CAT FIRE

CFTIU-1

TRINITY DIGITAL

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CATFire – CFTIU-1 Timecode Interface Unit

Disclaimer

Revision history

Revision	Changes
1	First; Support hardware version 1; Firmware version 2.
2	Business address change

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Familiarising yourself with the CFTIU-1

3-Pin XLR

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EXT   USB

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EXT   USB

Extension interface

PC Interface
USB (Micro and B)

Arming Lock/Unlock key.
Removable in LOCKED position only.

⚠ DO NOT CONNECT TO A COMPUTER NETWORK

About your unit – intended usage

⚠	Keep children, pets and animals away from this unit.

⚠	Only competent adults should operate this unit.

⚠	Do not operate this equipment if you are unwell or under the influence of drugs or alcohol.

This unit receives timecode information in SMPTE LTC or CATFire FSK format as an audible signal (rather like a fax machine noise), this information is fed to the CATFire Windows 10 App CFWFS-1 so to synchronise the firing of pyrotechnics to music.

Throughout this manual when we mention pyrotechnics we are also referring to fireworks.

Windows 10 Electrical Connection

The unit connects to your Windows 10 computer using a USB-B *or* Micro-USB connection lead, you may use one at a time depending on cable availability.

The supplied lead is no longer than 2 metres. You can use your own lead up to 5 metres in length, but you must ensure that you use a premium quality fully shielded USB cable, and in this scenario the cable should also include ferrite chokes on each end of the lead.

Buzzer

The unit contains a buzzer to provide audible signals to you.

When the unit is powered up (by connecting the USB cable to your Windows 10 computer) the buzzer will sound for a short while before falling silent.

If the buzzer does not fall silent there is a problem.

Be sure to remove the arm lock key switch before connecting to the Windows 10 computer, if the key switch is in the unlocked position when powered up the unit will emit a continuous buzzer tone and will not function.

If the key switch has been removed but, when powered up, the unit still emits a continuous buzzer tone it may have detected an anomaly in its internal state and is resetting to defaults. Try a power cycle of the device up to two more times, if the condition does not clear contact Trinity Digital for further advice.

Extension interface

The unit contains two RJ45 connections labelled EXT on the unit, electrically they are both the same.

These are not an ethernet communications interface, rather a proprietary interface to which you can connect additional CATFire family devices to the unit.

XLR Audio connection

At the rear of the unit you can connect a balanced or unbalanced 3 pin XLR connection, this connection provides an audible tone (rather like a fax machine) which carries the SMPTE LTC or CATFire FSK timecode signal.

This signal must be a "line level" signal, both consumer and professional line levels are supported.

This is a signal from 0.894 to 3.472 volts peak-to-peak, -10dBV to +4dBV.

> ⚠ NEVER connect an amplified audio signal to this input – severe damage and risk of electrical shock or death could result.

The audio signal must not be subject to any filtering – it must be a "direct" signal from the audio source.

For best signal quality use a balanced XLR connection, with no filtering applied. Also the audio source should be from a WAV (PCM) audio file format which, for CATFire FSK is generated by the CFWFS-1 App. Use of 'lossy' formats such as mp3 may reduce signal quality.

Be sure not to route the audio signal cable near any noisy power lines and when using a balanced signal the use of proper balanced twisted pair copper wire is necessary.
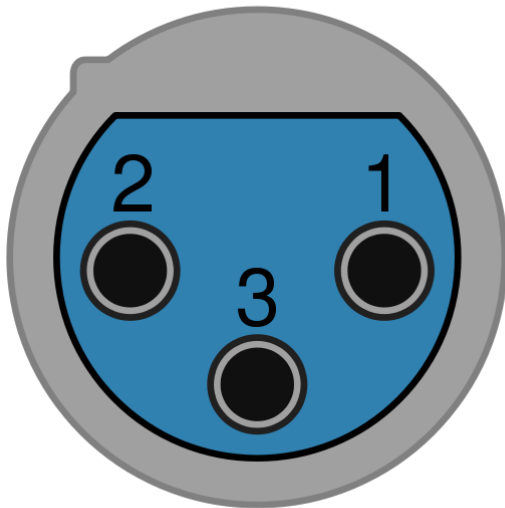
XLR wiring / pinout

Connection from the mixing desk to the CFTIU-1 is done using an XLR cable, one end called 'male' has pins, the other 'female' has a socket.

MALE

FEMALE

The male plug connects to the CFTIU-1. The female plug connects to a mixing desk.

Balanced connection

Female

Male

(Facing the end of the connectors)

Pin	Name
1	Shield
2	Balanced Positive / Hot
3	Balanced Negative / Cold
Metal Casing	Shield

Unbalanced connection

An unbalanced connection, while not recommended due to its susceptibility to noise, may be made to this unit. The following diagram shows the wiring to be made to an XLR connector.

Use only a very short length of cable in this scenario, 2 metres max. and keep the cable away from other electrical cables, especially other audio and power lines.

Essentially the unbalanced signal is fed into the Positive / Hot terminal. The other connections are ground / shield.
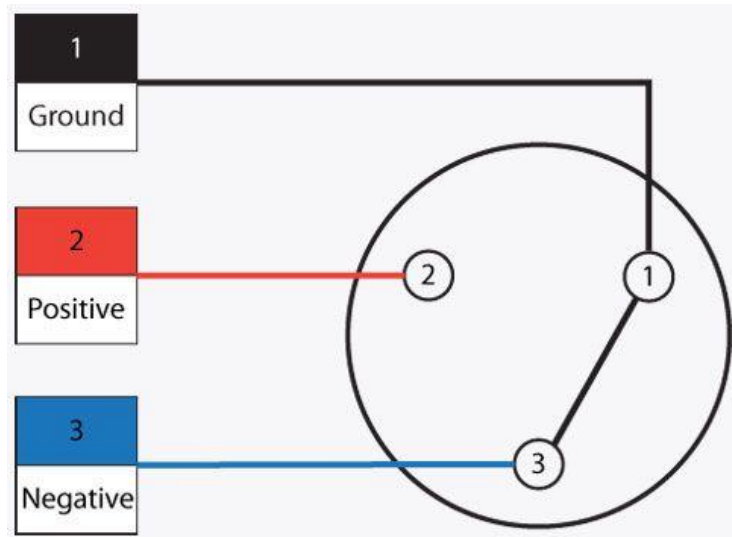
Arm lock

On the front of the unit is a key switch, the key can only be REMOVED in the LOCKED position.

This lock is used to prevent the CFWFS-1 going into ARMED state, you should remove this key (i.e., locked) except when intending to arm the system using the App.

Once the key is inserted and turned (i.e., unlocked) wait at least 5 seconds before attempting to arm the system from the App as there is an 'unlock delay'. Locking is instant.

> When locked (i.e., key removed), arming is prevented using the App.
> However it is not an arming enable/disable function.
> Once unlocked, and system is armed via the App, locking once more will not disarm.
> Arming and disarming is under App control.

How this unit works

This unit uses electronics and software to listen to the incoming audio signal via the XLR connection.

The signals are automatically read as SMPTE LTC or CATFire FSK and timecode information is extracted from them.

This timecode information is then fed to the computer and the CFWFS-1 App which uses this timecode information to control the pace of firing your pyrotechnics.

The USB cable provides the unit with power and communications to the CFWFS-1.

This unit is not weatherproof and so must be protected from the elements.

It is intended to be used from -20 to 60 degrees Celsius with 90% relative humidity non-condensing.

It is not impervious to damage from things like explosion, fire or misuse, and as with any electronic or software product, could malfunction.

> ⚠ Never use a unit that looks damaged or is behaving in a way you are not expecting it to. Turn it off and walk away from the danger immediately.

> ⚠ The unit must not be used in an area where static electricity is expected or present.

> ⚠ The unit must not be used when an electrical storm is expected or present.

> ⚠ Always REMOVE the arm lock key unless intending to arm the system.

> ⚠ Keep radios, mobile telephones and external power sources away from the unit and pyrotechnics.

Cleaning your unit

Clean the units with a soft slightly damp cloth that has been rinsed in a weak soapy washing up solution.

Do not get the unit wet.

Features of your unit

1. Stackable enclosure.
2. Arm lock/unlock key switch, removable in the locked position only
3. Informational buzzer
4. RJ45 proprietary extension interface
5. USB-B connection to the Windows 10 computer, power and communications over this line.
   a. Additional Micro-B socket is provided as an alternative means of connectivity instead of the USB-B.
6. XLR 3 pin female connection accepting consumer & pro line level audio signals containing SMPTE LTC and CATFire FSK timecode signals.
7. Event logging
8. Firmware update capability

Timecode

CATFire FSK

CATFire FSK is a highly robust timecode signal that is generated by the CFWFS-1 as part of your show script design.

This timecode signal is created as a WAV audio file. The file may contain just your timecode signal that perfectly matches your show, and it may also contain your show music too.

The last channel in the WAV file contains the timecode signal – only this signal is to be directed as a monaural signal to the XLR input of this unit. The other audio channels in the WAV file should be directed to your audio amplifier as normal.

CATFire FSK timecode includes not only the time information but also a firing file id (ff id). This associates the WAV file with the firing file – thereby ensuring that the system will fire only to the correct time code and music contained within.

SMPTE LTC

SMPTE LTC (Linear TimeCode) is an old method from the late 1960's used by film makers to synchronise video with audio, it is typically used to "Lip Sync" while a video is being edited.

SMPTE LTC is sometimes used today to synchronise a pyrotechnic display too, especially if you are working in tandem with a broadcaster.

SMPTE LTC is associated with a 'frame rate' – a video frame rate, typically, even if only audio is being played. The frequency and resolution of the updates depends on this frame rate.

For example in the USA the frame rate might be 30 frames per second. In the EU this is typically 25 and for cinematic movies this is 24. These equate to time resolution of (1/30 = 33.33ms; 1/25 = 40ms; 1/24 = 41.66ms respectively)

Another format in the USA born out of an NTSC colour TV signal idiosyncrasy is 29.97 frames per second, this is known as 30 frames per second "drop frame" format. In this format video frames are

not actually dropped, rather a time update is skipped periodically to compensate for the lower frame rate.

CATFire CFTIU-1 supports 24, 25 and 30 (drop and non-drop) formats.

Show lead in

When designing your display you must always include a 'lead in' – a period of time where nothing happens with the pyrotechnics but gives the system chance to receive and synchronise the timings with the timecode signal.

This is especially important with SMPTE LTC where the CFTIU-1 needs to train itself to the incoming signal to learn the format type and rate of the time signal.

In both types of timecode a good lead in gives the operator chance to check that the signal incoming is of high quality and a chance to stall the display if there are issues with the signal, this is especially true for SMPTE LTC which has lower robustness in this environment.

The more lead in time the better, with CATFire FSK we recommend a minimum of 30 seconds, with SMPTE LTC we recommend 1 to 2 minutes, but as much as you can lead in the better.
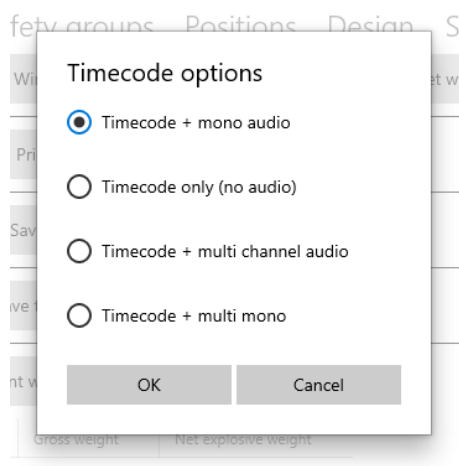
Mixing desks tips

There are many possible configurations in handling audio and timecode, here we will explain the most common and give you a few hints and tips on how to select and set up your equipment.

Audio file

Always use the WAV file generated by the CATFire CFWFS-1 App.

Typically you ask the app to generate "Timecode + mono audio"

This will generate a **Stereo** WAV file containing a left and right channel of audio.

The left channel will be your music (converted to mono).

The right channel will contain the timecode signal.

This file is then loaded onto a USB stick or SD memory card which is then loaded into the mixing desk.

Mixing desk

Typically a mixing desk is used to ensure all audio in your show is controlled properly – microphones, instruments, music and timecode. You can set volume, filtering, equalisation, effects etc.

They output stereo audio, left and right, via two balanced XLR output jacks.

Care in selecting your mixing desk will reap benefits.

Today many mixing desks – even the low cost ones - have a USB or SD memory card slot, some even have Bluetooth connectivity, allowing audio to be played from these sources.

We *do not* recommend you use Bluetooth for connectivity – the risk of dropouts due to radio interference is high, especially when crowds turn up with their Bluetooth connected phones and the spectrum gets crowded. Further, Bluetooth compresses audio and that will cause loss of clarity on the timecode signal.

The use of USB and SD is recommended, however, observe how your mixing desk handles this audio source.

Also ensure the mixing desk can play WAV audio files at 48KHz, some can only handle 44.1KHz and some can only handle mp3 files.

The WAV file can be very large, ensure the mixing desk can play large and long duration WAV files, this should be tested beforehand.

Many basic mixing desk models treat the audio coming from the USB/SD as a 'single' input at the desk.

This means that the left and right stereo channels contained in the WAV file are treated the same when setting gain, filtering and effects etc.

While gain, filtering and effects may be appropriate for your music on the left channel of the stereo WAV file, they would cause 'damage' to the clarity of the timecode residing on the right channel.

We recommend selecting a mixing desk that treats the stereo WAV file as separate left and right channels, assigning each channel to its own input on the mixing desk.

This way you can independently tune the music and timecode, as follows:

Music (Left channel of WAV file)
1. Set the channel balance to left output – music should ONLY be sent to the left output anything else risks mixing music in with timecode and will damage the signal.
2. Adjust volume, filtering and effects as desired.
3. Connect the left output of the mixer to your amplifier / speakers.

Timecode (Right channel of WAV file)

1. Set the channel balance to the right output – timecode should only be sent to the right output or you risk mixing the timecode signal in with your music and that would ruin your music.
2. Apply NO filtering. All filtering should be set to 0.
3. Apply NO effects. All effects should be set to 0 / off.

All other channels

Your mixing desk has many more inputs– e.g. microphones or instruments.

Ensure the channel balance for all other inputs are set to the left output so to avoid this audio mixing in with the timecode signal.

Any unused inputs should have their volumes set to 0.

Setting levels

Connect the right output of the mixer to the CFTIU-1, set this timecode input channel volume to 0 to begin with.

Connect the left output of the mixer to the amplifier and speaker(s).

Play your music, operate your microphones / instruments, adjusting the master output volume and input volumes according to desired levels. Of course also adjust filtering and effects as necessary too for these.

Once the master volume is set do not adjust it as the master volume will affect timecode on the right output. Only alter the volumes for the individual channels from now on.

Run the CFWFS-1 App and connect to the CFTIU-1. Observe its status page.

While playing your music and timecode, raise the volume of the timecode input until you see the app has detected the timecode, ensure it is reading as an excellent signal. For FSK the carrier detection should be rock solid.

It takes a little time for the CFTIU-1 to determine the quality of the signal, so make small adjustments on the mixer, observe the signal quality, repeat if necessary.

Observe that you are not 'saturating' the output with a high timecode volume – this can cause clipping of the signal and can damage the signal quality.

Digital mixing desks.

The same principles described above also apply to digital mixing desks.

With these, however, you typically put your music and timecode as separate WAV files onto the USB or SD memory card.

The WAV files need to be mono audio and each gets assigned - by you - to an input channel of the mixing desk.

You must ensure that the mixing desk is configured for 48KHz audio as many digital mixing desks will not play WAV files sampled at a different rate to their configuration.

Here you would create "Timecode + multi mono" in the CFWFS-1 App.

This creates several mono WAV files, each one a channel of your music and an additional one for your timecode, this makes it easy to work with a digital mixing desk.
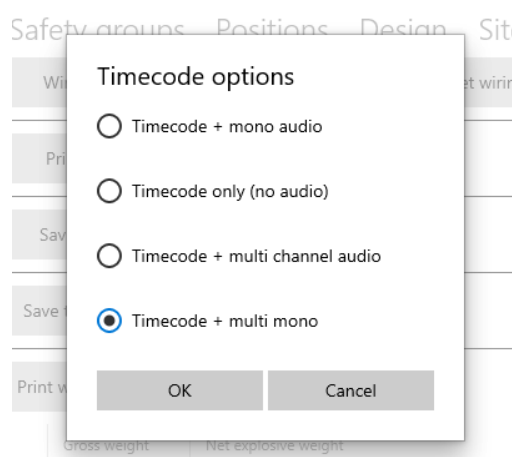
It is important to note that if the music used in your show design is stereo you will get two WAV files one for left audio, one for right audio. However ALL music WAV files must be directed to the LEFT output channel of the mixer, don't make the mistake of sending the right music WAV file to the same output as the timecode or you will damage the timecode signal.

USB / SD card selection

You must check with the technical specification of your mixing desk what USB and SD memory cards it requires. Many have speed ratings and these must match the demands of your mixing desk.

This is important to ensure stability of playback and that the mixing desk can read the data at the required rate from the memory card.

If you choose your USB/SD card poorly you can (randomly) crash your mixing desk or have audio dropouts as it struggles to read audio data at high speed.

It goes without saying that you must test your mixing desk with a full rehearsal of your music / timecode with intended USB/SD cards.

Due to their fragility, always have back up USB/SD cards with copies of the audio files on them.

CFWFS-1 App

Connection

Ensure the key is removed from the CFTIU-1 unit and then connect the CFTIU-1 to your Windows 10 (or higher) computer using the USB cable.

The CFTIU-1 will emit a tone then fall silent.

NOTE: On first connection the Windows computer may need to install drivers, this will be automatic. Ensure your computer is connected to the Internet so it may download suitable drivers without any difficulty.
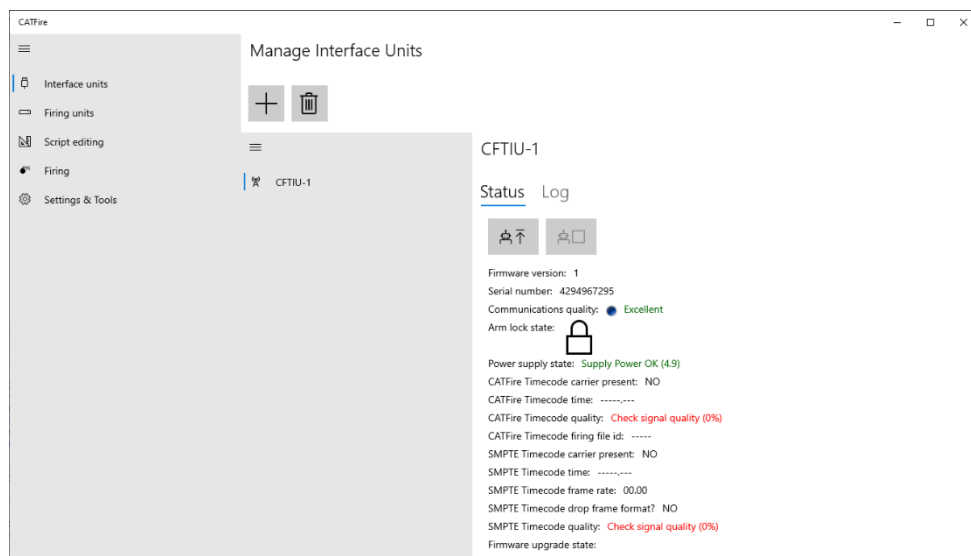
Open the Windows 10 CATFire App, CFWFS-1.

Navigate to the "Interface Units" section of the App.

Click the PLUS (+) button to detect the connected device and add it into the App.
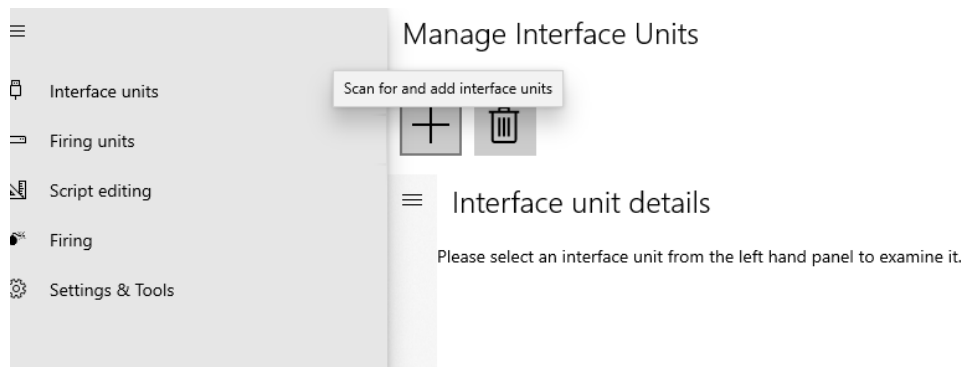
The CFTIU-1 will be detected and added into the App, clicking on the CFTIU-1 in the list will bring up its properties as shown here.
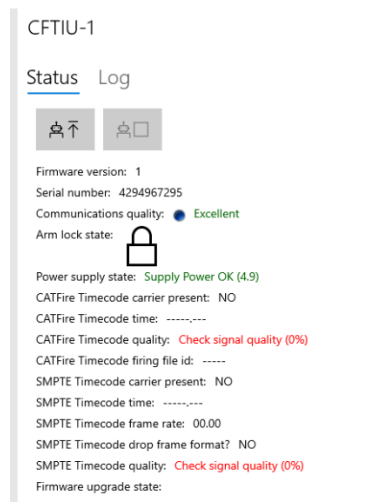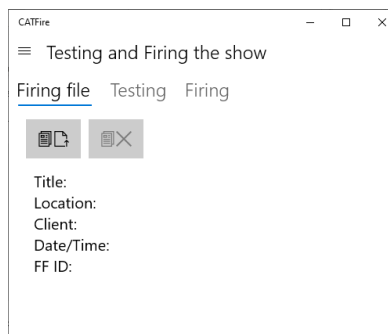
Firing

Pre-checks

Well before arming your firing script – as part of your pre-show testing - you should perform timecode testing and feed live timecode to the unit and observe that the timecode is being received and that the quality is acceptable.

This can be done on the CFTIU-1 interface unit status screen.

Once you are satisfied that the timecode is good you MUST stop the timecode feed.

NOTE: If using CATFire FSK ensure the firing file id matches the firing file id of the script you intend to use. This is shown on the Firing "Firing file" section of the CFWFS-1 App.

Arming the script

Once your system is armed on the firing page you then proceed to arm your script and select the correct type of timecode you wish to use.
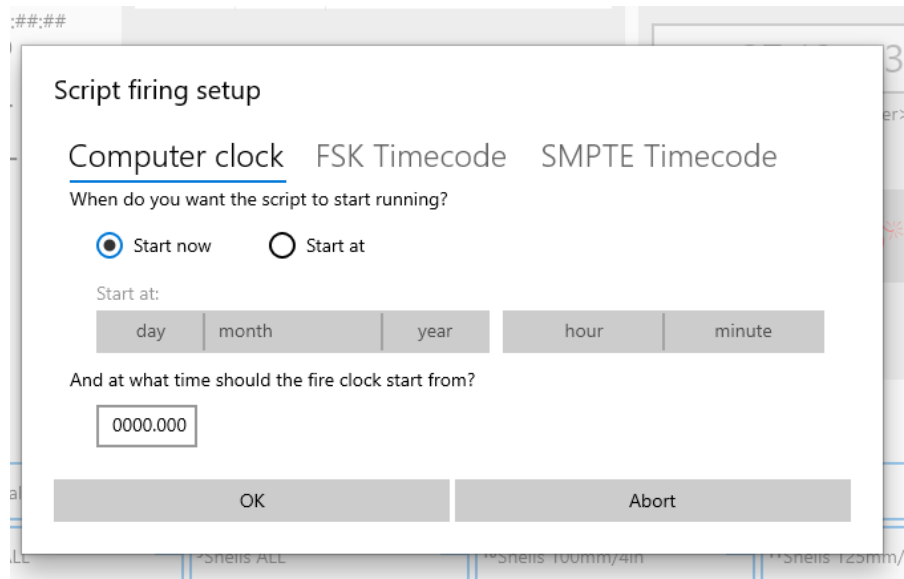
From the Script firing setup screen select FSK Timecode or SMPTE Timecode.

Various parameters are selectable for each type of timecode, then click OK.

CATFire will then wait for timecode to be received and will start your show using the incoming timecode.

Refer to the user manual of the CFWFS-1 App for more information on using timecode to control your show.

End of life

Recycling

Sadly, this product will not last forever, wear and tear will eventually bring about its end of life.

This product contains precious earth metals and other recyclable material.

You should dispose of the product in accordance with your local authority rules on recycling electronic devices – please do not dispose of this product in general waste.

Alternatively, you may return your end-of-life equipment to Trinity Digital for correct recycling. Please contact support@trinitydigital.co.uk or call +44(0)1782 977500 to do so before returning equipment so that we may track its recycling properly.

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Guarantee

The Guarantee is provided by Trinity Digital, the owner of the CATFire® brand.

Terms and conditions

These terms and conditions do not affect your statutory rights.

You must register your product within 14 days of purchase to receive this guarantee, please contact support@trinitydigital.co.uk or call +44(0)1782 977500 to do so.

Have your product model and serial number to hand including the date and place of purchase. If the product is a gift, register the intended owner details.

This product carries a 12-month parts and labour guarantee against defects in workmanship.

These terms and conditions are only applicable within the United Kingdom and is subject to provision(s) that your product:

1. Has been used solely in accordance with the instruction manual.
2. Has not been subject to misuse or accident; modified or repaired by anyone other than our own service engineers.
3. The product is in the United Kingdom.
4. The product has been registered and the person claiming is the registered owner.

If you wish to make a claim contact support@trinitydigital.co.uk or call +44(0)1782 977500.

Please provide the model number, the serial number, and a description of the fault. When emailing you can also provide images or video footage of the issue you are experiencing.

Trinity Digital will, at its discretion, repair or replace the unit.

Please do not send anything to Trinity Digital without first contacting us, nothing can be accepted without prior authorisation, this is so we can track the product and its problems properly.

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Declaration of conformity

- UKCA: Electrical Equipment (Safety) Regulations 2016
- UKCA: Radio Equipment Regulations 2017
- 2014/30/EU   Electromagnetic Compatibility
- 2014/53/EC   Radio Equipment Directive
- 2011/65/EU   RoHS
- 2012/19/EU   WEEE

Trinity Digital hereby certifies that the product

CATFire CFTIU-1

Conforms to the essential requirements of the above listed regulations and directives on this day Monday 20th June 2022.

Mr. Gareth Williams.

Company:

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CW11 4UD

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NOTES