PYRODIGITAL PHASE III

FIELD CONTROLLER

USERS GUIDE

Note: This USER'S GUIDE applies to the latest (October 1996) Pyrodigital Field Controllers. Earlier Units may not have some of the Hardware Features as described in this USER'S GUIDE.

COPYRIGHT 1996

ALL RIGHTS RESERVED

PYRODIGITAL CONSULTANTS

PEBBLE BEACH, CALIFORNIA

PYRODIGITAL PHASE III

FIELD CONTROLLER

USERS GUIDE

V3.00M Firmware

Operating System

SECTION I

As a CONVENIENCE to EXPERIENCED USERS

Who are Updating their Field Controller from V1.33B

Please Go to Section II if you wish to ONLY learn of New Features Implemented since V1.33B Firmware.

SECTION II ONLY HAS UPDATES FROM V1.33B

Section II follows the Heavy Divider Section

THE EXPERIENCED USER IS STILL ABSOLUTELY RECOMMENDED TO REVIEW THE ENTIRE MAIN SECTION I OF THIS USER'S GUIDE TO REFRESH YOUR MEMORY ON ALL FUNCTIONS OF THE FIELD CONTROLLER.

ALL INFORMATION IN SECTION II IS CONTAINED WITHIN SECTION I

TABLE OF CONTENTS

SECTION 4

SAFETY KEY WARNING SYSTEM

SECTION 5

BASIC OPERATION OVERVIEW

SECTION 6

ACTIVE TEST LIGHTS

SECTION 8

PASSWORD PROTECTION AND MEMORY SIZE

SECTION 9

TIME CODE OPERATING MODE

SECTION 10

CHECK STATUS OPERATING MODE

SECTION 14

CALIBER GROUP FIRE

SECTION 15

AUTO FIRE OPERATING MODE

SECTION 16

HAZARD LOCKOUT FIRING

SECTION 17

MIDI SHOW CONTROL FIRING

APENDIX A

DATA TABLE CONDITIONS – CONDENSED

END OF SECTION II - (Last 4 Pages of this Users Guide)

END OF TABLE OF CONTENTS FOR MAIN SECTION I

FOR EXPERIENCED USERS

Section II, past the HEAVY PAPER SECTION DIVIDER, ONLY includes UPDATES from V1.33B Firmware Operating System. Section II contains abbreviated information pertaining ONLY to Updates since V1.33B and is provided as a convenience for the EXPERIENCED USER.

EXPERIENCED USERS are ABSOLUTELY RECOMMENDED to REVIEW the Complete User's Guide in this Main Section I. Further information or details from Section II can be found in this Main Section I.

ALL INFORMATION IN SECTION II IS INCLUDED WITHIN MAIN SECTION I

SEE TABLE OF CONTENTS FOR SECTION II AT START OF SECTION DIVIDER

INTRODUCTION and REQUIREMENTS

SECTION 1
FIELD CONTROLLER USERS GUIDE
USERS GUIDE
for the

PYRODIGITAL PHASE III

FIELD CONTROLLER

for V3.00M Firmware

INTRODUCTION, THE PYRODIGITAL FIELD CONTROLLER

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

Pyrodigital Consultant's Field Controller, as a Professional Level Tool, is designed, intended, and only to be used by Professional Pyrotechnic Operators in a controlled Professional Environment permitted by the Fire Authority having jurisdiction, in conjunction with UN 1.4S / UN 1.4G (Class C) or UN 1.3G (Class B) explosives ONLY that have been examined and issued Federal EX numbers by the US Department of Transportation. The Pyrodigital Field Controller 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 and the Pyrodigital Phase III Firing System Network, or intend to use the Pyrodigital Field Controller and Firing System Network for any other purpose - STOP - do not proceed any further. Consult Pyrodigital Consultants about purchase back of your Field Controller or cancellation of your order.

DEFINITIONS - SYSTEM CONTROLLER & SYSTEM NETWORK

For purposes of identification, and in this Users Guide, the Phase III System can be divided into two major components, The SYSTEM CONTROLLER and the SYSTEM NETWORK. For this Users Guide, the FIELD CONTROLLER IS THE SYSTEM CONTROLLER.

The PYRODIGITAL FIELD CONTROLLER (the SYSTEM CONTROLLER) is what Controls the operation of the Phase III SYSTEM NETWORK. The Field Controller is at the Control Location, at the point where the operator, or user, controls the Fireworks Display or Special Effects. The Pyrodigital Phase III System Network could also be Controlled by another type of Pyrodigital Phase III Controller.

The standard SYSTEM NETWORK is composed of the Firing Modules, the Interconnecting Cables, and the Splitter Boxes. This Network originates at the Field Controller via the single main Interconnecting Cable. This main Interconnecting Cable then goes to the Splitter Box(s) which are then connected with additional Interconnecting Cables to the Firing Modules.

The SYSTEM NETWORK may also be composed of Pyrodigital PAM(s) (Pyrodigital Automation Modules), 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 various places in this Users Guide. Likewise, the Field Controller may sometimes be referred to as simply the Controller, or generically as the System Controller. The Field Controller together with the System Network may be referred to, in total, as simply the (Pyrodigital) Firing System.

THIS USERS GUIDE ONLY DESCRIBES OPERATION OF THE FIELD CONTROLLER.

FOR OPERATION OF THE SYSTEM NETWORK PLEASE REFER TO THE USERS GUIDE FOR THE PYRODIGITAL SYSTEM NETWORK. THE USER MAY ADDITIONALLY NEED TO REFER TO USERS GUIDE(S) FOR ANY OTHER PYRODIGITAL OUTPUT DEVICES WHICH ARE USE IN THE SYSTEM NETWORK.

There is a separate Users Guide:

1) for the System Network (composed of Firing Modules), and
2) for other Phase III Firing Output Devices (such as the PAM)
3) for the Software that is used to control the System Network via a PC Computer (with the Pyrodigital Interface Box),
4) for any other Pyrodigital System Controllers that may be manufactured.

GENERAL DISCLAIMER

The Pyrodigital Consultants Phase III Field Controller 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 or Special Effects including your 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 unforseeable 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: great personal injury or death from unintentional and erratic electric match ignition, failure of execution of a display or performance due to system failures. Such risks exist even though the Pyrodigital Firing System is reasonably fit for uses stated in all advertising, brochures, and documentation, and even though all the directions are followed.

By proceeding with the use of the Pyrodigital Consultants Phase III Field Controller operating the Pyrodigital Consultants Phase III Firing System Network you hereby accept and assume all risks and liability resulting from the use thereof.

WARNING - EXTREME DANGER

Specific Procedures pertaining to the Use and Operation of the Pyrodigital Consultants Phase III Field Controller are outlined in this Users Guide. Deviation from any of the Procedures outlined in this Users Guide are specifically forbidden and absolutely not recommended by Pyrodigital Consultants. Injury or Death to yourself and others, as well as property damage, could result from deviations to the Procedures as outlined in the Users Guide. Any deviation from the Procedures as outlined in this Users Guide are clearly at your own risk.

ABOUT THIS USERS GUIDE

WARNING - CAUTION

IT IS INTENDED AND REQUIRED THAT EACH AND EVERY OPERATOR RESPONSIBLE FOR THE USE OF THE PYRODIGITAL PHASE III FIELD CONTROLLER SHALL HAVE THEIR OWN COPY OF THIS USERS GUIDE

EACH OPERATOR'S USERS GUIDE SHOULD BE WITH EACH OPERATOR WHILE OPERATIONS INVOLVING THE USE OF THE PYRODIGITAL PHASE III FIELD CONTROLLER ARE ONGOING.

If you do not have your own copy of this Users Guide or to request additional copies of this Users Guide contact Pyrodigital Consultants. There is a nominal charge to cover printing costs.

This Users Guide, in its entirety, is a technical reference work for the Operation of the Pyrodigital Phase III Field Controller.

No part of the Users Guide 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 Pyrotechnic 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 this Users Guide.

Like all technical references on a specific advanced subject, this Users Guide immediately concerns itself with the subject matter and may dispense with or not include explanations of foundation or groundwork 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 this Users Guide, or your 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 FURTHER1 Show your supervisor this paragraph and explain your doubts about your prior knowledge and abilities. If you have no Supervisor, or your are the top level Supervisor, then contact Pyrodigital Consultants directly and obtain clarification or further assistance before proceeding.

CUSTOMER SUPPORT

If you are having difficulty in operating the Pyrodigital Consultants Field Controller, please;

1) Re read the sections of this Users Guide, or other supporting User Guides, 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 Phase III Firing System in an inert Test Environment, then you are not learning as intended.
3) Call Pyrodigital Consultants Technical Support at USA 1-408-375-9489.
4) You may wish to consult with your Supervisor or other Experienced Users of Pyrodigital Equipment.

OPERATOR AND SITE REQUIREMENTS

The procedures, functions, and all information outlined and described in this Users Guide 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 Public Display Fireworks or Special Effects. It is assumed that these operations, including the Operation of the Pyrodigital Field Controller 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 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.

This Users Guide will only cover the Operation of the Pyrodigital Phase III Field Controller. The user MUST also refer to the Users Guide for Pyrodigital Phase III System Network composed of Firing Modules. Additionally the user may need to refer to Users Guide(s) for other Pyrodigital output devices, if such devices are used.

This Users Guide will NOT cover specific information relating general Safety related background material in handling Explosive Products including Pyrotechnic Materials. This Users Guide assumes that the user has prior knowledge and experience and that the user brings that knowledge and experience with he/she as he/she reads this Users Guide and gains understanding of how to use the Pyrodigital Field Controller. If you do not have this prior experience you should stop reading here. Proceed no further. Explain to your supervisor or to Pyrodigital Consultants 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 current regarding the person or persons 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, that 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. GREAT 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 that you posses the proper qualifications as outlined above and below you should not proceed with attempting operation of the Pyrodigital Field Controller or the Pyrodigital Firing System. Contact your Supervisor or Pyrodigital Consultants and explain any questions that you may have before taking it upon yourself to proceed.

General Safety knowledge is gained through familiarity with applicable laws and 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 state Explosives, Pyrotechnician, or Special Effects License.
2) A minimum of 2 years prior experience under the direct supervision of Professional Operators.

The Physical site at which any operations take place must have at least;

1) Been permitted by the local fire 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.

SAFETY AND GENERAL GUIDELINES

WARNING - EXTREME DANGER

The Purpose of the Phase III Firing System is to cause initiation of industry standard pyrotechnic electric matches to ignite Display Type Fireworks or Pyrotechnic Special Effects. If you do not understand this usage or intend to use the Phase III System for any other purpose do not use the Phase III Firing System.

WARNING - EXTREME DANGER

Fireworks 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 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 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 Federal, 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.

SAFETY

It is beyond the scope of these instructions or this Users Guide to give general safety instructions pertaining to the use of 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 this Users Guide. 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.

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 Field Controller or the Phase III Firing System in a Safe or non Armed condition does not mean that anything is SAFE.

- Electric matches should be handled, stored, and used with the same respect and precautions as one would religiously follow for electric blasting caps, and in fact, the electric match is the first initiating stage of a blasting cap.
- Electric matches are very sensitive devices and can ignite when subjected to friction, impact, and sufficient electrical energy. Some potential sources of electrical energy are static discharges (human, dust, snow, & electrical storms) and RF (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.
- Keep your electric matches stored in a sealed METAL container located remote from all other pyrotechnic material (the METAL of the container provides RF 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.
- The practice of pre-assembling shells should be avoided, especially in the case of shipping and transportation.
- 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.

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.

GENERAL OVERVIEW, THE FIELD CONTROLLER

The Field Controller controls the Phase III System. The Phase III system is built around the modular concept. Firing Modules form the basic building blocks of the 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 Users Guide for the System Network for description, layout, and operation of the System Network.

The Field Controller is a self powered, portable Unit. The Field Controller operates the Phase III System Network via connection to the 3 wire (shielded twisted pair) Main Interconnecting Cable. This Main Interconnecting Cable then goes to the System Network. The System Network contains Pyrodigital Output Devices (Firing Modules, PAMs, or other Pyrodigital devices) 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 output devices (Firing Modules, PAMs, or other Pyrodigital devices) have an electrical communications address. The address is selectable and must be unique for each output device. This address is what uniquely distinguishes each output device. Thus 2 way communications are possible between each and every output device and the Field Controller. The Field Controller, then, individually controls the operation of each Firing Circuit on every output device.

The Field Controller 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 Field Controller. This set of instructions is called the Data Table. The Field Controller has provisions for several user selectable Data Tables.

The Field Controller top panel is grouped into logical control areas. The 5 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 6^{th} Operating Mode, called the STOP MODE. The STOP MODE is selected whenever the Stop Key is depressed or when the Field Controller is first switched ON (by the main power switch).

Thus the Field Controller provides the means for the user to define the Firing Instructions (the Data Table(s)) and then execute (FIRE) those instructions.

PRACTICE AND INERT TESTING

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

WARNING - EXTREME DANGER

DO NOT OPERATE THE FIELD CONTROLLER OR THE PHASE III FIRING SYSTEM IN A LIVE FIRING ENVIRONMENT UNLESS YOU ARE COMPLETELY FAMILIAR WILL ALL OPERATING PROCEDURES AND WARNINGS IN THIS USERS GUIDE, PLUS THE USERS GUIDE FOR THE PYRODIGITAL PHASE III SYSTEM NETWORK, PLUS THE USERS GUIDE(S) FOR ANY OTHER PYRODIGITAL OUTPUT DEVICES THAT YOU ARE USING (other than standard Firing Modules which are covered in the Pyrodigital Phase III System Network Users Guide 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 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 Field Controller by operating the Field Controller by itself, with no external connections. Soon however, the user must connect at least 1 Firing Module (or other Pyrodigital Output Device) to the Field Controller. This will allow the user to gain familiarity with the many functions of the Field Controller that pertain to, or directly communicate to, the System Network. Many functions of the Field Controller may not be clearly understood without connection to the System Network.

Your System originally came with Test Lamps that are to be used as simulated electric matches so that you may practice Firing repeatedly without actually igniting any Pyrotechnic Material. Test Lamps are available from Pyrodigital Consultants, or 12 - 16 volt incandescent Lamps rated at approximately 75 ma may be used. Additional or replacement Test Lamps may be obtained from Pyrodigital Consultants.

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 1 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 this Users Guide PLUS the Users Guide for the System Network and the Users Guide(s) for any other Phase III Output Devices which are used.

You should create data tables (and download .sho files from a PC Computer and/or tape, if applicable with Computer Scripting Software) and PRACTICE all the procedures outlined in this Users Guide. Data tables (and/or .sho files) 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, Loading / Saving to Tape, and other procedures requiring external connections to the Field Controller 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 CALL PYRODIGITAL CONSULTANTS IMMEDIATELY FOR CLARIFICATION.

PYRODIGITAL CONSULTANTS IS AVAILABLE AT (USA) 810-375-9489.

CONTROLS IDENTIFICATION AND USAGE

1 MAIN POWER SWITCH - Toggle to ON to power up the unit. The LCD Display with backlighting is illuminated and power is provided to the momentary push button switch of the overhead light connector (47 & 48). The LCD Display will temporarily show "CHECKING SYSTEM EPROM" (for about 8 seconds) and then the opening menu (or top menu) will be shown on the LCD DISPLAY. Please refer to the BASIC OPERATION Section of this manual for information about the EPROM MEMORY CHECK.

After the 8 second EPROM MEMORY CHECK, the Field Controller exits to the STOP MODE, or the TOP MENU, which is also always available by depressing the STOP KEY (23) at any time.

The unit has internal lithium battery backed up memory of the data table(s) and operating software so power may be removed (MAIN POWER SWITCH OFF) without loss of any Data Table Memories.

2 KEY ARMING SWITCH - Insert the Safety Key and fully rotate (90 degrees) clockwise to apply power to the System Network. This is the ARMED Safety Key Position and the Safety Key cannot be removed. Fully rotate the Safety Key counterclockwise and remove the Safety Key from the KEY ARMING SWITCH to disable power to the System Network. There is a Safety Key Warning Interlock System which helps alert the user (via warning buzzers and instructions on the LCD DISPLAY) when applying or removing System Network power. SEE SECTION, SAFETY KEY WARNING SYSTEM.

WARNING - EXTREME DANGER

NEVER, 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 ONLY ARM OR DISARM THE SAFETY KEY WHEN INSTRUCTED TO DO SO BY THE LCD DISPLAY.

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

3 LED STATUS INDICATORS

Key On - RED LED illuminates whenever the KEY ARMING SWITCH is ON, indicating that power is applied to the System Network. If the Circuit Breaker (49) is tripped the Key On Red LED will be out even though the Key is Armed.

Short - RED LED fully illuminates when power is applied to the System Network (Safety Key ON) AND there is an electrical short in the System Network. A temporary flash when first powering up is normal. The Short LED may also flicker under Status Check with a very large System Network Connected. CHECK THE ACTIVE TEST LIGHTS (30) to help analyze if there is Shorting Problem. REFER TO THE ACTIVE TEST LIGHTS SECTION OF THIS USER'S GUIDE.

A continuous bright illumination of the Red Short LED indicates short(s) in the System Network. The Safety Key should immediately be turned off and the System Network fault should be found before proceeding. If the Circuit Breaker (49) is tripped the Red Short LED will be out even though the Key is Armed.

REFER TO THE TROUBLE SHOOTING SECTION of the SYSTEM NETWORK USER'S GUIDE, TROUBLE SHOOTING.

Hold Fire - Yellow / Orange LED - illuminates when DEADMAN BUTTON is NOT depressed on Remote "Pickle". FIRING COMMANDS WILL NOT BE ISSUED BY THE UNIT UNLESS THE DEADMAN BUTTON IS HELD DOWN. If the unit is instructed to Fire and the Deadman Switch is not depressed (as indicated by the illumination of the Yellow / Orange Hold Fire LED), the unit will "beep" but not Fire. The unit may or may not skip over to the next shot, depending on whether the attempted Fire was in a Manual Fire or Auto Fire mode.

CHARGING - Green LED illuminates when battery charger power is applied to the unit. The unit may be operated with the battery charger connected to charge the internal batteries and provide operating power simultaneously. This is a good practice, whenever possible. The battery charger may be left on indefinitely (to keep the internal batteries fully charged), as protection circuits prevent the battery from being overcharged.

The internal batteries are 2ea 12 volts DC Gel Cells in parallel with a separate power supply circuit that raises the voltage to 24 volts DC for the Phase III System Network.

The batteries should be charged for 24 hours at least once every 2 months to keep the batteries in peak condition. THE BATTERIES CANNOT BE OVERCHARGED AND DO NOT HAVE MEMORY PROBLEMS. The expected battery life is 2 - 3 years.

The charging input is 16 volts AC, 1 ¼ amps minimum or 24 volts DC (tip positive), 1 ¼ amps minimum. Replacement CORRECT Battery Chargers are available from Pyrodigital Consultants for any input line voltage / frequency Worldwide.

LOW BATT - Red LED illuminates when internal batteries are nearly discharged. A minimum of 2 hours normal operating time still remains if the batteries are in good shape. DO NOT OPERATE THE OVERHEAD LIGHT for maximum conservation of the battery power remaining. Charge the internal batteries ASAP (As Soon As Possible).

If the Field Controller "dies" shortly after the LOW BATT Light illuminates, then replacement batteries are needed. USE THE 12 VOLTS DC EXTERNAL BATTERY INPUT (37) TO OPERATE THE FIELD CONTROLLER WITH EXHAUSTED INTERNAL BATTERIES.

Ext Batt - Green LED illuminates when external power is applied to external power input terminals (37). EXTERNAL POWER INPUT IS A 12 VOLTS DC BATTERY WITH HIGH

INRUSH CURRENT CAPACITY SUCH AS A AUTOMOBILE BATTERY OR LARGE 12 VOLT DC GEL CELL. External input will NOT charge the internal batteries.

4 OPERATING MODES SELECTOR KEYS - Select an operating mode, and the corresponding green LED will illuminate.

Data Table - to manipulate the data table or other operating parameters; Editing (Edit), Loading (Load), Saving (Send), Scripting with Time Code (Create Table), Changing the Data Table memories (Select Table), or Changing the Operating Parameters (Setup); as directed by commands posted on the LCD DISPLAY. SEE SECTION, PASSWORD PROTECTION AND MEMORY SIZE.

Time Code - to Monitor time code for integrity (Pyrodigital, SMPTE, or MIDI Time Code) or to generate Pyrodigital Time Code for recording.

Check Status - Check electric match continuity status of the System Network; Manual, Semi-auto, Auto, or Print Report as directed by posted LCD commands

Manual Fire - Operation for Manual Firing; Direct Address Entry, step through the Data Table, Caliber Group Firing, Zipper Firing, & Timed Macro Firing.

Auto Fire - Internal or External Drive as selected by the LCD indicated choices; Internal drive uses the Internal Clock and External uses user input Pyrodigital Time Code, SMPTE Time Code or MIDI Time Code (30 fps ND, 30 fps DROP, 25 fps EBU, 24 fps Film) for true pyromusical synchronization. Also available is MSC (MIDI Show Control) Firing.

5 LCD DISPLAY - The Liquid Crystal Display, 2 lines by 40 Characters, with back lighting, which shows operation of the unit.

6 EVENT LINE INDICATORS FOR LCD DISPLAY - indicates the data fields of the Data Table (on the LCD Display, top line, directly below), in Edit or Fire Modes

7 UPPER EDIT FUNCTION KEYS

VIEW - used to view the data table in various sorted orders; Line #, Fire time, show time (event time), shot #, address, and caliber sorts.

LOC - used to locate particular items within the data table, by line #, shot #, time, PFT, address, or caliber.

PRINT - to print data table & table report, or report only; The data table is printed sorted according to how sorted in View.

UNDO ENTRY - to erase bad data incorrectly entered and restore the original data

QUICK ENTRY - Manual or Automatic. Manual to auto advance to the next line after a Data entry. Automatic fill for specialized Data Tables or automatic shot number sequencing. See DATA TABLE OPERATING MODE.

8 CALIBER GROUP SELECT KEYS - used in Manual Fire to select the next available shot (event) in one of 16 Caliber Groups (1 through 16) as the next shot (event) to be Fired. The Caliber Groups are defined in the data table as numbers 1 through 16 in the caliber data field. Also used in Auto Fire for HAZARD LOCKOUT.

9 CALIBER GROUP NOTE PAD AREA - Space provided for marking notes relating to what each 1 of 16 Caliber Groups is. Use ONLY a Special ERASABLE dry felt type marker or

add removable tape and write your notes on the tape. DO NOT USE PERMANENT MAGIC MARKERS, PENS, OR GREASE PENCILS.

10 CALIBER GROUP SHOTS REMAINING KEY - In Manual Fire, press to display (on the LCD DISPLAY) the number of events (shots) remaining in each of the 16 (1 through 16) Caliber Groups. Also shows Hazard Calibers which are Locked Out (Non Firing) in Auto Fire.
11 UP ARROW KEY - to move up through the data table in Edit; also used in manual Fire to move up through the data table
12 DOWN ARROW KEY - to move down through the data table in Edit; also used in manual Fire to move down through the data table
13 LEFT ARROW KEY - used to move left between the data fields in Edit (line number through caliber); also used in manual Fire for sequentially moving backwards through un-addressed potential Firings.
14 RIGHT ARROW KEY - used to move right between the data fields in Edit (line number through caliber); also used in manual Fire for sequentially moving forwards through un-addressed potential Firings.
15 DELETE (DEL) KEY - to delete a line of data in the data table (in Edit); data table must be arranged by default line number order
16 INSERT (INS) KEY - to insert a blank line for data (at the line shown) in the data table (in Edit); data table must be arranged by default line number order
17 HOME KEY - takes you to the top of the data table in both Edit and Manual Fire
18 END KEY - takes you to the end of the data table in Edit
19 GO TO ADDRESS KEY - to go to a particular address - used in Edit or in Manual Fire (Note: similar to Locate by address, except Locate only works in Edit)
20 GO TO SHOT KEY - used to locate a shot by entering the shot number in both Edit and Manual Fire (Note; similar to Locate by shot #, except Locate only works in Edit)
21 RETURN TO SEQUENTIAL KEY - to return to where you were in the data table, in Manual Fire, after you have used GO TO ADDRESS, GO TO SHOT, or GROUP CALIBER FIRING.
22 HEX KEYPAD ENTRY KEYS - used to enter data or to select function / operation as directed by the LCD DISPLAY
23 STOP KEY - Stop always clears the Operating Modes and brings you to the top opening menu, which is the STOP MODE.
24 ENTER KEY - Used is some operations to enter data
25 FIRE KEY - The master command button to FIRE the displayed shot or enable Firing in the Auto mode
26 AUTO FIRE / PAUSE, MANUAL FIRE / SKIP, KEY - skips over the displayed upcoming shot in manual Fire (to skip in auto Fire release the DEADMAN or temporarily switch key off). Stops time running in Auto Fire, Internal Drive. (press Fire to continue running time)
27 REFIRE KEY - press to refire the last shot (address as indicated by the LCD DISPLAY as LF [last Fired])
28 AUDIO MIXER INPUT LEVEL CONTROLS

Script Beep - used to control the relative level (volume) of the Script Beep Tone available at the Output Level Controls. The Script Beep Tone comes from the “Create Table” Option under the Data Table Operating Mode.

Aux Music (Auxiliary Music) - used to control the relative level (volume) of the Auxiliary Input available at the Output Level Controls. The Auxiliary Input can be any audio source, such as the Program Music.

Time Code - used to control the relative level (volume) of the Time Code Audio available at the Output Level Controls. The Time Code Audio is from the Time Code Input Jacks. This Control is provided so that the Time Code Audio Line may be monitored for audio integrity of the Line and verification of the incoming Time Code Signal.

29 AUDIO MIXER OUTPUT LEVEL CONTROLS

Aux Out (Auxiliary Output) - Controls the overall level (volume) of the mix (sum) of the three Inputs (Script Beep, Aux Music, and Time Code) as Output to the Aux (Auxiliary) Output jack on the rearward sloping panel of the unit. This is provided for an external amplification / audio monitor System.

Spkr - Phones (Speaker - Headphones) - Controls the overall level (volume) of the mix (sum) of the three Inputs (Script Beep, Aux Music, and Time Code) as Output to either the built in internal Speaker or the front panel headphone jack. Plugging in headphones disconnects the internal speaker.

30 ACTIVE TEST LIGHTS - Two GREEN LED'S with 3rd Center RED LED labeled as "2 A 3" (51) on rear connecting panel ("A" is center RED LED). GREEN LED's 2 & 3 indicate 24 volts DC Power to the System Network (Safety Key ON) on Cable lines 2 and 3. Flashing RED LED "A" indicates digital communications between line 2 & 3. USED TO VERIFY THAT THERE ARE NO SHORTS IN THE SYSTEM NETWORK. See ACTIVE TEST LIGHTS Section.

31 SMPTE INDICATOR - BLUE LED illuminates whenever valid SMPTE Time Code is being received at either Time Code input jack (40 / 41) WHENEVER the Field Controller is powered ON. Labeled as SMPTE on Top of Rear Connection Panel (52).

REAR PANEL IDENTIFICATION AND USAGE SECTION 3

32 PH III System - XLR 3 PIN FEMALE CONNECTOR - for connection to the Phase III System Network, Main Interconnecting Cable.

33 Remote - DEADMAN / FIRE "PICKLE" JACK - for connection of supplied hand held "Pickle", consisting of Thumb Operated Deadman Button and Remote Fire Trigger Switch. The Remote Fire Trigger Switch simply operates in parallel with the FIRE KEY (25) on the main Control Surface, as either one may be depressed by itself to issue a FIRE Command.

The Deadman Button MUST be held down for the Field Controller to issue Firing Commands to the System Network. To Fire in Manual Fire, the Deadman Button must be depressed first and held down, before the Fire Trigger is depressed.

NOTE: In an Emergency, if the Pickle is lost, Firing can be achieved by jumping pin 1 to pin 4 to temporarily bypass the Deadman Button.

34 MIDI In - MIDI (Musical Instrument Digital Interface) Standard input jack provided input for MIDI Time Code or MIDI Show Control (MSC) Commands.

35 MIDI Out - MIDI (Musical Instrument Digital Interface) Standard output jack for MIDI Echo Acknowledgment of executed MIDI Show Control (MSC) Command.

36 MIDI Thru - MIDI (Musical Instrument Digital Interface) Standard through jack. This jack directly passes the MIDI input signal (unprocessed) for daisy chaining MIDI Units.

37 EXT 12 VDC (+/- TERMINAL) - 12 VOLTS DC BACKUP BATTERY INPUT - for providing additional redundant power to operate the Field Controller. Use for extended operation of the Field Controller, especially for extended use of the Littlite Overhead Light, when internal batteries are weak or exhausted, or as backup power to internal batteries (battery charger input can also be used for these functions). The Field Controller will draw power from either the internal batteries (and Battery Charger, if used) or the external Power Input, depending on which is at the higher voltage.

EXTERNAL POWER INPUT IS A 12 VOLTS DC BATTERY WITH HIGH INRUSH CURRENT CAPACITY SUCH AS A AUTOMOBILE BATTERY OR LARGE 12 VOLT DC GEL CELL. A 12 VOLT WALL PACK (Standard Low Amperage) WILL NOT WORK. External input here will NOT charge the internal batteries.

38 LITTLITE OVERHEAD LIGHT - for overhead night illumination of the Field Controller; Remove Littlite from Storage Clamps (39) and plug into Littlite Socket (47). Depress Littlite ON Button (48) for illumination. Adjust Littlite flexible gooseneck for desired light coverage pattern.

39 LITTLITE STORAGE CLAMPS - for storage of Littlite when transporting Field Controller.

40 Tape In - TIME CODE (OR LOADING DATA TABLE) INPUT; RCA JACK - for inputting Time Code, Pyrodigital or SMPTE, at nominal -10db, unbalanced, high impedance (normal Japanese standard audio level). Automatic gain control can accept recommended -40db to -5db. Also for inputting data table under Data Table Operating Mode; Load; Tape modem, 1200 Baud (Also CONVENIENT FOR CROSS-LOADING DATA TABLES, INPUT HERE FROM ANOTHER FIELD CONTROLLER VIA RCA PATCH CABLE; Load; Tape modem 1200 Baud)

41 Line In - TIME CODE (OR LOADING DATA TABLE) INPUT; 600 OHM BALANCED XLR 3 PIN FEMALE CONNECTOR - Same as above RCA Jack, Time Code input RCA

Jack; only 600 ohm professional, transformer balanced, ISOLATED FROM GROUND (Pin 1 Lifted) line input; -20dbm to +8dbm. May also be used for 600 ohm unbalanced phone lines, Pins 2 & 3.

42 Tape Out - TIME CODE (OR SAVING DATA TABLE) OUTPUT; RCA JACK - FOR CONVENIENT CROSS-LOADING OF DATA TABLES TO ANOTHER FIELD CONTROLLER WITH A SIMPLE RCA PATCH CABLE, for outputting internally generated Pyrodigital Time Code (for recording to audio tape; used in Scripting / Choreography), or for output of Data Table (Data Table Operating Mode; Send) for recording to audio tape. Output level at -10db, unbalanced, for high impedance load (normal Japanese standard audio level).

43 Printer - A DB-25 pin female connector is provided for output to an IBM PC Compatible Printer. The Data Table(s) may be printed, as well as the electric match status information.

44 Com - COMPUTER CONNECTION - A DB-25 pin female connector is provided to connect directly to an Async Serial Com Port of an IBM PC Compatible Computer. The purpose is to download the Data Table directly into the Field Controller from the PC (via a DB-25 pin Male / Female cable).

45 Aux Out - An RCA Jack provided for the output of the AUX OUT Level (volume) Control on the rear connection panel of the Field Controller. The AUX OUT would connect to an external amplifier / Speaker for monitoring the audio output. Output level for high impedance, unbalanced load (normal Japanese standard audio level).

46 Aux In - An RCA Jack input for an external source, such as the Program Music, for monitoring, or Scripting / Choreography purposes. The level (volume) is controller by the AUX MUSIC volume control on the front panel of the Field Controller. Nominal -10db, unbalanced, high impedance (normal Japanese standard audio level).

47 Lamp - LITTLITE BNC CONNECTOR - Remove the Littlite from it's Storage Clamps and connect here. Bend the flexible gooseneck of the Littlite for optimum lighting.

48 Lamp Switch - A momentary toggle switch to activate the Littlite Overhead Light. The switch must be held ON. DO NOT OPERATE THE LITTLITE EXCESSIVELY BECAUSE IT DRAWS MUCH POWER (more than a few hours Total Littlite ON time would be considered excessive). This is the reason the switch is momentary (so you won't inadvertently leave the Overhead light ON and exhaust the internal batteries). Use the Battery Charger or 12 volts dc external power input if you need to run the Littlite continuously.

49 CIRCUIT BREAKER - Protects 24 volts DC Power Supply inside Field Controller from Shorts in System Network (Shorted Cables, Splitters, Firing Modules, or other Phase III Output Devices). Push to Reset (after short cool down period). Key On and Short LED indicators will be extinguished if Circuit Breaker is Tripped (and Safety Key is Armed).

50 SPARE KEY - Easily removed with standard screwdriver

51 2 A 3 - LABELING FOR ACTIVE TEST LIGHTS - 2, A, or 3 corresponds to Left Green LED (# 2; for line 2), Center Red LED (# A; for Activity), Right Green LED (# 3; for line 3) near labeling on top of front panel. SEE ACTIVE TEST LIGHTS

52 SMPTE - LABELING FOR SMPTE INDICATOR LED - SMPTE corresponds to BLUE SMPTE LED near labeling; top of front panel

53 16 VAC 1.2 A - BATTERY CHARGER INPUT - Input jack for supplied Battery Charger Transformer Wall Pack to Charge the internal gel cell batteries of the Field Controller. The internal batteries are protected from overcharging and the Battery Charger Transformer Wall

Pack may be left ON indefinitely to keep the internal batteries at full charge. The Battery Charger Transformer Wall Pack may also be used to simultaneously power the Field Controller and Charge the internal batteries.

The batteries should be charged for 24 hours at least once every 2 months to keep the batteries in peak condition. THE BATTERIES CANNOT BE OVERCHARGED AND DO NOT HAVE MEMORY PROBLEMS. The expected battery life is 2 - 3 years.

The charging input is 16 volts AC, 1 ¼ amps minimum or 24 volts DC (tip positive), 1 ¼ amps minimum. Replacement CORRECT Battery Chargers are available from Pyrodigital Consultants for any input line voltage / frequency Worldwide.

54 SERIAL NUMBER PLATE - Model Number, Serial Number, and Month / Year of Manufacture.

SAFETY KEY WARNING SYSTEM SECTION 4

INTRODUCTION

The Pyrodigital Field Controller is equipped with audible Warning Buzzers and appropriate LCD Displays pertaining to ARMING and turning OFF the Safety Key. Turning ON the Safety Key constitutes ARMING the System Network by applying 24 Volts DC Power to the System Network. This 24 Volts DC Power is applied through the XLR Female 3 pin connector to the Main Interconnecting Cable and on to the System Network composed of Firing Modules, PAM's, and/or other Pyrodigital Output Devices.

The purpose of the Safety Key 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. Arming the Safety Key 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 Safety Key Warning System operates is two distinctly different modes;

I When the Safety Key is to be turned ON, or ARMED, and then following when the Safety Key is ARMED.

II When the Safety Key is to be turned OFF, removed from the lock, and secured.

These two conditions will be covered separately as follows;

I - ARMING THE SAFETY KEY

Power is required to the System Network for the three Operating Modes: Check Status, Manual Fire, and Auto Fire. When the user selects any of these three Operating Modes, an audible Warning Buzzer begins sounding and the LCD Display shows a Warning Message. The Warnings continue until the user aborts any of these three Operating Modes or the user proceeds and Arms the Safety Key.

Aborting the Warnings would consist of selecting an Operating Mode which does not require power to be applied to the System Network. These are the Time Code and Data Table Operating Modes, as well as the STOP Mode.

The Stop Mode is activated by depressing STOP. The Stop Mode is also the same condition as when the Field Controller is first turned ON, before any Operating Mode has been selected. The STOP Mode is indicated by; 1) the LCD Display shows the top Opening Menu, and 2) NONE of the Green Operating Mode LED's are illuminated (indicating that NO Operating Mode has been selected).

When an Operating Mode is selected that requires power to the System Network (Check Status, Manual Fire, Auto Fire), the LCD Display indicates;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ CLEAR FIRING SITE OF PERSONNEL ³
³ IF SAFE..., POWER UP – ARM KEY ³
```

WARNING - EXTREME DANGER

NEVER, 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 LCD DISPLAY.

The Main Warning Buzzer also continues to “beep”, until the user performs another action.

If the user does not abort, as indicated previously, AND IT IS SAFE TO PROCEED, the user may ARM the Safety Key.

When the user ARMS the Safety Key, the first buzzer stops and a secondary buzzer emits 2 loud beeps. The LCD Display, or simply LCD, changes to a screen appropriate for the Operating Mode selected. These screens are covered is subsequent sections of this users guide.

II - TURNING OFF THE SAFETY KEY

A Warning buzzer is provided to alert the user to turn OFF the Safety Key, and remove it from the lock. This occurs when an Operating Mode is selected which does not require power to the System Network. The selection of the requested un-powered Operating Mode may be made by the user, or automatically selected by the Field Controller. The Operating Modes, for which no power to the System Network is required, are; 1) the Time Code Operating Mode, 2) the Data Table Operating Mode, and 3) the STOP Mode.

The Field Controller will automatically select the STOP Mode from the Auto Fire Mode when the end of the Data Table is reached.

If the Safety Key is ARMED, and, the Time Code Operating Mode, the Data Table Operating Mode, or the Stop Mode is selected; then the Field Controller Warns the user to turn OFF the Safety Key. The Warnings consist of 1) one loud, long "audible "beep" followed by a continuous audible "beeping" sound (of the secondary Warning Buzzer) and 2) a message on the LCD.

The LCD shows the following message;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³          TURN KEY OFF, AND                ³
³         REMOVE FROM LOCK !                ³
```

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 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 Key removes all Firing Voltages from the System Network.

The audible beep Warning and the LCD Warning message continues indefinitely until the user turns OFF the Safety Key or the internal batteries become exhausted.

OPERATIONAL NOTES

IF THE SAFETY KEY IS ARMED AND THE LCD DISPLAY WITH 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). Since the Safety Key is already ARMED, only the secondary buzzer will Warn with it's two "beeps", indicating that power is present to the System Network.

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 3 powered Operating Modes without incurring any additional Warnings by the Safety Key Warning System (the Safety Key is already ARMED). This allows the user to, for example, to proceed directly from Check Status to one of the Fire Modes (and visa versa) without having to Re-ARM the Safety Key.

Thus the Safety 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 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 Key Warning System cannot, in any way, insure 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.

BASIC OPERATION OVERVIEW SECTION 5

5-□ FIELD CONTROLLER USERS GUIDE

INTRODUCTION

The Basic Operation of the Field Controller is;

1) Turn the Main Power Switch ON.
2) Wait until the message "CHECKING SYSTEM EPROM" disappears
3) SELECT AN OPERATING MODE

Which Operating Mode you select and then what to do is what this User's Guide describes. To IMMEDIATELY be able to FIRE, SEE BASIC MANUAL FIRE - Example; which follows in a few pages within this Section of this User's Guide.

SYSTEM FIRMWARE EPROM MEMORY CHECK

Whenever the Field Controller is turned ON via the main Power Switch, the Operating System Software EPROM (Erasable Programmable Read Only Memory) is checked for integrity. This is a diagnostic check to be sure that the System Operating Instructions have not been corrupted. This is done by computing a CRC Checksum of the Operating System Memory Contents, storing the computed Checksum in memory, and comparing this against the correct Checksum, which is a permanent record in the EPROM Memory. This check takes a few moments and the LCD Displays the screen below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ CHECKING SYSTEM EPROM                    ³
³                                          ³
```

If the CRC Checksums agree, the Field Controller Initializes itself, all 5 Operating Mode LED's Flash, a beep tone is emitted, and the Opening, or Top Menu (Stop Operating Mode) is Displayed, as shown below.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³   PHIII Pyromusical Field Controller     ³
³ V3.00M ©1996 Pyrodigital Consultants   ³
```

THIS IS THE STOP OPERATING MODE, OR TOP, OPENING MENU. THE LOWER LEFT CORNER OF THE LCD SHOWS THE OPERATING SYSTEM SOFTWARE (EPROM) VERSION NUMBER, V3.00M

SYSTEM FIRMWARE EPROM MEMORY FAILURE

Normally, the EPROM Memory Chip should work flawlessly for many years. The System EPROM Memory Check is provided as a diagnostic tool for additional assurance that the Operating System of the Field Controller will function as expected.

If the EPROM 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 LCD Display. If the EPROM Memory has completely or partially failed, an error message may or may not be issued, depending on how much of the Operating System is intact. IN EITHER CASE, THE FIELD CONTROLLER HAS BECOME NON OPERATIONAL AND NO ATTEMPTS SHOULD BE MADE TO USE THE FIELD CONTROLLER OR FURTHER BYPASS THE CORRUPTED OPERATING SYSTEM. Immediately discontinue use of the Field Controller and ship to Pyrodigital Consultants for repair. Switch to the backup Field Controller, if available.

BYPASS OF SYSTEM FIRMWARE EPROM MEMORY CHECK

The System EPROM Check takes a certain amount of time to complete before the Field Controller is ready to be operated. For those conditions requiring immediate use of the Field Controller the instant the machine is turned ON, a bypass is provided to immediately go to the Top Opening Menu.

The EPROM Memory Check can be bypassed by depressing ANY KEY on the Field Controller during the “CHECKING SYSTEM EPROM” message on the LCD.

If the System EPROM Check is bypassed, the CRC Checksum calculated the last time the Field Controller was powered on is quickly compared to the permanent record of the correct CRC checksum. This gives a superficial check that the EPROM Memory Chip is still functional. The Field Controller then immediately initializes to the Top Opening Menu, ready to be used.

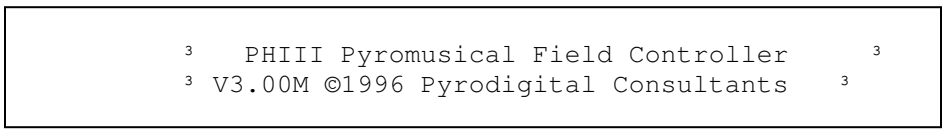
TO INSURE THAT THE EPROM SYSTEM MEMORY IS PROPERLY CHECKED, IT IS RECOMMENDED THAT YOU DO NOT NORMALLY BYPASS THIS CHECK. The bypass is only provided for emergency expedient operation of the Field Controller.

STOP MODE, or STOP Operating Mode;

Whenever the STOP Key is depressed (Safety Key OFF), or after the initial Power On, CHECKING SYSTEM EPROM, the Field Controller is in the STOP MODE, or STOP Operating Mode. This is also the TOP MENU, or the OPENING MENU. The LCD Display will be as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



THIS IS THE STOP MODE, or the TOP OPENING MENU:

The STOP MODE is indicated by the presence of the above LCD Display and the absence of illumination of the Green LED indicators above the 5 Operating Mode selector Keys. If none of the 5 Operating Modes are selected, as indicated by 1 of the 5 Green LEDs above each respective Operating Mode Selector Key, then the Field Controller is in the STOP MODE. The Stop Mode also always shows the Top Menu, or Opening Menu, as shown above.

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, or STOPPED. If the Safety Key has been previously Armed, then 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 LCD will then display the top, or opening, menu. 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.

WARNING - CAUTION

DEPRESSING STOP WILL CLEAR AND RESET ALL LOCATORS (Internal Pointers and Asterisks; *) OF LAST SHOT FIRED

OPERATING MODES, BASIC

From the Stop Mode an OPERATING MODE must be selected. There are 5 (five) possible Operating Modes, in addition to the Stop Mode, or Stop Operating Mode (the Stop NON-Operating Mode).

When one of the 5 Operating Modes is selected, by depressing the corresponding key, the associated Green LED above that Operating Mode key will illuminate. Switching between Operating Modes directly (without depressing Stop) is always possible, being a fast and recommended procedure.

The 5 Operating Modes are;

- DATA TABLE
- TIME CODE
- CHECK STATUS
- MANUAL FIRE
- AUTO FIRE

When Check Status, Manual Fire, or Auto Fire is selected, the Safety Key Warning System will Warn the user, IF SAFE TO PROCEED, to ARM the Safety Key. Please refer to the SAFETY KEY WARNING SYSTEM Section of this Guide.

The LCD will show a menu appropriate to the Operating Mode selected. In the case of Check Status, Manual Fire, or Auto Fire, the menu will appear after the Safety Key is Armed.

Purposes of the Operating Modes

DATA TABLE - This is where the INSTRUCTIONS for FIRING are Created, Edited, Loaded, Saved, and Stored.

TIME CODE - For Checking the INTEGRITY of the Time Code Links used for Pyromusical Synchronization and Automated Firing

CHECK STATUS - For Checking the ELECTRIC MATCH CONNECTIONS to the System Network

MANUAL FIRE - Direct User Control of Firing Sequences

AUTO FIRE - Automated Control of Firing Sequences under User Supervision.

For FIRING, the Field Controller MUST be thought of and OPERATED as having many Firing Modes WITHIN BOTH AUTO FIRE AND MANUAL FIRE.
In MANUAL FIRE There are many possible Modes and Sub Modes of Firing;

Without a Data Table (Basic Manual Fire)

1) Direct Addressing
2) Sequential Step Firing

With a Data Table;

1) Manual Fire - by sequence(s) of Events

a) Single Event Fire
b) Zipper Fire (Simultaneous Events)
c) Timed Macro Fire (Time Automated Events)
d) Overide Direct Addressing

2) GRC, Group Caliber Fire - by "shots"

a) Single Event Fire
b) Zipper Fire (Simultaneous Events)
c) Timed Macro Fire (Time Automated Events)

In AUTO FIRE there are 3 Modes of Firing;

1) Time Code Operation; Pyrodigital, SMPTE, & MIDI (with HAZARD LOCKOUT)
   a) with overide direct addressing
2) Internal Clock Operation w/ Pause & any Event Start (with HAZARD LOCKOUT)
3) Optional MIDI Show Control

At this point in this User's Guide, the user is not expected to understand all of the above Types of Firing Modes. Each of these Firing Modes are fully explained in each of the OPERATING MODES in the Subsequent Sections of this USER'S GUIDE.

BASIC MANUAL FIRE - by Example

Select the Manual Fire 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;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³            NO TABLE !                    ³
³ DIRECT                          MF000    ³
```

The only option for Firing with no Data Table is direct manual Firing by specifying addresses. Notice “MF000” Displayed with a cursor underline under the first zero. The letters “MF” indicate Manual fire Address. MF = Manual Fire address, always, regardless of operating mode or data table availability. A 3 character hex address must now be entered to specify a starting point from which Firing is to proceed.

Depress 100, from the hex keypad, one character at a time. The LCD top Line posts “NO MATCHING EVENT THIS ADDRESS !” because there is no matching event in the Data Table (there is no Data Table). Notice “DIRECT” on the LCD which indicates that this is a direct Fire Address. MF displays 100, your entered address. The underline cursor is now to the right of the last zero in your entered address, 100 .

Press FIRE (assuming you are in an INERT TEST ENVIRONMENT AND IT IS SAFE TO DO SO). You get a beep and nothing happens. Now DEPRESS AND HOLD THE DEADMAN BUTTON and press Fire again. The LCD now additionally shows “LF100”, which indicates that the last fired address was 100. “MF”, or the next address to be Manually Fired, when you depress Fire, is shown as address 101 . FIRE will now Fire at 101. The unit has advanced sequentially to the next logical hexadecimal address because there is no Data Table to tell the unit where to go.

The LCD should now show as;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ NO MATCHING EVENT THIS ADDRESS !          ³
³ DIRECT                    LF100 MF101     ³
```

Notice that the LEFT / RIGHT ARROW keys may be used to increment / decrement the next address to be Fired as displayed by MF. Also direct keyboard entry of a new address to Fire is also possible. Only addresses between 000 and 7FF are permitted. The underline cursor and “beeper” will help guide you to enter the desired direct address. Practice entering addresses, from the hex keypad (to be Manually Fired), to understand how the beeping and cursor underline assist the user in correct and complete entry of the address.

AUTO FIRE WITH NO DATA TABLE OR TIME EVENTS

Select the AUTO FIRE Operating Mode. Notice that “NO TABLE” is displayed temporarily on the LCD and the unit exits to the opening menu, the STOP MODE. It is not possible to Fire in AUTO FIRE without a Data Table (to tell the unit what to do).

For quick operation under BASIC MANUAL FIRE, a Data Table can be created that contains no entries in any of the Time Fields, because these are not needed. If the User attempts to AUTO FIRE such a Data Table, there is no Time information for any of the Auto Fire functions to operate with. In such case, the message "NO TABLE" is not posted because there is some kind of Data Table. However, once a selection of the time code type has been made, the Field Controller attempts to internally sort the Data Table into the correct Firing Order by Time. Since there is no Firing Order by Time, there is no operation possible with Auto Fire. The LCD becomes temporarily almost blank, because there are no Events to be Displayed, and only part of the normal Auto Fire LCD Display is presented, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

After about 5 seconds, this screen exits to the STOP Operating Mode, the Field Controller starts beeping for you to turn OFF the key, and the LCD Display posts the message to Turn OFF the key. Pressing FIRE at the above LCD Display does nothing.

ACTIVE TEST LIGHTS SECTION 6

NOTE: The LED Indicator Lights and Circuitry from the original Active Test Box are NOW BUILT INTO FIELD CONTROLLERS AS STANDARD EQUIPMENT; starting with FC-1 Serial # 0092.

Additionally a separate, external, Active Test Box (with the same Active Test Lights & Circuitry, including circuit breaker protection), is available as an additional DIAGNOSTIC TOOL to test for Shorts at the ends of Cables or Firing Modules.

The separate, external Active Test Box, is STRONGLY recommended to be used with early Field Controllers not equipped with either the Active Test Lights or Circuit Breaker protection.

WHAT ARE THE "ACTIVE TEST LIGHTS"

The "Active Test Lights" consist of 4 LED (Light Emitting Diodes) on the control surface of the Field Controller, just above the LCD Display. There is a cluster of 3 LED's (2 Green with a center Red), plus a Blue LED on the right. Labeling is printed at the top of the rear connector surface as "2 A 3 SMPTE".

"2" is for the left, Green LED (Line # 2)
"A" is for the center Red LED (A is for Activity)
"3" is for the right, Green LED (Line # 3)
"SMPTE" is for the rightmost, Blue LED.

Additionally a Circuit Breaker has been added just above the Phase III System Network Connector to protect the power supply from Cable Shorts (top right corner of the rear connector panel).

WHAT DO THE ACTIVE TEST LIGHTS SHOW?

1) No SHORTS in Cables or Components
2) Valid SMPTE Time Code being received

HOW DO YOU USE THE ACTIVE TEST LIGHTS?

VERY SIMPLE! Any time the Key is ARMED the 2 Green LED's should illuminate. Also the center Red LED should continuously flicker during Status Check or briefly flicker when the Field Controller Fires.

IF THE GREEN LED'S DO NOT ILLUMINATE, IMMEDIATELY TURN OFF THE ARMING KEY AND CORRECT THE PROBLEM BEFORE PROCEEDING. THE RED CENTER LED SHOULD ONLY FLICKER DURING STATUS CHECK OR WHEN FIRING

(The Blue SMPTE LED ONLY illuminates for valid SMPTE input)

SHORTS IN CABLES / FIRING MODULES / SPLITTER BOXES

If both Green LED's do NOT illuminate, determine whether the problem is in the Field Controller or the System Network as follows;

1) Disconnect System Network Cable from the Field Controller. Reset Circuit Breaker (if necessary), Select Check Status Operating Mode, Arm Key, Select Manual Check (option zero)

    a) If both Green LED's now illuminate and Red LED Flickers, this indicates a Short Circuit in Cables, Splitter Boxes, or Firing Modules.
    b) No Green LED's, the Field Controller is at Fault and must be repaired

FINDING THE SHORTS

Finding a shorted cable(s) or component(s) is a simple matter of logically isolating the fault by a progression of disconnecting (unplugging) the System Network at various points, STARTING FROM THE FIELD CONTROLLER and re-Arming the Field Controller to check for illumination of the Test Lights.

OBSERVE which LED(s) do not illuminate. This indicates which lines are shorted. See THEORY OF OPERATION.

1) ABSOLUTELY SHUNT ALL FIRING MODULES.
2) Reconnect the Main Cable to the Field Controller. Unplug the Main Cable, just before the first Splitter or Firing Module.
3) Select Check Status, BRIEFLY AND ONLY FOR A VERY SHORT PERIOD OF TIME, ARM the Field Controller, select Option Zero, Manual Status and observe for all 3 LED's on the Active test Box. IF all OK, proceed. DO NOT CONTINUE TO APPLY POWER (LEAVE THE KEY ON) IF SHORTS ARE INDICATED (non illumination of Active Test Lights). Re-check to be sure the Circuit Breaker has not been tripped.

If no or partial LED's, the Main Cable is Shorted; Replace/Repair

4) Individually test each of the branch lines by plugging them one at a time directly into the Main Cable and repeating procedure 3). You are using the Active Test Lights to find which branch cable path has a short. If all branch cables check OK, then splitter is shorted. Verify by testing with splitter only at end of Main Cable.
5) Continue down the bad branch line(s) to the next Splitter Box to isolate which sub branch(s) is shorted, similar to method 4) above. Be aware that the short could be in a Firing Module at the end of a Cable or in Splitter Box. Replace / Repair fault components and re-test.

ABSOLUTELY REPAIR / REMOVE SHORTED CABLES / COMPONENTS BEFORE PROCEEDING WITH A LIVE STATUS CHECK.

THEORY OF OPERATION

The Test Lights are called “Active” because they continuously Verify that the Phase III System has no Cable or Component Shorts and is operating with the correct voltages, while the System is actually Operating and Firing. (Additionally the circuitry also provides “Active” Continuous Circuit Breaker Protection for the Field Controller Power Supply).

The Phase III System functions via 24 volts dc power and digital communications on the 3 wire System Network. Pin 1 (or line 1) is the System Ground, which is the Cable shield wire. Pin 2 (line 2) and Pin 3 (line 3) carry the +24 volts dc Power with digital communications as a differential voltage between these 2 lines (digital ones are carried with line 2 low and line 3 high, digital zeros are carried with line 2 high and line 3 low, with +24vdc always available on the “high” line).

The Active Test Lights are equipped with zener diodes and special circuitry which only illuminate the corresponding LED indicators at or above very specific operating voltages. The Active Test Lights indicate the presence of 3 voltages;

2, GREEN LED; +24vdc on line 2 (ref to line 1, System Ground)

RED CENTER LED; +/-24vdc line 2 ref to line 3 (digital communications)

3, GREEN LED; +24vdc on line 3 (ref to line 1, System Ground)

Thus the Line 2 Green LED verifies that there are no shorts between Cable Lines #2 and #1. The Line 3 Green LED verifies that there are no shorts between Cable Lines #3 and #1. The Red LED verifies that Cable Lines #2 and #3 are not shorted together

Part of the circuitry also provides circuit breaker protection directly to the Power Supply. If the circuit breaker is tripped, none of the 3 LED’s will illuminate.

OTHER CONDITIONS - THAT MAY CAUSE ERRONEOUS TEST INDICATIONS

I) EXTREMELY LONG CABLE RUNS WITH SHORTS AT EXTREME END(S) OR HIGH RESISTANCE SHORTS - If there is a short far away from the location of the Field Controller, or a partial short (high resistance short), then the GREEN LED’s (and even the RED LED) may still illuminate, indicating all OK. This short could cause improper digital communications or non-Firing of a circuit, even though the LED’s do not indicate a problem. This can occur because the voltage drop is insufficient to cause the Active Test Lights to see the short.

II) OPEN LINES - Consider that the Active Test Lights will show all OK with NO System Network Connected. Thus the Active Test Lights cannot indicate if any (or all 3) lines are open.

The use of the ACTIVE TEST BOX (an optional accessory, not to be confused with the Active Test Lights), which can be located at any point within the System Network, provides an additional DIAGNOSTIC TOOL. The Active Test Box can be used to test at the end of long cable runs or at isolated single Firing Modules, as an “add on” extension cable, “termination”

device. This will test to be sure that proper voltages exist from the Field Controller at the point of test. The Active Test Box is identical to the Active Test Lights, excepting that it may be placed anywhere within the System Network.

SMPTE, BLUE LED; Valid SMPTE Time Code being received

The BLUE SMPTE will ONLY illuminate for valid SMPTE Time Code. Use the Time Code Operating Mode, SMPTE Monitor function. If the Blue LED does not come on, then good, clean SMPTE Time Code Audio is NOT being received by the Field Controller. Check the input connections, audio lines, and the Source.

The BLUE SMPTE will Illuminate AT ANY TIME WHEN SMPTE IS BEING RECEIVED WHENEVER THE FIELD CONTROLLER IS POWERED ON, REGARDLESS OF THE OPERATING MODE. NOTE THAT THIS INDICATOR DOES NOT WORK FOR MIDI TIME CODE (MTC).

The SMPTE LED is illuminated directly by a separate SMPTE PC Board and indicates that the SMPTE PC Board is receiving valid SMPTE Time Code. The valid SMPTE Time Code is then send to the main processor Board of the Field Controller. The Blue SMPTE LED MUST ILLUMINATE FIRST (indicating SMPTE at this PC Board) before any signal is passed on to the Field Controller. Since the SMPTE PC Board is independent, the Blue LED will illuminate upon the presence of SMPTE, regardless of the Operating Mode selected.

DATA TABLE OPERATING MODE SECTION 7

Select the DATA TABLE Operating Mode. The LCD Shows 6 Options;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ PRESS:0=EDIT, 1=LOAD, 2=SEND          ³
³ 3=CREATE TABLE, 4=SELECT TABLE, 5=SETUP ³
```

Select one of the 6 Options by depressing the appropriate key on the hex keypad.

NOTE: SEE PASSWORD PROTECTION AND MEMORY SIZE, SECTION 8, if applicable (if you are locked out by Password).

EDIT, Option 0

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

Edit is for Editing of the Data Table. The Data Table is the set of instructions which tell the Field Controller how to Fire. Edit is the most complicated function available on the Field Controller. This is because there are many keys available to do many functions.

Select edit (option 0 on hex keypad) from the Data Table Operating Mode. The LCD shows the first line of the Data Table on the top line of the LCD. The second, or bottom line, of the LCD shows a command line for editing the Data Table. Exactly what you see on the first line of the LCD will be a function of the contents, or instructions, of the Data Table. For an empty, or blank, Data Table (NO TABLE !), the LCD is shown as;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³    0    0 00:00:00:00    0  000  0       ³
³ New SEQUENCE number:                      ³
```

The Data Table is arranged as a series of complete lines. The previous LCD Display shown one complete horizontal line (the top line). Each complete horizontal line constitutes one pyrotechnic EVENT. For each EVENT, or each line, there are separate DATA FIELDS within that line.

Data Fields

Notice that directly above the LCD Display there are written permanent abbreviations relating to the DATA FIELDS on the LCD first line directly below. The DATA FIELDS are;

- LINE - This is a 4 digit Field that specifies the Line Number of each complete horizontal EVENT Line (up to 4 digits maximum). The Line Number, or as shown on the LCD as the SEQUENCE number, is a fixed, unchangeable number which is simply a counter of the number of lines down from the first line of the Data Table. Restating; the Data Table can have many Event Lines. Each Event Line (each complete horizontal line) is arranged in a vertical table which makes up the Data Table. Each Event Line has a Line Number, or SEQUENCE number. The Sequence number defines the position of the Event Line within the Data Table. Sequence number 4 (or line number 4) would be the 5th line down (remember 0 is a valid number) from the top of the Data Table, or from the first line of the Data Table. This line number (or sequence number) is used to quickly locate a specific Event Line, by simply entering the line number. Remember that it is an internally assigned number that corresponds to the position of that event line within the memory stack of the data table.
- SHOT - This is the user defined Shot Number, up to 4 digits long. This relates the entire EVENT Line to a specific Shot number. Remember an EVENT Line is one complete horizontal line which defines one Pyrotechnic EVENT.
- TIME - This is the TIME that the EVENT is to actually occur. This is NOT necessarily the time the Event is to be Fired (Fire Time = (Event) TIME minus PFD (pre-fire delay)). TIME is in SMPTE time (Society of Motion Pictures and Television Engineers). SMPTE time is in 24hours, minutes, second, and frames; written as hh:mm:ss:ff, where hh is hours from 00 to 24, mm is minutes from 00 to 59, ss is seconds from 00 to 59, and ff is frames from 00 to 29. Frames are normally 1/30 of 1 second, or 30 frames per second (30 fps), Non Drop format. SMPTE can also be in 29.97 fps Drop Frame Format (which is 30 frames per second with some frames dropped every so often), 25 frames per second (EBU European Format), or 24 frames per second for film. For 25 or 24 frame, correspondingly frame numbers higher than 24 or 23 are not used (frames 0 to 24 for 25 fps, frames 0 to 23 for 24 fps)

From VER250 Scripting Software, the input of Pyrodigital 1/10 second Time Code is automatically converted into 30 fps ND SMPTE format, with each 1/10 of 1 second equivalent to 3 frames. The Field Controller also automatically converts the incoming data from LOAD (with the time specified in 1/10 seconds format) to this 30 frame SMPTE format.]

SMPTE exact frames may also be Loaded from other Scripting Software, through direct Cross-Loading from another Field Controller, or Loaded from tape.

- PFD - Pre Fire Delay, or PFT; Pre Fire Time, is specified in 1/10's of 1 second, from 0 to 99 (up to 2 digits). This is the time required, for example, from when an aerial shell is Fired to when it actually bursts in the air. Thus a 12" aerial shell might have a PFD of 70 (70 1/10's = 7.0 seconds). PFD, or PFT, is the amount of time from which a Firing Command will be issued prior to the Event Time (TIME). Firing Time = TIME - PFD.
- ADDR - ADDRESS; This is the 3 hexadecimal character Firing Address of the Phase III Firing System, from 000 to 7FF. Each Event must have, at minimum, an address, if the Field Controller is to issue a Firing Command to the System Network (the output devices to which the electric matches are connected). The address always consists of exactly 3 hex characters, from 000 through to 7FF. See the SYSTEM NETWORK USERS GUIDE for an explanation of the hexadecimal numbering system and the ADDRESS as used in the Phase III System.
- CAL - CALIBER; This is a 2 digit, optional, user defined, Field. The CALIBER is used to relate specific pyrotechnic devices to an associated Caliber number. As an example; 3 could be for 3" shells, 4 for 4", 30 for Class C candles, 63 for xyz flash pots, etc.. Caliber numbers are most useful for sorting and/or printing lists of the Data Table sorted by caliber. Caliber can be used with Caliber Group Firing for Caliber numbers 1 through 16. Caliber Numbers are also used for Hazard Zone Lockout in Auto Fire.

Command Line

In the Data Table Operating Mode, Option 0, EDIT, the second line of the LCD is called the COMMAND LINE. When first entering EDIT, the LCD shows "New SEQUENCE number:" with the cursor blinking for an entry over the underlining. Depress the RIGHT ARROW key once. Now the LCD shows; "new SHOT NUMBER:", depress RIGHT ARROW again, "New TIME:", again "New PREFIRE time ?:, again, "New ADDRESS ?:", again "New CALIBER SIZE?:" Use the RIGHT ARROW to shuttle back the other direction to previous commands. Thus the Right and Left Arrow keys are now used to display different commands pertaining to EDIT.

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 Event Line.

Exception; SEQUENCE number: the sequence number, or line number, always locates to that Event Line when you depress Enter. The sequence number is an internal number of the position, relative to the top line of the Data Table, of the location of that Event Line. The sequence number cannot be changed and entering a number for the sequence ALWAYS locates that entered Event Line. It is always possible to locate an Event Line beyond the end of the the Data Table. In this case the Data Fields will all be zeros (except, of course, for the sequence number of the event line which you have located).

TIME must be entered in the SMPTE format. Enter the frame number, depress Enter, enter the seconds, depress enter, enter the hours, depress enter, enter the hours, and finally depress enter.

The final depression of Enter will then insert the Time into the Time Data Field of the Event Line. If you make a mistake the entire entry may be rejected and you will have to re-enter the data starting with the frame number. You can enter only one 0 (zero) for each portion of the Time Field which is zero and then depress ENTER. This will automatically enter a double zero value for that portion of the Time Field.

For LINE NUMBER, SHOT NUMBER, PFD, and ADDRESS; you only need to enter the actual number desired and then depress ENTER.

PFD need only be entered if the pyrotechnic device needs to be Fired before the Event Time. PFD is always assumed as zero unless a non zero value is entered.

ADDRESS must be the full 3 hex character address from 000 to 7FF.

If you enter an UNACCEPTABLE VALUE then the Field Controller will "beep" at you, erase your entered data, and you can re-enter the correct data.

If you make a MISTAKE depress the UNDO ENTRY key, before depressing the Enter key. Your entry will be erased and you can re-enter the correct data.

THE ONLY DATA ACTUALLY NEEDED TO FIRE IS THE ADDRESS (when Firing with a Data Table; see BASIC MANUAL FIRE; NO TABLE !). In order to AUTO FIRE you must additionally have TIME specified. PFD is an enhancement to the Event TIME and is only used when Auto Firing with Time Code (for Pyromusical Synchronization), or with the Internal Clock. SHOT number and CALiber are user defined and not required for any Firing Function, however they are extremely useful for organization, loading, and assistance in Firing the Pyrotechnic Devices. As Mentioned previously, CALiber can also be used for Caliber Group Firing and Hazard Lockout in Auto Fire.

The amount of information in the Data Table will thus be determined by the length and complexity of the Pyrotechnic Firings required.

Moving to Different Event Lines

Moving from the currently LCD Displayed EVENT LINE TO ANOTHER EVENT LINE can be accomplished by in many different ways. Some ways are faster or easier than others, depending on where you want to move to within the Data Table.

- Use the UP ARROW or DOWN ARROW to move up or down within the Data Table, one Event line per depression.
- Use the HOME key to move to the top Event line of the Data Table; sequence, or line number zero.
- Use the END key to move to the last Event Line in the Data Table. The last Event line is the last line which contains any non zero information in any of the Data Fields (excluding the sequence number).
- Use the SEQUENCE Number, or LINE Number, to locate an Event Line within the Data Table (enter a sequence number when the command line shows "New SEQUENCE Number:"). You can use this as a approximate quick locator, for example by advancing plus 100 lines from the current sequence number (by adding 100 lines to the current sequence number and entering this new sequence 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;

LOC Key

The LOC or LOCATE Key is used to locate a specific item within the Data Fields of the Data Table.

You can “Locate by SHOT NUMBER:”, “Locate by TIME:”, “Locate by PREFIRE TIME:”, “Locate by ADDRESS:”, or “Locate by CALIBER:”.

When you are in the EDIT Mode, Option 0, of the DATA TABLE Operating Mode, depress the LOC key. The LCD shows the above “Locate by xxxxxx” in the Command Line. What the LCD shows to Locate by, “xxxxxx”, is a function what Data Field was shown by the Command Line.

Exception; When the command line is at the Sequence Number Field, “New SEQUENCE number:”, this is already, and only, a locating field. Depressing LOC, with the Sequence number command line displayed, does nothing, because any numbers you enter (and then depress ENTER) will automatically be located. Remember, the sequence number, or line number, is for locating Event Lines ONLY.

To use Locate, simply enter the desired data to be located and depress ENTER.

Locating is for exact matches only. If the data you enter in response to the “Locate by xxxxx” command line cannot be found, then the command line temporarily displays; ! MATCHING LOCATION NOT FOUND !”. The Event Line remains unchanged. Also you cannot Locate the line which is currently displayed (you are already located there).

Go to Address Key

The GO TO ADDRESS Key functions similarly to the LOC Key except that this Key may be depressed at any time (EDIT Mode) to directly access the command line “Locate by ADDRESS:. In other words, you do not have to be in the Address Field to locate by address. The Go to Address Key is also used in the MANUAL FIRE Operating Mode. Note also that the Go To Address key may be toggled on and off by repeated depressions of the key.

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. Go to Shot number is also used in MANUAL FIRE.

INS / DEL Keys

The INSERT and DELETE Keys are used to insert or delete an Event Line within the Data 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.

INSERT will insert a blank (all data fields equal zero) directly below the currently displayed event line and shift the LCD Display down one line to the new blank line. The sequence numbers of all subsequent lines will be increased by 1 because you have added a new line in the sequence.

DELETE will permanently remove the entire currently displayed Event Line from memory. The LCD 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 Data Table Memory Stack.

VIEW Key

Depress the VIEW key. The LCD shows as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ EDIT VIEW: 0=LINE NBR, 1=FIRE TM      ³
³ 2=SHOW TM, 3=SHOT #, 4=AD, 5=CAL      ³
```

The VIEW Key allows you to View, or See, the Data Table SORTED in 6 different possible ways. Being able to see the Data Table Sorted in different orders is a very powerful and extremely useful feature. The possible sorts are;

0 LINE NUMBER - 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 Event Lines are ALWAYS in this order, UNLESS they are VIEWED in a different order by use of the View Key.

1 FIRE TIME - This is a sort by Firing Order, which is the Event Time minus the Pre-Fire Time. The Event Time numbers are unchanged (the actual Fire Time is NOT shown), however the Viewed Data Table has been rearranged in order to show any Events which actually may be Fired before other Events due to Pre-Fire Times. Obviously, if all the Pre-Fire Times are zero then the sorted, or Viewed order by Fire Time equals the sorted order by Show Time. This sorted order IS the order in which the pyrotechnic devices will actually be Fired, in both Manual Fire and Auto Fire. BE AWARE THAT THE FIRING ORDER MAY NOT BE THE SAME AS THE EVENT ORDER OR THE ORDER OF THE DATA TABLE AS IT EXISTS IN MEMORY!

2 SHOW TIME, OR EVENT TIME - This is a sort, or View, by the TIME Data Field. This is the EVENT TIME, or the "real" time order that the pyrotechnic performance would be Scripted or Choreographed to. Thus the Event Time is the desired Time for the Pyrotechnic Device to function (such as the opening burst of an aerial shell). Normally the sort by Event Time would be the same as the sort by line number, unless Event Line(s) have been inserted / deleted out of order, or the time has been changed. Obviously, Viewing by Event Time is only possible for Data Tables that contain Event Times.

3 SHOT NUMBER - This is a sort by the SHOT NUMBER Data Field. Again, normally the Shot Number order would be the same as the sequence number sort, or the Event Time sort. This sort is useful for view (or printing) the Data Table by a sequentially increasing shot number.

4 ADDRESS - This is a sort by the ADDRESS Data Field. The sort is by hexadecimal logical order, increasing from 000 to 7FF. This is extremely useful in checking for missing or duplicative addresses, as well as for connecting the Pyrotechnic Devices (if the Pyrotechnic Performance is pre-addressed).

5 CALIBER - This is a sort by the CALIBER Data Field, increasing from Caliber 0 to Caliber 99. This is very useful in grouping specific Calibers for Viewing.

The VIEW Mode creates a special table just for Viewing specific sorts. The Data Table in memory is never changed by use of the View Key. This is to prevent, for example, having a Data Table which ONLY has addressees specified in the desired Firing Order from being rearranged by a View by Address Command (and thus destroyed). View by LINE NUMBER is Viewing the Data Table in the order that it actually exists in memory. The sequential order can only be changed by inserting or deleting lines, or adding new data to the end of the Data Table.

When you select a VIEW Option, the LCD temporarily shows; "Please WAIT.....preparing data", and then the LCD displays the normal EDITING Screen, Plus an additional indicator "VIEW: x". The "x" of "VIEW: x" indicates that the Data Table is presented in a specially sorted VIEW Mode and the Sort Type is number "x".

Thus, when you are in a View Mode, THE VIEW INDICATOR ON THE LCD DISPLAY WILL ALWAYS BE PRESENT. In the View Mode, Event lines may NOT be inserted of deleted, however data may be changed. You can move through the Data Table with the normal Keys (ARROW Keys, HOME, END), however when you select a special function Key (like LOC, GO TO) the View Mode will be terminated.

PRINT Key

When the PRINT Key is depressed (DATA TABLE Operating Mode, Option 0; EDIT), the LCD appears as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ PRINT table options:                    ³
³ 0=TABLE & REPORT, 1=REPORT ONLY         ³
```

Select Option 0 or 1 by depressing the respective Key on the hex keypad. The LCD will then show "Printing.....!" and send the printout information to the PARALLEL PRINTER PORT on the rear panel of the Field Controller. An IBM Compatible PRINTER should be CONNECTED, ON, and READY. A printout of the Data Table and Report, or Report Only will then be printed out. If the Data Table is extremely complex, or long, it may take the Field Controller a few moments to complete it's analysis for the REPORT.

If the Printer is NOT connected or ready, then after about 20 seconds the Field Controller will give up and the LCD will temporarily display "PRINTER IS NOT RESPONDING". After a few seconds of this message, the Field Controller will then exit to the STOP MODE. Connect or Ready your printer, re-select Data Table Operating Mode, Select Option 0, EDIT, select Print, select Print Option and try again.

THE DATA TABLE WILL BE PRINTED IN THE ARRANGEMENT AS SORTED IN VIEW. If no VIEW Sort had been selected, then the Data Table, or TABLE, Printout will be a mirror image of your table as it exists in current memory (or same as View by Line / Sequence Number).

The REPORT is very useful as an analysis tool of your current Data Table. The REPORT checks for and displays information concerning;

- Line Numbers with Duplicate Shot Numbers
- Line Numbers with Duplicate Address Numbers
- Caliber Usage Report and Totals, with Grand Total
- Firing Module (shot box) Usage Report

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 (enter zeros), 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 make.

QUICK ENTRY Key

The QUICK ENTRY Key is a specialized Key available only in the EDIT Mode (DATA TABLE Operating Mode, Option 0; EDIT). This Key provides 2 Options for functions which assist the user to rapidly make entries into the Data Fields.

QUICK ENTRY is available for SHOT NUMBER, PFT, ADDRESSES, and CALIBER. Therefore, only if the command line is selected to one of these Data Fields, will the LCD below appear (when QUICK ENTRY is depressed);

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ QUICK ENTRY FUNCTIONS:                    ³
³ 0=AUTO FILL, 1=MANUAL FILL                ³
```

Option 1, MANUAL FILL

This creates a special automatic Data Entry procedure to quickly assist the user in Filling the SELECTED DATA FIELD. When you first select Option 1, the Field Controller will beep at you, indicating that this Option is functional. If Option 1 is selected, when you depress ENTER (to enter the data you have put in via the hex keypad), the Field Controller enters the data, and then 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. The Field Controller also beeps to tell you that it has automatically advanced to the next line.

Thus essentially, MANUAL FILL automatically depresses DOWN ARROW and beeps. This allows you to easily enter data from written list without having to look at the LCD screen after each entry. MANUAL FILL WILL REMAIN IN EFFECT (as indicated by the beeping in other Data Fields or whenever DOWN ARROW is depressed) UNTIL SOME OTHER FUNCTION IS SELECTED.

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

TIP: The TIME Field can be tricked into this data entry mode by selecting Option 1, Manual Fill in one of the other Data Fields and then moving the Cursor to the Time Data Field.

Option 0, AUTO FILL - Creating Specialized Data Tables

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 Data Table in a very specialized manner. AUTO FILL will function for the SHOT NUMBER, TIME, PREFIRE, and the ADDRESS Data Fields.

When Option 0, AUTO FILL is selected, the LCD appears as;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ OK to FILL TABLE ! ?:                    ³
³ PRESS "ENTER" IF OK !                    ³
```

WARNING - CAUTION

AUTO FILL WILL PERMANENTLY CHANGE ALL DATA IN THE SELECTED DATA FIELD(S) OF THE DATA TABLE. DO NOT USE AUTO FILL UNLESS YOU WANT TO CHANGE THE ENTIRE DATA FIELD SELECTED TO THE SPECIFIC TYPE OF DATA WHICH AUTO FILL WILL CREATE.

When this LCD screen appears, the Field Controller emits 3 audible beeps to WARN the user that he/she is about to change the data in the selected Data Field. The LCD prompts the user to depress ENTER if OK to proceed. BE SURE YOU WISH TO PERMANENTLY CHANGE ALL DATA IN THE ENTIRE DATA TABLE OF THE SELECTED DATA FIELD BEFORE DEPRESSING ENTER.

TIP: Create one entry at the END LENGTH, or desired length of the Data Table (locate to line / sequence 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 Data Table and the false End of the Data Table you just created.

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

PREFIRE TIME; If the cursor was in PFT while Auto Fill was entered, final depression of enter will clear, or reset to zero, all PFT Times in the entire Data Table. This is very useful to Specifically and Purposefully clear all PFT times.

ADDRESS; If the ADDRESS was selected, final depression of ENTER will sequentially, in logical hexadecimal sequence, re-address the entire Data Table, starting with 000 to the end of the Data Table. This may or may not be acceptable, SO BE CAREFUL. You would only address the Data 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; Auto Fill in Caliber leaves the Data Unchanged.

EVENT TIME; For purposes of analysis of SMPTE / MIDI reception, it is possible to easily and quickly create a special new data table in the SMPTE frames notation of the Field Controller that has sequentially numbered frames. This table may then be operated in an Inert Test Environment to test troubled sections of SMPTE / MIDI Time Code to check that each and every frame is simulated to Fire.

To use this feature, select a BLANK or unused data table, as all the Time Numbers will be changed. With the Blank (or erased by loading nothing) data table, advance the line number to, FOR EXAMPLE #900, by entering 900 and depressing enter. Use the right arrow and advance the cursor by one to the Shot Number field. Enter 900 for the shot number and depress enter. Now you have a completely blank data table except for one entry in line number 900 of shot number 900. Go to the top of the table by hitting the Home key. Depress the right arrow to advance to the time field. Depress the Quick Entry key. Enter the option 0 for Auto Fill. Now a New Display “New TIME: __ “ will appear. This is the STARTING TIME. For example enter “0, ENTER, 0, ENTER, 1, ENTER, 0 ENTER”. The Field Controller will beep at you and ask if OK to proceed. Depress ENTER to proceed (Caution, new entries will be created and if you have data in the table you do not wish to change, depress STOP). After you have depressed enter to proceed, look at the table you have created, Down / Up Arrow, HOME, END. Notice that the a table has been created with 900 lines starting at time 00:01:00:00 to time 00:01:30:00. The table has one event for every frame between SMPTE one minute and SMPTE one minute, 30 seconds (30 fps ND SMPTE). Now let’s fill in the shot numbers; left arrow to shot number field, quick entry, auto fill OK. Now Auto fill in the Address Field. Now you have a 900 shot sequential, every frame, table with addresses sequential from 000 to 384.

Now, what in the world is this strange data table good for anyway? It is useful for checking 30 seconds of SMPTE or MIDI (or even Pyrodigital) Time Code input to be sure that each and every frame is simulated, that is simulated to be Fired. How is this Done? DISCONNECT ANY FIRING MODULES BY UNPLUGGING THE MAIN CABLE AT THE FIELD CONTROLLER. THIS IS FOR INERT, that is INERT TESTING. (Live tests can be done if you wish to blow up 900 electric matches). NO FM’s Connected, enter Auto Fire, select SMPTE or MTC, depress Fire, and play the tape. Do NOT hold down the deadman, and, at the appropriate time code start you should hear a continuous 30 seconds of “beep” indicating that the deadman is not being held down. If the time code should jump, stop, or otherwise misbehave this continuous “beep” will not be continuous, thus indicating missed events. Get the idea? Also remember that an * (Asterik) will be placed directly behind each and every address to which the Field Controller issued a Firing Command. See the MANUAL FIRE Section, the asterik, *.

Example 1 Data Table

In the below example 1 you will create a 10 shot, or EVENT, Data Table. The example is provided to help familiarize the user with the operation of the Field Controller in the EDIT MODE. This example 1 Data Table that you create will also be used for learning in the AUTO FIRE and MANUAL FIRE Operating Modes.

First lets make sure you have a blank Data Table to start with. CAUTION - you will erase any Data Table information currently in the selected Data Table. If you do not want to do this, select another Memory (See DATA TABLE Operating Mode, Option 4, SELECT TABLE).

To erase; Depress DATA TABLE Operating Mode Key. Depress, or select, number 1 on the hex keypad. Depress ENTER. Depress either 0, 1, or 2 on the hex keypad, then Depress Stop (you have loaded nothing into the Data Table so it is cleared).

Get into the EDIT MODE; Select the DATA TABLE Operating Mode. Select Option 0, EDIT.

Let's now enter a simple table. Advance to the Time Field (depress the RIGHT ARROW Key twice). Enter 0 from the hex keypad, press ENTER. This is now zero frames. Hex key pad enter 10, depress ENTER. Hex key pad enter 0, depress ENTER. Hex key pad enter 0, depress ENTER. Now notice that the time displayed on line 0 is now 0 hours, 0 minutes, 10 seconds, 0 frames.

Depress DOWN ARROW and make 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 # 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'll look at an advanced feature. LEFT ARROW to "New SHOT NUMBER:", depress QUICK ENTRY. Answer option 0, AUTO FILL. Press enter as it's OK. Now look at the shot numbers for each event (use Up/Down Arrow Keys and try the HOME/END keys). Notice that the SHOT NUMBERS have been sequentially numbered. If you answered option 1 for manual fill this would keep the cursor in the same field and auto advance to the next event line upon completion of entry. This alleviates having to depress the DOWN ARROW after each entry.

Let's AUTO Address, Manual Fill. Depress "HOME" to move to the top of the table, Move to "New ADDRESS?" , depress QUICK ENTRY, MANUAL FILL, Option 1. The Field Controller beeps at you to indicate that MANUAL FILL has been selected. Now start address 100 via the hex keypad and depress ENTER. The Field Controller beeps and 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 ARROW / 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 table. Try inserting a line and deleting it INS / DEL.

Let's sequentially number our calibers in the table from 0 to 9. You can figure out how to do that. Notice that the UNDO ENTRY key may be used to remove a bad entry (clears data field).

Now Let's try the LOC key. Notice that Locate will be by the field selected with the LEFT / RIGHT ARROW Keys. Can you locate address 106? Can you locate line number, or sequence number 2? (the sequence number Field ALWAYS functions in a locate mode). Can you locate shot number 8? (remember to LOCate, not actually change the Data). Can you locate caliber number 3? Can you locate the event line at time = 14 seconds. Try locating shot number 12. Note "! MATCHING LOCATION NOT FOUND !", the unit cannot locate what doesn't exist.

Notice that if you VIEW this table in different Options, it essentially remains unchanged. This is because this Data Table is already arranged sequentially in all the Data Fields. Change the Caliber numbers and then try VIEW again by Caliber. 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. Try Printing the Data Table.

End of Example 1 Data Table, for now.

LOAD, Option 1

NOTE: SEE PASSWORD PROTECTION AND MEMORY SIZE, SECTION 8, if applicable (if you are locked out by Password).

LOAD is for importing a Data Table into the Field Controller from an external source, as opposed to entering all the data directly with the Keys of the Field Controller. The external source could be SCRIPTING SOFTWARE, ANOTHER FIELD CONTROLLER, A DATA TABLE RECORDED TO TAPE, or some other source.

LOAD IS ALSO USED TO CLEAR, OR ERASE, THE CURRENTLY SELECTED DATA TABLE. All Data Tables can also be cleared at once by SYSTEM INITIALIZATION. See SYSTEM INITIALIZATION.

The primary function of LOADING is so that you may transfer your Choreography, or Scripting, from the PC Computer to the Field Controller. The Field Controller is then used to execute, or FIRE, your Choreography. Scripting may be done on the Field Controller (See DATA TABLE Operating Mode, Option 3, CREATE TABLE), however complex Scripting is easier and faster to do on an IBM PC Computer (or Compatible) using the Pyrodigital Scripting Software. The PC has a CRT Display Screen which can display much more data at one time, and the Choreography Program is optimized exclusively for Scripting.

The Scripting from the Pyrodigital Program may be loaded directly into the Field Controller via a direct cable connection OR the scripting from the PC may be recorded to tape. The PC Scripting may then be transferred to the Field Controller by playing the tape, when the Field Controller is in the LOAD Mode. This allows the Scripting to be done remote from the physical location of the Field Controller.

Also Data Tables may be Cross-Loaded from one Field Controller directly to another Field Controller with a simple RCA patch Cable. This is especially convenient when using a backup Field Controller.

Additionally, via the SAVE and LOAD Modes (of the DATA TABLE Operating Mode), the Data Table may be archived and/or backed up to tape. A Simple cassette recorder serves nicely for LOAD and SAVE.

When the DATA TABLE Operating Mode, Option 1, LOAD; is selected, the LCD appears as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Do you want to ERASE the table          ³
³ and load a new one ? PRESS "ENT"        ³
```

Depress ENTER to proceed. The current Data Table in NOT erased yet, you must proceed to the next LCD screen, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LOAD SOURCE: TAPE modem (1200 Baud)=0    ³
³ DIRECT connection 1200 BD=1, 9600 BD=2   ³
```

Erasing the Data Table

By selecting Options 0, 1, or 2 the current Data Table will be immediately ERASED. DO NOT DEPRESS THE 0, 1, OR 2 KEY ON THE HEX KEYPAD UNLESS YOU WANT TO PERMANENTLY ERASE THE SELECTED DATA TABLE. DEPRESS STOP TO ABORT.

If you wish to delete your current Data Table, depressed 0, 1, or 2. The LCD Display will show "Processing table data" and you then depress STOP (exit from the "Processing table data" message as this message will remain indefinitely). Your Data Table has been Erased from the selected Memory (Processing table data is a message waiting for data input, after the data table has been cleared, but you have loaded nothing, so the cleared data table is blank). You can verify that the Data Table has been erased by looking at the table in DATA TABLE Operating Mode, Option 0, EDIT. All Data Fields will contain zeros and END takes you nowhere.

Option 0; LOAD SOURCE: Tape Modem (1200 Baud)=0

This Option is most commonly used for receiving (Loading) a Data Table from another Field Controller. This Option can also be used to LOAD a Data Table (or Translated .sho file) into the Field Controller FROM A PREVIOUS TAPE RECORDING OF THE DATA TABLE. The procedures are the same for Loading from another Field Controller or from Tape (See next;

Translation of VER250 Scripted .sho file to Tape, and, DATA TABLE Operating Mode, SEND, Option 2; next sub-Section).

Loading from another Field Controller or from Tape

Prepare the Field Controller, as described previously, selecting Option 0, LOAD SOURCE: Tape Modem (1200 Baud)=0. The Field Controller is waiting for input of the Data Table.

The Field Controller LCD displays "Processing table data" on the second line. Connect a patch cable from the source (tape machine or another Field Controller) to the the same input as the TIME CODE INPUT, either the Tape In, RCA Jack, or the Line In, 600 Ohm, Professional, Balanced, Male, XLR Connector. Now press send on the other Field Controller (SEND, Option 2 in Edit) or play the tape directly into the Field Controller.

If the Field Controller is receiving this data correctly you should see the first line of the LCD indicating SMPTE Time Numbers. For the Pyrodigital Scripting Software, VER250 .sho Files (recorded to tape), the Field Controller is converting the Event Time Numbers from 1/10 second frames to SMPTE 1/30 second frames. For transfer from another Field Controller direct, actual SMPTE frame numbers are transferred. Other Choreography / Data Transfer Software may also transfer direct SMPTE frame numbers (30 fps ND, 30 fps DF, 25 fps EBU, 24 fps film). This process will continue until the entire .sho file has been Loaded. When the Loading is completed the Field Controller will exit to the STOP MODE.

If the Field Controller encounters an error (bad connection, bad playback or recording, tape dropout, etc.) it will Abort with an error message. Any Data subsequent to the error has not been Loaded, however any data Loaded before the error will be in Memory.

NOTE THAT IT IS POSSIBLE, AND HELPFUL, TO MONITOR THE TAPE IN / LINE IN INPUTS VIA THE VOLUME CONTROLS AND LISTEN TO THE DATA TABLE INPUT. This can help you locate the start of the desired Data Table Recording, when using a tape machine without headphones or speakers. When transferring from another Field Controller (or at the start of your tape recording) you will notice the steady, unmodulated TONE being received before the data transfer starts. Use the Time Code Input Level (volume) Control and the Speaker / Phones Output Level (volume) Control.

It is good procedure to check the Data Table In EDIT to be sure that it's all there (END Key).

Option 2; LOAD SOURCE: DIRECT connection, 9600 Baud=2

Option 1; LOAD SOURCE: DIRECT connection, 1200 Baud=1

Both Options ARE IDENTICAL EXCEPT FOR THE DATA TRANSFER SPEED. Therefore IT IS RECOMMENDED THAT YOU ALWAYS USE 9600 BAUD, OPTION 2 for faster operation.

This is specifically for LOADING Data Tables which have been created with the Pyrodigital Scripting Software directly into the Field Machine.

Loading from Pyrodigital VER250 Super Script Software

The Scripting PC Computer must be prepared to TRANSLATE the VER250 .sho file to the Field Controller and the Field Controller must be prepared to RECEIVE the translated .sho file.

In order for the PC Computer to TRANSLATE the desired VER250 .sho file, you must have the Translation Program, TRANSLAT, available at the DOS C:\SCRIPT Directory (copy the Translat Program into the SCRIPT Directory, or the SAME Directory which contains the .sho file you want to load into the Field machine).

PREPARE THE FIELD CONTROLLER to receive the .sho file as follows;

- Connect an RS - 232 SERIAL Cable from COM1 (or COM2 may be use) on your computer to the Com Port connector on the Field Machine.
- Select DATA TABLE Operating Mode.
- Select the desired Data Table (if other than current Data Table, See following Section, DATA TABLE OPERATING MODE, Option 4, SELECT TABLE)
- Select 1 to load table.
- Follow the LCD instructions and press ENTER.
- Select option 2, DIRECT CONNECTION @ 9600 Baud
- The Field Machine now displays “processing table data” on the second line of the LCD, however it will just sit there as you are not yet actually inputting data.

Prepare your Scripting Computer to send the Data Table (VER250 .sho file). THE CURRENT TRANSLATION PROGRAM IS CALLED TRANSLAT. Translat is a Command Line Program. Simply type TRANSLAT on your computer and the program will post instructions on how to fully operate the program. For example typing “Translat mysho 9600 com1” and depressing return will send the data of “mysho.sho” out serial com port 1 at 9600 baud (do not include the .sho DOS extension for your show file name). Remember to just type translat and the program will instruct you how to use it.

The TRANSLAT Program in your scripting computer should begin to translate the .sho file. You will see this as a series of lines of characters displayed on your scripting computer screen. If you do not have the RS-232 cable connected or improperly connected you will get and error message “communications transmit failure”. If the translat is working properly you should see data lines of translation on your scripting computer screen.

If the Field Controller is receiving this data correctly you should see the first line of the LCD indicating SMPTE Time Numbers. The Field Controller is converting the Event Time Numbers from 1/10 second frames to SMPTE 1/30 second frames. This process will continue until the entire .sho file has been Loaded.

Translation of VER250 Scripted .sho file to Tape

THIS PROCEDURE MAY BE USED TO RECORD THE DATA TABLE TO TAPE THROUGH THE EXTERNAL TIME CODE MODEM CONNECTED TO THE PC COMPUTER, WHICH THEN MAY BE LOADED INTO THE FIELD MACHINE WITH OPTION 0, TAPE MODEM. IN THIS CASE THE TRANSFER RATE MUST BE 1200 BAUD as set with the Scripting Software (9600 Baud WILL NOT record to tape properly).

It is possible to use the Pyrodigital Time Code Modem Unit (that is used for generating and reading Pyrodigital Time Code to/from tape) or the Pyrodigital Interface Box, Modem Section, to output the TRANSLAT .sho file to tape for recording (and subsequent Loading into the Field Controller).

Connect a regular tape recorder (cassette or open reel or whatever, standard analog everyday machine) to the REC OUTPUT of the Pyrodigital Time Code Modem Unit (or Interface Box Modem Section). Run TRANSLAT on your PC at 1200 BAUD ONLY and record the output of the Pyrodigital Time Code Modem Unit (your .sho file) onto tape (instead of the direct RS-232 cable connection). BE SURE TO BEGIN RECORDING BEFORE DEPRESSING THE RETURN KEY ON YOUR PC COMPUTER. Also continue recording for a few seconds after the Translation has finished. This will insure that your recording has a lead in and lead out pure TONE at the beginning and end of your Translated .sho file. Leave blank spaces between .sho files on tape so you can find them. Also make NOTES as to what .sho file is recorded, and where, on tape.

Loading from other Pyrodigital Software

The procedure on the Field Controller IS THE SAME as Loading from VER250. Prepare the Field Controller to receive the Data Table at 9600 Baud, Direct Connection, Option 2. Note that newer Software may directly send the Data Table in exact SMPTE frames for all types of SMPTE Time Code. Consult the User's Guide or Help file of the other Software to determine how to Send the Data Table out the Serial Com Port.

Loading from Pyrodigital /Infinity Visions SHOW DIRECTOR Software

The Scripting PC Computer must be prepared to DOWNLOAD the Show Director .scx file to the Field Controller and the Field Controller must be prepared to RECEIVE the translated .sho file.

In order for the PC Computer to to DOWNLOAD the Show Director .scx file, you must follow the instructions given by the Download tables menu of the Shoew Director software. (See Show Director User's Guide)

PREPARE THE FIELD CONTROLLER to receive the .sho file as follows;

- Connect an RS - 232 SERIAL Cable from COM1 (or COM2 may be use) on your computer to the Com Port connector on the Field Machine.
- Select DATA TABLE Operating Mode.
- Select the desired Data Table (if other than current Data Table, See following Section, DATA TABLE OPERATING MODE, Option 4, SELECT TABLE)
- Select 1 to load table.
- Follow the LCD instructions and press ENTER.
- Select option 2, DIRECT CONNECTION @ 9600 Baud
- The Field Machine now displays "processing table data" on the second line of the LCD, however it will just sit there as you are not yet actually inputting data.

Prepare your Scripting Computer to send the Data Table. Remember , the program will instruct you how to use it.

The to DOWNLOAD the Show Director .scx file in your scripting computer should begin to translate the Data Table file. You will see this as a progress bar displayed on your scripting computer screen. If you do not have the RS-232 cable connected or improperly connected you will get and error message “communications transmit failure”. If the translat is working properly you should see data lines of translation on your scripting computer screen.

If the Field Controller is receiving this data correctly you should see the first line of the LCD indicating SMPTE Time Numbers. The Field Controller is converting the Event Time Numbers from 1/10 second frames to SMPTE 1/30 second frames. This process will continue until the entire .scx file has been Loaded.

SEND, Option 2

NOTE: SEND IS NOT PASSWORD PROTECTED

The Field Controller can use it’s built-in Time Code Modem to output the Data Table FOR CROSS-LOADING TO ANOTHER FIELD CONTROLLER, or for the rare use of recording to tape. The Data Table Output is at the Tape Out RCA Jack on the rear panel.

The Data Table SENT will be the Data Table that is currently selected (SEE DATA TABLE OPERATING MODE, Option 4, SELECT TABLE).

Select the DATA TABLE Operating Mode, Option 2, SEND and the LCD appears as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Sending DATA TABLE...!                    ³
³ xxxxxxxxxxxxxxxxxxxxxxxxxxx               ³
```

xxxxxxxxxxxxxxxxxxxxxxxxxxx is hexadecimal representation of the data being Sent and is provided so that you can verify that the Data Table is being Sent and when the transmission is completed. THe hexadecimal representation will start a few moments after SEND, Option 2, is Selected. After Sending the complete Data Table, the Field Controller will exit to the STOP MODE.

for Cross-Loading to another Field Controller

Connect an RCA Patch Cable from the Tape Out RCA Jack on the SENDING Field Controller to the Tape In RCA Jack of the Field Controller you wish to LOAD the Data Table to. Be sure to Select the desired Data Tables on BOTH the Sending and Receiving Field Controllers. Adjust the Time Code and Spkr Phones VOLUME knobs on the receiving Field Controller until you

hear the steady TONE. Prepare the receiving Field Controller by selecting LOAD, Option 1, depressing ENTER, and then selecting Option 0, LOAD SOURCE: TAPE modem (1200 Baud)=0 (DATA TABLE OPERATING MODE). Select Option 2, SEND on the Sending Field Controller (DATA TABLE OPERATING MODE). Observe both LCD Displays and Monitor the Volume to insure Data Table Transmission and Reception. (SEE DATA TABLE OPERATING MODE, Option 1, LOAD)

for Recording the Data Table to Tape

Currently, there is little use for Recording the Data Table to Tape because most Data Tables are transferred from the PC Scripting Software directly to the Field Controller (and therefore Saved as a file in the PC Computer). However if you should create a Data Table directly on the Field Controller and wish to Save or Archive that Data Table, you can record it directly to Tape (since you cannot currently upload that Data Table to the PC Computer).

Be aware that when recording to tape, transmission of the Data Table ALWAYS begins at the Beginning of the Data Table. Therefore if you missed recording the beginning, simply re-select SEND. THE VERY BEGINNING OF THE SEND TRANSMISSION MUST BE RECORDED. If you start recording after the Data Table Transmission has started (as soon as you select Option 2, and shown by the presence of the changing numbers on the second line of the LCD), THE DATA TABLE WILL BE UNRECOVERABLE. Load will indicate errors and you cannot recover ANY PART of the Data Table.

It is recommended that you ALWAYS make 2 recordings of the same Data Table, at minimum, with one recording directly following the other, or on a another tape for backup security. You can LOAD into another memory to be sure you have the data, before you load into the same memory and, therefore, erase the data table.

Note that, at all times, a pure TONE exists at the TIME CODE OUTPUT, RCA Jack. You can use this for setting the recording levels on your tape recorder. WHEN YOU RECORD THE DATA TABLE, START THE RECORDER FIRST FOR A FEW SECONDS BEFORE DEPRESSING OPTION 2, SEND. Also record a few seconds past the end of the Data Table Transmission. This will insure that you have a smooth lead in and lead out of pure TONE before and after the data. AGAIN - CAUTION - If you do not have this smooth lead in with pure TONE recorded before the data signal, then the Data Table will be unreadable! Likewise, if you stop recording to soon, you will not have the complete Data Table.

In reality, this procedure is very simple, and the tape recording of the data is very robust. It is recommended that you PRACTICE LOADING AND SAVING with non critical Data Tables first. In practicing, Verify that the Data Table has been erased (Load nothing and check in EDIT) before you actually Load from tape, so that you will know for sure that you have successfully Loaded a Data Table.

CREATE TABLE, Option 3

NOTE: SEE PASSWORD PROTECTION AND MEMORY SIZE, SECTION 8, if applicable (if you are locked out by Password).

INTRODUCTION to Create Table

CREATING a DATA TABLE with this Option, 3, in FOR SCRIPTING OF A PYROMUSICAL (or MULTIMEDIA SHOW) WITH TIME CODE. CREATE TABLE SHOULD REALLY SAY - SCRIPT TABLE. Although we recommend that you Script (or Choreograph) a Show using Pyrodigital Choreography Software running on a Computer, the Field Controller does incorporate simple Scripting Functions. The Field Controller's Scripting Function are better suited for last minute changes and/or adjustments in the Field.

THE FIELD CONTROLLER CAN HOWEVER SCRIPT WITH ALL TYPES OF TIME CODE (Pyrodigital Time Code & SMPTE / MIDI Time Code at 30 fps ND, 30 fps DF, 25 fps EBU, and 24 fps Film).

In order to Script, you must have previously prepared a Scripting Tape. In the simplest form, a Scripting Tape consists of an audio cassette with music on one track and Pyrodigital Time Code (or SMPTE Time Code) on the other track (use Right track as a Pyrodigital standard). The Music Track contains the Music to which you desire to Choreograph the Display. This Scripting Cassette can be prepared from a multitrack Audio Master (Digital or Open Reel Tape) for convenient use in the Field with a simple cassette recorder.

A Stereo Walkman will serve nicely (for playback only, however). A more expensive Walkman or DAT Tape Recorder that has STEREO (at least 2 tracks) recording capabilities is a better investment because you can also use it to SAVE the Data Table(s). The Tape Machine does not have to have built in speakers, because the Field Controller can serve this purpose. Therefore a STEREO RECORDING WALKMAN OR DAT which operates on batteries is ideal, because you can operate totally independent of 110 vac directly with the Field Controller.

The Field Controller has provisions for MONITORING the Sound of the Music Track by simply connecting the Music Track Output to the AUX IN RCA Jack on the Field Machine. Additionally the Time Code Sound can be Monitored (only to make sure it's there), but more importantly is the SCRIPT BEEP Volume Control. The Script Beep is generated by the Field Controller when the TIME Number of an EVENT LINE in the Data Table MATCHES the incoming Time Code Number. Re-Read the previous line. If you understand it fully then you understand the Scripting Function. Repeating again;

The Script Beep is generated by the Field Controller when the TIME Number of an EVENT LINE in the Data Table MATCHES the incoming Time Code Number. Additionally, when you depress any one of the 16 keys on the hex keypad, while Time Code is being played, the TIME NUMBER of the Time Code is added to the END OF THE DATA TABLE as an Event Line, at the instant when you depress one of the hex keypad keys.

OPERATION with Create Table

With the above information in mind, from the DATA TABLE OPERATING MODE, Select Option 3, CREATE TABLE,

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ SCRIPTING MODE, PRESS:                    ³
³ CLOCK:1=PYDL FSK, 2=SMPTE, 3=MTC          ³
```

Select the appropriate option, based on which time code was used to create the Scripting Tape. The exact SMPTE / MIDI Time Code format (30 ND, 30 DF, 25 EBU, 24 Film) will automatically be determined by the Field Controller. NOTE: If you select the improper Time Code TYPE (one that does not match the Time Code on your Scripting Tape), the Field Controller will not recognize your Time Code and Scripting will Not Commence. You Must select the proper Time Code Type.

Once you have Selected any of the Options, the LCD quickly flashes the following message;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³                                           ³
³ Press NUMBER KEY of CALIBER size          ³
```

Almost IMMEDIATELY, the LCD then appears as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Waiting for TAPE clock.....               ³
³                                           ³
```

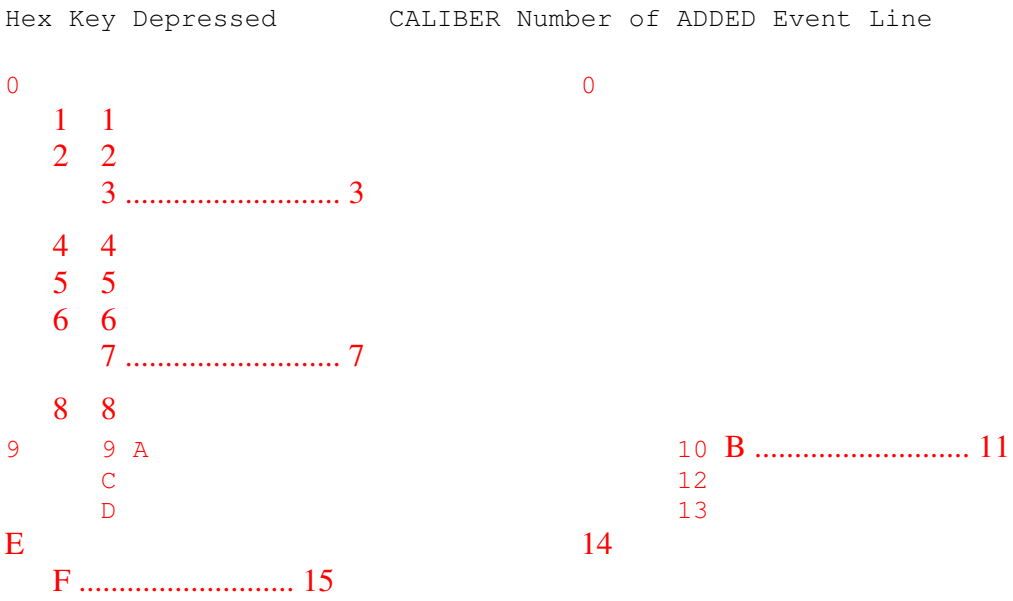
The Field Controller is waiting for matching Time Code to be coming in through the Tape In RCA Jack or the Line In 600 ohm Balanced XLR Connector on the rear connector panel.

Thus you play the Scripting Tape. You Listen to the Music (Monitor). You depress a key (on the hex keypad) at the moment in the Music where you want a Pyrotechnic Event to Occur! (remember that the PFD will compensate for the Rise Time of an aerial shell, so you don't have to worry about Firing Time, just SCRIPT in real time, or Event Time, to the Music).

At this point you can ABORT by selecting STOP or another (or the same) Operating Mode. If you continue you may make changes to the Data Table.

The CREATE TABLE Mode also REVIEWS those Events already in the Data Table. You therefore can simultaneously add new Events, if desired, while you REVIEW those Events already existing.

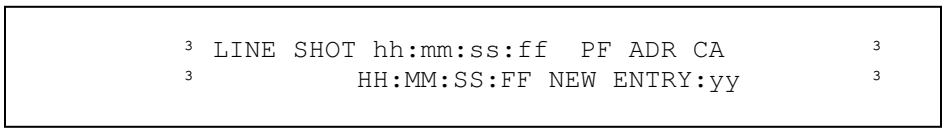
The CALIBER Number of the ADDED Event Line is a function of which Key is depressed on the Hex Keypad. The Correlation is as follows;



When playing the Scripting Tape (inputting Time Code), the LCD could show up to the following information;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



Where the top line is last Reviewed EVENT, complete with all it's Data Fields displayed. The bottom line of the LCD shows HH:MM:SS:FF as the running time of the Time Code. "NEW ENTRY:yy" shows "yy" as the hex (Caliber) entry made by the last depression of the corresponding hex keypad key.

When the tape is stopped (Time Code input terminated), the LCD reverts to the previous LCD, Waiting for TAPE clock..... When you restart the tape (resume Time Code) the LCD will again show as above. REWIND THE TAPE SLIGHTLY AND PLAY AGAIN TO REVIEW ANY JUST ADDED CUES.

THUS THE LCD DISPLAY IS SLAVED TO THE TAPE (via Time Code). WHENEVER AND WHEREVER YOU START THE TAPE THE LCD DISPLAY WILL SHOW ANY EVENTS EXISTING IN THE DATA TABLE AND BE LIVE, READY TO ACCEPT ANY DESIRED NEW EVENTS. THIS IS A VERY POWERFUL SCRIPTING TOOL!

You may make errors in depressing the hex Key at the wrong time. Select the EDIT Mode and adjust the TIME Number, or DELete the entire line(s) and try again.

IMPORTANT NOTE: EVENT LINES ARE ALWAYS ADDED TO THE END OF THE DATA TABLE. Every Time you enter an Event by depressing one of the 16 Hex Keypad Keys (while Time Code is running), THAT EVENT IS ADDED TO THE END OF THE DATA TABLE AS THE LAST EVENT LINE. This means that Events are added to the Data Table in the ORDER IN WHICH YOU ADD THEM. Thus if you don't add Events in sequential Time order, they WILL NOT be ordered by Time as seen in the Data Table (or a normal printout of the Data Table).

THE EVENTS WILL PLAY (Create Table) CORRECTLY IN TIME AND FIRE (Auto Fire) CORRECTLY IN TIME (because the Field Controller INTERNALLY Sorts by Time and Firing Order), HOWEVER they may appear out of sequence when you look at the Data Table.

For Example: You have Scripted a song with Events throughout the entire song. Later you go back and play the Tape again and add 2 more NEW Events to the middle of your song. These 2 NEW Events are now at the End of the Data Table, NOT IN THE MIDDLE OF YOUR SONG where they actually occur in Time. However, when you again play the song the Events appear REVIEWED correctly in the middle of your song.

THE POINT IS THAT THE DATA TABLE CAN LOOK OUT OF ORDER and you may have difficulty understanding it or even finding your Events to associate them with Pyrotechnic Devices.

Unlike Pyrodigital Scripting Software, the DATA TABLE CANNOT BE SORTED BY TIME. The Data Table may Be VIEWED by Time, but the order of the Event Lines cannot be changed unless you physically change the Data Table. THEREFORE you may wish to Change The Data Table by Inserting Lines at the Correct Times and Moving the Data to the Correct Place (you will have to write it down the Event Line Data (Time) and physically re-enter the Event Line(s).

REMEMBER - The out of sequence Data will PLAY CORRECTLY and FIRE CORRECTLY, it just may be confusing to look at. You can also avoid this by entering your Events in Sequential Order.

The CREATE TABLE Function is very easy to use and much easier to understand if you actually try it, so PRACTICE.

You can create a quick Scripting Tape for PRACTICE by Recording one song on a cassette while simultaneously recording Time Code (from TIME CODE Operating Mode, Option 4, STRIPE w/ PYDL FSK) on the other track (normal cassette recorders won't let you record the Left and Right tracks at different times, so you have to record them simultaneously).

Obviously, you must have some idea of where and what devices are going to be Choreographed with the Music. It is recommended that you consult the Pyrodigital Scripting USERS GUIDE to more fully understand the Scripting Function and Concepts, the use of tape machines, recording time code, etc..

SELECT TABLE, Option 4

NOTE: SELECT TABLE IS NOT PASSWORD PROTECTED

The Field Controller has several Data Table MEMORIES available for operation with more than 1 Data Table. You can select between the different Data Tables, with the Selected Data Table Memory as the one currently available for all functions of the Field Controller. The UN-Selected Data Tables remain in the Field Controller's Memory and are always available with the SELECT TABLE OPTION.

FURTHERMORE THE ENTIRE MEMORY OF THE FIELD CONTROLLER CAN BE CONFIGURED FOR DIFFERENT NUMBERS OF DATA TABLES OF DIFFERENT SIZES. THE CONFIGURATION OF THE FIELD CONTROLLER'S MEMORY IS COVERED IN A SUBSEQUENT SECTION OF THIS USERS GUIDE.

The Data Table Memories are stored in Lithium Battery, Backed Up RAM and will remain resident in the Field Controller for years, regardless of whether the main power switch is ON or OFF, or the charge state of the internal batteries. In fact the Memories will remain intact even if the internal main power gel cell batteries are removed.

Thus the Data Table(s) may be created and/or Loaded and the Field Controller may be turned OFF without loss of the Data Table(s).

Selecting Data Table Memories

To change, or SELECT TABLE, depress 4 on the hex keypad from the DATA TABLE OPERATING MODE. The LCD will appear as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ TABLE NUMBER NOW SELECTED:x ³
³ SELECT TABLE NUMBER ³
```

The LCD indicates that the current Data Table selected is number "x". Depress the corresponding number Key (on the hex keypad) for the desired Data Table. The Field Controller will automatically switch to that Selected Data Table, and show your selection as number "x". Note that intentionally, by design, the Data Table selected remains in place, so that the User can verify the desired Data Table. You may now exit back to the DATA TABLE OPERATING MODE or any other OPERATING MODE (including STOP MODE) by pushing that OPERATING MODE Key.

Since the Memory configuration of the Field Controllers is variable, THE NUMBER "x" IS VARIABLE.

The DATA TABLE MEMORIES may be configured internally in 3 possible configurations;

12 Data Tables of up to 475 lines each (Tables 0 through B)

6 Data Tables of up to 950 lines each (Tables 0 through 5)
2 Data Tables of up to 2,500 lines each (Tables 0 and 1)

Determining Memory Configuration

Therefore the MAXIMUM Value of "x" can be used to determine the present type of Memory Configuration. Any unacceptable entry for "x" from the hex keypad will result in a "beep" from the Field Controller and NO CHANGE to the previous value of "x".

FOR EXAMPLE: Depress "B" and the Field Controller "Beeps". You know that the Field Controller IS NOT configured for 12 Data Tables. Depress "5" and the Field Controller "Beeps" again. Try now 1 and the Selection is accepted. Try 2 and the selection is NOT accepted. You now KNOW that you have 2 Data Tables and according to the chart above they are each 2,500 lines long.

Loading Data Tables Larger than the Configured Memory Size

If you LOAD a Data Table that it is TOO LARGE for the presently Configured Memory Size, then you will receive an ERROR MESSAGE. The Data Table will have entries only up to it's last line, without the ending portion of the oversize .sho file you attempted to Load. In this case, Re-Configure the Memory for larger Data Tables. If you load past the last line of the Data Table, then the error message is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ RECORD NUMBER ERROR !                    ³
³ Processing table data                    ³
```

Determining Memory Size

If you forget the size of each Data Table Memory that it is currently configured, you can easily determine this without consulting this User's Guide.

Select the desired Memory. Select the EDIT Mode. Use the "New SEQUENCE Number:" location feature and the UP / DOWN ARROWS to attempt to locate the last, or end line of the Selected Data Table.

For example, your Selected Memory can hold up to 950 Event Lines, but you don't know that yet. Enter a rough guess, say 800, for the sequence number. Depress ENTER. You are now at line # 800. Try 900, you are now at Event Line # 900. Try 1,000, nothing happens. Now you know that the Last Event Line # is 900 or greater, but less than Line # 1,000. Try 950, nothing

happens. Try 925, you are now at line number 925. Try 945, you are now at line 945. Now, since only 5 possible lines remain, use the DOWN ARROW Key to move down to the physical End of the Data Table. At Event Line # 949 the Down Arrow has no effect. This is the last available Event Line in the Selected Memory. Verify by Up Arrow and then Down Arrow. In this example, this Selected Memory has 950 Event Lines, or Event Line Numbers 0 to 949. Since all Memories are configured to the SAME SIZE, you know you have 6 Data Tables of 949 lines each (assuming you also observed that "5" was the highest allowable selection number for Option 4, SELECT TABLE).

SETUP, Option 5

NOTE: SEE PASSWORD PROTECTION AND MEMORY SIZE, SECTION 8, if applicable (if you are locked out by Password).

SETUP 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 DEFAULT SETTINGS OF THE OPERATIONAL PARAMETERS UNDER SETUP, OPTION 5, OF THE DATA TABLE OPERATING MODE UNLESS YOU ARE ABSOLUTELY AWARE OF THE CONSEQUENCES. CHANGING THE DEFAULT SETTINGS CAN MAKE THE FIELD CONTROLLER APPEAR TO NOT FUNCTION UNDER NORMAL CIRCUMSTANCES.

THE DEFAULT SETTINGS ARE;

TAPE CLOCK MODE = 0, AUTO SWITCH

(Auto Timecode Switchover mode = 0)

SMPTE/MTC TIME CODE OFFSET = 00:00:00:00 (Zero Hours)

MSC DEV = 1 (one)

Select Option 5, SETUP, from the DATA TABLE OPERATING MODE, by depressing number 5 on the hex keypad. The LCD Display appears as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ 0=TAPE CLOCK MODE, 1=SET SMPTE OFFSET    ³
³ 2=SET MSC DEVICE NO.                     ³
```

TAPE CLOCK MODE, Option 0

For SPECIAL APPLICATIONS ONLY the Internal Clock can be disabled so that the Field Controller will Stop Firing when the Time Code input stops and resume Firing when Time Code input resumes. SEE AUTO FIRE OPERATING MODE for further understanding of this feature.

Select Option 0 from the SETUP Option, Option 5 of the DATA TABLE OPERATING MODE, and the LCD Display is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Auto Timecode Switchover mode:0          ³
³ 0=Auto Switch, 1=STOPS when TAPE STOPS   ³
```

Enter either 0 or 1 to change the Auto Time Switchover Mode. The entered selection remains on the LCD Display to verify your selection. Selecting any Key, other than 0 or 1, returns you to the DATA DATE OPERATING MODE Menu without changing the Auto Time Switchover Mode. After your correct selection, exit by depressing an OPERATING MODE Key.

SET SMPTE OFFSET, Option 1

INTRODUCTION

A SMPTE Time Offset may be entered IN WHOLE HOURS ONLY in order to SUBTRACT Time FROM THE INCOMING SMPTE TIME CODE. The purpose is allow for exact synchronous Firing to VER250 Scripted Displays that were Scripted using Pyrodigital Time Code CONVERTED SMPTE Time Stripes, WITH SMPTE GREATER THAN 1 (one) HOUR (greater than 01:00:00:00).

The SMPTE OFFSET Feature provides a Temporary, interim solution to SMPTE Scripting with the USERS existing VER250 Scripting Software (for SMPTE Format in 30 fps ND Only). The newer versions of Scripting Software works with all types of SMPTE Time Code directly, NOT requiring the use of the SMPTE Offset.

SMPTE Time is based on the 24 hour clock. The Pyrodigital Time Code is limited to 52 minutes. VER250 Scripting Software only uses Pyrodigital Time Code. The optional CONVERT Software Program mathematically Converts a SMPTE Time Code Stripe to an exact Pyrodigital mathematical equivalent, however at the expense of IGNORING the SMPTE Hours. If Firing on the Field Controller with the original SMPTE Time Code Stripe, the SMPTE Offset Feature allows removal of the original SMPTE Hours. This makes the Scripting work done with VER250 function exactly in sync with the original SMPTE Time Code stripe.

MIDI Time Code is derived from SMPTE Time Code, being, by definition, SMPTE Time Code in a special MIDI Format. Therefore the SMPTE OFFSET is also applicable to MTC (MIDI Time Code). Operation and use of the SMPTE OFFSET with MTC is identical to use with SMPTE.

Note that a SMPTE/MTC Offset operates with every Function of the Field Controller which uses SMPTE/MTC Time Code; Auto Fire, Time Code Monitor, and the Create Table Function in Edit.

WARNING - CAUTION

ANY SMPTE OFFSET ENTERED IS STORED IN MEMORY AND WILL REMAIN 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

THE TIME CODE MONITOR OPERATING MODE SHOWS THE OFFSET VALUE FOR VERIFICATION

AUTO FIRE FOR SMPTE OR MIDI TIME CODE (MTC) SHOWS THE OFFSET VALUE FOR VERIFICATION

LIMITS

The SMPTE Offset must be in Whole Hours, between 0 and 23 Hours. NEGATIVE OFFSETS ARE NOT ALLOWED. A negative offset would be interpreted as a time less than zero. Remember that the Memory Stored Offset Hour will be Subtracted from the INCOMING SMPTE Time Code. This adjusted value will be used for the FIRING TIME in AUTO FIRE.

Any SMPTE / MTC Offset will have no effect when operating with Pyrodigital Time Code, operating with the Internal Clock, or any Manual Fire Operating Mode.

Note that a SMPTE/MTC Offset operates with every Function of the Field Controller which uses SMPTE/MTC Time Code; Auto Fire, Time Code Monitor, and the Create Table Function in Edit.

SETTING THE SMPTE / MTC OFFSET

Select Option 1 from the SETUP Option, Option 5 of the DATA TABLE OPERATING MODE, and the LCD Display is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ SMPTE/MTC TIME CODE OFFSET:00:00:00:00   ³
³ New HOUR:                                ³
```

Enter the New HOUR, from 0 to 23, and depress ENTER to change the SMPTE/MTC TIME CODE OFFSET. The entered HOUR will now be shown in the top line as the NEW SMPTE/MTC TIME CODE OFFSET. The entered OFFSET remains on the LCD Display to verify your selection. If you do not change the SMPTE Offset, then the offset shown IS the Offset value. Exit by depressing an OPERATING MODE Key.

SET MSC DEVICE NO., Option 2

MIDI Show Control, abbreviated as MSC, is an Operating Mode under AUTO FIRE that allows MIDI (Musical Instrument Digital Interface) input signals in the MIDI Show Control format to Fire a PRE-PROGRAMMED sequence(s) on the Field Controller. MIDI Show Control commands are input to the standard MIDI IN connector on the Field Controller, with a standard MIDI cable.

The MIDI Show Control (MSC) Device Number is used as an identification number for the Field Controller. A MIDI Show Control Command must be issued with the same MSC Device Number for the Field Controller to recognize the MSC Command.

THE MSC DEV (MIDI Show Control Device Number) IS ONLY IMPORTANT FOR THE OPERATION IN AUTO FIRE UNDER MSC FIRING, OPTION 4. SEE MIDI SHOW CONTROL FIRING, SECTION 17.

Select Option 2 from the SETUP Option, Option 5 of the DATA TABLE OPERATING MODE, and the LCD Display is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ MSC DEV: y                               ³
³ NEW MSC DEV:                             ³
```

Enter the New MIDI Show Control Device Number, NEW MSC DEV:, from 0 to 99, and depress ENTER to change the MSC DEV Number. The entered MSC Device Number will now be shown in the top line in place of “y”, as MSC DEV:y The entered MSC Device Number remains on the LCD Display to verify your selection. Exit by depressing an OPERATING MODE Key.

PASSWORD PROTECTION AND MEMORY SIZE SECTION 8

INTRODUCTION

The Field Controller offers Password Protection which can be activated to prevent unauthorized changes to the Data Tables. Password Protection only affects operation within the Data Table Operating Mode. All other Operating Modes of the Field Controller (Time Code, Check Status, Manual Fire, Auto Fire) do NOT require the password to operate. The Password is only intended to prevent accidental or intentional tampering with the Firing Instructions and any Set-Up Parameters (excluding the Data Table selected).

If the Password feature is activated, access to the Data Tables without the correct Password is only permitted in a VIEWING MODE. In the Viewing Mode (without entry of the proper password), the user may View the Data Table in Edit, but cannot change any entries. Additionally (without password), the user may not Load, Create Table, access Set-Up, or actually perform Edits in the Data Table Operating Mode. The user may Send the Data Table, changed the Data Table selected, or View ONLY the Data within the already selected Data Table.

To View the Data in the EDIT Option of the DATA TABLE OPERATING MODE, the user is prompted to enter 0000 as 4 characters and will receive a message indicating VIEWING ONLY (so DON'T use 0000 as your Password). In other selections of the Data Table Operating Mode, the user is also requested to enter the Password. An incorrect entry cause a message "BAD PASSWORD - ACCESS DENIED" to be posted and the Field Controller exits to the STOP MODE.

Additionally the Data Table Memories of the Field Controller can be configured into different sizes to accommodate many small or a few large Data Tables. The options are 12 small Data Tables of 475 lines maximum each, 6 Tables of 950 maximum lines each, or 2 Data Tables of 2,500 maximum lines each (6 tables of 950 lines each was the old Field Controller unchangeable default).

SYSTEM INITIALIZATION - Change Data Table Sizes or Password

WARNING - CAUTION

THE SYSTEM INITIALIZATION PROCEDURE AND KNOWLEDGE OF THIS PROCEDURE SHOULD BE RESTRICTED TO QUALIFIED USERS ONLY. Since Initialization can remove or change passwords and erase all information in all Data Tables, please restrict knowledge of this procedure on a need to know basis.

When a new EPROM (Erasable Programmable Read Only Memory) Firmware is installed for the FIRST TIME, the Field Controller will automatically initialize and ask the user to select password preferences and Data Table Memory sizes. CAUTION; any previous information in all Data Tables will be lost when a new EPROM is installed, for the FIRST TIME.

In order to ENTER or CHANGE THE PASSWORD, or CHANGE THE SIZE AND NUMBER OF DATA TABLE MEMORIES, the Field Controller needs to be Initialized. After the initial Initialization (when a new EPROM is installed), the user may change the password, eliminate the password entirely, or leave the password unchanged without loss of any information within the Data Tables. However, if the memory sizes are changed or selected to the same sizes, all information in the previous Data Tables is erased, the memories are checked for integrity, and the memories are cleared.

Additionally when the Memories are Re-Configured, the TAPE CLOCK MODE will be set to Auto Switch, the SMPTE Offset will be set to zero (00:00:00:00) and the optional MIDI Show Control Device Number will be re-set to Device Number 1.

System Initialization may be used to rapidly clear all Data Tables at the same time. This also provides A GOOD PROCEDURE FOR VERIFYING THE INTEGRITY OF THE MEMORY PARTS. It is recommended periodically that the System be Initialized specifically to check the integrity of the memory parts. The memory size can remain the same as previously, if that size option is selected.

Initialization can Re-Configure the Memory without changing the Password, or can Change the Password without Re-Configuring the Memory. Changing the Password may be to add, remove, or alter the Password. If the Memory is NOT Re-Configured, all information within the Data Tables remains as it was. Also the user may bypass both Password Changes and Memory Changes, thus not changing anything.

INITIALIZATION PROCEDURE

With Field Controller switched OFF, press and hold both the AUTO FIRE and the DATA TABLE Operating Mode keys, and continue to hold these two keys down while switching Field Controller ON. Continue to hold the AUTO FIRE & DATA TABLE Keys while the message “CHECKING SYSTEM EPROM” is Displayed, until the next message appears. During the message “CHECKING SYSTEM EPROM”, if both keys are not continuously held down, or the keys are pressed during the message (having mistakenly turned the Field Controller ON first), the Field Controller will Bypass the System EPROM Check, as well as NOT Initialize.

With such deliberate and continuous action required, it is unlikely that an uninformed person can Initialize the Field Controller.

PASSWORD PROTECTION

After Initializing the Field Controller (or when a new EPROM is installed), the following LCD Display will temporarily appear.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ CHECKING SYSTEM EPROM                    ³
³                                          ³
```

After a few moments, one of the following 2 (two) LCD Displays will be presented.

If this is the FIRST INITIALIZATION after installing a new EPROM, then the following LCD Display will appear. The user MUST choose whether a Password is desired or not (password control can be changed on the next initialization).

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Do you want to use Password Protection? ³
³ press “ENTER” if so or “STOP” if not.   ³
```

Subsequent Initializations (after the first time) will additionally include an option to keep the existing Password by the inclusion of the “SKIP” option, as shown below.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Do you want to use Password Protection? ³
³ press “ENTER”(Y), “STOP”(N), or “SKIP”  ³
```

At the above LCD Display, the user has the choice of having a Password (Y for YES = press ENTER), Removing or Not having a Password (N for NO = press STOP), or leave the existing Password Unchanged (press SKIP for No Change).

If you Initialized in order to just Re-Configure the memory and you desire to keep your original password, press SKIP to leave your Password unchanged. Either SKIP or STOP bypasses the Enter Password LCD Display, proceeds directly to the Selecting Memory Sizes LCD Display, and asks if you want to RE-CONFIGURE the Memory.

Upon pressing ENTER the following LCD Display will appear.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Enter four digit password:                ³
³                                           ³
```

Enter 4 digits or characters from the hex keypad, 0 through F. These will not show on the LCD Display. Upon entering the 4th character, the LCD Display will advance to the next Display.

The password is not visible on the LCD Display at any time, in any Operating Mode, so that no one may ever see your password.

SELECTING MEMORY SIZES

The user may configure the internal DATA TABLE Memories in 3 configurations;

12 Data Tables of up to 475 lines each (Tables 0 through B)

6 Data Tables of up to 950 lines each (Tables 0 through 5)

2 Data Tables of up to 2,500 lines each (Tables 0 and 1)

TIP: Data Table size presently configured can easily be determined by Selecting Data Table under Data Table Operating Mode, Option 4; determine largest table number allowed.

After the Password procedure, the user is asked if Memory Re-Configuration is desired, as shown below;

EXCEPTION; When a new EPROM is installed and the Field Controller is first turned ON, the user must select a Memory Configuration. The user is sent Directly to the Select Size Option LCD Display.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ DO YOU WANT TO RE-CONFIGURE MEMORY?       ³
³ Press "ENTER" if so, or "STOP" to EXIT    ³
```

The previous LCD Display provides the user the opportunity to just alter the Password without erasing or changing the existing Data Tables. "STOP" will abort without changing, checking, or clearing the Data Table memories. The Field Controller flashes the Operating Mode LED's, beeps, and Displays the opening Menu.

If “ENTER” is depressed, the user is presented with a second chance to abort (“STOP”), without losing all data in all Data Tables, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

³ WARNING *** THIS WILL CLEAR MEMORY *** ³
³ Press “ENTER” if so, or “STOP” to EXIT ³

“STOP” will abort without changing, checking, or clearing the Data Table memories. The Field Controller flashes the Operating Mode LED’s, beeps, and Displays the opening Menu.

If “ENTER” is selected from the above LCD Display, the user is then asked to select the Memory Configuration, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

³ Select size option: ³
³ 0 = 12 x 475, 1 = 6 x 950, 2 = 2 x 2500 ³

Upon entry of Memory Size Selection (0, 1, or 2), the Field Controller verifies the integrity of the 2 internal memory parts, and actually Initializes the System which configures the Memories (a final, beyond last chance, abort would be to turn OFF the Field Controller before entering a memory size option). As mentioned previously, the TAPE CLOCK MODE is set to Auto Switch, the SMPTE Offset will be zeroed and the optional MSC (MIDI Show Control) Device Number will be set at 1.

During this time, the Field Controller temporarily displays the 3 LCD screens shown below;

LCD DISPLAY

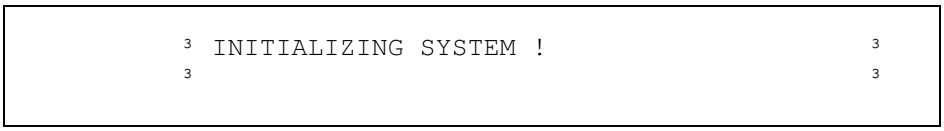
LINE SHOT TIME PFD ADDR CAL

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



Upon completion of Initializing the System, the Field Controller flashes the Operating Mode LED's, beeps, and Displays the opening Menu. If you see the above LCD Display "INITIALIZING SYSTEM !", the memories have been verified, configured (sized), and cleared; all previous Data Tables have been erased. The Data Table selected is Table 0 (zero), the TAPE CLOCK MODE (Auto Time Code Switchover Mode) is set to Auto Switch, SMPTE Offset is 00:00:00:00, and the MSC Device Number is 1.

TIME CODE OPERATING MODE SECTION 9

INTRODUCTION

The TIME CODE OPERATING MODE'S PURPOSE IS TO VERIFY THE INTEGRITY OF THE TIME CODE RECEPTION BY THE FIELD CONTROLLER. Additionally the TIME CODE OPERATING MODE provides a function to GENERATE PYRODIGITAL TIME CODE.

Use the TIME CODE OPERATING MODE to VERIFY the Time Code Signal;

LISTENING TO THE AUDIO (Volume Controls/ Internal Speaker)

OBSERVE THE LCD DISPLAY (Check for Errors)

For PYRODIGITAL TIME CODE (PYDL FSK Time Code) or SMPTE Time Code, the input is to either the Tape In RCA Jack or the Line In 600 ohm XLR Connector on the rear connection panel. For MIDI Time Code (MTC) the input is to the MIDI In jack on the rear connection panel.

SMPTE OR MTC (MIDI Time Code) can be;

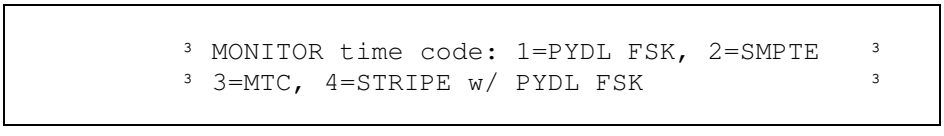
- 30 fps ND (30 frames per second, Non Drop)
- 30 fps DF (30 frames per second, Drop Frame)
  (same as 29.97 NTSC Video Drop Frame)
- 25 fps (25 frames per second EBU)
- 24 fps (24 frames per second for Film)

OPERATION

Select the TIME CODE OPERATING MODE. The LCD shows 4 options. BE SURE TO SELECT THE CORRECT OPTION FOR THE TYPE OF TIME CODE BEING USED;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



PYDL FSK, Option 1

Select "1" on the hex keypad to monitor Pyrodigital Time Code (PYDL FSK = Pyrodigital Frequency Shift Keying). The LCD shows as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ TIME CODE monitor        NO AUDIO          ³
³                                            ³
```

Indicators on the top line of the LCD are "AUDIO ON" or "NO AUDIO", to indicate whether any audio signal is present on the line. Noise, Music, or other non Time Code signals may be present on the line, which is indicated as "AUDIO ON", however the second line of the LCD will only appear when at least one valid Time Code Frame has been received.

When valid Time Code is received, the second line of the LCD display becomes visible. The top line continues to show whether an Audio signal is present or not. The second line of the LCD display, once it has appeared, will remain, even if any Audio Signal is removed. This would be indicated by "NO AUDIO" and TIME is frozen.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ TIME CODE monitor        AUDIO ON          ³
³ TIME:xxxxx           ERRORS:yyyyy          ³
```

"TIME:xxxxx" displays the running time of the Time Code, in 1/10's of a second, xxxxx. "ERRORS:yyyyy" displays the number of errors, yyyyy incurred in the Time Code within each block of solid uninterrupted Time Code. The Error number counter (yyyyy) is reset to zero each time the Time Code (Monitor) Operating Mode is selected. Refer to the SYSTEM NETWORK USERS GUIDE for information on the actual structure of Pyrodigital Time Code.

Use the Pyrodigital Time Code Monitor function to check the integrity of the time code transmission. IT IS VERY IMPORTANT TO VERIFY THE INTEGRITY OF THE TIME CODE TRANSMISSION. Be sure to look at all 3 indicators to make a qualitative judgment about the incoming time code (Audio, running Time, and Errors). Noise may cause Audio ON with no time code. Certain errors are not reported, like when stopping and starting the tape, the time code is not continuous. Look at the actual Time numbers to be sure that they are running, or sequentially increasing, when evaluating the Error number. STOP to exit Time Monitor mode (or select another Operating Mode, or re-select the Time Code Operating Mode again to clear error number).

SMPTE, Option 2 (with OFFSET)

MTC, Option 3 (with OFFSET)

When the SMPTE Option 2, or the MTC Option 3 is selected from the Time Code Operating Mode, a the LCD Display will show the Time Code using the OFFSET HOUR.

The LCD will not fully Display the information until actual valid SMPTE or MTC Time Code within the Offset range is received. The opening, temporary LCD Display is as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ OFFSET: 00:00:00:00                    ³
³                                        ³
```

WARNING - CAUTION

IF SMPTE / MTC OFFSET IS GREATER THAN THE ACTUAL TIME OF THE SMPTE / MTC BEING RECEIVED, THEN IT WILL APPEAR THAT THE FIELD CONTROLLER IS NOT RECEIVING SMPTE / MTC AT ALL

SET THE SMPTE / MTC OFFSET TO 0 (ZERO) HOURS 00:00:00:00

(Data Operating Mode, Option 5=SETUP, Option 1, SET SMPTE OFFSET)

Upon reception of valid SMPTE or MTC, and WHOSE TIME IS GREATER THAN THE OFFSET HOUR, the LCD Display will appear as;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ OFFSET :hh:mm:ss:ff TYPE SMPTE/MTC ON/OFF³
³ RELTIME:h2:m1:s1:f1 ABSTIME:h1:m1:s1:f1  ³
```

The Top Line displays the OFFSET HOUR set in memory shown as “hh:mm:ss:ff”. The OFFSET will be in WHOLE HOURS ONLY. The TYPE indicates the TYPE of SMPTE / MTC being received as either; 30 ND, 30 DF, 25 FPS, or 24 FPS. The “ON/OFF” indicator will be

ON if valid SMPTE or MIDI Time Code is being received. If any distorted, unintelligible, or NO Time Code is being received, then OFF will be indicated.

Use the audio VOLUME Controls to listen to the SMPTE Time Code to be sure it's there (MTC cannot be audio monitored).

THERE IS NO ERROR ANALYSIS (as with Pyrodigital Time Code).

THE SMPTE / MTC is either:

VALID SMPTE / MTC (Time is running continuously, Audio ON)

INVALID SMPTE / MTC (No Time running, Audio OFF)

No SMPTE / MTC Time Code coming in

Distorted, Noisy, or Poor Quality SMPTE / MTC

Out of Offset Range SMPTE / MTC

For Field Controllers so equipped, the SMPTE BLUE LED will be illuminated when valid SMPTE Time Code is being received (NOTE: the BLUE LED will illuminate for ANY Hours of SMPTE even if the OFFSET is out of Range, see Warning - Caution above).

The "ABSTIME:" is the ABSOLUTE TIME, or the actual SMPTE/MTC Time Code Numbers, being received, shown as "h1:m1:s1:f1". "RELTIME" is the RELATIVE TIME, or the Absolute SMPTE/MTC Time with the OFFSET SUBTRACTED, shown as "h2:m1:s1:f1". Since the OFFSET is in Whole Hours ONLY, the minutes, seconds, and frame numbers will be identical.

"RELTIME" is the Time that AUTO FIRE uses to FIRE the selected Data Table.

When the SMPTE or MTC input is stopped, there may be a slight discrepancy shown in the frame numbers between ABSTIME AND RELTIME. This is due to the fact that the internal clock may continue to run slightly after the input has stopped.

REMEMBER: If the OFFSET is Greater than the ABSTIME (actual time of incoming SMPTE / MTC), then the RELTIME would be NEGATIVE, thus the Field Controller would appear as though IT IS NOT RECEIVING SMPTE / MTC AT ALL. Set the OFFSET to ZERO and Check Again.

STRIPE w/ PYDL FSK, Option 4

Depress the "4" key on the hex keypad to immediately begin GENERATING PYRODIGITAL TIME CODE. The LCD shows a new screen, with progression of the Pyrodigital Time Code as generated, always starting with Time = 1. The Pyrodigital Time Code is for recording to tape for use in Scripting / Choreography. The output of the Time Code is on the rear panel, Tape Out, RCA jack.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Sxxxxxx                                    ³
³ Generating time code.....                  ³
```

Notice that an unmodulated TONE is always available at the Tape Out RCA Jack for setting recording levels. Pyrodigital recommends recording at -10 Vu on your Tape Deck. Set your level BEFORE depressing Option 4, which then immediately starts generating Pyrodigital Time Code.

Generating Pyrodigital Time Code on the Field Controller is the better than using the VER250 TIMEGEN utility (TIMEGEN is part of the Pyrodigital VER250 IBM PC Scripting Software used for Scripting a Display on a separate PC Computer). The Pyrodigital Time Code generated by the Field Controller will be much more accurate than can be calibrated on your PC Computer with the TIMEGEN Program (1 minute Pyrodigital Time Code from Field Controller = extremely close to exactly 1 minute of Real Time).

The Pyrodigital Time Code is also available on COMPACT DISK for convenient and very accurate use in a Recording Studio.

Also, in this Users Guide, see the DATA TABLE OPERATING MODE, Option 3, CREATE TABLE, for information on using Pyrodigital Time Code to Script a Show with the Field Controller.

Please refer to the SYSTEM NETWORK USERS GUIDE for information on recording, using, and the structure of Pyrodigital Time Code.

CHECK STATUS OPERATING MODE SECTION 10

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.

THIS USERS GUIDE ONLY DESCRIBES DIRECT OPERATION OF THE FIELD CONTROLLER AND DOES 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 SYSTEM NETWORK ARE INCLUDED IN THE SYSTEM NETWORK USERS GUIDE.

THE USER MUST, ABSOLUTELY, BECOME FAMILIAR WITH ALL PROCEDURES IN THE PHASE III SYSTEM NETWORK USERS 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. Refer to this Users Guide Section, the SAFETY KEY WARNING SYSTEM, for an understanding of how the Warning System operates. If it is SAFE to Proceed, per the above Warning, and all Warnings and Safety Procedures outlined in the System Network Users Guide, the user may then ARM the Safety Key.

WARNING - EXTREME DANGER

USE THE ACTIVE TEST LIGHTS TO CHECK FOR SHORTS

Status Check is normally where any Shorts in the System Network are first found. See the ACTIVE TEST LIGHTS Section of this User's Guide.

ABSOLUTELY FIND & CORRECT ANY SHORTS BEFORE PROCEEDING

It is required that the user PRACTICE using the CHECK STATUS Operating Mode in an INERT TEST ENVIRONMENT. See this Users Guide for information on Inert Testing and Practice with Test Lamps. CHECK STATUS WITH EXAMPLE 1 DATA TABLE is included at the end of this section for "hands on" practicing.

When the CHECK STATUS Operating Mode is depressed, and the Safety Key is Armed, the LCD appears as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ STATUS: 0=MANUAL, 1=SEMI-AUTO ³
³ 2=AUTO CHECK, 3=PRINT REPORT ³
```

The user may then Select any one of the 4 Options by depressing the corresponding Key on the hex Keypad.

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 PYRODIGITAL PHASE III SYSTEM NETWORK USERS MANUAL, INERT SYSTEM CHECK-OUT See also ACTIVE TEST LIGHTS

2 Provide a means to Check the electrical connections of the Pyrotechnic electric matches to the Phase III Firing System Network. SEE THE PYRODIGITAL PHASE III SYSTEM NETWORK USERS MANUAL, OPERATION WITH LIVE PYROTECHNICS.

In Check Status, continuity status information from each and every circuit in the System Network is sent back to the Field Controller. This information consists of whether a complete electrical circuit (approximately 200 ohms or less) exists on the particular circuit being tested. Thus the Phase III System can only tell if a complete circuit connection exists on a particular Firing Circuit. Phase III, obviously, cannot tell if this is the correct Pyrotechnic Device.

Status Information as a Function of the Data Table

The Electric match Continuity Status Information displayed on the LCD screen will be a function of what Firing Addresses are specified in the Selected Data Table.

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 Data Table.

If there is NO DATA TABLE, THEN THERE EXISTS NO ADDRESSES WITH WHICH TO COMPARE THE ACTUAL STATUS INFORMATION. This is the same condition as when there are unspecified addresses within a Data Table, excepting that the whole Data Table has no addresses (NO TABLE !).

When the Check Status routines COMPARE the actual electric match status against the Firing Addresses specified in the Data Table, there are 4 possible Comparison Conditions which are shown on the LCD screen;

Status returns are;

```
=     (equals sign) Address specified in Data Table and something is
Connected to this Address;  OK CONDITION

?     (question mark) Address not specified in Data Table but something is
Connected to this Address; ERROR CONDITION
X     (capitol letter X) Address specified in Data Table but nothing is
Connected to this Address; ERROR CONDITION

      (blank space) No Address specified in Data Table and nothing is
Connected to this Address;  OK CONDITION
```

Thus what is shown on the LCD for STATUS will be" = , ? , X , , ". These indications will be a function of whether that corresponding ADDRESS EXISTS, OR DOES NOT EXIST, in the SELECTED Data Table.

Status LCD Display

In all STATUS Options, the LCD appears similarly as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ 0 1 2 3 4 5 6 7 8 9 A B C D E F          ³
³ Status BOX :xx                           ³
```

The STATUS LCD display always indicates STATUS in terms of one Firing Module, or 16 Status Returns (0 through F) per screen. This is like separating the full 3 character FIRING ADDRESS into 2 components; the BOX is the first two Address Characters, and there are 16 possible 3rd hex characters of the complete address.

In the above LCD screen, all possible 16 exact Addresses are shown for BOX : "xx". The displayed STATUS, as determined by COMPARING the actual Status against the Data Table, would be shown for each exact Address following each Address Hex Character.

Consider the below example LCD STATUS display;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ 0=1=2=3=4X5X6X7X8?9?A?B?C D E F          ³
³ Status BOX :01                           ³
```

This shows complete STATUS information for Addresses 010 through 01F. Addresses 010 through 013 have an electric match connected which should be connected, this is OK. Addresses 014 through 017 do NOT have an electric match connected but should have an electric match connected, these addresses have something wrong. Addresses 018 through 01B have an electric match connected to them but nothing is supposed to be connected, these addresses have something wrong. Addresses 01C through 01F do not have anything connected and nothing is supposed to be connected, these addresses are OK.

If, in the above LCD example, the Connections on 018 through 01B were moved to Addresses 014 through 017, then the LCD 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. You would have to Verify that the correct Pyrotechnic Device is connected to the correct Address, in all 4 cases, or the Firing Sequence would be wrong. Carrying the above example 1 step further, suppose that in fact these 4 Pyrotechnic Devices needed to be moved, as per above, from 018 through 01B to 014 through 017. Instead of physically moving them, you could enter the EDIT Mode and change the 4 Addresses instead.

OPTION O, MANUAL STATUS CHECK

MANUAL STATUS CHECK will display STATUS COMPARISON information for the BOX Address selected by the User.

The BOX Address (or the first two hex characters of the complete Firing Address) can be selected either by using the UP / DOWN ARROW Keys or entering a BOX address from the hex keypad (and then depressing ENTER).

When you select Option 0, MANUAL, you may immediately get an LCD display as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ GET NO RESPONSE AT THIS ADDRESS!          ³
³ Status BOX :00      New Box #:            ³
```

The above LCD indicates that BOX 00 (Addresses 000 through 00F) is not available on the System Network. This would be because the System Network is NOT CONNECTED, OR, at there is NO FIRING MODULE (or other output device) SET TO ADDRESS 00 (on the Thumbwheel Address Switch). Certainly such would be the case if nothing is connected to the Field Controller.

"GET NO RESPONSE AT THIS ADDRESS" will always be indicated for any Address when there is no device responding to a Status Request sent out by the Field Controller.

Notice that in MANUAL STATUS the UP / DOWN ARROW may be used to step, in logical hex sequence, to any BOX Address from 00 to 7F. You cannot go beyond 7F (Down Arrow) nor before 00 (Up Arrow).

You can also request STATUS from any BOX Address (from 00 through 7F) by entering these two Box Address Hex Characters and then depressing ENTER. As soon as you enter 1 hex character the previous STATUS display disappears and the LCD only shows "New Box #:". If you make a mistake and enter a 3rd hex character, before ENTER, the Field Controller will "beep", indicating an entry error, and the Status LCD will return to the previous Box Address. Use the UNDO ENTRY Key to remove an incorrectly entered address (one or both characters) before depressing return.

Thus MANUAL STATUS may be used for Checking STATUS from all possible Addresses of the Phase III Firing System.

OPTION 1, SEMI-AUTO STATUS CHECK

SEMI-AUTO Status Check behaves very similarly to Option 0, Manual Status Check. The LCD display is the same, except "New Box #:" is not displayed, or available.

IN SEMI-AUTO, ONLY BOX ADDRESSES SPECIFIED IN THE SELECTED DATA TABLE ARE CHECKED FOR STATUS. The UP / DOWN ARROW Keys are used to select between these Addresses, in a cycling behavior. The cycling behavior means that you can jump from Status at the highest address back to Status at the lowest Address, and visa versa, like in a big circle, or loop.

IF THERE IS NO DATA TABLE (NO TABLE!) THEN THE LCD WILL GO BLANK because there are NO ADDRESSES to compare Status Against. MANUAL CHECK must be used when there is NO DATA TABLE.

SEMI-AUTO is an extremely useful STATUS Check because it ONLY shows STATUS for BOX Addresses that are supposed to have electric match connections (per the Selected Data Table). Thus you do NOT have to look at all 128 possible Box Addresses (00 through 7F) to check Status. SEMI-AUTO, however, will NOT show STATUS for any BOX Addresses which are NOT Specified in the Selected Data Table. In this case, Specify the Addresses in the Data Table, or use MANUAL Status Check. Note that UN-Specified Addresses in the SELECTED Data Table will NOT be Fired.

OPTION 2, AUTO STATUS 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, this means that there is an error is the electric match connections.

In AUTO CHECK, a BOX Address which is connected OK, will appear on the LCD as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ THIS BOX MEETS TABLE REQUIREMENTS        ³
³ Status BOX :xx                           ³
```

The above LCD indicates that BOX Address "xx" is connect correctly in accordance with the Firing Addresses specified in the Selected Data Table.

In AUTO CHECK the Field Controller will continue to rapidly cycle through all Addresses in the Selected Data Table, beeping and temporarily showing the STATUS of any Addresses which are not correctly connected. Thus for a perfectly connected System Network, the above LCD is all that will appear in AUTO CHECK and no "beeps" will be heard. If you hear beeps and see anything on the LCD display other than "THIS BOX MEETS TABLE REQUIREMENTS" there are possible errors in the electric match connections.

AUTO CHECK ALSO CHECKS ALL POSSIBLE 128 BOX ADDRESSES AND REPORTS ON EVERY BOX WHICH IS CONNECTED TO THE SYSTEM NETWORK. Thus Addresses which are NOT specified in the Selected Data Table will show up in AUTO CHECK. Additionally, if a BOX Address is found which is NOT Specified in the Data Table, and nothing is connected to it, then it is reported as "THIS BOX MEETS TABLE REQUIREMENTS".

IF THERE IS NO DATA TABLE (NO TABLE!) THEN THE LCD WILL GO BLANK because there are NO ADDRESSES to compare Status Against. MANUAL CHECK must be used when there is NO DATA TABLE.

OPTION 3, PRINT STATUS REPORT

PRINT REPORT IS AN ACTIVE STATUS TEST AND THE SAFETY KEY MUST BE ARMED AND THE SYSTEM NETWORK CONNECTED JUST AS FOR THE OTHER STATUS CHECK MODES.

PRINT REPORT WILL ONLY FUNCTION IF A PRINTER IS CONNECTED AND READY. If no Printer is Connected (an IBM Compatible printer using the Parallel Printer ASCII Format) then the "Printing STATUS" message will time out with the message "PRINTER IS NOT RESPONDING" after about 20 seconds. Then the Field Controller will exit to the STOP Mode (and Warn the user to turn OFF the Safety Key). This serves to help alert the user that there was a problem with the printer (not connected, OFF LINE, out of paper, etc.).

When a Printer is connected, and ready, a REPORT of the STATUS COMPARISON will be printed out. The Field Controller will exit back to the Options Menu of the CHECK STATUS Operating Mode.

The printout REPORT is similar to the results determined in AUTO CHECK. The REPORT is extremely useful, on location, for both checking the operation of the System Network (Inert System Check-Out) and in repairing faulty circuits. It is most convenient to be able to have the REPORT Printout in your hands when going into the Firing Area to Check electric match connection faults.

As In Auto Check, PRINT REPORT ALSO CHECKS ALL POSSIBLE 128 BOX ADDRESSES AND REPORTS ON EVERY BOX WHICH IS CONNECTED TO THE SYSTEM NETWORK.

Check Status with Example 1 Data Table

AS A REMINDER, PLEASE REMEMBER Normally, DO NOT USE THUMBWHEEL ADDRESS 00 (Box Address 00) FOR ACTUAL FIRING PROGRAMS CREATED WITH PYRODIGITAL SCRIPTING SOFTWARE. This is because any NOTES or UN-ADDRESSED EVENT LINES will be TRANSLATED and FIRED AS ADDRESS 000.

PLEASE CONNECT ONE FIRING MODULE TO THE FIELD CONTROLLER, SET THUMBWHEEL ADDRESS TO 00. CONNECT ELECTRIC MATCH TEST LIGHTS on Addresses 001 through 009.

---------- WITH NO, REPEAT, NO PYROTECHNICS CONNECTED -------

Use the DATA TABLE created in EDIT, EXAMPLE 1 DATA TABLE. If you have lost this Data Table, go to DATA TABLE Operating Mode, Option 0, EDIT, Example 1 Data Table, and re-enter this Data Table.

Depress the Status Check Operating Mode button, turn key ON, and select zero, or manual option. If you have Firing Module 00 connected with shunt switch open and 10 test lights connected on 000 through 009; then you should see response indicated as "=" (equals sign) from circuit 0 to circuit 9. Blanks are indicated on circuits A through F.

For our above example, close the shunt switch. You will now read status as if there were no connections on Module 00, however it is responding. You should now see "X" (capitol X) indicated for STATUS on circuits 0 through 9 (Addresses 000 through 009). This is the mirror image of the status with the shunt switch open.

Depress the DOWN ARROW. Observe the LCD, no response at Box Address 01. Depress the UP ARROW to go back to Box Address 00. You have observed that the DOWN ARROW and UP ARROW will increment / decrement the box address, logically in hexadecimal sequence. One depression of the DOWN ARROW moved to box 01.

In MANUAL Mode however, we have forced the program to look at box 01 which is not supposed to be in the circuit according to our Data Table. If you change a thumbwheel address to 01 and UP / DOWN ARROW to check status of 01, Shunt Switch Open, you will note question marks, indicating no circuits are supposed to be connected to circuits 000 through 009. With the shunt closed note that status shows all blanks, or that this Firing Module is functionless in the System Network and should be removed.

Notice also that you can manually specify a box to check by entering it from the hex key pad. Try this by depressing 10 and ENTER. Change the thumbwheel address switch to 10. You should get the same responses (shunt open and closed) as when the Firing Module was set on 01.

Now depress CHECK STATUS again directly (you still have the key on so you step around the Safety Key Warning System), select option 1, SEMI-AUTO. You should GET NO RESPONSE AT THIS ADDRESS. Change the thumbwheel back to Box Address 00. The Firing Module should now be responding as before, in Manual Check. Use the DOWN ARROW and notice that it does nothing. This is because you only check status of those boxes which are specified in the data table as being required circuits (in SEMI-AUTO). The example 1 Data Table ONLY has Addresses specified for BOX Address 00. This is different than in manual mode where you sequentially step in hexadecimal through each and every Box Address. Notice also that in SEMI-AUTO you can no longer request status from any box by entering it from the hex key pad.

Try full auto or option 2, AUTO CHECK. In this mode you will notice that the status check seems frozen, and THIS BOX MEETS TABLE REQUIREMENTS. If the Data Table had Addresses for additional BOXES then AUTO CHECK would have progressed automatically through all boxes that are Addressed. Switch the Shunt Switch to the Shunted Position and observe the response. A "beep" indicates that there are errors on that box. A 100% correct status check would be indicated by no "beeps" with the LCD indicating "THIS BOX MEETS TABLE REQUIREMENTS" for all boxes.

You can fool the Field Controller by setting the Module address to 01 and then engaging auto check. Note that for 01 "THIS BOX MEETS TABLE REQUIREMENTS" in that nothing is connected (shunted) and nothing is supposed to be connected, however this box serves no purpose as nothing will be Fired from it and nothing is supposed to be Fired from it. This Firing Module should be removed from the System Network in a show situation. Try opening the shunt on 01 and see what happens. (Now you have errors for both BOX 00 and Box 01)

The only mode left is option 3 Print Report. Connect an IBM compatible printer, using the IBM printer cable, and try option 3. Note that this is an active test and the key must be on the get response from the Firing Modules. The printout report should be self evident. Notice that checks are made for those boxes required in the data table, plus any boxes are reported that are connected but are not specified in the table. This printed report is a very handy tool to take in hand to the Firing Site and make the necessary corrections to the wiring.

Try connecting several Firing Modules and making up your own test Data Table (Select a different Memory so that this Example 1 Data Table can be used again in the Manual Fire and Auto Fire Modes).

MANUAL FIRE OPERATING MODE SECTION 11

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.

THIS USERS GUIDE ONLY DESCRIBES DIRECT OPERATION OF THE FIELD CONTROLLER AND DOES 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 SYSTEM NETWORK ARE INCLUDED IN THE SYSTEM NETWORK USERS GUIDE.

THE USER MUST, ABSOLUTELY, BECOME FAMILIAR WITH ALL PROCEDURES IN THE PHASE III SYSTEM NETWORK USERS GUIDE BEFORE THE SAFETY KEY OF THE FIELD CONTROLLER IS EVER ARMED.

INTRODUCTION

In order to access the MANUAL FIRE Operating Mode, the Safety Key Must be ARMED. Refer to this Users Guide Section, the SAFETY KEY WARNING SYSTEM, for an understanding of how the Warning System operates. If it is SAFE to Proceed, per the above Warning, and all Warnings and Safety Procedures outlined in the System Network Users Guide, the user may then ARM the Safety Key.

It is required that the user PRACTICE using the MANUAL FIRE Operating Mode in an INERT TEST ENVIRONMENT. See this Users Guide for information on Inert Testing and Practice with Test Lamps. MANUAL FIRE WITH EXAMPLE 1 DATA TABLE is included at the end of this section for “hands on” practicing.

BASIC MANUAL FIRE WITH NO DATA TABLE was previously covered in this Users Guide under: BASIC OPERATION OVERVIEW, Section 5, Subsection: BASIC MANUAL FIRE - Example.

MANUAL FIRE WITH A DATA TABLE is used for those cases where it is desired to pre-define the sequence of Pyrotechnic FIRINGS by the use of the DATA TABLE. If the END OF THE DATA TABLE IS EXCEEDED, THEN THE FIELD CONTROLLER BEHAVES AS IF THERE WAS NO DATA TABLE. All BASIC MANUAL FIRE functions are always still available, regardless of whether there is a Data Table or not. The Data Table serves to tremendously enhance the Firing capabilities of the Field Controller.

THE DEADMAN SWITCH MUST BE ACTIVATED, AS INDICATED BY THE ABSENCE OF THE YELLOW "HOLD FIRE" LED, IN ORDER FOR A FIRING COMMAND TO BE ISSUED TO THE SYSTEM NETWORK. The Field Controller will "beep" whenever the FIRE Key is depressed and the DEADMAN is not held down TO WARN the user that a FIRING Command has NOT been issued. Note that it is most convenient IN MANUAL FIRE, to FIRE with the Remote PICKLE (Hold the Deadman Button and Fire with the Trigger).

OPERATION

If there is a Data Table (a Data Table that has any non zero Data Fields), when the MANUAL FIRE Operating Mode Key is depressed, and the Safety Key is Armed, the following LCD Display will TEMPORARILY appear;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Please WAIT......preparing data          ³
³                                          ³
```

After a few moments, the LCD appears similar to as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF xxx CA         ³
³ EVENT    TABLE #:z         MFxxx         ³
```

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 PICKLE FIRE TRIGGER IS DEPRESSED.

BE ABSOLUTELY SURE THAT IT IS SAFE TO FIRE.

The first line of the LCD is the first EVENT LINE of your Data Table. Whatever information was in the Data Fields of the First Event Line, OF THE SELECTED DATA TABLE, is now displayed as the upper line of the Manual Fire Operating Mode LCD Display. The Selected Data Table is indicated on the second line of the LCD as “TABLE #:z”, where “z” is the Selected Data Table Number.

Also on the second , or bottom line of the LCD, in the lower left corner, is the word “EVENT”. This lower left corner area is used to display many indicators relating to functions in both Manual Fire and Auto Fire. In the MANUAL FIRE Operating Mode, there are two possible indicators for this lower left corner area;

EVENT - The ADDRESS displayed following MF, IS an EVENT within the Selected Data Table. The Field Controller LCD top line shows the entire Event Line.

DIRECT - The ADDRESS displayed following MF, IS NOT an EVENT within the Data Table. The Field Controller is in the DIRECT ADDRESSING MODE.

In the MANUAL FIRE Operating Mode (and the AUTO FIRE Operating Mode), MF, which stands for Manual Fire, ALWAYS INDICATES WHAT ADDRESS WILL BE MANUALLY FIRED WHEN THE FIRE KEY IS DEPRESSED. (The ADDRESS TO BE FIRED is the 3 hex character address that follows the letters MF in the LCD display). The Firing Address of the EVENT is always transferred to the MF display area (in the MANUAL FIRE Operating Mode ONLY), if there is in fact an Event in the Data Table that has that Firing Address. (The cursor underlining will affect the FIRING ability of the displayed MF Address when directly entering an Address from the hex keypad. See MF Address Underlining - Subsection of this Section).

Each time you depress FIRE you will Fire the address shown for MF, which is the same as the address for the Event Line shown on the top LCD line. Notice in the above LCD display, “xxx” is indicated as the Address to be Fired.

When FIRE is depressed, the Field Controller will automatically advance to the NEXT EVENT in the Data Table, and show this next Event Line on the top line of the LCD. This next line is now available for Firing. NOTE: THE FIELD CONTROLLER WILL NOT FIRE, WILL NOT ADVANCE TO THE NEXT EVENT LINE, AND WILL “BEEP” IF THE DEADMAN SWITCH IS NOT HELD DOWN.

THUS, EACH TIME FIRE IS DEPRESSED, THE EVENT LINE ADDRESS SHOWN WILL BE FIRED, AND THE FIELD CONTROLLER WILL ADVANCE AND DISPLAY THE NEXT EVENT LINE AVAILABLE TO BE FIRED, AT THAT EVENT LINE’S ADDRESS.

When the Event Line’s ADDRESS is Fired, that Address is transferred to LF, for Last Fired. Whatever Address is shown following LF is also available for REFIRE. The REFIRE Key issues another Firing Command at the LF Address each time REFIRE is depressed. The LCD below shows Address “xxx” as Last Fired, LF, with the next Address available for Firing as “yyy”;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF yyy*CA        ³
³ EVENT    TABLE #:z   LFxxx MFyyy___³
```

Also shown is an asstericks (*) directly following the Address “yyy” in the Event Line. This asstericks would NORMALLY not be seen because it is added to the Event AFTER it has been Fired. It serves the purpose, when using advanced Manual Firing Features, to locate what was the last shot Fired. The asstericks can be seen, if after a few Events are Fired, the UP ARROW Key is used to go back to a Fired Event.

If all EVENTS are FIRED within the selected Data Table, the END OF THE DATA TABLE is reached. If you FIRE again at the Last Event of the Data Table, the Field Controller “beeps” as a Warning, and the LCD appears as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ END OF TABLE – DIRECT ADDRESSING        ³
³ EVENT    TABLE #:z   LFvvv MF000        ³
```

Going beyond the END OF THE DATA TABLE is possible by Direct Addressing. In this case it is not possible to GO Back TO the Data Table. The Field Controller behaves as per the previous section of this Users Guide, BASIC OPERATION OVERVIEW, BASIC MANUAL FIRE - by Example (NO DATA TABLE). GOING BEYOND THE END OF THE DATA TABLE IS AN ABNORMAL OPERATING CONDITION.

MF, MANUAL FIRE DIRECT ADDRESSING

Direct entry of an ADDRESS VIA THE HEX KEYPAD is possible. All 2,048 possible addresses can be FIRED. The entered Address may or may not be in the selected Data Table. If the entered Address is in the Data Table, then the Field Controller will automatically Go To the Event Line which contains that Address, and display that Event Line on the LCD. If the entered Address is not in the selected Data Table, then the LCD will appear as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ NO MATCHING EVENT THIS ADDRESS !          ³
³ DIRECT   TABLE #:z   LFjjj MFkkk          ³
```

DIRECT indicates that Address "kkk" is NOT in the Data Table (as also shown by the top line of the LCD).

MF ADDRESS UNDERLINING

When entering Addresses directly from the hex keypad, there is an UNDERLINING Feature which indicates the sequence of Address Entry as well as Firing availability of that ENTERED Address. Each time you enter one hex character the underline cursor moves over one position to indicate where the next Address character will be shown on the LCD. This behaves in a cyclic fashion, resetting the underline cursor to the beginning position upon entry of a 4th character. This serves as an automatic enter function, so that you do not have to depress ENTER when entering Addresses from the hex keypad.

For an entry made from the hex keypad, the cursor underlining must be to the right of the 3rd Address character in order to Fire. The underlining to the right of the last Address Character indicates that this is a full 3 hex character, Valid, entered Address which will be Fired when the Fire Key is depressed. If the underlining is NOT to the right of the 3rd Address Character, then the Field Controller will "beep" and the LCD will return to where it was. For Addresses within the Data Table the underlining position only serves as an indicator for character entry position (the underlining does not affect the Firing function).

MOVING TO EVENTS WITHIN THE DATA TABLE

The Field Controller has many features for moving to different EVENT LINES within the Data Table, plus provisions for Firing Events not specified in the Data Table.

NOTE THAT A DATA TABLE FOR MANUAL FIRE NEED ONLY HAVE THE FIRING ADDRESSES SPECIFIED. Time and Pre-Fire Time need not used in Manual Fire, except for advanced features, such as Zipper Fire and Timed Macro Fire. The Shot Number and Caliber Data Fields can be used for advanced features in Manual Fire, such as GO TO SHOT #. Certainly the SHOT NUMBER provides a very useful reference for the user and should be included as part of every Data Table. Caliber can be used for GROUP CALIBER FIRING within the Manual Fire Operating Mode and HAZARD LOCKOUT in the Auto Fire Operating Mode.

The first basic ability is to directly move within the Data Table. The UP / DOWN ARROW Keys move up and down, one Event Line per depression, within the Data Table. The HOME Key goes to the beginning (first line) of the Data Table.

SKIP; In Manual Fire, the MF/SKIP Button (same Button as AF/PAUSE) normally skips the Event Line shown and advances to the next Event Line. This function has been expanded to include Zipper Sequences, Timed Macro Sequences, and Group Caliber Sequences. Thus, if you depress the MF/SKIP Button at the beginning or in the middle of a Pre-Programmed sequence of events (Zipper Firing, Timed Macro Firing, or Caliber Group Firing), the Field Controller Skips to the next Event or sequence of Events to be Fired.

The Down Arrow and the Up Arrow are functional for moving only one Event Line anywhere within the Data Table, including with in a Pre-Programmed Sequence.

See TIMED MACRO FIRE, DATA TABLE SETUP and PAUSING AND STOPPING MACRO FIRE to understand how MF/SKIP works and how it may be used. See also CALIBER GROUP FIRE, CALIBER GROUP SET UP; the number of "shots" (one SHOT could be Pre-Programmed to be number of Event Lines) Skipped is included in the total number of Shots Left.

GO TO ADDRESS and GO TO SHOT (NUMBER) can be used to GO TO a specific Address or Shot Number within the Data Table. This is very similar to the LOCATE Function in EDIT. If the requested GO TO SHOT / ADDRESS is not in the Data Table, then the LCD second line will temporarily display "MATCHING LOCATION NOT FOUND". The Event Line will remain unchanged. If the Event Line IS FOUND then the LCD will show the requested Event Line and FIRING may proceed from this new Event.

The RETURN TO SEQUENTIAL Key can then be used to return to that Event Line that was displayed BEFORE you used the GO TO Function.

IT IS NOT POSSIBLE TO RE-FIRE OR REPEAT SHOTS BY RE-ACCESSING PREVIOUSLY FIRED SHOTS. If you use GO TO SHOT, GO TO ADDRESS, UP ARROW, DOWN ARROW, or the HOME keys to located to a previously FIRED Event, depressing FIRE again will NOT Re-Fire that Event, but only result in a "beep" from the Field Controller. This is due to the Asstericks (*) feature used to keep track of what shots have been Fired (used in Group Caliber Firing, Skip and other functions). Of course the actual Re-Fire Key still Re-Fires the Last Fired Address as shown by the "LF" Address on the LCD Display.

MANUAL FIRE WITH EXAMPLE 1 DATA TABLE

PLEASE CONNECT ONE FIRING MODULE TO THE FIELD CONTROLLER, SET THUMBWHEEL ADDRESS TO 10. CONNECT SQUIB TEST LIGHTS on Addresses 101 through 109.

---------- WITH NO, REPEAT, NO PYROTECHNICS CONNECTED -------

ONLY TEST LIGHTS ARE TO BE USED ON THE FIRING MODULES TO BECOME FAMILIAR WITH THE FIELD CONTROLLER OPERATION

Use the DATA TABLE created in EDIT, EXAMPLE 1 DATA TABLE. If you have lost this Data Table, go to DATA TABLE Operating Mode, Option 0, EDIT, Example 1 Data Table, Subsection of this Users Guide and re-enter this Data Table (or re-create; Data Table: 10 shots 0 - 9, Time every 2 seconds from 00:00:10:00 to 00:00:28:00, all 0 PFT, Address sequential from 100 to 109, Calibers sequential from 0 to 9).

Select Manual Fire. Arm key. Look at the LCD Display. MF indicates 100 with underline under the 1, indicating that there is not yet a valid entry for direct manual Fire, however the first address to be fired is 100 under MF (Manual Fire), because this is an EVENT in the Data Table. The indicator “EVENT” in the lower left corner indicates that this is an “EVENT” in the data table.

DO NOT hold down the Deadman switch and depress FIRE one time. Notice that the Field Controller “beeps” unless the DEADMAN is held down. Also the Field Controller will not advance to the next Event Line and no Firing Command will be issued (watch test lamp 100) unless the Deadman is held down. Depress Fire several more times and notice that basically nothing happens except you get beeped at.

Now hold down the Deadman and depress FIRE. Notice LF indicates the Last Fired Address as 100 and may be indefinitely Re-Fired (with deadman held down). Try REFIRE several times. Fire shot #1 and shot #2. Verify all your Firings by observing the Test Lights (with Firing Module unshunted).

Enter address 105 from the hex keypad. Notice that you don’t have to depress Enter and the first line of the LCD has located to this Event Line in the Data Table automatically (as soon as you entered the last character of the Address). The Field Controller is ready to Fire at address 105. Hold the Deadman and press Fire. Your simulated electric match test light should illuminate for 105.

RE-SELECT THE MANUAL FIRE OPERATING MODE, FIRE Shot #0, #1, and #2. Try a manual entry of address 6FF to be Fired. Now there is “NO MATCHING EVENT THIS ADDRESS !” and “DIRECT” is indicated. Address 6FF is NOT in the Data Table. Fire this address with the Deadman NOT depressed. The Field Controller “beeped” and returned back to Shot # 3 ready to be Fired. Re-enter Address 6FF and hold down the Deadman, and depress FIRE. Now the LCD indicates 6FF as Last Fired and now shows MF as 103 with the underlining under the 1.

Now it is decision time - what is the next address to be Fired? You may continue on manually entering each address via the hex key pad. Notice that for every 4th entry via the hex key pad you start a new entry. It seems that you can get lost, but pay attention to the underline cursor. When the underline curser is to the RIGHT of the 3rd Address Character, that is the address to be Fired. If you don't like that address or it is in error simply re-enter 3 new hex characters. Notice that if you entered an address that was in the Data Table you would have gone to that Event Line. Try entering Address 102. The UP ARROW / DOWN ARROW will advance or decrement within the data table. Try moving UP and Down from shot # 2.

Because of the Asstericks (*), any Event cannot be FIRED again. The Field Controller "beeps" (for attempted FIRE again at an Event with a *), Does Not FIRE, and advances to the next Event Line.

Try the SKIP button to skip over an event. Skip, only in this Data Table, behaves the same as depressing the Down Arrow (Skip will also skip over entire sequences that are linked together, such as may be used for Zipper Fire, Timed Macro Fire, or Caliber Group Fire; see SKIP in those Sections).

Notice Home will take you back to the top of the data table (only when you are inside the Data Table). NOTICE AN ASTERISK (*) directly after the address indicates that this Event HAS BEEN FIRED (and CANNOT be Fired again). Notice that when Fire the last shot of the table the Field Controller "beeps" and shows the Asstericks (*). If you FIRE again, the Field Controller "beeps" and posts the message "END OF TABLE - DIRECT ADDRESSING". Each time you depress Fire at this message you just get "beeped" and nothing happens. You are at the END and normally you would be finished Firing.

You may, however, continue on Firing as if there were no data table. This means direct Addressing via the hex keypad. You can also "fool" the Field Controller into an ABNORMAL condition where it is resident outside of the Data Table. In this condition you cannot get back into the Data Table and the Field Controller behaves as if there were no Data Table. In order to do this you must advance beyond the END OF TABLE Marker. In this mode the Field Controller resorts to automatic hex sequencing to the next logical Address, per Firing. In this ABNORMAL MODE if you enter an Address that WAS in the Data Table, this may be posted as the Top Line of the LCD Display, HOWEVER Firing is in a Logical Hexadecimal Progression, NOT AS PER THE DATA TABLE (the Top Line doesn't change, except for another direct Entered Address which WAS within the Data Table). Operating Outside the Data Table is ABNORMAL and NOT RECOMMENDED.

Depress the MANUAL FIRE Operating Mode Key. Notice that your back instantly ready to Start Firing Again. Notice that this CLEARS all Asstericks (*) (previously FIRED indicators).

Depress GO TO ADDRESS and enter 108 and depress ENTER. Now you are at address 108 which happens to be an event in the data table at line # 8, shot # 8. FIRE. Now try to GO TO ADDRESS 10E. Notice now you get a different response. "MATCHING LOCATION NOT FOUND" on the second line of the LCD, temporarily and then the LCD returns to where you just left off. The same behavior can be noted for shot numbers not in the data table using the GO TO SHOT command. Thus GO TO only locates for items within the data table. To go outside the data table you must Directly enter the hex address.

Basically there is far more control to FIRE shots than you would normally need. You load the data table and press FIRE or SKIP to Fire down your shot list. If you need to go somewhere else you can GO TO if it is in the data table and RETURN TO SEQUENTIAL or go direct by entering the desired address and RETURN TO SEQUENTIAL. REFIRE is always active for the last shot Fired as indicated under LF. When you use these advanced Functions you should have some plan of what and where you are Firing. You can get lost if you don't know where you are going.

Please familiarize yourself with the unit operation by making your own data table and trying various keys to see how the unit responds.

ZIPPER FIRE SECTION 12

INTRODUCTION

THE PURPOSE OF ZIPPER FIRE IS TO SIMULTANEOUSLY FIRE SEVERAL DIFFERENT ADDRESSES, AT DIFFERENT LOCATIONS (ie; AT THE SAME TIME). For example, Zipper Fire allows a FRONTAGE of say 5 different physical positions of Stage Gerbs or Outdoor Exhibition Candles to be FIRED SIMULTANEOUSLY, all functioning at the same time.

ZIPPER FIRE CAN BE USED IN BOTH MANUAL FIRE AND AUTO FIRE. In AUTO FIRE the Simultaneous Firing is AUTOMATIC. In MANUAL FIRE a single Depression of the Remote Pickle FIRE Trigger (or the FIRE Key) FIRES the Pre-Programmed sequence SIMULTANEOUSLY. This is a VERY POWERFUL FEATURE.

ZIPPER FIRE IS NOT TO ENABLE FIRING MANY ELECTRIC MATCHES ON THE SAME FIRING MODULE. ZIPPER FIRING IS TO ENABLE DIFFERENT FIRING MODULES, AT DIFFERENT PHYSICAL LOCATIONS, (a FRONTAGE, for example) TO EACH FIRE THEIR ELECTRIC MATCHES AT THE SAME TIME.

CAUTION - WARNING

DO NOT ZIPPER FIRE ON THE SAME FIRING MODULE

AT THE SAME TIME

FIRING POWER IS REDUCED

THE ELECTRIC MATCH(S) MAY NOT BE FIRED

EXPLANATION: The Zipper Fire advances at the rate of 10 milliseconds (10/1000 or 1/100 of 1 second). Each Firing Module has an automatic, built in, Fire Pulse hold time of greater than 30 milliseconds (30/1000, or 3/100 of 1 second). If you Zipper Fire on the Same Firing Module you will FORCE the Firing Module to FIRE on another circuit on the same Firing Module 10 milliseconds later. This reduces the normal Fire Pulse to at least 1/3 of it's normal time on each Zippered Event (except the last one). This occurs because you will command the Firing Module to advance to the next address on the same Module BEFORE the automatic Fire Pulse Hold Time has expired. This will reduce your available Firing Power AND THE ELECTRIC MATCH(S) MAY NOT BE FIRED.

DATA TABLE SETUP FOR ZIPPER FIRE

To make the Field Controller ZIPPER FIRE, a special set of conditions must exist within the Data Table for those Event Lines that are to be Simultaneously Fired. The same conditions CAN be used in both MANUAL FIRE and AUTO FIRE, so that Data Tables set up for Zipper Fire in AUTO FIRE with Time Code will also AUTOMATICALLY Zipper Fire in MANUAL FIRE. This allows intended Frontages, etc., in Auto Fire to also Automatically happen under Manual Fire (for emergency backup, as an example). This requires additional SPECIAL CONDITIONS on the Auto Fire Data Table (ie: All PFT Times must be equal).

EACH Address to be simultaneously Fired still occupies one Event Line. In order to Zipper Fire, the EVENT TIME and PRE-FIRE TIME of Each SEQUENTIAL EVENT LINE is made IDENTICAL. Zipper Fire is achieved by Firing all the Event Lines at a rate of 1/100 of 1 second (100 per second). Thus, in Manual Fire, when you depress the FIRE Key, several Addresses may be Fired almost simultaneously per that one depression of the Fire Key.

TO CREATE A ZIPPER FIRE;

1) EACH EVENT LINE MUST HAVE A TIME ENTRY SPECIFIED
2) EACH EVENT LINE MUST BE IN SEQUENTIAL ORDER
2) EACH OF THE TIME ENTRIES MUST BE THE SAME TIME NUMBER
3) EACH OF THE PRE-FIRE TIMES MUST BE THE SAME
4) MAXIMUM OF 40 EVENTS PER ZIPPER

BY DEFINITION a Zipper is created by having the same EVENT TIME. (Fire time must be the same for Zipper to execute, which means that the PFT MUST be the same)

IN MANUAL FIRE, a Zipper Fire WILL NOT be created for Events with the same FIRE TIME whose Event Times are not the same. It is possible for a series of sequential lines to have the same FIRE Time, but being so with a different combination of Event Times minus Pre-Fire Times = Fire Times. Such Event Lines WILL NOT Zipper Fire in Manual Fire, but WILL Fire simultaneously in Auto Fire.

IN AUTO FIRE, Events occurring at the SAME FIRING TIME will BE FIRED SIMULTANEOUSLY, but May or May NOT function as a ZIPPER FIRE in MANUAL FIRE. Only IF BOTH the Event Time and the PRE-FIRE Time are identical for each sequential Event Line, will a Zipper Fire occur in MANUAL FIRE (NOTE: a PFT of 0 is also a VALID PFT).

MULTIPLE ZIPPERS

Several Zipper Firing Sequences (one or more) can be located anywhere within the Data Table, however each Set, or Series of Events MUST be in sequential order. That means that the Event Lines must directly follow each other. Zipper Fire cannot jump around within the Data Table, it must see a series of Consecutive Event Lines.

ZIPPER FIRING ADDRESS ONLY DATA TABLES

FOR MANUAL FIRE, it is possible to create a Zipper Fire (multiple simultaneous Shot) as a simple Address only Data Table by adding any time number, the same time number to the desired simultaneous events. For example: the 4th, 5th, and 6th, event lines in the data table are desired to be Fired at the same time MANUALLY. The data table consists only of a listing of addresses, because this is all that is needed for Manual Fire. Set the Time of lines 4, 5, and 6 all equal to 10 seconds, for example. Now when you depress FIRE at line 4, lines 4, 5, and 6 will be Fired simultaneously (at 1/100 of a second spacing, near simultaneously). Firing at line 7 is stopped because there is no entry (or specifically no Same Fire Time Entry) in the Time Field.

This 10 second Time may again be used further in the data table to tie several events together for another Zipper Fire sequence farther down in the data table. The actual time number itself is not important (just that it be the same for sequential lines), as it serves to tell the Field Controller to continue to Fire the next line in the data table as a Zipper FIRE if it has the same Fire Time as the previous event line. Note that the PFT's are all ZERO (all PFT = 0) in this example, thus meeting the other requirement that the PFT Times are also the same.

Also NOTE that such a Table will NOT WORK PROPERLY IN AUTO FIRE (repeated same Times at different places = ALL Fire as one Zipper, & No Times = No Auto Fire).

WARNING - CAUTION

ALWAYS USE AN EVENT TIME OF AT LEAST 10 SECONDS, 00:00:10:00, IN THE DATA TABLE. This habit will help you avoid potential un-Fired Events when using other features (Timed Macros, Caliber Group Firing, etc.)

OPERATION WITH ZIPPER FIRE

In Manual Fire, every time the Fire Key is depressed, the Field Controller looks ahead at the Event Time (and PFT) of the next line in the Data Table. If the Event Time (and PFT) is the same as the Event Time (and PFT) just Fired, then the Field Controller will FIRE this next line, and look ahead to the next line. Firing will continue at 1/100 second intervals until the Event Time (or PFT) on the next line is no longer the same. When this occurs, the Field Controller stops Firing and waits for the next user action. The next series of Event Lines could also be another zipper Fire, just use a different time.

In Manual Fire the Data Table is NOT pre-sorted by FIRING TIME when the Manual Fire Operating Mode is entered. In AUTO FIRE, it is. Thus the TIME used for the Event, IN MANUAL FIRE, can be any non zero number (minimum of 10 seconds is recommended). The same Time number can be used again, as long as there is a different number between the Series (zero works nicely). If the entire Data Table has the same Time Number and PFT, then the whole table will be Fired simultaneously.

A MAXIMUM OF 40 EVENTS CAN BE FIRED SIMULTANEOUSLY AT ONE TIME. This applies to BOTH AUTO FIRE AND MANUAL FIRE. The Field Controller has a Firing

Memory buffer that can store only up to 40 Events for Firing at 1/100 of a second spacing. So after 40/100's second the buffer will be clear and ready to accept up to 40 more Firing Addresses. If you exceed this buffer capacity, then any Addresses that were to be loaded into the end of the buffer will be lost, and therefore NOT FIRED. This would probably never happen as it is unlikely that anyone will ever need to Fire more than 40 individual Addresses at one time.

TIMED MACRO FIRE SECTION 13

INTRODUCTION

TIMED MACRO FIRE IS FOR THE MANUAL FIRE OPERATING MODE ONLY.

Timed Macro Fire, OR MACRO FIRE for short, is a function in MANUAL FIRE, where a number of Events can be Fired in a PRE-PROGRAMMED TIMED sequence with a single depression of the Fire Button / Trigger.

This function, as in Zipper Fire, or Group Caliber Fire, operates by special Programming of Events within the Data Table. The PFT Data Field is used as the Running TIME, in tenths of seconds, of delay in automatic Firing FROM THE FIRST EVENT of the sequence. If the table has 3 events and it is desired (in MANUAL FIRE) to AUTOMATICALLY Fire the second event exactly 5 seconds from the First Event, the second event has a PFT of 50. If the third event has a PFT of 60 it will Fire 6.0 seconds from the First Event (the time when the Fire Button is first depressed), or exactly 1.0 seconds from the second Event.

Thus, TIMED MACRO FIRE is limited, by design, to be able to operate no more that 9.9 seconds (PFT = 99). In order for a Macro Fire to occur, specific conditions must exist within the Data Table. No special characters are required, thus Macro Fire can be set up using VER250 or other external Scripting Programs. The Programming is identical to Zipper Fire, excepting that two additional requirement are imposed. These ADDITIONAL requirements are that: 1) the First Event of the sequence MUST HAVE A ZERO PFT, and that 2) the NEXT Event MUST HAVE A NON-ZERO PFT.

DATA TABLE REQUIREMENTS FOR MACRO FIRE

TO CREATE A TIMED MACRO FIRE;

1) EACH EVENT LINE MUST HAVE A TIME ENTRY SPECIFIED
2) EACH EVENT LINE MUST BE IN SEQUENTIAL ORDER
3) EACH OF THE TIME ENTRIES MUST BE THE SAME TIME NUMBER
4) THE TIME NUMBER MUST BE GREATER THAN THE LARGEST PFT (use 10 seconds MINIMUM to always avoid trouble)
5) THE FIRST EVENT MUST HAVE PFT SET TO 0 (ZERO)
6) EACH SUBSEQUENT EVENT LINE MUST HAVE A NON-ZERO PFT EQUAL TO (Zipper Fire) OR GREATER THAN (Timed Macro Fire) THE PREVIOUS EVENT LINE

LIMITS IN TIMED MACRO FIRE

A) TIMED MACRO FIRE CANNOT START WITH A ZIPPER FIRE (NOTE: start Zipper at 1/10 of a second)

B) MAXIMUM OF 7 EVENTS PER EACH PFT TIME
(Zipper Firing WITHIN Timed Macro Limited to 7 Events per each 1/10 of a second)

C) LIMITED TO 255 EVENT LINES MAXIMUM IF USED WITH WITH CALIBER GROUP FIRE (255 Events Max per Caliber)

MACRO FIRE DATA TABLE SETUP

A MACRO FIRE can occur anywhere within the Data Table. To create a Macro Fire, the first event of the sequence, and all following events must have THE SAME time number specified (same as Zipper Fire). The time number must be greater than the largest delay desired. For example if time 00:00:02:00, or 2 seconds is used, then a PFT of greater than 19 (1.9 seconds) will cause MALFUNCTIONS (because you have told the Field Controller that the delayed Firing timing period should start counting before you actually depress the Fire Button).

THEREFORE NEVER USE A TIME FOR MACRO FIRE LESS THAN 10 SECONDS.

WARNING - CAUTION

ALWAYS USE AN EVENT TIME OF AT LEAST 10 SECONDS, 00:00:10:00, IN THE DATA TABLE. This habit will help you avoid potential un-Fired Events when using other features (Timed Macros, Caliber Group Firing, etc.)

This is a good habit to get into, use 00:00:10:00 as the MINIMUM time whenever creating ZIPPER FIRINGS OR MACRO FIRINGS.

Note that ANY time number may be used, and even subsequent Zipper or Timed Macro Firings can repeat the use of this same time number. In this case the two different sequences must be separated by at least 1 entry with no (or a different) time entry, otherwise they will be as one sequence.

Note for Timed Macro Fire, as in Zipper Fire, the ONLY information actually required is the time and the Pre Fire Time. Obviously, to be useful, a Firing Address is necessary. Shot number is not required, however it is a good habit to make all the shot numbers the same, or use shot numbers in specific groups (such as 100's, 200's, 300's) so that you are always aware of what the Field Controller is doing.

TIMED MACRO FIRE OPERATION

When a Macro Fire occurs in Manual Fire, the LCD Display is as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff PF add CA          ³
³ MACRO TIME:xx            LFad1 MFad2     ³
```

Where the Top line of the LCD is the next Event to be Fired, and the Bottom line of the LCD shows “MACRO TIME”, with LF as the Last Fired Address, ad1 and MF as the Address ad2 that WAS the first Event Address Fired. The MF Address will be Updated at the completion of the Timed Macro.

MACRO TIME is a clock running (Time = “xx”), starting from 0 (zero) and counting upward in TENTHS OF A SECOND from the time when Fire was depressed. When the Macro Clock Time matches the PFT time, that Event will be Fired. The clock will continue up to the maximum specified PFT of the sequence, stopping when it reaches the last same Time Number Event Line. Note that since the time is counting upward, EACH SUBSEQUENT EVENT LINE IN THE MACRO MUST HAVE A PFT EQUAL TO (Zipper Fire) OR GREATER THAN THE PREVIOUS EVENT LINE.

WARNING - CAUTION

THE DEADMAN BUTTON MUST BE DEPRESSED DURING THE ENTIRE TIMED MACRO SEQUENCE OR ADDRESSES WILL BE UN-FIRED.

PAUSING AND STOPPING MACRO FIRE

Macro Fire AUTOMATICALLY STOPS (like Zipper Fire) when the next line in the data table no longer has the same Time Number as the previous Event Line.

Obviously, Macro Fire may be Stopped by Depressing STOP, as with any other Firing Mode. Stop should be used as an "EMERGENCY STOP". STOP will reset the Field Controller so that when any Firing Mode is re-selected, Firing will be Programmed to start at

the beginning. The internal "notes" (the asterik, *) of where the last shot WAS, is cleared upon STOP. Only Auto Fire with Time Code will be able to re-start automatically at the "next" Event.

A better "stop" would be to Let up on the Deadman Pickle which will cease fire, and the Macro will continue to run, beeping at the Fire Times because the deadman pickle is not depressed. Turning off the key will also STOP by disconnecting Firing power.

The AF/PAUSE MF/SKIP Button may be used to STOP the CLOCK of the running Macro, by depressing this Button. The Clock will be "frozen" and Firing will Stop. The Fire Button can then be depressed to re-start the clock running from it's "frozen" time. This is identical to Operation under Internal Clock of the Auto Fire operating mode.

CANCELING AND EXITING MACRO FIRE

Also active during "PAUSE" is the DOWN ARROW BUTTON. WHEN PAUSED, USE THE DOWN ARROW TO CANCEL THE MACRO, BUT THIS ONLY MOVES TO THE NEXT SEQUENCE. Note that once the Down Arrow is used, the Macro WILL BE CANCELED and depressing Fire will only execute the next Event. That next Event could be a Zipper Fire (or just another single Event within the Timed Macro), however the Macro Fire will be canceled (because it's only the very First Line of the Sequence with the PFT = 0 that tells the Field Controller to perform a Macro Fire). BE AWARE THAT ONLY ONE DEPRESSION OF THE DOWN ARROW WILL NOT MOVE YOU OUT OF THE MACRO SEQUENCE.

In order to completely advance within the Data Table past the Paused Macro, or in Other Words; Cancel the Paused Macro and Skip to the next sequence; Depress the AF/PAUSE MF/SKIP key AGAIN AFTER YOU HAVE DEPRESSED THE DOWN ARROW ONE TIME.

To STOP, CANCEL, and EXIT a Timed Macro WHILE IT IS RUNNING, THE KEY SEQUENCE WOULD BE;

1) Depress AF/PAUSE to Stop Clock and "freeze" the running Time
2) Depress Down Arrow to advance down one line
3) Depress MF/SKIP (same button as AF/PAUSE) to skip through entire Macro to next Event(s).

NOTE THAT THE KEY SEQUENCE IS DIFFERENT FOR EXITING THE TIMED MACRO IN CALIBER GROUP FIRING. SEE the CALIBER GROUP FIRING Section in this User's Guide.

SKIP; The MF/SKIP Key uses the same routine as Zipper Fire and Macro Fire by looking to see if the next line has a matching time number. Thus SKIP will skip an entire Macro Sequence whether it has never been started or has been canceled.

The Down Arrow or Up Arrow Button may be used to selectively move to desired shots WITHIN a Macro Fire, either before execution or after it has been stopped with AF/PAUSE. In the case of Stopping by Pause, the Up Arrow will only be functional AFTER the Down Arrow HAS BEEN Depressed.

Again, the Timed Macro will ONLY FUNCTION if started (by depressing Fire) on the FIRST LINE of the Timed Macro Sequence.

TIMED MACRO COMBINED WITH ZIPPER FIRE

ZIPPER FIRE WITHIN TIMED MACRO FIRE

A Zipper Fire can be created at any time WITHIN the Timed Macro by simply repeating the same PFT as the previous line. EXCEPTION: A TIMED MACRO FIRE CANNOT START WITH A ZIPPER FIRE

Timed Macro Fire, as in Zipper Fire, operates by looking ahead 1 (one) Event Line from the Event Line it's currently on. If the Time Number is the same AND the PFT Time is the same, then the next Event Line will be Zipper Fired. This procedure repeats, again looking to the next line, STOPPING when the Event Time is no longer the same as the previous Event Line. Timed Macro Fire is a special case of Zipper Fire; BY DEFINITION: the Zipper Fire conditions are met AND ADDITIONALLY The FIRST EVENT of the Sequence has a PFT = 0 and the next Event Line has a Non-Zero PFT.

If the Timed Macro is to start with a Zipper fire, then this is not possible because, by the Definition, a Timed Macro Fire CANNOT start with a Zipper Fire. If an ERROR was made, and the second Event Line also has a PFT = 0 (in an attempt to start a Timed Macro with a Zipper Fire), then the second Event Line(s) will ONLY be a Zipper Fire. A Timed Macro will not executed. The Second Event Line MUST HAVE a PFT of 1 or more for a Timed Macro to occur. Any subsequent Event Lines that were intended to be part of the Timed Macro will only be Fired as single Events (or Zipper(s) if both TIME and PFT were equal).

STARTING A TIMED MACRO FIRE WITH A ZIPPER FIRE

It is most useful to Fire a "FRONTAGE" (several Firing Modules) as soon as the Fire Trigger is depressed. In this case, SIMPLY START THE ZIPPER AT THE SECOND EVENT LINE WITH A PFT = 1. The First Event Line with PFT = 0 (to Start Timed Macro Fire) could be a un-used Firing Event (such as the recommended unused 000 Address), and the actual Firing will start 1/10 of a second after you depress Fire. No one will notice the 1/10 second delay.

ZIPPER FIRES LARGER THAN 7 EVENTS

Remember the Limit of 7 Events MAX per 1/10 of a second. After 7 Events are Zippered, the Field Controller moves on to the next 1/10 of a second AND ANY EVENTS PAST THE 7th WILL BE UN-FIRED.

To continue Zipper Firing, JUST INCREASE THE PFT BY 1 (one) FOR THE NEXT 7 EVENTS. Repeat as Necessary. (break the single Large Zipper into several Zippers at 1/10 second spacing with 7 events per each zipper).

TIMED MACRO FIRE WITHIN GROUP CALIBER FIRE

THIS IS AN EXTREMELY POWERFUL FEATURE. SEE the CALIBER GROUP FIRING Section of this User's Guide.

If you use caliber numbers from 1 to 16, the Caliber Group Fire can also be activated and Timed Macro Firings can be selected and Fired from Group Caliber Select. Group Caliber Firings with Zippers and/or Macros must meet all the requirements of Zipper and/or Macro, being as sequential Event Lines within the Data Table. SEE the CALIBER GROUP FIRING Section of this User's Guide.

SPECIAL CAUTIONS FOR TIMED MACRO FIRE DATA TABLES

OPERATING AUTO FIRE TABLES IN MANUAL FIRE

IN A TABLE FOR MANUALLY FIRING, REMOVE ALL NON FIRE EVENTS, SUCH AS NOTES.

A potential problem can be caused when operating a Data Table setup for AUTO FIRE in the MANUAL FIRE OPERATING MODE WHEN EVENT LINES ARE USED FOR NOTES. This can easily Occur WHEN USING SCRIPTING SOFTWARE. Never specify a Note at the same time as a Firing Event. Your notes will have a zero PFT and your Event will have a non-zero PFT THUS CAUSING AN UNINTENDED TIMED MACRO TO FUNCTION IN MANUAL FIRE.

When using "Super Script" it is sometimes useful to use Events for placing Scripting or song NOTES within the .sho file. If a reference "Note" is followed by an actual Pyrotechnic Event having the same EVENT TIME (such as for the first starting musical note of a song), then this may cause a MACRO to start running WHEN OPERATING THIS .SHO FILE UNDER MANUAL FIRE (when downloaded into the Field Controller). This is because your start of song "Note" will probably have a 0 (zero) PFT (no reason to give it any PFT) and your Pyrotechnic Event will have some actual PFT value for Firing. Thus the 0 (zero) PFT has instructed the Field Controller to execute a Timed Macro, lasting for the PFT specified for the Pyrotechnic Event.

Therefore, NEVER SPECIFY A "NOTE" AT THE SAME EVENT TIME AS AN ACTUAL PYROTECHNIC EVENT. In Manual Fire, NOTES can cause other problems, such as apparent Non-Firings (of the "Notes") with the resulting confusion. This occurs because when you FIRE

at the Event which is in fact a “Note”, a Firing Command will be transmitted for Address 000 and nothing will Fire (assuming you did not specify an address for the “Note”; a blank Address in “Super Script” is translated to the Field Controller as address 000 and you headed the warnings previously in the User’s Guide about NEVER using Thumbwheel Address 00 for this EXACT REASON, use only box addresses from 01 through 7F).

The recommended best and SAFEST procedure is to remove all Notes for Manual Fire Usage or for any Auto Fire Table that may possibly be used in a “backup mode” under Manual Fire.

EVENT LINES WITH PFT = 0

BE VERY CAREFUL OF ANY EVENT LINE WITH A 0 (zero) PFT. If the next event line HAS A MATCHING EVENT TIME, then by Definition a Timed Macro will be executed (or a Zipper Fire if subsequent Event Lines have 0 PFT).

DECREASING PRE-FIRE TIMES

SEQUENTIAL ORDER IN THE DATA TABLE IS CRITICAL. THIS APPLIES TO THE SEQUENTIAL ORDER OF THE PFT’s FOR A TIMED MACRO AS WELL. Events which DO NOT HAVE EQUAL TO OR INCREASING PFT’s in the middle or at the end of a Timed Macro WILL BE IGNORED AND NOT FIRED, IN MANUAL FIRE (and also within Group Caliber).

In other words if you start a Timed Macro (with PFT=0), each subsequent line MUST have the same PFT (Zipper Fire) or a larger PFT (Timed Macro Fire), in order to be Fired. If the PFT is SMALLER than the previous lines, then this Event(s) will be ignored and un-Fired. If an event(s) with a LARGER PFT follows this Event, then this next event will be Fired as the Macro continues on and the middle Event with the smaller PFT will be passed over (unseen for purposes of Timed Macro) and un-Fired. For SAFETY Reasons, the Firmware (EPROM Software of the Field Controller) was specifically designed to pass by these incorrectly specified PFT’s and leave them Un-Fired, (for lack of any better instructions of what to do with these event(s)).

WARNING FOR SORTING BY TIME WITH VER250 SUPER SCRIPT

WARNING - DANGER

A SORT BY TIME CAN SERIOUSLY SCRAMBLE THE ORDER OF A TIMED MACRO WHEN USING VER250 SUPER SCRIPT AND CAUSE THE FIELD CONTROLLER TO NOT FIRE CORRECTLY

THIS CAN BE AVOIDED BY ALWAYS HAVING SEQUENTIALLY INCREASING SHOT NUMBERS FOR THE TIMED MACRO

The problem occurs in VER250 when the Event Time, the Shot Number, and the Device Description are all Identical for several Events. A sort by Time will randomize the placement of the Events for the same time. This scrambles the sequence of increasing PFT's (created in order to cause a Timed Macro), and the Timed Macro will not function correctly (in a sort by Time, VER250 doesn't consider the PFT field value).

CALIBER GROUP FIRE SECTION 14

INTRODUCTION

CALIBER GROUP FIRE IS FOR THE MANUAL FIRE OPERATING MODE ONLY.

Caliber Group Firing, abbreviated on the Field Controller as GRC, for GRoup Caliber, uses the LEFT Section of the Field Controller to Select specific PROGRAMMED Groups of Events for FIRING in Manual Fire. The selected Caliber Group can be single event(s), Zipper Firings, Timed Macro Firings, or any combination or multiple combination of these.

Caliber Group, or Group Caliber, specifically relates the CAL, or CALIBER Field of each EVENT LINE in the Data Table to THE CORRESPONDING CALIBER NUMBER BUTTON on the LEFT SIDE of the Field Controller.

The idea is that you select a Group # (1 through 16) and then FIRE the next available shot (or sequence of shots) in that Group.

Group Caliber Firing of Timed Macros, containing Zipper Fires, is perhaps the most powerful MANUAL FIRING function of the Field Controller. Consider that a data table can be created for up to 16 different types of Pyrotechnic Sequences. Each sequence can be a single event, a Zipper Firing, a Timed Macro Firing, or a Timed Macro with one or more Zipper Firings within the Timed Macro. There ALSO may be MORE than one “shot” or sequence within EACH Caliber Group. Thus a specific type of Pyrotechnic sequence may be selected, which may be a Timed/Zipper Sequence, and Fired with the depression of one button (Fire). A DIFFERENT sequence under a DIFFERENT Caliber Number may then be selected and Fired. Then additional sequences back in the PREVIOUS Caliber Number may be Fired, be re-selecting the previous Group Caliber Number (assuming that there is more than 1 sequence in the first group caliber).

Thus CALIBER GROUP SELECT provides a means of FIRING specific groups, OR TYPES of PYROTECHNIC DEVICES AT ANY TIME AND IN ANY ORDER. Additionally, through careful arrangement of the Data Table, Caliber Group Select could be used to instantly locate and FIRE Zippered Events, Timed Events, or a specific sequence of Pyrotechnic Events for each 1 of 16 Keys (true Macro Firing).

The user should be Cautioned, however, to avoid complexity. DO NOT TRY TO DO TO MANY THINGS, OR YOU WILL SURELY GET LOST AND FIRE THE WRONG DEVICE AT THE WRONG TIME. DEATH OR INJURY TO YOURSELF OR INNOCENT BYSTANDERS COULD RESULT FROM YOUR INABILITY TO OPERATE THE FIELD CONTROLLER CORRECTLY AND SAFELY.

DANGERS WITH GROUP CALIBER FIRING

Group Caliber Firing, is a DIFFERENT Type of Firing (even though is occurs within Manual Fire) and should be thought of as a SEPARATE TYPE OF FIRING, henceforth called GRC, or Group Caliber Fire. GRC introduces the new concept of "shots". CRC behaves differently than Manual Fire.

The point of all this is that IT IS NOW DIFFICULT, OR IN SOME CASES IMPOSSIBLE, TO CREATE A DATA TABLE THAT WILL FUNCTION EXACTLY, PERFECTLY AS DESIRED IS EVERY POSSIBLE FIRING MODE.

"MIXED MODES" OF OPERATION (Mixed Modes of Firing) SHOULD NOT BE ATTEMPTED. SET UP A DATA TABLE FOR A SPECIFIC TASK AND THEN INERT TEST. LIVE FIRE ONLY WITHIN THAT MODE OF FIRING UPON SUCCESSFUL VERIFICATION OF THE INERT TESTING.

It can be, and is, extremely confusing AND EXTREMELY DANGEROUS to jump all around in the various Firing Modes and keep track of exactly what you are doing, what is going to be Fired, what has been Fired, and where you are. AVOID JUMPING AROUND AT ALL COSTS. "keep it simple". Set up for a specific task and stick to it. If you set up and practice by INERT TEST FIRING, the operation of the Field Controller will be easy, simple, and natural. The responsibility is yours, so if you don't know what you are doing or what is going to happen DON'T DO IT!

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 DATA 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

GROUP CALIBER SET UP

The Left Side of the Field Controller Control Panel has 16 buttons, labeled 1 (one) through 16 (sixteen), directly under the Title Label of "Caliber Group Select". There is also an additional 17th Button, labeled "PRESS TO DISPLAY SHOTS REMAINING".

Also a writing space has been provided, next to each caliber number, for the user to write what that particular Caliber Number specifies (under the "Caliber Group Select" portion of the Control Surface). Use erasable Marking Pens of the type used for writing on White Lecture Boards that can be wiped clean from Mylar or Lexan surfaces. These markers are SPECIAL, erasable, Non Permanent type, felt tipped, marking pens. DO NOT USE GREASE PENCILS as indicated in earlier User's Guides (or any other type of marker). Masking tape (or similar) may placed over the control surface of the Field Controller as a temporary, removable writing surface.

Group Caliber works by having the CALIBER Data Field of a desired Event Line(s) set to a value of 1 (one) to 16 (sixteen). Thus if you want an Event Line to be associated with a particular Group Caliber Button, use that Caliber Number for that Event in the Data Table.

Now when in Manual Fire, select the desired Caliber Group to Fire by depressing one of the 16 number buttons. Depressing one of these Caliber Group Select Keys causes the Field Controller to automatically Locate and Display the NEXT AVAILABLE Event Line of that corresponding Caliber Number, available for Firing.

When you depress FIRE, you FIRE that Event. When that Event Line is Fired, the Field Controller Locates and Displays the next Event Line of THAT Caliber Number, ready for Firing. The Firing progression of the Selected Caliber follows the sequential order of that Caliber number as it exists in that Selected Data Table. If the Event is a Zipper Fire and/or Timed Macro Fire, that sequence of Events will be Fired.

This continues until there are no more UNFIRED Event Lines of that Caliber Number in the Selected Data Table (the Field Controller just "beeps"), or the user performs another action. If you select a Caliber Group that has no matching Caliber Numbered Events in the Data Table, then the LCD Displays "NO SHOTS IN THIS GROUP". In this case, you may select another Group Caliber or Return to Normal Manual Fire by depressing "Return to Sequential".

Any one of the 16 Caliber Group Select Keys may be depressed AT ANY TIME, thus locating and displaying the Next Available Event of that Corresponding Caliber Number.

Another feature of Caliber Group Firing is the ability come back to a group you have already partially Fired, and continue Firing THE NEXT AVAILABLE SHOT. The Field Controller does this by using the "asterik" (*) to indicate that an event(s) have already been Fired. If you STOP or Re-Enter Manual Fire, this record of shots already Fired will be lost.

A Key is also provided to DISPLAY SHOTS REMAINING, or temporarily post on the LCD the number of Events remaining for each Caliber Number, 1 through 16.

You can exit Caliber Group Firing back to Normal Manual Fire, at any time, by depressing "Return to Sequential". Caliber Group Fire can be continued again by depressing one of the Caliber Numbers in "Caliber Group Select". "Return to Sequential" will place you back in the

sequential Table at the place where you left. Note that it is possible to Fire some or all of the Events that were intended for Caliber Group Firing in Normal Manual Fire.

Caliber Group also uses and displays the number of Shots within that Caliber Group, BASED ON THE PROGRAMMING OF THE SEQUENCE OF EVENTS FOR THAT CALIBER. Thus if 3 Event lines are Programmed as a Zipper Fire, then the Field Controller will count this as 1 (one) SHOT. Also, the MF/SKIP Key will skip the entire group, advancing to the next "SHOT". If the group is a Timed Macro, then the MF/SKIP key functions as described for the Timed Macro Fire (becomes a pause key, if macro running, plus other behavior, see Timed Macro Fire).

If you SKIP a "Shot" which is a sequence of Events, this Skipped Shot IS NOT COUNTED AS BEING FIRED. No asterik (*) will be placed behind the Firing Address for Skipped Shots. In this case, it is possible to arrive at the last "shot" of the Caliber Group, and still have Shots remaining, as displayed by the number of Shots Left. However the Field Controller just beeps at you if you attempt to Fire the supposed shots left, because it is at the last shot of the group. You have, in fact skipped shots that Can be Fired, however you told the Field Controller that you did not want to Fire these Skipped Shots.

If you wish to gain access to these Skipped Shots, DEPRESS THE HOME BUTTON, when in that Caliber Group, and you will be advanced back to the Top of that Caliber Group. This Top Event may or may not have been Fired, as indicated by the asterik(*). If this shot was not Fired, you may Fire it, or you could Skip it again. AFTER DEPRESSING THE HOME BUTTON, USE THE SKIP KEY TO LOCATE THE "SHOT" YOU PREVIOUSLY SKIPPED FOR FIRING. Note that Skip will move by "shots". If you Fire, then the next "shot" to be located will be the next shot available for Firing. In this case, the Field Controller will skip over any shots marked with an asterik (*). Thus Depressing FIRE at the Top Line of the Caliber Group, located by HOME, will Fire the Top Shot and auto locate to the next available shot within the Caliber Group. If the Top Shot was previously Fired, then you CANNOT Fire it again (the Field Controller just "beeps"). Use "SKIP" to move past the Top Fired Shot to gain access to your previously Skipped Shots.

WARNING - CAUTION

GROUP CALIBER FIRING, AS WELL AS TIMED MACRO FIRING, DEPEND ON A SPECIFICALLY PROGRAMMED DATA TABLE. PYRODIGITAL CONSULTANTS RECOMMENDS THAT YOU SET UP THE DATA TABLE AND OPERATE THE FIELD CONTROLLER ONLY IN THAT MODE OF OPERATION. OPERATION IN OTHER MODES MAY CAUSE UNEXPECTED FIRINGS.

ABSOLUTELY INERT TEST THE OPERATION OF THE ENTIRE DATA TABLE IN ALL FIRING MODES, BEFORE LIVE FIRING, TO BE SURE THAT THE FIELD CONTROLLER WILL OPERATE AS YOU INTEND IT TO. ERRORS IN THE DATA TABLE, OR FAILURE TO UNDERSTAND THE BEHAVIOR OF THE FIELD CONTROLLER WITH SPECIAL DATA TABLES, MAY RESULT IN UNEXPECTED FIRINGS OR FAILURE OF FIRINGS

LIMITS WITHIN GROUP CALIBER

255 EVENTS MAXIMUM per each Caliber Group (whether single Events, Zippers and/or Timed Macros). This IS NOT the number of "shots" but the TOTAL number of Event Lines that may be used within one Group Caliber Number. Obviously, also the GRAND TOTAL number of Events is limited to memory capacity of selected Data Table Memory. If there are MORE than 255 Event Lines for a Caliber Group, then ONLY the Top, or First 255 will be available for Group Firing. Anything past the 255 Limit will be ignored in the Caliber Group Firing Mode. (255 lines per caliber is the internal sort by Caliber Group limit)

The number of "SHOTS" remaining that can be DISPLAYED is 99 MAXIMUM. If there are more than 99 Shots (up to 255, if all single Events), 99 will be displayed until the number of shots drops below 99. Any "SKIPPED" shots will still be counted in the number of shots left.

TIP - USE THE SORT BY CALIBER "VIEW" UNDER DATA TABLE EDIT TO CHECK YOUR DATA TABLE

GROUP CALIBER OPERATION

When in manual Fire, if one of the Group Caliber Buttons is depressed, one of the two displays shown below will appear;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ NO SHOTS IN THIS GROUP                    ³
³                                           ³
```

If there are "NO SHOTS" in the Group (for that Caliber Number depressed), select another Caliber Group Number or DEPRESS Return to Sequential" to EXIT the Group Caliber Firing Mode, back to Normal MANUAL FIRE.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff pft add CA          ³
³ GRC # xx SHOTS LEFT:yy                    ³
```

If there ARE Events with matching CALIBER Numbers, the LCD top line shows the First Event to be Fired of that matching Caliber Number. All information for the Event Line is shown (as

identical to Normal Manual Fire), being information (if any) for Time, Pre-Fire time, Address, and CA for Caliber which will, by definition be a number from 1 to 16. The second Line shows what Group Caliber you have selected, how many shots are remaining, and the Manual Firing Address to be Fired when the Fire Button is depressed.

If you Fire until all the Events have been exhausted, then the Display will change to indicate that there are NO SHOTS LEFT, as below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff pft add CA          ³
³ GRC # xx NO MORE SHOTS                    ³
```

Note that the Field Controller will beep when you Fire the Last Shot, and beep if you try to Fire when there are "NO MORE SHOTS" Left to Fire in that Caliber Group.

Remember that a "Shot" may several events, such as a Zipper Fire, or a Timed Macro Fire, or a combination of both. In such a case the entire sequence of events which are linked together will be counted as 1 (one) shot. MF/SKIP can be used to skip this entire shot group (with the limit in Timed Macro Fire for what MF/SKIP does).

If the Group Caliber function has been activated, then pressing the button "PRESS TO DISPLAY SHOTS REMAINING", will Display as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ GC  1-8:aa  bb  cc  dd  ee  ff  gg  hh   ³
³ GC 9-16:ii  jj  kk  ll  mm  nn  oo  pp   ³
```

Where GC means Group Caliber, with the number of "shots" remaining in Caliber numbers 1 through 8 displayed on the top line. The bottom line displays the number of "shots" remaining in group caliber numbers 9 through 16. "aa" is for Group Caliber Number 1, "bb" is for Group Caliber Number 2, etc.. Note that also the LCD will display the "SHOTS LEFT:yy", when a particular group is selected (with "yy" shots remaining to Fire as the Same Number for DISPLAY SHOTS REMAINING, or post "NO MORE SHOTS").

The number of "SHOTS" remaining that can be DISPLAYED is 99 MAXIMUM. If there are more than 99 Shots (up to 255, if all single Events), 99 will be displayed until the number of shots drops below 99. Any "SKIPPED" shots will still be counted in the number of shots left.

Depress the "RETURN TO SEQUENTIAL" BUTTON to exit the Group Caliber Mode and return to Normal Manual Fire (sequential Data Table Firing). Use this method to leave Group Caliber Fire if one of these buttons was accidentally depressed or you want to operate in the normal function of Manual Fire. Note that "Mixed Modes" of operation between normal Manual Fire and Group Caliber Fire are possible. If operating in Mixed Modes, be very sure what you are doing and know how the Field Controller will behave. A special Table can be made for Mixed Modes with perhaps the Group Caliber Section in a separate section of the Data Table, to prevent over-Firing Group Caliber Sequences and to prevent repeat-Firing Events that may have already been Fired in Group Caliber Fire. SEE PREVIOUS WARNINGS & DANGERS.

MOVING WITHIN GROUP CALIBER

SKIP function works the same as in Normal Manual Fire which Skips all events which are tied together in sequence by Zipper and/or Timed Macro.

In Group Cal you can't Skip last shot. If you skip to last shot, it is ready to Fire.

Shots Remaining Display DOES Count SKIPPED Shots.

If you Skip a Group Caliber Shot (and don't even Fire any), then leave that Group Caliber (via Return to Sequential or switch Group Caliber Number), and then later come back to this same Group Caliber, this Skipped Shot is always Skipped (exception is the Last Shot). You can locate Skipped Shots in GRC by depressing HOME and then using SKIP to move down to the Skipped Shot. Continued depression of Skip moves down one Shot per depression.

NOTE: IT IS POSSIBLE THAT THE LCD DISPLAY WILL SHOW "X" NUMBER OF SHOTS LEFT BUT YOU APPARENTLY CANNOT FIRE ANYTHING, THE FIELD CONTROLLER JUST "BEEPS". This is because you previously Skipped Shots and you have FIRED the Last Shot. You Must re-access those Skipped Shots and Fire them All before the LCD Display will indicate "NO MORE SHOTS" (and indicate 0 Shots under "Display Shots Remaining").

If the first Shot was previously Skipped, HOME will directly locate to that Shot (HOME locates to the very first Shot of that Group Caliber). If the first Shot has been Fired it will have an asstericks (*) after the Address shown on the top line of the LCD Display. Pressing FIRE will NOT Re-Fire any Shot that has already been Fired (because of asstericks, *), and the Field Controller will only "beep".

If you FIRE a previously skipped shot (in GRC), the next shot to be auto located will be the next UN-FIRED shot, if any other shots were skipped, or the last shot, in which case "NO MORE SHOTS" will be displayed. (Pay attention to the * (asterik) to know if you have Fired a shot or not when going HOME and skipping down).

Note that in GRC SKIP and the DOWN ARROW behave the SAME; both Skip by SHOTS, not individual Events (unless the Shot is a single Event). In the case of a halted Timed Macro, Skip is not available (it's the same key as the Pause key). In this case use the Down Arrow to move to the next SHOT.

In Normal Manual Fire Skipped Shots can also be re-accessed by going HOME, which will locate to the VERY TOP OF THE ENTIRE DATA TABLE, and then skipping down to the previously Skipped Shot. Perhaps GO TO SHOT or GO TO ADDRESS can locate the previously Skipped Shot more quickly.

If you need to move by individual Event Lines within a SHOT, these can be accessed in Normal Manual Fire (not in GRC) by Skipping (go to top of Table by HOME, if necessary first) or Locating (Go To Shot / Address) to the top of the desired Shot and then using the DOWN ARROW to move within that Shot. In Normal Manual Fire, Skip moves by Shots and the Down Arrow moves by single Event Lines.

This behavior difference of the Down Arrow between Normal Manual Fire and Group Caliber Fire protects Group Caliber Fire so that you cannot mess up a "Shot" in Group Caliber Fire (disrupt a Timed Macro or partially Fire any Zippers within the Group Caliber selected). In "the heat of the battle" is no time to get your GRC "Shot" messed up because you used Down Arrow and got trapped in middle of Shot. So therefore in GRC, the Down Arrow is the same as Skip and moves by Shots only. GRC is for "Shots" and moving by individual Event Lines is not possible in Group Caliber Firing (unless, of course, a Shot is one single Event Line)

Be aware that in Normal Manual Fire it is possible to interrupt or "mess up" a Timed Macro or Zipper Fire by accessing and Firing an Event within that Zipper Fire or Timed Macro.

Remember that FIRING in Normal Manual Fire will move by sequences as set up in the logical progression of the Data Table, be they single Shots, Zippers, or Timed Macros. In Group Caliber, the behavior will be different due to capturing of Shots by the Caliber Number. GRC will move to the next available "Shot" which may be at an entirely different place within the Data Table.

Note also that in GRC, the PAUSE/SKIP key is used to HALT a Timed Macro from continuing. Press Fire to again start the Clock or press the DOWN ARROW to CANCEL the TIMED MACRO. When the Timed Macro is halted by Pause, then when the Down Arrow is depressed, the Field Controller advances to the NEXT SHOT. Skip/Pause is not available (to move to the next Shot) because it has already been used to halt the Timed Macro.

In Normal Manual Fire (upon Pause of Timed Macro), the Down Arrow will move to the next Event Line, which, as previously mentioned, may be in the middle of the Timed Macro. In this case, now Skip can be depressed to move out of the Timed macro to the next "Shot" (because the Timed Macro has been disengaged by the action of the Down Arrow and the Skip key is now available).

NOTE THAT THE SKIP KEY AND THE PAUSE KEY ARE PHYSICALLY THE SAME IDENTICAL KEY.

Rephrasing, in Normal Manual Fire, PAUSE/SKIP is depressed to Stop the Timed Macro from running and Time is Frozen. At this time the only keys that work are Stop, Fire (continues clock), and the Down Arrow (besides selecting another Operating Mode). The Down Arrow cancels the Timed Macro and moves to NEXT EVENT ONLY. Skip/Pause was not available because it was already used for Pause. After using the Down Arrow, which moves to the Next Event, a problem may be caused if you are still within a Timed Macro. When you press Fire again you will not continue with the Timed Macro, but will Fire the next Event, which may or may not be what you intend. The reason is that the start of the Timed Macro (which was the combination of the first and second Event Lines) has already gone past. USE SKIP TO MOVE PAST THE HALTED TIMED MACRO.

GROUP CALIBER FIRING NOTES & POTENTIAL PROBLEMS

Group Caliber introduces a new behavior to the Field Controller revolving around the concept of "shots". When the Manual Fire Operating Mode is depressed on the Field Controller, the Data Table is additionally sorted into a series of Group Caliber "shots" by means of an internal set of reference "pointers". These pointers define the locations of the specific GRC numbers within the Data Table.

Thus Shots related to a specific Caliber Number MAY OCCUR ANYWHERE WITHIN THE DATA TABLE. Group Caliber Firing can cause RADICALLY different behavior than Sequentially Firing the Data Table, as in Normal Manual Fire, because of GRC's ability to move ANYWHERE within the Data Table.

A Shot is defined as any consecutive, sequential series of 2 or more events in the Data Table which have THE SAME EVENT TIME, REGARDLESS OF THE PFT. Additionally GRC "shots" are defined by the Caliber Number, being from 1 to 15 for the FIRST Event of that Shot.

Therefore a series of Events set up (such as for Auto Fire) with different non zero PFT's have the risk of being only partially Fired in Group Caliber Firing or ALL skipped completely with Skip in Manual Fire.

Note that the Shot Number for GRC is ONLY required and used for the First Event of that Shot (for a "Shot" that is more than 1 Event, such as a Zipper / Macro). Thus it is possible to "capture" an Event within a Shot that has a different Caliber Number than the Caliber Number of the first Event of that Shot. This different Caliber Number Event Line may be within 1 - 15 Caliber range for GRC, but that Event will not be available for that other GRC because it it belongs to the Shot sequence as defined by the Zipper / Macro.

Be aware of these potential pitfalls caused by having sequential Lines in the Data Table with identical Event Times. These are normally Zipper Firings or Timed Macros.

Consider 2 Events which have the same Event Time and are sequential within the Data Table. They have different PFT's (so NOT a Zipper Fire), and the first Event PFT is NOT EQUAL to 0 (so NOT a Timed Macro). If they have different Caliber Numbers (and the first Event Cal # is within GRC range), the second Event is "captured" as a "shot". Additionally GRC Fire will ONLY FIRE THE FIRST EVENT, whereas in Normal Manual Fire, each can be Fired as a separate Event (because each has different non zero PFT's, therefore a Zipper will not be executed, so each is considered as an individual Event in Normal Manual Fire). If the second Event were to have the same PFT as the First, then a Zipper Fire would be executed in GRC or Manual Fire.

It is important to note that regardless of the Caliber Number of the second Event, it is NEVER available to GRC as a separate Event (same Event Time LOCKS together as a "shot", by definition).

Also the fact is that GRC Caliber Number is NOT required & has no meaning if different from the 1st line OF A SHOT on subsequent same Time (simultaneous) Event Lines (GRC will capture sequential simultaneous (same Event Time) Events on the basis of the Caliber Number of the first Event Line).

POTENTIAL PROBLEM occurring from above; A Simultaneous Event, or SEQUENCE, set up for Auto Fire (same Event Times, different non zero PFT's), having different Caliber numbers,

the first caliber number within 1 to 15. If you were to Fire this in Group Caliber as a Shot, then ONLY the first Event would be Fired. The second Event would be unavailable in any Group Caliber and could not be Fired in Group Caliber. In Manual Fire you would have to Fire each as a separate Event.

WARNING - CAUTION

NEVER ATTEMPT TO LIVE FIRE IN GROUP CALIBER A DATA TABLE WHICH HAS BEEN SET UP FOR USE IN AUTO FIRE.

FOR MANUAL FIRE BACKUP OF A DATA TABLE SET UP FOR AUTO FIRE, INERT TEST FIRE EVERY EVENT OF THE DATA TABLE. WATCH FOR TIMED MACROS OR OTHER UNEXPECTED BEHAVIOR AND CORRECT THESE PROBLEMS BEFORE ANY LIVE FIRING.

BE AWARE THAT FOR AN AUTO FIRE SIMULTANEOUS SEQUENCE, (made up of event lines with different PFT's), THAT IN MANUAL FIRE, MULTIPLE DEPRESSIONS OF THE FIRE BUTTON WILL BE REQUIRED TO FIRE EACH EVENT OF THE SIMULTANEOUS SEQUENCE.

GRC + ZIPPER & TIMED MACRO FIRE WITH EXAMPLE 1 DATA TABLE

PLEASE CONNECT ONE FIRING MODULE TO THE FIELD CONTROLLER, SET THUMBWHEEL ADDRESS TO 10. CONNECT ELECTRIC MATCH TEST LIGHTS on Addresses 101 through 109.

---------- WITH NO, REPEAT, NO PYROTECHNICS CONNECTED -------

Use the DATA TABLE created in EDIT, EXAMPLE 1 DATA TABLE. If you have lost this Data Table, go to DATA TABLE Operating Mode, Option 0, EDIT, Example 1 Data Table, and re-enter this Data Table (or re-create; Data Table: 10 shots 0 - 9, Time every 2 seconds from 00:00:10:00 to 00:00:28:00, all 0 PFT, Address sequential from 100 to 109, Calibers sequential from 0 to 9).

Select Manual Fire, Key ON. Depress Caliber Group Select 1 (one). Notice that this is Shot # 1 BECAUSE you have Selected CALIBER # 1 (which is shot #1 in our Data Table). Notice the GRC # (GRoup Caliber Number) in the lower Left Corner matches the Group Caliber you have selected. Depress each of the other Caliber Group Keys and notice the Event Lines. There are "NO SHOTS IN THIS GROUP" for Calibers 10 through 16. There is ONE (1) "SHOTS LEFT" for each of the Calibers 1 through 9 BECAUSE this Data Table HAS 1 shot for each caliber 1 through 9. Notice that there is no Caliber Group Select for Caliber Number zero (0). Shot #0, OR MORE SPECIFICALLY, Caliber Number 0 (zero) is unavailable in GRC.

Depress "PRESS TO DISPLAY SHOTS REMAINING" and notice that you have 1 shot each for Calibers 1 through 9. (Display Shots Remaining only works when you are in Group Caliber).

Re-Select Group Caliber # 1, Depress the Deadman, and FIRE. You also get "beeped" because this was your last shot for this Caliber. Notice that there are "NO MORE SHOTS" and

attempted Firing again results only in a “beep” from the Field Controller. Select Caliber #4 and FIRE. Check the shots left with “Display Shots Remaining”.

NOW RE-SELECT THE MANUAL FIRE OPERATING MODE. Check Shots Remaining (you must select a Group Caliber Number first). Notice that everything is as though you never Fired anything. The asstericks are cleared and all shots are available. THUS IF YOU RE-SELECT ANY OPERATING MODE, ALL INTERNAL POINTERS AND ASSTERICKS WILL BE CLEARED AND RESET. The Field Controller is ready for your First Shot (Thus NEVER Do This when actually Firing or you will loose all information on what has been Fired!!!)

Now go to the Data Table Operating Mode and Select Edit. We are going to modify our Data Table.

Locate Shot #2. We are going to make shot #3 & #4 as a Zipper Fire to shot #2. Can you figure out how to do that? Well - ? OK - Change the times of shot #3 and shot #4 to be the same as the desired start of the Zipper Fire (ie; 14 seconds). Now lets try FIRING with these two changes.

Fire all the Shots in the Data Table and notice how the are Fired. Re-Select Manual Fire and try FIRING all shots again, several times. Notice that Shot #2 is a Zipper Fire and Fires Address 102, 103, and 104 in rapid secession. You however notice that with the Test Lamps, 102 and 103 seem somewhat DIM. THIS IS BECAUSE YOU ARE NOT SUPPOSED TO ZIPPER FIRE ON THE SAME FIRING MODULE AT THE SAME TIME. Now you see the reason why - because of reduced power. You can hook up 2 other Firing Modules and change the Data Table for Shot 3 and Shot 4 to DIFFERENT ADDRESSES (example 113 & 124; FM-3 thumbwheel @ 11 & 12) and Fire these shots. You will observe how Zipper Fire actually works quite effectively.

Now let’s try FIRING under Caliber Group Fire. Re-Select Manual Fire and SELECT Caliber #2. Try Caliber #3 and #4. Notice that Caliber #2 HAS CAPTURED Caliber #3 and #4 as a one shot Zipper Fire under Caliber #2. Caliber Numbers 3 and 4 have NO SHOTS because GRC #2 has captured them. Try Firing Caliber #2 and see that this, in fact, a one shot Zipper. Re-Select Manual Fire, and Re-Select GRC #2 as many times as you like and try again.

No lets go to Edit and make another Change. Change the Pre-Fire (PFT) time of Shot #3 to 50. Change the PFT of Shot #4 to 90. What do you think is going to happen? Go to Manual Fire and Find Out - try under Normal Manual Fire and Group Caliber Fire (under Caliber #2) as well.

You have created a TIMED MACRO - Congratulations!

Observe the Running Time. Notice that the Deadman MUST be held down for you to Fire the upcoming Addresses (or just “beep”, also “beep” on last shot in GRC). Re-Select Manual Fire and Test Again. If you go to Edit WITHOUT selecting another Powered Mode (DO NOT Select Auto Fire, Manual Fire, or Check Status), the you will notice the Asstericks (*) can be seen for those shots which the Field Controller actually issued a Firing Command (DON’T Depress END when in EDIT or you will Erase the *, HOME, Up/Down Arrow OK).

While were in EDIT, lets further MODIFY the TIMED MACRO to be a Timed Macro with a Zipper Fire, which is available as the second shot under group caliber #2. First Change the Caliber of shot #1 to #2. Now Change the Time of shots #5 and #6 to 14 seconds. Now Change the PFT of shots #5 and #6 to 90.

Try FIRING this Data Table (several Times). You now have the 2nd shot of Caliber #2 as a Timed Macro ending in a 3 shot Zipper Fire. Notice also that Caliber Number 1 no longer has any shots available.

Let's ON PURPOSE do an error in the Data Table. Change the PFT of SHOT #5 and #6 to 40. Try Firing and see what happens.

Notice that IN GROUP CALIBER now the 3 shot zipper is gone and shots 5 and 6 are not Fired. NOTICE ALSO THAT SHOTS 5 AND 6 ARE NOT AVAILABLE ANYWHERE IN GROUP CALIBER AND CANNOT BE FIRED IN GROUP CALIBER. Notice in Normal Manual Fire that Shots 5 and 6 are NOT AVAILABLE EITHER. If you use the Up Arrow Key in Normal Manual Fire and locate shot 5 AND THE FIRE, now a separate Zipper Fire occurs for shots 5 and 6. Shots 5 and 6 have been captured by shot #2 for the Timed Macro but won't Fire because their Pre-Fire Times are SMALLER than the previous Event. They are not available in Normal Manual Fire because they were tagged on to the End of a Zipper Fire, but could not be executed.

Change the Event Times of Shot 5 and 6 to 10 seconds and see what happens under Normal Manual Fire and GRC Fire.

Notice that now in Normal Manual Fire, shots 5 & 6 become a separate Zipper Fire, which is also available in GRC under Caliber Number 5. Observe that the Time (10 seconds) is less than previous Event Lines, but TIME only serves to Lock Event Lines Together in Manual Fire. This Data Table IS UNSUITABLE for USE in AUTO FIRE (Do you know what will happen? / Did we design this Data Table for Use in Auto Fire? NO, NO, NO).

As you can see it's simple to Create Very Powerful "Shots" for use in Group Caliber Fire, However you can also see the necessity of TESTING in an Inert Environment BEFORE LIVE FIRING.

Try making your own Data Table (or Change the Example further) until you feel comfortable by knowing before you TEST, exactly how your Data Table will behave. If you continue to be surprised at what FIRES and at WHAT TIME (and what Doesn't Fire), then YOU ARE NOT READY FOR LIVE FIRING. Go Over this Example again until YOU KNOW WHAT YOU ARE DOING!

Now please re-set the DATA TABLE as it was for use as an example in AUTO FIRE. If you have forgotten "how it was", it was; (Data Table: 10 shots 0 - 9, Time every 2 seconds from 00:00:10:00 to 00:00:28:00, all 0 PFT, Address sequential from 100 to 109, Calibers sequential from 0 to 9). NOTE: You can use Quick Entry, Auto Fill to instantly change all PFT's to zero.

AUTO FIRE OPERATING MODE SECTION 15

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.

THIS USERS GUIDE ONLY DESCRIBES DIRECT OPERATION OF THE FIELD CONTROLLER AND DOES 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 SYSTEM NETWORK ARE INCLUDED IN THE SYSTEM NETWORK USERS GUIDE.

THE USER MUST, ABSOLUTELY, BECOME FAMILIAR WITH ALL PROCEDURES IN THE PHASE III SYSTEM NETWORK USERS 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. Refer to this Users Guide Section, the SAFETY KEY WARNING SYSTEM, for an understanding of how the Warning System operates. If it is SAFE to Proceed, per the above Warning, and all Warnings and Safety Procedures outlined in the System Network Users Guide, the user may then ARM the Safety Key.

It is required that the user PRACTICE using the AUTO FIRE Operating Mode in an INERT TEST ENVIRONMENT. See this Users Guide for information on Inert Testing and Practice with Test Lamps. AUTO FIRE WITH EXAMPLE 1 DATA TABLE is included at the end of this section for “hands on” practicing.

INVALID DATA TABLES

NO DATA TABLE

AUTO FIRE IS NOT POSSIBLE WITHOUT A DATA TABLE. If the AUTO FIRE Operating Mode is selected, and the Selected Data Table has no entries (all Data Fields are zeros), then the LCD immediately displays “NO TABLE !”, without having ever asked the user to ARM the

Safety Key. The Field Controller then exits to the STOP Mode. This LCD Display temporarily appears as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³          NO TABLE !           ³
³                               ³
```

DATA TABLES WITH NO TIME EVENTS

EXCEPT in the case of MIDI SHOW CONTROL, Option 4 (MSC), IS IS NOT POSSIBLE TO AUTO FIRE WITH A DATA TABLE WHICH HAS NO TIME ENTRIES.

For quick operation under Manual Fire, a Data Table can be created that contains no entries in any of the Time Fields, because these are not needed. If the User attempts to AUTO FIRE such a Data Table, there is no Time information for any of the Auto Fire functions to operate with (except for MSC). In such case, the message "NO TABLE" is not posted because there is some kind of Data Table. However, once a selection of the Time Code type (or Internal Clock) has been made, the Field Controller attempts to internally sort the Data Table into the correct Firing Order by Time. Since there is no Firing Order by Time, there is no operation possible with Auto Fire.

In this case, the Options LCD is presented (after the Safety Key is Armed), however when one of the Options is Selected (INTERNAL (0) or EXTERNAL CLOCK; Pyrodigital Time Code (1), SMPTE Time Code (2) or MIDI Time Code(3)), the Field Controller temporarily posts the following LCD Display;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ END OF TABLE - LAST EVENT WAS PROCESSED ³
³                           ³
```

After about 5 seconds, this screen exits to the STOP Operating Mode, the Field Controller starts beeping for you to turn OFF the key, and the LCD Display posts the message to Turn OFF the key. Pressing FIRE at the above LCD Display does nothing.

THIS IS THE SAME MESSAGE THAT WILL BE POSTED WHEN YOU HAVE FIRED THE LAST EVENT IN AUTO FIRE.

DATA TABLES WITH PFT GREATER THAN EVENT TIME

If any Event Times minus the PFT (the Fire Time), are less than zero (PFT Time greater than Event Time), those Events can never be Fired, in Auto Fire. Thus the Event Time should always be larger than the PFT. If the PFT is 99 (9.9 seconds maximum) then the Event Time must be at least 10 seconds (greater than 00:00:09:28).

In Auto Fire, Internal Clock, if the ALL Fire Times are less than zero, the CLOCK will continue running indefinitely and nothing will be Fired (because the End of the Data Table has been sub-tracted away with the PFT's). Such Events can occur when creating Zipper Firings for Manual Fire by using a small time numbers to link the Zippers together. Such Events can also cause the Timed Macro Function of Manual Fire to operate incorrectly. As with all previous Field Controller Software, such Events also cannot be Fired with Time Code.

WARNING - CAUTION

ALWAYS USE AN EVENT TIME OF AT LEAST 10 SECONDS, 00:00:10:00, IN THE DATA TABLE. This habit will help you avoid potential un-Fired Events

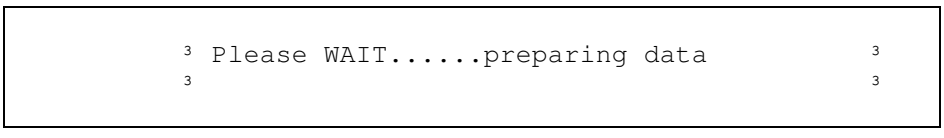
---

OPERATION OF AUTO FIRING WITH TIME

If there is a Data Table (a Data Table that has TIME in any Data Field), when the AUTO FIRE Operating Mode is depressed, and the Safety Key is Armed, the LCD may temporarily display the message "Please WAIT.....preparing data". The Field Controller is arranging the Event Lines by FIRING ORDER, which may take a few moments, depending on the length of the Data Table. This LCD Display is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



After the message “Please WAIT.....preparing data”, the LCD appears as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ WARNING: AUTO FIRING MODE! 0=INTERNAL    ³
³ 1=PYDL FSK, 2=SMPTE, 3=MTC, 4=MSC        ³
```

If ANY KEY IS DEPRESSED, OTHER THAN 0, 1, 2, 3 OR 4 on the hex keypad, then THE FIELD CONTROLLER IMMEDIATELY EXITS TO THE STOP MODE, and the Safety Key Warning System Warns the user to turn OFF the Safety Key.

When EITHER 0, 1, 2, 3, or 4 is depressed, AS DELIBERATE ACTION BY THE USER TO CONTINUE WITH ENTRY INTO THE AUTO FIRE MODE, the AUTO FIRE LCD is displayed as shown per the next Sections of this User’s Guide, appropriate to the Option Selected.

NOTE: THE OPTIONS FOR AUTO FIRING ARE;

- INTERNAL CLOCK (Option 0)
- TIME CODE INPUT (Option 1, 2, or 3)

  1 = Pyrodigital Time Code (PYDL FSK)
  2 = SMPTE Time Code (30 ND, 30 DF, 25 FPS, 24 FPS)
  3 = MTC (MIDI Time Code; 30 ND, 30 DF, 25 FPS, 24 FPS)

- MSC; MIDI Show Control (Option 4)

INTERNAL, Option 0

When OPTION 0 is selected, the LCD Display will appear as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADD CA         ³
³ RUN=FIRE TABLE #:z                       ³
```

Note that the LCD Display is very similar to the MANUAL FIRE LCD Display, with the "EVENT" or "DIRECT" indicators replaced with "RUN=FIRE". This same area (lower left corner) of the LCD will also show other indicators applicable to Auto Fire. Otherwise, the LCD display essentially appears the same as for the MANUAL FIRE Operating Mode. This is done intentionally for user familiarly with essentially one "Fire" screen, common to both Auto Fire and Manual Fire.

In the previous LCD Display, the TOP LINE of the display is the First EVENT LINE of the DATA TABLE which will be FIRED. Note that this MAY NOT necessarily be the actual first line of the Data Table, because the Field Controller will arrange the Data Table by FIRING ORDER.

Rephrasing THE FIRST PYROTECHNIC EVENT MAY NOT BE THE FIRST EVENT LINE ENTERED IN THE DATA TABLE. THE FIRST PYROTECHNIC EVENT WILL BE DETERMINED BY THE EVENT TIME MINUS THE PFT TIME.

The FIRING ORDER TABLE is an internal, non user accessible Table which sorts the Event Lines by EVENT TIME MINUS PFT, which is Firing Order. Data Tables for which the first Event available for Firing IS NOT the first Line Event of the Data Table would be; for a Data Table which has either TIME Numbers lower than the first Event Line down in the Data Table, or when the PFT causes subsequent Event Lines to be Fired before the actual first Event Line of the Data Table.

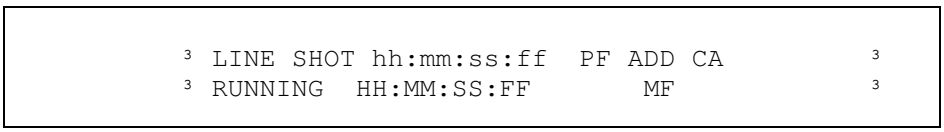
The SECOND LINE of the LCD display shows that the FIRE Key (or remote Pickle FIRE Trigger) should be depressed to start the Internal Clock, or RUN; RUN=FIRE. Notice also "TABLE #:z", or the number of the SELECTED DATA TABLE which will be used to Fire. This helps alert the user as to what Data Table is being used.

RUNNING THE INTERNAL CLOCK

When the FIRE Key is depressed (or the Fire Trigger on the remote Pickle), from the previous LCD display, the LCD appears as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



WARNING - EXTREME DANGER

FIRING OF THE PYROTECHNIC DEVICES MAY BEGIN AS SOON AS THE FIRE KEY OR REMOTE PICKLE FIRE TRIGGER IS DEPRESSED.

BE ABSOLUTELY SURE THAT IT IS SAFE TO FIRE.

The lower left corner of the LCD shows “RUNNING” which means that the Internal Clock is operating. This can be seen by the “HH:MM:SS:FF” SMPTE Time display which is counting forward, or increasing in Time. The Running Time always starts at zero time.

Also, as in the Manual Fire Operating Mode, the “MF”, or MANUAL FIRE indicator is now shown for Manually Firing by direct Address Entry (a Manual Fire Entry cannot be made until the clock has been started by depression of the Fire key).

STOP may be depressed at any time to STOP FIRING.

When the RUNNING TIME MATCHES THE FIRE TIME (EVENT TIME MINUS PFT), A FIRE COMMAND WILL BE ISSUED AT THE ADDRESS OF THAT EVENT LINE. A FIRE command will only be issued if the DEADMAN SWITCH is held down as indicated by the absence of the Yellow HOLD FIRE LED.

The TOP LINE of the LCD will show the NEXT EVENT LINE to be FIRED. Thus, after the Event Line has been FIRED, or SKIPPED OVER (because the deadman was not activated), the next Event Line to be Fired will be displayed. If the deadman is not activated, then the Field Controller will “beep” at each Skipped Over Event.

Note that FIRING will NOT occur at the TIME of the EVENT LINE, unless the Pre-Fire Time = 0 (zero). The actual Firing Time will always be the Event Time minus the Pre-Fire Time.

MF, or MANUAL FIRE is available to FIRE at a user entered 3 hex character ADDRESS (and then depress FIRE), as in the MANUAL FIRE Operating Mode. The Top Event Line will, however not locate (or attempt to locate) to the entered Address. The top Event Line will continue to show the next Event To Be FIRED in the Running Time sequence. You only get one FIRE attempt at the entered MF Address, so if the deadman switch is not activated, a “beep” will sound any you will have to re-enter the Address and depress FIRE again.

The LEFT / RIGHT ARROW Keys can be used to sequentially CHANGE the entered Manual Address under MF. The GO TO keys are inoperative. The only way to Manually Fire an additional Event (besides those being fired automatically) is to direct enter the Address or Move to the desired Address with the LEFT / RIGHT ARROW keys (once a starting Manual Fire address has been entered). Notice that FIRE for Manual entry only Fires once.

LF, or Last Fired, will indicate the Last Fired Address, which is also available for REFIRE. This is the same as in the MANUAL FIRE Operating Mode, excepting that now LF will also include those Events FIRED by the Running Time Clock.

The Field Controller will continue to FIRE until the End of the Data Table is reached. At that time the Field Controller will post the message "END OF TABLE - LAST EVENT WAS PROCESSED", and after about 5 seconds, exit to the STOP Mode and the Safety Key Warning System will Warn the user to turn OFF the Safety Key.

PAUSING THE INTERNAL CLOCK

INSTANTANEOUS FIRING AND RUNNING OF THE INTERNAL CLOCK CAN BE STARTED AT ANY EVENT. Once started at Time = 0, the Internal Clock can be PAUSED and any Event within the Data Table can be selected, ready for Immediate Firing and resuming of the Internal Clock, from that Time. THIS IS A VERY POWERFUL FEATURE.

This is EXTREMELY USEFUL for timed sequences which can be taken by verbal or sight cues. A Data Table can be created of many timed sequences, each of which can be started on cue.

The PAUSE Key may be used to Start and Stop the Field Controller when running on Internal Drive, once started by Run=Fire. The Up/Down Arrow may then be used to select the NEXT (or any) shot for re-starting the clock at that time, (actual start time will be event time minus PFT). That new selected Event is READY FOR FIRING INSTANTANEOUSLY WHEN YOU DEPRESS FIRE (remote Pickle FIRE Trigger or FIRE Button) which re-starts the Internal Clock from that new Time.

To operate the Field Controller in this manner, practice with INERT TESTING. Enter Auto Fire, Option 0 for Internal Drive. Depress FIRE when you wish to start. Note that the Up Down Arrow cannot be used until the Field Controller has been started and paused. Also the starting time for the first event must be greater than zero. This means that the event time minus the PFT MUST BE GREATER THAN ZERO. A simple way to get to the first cue to start on is to substitute a dummy cue with a lower Event Time, for the first event in order to start the internal clock (Dummy Event Time = 00:00:10:00; 10 seconds, make First Firing Event Time = 00:00:60:00. Then you have 10 seconds to Pause the Clock for the Dummy Cue and UP TO 60 SECONDS to Pause before you are in Danger of actually FIRING your First Firing Event).

Then DEPRESS the PAUSE KEY. The Clock will stop, however the presence of the "RUNNING" indicator shows that you are in Internal Drive, but notice that the time display is frozen. You may now depress the Down Arrow key to advance the time to the start of this next shot (Go PAST the Dummy Cue to the First Firing Event, Down Arrow twice).

Now when you depress FIRE the selected shot will be immediately Fired and the clock will start counting time again, from that time.

NOTE THERE MAY BE A DISCREPANCY BETWEEN THE TIME DISPLAYED AND THE ACTUAL TIME THE CLOCK RE-STARTS. THIS DISCREPANCY WILL BE THE EVENT TIME MINUS THE PRE-FIRE TIME, EQUALS THE FIRING TIME. If PFT equals zero then the paused display starting time (from down arrow) will be equal to the time the Field Controller actual re-starts at when you depress Fire. IF PFT IS NOT EQUAL TO ZERO, THEN THE RUNNING CLOCK WILL INSTANTLY JUMP BACKWARDS TO THE FIRING TIME THE MOMENT YOU FIRE.

Thus you may advance to the next shot and depress FIRE when you wish the next timed sequence to start. This can be done any number of times and the Up / Down Arrow Keys can be used to select any desired starting next shot.

Remember, that if you have PAUSED AND advanced to another Event via the UP / DOWN Arrow Keys, THAT EVENT WILL BE IMMEDIATELY FIRED WHEN YOU DEPRESS FIRE, REGARDLESS OF THE PRE-FIRE TIME OF THE EVENT. This will cause the indicated Running Clock Time (which was frozen) to IMMEDIATELY JUMP BACK TO THE FIRE TIME OF THE EVENT, the instant you depress Fire. If the Pre-Fire Time were zero, then the Clock Time would be the same as the Fire Time, therefore the Clock Time would not change.

CAUTION - DANGER

FIRING WILL BE INSTANTANEOUS THE MOMENT THE FIRE KEY (or remote Pickle FIRE TRIGGER) IS DEPRESSED, When Stopping or Starting via the PAUSE KEY in Auto Fire, Internal Drive AND Selecting Events via the UP or DOWN ARROW KEY

THE TIME DISPLAYED AND USED FOR FIRING WILL BE THE EVENT TIME MINUS THE PRE-FIRE TIME FOR EACH EVENT.

THE PREVIOUSLY FROZEN RUNNING CLOCK WILL IMMEDIATELY JUMP BACKWARDS IN TIME (by the amount of the PFT) AND RE-START AT THE FIRE TIME, WHICH IS THE EVENT TIME MINUS THE PRE-FIRE TIME.

ALSO, UNEXPECTED EARLY FIRINGS MAY OCCUR BECAUSE PRE-FIRE TIMES ARE USED FOR ALL EVENTS

IT IS RECOMMENDED THAT YOU ALWAYS HAVE THE PRE-FIRE TIME EQUAL TO ZERO IN ALL EVENTS TO PREVENT UNEXPECTED EARLY FIRINGS.

Pre-Fire times can, of course, be used for example in synchronizing aerial bursts to a live orchestra via a script created from a rehearsal soundtrack. Just be aware of what you are doing if using pre-fire times in internal drive. Remember, from a paused and selected Event, FIRING IS INSTANTANEOUS, and the PFT for that Event only moves the Running Internal Clock backwards. Subsequent Events WILL USE the PFT for Firing as the Internal Clock continues to run.

NOTE; Zipper Cues (simultaneous Fire Events) may be used in Internal Drive to Fire multiple Addresses. In this case, you will only see the First Event indicated on the Field Controller LCD as the subsequent zipper events will pass by at the rate of 1/100 of a second and will not be seen on the LCD. LF, or Last Fired will show the Address of the last zipper cue. RE-FIRE will only Fire the Address shown by LF, so an entire Zipper String cannot be Re-Fired.

See Special Cautions for the Auto Fire Data Table at the end of this section for special notes concerning the structure of the Data Table used with AUTO FIRE.

PYDL FSK, Option 1

The Pyrodigital Time Code (PYDL FSK) Option 1, is essentially the same as when using the Internal Clock, excepting the source of the Clock is now Pyrodigital TIME CODE. Time Code is input to the Field Controller through one of the two input Jacks and provides an exact synchronization reference to the MUSIC that the Pyrotechnic Performance was originally Scripted.

BE SURE TO USE THE TIME CODE OPERATING MODE, OPTION 1, MONITOR Pyrodigital Time Code, TO CHECK THE INTEGRITY OF THE TIME CODE TRANSMISSION. ALSO USE THE AUDIO MONITOR SYSTEM TO LISTEN TO THE TRANSMISSION LINE AND THE TIME CODE FOR VERIFICATION.

Select Option 1 from the Auto Fire Operating Mode. Note that this LCD display is the same as for the INTERNAL CLOCK, Option 0, as shown again below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADD CA          ³
³ RUN=FIRE TABLE #:z                        ³
```

All associated Keys, Functions, and Displays are nearly identical to Firing with the Internal Clock, Option 0.

When the Fire Key is depressed, from the previous LCD display, the LCD appears as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADD CA          ³
³ WAITCODE TABLE #:z          MF            ³
```

WARNING - EXTREME DANGER

FIRING MAY INSTANTLY BEGIN UPON DEPRESSION OF THE FIRE KEY IF THE FIELD CONTROLLER IS ALREADY RECEIVING TIME CODE. THE ABOVE LCD SCREEN WILL QUICKLY BYPASSED AND THE FIELD CONTROLLER WILL DIRECTLY PROCEED TO THE FIRING LCD SCREEN SHOWN BELOW. FIRING WILL OCCUR FOR THE FIRE TIMES (EVENT TIMES MINUS PRE-FIRE TIMES) THAT MATCH THE INCOMING TIME CODE.

The Field Controller is now WAITING TO RECEIVE VALID TIME CODE.

At the above “WAITCODE” LCD Display, MF, or Manual Fire Direct Addressing capability is available.

When Valid Time Code is received the LCD will appear as below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADD CA          ³
³ IN SYNC  HH:MM:SS:FF LFyyy MFxxx          ³
```

The above LCD shows the Field Controller in an INTERMEDIATE STATE OF OPERATION, as indicated by the presence of both “LFyyy” and MF”xxx”. “LFyyy” would not appear until the Field Controller has actually FIRED, and as in all Firing Modes, the LF (Last Fired) ADDRESS is available for REFIRE. Also the presence of Address “xxx” under MF (Manual Fire) indicates that Address “xxx” has been entered from the hex Keypad.

The Running Time of the TIME CODE is shown under “HH:MM:SS:FF”, similar to Internal Drive. The Field Controller will recover this time from the Time Code at whatever Time (wherever the tape is started) is specified by the Time Code, which DOES NOT necessarily have to be the beginning of the Time Code.

Notice that the lower left corner indicator of the LCD (“WAITCODE”) has been replaced by “IN SYNC”. One of three possible indicators will be shown in this lower left corner of the LCD. They are “IN SYNC”, “SYNCFIND” , and “INTDRIVE”.

In the Pyrodigital Time Code Mode, the Field Controller is operating it’s Internal Clock in synchronization with the incoming Time Code. Actual FIRING Commands are issued on the basis of the Internal Clock (just as in Internal Drive Mode). This provides a stable and uninterrupted Clock for AUTO FIRING. The 3 indicators show the status of the relationship between these two clocks, the incoming Time Code (which is essentially the clock time of the tape and MUSIC) and the Internal Clock. The conditions indicated are as follows;

- IN SYNC - indicates that VALID TIME CODE IS BEING RECEIVED and that the the Internal Clock used for Firing is in EXACT SYNCHRONIZATION with the incoming Time Code.
- SYNCFIND - indicates that VALID TIME CODE IS BEING RECEIVED and the Internal Clock used for Firing IS BEING ADJUSTED TO FIND SYNCHRONIZATION with the incoming Time Code.
- INTDRIVE - indicates that NO TIME CODE, OR INVALID (NOISY) TIME CODE IS BEING RECEIVED and that the INTERNAL CLOCK IS BEING USED FOR FIRING (Internal Drive).

WARNING - EXTREME DANGER

FIRING WILL CONTINUE UNTIL STOPPED BY THE USER, OR THE END OF THE DATA TABLE IS REACHED, REGARDLESS OF WHETHER THE TIME CODE IS PRESENT OR NOT, ONCE FIRING HAS BEEN STARTED BY THE TIME CODE.

SEE THE SYSTEM NETWORK USERS GUIDE, AUTO TIME SWITCHOVER SECTION, FOR RAMIFICATIONS AND PROCEDURES CONCERNING THE FACT THAT AUTO FIRE WILL CONTINUE TO FIRE EVEN IF THE TIME CODE SIGNAL IS STOPPED OR LOST.

Thus TIME CODE serves to update and synchronize the Internal Clock. If bad Time Code is encountered, or the transmission of the Time Code is lost, the Field Controller will continue to FIRE, and is indicated by "INTDRIVE" on the LCD. THIS IS A VERY POWERFUL FEATURE WHICH CAN PREVENT YOUR PYROTECHNIC PERFORMANCE FROM STOPPING, SHOULD THE TIME CODE TRANSMISSION BE NOISY OR LOST. YOU MUST BE AWARE OF THE FACT THAT THE FIELD CONTROLLER WILL CONTINUE TO FIRE AND KNOW HOW TO DEAL WITH THE RAMIFICATIONS OF THIS FEATURE.

"SYNCFIND" and "IN SYNC" may flicker between each other, which indicates that the Internal Clock is continuously being UPDATED by the incoming Time Code. The flickering, or updating, will be a function of how accurate the Time Code is in relation to the Internal Clock. If the Time Code is slow or fast (as PLAYED on the tape recorder) then the Internal Clock must always be updated as opposed to remaining IN SYNC.

If the Time Code Transmission is temporarily interrupted, or becomes noisy, then "INTDRIVE" will be shown, followed by a brief period of "SYNCFIND" as the Field Controller adjusts the Internal Clock. NOTE: if ABNORMALLY the tape is fast forwarded or rewound, then the Internal Clock will be UPDATED to the new Time Code Time.

See Special Cautions for the Auto Fire Data Table at the end of this section for special notes concerning the structure of the Data Table used with AUTO FIRE.

SMPTE, Option 2 (with OFFSET)
MTC, Option 3 (with OFFSET)

When AUTO FIRE with either SMPTE or MIDI Time Code (MTC) is selected, the LCD Display will be presented as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ SMPTE OFFSET TIME:hh:mm:ss:ff ³
³ RUN=FIRE TABLE #:x ³
```

The current setting of the SMPTE / MTC Offset is displayed on the Top Line. NORMALLY THE OFFSET SHOULD BE SET TO ZERO 00:00:00:00. For very special applications, HOUR Offsets may be used. In this case, BE SURE THE OFFSET IS THE HOUR OFFSET THAT DATA TABLE "x" REQUIRES.

Remember that RELTIME (Relative Time, the Incoming SMPTE / MIDI Time Code MINUS the OFFSET) is the Time that AUTO FIRE uses to FIRE the selected Data Table.

RUN=FIRE and the Data Table selected, TABLE #:x are the same as for the previous Auto Fire Options.

When you depress FIRE in order to start looking for Time Code, the LCD Display is again the same as for Pyrodigital Time Code, Option 1, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADD CA ³
³ WAITCODE TABLE #:z        MF ³
```

WARNING - EXTREME DANGER

FIRING MAY INSTANTLY BEGIN UPON DEPRESSION OF THE FIRE KEY IF THE FIELD CONTROLLER IS ALREADY RECEIVING TIME CODE. THE ABOVE LCD SCREEN WILL QUICKLY BYPASSED AND THE FIELD CONTROLLER WILL DIRECTLY PROCEED TO THE FIRING LCD SCREEN SHOWN BELOW. FIRING WILL OCCUR FOR THE FIRE TIMES (EVENT TIMES MINUS PRE-FIRE TIMES) THAT MATCH THE INCOMING TIME CODE.

The Field Controller is now WAITING TO RECEIVE VALID TIME CODE.

IF A NON-ZERO OFFSET IS USED LARGER THAN THE INCOMING TIME CODE, THE FIELD CONTROLLER WILL REMAIN FROZEN AT THE "WAITCODE" LCD DISPLAY.

At the above "WAITCODE" LCD Display, MF, or Manual Fire Direct Addressing capability is available.

When Valid Time Code is received the LCD will appear as below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADD CA TYPE    ³
³ IN SYNC  HH:MM:SS:FF LFyyy MFxxx         ³
```

The above LCD shows the Field Controller in an INTERMEDIATE STATE OF OPERATION, similar to Operation with Pyrodigital Time Code, Option 1, however with the addition of TYPE in the upper right corner for the TYPE of SMPTE / MTC Time Code being received.

Also IN SYNC behaves differently for SMPTE / MTC Time Code.

TYPE OF TIME CODE BEING RECEIVED IS INDICATED AS;

- 30 ND (30 frames per second, Non Drop)
- 30 DF (30 frames per second, Drop Frame)
  (same as 29.97 NTSC Video Drop Frame)
- 25 FPS (25 frames per second EBU)
- 24 FPS (24 frames per second for Film)
- INTCLK; INTERNAL CLOCK

(at previously established Frame Rate; one of above)

NOTE: INTDRIVE will also show in the lower left Corner

Once valid SMPTE Time Code is received THE SYNCHRONIZATION OF THE INTERNAL CLOCK SPEED and FRAME COUNTING IS ESTABLISHED. This means that should the SMPTE Time Code input stop or become distorted (unrecoverable) the Auto Time Switchover feature will continue operating Fire according to the Internal Clock. THE TIME CODE DISPLAY WILL NOW SHOW "INTCLK" (for internal clock) where the Time Code TYPE was Displayed (upper right hand corner) and INTDRIVE (lower left corner) . The Internal Clock will operate at with the Same type of SMPTE Time Code present before SMPTE Time Code was lost. This means that, for example at 25 fps (25 frames per second), the Internal Clock will count at 25 frames per second to keep exact sync as if 25 fps SMPTE was still coming in at the same rate.

For Field Controllers so equipped, the SMPTE BLUE LED will be illuminated when valid SMPTE Time Code is being received.

CAUTION - WARNING

THE SMPTE/MIDI TIME CODE TYPE FOR FIRING MUST BE THE SAME TYPE OF TIME CODE USED FOR SCRIPTING, and in fact must be the same exact time code to which the Events were Scripted. OPERATING AUTO FIRE WITH A DATA TABLE SET UP FOR ONE TYPE OF SMPTE/MIDI TIME CODE WITH A DIFFERENT TYPE OF SMPTE/MIDI TIME CODE MAY RESULT IN MISSED SHOTS AND/OR UNEXPECTED FIRINGS AS WELL AS OUT OF SYNC BEHAVIOR.

For example, it is not possible to script at 30 DF (Drop Frame) and operate Fire with 30 ND (Non Drop) or absolutely timing errors will occur, shots will be missed and un-Fired, and the show will not be synchronized.

When valid SMPTE / MIDI is received the Indicator “WAITCODE” will changes to “IN SYNC”. Once SMPTE / MIDI has been received, and then is lost, the Field Controller continues FIRING on Internal Drive, only now the indicator displays “INTERNAL” and “INTCLK”. As mentioned previously, the Internal Clock will run at the Frame Rate established just prior to losing Time Code. If valid SMPTE / MIDI is re-established, then the indicator will revert to “IN SYNC”. The indicator will continue to Display “IN SYNC” or “INTERNAL”, as appropriate to whether running on valid SMPTE / MIDI input or on the Internal Clock.

This indicator is EXTREMELY USEFUL in determining the integrity of the incoming Time Code. Flickering or switching to “INTERNAL” indicated sections of bad Time Code reception. The indicator control is based on the reception of 5 previous frames of Time Code within the frame block times expected. If 5 frame blocks pass without any Time Code, then the Field Controller reverts to the INTERNAL CLOCK.

NOTE: IMPORTANT: SMPTE / MTC behavior is different than behavior with Pyrodigital Time Code.

THE SMPTE / MTC INPUT IS NOT ANALYZED FOR ERRORS

This is because SMPTE / MIDI is decoded by a third party SMPTE to MIDI, or direct MIDI input processor board. The output of this board is ASSUMED TO BE VALID AND CORRECT, and is the direct Time Code input for control of the Field Controller. Thus any bad SMPTE or MIDI input, or that which is interpreted as bad SMPTE or MIDI is directly passed on to the Field Controller as the absolute correct Time Code. THIS MAKES IT ABSOLUTELY NECESSARY THAT THE SMPTE / MIDI INPUT IS ACCURATE, STABLE, AND PURE.

Pyrodigital Time Code, on the other hand, has built in parity, or error checking ability, plus other advantages. Thus, unlike SMPTE / MIDI, the Field Controller is able to analyze Pyrodigital

Time Code for errors or unexpected bad Time Code Frames and correct or compensate for problems. THIS IS ONE OF THE MANY REASONS WHY WE ABSOLUTELY RECOMMEND THAT YOU ALWAYS, ALWAYS, USE PYRODIGITAL TIME CODE IF AT ALL POSSIBLE. SMPTE / MIDI Time Code is a very fragile and NON-robust Time Code that is really not suitable for this application, even if it is a "standard".

See Special Cautions for the Auto Fire Data Table at the end of this section for special notes concerning the structure of the Data Table used with AUTO FIRE.

MSC, Option 4

MSC, or MIDI Show Control Firing is covered as a complete separate Section in this User's Guide. SEE MIDI SHOW CONTROL FIRING.

OPTIONAL DEFEATABLE AUTO TIME SWITCHOVER

For VERY SPECIAL APPLICATIONS ONLY the Internal Clock can be disabled so that the Field Controller will Stop Firing when the Time Code input stops and resume Firing when Time Code input resumes. This feature functions with Pyrodigital Time Code as well as with SMPTE and MIDI Time Code.

This may be selected (and verified) under SET-UP (Option 5) of the DATA TABLE OPERATING MODE. Re-Initialization of the Field Controller will reset to enable Auto Time Switchover (the Default condition). SEE DATA TABLE OPERATING MODE, Option 5 = SETUP, OPTION 0 = TAPE CLOCK MODE.

WARNING - CAUTION

DO NOT Operate the Field Controller with the Auto Time Switchover Feature Defeated (Defeated = 1 = Stop when Tape Stops) unless operating under VERY special circumstances. Disabling Auto Time Switchover can cause the Field Controller Operation to become erratic or unstable with poor or bad Time Code.

NORMAL OPERATION IS ALWAYS WITH AUTO TIME SWITCHOVER ENABLED (Data Table Operating Mode, Option 5=SETUP, Option 0=Tape Clock Mode, Auto Time Switchover Mode=0=AUTO SWITCH)

There will be a brief period of time before the Field Controller stops running when Time Code Input Stops. This will be longer with SMPTE or MIDI Time Code (as opposed to Pyrodigital Time Code).

When Time Code stops the Field Controller LCD Display will appear as “frozen”, awaiting further input to Time Code.

THE * ASTERISK FUNCTION

When the Field Controller transmits a Firing Command, in Auto or Manual Fire, an * (Asstericks) is placed directly behind the Address for that event line only. This is so the Field Controller knows that it Fired that event.

After you have Fired a table (either Live or in Inert testing) you can review the table to check for Asstericks to be sure that the Field Controller actually, in fact, issued a Firing Command to that Address. You must check for Asterik BEFORE you re-enter any powered mode (Auto Fire, Manual Fire, or Check Status) because the Asstericks are cleared / reset each time you enter a powered mode. Also a minor nuisance bug in the Software will clear the Asterik if you depress END to go to the end of the table in the data table, edit (option 0) mode.

DO NOT DEPRESS END in EDIT if you wish to check the Asterik. Check each and every Event Line with the Up / Down Arrow Keys (Home is also OK to use) for an Asterik (*) behind each Event Line’s Address. Note that the Field Controller may be powered off and the Asterik on each event will be retained, as long as you do not clear (by entering a powered mode) or depress End in edit when you power up the Field Controller at a later time.

Looking at the Asterik is useful in 2 cases: 1) non-fired shots that appear to be fully connected; was a Firing Command issued by indication of an asterik?, and 2) play the tape in an INERT mode to check bad or suspected bad portions of the time code to be sure no event frames are skipped or missed. This is especially critical with SMPTE or MIDI Time Code (to easily make continuous SMPTE frame Time Table, See Data Table Operating Mode, Edit, Option 0, Auto Fill in Time Field, Quick Entry, Option 0).

SPECIAL CAUTIONS FOR THE AUTO FIRE DATA TABLE

- AUTO FIRE IS NOT POSSIBLE WITH INVALID DATA TABLES; (beginning of this Section on the AUTO FIRE OPERATING MODE)

NO DATA TABLE

DATA TABLES WITH NO TIME EVENTS

DATA TABLES WITH PFT GREATER THAN EVENT TIME

- Make sure that the FIRE TIME does not occur before the start of the Running Time, because the Event cannot be Fired.

In Internal Clock Drive do not specify a Firing Time (Event Time minus PFT) before AT LEAST 2 frames (00:00:00:02)

AS RECOMMENDED PREVIOUSLY, ALWAYS USE EVENT TIMES GREATER THAN 10 SECONDS (then any possible PFT cannot cause problems).

In Time Code Drive (External, all Time Code Types) do not specify a Firing Time (Event Time minus PFT) before the start of the first Time Code number that will be received (those Events will be Un-FIRED). If you always use the recommended 60 second Time Code Leader, then this rarely becomes a problem, in any case allow at least 5 seconds for the Time Code to stabilize.

- FOR THE MF, MANUAL FIRE Direct Address Entry;

DO NOT PRESS ENTER after entering an Address, or that Address will NOT BE FIRED. After Firing this MF Address, notice that an Asstericks will be placed after the Address indicating that it has been Fired.

If you FIRE a device that is in your Data Table, then that device is not available to be Fired at it's Firing Time from the Clock (because you already FIRED it).

When using MF, ONLY THAT EXACT SINGLE ADDRESS WILL BE FIRED; NO ZIPPERS CAN BE FIRED.

AUTO FIRE WITH EXAMPLE 1 DATA TABLE

PLEASE CONNECT ONE FIRING MODULE TO THE FIELD CONTROLLER, SET THUMBWHEEL ADDRESS TO 10. CONNECT ELECTRIC MATCH TEST LIGHTS on Addresses 101 through 109.

---------- WITH NO, REPEAT, NO PYROTECHNICS CONNECTED -------

Use the DATA TABLE created in EDIT, EXAMPLE 1 DATA TABLE. If you have lost this Data Table, go to DATA TABLE Operating Mode, Option 0, EDIT, Example 1 Data Table, and re-enter this Data Table (or re-create; Data Table: 10 shots 0 - 9, Time every 2 seconds from 00:00:10:00 to 00:00:28:00, all 0 PFT, Address sequential from 100 to 109, Calibers sequential from 0 to 9).

Select Auto Fire, Key ON. Select option 0, INTERNAL CLOCK. Now you have a LCD screen very similar to Manual FIre. Notice that (as in all cases) the first line indicates the shot to be Fired. The lower left indicator indicates that you must depress FIRE to start (or run). Depress FIRE and your off and running. Notice the lower left indicator says "RUNNING". Notice that if the DEADMAN is not depressed the unit will "beep" at each event and not issue any Firing Commands. Observe the TEST LIGHTS. Once Running, MF, is now Displayed and awaiting any manually override Address to be Fired. Manual Fire Address 102 by entering 102 on the hex keypad and depressing Fire. Try the REFIRE Key to Re-fire the Last Fired Address (LF). Notice that FIRE for Manual entry only Fires once.

Notice that the LEFT / RIGHT Arrows can be used to sequentially move the selected manual shot under MF. Notice that the GO TO keys are inoperative. The only way to Manually Fire an additional shot (besides those being fired automatically) is to direct enter the shot address or move to it with the LEFT / RIGHT ARROW keys, once a starting manual fire address has been selected. Notice that FIRE for Manual entry only Fires once.

When the Field Controller is "RUNNING", or at any time, depress the AUTO FIRE Operating Mode. You have stopped FIRING under Internal Drive and are at the options menu.

Notice that when the Time (Internal Clock or Time Code) goes past your Last Event, the Field Controller exits Auto Fire to the Stop Mode and "beeps" at you to Turn Off the Safety Key (after the message "END OF TABLE - LAST EVENT WAS PROCESSED).

Re-Select Auto Fire, Select Option 0, and depress FIRE to start the Internal Clock running from Time = 0. NOW IMMEDIATELY DEPRESS PAUSE (the AF Pause and MF / Skip Key). Time (and all functions) are frozen. Depress the DOWN Arrow and notice that it moves by Events within the Data Table. Depress the UP Arrow; moves UP. Move (with Up / Down Arrow) to Shot # 2. Now hold the Deadman and squeeze the Fire Trigger. Firing immediately starts at shot #2 and the clock starts running at 14 seconds. Observe how the Pause and Up / Down Arrow may be used to start AT ANY EVENT. If Shot #2 had a PFT of 20, then when you FIRED the Running Clock would have Immediately jumped back to 12 seconds and continued on from there. Try this (change Shot #2 PFT to 20). Notice also that now it's 4 seconds to get to Shot #2 when before it was 2 seconds. This illustrates some of the pitfalls when using PFT and Pausing the Internal Clock.

Hook up a tape with Pyrodigital Time Code and let's look at Auto Fire, Option 1, Pyrodigital Time Code. When you press FIRE the message is now "WAITCODE", indicating the unit is waiting for time code to start.

Notice that at this point (before receiving time code, but at WAITCODE) it is possible to manually fire (as opposed to Internal Drive which must actually be Running). Enter an address to start and you can use the LEFT / RIGHT Arrow keys to move, or simple keep entering hex addresses and Firing. Try Firing 101 through 109 sequentially, while verifying on your test lights. Notice that an Asstericks is posted after you Fire the Event in this manner. Notice that if you did not have the DEADMAN down when you attempted to Fire at a manually entered address you get a "beep" AND the unit behaves as though that shot is now Fired. To actually Fire it now (after a failed attempt because the DEADMAN was NOT held down) you 1) can use REFIRE, 2) go LEFT and the RIGHT ARROW to go back to it, or 3) re-enter the 3 character hex address.

Start your tape and input Pyrodigital Time Code (Pyrodigital Time Code should start at the beginning, from Time starting at 1 - 2 seconds, or so). The message should change to "IN SYNC" and the clock should start running. The unit may display "SYNCFIND" as it aligns it's internal clock to the incoming time code. Notice that "IN SYNC" and "SYNCFIND" (Sync Find) may jitter or toggle back & forth between each other. This indicates that sync is good. If you stop the tape (interrupt the time code) the unit will switchover to "INTDRIVE", indicating that the unit is not receiving time code and is in "auto time switchover". If time code is re-established the unit will re-sync to the incoming time code.

Try pulling the time code feed from the tape deck (but leave the tape deck running). We are now in INTDRIVE (Internal Drive). Plug back in the time code and see how long it takes to re-establish sync. You should be locked back up in sync within a few seconds. If you have a variable speed tape machine feeding the time code, notice that you have only a small range of speed where sync can be maintained. This is about plus or minus 2 to 3%, which should be no

problem for open reel tape machines. Be sure to check beforehand to make sure the Field Controller can maintain sync with THE tape on THE machine to be played at show time.

Pay attention to the SYNC indicators while running the show and you will always be aware of your synchronization status or problems with the time code feed.

PRACTICE with SMPTE Time Code to become familiar with the differences and indicators (NOTE: you can use the Pyrodigital Time Code COMPACT DISK as a convenient source for Pyrodigital Time Code or SMPTE Time Code).

HAZARD LOCKOUT FIRING SECTION 16

INTRODUCTION

HAZARD LOCKOUT IS USED ONLY IN THE AUTO FIRE OPERATING MODE

While AUTO FIRE is running, any (or all) of the "Group Caliber Select" Buttons (on left side of Field Controller) may be depressed which causes ANY REMAINING EVENT LINES WITH MATCHING CALIBER NUMBERS TO NOT BE FIRED. Thus, for example, if Auto Fire is Operating, and you depressed Group Caliber #3, any remaining Event Lines in the Data Table with Caliber Number 3 would NOT BE Fired, as Auto Fire continues through your Data Table.

The "Caliber Number" can be used to represent whatever Event Line(s) you chose. The Caliber Number can relate to specific types of Devices or relate to Zones or Specific Areas within the System Network, such as "stage far left", for example.

Any, or all or the sixteen (16) Group Caliber Buttons may be used, depending on the desired results.

WARNING - EXTREME DANGER

DO NOT ROUTINELY USE OR DEPEND ON HAZARD LOCKOUT TO ENABLE YOUR DISPLAY TO SAFELY CONTINUE. STOP FIRING AND DISABLE OR DISCONNECT SPECIFIC DEVICES OR FIRING MODULES SHOULD AN UNSAFE CONDITION ARISE, BEFORE CONTINUING.

HAZARD LOCKOUT WILL ONLY LOCKOUT EVENT(S) FROM FIRING ACCORDING TO THE MATCHING CALIBER NUMBER(S) WITHIN THE SELECTED DATA TABLE

THIS PLACES VERY SPECIFIC REQUIREMENTS ON THE SELECTED DATA TABLE TO ALREADY HAVE MATCHING GROUP CALIBER NUMBERS WHICH CORRESPOND TO THE CALIBER NUMBERS OF GROUP CALIBER SELECT BUTTONS (Limited to Numbers 1 through 16) FOR THE EVENT LINE(S) DESIRED TO BE BYPASSED

WITHOUT SPECIFIC AND PRE-PLANNED DATA TABLES RELATING TO SPECIFIC CALIBER BUTTONS, HAZARD LOCKOUT MAY FAIL TO DISABLE FIRING OR CAUSE UNPREDICTABLE RESULTS

YOU MUST ABSOLUTELY KNOW YOUR DATA TABLE AND KNOW EXACTLY WHAT YOU ARE DOING TO USE THE HAZARD LOCKOUT FEATURE

HAZARD LOCKOUT CANNOT BYPASS DEVICES WHICH ARE PHYSICALLY CONNECTED TO THE WRONG ADDRESS (therefore NOT MATCHING the intent of the Data Table).

Additionally, any use of Hazard Lockout will intentionally leave un-Fired devices which must be Safely un-Loaded and/or removed.

Also, UNINTENTIONALLY OR ACCIDENTAL DEPRESSION OF ONE OR MORE OF THE GROUP CALIBER BUTTONS DURING AUTO FIRE MAY CAUSE UNEXPECTED NON FIRING OF VARIOUS DEVICES. This may occur in a random and unpredictable nature if the Data Table Caliber numbers were NOT specifically set-up for Hazard Lockout.

THEREFORE DO NOT ACCIDENTALLY DEPRESS OR PLACE OBJECTS ON THE NOW FUNCTIONAL GROUP CALIBER KEYS. The User may depress the "Display Shots Remaining" Button during Auto Fire to verify that none (or only those desired) calibers are to be bypassed.

DATA TABLE SET-UP FOR HAZARD LOCKOUT

The DATA TABLE MUST BE PRE-PROGRAMMED WITH CALIBER NUMBERS TO MATCH THE DESIRED LOCKOUT RESULT. The ONLY Caliber Numbers used for Hazard Lockout are Numbers 1 through 16. These are the SAME numbers on the Caliber Group Select section of the left side of the Field Controller.

If, for example, you wish to have potential Hazard Lockout capability of all 12" shells, then all Event Lines with Addresses which actually are connected to 12" shells MUST HAVE THEIR CALIBER NUMBERS AS 12 IN THE DATA TABLE FOR EACH EVENT LINE.

If, for example, you have some devices at stage far left which you may want to disable for High Wind conditions DURING AUTO FIRE, give each of these Devices caliber number 5 (for example) as they occur in the Data Table.

The idea is that when you depress Group Caliber number 5 (or 12), while Auto Fire is running, you will cease to Fire, or Bypass any remaining Event Lines with Caliber Number 5 (or 12). The Field Controller will Bypass any Event Lines that exist within the Selected Data Table (treat them as skipped) when the corresponding Group Caliber Number is Depressed during Auto Fire.

HAZARD LOCKOUT OPERATION

Simply Depress the desired Caliber Number Button WHILE AUTO FIRE IS RUNNING to bypass the Event Lines which correspond to the selected Caliber Number. The Field Controller emits a normal "beep" when any Group Caliber Button is depressed.

Note that any selected Group Caliber can be De-selected, or reinstated to Fire, by again depressing the same Button. In this case the Field Controller emits a "lower tone beep". Thus THE GROUP CALIBER HAZARD LOCKOUT BUTTONS MAY BE CONTINUOUSLY TOGGLED ON AND OFF.

To Verify the status of each Hazard Lockout Selection, depress "DISPLAY SHOTS REMAINING". The lower Button, below the Group Caliber Select Buttons, labeled "Press to

Display Shots Remaining" may be depressed during Auto Fire to indicate which Caliber Numbers are to be bypassed. The LCD Display will appear as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Hazzard                                          ³
³ Lockout:                                         ³
```

ANY NUMBERS APPEARING IN LCD DISPLAY WILL BE THOSE CALIBER NUMBERS WHICH ARE LOCKED OUT.

The LCD Display below has ALL 16 CALIBERS LOCKED OUT as shown when the DISPLAY SHOTS REMAINING Key is depressed;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Hazzard  1   2   3   4   5   6   7   8   ³
³ Lockout: 9  10  11  12  13  14  15  16   ³
```

Note that the Group Caliber selected for Hazard Lockout may be depressed WHILE THE DISPLAY SHOTS REMAINING BUTTON IS ALREADY DEPRESSED. This makes it absolutely clear when Hazard Lockout is enabled (or disabled).

HAZARD LOCKOUT USAGE

It is a good idea to check the Hazard Lockout LCD Display once in a while to be sure Calibers are Locked Out or NOT LOCKED OUT, as desired.

The Hazard Lockout Group Caliber Number cannot be "pre-selected", but only selected while Auto Fire is actually running. If paused while running in internal clock, Hazard Lockout HAS NO EFFECT (the clock must be running).

Note, that should you Lockout a specific Caliber Number and the later Toggle the Button back to the Normal "off" state, you could leave a section of un-Fired devices (as per the Data Table), having only "Locked Out" those Event(s) for a portion of Time while running Auto Fire. There could be several sections of un-Fired Event Lines for several Caliber Numbers, all depending on how you operated the Group Caliber Buttons for hazard Lockout.

Caliber numbers 0 (zero) or higher than 16 cannot, and will not, be affected by Hazard Lockout.

Re-Selecting any Operating Mode WILL CLEAR AND REMOVE ALL HAZARD LOCKOUTS (Reset to NO Hazzard Caliber Numbers are Locked Out).

MIDI SHOW CONTROL FIRING SECTION 17

INTRODUCTION

MIDI SHOW CONTROL OPERATES WITH THE AUTO FIRE OPERATING MODE ONLY

MIDI Show Control, abbreviated as MSC, is an Operating Mode under AUTO FIRE that allows MIDI (Musical Instrument Digital Interface) input signals in the MIDI Show Control format to Fire a PRE-PROGRAMMED sequence(s) on the Field Controller. MIDI Show Control commands are input to the standard MIDI In connector on the Field Controller, with a standard MIDI cable.

MIDI Show Control, MSC, was specifically developed to operate with RICHMOND SOUND DESIGN LTD., Vancouver, Canada, Stage Manager Software. Richmond Sound Design MIDI Show Control uses MIDI communications and commands as defined in the MIDI Show Control Specification, Specifically the "GO" Command and the "RESET" Command. If using any other Manufacturers version(s) of MIDI Show Control, the user should carefully check for proper functioning of MSC (MIDI Show Control). Normal Musical MIDI Note Commands will not operate the Field Controller.

MIDI Show Control operation is selected under the Auto Fire Operating Mode, however MSC actually controls the Field Controller in a manner similar to the Manual Fire Operating Mode. MSC DIRECTLY CONTROLS WHICH SHOT NUMBERS ARE TO BE FIRED WITHIN THE DATA TABLE VIA THE MSC GO. Thus MSC, like normal operation under Manual Fire, can operate Zipper Firings and/or Macro Firings by initiating the first Event to Fire of such a sequence(s). There are specific limitations to Firing Zippers or Macros with MSC and Pyrodigital Consultants recommends very limited, careful, and prudent use of MIDI Show Control in combination with Zipper Firing and ESPECIALLY with Timed Macro Firing.

USING MIDI SHOW CONTROL REQUIRES THAT THE DATA TABLE MUST BE VERY CAREFULLY SET UP TO FUNCTION PROPERLY.

DATA TABLE SET UP FOR MIDI SHOW CONTROL

MIDI Show Control works by actually transmitting THE SHOT NUMBER of the desired Event to be Fired. IN RICHMOND SOUND DESIGN THIS IS THE CUE, OR QUE NUMBER, as a GO Command. The QUE Number is interpreted by the Field Controller as the SHOT NUMBER which DIRECTLY CORRESPONDS to the Shot Number of the PRE-PROGRAMMED Data Table. Thus the actual Phase III Firing Address is part of the Event Line, that has the the Shot Number, that matches the Richmond Sound Design MSC Que Number.

Therefore the Richmond Sound Design Software can be programmed independently from, or without specific knowledge of, the Field Controller. The Richmond Sound Design Programmer

specifies a QUE Number (must be within Configured Memory Size) where a pyrotechnic Event(s) is desired. It then becomes the task of the User of the Field Controller to relate that Que Number to a Shot Number on an EVENT LINE within the Data Table. This Same EVENT LINE contains the Phase III Firing Address. Additional information on the Event Line can be used for Zipper Firing and/or Timed macro Firing.

When a valid MSC GO Command is received by the Field Controller, The EVENT LINE is Fired and then the Field Controller awaits another MSC GO command to Fire the next Event. An Event, as previously mentioned, can be Set Up in the Data Table such that it is a series of sequential Event Lines Pre-Programmed to operate as a Zipper Fire and/or Timed Macro Fire. See the appropriate sections of the Users Guide on Data Table Set Up for Zipper Firing and Macro Firing. Caliber Group Firing IS NOT applicable to MIDI Show Control (Event sequences set up for Group Caliber will not interfere with operation under MIDI Show Control).

It must be clearly understood that a MSC GO Command can act only on the FIRST occurrence of a particular shot number, from the TOP of the Data Table. If the same shot number were to occur further in the Data Table, then this shot would NOT be Fired by another MSC GO command for that same shot number. The second MSC GO Command would only cause the Field Controller to “beep” at the first occurrence of this shot number, WITHOUT Re-Firing (of course, the MSC GO Command can act on a Zipper or Timed Macro, which can have the same shot number for all Events within that Zipper or Timed Macro). In this case the Zipper or Timed Macro behaves as one “Shot” and ONLY the FIRST MSC GO Command of that Shot Number causes execution of that sequence.

MIDI Show Control is specifically intended to Fire a single Event having the Event Shot Number equal to the MSC (Richmond Sound Design) Que Number. Using this MSC Que to trigger Zipper Events or Timed Macros on the Field Controller should only be done after careful consideration and thought have been given to all the implications of doing so, especially those concerning SAFETY.

MIDI SHOW CONTROL REQUIREMENTS

Since MSC DEPENDS EXCLUSIVELY ON SHOT NUMBERS, special requirements are imposed on the Shot Numbers and the Sequence of Shot Numbers within the Data Table. Additionally other requirements are imposed on the times when MSC GO Commands can be sent to the Field Controller. The requirements are as follows;

1) Shot Numbers Requirements (equal to the Que Numbers);

   a) Shot Number 0 (zero) is NOT ALLOWED
   b) Maximum of 3 Digits = 999 Maximum
   c) Must be from 1 to the Maximum Configured Memory Size
      i) from 1 to 474 for 12 Memories (475 lines)
      ii) from 1 to 949 for 6 Memories (950 lines)
      iii) from 1 to 999 for 2 Memories (2,500 lines)

2) If the same shot number exists MORE THAN ONCE within the Data Table, MSC GO will only act on the First Occurrence of that same Shot Number
3) DO NOT send an additional MSC GO Command while the Field Controller is acting on or operating the previous MSC Command (MAXIMUM MSC GO Command buffering is 1 (one) command)
4) MSC GO Commands must be in the correct format as specified for MIDI Show Control, transmitted in SYSEX; Controlled Device, Pyro, General Category, # 60
5) MSC Device Number must match for both the MSC GO Command and the Field Controller User Defined MSC Device Setting
6) Any MSC List and Path numbers in the GO Command are ignored.

SHOT NUMBER LIMITATIONS AND POTENTIAL PROBLEMS

Even with new Configurable Memories, the Que Number, or Shot Number, cannot exceed 3 characters. Therefore the highest show number allowed is 999 for the 2,500 line Data Table. If the memory is Configured for 12 Data Tables of 475 Lines, then the highest Shot Number is 474. Similarly if the Data Table is Configured for 6 Memories of 950 shots, the highest Shot number allowed is 949.

Shot numbers DO NOT have to be sequential in order, nor do they have to be continuous. Shot numbers do not have to exist for an event line to be Fired, as long as the non shot numbered Event Line is WITHIN a Zipper Fire or Timed Macro Fire.

To understand how this works, MSC SPECIFIES a SINGLE Shot Number with each GO Command. This MSC command causes the Field Controller to locate THE FIRST OCCURRENCE (from the top) of the Event Line having that specific shot number, within the selected Data Table, AND then instantly Fire that Event Line.

Thus a shot number of 0 (zero) cannot be used because all Event Lines of the Data Table have 0 as their shot number (by default), until changed or specified by the user. Additionally, it is un-wise to use the same shot number more than once, thus avoiding confusion and possibly non Firing a desired Event Line. Also, since the First Event Line with the matching Shot Number is Fired, any sequentially following Event Lines that are tied to this first Event Line via Zipper Firings and/or Macro Firings will also be Fired. See the User Guide sections for Zipper Fire and Macro Fire for Data Table set up.

The MSC “Cue Number” can only be used ONCE for the FIRST OCCURRENCE of that Shot Number within the Data Table (from the top of the Table). Subsequent issuance of the same Cue Number by MSC will re-Locate this same shot number, but the Field Controller will only “beep”, as it has already FIRED this Shot. ALSO, AND MORE IMPORTANTLY, SUBSEQUENT SAME CUE NUMBERS (SHOT NUMBERS) WITHIN THE DATA TABLE WILL BE IGNORED (unless related to the First occurrence of this shot number by Zipper / Macro Fire, in which case the sequence progression is DEFINED by the Zipper / Macro AND THE SHOT NUMBER DOESN’T MATTER ANYWAY).

It is also possible to have MSC execute in the middle of a Zipper / Macro which was intended to start with a different Cue Number by having a different Shot Number for event(s) within the Zipper / Macro. Such bad usage of Shot Numbers with MSC Cue calls could result in Firing of

Event(s) which were already Fired Previously, or FIRING OF UNEXPECTED EVENTS due to a "hidden" shot number previous to, but the same as, the desired shot number.

Note also in MSC that if a Shot Number (Que Number) is captured via a Zipper or Timed Macro Firing, then when the Zipper or Timed Macro is Fired, the captured Shot cannot be Re-Fired because it has already been Fired. This would only occur if you incorrectly tried to Fire a Shot that you had already placed within a Timed Macro or Zipper Fire.

Conversely, if you MSC Fire a shot in the Middle of a Zipper or Timed Macro before Firing the Zipper or Timed Macro (for some strange reason), then that particular shot within the Zipper or Timed Macro will be Fired again when the Zipper or Timed Macro is Fired (however that particular device will already have been Fired).

MIDI SHOW CONTROL COMMANDS

The MIDI Show Control GO Command must be in the propped format. This is normally automatically done by the Controlling Software, the Richmond Sound Design Stage Manager. In order for Richmond Sound Design to successfully communicate to the Field Controller, the GO Command must be VERY Specific to the Field Controller. The Command must;

1) Be for Controlled Device Pyro, HEX 60 (General Category)
2) Have the DEVICE NUMBER match the device number as selected on the Field Controller (User defined)
3) Specify the QUE NUMBER as THE SHOT NUMBER of the Event to be Fired.
4) Que (Q____) List and (Q____) Que Path are not needed and ignored if any data MSC data is sent for these

EXAMPLE MSC COMMAND

Consider the following MSC Command as a SYSEX Command;

FO 7F 63 02 60 01 34 37 30 F7

a) "FO 7F" set up the MSC Command
b) "63" is the MSC Device Number in Hex = Device # 99 in Decimal as entered on the Field Controller
c) "02" is for MIDI Show Control
d) "60" is for MSC Pyro, General Category # 60.
e) "01" for Device Number 1 in Pyro Category # 60.
f) "34 37 30" is a string for Shot (Que) Number 470.
("31" would be shot # 1)
("31 31" would be shot # 11)
("31 31 31" would be shot # 111)

g) "F7" completes the Command

SENDING MSC GO COMMANDS TO FAST

An additional LIMIT is imposed on the relational timing between MSC GO Commands. Since MSC GO Commands can be sent much faster than the Field Controller can process and execute them, IT IS THE USERS RESPONSIBILITY TO NOT ISSUE MSC COMMANDS FASTER THAN THEY CAN BE EXECUTED. THIS IS OBVIOUSLY, AND ESPECIALLY CRITICAL DURING TIMED MACRO FIRING WHEN THE FIELD CONTROLLER CAN BE TAKING UP TO 9.9 SECONDS EXECUTING THE MSC COMMAND. Also the Field Controller will Buffer, or store in memory, one (1) MSC Command TO BE EXECUTED as soon as it completes its current MSC Execution. If another MSC GO Command is sent, while a MSC GO Command is currently in the Buffer awaiting execution, THE SECOND MSC GO COMMAND WILL BE DISCARDED, AND IGNORED.

WARNING - EXTREME DANGER

Because of the MIDI SHow Control GO Command, Memory Buffer Storage, UNEXPECTED FIRING OF EVENT(S) MAY OCCUR IMMEDIATELY FOLLOWING EXECUTION OF THE CURRENT MSC GO COMMANDED EVENT(S). TO AVOID THIS DO NOT SEND MSC GO COMMANDS WHILE AN EVENT IS CURRENTLY IN PROGRESS ON THE FIELD CONTROLLER. THIS IS ESPECIALLY CRITICAL DURING EXECUTION OF A TIMED MACRO SEQUENCE WHERE THERE CAN BE A DELIBERATE PRE-PROGRAMMED DELAY OF UP TO 9.9 SECONDS BEFORE THE FIELD CONTROLLER IS READY TO EXECUTE THE NEXT MSC FIRING EVENT. IN THIS CASE ANY MSC GO COMMAND SENT DURING THIS 9.9 SECOND DELAY WOULD BE IMMEDIATELY FIRED AT THE END OF THE 9.9 SECOND PRE-PROGRAMMED DELAY.

The Field Controller requires 10 msec (10 milliseconds, ten one thousands of a second) to issue 1 Firing Command to a Firing Module. In the case of a Zipper Firing, 10 msec is required for each Event of the Zipper. Thus if operating MIDI Show Control to a resolution of SMPTE 30 frames per second, no more than 3 Zipper Fired Events could be accomplished within 1 SMPTE Frame. IT IS THE USERS RESPONSIBILITY TO AVOID TRANSMITTING MSC COMMANDS FASTER THAN THE FIELD CONTROLLER CAN EXECUTE THEM. As mentioned in the WARNING - EXTREME DANGER Statement above, the possibility of Unexpected Firing Exists as well as the possibility of un-Fired Events due to sending MSC Commands to fast.

A simple recommendation is that NO MORE THAN ONE QUE PER SMPTE FRAME BE SENT, AND THAT NO QUES ARE SENT DURING A TIMED MACRO FUNCTION.

SETTING THE MSC DEVICE NUMBER

NOTE: SEE PASSWORD PROTECTION Section of this User's Guide, if applicable (if you are locked out by Password).

In the Field Controller, DATA TABLE OPERATING MODE, there is an option # 5 = "SETUP". Select Option # 5 = "SETUP" by depressing 5 on the control panel. Then select Option 2, "2=SET MSC DEVICE NO.", by depressing "2" on the control panel. The LCD will be as follows;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ MSC DEV:xx                                    ³
³ NEW MSC DEV:yy                                ³
```

The "MSC DEV" (MIDI Show Control Device Number) value currently stored in Memory is displayed as "xx". To change this setting enter a one or two digit number, which will appear on the LCD as "yy". When the ENTER Button is depressed this new value "yy" will be moved to "xx" as the new setting stored in Memory. This value of "xx" is permanently stored in Memory and will remain even when the Field Controller is turned OFF and will remain at this setting until changed by the User. If the Field Controller is RE-INITIALIZED, then the MSC DEVICE Number will be reset to 1 (one).

VALID MSC DEVICE NUMBERS ARE FROM 0 (zero) THROUGH 99

MSC DEVICE NUMBERS ARE ENTERED IN DECIMAL FORM IN THE FIELD CONTROLLER SETUP MENU BUT ARE INTERPRETED AS HEXADECIMAL NUMBERS TO MATCH THE MSC GO COMMAND. (Example: "63" is the MSC Device Number in Hex = Device # 99 in Decimal as entered on the Field Controller).

To exit this LCD screen display, depress STOP, or select one of the other Operating Modes.

This MSC Device Number setting (in DECIMAL) must be matched by the MSC GO Command (in HEXADECIMAL) in order for the Field Controller to respond.

MIDI SHOW CONTROL OPERATION

When the AUTO FIRE OPERATING MODE is selected, option "4 = MSC" will appear on the LCD Display (after the key is ARMED, assuming there is a data table). When "4" is depressed to select MSC, MIDI Show Control, the LCD appears as below;

MSC Opening, or first, LCD Display

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ MSC RECEIVE MODE  MSC DEV:xx                  ³
³                                               ³
```

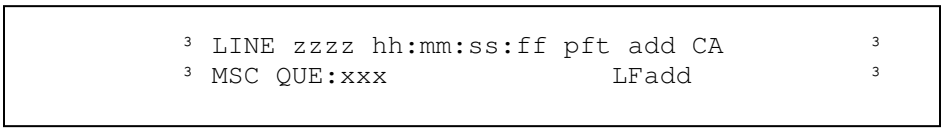
The Field Controller is in a full Armed and Ready to Fire Mode, waiting for the FIRST MSC GO Command, containing the SHOT NUMBER of the Event Line to Fire. The MSC Device Number selected is displayed as "xx".

MSC Normal LCD Display

After the Field Controller has received at least one valid MSC GO Command, the LCD Display changes to reflect the last Event Fired, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



On the TOP LINE, "LINE" is the Line Number, "zzzz" IS THE SHOT NUMBER, which IS the MSC QUE Number. The remaining information of the Top Line may have some non zero values, depending on the set up of the Data Table; hh:mm:ss:ff being the Event Time, PFT is the Pre-Fire Time, add is the Phase III Firing Address, and CA is the device caliber, if used.

The SECOND LINE displays the "MSC QUE:" number received, which is the Shot Number, of the Last MSC GO Command as "xxx". Normally the Que Number should agree with the Shot Number displayed on the Top Line. This will not be the case if the Event was a Zipper Firing or a Timed Macro Firing. The Top Line will always display the actual last event line Fired. Note that "LF" displays the Last Fired Address as "add" and there is no "MF", or Manual Fire Address, because the Field Controller has no way to know what the next Event by MSC GO Commands will be.

REFIRE directly on the Field Controller (via the REFIRE Key) is not possible in MIDI SHOW CONTROL Sub-Operating Mode of AUTO FIRE. If you attempt to REFIRE a shot (que) on the Field Controller, it just "beeps" and now posts the asstericks (*) after the Address of the Que # (Shot #) you just Re-Fired.

MIDI SHOW CONTROL WITH TIMED MACROS

If the Data Table is Set Up to perform a Timed Macro when the first Event line of that sequence is Fired, then MSC will also cause the Timed Macro to execute when that same first line is commanded to Fire by MSC. The LCD will change to show the "MACRO TIME" and operate identically as described within the Timed Macro Section of this Users Guide. For reference, the LCD will appear as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff pft add CA      ³
³ MACRO TIME:xx           LFadd MFadd   ³
```

STOPPING A TIMED MACRO IN PROGRESS

The TIMED MACRO may be stopped by direct intervention from the USER (with the controls of the Field Controller), as described in the Timed Macro Fire Section of this Users Guide. Also an external MIDI SHOW CONTROL RESET COMMAND may be issued by Richmond Sound Design to STOP the progress of the Timed Macro. When a new MSC GO Command (to a different Shot Number) is issued the Field Controller will then execute this new command.

A MSC RESET Command fully cancels the Macro in addition to Stopping any further execution of the Macro. The Macro CANNOT be re-started from the point at which it was canceled. If an MSC GO Command is issued again for the Shot Number to start this same Macro, then the Field Controller will only "beep" and Display that Shot Number Again. THE TIMED MACRO CANNOT BE RE-STARTED BY MSC ONCE IT HAS BEEN CANCELED (NOT from the beginning or ANY point). If the Field Controller is itself physically RE-SET by STOPPING or Re-Entering Auto Fire, MIDI SHow Control, then this Shot Number can be re-executed (because the Field Controller will now have lost all information that this Shot was ever Fired).

It is possible for the USER to directly PAUSE, thus Stopping, a Timed Macro in progress via the MF/PAUSE Button on the Field Controller. In this case, depressing FIRE on the Field Controller will continue running the Timed Macro Clock from the time at which it was Paused. See Timed Macro Firing.

Note that the MSC RESET Command received can be ANY Reset Command, a General Reset Command. MSC RESET does not have be for the PYRO Category 60, although the Field Controller will respond to such a specific RESET as well.

The Richmond Sound Design, MIDI Show Control, STOP and RESUME Commands are not implemented in the Field Controller. In the Case of Richmond Sound Design, MSC STOP works essentially as a Pause, with RESUME being a continue from where Paused, or Stopped. Since the primary function of the Field Controller, with MSC, is to Fire a single Event, per QUE, MSC STOP and MSC RESUME serve no useful function. Once a MSC Que to Fire has been issued, the Field Controller immediately Fires the Shot Number and is already Stopped, awaiting another MSC Que. Thus MSC STOP essentially Stops Richmond Sound Design from issuing another Firing GO Command until the Richmond Sound Design MSC itself is again started, via a USER input RESUME Command directly to the Richmond Sound Design Software.

The implication is that the Richmond Sound Design MSC STOP is not really a true Stop, or CEASE ALL ACTIVITY Command, and would not therefore routinely be used as a Stop Pyro Command. Richmond Sound Design MSC Stop and MSC Resume are used to keep all action

coordinated, and therefore, the Richmond Sound Design will only send the QUE to Fire when it is running, or RESUMED.

MSC RESET is provide as a means of externally STOPPING any Firing in progress on the Field Controller, from the Richmond Sound Design Controlling Software. This essentially is applicable in the case of TIMED MACRO FIRE. Zipper Firing, if used, occurs so fast that it is essentially one QUE, or SHOT, fired at multiple locations.

Again, the User is cautioned in the careful and SAFE use of Timed Macro Firing with MIDI Show Control. Remember the MSC Command buffer may cause a delayed Firing at the end of a Timed Macro, if a MSC GO Command was issued during the Macro.

NO SHOT NUMBER FOR TRANSMITTED MSC GO COMMAND QUE

If a valid MSC GO Command is sent to the Field Controller and there is no Event Line with the matching Shot Number, the following message is seen on the LCD Display.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ NO TABLE ENTRY FOR THIS QUE ³
³ MSC QUE:xxx ³
```

The QUE number of the received MSC GO Command is displayed as “xxx”.

The Display will revert to the previous normal MSC LCD Display upon receiving the next valid MSC GO Command. (If another Que is sent with a non existent shot number, then this message will be repeated with the new shot/que number).

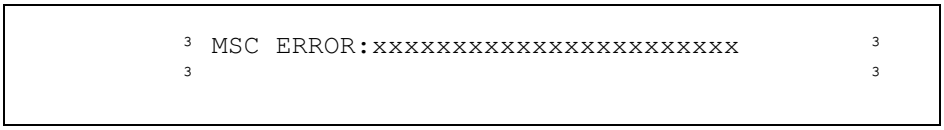
INVALID OR OUT OF RANGE MSC COMMANDS

If any MIDI command is received not in specification with MIDI Show Control, it will be ignored. If a MIDI Show Control GO Command is received without the proper Category number, hex 60, or an incorrect Device Number, it will be ignored.

If a valid MIDI Show Control GO Command is received, with the correct Controlled Device Category and the Correct Device Number, but an out of range QUE Number (0, zero or above Configured Memory Maximum), an MSC Error message will be displayed, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



The "MSC ERROR:" message displays the SYSEX (System Exclusive) character string that it received as "xxxxxxxxxxxxxxxxxxx". This Error Message will only be posted for MSC GO Commands that had enough valid information to be interpreted by the Field Controller as a MSC GO Command intended for the Field Controller, but for some reason the Field Controller was unable to execute the command. This could be from receiving bad or garbled data, or from an out of range Que number. Que Numbers are only valid for the Size of the Configured Memory (1 to 474, 1 to 949, or 1 to 999). Analysis of the displayed SYSEX command in relation to the MIDI Show Control Specification may reveal the problem.

The Display will revert to the previous normal MSC LCD Display upon receiving the next valid MSC GO Command. (If another MSC ERROR is sent, then this message will be repeated with the new SYSEX command).

MSC ACKNOWLEDGMENT ECHO

The Field Controller sends an acknowledgment "ECHO", or command, out the MIDI Out port when it issues a Firing Command to the Phase III System Network.

The MSC "ECHO" acknowledgment return sent to the MIDI Out Port of the Pyrodigital Field Controller is;

F0 7F MSCDEV 02 60 20 F7

1) MSCDEV is the actual MSC Field Controller Device Number which has been entered into the Field Controller: ie Device Number set on Field Controller is #1, MSCDEV = 01 (default = 01)
2) This acknowledgment "ECHO" is ONLY returned if the Field Controller actually sent Firing Commands; ie:

    a) Valid MSC Go (Pyro) Command (for Field Controller)
    b) Data Table entry IS present
    c) Deadman Control IS activated

3) This return is sent to the MIDI Out Port ONLY (MIDI Thru Port would be MSC command, as sent unchanged, to Field Controller)
4) The ECHO return is always THE SAME, or identical, for each event Fired, regardless of which valid event was Fired.

END OF SECTION I USERS GUIDE

PYRODIGITAL PHASE III

FIELD CONTROLLER

USERS GUIDE

V3.00M Firmware
Operating System

SECTION II

FOR EXPERIENCED USERS

As a CONVENIENCE to EXPERIENCED USERS

Who are Updating their Field Controller from V1.33B

SECTION II ONLY HAS UPDATES FROM V1.33B

THE EXPERIENCED USER IS STILL ABSOLUTELY RECOMMENDED TO REVIEW THE ENTIRE MAIN SECTION I OF THIS USER'S GUIDE TO REFRESH YOUR MEMORY ON ALL FUNCTIONS OF THE FIELD CONTROLLER.

ALL INFORMATION IN SECTION II IS CONTAINED WITHIN SECTION I

SECTION II TABLE OF CONTENTS

SECTION II-0

FIELD CONTROLLER USERS GUIDE

THERE IS NO SECTION II-1, II-2, II-3, OR II-4

SECTION II-7

DATA TABLE OPERATING MODE

SECTION II-8

PASSWORD PROTECTION AND MEMORY SIZE

SECTION II-9

TIME CODE OPERATING MODE

SECTION II-10

CHECK STATUS OPERATING MODE

SECTION II-11

SECTION II-12

SECTION II-13

SECTION II-14

SECTION II-15

SECTION II-16

SECTION II-17

APENDIX A

END OF SECTION II TABLE OF CONTENTS

BASIC OPERATION OVERVIEW SECTION II-5

TYPES OF FIRING

The Field Controller MUST be thought of and OPERATED as having many Firing Modes WITHIN BOTH AUTO FIRE AND MANUAL FIRE.

In MANUAL FIRE There are many possible Modes and Sub Modes of Firing;

Without a Data Table (Basic Manual Fire)

1) Direct Addressing

2) Sequential Step Firing

With a Data Table;

1) Manual Fire - by sequence(s) of Events

a) Single Event Fire
b) Zipper Fire (Simultaneous Events)
c) Timed Macro Fire (Time Automated Events)
d) Overide Direct Addressing

2) GRC, Group Caliber Fire - by “shots”

a) Single Event Fire
b) Zipper Fire (Simultaneous Events)
c) Timed Macro Fire (Time Automated Events)

In AUTO FIRE there are 3 Modes of Firing; (Data Table Required)

1) Time Code Operation; with HAZARD LOCKOUT

Pyrodigital Time Code

SMPTE / MIDI Time Code

30 fps ND (30 frames per second, Non Drop)

30 fps DF (30 frames per second, Drop Frame)
(same as 29.97 NTSC Video Drop Frame)

25 fps (25 frames per second EBU)

24 fps (24 frames per second for Film)

a) with overide direct addressing

2) Internal Clock Operation w/ Pause & any Event Start
& with HAZARD LOCKOUT

3) Optional MIDI Show Control

DANGERS WITH MIXED MODES OF FIRING

IT IS NOW DIFFICULT, OR IN SOME CASES IMPOSSIBLE, TO CREATE A DATA TABLE THAT WILL FUNCTION EXACTLY, PERFECTLY AS DESIRED IS EVERY POSSIBLE FIRING MODE.

”MIXED MODES” OF OPERATION (Mixed Modes of Firing) SHOULD NOT BE ATTEMPTED. SET UP A DATA TABLE FOR A SPECIFIC TASK AND THEN INERT TEST. LIVE FIRE ONLY WITHIN THAT MODE OF FIRING UPON SUCCESSFUL VERIFICATION OF THE INERT TESTING.

It can be, and is, extremely confusing AND EXTREMELY DANGEROUS to jump all around in the various Firing Modes and keep track of exactly what you are doing, what is going to be Fired, what has been Fired, and where you are. AVOID JUMPING AROUND AT ALL COSTS. “keep it simple”. Set up for a specific task and stick to it. If you set up and practice by INERT TEST FIRING, the operation of the Field Controller will be easy, simple, and natural. The responsibility is yours, so if you don’t know what you are doing or what is going to happen DON’T DO IT!

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 DATA TABLE WAS INTENDED, DUE TO UNEXPECTED FIRINGS.

NEVER LIVE FIRE IN MIXED FIRING MODES

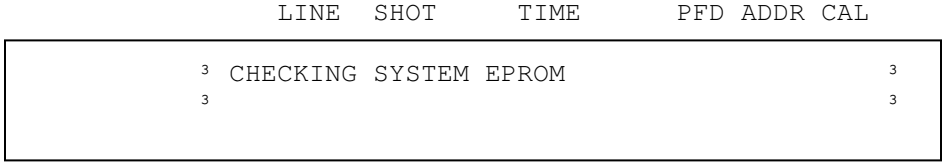
ABSOLUTELY INERT TEST FIRE ALL EVENTS IN THE INTENDED MODE OF OPERATION(S) TO VERIFY INTENDED BEHAVIOR OF THE FIELD CONTROLLER.

THE USE OF SIMULATED ELECTRIC MATCH TEST LIGHTS CONNECTED TO FIRING MODULES IN AN INERT TEST ENVIRONMENT IS CONSIDERED AS A ROUTINE TEST

SYSTEM FIRMWARE EPROM MEMORY CHECK

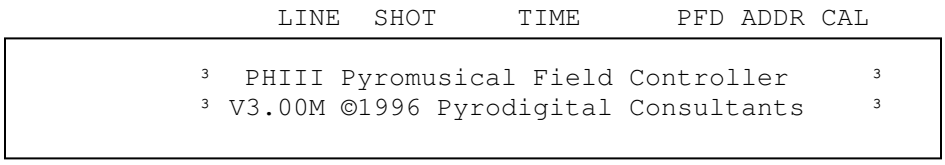
Whenever the Field Controller is turned ON via the main Power Switch, the Operating System Software EPROM (Erasable Programmable Read Only Memory) is checked for integrity. This is a diagnostic check.

LCD DISPLAY



If the check is OK, the Field Controller Initializes itself, all 5 Operating Mode LED's Flash, a beep tone is emitted, and the Opening, or Top Menu (Stop Operating Mode) is Displayed.

LCD DISPLAY



NOTE THE LOWER LEFT CORNER OF THE LCD SHOWS THE OPERATING SYSTEM SOFTWARE EPROM VERSION NUMBER.

QUICK BYPASS OF CHECKING SYSTEM EPROM

The EPROM Memory Check can be bypassed by depressing ANY KEY on the Field Controller during the "CHECKING SYSTEM EPROM" message.

TO INSURE THAT THE EPROM SYSTEM MEMORY IS PROPERLY CHECKED, IT IS RECOMMENDED THAT YOU DO NOT NORMALLY BYPASS THIS CHECK. The bypass is only provided for emergency expedient operation.

ACTIVE TEST LIGHTS SECTION II-6

NOTE: The LED Indicator Lights and Circuitry from the original Active Test Box are NOW BUILT INTO FIELD CONTROLLERS AS STANDARD EQUIPMENT; starting with FC-1 Serial # 0092.

Additionally a separate, external, Active Test Box (with the same Active Test Lights & Circuitry, including circuit breaker protection), is available as an additional DIAGNOSTIC TOOL to test for Shorts at the ends of Cables or Firing Modules.

The separate, external Active Test Box, is STRONGLY recommended to be used with early Field Controllers not equipped with either the Active Test Lights or Circuit Breaker protection.

WHAT ARE THE "ACTIVE TEST LIGHTS"

The "Active Test Lights" consist of 4 LED (Light Emitting Diodes) on the control surface of the Field Controller, just above the LCD Display. There is a cluster of 3 LED's (2 Green with a center Red), plus a Blue LED on the right. Labeling is printed at the top of the rear connector surface as "2 A 3 SMPTE".

"2" is for the left, Green LED (Line # 2)
"A" is for the center Red LED (A is for Activity)
"3" is for the right, Green LED (Line # 3)
"SMPTE" is for the rightmost, Blue LED.

Additionally a Circuit Breaker has been added just above the Phase III System Network Connector to protect the power supply from Cable Shorts (top right corner of the rear connector panel).

WHAT DO THE ACTIVE TEST LIGHTS SHOW?

1) No SHORTS in Cables or Components
2) Valid SMPTE Time Code being received

HOW DO YOU USE THE ACTIVE TEST LIGHTS?

VERY SIMPLE! Any time the Key is ARMED the 2 Green LED's should illuminate. Also the center Red LED should continuously flicker during Status Check or briefly flicker when the Field Controller Fires.

IF THE GREEN LED'S DO NOT ILLUMINATE, IMMEDIATELY TURN OFF THE ARMING KEY AND CORRECT THE PROBLEM BEFORE PROCEEDING. THE RED CENTER LED SHOULD ONLY FLICKER DURING STATUS CHECK OR WHEN FIRING

(The Blue SMPTE LED ONLY illuminates for valid SMPTE input)

SHORTS IN CABLES / FIRING MODULES / SPLITTER BOXES

If both Green LED's do NOT illuminate, determine whether the problem is in the Field Controller or the System Network as follows;

1) Disconnect System Network Cable from the Field Controller. Reset Circuit Breaker (if necessary), Select Check Status Operating Mode, Arm Key, Select Manual Check (option zero)

    a) If both Green LED's now illuminate and Red LED Flickers, this indicates a Short Circuit in Cables, Splitter Boxes, or Firing Modules.
    b) No Green LED's, the Field Controller is at Fault and must be repaired

FINDING THE SHORTS

Finding a shorted cable(s) or component(s) is a simple matter of logically isolating the fault by a progression of disconnecting (unplugging) the System Network at various points, STARTING FROM THE FIELD CONTROLLER and re-Arming the Field Controller to check for illumination of the Test Lights.

OBSERVE which LED(s) do not illuminate. This indicates which lines are shorted. See THEORY OF OPERATION.

1) ABSOLUTELY SHUNT ALL FIRING MODULES.
2) Reconnect the Main Cable to the Field Controller. Unplug the Main Cable, just before the first Splitter or Firing Module.
3) Select Check Status, BRIEFLY AND ONLY FOR A VERY SHORT PERIOD OF TIME, ARM the Field Controller, select Option Zero, Manual Status and observe for all 3 LED's on the Active test Box. IF all OK, proceed. DO NOT CONTINUE TO APPLY POWER (LEAVE THE KEY ON) IF SHORTS ARE INDICATED (non illumination of Active Test Lights). Re-check to be sure the Circuit Breaker has not been tripped.

If no or partial LED's, the Main Cable is Shorted; Replace/Repair

4) Individually test each of the branch lines by plugging them one at a time directly into the Main Cable and repeating procedure 3). You are using the Active Test Lights to find which

branch cable path has a short. If all branch cables check OK, then splitter is shorted. Verify by testing with splitter only at end of Main Cable.

5) Continue down the bad branch line(s) to the next Splitter Box to isolate which sub branch(s) is shorted, similar to method 4) above. Be aware that the short could be in a Firing Module at the end of a Cable or in Splitter Box. Replace / Repair fault components and re-test.

ABSOLUTELY REPAIR / REMOVE SHORTED CABLES / COMPONENTS BEFORE PROCEEDING WITH A LIVE STATUS CHECK.

THEORY OF OPERATION

The Test Lights are called “Active” because they continuously Verify that the Phase III System has no Cable or Component Shorts and is operating with the correct voltages, while the System is actually Operating and Firing. (Additionally the circuitry also provides “Active” Continuous Circuit Breaker Protection for the Field Controller Power Supply).

The Phase III System functions via 24 volts dc power and digital communications on the 3 wire System Network. Pin 1 (or line 1) is the System Ground, which is the Cable shield wire. Pin 2 (line 2) and Pin 3 (line 3) carry the +24 volts dc Power with digital communications as a differential voltage between these 2 lines (digital ones are carried with line 2 low and line 3 high, digital zeros are carried with line 2 high and line 3 low, with +24vdc always available on the “high” line).

The Active Test Lights are equipped with zener diodes and special circuitry which only illuminate the corresponding LED indicators at or above very specific operating voltages. The Active Test Lights indicate the presence of 3 voltages;

2, GREEN LED; +24vdc on line 2 (ref to line 1, System Ground)

RED CENTER LED; +/-24vdc line 2 ref to line 3 (digital communications)

3, GREEN LED; +24vdc on line 3 (ref to line 1, System Ground)

Thus the Line 2 Green LED verifies that there are no shorts between Cable Lines #2 and #1. The Line 3 Green LED verifies that there are no shorts between Cable Lines #3 and #1. The Red LED verifies that Cable Lines #2 and #3 are not shorted together

Part of the circuitry also provides circuit breaker protection directly to the Power Supply. If the circuit breaker is tripped, none of the 3 LED’s will illuminate.

OTHER CONDITIONS - THAT MAY CAUSE ERRONEOUS TEST INDICATIONS

I) EXTREMELY LONG CABLE RUNS WITH SHORTS AT EXTREME END(S) OR HIGH RESISTANCE SHORTS - If there is a short far away from the location of the Field Controller, or a partial short (high resistance short), then the GREEN LED’s (and even the RED LED) may still illuminate, indicating all OK. This short could cause improper digital communications or non-Firing of a circuit, even though the LED’s do not indicate a

problem. This can occur because the voltage drop is insufficient to cause the Active Test Lights to see the short.

II) OPEN LINES - Consider that the Active Test Lights will show all OK with NO System Network Connected. Thus the Active Test Lights cannot indicate if any (or all 3) lines are open.

The use of the ACTIVE TEST BOX (an optional accessory, not to be confused with the Active Test Lights), which can be located at any point within the System Network, provides an additional DIAGNOSTIC TOOL. The Active Test Box can be used to test at the end of long cable runs or at isolated single Firing Modules, as an "add on" extension cable, "termination" device. This will test to be sure that proper voltages exist from the Field Controller at the point of test. The Active Test Box is identical to the Active Test Lights, excepting that it may be placed anywhere within the System Network.

SMPTE, BLUE LED; Valid SMPTE Time Code being received

The BLUE SMPTE will ONLY illuminate for valid SMPTE Time Code. Use the Time Code Operating Mode, SMPTE Monitor function. If the Blue LED does not come on, then good, clean SMPTE Time Code Audio is NOT being received by the Field Controller. Check the input connections, audio lines, and the Source.

The BLUE SMPTE will Illuminate AT ANY TIME WHEN SMPTE IS BEING RECEIVED WHENEVER THE FIELD CONTROLLER IS POWERED ON, REGARDLESS OF THE OPERATING MODE. NOTE THAT THIS INDICATOR DOES NOT WORK FOR MIDI TIME CODE (MTC).

The SMPTE LED is illuminated directly by a separate SMPTE PC Board and indicates that the SMPTE PC Board is receiving valid SMPTE Time Code. The valid SMPTE Time Code is then send to the main processor Board of the Field Controller. The Blue SMPTE LED MUST ILLUMINATE FIRST (indicating SMPTE at this PC Board) before any signal is passed on to the Field Controller. Since the SMPTE PC Board is independent, the Blue LED will illuminate upon the presence of SMPTE, regardless of the Operating Mode selected.

DATA TABLE OPERATING MODE SECTION II-7

CREATE TABLE, Option 3

NOTE: SEE PASSWORD PROTECTION AND MEMORY SIZE, SECTION 8, if applicable (if you are locked out by Password).

CREATING a DATA TABLE with this Option, 3, in FOR SCRIPTING OF A PYROMUSICAL (or MULTIMEDIA SHOW) WITH TIME CODE. CREATE TABLE SHOULD REALLY SAY - SCRIPT TABLE. Although we recommend that you Script (or Choreograph) a Show using Pyrodigital Choreography Software running on a Computer, the Field Controller does incorporate simple Scripting Functions.

THE CREATE TABLE MODE NOW FUNCTIONS VERY SIMILAR TO THE PYRODIGITAL VER250 “SUPER SCRIPT” SOFTWARE.

THE FIELD CONTROLLER CAN SCRIPT WITH ALL TYPES OF TIME CODE.

PYRODIGITAL TIME CODE

SMPTE OR MTC (MIDI Time Code) can be;

- 30 fps ND (30 frames per second, Non Drop)
- 30 fps DF (30 frames per second, Drop Frame)
  (same as 29.97 NTSC Video Drop Frame)
- 25 fps (25 frames per second EBU)
- 24 fps (24 frames per second for Film)

The exact SMPTE / MIDI Time Code format (30 ND, 30 DF, 25 EBU, 24 Film) will automatically be determined by the Field Controller. NOTE: If you select the improper Time Code TYPE (one that does not match the Time Code on your Scripting Tape), the Field Controller will not recognize your Time Code and Scripting will Not Commence. You Must select the proper Time Code Type.

Whenever there is NO TIME CODE being input to the Field Controller, the following LCD Display is shown;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Waiting for TAPE clock.....          ³
³                                      ³
```

The Field Controller is waiting for matching Time Code to be coming in through the Tape In RCA Jack or the Line In 600 ohm Balanced XLR Connector on the rear connector panel.

The CREATE TABLE Mode also REVIEWS those Events already in the Data Table. You therefore can simultaneously add new Events, if desired, while you REVIEW those Events already existing.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADR CA     ³
³           HH:MM:SS:FF NEW ENTRY:yy   ³
```

Where the top line is last Reviewed EVENT, complete with all it's Data Fields displayed. The bottom line of the LCD shows HH:MM:SS:FF as the running time of the Time Code. "NEW ENTRY:yy" shows "yy" as the hex (Caliber) entry made by the last depression of the corresponding hex keypad key.

When the tape is stopped (Time Code input terminated), the LCD reverts to the previous LCD, Waiting for TAPE clock..... When you restart the tape (resume Time Code) the LCD will again show as above. REWIND THE TAPE SLIGHTLY AND PLAY AGAIN TO REVIEW ANY JUST ADDED CUES.

THUS THE LCD DISPLAY IS SLAVED TO THE TAPE (via Time Code). WHENEVER AND WHEREVER YOU START THE TAPE THE LCD DISPLAY WILL SHOW ANY EVENTS EXISTING IN THE DATA TABLE AND BE LIVE, READY TO ACCEPT ANY DESIRED NEW EVENTS. THIS IS A VERY POWERFUL SCRIPTING TOOL!

IMPORTANT NOTE: EVENT LINES ARE ALWAYS ADDED TO THE END OF THE DATA TABLE. Every Time you enter an Event by depressing one of the 16 Hex Keypad Keys (while Time Code is running), THAT EVENT IS ADDED TO THE END OF THE DATA TABLE AS THE LAST EVENT LINE. This means that Events are added to the Data Table in the ORDER IN WHICH YOU ADD THEM. Thus if you don't add Events in sequential Time order, they WILL NOT be ordered by Time as seen in the Data Table (or a normal printout of the Data Table).

THE EVENTS WILL PLAY (Create Table) CORRECTLY IN TIME AND FIRE (Auto Fire) CORRECTLY IN TIME (because the Field Controller INTERNALLY Sorts by Time and Firing Order), HOWEVER they may appear out of sequence when you look at the Data Table.

For Example: You have Scripted a song with Events throughout the entire song. Later you go back and play the Tape again and add 2 more NEW Events to the middle of your song. These 2 NEW Events are now at the End of the Data Table, NOT IN THE MIDDLE OF YOUR SONG where they actually occur in Time. However, when you again play the song the Events appear REVIEWED correctly in the middle of your song.

THE POINT IS THAT THE DATA TABLE CAN LOOK OUT OF ORDER and you may have difficulty understanding it or even finding your Events to associate them with Pyrotechnic Devices.

Unlike Pyrodigital Scripting Software, the DATA TABLE CANNOT BE SORTED BY TIME. The Data Table may Be VIEWED by Time, but the order of the Event Lines cannot be changed unless you physically change the Data Table. THEREFORE you may wish to Change The Data Table by Inserting Lines at the Correct Times and Moving the Data to the Correct Place (you will have to write it down the Event Line Data (Time) and physically re-enter the Event Line(s).

REMEMBER - The out of sequence Data will PLAY CORRECTLY and FIRE CORRECTLY, it just may be confusing to look at. You can also avoid this by entering your Events in Sequential Order.

SELECT TABLE, Option 4

NOTE: SELECT TABLE IS NOT PASSWORD PROTECTED

Data Table Selection Remains in Place

The new selection for the Data Table being used now remains on the LCD Display. Entering a new Data Table number instantly places this new table number on the Top Line following "TABLE NUMBER NOW SELECTED:", as before, however the LCD Display remains in place, so that the User can verify this change.

TO CONTINUE SIMPLY RE-SELECT THE DATA TABLE OPERATING MODE

(TO EXIT, Depress STOP or one of the Other Operating Modes).

Data Table Options NOT Shown

The Data Table Selection now does NOT indicate the possible selection options. This is because, depending on which Memory Size is configured, the number of tables will be different. For 2ea Memories of 2,500 lines each, the options will only be 0 or 1. For 6ea Memories of 950 lines each, the options are Data Tables 0 through 5. For 12 Data Tables of 475 lines each, the Selection options are 0 through B, corresponding (in all cases) to the Table Number desired.

If an incompatible Data table Number is selected, the Field Controller just beeps, leaving the selection unchanged (the Data Table Selected will default to table number 0 just after Re-Configuration of Memory Size). This makes it easy to check what Data table Sizes are currently Configured. For example, if 5 was the highest entry permitted, then the memory has been configured for 6 Data Tables of up to 950 lines each.

Determining Memory Size

If you forget the size of each Data Table Memory that it is currently configured, you can easily determine this without consulting this User's Guide.

Select the desired Memory. Select the EDIT Mode. Use the "New SEQUENCE Number:" location feature and the UP / DOWN ARROWS to to locate the last, or end line of the Selected Data Table.

Loading Data Tables Larger than the Configured Memory Size

If you LOAD a Data Table that it is TOO LARGE for the presently Configured Memory Size, then you will receive an ERROR MESSAGE. The Data Table will have entries only up to it's last line, without the ending portion of the oversize .sho file you attempted to Load. In this case, Re-Configure the Memory for larger Data Tables. If you load past the last line of the Data Table, then the error message is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ RECORD NUMBER ERROR !                    ³
³ Processing table data                    ³
```

SETUP, Option 5

NOTE: SEE PASSWORD PROTECTION AND MEMORY SIZE, SECTION 8, if applicable (if you are locked out by Password).

WARNING - DANGER

DO NOT CHANGE THE DEFAULT SETTINGS OF THE OPERATIONAL PARAMETERS UNDER SETUP, OPTION 5, OF THE DATA TABLE OPERATING MODE UNLESS YOU ARE ABSOLUTELY AWARE OF THE CONSEQUENCES. CHANGING THE DEFAULT SETTINGS CAN MAKE THE FIELD CONTROLLER APPEAR TO NOT FUNCTION UNDER NORMAL CIRCUMSTANCES.

THE DEFAULT SETTINGS ARE;

TAPE CLOCK MODE = 0, AUTO SWITCH

(Auto Timecode Switchover mode = 0)

SMPTE/MTC TIME CODE OFFSET = 00:00:00:00 (Zero Hours)

MSC DEV = 1 (one)

Select Option 5, SETUP, from the DATA TABLE OPERATING MODE, by depressing number 5 on the hex keypad. The LCD Display appears as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ 0=TAPE CLOCK MODE, 1=SET SMPTE OFFSET    ³
³ 2=SET MSC DEVICE NO.                     ³
```

TAPE CLOCK MODE, Option 0

For SPECIAL APPLICATIONS ONLY the Internal Clock can be disabled so that the Field Controller will Stop Firing when the Time Code input stops and resume Firing when Time Code input resumes. SEE AUTO FIRE OPERATING MODE for further understanding of this feature.

Select Option 0 from the SETUP Option, Option 5 of the DATA TABLE OPERATING MODE, and the LCD Display is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Auto Timecode Switchover mode:0          ³
³ 0=Auto Switch, 1=STOPS when TAPE STOPS   ³
```

Enter either 0 or 1 to change the Auto Time Switchover Mode. The entered selection remains on the LCD Display to verify your selection. Selecting any Key, other than 0 or 1, returns you to the DATA DATE OPERATING MODE Menu without changing the Auto Time Switchover Mode. After your correct selection, exit by depressing an OPERATING MODE Key.

SET SMPTE OFFSET, Option 1

INTRODUCTION

A SMPTE Time Offset may be entered IN WHOLE HOURS ONLY in order to SUBTRACT Time FROM THE INCOMING SMPTE TIME CODE. The purpose is allow for exact synchronous Firing to VER250 Scripted Displays that were Scripted using Pyrodigital Time Code CONVERTED SMPTE Time Stripes, WITH SMPTE GREATER THAN 1 (one) HOUR (greater than 01:00:00:00).

The SMPTE OFFSET Feature provides a Temporary, interim solution to SMPTE Scripting with the USERS existing VER250 Scripting Software (for SMPTE Format in 30 fps ND Only). The

newer versions of Scripting Software works with all types of SMPTE Time Code directly, NOT requiring the use of the SMPTE Offset.

SMPTE Time is based on the 24 hour clock. The Pyrodigital Time Code is limited to 52 minutes. VER250 Scripting Software only uses Pyrodigital Time Code. The optional CONVERT Software Program mathematically Converts a SMPTE Time Code Stripe to an exact Pyrodigital mathematical equivalent, however at the expense of IGNORING the SMPTE Hours. If Firing on the Field Controller with the original SMPTE Time Code Stripe, the SMPTE Offset Feature allows removal of the original SMPTE Hours. This makes the Scripting work done with VER250 function exactly in sync with the original SMPTE Time Code stripe.

MIDI Time Code is derived from SMPTE Time Code, being, by definition, SMPTE Time Code in a special MIDI Format. Therefore the SMPTE OFFSET is also applicable to MTC (MIDI Time Code). Operation and use of the SMPTE OFFSET with MTC is identical to use with SMPTE.

Note that a SMPTE/MTC Offset operates with every Function of the Field Controller which uses SMPTE/MTC Time Code; Auto Fire, Time Code Monitor, and the Create Table Function in Edit.

WARNING - CAUTION

ANY SMPTE OFFSET ENTERED IS STORED IN MEMORY AND WILL REMAIN 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

THE TIME CODE MONITOR OPERATING MODE SHOWS THE OFFSET VALUE FOR VERIFICATION

AUTO FIRE FOR SMPTE OR MIDI TIME CODE (MTC) SHOWS THE OFFSET VALUE FOR VERIFICATION

LIMITS

The SMPTE Offset must be in Whole Hours, between 0 and 23 Hours. NEGATIVE OFFSETS ARE NOT ALLOWED. A negative offset would be interpreted as a time less than zero. Remember that the Memory Stored Offset Hour will be Subtracted from the INCOMING SMPTE Time Code. This adjusted value will be used for the FIRING TIME in AUTO FIRE.

Any SMPTE / MTC Offset will have no effect when operating with Pyrodigital Time Code, operating with the Internal Clock, or any Manual Fire Operating Mode.

Note that a SMPTE/MTC Offset operates with every Function of the Field Controller which uses SMPTE/MTC Time Code; Auto Fire, Time Code Monitor, and the Create Table Function in Edit.

SETTING THE SMPTE / MTC OFFSET

Select Option 1 from the SETUP Option, Option 5 of the DATA TABLE OPERATING MODE, and the LCD Display is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ SMPTE/MTC TIME CODE OFFSET:00:00:00:00   ³
³ New HOUR:                                ³
```

Enter the New HOUR, from 0 to 23, and depress ENTER to change the SMPTE/MTC TIME CODE OFFSET. The entered HOUR will now be shown in the top line as the NEW SMPTE/MTC TIME CODE OFFSET. The entered OFFSET remains on the LCD Display to verify your selection. If you do not change the SMPTE Offset, then the offset shown IS the Offset value. Exit by depressing an OPERATING MODE Key.

SET MSC DEVICE NO., Option 2

MIDI Show Control, abbreviated as MSC, is an Operating Mode under AUTO FIRE that allows MIDI (Musical Instrument Digital Interface) input signals in the MIDI Show Control format to Fire a PRE-PROGRAMMED sequence(s) on the Field Controller. MIDI Show Control commands are input to the standard MIDI IN connector on the Field Controller, with a standard MIDI cable.

The MIDI Show Control (MSC) Device Number is used as an identification number for the Field Controller. A MIDI Show Control Command must be issued with the same MSC Device Number for the Field Controller to recognize the MSC Command.

THE MSC DEV (MIDI Show Control Device Number) IS ONLY IMPORTANT FOR THE OPERATION IN AUTO FIRE UNDER MSC FIRING, OPTION 4. SEE MIDI SHOW CONTROL FIRING, SECTION 17.

Select Option 2 from the SETUP Option, Option 5 of the DATA TABLE OPERATING MODE, and the LCD Display is shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ MSC DEV: y                                    ³
³ NEW MSC DEV:                                  ³
```

Enter the New MIDI Show Control Device Number, NEW MSC DEV:, from 0 to 99, and depress ENTER to change the MSC DEV Number. The entered MSC Device Number will now be shown in the top line in place of "y", as MSC DEV:y The entered MSC Device Number remains on the LCD Display to verify your selection. Exit by depressing an OPERATING MODE Key.

PASSWORD PROTECTION AND MEMORY SIZE SECTION II-8

INTRODUCTION

The Field Controller now offers Password Protection which can be activated to prevent unauthorized changes to the Data Tables. Password Protection only affects operation within the Data Table Operating Mode. All other Operating Modes of the Field Controller (Time Code, Check Status, Manual Fire, Auto Fire) DO NOT require the password to operate. The Password is only intended to prevent accidental or intentional tampering with the Firing Instructions and any Set-Up Parameters (excluding the Data Table selected).

If the Password feature is activated, access to the Data Tables without the correct Password is only permitted in a VIEWING MODE. In the Viewing Mode (without entry of the proper password), the user may View the Data Table in Edit, but cannot change any entries. Additionally (without password), the user may not Load, Create Table, access Set-Up, or actually perform Edits in the Data Table Operating Mode. The user may Send the Data Table, changed the Data Table selected, or View ONLY the Data within the already selected Data Table.

To View the Data in the EDIT Option of the DATA TABLE OPERATING MODE, the user is prompted to enter 0000 as 4 characters and will receive a message indicating VIEWING ONLY (so DON'T use 0000 as your Password). In other selections of the Data Table Operating Mode, the user is also requested to enter the Password. An incorrect entry cause a message "BAD PASSWORD - ACCESS DENIED" to be posted and the Field Controller exits to the STOP MODE.

Additionally the Data Table Memories of the Field Controller can be configured into different sizes to accommodate many small or a few large Data Tables. The options are 12 small Data Tables of 475 lines maximum each, 6 Tables of 950 maximum lines each, or 2 Data Tables of 2,500 maximum lines each (6 tables of 950 lines each was the old Field Controller unchangeable default).

INITIALIZATION; To Change Memory Table Sizes or Password

WARNING - CAUTION

THIS PROCEDURE AND KNOWLEDGE OF THIS PROCEDURE SHOULD BE RESTRICTED TO QUALIFIED USERS ONLY. Since Initialization can remove or change passwords and erase all information in all Data Tables, please restrict knowledge of this procedure on a need to know basis.

When a new EPROM (Erasable Programmable Read Only Memory) Firmware is installed for the FIRST TIME, the Field Controller will automatically initialize and ask the user to select password preferences and Data Table Memory sizes. Caution; any previous information in all Data Tables will be lost when a new EPROM is installed, for the FIRST TIME.

In order to ENTER or CHANGE THE PASSWORD, or CHANGE THE SIZE AND NUMBER OF DATA TABLE MEMORIES, the Field Controller needs to be Initialized. After the initial Initialization (when a new EPROM is installed), the user may change the password, eliminate the password entirely, or leave the password unchanged without loss of any information within the Data Tables. However, if the memory sizes are changed or selected to the same sizes, all information in the previous Data Tables is erased, the memories are checked for integrity, and the memories are cleared.

Additionally when the Memories are Re-Configured, the TAPE CLOCK MODE will be set to Auto Switch, the SMPTE Offset will be set to zero (00:00:00:00) and the optional MIDI Show Control Device Number will be re-set to Device Number 1.

System Initialization may be used to rapidly clear all Data Tables at the same time. This also provides A GOOD PROCEDURE FOR VERIFYING THE INTEGRITY OF THE MEMORY PARTS. It is recommended periodically that the System be Initialized specifically to check the integrity of the memory parts. The memory size can remain the same as previously, if that size option is selected.

Initialization can Re-Configure the Memory without changing the Password, or can Change the Password without Re-Configuring the Memory. Changing the Password may be to add, remove, or alter the Password. If the Memory is NOT Re-Configured, all information within the Data Tables remains as it was. Also the user may bypass both Password Changes and Memory Changes, thus not changing anything.

INITIALIZATION PROCEDURE

With Field Controller switched OFF, press and hold both the AUTO FIRE and the DATA TABLE Operating Mode keys, and continue to hold these two keys down while switching Field Controller ON. Continue to hold the AUTO FIRE & DATA TABLE Keys while the message "CHECKING SYSTEM EPROM" is Displayed, until the next message appears. During the message "CHECKING SYSTEM EPROM", if both keys are not continuously held down, or the keys are pressed during the message (having mistakenly turned the Field Controller ON first), the Field Controller will Bypass the System EPROM Check, as well as NOT Initialize.

With such deliberate and continuous action required, it is unlikely that an uninformed person can Initialize the Field Controller.

PASSWORD PROTECTION

During the Initializing Procedure (or when a new EPROM is installed), the following LCD Display will temporarily appear.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ CHECKING SYSTEM EPROM                    ³
³                                          ³
```

After a few moments, one of the following 2 (two) LCD Displays will be presented.

If this is the FIRST INITIALIZATION after installing a new EPROM, then the following LCD Display will appear. The user MUST choose whether a Password is desired or not (password control can be changed on the next initialization).

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Do you want to use Password Protection? ³
³ press "ENTER" if so or "STOP" if not.   ³
```

Subsequent Initializations (after the first time) will additionally include an option to keep the existing Password by the inclusion of the "SKIP" option, as shown below.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Do you want to use Password Protection? ³
³ press "ENTER"(Y), "STOP"(N), or "SKIP"  ³
```

If you Initialized in order to just Re-Configure the memory and you desire to keep your original password, press SKIP to leave your Password unchanged. Either SKIP or STOP bypasses the Enter Password LCD Display, proceeds directly to the Selecting Memory Sizes LCD Display, and asks if you want to RE-CONFIGURE the Memory.

Upon pressing ENTER the following LCD Display will appear.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Enter four digit password:          ³
³                                     ³
```

Enter 4 digits or characters from the hex keypad, 0 through F. These will not show on the LCD Display. Upon entering the 4th character, the LCD Display will advance to the next Display.

The password is not visible on the LCD Display at any time, in any Operating Mode, so that no one may ever see your password.

SELECTING MEMORY SIZES

The user may configure the internal DATA TABLE Memories in 3 configurations;

12 Data Tables of up to 475 lines each (Tables 0 through B)
6 Data Tables of up to 950 lines each (Tables 0 through 5)
2 Data Tables of up to 2,500 lines each (Tables 0 and 1)
TIP: Data Table size presently configured can easily be determined by Selecting Data Table under Data Table Operating Mode, Option 4; determine largest table number allowed.

After the Password procedure, the user is asked if Memory Re-Configuration is desired, as shown below;

EXCEPTION; When a new EPROM is installed and the Field Controller is first turned ON, the user must select a Memory Configuration. The user is sent Directly to the Select Size Option LCD Display.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ DO YOU WANT TO RE-CONFIGURE MEMORY?      ³
³ Press "ENTER" if so, or "STOP" to EXIT   ³
```

The above LCD Display provides the user the opportunity to just alter the Password without erasing or changing the existing Data Tables. "STOP" will abort without changing, checking, or clearing the Data Table memories.

If "ENTER" is depressed, the user is presented with a second chance to abort ("STOP"), without losing all data in all Data Tables.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ WARNING *** THIS WILL CLEAR MEMORY *** ³
³ Press “ENTER” if so, or “STOP” to EXIT ³
```

“STOP” will abort without changing, checking, or clearing the Data Table memories.

If “ENTER” is selected from the above LCD Display, the user is then asked to select the Memory Configuration, as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Select size option:                    ³
³ 0 = 12 x 475, 1 = 6 x 950, 2 = 2 x 2500 ³
```

Upon entry of Memory Size Selection (0, 1, or 2), the Field Controller verifies the integrity of the 2 internal memory parts, and actually Initializes the System which configures the Memories (a final, beyond last chance, abort would be to turn OFF the Field Controller before entering a memory size option).

During this time, the Field Controller temporarily displays the 3 LCD screens shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ MEM 1 CHECK                            ³
³                                        ³
```

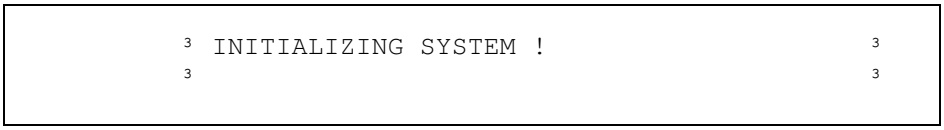
LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ MEM 2 CHECK                            ³
³                                        ³
```

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL



Upon completion of Initializing the System, the Field Controller flashes the Operating Mode LED's, beeps, and Displays the opening Menu. If you see the above LCD Display "INITIALIZING SYSTEM !", the memories have been verified, configured (sized), and cleared; all previous Data Tables have been erased. The Data Table selected is Table 0 (zero), TAPE CLOCK MODE (Auto Time Code Switchover Mode) is set to Auto Switch, the SMPTE Offset is 00:00:00:00, and the MSC Device Number is 1.

WARNING - DANGER

DO NOT CHANGE THE DEFAULT SETTINGS OF THE OPERATIONAL PARAMETERS UNDER SETUP, OPTION 5, OF THE DATA TABLE OPERATING MODE UNLESS YOU ARE ABSOLUTELY AWARE OF THE CONSEQUENCES. CHANGING THE DEFAULT SETTINGS CAN MAKE THE FIELD CONTROLLER APPEAR TO NOT FUNCTION UNDER NORMAL CIRCUMSTANCES.

THE DEFAULT SETTINGS ARE;

TAPE CLOCK MODE (Auto Timecode Switchover mode) = 0, AUTO SWITCH

SMPTE/MTC TIME CODE OFFSET = 00:00:00:00 (Zero Hours)

MSC DEV = 1 (one)

TIME CODE OPERATING MODE SECTION II-9

TIME CODE OPERATING MODE WITH ALL TYPES SMPTE/MTC & OFFSET

When the SMPTE Option 2, or the MTC Option 3 is selected from the TIME CODE OPERATING MODE, a the LCD Display will show the Time Code using the OFFSET HOUR.

SMPTE OR MTC (MIDI Time Code) can be;

- 30 fps ND (30 frames per second, Non Drop)
- 30 fps DF (30 frames per second, Drop Frame)
  (same as 29.97 NTSC Video Drop Frame)
- 25 fps (25 frames per second EBU)
- 24 fps (24 frames per second for Film)

The LCD will not fully Display the information until actual valid SMPTE or MTC Time Code within the Offset range is received. The opening, temporary LCD Display is as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ OFFSET: 00:00:00:00                                    ³
³                                                        ³
```

WARNING - CAUTION

IF SMPTE / MTC OFFSET IS GREATER THAN THE ACTUAL TIME OF THE SMPTE / MTC BEING RECEIVED, THEN IT WILL APPEAR THAT THE FIELD CONTROLLER IS NOT RECEIVING SMPTE / MTC AT ALL

SET THE SMPTE / MTC OFFSET TO 0 (ZERO) HOURS 00:00:00:00

(Data Operating Mode, Option 5=SETUP, Option 1, SET SMPTE OFFSET)

Upon reception of valid SMPTE or MTC, and WHOSE TIME IS GREATER THAN THE OFFSET HOUR, the LCD Display will appear as;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

³ OFFSET :hh:mm:ss:ff TYPE SMPTE/MTC ON/OFF³ ³ RELTIME:h2:m1:s1:f1 ABSTIME:h1:m1:s1:f1 ³

The Top Line displays the OFFSET HOUR set in memory shown as "hh:mm:ss:ff". The OFFSET will be in WHOLE HOURS ONLY. The TYPE indicates the TYPE of SMPTE / MTC being received as either; 30 ND, 30 DF, 25 FPS, or 24 FPS. The "ON/OFF" indicator will be ON if valid SMPTE or MIDI Time Code is being received. If any distorted, unintelligible, or NO Time Code is being received, then OFF will be indicated.

Use the audio VOLUME Controls to listen to the SMPTE Time Code to be sure it's there (MTC cannot be audio monitored).

THERE IS NO ERROR ANALYSIS (as with Pyrodigital Time Code).

THE SMPTE / MTC is either:

VALID SMPTE / MTC (Time is running continuously, Audio ON)

INVALID SMPTE / MTC (No Time running, Audio OFF)

No SMPTE / MTC Time Code coming in

Distorted, Noisy, or Poor Quality SMPTE / MTC

Out of Offset Range SMPTE / MTC

For Field Controllers so equipped, the SMPTE BLUE LED will be illuminated when valid SMPTE Time Code is being received (NOTE: the BLUE LED will illuminate for ANY Hours of SMPTE even if the OFFSET is out of Range, see Warning - Caution above).

The "ABSTIME:" is the ABSOLUTE TIME, or the actual SMPTE/MTC Time Code Numbers, being received, shown as "h1:m1:s1:f1". "RELTIME" is the RELATIVE TIME, or the Absolute SMPTE/MTC Time with the OFFSET SUBTRACTED, shown as "h2:m1:s1:f1". Since the OFFSET is in Whole Hours ONLY, the minutes, seconds, and frame numbers will be identical.

"RELTIME" is the Time that AUTO FIRE uses to FIRE the selected Data Table.

When the SMPTE or MTC input is stopped, there may be a slight discrepancy shown in the frame numbers between ABSTIME AND RELTIME. This is due to the fact that the internal clock may continue to run slightly after the input has stopped.

REMEMBER: If the OFFSET is Greater than the ABSTIME (actual time of incoming SMPTE / MTC), then the RELTIME would be NEGATIVE, thus the Field Controller would appear as though IT IS NOT RECEIVING SMPTE / MTC AT ALL. Set the OFFSET to ZERO and Check Again.

CHECK STATUS OPERATING MODE SECTION II-10

ELIMINATE ALL SYSTEM SHORTS

Use the ACTIVE TEST LIGHTS to VERIFY that there are no SHORTS in the System Network! SEE ACTIVE TEST LIGHTS, Section 6 and Section II-6 in this User's Guide.

WARNING - EXTREME DANGER

USE THE ACTIVE TEST LIGHTS TO CHECK FOR SHORTS

Status Check is normally where any Shorts in the System Network are first found. See the ACTIVE TEST LIGHTS Section of this User's Guide.

ABSOLUTELY FIND & CORRECT ANY SHORTS BEFORE PROCEEDING

STATUS NIGHTMARE WITH MULTIPLE DATA TABLES

It is possible to have the various individual circuits on the SAME FIRING MODULE controlled by DIFFERENT DATA TABLES within the Field Controller. In this case, CHECKING STATUS CAN BE RATHER DIFFICULT. This is because certain Circuits on the Same Firing Module are OK in one Data Table but appear as question Marks (?) in another Data Table. This can be very CONFUSING.

To avoid this Problem DO NOT specify any Addresses for one Firing Module in more than one Data Table. If you must use Different Data Tables for the SAME SYSTEM NETWORK, then keep it simple by either:

- Create a Data Table will ALL THE ADDRESSES used in the Entire connected System Network for Status Check Only
- Only use ADDRESSES for one particular Firing Module in ONE Data Table. This will make it less Confusing as it's easier to tell if whole Firing Modules are supposed to be there or not.

Remember that the Electric match Continuity Status Information displayed on the LCD screen will be a function of what Firing Addresses are specified in the Selected Data Table.

MANUAL FIRE OPERATING MODE SECTION II-11

PLEASE WAIT.....PREPARING DATA MESSAGE

The LCD may temporarily display the message “Please WAIT.....preparing data”. The Field Controller is Locating internal Pointers for Caliber Group Firing, which may take a few moments.

IMPROVED SKIP FUNCTION

SKIP; In Manual Fire, the MF/SKIP Button (same Button as AF/PAUSE) normally skips the Event Line shown and advances to the next Event Line. This function has been expanded to include Zipper Sequences, Timed Macro Sequences, and Group Caliber Sequences. Thus, if you depress the MF/SKIP Button at the beginning or in the middle of a Pre-Programmed sequence of events (Zipper Firing, Timed Macro Firing, or Caliber Group Firing), the Field Controller Skips to the next Event or Sequence of Events to be Fired.

Skip functions, by definition, as skipping past any consecutive, sequential series of 2 or more Event Lines in the Data Table which have THE SAME EVENT TIME, REGARDLESS OF PFT, stopping at the NEXT Event Line which has a Different Time.

The Down Arrow and the Up Arrow are functional for moving only one Event Line anywhere within the Data Table, including with in a Pre-Programmed Sequence.

See TIMED MACRO FIRE, DATA TABLE SETUP and PAUSING AND STOPPING MACRO FIRE to understand how MF/SKIP works and how it may be used. See also CALIBER GROUP FIRE, CALIBER GROUP SET UP; the number of “shots” (one SHOT could be Pre-Programmed to be number of Event Lines) Skipped is included in the total number of Shots Left.

REPEAT-FIRE NOT POSSIBLE BECAUSE OF *

With the New Firmware, IT IS NOT POSSIBLE TO REPEAT-FIRE SHOTS BY RE-ACCESSING PREVIOUSLY FIRED SHOTS. This is due to the Asstericks (*) feature used to keep track of what shots have been Fired (used in Group Caliber Firing, Skip and other functions). Of course the actual Re-Fire Key still Re-Fires the Last Fired Address as shown by the "LF" Address on the LCD Display.

If you use GO TO SHOT, GO TO ADDRESS, UP ARROW, DOWN ARROW, or the HOME keys to located to a previously Fired Event, depressing FIRE again will NOT Repeat-Fire that Event, but only result in a "beep" from the Field Controller. This should not present any problems because there should be no reason to Fire or repeat an event that has already been Fired.

ZIPPER FIRE SECTION II-12

ZIPPER FIRING ONLY OCCURS FOR EQUAL EVENT TIMES

Contrary to what was previously stated in the USER'S GUIDE; It is NOT TRUE in MANUAL FIRE that a Zipper Fire will occur if "FIRE" Times are equal due to a combination of different Event Times and PFT Times that cause "FIRE" Times to be the same. Such events will Zipper Fire in Auto Fire BUT NOT IN MANUAL FIRE.

FOR A ZIPPER FIRE TO FUNCTION IN MANUAL FIRE, THE EVENT TIMES MUST BE THE SAME, AND THEY MUST HAVE THE SAME PFT. SIMILARLY, FOR TIMED MACRO FIRING THE EVENT TIMES MUST BE THE SAME. This applies to Zippers & Timed Macros for GROUP CALIBER FIRING as well.

BY DEFINITION a Zipper or Timed Macro is created by having the same EVENT TIME (and Fire time must be the same for Zipper to execute, which means that the PFT MUST be the same; 0 PFT is valid)

ZIPPER FIRE MAXIMUM OF 40 EVENTS

A MAXIMUM OF 40 EVENTS CAN BE FIRED SIMULTANEOUSLY AT ONE TIME. This applies to BOTH AUTO FIRE AND MANUAL FIRE. The Field Controller has a Firing Memory buffer that can store only up to 40 Events for Firing at 1/100 of a second spacing. So after 40/100's second the buffer will be clear and ready to accept up to 40 more Firing Addresses. If you exceed this buffer capacity, then any Addresses that were to be loaded into the end of the buffer will be lost, and therefore NOT FIRED. This would probably never happen as it is unlikely that anyone will ever need to Fire more than 40 individual Addresses at one time.

TIMED MACRO FIRE SECTION II-13

INTRODUCTION

TIMED MACRO FIRE IS FOR THE MANUAL FIRE OPERATING MODE ONLY.

Timed Macro Fire, OR MACRO FIRE for short, is a function in MANUAL FIRE, where a number of Events can be Fired in a PRE-PROGRAMMED TIMED sequence with a single depression of the Fire Button / Trigger.

This function, as in Zipper Fire, or Group Caliber Fire, operates by special Programming of Events within the Data Table. The PFT Data Field is used as the Running TIME, in tenths of seconds, of delay in automatic Firing FROM THE FIRST EVENT of the sequence. If the table has 3 events and it is desired (in MANUAL FIRE) to AUTOMATICALLY Fire the second event exactly 5 seconds from the First Event, the second event has a PFT of 50. If the third event has a PFT of 60 it will Fire 6.0 seconds from the First Event (the time when the Fire Button is first depressed), or exactly 1.0 seconds from the second Event.

Thus, TIMED MACRO FIRE is limited, by design, to be able to operate no more that 9.9 seconds (PFT = 99). In order for a Macro Fire to occur, specific conditions must exist within the Data Table. No special characters are required, thus Macro Fire can be set up using VER250 or other external Scripting Programs. The Programming is identical to Zipper Fire, excepting that two additional requirement are imposed. These ADDITIONAL requirements are that: 1) the First Event of the sequence MUST HAVE A ZERO PFT, and that 2) the NEXT Event MUST HAVE A NON-ZERO PFT.

DATA TABLE REQUIREMENTS FOR MACRO FIRE

TO CREATE A TIMED MACRO FIRE;

1) EACH EVENT LINE MUST HAVE A TIME ENTRY SPECIFIED
2) EACH EVENT LINE MUST BE IN SEQUENTIAL ORDER
3) EACH OF THE TIME ENTRIES MUST BE THE SAME TIME NUMBER
4) THE TIME NUMBER MUST BE GREATER THAN THE LARGEST PFT (use 10 seconds MINIMUM to always avoid trouble)
5) THE FIRST EVENT MUST HAVE PFT SET TO 0 (ZERO)
6) EACH SUBSEQUENT EVENT LINE MUST HAVE A NON-ZERO PFT EQUAL TO (Zipper Fire) OR GREATER THAN (Timed Macro Fire) THE PREVIOUS EVENT LINE

LIMITS IN TIMED MACRO FIRE

A) TIMED MACRO FIRE CANNOT START WITH A ZIPPER FIRE (NOTE: start Zipper at 1/10 of a second)

B) MAXIMUM OF 7 EVENTS PER EACH PFT TIME
(Zipper Firing WITHIN Timed Macro Limited to 7 Events per each 1/10 of a second)

C) LIMITED TO 255 EVENT LINES MAXIMUM IF USED WITH WITH CALIBER GROUP FIRE (255 Events Max per Caliber)

MACRO FIRE DATA TABLE SETUP

A MACRO FIRE can occur anywhere within the Data Table. To create a Macro Fire, the first event of the sequence, and all following events must have THE SAME time number specified (same as Zipper Fire). The time number must be greater than the largest delay desired. For example if time 00:00:02:00, or 2 seconds is used, then a PFT of greater than 19 (1.9 seconds) will cause MALFUNCTIONS (because you have told the Field Controller that the delayed Firing timing period should start counting before you actually depress the Fire Button).

THEREFORE NEVER USE A TIME FOR MACRO FIRE LESS THAN 10 SECONDS.

WARNING - CAUTION

ALWAYS USE AN EVENT TIME OF AT LEAST 10 SECONDS, 00:00:10:00, IN THE DATA TABLE. This habit will help you avoid potential un-Fired Events when using other features (Timed Macros, Caliber Group Firing, etc.)

This is a good habit to get into, use 00:00:10:00 as the MINIMUM time whenever creating ZIPPER FIRINGS OR MACRO FIRINGS.

Note that ANY time number may be used, and even subsequent Zipper or Timed Macro Firings can repeat the use of this same time number. In this case the two different sequences must be separated by at least 1 entry with no (or a different) time entry, otherwise they will be as one sequence.

Note for Timed Macro Fire, as in Zipper Fire, the ONLY information actually required is the time and the Pre Fire Time. Obviously, to be useful, a Firing Address is necessary. Shot number is not required, however it is a good habit to make all the shot numbers the same, or use shot numbers in specific groups (such as 100's, 200's, 300's) so that you are always aware of what the Field Controller is doing.

TIMED MACRO FIRE OPERATION

When a Macro Fire occurs in Manual Fire, the LCD Display is as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff PF add CA          ³
³ MACRO TIME:xx            LFad1 MFad2     ³
```

Where the Top line of the LCD is the next Event to be Fired, and the Bottom line of the LCD shows “MACRO TIME”, with LF as the Last Fired Address, ad1 and MF as the Address ad2 that WAS the first Event Address Fired. The MF Address will be Updated at the completion of the Timed Macro.

MACRO TIME is a clock running (Time = “xx”), starting from 0 (zero) and counting upward in TENTHS OF A SECOND from the time when Fire was depressed. When the Macro Clock Time matches the PFT time, that Event will be Fired. The clock will continue up to the maximum specified PFT of the sequence, stopping when it reaches the last same Time Number Event Line. Note that since the time is counting upward, EACH SUBSEQUENT EVENT LINE IN THE MACRO MUST HAVE A PFT EQUAL TO (Zipper Fire) OR GREATER THAN THE PREVIOUS EVENT LINE.

WARNING - CAUTION

THE DEADMAN BUTTON MUST BE DEPRESSED DURING THE ENTIRE TIMED MACRO SEQUENCE OR ADDRESSES WILL BE UN-FIRED.

PAUSING AND STOPPING MACRO FIRE

Macro Fire AUTOMATICALLY STOPS (like Zipper Fire) when the next line in the data table no longer has the same Time Number as the previous Event Line.

Obviously, Macro Fire may be Stopped by Depressing STOP, as with any other Firing Mode. Stop should be used as an “EMERGENCY STOP”. STOP will reset the Field Controller so that when any Firing Mode is re-selected, Firing will be Programmed to start at

the beginning. The internal “notes” (the asterik, *) of where the last shot WAS, is cleared upon STOP. Only Auto Fire with Time Code will be able to re-start automatically at the “next” Event.

A better "stop" would be to Let up on the Deadman Pickle which will cease fire, and the Macro will continue to run, beeping at the Fire Times because the deadman pickle is not depressed. Turning off the key will also STOP by disconnecting Firing power.

The AF/PAUSE MF/SKIP Button may be used to STOP the CLOCK of the running Macro, by depressing this Button. The Clock will be "frozen" and Firing will Stop. The Fire Button can then be depressed to re-start the clock running from it's "frozen" time. This is identical to Operation under Internal Clock of the Auto Fire operating mode.

CANCELING AND EXITING MACRO FIRE

Also active during "PAUSE" is the DOWN ARROW BUTTON. WHEN PAUSED, USE THE DOWN ARROW TO CANCEL THE MACRO, BUT THIS ONLY MOVES TO THE NEXT SEQUENCE. Note that once the Down Arrow is used, the Macro WILL BE CANCELED and depressing Fire will only execute the next Event. That next Event could be a Zipper Fire (or just another single Event within the Timed Macro), however the Macro Fire will be canceled (because it's only the very First Line of the Sequence with the PFT = 0 that tells the Field Controller to perform a Macro Fire). BE AWARE THAT ONLY ONE DEPRESSION OF THE DOWN ARROW WILL NOT MOVE YOU OUT OF THE MACRO SEQUENCE.

In order to completely advance within the Data Table past the Paused Macro, or in Other Words; Cancel the Paused Macro and Skip to the next sequence; Depress the AF/PAUSE MF/SKIP key AGAIN AFTER YOU HAVE DEPRESSED THE DOWN ARROW ONE TIME.

To STOP, CANCEL, and EXIT a Timed Macro WHILE IT IS RUNNING, THE KEY SEQUENCE WOULD BE;

1) Depress AF/PAUSE to Stop Clock and "freeze" the running Time
2) Depress Down Arrow to advance down one line
3) Depress MF/SKIP (same button as AF/PAUSE) to skip through entire Macro to next Event(s).

NOTE THAT THE KEY SEQUENCE IS DIFFERENT FOR EXITING THE TIMED MACRO IN CALIBER GROUP FIRING. SEE the CALIBER GROUP FIRING Section in this User's Guide.

SKIP; The MF/SKIP Key uses the same routine as Zipper Fire and Macro Fire by looking to see if the next line has a matching time number. Thus SKIP will skip an entire Macro Sequence whether it has never been started or has been canceled.

The Down Arrow or Up Arrow Button may be used to selectively move to desired shots WITHIN a Macro Fire, either before execution or after it has been stopped with AF/PAUSE. In the case of Stopping by Pause, the Up Arrow will only be functional AFTER the Down Arrow HAS BEEN Depressed.

Again, the Timed Macro will ONLY FUNCTION if started (by depressing Fire) on the FIRST LINE of the Timed Macro Sequence.

TIMED MACRO COMBINED WITH ZIPPER FIRE

ZIPPER FIRE WITHIN TIMED MACRO FIRE

A Zipper Fire can be created at any time WITHIN the Timed Macro by simply repeating the same PFT as the previous line. EXCEPTION: A TIMED MACRO FIRE CANNOT START WITH A ZIPPER FIRE

Timed Macro Fire, as in Zipper Fire, operates by looking ahead 1 (one) Event Line from the Event Line it's currently on. If the Time Number is the same AND the PFT Time is the same, then the next Event Line will be Zipper Fired. This procedure repeats, again looking to the next line, STOPPING when the Event Time is no longer the same as the previous Event Line. Timed Macro Fire is a special case of Zipper Fire; BY DEFINITION: the Zipper Fire conditions are met AND ADDITIONALLY The FIRST EVENT of the Sequence has a PFT = 0 and the next Event Line has a Non-Zero PFT.

If the Timed Macro is to start with a Zipper fire, then this is not possible because, by the Definition, a Timed Macro Fire CANNOT start with a Zipper Fire. If an ERROR was made, and the second Event Line also has a PFT = 0 (in an attempt to start a Timed Macro with a Zipper Fire), then the second Event Line(s) will ONLY be a Zipper Fire. A Timed Macro will not executed. The Second Event Line MUST HAVE a PFT of 1 or more for a Timed Macro to occur. Any subsequent Event Lines that were intended to be part of the Timed Macro will only be Fired as single Events (or Zipper(s) if both TIME and PFT were equal).

STARTING A TIMED MACRO FIRE WITH A ZIPPER FIRE

It is most useful to Fire a "FRONTAGE" (several Firing Modules) as soon as the Fire Trigger is depressed. In this case, SIMPLY START THE ZIPPER AT THE SECOND EVENT LINE WITH A PFT = 1. The First Event Line with PFT = 0 (to Start Timed Macro Fire) could be a un-used Firing Event (such as the recommended unused 000 Address), and the actual Firing will start 1/10 of a second after you depress Fire. No one will notice the 1/10 second delay.

ZIPPER FIRES LARGER THAN 7 EVENTS

Remember the Limit of 7 Events MAX per 1/10 of a second. After 7 Events are Zippered, the Field Controller moves on to the next 1/10 of a second AND ANY EVENTS PAST THE 7th WILL BE UN-FIRED.

To continue Zipper Firing, JUST INCREASE THE PFT BY 1 (one) FOR THE NEXT 7 EVENTS. Repeat as Necessary. (break the single Large Zipper into several Zippers at 1/10 second spacing with 7 events per each zipper).

TIMED MACRO FIRE WITHIN GROUP CALIBER FIRE

THIS IS AN EXTREMELY POWERFUL FEATURE. SEE the CALIBER GROUP FIRING Section of this User's Guide.

If you use caliber numbers from 1 to 16, the Caliber Group Fire can also be activated and Timed Macro Firings can be selected and Fired from Group Caliber Select. Group Caliber Firings with Zippers and/or Macros must meet all the requirements of Zipper and/or Macro, being as sequential Event Lines within the Data Table. SEE the CALIBER GROUP FIRING Section of this User's Guide.

SPECIAL CAUTIONS FOR TIMED MACRO FIRE DATA TABLES

OPERATING AUTO FIRE TABLES IN MANUAL FIRE

IN A TABLE FOR MANUALLY FIRING, REMOVE ALL NON FIRE EVENTS, SUCH AS NOTES.

A potential problem can be caused when operating a Data Table setup for AUTO FIRE in the MANUAL FIRE OPERATING MODE WHEN EVENT LINES ARE USED FOR NOTES. This can easily Occur WHEN USING SCRIPTING SOFTWARE. Never specify a Note at the same time as a Firing Event. Your notes will have a zero PFT and your Event will have a non-zero PFT THUS CAUSING AN UNINTENDED TIMED MACRO TO FUNCTION IN MANUAL FIRE.

When using "Super Script" it is sometimes useful to use Events for placing Scripting or song NOTES within the .sho file. If a reference "Note" is followed by an actual Pyrotechnic Event having the same EVENT TIME (such as for the first starting musical note of a song), then this may cause a MACRO to start running WHEN OPERATING THIS .SHO FILE UNDER MANUAL FIRE (when downloaded into the Field Controller). This is because your start of song "Note" will probably have a 0 (zero) PFT (no reason to give it any PFT) and your Pyrotechnic Event will have some actual PFT value for Firing. Thus the 0 (zero) PFT has instructed the Field Controller to execute a Timed Macro, lasting for the PFT specified for the Pyrotechnic Event.

Therefore, NEVER SPECIFY A "NOTE" AT THE SAME EVENT TIME AS AN ACTUAL PYROTECHNIC EVENT. In Manual Fire, NOTES can cause other problems, such as apparent Non-Firings (of the "Notes") with the resulting confusion. This occurs because when you FIRE at the Event which is in fact a "Note", a Firing Command will be transmitted for Address 000 and nothing will Fire (assuming you did not specify an address for the "Note"; a blank Address in "Super Script" is translated to the Field Controller as address 000 and you headed the warnings previously in the User's Guide about NEVER using Thumbwheel Address 00 for this EXACT REASON, use only box addresses from 01 through 7F).

The recommended best and SAFEST procedure is to remove all Notes for Manual Fire Usage or for any Auto Fire Table that may possibly be used in a "backup mode" under Manual Fire.

EVENT LINES WITH PFT = 0

BE VERY CAREFUL OF ANY EVENT LINE WITH A 0 (zero) PFT. If the next event line HAS A MATCHING EVENT TIME, then by Definition a Timed Macro will be executed (or a Zipper Fire if subsequent Event Lines have 0 PFT).

DECREASING PRE-FIRE TIMES

SEQUENTIAL ORDER IN THE DATA TABLE IS CRITICAL. THIS APPLIES TO THE SEQUENTIAL ORDER OF THE PFT's FOR A TIMED MACRO AS WELL. Events which DO NOT HAVE EQUAL TO OR INCREASING PFT's in the middle or at the end of a Timed Macro WILL BE IGNORED AND NOT FIRED, IN MANUAL FIRE (and also within Group Caliber).

In other words if you start a Timed Macro (with PFT=0), each subsequent line MUST have the same PFT (Zipper Fire) or a larger PFT (Timed Macro Fire), in order to be Fired. If the PFT is SMALLER than the previous lines, then this Event(s) will be ignored and un-Fired. If an event(s) with a LARGER PFT follows this Event, then this next event will be Fired as the Macro continues on and the middle Event with the smaller PFT will be passed over (unseen for purposes of Timed Macro) and un-Fired. For SAFETY Reasons, the Firmware (EPROM Software of the Field Controller) was specifically designed to pass by these incorrectly specified PFT's and leave them Un-Fired, (for lack of any better instructions of what to do with these event(s)).

WARNING FOR SORTING BY TIME WITH VER250 SUPER SCRIPT

WARNING - DANGER

A SORT BY TIME CAN SERIOUSLY SCRAMBLE THE ORDER OF A TIMED MACRO WHEN USING VER250 SUPER SCRIPT AND CAUSE THE FIELD CONTROLLER TO NOT FIRE CORRECTLY

THIS CAN BE AVOIDED BY ALWAYS HAVING SEQUENTIALLY INCREASING SHOT NUMBERS FOR THE TIMED MACRO

The problem occurs in VER250 when the Event Time, the Shot Number, and the Device Description are all Identical for several Events. A sort by Time will randomize the placement of the Events for the same time. This scrambles the sequence of increasing PFT's (created in order to cause a Timed Macro), and the Timed Macro will not function correctly (in a sort by Time, VER250 doesn't consider the PFT field value).

CALIBER GROUP FIRE SECTION II-14

INTRODUCTION

CALIBER GROUP FIRE IS FOR THE MANUAL FIRE OPERATING MODE ONLY.

Caliber Group Firing, abbreviated on the Field Controller as GRC, for GRoup Caliber, uses the LEFT Section of the Field Controller to Select specific PROGRAMMED Groups of Events for FIRING in Manual Fire. The selected Caliber Group can be single event(s), Zipper Firings, Timed Macro Firings, or any combination or multiple combination of these.

Caliber Group, or Group Caliber, specifically relates the CAL, or CALIBER Field of each EVENT LINE in the Data Table to THE CORRESPONDING CALIBER NUMBER BUTTON on the LEFT SIDE of the Field Controller.

The idea is that you select a Group # (1 through 16) and then FIRE the next available shot (or sequence of shots) in that Group.

Group Caliber Firing of Timed Macros, containing Zipper Fires, is perhaps the most powerful MANUAL FIRING function of the Field Controller. Consider that a data table can be created for up to 16 different types of Pyrotechnic Sequences. Each sequence can be a single event, a Zipper Firing, a Timed Macro Firing, or a Timed Macro with one or more Zipper Firings within the Timed Macro. There ALSO may be MORE than one “shot” or sequence within EACH Caliber Group. Thus a specific type of Pyrotechnic sequence may be selected, which may be a Timed/Zipper Sequence, and Fired with the depression of one button (Fire). A DIFFERENT sequence under a DIFFERENT Caliber Number may then be selected and Fired. Then additional sequences back in the PREVIOUS Caliber Number may be Fired, be re-selecting the previous Group Caliber Number (assuming that there is more than 1 sequence in the first group caliber).

Thus CALIBER GROUP SELECT provides a means of FIRING specific groups, OR TYPES of PYROTECHNIC DEVICES AT ANY TIME AND IN ANY ORDER. Additionally, through careful arrangement of the Data Table, Caliber Group Select could be used to instantly locate and FIRE Zippered Events, Timed Events, or a specific sequence of Pyrotechnic Events for each 1 of 16 Keys (true Macro Firing).

The user should be Cautioned, however, to avoid complexity. DO NOT TRY TO DO TO MANY THINGS, OR YOU WILL SURELY GET LOST AND FIRE THE WRONG DEVICE AT THE WRONG TIME. DEATH OR INJURY TO YOURSELF OR INNOCENT BYSTANDERS COULD RESULT FROM YOUR INABILITY TO OPERATE THE FIELD CONTROLLER CORRECTLY AND SAFELY.

DANGERS WITH GROUP CALIBER FIRING

Group Caliber Firing, is a DIFFERENT Type of Firing (even though is occurs within Manual Fire) and should be thought of as a SEPARATE TYPE OF FIRING, henceforth called GRC, or Group Caliber Fire. GRC introduces the new concept of "shots". CRC behaves differently than Manual Fire.

The point of all this is that IT IS NOW DIFFICULT, OR IN SOME CASES IMPOSSIBLE, TO CREATE A DATA TABLE THAT WILL FUNCTION EXACTLY, PERFECTLY AS DESIRED IS EVERY POSSIBLE FIRING MODE.

"MIXED MODES" OF OPERATION (Mixed Modes of Firing) SHOULD NOT BE ATTEMPTED. SET UP A DATA TABLE FOR A SPECIFIC TASK AND THEN INERT TEST. LIVE FIRE ONLY WITHIN THAT MODE OF FIRING UPON SUCCESSFUL VERIFICATION OF THE INERT TESTING.

It can be, and is, extremely confusing AND EXTREMELY DANGEROUS to jump all around in the various Firing Modes and keep track of exactly what you are doing, what is going to be Fired, what has been Fired, and where you are. AVOID JUMPING AROUND AT ALL COSTS. "keep it simple". Set up for a specific task and stick to it. If you set up and practice by INERT TEST FIRING, the operation of the Field Controller will be easy, simple, and natural. The responsibility is yours, so if you don't know what you are doing or what is going to happen DON'T DO IT!

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 DATA 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

GROUP CALIBER SET UP

The Left Side of the Field Controller Control Panel has 16 buttons, labeled 1 (one) through 16 (sixteen), directly under the Title Label of "Caliber Group Select". There is also an additional 17th Button, labeled "PRESS TO DISPLAY SHOTS REMAINING".

Also a writing space has been provided, next to each caliber number, for the user to write what that particular Caliber Number specifies (under the "Caliber Group Select" portion of the Control Surface). Use erasable Marking Pens of the type used for writing on White Lecture Boards that can be wiped clean from Mylar or Lexan surfaces. These markers are SPECIAL, erasable, Non Permanent type, felt tipped, marking pens. DO NOT USE GREASE PENCILS as indicated in earlier User's Guides (or any other type of marker). Masking tape (or similar) may placed over the control surface of the Field Controller as a temporary, removable writing surface.

Group Caliber works by having the CALIBER Data Field of a desired Event Line(s) set to a value of 1 (one) to 16 (sixteen). Thus if you want an Event Line to be associated with a particular Group Caliber Button, use that Caliber Number for that Event in the Data Table.

Now when in Manual Fire, select the desired Caliber Group to Fire by depressing one of the 16 number buttons. Depressing one of these Caliber Group Select Keys causes the Field Controller to automatically Locate and Display the NEXT AVAILABLE Event Line of that corresponding Caliber Number, available for Firing.

When you depress FIRE, you FIRE that Event. When that Event Line is Fired, the Field Controller Locates and Displays the next Event Line of THAT Caliber Number, ready for Firing. The Firing progression of the Selected Caliber follows the sequential order of that Caliber number as it exists in that Selected Data Table. If the Event is a Zipper Fire and/or Timed Macro Fire, that sequence of Events will be Fired.

This continues until there are no more UNFIRED Event Lines of that Caliber Number in the Selected Data Table (the Field Controller just "beeps"), or the user performs another action. If you select a Caliber Group that has no matching Caliber Numbered Events in the Data Table, then the LCD Displays "NO SHOTS IN THIS GROUP". In this case, you may select another Group Caliber or Return to Normal Manual Fire by depressing "Return to Sequential".

Any one of the 16 Caliber Group Select Keys may be depressed AT ANY TIME, thus locating and displaying the Next Available Event of that Corresponding Caliber Number.

Another feature of Caliber Group Firing is the ability come back to a group you have already partially Fired, and continue Firing THE NEXT AVAILABLE SHOT. The Field Controller does this by using the "asterik" (*) to indicate that an event(s) have already been Fired. If you STOP or Re-Enter Manual Fire, this record of shots already Fired will be lost.

A Key is also provided to DISPLAY SHOTS REMAINING, or temporarily post on the LCD the number of Events remaining for each Caliber Number, 1 through 16.

You can exit Caliber Group Firing back to Normal Manual Fire, at any time, by depressing "Return to Sequential". Caliber Group Fire can be continued again by depressing one of the Caliber Numbers in "Caliber Group Select". "Return to Sequential" will place you back in the

sequential Table at the place where you left. Note that it is possible to Fire some or all of the Events that were intended for Caliber Group Firing in Normal Manual Fire.

Caliber Group also uses and displays the number of Shots within that Caliber Group, BASED ON THE PROGRAMMING OF THE SEQUENCE OF EVENTS FOR THAT CALIBER. Thus if 3 Event lines are Programmed as a Zipper Fire, then the Field Controller will count this as 1 (one) SHOT. Also, the MF/SKIP Key will skip the entire group, advancing to the next "SHOT". If the group is a Timed Macro, then the MF/SKIP key functions as described for the Timed Macro Fire (becomes a pause key, if macro running, plus other behavior, see Timed Macro Fire).

If you SKIP a "Shot" which is a sequence of Events, this Skipped Shot IS NOT COUNTED AS BEING FIRED. No asterik (*) will be placed behind the Firing Address for Skipped Shots. In this case, it is possible to arrive at the last "shot" of the Caliber Group, and still have Shots remaining, as displayed by the number of Shots Left. However the Field Controller just beeps at you if you attempt to Fire the supposed shots left, because it is at the last shot of the group. You have, in fact skipped shots that Can be Fired, however you told the Field Controller that you did not want to Fire these Skipped Shots.

If you wish to gain access to these Skipped Shots, DEPRESS THE HOME BUTTON, when in that Caliber Group, and you will be advanced back to the Top of that Caliber Group. This Top Event may or may not have been Fired, as indicated by the asterik(*). If this shot was not Fired, you may Fire it, or you could Skip it again. AFTER DEPRESSING THE HOME BUTTON, USE THE SKIP KEY TO LOCATE THE "SHOT" YOU PREVIOUSLY SKIPPED FOR FIRING. Note that Skip will move by "shots". If you Fire, then the next "shot" to be located will be the next shot available for Firing. In this case, the Field Controller will skip over any shots marked with an asterik (*). Thus Depressing FIRE at the Top Line of the Caliber Group, located by HOME, will Fire the Top Shot and auto locate to the next available shot within the Caliber Group. If the Top Shot was previously Fired, then you CANNOT Fire it again (the Field Controller just "beeps"). Use "SKIP" to move past the Top Fired Shot to gain access to your previously Skipped Shots.

WARNING - CAUTION

GROUP CALIBER FIRING, AS WELL AS TIMED MACRO FIRING, DEPEND ON A SPECIFICALLY PROGRAMMED DATA TABLE. PYRODIGITAL CONSULTANTS RECOMMENDS THAT YOU SET UP THE DATA TABLE AND OPERATE THE FIELD CONTROLLER ONLY IN THAT MODE OF OPERATION. OPERATION IN OTHER MODES MAY CAUSE UNEXPECTED FIRINGS.

ABSOLUTELY INERT TEST THE OPERATION OF THE ENTIRE DATA TABLE IN ALL FIRING MODES, BEFORE LIVE FIRING, TO BE SURE THAT THE FIELD CONTROLLER WILL OPERATE AS YOU INTEND IT TO. ERRORS IN THE DATA TABLE, OR FAILURE TO UNDERSTAND THE BEHAVIOR OF THE FIELD CONTROLLER WITH SPECIAL DATA TABLES, MAY RESULT IN UNEXPECTED FIRINGS OR FAILURE OF FIRINGS

LIMITS WITHIN GROUP CALIBER

255 EVENTS MAXIMUM per each Caliber Group (whether single Events, Zippers and/or Timed Macros). This IS NOT the number of "shots" but the TOTAL number of Event Lines that may be used within one Group Caliber Number. Obviously, also the GRAND TOTAL number of Events is limited to memory capacity of selected Data Table Memory. If there are MORE than 255 Event Lines for a Caliber Group, then ONLY the Top, or First 255 will be available for Group Firing. Anything past the 255 Limit will be ignored in the Caliber Group Firing Mode. (255 lines per caliber is the internal sort by Caliber Group limit)

The number of "SHOTS" remaining that can be DISPLAYED is 99 MAXIMUM. If there are more than 99 Shots (up to 255, if all single Events), 99 will be displayed until the number of shots drops below 99. Any "SKIPPED" shots will still be counted in the number of shots left.

TIP - USE THE SORT BY CALIBER "VIEW" UNDER DATA TABLE EDIT TO CHECK YOUR DATA TABLE

GROUP CALIBER OPERATION

When in manual Fire, if one of the Group Caliber Buttons is depressed, one of the two displays shown below will appear;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ NO SHOTS IN THIS GROUP                    ³
³                                           ³
```

If there are "NO SHOTS" in the Group (for that Caliber Number depressed), select another Caliber Group Number or DEPRESS Return to Sequential" to EXIT the Group Caliber Firing Mode, back to Normal MANUAL FIRE.

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff pft add CA          ³
³ GRC # xx SHOTS LEFT:yy                    ³
```

If there ARE Events with matching CALIBER Numbers, the LCD top line shows the First Event to be Fired of that matching Caliber Number. All information for the Event Line is shown (as

identical to Normal Manual Fire), being information (if any) for Time, Pre-Fire time, Address, and CA for Caliber which will, by definition be a number from 1 to 16. The second Line shows what Group Caliber you have selected, how many shots are remaining, and the Manual Firing Address to be Fired when the Fire Button is depressed.

If you Fire until all the Events have been exhausted, then the Display will change to indicate that there are NO SHOTS LEFT, as below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff pft add CA          ³
³ GRC # xx NO MORE SHOTS                    ³
```

Note that the Field Controller will beep when you Fire the Last Shot, and beep if you try to Fire when there are "NO MORE SHOTS" Left to Fire in that Caliber Group.

Remember that a "Shot" may several events, such as a Zipper Fire, or a Timed Macro Fire, or a combination of both. In such a case the entire sequence of events which are linked together will be counted as 1 (one) shot. MF/SKIP can be used to skip this entire shot group (with the limit in Timed Macro Fire for what MF/SKIP does).

If the Group Caliber function has been activated, then pressing the button "PRESS TO DISPLAY SHOTS REMAINING", will Display as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ GC  1-8:aa  bb  cc  dd  ee  ff  gg  hh   ³
³ GC 9-16:ii  jj  kk  ll  mm  nn  oo  pp   ³
```

Where GC means Group Caliber, with the number of "shots" remaining in Caliber numbers 1 through 8 displayed on the top line. The bottom line displays the number of "shots" remaining in group caliber numbers 9 through 16. "aa" is for Group Caliber Number 1, "bb" is for Group Caliber Number 2, etc.. Note that also the LCD will display the "SHOTS LEFT:yy", when a particular group is selected (with "yy" shots remaining to Fire as the Same Number for DISPLAY SHOTS REMAINING, or post "NO MORE SHOTS").

The number of "SHOTS" remaining that can be DISPLAYED is 99 MAXIMUM. If there are more than 99 Shots (up to 255, if all single Events), 99 will be displayed until the number of shots drops below 99. Any "SKIPPED" shots will still be counted in the number of shots left.

Depress the "RETURN TO SEQUENTIAL" BUTTON to exit the Group Caliber Mode and return to Normal Manual Fire (sequential Data Table Firing). Use this method to leave Group Caliber Fire if one of these buttons was accidentally depressed or you want to operate in the normal function of Manual Fire. Note that "Mixed Modes" of operation between normal Manual Fire and Group Caliber Fire are possible. If operating in Mixed Modes, be very sure what you are doing and know how the Field Controller will behave. A special Table can be made for Mixed Modes with perhaps the Group Caliber Section in a separate section of the Data Table, to prevent over-Firing Group Caliber Sequences and to prevent repeat-Firing Events that may have already been Fired in Group Caliber Fire. SEE PREVIOUS WARNINGS & DANGERS.

MOVING WITHIN GROUP CALIBER

SKIP function works the same as in Normal Manual Fire which Skips all events which are tied together in sequence by Zipper and/or Timed Macro.

In Group Cal you can't Skip last shot. If you skip to last shot, it is ready to Fire.

Shots Remaining Display DOES Count SKIPPED Shots.

If you Skip a Group Caliber Shot (and don't even Fire any), then leave that Group Caliber (via Return to Sequential or switch Group Caliber Number), and then later come back to this same Group Caliber, this Skipped Shot is always Skipped (exception is the Last Shot). You can locate Skipped Shots in GRC by depressing HOME and then using SKIP to move down to the Skipped Shot. Continued depression of Skip moves down one Shot per depression.

NOTE: IT IS POSSIBLE THAT THE LCD DISPLAY WILL SHOW "X" NUMBER OF SHOTS LEFT BUT YOU APPARENTLY CANNOT FIRE ANYTHING, THE FIELD CONTROLLER JUST "BEEPS". This is because you previously Skipped Shots and you have FIRED the Last Shot. You Must re-access those Skipped Shots and Fire them All before the LCD Display will indicate "NO MORE SHOTS" (and indicate 0 Shots under "Display Shots Remaining").

If the first Shot was previously Skipped, HOME will directly locate to that Shot (HOME locates to the very first Shot of that Group Caliber). If the first Shot has been Fired it will have an asstericks (*) after the Address shown on the top line of the LCD Display. Pressing FIRE will NOT Re-Fire any Shot that has already been Fired (because of asstericks, *), and the Field Controller will only "beep".

If you FIRE a previously skipped shot (in GRC), the next shot to be auto located will be the next UN-FIRED shot, if any other shots were skipped, or the last shot, in which case "NO MORE SHOTS" will be displayed. (Pay attention to the * (asterik) to know if you have Fired a shot or not when going HOME and skipping down).

Note that in GRC SKIP and the DOWN ARROW behave the SAME; both Skip by SHOTS, not individual Events (unless the Shot is a single Event). In the case of a halted Timed Macro, Skip is not available (it's the same key as the Pause key). In this case use the Down Arrow to move to the next SHOT.

In Normal Manual Fire Skipped Shots can also be re-accessed by going HOME, which will locate to the VERY TOP OF THE ENTIRE DATA TABLE, and then skipping down to the

previously Skipped Shot. Perhaps GO TO SHOT or GO TO ADDRESS can locate the previously Skipped Shot more quickly.

If you need to move by individual Event Lines within a SHOT, these can be accessed in Normal Manual Fire (not in GRC) by Skipping (go to top of Table by HOME, if necessary first) or Locating (Go To Shot / Address) to the top of the desired Shot and then using the DOWN ARROW to move within that Shot. In Normal Manual Fire, Skip moves by Shots and the Down Arrow moves by single Event Lines.

This behavior difference of the Down Arrow between Normal Manual Fire and Group Caliber Fire protects Group Caliber Fire so that you cannot mess up a "Shot" in Group Caliber Fire (disrupt a Timed Macro or partially Fire any Zippers within the Group Caliber selected). In "the heat of the battle" is no time to get your GRC "Shot" messed up because you used Down Arrow and got trapped in middle of Shot. So therefore in GRC, the Down Arrow is the same as Skip and moves by Shots only. GRC is for "Shots" and moving by individual Event Lines is not possible in Group Caliber Firing (unless, of course, a Shot is one single Event Line)

Be aware that in Normal Manual Fire it is possible to interrupt or "mess up" a Timed Macro or Zipper Fire by accessing and Firing an Event within that Zipper Fire or Timed Macro.

Remember that FIRING in Normal Manual Fire will move by sequences as set up in the logical progression of the Data Table, be they single Shots, Zippers, or Timed Macros. In Group Caliber, the behavior will be different due to capturing of Shots by the Caliber Number. GRC will move to the next available "Shot" which may be at an entirely different place within the Data Table.

Note also that in GRC, the PAUSE/SKIP key is used to HALT a Timed Macro from continuing. Press Fire to again start the Clock or press the DOWN ARROW to CANCEL the TIMED MACRO. When the Timed Macro is halted by Pause, then when the Down Arrow is depressed, the Field Controller advances to the NEXT SHOT. Skip/Pause is not available (to move to the next Shot) because it has already been used to halt the Timed Macro.

In Normal Manual Fire (upon Pause of Timed Macro), the Down Arrow will move to the next Event Line, which, as previously mentioned, may be in the middle of the Timed Macro. In this case, now Skip can be depressed to move out of the Timed macro to the next "Shot" (because the Timed Macro has been disengaged by the action of the Down Arrow and the Skip key is now available).

NOTE THAT THE SKIP KEY AND THE PAUSE KEY ARE PHYSICALLY THE SAME IDENTICAL KEY.

Rephrasing, in Normal Manual Fire, PAUSE/SKIP is depressed to Stop the Timed Macro from running and Time is Frozen. At this time the only keys that work are Stop, Fire (continues clock), and the Down Arrow (besides selecting another Operating Mode). The Down Arrow cancels the Timed Macro and moves to NEXT EVENT ONLY. Skip/Pause was not available because it was already used for Pause. After using the Down Arrow, which moves to the Next Event, a problem may be caused if you are still within a Timed Macro. When you press Fire again you will not continue with the Timed Macro, but will Fire the next Event, which may or may not be what you intend. The reason is that the start of the Timed Macro (which was the combination of the first and second Event Lines) has already gone past. USE SKIP TO MOVE PAST THE HALTED TIMED MACRO.

GROUP CALIBER FIRING NOTES & POTENTIAL PROBLEMS

Group Caliber introduces a new behavior to the Field Controller revolving around the concept of "shots". When the Manual Fire Operating Mode is depressed on the Field Controller, the Data Table is additionally sorted into a series of Group Caliber "shots" by means of an internal set of reference "pointers". These pointers define the locations of the specific GRC numbers within the Data Table.

Thus Shots related to a specific Caliber Number MAY OCCUR ANYWHERE WITHIN THE DATA TABLE. Group Caliber Firing can cause RADICALLY different behavior than Sequentially Firing the Data Table, as in Normal Manual Fire, because of GRC's ability to move ANYWHERE within the Data Table.

A Shot is defined as any consecutive, sequential series of 2 or more events in the Data Table which have THE SAME EVENT TIME, REGARDLESS OF THE PFT. Additionally GRC "shots" are defined by the Caliber Number, being from 1 to 15 for the FIRST Event of that Shot.

Therefore a series of Events set up (such as for Auto Fire) with different non zero PFT's have the risk of being only partially Fired in Group Caliber Firing or ALL skipped completely with Skip in Manual Fire.

Note that the Shot Number for GRC is ONLY required and used for the First Event of that Shot (for a "Shot" that is more than 1 Event, such as a Zipper / Macro). Thus it is possible to "capture" an Event within a Shot that has a different Caliber Number than the Caliber Number of the first Event of that Shot. This different Caliber Number Event Line may be within 1 - 15 Caliber range for GRC, but that Event will not be available for that other GRC because it it belongs to the Shot sequence as defined by the Zipper / Macro.

Be aware of these potential pitfalls caused by having sequential Lines in the Data Table with identical Event Times. These are normally Zipper Firings or Timed Macros.

Consider 2 Events which have the same Event Time and are sequential within the Data Table. They have different PFT's (so NOT a Zipper Fire), and the first Event PFT is NOT EQUAL to 0 (so NOT a Timed Macro). If they have different Caliber Numbers (and the first Event Cal # is within GRC range), the second Event is "captured" as a "shot". Additionally GRC Fire will ONLY FIRE THE FIRST EVENT, whereas in Normal Manual Fire, each can be Fired as a separate Event (because each has different non zero PFT's, therefore a Zipper will not be executed, so each is considered as an individual Event in Normal Manual Fire). If the second Event were to have the same PFT as the First, then a Zipper Fire would be executed in GRC or Manual Fire.

It is important to note that regardless of the Caliber Number of the second Event, it is NEVER available to GRC as a separate Event (same Event Time LOCKS together as a "shot", by definition).

Also the fact is that GRC Caliber Number is NOT required & has no meaning if different from the 1st line OF A SHOT on subsequent same Time (simultaneous) Event Lines (GRC will capture sequential simultaneous (same Event Time) Events on the basis of the Caliber Number of the first Event Line).

POTENTIAL PROBLEM occurring from above; A Simultaneous Event, or SEQUENCE, set up for Auto Fire (same Event Times, different non zero PFT's), having different Caliber numbers, the first caliber number within 1 to 15. If you were to Fire this in Group Caliber as a Shot, then ONLY the first Event would be Fired. The second Event would be unavailable in any Group Caliber and could not be Fired in Group Caliber. In Manual Fire you would have to Fire each as a separate Event.

WARNING - CAUTION

NEVER ATTEMPT TO LIVE FIRE IN GROUP CALIBER A DATA TABLE WHICH HAS BEEN SET UP FOR USE IN AUTO FIRE.

FOR MANUAL FIRE BACKUP OF A DATA TABLE SET UP FOR AUTO FIRE, INERT TEST FIRE EVERY EVENT OF THE DATA TABLE. WATCH FOR TIMED MACROS OR OTHER UNEXPECTED BEHAVIOR AND CORRECT THESE PROBLEMS BEFORE ANY LIVE FIRING.

BE AWARE THAT FOR AN AUTO FIRE SIMULTANEOUS SEQUENCE, (made up of event lines with different PFT's), THAT IN MANUAL FIRE, MULTIPLE DEPRESSIONS OF THE FIRE BUTTON WILL BE REQUIRED TO FIRE EACH EVENT OF THE SIMULTANEOUS SEQUENCE.

AUTO FIRE OPERATING MODE SECTION II-15

SUPPORT FOR ALL TYPES SMPTE / MTC TIME CODE + OFFSET FEATURE

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ SMPTE OFFSET TIME:hh:mm:ss:ff ³
³ RUN=FIRE TABLE #:x ³
```

The current setting of the SMPTE / MTC Offset is displayed on the Top Line. NORMALLY THE OFFSET SHOULD BE SET TO ZERO 00:00:00:00. For very special applications, HOUR Offsets may be used. In this case, BE SURE THE OFFSET IS THE HOUR OFFSET THAT DATA TABLE "x" REQUIRES.

The RELTIME (Relative Time, the Incoming SMPTE / MIDI Time Code MINUS the OFFSET) is the Time that AUTO FIRE uses to FIRE the selected Data Table.

IF A NON-ZERO OFFSET IS USED LARGER THAN THE INCOMING TIME CODE, THE FIELD CONTROLLER WILL REMAIN FROZEN AT THE "WAITCODE" LCD DISPLAY.

When Valid Time Code is received the LCD will appear as below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ LINE SHOT hh:mm:ss:ff  PF ADD CA TYPE ³
³ IN SYNC  HH:MM:SS:FF LFyyy MFxxx ³
```

TYPE OF TIME CODE BEING RECEIVED IS INDICATED AS;

- 30 ND (30 frames per second, Non Drop)
- 30 DF (30 frames per second, Drop Frame)
  (same as 29.97 NTSC Video Drop Frame)
- 25 FPS (25 frames per second EBU)
- 24 FPS (24 frames per second for Film)
- INTCLK; INTERNAL CLOCK

(at previously established Frame Rate; one of above)

NOTE: INTDRIVE will also show in the lower left Corner

Once valid SMPTE Time Code is received THE SYNCHRONIZATION OF THE INTERNAL CLOCK SPEED and FRAME COUNTING IS ESTABLISHED. This means that should the SMPTE Time Code input stop or become distorted (unrecoverable) the Auto Time Switchover feature will continue operating Fire according to the Internal Clock. THE TIME CODE DISPLAY WILL NOW SHOW "INTCLK" (for internal clock) where the Time Code TYPE was Displayed (upper right hand corner) and INTDRIVE (lower left corner) . The Internal Clock will operate at with the Same type of SMPTE Time Code present before SMPTE Time Code was lost. This means that, for example at 25 fps (25 frames per second), the Internal Clock will count at 25 frames per second to keep exact sync as if 25 fps SMPTE was still coming in at the same rate.

For Field Controllers so equipped, the SMPTE BLUE LED will be illuminated WHENEVER valid SMPTE Time Code is being received.

CAUTION - WARNING

THE SMPTE/MIDI TIME CODE TYPE FOR FIRING MUST BE THE SAME TYPE OF TIME CODE USED FOR SCRIPTING, and in fact must be the same exact time code to which the Events were Scripted. OPERATING AUTO FIRE WITH A DATA TABLE SET UP FOR ONE TYPE OF SMPTE/MIDI TIME CODE WITH A DIFFERENT TYPE OF SMPTE/MIDI TIME CODE MAY RESULT IN MISSED SHOTS AND/OR UNEXPECTED FIRINGS AS WELL AS OUT OF SYNC BEHAVIOR.

For example, it is not possible to script at 30 DF (Drop Frame) and operate Fire with 30 ND (Non Drop) or absolutely timing errors will occur, shots will be missed and un-Fired, and the show will not be synchronized.

When valid SMPTE / MIDI is received the Indicator "WAITCODE" will changes to "IN SYNC". Once SMPTE / MIDI has been received, and then is lost, the Field Controller continues FIRING on Internal Drive, only now the indicator displays "INTERNAL" and "INTCLK". As mentioned previously, the Internal Clock will run at the Frame Rate established just prior to losing Time Code. If valid SMPTE / MIDI is re-established, then the indicator will revert to "IN SYNC". The indicator will continue to Display "IN SYNC" or "INTERNAL", as appropriate to whether running on valid SMPTE / MIDI input or on the Internal Clock.

This indicator is EXTREMELY USEFUL in determining the integrity of the incoming Time Code. Flickering or switching to "INTERNAL" indicated sections of bad Time Code reception. The indicator control is based on the reception of 5 previous frames of Time Code within the frame block times expected. If 5 frame blocks pass without any Time Code, then the Field Controller reverts to the INTERNAL CLOCK.

NOTE: IMPORTANT: SMPTE / MTC behavior is different than behavior with Pyrodigital Time Code.

THE SMPTE / MTC INPUT IS NOT ANALYZED FOR ERRORS

This is because SMPTE / MIDI is decoded by a third party SMPTE to MIDI, or direct MIDI input processor board. The output of this board is ASSUMED TO BE VALID AND CORRECT, and is the direct Time Code input for control of the Field Controller. Thus any bad SMPTE or MIDI input, or that which is interpreted as bad SMPTE or MIDI is directly passed on to the Field Controller as the absolute correct Time Code. THIS MAKES IT ABSOLUTELY NECESSARY THAT THE SMPTE / MIDI INPUT IS ACCURATE, STABLE, AND PURE.

Pyrodigital Time Code, on the other hand, has built in parity, or error checking ability, plus other advantages. Thus, unlike SMPTE / MIDI, the Field Controller is able to analyze Pyrodigital Time Code for errors or unexpected bad Time Code Frames and correct or compensate for problems. THIS IS ONE OF THE MANY REASONS WHY WE ABSOLUTELY RECOMMEND THAT YOU ALWAYS, ALWAYS, USE PYRODIGITAL TIME CODE IF AT ALL POSSIBLE. SMPTE / MIDI Time Code is a very fragile and NON-robust Time Code that is really not suitable for this application, even if it is a “standard”.

MSC, Option 4

MSC, or MIDI Show Control Firing is covered as a complete separate Section in this User’s Guide. SEE MIDI SHOW CONTROL FIRING.

OPTIONAL DEFEATABLE AUTO TIME SWITCHOVER

For VERY SPECIAL APPLICATIONS ONLY the Internal Clock can be disabled so that the Field Controller will Stop Firing when the Time Code input stops and resume Firing when Time Code input resumes. This feature functions with Pyrodigital Time Code as well as with SMPTE and MIDI Time Code.

This may be selected (and verified) under SET-UP (Option 5) of the DATA TABLE OPERATING MODE. Re-Initialization of the Field Controller will reset to enable Auto Time Switchover (the Default condition). SEE DATA TABLE OPERATING MODE, Option 5 = SETUP, OPTION 0 = TAPE CLOCK MODE.

WARNING - CAUTION

DO NOT Operate the Field Controller with the Auto Time Switchover Feature Defeated (Defeated = 1 = Stop when Tape Stops) unless operating under VERY special circumstances. Disabling Auto Time Switchover can cause the Field Controller Operation to become erratic or unstable with poor or bad Time Code.

NORMAL OPERATION IS ALWAYS WITH AUTO TIME SWITCHOVER ENABLED (Data Table Operating Mode, Option 5=SETUP, Option 0=Tape Clock Mode, Auto Time Switchover Mode=0=AUTO SWITCH)

There will be a brief period of time before the Field Controller stops running when Time Code Input Stops. This will be longer with SMPTE or MIDI Time Code (as opposed to Pyrodigital Time Code).

When Time Code stops the Field Controller LCD Display will appear as "frozen", awaiting further input to Time Code.

THE * ASSTERICKS FUNCTION

When the Field Controller transmits a Firing Command, in Auto or Manual Fire, an * (Asstericks) is placed directly behind the Address for that event line only. This is so the Field Controller knows that it Fired that event.

After you have Fired a table (either Live or in Inert testing) you can review the table to check for Asstericks to be sure that the Field Controller actually, in fact, issued a Firing Command to that Address. You must check for Asterik BEFORE you re-enter any powered mode (Auto Fire, Manual Fire, or Check Status) because the Asstericks are cleared / reset each time you enter a powered mode. Also a minor nuisance bug in the Software will clear the Asterik if you depress END to go to the end of the table in the data table, edit (option 0) mode.

DO NOT DEPRESS END in EDIT if you wish to check the Asterik. Check each and every Event Line with the Up / Down Arrow Keys (Home is also OK to use) for an Asterik (*) behind each Event Line's Address. Note that the Field Controller may be powered off and the Asterik on each event will be retained, as long as you do not clear (by entering a powered mode) or depress End in edit when you power up the Field Controller at a later time.

Looking at the Asterik is useful in 2 cases: 1) non-fired shots that appear to be fully connected; was a Firing Command issued by indication of an asterik?, and 2) play the tape in an INERT mode to check bad or suspected bad portions of the time code to be sure no event frames are skipped or missed. This is especially critical with SMPTE or MIDI Time Code (to easily make continuous SMPTE frame Time Table, See Data Table Operating Mode, Edit, Option 0, Auto Fill in Time Field, Quick Entry, Option 0).

SPECIAL CAUTIONS FOR THE AUTO FIRE DATA TABLE

- AUTO FIRE IS NOT POSSIBLE WITH INVALID DATA TABLES;

NO DATA TABLE

DATA TABLES WITH NO TIME EVENTS

DATA TABLES WITH PFT GREATER THAN EVENT TIME

- Make sure that the FIRE TIME does not occur before the start of the Running Time, because the Event cannot be Fired.

In Internal Clock Drive do not specify a Firing Time (Event Time minus PFT) before AT LEAST 2 frames (00:00:00:02)

AS RECOMMENDED, ALWAYS USE EVENT TIMES GREATER THAN 10 SECONDS (then any possible PFT cannot cause problems).

In Time Code Drive (External, all Time Code Types) do not specify a Firing Time (Event Time minus PFT) before the start of the first Time Code number that will be received (those Events will be Un-FIRED). If you always use the recommended 60 second Time Code Leader, then this rarely becomes a problem, in any case allow at least 5 seconds for the Time Code to stabilize.

- FOR THE MF, MANUAL FIRE Direct Address Entry;

DO NOT PRESS ENTER after entering an Address, or that Address will NOT BE FIRED. After Firing this MF Address, notice that an Asstericks will be placed after the Address indicating that it has been Fired.

If you FIRE a device that is in your Data Table, then that device is not available to be Fired at it's Firing Time from the Clock (because you already FIRED it).

When using MF, ONLY THAT EXACT SINGLE ADDRESS WILL BE FIRED; NO ZIPPERS CAN BE FIRED.

HAZARD LOCKOUT FIRING SECTION II-16

INTRODUCTION

HAZARD LOCKOUT IS USED ONLY IN THE AUTO FIRE OPERATING MODE

While AUTO FIRE is running, any (or all) of the "Group Caliber Select" Buttons (on left side of Field Controller) may be depressed which causes ANY REMAINING EVENT LINES WITH MATCHING CALIBER NUMBERS TO NOT BE FIRED. Thus, for example, if Auto Fire is Operating, and you depressed Group Caliber #3, any remaining Event Lines in the Data Table with Caliber Number 3 would NOT BE Fired, as Auto Fire continues through your Data Table.

The "Caliber Number" can be used to represent whatever Event Line(s) you chose. The Caliber Number can relate to specific types of Devices or relate to Zones or Specific Areas within the System Network, such as "stage far left", for example.

Any, or all or the sixteen (16) Group Caliber Buttons may be used, depending on the desired results.

WARNING - EXTREME DANGER

DO NOT ROUTINELY USE OR DEPEND ON HAZARD LOCKOUT TO ENABLE YOUR DISPLAY TO SAFELY CONTINUE. STOP FIRING AND DISABLE OR DISCONNECT SPECIFIC DEVICES OR FIRING MODULES SHOULD AN UNSAFE CONDITION ARISE, BEFORE CONTINUING.

HAZARD LOCKOUT WILL ONLY LOCKOUT EVENT(S) FROM FIRING ACCORDING TO THE MATCHING CALIBER NUMBER(S) WITHIN THE SELECTED DATA TABLE

THIS PLACES VERY SPECIFIC REQUIREMENTS ON THE SELECTED DATA TABLE TO ALREADY HAVE MATCHING GROUP CALIBER NUMBERS WHICH CORRESPOND TO THE CALIBER NUMBERS OF GROUP CALIBER SELECT BUTTONS (Limited to Numbers 1 through 16) FOR THE EVENT LINE(S) DESIRED TO BE BYPASSED

WITHOUT SPECIFIC AND PRE-PLANNED DATA TABLES RELATING TO SPECIFIC CALIBER BUTTONS, HAZARD LOCKOUT MAY FAIL TO DISABLE FIRING OR CAUSE UNPREDICTABLE RESULTS

YOU MUST ABSOLUTELY KNOW YOUR DATA TABLE AND KNOW EXACTLY WHAT YOU ARE DOING TO USE THE HAZARD LOCKOUT FEATURE

HAZARD LOCKOUT CANNOT BYPASS DEVICES WHICH ARE PHYSICALLY CONNECTED TO THE WRONG ADDRESS (therefore NOT MATCHING the intent of the Data Table).

Additionally, any use of Hazard Lockout will intentionally leave un-Fired devices which must be Safely un-Loaded and/or removed.

Also, UNINTENTIONALLY OR ACCIDENTAL DEPRESSION OF ONE OR MORE OF THE GROUP CALIBER BUTTONS DURING AUTO FIRE MAY CAUSE UNEXPECTED NON FIRING OF VARIOUS DEVICES. This may occur in a random and unpredictable nature if the Data Table Caliber numbers were NOT specifically set-up for Hazard Lockout.

THEREFORE DO NOT ACCIDENTALLY DEPRESS OR PLACE OBJECTS ON THE NOW FUNCTIONAL GROUP CALIBER KEYS. The User may depress the "Display Shots Remaining" Button during Auto Fire to verify that none (or only those desired) calibers are to be bypassed.

DATA TABLE SET-UP FOR HAZARD LOCKOUT

The DATA TABLE MUST BE PRE-PROGRAMMED WITH CALIBER NUMBERS TO MATCH THE DESIRED LOCKOUT RESULT. The ONLY Caliber Numbers used for Hazard Lockout are Numbers 1 through 16. These are the SAME numbers on the Caliber Group Select section of the left side of the Field Controller.

If, for example, you wish to have potential Hazard Lockout capability of all 12" shells, then all Event Lines with Addresses which actually are connected to 12" shells MUST HAVE THEIR CALIBER NUMBERS AS 12 IN THE DATA TABLE FOR EACH EVENT LINE.

If, for example, you have some devices at stage far left which you may want to disable for High Wind conditions DURING AUTO FIRE, give each of these Devices caliber number 5 (for example) as they occur in the Data Table.

The idea is that when you depress Group Caliber number 5 (or 12), while Auto Fire is running, you will cease to Fire, or Bypass any remaining Event Lines with Caliber Number 5 (or 12). The Field Controller will Bypass any Event Lines that exist within the Selected Data Table (treat them as skipped) when the corresponding Group Caliber Number is Depressed during Auto Fire.

HAZARD LOCKOUT OPERATION

Simply Depress the desired Caliber Number Button WHILE AUTO FIRE IS RUNNING to bypass the Event Lines which correspond to the selected Caliber Number. The Field Controller emits a normal "beep" when any Group Caliber Button is depressed.

Note that any selected Group Caliber can be De-selected, or reinstated to Fire, by again depressing the same Button. In this case the Field Controller emits a "lower tone beep". Thus THE GROUP CALIBER HAZARD LOCKOUT BUTTONS MAY BE CONTINUOUSLY TOGGLED ON AND OFF.

To Verify the status of each Hazard Lockout Selection, depress “DISPLAY SHOTS REMAINING”. The lower Button, below the Group Caliber Select Buttons, labeled “Press to Display Shots Remaining” may be depressed during Auto Fire to indicate which Caliber Numbers are to be bypassed. The LCD Display will appear as shown below;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Hazzard                                   ³
³ Lockout:                                  ³
```

ANY NUMBERS APPEARING IN LCD DISPLAY WILL BE THOSE CALIBER NUMBERS WHICH ARE LOCKED OUT.

The LCD Display below has ALL 16 CALIBERS LOCKED OUT as shown when the DISPLAY SHOTS REMAINING Key is depressed;

LCD DISPLAY

LINE SHOT TIME PFD ADDR CAL

```
³ Hazzard  1   2   3   4   5   6   7   8   ³
³ Lockout: 9  10  11  12  13  14  15  16   ³
```

Note that the Group Caliber selected for Hazard Lockout may be depressed WHILE THE DISPLAY SHOTS REMAINING BUTTON IS ALREADY DEPRESSED. This makes it absolutely clear when Hazard Lockout is enabled (or disabled).

HAZARD LOCKOUT USAGE

It is a good idea to check the Hazard Lockout LCD Display once in a while to be sure Calibers are Locked Out or NOT LOCKED OUT, as desired.

The Hazard Lockout Group Caliber Number cannot be “pre-selected”, but only selected while Auto Fire is actually running. If paused while running in internal clock, Hazard Lockout HAS NO EFFECT (the clock must be running).

Note, that should you Lockout a specific Caliber Number and the later Toggle the Button back to the Normal “off” state, you could leave a section of un-Fired devices (as per the Data Table), having only “Locked Out” those Event(s) for a portion of Time while running Auto Fire. There

could be several sections of un-Fired Event Lines for several Caliber Numbers, all depending on how you operated the Group Caliber Buttons for hazard Lockout.

Caliber numbers 0 (zero) or higher than 16 cannot, and will not, be affected by Hazard Lockout.

Re-Selecting any Operating Mode WILL CLEAR AND REMOVE ALL HAZARD LOCKOUTS (Reset to NO Hazzard Caliber Numbers are Locked Out).

MIDI SHOW CONTROL FIRING UPDATE SECTION II-17

IMPORTANT NOTE:

FOR USERS NOT FAMILIAR WITH MIDI SHOW CONTROL PLEASE SEE THE ENTIRE SECTION 17 IN THE MAIN SECTION I OF THIS USERS GUIDE

THIS SECTION ONLY UPDATES USERS OF FIELD CONTROLLERS ALREADY EQUIPPED WITH MIDI SHOW CONTROL

MIDI SHOW CONTROL UPDATES OF V3.00M FROM V1.50M

MIDI SHOW CONTROL OPERATIONAL NOTES

Even with new Configurable Memories, the Que Number, or Shot Number, cannot exceed 3 characters. Therefore the highest show number allowed is 999 for the 2,500 line Data Table. If the memory is Configured for 12 Data Tables of 475 Lines, then the highest Shot Number is 474. Similarly if the Data Table is Configured for 6 Memories of 950 shots, the highest Shot number allowed is 949.

RE-FIRE is now not possible with MIDI SHOW CONTROL. If you attempt to Re-Fire a shot (que) on the Field Controller, it just "beeps" and now posts the asstericks (*) after the Address of the Que # (Shot #) you just Re-Fired.

Note also in MSC that if a Shot Number (Que Number) is captured via a Zipper or Timed Macro Firing, then when the Zipper or Timed Macro is Fired, the captured Shot cannot be Re-Fired because it has already been Fired. This would only occur if you incorrectly tried to Fire a Shot that you had already placed within a Timed Macro or Zipper Fire.

Conversely, if you MSC Fire a shot in the Middle of a Zipper or Timed Macro before Firing the Zipper or Timed Macro (for some strange reason), then that particular shot within the Zipper or Timed Macro will be Fired again when the Zipper or Timed Macro is Fired (however that particular device will already have been Fired).

The MSC "Que Number" can only be used ONCE for the FIRST OCCURRENCE of that Shot Number within the Data Table (from the top of the Table). Subsequent issuance of the same Que Number by MSC will NOT re-execute this same shot number (the Field Controller will only "beep"). ALSO, AND MORE IMPORTANTLY, SUBSEQUENT SAME QUE NUMBERS (SHOT NUMBERS) WITHIN THE DATA TABLE WILL BE IGNORED (unless related to the First occurrence of this shot number by Zipper / Macro Fire, in which case the sequence

progression is DEFINED by the Zipper / Macro AND THE SHOT NUMBER DOESN'T MATTER ANYWAY).

It is also possible to have MSC execute in the middle of a Zipper / Timed Macro which was intended to start with a different Que Number by having a different Shot Number for event(s) within the Zipper / Timed Macro. Such bad usage of Shot Numbers with MSC Que calls could result in Firing of Event(s) which were already Fired Previously, or FIRING OF UNEXPECTED EVENTS due to a "hidden" shot number previous to, but the same as, the desired shot number.

Remember that every time an MSC Que is issued, it will ONLY act on the FIRST Occurrence of that matching shot number within the Data Table. Therefore if MSC issues the same Que Number again, it will only result in a "beep" from the Field Controller as the Que cannot be Repeat-Fired again.

ADDITIONALLY THE SECTION ON MIDI SHOW CONTROL, SECTION 17 OF THIS USER'S GUIDE HAS BEEN UPDATED. IT IS RECOMMENDED THAT THE USER REVIEW SECTION 17, MIDI SHOW CONTROL. ALSO ZIPPER FIRE AND TIMED MACRO HAVE BEEN UPDATED - PLEASE REVIEW THESE SECTIONS.

EXAMPLE MSC COMMAND

Consider the following MSC Command as a SYSEX Command;

FO 7F 63 02 60 01 34 37 30 F7

a) "FO 7F" set up the MSC Command
b) "63" is the MSC Device Number in Hex = Device # 99 in Decimal as entered on the Field Controller
c) "02" is for MIDI Show Control
d) "60" is for MSC Pyro, General Category # 60.
e) "01" for Device Number 1 in Pyro Category # 60.
f) "34 37 30" is a string for Shot (Que) Number 470.

("31" would be shot # 1)
("31 31" would be shot # 11)
("31 31 31" would be shot # 111)

g) "F7" completes the Command

MSC DEVICE NUMBERS ARE ENTERED IN DECIMAL FORM IN THE FIELD CONTROLLER SETUP MENU BUT ARE INTERPRETED AS HEXADECIMAL NUMBERS TO MATCH THE MSC GO COMMAND. (Example: "63" is the MSC Device Number in Hex = Device # 99 in Decimal as entered on the Field Controller).

MIDI SHOW CONTROL ECHO

The Field Controller sends an acknowledgment "ECHO", or command, out the MIDI OUT port when it issues a Firing Command to the Phase III System Network.

The MSC “ECHO” acknowledgment return sent to the MIDI OUT Port of the Pyrodigital Field Controller is;

F0 7F MSCDEV 02 60 20 F7

NOTES on above ECHO:

1) MSCDEV is the actual MSC Field Controller Device Number which has been entered into the Field Controller: ie Device Number set on Field Controller is #1, MSCDEV = 01 (default = 01)
2) This acknowledgment “ECHO” is ONLY returned if the Field Controller actually sent Firing Commands; ie:

    a) Valid MSC Go (Pyro) Command (for Field Controller)
    b) Data Table entry IS present
    c) Deadman Control IS activated

3) This return is sent to the MIDI OUT Port ONLY (MIDI thru Port would be MSC command, as sent unchanged, to Field Controller)
4) The ECHO return is always THE SAME, or identical, for each event Fired, regardless of which valid event was Fired.

APPENDIX A - DATA TABLE CONDITIONS SECTION - APPENDIX A

DATA TABLE REQUIREMENTS, LIMITS, CAUTIONS

This listing is provided as a Convenience for the User. This is a CONDENSED Listing of ONLY Some of the Requirements, Limits, and Cautions for DATA TABLES used with the Field Controller. The USER should check the respective Section of this User's Guide for more detailed information.

GENERAL

- ADDRESSES ONLY BETWEEN 010 AND 7FF
- ESPECIALLY IMPORTANT WITH 2,500 EVENT LINE DATA TABLE (NEVER use Box Address 00 or any Higher than 7F)
- DEPRESSING STOP OR RE-SELECTING AN OPERATING MODE WILL CLEAR AND
- RESET ALL INFORMATION ON WHAT HAS BEEN FIRED
- CALIBER GROUP SELECT NUMBERS HAVE DIFFERENT FUNCTIONS
- IN AUTO FIRE - USED FOR HAZARD LOCKOUT
- IN MANUAL FIRE - USED FOR CALIBER GROUP FIRING
- MONITOR THE ACTIVE TEST LIGHTS TO CHECK FOR SHORTS
- DON'T CHANGE DEFAULT VALUES IN SETUP
- "MIXED MODES" OF FIRING SHOULD NOT BE ATTEMPTED. SET UP DATA TABLES AND USE FOR A SPECIFIC TASKS ONLY.

MANUAL FIRE

- REMOVE ALL NON FIRE EVENTS, SUCH AS NOTES.
- NEVER USE THUMBWHEEL ADDRESS 00 (only box Addresses 01 - 7F)
- BE CAREFUL OF ANY EVENT LINE WITH A 0 (zero) PFT. (can Start Timed Macros)
- SORTING BY TIME WITH VER250 SUPER SCRIPT CAN BE DISASTROUS
- FOR THE MF, MANUAL FIRE Direct Address Entry: DO NOT PRESS ENTER
- NO ZIPPERS CAN BE FIRED.

ZIPPER FIRE

- EACH EVENT LINE MUST HAVE A TIME ENTRY SPECIFIED
- EACH EVENT LINE MUST BE IN SEQUENTIAL ORDER
- EACH OF THE TIME ENTRIES MUST BE THE SAME TIME NUMBER
- EACH OF THE PRE-FIRE TIMES MUST BE THE SAME
- MAXIMUM OF 40 EVENTS PER ZIPPER
- TIMED MACRO (Subset of Zipper Fire)
- EACH EVENT LINE MUST HAVE A TIME ENTRY SPECIFIED
- EACH EVENT LINE MUST BE IN SEQUENTIAL ORDER
- EACH OF THE TIME ENTRIES MUST BE THE SAME TIME NUMBER
- THE TIME NUMBER MUST BE GREATER THAN THE LARGEST PFT :(use 10 seconds MINIMUM to always avoid trouble)

- THE FIRST EVENT MUST HAVE PFT SET TO 0 (ZERO)
- EACH SUBSEQUENT EVENT LINE MUST HAVE A NON-ZERO PFT EQUAL TO (Zipper Fire) OR GREATER THAN (Timed Macro Fire) THE PREVIOUS EVENT LINE
- TIMED MACRO FIRE CANNOT START WITH A ZIPPER FIRE:(NOTE: start Zipper at 1/10 of a second)
- MAXIMUM OF 7 EVENTS PER EACH PFT TIME:(Zipper Firing WITHIN Timed Macro Limited to 7 Events per each 1/10 of a second)
- CALIBER GROUP FIRE (GRC):LIMITED TO 255 EVENT LINES MAXIMUM PER CALIBER
- FUNCTIONS (AND COUNTS) BY SHOTS ONLY
- SKIPPED SHOTS COUNT AS SHOTS REMAINING
- 99 SHOTS MAXIMUM CAN BE DISPLAYED AS SHOTS REMAINING
- WATCH OUT FOR “CAPTURED” EVENT LINES BY DEFINITION OF A SHOT (Shot = sequential Event Lines with Same Event Time)

AUTO FIRE

- NEVER USE THUMBWHEEL ADDRESS 00 (only box Addresses 01 - 7F)
- INVALID DATA TABLES;
- NO DATA TABLE

- DATA TABLES WITH NO TIME EVENTS (EXCEPT in the case of MIDI Show Control)

- DATA TABLES WITH PFT GREATER THAN EVENT TIME

- RUNNING TIME MUST START BEFORE FIRE TIME.

- ALWAYS USE EVENT TIMES GREATER THAN 10 SECONDS

- TIME CODE TIME AT LEAST 5 SECONDS BEFORE FIRE TIME

- FOR THE MF, MANUAL FIRE Direct Address Entry;

- DO NOT PRESS ENTER

- NO ZIPPERS CAN BE FIRED.

- MIDI SHOW CONTROL:Shot Numbers Requirements (equal to the Que Numbers);

- Shot Number 0 (zero) is NOT ALLOWED
  Maximum of 3 Digits = 999 Maximum