TX2-20K

Manual 1.0

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PREAMBLE

Dear Explo-Customer,

Please read through this document before usage of the devices. It contains many informations which will help you with using the system.

We ask you to adhere to the safety and usage guidelines we have listed.

Should you have any questions or should any unclarities arise during the usage of the devices, that can’t be answered by this manual, please do not hesitate to contact us either by mail or by phone.

We wish you a lot of fun with your new ignition device.

Your Explo Team

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1 ABOUT THE EXPLO IGNITION SYSTEM

The Ignition system of the "explo" brand, are radio controlled ignition systems for fireworks and special effects. The usage of the devices requires at least one transmitter (eg. TX2-70K or TX2-20K) and a fitting receiver (eg. RX2-30K, RX2-20K or RX2-1K).

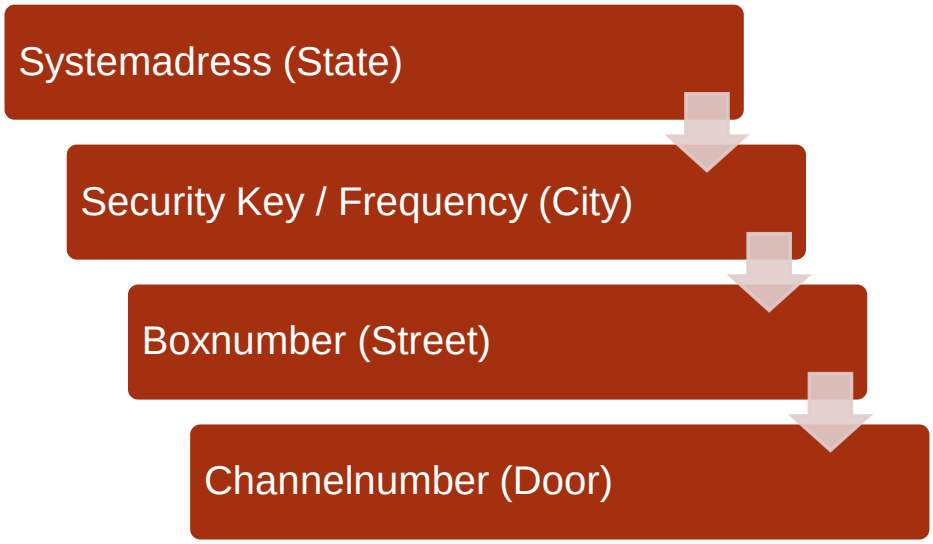
The handheld transmitte TX2-20K is a compact transmitter in a plastic case, used to control explo receivers via manual ignition signals. Due to its small size and mass, it is ideal for smaller indoor shows, where effects need to be triggered manually, and a timed synchronization with a show is not neccessary (eg. during a concert).

Automatic shows cannot be played with this transmitter. It is also not possible to receive any status updates from your receivers.

1.1 FUNCTION OF THE RADIO CONTROL

To allow the user of the ignition system upmost security and to set every ignition channel exactly, the X2 system offers various settings, that are used to encode the addresses of the devices.

In general, you could imagine the adressing of a channel like the adress of a house, which is why the below table shows the hierarchy in a similiar fashion as a post adress:



1.1.1 SYSTEMADRESS

Die Systemadresse stellt die grundlegende Verschlüsselung dar und wird für jeden Kunden einzigartig vergeben. Generell können nur Empfänger nur von Sendern angesteuert werden, welche dieselbe Systemadresse eingestellt haben.

Die Systemadresse wird herstellerseitig vergeben und kann bei Sendern nicht vom Kunden geändert werden, jedoch können bei Bedarf Empfänger an Sender und deren Systemadresse angelernt werden, was den Betrieb mit diesen Sendern ermöglicht. Dies hat den Vorteil, dass kein fremder Explo-Besitzer Zugriff auf die eigene Systemadresse besitzt, aber Explo-Kunden trotzdem untereinander Empfänger verleihen können.

1.1.2 SECURITY KEY / FREQUENZ

Die zweite Ebene der Verschlüsselung stellen der Security Key und die Frequenz dar. Der Security Key ist eine dreistellige Verschlüsselungszahl, die zusätzlich zur Systemadresse genutzt wird, um die

Zündanlage zu verschlüsseln. Wie auch bei der Systemadresse können nur Empfänger und Sender mit demselben Sicherheitsschlüssel untereinander kommunizieren. Ein Subsystem sollte immer dann erstellt werden, wenn die gleiche Zündanlage an zwei verschiedenen Orten genutzt wird, die nicht weiter als 20km voneinander getrennt sind.

Im Gegensatz zur Systemadresse kann der Security Key vom Kunden frei vergeben werden. Dies hat den Vorteil, dass der Kunde diesen Key nutzen kann, um sein eigenes System in Sub-Systeme zu unterteilen und bei Bedarf zwei Shows in nächster Nähe zu steuern, ohne gegenseitig für Fehlzündungen zu sorgen.

Die Frequenz der Zündanlage kann bei der X2-Serie leicht abgeändert werden. Dies hat zum einen den Vorteil des Security Keys (Erstellen von Sub-Systemen), kann aber auch als Ausweichfrequenz genutzt werden, falls die genutzte Frequenz auch von anderen Geräten in der Nähe genutzt wird. Auch hier gilt: Nur Zündgeräte mit derselben Frequenz können miteinander verwendet werden. Wichtig: Beim Umstellen der Frequenz wird automatisch auch ein eigener Security-Key genutzt.

1.1.3 BOXNUMMER

Die Boxnummer wird neben der Channelnummer primär zum Adressieren des spezifischen ZündChannels verwendet. Jedem Empfänger kann eine Boxnummer von 1-99 zugeteilt werden, mit der er direkt angesprochen werden kann. Die Boxnummern können mehrfach vergeben werden, falls Empfänger simultan angesprochen werden sollen.

1.1.4 CHANNELNUMMER

Die letztendlich ausschlaggebende Adressierung der Zündung erfolgt über die Channelnummer. Sie definiert den exakten ZündChannel bei Zündgeräten und den Effekt bei Effektgeräten. Jeder ZündChannel eines Empfängers verfügt über seine eigene, auf dem Empfänger einzigartige Channelnummer.

Zusammengefasst: Mittels Box- und Channelnummer erfolgt die eigentliche Zündung, sowohl in automatischen Shows als auch bei manuellen Zündungen. Grundvoraussetzung ist jedoch, dass sowohl Systemadresse, Security Key und Frequenz von Sender und Empfänger übereinstimmen.

Security-Key und Frequenz können am TX2-20K nicht vom Endanwender abgeändert werden. Sollte eine zusätzliche Verschlüsselung des Systems notwendig sein, wenden Sie sich bitte an den Hersteller.

2 COMPONENTS OF THE TX2-20K

2.1 OVERVIEW OF THE TX2-20K FRONT VIEW

Components of the TX2-Frontal view	
1	Antenna
2	Status display
3	Usage buttons left (Armed-buttons)
4	Usage buttons right (Ignition-buttons)

2.2 OVERVIEW OF THE TX2-20K SIDE VIEW

Components of the TX2-20K Side view	
1	Key switch
2	Programming socket

2.3 OVERVIEW OF THE TX2-20K TOP VIEW

Components of the TX2-20K Top view	
1	BNC-Antenna socket
2	Key switch

2.4 OVERVIEW OF THE TX2-20K BACK VIEW

Components of the TX2-20K Back view	
1	BNC-Antenna socket
2	Key switch
3	Battery compartment and battery

2.5 DESCRIPTION OF COMPONENTS

2.5.1 ANTENNA

The provided antenna with BNC connector is used to control the receivers via radio. It is a passive antenna 50 Ohm, 1/4 Lambda (used for 433MHz) of the type Midland RH-707.

2.5.2 STATUS DISPLAY

The two LEDs are used to display the transmitter status. The following states are shown via flashing and blinking:

Status displays red LED during start	
#-times short blinking	The TX2-20K sends on Boxnumber #
One long flash	The TX2-20K sends to all Boxnumbers

Status displays red LED during use	
Lit continuously	Transmitter is armed (Armed-button pressed)
One short flash	Ignition signal sent (Ignition-button pressed)

Status displays yellow LED during use	
Lit continuously	Device is on, battery is okay
Flashes continuously	Device is on, battery is empty

2.5.3 USAGE BUTTONS LEFT (ARMED-BUTTONS)

The usage buttons on the left side are used to switch the transmitter armed. These buttons must be pressed in order to make an ignition with the ignition-buttons.

As long as one of the armed-buttons is pressed during use, the red status LED will light up, to indicate readyness.

The armed-buttons are numbered 1 to 4. The different buttons signal channel groups of the trsansmitter, which can be triggered by combined pressing of the armed- and ignition-buttons.

Channel groups	
Armed-button 1	Channel 1 to 5
Armed-button 2	Channel 6 to 10
Armed-button 3	Channel 11 to 15
Armed-button 4	Channel 16 to 19, Steppfunction from Channel 20 to Channel 70

2.5.4 USAGE BUTTONS RIGHT (IGNITION-BUTTONS)

The usage buttons on the right side of the transmitter are used to trigger ignition a channel during the armed mode of its channel group.

There are five ignition-buttons available, numbered from 1 to 5, corresponding to their respective channelnumbers in each group.

2.5.5 KEY SWITCH

The key switch is used to turn the device on or off. To switch it on, turn it 90° clockwise. The yellow status LED will then show if the device is ready for use.

2.5.6 PROGRAMMING SOCKET

Using the separately available bootloade cable, a firmware update can be made on the transmitter.

The pins are labeled accordingly:

Pins of the TX2-20K	
Pin 1	Not connected
Pin 2	Not connected
Pin 3	GND
Pin 4	RX
Pin 5	TX

2.5.7 BNC-ANTENNA SOCKET

An antenna socket of the BNC type, used to connect the provided antenna.

2.5.8 BATTERY COMPARTMENT AND BATTERY

On the back of the device, you can find the battery compartment. It can be opened to exchange the 9V Block battery of the device. An empty battery is indicated by permanet flashing of the yellow status LED during use.

When changing the battery, please make sure that the connection cable isn't pinched when closing the battery compartment.

3 USAGE OF THE TX2-20K

3.1 SETTING THE BOXNUMBER

Before using the transmitter, the correct Box number should be set. This is done by pressing certain buttons during startup. Using the following buttons, you can select between Box 1 to 5, or "all":

Button combinations for Box number selection	
Ignition-button 1	Boxnumber 1
Ignition-button 2	Boxnumber 2
Ignition-button 3	Boxnumber 3
Ignition-button 4	Boxnumber 4
Ignition-button 5	Boxnumber 5
Armed-button 1 and Armed-button 4	Boxnumber „All“ (All Boxes)

The above buttons must be pressed during the start. Check the red status LED, which shows the currently set box number.

3.2 SWITCH ON

To turn the device on, the key switch must be turned 90° clockwise. The yellow status LED will then show if the device is ready for use. Also check the feedback of the red LED during start. It will indicate which box number has been set.

During use, check the yellow LED. Should it flash continually, you should change the 9V block battery.

We recommend carrying a spare battery.

3.3 SENDING TEST SIGNALS

During use, you can send test signals by pressing both Armed buttons 1 and 4 at the same time. Test signals are sent on all boxes. This means any receiver using the same radio settings (Systemadress, Security-Key, Frequency), will get these signals.

Since the TX2-20K does not allow for bidirectional testing, a proper radio connectivity can only be tested by looking at the receivers LEDs.

3.4 SENDING IGNITION SIGNALS

Before sending ignition signals, makde sure no persons linger in the dangerous vicinity of your receivers and their attached effects. Ignition signals can be sent by pressing an Armed- and ignition button at the same time.

As soon as an Armed-button is pressed, the red status LED will light up. This shows that the transmitter is armed, and will trigger once an ignition-button is pressed. Once this is done, the red LED will flash shortly, indicating that an ignition signal has been sent.

The following button combinations allow you to trigger channels 1 to 20 directly, and a further stepping up to channel number 70:

Button combinations to select channels		
Armed-button 1	**+ Ignition-button 1**	= Ignite Channel 1
	+ Ignition-button 2	= Ignite Channel 2
	+ Ignition-button 3	= Ignite Channel 3
	+ Ignition-button 4	= Ignite Channel 4
	+ Ignition-button 5	= Ignite Channel 5
Armed-button 2	**+ Ignition-button 1**	= Ignite Channel 6
	+ Ignition-button 2	= Ignite Channel 7
	+ Ignition-button 3	= Ignite Channel 8
	+ Ignition-button 4	= Ignite Channel 9
	+ Ignition-button 5	= Ignite Channel 10
Armed-button 3	**+ Ignition-button 1**	= Ignite Channel 11
	+ Ignition-button 2	= Ignite Channel 12
	+ Ignition-button 3	= Ignite Channel 13
	+ Ignition-button 4	= Ignite Channel 14
	+ Ignition-button 5	= Ignite Channel 15
Armed-button 4	**+ Ignition-button 1**	= Ignite Channel 16
	+ Ignition-button 2	= Ignite Channel 17
	+ Ignition-button 3	= Ignite Channel 18
	+ Ignition-button 4	= Ignite Channel 19
	+ Ignition-button 5	= Ignite Channel 20 to 70

Channels 21 to 70 will be triggered after one another. During the first time, channel 20 will ignite, during the second time channel 21, and so on. If the device is restarted, the channel will be reverted to channel 20.

4 OTHER

4.1 SAFETY GUIDELINES

The system may only be used to ignite pyrotechnical effects, and be used only by trained pyrotechnicians. The generals safety guidelines regarding pyrotechnics are to be adhered. After the device is switched on, no persons may linger in the dangerous vicinity of the effects connected to the system. Works on the system may only be done when it is switched off. During the show, the safety distances to the system and effects must be kept. Works on the system during use is strictly prohibited. During the setup of the system, it is recommended to proof the receivers against activation (eg.: removing the key). Under no circumstances may a transmitter be left unsupervised, unless it has been proofed against unauthorized use.

Never leave the transmitter unattended!

4.2 TIPPS & TRICKS

4.2.1 RADIO CONNECTIVITY:

A good radio connectivity is an essential part of a trouble free usage of a radio controlled system. Taking note of these few hints can improve the connection between transmitter and receiver drastically.

4.2.1.1 ABOUT RADIO WAVES:

Radio waves are electromagnetic waves that expand with near lightspeed(~300.000km/s). Radiowaves are unhindered in a vacuum and air, but can be reflected by metal or be absorbed by natural materials like wood or water.

4.2.1.2 POSITIONING YOUR DEVICES:

Ideally, you should place the transmitter and receiver in a way that no objects are placed between them, and you have free line of sight. You should especially take heed not to have any metallic objects, as well as mountains between them.Theoretically it is possible to receive signalseven behind these objects, since radio waves can reach their destination indirectly by breaking or reflecting off of objects. The maximum range can however only be achieved by a free line of sight. Transmitter and receiver must not be covered by metalls,since these can shield against radio waves. Ideally, the devices should be placed in an elevated position, like a table. Should the devices be placed on water, with a raft for example, we recommend using magnetic antennas, and placing these about a meter above the water level.

4.2.1.3 SETTING UP YOUR ANTENNAS

Thanks to their emmission, the antennas (should the devices be placed at the same height) should be upright, since the emit signals from their sides the strongest. If the transmitter and receivers are placed at adifferent height, the antennas should be placed in a way that they are parallel to eachother.If possible, the usage of a Grounplane-Antenna (transmitter) and Magnetic antennas (receiver) is recommended, since they can drastically improve the radio range.the magnetic antennas of the receivers should be placed on top of a 15x 15cm metallic plate. During rain or thaw, especially with wet or salty sea air, it is best to connect the antenna before placing the receiver in the field, since otherwise there is a possibility of water entering the BNC socket. After usage in wet conditions, we recommend allowing your devices to dry, especially the antenna and BNC socket. Ideally using compressed air.The antennas can be damaged by physical means, like bending or pulling on them too strongly. Should this happen, a short circuit within the antenna can occur. In this case, the antenna needs to be replaced immediately, since it won't function properly anymore. You can check for such an error, by measuring for a connection between the inner pin of the antenna, and the outer rim.

5 TECHNICAL DATA

Here you can find the technical data of the TX2-20K:

Transmitter TX2-20K	
Measurements	160 x 80 x 30mm
Weight	300 g
Case	Plastic
Radio range	150m
Stand-By	10 hours
Power supply	1x 9V-Block-Battery
Radio frequency	433 – 434 MHz
Max. output	10mW

6 ENTSORGUNG

Dieses Gerät darf entsprechend der europäischen WEEE-Richtlinie nicht im Haushaltsabfall entsorgt werden. Bitte entsorgen Sie dieses Produkt bei einer entsprechenden Sammelstelle für Elektro- und Elektronikaltgeräte.

Alternativ können Sie uns Ihre Altgeräte gerne zur kostenfreien Entsorgung zukommen lassen.

Bei Rückfragen zur korrekten Entsorgung stehen wir Ihnen gerne zur Verfügung.

7 SOFTWAREUPDATES

Softwareupdates können auf der entsprechenden Produktseite unserer Webseite gefunden werden:

http://www.explo.at/

Schritte zum Durchführen eines Softwareupdates	
1	Bootloader-Software (Alternativ kann die AutoShow-Software der X2-Serie genutzt werden) und Treiber für das Programmierkabel herunterladen und installieren. Die benötigten Installationsdateien finden sich unter: https://www.explo.at/en/software/gerate-programmierung/bootloader-software.html Beim Treiber wird zwischen 32-Bit (Installer x86) und 64-Bit (Installer x64) Windows-Systemtypen unterschieden. Die verwendete Windows-Systemtype findet sich unter „System“.
2	Update-File von der Produktseite herunterladen. Der Download-Link findet sich unter dem Download-Reiter am Ende der Produktseite des TX2-20K: https://www.explo.at/de/zundanlagen/sender/tx2-20k.html
3	Korrekte COM-Schnittstelle in der Bootloader-Software auswählen. Die COM-Schnittstelle findet sich im Windows-Gerätemanager unter „Anschlüsse (COM & LPT)“. Die korrekte COM-Schnittstelle sollte bei installiertem Treiber als „Silicon Labs“ oder „Silabs“ aufscheinen.
4	TX2-20K mittels Bootloader-Programmierkabel mit dem PC / Notebook verbinden.
5	Das Update-File mit der Bootloader-Software öffnen (File > Select File).
6	Der TX2-20K muss ausgeschaltet sein.
7	Die Übertragung in der Bootloader-Software starten (File > Upload).
8	Sender einschalten und warten bis die Statusanzeige der Programmierung (grüne Statusbalken) vollständig geladen hat. Sollten die grünen Statusbalken nicht erscheinen, so kann dies auf eine fehlerhafte Verbindung zwischen Power Flame und Computer hinweisen.
9	Nach dem Update sollte die Funktion des Senders überprüft werden.

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Konformitätserklärung gemäß der Richtlinie 2014/53/EU (RED)

Declaration of Conformity appropriate to the Directive 2014/53/EU (RED)

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.

Hersteller / Verantwortliche Person: *Manufacturer / responsible person:*	explo GmbH, Völkermarkterstraße 240, 9020 Klagenfurt am Wörthersee, Österreich (AUT)
Erklärt, dass das Produkt: *Declares that the product:*	Funkzündanlage *Radio controlled ignition system*
Type: *Type:*	TX2-70M, TX2-70K, TX2-Stage (TX2-Bühne), TX2-20K, RX2-70K, RX2-30K, RX2-20K, RX2-5K, RX2-1K, Explo Stick (X2 Modem)
Verwendungszweck: *Intended purpose:*	Sender und Empfänger unseres Zündsystems *Transmitters (TX) and Receivers (RX) of our ignition system*
Verwendete Antennen: *Used antennas:*	Passive Antennen 50Ohm, ¼ Lambda (433MHz), namentlich: *Passive antennas 50Ohm, ¼ Lambda (433MHz), namely:* Midland RH-707 (TX2-70M / TX2-70K / TX2-Stage / TX2-20K) Albrecht MiniMag 440 BNC (RX2-70K, RX2-30K, RX2-20K) Whip antenna SMA 21cm (RX2-5K, RX2-1K) Whip antenna SMA 11cm (Explo Stick, RX2-1K)
Seriennummer: *Serial number:*	20-xxxxx / 20xxxxx

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen der Richtlinie 2014/53/EU entspricht.

are complying with the essential requirements of the Directive 2014/53/EU, when used for its intended purpose.

Einhaltung der grundlegenden Anforderungen durch (verwendete Standards/Spezifikationen):

Means of proving conformity with the essential requirements (standards/specifications used):

Gesundheit und Sicherheit

Health and safety requirements

Angewandte Normen: 2014/35/EU (Low Voltage Directive)
Standards applied: EN 60950-1:2006 / A1:2010+A2:2013+A11:2009+A12:2011
EN 62479:2010

Schutzanforderungen in Bezug auf elektromagnetische Verträglichkeit

Protection requirements concerning electromagnetic compatibility

Angewandte Normen: EN 301489-1 v2.1.1 (2017-02)
Standards applied: EN 301489-3 v2.1.1 (2017-03)

Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums

Measures for the efficient use of the radio frequency spectrum

Angewandte Normen: EN 300220-2 v3.1.1 (2016-11)
Standards applied:

Klagenfurt a.W., am 21.02.2020 — Harald Kulterer, Geschäftsführer explo GmbH

Ort, Datum *Place, date* — **Name und Unterschrift** *Name and signature*