

Televes®



H30 CRYSTAL

EN DVB Meter / Analyser
with digital processing

Instruction Manual

Refs. 593601, 593602, 593603, 593604, 593605,
593661

www.televes.com

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Safety requirements

● Product inspection

- Inspect the equipment for shipping damage. Should any damage be discovered, immediately file a claim with the carrier.

● Read and Follow All Instructions

- All the safety and operating instructions should be read prior to and followed while operating this product.

● Do not obstruct the ventilation slots

● Cleaning

- Follow the cleaning instructions contained in the Maintenance section of this manual.

● Attachments

- Do not use attachments that are not approved by the product manufacturer.

● Water and Moisture

- This product is splash water resistant but is not submersible.
- Do not place objects filled with liquids on or near the meter, such as glasses.

● Power Sources

- This product should be operated only from the type of power source specified (12VDC - 2A).
- Ensure that the voltage applied to the power connector does not exceed 15V. Higher voltages could damage the equipment
- Maximum consumed current: 2A

● Grounding or Polarization

- Do not bypass or defeat electrical plug polarization or grounding. Doing so will violate the warranty and may pose a risk of fire or electrocution.

● RF connector electrical protection

- Maximum VAC: 18VAC
- Maximum positive VDC: 58V
- Maximum negative VDC: -18V

● Wire Protection

- Ensure all connected wiring is routed correctly to avoid damage including pinching, excessive bends, or compression.

● Electrical Supply, Grounding, and Surge Protection

- Ensure that all local or national electrical codes are followed.

● Power Lines

- Always use caution and avoid operating this or any connected equipment near uninsulated power lines or any other hazards.

● Servicing

- There are no user serviceable parts except the battery. Do not attempt to service this product or remove covers other than the battery cover. Refer all servicing to qualified service personnel. Follow the instructions in this manual when replacing the battery.

● Heat

- The product should be situated away from heat sources such as radiators, heat registers, stoves, or other products that produce heat.
- Do not place naked flame sources on the meter, such as lighted candles.

● Maximum current consumed by the meter: 2A

● Battery

- Battery must be replaced by qualified personnel, following the steps mentioned in the corresponding section.
- If the battery is replaced, the new one must have the same features, because there is risk of explosion. Furthermore, the new battery must be approved by the manufacturer. Otherwise, the company is not responsible for damages caused to the meter.
- Battery features:
Li-Ion
2600mAh 7.26V 19 Wh

Symbols and safety labels



Recycle or dispose of used electronic devices properly.



Remove the battery from the equipment following the instructions given in this manual and dispose it properly



Replace the batteries only with the same type.

Overview

Introducing the H30Crystal.

New from Televes, a go-to meter designed with the needs of a DVB installer in mind.

The **H30Crystal** is a light weight, rugged unit, packed with all the features needed to install and troubleshoot a television system using DVB-S/S2, DVB-T/T2, DVB-C (Annex A/C) and ISDB-T/Tb digital modulation as well as analog signals.

Available for the first time in such a portable and affordable package, its real time digital processing engine gives the installers a great precision measurements needed in today's fulfilment environment.



Key Features

- **User friendly**, handheld DVB meter.
- Complete portfolio of Analog/Digital measurements with easy-to-read **pass/fail indicators**.
- **Quick and easy to use interface** with features such as Channel measurements, System Scans, Constellation Diagram, Spectrum Analyzer, Echoes, Datalogger, and more.
- Rugged, light weight, fully automatic, fast, and accurate.
- **Easy updates**.
- **1 GHz spectrum range** with selectable span.
- **PASS/FAIL Indicators**: Icons indicate if a measurement is good, bad, or in the warning zone for quick and easy status checks. Reduce installer entry errors and improve decision making.
- LNB powering, and SCR and DiSEqC parameters setup
- MPEG image visualization

General Specifications

Display	2.8" TFT 400 x 240 full colour
Weight	510g (12.12lb)
Dimensions	175 x 100 x 52 mm / 6.9 x 3.9 x 2 in (H x W x D)
Power Source	Input: 100-240V~ 50-60Hz Output: 12VDC, 2A
Battery	Li-Ion smart battery (7.2VDC, 2300mAh)
Operating Time	Up to 4 hours
Operating Temperature	23°F to 104°F (-5°C to 45°C)
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Humidity	5% to 95% non-condensing
Ruggedness	Survives 1 m (3 ft) drop to concrete on all sides
Communication Interfaces	USB 2.0 to download Datalogs and software updates
Storage	400 MB (internal) for measurements
Power up time	< 10 seconds

References and options

Non-Selective Optical Fibre References	
593601	H30Crystal OF (S/S2+T)
593602	H30Crystal OF (S/S2+T/T2)
593603	H30Crystal OF (S/S2+C)
593604	H30Crystal OF (S/S2+T/T2+C)
593605	H30Crystal OF FULL
593661	H30Crystal OF (S/S2+ISDB-T/TB)

Selective Optical Fibre References	
593621	H30Crystal Selective OF (S/S2+T)
593622	H30Crystal Selective OF (S/S2+T/T2)
593624	H30Crystal Selective OF (S/S2+T/T2+C)
593625	H30Crystal OF Select. FULL

Options	
593231	DVB-T OPTION
593232	DVB-T2 OPTION
593233	DVB-C OPTION
593234	dCSS OPTION
593235	EXT. ENT TERREST. 120dB μ V OPTION
593250	Wi-Fi ANALYSER OPTION
593236	Video Camera
593251	IPTV Analyser
593253	HEVC+4K Visualization *
593254	Upgrade 4K Visualization *

*Only for units manufactured before 01/03/2024
Units manufactured after this date have HEVC+4K visualization as a standard

Technical Specifications

Frequency	
Range	50 - 880 MHz and 950 - 2400 MHz
Resolution	125 kHz
Tuning	Frequency or channel
Input	
Impedance	75Ω F-type connector
Spectrum Analyzer	
Span	5, 10, 20, 50, 100, 200, 500 and Full span
Scale	5 and 10 dB/div
Hold mode	✓
Auto and manual reference level	✓
Return Channel	✓
Optical Fiber (Sel.OF: 593601/02/03/04/05/61 - Non-SelfO: 593621/22/24/25)	
No Selective	-40dBm to +7dBm
Selective	-40dBm to +7dBm
RF Overlay	-10dBm to +5dBm
Optical Attenuation	✓
Digital Measurements DVB-T (ref. 593601, 593602, 593604, 593605, 593621, 593622, 593624, 593625 and opt. 593231)	
MPEG image	✓
Modulations	CFDM (QPSK, 16QAM, 64QAM)
Power	45-110dBuV(45-120dBuVopt.593235)
CBER	9.9E-2 - 1.0E-6
VBER	1.0E-3 - 1.0E-8
MER	Up to 35dB
C/N	Up to 40dB
Echoes	✓
Constellation	✓
Digital Measurements DVB-T2 (ref. 593602, 593604, 593605, 593622 and opt. 593232)	
MPEG image	✓
Modulations	COFDM (QPSK, 16QAM, 64QAM and 256QAM)
Power	45-110dBuV(45-120dBuVopt.593235)
LDPCBER	9.9E-2 - 1.0E-6 (Pre LDPCBER)
BCHBER	1.0E-3 - 1.0E-8 (Pre BCHBER or Post LDPCBER)
Link Margin	Up to 30dB
MER	Up to 35dB
C/N	Up to 40dB
Echoes	✓
Constellation	✓
Digital Measurements DVB-C (ref. 593603, 593604, 593605, 593624, 593625 and opt. 593233)	
MPEG image	✓
Modulations	16QAM, 32QAM, 64QAM, 128QAM and 256QAM
Power	45-110dBuV(45-120dBuVopt.593235)
CBER	1.2E-2 - 1.0E-8
MER	Up to 38dB

C/N	Up to 40dB
Constellation	✓
Digital Measurements DVB-S	
MPEG image	✓
Power	45-110dBuV(45-120dBuVopt.593235)
CBER	9.9E-2 - 1.0E-6
VBER	1.0E-4 - 1.0E-8
MER	Up to 20dB
C/N	Up to 20dB
Constellation	✓
Digital Measurements DVB-S2	
MPEG image	✓
Modulations	QPSK, 8PSK
Power	45-110dBuV(45-120dBuVopt.593235)
Link Margin	Up to 10dB
MER	Up to 20dB
LDPCBER	9.9E-2 - 1.0E-6 (Pre LDPCBER)
BCHBER	9.9E-2 - 1.0E-8 (Pre BCHBER or Post LDPCBER)
Constellation	✓
Digital Measurements ISDB-T/Tb (ref.593661)	
MPEG image	✓
Modulations	DQPSK, QPSK, 16QAM and 64QAM)
Power	45-110dBuV(45-120dBuV opt.593235)
Pre-BER (by layer)	9.9 E-2 - 1.0E-6
Post-BER (by layer)	1.0 E-3 - 1.0E-8
MER	Up to 35dB
C/N	Up to 40dB
Echoes	✓
Constellation	✓
Analog Measurements	
Level	25 - 125dBuV
V/A	✓
C/N	Up to 45dB
Features	
Terrestrial and Satellite channel plans	Channel plans from different world wide regions
User channel plans	✓
Units	dBuV, dBmV, dBm
Preamp powering	13, 18, 24Vdc (max. current 475, 370, 140mA)
LNB powering	13, 18Vdc (max. current 475, 370mA)
LNB tone	22KHz
SCR (EN 50494) dCSS (EN 50607)	✓ Opt.593234
DiSeqC	✓
Wi-Fi Analyser	Opt. 593250
Video Camera	Opt. 593236
IPTV Analyser	Opt. 593251
HEVC+4K visualization	✓**

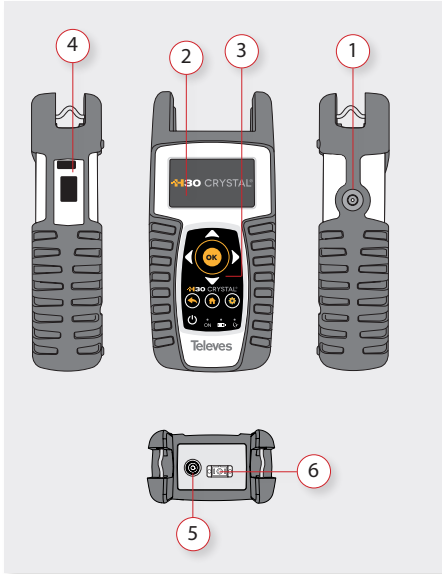
EN

Specifications are subject to change without notice.

** Only units manufactured after 01/03/2024
For units manufactured before this date, please see the Options Table

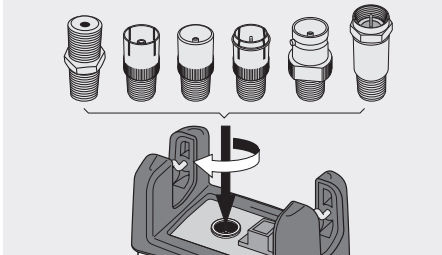
Description of equipment components

Connectors and controls








1. External power connector (12VDC).
2. LCD display.
3. Keyboard and LED indicators
4. Ethernet and USB connectors
5. RF F-connector (see options below)
6. Optical fiber connector (SC/APC)

F-connector options



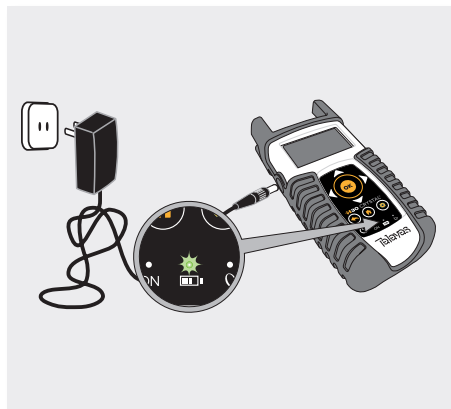
Keyboard



1.  **Device On/Off button:** To turn the equipment off, press and hold for approximately 3 seconds.
2.  **Back button:** Return to the previous menu or close a parameter entry window.
3.  **Home button:** Return to the main menu.
4. **Navigation buttons:** Used to scroll through options.
5.  **OK Button:** To confirm selection.
6.  **Setup button:** Parameter window for the current function.
7. **LED Powering:** Indicates if the equipment is powering an external load.
8. **LED Charging Battery:** LED flashes while the battery is charging.
9. **LED Power ON:** Illuminated when the equipment is on.

Power supply

A DC adapter is provided to power and charge the meter. Plug the adapter into a properly grounded electrical supply and the power connector on the side of the unit.








When external power is supplied, the battery management system automatically controls the charging process.

A battery icon indicates the charge status of the battery.

When the battery is fully charged, the battery icon is completely filled. As the battery discharges, the amount the icon is filled decreases in steps.

The icon shows 5 states representing the approximate battery charge:

-  - Battery charge less than 5%.
-  - Battery charge between 5% and 25%.
-  - Battery charge between 25% and 50%.
-  - Battery charge between 50% and 75%.
-  - Battery charge greater than 75%.

From a fully discharged state, a full charge takes approximately 8 hours and a 3 hour charge will provide approximately a 75% charge.

The charge management system will detect various conditions preventing charging, such as a battery that is over a safe temperature.

About battery

Important:

If the meter detects a shortcircuit or over consumption, and it is not connected to the power supply, it automatically shuts down.

To turn it on again, it is necessary that it is connected to the power supply.

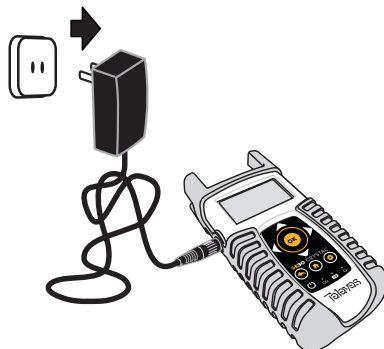
To maximize battery life:

- ▶ Avoid fully discharging the battery.
- ▶ The battery should always be charged with the battery pack attached to the device and using the supplied DC adapter or applying a constant voltage within the specified range (12-15VDC).
- ▶ For long term storage, keep the unit at room temperature, or about 25° C. Start with a charged battery and re-charge the battery every 2 to 3 months.

Battery replacement:

It is recommended that the replacement of the battery is carried out by qualified personnel following the following instructions:

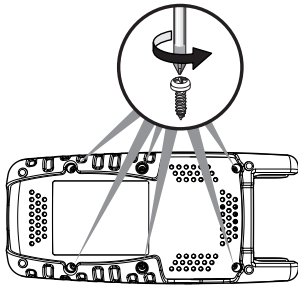
- ▶ Disconnect the meter from the power supply:



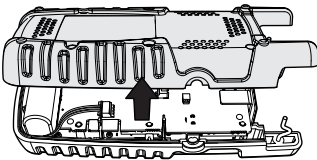
- ▶ Turn the H30Crystal off



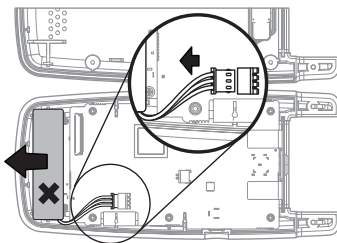
- ▶ Remove the screws from the backside



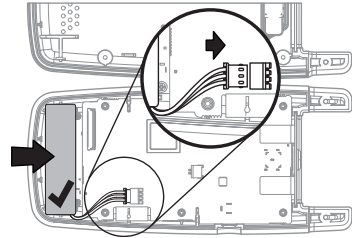
- ▶ Open the back cover



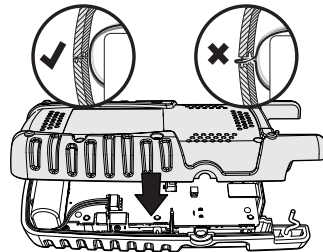
- ▶ The battery is located at the bottom of the meter. Carefully remove the connector from the power board, and then remove the battery



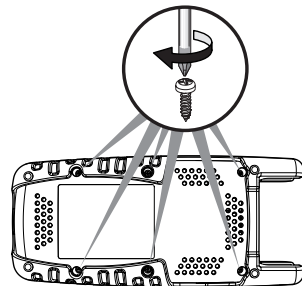
- ▶ Place the new battery and then connect it to the power board



- ▶ Replace the back cover of the meter. Make sure that the cable is not trapped between the two covers





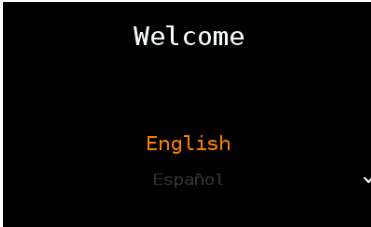
- ▶ Replace the screws of the back cover



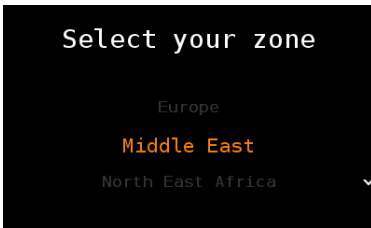
Before starting

The first time you turn your H30Crystal on, please follow the next steps for a proper configuration:

- 1.- Select the language using  and 



- 2.- Select the geographical area, so the proper channel plans will be enabled:

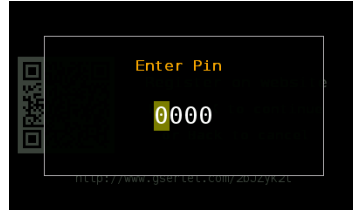


- 2.- Register your H30Crystal:

- 2.1.- Read the QR code using your mobile phone or tablet. or use the App H30Suites (Available for iOS and Android):



- 2.2.- Register your H30Crystal in our web. Once the process is completed, you will get a PIN code. Enter the PIN in your H30Crystal:



- 2.3.- If the PIN is OK, you have finished the registration process.

NOTE: Options 593234 (dCSS) and 593235 (Extended terrestrial input level range) will be activated automatically in your H30Crystal whenever you register it within 30 days after you turn it on for the first time.

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Product operation



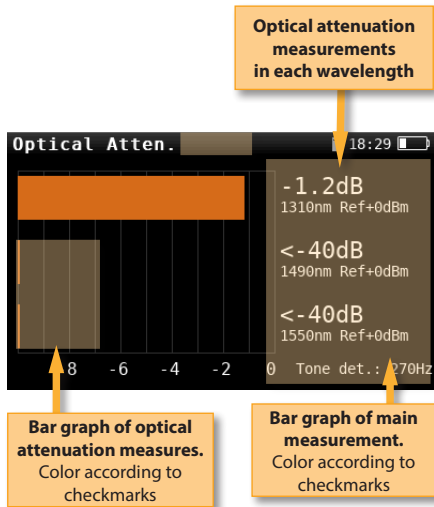
1. Optical Attenuation

Measures the optical attenuation over the three wavelengths using this feature.

Depending on the type of your H30Crystal (selective or non-selective optical fibre), the operation of this function will be slightly different.


1.1. Main window

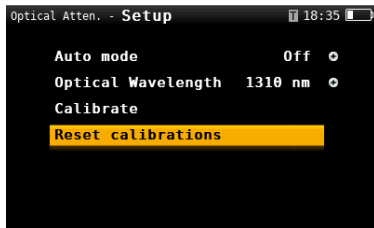
Below is a capture of a Optical Attenuation window with a brief explanation of its features.



1.2. Setup



Press  to change the Channel Info options.



- **Auto mode (both Selective and Non-Selective models):** On/Off. Allows to operate with the Auto mode of the Televes OPS3L, which communicates to the H30Crystal the lambda it is emitting.

- **Optical wavelength (only Non-Selective models):** Allows to select the wavelength to be measured.

- **Calibrate:** In Non-Selective models, this function calibrates the selected wavelength. In Selective models, each wavelength must be calibrated separately

- **Reset calibration (both Selective and Non-Selective models):** Resets the calibration

-**Save datalog:** Saves the current scan measurements. You can see the datalogs using the remote control application.



2. Channel Info

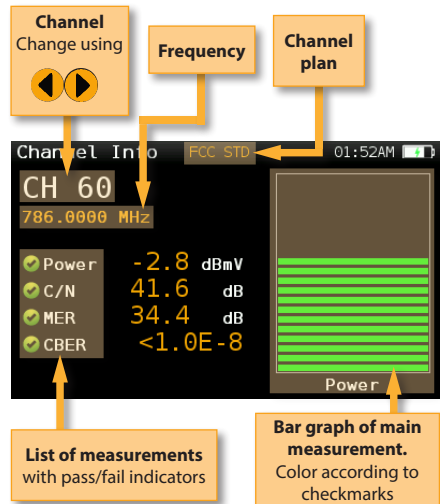
Analog and digital channels are very different in terms of signal content and power distribution.

In analog mode, video and audio levels, V/A and Carrier to Noise (C/N) are measured.


In digital mode measurements depend on the modulation

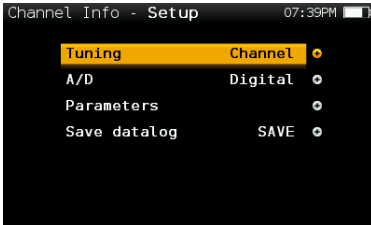
2.1. Main window

Below is a capture of a Channel Info window with a brief explanation of its features.



2.2. Setup

Press  to change the Channel Info options.



- **Band:** Terrestrial/Satellite
- **Plan:** Selects the channel plan
- **Powering:** Selects the LNB powering
- **DiSEqC (only satellite band):** Selects DiSEqC parameter (Sat A, sat B, sat C, sat D)
- **SCR (only satellite band):** Selects the SCR parameters (multiswitch, standard and slots) When a slot is enabled (for example slot 3, freq. 1210MHz), the meter will tune into the slot frequency (1210MHz) and will set the slot with the meter parameters: frequency, band (powering), and DiSEqC. In addition, a SCR icon will be shown in the bar at the top (SCR3) to indicate that the slot is enabled.

While the slot is enabled, all the setting changes of the meter, will be applied to the currently slot (SCR3).

- **Tuning:** Channel, Frequency
- **A/D:** Auto, Analog, Digital.
- **Save datalog:** Saves the current scan measurements. You can see the datalogs using the remote control application.



3. Spectrum

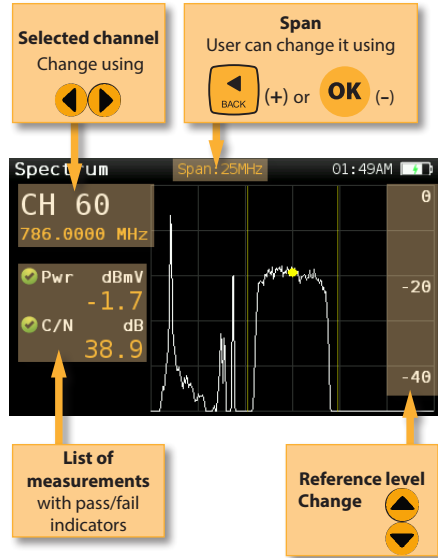
Real-time processing speeds ensure capture of any fast, intermittent plant impairments.

Due to the accuracy and level of detail provided by this spectrum analyzer, the **H30Crystal** is the ideal tool for identifying and locating noise, interference, ingress and other waveforms that may be affecting


cable services quality.

3.1. Main window

Below is a capture of a Spectrum window with a brief explanation of its features:



3.2. Setup

Press  to change Spectrum options.



- **Band:** Terrestrial/Satellite
- **Plan:** Selects the channel plan
- **Powering:** Selects the LNB powering
- **DiSEqC (only satellite band):** Selects DiSEqC parameter (Sat A, sat B, sat C, sat D)
- **SCR (only satellite band):** Selects the SCR

parameters (multiswitch, standard and slots)
When a slot is enabled (for example slot 3, freq. 1210MHz), the meter will tune into the slot frequency (1210MHz) and will set the slot with the meter parameters: frequency, band (powering), and DiSEqC. In addition, a SCR icon will be shown in the bar at the top (SCR3) to indicate that the slot is enabled.

While the slot is enabled, all the setting changes of the meter, will be applied to the currently slot (SCR3).

- **Aim antenna:** Emits a modular audible signal with frequency directly proportional to signal level in the spectrum trace relative to reference level. It is recommended to set the reference level manually, as well as to select the span to include a frequency range wide enough.

The audible signal becomes continuous when the signal level is close to the reference level. Then it is necessary to increase the reference level to get a more accurate adjustment.

This is a useful feature to point antennas without having to look at the display

- **Span:** 5MHz, 10MHz 20MHz, 50MHz, 100MHz, 200MHz, 500MHz, Full.

Set the span of the spectrum. To easily change the span, use the **OK** Button to decrease the span and the Back Button to increase the span.

- **Ref. Level:** Select the reference level of the spectrum graph
- **dB/div:** 5 dB/div, 10 dB/div
- **Tuning:** Channel, Frequency
- **A/D:** Auto, Analog, Digital.
- **C/N:** ON, OFF. Shows/Hides the C/N measure.
- **Hold:** ON/OFF. Shows/hides the maximum graph
- **Save datalog:** Saves the current scan measurements. You can see the datalogs using the remote control application.



4. Television


The **H30Crystal** Television feature will show the image of the selected service.

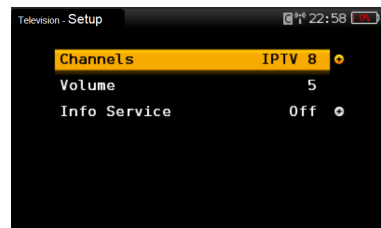
4.1. Main window

Below is a capture of a Television Info window with a brief explanation of its features:



4.2. Setup

Press  to change the Channel Info options.



- **Band:** Terrestrial/Satellite
- **Plan:** Selects the channel plan

- **Powering:** Selects the LNB powering
- **DiSEqC (only satellite band):** Selects DiSEqC parameter (Sat A, sat B, sat C, sat D)
- **SCR (only satellite band):** Selects the SCR parameters (multiswitch, standard and slots) When a slot is enabled (for example slot 3, freq. 1210MHz), the meter will tune into the slot frequency (1210MHz) and will set the slot with the meter parameters: frequency, band (powering), and DiSEqC. In addition, a SCR icon will be shown in the bar at the top (SCR3) to indicate that the slot is enabled.

While the slot is enabled, all the setting changes of the meter, will be applied to the currently slot (SCR3).

- Volume



5. System Scan

This function scans the selected channel plan and detects every existing analog and digital channel in real time to determine the overall frequency response of the system.

The scan measurement leverages the location based thresholds to clearly show whether or not signal levels comply with the cable system specifications with their green, yellow and red bars. This gives an easy-to-understand real-time view of the system, including the BER and MER values of the selected channel.

5.1. Main window

Below is a capture of a System Scan window with a brief explanation of its features:

The screenshot shows the 'System Scan' interface. Callouts point to various elements:

- Channel Change using:** Points to the left and right arrow buttons at the top left.
- Frequency:** Points to the 'CH 69' and '858.0000 MHz' display.
- Channel plan:** Points to the 'CCIR' label.
- Measurements of the selected channel with pass/fail indicators:** Points to the 'Power -3.0 dBmV' and 'C/N 34.5 dB' displays.
- Bar graph representing all the found channels. Color according to checkmarks:** Points to the spectrum bar graph at the bottom.

5.2. Setup



Press **SETUP** to change the System Scan options.

The 'System Scan - Setup' menu shows the following options:

- Digital tuning: Off
- Ref. Level: Auto
- Span: Full span
- Plan: CCIR
- Save datalog

- **Band:** Terr, Sat
- **Plan:** Selects the channel plan
- **Powering:** Selects the LNB powering
- **DiSEqC (only satellite band):** Selects DiSEqC parameter (Sat A, sat B, sat C, sat D)
- **SCR (only satellite band):** Selects the SCR parameters (multiswitch, standard and slots) When a slot is enabled (for example slot 3, freq. 1210MHz), the meter will tune into the slot frequency (1210MHz) and will set the slot with the meter parameters: frequency, band (powering), and DiSEqC. In addition, a SCR icon will be shown in the bar at the top (SCR3) to indicate that the slot is enabled.

While the slot is enabled, all the setting changes of the meter, will be applied to the currently slot (SCR3).

- **Digital tuning:** If it is ON, allows to see MER and CBER measurements when a digital channel is selected and the user presses Ok button.
- **Span:** Select the number of channels showed in the bar graph
- **Ref. Level:** Select the reference level of the bar graph
- **Save datalog:** Saves the current scan measurements. You can see the datalogs using the remote control application



6. Dish Alignment

This feature helps the installer to align the dish.

The **performance measurement** is the quotient between the current LKM value and the maximum one. When the performance indicator is green, the dish is aligned.

6.1. Main window

Below is a capture of the Dish Alignment window with a brief explanation of its features.

The screenshot shows the 'Dish Alignment' window with the following callouts:

- Bar graph of LKM measurement:** Color according to checkmarks. Points to the LKM bar graph.
- Channel and Frequency:** Points to the TS3 channel and 11.758 GHz frequency.
- List of measurements:** Performance measure has pass/fail indicator. Points to the Power (61.5 dBμV), LKM (3.7 dB), and PERF (99%) values.
- Bar graph of power measurement:** Color according to performance. Points to the Perf bar graph.
- Follow the guided steps to perform the alignment:** Points to the 'Press OK to confirm' instruction.

6.2. Setup

Press  to change the Dish Alignment options.



- **Sat Plan:** Allows the user to select the satellite plan he wants to align the dish to.
- **Beep:** ON/OFF. If ON is selected, the H30Crystal emits a sound whose frequency increases as the performance measurement increases.



7. Satellite Test

This function checks that the input signal corresponds to the selected satellite, and at the same time checks the proper reception of the selected transponders (from 1 to 4 transponders). To do that, the meter performs all the measurements on those transponders.

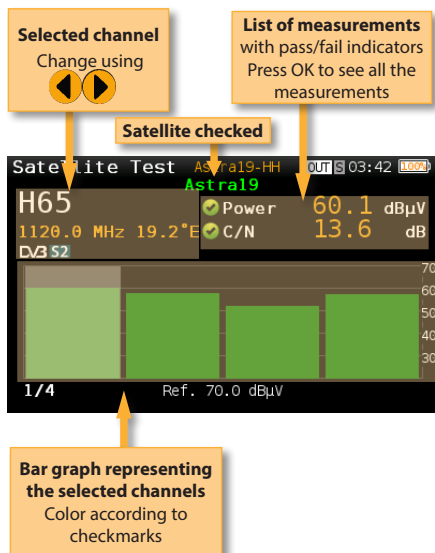
First of all the user must select the channel plan of the satellite towards which the antenna is oriented.

Then the user must select the transponders on which you want to carry out the measurements (see Setup section of this function).

The information necessary to verify the satellite is extracted from these channels, and the measurements of the selected transponders are displayed.


7.1. Main window

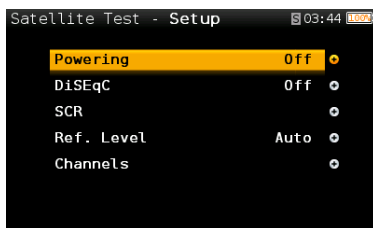
Below is a capture of a Satellite Test window with a brief explanation of its features:



7.2. Setup



Press  to change the Satellite Test options.



- **Powering:** Select the powering of the LNB if needed.
- **DiSEqC:** Select the SAT of the DiSEqC command.
- **SCR (only satellite band):** Selects the SCR parameters (multiswitch, standard and slots). When a slot is enabled (for example slot 3, freq. 1210MHz), the meter will tune into the slot frequency (1210MHz) and will set the slot with the meter parameters: frequency, band (powering), and DiSEqC. In addition, a SCR icon will be shown in the bar at the top (SCR3) to indicate that the slot is enabled. While the slot is enabled, all the setting changes of the meter, will be applied to the currently slot (SCR3).
- **Ref. Level:** Select the reference level of the bar graph.
- **Channels:** Select the number of channels as well as the channels from the channel plan.



8. Learning plan

Analyzes the input signal to the meter and automatically detects all channels.

This feature automatically identifies the channels as either analog or digital and performs measurements on each.

A bar graph is displayed with the height representing the power for digital channels and the level of the video carrier for the analog channels.

The measurements made for analog channels are video carrier level and V/A. For digital channels the measurements are power and C/N.

The analog channels will have an extra, smaller white bar indicating the level of the audio carrier.

8.1. Main window

Below is a capture of a Learning Plan window with a brief explanation of its features:

The Learning Plan window displays channel information for CH 69 at 858.0000 MHz. It shows a bar graph with 17 channels, a reference level of 80.0 dBμV, and a 'Done' button. Callouts include: 'Selected channel Change using' (with left/right arrow icons), 'List of measurements with pass/fail indicators' (pointing to the bar graph), 'Bar graph representing found channels Color according to checkmarks', and 'Indicates that the scan is finished. Press HOME to save the plan' (with a home button icon).

Ideally, each of the symbols in a constellation diagram should display a clean dot indicating a perfect signal.

The **H30Crystal** real time constellation, allows the installer to assess the size and shape of the build up of dots indicative of problems which contribute to bit errors leading to service disruption

9.1. Main window

Below is a capture of a Constellation window with a brief explanation of its features:

The Constellation window displays channel information for CH 60 at 786.0000 MHz with modulation QAM64 6108. It shows a list of measurements: Pwr (8.3 dBmV), C/N (41.5 dB), MER (36.0 dB), and CBBER (1.0E-8). A constellation diagram is visible on the right. Callouts include: 'Selected channel Change using' (with left/right arrow icons), 'Modulation' (pointing to the modulation type), 'List of measurements with pass/fail indicators' (pointing to the measurement list), and 'Constellation diagram' (pointing to the constellation plot).



9. Constellation

Digital video often does not show signal impairment until it is too late due to the small margin between acceptable quality and failure.

Constellation diagrams are an indispensable tool to help detect the presence of noise, phase jitter, interference, and gain compression, all of which impact overall signal quality and thus reduce Modulation Error Ratio (MER).

9.2. Setup

Press  to change Constellation options.

The Constellation Setup menu shows options: Zoom (OFF), Parameters, Tuning, Channel, Save datalog, and SAVE.

- **Band:** Terr, Sat
- **Plan:** Selects the channel plan
- **Powering:** Select the powering of the LNB if needed.
- **DiSEqC:** Select the SAT of the DiSEqC command.
- **SCR (only satellite band):** Selects the SCR parameters (multiswitch, standard and slots) When a slot is enabled (for example slot 3, freq. 1210MHz), the meter will tune into the slot frequency (1210MHz) and will set the slot with the meter parameters: frequency, band (powering), and DiSEqC. In addition, a SCR icon will be shown in the bar at the top (SCR3) to indicate that the slot is enabled. While the slot is enabled, all the setting changes of the meter, will be applied to the currently slot (SCR3).
- **Zoom:** OFF, 1st, 2nd, 3rd, 4th. Select a quadrant of the constellation to be represented for more detailed view. Select Zoom OFF for the full constellation.
- **Tuning:** Channel, Frequency
- **Save datalog:** Saves the current constellation measurements. You can see the datalogs using the remote control application.



10. Echoes

It is important to check that no echoes can cause problems in the reception of DVB-T and DVB-T2 signals.

This feature allows you to visualize the echoes of the received signal, helping the installer to minimize them as much as possible for optimal signal reception.

In addition to the echoes graph, this function shows the channel power and MER measurements, as well as the FFT mode, the guard interval, and the Cell ID.

10.1. Main window

Below is a capture of a Echoes window with a brief explanation of its features:

The screenshot shows the Echoes main window with the following callouts:

- Selected channel:** Change using (indicated by left and right arrow icons).
- FFT mode, Guard Interval, and Cell ID:** Points to the top status bar showing 'BK, 1/4, CID 0'.
- List of measurements with pass/fail indicators and number of echoes:** Points to the left panel showing 'CH 45', '666.000 MHz', 'Pwr 53.5 dBμV', 'MER 27.0 dB', and 'Num .Echoes 1'.
- Echoes graph:** Points to the right panel showing a signal spectrum graph.

10.2. Setup



Press  to change Echoes options.

The screenshot shows the Echoes Setup menu with the following options:

- Powering:** Off
- Tuning:** Channel
- Units:** μs

- **Powering:** Off, 13V, 18V, 24V.
- **Tuning:** Channel, Frequency
- **Units:** us, Km



11. Video Camera (opt. 593236)

This feature allows the H30Crystal meters to have an analog video and audio input using an external USB 2.0 adapter, with capability to digitize the analog input signals.

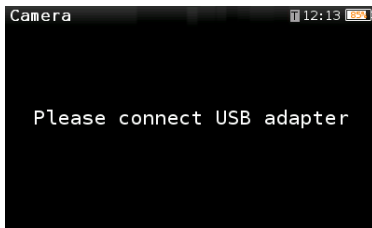
It is specifically aimed for installation and maintenance of analog video surveillance systems.

The supported interface is composite RCA (S-VHS).

The input video formats that can be displayed are the following:

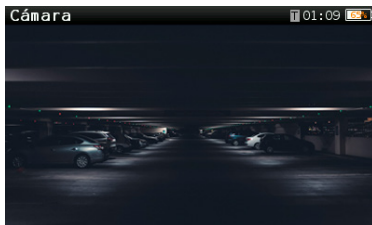
- NTSC: 720x480 @ 30fps
- PAL: 720x576 @ 25fps

To run the feature you just have to connect the input signal to the adaptor provided with the H30Crystal, making sure that the adaptor is connected to the USB input of the meter. If there is something wrong, the next screen will be shown:



11.1. Main window

Below is a capture of a Camera window:



12. Wi-Fi Scan (opt. 593250)

Analyzes the Wi-Fi band and automatically detects all the Wi-Fi networks, as well as their names and the power of the access point signal.

There are two different screens to display the information: List and Map.

12.1. List view

The screenshot shows a list of Wi-Fi networks with the following columns: Network Name, MAC Address, Channel, Security Type, and Signal Strength. Annotations point to specific fields:

- Wi-Fi network name:** Points to the network name (e.g., Arantia hotel).
- Wi-Fi network MAC:** Points to the MAC address (e.g., 64:d1:54:da:97:47).
- Wi-Fi protect access type:** Points to the security type (e.g., WPA2).
- Power of each Wi-Fi access point signal. The list is sorted by power:** Points to the signal strength bar and dBm value (e.g., -64 dBm).
- Wi-Fi network channel:** Points to the channel number (e.g., CH03).
- The red lock indicates that the network is locked:** Points to a red lock icon next to the security type.

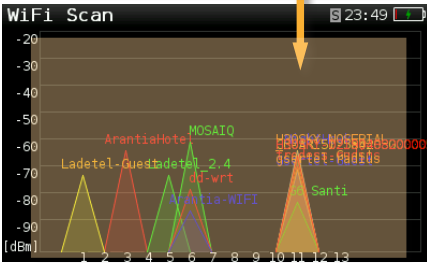
Wi-Fi network name	Wi-Fi network MAC	Wi-Fi network channel	Wi-Fi protect access type	Power of each Wi-Fi access point signal
Arantia hotel	64:d1:54:da:97:47	CH03	WPA2	-64 dBm
dd-wrt	58:ef:68:4e:cf:4a	CH06	WPA2	-77 dBm
G6 Santi	a8:b8:6e:46:d5:07	CH11	WPA2	-88 dBm
GL - AR150 - 5ad	e6:95:6e:41:e5:ad	CH11	WPA2	-73 dBm
Gsertel - Guest	12:da:43:c3:4a:d8	CH11	WPA2	-58 dBm

You can go through the list using and and select one of the Wi-Fi networks to display it separately.


If a Wi-Fi network has multiple access points, you will see several networks with the same name. If you select one of them, you will separately all the access points of that network. The first one in the list is the one you are connected to, which is the one that has more signal power at that point.

12.2. Map view

Graph showing the wifi networks. Each triangle represents a network. The height of the triangle represents the power of the access point signal.



12.3. Setup

Press  to change the Wi-Fi Scan options.



- **Band:** Terrestrial/Satellite
- **Mode:** Selects between Map or List View
- **Sort:** Only in List View mode. Allows to select how to sort the Wi-Fi list: name, level, or channels
- **Screen capture:** Captures the current screen and saves it as a .png image. You can see the captures using the remote control application

IPTV

13. IPTV (opt. 593251)

This menu provides the necessary measurements and parameters to guarantee a correct reception of IPTV services.

13.1. IPTV functions

To achieve this, this menu has three functions:



13.1.1. Measurements

This function shows all the necessary measurements of the selected IPTV channel.

13.1.1.1. Main Window


Below is a capture of a IPTV Measurements window with a brief explanation of its feature:

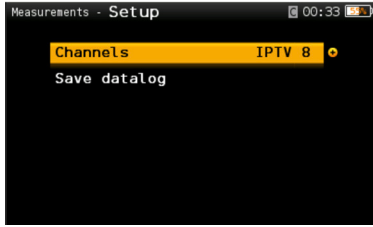
The figure shows the 'Measurements' window for IPTV channel 8. It displays channel data and a list of performance metrics. Callouts point to 'Selected channel data' and 'Selected channel'.

Selected channel data	
Selected channel	IPTV 8

List of measurements		
CH	IPTV 8	IP 230.0.1.8 Port 3000
Pkts	3782	pps
Pkt arrival min	77.67	us
Pkt arrival max	426.33	us
IP payload BR	40.661	Mbps
UDP payload BR	39.813	Mbps
Media Loss Rate	0	ppm
Lost IP Frame	0	frames

13.1.1.2. Setup


Press  to change IPTV Measurements options.



- **Channels:** Allows to change the selected IPTV channel.
- **Save Datalog:** Saves the current IPTV measurements. You can see the datalogs using the remote control application.



13.1.2.2. Setup

Press  to change IPTV MPEG options.



- **Channels:** Allows to change the selected IPTV channel.
- **Volume**
- **Info Service:** Shows/Hides the service information overlapped to the image:



13.1.2. MPEG

Using this function you can see the MPEG image.

13.1.2.1. Main Window

Below is a capture of a IPTV MPEG window with a brief explanation of its feature:



13.1.3. Services

This function shows the parameters and the bitrates of the selected channel services.

13.1.3.1. Main Window

Below is a capture of a IPTV Services window with a brief explanation of its feature:

If you press the OK button, the services list will be shown, so you can change the selected service easily:

Selected channel parameters

Selected channel

Services IPTV 8 22:24 15%

IP	238.0.1.8	PORT	3000
CBRT	39.82Mbps	NID	1 -
PAT	4 Services	TSID	1101

SERVICES

- hr-fernsehen 7.47Mbps ▶
- BR Fernsehen Nord 8.02Mbps ▶
- WDR Köln 4.67Mbps ▶
- SWR Fernsehen BW 5.06Mbps ▶

List of services and bitrates.

Press OK to select a service

Once you have selected a service, press OK to see all the parameters and bitrates of the audio and video:

Selected service ID

Selected service name

Services IPTV 8 22:25 15%

hr-fernsehen

SID 28108

VIDEO

VID	301	Type	MPEG2
Bitrate	6.59Mbps		

< 1/2 >

AID	302	Type	MPEG1
Bitrate	204kbps	Lang	deu

Video ID, Video Type and bitrate

Audio ID, Audio Type, bitrate and language.

Press ◀ ▶ to select other Audio

13.1.3.2. Setup

Press to change IPTV Services options.

- **Channels:** Allows to change the selected IPTV channel.
- **Edit channel:** Allows to edit the IP and the port of the selected channel.

EN



14. Setup

Change main configuration settings:

Home - Setup 10:02AM

- Language English ◯
- Units dBmV ◯
- Quality profile End Line ◯
- Plan FCC STD ◯
- Network ◯
- Time and Date ◯

- **Input:** Optics, RF. Allows to select the input
- **Optical Wavelength:** 1310 nm, 1490 nm, 1550 nm
- **Band:** Terr, Sat
- **Ter. Network:** Aerial, Cable
- **Cable Standard:** J.83-A, J.83-B. Allows to select the standard whenever Cable Network is selected
- **Terr Plan:** Several terrestrial plans and customers plans.
- **Sat Plan:** Several satellite plans from multiple Zones (Europe, Asia, Atlantic and America) and customers plans
- **Sat. Freq.:** IF, real Freq.
- **Sat. LNB:** Universal, C Band, Other.

If Other is selected, you must enter the frequency.

- **Restore Powering:** On/Off. When you turn your H30Crystal on, the meter will set the last LNB configuration automatically whenever this parameter is On.

- **Language:** English, Spanish.

- **Units:** dBμV, dBmV, dBm

- **Quality profiles:** Trunk, Tap, End Line, Ground.

Different thresholds are available for different testing locations.

- **Analog Standard:** Selects the standard for the analog channels and changes automatically the audio carrier to a value according to the selected standard.

- **Audio Carrier:** 4.5 MHz, 5.5 MHz, 6.0 MHz, 6.5 MHz.

- **Volume**

- **Network:**

Setup: Manual, Auto

When Setup Manual is selected, the user must set the gateway.

IP.

When Setup Manual is selected, the user must set the IP.

DNS.

When Setup Manual is selected, the user must set the DNS.

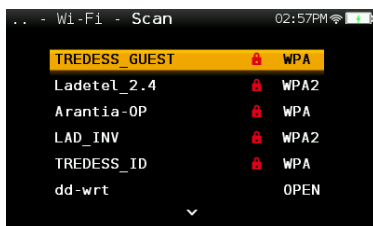
Gateway.

- **Wi-Fi:** Allows to connect the H30 to a Wi-Fi network.

Wi-Fi: On, Off




Mode: AP (Access Point), Client

Scan: When Wi-Fi is turned on and the selected mode is Client, it shows a list of all the found Wi-Fi networks.



As you can see in the image above, the list shows the name of the Wi-Fi networks and indicates if the network is open or restricted, as well as the protection access type.

To access to a restricted network, you must

enter the password using  and 
To verify the password, find  and square behind the last character of the password

and press 

- **Bluetooth:** On, Off

- **Units System:** Metric, Imperial

- **Time and Date:**

Set current time (hour and minutes) and date (day of the month, month and year).

- **Energy:**

Auto suspension

Auto shutdown

- **Update firmware:** See section *Firmware update*

- **Reset configuration:** Resets the H30Crystal to factory settings

- **Reset Zone:** Resets the zone and language.

The equipment will ask again for the geographic zone and language, to load the default plans of that zone. (this option will delete the user plans)

- **Licenses:** Shows a list with all the licenses included in your H30Crystal

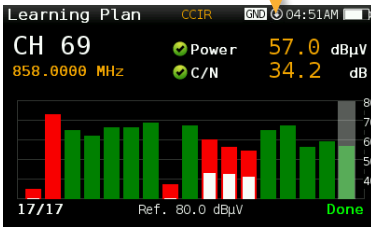
- **About SW**

- **About HW**

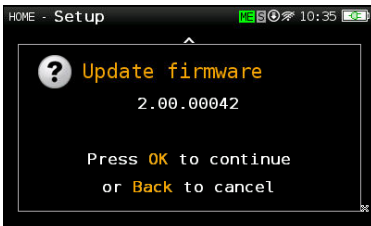
Firmware Update

Whenever your H30Crystal is connected to the internet, it will automatically check if there is a newer firmware version. If it is so, an arrow icon will appear at the top of the screen:

The icon with the arrows indicates that there is a new firmware version



If the user wants to update the firmware, please select function *Update firmware* in the *Setup* menu
 If there is a new firmware version, a message will be displayed when the user selects this function:



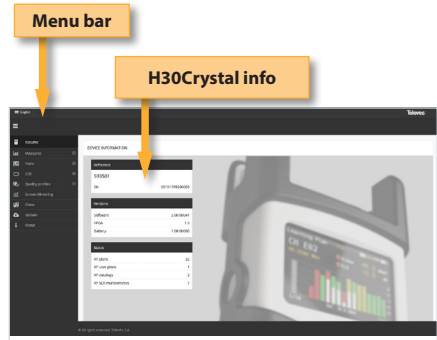
Press OK button to automatically download and install the new firmware version.

Web Application

First of all, connect your H30Crystal to the network using the Ethernet connector or the Wi-Fi interface. Then you must find out the IP of your H30Crystal (see section 11.- *Setup - Network/Wi-Fi*).

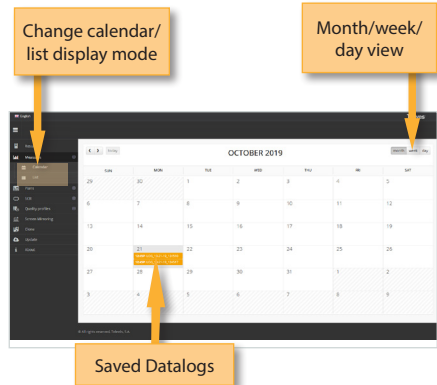
Then, type your H30Crystal IP in the address bar of your web browser and press Enter.

Then you can see the home window of the **H30Crystal** web application:

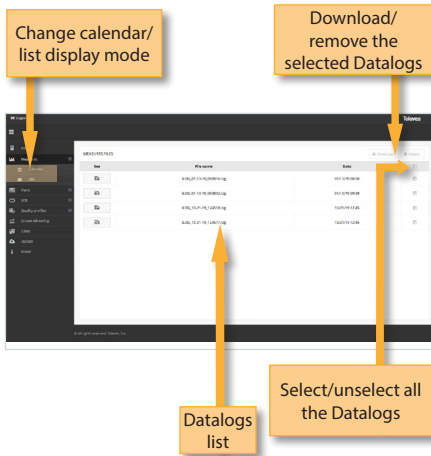


1. Measurements

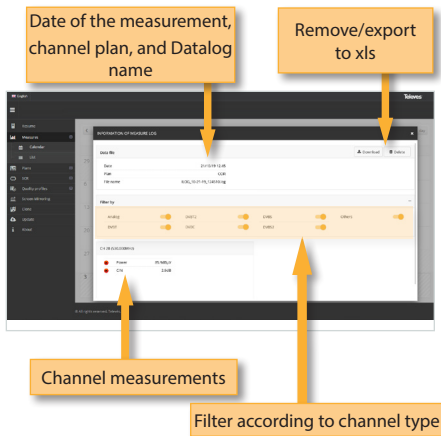
In this window, you can see all the datalogs saved in your H30Crystal. They are grouped by date in a calendar:



To change the display mode from calendar mode to list mode, just click on the corresponding button placed in the menu bar:



Using the buttons placed at the top right of the screen, you can remove the selected Datalogs or download them to your computer in .xls format (it will be generated a .xls file for each Datalog and they all will be downloaded together in a .zip file) Clicking on a Datalog of the list, the measurements of that Datalog will be displayed:



2. Plans

In this window, you can see all the channel plans of your H30Crystal.

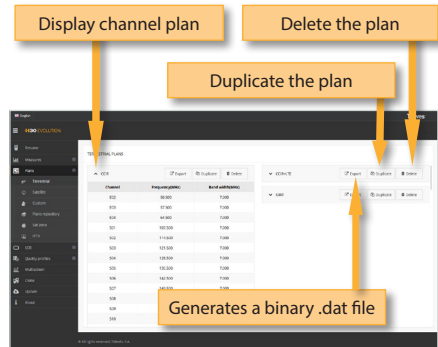
2.1.- Terrestrial, Satellite and Custom Channel Plans

The channel plans are grouped in three categories: Terrestrial, Satellite and Custom.

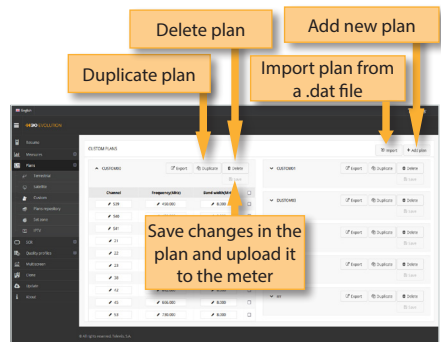
The Terrestrial and Satellite channel plans are the standard channel plans of the corresponding band.

These plans can be removed from the meter, but they can not be edited. However, you can make a copy of one of them to build a new customer channel plan from it. You can also export a selected plan to a binary .dat file, that can be then imported in the Custom section. It is a easy way to copy a channel plan from a meter to another(s).

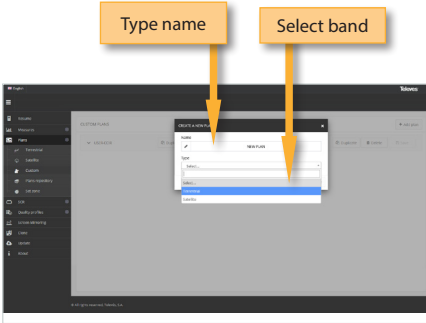
The duplicated plans will appear in the Custom list automatically.



The custom channel plans can be edited:

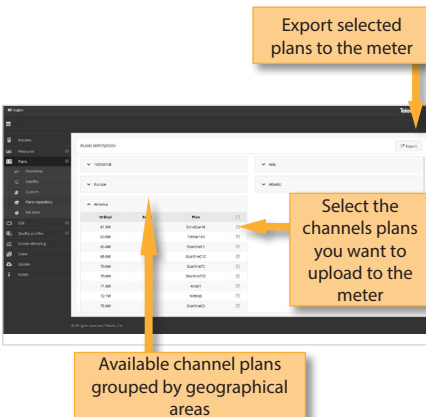


You can create a new channel plan from an existing one by clicking on the corresponding button or importing it from a binary .dat file. Or you can start from scratch, by clicking on the “New custom plan” button:



2.2.- Plans repository

The application also allows to configure the channel plans according to the geographic area you will use the meter. When you turn the meter on for the first time, you must select the language and then you must select the geographic area. So, the channel plans corresponding to that area will be available in your H30Crystal. But the user may add other standard channel plans corresponding to other geographic areas (this is specially helpful for those places located near the frontier between two areas). To do that, click on the “Channel plan repository” button :



The channel plans added from the repository will be uploaded to your H30Crystal, but none of the channel plans in your meter will be removed.

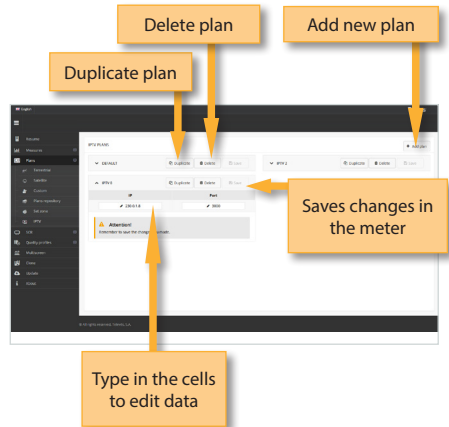
2.3.- Set zone

Using the “Set zone” button, the user can change the area of his/her meter. When you change the area, all the plans of your H30Crystal will be removed and the new channel plans corresponding to the selected area, will be upload to your meter.



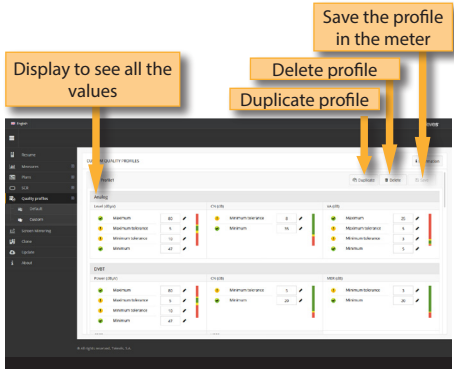
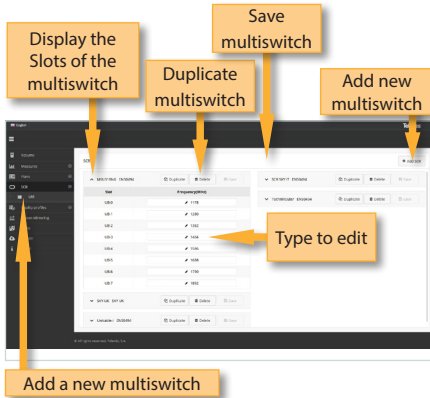
2.4.- IPTV

Using this function, the user can create and edit IPTV channel plans. Each channel plan has only one plan, indicating the IP address and the port for each channel:



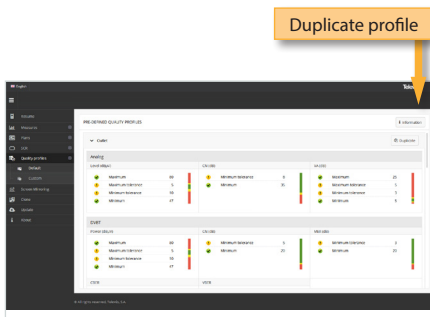
3. SCR

In this window, you can setup the multiswitches. The H30Crystal includes a list of multiswitches by default, but you can add more or edit any of the existing ones.



4. Quality Profiles

Using the web application you can add new quality profiles. The H30Crystal has two pre-defined quality profiles (head-end and outlet) that can not be edited, but they can be duplicated. The duplicated quality profiles are saved in the custom quality profiles, and the custom quality profiles can be edited.



5. Multiscreen

Using this feature you can control your H30Crystal remotely. For this to work, it is necessary that the H30Crystal and the computer are connected to the same LAN. To access to this feature you must enter the password admin in the right top part of the window. Then you will see the screen of the H30Crystal in your computer:

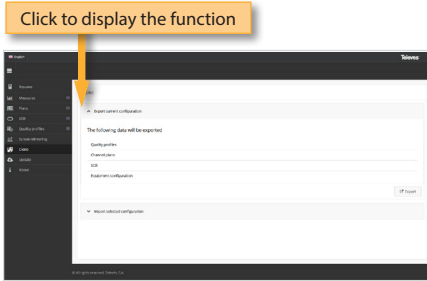


6. Clone

Using this feature it is very easy to have the same configuration in all your H30Crystal meters. You only have to export the configuration of the H30Crystal that you want to copy, using the Export feature. So, the configuration will be saved in a file

on your computer.

Then, connect other H30Crystal where you want to copy the configuration to and select the Import feature.



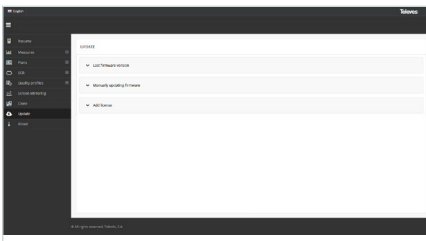
7. Update

In this section you can update the firmware of your H30Crystal, as well as install new licenses in your meter.

If your H30Crystal is connected to the internet, the system will detect automatically if your meter is already updated by clicking on "Last firmware version". If it is not, then you can download the new version and install it automatically from this menu.

If you get the update file from your distributor, you can install it in your H30Crystal by clicking on "Manually updating firmware".

Same with licenses: if your H30Crystal is connected to the internet, it will detect new purchased licenses automatically when you turn it on, and will install them automatically. But if you get the licenses from your distributor, you can install them in your device by clicking on "Add license".

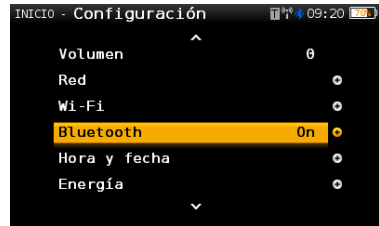


Mobile Devices App

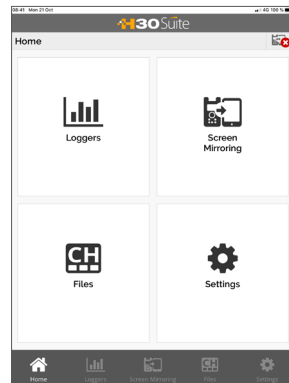
1.- Connection between the App and the H30Crystal

The app connects to the H30Evolution via Bluetooth:

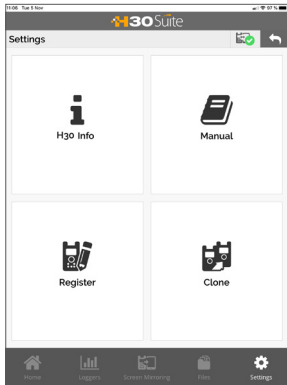
1.- Activate Bluetooth in the Setup menu (see section 11.- Setup).



2.- Then, open the H30Series App. The App main screen looks like this:



When you tap on the Settings button, you will see this screen:

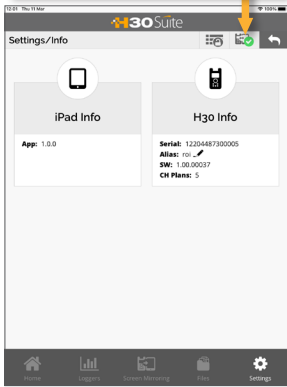


Tapping on Info, the users can see the following screen, where they must tap on the Pair button. A list with the H30Evolution detected will be displayed. Select the pair button of the device that you wants to connect to:



Once paired, the information of the device will appear (Serial number, software version and Plans) It is only allowed to have a device paired with the app. If you want to pair another device, it is necessary to unpair the previous one.

When the H30Crystal is connected, the icon is green



If you want, you can choose an alias for the device writing the name in the Alias field.

There are 3 icons to show the connection status with the meter:



- Red cross:** There are no devices connected
- Yellow exclamation:** A device is paired, but it is not connected
- Green check:** The device is connected.

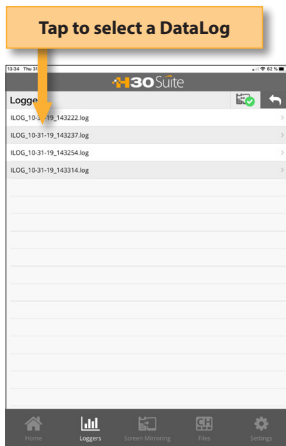
2. Features

Once your tablet and your H30Crystal are connected, you can operate with the App using the following features:

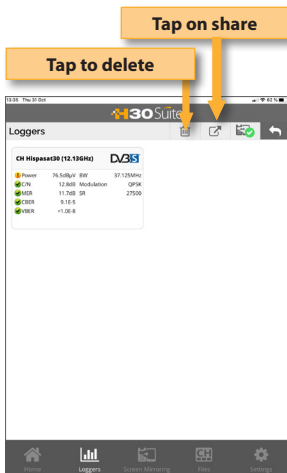
2.1.- Loggers

This window shows the Logs saved in your H30Crystal.

When you tap on one of these logs to select it, you will see all the measurements at the bottom of the screen.



When you tap on logger, the measurements in that logger will be shown:



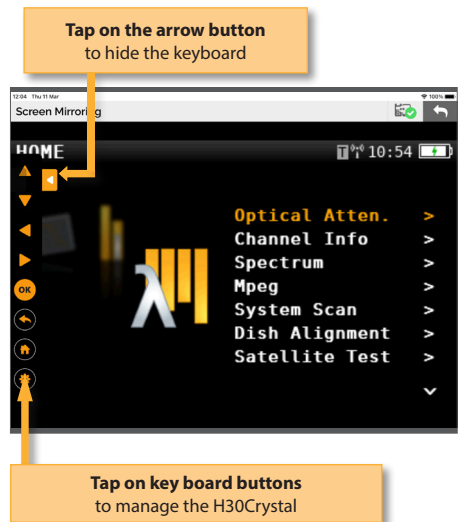
2.2.-Multiscreen

Using this feature, you can use your tablet to control remotely your H30Crystal.

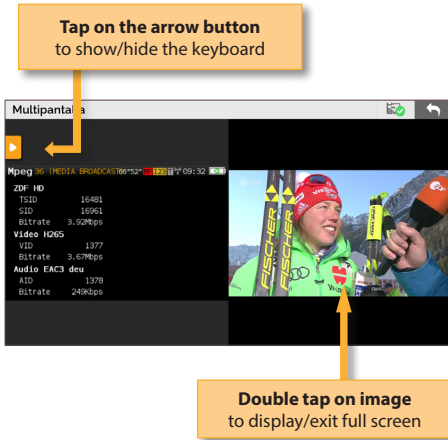
Note: in the current version it is not possible to run the Wi-Fi Scan function using the Multiscreen feature.



When you tap on the arrow button, the keyboard will be displayed. Use these buttons as if they were the device.



If the selected function is MPEG, the video is shown next to the information window:

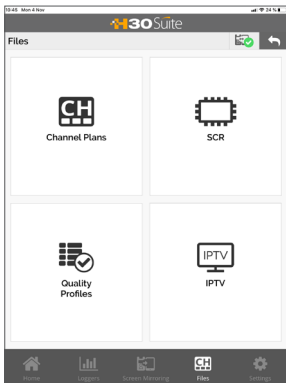


Note1: HEVC videos only can be displayed on tablets that support this standard.

Note2: If the user selects the Video Camera function while using the multiscreen feature, the image will not be displayed in real-time.

2.3.-Files

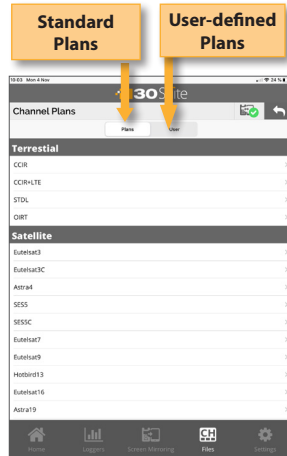
This feature allows to manage channels plans, SCR files and quality profiles:



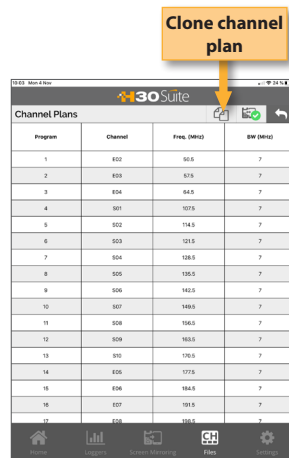
2.3.1.- Channel Plans

Using this function of the App, you can see all the channel plans of your H30Crystal, as well as add new user channel plans and edit them.

The standard channel plans can not be edited.

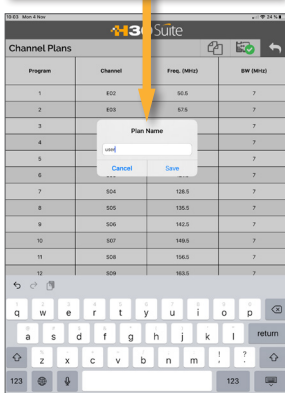


The standard plans can be cloned. When the user does this, a new channel plan is added to the User channel plans list:



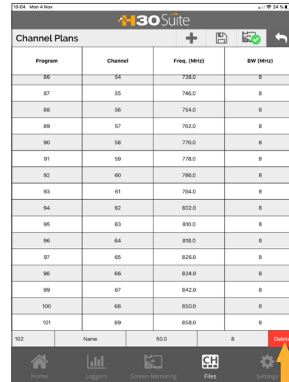
Enter the new user-defined channel plan name, and it will be automatically uploaded to your H30Crystal.

Type the new channel plan name and tap on Save



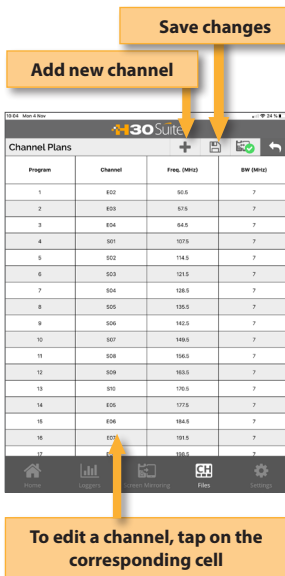
When the user adds a new channel to a plan, it will be added at the end of the table with default-value parameters (name, frequency, etc.), that the user must edit.

When the user saves the changes, they will be automatically loaded in the H30Crystal. To delete a channel plan, swipe to the left the corresponding line:



When the Delete button is visible, tap it to delete the channel

The channel plans in the user-list can be edited:



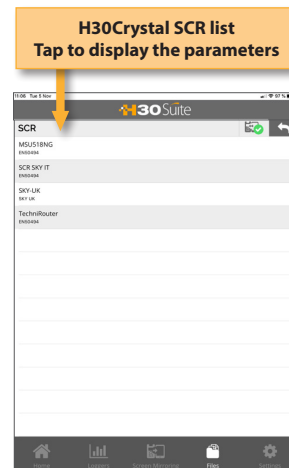
Add new channel

Save changes

To edit a channel, tap on the corresponding cell

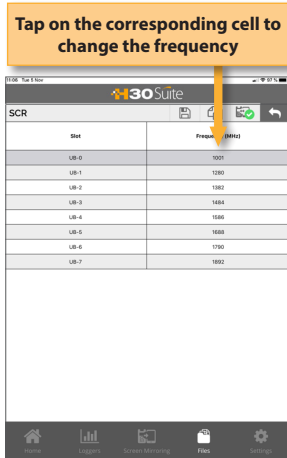
2.3.2.- SCR

This function allows to add and edit SCR files

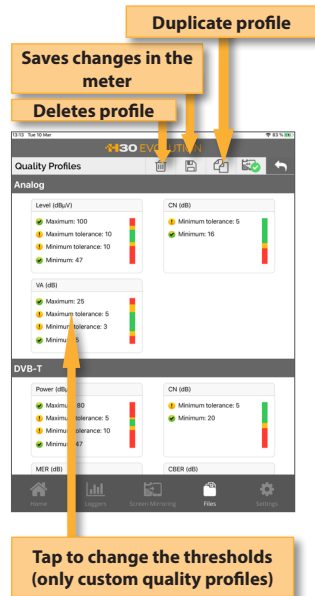


H30Crystal SCR list Tap to display the parameters

Tap on one of the SCR of the list to display its parameters:

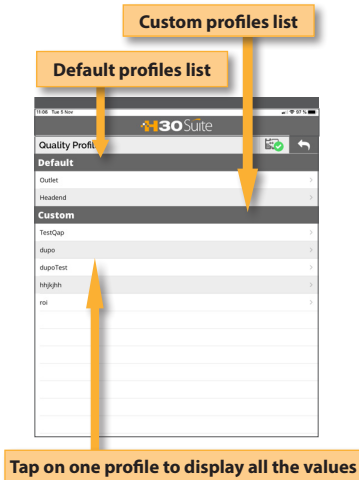


You can see the threshold values of all the measures of a quality profile by tapping on it:



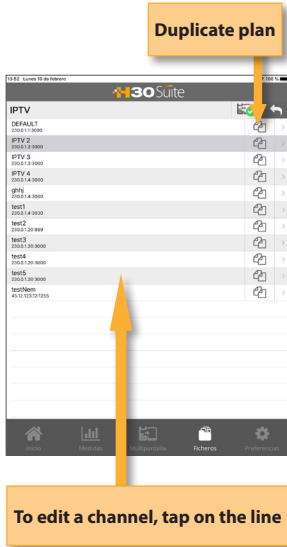
2.3.3.- Quality Profile

This function allows to add and edit the quality profiles of your H30Crystal. H30Crystal has two predefined quality profiles (headend and outlet), shown on the “Default” list. These profiles can not be edited, but you can duplicate them. The duplicated profiles are saved in the “Custom” list, and those profiles can be edited by the user.



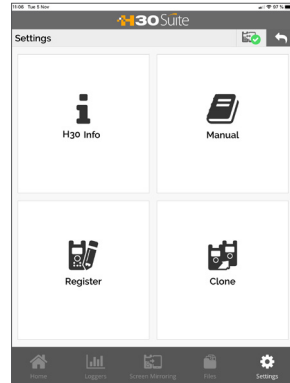
2.3.4.- IPTV

With this function, the user can create and edit IPTV channel plans. Each plan has only one channel, indicating the IP address and the port for each channel. To add a new IPTV plan, it is necessary to duplicate an existing IPTV plan, and then edit the data. To delete a channel plan, swipe to the left the corresponding line, and when the “Delete” button is visible, tap it.



2.4.-Settings

When the user taps on Settings, the following window will be displayed:



EN

When you tap on the line corresponding to a channel, a pop up window will appear, allowing the user to modify the IP address and the port:



2.4.1.- Info

Using this function of the App, the user can see the App information, as well as the H30Crystal whenever it is connected to the App.



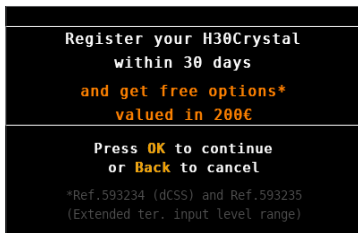
2.4.2.- Manual

Using this funtions, the user manual will be displayed in the App

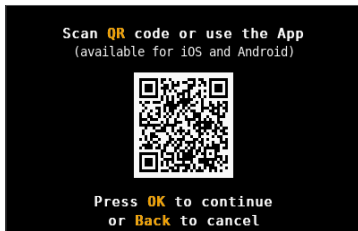
2.4.3.- Register

The user can register his H30Crystal using this function.

The first time that you turn your H30Crystal on, it will ask you to register it. If you register your H30Crystal within 30 days, you will get two options (valued in 200€) for free.

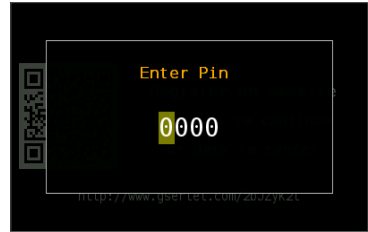


If you press BACK, you can use your H30Crystal. If you press OK, it will begin the registration process:



The user can choose to use his / her mobile phone to read the QR code, or use the Register function of the H30Crystal App (note, the mobile device which the app is running on, must have access to the internet).

i)If you use your mobile phone, read the QR code using the camera. Then a web browser will be open with the Televs Meter Registration web page. Register your H30Crystal in our web. Once the process is completed, you will get a PIN code by email. Enter the PIN code in your H30Crystal:



ii) If you choose to use the app to register your H30Crystal, you first have to connect your H30Crystal with your mobile device. To do that, press BACK to leave the registration process for a moment and follow the instructions explained in the section 1.- Connection between the App and the H30Crystal.

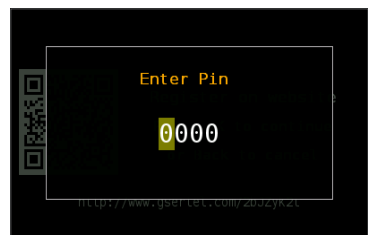
Then turn your H30Crystal OFF, and then ON again to start the Register process.

Select Settings->Register menu in the App.

Now you must disconnect your mobile device from your H30Crystal and connect it to the internet.

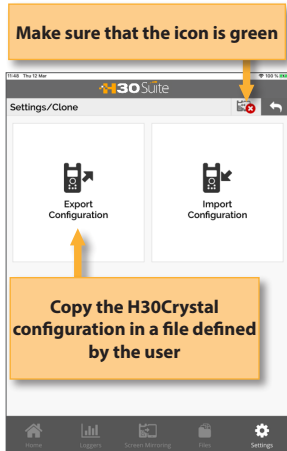
Then it will be open a web browser with the Televs Meter Registration web page. Register your H30Crystal in our web. Once the process is completed, you will get a PIN code by email.

Enter the PIN code in your H30Crystal:

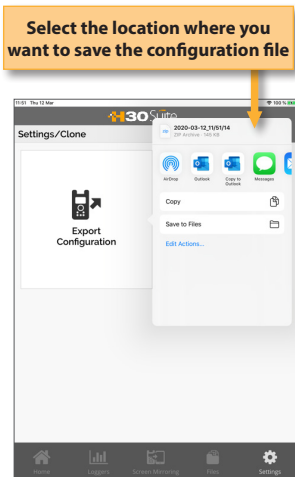


2.4.4.- Clone

Using this feature it is very easy to have the same configuration in all your H30Crystal meters.



You only have to export the configuration of the H30Crystal that you want to copy, using the Export feature. So, the configuration will be saved in a file on your computer.



Then, connect other H30Crystal where you want to copy the configuration to and select the Import feature and search the configuration file in your device.

Error Messages

LOW BATTERY

Indicates that the battery is about to finish. The battery icon is red now. It is recommended to connect the meter to the external power source.

LOW BATTERY Shutting down

Some time after the LOW BATTERY message appears (time varies depending on the functions used), it will appear this message. If the meter is not connected to the external power source, it will switch off.

BAD POWER Unplug power source

This message appears when the meter is connected to an external power source that does not supply it the right power. Please, use only the power source provided with the **H30Crystal**.

SHORT-CIRCUIT Check installation

This message appears when the meter detects a short-circuit at the RF input. It is recommended to check the installation to find out why the short-circuit is produced.

DC OUTPUT LIMIT EXCEED Switch DC OUTPUT off

This message appears when the meter detects an excessive consumption from the device that is being powered. It is recommended to turn off the powering feature of the **H30Crystal**.

DC AT RF INPUT Check installation

This message appears when the meter detects DC at the RF input that is not generated by the **H30Crystal**. It is recommended to check the installation.

Maintenance

Always disconnect the unit before cleaning. Use only a mild solution of detergent and water applied with a soft damp cloth. Dry thoroughly before use.

Do not use aromatic hydrocarbons or chlorinated solvents. These products may damage the unit.

Do not use alcohol or alcohol based products on the front panel, especially the display. These products may damage the unit.

Technical support

For any questions, contact Technical Support at www.televes.com

Before contacting Technical Support for repair, read the manual to ensure proper use and attempt to RESET the unit to clear any problems.

Repair service

Do not return the unit without first contacting Televes Technical Support.

If the unit needs to be returned, Televes will arrange for free shipping. The unit will need to be appropriately packed for shipping.

In compliance with IATA Regulations, when using our shipping service follow these instructions:

- ▶ Label the package.
- ▶ The equipment should fit as snugly as possible in the box. It is recommended to use the original packing materials.
- ▶ Attach the precaution label to the package.



Failure to comply with these shipping requirements may result in the shipping agent rejecting the package.

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