User Manual

Galaxis Showtechnik

PYROTEC

PFE Advanced Mini 5 Outputs

Firmware V2.5
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Table of contents:

1 Introduction

1.1 Safety instructions

Observe all safety instructions in this documentation! Safety instructions warn of dangers when handling devices and provide information on how to avoid them. They are classified according to the severity of the danger and divided into the following groups:

DANGER	Danger signals dangers for persons. If you do not follow the instructions for avoiding the hazard, the hazard will certainly result in death or serious physical injury.

WARNING	Warning indicates dangers for persons. If you do not follow the instructions for avoiding the hazard, the hazard is likely to result in death or serious injury.

CAUTION	Caution indicates danger to persons. If you do not follow the instructions for avoiding the hazard, the hazard is likely to result in minor physical injury.

NOTICE	Note signals dangers for objects or data. If you do not follow the instructions for avoiding the hazard, the hazard will probably result in damage to property.

TIP	A tip provides additional or supplementary information.

1.2 Requirements the operator has to fulfill and necessary qualification

This product may only be operated by persons of legal age. In Germany the user must be at least 18 years of age.

This product may only be used within the scope of a professional and occupational activity.

DANGER ⚠️ 2.1.1	**Unintended firing** Fatal injuries due to explosion/deflagration of pyrotechnic effects and compositions and secondary effects due to explosion (flying objects) • Handling of pyrotechnic items only by personnel qualified for the respective effect. • Intended use of the effects only. • Make sure that the required safety distance to persons is maintained. • Minimize the presence in the danger zone. • Follow all safety instructions and regulations at all times.

Make sure that all legal requirements for the performance of aerial display fireworks, stage fireworks (also known as close proximity pyrotechnics) and special effects are met in the respective country of use.

TIP	In Germany, these regulations of the employers' liability insurance association and the BAM, among others, apply: • DGUV-Vorschrift 213-049: Abbrennen von Feuerwerken • DGUV-Vorschrift 215-312: Sicherheit bei Veranstaltungen und Produktionen • BAM Py/2012/2: Leitfaden zu Sicherheitsmaßnahmen für das Verwenden von Feuerwerk der Kategorie 4

1.3 Safety Instructions

Safety instructions for the firing of pyrotechnical effects and aerial shells by using e-matches:

The following instructions are for your understanding about important and basic safety principles.

Our general safety requirements are based on our own experience plus the contact and feedback from our customers. These rules allow the safe and successful usage of all components of our wireless firing systems. With proceeding development of our products, we will continuously revise and adapt the safety standards in conclusion with your notifications and support.

The following safety instructions are part of all our operation manuals within our product range. These instructions are also available in printed form and can be downloaded via our internet homepage at any time. Please forward these instructions to any relevant persons in your company dealing with this topic.

Any technical device can potentially cause a fault. This could be encouraged through: wrong usage, unit damage, unit aging as well as the wear and tear of the unit. This fundamental thesis was the basic principle when writing these instructions.

1. Smoking or open fire is strictly prohibited within the safety zone!

2. Depending on the type, size and quantity of the pyrotechnical effects that are being used and depending on the local conditions, allocate the necessary fire prevention and first aid measurements.

3. In all cases respect and follow any national and technical regulations as well as the operation manuals respective to the pyrotechnical effects in use.

4. Make sure that non authorized persons are not within the vicinity of the pyrotechnical effects and to the respective firing system.

5. The safety boundary distances required by the manufacturer and authorities are to be respected. Secure the area so that non authorized persons cannot gain access to the same.

6. The operation manuals and safety instructions of the pyrotechnical manufacturers must be observed at all times. If in doubt these must be discussed with the relevant safety organisations.

7. The usage of pyrotechnical effects as well as the respective firing systems are only allowed to be used according to it's defined function.

8. The components of our firing system are to be covered or encased against burn-off cinders or weather conditions where necessary. Electrical contacts should be protected against corrosion, soiling and damage plus they should be cleaned regularly.

9. The contacts of the pyrotechnical articles or their e-matches, which have not yet been connected, must always be short circuited.

10. We recommend to have our products inspected every one to two years. Along with the testing of the rechargeable battery, a visual test as well as a functional test will prove that the operational safety standards are still met.

11. Do not use damaged equipment. If a damage is found, immediately send the device back to the manufacturer for professional repair. Our warranty for the proper function for our equipment is only for components of our system, which have no damage.

12. Any changes in the devices or to the firing system as well as repair work on the units other than that through the manufacturer will invalidate any warranty claims and our product liability will be void. Should repair of the units be necessary, then we do require a detailed report of the problem.

13. Please make sure when lending or renting out the equipment, that no damage has occurred during the rental period of the units. Advise your staff, that it is very important to report any possible damage of the units immediately. Customers, which have borrowed or rented the equipment are hereby informed, that it is their duty to report any damage found or suspected on the unit when returning such.

14. Wire connections from the firing device to the e-matches are always to be insulated. At the same time avoid wire damage, for example through heat, cable twisting, cable pinching and burn-off cinders or through forced piercing. All cables must be checked before each use on it's faultless construction. When using used wires we do recommend a continuity and short circuit test between each insulated connection before using it again.

15. The firing of igniters in accordance with 'SprengG' (i.e. German explosive law) is not allowed with our products. For this purpose only firing units with a special certification in accordance with 'SprengG' or equivalent are allowed. The same applies to high explosives.

16. Avoid unintended firing through electrostatic charging. When using e-matches, make sure that you only use those types which are protected against unintended firing through electrostatic discharges. The e-matches that you use should also have a BAM certification or equivalent.

17. Avoid possible or even physical contact of the e-matches or their firing lines with other conductible materials if the possibility is given that either a static discharge or potential equalization can arise.

18. Make sure that no unintended firing possibilities are given. Commonly caused either through strong electrical, magnetic, electromagnetical fields as well as other voltage sources.

19. An often underestimated risk are unintended firings due to live contacts found as charging contacts on mobile phones, walkie talkies as well as rechargeable battery driven tools. Even when due care and attention is taken, a battery pack or similar can be a hazard when dropped especially when live contacts are revealed.

20. Unintended firing can be caused by thunderstorms or the electrostatic fields during the drawing up of a thunderstorm. We recommend clearing and securing the area in question.

21. Another possible danger for unintended firings are potential equalization currents. Be aware that these currents may occur in between conductive building segments themselves or between these conductive segments and earth potential. Neither e-matches nor wiring should come in contact with such segments.
22. Please be aware that through your pyrotechnical effects ionized gases are created. The thereby produced ions increase the conductivity within the air. This ionization process can cause an electrical arcing especially within the vicinity of high voltage overland cables. This may lead to

lethal consequences for the pyrotechnicians and other persons. Please note that wind conditions can be totally different a few meters above the ground.

23. Please assure that the firing can only be initiated through the pyrotechnician. Keep firing system under lock and key! Within our safety concept, all firing systems are set with individual codes, which inhibit unintended and accidental firing through third parties. If requested we can also supply systems with the same coding. This may be necessary if in a company more than one transmitter is used or when companies exchange the units between each other.

24. With our using the key code numbers 901 and 311, we are using a standard key code, which can also be found in other products. On a customer's request we can also supply other key codes.

25. Please ensure that the relevant safety distances are met by everybody. The safety margins are to be kept as from the beginning of the project until the pyrotechnician releases the area after firing and containment of unfired effects and shells.

26. Connect at all times first the e-match to a 100% non-live firing line, which is also not connected to a firing unit. A pyrotechnical effect is given from the time onwards as 'armed' when the e-match wires are connected to the firing unit. This is independent if the units are on or off!

27. In the interest of your own safety and protection of the devices always use a sufficient length of firing wire.

28. Along with a sufficient length of firing wire you should ensure also the following:

In the field of display fireworks: The fireworks shells are only allowed to be loaded after the mortars have been stabilized and secured. Only after loading it is then allowed that the e-matches are connected to the respective firing units. At all times the most important rule is to never put your head or other part of the body into or over the mortar opening. This would also apply to other pyrotechnical effects.

In the field of special effects: Depending on the explosiveness of the pyrotechnical effects or materials that are being used it is advisable to proceed with higher care and attention (lies within the pyrotechnician's responsibility) and this could include for example a short circuit bridge over the contacts of the e-match to prevent unintended firing. Also it is possible to make a physical switch breakage in the firing line, which is only then closed when all safety instructions are met and kept! Should there be any unclarified situations, then discussions with the safety authorities are to be taken until all is clear for everyone. When it comes to the safety of your projects we are at all times at your disposal to develop a customized safety concept.

29. Make sure the devices are switched off before connecting the e-matches.

30. When stripping the cable insulation of the igniters and connecting them, you have to make sure that they are not stripped so long so that the conductors can touch each other. Short circuits between different outputs must be avoided by all means because this may cause unwanted firings.

31. When checking the various system parameters as well as during firing, nobody is allowed within the danger zone.

32. After the effects have been fired, an ample amount of time should be given before disassembling the pyrotechnical setup. Before securing

possible unfired effects first disconnect the corresponding wiring and then switch off the receivers. Especially in the field of special effects, during the installation special care should be taken of how to disassemble unfired effects or installations in a safe way.

33. When using receivers inside of Zarges cases it is important to make sure that the top case (aluminium top) is closed during the fireworks display. The lashes of the bottom case have to be locked to the top case. There is still enough space for the wires of the e-matches going out on both sides of the case. This guarantees the safety and protection of the receiver and also prevents opening of the top case due to windy conditions.

34. Read the user manual of all devices completely and follow all given instructions. Teach your staff and everyone in your company who will work with the devices.

35. Only use original accessories. Otherwise, the safety of the equipment cannot be guaranteed. Further information can be found in the chapter 'Accessories' in the respective user manuals.

The most current version of the safety instructions is always available in the download section of our website: www.galaxis-showtechnik.de

1.4 Application fields

The device PFE Advanced Mini 5 Outputs is suitable for the following areas of application:

- Lighting of category 2 end user fireworks
- Stage pyrotechnics of the categories T1 and T2
- Special effects (SFX)
- Triggering of effects on the body of performers (body hits)
- Lighting of illumination effects such as Bengali luminaires and strobes
- Lighting of ice fountains, candles etc. on tables during Gala Events (Table Top Pyro)

The device is not intended for use in aerial fireworks (categories 3 and 4).

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Also, under no circumstances may explosives be detonated. Specially certified firing systems must be used for this purpose (in Germany BAM certified devices).

Please observe the relevant safety instructions for the use of firing devices in the field of pyrotechnics and the safety instructions printed in these operating instructions.

An optional step function is also available for this device. This can also be retrofitted at any time.

2 Illustrations

PFE Advanced Mini 5 Outputs

Illustrations

2.1 Description of indicators and control elements

1	Magnetic sensitive area 'Down'	By pointing to this area with the magnetic pen the parameter of the current menu item will be decreased or changed. If you point on this field for a longer time the parameter will decrease automatically.
2	Magnetic sensitive area 'Up'	By pointing to this area with the magnetic pen the parameter of the current menu item will be increased or changed. If you point on this field for a longer time the parameter will increase automatically.
3	LC-Display	Displays the current information.
4	Multicolor LED indicators for Output 1-5	All relevant output conditions and test information will be displayed with various colors.
5	Terminal block connector	Positive and negative clamps of the outputs.
6	SMA antenna	Screwable SMA antenna
7	Magnetic sensitive area 'Mode'	By pointing to this area for some time, you will enter the menu. If you point to this field for a longer time, you will step through the different menu items automatically. At the end you will return to the receiving mode again.
8	Info LED	Displays status information like 'Operation' and 'Low Battery' with different colors.
9	Magnetic sensitive area 'On/Off'	By activation of this sensor field with the magnetic pen you switch on the device. You have the option to program the device that a user code has to be entered after power-on to prevent unauthorized usage. To switch off enter the main menu. The first menu item is 'Switch off'. If this sensor field is activated again the device is turned off.
10	Socket 'Antenna'	The antenna is connected here.
11	Locking for terminal block connector	The terminal block connector is locked in here. The terminal block connector can be removed by pressing the unlocking pin.
12	Identification plate	Identification plate incl. serial number
13	Battery case	Battery case for either 2x AA Alkaline batteries or 2x AA Eneloop rechargeable batteries
14	SMA antenna	Screwable SMA antenna
15	E-match cables	Example of how to connect e-matches

3   Basic operation of the device

3.1 Insertion of batteries, power supply, operation time

First you have to insert new batteries. Please mind correct polarity. Open the battery compartment, insert the batteries and close the lid again afterwards.

You should remove the batteries if you do not use the device for a longer time.

WARNING	Leaking batteries or moisture in the device
  2.1.6	Leaking batteries or moisture in the device may trigger firings. • The device must be protected against moisture. • Do not use the device after ingress of moisture. • If batteries have leaked, send the device to the manufacturer for repair. • Follow all safety instructions and regulations at all times.

3.2 Switching on

By a short activation of the sensor field 'On/Off' the device is being switched on.
First a start message is being displayed followed by the display of the software version:

```
    Galaxis          PFE Adv. Mini 5
    PYROTEC          V2.4  S Z
```

'S' indicates that the device has been equipped with the optional stepping function.
'Z' indicates that the device has been equipped with the optional Sleep function.

3.3 Warning messages after switching on

After the software version the device will display warning messages if there are any:

```
Temperature      !
Fuse:
```
The temperature fuse is blown. You will find more information in the section of the menu item 'Temperature Fuse'.

3.4 Code request

To restrict the operation of the device to authorized personnel only you can choose to set an access code. This option can be selected in the submenu.

For more information please see the section of the menu item 'Code' in this manual.
The device will not activate the receiving mode if no correct user code has been entered.

If '0000' has been selected as the access code no access code will be requested after power-up.

TIP	If you have forgotten the programmed code you are still able to operate the device by entering the universal code 16777216. You can program a new user code in the submenu after entering this universal code so that you can use your device normally the next time.

3.5 Receiving mode

The device will automatically enter the receiving mode after switching on.

Effects can only be fired if the device is in the receiving mode. For bi-directional remote access it is also essential that the device is in receiving mode.
These three alternating displays (e.g.) will be shown:

```
Dev.ID:  1 -|---
5 Outputs
```
```
Dev.ID:  1 ---|-
Hazard Zone:  A✓
```

The device ID number is permanently being displayed in the upper left corner.
The bottom line alternately shows the selected operation mode, ground mode and the hazard zone, which the receiver has been assigned to.

For detailed information regarding the topics 'Device ID Number' and 'Hazard Zones' please see the corresponding sections in this manual (menu items in the submenu).

In the upper right corner, a vertical bar is moving back and forth to show that device is in receiving mode.

3.6 Teach-in of receivers

The teach-in of a receiver to a transmitter or controller can be executed in receiving mode. This function is particularly helpful if you rent devices or want to split your system into several independent systems.

To teach-in a receiver, you need a PFC Advanced controller, the PFC Advanced Black Edition, the PFM Advanced USB Radio Modem or the PFS Pocket. In the respective transmitter manual you will learn how to get to the respective menu item in order to execute the 'Transmit System ID' command.

In order for the PFE Advanced Mini 5 Outputs receiver to be taught-in, you must hold 'Up' on the receiver using a magnetic pen and select 'Transmit System ID' using the transmitter. After successful execution, the message 'Teach-in successful' appears in the display of the PFE Advanced Mini 5 Outputs. The receiver then switches back to receiving mode.

TIP	Make sure that both the transmitter and the receiver to be taught are on the same radio channel. Otherwise the receiver cannot be taught-in.

3.7 The function of the Info LED

The following status information is being displayed by the Info LED:

Blue color, Continuously	The device is displaying start messages or the menu has been entered.
Blue color, Flashing	The device is in receiving mode.
Red color, Flashing	The device is in receiving mode and the accumulator should be charged because the charging level is below 30% (i.e. low battery warning).

If the flashing Info LED should be disturbing e.g. on the stage you can deactivate this function in the submenu. For further information regarding this feature please see the sections of the menu items 'Flashing LED if receiving' in this manual.

3.8 Switching off

The device is switched off by activating 'Mode' with the magnetic pen for approx. 1 second. Then you will enter the first menu item and you will see the following display:

Switch off?

The device will be turned off as soon as the sensor area 'On/Off' is being activated with the magnetic pen. You will enter the first main menu item by activating 'Mode'.

Saving Event Memory...

When the receiver is turned off, this message appears first.

I→O

Immediately afterwards, this display appears and the device switches itself off.

3.9 Firing mode

If the controller is in firing mode the display will show the following text e.g.:

Dev.ID: 1 ---F-
5 Outputs

Instead of the vertical bar a moving character 'F' is displaying that the controller is in the firing mode.

| TIP | Every time the firing mode is turned on or off the controller transmits this information to the receiver. If the status of the firing mode is being changed the receivers can only display the current status of the firing mode correctly if they are in the receiving mode and within radio coverage. |

| TIP | If the firing mode is being switched off all active outputs are turned off. It does not matter if the outputs have been turned on due to a conventional firing or by a firing of the terminal function. In addition, all stepping sequences that are currently in progress are deleted. All this requires that the receiver is within radio range and that this information is being received. |

3.10 The monitoring function Radio Interference

The receivers are monitoring their frequency permanently. An interference is present if an external carrier with a signal strength of more than 30% in respect to 100% maximum signal strength of the system is present for more than 45 seconds.

```
Dev.ID:  1 -RI!-
5 Outputs
```

'RI' stands for 'Radio Interference' and is flashing in the display. If the display backlight has been activated the display will be illuminated periodically, too. In this case it is advisable to check if the receiver has been installed close to a strong source of interference. Therefore, enter the menu item 'Interfering Signal' and check if there is a higher value all the time.

By stepping through the menu with the magnetic pen the warning 'Radio Interference' will be cleared. The device is always ready for use even if you do not clear this warning message.

TIP	If you switch on a receiver while the transmitter is in the firing mode the receiver will display the warning message 'Radio interference' soon. The PFS Profi, PFS Pocket and the PFC Advanced are transmitting continuously (i.e. they are active carriers) if they are in the firing mode. If you change from normal mode to firing mode the controllers are telling the receivers that a continuous and intended transmission will follow. If a receiver has been switched on after this or was in the menu while this signal has been sent it will interpret the signal of the own transmitter as an interfering signal.

TIP	You can select another frequency in the submenu of the device if the used radio channel is busy or if there is an interference. Of course, you have to select the same frequency also at the controller and all other receivers (only possible with Advanced series).

TIP	Using the controller PFC Advanced or the PFM Advanced USB Radio Modem the warning 'Radio Interference' and the level of interference can even be checked remotely.

3.11 The function 'Reset to defaults'

Sometimes it comes in handy to program the device to the default settings. To achieve this proceed this way:

1. Switch on the device
2. Activate the sensor field 'Mode' while the start messages are being displayed until you see the following display:

```
Set to      | Yes
defaults?   |  No
```

By activation of 'Up' the device is set to defaults. You will enter the receiving mode without anything being changed by 'Down' or 'Mode'.

```
Device has been
set to defaults
```

If you have selected 'Yes' in the previous request you will see this acknowledgement message in the display for some seconds. Afterwards the device switches to receiving mode automatically.

This list shows which parameters are reset by this function:

Hazard Zone	A, active
Acoustic Signals	On
Flashing LED if Low. Battery	On
Flashing LED if receiving	On
Submenu	Unlocked
Maximum resistance	10 Ohms
LCD Backlight	auto & dimmed

TIP	The memory of the channels and delays, the device ID number, the radio channel, menu language and the user code to switch on the device remain unchanged!

4   The menu

The menu is divided in two sections: the main menu and the submenu.
The submenu can be locked e.g. to simplify the operation for less skilled staff members.

4.1 The main menu

By activation of 'Mode' for approx. one second the main menu is being entered.
The first menu item is 'Switch off' and is fully described in the corresponding section in this manual.
For the following we are assuming that this menu item is being skipped by an activation of 'Mode'.

```
Info: Subemu is
deactivated!
```
If the submenu has been locked this information text is being displayed for approx. two seconds after skipping 'Switch off'.

4.1.1 The menu item 'Battery capacity'

You see e.g. this result in the display:

```
Battery
Capacity:      95%
```
In this example the remaining charging level is 95%. If the value decreases below 30% the charging reserve is being touched

TIP	The display of the accumulator capacity is related to an ambient temperature of 20°C. A fully charged battery could also lead to a reading of e.g. 80% if the temperature is very low.

TIP	The result of this menu item can also be displayed at the controller PFC Advanced or via the PFM Advanced USB Radio Modem by using the function 'Remote data request'.

4.1.2 The menu item 'Interfering Signal'

This is the next menu item. You may see this being displayed:

```
Interfering
Signal         5%
```
The device is measuring and displaying the signal strength on the used radio frequency permanently as long as this menu item is present.

Normally this function is used to find out the cause of a radio interference. Values below 15% are uncritical. If the radio channel is busy you can select another frequency. Please see the section 'RF Channel' in this manual for further information.

TIP	The result of this menu item can also be displayed at the controller PFC Advanced or via the PFM Advanced USB Radio Modem by using the function 'Remote data request'.

TIP	You can use this menu item for a range test, too. Activate the firing mode at your controller PFS Profi, PFS Pocket or PFC Advanced. The device is now measuring the signal strength of your controller. By changing the location of the receiver, you can try to find out which installation is best. You should definitely switch off the firing mode before you quit the menu and always make sure that there is no unintended activation of the firing button at the controller during the range test.

4.1.3 The menu item 'Last Range Test Result'

You will enter this menu item with another activation of 'Mode'. This function is mainly intended for users who are operating the transmitter PFS Profi or PFS Pocket. The new controller PFC Advanced is now offering the comfort of requesting the result of the range test remotely.

This function comes in handy if you do the set-up of the system without a helping person. After starting a range test at the transmitter the receivers are displaying the results for approx. 10 seconds.
Within this short period of time you can not check the results of many different receivers all over the place. This function enables you to ease this task.

Proceed this way:

- Switch on the receivers and start a range test at the controller.
- Go to each receiver, step through the menu and read the result which is being displayed under 'Last range test result'. This value has been displayed during the test.
- You can do another test if you like after reading <u>all</u> results.

Last Range Test Result: ?%	This means that there is no result stored in the memory of the device. There are several possibilities: Maybe no range test was made so far or the device was not within the radio coverage area. Another reason could be that the result has just been cleared by invoking this menu item before.
Last Range Test Result: 65%	In this example the signal level was 65%. Values below 30% are critical. If this should be the case please refer to the instructions in the section 'Radio range' in this manual.

TIP	The result is being cleared after stepping through the menu to ensure that the same result is not being displayed again after the next range test although the receiver is possibly out of reach. If you are using this function it is essential to read <u>all the old results before starting a new test</u> to make sure that they are all being cleared!

The next menu item is the entry point for the submenu. This is explained in the section 'submenu' in this manual.

4.1.4 The menu selection 'Output Programming'

The next activation of 'Mode' leads to the menu section 'Output Programming'. You can select one of the following choices by activating 'Up' and 'Down':

Output Programming: Keep up & Exit / Edit / Delete / Consecutive Channels

4.1.4.1 The menu item 'Output Programming: Keep up & Exit'

This option is preselected after entering the menu 'Output Programming'.

```
Outputprogr.:
Keep up & Exit
```

You will leave this menu without changes to the output programming of the device if you are activating 'Mode' here. Use this selection also after previously choosing another option to exit the menu 'Output Programming'.

4.1.4.2 The menu item 'Output Programming: Edit', without stepping function

The following section describes the editing of the channel programming assuming that the device has not been equipped with the optional stepping function. Therefore, this section is applicable for all devices even if the stepping function is present.

```
Outputprogr.:
Edit
```

Activating 'Mode' here will lead you to the editing menu of the channel programming.

```
Outp.  1♦: C  -
[--Ω]
```

An example of the editing menu is shown on the left. The double-headed arrow indicates which parameter is currently being changed with 'Up' and 'Down'. The output to be programmed can be selected in this example. Which output is being programmed right now is being displayed in red color by the output LED. The measured resistance value of the selected output is being displayed in the left corner on the bottom. The two horizontal bars inform you that the resistance is higher than the maximum measurable resistance of 99 Ohms.

```
Outp.  1 : C  -♦
[--Ω]
```

The required firing channel can be selected after a short activation of 'Mode'. The arrows are next to the channel value. '-' means that no firing channel (i.e. cue number) has been assigned yet.

```
Outp.  1 : C 53♦
[--Ω]
```

In this example the firing channel 53 has been assigned to output 1. If this channel will be fired later this output will fire immediately.

```
Outp.  2♦: C  -
[12Ω]
```

By another short activation of 'Mode' you can select the output again. The output number has been incremented automatically. Therefore, you are now editing output 2. Again, you see the current resistance of the connected firing line which is 12 Ohms in this example. You can rotate through the whole output programming simply by short activations of 'Mode'. If you want to select a certain output you can always position the arrow symbol next to the parameter 'output' and then activate 'Up' or 'Down'. Longer activations of 'Up' or 'Down' lead to an automatic changing of the current parameter with increasing speed.

```
Outp.  4♦: C276
[??Ω]
```

These two question marks ('??') are being displayed if the output number has just been changed because the receiver needs some time to measure the resistance of the output. If you are changing the output all the time the two question marks are being displayed constantly.

To quit the edit function, activate 'Mode' for approx. one second. You will reach the menu selection 'Output Programming' again and by selecting 'Keep up & Exit' you may exit this part of the main menu.

TIP	The editing of all relevant output parameters (firing channel, step delay) can be done either directly at the device or remotely from the PFC Advanced by using the function 'Remote data programming'. Furthermore, if our choreographic software PYROTEC Composer is being used, you may edit these parameters remotely with a computer and the USB Modem.

4.1.4.3 The menu item 'Output Programming: Edit', with stepping function

This section explains the detailed programming of the stepping function (i.e. semi-automatic firing).

```
Outputprogr.:
Edit
```
Select 'Outputprogr.: Edit' in the main menu and call up the edit menu with an activation of 'Mode' to program the stepping function.

```
Outp.  1♦: C  -
[--Ω]  D: 0.00s
```
This edit screen is being displayed for example. A stepping delay ('D' = Delay) can be entered in the right part of the bottom line. The arrow symbol for altering the various parameters can be positioned by short activations of 'Mode'.

```
Outp.  3 : C  7♦
[--Ω]  D: 0.00s
```
Firing channel 7 has been assigned to Output 3 in this example. The stepping delay is still 0.00s which means that the output will fire immediately as soon as the firing command for channel 7 has been sent.

```
Outp.  3 : C  7
[--Ω]  D: 1.52s♦
```
A stepping delay has been programmed here. 1.52s in this case. So the receiver will wait for 1.52s after receiving the firing command of channel 7 until it will fire the output 3.

Please see also the section 'The stepping function' in this manual which contains more general information about using this feature.

4.1.4.4 The menu item 'Output Programming: Delete'

```
Outputprogr.:
Delete
```
You can delete the whole channel programming memory here. During deletion all channel assignments will be cleared. If the device is equipped with the optional stepping function all delays will be set to 0.00s, too.

4.1.4.5 The menu item 'Output Programming: Consecutive Channels'

In some cases a consecutive programming of the channel numbers is convenient. This useful function in the menu 'Output programming' is intended to do this kind of programming very quickly.

```
Outputprogr.:
Consecutive CHs
```
To achieve an automatic channel programming in consecutive order select this option in the menu.

```
Are you    | Yes
sure?      | No
```
Activate 'Mode' and after that you are asked if you are sure to program consecutive channels.

```
Outputprogr.:
from    1 to    5
```
Activate 'Mode' and after that you can determine the channel area which should be programmed.

```
Outputprogr.:
from 101 to   105
```
This example shows that the user has selected a channel area beginning with channel 101 up to channel 105. This means that channel 101 will be assigned to output 1, channel 102 to output 2, etc.

```
Progr. CH:    101
```

You may see this being displayed after confirming your selection with 'Mode'. The channel which has just been programmed is shown in the upper right corner of the display. The device will be finished with programming shortly.

Of course, you may edit the firing channel assignment manually after the automatic channel programming.

```
Note: All Delays
are now 0.00!
```

All delay values will be set to 0.00s during the consecutive programming if the device is equipped with the optional stepping function. In this case after the automatic programming this information screen is being displayed.

4.1.5 The Continuity and Programming Check: 'OK-PRG-Test'

'OK-PRG-Test' is an abbreviation for this function.

This test illustrates clearly and conveniently if the connected firing lines have sufficient continuity (OK Test). In addition information regarding the programming of the outputs is being displayed (PRG Test). Both test results are being displayed alternately and periodically. Which test result is being displayed is always clearly visible due to different colors that are being used.

```
OK-PRG-Test| Yes
Start?     | No
```

After another activation of 'Mode' you see this being displayed. Activate 'Up' to start the OK-PRG-Test. With 'Down' and 'Mode' you quit the main menu and enter the receiving mode again.

We begin with the description of the OK test.
While in this mode the following is being displayed:

```
Green=Resistance
of   1 -   5<10Ω
```

In the bottom line the current output range is displayed. The programmed maximum resistance is shown in the right corner on the bottom. The firing line is OK if the resistance is lower than the maximum resistance.

There are the following possible states for each output in this phase:

LED color:	Meaning:
Off	The output has no connection or the continuity of the connected firing line is insufficient (maximum resistance exceeded).
Green	The measured continuity is OK (resistance is lower than maximum resistance).

Only the LEDs of the outputs with sufficient continuity are illuminated green. The LEDs remain dark if the resistance is infinite or too high.

TIP	If the corresponding LED of an output with e-matches connected does not become green during the test this does not necessarily mean that no firing will happen. Possibly only the maximum resistance is exceeded. In this case you should take actions to reduce the line resistance to ensure that the e-matches will be fired reliably. In the menu 'Output Programming' the exact result of the resistance metering can always be checked.

TIP	The specification and metering of the maximum resistance is only meaningful if the firing line is a series connection of e-matches. The total line resistance of a parallel connection is lower than the lowest individual resistance. Therefore, no prediction regarding the firing capability can be made if a parallel connection is used.

The display phase with the programming information will follow the display phase with the OK-Test automatically. Meanwhile the following text will be displayed:

```
Blue=CH, Red=D
Magenta=CH&D
```

'CH' stands for Channel, 'D' for Delay of the stepping function. 'CH&D' means that both, Channel and Delay value, have been programmed.

The following states are possible:

LED color:	Meaning:
Off	The output is not programmed at all.
Blue	A firing channel has been assigned to the output but the delay value is still 0.00s.
Magenta	A firing channel has been assigned to the output and a delay value between 0.01 and 99.99s has been programmed.
Red	No firing channel but a delay between 0.01 and 99.99s has been assigned. This means that this output cannot fire because a channel programming is missing.

You can change the setting of the maximum resistance by activating 'Up' or 'Down' during the OK-PRG-Test. The selectable range is 5 to 50 Ohms. An e-match of type 'A' (i.e. all fire current of 0.8 Amperes) requires a typical setting of 10 Ohms. Using igniters of type 'U' (i.e. all fire current of 1.5 Amperes) a value of 5 Ohms should be selected. The maximum resistance is a criterion to predict the reliable firing of e-matches connected in series.

4.2 The submenu

The submenu can only be invoked if it is unlocked.

To unlock the submenu proceed this way:

1. Switch on the device
2. Activate the sensor field 'Up' while the start messages are being displayed until you see the following text:

```
Unlock      | Yes
Submenu?     | No
```

The submenu can be unlocked by activating 'Yes'. The activation of 'Down' or 'Mode' cancels the request without unlocking the submenu. You will automatically enter the receiving mode in both cases afterwards.

To enter the submenu first call-up the main menu by activating 'Mode'.
The following request is being displayed right after the menu item 'Last range test result':

```
Enter       | Yes
Submenu?     | No
```

This is the entry point for the submenu. By activating 'Up' you will enter the submenu. 'Down' and 'Mode' will skip this option and you enter the next item of the main menu.

We will explain the different items of the submenu in the following section:

4.2.1 The menu item 'Language'

```
Sprache/Language
English
```

You can choose the menu language here.

4.2.2 The menu item 'Code'

The 'Code' is a safety code request after power-up which is needed to operate the device.

```
Change      | Yes
Code?       |  No
```

In this menu item you can program the 4 digit code. If 0000 has been programmed there will be no code request after power-up. Activate 'Up' now to change the code.

```
New Code:
♦
```

If you have selected 'Yes' you will see this text in the display. The digits can be altered with 'Up' and 'Down'. With 'Mode' you jump to the next digit. If you activate 'Mode' and no number has been selected a '0' will be programmed for this digit.

```
New Code:
4567 activated
```

A code has been entered in this example. Memorizing your access code well is essential for the safety code request next time you turn on the device. For reasons of safety once programmed the code will never be displayed again.

TIP	If you have forgotten the programmed code you are still able to operate the device by entering the universal code 16777216. You can program a new user code in the submenu after entering this universal code so that you can use your device normally the next time.

4.2.3 The menu item 'Device ID number'

```
Dev. ID No. for
bidir. Comm.:  -
```

This is the next menu item in the submenu. A device ID number ranging from 1 to 999 can be programmed here. The device ID number is used as an identification address during bi-directional remote access. If no device ID number has been programmed the receiver can not be accessed from the controller PFC during remote data requests and programming. Normally the devices are programmed with ID numbers in consecutive order. It is not allowed to program the same ID number to more than one device.

4.2.4 The menu item 'RF Channel' (i.e. frequency selection)

This menu item enables the user to determine which radio channel (RF = Radio Frequency) is being used by the device.

```
RF Channel: 69♦
= 434.775 MHz
```

The device shows the channel number as well as the frequency. With 'Up' and 'Down' you can adjust the radio channel.

If you are changing the RF channel you will have to program all other devices to the new RF channel to ensure proper radio communication.

WARNING 2.1.4	**Unintentional triggering of a firing if the user is splitting a Galaxis firing system into two or more systems** Simultaneous operation of systems that vary only in terms of different radio channels bear a safety risk. If you split your Galaxis firing system into two or more systems: • Make sure that you have assigned different System IDs to the firing systems.

4.2.4.1 European Version (and also various other countries)

There are 70 different frequencies available between 433.0500 MHz and 434.7750 MHz in steps of 25 kHz. Normally you should use the frequency that has been assigned by the manufacturer and only switch to another channel if the selected frequency is occupied.

The frequency 433.9250 MHz (radio channel 35) and the two neighboring channels should not be used. This is a heavily used standard frequency and radio interferences are likely to occur.

In the countries Azerbaijan, Georgia and Russia the European harmonization standards have not been completely implemented so far. If you have an application in these countries, please ask the manufacturer or the appropriate authorities in the specific countries if a license exempt usage is possible or if you can apply for a license or if the usage is prohibited.

Other regulations may apply in non-European countries. Please ask the manufacturer if you need more information about the usage of frequencies. Most non-European countries allow the frequencies used by us. For customers in the USA and Canada we provide devices with a different frequency band. Please see 'Version for USA/Canada'.

4.2.4.2 Version for USA/Canada

There are 360 different frequencies available between 458.0000 MHz and 462.4875 MHz with a channel spacing of 12.5 kHz.

You need to choose a frequency which allows nationwide use and which is exempt from any duties. More information can be obtained from frequency coordinators, the authority who is in charge of frequency allocation or the manufacturer. Even if the duty-free and nationwide usage of specific frequencies is possible, you have to register as user at the FCC before operating the devices. Upon your request we will provide the contact details of a competent frequency coordinator who will support you in this process.

Alternatively you can apply for a license. In that case you will get a frequency assigned by a frequency coordinator. The disadvantage of a license is that the usage of the assigned frequency is only allowed in a certain region. You are allowed to use this frequency in a specific radius only. Every usage outside of this radius demands an additional license, except you are using a nationwide frequency (see above).

The highest available radio channel is 359. The selection of the number '3' on the hundreds is only possible if no inadmissible values form. For example: Forming radio channel 383 from 283 by pressing the arrow button 'Hundreds +1' is not allowed. Select a value from 0 to 5 in the tens before selecting the value 3 in the hundreds.

4.2.5 The menu item 'Determine Hazard Zone'

```
Determine
Hazard Zone:  A✓
```
Here you can change the receiver's hazard zone. The default setting zone is hazard zone A. The check symbol indicated that the hazard zone is active, i.e. the receiver processes firing commands.

```
Determine
Hazard Zone:  E✓
```
You may use up to 16 different hazard zone. These hazard zones are represented by the letters A to P. In this example the receiver has been assigned to the hazard zone E.

TIP	If you change the hazard zone in the submenu the status is 'active' by default. Thus, firing commands will be processed. If a specific hazard zone has been deactivated and you select another zone in the submenu for the time being and then select the previous hazard zone this zone will be activated by doing so.

The 16 hazard zones can be deactivated and also activated again according to your requirements in the manual and automatic firing mode of the controller PFC Advanced. For this please read the user manual of the controller PFC Advanced.

The hazard zone which is currently assigned to the device and its status is being displayed in the receiving mode. Besides the selected operation mode and the selected ground mode you see e.g. this being displayed on the receiver's LCD:

```
Dev.ID: 17 -|---
Hazard Zone:  G✓
```
In this example the hazard zone 'G' has been assigned to device with the device ID 17. The hazard zone is active.

```
Dev.ID: 17 -|---
Hazard Zone:  Gx
```
The symbol 'X' right next to the hazard zone indicates that this hazard zone has been deactivated. Firings are suppressed until this hazard zone is activated again.

TIP	The status of the device's hazard zone is always 'active' after switching the receiver on. Due to that firing commands will be allowed. We assume that all hazard zones should be active after powering up all devices so that only those hazard zones need to be deactivated which should not be active.

TIP	When you enable or disable hazard zones at the controller the receiver displays the current status of the hazard zone right after receiving the command if this hazard zone has been assigned to this receiver. The display backlight is activated also to show that the device has received the command. This is useful if you want to test if the receivers respond to the hazard zone commands.

4.2.6 The menu item 'Acoustic Signals'

This menu item switches the acoustic signals of the device on or off. Beep tones etc. may be disturbing on theatre stages and in this case it is meaningful to disable the sounds.
Please note that there will be no acoustic signals at all if the sounds are turned off, even no warning signal if the battery needs recharging.

```
Acoustic
Signals:      On
```

In this example the acoustic signals are enabled.

4.2.7 The menu item 'Flashing LED if receiving'

You can determine if the Info LED should flash in blue color while the device is in receiving mode. This may disturb in some applications and therefore the option for turning this function off has been implemented.

```
Flashing LED if
receiving.:  Off
```

In this case the blue flashing LED which is indicating the receiving mode has been deactivated.

4.2.8 The menu item 'Flashing LED if Low Battery'

This menu item is only present in the submenu if the indication of the receiving mode has been turned off in the previous menu item. Here you can determine if there should be an optical warning signal or not if the battery needs recharging (flashing Info LED in red color).

```
Flashing LED if
Low Batt.:   Off
```

With this setting as soon as the accumulator is being discharged below 30% the Info LED will begin to flash in red color in the receiving mode only.

You should disable this optical warning only if the flashing could be disturbing.

4.2.9 The menu item 'LCD Backlight'

This text for example is being displayed:

```
LCD Backlight:
auto & dimmed
```

The display backlight is turned on automatically as soon as the menu is called up or messages are being displayed. The display is illuminated slightly (dimmed) in all other cases. That enables you to read the display content in darkness without any further action required. The power consumption for this slight permanent illumination is negligible.

```
LCD Backlight:
auto & off
```

If you choose this setting the display backlight is completely turned off as soon as the device is not in the menu or if there is no message.
This is preferable in some applications where the slight illumination of the display could be disturbing.

```
LCD Backlight:
always off
```

With this setting the display backlight is off all the time.

4.2.10   The menu item 'Inner Temperature'

The temperature inside of the device is displayed in this menu item as a user information.

```
Inner Temp.:
          21°C
```

The temperature is allowed to vary in the range from -20 to +65°C. The LCD is becoming slow in extremely cold environments. This effect is completely normal and does not impair the function.

You should take precautions to prevent excessive overheating if the device is operated in extremely hot environments. Especially in very hot countries the device should not be exposed to direct sunlight. In most cases a simple protective cover will give shadow and will be sufficient to prevent overheating. The battery's life is reduced if the device is exposed to warm environments continuously.

4.2.11   The menu item 'Temperature fuse'

A temperature fuse is build-in the device. This fuse is blown as soon as the temperature rises over 72°C.

Sometimes a device becomes overheated in an SFX application e.g. if the fire department was not able to extinguish the fire fast enough after the shot was taken. This function enables the user to check afterwards if the device was overheated excessively. In this case you should send the device to the manufacturer to be checked thoroughly and repaired if necessary.

```
Temperature      *
Fuse:
```

If you see this display the temperature fuse is OK.

```
Temperature      !
Fuse:
```

The temperature fuse is blown. The device needs to be checked.

If the temperature fuse is blown the function of the device itself is not locked or limited but you should have the device checked before using it the next time. The high temperature trip point is also recognized if the device is turned off.

TIP	If the temperature fuse is blown a warning display is shown every time after powering up the device.

TIP	The status of this menu item can also be displayed at the controller PFC Advanced by using the function 'Remote data request'.

4.2.12   The menu item 'LED-Check'

This menu item is used to check if all six multicolor LEDs are operating properly.

```
LED-         | Yes
Check?       | No
```

You can start the test by activating 'Up'. The next menu item is being entered with 'Down' or 'Mode'.

This is the course of the test procedure:
Chasing light in primary colors red, green and blue;
all LEDs on in primary colors red, green and blue, one after another;
all LEDs on in combination colors magenta, yellow, cyan and white.

Magenta is the combination color of red and blue. Yellow is the combination color of red and green. Cyan is the combination color of blue and green. White is the combination color of red, green and blue.

It is a normal effect that the combination colors are slightly different from LED to LED because of the deviation in brightness. Color nuances are the result of that.

```
Activate Mode to
continue
```
All LEDs are emitting white light at the end of the test until 'Mode' is activated. Theoretically in this mode you could use the device as a provisional light source.

4.2.13   The menu item 'Recall Event Memory'

This menu item offers you the possibility to recall the event memory again if you have switched off the receiver. This is especially helpful if you want to determine the cause of an error after a show, but the circumstances prevent this from happening immediately afterwards.

```
Recall Event|Yes
Memory?      | No
```
By selecting 'Up' you can recall the Event Memory.

```
OK
```
Recalling is finished and you can then check the contents of the Event Memory directly on the device or remotely to narrow down the causes of errors.

4.2.14   The menu item 'Lock Submenu?'

This menu item offers the option to lock the submenu. This can be useful to simplify the operation for less experienced personnel.

```
Lock        | Yes
Submenu?    | No
```
You can lock the submenu by activating 'Up'. The submenu is closed without locking it with 'Down' or 'Mode'.

If you want to unlock the submenu please proceed as already explained in the beginning of the section 'submenu'.

After leaving the submenu the device will automatically switch back to the main menu.

5 The stepping function (optional)

The stepping function is used mainly if short firing delays are required.
Due to the high resolution of the delay programming the stepping function is ideally suited to generate e.g. accelerated stepping sequences.

There are also lots of applications in pyromusicals and in the SFX business.

Right after power-on you can see if a device is equipped with this function. If the stepping function is present 'S' will appear in the lower right corner of the display.

The following section describes the functional principle of the stepping function.
This stepping function is offering a completely new flexibility and is different compared to the devices PFE Profi 3/10 Outputs.

A stepping delay can be assigned to every output. The device will wait for this period of time after firing the programmed firing channel before the actual firing of the output will happen.
This stepping delay is called the 'Delay' parameter.

If you want to fire five outputs in a step sequence with a delay of one second you have to program those five outputs with the same firing channel. You can use any outputs of the device, they do not have to be adjacent. The firing of the firing channel will initiate the subsequent stepping sequence.
A zero delay (0.00s) is programmed to the first output so that this output will fire immediately.
The next output is programmed to 1.00s, the next to 2.00s and so on up to the fifth output which has to be programmed with a delay of 4.00s. The first output will fire simultaneously with the firing of the programmed firing channel. The other outputs will fire in steps of one second.

TIP	The programmed delay is always the absolute time from initiating the sequence to the actual firing of the output.

Fundamentally it does not matter which outputs are used for the stepping task. They do not have to be in consecutive order. In addition, any number of stepping sequences can be executed simultaneously.

You achieve an accelerated stepping sequence by reducing the time difference between firings with each step. The following example shows such a programming with five outputs:

Output No.:	Programmed firing channel:	Programmed step delay:	Delay between this and the consecutive firing:
1	34	0.00s	1.00s
2	34	1.00s	0.90s
3	34	1.90s	0.80s
4	34	2.70s	0.70s
5	34	3.40s	0.60s

In this example the difference to the consecutive ignition is reduced by 0.1s with every step.

Smart programming enables the user to extend a stepping sequence over many more than one device. The firing cue which is initiating the sequence is the same for all outputs involved even if the outputs are located on two or more separated devices and the delay parameter determines the timing.

If this way of programming is uncommon for you at first just imagine that every output has its own timer (0.00 to 99.99s) which is set to the programmed value at the moment of firing. After this time has elapsed the actual firing of the output will happen.

Prior to programming a complex stepping sequence, you should create a programming spreadsheet. After entering all parameters, you can fire a test ignition and watch the stepping sequence by looking at the red firing LEDs. Please note that no e-matches should be connected to the device for the purpose of testing because they would be ignited.

TIP	It is highly recommended to extend a stepping sequence over lots of devices to minimize cable runs. Only one output per receiver will be used for a sequence in the most extreme case like in this example:

Device 1;   Output No. 1   = Firing Channel 72; Delay: 0.00s
Device 2;   Output No. 3   = Firing Channel 72; Delay: 0.05s
Device 3;   Output No. 5   = Firing Channel 72; Delay: 0.10s
Device 4;   Output No. 1   = Firing Channel 72; Delay: 0.15s
Device 5;   Output No. 2   = Firing Channel 72; Delay: 0.20s
Device 6;   Output No. 4   = Firing Channel 72; Delay: 0.25s
Device 7;   Output No. 5   = Firing Channel 72; Delay: 0.30s
Device 8;   Output No. 1   = Firing Channel 72; Delay: 0.35s

This example shows a stepping sequence with eight firings. The selected interval time in-between the different firings is 50 milliseconds (i.e. 0.05s).
It does not matter which outputs you are using. Decisive is only the meaningful programming of the delay values and that the firing channel is the same on all outputs involved.
The advantage of this programming is that the devices can be spread over a large area e.g. on several pontoons but all devices are performing a stepping sequence together.

TIP	If you select the option 'Consecutive CHs' in the channel programming menu all delay values will be reset to 0.00s during programming. Therefore, you will see the following message after this procedure in the display:

```
Note: All Delays
are now 0.00!
```

TIP	The editing of all relevant output parameters (firing channel, step delay) can be done either directly at the device or remotely from the PFC Advanced by using the function 'Remote data programming'. Furthermore, if our choreographic software PYROTEC Composer is being used, you may edit these parameters remotely with a computer and the USB Modem.

6 Firing characteristic and firing power

6.1 General information

Due to the high output voltage of 20 V, e-matches can be connected in either series or parallel connection.

Provided that the conductor cross-section is sufficiently high, up to three e-matches of type 'A' or two e-matches of type 'U' can be fired in series or parallel connection.

WARNING	Unintentional triggering of an effect
⚠️ 2.1.2	Technical faults could possibly trigger firings. - Only connect the effects when the device is switched off. - Follow all safety instructions and regulations at all times.

When connecting in series, a thinner cable conductor cross-section can be used (at least 0.25 mm²).

TIP	If you want to fire a higher number of e-matches, you can program all outputs to the same cue and therefore raise the maximum amount of e-matches. With this method you can fire 15 e-matches of type 'A' or ten e-matches of type 'U' with this device in series or parallel connection.

6.2 Displayed information while firing

If a firing command has been received, the following text will be displayed:

```
Fire
Channel:     999
```
Each output which has been programmed to this firing channel will be ignited. If a delay (stepping function) has been programmed in addition the actual firing will be delayed accordingly.

The LEDs of all active outputs are illuminated in red color.

7   The function 'Event Memory'

The device is equipped with a so-called 'event memory'. As soon as a firing command or stepping sequence is being executed or a hazard zone is being disabled this event will be stored in the memory. After the show you can check which outputs have been fired on the receiver and which outputs did not fire due to disabled hazard zones or stopped stepping sequences.

When the receiver is switched off, the Event Memory is additionally stored so that it can also be called up the next time the receiver is switched on to investigate the causes of errors at a later point in time. If you want to access the event memory again after you have switched off the receiver, switch it on and navigate to the 'Recall Event Memory?' submenu item. After pressing 'Up', the event memory of the last operation is recalled. The event memory is automatically saved again when the device is switched off and is available the next time the device is put into operation if it is recalled again.

```
Outp.  3♦: C188
[--Ω] F  D: 0.00s
```
The 'F' next to the result of the resistance metering means that this output has fired at least one time since power-up of the device.

```
Outp.  4♦: C215
[14Ω] S  D: 7.50s
```
The 'S' represents 'stepping sequence'. This character is being displayed if a stepping sequence has been initiated but the output has not been fired either because the menu has been entered or the firing mode has been switched off at the controller before the time elapsed.

```
Outp.  5♦: C381
[ 2Ω] x  D: 0.00s
```
The 'x' means that the hazard zone which has been assigned to this device has been deactivated. All outputs which have not been marked previously with 'F' for 'Fire' or 'S' for 'stepping sequence' will be labelled with ´'x' in this case.

This is a useful function during fault finding and should help you to locate the cause of a misfired e-match.

TIP	The contents of the event memory can also be checked at the controller PFC Advanced or the PFM Advanced USB Radio Modem by using the remote access functions.

8   Radio range

The range is up to 400 m under good conditions.

The range can be easily increased if the device is positioned higher or if the antenna is installed at an elevated position by using an antenna extension cable.

It is a general rule that the higher the antenna is positioned the better the reception will be. Please do not hesitate to inquire for more information about the various possibilities of range improvement.

If your projects demand a high range, please contact us so that we can work out a tailored solution for your application.

8.1 Radio Range Test

The remote access functions of the controller PFC Advanced make very convenient radio range tests possible because the signal strength of both devices (signal back and forth) are displayed at the controller.

If you want to read the test result at the receiver or if you work with the transmitter PFS Profi or PFS Pocket the radio range test can also be done the conventional way.

After starting the test procedure, the receivers will for example display the following text:

Remaining Range: 50%	This result means that the distance to the transmitter can be approximately doubled until the signal will be too low. In general, you should try to achieve at least a signal level of 30%.

TIP	An 'OK-PRG-Test' is executed automatically during a range test if the device is in the operation mode '10 Outputs'. First the multicolor LEDs display the result of the continuity check for 5 seconds followed by the status of the output programming for another 5 seconds.

9 Remote access

If the device has been accessed remotely one of the following text messages will be displayed depending whether data is being read from the device or data is being written to the memory of the receiver:

Transmitting Data...	The device is transmitting while the controller is receiving data.
Writing Data...	The controller is transmitting data which is written to the receiver's memory.

10 Terminal block connector

A new type of connection socket makes working much easier. No tools are required for connecting and disconnecting. To connect the ignitor wire, simply plug it into the contact mechanism and is automatically clamped. To disconnect the wires, simply press the respective button to release the wires.

The connection terminal can also be removed completely. This makes the preparation of effects much easier, especially if it is a recurring show or if the preparation of numerous props for multiple takes on the set is demanded.

11 Operation time and Sleep Mode

As soon as the device is in operation power is consumed from the internal batteries. If these batteries are full, 30% of energy will be left after an operation time of 18 hours.

With the optional Sleep Mode function of the receiver, the standby time can be increased to up to 23 days.

Sleep	After the device has received the Sleep command, it confirms the received command and immediately shows 'Sleep' in the display. The device is now in power saving mode. Meanwhile the Info-LED flashes with a long-time interval.
Wake up	When the device has received the command to wake up, you will see this being displayed. The unit then switches to receiving mode.

TIP	You can also manually switch off a device that is in Sleep Mode directly at the device by pressing 'Mode' for a longer time until you see the display 'Switch off?' Now you must briefly activate 'On/Off' with the magnetic pen. Also, in this case the Event Memory is being saved and afterwards the device switches itself off completely.

12 Batteries and rechargeable batteries recommendations

We recommend Varta alkaline batteries for optimum operating times. In addition, other batteries often leak and can damage the device. If you choose rechargeable batteries, we recommend Panasonic Eneloop type BK-3MCCE. These are NiMH batteries with very low self-discharge and their voltage level is a little higher.

With the PFE Advanced Mini 5 Outputs it is not necessary to set whether you use NiMH batteries or alkaline batteries. The values displayed in the menu item 'Battery Capacity' apply to both variants.

13 Protection against water, moisture, humidity and condensation

This device is not waterproof. Always protect it from water, moisture, humidity and condensation.

WARNING	Leaking batteries or moisture in the device
⚠️ 2.1.6	Leaking batteries or moisture in the device may trigger firings. • The device must be protected against moisture. • Do not use the device after ingress of moisture. • If batteries have leaked, send the device to the manufacturer for repair. • Follow all safety instructions and regulations at all times.

14 Cleaning and maintenance

For cleaning, please use a cloth moistened with water and detergent. Chemicals and scouring agents can disfigure the surfaces. Keep all electrical contacts clean.

In general, the PFE Advanced Mini 5 Outputs needs no special maintenance if used properly. However, we recommend that you send the device to the manufacturer approximately every one to two years in order to have all device functions checked.

15 Warranty

The warranty period is 24 months.
If there is any defect during in this period please pack the device properly and send it to the manufacturer with carriage paid to have it repaired free of charge. Please do not forget to attach a description of the symptoms, which have occurred.

Warranty is excluded if the device was damaged due to wrong usage or excessive stress. Unauthorized repairs and the use of non-original parts will void all warranty, guarantee and product liability claims with immediate effect.

16 Damages caused by misusage, maloperation, malfunction

This device has been designed for the firing of pyrotechnical effects in certain application fields, see 'Application fields'. Discuss all other applications with the manufacturer before usage. In the case that one of the events stated above has happened we are only liable if the causation was within our range of influence. The devices have been developed, manufactured and tested to the best of our knowledge and belief.

Especially the user's work must comply with the safety instructions at all times.

A long test period and our practical experience proved that the system is absolutely reliable even if used in difficult conditions.

Please follow the instructions given here e.g. regarding protection against humidity.

17 Troubleshooting

If the display text is not correctly displayed, please enter the main menu of the PFE Advanced Mini 5 Outputs first. By doing so the display will be initialized again and possible display errors are corrected. If this does not work or the device does not recognize the magnetic pen, remove the batteries for approx. 10 seconds. Insert the batteries again and start the device. If the device is still not functional please contact the manufacturer.

18 Technical data

Radio parameters
EU version
	Frequency Band: 433.05 - 434.79 MHz
	Maximum radio-frequency power transmitted: <=10 mW
	Channel Spacing: 25 kHz
	Number of radio channels: 70 (433.050 - 434.775 MHz)
	Modulation: FM narrow band
	Frequency Shift: +/- 3 kHz
	Duty Cycle: <10%
	Radio equipment class according to 2014/53/EU (RED): 1
	Radio equipment type: non-specific short range device,
	                      transmitter and receiver (Transceiver)
	Receiver Category according to ETSI EN 300 220 V3.1.1:
	  demanded by the application: 3 (lowest performance level),
	  fulfilled by the device up to SN E700XXXX0079: 1.5
	  (second-best performance level),
	  fulfilled by the device starting at SN E700XXXX0080: 1 (best
	  performance level);
	  The receiver category indicates how well the device can still
	  receive radio protocols when strong signals are present on
	  frequencies below and above the used frequency
	  (blocking).
	Receiver Principle: Double superheterodyne
	Receiver Sensitivity: -119 dBm @ 12 dB SINAD
	Wave Length: 70 cm
	SMA antenna included in delivery:
	  Center Frequency: 434 MHz
	  Radiation Pattern: omnidirectional
	  Radiator Length: Lambda/4, coiled
	  Antenna Gain: 0.00 dBd, 2.15 dBi

Radio parameters
US version
	Frequency Range: 458 - 462.5 MHz
	License: FCC Part 90, FCC-ID: V9X-LMD400R
	Maximum radio-frequency power transmitted: <=10 mW
	Channel Spacing: 12.5 kHz
	Number of radio channels: 360 (458.0000 - 462.5000 MHz)
	Modulation: FM narrow band
	Frequency Shift: +/- 3 kHz
	Receiver Principle: Double superheterodyne
	Receiver Sensitivity: -119 dBm @ 12 dB SINAD
	Wave Length: 65 cm
	SMA antenna included in delivery:
	  Center Frequency: 460 MHz
	  Radiation Pattern: omnidirectional
	  Radiator Length: Lambda/4, coiled
	  Antenna Gain: 0.00 dBd, 2.15 dBi

Protocol parameters	half-duplex, PCM with Manchestercoding, Checksum: 40 Bit CRC, data rate approx. 2,500 bps
Temperature range	Transport und storage: -30 to +70°C Operation: -20 to +65°C The maximum temperature difference between devices must not exceed 60 K in order to enable unimpaired radio communication.
Humidity	10 - 90% rH, no condensation allowed
Allowable altitudes above sea level	Storage and transport: -500 to 12,500 m Operation: -500 to 4,000 m
Protection class	III

Dimensions (L x W x H) and weight, each without antenna, incl. Alkaline batteries:
65 x 23 x 128 mm, 193 g

Power supply:
2 x AA cell, Alkaline batteries or NiMH rechargeable batteries

Optional additional functions:
- Stepping function
- Sleep Mode

Operation time:
with Alkaline batteries with 2.700 mAh in receiving mode: approx. 18 h,
with Alkaline batteries with 2.700 mAh in Sleep Mode: approx. 550 h,
with NiMH rechargeable batteries with 2.000 mAh in receiving mode: approx. 12 h,
with NiMH rechargeable batteries with 2.000 mAh in Sleep Mode: approx. 370 h

Firing voltage, capacity of the firing capacitors, firing energy
20 V, 5 x 470 µF, 5 x 9.0 mC

Firing power:
max. 3 e-matches type 'A' in series or parallel connection
max. 2 e-matches type 'U' in series or parallel connection

Maximum resistance:
Series connection of e-matches type 'A': 10 Ohm
Series connection of e-matches type 'U': 5 Ohm

Supplied accessories, included in delivery:
1 SMA antenna
2 AA Alkaline batteries
1 User manual

The magnetic pen for controlling the device is only part of the supplied accessories included in the delivery of the transmitters and available as accessory as well.

19 Compatibility and Firmware Revision History

The device can be controlled by the

-   PFS Profi
-   PFS Pocket
-   PFC Advanced

Furthermore, it may be programmed with the PFC Advanced or the PFM Advanced USB modem via any PC. With the PFC Advanced or the USB modem it is also possible to request data from this receiver. This device is able to communicate bi-directionally with the PFC Advanced and with the PFM Advanced as well.

The firmware of the devices is continuously developed. Information about changes between different firmware versions is available on request. Please inform us about the version you are currently using. We will then send you an easy-to-understand extract from the firmware revision history.

20 Accessories

Below is a list of original accessories that can be obtained from the manufacturer or authorized distributors at any time. The device may only be operated with these original accessories. Otherwise, all claims arising from warranty, guarantee and product liability will become void with immediate effect.

Item No.:	Description:
1929	Antenna for PFE Advanced Mini 5
1931	Terminal block connector PFE Advanced Mini 5
1311	Magnetic pen

21 CE marking of the EU version

The EU version of this device is marked with the CE logo:

Each device intended for operation in the EU is accompanied by an EU Declaration of Conformity.

22 Address of the manufacturer and contact details for requesting an EU declaration of conformity

Galaxis Showtechnik GmbH
Lohgerberstr. 2
84524 Neuötting
Germany

Tel.: +49 / 8671 / 73411
Fax: +49 / 8671 / 73513

Homepage: www.galaxis-showtechnik.de
E-Mail: info@galaxis-showtechnik.de

Please use these contact details if you want to request an EU declaration of conformity.

Each device intended for operation in the EU is accompanied by an EU Declaration of Conformity.