Exploring with Promax

The Promax TV Explorer is one of the most powerful tools the installer can use. In the first of a two-part examination, Chris Jenkins looks at the new HD version

Simon Humphries

Thanks to Simon Humphries from Promax for his help and patience in the preparation of this feature.

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The latest version, the Explorer HD, adds high-definition features, so it's a good time to run through the features of this flexible box for the benefit of anyone who has not been exposed to its potential.

The Promax Explorer HD is, like its predecessors, a portable signal spectrum analyser, measuring signal power against frequency. Where it differs from a normal signal meter is that it can show the operator the whole of the desired spectrum at one time; it doesn't just show you what's happening with signals of one frequency, but what's happening elsewhere in the signal spectrum – and what might be causing reception problems with the signal you are trying to receive.

The Promax TV Explorer HD is the most powerful evolution of the range to date

The Explorer's analysis tools make it possible to detect all sorts of reception problems, but it's still up to the skill and knowledge of the operator to solve those problems; that's why Promax runs in-depth training courses covering all the Explorer's functions.

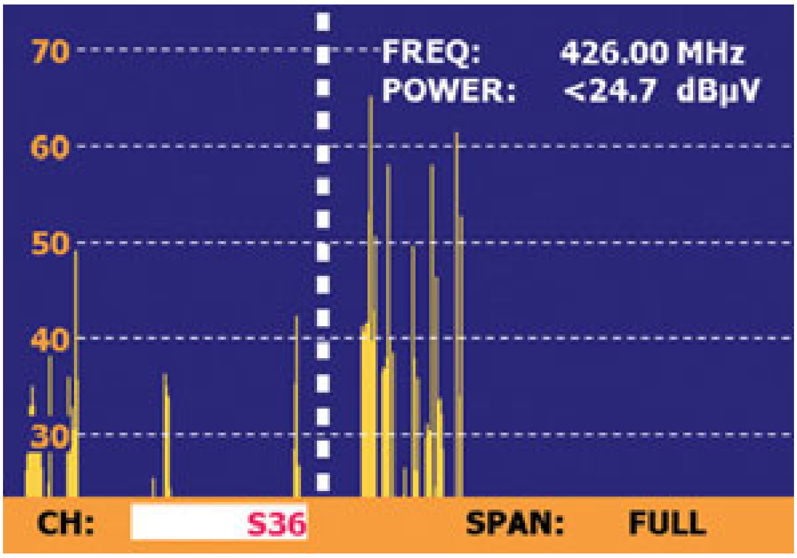
Admittedly, the Explorer is a significant investment, and for a small business tackling simple jobs it may be over the top; but for a large project where time is money, the amount of time it will save should see it paying for itself in short order.

Promax origins

Promax Electronica SA originated in Spain in 1964, and moved from scientific test equipment into the broadcast test market.

Still a family company, Promax does most of its research and development and manufacturing in Spain, but the single European market and the spread of digital TV make it easy to develop localised versions of its software and hardware. Promax bought UK company Alban Electronics some years ago, and the company has now become Promax Electronics Ltd.

Features such as interchangeable connectors and regular software updating make it easy to conform the Explorer products to each market, and the UK division leads the way in innovation in testing. There are big differences in test equipment for the US market, of course, but that's another story!



The Explorer HD has the same form-factor as the Explorer II+. In fact, most of its functions are the same. The major changes are support for MPEG-4 signals, the addition of an HDMI socket so 1080i signals can be output to a monitor, and a two-way USB socket so the device can act as a master – not just a slave – for dumping test results and other data. Also added is the ability to pass through Asi streams via the two rear-panel BNC sockets.

The most striking design feature of the Explorer, apart from its impact-resistant case, is probably its 16:9 display. This uses a specially developed and patented transflective screen that offers high visibility even in bright sunlight – a distinct advantage when you're perched up a ladder with the Explorer slung around your neck.

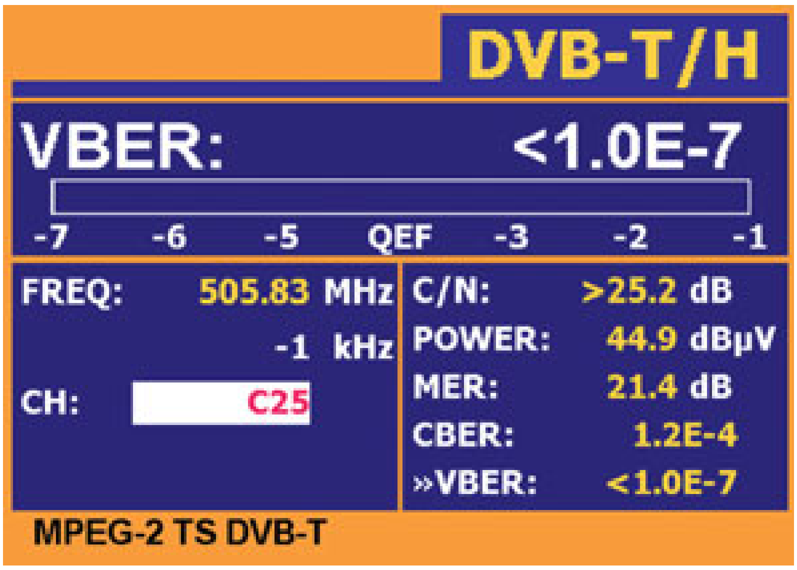
Other features remain similar to those on the original Explorer: a series of soft-touch buttons to select functions, a big thumb-wheel control to scroll through menus, and a rechargeable battery (now a Li-Ion type, which offers better performance than NiCad and NiMh).

TV functions

So how does the Explorer work and how can it help us in a typical terrestrial installation job?

Basically, it can display signals in the entire VHF/UHF range from 5-1000MHz. It not only tells you about the signal you want to pick up, but also about others that might be causing interference.

Say, for example, you were trying to pick up a signal from Crystal Palace transmitter. The signals would appear as a cluster or large spikes on the appropriate frequency, but we may also see signs of interference from other signals, perhaps the police TETRA band around 395MHz. The fact that the TETRA signal is about 100MHz away from the Crystal Palace signal will not stop it from causing interference if its source is strong enough. On an analogue signal the typical result would be herringboning or – on a digital



TV Explorer HD specifications

Video decoding: MPEG-2 and MPEG-4 H.264
Audio decoding: MPEG-1, MPEG-2 and AAC
Video formats: SD (standard definition) and HD (high definition)
Video resolutions: 1080i, 720p and 576i
Screen formats: 16:9 and 4:3
HDMI interface
DVB-T/H, DVB-C and DVB-S/S2
CAM module (Conditional Access) for encrypted channels
TS-ASI input and output
MPEG-2 and H.264 video decoder
MPEG-1/2 and AAC audio decoder
Link margin measurement
Frequency margin: Continuous tuning from 5 to 1000MHz and from 950 to 2150MHz
Tuning modes: Channel or frequency (IF or downlink at satellite band)
Channel plan: Configurable on demand
Resolution: 5-1000MHz: 50kHz
950-2150MHz < 200kHz (span FULL-500-200-100-50-32-16MHz)
Automatic search: Threshold level selectable, DVB-T/H, DVB-C and DVB-S2 selection
Analogue and digital signal identification: Automatic
Transport Stream parameters: Detection of Audio and video bit rate, Network ID and Service list
Digital modulations: DVB-T, DVB-H, DVB-S, DVB-S2, DVB-C
Resolutions: 1080i, 720p, 576i
Video formats: MPEG-2, MPEG-4 H.264
Colour system: PAL, NTSC, SECAM
TV standard: M, N, B, G, I, D, K and L
Aspect ratio: 16:9, 4:3
RF input impedance: 75Ω
Connector: Universal, with BNC or F adapter
Maximum signal: 130dBµV
Maximum input voltage: DC to 100Hz 50V rms (powered by the AL-103 power charger) 30V rms (not powered by the AL-103 power charger)
5MHz to 2150MHz 130dBµV
Digital measurements: Numeric and level bar
DVB-T/H (COFDM) Power, CBER, VBER, MER, C/N and noise margin, DVB-C (QAM) Power, BER, MER, C/N and Noise margin, DVB-S (QPSK) Power, CBER, VBER, MER, C/N and Noise margin, DVB-S2 (QPSK/8PSK) Link Margin, Power, CBER, LBER, MER, C/N and Noise margin
Analogue measurements:
Terrestrial bands: Level, V/A ratio, C/N ratio and FM deviation and demodulation
Satellite bands: Level and C/N ratio
Advanced functions: Constellation diagram for DVB-T/H, DVB-C, DVB-S and DVB-S2
Echo analyser mode
Built-in spectrum analyser with direct access keys
Datalogger (measurements automatic acquisition and storage) for digital and analogue channels
SAT IF test (IF distribution network response for satellite band)
Attenuation test function (signal distribution network response for terrestrial band)
DiSEqC generator and LNB supply
Audio and Video recording and playing
Connections: Scart, HDMI, TS-ASI (input and output), USB, common interface

signal – pixellation, and the solution would be to fit a TETRA filter to the aerial feed.

The Explorer's display tools allow you to zoom in on any required portion of the frequency spectrum, using the left and right cursors to define the range right down to a single channel band on digital TV, or a single satellite transponder width.

If the signal peaks off the top of the display, you can use the other set of cursors to change the amplitude of the display, and there's a warning flag if the signal is overloading.

But Explorer can do more than just display a signal; it can also analyse and explain it. The green Explore button activates a Scan function that sweeps through the frequency band, detecting analogue or digital signals (including cases where both types are coming from the same source). For a terrestrial signal, the meter can be set to sweep through a particular range, such as the UK UHF frequencies from 21-69, and for a satellite signal, it can be set to sweep through a particular Satellite Channel Plan, such as 28E2 ASTRA.

This function is not limited to off-air broadcasts – it could equally be used for, say, a hotel's TV distribution system – and preferences can be set to limit the detection threshold for analogue or digital signals.

For terrestrial digital or satellite signals, the Scan function will look for the network name data and identify the transmitter. This is a particularly useful function as some networks transition to a single frequency with relay stations providing better multi-path coverage on the same frequency.

The Scan function will apply the appropriate measurements for digital and analogue signals, so you don't have to keep going back to the main menu to change parameters. You can screen-grab any display at any time, and store images as BMP files in the Explorer's huge memory. The images can be exported via USB to any compatible device, forming a useful part of any site report.

Each result is shown with a bar graph and the appropriate units of measurement; for instance, the Quasi-Error Free point for a digital signal, the carrier-to-noise ratio, power, MER, Noise Margin, Link Margin, CBER and VBER.

Of course, having these measurements is not much use if you don't know what results are required for an acceptable signal – this is where the operator's skills in interpretation come in. Possibly a good digital signal could be suffering interference from an analogue signal hidden on the same frequency – the correct use of the meter's functions could help you to determine this.

It's also important to know how the parameters can interact. For example, a good VBER result can quickly go bad if the CBER is unacceptable, and an acceptable average power result doesn't tell the whole story, as bit error rate could be inadequate.

We'll look at Promax TV Explorer HD's satellite functions and other features in February's issue.

Contact Promax UK on 01727 832266, or visit the website.

With the Explorer HD, you can see the light (weather not included)

Into orbit with Promax Explorer

Last month we looked at the main features of the new Promax Explorer HD signal spectrum analyser. Now, Chris Jenkins explores its satellite signal analysis functions

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The latest version, the Explorer HD, adds high-definition features, so it's a good time to run through the features of this flexible box for the benefit of anyone who has not been exposed to its potential.

Last month we discussed the general features of the Promax Explorer HD. It is a portable signal spectrum analyser, measuring signal power against frequency. But where it differs from a normal signal meter is that it can show the operator the whole of the desired spectrum at one time; it doesn't just show you what's happening with signals of one frequency, but what's happening elsewhere in the signal spectrum – and what might be causing reception problems with the signal you are trying to receive.

The Promax TV Explorer HD is leaps ahead

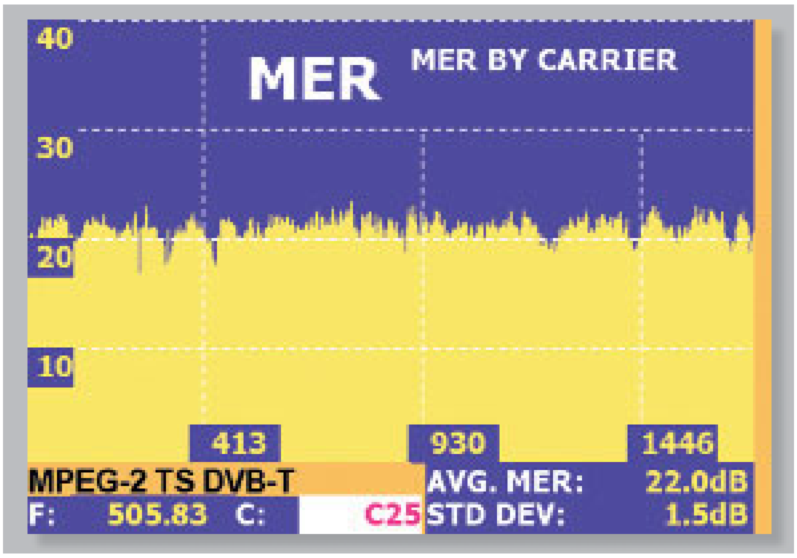
This month we'll look at the satellite signal analysis features of the Promax Explorer HD.

Uniquely, the Explorer will analyse a signal for each digital mux and display the MER for each carrier, as well as the average over the whole channel.

For digital broadcasts the Explorer's 'constellation diagram' is an invaluable indicator of the quality of the signal. On a good signal all the points will appear as a small tight area with no 'spreading out' of the pattern. Any distortion of the pattern will instantly give the skilled engineer a valuable insight into the root of the problem. This is a much better way than a table of measurements to visualise problems such as phase jitter.

The Explorer can also measure the 'Noise Margin', the safety margin that prevents one digital word from being mistaken for another one, helping to identify a signal that could be close to pixellation. It also has the facility to power an external device over coax aerial cable. This could be used, for instance, to verify that an amplifier is working properly.

The unique MER By Carrier function is useful in cases where sources of interference may be hidden by a mux. For example, different transmitters may use the same channels for digital and analogue. This is a widespread issue during the digital transition. The



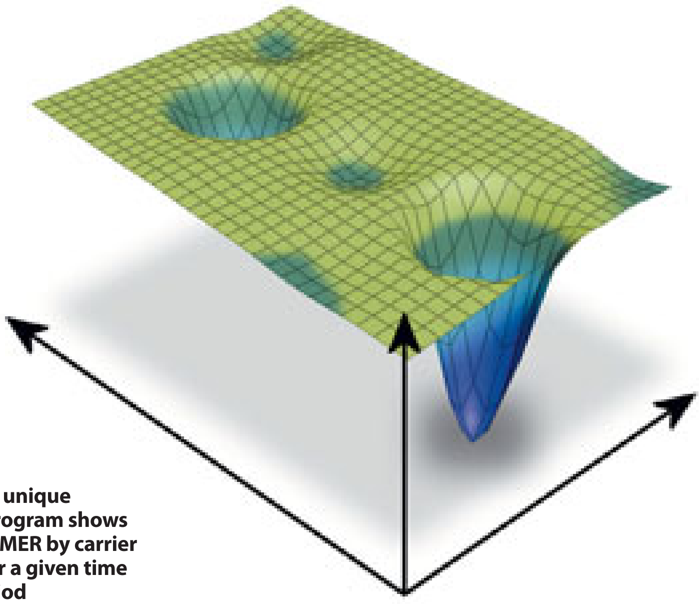
interfering analogue signal causing pixellation would be completely hidden in a spectrum display behind the digital mux, but would show up in the display as an inverted analogue signal as the carriers at these points would have significantly higher error rate.

On a single-frequency network, the COFDM Echoes function will show you first time arrival of signal, then the arrival times of subsequent echoes. A digital signal features a guard interval, which ensures that echoes received within a certain time are ignored, but others that are significantly delayed by multipath effects will begin to degrade signal quality.

In conjunction with a small signal generator, the Explorer can also be used to carry out attenuation tests, where the power loss over long runs of cable can be measured. This is crucial for work on large systems or in measuring the characteristics of cables.

For problems with sporadic interference the Explorer has Spectrogram and Merogram functions, which take the MER By Carrier and Spectrum functions and record all the sweeps over time, to help highlight where a problem occurs erratically or over a set time frame. The unit's 1GB memory is sufficient to store many hours of recordings and the resulting information can be viewed on screen or exported to an external application such as Microsoft Excel and processed in various ways to highlight and identify the interference.

Another recording function of the Explorer is the Datalogger. This will record snapshots of data on each frequency of interest and build up a record of the full characteristics of a complete system. The Explorer comes supplied with PKTools software for Windows PCs, which allows these data files to be presented to industry



The unique Merogram shows the MER by carrier over a given time period

Ofcom's 'white space' proposals: A headache for installers?

There are fears that new wireless technology could interfere with TV broadcasts. Chris Jenkins explains

Ever since the switch to digital was planned there has been heated discussion about the best way to make use of the 'digital dividend' offered by the broadcast spectrum freed up by digital switchover.

Ofcom's latest discussion document, *Digital Dividend: Geolocation for Cognitive Access*, suggests that because the capacity available within the spectrum retained to carry the six digital terrestrial television (DTT) multiplexes is 'interleaved', there will be some space available in any particular location for other services on a shared basis.

These are known as 'cognitive' applications – in other words, they will have to be able to detect what spectrum is being used locally and adjust themselves to use the 'white space' between existing services.

The most interesting possible uses of the technology could be to wirelessly link different devices so that, say, a digital camera could be set to automatically transmit its pictures to your home, or you could control your central heating from a distance. Another potential application would be to improve mobile broadband access in rural areas.

Because 'white space' devices would use lower frequencies than existing wireless technologies such as Bluetooth and WiFi, their signals would travel farther and penetrate obstacles more easily – but this is the aspect that is worrying some experts.

A SatNav approach

As long ago as December 2007, Ofcom concluded that 'we should allow cognitive access as long as we were satisfied that it would not cause harmful interference to licensed uses, including DTT and programme-making and special events (PMSE). This could potentially bring substantial benefits to citizens and consumers in the form of new devices and services.'

A further consultation on proposed parameters for licence-exempt cognitive devices using interleaved spectrum was published in February 2009, and in July 2009 Ofcom concluded that cognitive devices should either sense the presence of other signals, or make use of a geolocation database to determine which spectrum was unused in the vicinity. The latest document is intended to encourage debate on how such a geolocation database might operate.

Until recently it has been assumed that cognitive devices would sense the use of spectrum by monitoring for licensed transmissions and only transmit if they found none in a particular frequency range. But recent studies have shown that the signal levels they would need to sense down to – to be certain of not causing harmful interference – are extremely low, so Ofcom is considering the geolocation approach, using a system similar to SatNav.

The cognitive devices would measure their location and make use of a geolocation database to determine which frequencies they can use at their current location. They would be prohibited from transmitting until they have successfully determined from the database which frequencies, if any, they are able to transmit on in their location. The device would have to be able to provide its location and type to the database, and receive information on frequencies and power levels from the database and, of course, it would be important that the database be kept up to date.

If it could be shown that 'white space' devices can coexist with neighbouring TV signals and wireless microphones without causing interference, Ofcom could authorise their development.

Prof William Webb, Ofcom's head of R&D, said: 'White space devices have the potential to enable a vast range of new applications – from broadband access for rural communities, to innovative personal consumer applications – each benefiting from improved signal reliability, capacity, and range offered by unused TV frequencies. But this technology remains largely unproven and a significant amount of work needs to be done before these claims can be tested. The purpose of this discussion document is to further the thinking that is taking place around the world on geolocation and speed the development of possible solutions.'

The Ofcom document ends by inviting responses by February 9, 2010, after which it will consider them and decide what to do next.
www.ofcom.org.uk

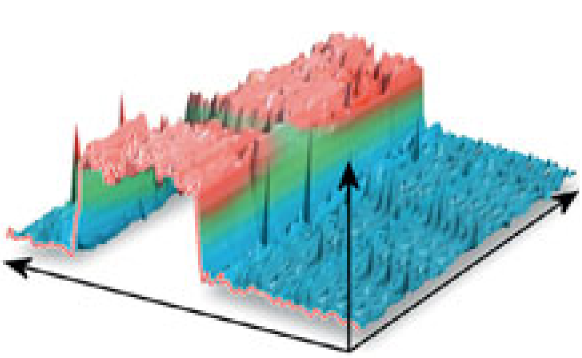
standards, or as CSV files. All measurements can be named and stored in folders, with each test point or transponders identified.

The function is more than sufficient to meet Sky's requirements for data recording, and could be a lifesaver if you need to verify your measurements in legal cases.

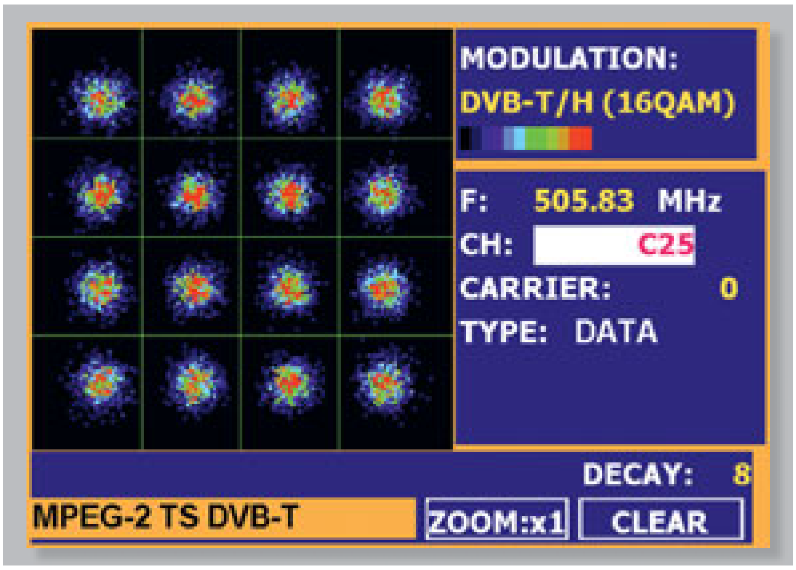
In cases where you need to be able to show a customer something that means more to them than a row of figures, the last resort is always to show them a picture!

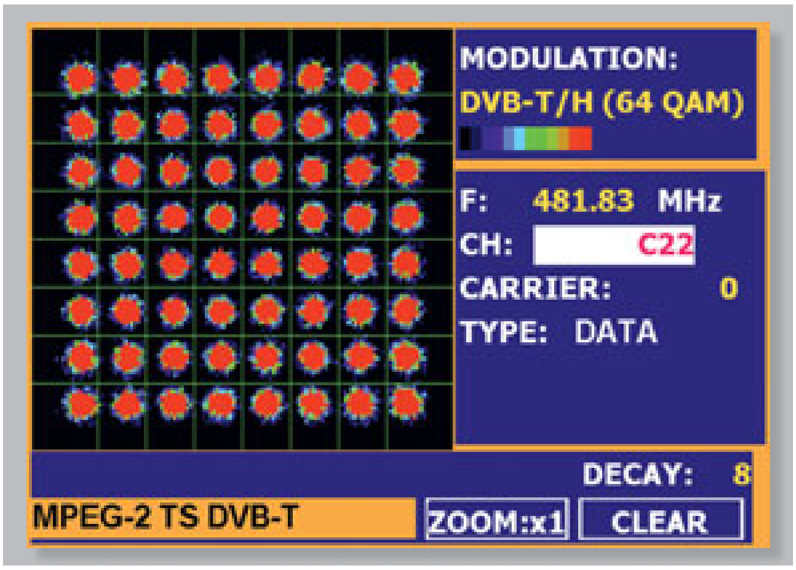
The Explorer will display a picture (the display is not HD, although the HDMI output is), and will play sound through its internal speaker. This is a straightforward aid to retuning and an easy way to look at the individual channels on each mux. There's also a quick sweep measurement function which gives an almost instant spectrum display, power bar graph and audible tone, for help with alignment before you do a full spectrum analysis.

The Explorer will also play an audio signal and show level and deviation for FM radio. And although it doesn't support DAB directly, it can be checked by using the Explorer function, setting it to the frequency allocation for one of the eight DAB multiplexes. Although DAB is regarded as a robust signal, it is essential to have the carrier-to-noise and power measurements for antenna alignment this test will provide.



A spectrogram display helps to identify sporadic sources of interference





The constellation diagrams display signal in an easy-to-interpret format

Satellite functions

The Explorer comes pre-programmed with data for many European satellites, but doesn't have channel data pre-programmed, as this often changes. Instead, it takes this data from the satellite's transponder. On scanning for satellite signals, the Explorer will identify each satellite by displaying the information broadcast by the transponder – this should include name and orbital position.

A split display function means that you can look at a satellite channel picture and its parameters at the same time – and check if the channel is scrambled.

There's a common interface slot on the back of the Explorer, so for scrambled channels (with the exception of Sky), you can insert the necessary CAM and card to view a clear MPEG-2 or MPEG-4 picture. You can also analyse the video and audio bit rate, programme identifiers, network ID, Station ID and so on, regardless of encryption.

For HD channels, Explorer will identify an S2 channel, give the LBER, link margin, packet error ratio, MPEG-4 bit rate and so on.

The system incorporates a PVR function, so ASI signals can be recorded, exported to a PC or memory stick, and re-imported into the Explorer.

Explorer supports DiSEqC 1.2, and can send the necessary parameters for switching to compatible devices.

Other features

The Explorer HD is fitted with points for a shoulder strap that is supplied with it, along with a soft case, hard case, mains and car chargers, USB stick and Lithium-Ion batteries. These are an improvement over NiCad and NiMh as they have no memory effect, can be charged to 60-70 per cent in 30 minutes, and have up to a 4-5 hour life.

Explorer HD is a part of a range that includes the Prodig-3, Explorer, Explorer SE, Explorer II and Explorer II+. Each offers a range of features aimed at different areas of use, and also in the range is The Prolink 4C advanced TV and satellite meter, and the Sathunter and TVHunter finders.

At the moment the Explorer HD is available at a special promotional price of £3,499, and there are trade-in deals ranging from £100-£600 on older Promax products. When the DVB-T2 standard is confirmed there will, of course, be an upgrade path available for the Explorer HD.

Contact Promax UK on 01727 832266, or visit the website. ■ www.promaxelectronics.co.uk.