

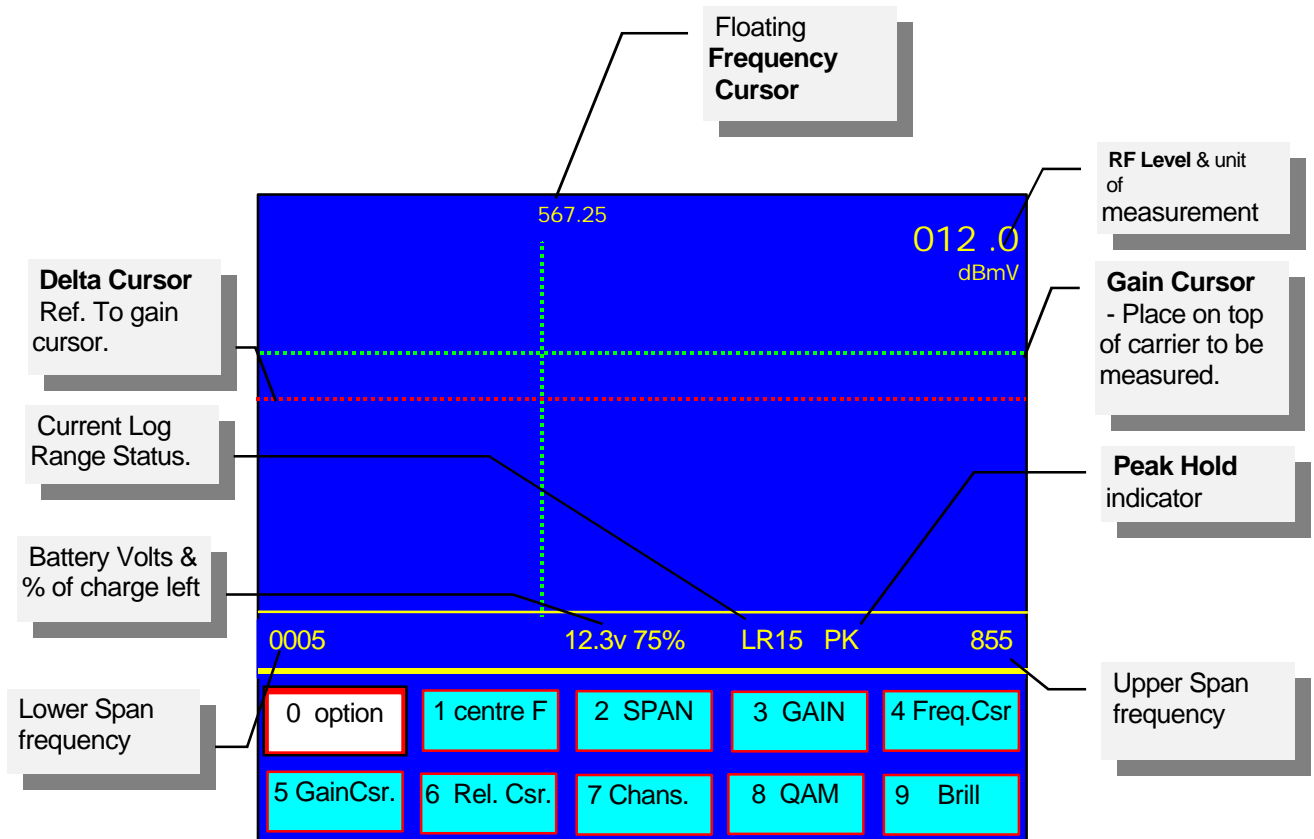
0 Option 1 centre F 2 Span 3 Gain 4 Freq Csr
 6 Gain Csr 7 Rel Csr 7 Chans. 8 QAM

Portable QAM Spectrum Analyser

An overview of the functions available to the engineer.

- ON SCREEN symbols and there meanings. 2.
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‘ON SCREEN’ Symbols and their Meanings



The above diagram shows an overview of the TVA2000-Q screen in **Spectrum Analyser** mode.

It shows more information than would be seen in ‘normal’ use - ie you would not normally use the ‘Delta’ cursor with the ‘Peak Hold’ facility in use.

Constellation Display

A constellation display shows a QAM modulated signal in a ‘graphical’ form. The ‘dots’ that are formed tell the engineer whether to be worried or not. The size, shape and ‘pattern’ that forms over a rather short period of time tell the engineer all the ‘symptoms’ of the Network under test.

As well as a **M**odulation **E**rror **R**atio (MER) figure, a **B**it **E**rror **R**ate (BER) figure is shown . Although the MER reading is more ‘responsive’ to changes in terms of time duration.

‘Real Time’ Full Band Spectrum Analyser

In addition to 64QAM constellation diagrams the TVA2000-Q is a fully functional ‘Real time’ Spectrum Analyser’. This allows for Full Spectrum Tests of your network. Showing instantaneous problems such as ‘Suck outs’ and ‘Roll Offs’ of signals.

How to move around the 'menu' keys.

Press the number in the 'Box' on the keypad whose function you want to use.

| | | | | |
|------------|-------------|----------|--------|-------------|
| 0 option | 1 centre F | 2 SPAN | 3 GAIN | 4 Freq.Csr. |
| 5 GainCsr. | 6 Rel. Csr. | 7 Chans. | 8 QAM. | |

How to Change range of frequencies (Span) being viewed.

Press the 'No. 2 box' so that the **SPAN** box is highlighted as below

| | | | | |
|------------|-------------|----------|--------|-------------|
| 0 option | 1 centre F | 2 SPAN | 3 GAIN | 4 Freq.Csr. |
| 5 GainCsr. | 6 Rel. Csr. | 7 Chans. | 8 QAM. | 9 Brill. |

Press the **ENTER** key, then press the relevant keys for the frequencies you require.

The range of frequencies is 0 to 860 MHz. For instance to change the **SPAN** to 500MHz press the **ENTER** key.

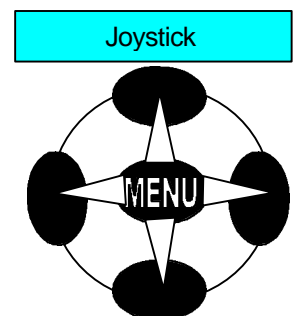
You are prompted for a range of frequencies - press 5,0,0 and **ENTER** keys.

The '**SPAN**' of frequencies on the screen is now 500MHz. You can see this from the STATUS BAR.



The **SPAN** is the 'difference' between the two readings.

Use the UP/DOWN keys from the 'JOYSTICK' to increase the on screen range of frequencies use UP key. Or to decrease the range of frequencies being viewed use DOWN key .



How to Move Cursors around the screen.

There are 3 'on screen' cursors available

- **The Frequency Cursor .**

This is used to Identify the frequency of a particular carrier signal. Whilst the frequency cursor menu box is highlighted as below. Pressing either the LEFT or RIGHT keys on the 'Joystick' moves the frequency cursor LEFT to go down in frequency, or RIGHT to go up in frequency. If you Hold down either key for more than 5 Seconds the speed the cursor moves accelerates. **N b If the ENTER key is pressed while 'Freq Cursor' box is highlighted as below the cursor moves back to the centre of the screen.**

| | | | | |
|------------|-------------|----------|--------|------------|
| 0 Option | 1 centre F | 2 SPAN | 3 GAIN | 4 Freq.Csr |
| 5 GainCsr. | 6 Rel. Csr. | 7 Chans. | 8 QAM. | 9 Brill. |

- **The Gain Cursor**

This is used to measure the signal strength of a particular carrier signal. Whilst the Gain cursor menu box is highlighted as below. Pressing either the UP or DOWN keys on the 'Joystick' moves the Gain cursor down to go down in level, or UP to go up in level. If you Hold down either key for more than 5 Seconds the speed of the cursor increases - ie accelerates.

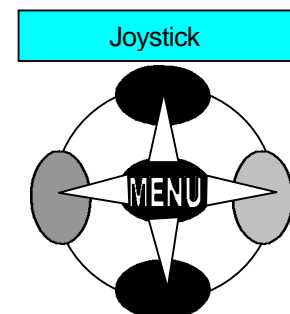
| | | | | |
|------------|-------------|----------|--------|------------|
| 0 option | 1 centre F | 2 SPAN | 3 GAIN | 4 Freq.Csr |
| 5 GainCsr. | 6 Rel. Csr. | 7 Chans. | 8 QAM. | 9 Brill. |

- **The Relative Cursor**

This is used to measure the Relative difference between two carriers of different amplitudes ie the difference between the Vision and sound carriers of a particular channel.

Whilst the REL.Cursor menu box is highlighted as on page 5, Pressing either the UP or DOWN keys on the 'Joystick' moves the Gain cursor DOWN to go down in level, or UP to go up in level. On Analogue carriers to measure the difference between a vision carrier and its sound carrier, place the Gain cursor on the top of the Vision carrier, press '6' on the keypad

Cont... over




How to use the Relative (*delta*) cursor. *continued*

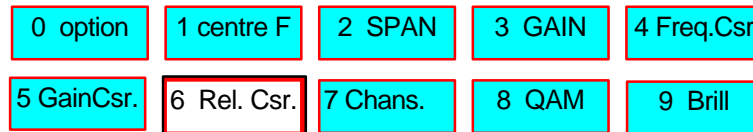
Now a red 'delta' cursor should be apparent on the screen. Place this on top of the sound carrier of a particular channel. The level indicator in the top right hand corner of the screen now becomes the 'difference' level between the two carriers. It is Always linked to the 'Gain cursor' whether it is above the gain cursor or below the gain cursor.

This is indicated by a '+ dB' or '- dB' reading.

Carrier to noise measurements can be implemented in the same way -but remember to change the bandwidth of the TVA2000-Q to 280KHz. For cable TV channel measurements.

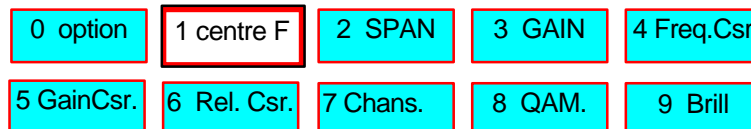
If you hold down either key for more than 5 Seconds the speed of the cursor increases - ie accelerates. The **Enter** key will 'toggle' the 'Relative' cursor OFF and ON as long as the No.6 box on the menu is highlighted as illustrated below.

Use the  key to return to main screen.




How to Change the Frequency viewed

Use the keypad to press the **No.1** key so that it is highlighted as below.




Press the ENTER key and you are prompted for a frequency to be entered on the keypad.

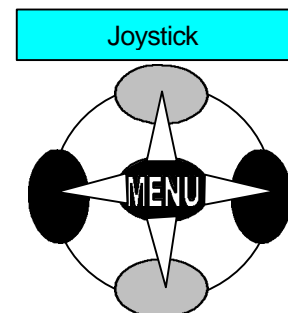
For instance type 1,2,8 +  and the frequency cursor is now at 128MHz.

Or...

Pressing the LEFT key on the 'joystick' moves

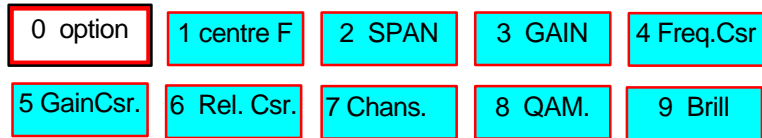
the frequency DOWN or RIGHT key moves the frequency UP.

Use the  key to return to the main Menu.

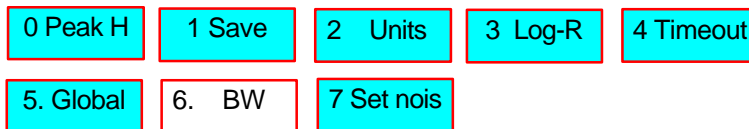


How to Change the IF bandwidth.

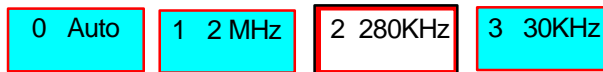
Select the **OPTION** box as below and press the **ENTER** key.



Select the **BW** (bandwidth) box as below by pressing the **No.6** key and press the **ENTER** key again.



Select the relevant bandwidth you require by pressing either 0,1,2,or 3 keys on the keypad.

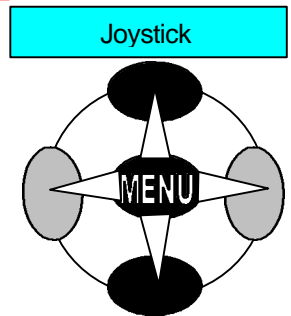
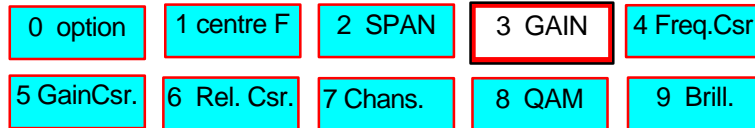


Use the **menu** key to return to the main screen - Press 2 times

For Cable operators use the 280KHz setting exclusively to avoid errors in level readings!

How to Change the Gain (Sensitivity . +/- attenuation)

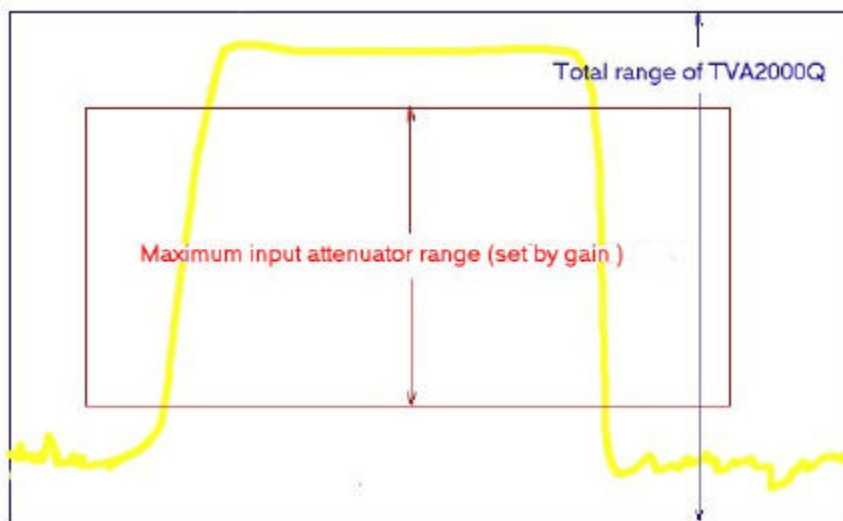
The Sensitivity (Gain) of the instrument is adjusted by highlighting the GAIN box as below.



Use the 'JOYSTICK' to adjust the position of the displayed waveform

Within the viewing window on the TVA2000-Q screen using the UP/DOWN Keys.

Extending the range of the measurement window



The TVA 2000Q is capable of accurately measuring signals on the spectrum analyser screen between +55 and -35-dBmV -a total dynamic range of 90dB.

Extending range of the measurement window *continued..*

To optimise the accuracy of the instrument the input attenuator range has been limited to 58 dB. The attenuator is changed in 2dB steps by the up/down arrow keys when GAIN is selected.

In order to view signals at the extreme range of the instrument the “window” in which the input attenuator operates can be moved.

This window movement is adjusted as follows.

Select the gain cursor (button 5)

To view high signals levels

Move the cursor to the top of the screen and continue to hold the up arrow key. The signals displayed on the screen will move down the screen. Hold the arrow key down until the peak of the highest signal to be measured is visible on screen.

To view low level signals

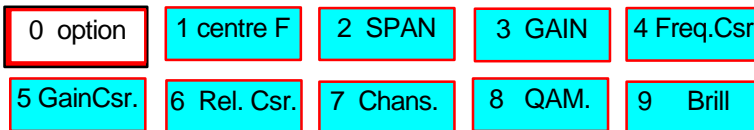
Move the cursor to the bottom of the screen and continue to hold the down arrow key .The signals displayed on the screen will move up the screen. Hold the arrow key down until the desired signal is visible on the screen. Eventually the noise floor of the instrument will become visible. This is useful for looking for low level spurious signals but accurate measurements can only be taken down to -35 dBmV.

After looking at signals at a very low level it is important that the window is returned to it's normal setting with NO visible noise floor. This is achieved by moving the gain cursor to the top of the screen and holding the up arrow key until the noise floor disappears. **If this is not done excess noise can upset digital power readings.**

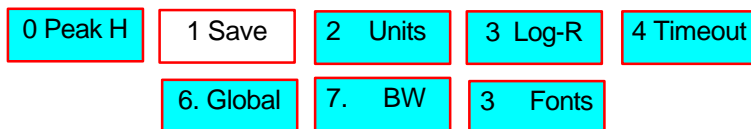


Screen information can be stored within theTVA2000-Q to be downloaded at a later date onto a PC. This information can then be printed as a hard copy for commissioning purposes etc.

Press '0' on the keypad.



Press the  key. Press '1' on the keypad to highlight the box as shown below

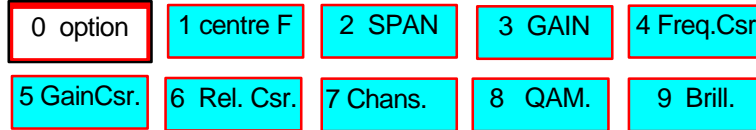


Each press of the 'No.1' key **saves** the current screen. The TVA2000-Q has a capacity of approximately 60 screen 'snapshots' before the need to download and 'Flush' the instrument ready for the next set of screen stores.

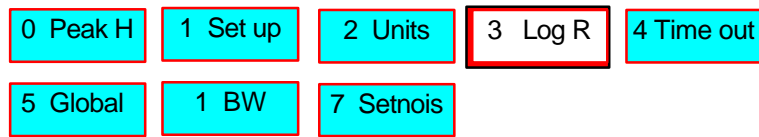
How to Change the Log Range (15dB , 30dB , 60dB)

The dynamic ON SCREEN range - ie from the top to the bottom of the screen in dB's is better referred to as the dynamic **LOG RANGE**.

The TVA2000-Q has 3 log ranges, 15, 30, and 60dB. To change the range highlight the '**OPT**' (options) box by using the left or right $\leftarrow \rightarrow$ keys on the 'joystick'

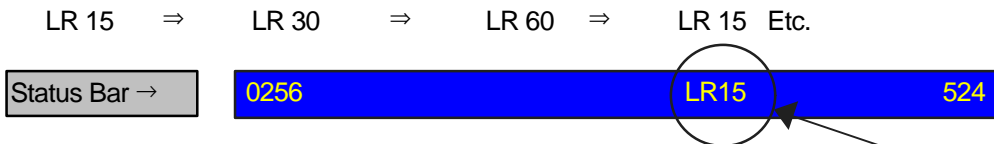


(or press the '**O**' key on the keypad .) Press the ENTER key.



Highlight the **LOG R** box as above by pressing the ' 3 ' on the keypad. Press the ENTER key repeatedly.

This 'Toggles' the Log range between the settings in the sequence as below :-

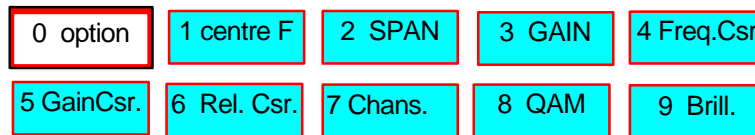


The Active Log Range is shown on the Status bar as above.

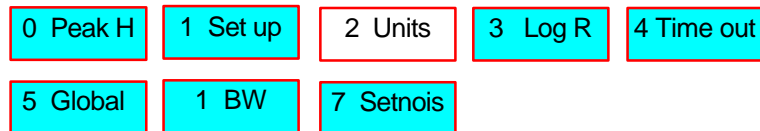
How to Change Units Of Measurement (dB μ Volt - dBmVolt - dBmW)

Whether you prefer dB microvolts (dB μ V) or dB millivolts (dBmV), both are catered for and the user can set the TVA97 to their preference. There is also a dBmilliwatt (dBmW) setting for measurement of digital carriers, using the Measure function from the main Spectrum Analyser screen.

To change ' Unit of Measurement ' highlight the **OPTIONS** box as below by pressing ' 0 ' on the keypad.



Then press the ' 2 ' key to highlight the ' **UNITS** ' box as below.



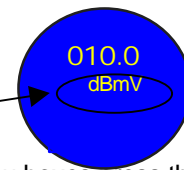
Repeated presses of the **ENTER** key 'toggles' the unit of measurement as below.

dB μ V \Rightarrow dBmV \Rightarrow dBmW \Rightarrow dB μ V etc.

It can be seen from the top right hand side of the screen

which unit of measurement is active

To return to the main menu boxes press the **menu** key.

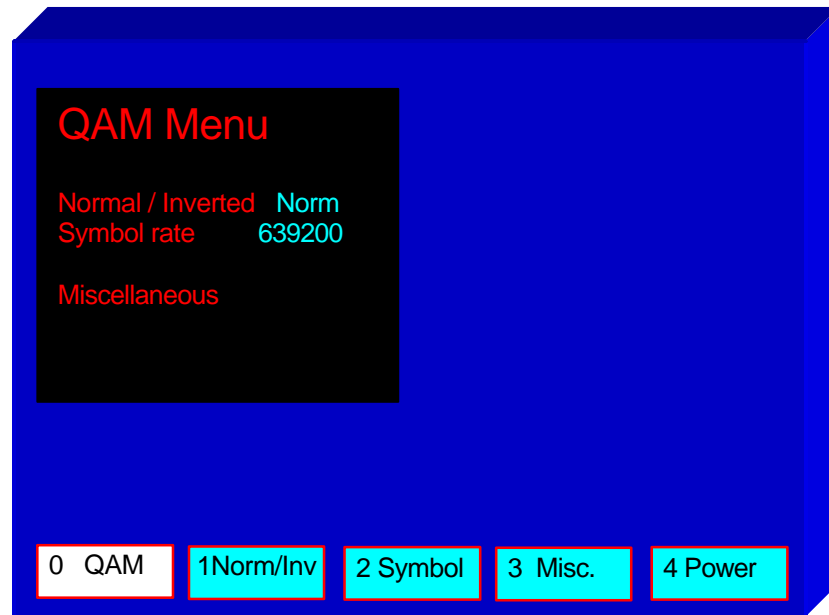
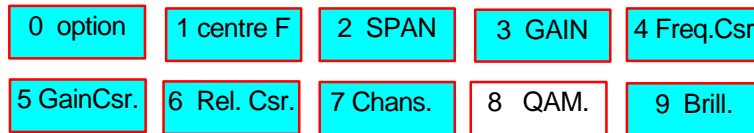


Make sure the Relative cursor is OFF first!

64 QAM Constellation Display

To view a 64 QAM digital carrier as a Constellation diagram highlight the 'QAM' box as below by press the

No. 8 key on the keypad. Press the **Enter** key. You will now see the **QAM** menu screen as below :-



The 5 boxes shown have the following result if activated with the '**ENTER**' key

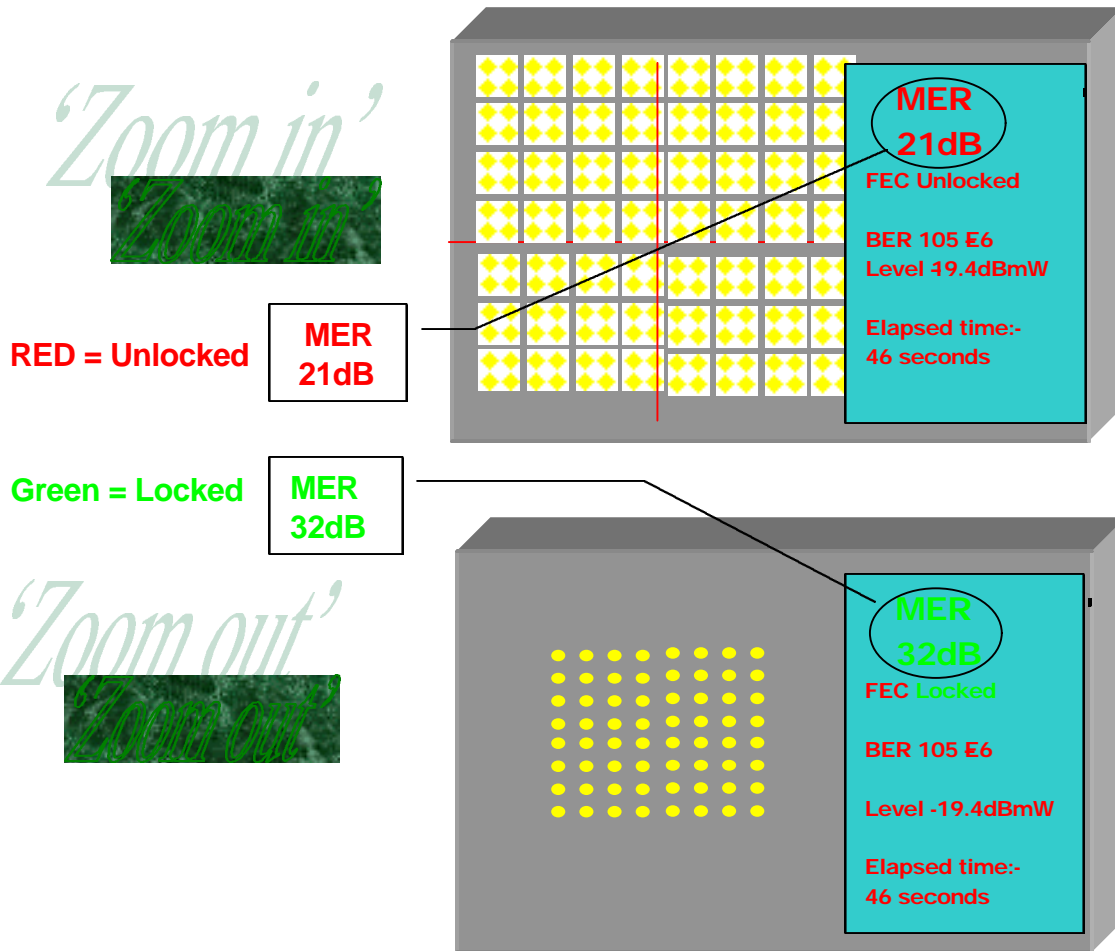
- | | |
|-------|---|
| Box 0 | QAM. Takes you to the 64 QAM constellation diagram. |
| Box 1 | Normal – Forward. Type of error trapping applied at source of signal |
| Box 2 | Symbol rate. This will need to be set to obtain a Locked signal. (Current figures available are :-5057000, 6875000, 6952000) |
| Box 3 | Misc. For 'Future Development' - Not Activated. |
| Box 4 | Power This option takes you to the 'Power measurements' screen |

Continued on next page...

64 QAM Constellation Display

- Continued from previous page...

The **QAM constellation** screen should now be seen if as on the previous page box '0' was selected and the **ENTER** key pressed. Two viewing choices are available as shown below :-

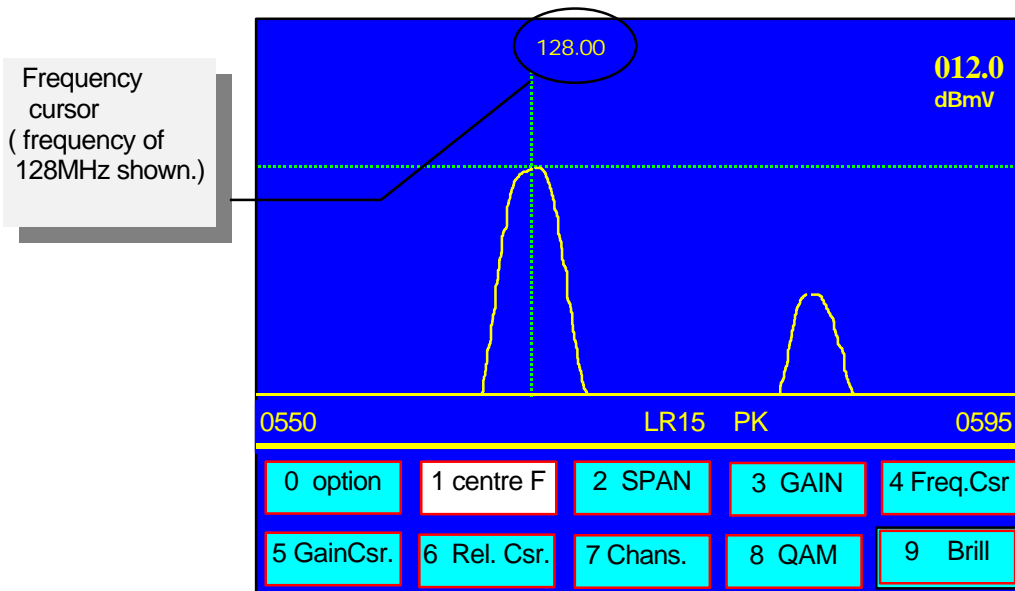


- To **'Refresh' the QAM screen**. Press **'0'** or the **ENTER** keys to activate. This also resets the elapsed time displayed.
- The **'Zoom'** facility allows closer scrutiny of the whole display. This is a useful tool for verifying data packet encroachment to adjacent sectors. Two states of operation are available: Zoom IN or Zoom OUT.
- MER** readings should be greater than 23dB to get a **locked** signal. Please allow a few seconds for the instrument to get **locked** onto the 64QAM signal. The better the MER reading, the less possibility of 'Lock ups' or 'freeze framing' of the decoded signal.

MER can be regarded as a form of Signal To Noise ratio that will give an accurate indication of a receivers ability to demodulate the signal, because it includes, not just Gaussian noise, but all uncorrectable impairments of the received constellation as well.

If the only significant impairment present in the signal is Gaussian noise then MER and SNR are equivalent.

How to view an Analogue Television carrier.



The display shows a single Analogue carrier with sub-carrier sound.

Normally -10 to -15 dB between the two carriers.

To tune to another channel either...

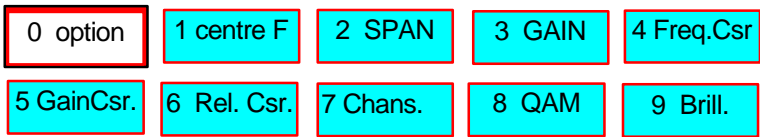
A/. Use a pre-loaded preset channel by pressing '7' on the keypad then the **ENTER** key.

You are prompted to enter a preset channel number. A full list of the factory loaded presets channels is available on the supplied 3-1/2" disk. File Name 'Cable.TXT'

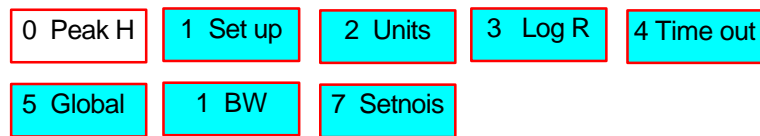
B/. The second method is to directly 'key in' the frequency of a required channel. Ie with the Centre frequency 'Box' highlighted as above, press the **Enter** Key. Then for example, key in 1,2,8 to set the Spectrum analyser to a frequency of 128 Mhz etc,etc...

How to Use the 'PEAK HOLD' Facility.

A 'PEAK HOLD' facility is used to store the peaks of incoming signals. Useful for capturing Radar interference or mobile radio signals or return path Data packets. To switch Peak Hold on highlight the 'OPTIONS' box as below by pressing '0' on the keypad.



Press the **ENTER** key. Press '0' on the keypad this highlights the **PEAK HOLD** box as indicated below :-



The **PEAK HOLD** Facility is toggled on/off with each press of the **ENTER** key indicated on the Status Bar by a 'PK' as below.



Each subsequent press of the **ENTER** key switches the peak hold ON / OFF.

Make sure it is **OFF** when you have finished with the facility.

To return to the main menu boxes press the **menu** key.

296.00

12.0dB

dBmV

Battery Monitor

Lower Span frequency: 0005

12.3v75%

LR15 PK

Upper Span frequency: 595

| | | | | |
|------------|-------------|----------|--------|------------|
| 0 option | 1 centre F | 2 SPAN | 3 GAIN | 4 Freq.Csr |
| 5 GainCsr. | 6 Rel. Csr. | 7 Chans. | 8 QAM | 9 Brill |

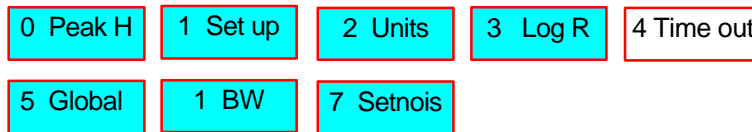
Time out facility (automatic switch off facility.)


The **TVA 2000-Q** has the ability to automatically switch off if a key press is not detected within a pre-determined length of time.

The time is entered in 'Minutes'. Minimum period being 1 minute. Maximum period being 2000 minutes. We suggest the best period to be 10 to 15 minutes.

To adjust this time enter it via the 'OPTION' box. Press the  key .

Press '4' on the key pad to highlight 'Timeout' box. Press **ENTER** again. You are then prompted for a number to be entered.



Enter your preferred switch off delay time in minutes and press the  key.

You must now switch off the TVA2000-Q for the delay time to be updated.

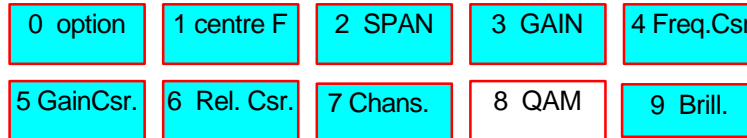
Screen Brilliance Control

- A screen Brilliance control was added from Software version 1.0.2. (23-3-00) and later .

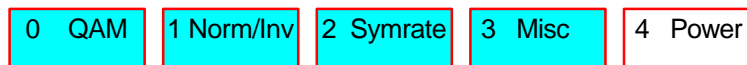
A battery power saving of **20%** can be achieved with a 25% lower brightness. (Ten presses of the down arrow key from 'joystick'). If being used **indoors** this is still a very acceptable level of illumination.

Power measurements (Digital carrier analysis)

To make a power measurement on a digital carrier press '8' on the keypad to highlight the box as below:-



The Sub-menu now looks like this :-



Press '4' on the keypad. It take you into the screen shown below :-

With a digital carrier displayed on the screen as in the diagram 1a. below make sure you are within the Red Horizontal Lines for Maximum accuracy also that you are on the correct Bandwidth for the type of system you are measuring. There are 2 preset bandwidths available, they are:-

6.0 MHz ⇒ 8.0 MHz ⇒ 6.0 MHz etc.

With the 'Span' box highlighted as above use the UP/DOWN arrow keys on the Joystick to toggle the bandwidth setting in the order as shown above.

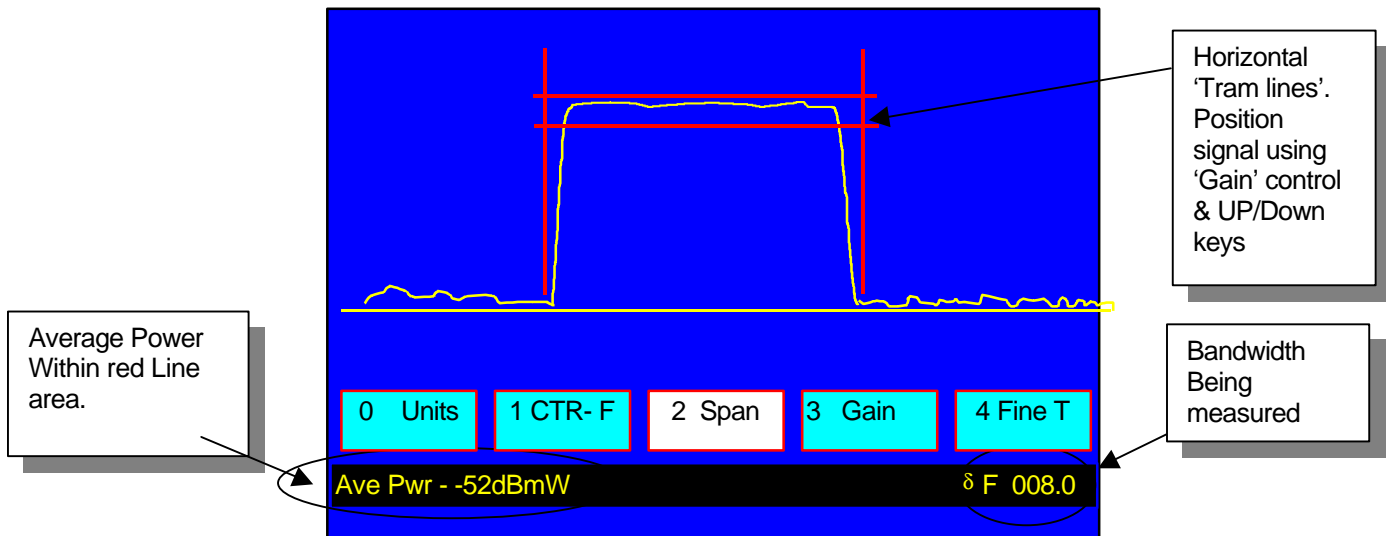
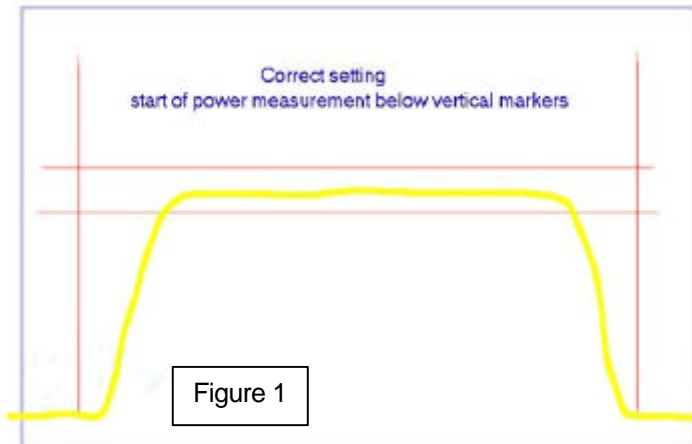


Diagram 1a.

The above sample shows a typical 'Digital' channel.

Enhancing the accuracy of digital power measurements



The power measurement facility on the TVA 2000Q provides an accurate method of measuring power in a digital channel. Under most circumstances the trace will be as shown in figure 1.

The trace shown is contained within the **vertical** frequency marker lines.

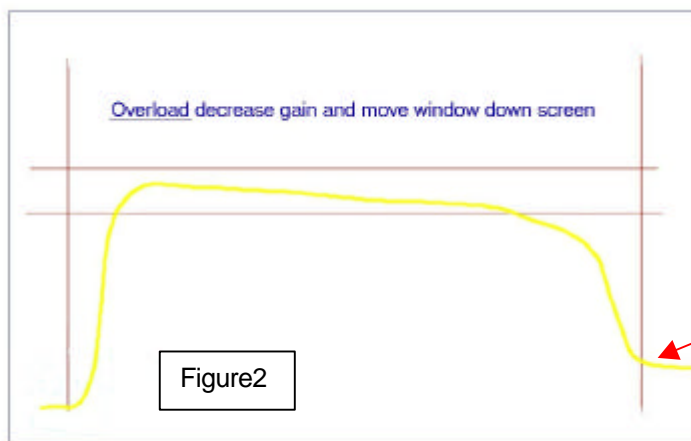
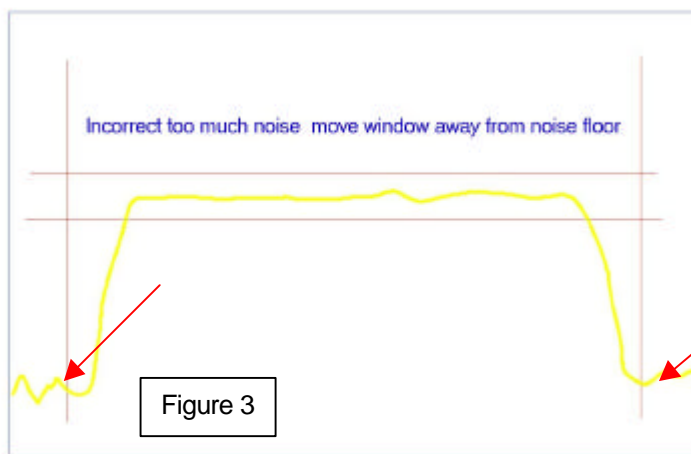


Figure 2 shows the effect when **too much power** is applied to the power detection circuits. If this occurs **reduce the instrument gain** by means of the Gain control and up /down arrows and re-set the gain window with the gain cursor. (See the section on extending the measurement window –page 7).

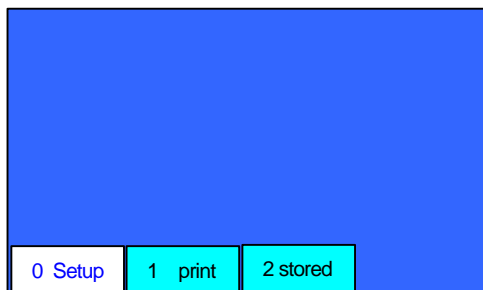


In figure 3 opposite the noise floor is visible rising above the lower end of the vertical markers, this reduces the accuracy of the power reading.

-Increase the gain

By means of the up arrow and then re-set the gain window with the gain cursor (see the section on extending the measurement window - page 7).

Retrieval of Stored information



Print. If you have an old fashioned Dot matrix printer

Instrument Reset

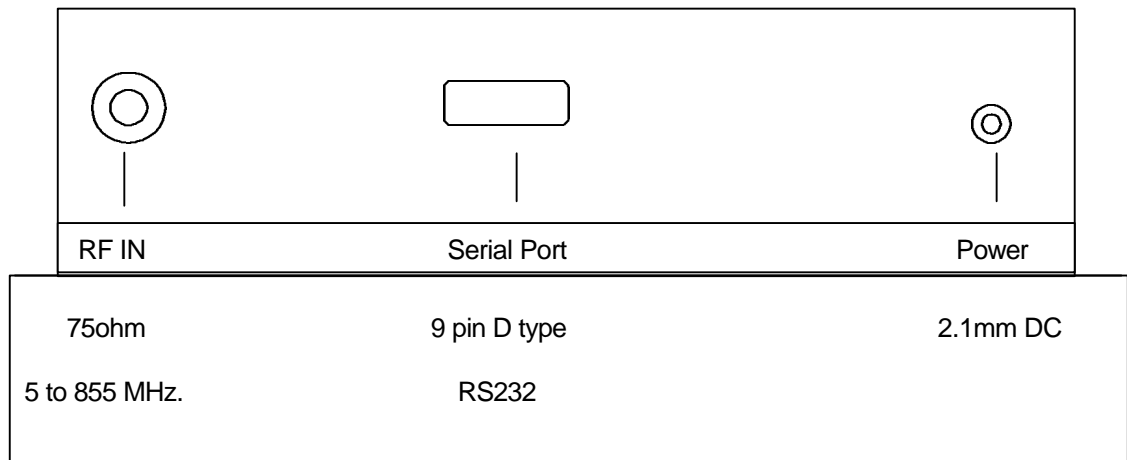
key for a few seconds until the instrument switches OFF.

The TVA 2000-Q can now be switched back on by once again pressing the **ON** key and resume as normal.

Do not use this facility instead of using the ' key, - otherwise a 'Controlled' shut down is not achieved and is not to be advised!

Connection Interface Panel

- Overview of the connector panel



Technical Specification

- Real-Time Spectrum Analyser:

- Sweep range: 5 to 855 MHz.
- Sweep span: 0 to 800 MHz.
- Accuracy: $<\pm 1$ dB, Typical. ± 2 dB Maximum over whole frequency range from -10 to $+45$ °C.
- Modulation Error Ratio (MER) working range : 21 dB to 36dB, ± 2 dB. (Above 36 dB -for indication only)
- Frequency accuracy: $< \pm 0.01$ MHz.
- Dynamic Log range: 15 dB, 30 dB or 60 dB, user selectable.
- IF bandwidth: 2 MHz, 280 kHz & 30 kHz, user selectable or automatic.
- RF input connector: 75Ω BNC.
- Analogue Input level range: -35 to +55 dBmV.

- Physical Specification

- Dimensions: 24 cm \times 27 cm \times 9 cm.
- Weight: 3.4 kg.
- Running time: 2.5 hours per charge. Charging is from the mains or through the car adapter charging lead. (Supplied with instrument.)
- External power supply: The instrument can be run from the mains or from a car using the supplied lead.
- Temperature range: -10 to $+45$ °C.
- Screen: 14.0 cm (5.5") TFT flat screen.
- Optical resolution: 750 \times 556 pixels.
- Housing: Glass fibre reinforced, polycarbonate body.
 - Carrying case: Nylon carrying case, incorporating an integral light hood.
- Comes complete with: Carrying case, batteries, mains charger preset software, RS232 special lead, also a car charging lead.

**40 Hornsby Square
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Sound to Vision Measurements – analogue only.

A method of measuring Sound to Vision Ratios is to place the gain and reference cursors as per the diagram below. The sound to vision ratio is given by the **dB R** figure that replaces the **RF level** reading once the 'Delta' cursor is switched on.

To measure the Vision to nicam carrier ratio manually highlight the **Relative** cursor box. Press the DOWN arrow key on the 'Joystick' and place the cursor on top of the nicam carrier.

The ratio between the vision and nicam carriers is now given by the dB relative **difference** reading.

Vision Carrier Peak - Gain cursor

Sound carrier Peak. -delta Cursor.

