HD audio MICROMEGA

FM10

The heritage of FM

FM10 is the FM successor whose sound qualities and exemplary reliability made of this product a best seller in its category. Micromega had in heart to develop a FM tuner whose performances would be exceptional while preserving a price quality ratio without equivalent.

The chassis

Entirely metal, the frame has the role to bring a stable and rigid base to the electronic circuits against the external disturbances as well electromagnetic as high frequency of which we today are largely surrounded. The aluminum front panel gives to this unit and all those of the range a class impressed of sobriety where minimalism and user-friendliness cohabit harmoniously.

A rotary encoder, controlled by the microcontroller of the unit, allows to adjust the frequency of reception or to reach the memorized stations quickly. Six tactile keys give access to the essential functions while preserving minimalist ergonomics intentionally. The 10 characters blue dot matrix display, driven by a Micromega software, gives in all information necessary in real time and in particular the name of the received station when mode RDS is activated.

The aluminum anodized top cover and whose color Black or Silver and finish harmonizes themselves perfectly with the brushing of the front panel gives to the product an incomparable distinction.

The power supply

Like all tuners, FM10 depends for its power supply on the user mains source. This source is polluted unfortunately more and more in particular since the advent of the switching power supplies which supply the computers but also consumer products like the television sets, the DVD players, the video tape recorders, and the satellite receivers among so much of others. All these power supplies, even if they are to CE standard, supposed to prevent any entering or outgoing disturbance, emit towards the mains parasites and high frequencies signals likely to disturb the reproduction of the units, and this more especially as the latter are powerful.

The FM10 transformer is of R-Core type. These very particular models show very interesting characteristics in comparison with the filtering of the mains disturbances. Contrary to the toroïdal transformers whose band-width is very broad, the R-Core transformers have, by construction, a very narrow band-width making their use ideal when the request for current is moderate. FM is equipped with a linear power supply made up of several distinct sections to be free from the problems of crosstalk between the various analog sections, the section of the HF Front end, the shaping circuits and the audio section. The specific power supply for the HF Front-end provides the current necessary to the HF head which receives and amplifies the signals coming from the antenna. In addition, the linear regulators with strong rejection guarantee to all of the elements of this section a power supply perfectly free from noise. The other sections take advantage of independent active regulations guaranteeing a treatment of the signal in the best conditions. To generate the specific voltage to the VFD display used in FM, a specific winding is used making it possible to isolate the power supply from this element whose purists know well the negative effects on the musical reproduction of very high quality.

The HF Front end

This module is the heart of any Fm tuner and the quality of reception of the final unit is often directly related to the quality of this vital element. Micromega selected for FM10 a Front-end of Asian origin the KST-F724VA model. This top-of-the-range model equipped in input with a double-grid FET transistor is particularly powerful. Indeed compared to the models commonly used in the tuner of the same category that FM10, the head HF presents, on aspects essential with a reception of great quality, quite higher performances. Although one cannot return here in all the details of the design, some figures are significant and prove the choice of this module. The Power Gain is 2 times more significant than that of the competitor models (32dB against 25dB) whereas the noise figure is 2 times smaller (4dB instead of 8dB). Moreover the double-grid FET allows to carry out what one calls in electronic jargon a AGC (automatic gain control) which allows adjust sensitivity of input of the Front-end to adapt the tuner to different input levels. Thus FM10 has a specific adjustment of sensitivity of input adapting to the environment of reception of the listener. If this last lies in an urban zone and has an Fm network, it is preferable then of adjust FM10 on the position CABLE to avoid the saturation of the input stage of the Front-end. The other cases and in particular during the use of an antenna or a dipole, it will be recommended to place FM10 on position ANTENNA to profit as well as possible from the very high sensitivity of the module of reception and to thus collect stations distant under good conditions with a minimum from noise.

The IF section

At the output of the HF Front-end, the signal leaves in fixed 10.7MHz IF intermediate frequency. The role of the section of amplification in intermediate frequency is to bring the largest possible gain in a sharp edge narrow band-width in order to as well as possible reject the residues of modulation of the adjacent channels. The choice of the gauge of the band pass filter results from a compromise. Too much narrow, part of the Fm band modulation is truncated and that involves distortion and band limitation after demodulation. Too much broad, of the undesirable signals can interfere with the useful signals. Everyone knows, that being given the number of Fm stations available today, the inter-channel spacing fixed in the plan of frequencies is not always respected, and particularly in the relay zones, just as the maximum frequency deviation recommended for the modulation Fm in the band 87.5-108 MHz. Micromega chose a structure on three discrete stages equipped with Murata high rank input-output impedance adapted ceramic filters and this in order to obtain a broader total response than the required 150kHz minimum (FM excursion of +/- 75kHz), but with a slope of extremely stiff cut at the ends in order to obtain an optimal selectivity. The intermediate frequency resulting signals are sent towards the limiter device of the FM10 discriminator.

The demodulator and the PLL (Phase Locked loop)

The FM10 discriminating section and treatment of the stereo multiplexing is entrusted to a LA1851 Sanyo circuit which was retained for its excellent performances and its many embarked functionalities. After a limitation of amplitude of the FM signals at intermediate frequency coming from the IF section, intended to eliminate any trace from parasitic amplitude modulation, the LA1851 carries out the demodulation of the multiplexing by a quadrature detector animated by an external resonant circuit entirely designed by Micromega. The demodulated signals on the one hand are directed towards decoder RDS without additional filtering and on the other hand towards the LA1851 internal stereo multiplexing decoder via an fifth order "anti-birdy" filter, entirely designed again by Micromega thanks to its simulation tools. Its role consists in eliminating the undesirable high frequency signals and mainly the third and upper sub carrier stereo control harmonics, which, if not, could cause undesirable "whistling" after the decoding operation. The multiplexing with removed sub carrier is then decoded by a synchronous demodulator with carrier regeneration animated by a VCO (Voltage Controlled Oscillator). The LA1851 has a circuit measuring the intensity of the received signal via a controlled threshold comparison circuit specific to Micromega, to operate a discrimination of the stations during sweeping and of the setting in memory according to the intensity of the collected field. Finally this circuit incorporates mute and mono functions very useful in the presence of badly received stations or during sweeping inter-stations. The optimal separation of the left-right signals is adjusted by hand in factory during tests, which makes it possible to obtain an optimal separation (50 dB) seldom met on tuners of this class. In a super heterodyne receiver, with translation of frequency, the local oscillator of the HF Front-end as well as the tracking filters, must be controlled by a voltage representative of the frequency of the selected station. On the FM10 board, this is achieved by the Sanyo LC7218 PLL, phase lock loop circuit, perfect complement of the demodulator LA1851. This circuit of synthesis compares the frequency of the local oscillator of the HF Front end with the frequency control data transmitted by the main microcontroller. It has its own crystal controlled quartz clock and provides, by means of the loop filter developed by Micromega, the correct voltage to the block of reception.

The RDS decoder

This circuit, a Philips SAA6581, takes care of the demodulation and working of the flow RDS (Radio System Dated) which occupies the top of the band of the Fm multiplexing. It ensures initially a low-pass filtering of the signals of input coming from the discriminator in order to reject the undesirable residues of frequency higher than 60 kHz, operates a very narrow band pass filtering (3kHz) of the eighth order centered on the removed RDS carrier (57 kHz), regenerates the carrier thanks to its internal PLL and demodulates the carrier removed signal by synchronous demodulation. The RDS modulating bi-phase signal obtained is then decoded in serial binary format with reconstruction of the RDS clock and sent to the microcontroller. The RDS data processing is carried out within the microcontroller by an Micromega algorithm.

The analogue stages

The analog stages are the last link of the unit and their role is of primary importance. Indeed, the specialists know it well, the Fm signal contains two control frequencies one with 38kHz for the stereo frequency control and the other with 19kHz for the mono frequency control. If the stereo frequency control is relatively far from the audio band, it is not the same issue for the mono frequency control which is at the end of the audio band in a zone where perception remains good. It is thus necessary to cancel these two frequencies or else a whistle with 19kHz would seriously disturb the content of the musical message. Fortunately the Fm band limits the band-width of the signal transmitted to 15kHz and there thus remains a band of 4kHz of width to remove the first pilot frequency. Stiff slope filters are thus necessary and Micromega designed and got manufactured specific 5th order filter elements. The powerful tools of CAD and simulation available at Micromega, once again, could make wonder and bring an invaluable help without which the time of development would have required long additional weeks. Very Low noise Operational amplifiers make the heart of these filters and of the unity gain buffers for a perfect interface with the units FM10 will have to be connected with. Finally an ultra fast presence or absence of power supply ac signal detection circuit, avoid FM10 to emit bursts of dc voltage at power on or in the event of abrupt mains shortage.

The musical discovery

The FM band is a place where all the music is offering to the listener a pallet of musical choices without precedent and this at the moderate cost of the purchase of the good tuner. FM is an excellent tuner and its quality of musical reproduction creates enthusiasm at all those which have the chance to be the happy owners for it.

TECHNICAL CHARACTERISTICS

Tuning range	87.5 - 108MHz
Stereo sensitivity	45µV/50dB
Selectivity	60dB/300 kHz
Distorsion	<0,5%
Bandwidth (±0,5dB)	20Hz-15kHz
Crosstalk	<-50dB-1kHz
Output impedance	<600Ω
Output level	1.5Vrms
RDS decoding	Yes
Preset station memory	50

Power supply

Power consumption	11 W
Fuse	T 160mA / 250V (Slow blow) T 315mA / 130V (Slow blow)

Dimensions : (L x P x H mm)	430 x 265 x 69
Weight	3.0 kg

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