

TS9050/60

microGen
electronics™

FM Modulation and Spectrum Analyser

Introducing the TS9050 and TS9060, new and updated versions of the TS9000 NAB2004 Radio World 'Cool Stuff' and The Radio Magazine 'Pick Hit' award winner



TS9050 desktop analyser

- The TS9050 is a fully featured FM Modulation and AF Spectrum analyser. Installation is simple and quick, with a single USB connection, providing power and all digital FM Multiplex data. Unique to this new product is that the Stereo multiplex audio is decoded by a special software algorithm. This method of decoding gives excellent phase matching between channels.
- With its 16 bit sampling, the measurement accuracy of FM Deviation and Modulation Power has greatly increased. The FFT spectrum analyser now has a dynamic range of 100dB, with a very low noise floor, making it ideal for demanding audio analysis.



TS9060 19inch rack case analyser

- The TS9060 benefits from all the features of the TS9050, but is housed in a standard 19 inch aluminium rack case.

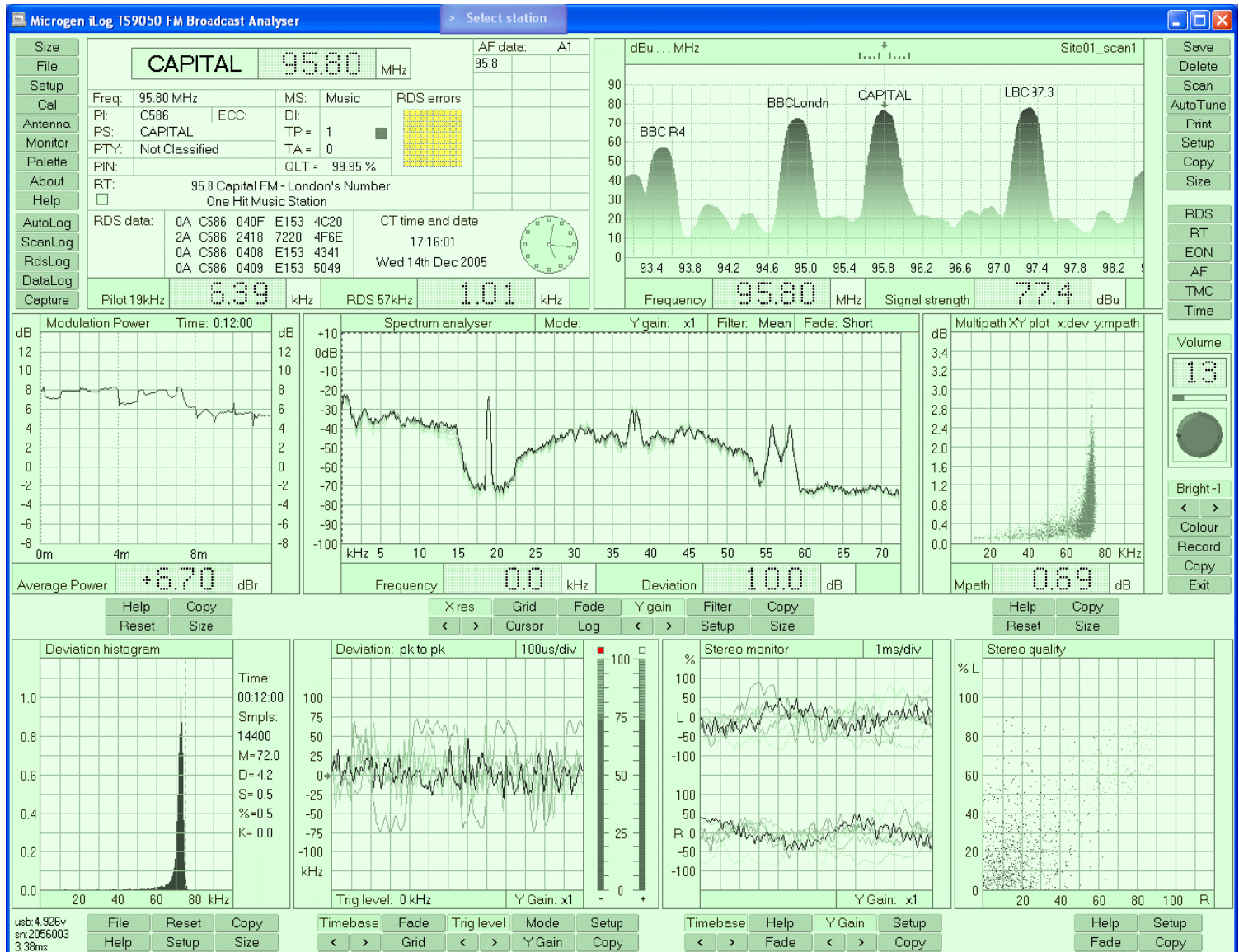
Special Features:

- 16 bit sampling for greater accuracy. (The TS9000 sampled at 12 bits)
- New IQ mixer, with two stage double-tuned low noise MOSFET FM front-end
- New IF log amplifier with additional computer modelled 6 pole LC 10.7MHz IF filter for improved stop-band performance
- 100dB audio spectrum analyser with 100kHz bandwidth, for precise audio measurement
- New software DSP stereo decoder. Excellent phase matching between channels, with lower distortion and noise than traditional analogue types
- Left and right channel monitor with a vectored stereo quality display
- Multiplex record and playback with full stereo audio monitoring using PC sound system
- Multi-site operation, allowing up to 32 sites of 100 stations each to be monitored directly from the iLog software
- Full RDS decoding, with RT history feature
- USB powered, complete with Windows iLog software



iLog Windows software

iLog application iLogV3.02 beta . . . screen dump at 1280 x 1024 screen resolution



FM Modulation analyser features:

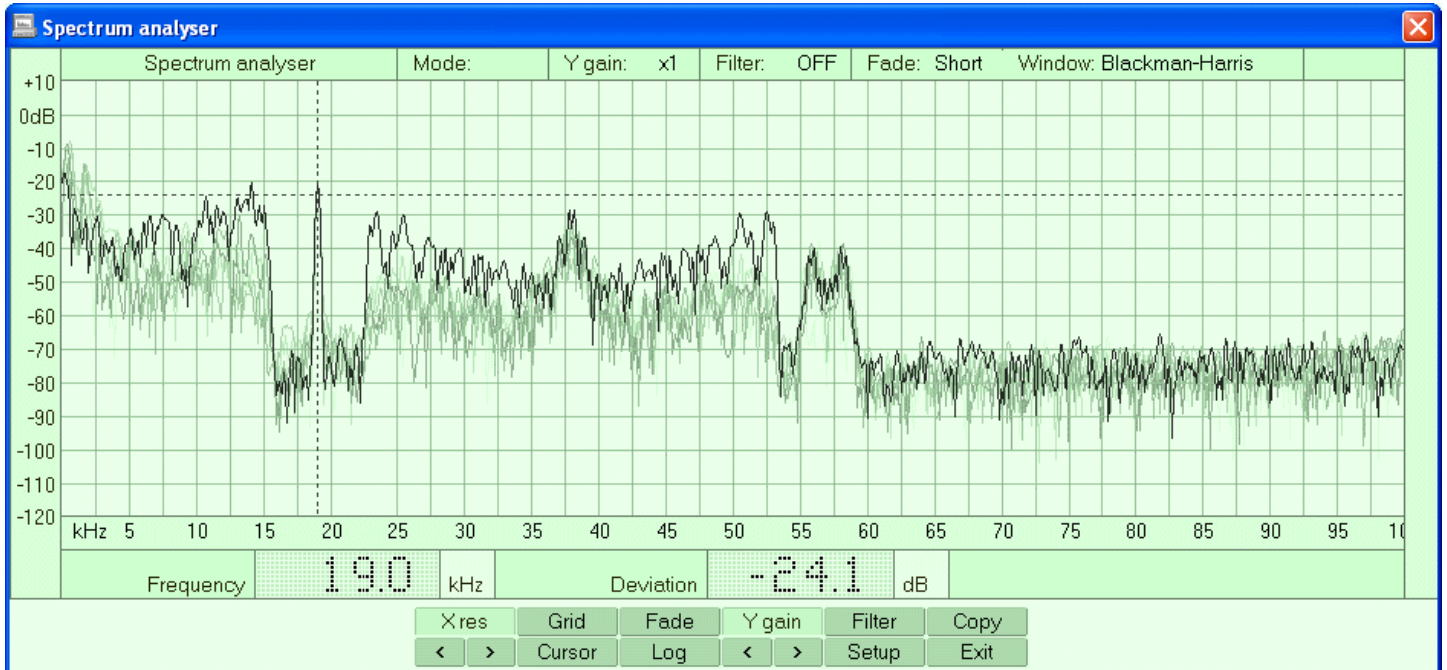
- High performance FM receiver and Modulation Analyser providing broadcast measurements over the band 87.5 to 107.9 MHz in 10kHz steps
- Signal strength with 80dB range and frequency scanning
- FM deviation 0 to 100kHz with histogram
- Modulation Power calculated with 32bit floating-point precision
- Multipath with XY plot
- Pilot 19kHz amplitude
- RDS 57kHz sub-carrier
- Left and right channel decoding, with stereo quality graphical readout
- Automatic logging of signal strength, pilot and RDS carrier.

RDS/RBDS decoder features:

- Full RDS/RBDS decoding, with signal quality readout.
- Decoded groups PI,PTY,PS,RT,CT,PIN,AF,TA,TP,DI,MS,EON

FFT Spectrum Analyser

- 16 bit sampling
- Precision base-band FFT Spectrum Analyser covering 10Hz to 100kHz
- Dynamic range of 100dB with a resolution of 20Hz
- Multiplex signal analysis
- External Multiplex analyser using the external BNC input
- Audio analyser using the external BNC input
- Linear or logarithmic scale with full cursor measurement



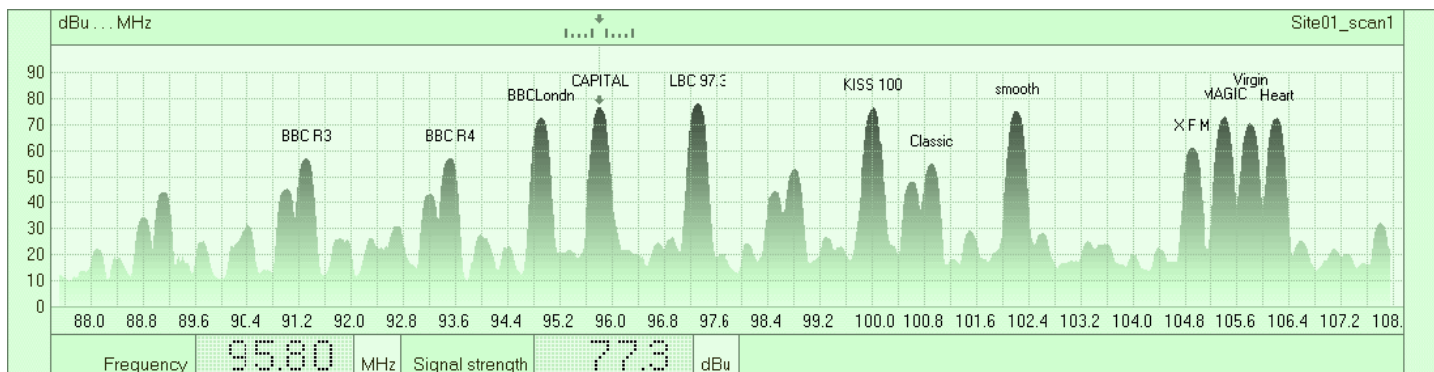
- The FFT spectrum analyser feature, provides a valuable tool for examining the FM multiplex signal. The TS9000/A units sampled at 12 bits, but on the new TS9050/60 this has been increased to 16bits using a very high quality A/D converter. This converter has a very low spurious output, coupled with low distortion and noise.
- With signal averaging it is possible to detect signals below noise. This will extend range to greater than 110dB.
- Various sample windows can be applied, Hanning, Hamming, Blackman-Harris etc, providing versatile measurement.
- The spectrum below details just the 57KHz RDS sub-carrier sideband modulation at a resolution of 250Hz per division.



RF BROADCAST SPECTRUM

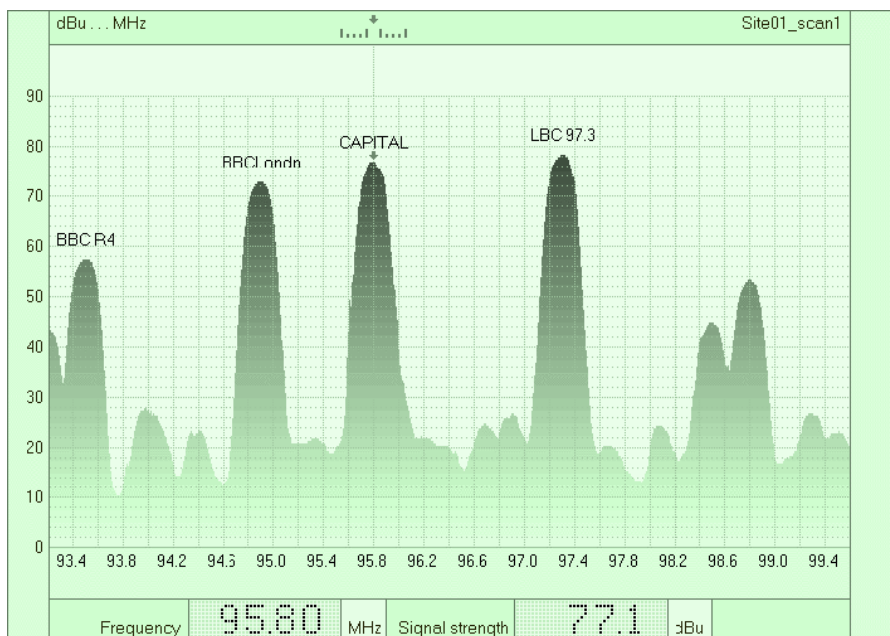
- The FM Broadcast frequency band can be scanned from 87.5 MHz to 107.9 MHz. This window can be resized to view any particular frequency. If the Radio station is transmitting it's PS name then this will be automatically displayed
- The AutoTune feature provides a completely automatic station search and save function
- The Windows iLog software provides extensive logging, manual or automatic, with an alarm on error.

RF Broadcast spectrum 87.5MHz to 107.9MHz



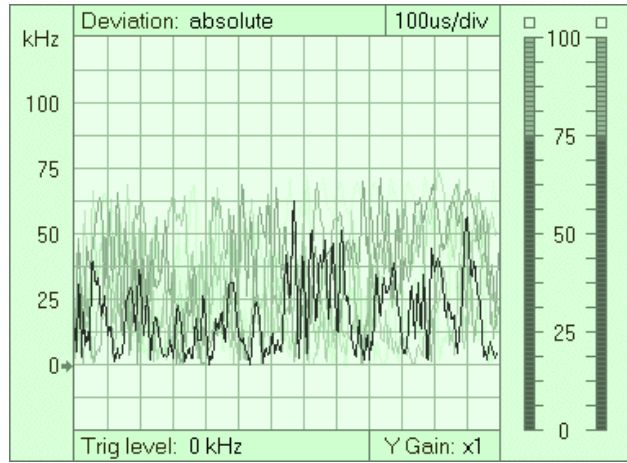
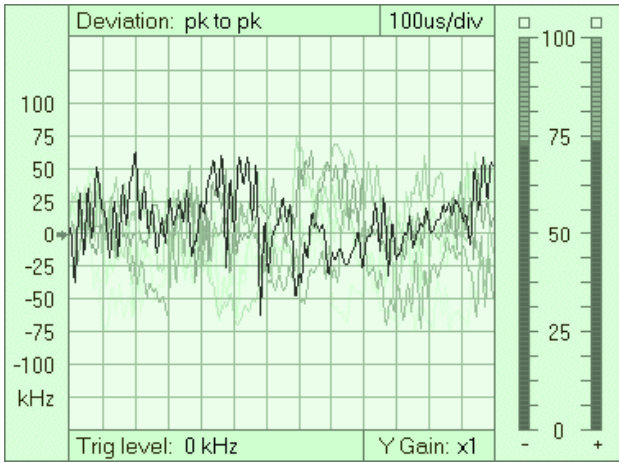
- The window above shows a complete frequency scan from 87.5MHz to 107.9MHz. The digital readout gives the frequency and signal strength of the station tuned. This spectrum can be printed out as a hard copy for future reference.

RF Broadcast spectrum detailing 95.8MHz



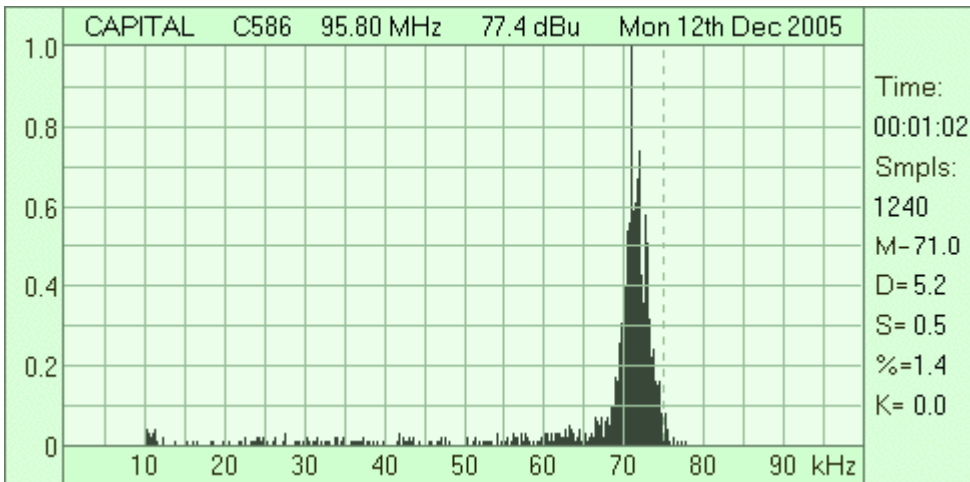
- The window shown here, details just a small frequency range at 10kHz resolution. The vertical scale has doubled to show 2dB increments.
- This frequency scan can be dragged with the computer mouse to show any frequency of interest.
- For strong signal areas, a user settable antenna attenuator can be selected. This has three settings of -10dB, -20dB and -30dB.
- These windows can be copied and pasted into any suitable application.

FREQUENCY DEVIATION



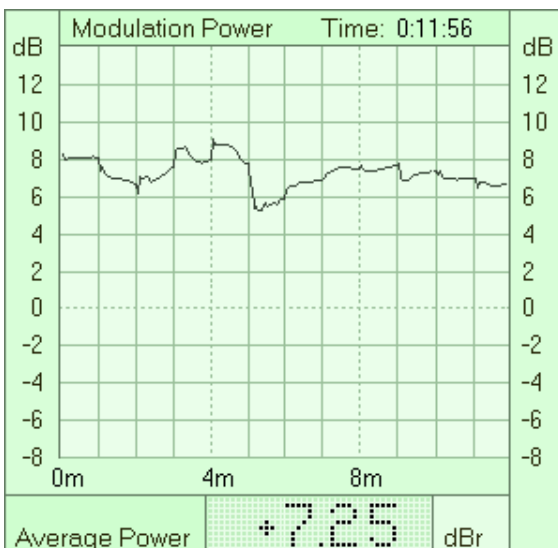
- The Multiplex signal can be viewed in the time domain with an oscilloscope type display
- The time-base can be set from 10ms/div to 10us/div. The Y-axis has a x10 function. The trigger point can be user set or automatic
- The deviation window shows a typical trace with the positive and negative deviation bar graphs.
- This deviation window now shows a typical trace set for absolute signal readings

FREQUENCY DEVIATION HISTOGRAM



- A frequency deviation histogram can be viewed in real time from this window. The following variables are calculated from the collected data.
- T Lapse time measured in minutes and seconds
- The number of samples taken
- M The mean value of deviation
- D The quadratic mean value of deviation
- S The mean of samples above 75KHz
- % The percentage of samples above 75KHz
- K Equals S*%

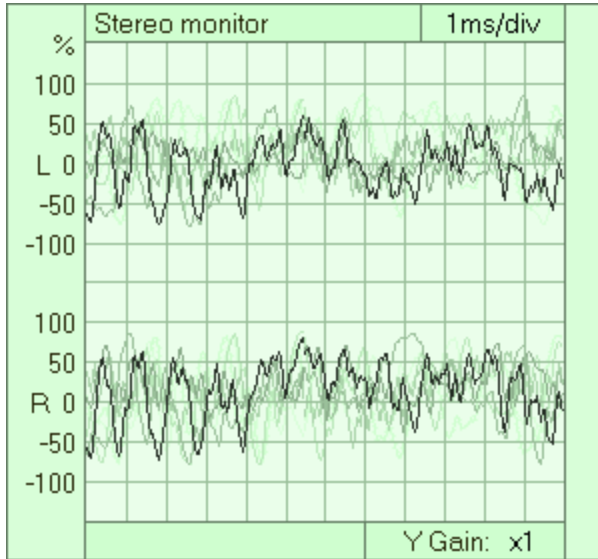
MODULATION POWER



- Modulation Power is calculated with 32bit floating-point precision
- The time-base automatically runs at 1 div/minute and resets on station frequency change, or can be user reset at any time
- The graph continuously scrolls over any period of time and can be printed as required
- The average power is calculated referenced to 0dBr

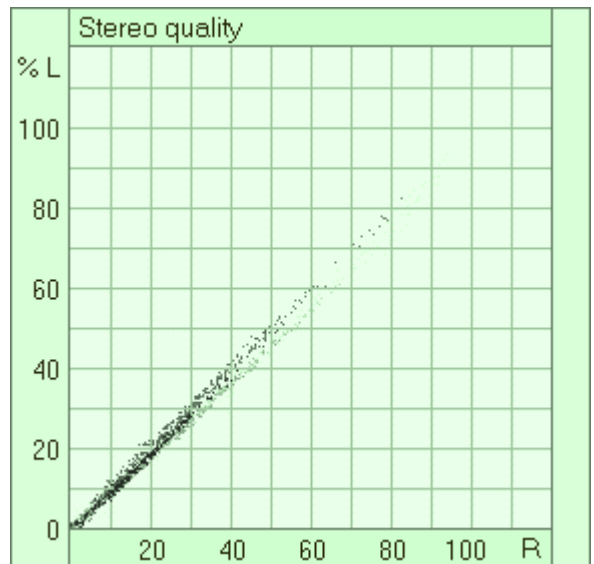
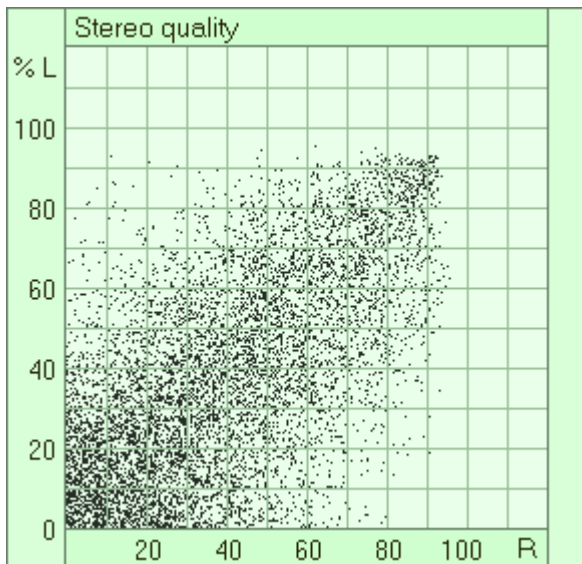
STEREO MONITOR

- Unique to the TS9050/60 is that the Stereo multiplex audio is decoded by a software algorithm. The 19kHz pilot is detected and phased locked to a narrowband filter and the left and right channels are then extracted with a synchronous detector. This new method of decoding gives excellent phase matching between channels. De-emphasis is finally applied with a further digital filter. No close tolerance components are required or any alignment necessary with this technique.
- The extracted left and right audio is then passed, via Windows, to the Sound Card for audio monitoring.
- The **iLog** software provides for digital recording of the USB data. This provides the complete monitoring of a Radio Station, i.e. it's multiplex data is decoded for Deviation and RDS data, and it's stereo audio signal. This will allow an engineer to take a snap-shot of a Radio Station, save it to file, and later play it back as if an 'off-air' broadcast.



- Shown here is the left and right channels.
- The time-base can set as required and the vertical gain can be set to x1 or x10, for detailed inspection.

VECTORED STEREO QUALITY



- To visualise the stereo quality, the left channel is set to the vertical axis and the right channel to the horizontal axis. The resultant 2D vectored display gives an instant display of the stereo content from the Radio Station being monitored.
- The graph on the left displays a typical stereo broadcast and on the right, it displays mono broadcast, which is probably speech. If the left or right channels are missing then the display will not show symmetrically about 45 degrees.

RDS DECODER

- The RDS decoder will decode groups PI,PTY,PS,RT,CT,PIN,AF,TA,TP,DI,MS,EON. This data can be viewed on-screen as it arrives and it can be stored to hard-disk.

Group rate: 10 sec		Received Blocks	500
0A 45	0B	Block errors	0
1A 11	1B	Block error ratio	-
2A 23	2B	RDS quality %	100.0000
3A	3B		
4A	4B	2A C204 2016 656E 204E	
5A	5B	14A C204 E005 390D C202	
6A 2	6B	0A C204 001F F13C 3420	
7A	7B	2A C204 2017 6577 732E	
8A	8B	0A C204 001C 3932 2042	
9A	9B	1A C204 1000 80E1 6B5E	
10A	10B	14A C204 E005 3206 C202	
11A	11B	0A C204 0019 4738 4243	
12A	12B	14A C204 E005 4707 C202	
13A	13B	0A C204 001A 4243 2052	
14A 33	14B	2A C204 2018 2020 2020	
15A	15B	14A C204 E005 3809 C202	

Group data

- Un-decoded continuous RDS data is displayed in this window.
- Group repetition rates are calculated over a sixty second period.
- RDS quality is given to four decimal places.

Group: 14A	Network: 3	TA: 0	PI: C201	PS: Radio 1					
PTY: Pop Music		LINK: 8001	PIN: 6B00 13th at 12:00						
AF		Map 1		Map 2	Map 3	Map 4	AM		
ON	ON	TN	ON	TN	ON	TN	ON	TN	ON
		93.5	98.8	94.2	97.7				
		93.2	98.5	94.4	99.5				
		92.5	97.7						
		94.6	99.2						
		93.1	98.3						
		94.1	99.3						
		94.2	99.4						
		94.4	99.6						
		92.8	98.0						
		94.5	99.7						
		93.0	98.2						
		93.9	99.1						
		92.9	98.2						
		93.3	98.5						
		94.3	99.5						
		92.7	97.9						
Group: 14B	PI:	TP:							
		TA:							

EON data

- A continuous update of EON data is available for all networks received.
- When all data has been captured, it can be stepped through for inspection, or printed out for hard copy.

Radio Text	<input type="checkbox"/>	Classic 100.90 MHz	Tue 13th Dec 2005
13:57:13		You can reach Classic FM by telephoning 020 7343 9000...	
13:57:28		Our address is Classic FM, PO Box 2834, W1A 5NT.	
13:57:44		Classic FM on the internet: www.classicfm.com	
13:57:59		Relaxing Classics at Two...with Nick Bailey	
13:58:14		Relax - it's Classic FM Relax - it's Classic FM	
13:58:28		You can reach Classic FM by telephoning 020 7343 9000...	
13:58:43		Our address is Classic FM, PO Box 2834, W1A 5NT.	
13:58:58		Classic FM on the internet: www.classicfm.com	
13:59:13		Relaxing Classics at Two...with Nick Bailey	
13:59:28		Relax - it's Classic FM Relax - it's Classic FM	
13:59:43		You can reach Classic FM by telephoning 020 7343 9000...	
13:59:59		Our address is Classic FM, PO Box 2834, W1A 5NT	
14:00:13		Classic FM on the internet: www.classicfm.com	
14:00:28		Relaxing Classics at Two...with Nick Bailey	
14:00:43		Relax - it's Classic FM Relax - it's Classic FM	
14:00:58		You can reach Classic FM by telephoning 020 7343 9000...	

RT history

- Sixteen consecutive RT messages are captured and displayed in the RT window.
- These messages can be logged directly to hard disk.
- Any number of messages to capture can be set and they will be stored as ASCII text.
- These can be cut and pasted into any text file. Any repeat messages can be ignored.

TS9050/60 TECHNICAL DATA

System Measurements:	
Deviation:	+100kHz to -100kHz
Modulation Power:	-8dBr to +12dBr (0dBr ref 19kHz)
Pilot 19KHZ:	dB or %
RDS carrier 57KHz:	dB or %
Signal Strength:	85dBu full scale range
Multipath:	10dBu full scale range
Stereo:	0 to 100% modulation

Provisional specification:
Document: TS905060_spec_20apr06.pub

Multiplex signal:	
Bandwidth:	0.1Hz to 100KHz < 3.0dB 20Hz to 80KHz < 0.4dB
Deviation accuracy:	0 to 75kHz < +/-1.5% (1kHz test sinusoid)

System parameters	Min	Typical	Max	Units
RF Bandwidth	87.5	-	107.95	MHz
Input impedance		50		ohms
Image rejection		100		dB
Sensitivity		2.8		uV
RSSI resolution		0.1		dB
Multipath resolution		0.1		dB
Pilot 19KHz range	18.95		19.05	kHz
RDS 57kHz range	55.5		58.5	kHz
THD		0.2		%
Stereo cross-talk	33	40		dB

Spectrum Analyser:	
Dynamic Range:	>100dB
Dynamic Range Averaged:	>110dB
Resolution:	20Hz

Sine wave generator:	TS9050s
Frequency: @ 25degC	1.0kHz +/-30ppm
Stability: 5 to 40degC	+/-50ppm
Amplitude: 5 to 40degC	1.0 vRMS +/- 1%

Signal connections: TS9050 and TS9060
BNC Antenna input 50ohms
BNC Analyser input 10Kohms 0dBm (FM multiplex signal or audio spectrum analyser)
BNC MPX multiplex. Output 50ohms 0dBm at 75KHz
Jack 3.5mm Stereo monitor
BNC ALARM: Sink 10mA on alarm
XLR Left channel balanced output
XLR Right channel balanced output
USB 1.1 and 2 compatible (Not suitable for non-powered hubs)

Dimensions: TS9050
275mm *158mm * 75mm
Weight 0.81 Kgm

Dimensions: TS9060
483mm *225m * 43mm (standard 1U height)
Weight 1.80 Kgm

System requirements:
TS9050 and TS9060 iLog software runs under Windows98/2, Me, 2000 and XP. Minimum usable system: Windows98/2 running on a 1 GHz Pentium/Athlon. Recommended system: WindowsXP +2 GHz Pentium/Athlon. Requires a minimum of 16MBytes of RAM.
Temperature: Operating: 5degC to 40degC Storage: -10degC to 50degC