock can still by 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 → timecode indicator LED is ON) 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 present → timecode indicator LED is ON) 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.)

19.5.2   Stop with Tape

In contrast to the 'Auto Switch-over' mode, in the 'Stop with Tape' mode, 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.

```
        ┌─────────────┐              ╭──────────────────────────────╮
        │   Entered   │              │  Tape Clock Mode = Stop with Tape │
        │  (Run=Fire) │              ╰──────────────────────────────╯
        └─────────────┘
              │ Fire
              ▼
        ┌─────────────┐
        │   Waitcode  │
        └─────────────┘
              │ first sync found
              ▼
                    sync lost
        ┌─────────────┐ ──────────▶ ┌─────────────┐
        │   In Sync   │             │ Sync Search │
        └─────────────┘ ◀────────── └─────────────┘
                    sync found
        Fire │  ▲ AF/Pause        Fire │  ▲ AF/Pause
             ▼  │                       ▼  │
                    sync lost
        ┌─────────────┐ ──────────▶ ┌─────────────┐
        │   Paused    │             │   Paused    │
        │   In Sync   │             │ Sync Search │
        └─────────────┘ ◀────────── └─────────────┘
                    sync found
```
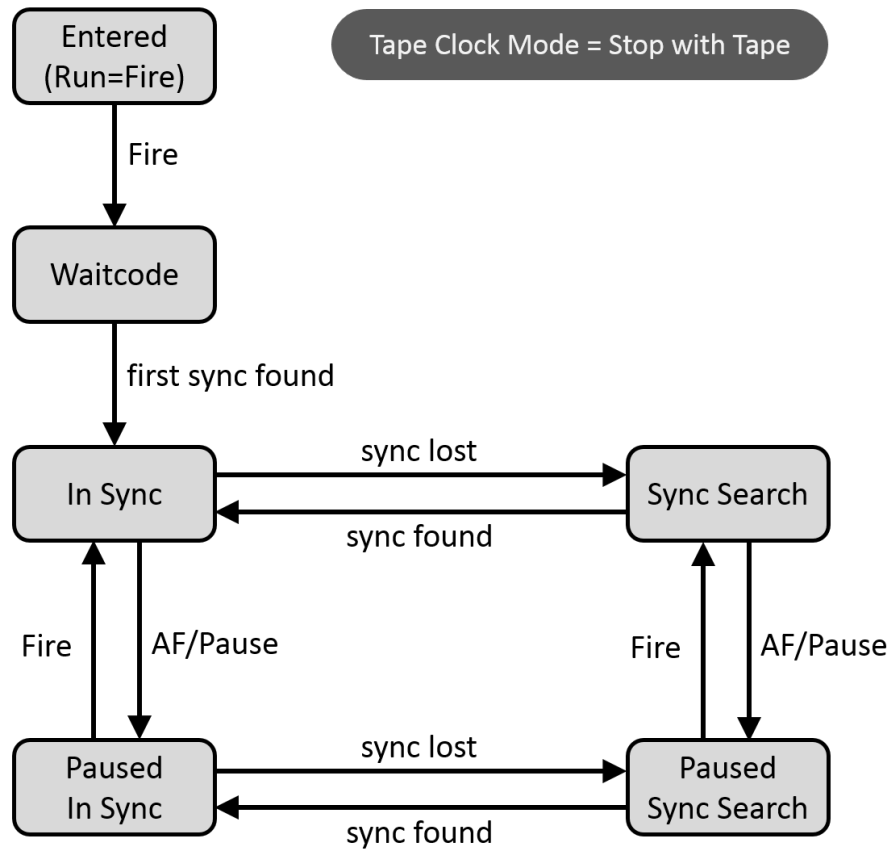
19.5.3 PD-FSK Timecode Slave

To synchronize to PD-FSK simply select 'FSK SLAVE' from the AUTO FIRE menu.

19.5.4 SMPTE Timecode Slave

To synchronize to SMPTE select 'SMPTE SLAVE' from the AUTO FIRE menu. The following sub-menu is displayed:

```
     LINE     SHOT        TIME        PFD   ADDR   CAL

  SMPTE AUTO FIRE:    0 for  24/25/30/29.97df
  23.976/29.97ndf:    1 absolute, 2 relative
```

Press the option 0 for the formats:

- SMPTE 24 fps

- SMPTE 25 fps

- SMPTE 30 fps

- SMPTE 29.97 fps df (drop frame) (sometimes also referred to as 30 fps drop frame)

All these four formats are 'true in time', meaning that the duration of e.g. an hour is in fact also one hour. *Comment: This is only partially true for 29.97 df, but this format is compensated be the Pyrodigital$^®$ Field Controller Model A to be in real time.*

For the remaining two formats this is not the case, those are not 'true in time':

- SMPTE 23.976 fps

- SMPTE 29.97 fps ndf (non drop frame)

These format run sightly slower (0.1 %) than their transmitted time. E.g. the timecode frame 01:00:00:00 (1 hour) is not transmitted at 1 hour, but at 1 hour and 3.6 seconds. In order to compensate this delay, the Field Controller needs to know if it should compensate on from time zero (00:00:00:00) - absolute - or on from the first received timecode frame - relative.

An example: A technician supplies you e.g. a 23.976 fps SMPTE timecode and you are told the first incoming frame will be 01:00:00:00. Now there are two possibilities: Either the compensation shall start on from the moment the timecode is started (so the first timecode frame represents 01:00:00:00 and you need to choose the option 2 'relative') or the compensation shall be calculated on from zero time (so the first timecode frame represents 01:00:03:14 - 14 frames $\approx$ 0.6 seconds and you need to choose the option 1 'absolute'). It is up to the operator to clarify which of the two options is appropriate.

If you require absolute compensation, choose option 1. If you require relative compensation, choose option 2.

19.5.5 SMPTE Offset

Quite commonly when using SMPTE, the timecode will be sent with an offset of e.g. 1 hour (01:00:00:00). If your script origins at 00:00:00:00, then you need to subtract this offset from the incoming timecode. You can do so by using the SMPTE Offset. For more details please read section 13.6.2 'SMPTE Offset'.

If you enter the SMPTE Timecode Drive, the display also shows you the currently set SMPTE Offset:

```
LINE     SHOT          TIME         PFD   ADDR   CAL

SMPTE Timecode Offset: hh:mm:ss:ff
Run=Fire, Table: X
```

19.6 Integrated Timecode Modem

Whenever the clock time is running on the display (in Internal Drive as well as in Timecode Drive PD-FSK and SMPTE), the field controller sends a digital synchronization signal (PD-FSK in digital manner) via the USB port ('LOAD TABLE / TCM'; TCM = Timecode Modem). This digital PD-FSK timecode signal allows the operator to synchronize Infinity Visions Showdirector (scripting Software) to your show. Please also refer to section 13.5 'Integrated Timecode Modem' for more information.

19.7 Hazard Lockouts

After the selection of the clock/synchronization source, the Hazard Lockout are automatically in use. The Hazard Lockouts allow the Operator to suppress any Script Line with a matching CGHZ Number (Caliber Group / Hazard Lockout). E.g. if the CGHZ parameter of the first 10 Script Lines are set to CGHZ = 2 and the Hazard Lockout Number 2 is

blocked, those 10 Script Lines will not be executed!

A Hazard Lockout Number blocks firing when it is activated, and let pass firing when it is deactivated. Therefore, the corresponding Hazard Lockout Number Key (the caliber group keys on the left hand side of the keyboard) is red colored if it let pass firing (Hazard Lockout deactivated) and yellow colored if firing is blocked (Hazard Lockout activated).

Additionally, the Hazard Lockout stats can be checked by pressing the 'Press to display shots remaining' key. While the key is hold depressed, the display shows the Hazard Lockout states.

If all of the Hazard Lockouts are deactivated (NO firing is blocked; all Hazard Lockout Number keys are red), the display looks as follows:

```
    LINE    SHOT         TIME        PFD   ADDR   CAL

 HAZARD
 LOCKOUT
```

If all of the Hazard Lockouts are activated (firing for all 16 groups is blocked; all Hazard Lockout Number key are yellow), the display looks like this:

```
    LINE    SHOT         TIME        PFD   ADDR   CAL

 HAZARD    1    2    3    4    5    6    7    8
 LOCKOUT   9   10   11   12   13   14   15   16
```

ATTENTION: Even if all Hazard Lockouts are activated, Script Lines with the CGHZ parameter set to 0 will be unaffected and thus are not blocked!
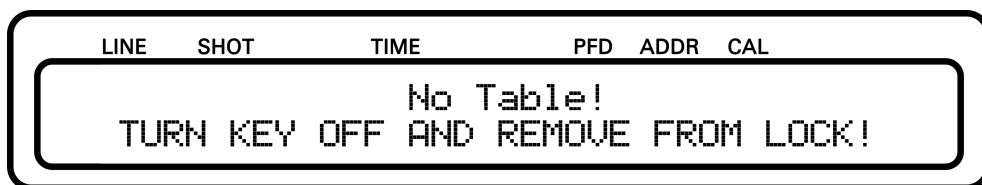

WARNING - EXTREME DANGER

Hazard Lockouts will only block firing events if an active Hazard Lockout Number matches the corresponding Script Lines parameter CGHZ (Caliber Group / Hazard Lockout). For a reliable usage of the Hazard Lockouts, the operator must have detailed knowledge of the script table in use and needs to be familiar with the Hazard Lockouts.

In factory settings, all 16 Hazard Lockout Numbers are initially deactivated (let pass firing) when entering the firing mode. If required, another initialization preset can be configured using the Hazard Lockout Preset (see section 8.2 'Hazard Lockout Preset').

19.8 Empty Fire Table

In case the selected Script table is empty or does not have any valid Script Line (compare section 19.2 'Scripting Auto Fire') and AUTO FIRE is selected, the Field Controller will directly return to STOP mode and display the following message:

```
LINE    SHOT         TIME         PFD   ADDR   CAL
                     No Table!
          TURN KEY OFF AND REMOVE FROM LOCK!
```

19.9 Optimize for Rapid Firing

The Pyrodigital® Field Controller Model A allows to optimize for rapid firing using its five independent Phase III Network Outputs. Please refer to chapter 14 'Controller Mode' for more information.