DEGEN DE1103: Correcting the errors

The original Russian version of this article can be found at
http://www.radioscanner.ru/info/radio/degen2.php

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The idea of writing this article came to me soon after the first review was published, with the several following months bringing forward the corrections which were required. During that time many visitors of the http://www.radioscanner.ru website bought the receiver, and stormy discussions ensued on the pages of our forum. In addition, I received many letters from DE1103 users with their comments and evaluations.

In spite of the many positive qualities of the DEGEN DE1103, some improvements can be made to make it work even better. This conviction accompanied me from the first days of using the receiver. Moreover with the passing of time, the benefits and drawbacks of the receiver seen in the first survey were confirmed. The more time passed, and with more DE1103 owners, the more complete the picture became. And here now, when all the strong and weak points of the Chinese receiver are known by almost everyone, I decided to actually realize the considerations and wishes of forum members.

The purpose of this article – is to sum up our desired improvements and to actually perform them on an actual DE1103. After repeating these simple recommendations, you will obtain an entirely different receiver. It will look the same from the outside, but it will be free of its "infancy problems", and it will work better and be more convenient to use.

When devising the improvements to the DE1103, I strived to make the improvements as simple as possible, using repetitive steps. This article provides concrete details of the modifications performed. To modifications will require simple tools and several inexpensive materials. However all my recommendations require to "surgically" operate in the receiver. Therefore for those, who are not very familiar with the technology and who do not feel confident in performing the steps given below, I advise you to refrain from doing this independent work, and to entrust this matter to an experienced specialist.

I consider it necessary to warn that the author does not bear responsibility for the risk of possibly damaging the receiver by performing any of the modifications published below.

It did not take long to come up with the title of the article.

DEGEN DE1103. Correcting the Errors.

The main disadvantages DE1103 were noted in the first article, and are summarized as follows:

- The inconvenient volume control
- Noisiness and the instability of PLL circuit, tuning susceptibility
- The constant frequency reconstruction pitch

- The power consumption
- The low (by professional standards) suppression of the mirror IF images channels of strong stations
- The reduced sensitivity as the frequency increases (in SW range).

A number of disadvantages from the initial list lost their urgency as time went by. Although the DE1103's energy consumption is above average, it is not great enough to deal with this first. Even by using the rechargeable NiMh 1300mAh batteries that come with the receiver, they last about 15 hours in continuous use. This is completely sufficient, if we take into account that the batteries are rechargeable. Moreover by using the latest batteries with capacities greater than 2000mAh, the problem of battery life with the receiver being off.

Several words about the batteries. The owner's experience shows that the DEGEN 1300ma/h NiMH batteries supplied with the receiver are of good quality, and work well with the receiver, and their capacity is close to the manufacturer's claimed rating.

Some receivers from other companies (in particular "Delay 4WD") are supplied with poor quality rechargeable batteries with their set. They are so unreliable that they often do not last more than a few days after purchase.

The impossibility to change the 9KHz tuning steps in the LW/MW, and the 5kHz steps in the SW range is quite inconvenient. To correct this independently by simple means is not possible. You have to get used to it and follow the readout on the display when searching and tuning the broadcast stations.

We will try to correct the remaining design shortages ourselves.

A bird in the hand is better than two in the bush?

From the very beginning I was astonished at the DE1103's stable operation with the external antenna, as described in the first review. Because of its ability to work with powerful signals in the VHF bands, the DEGEN DE1103 far surpasses its competitors. There was much bewilderment, when after a short time after the first review was published, many owners reported that the receiver overloaded even when a simple antenna was connected into the antenna jack. At the time these reports puzzled me, with negative comments still continuing to come in. This news was more than unpleasant, since it is precisely the DE1103's outstanding shifting stability that led me to separate this receiver from the other "soap-boxes", and recommend it to experienced users, who are looking for an inexpensive and good receiver for trips and around the house. My suspicion was that there was a fundamental problem, that the manufacturer was not aware of, and that this was not done by design. This suspicion has been recently confirmed by a change they have made on the new version. A forum associate of mine was given the new version of the DE1103, whose dissection confirmed our suspicions. The newly updated receiver, looks the same on the outside as the one that I had purchased in 2004. The model was revised sometime around October 2004.

The new DEGEN DE1103 version actually suffers overload from powerful SW signals. This new shortcoming forced me to add an additional deficiency to the DE1103 deficiencies list - Overload when using the external antenna.

The “new” DE1103 looks the same as the old version. The only way to determine if this is the newer version is by looking for the “CNR” sticker on the front panel.

Almost all new DE1103s are sold with this sticker, but the presence of the sticker (as its absence) is only an indirect sign of the receiver version.

In order to find out, what receiver version you have, you need to tune it to the FM band on any radio station. Insert an "empty" 3.5mm diameter plug into the antenna jack.

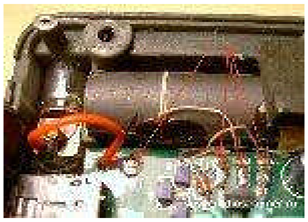
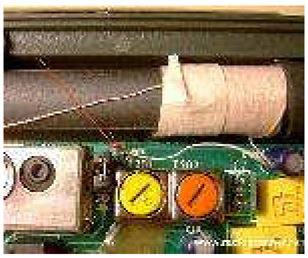
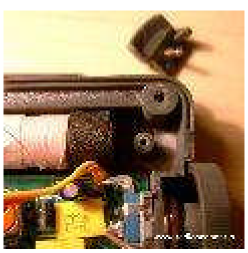
In the new receiver version, the whip antenna is always disconnected in the FM band when the plug is inserted into the jack; therefore the level of FM station reception during this test will either be lowered or will cease completely. To verify this even better, tune to a weak FM station, otherwise the difference between the whip antenna and the plug antenna may be impossible to note due to "leakage" of the powerful signal through the capacity of the jack contacts. If inserting the empty plug confirms that it is a "new" DE1103 - do not despair. Aside from this (and its performance in overloads when using an external antenna) the new receiver is not worse than the previous version. You will have to add two additional capacitors to the modification to return to the previous, more successful external antenna circuit.

The upgrades are divided into sections. Each section is dedicated to a separate upgrade. Several upgrades are highly recommended, as they are necessary for the correction of essential manufacturer deficiencies and I recommend performing them. These upgrades will be marked as “Recommended”. The remaining modifications do not greatly affect the receiver’s operation, performing them depends on the desire of the reader to obtain the maximum performance. But your labour will be rewarded by knowing that you possess a more advanced and convenient receiver.

Dismantling the receiver

The first practical part of the article is aimed at those who will open their receiver for the first time. It details the procedure to open the DE1103. Those who are already familiar with the steps to dismantle the receiver, can immediately go to the following sections.

	Place the receiver on the table with the front face facing downwards, remove the batteries from the battery compartment. Unscrew the seven screws, which are marked by pointers on the rear housing panel. Do not forget the fastening screw, located in battery compartment. Do not remove the screw which fastens the telescopic antenna. Carefully separate the rear half of the housing around its perimeter from the front on the middle joint, beginning from the lower part and the lateral sides.
	The upper parts of the housing halves are held more strongly, in order to separate them pull off firmly and you will separate the housing halves completely. The housing parts are connected together by three connections.
 	Disconnect the white ribbon cable from the connector on the PCB in the rear half of the housing. Do this, after undertaking train close in joint, slowly drawing out it outside.
	Disconnect the connector wire harness which goes to the tuning knob.

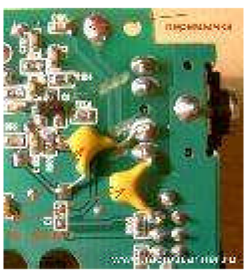
	Now the two housing halves are connected only by the wire to the speaker. Unsolder the wire from the speaker contacts.
 	For now, you can put the front half of the receiver housing (with the display and keyboard) aside, since the upgrade only affects the PCB in the back of the receiver. Unsolder the magnetic antenna and telescopic whip antenna outputs from the dime-sized contacts on the PCB. I recommend that you first sketch the magnetic antenna conductor connections to avoid errors when you reassemble it.
	Unsolder the brown wire which goes from the tuning knob to the PCB. Unscrew the small screws, which fasten the PCB inside the rear housing cover. Begin to lift the PC, beginning from the left side (where the antenna jack, head sets and net adapter are placed).
	If you hit the ferrite rod antenna while lifting the PCB, unscrew the antenna fastening on the right side of the rod and move the antenna rod a little upward.
	Finally from the right side, remove the PCB located under the tuning knob, from the rear housing cover.

Altering the antenna jack (recommended - only for the new version)

You will need two through-hole mount miniature ceramic capacitors 33... 150 nF (0,033 - 0,15μF).

1. Cut two PCB traces, as shown on the photo. Remove capacitor C1, from the circuit.

2. Solder the capacitors to the sections on the PCB and cross connect the two adjacent conductors at the upper edge of PCB, as shown in photo.



Now the whip antenna preamplifier is disconnected to the external antenna jack connection and the receiver will not be overloaded.

Synthesizer modification (recommended)

Two 15nF (0.015μF) Surface Mount (SMD) ceramic capacitors are required.

1. You will replace capacitor C404 (next to the synthesizer microcircuit) by the 15nF capacitor.

2. Clean the small section of the circuit trace, which leads under the cover of the second heterodyne shield (see photo) and solder the 15nF capacitor between it and PCB "ground".

When tuning with the knob you will not hear the characteristic "blip-blip" and flicks. SW tuning will become noiseless.

To get rid of roar and excitation of the PLL circuit, only shielding will help (see shielding section).

LW-MW-SW section input filter modification

This improvement is directed toward raising of the receiver sensitivity at frequencies above 15 MHz. As was mentioned in the first review, the input filter characteristic has a progressive "obstruction" above 12 MHz. Because of this the sensitivity falls about 3... 4 times in the upper region of VHF band. The author's experience in using receivers allows him to conclude that it is possible to completely solve this deficiency with the signals method in the ranges below 20 MHz. Those who mainly use the whip antenna, when the circuit preamplifier works, will find that the DE1103 sensitivity is extremely high.

Therefore the input filter modification is considered part of the "extended program", and is recommended first of all to high frequency SW listening amateurs with the external antenna and thereby, who are not ready to live with the annoying drop in sensitivity in the DE1103. The mirror channel of the first IF (see the measurement results) will also be considerably improved. Besides this, the filter modification makes it possible to increase sensitivity in the frequency band above 30 MHz, more details on this will be provided later.

These components are required:

- мiniature ceramic capacitors:
5,6 pF - 1 piece,
15 pF – 1 piece,
22 pF – 1 piece (better than the SMD-тype),
130 pF – 2 pieces (better than the SMD-тype).

- miniature high-frequency chokes with 330 nH (0,33 H) inductance with terminations - 2 pcs.

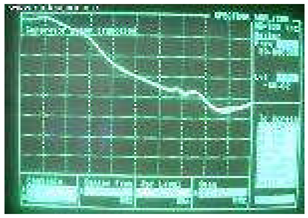
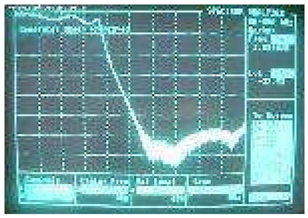
1. Cut the printed circuit trace at the location shown on the photo. Clean and tin the PCB traces as shown on the photo.

2. Replace inductor L105 by the 330 nH choke (above on the photo) and solder the second 330 nH choke to the PCB traces which were previously cut. Solder a 15pF capacitor in parallel to this inductor (not shown on the photo).

3. Replace capacitor C132 by a 22 pF, and C135 by a 130 pF. Add a 5.6pF filter capacitor into the circuit, as shown in photo and one additional 130pF capacitor in the new place (below on the photo).

Because 130pF capacitors are not available, it was necessary to replace each of these capacities with the parallel connection of two capacitors with a total capacitance of 130 pF (above on the photo).

The filter modification is completed.

Compare the initial filter characteristic...	
...and after the modification:	

The instrument divisions are 10 MHz along horizontal and 10 dB on the vertical line.

More details about the new filter characteristics will be provided later, in the measurement section.

Direct volume and frequency control in SSB mode

This modification converts the FINE control knob into a volume control knob, and converts the VOL knob into the SSB frequency fine tuning knob (tuning knob + pressing VOL).

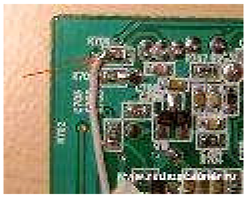
Requirements:
- one small 3.3kΩ resistor (possible 3,0 kΩ or 3,6 kΩ),

- thin insulated installation wire (MGTF type, etc.).

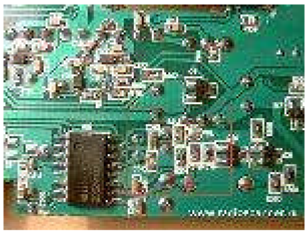
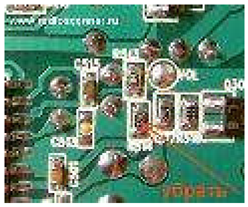
1. Cut the PCB traces on the face side of the PCB in the places, shown in the photographs.

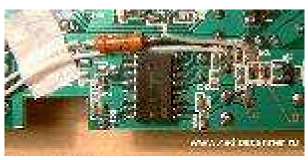
2. On the back side of the PCB use a short piece of insulated wire to connect the left output of resistor R706 to one of the connector pins (second pin from the top right).

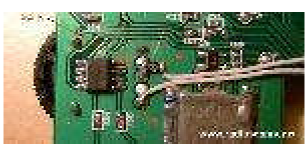
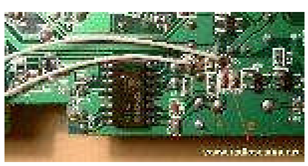
3. Remove resistor R514 from the circuit (to the left and below the terminal labelled “VOL”).

4. With a 90mm long conductor, connect the FINE lower regulator output to the point, shown on the second photo (connection "A"), and the average output of the FINE regulator to the “VOL” pin through the 3.0-3.6kΩ resistor (connection B). In this version, I placed the resistor inline with the wire, between two conductors measuring 15 mm and 65 mm respectively.



It is simpler and more convenient to connect the resistor directly on the average FINE regulator output. You connect the added resistor by one termination immediately to the average regulator output, and then solder a 70…75mm wire on the other end of the resistor to the “VOL” point.

5. Attach the conductors to the PCB using pieces of masking tape or quick drying glue.

Now you can control the volume using a more customary method of simply adjusting the FINE knob, and the fine adjustment of the third heterodyne in SSB mode is done by pushing the VOL button and turning the VOL knob (analogous to controlling the volume in the factory version). The loudness level number on the display after the alteration corresponds to the relative frequency offset of the third heterodyne. In the receiver given to me for the alteration the dependence of reconstruction of the third heterodyne was the following (measurements at several points of the range of step-by-step tuning):

Tuning Level, «VOL»	Offset relative to the IF center frequency, Hz
00	- 1860
10	- 1285
20	- 717
30	- 150
40	+ 470
50	+ 1168
60	+ 1562
63	+ 1622

In each receiver the extreme values of tuning range can differ from the example above, and the range of summary reconstruction lies within the 3,2... of 3,5 kHz range.

Thus, with sixty four levels of regulation, one reconstruction step on average is about 50 Hz, but it is not constant since the control curve is nonlinear curve and changes on the edges of the regulation range from 60 Hz to 30 Hz. Central tuning it is located around the 30... 34 level, and depends on the parameters of the third heterodyne in the actual receiver version.

Frequency stability of the third heterodyne is very good – the circuit adapts resonator with the electrical "stretching" with varicaps.

This modification now allows to use the alarm clock in SSB mode, since the radio will be accurately tuned at the center frequency. Recall that in the factory version it was possible to program to start the receiver on the last tuned frequency (or open a frequency stored in memory), in the reception mode selected, at the selected volume with the programmed loudness and operating time lasting up to 60 minutes. In this case turning on the receiver automatically in SSB mode was possible, but there was a possibility to lose the preliminary fine tuning by accidentally turning the FINE tuning wheel before the alarm went ON. Now, by "digitally" processing the third heterodyne by keeping this parameter in the alarm clock tuning memory, it is possible to be confident in the tuning stability in SSB mode. It will only be necessary to memorize or to write down the value of the current offset level (VOL Level), since with programming the alarm clock lodness parameter is now assigned separately from the frequency (or memory location). The alarm clock volume level with this modification is determined by the position of the FINE regulation knob, which must be previously set to a comfortable level. In other respects, the alarm clock operation of the receiver remains as before. Wireless enthusiasts and world band radio listeners, will appreciate the benefit of precisely setting the time and frequency at which the receiver automatically starts. Since the DE1103 receiver has two independent alarm clocks, this modification expands the possibilities of SSB mode using a timer.

The only drawback to this modification is that the sound stays ON during scanning (when in station search mode). In the factory version, station search is muted.

Changing the AGC time constant

In the initial receiver version, the AGC system seemed slow. This modification affects the LW-MW-SW ranges, since the AGC does not work in the FM band. With rapid changes in the received signal level, the receiver responds a little "late", restoring signal strength occurs with a small delay. This is far from critical behavior, most users will not have a problem with this, and will not note the sluggishness of the AGC. However, experimental radio reception amateurs who want a more lively control of the airwaves, can easily modify the DE1103's AGC.

A small (no more than 10mm high) chemical capacitor with a 1μF capacitance is required.

Remove capacitor C206 (10μF) from the PCB and replace it with the 1μF capacitor, being careful to place the positive terminal at the correct location. .

Now the AGC will operate a little "more rapidly", which is better for the reception of dynamic signals. The modification not only make the AGC less inert, it also provides a received signal indicator (S- meter).

Shielding (recommended)

The shielding of the reverse side of signal PCB is extremely desirable to improve the operation of the DE1103. This recommendation was mentioned even in my first review. This time the shielding shall be final in nature, after performing the changes described.

But before starting the work, I will explain how the DE1103 is shielded. This is necessary for the correct application of "forces and facilities", i.e., obtaining maximum effect from the shielding.

As has already been mentioned in the first article, the receiver has at least two sections, critical to the shielding. This pertains to the location of the frequency synthesizer microcircuit and the first IF quartz filter. The shield above the PLL microcircuit reveals a flaw in the excitation circuit when a hand is held near the synthesizer location. This modification allows to sharply reduce the "roar" of the synthesizer output signal. These factory deficiencies on the DE1103 noticeably influence the quality of the AM and SSB band signals. The majorities of users, which have implemented the shielding recommendations have already noted an explicit improvement in the operation of their receiver in SW band. The reason for the oversight of the developers was incomprehensible to me, until now: observing the need for shielding the PCB in the zone where the reference cavity and PLL loop filter is contained in the synthezier microcircuit description from the producer. And precisely because of the tuning susceptibility of her high-impedance terminations.

It is worthwhile to note that in the new receiver version given to me, the synthesizer roar was present to a considerably smaller degree, than in my first receiver. Similar opinions came also from other owners of the "new" DE1103. The synthesizer gUNa signal in the new version is clean both with its hearing on the check receiver and with the direct SSB mode in ether. However, shielding the synthesizer microcircuit is still necessary. The probability to excite the circuit when placing a hand close to the PCB still remains in the new receiver.

The shield above the quartz filter location with its subsequent fine adjustment allows it to obtain an additional 6 dB in the suppression of mirror channels on the second IF (+900 kHz relative to the frequency of tuning receiver). This weakness in the DE1103 was also detailed in the first review. If we consider the low initial value of this parameter (-42 dB), then the need for modification is obvious.

Shielding is desirable for the receiver's input section. The DE1103's high sensitivity also has disadvantages. The PCB section with the input circuits is subject to nearby interference sources, such as hands. To be fair, I will say that the antenna effect on the input section does not appear to the same extent as in the GRUNDIG YB400, but installing an additional shield will not interfere with DE1103 nevertheless.

Two shielding methods are tested on the DE1103. The first (partial) – which was detailed in my first review, and a second method which was devised repeatedly used , which consisted of installing a common shield above the back side of the PCB.

I remain an adherent of local shielding of critical PCB sections. The small complication of producing and installing separate shields pays off by not having to connect a large number of connections to the common wire, and by reducing the probability of connections between high-frequency circuit points through the common ground capacitance. Moreover preparing shields according to the sketches given below and to place them in the locations indicated is not that difficult.

Required:

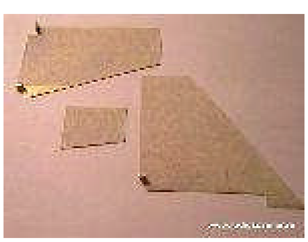
- brass, copper or tine plated steel ranging in thickness from 0.2 m to 0.35mm
- Ruler
- Scissors
- Mini-pliers
- Masking tape

1. Cut out the tin shields using the sketches (top view, sizes in millimetres).

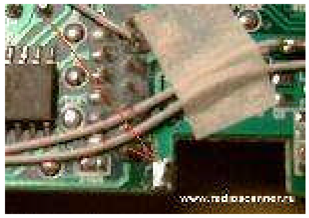
Make cuts for the fastening lips to a depth of 3 mm, also, at a distance of 2,5-3,0 mm from the edge.

2. Bend back the future shield fastening shield lips along the cuts downward relative to the plane of the sketch. The height of each lip obtained in this way must be about 2,5 mm. if the height of counter is greater, it is not terrible - it will be easy to decrease it by slightly bending it under, thus regulating the shield height of the installation above the PCB.

Apply masking tape to the internal surface of shields over all their complete surface.

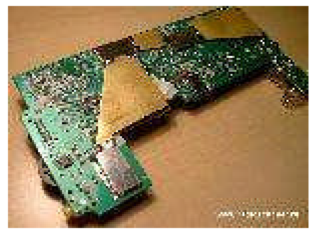


3. Clean and tin the shield attachment points on the PCB.

4. Install the shields to the PCB close to the installation and solder them, as shown in photo.





Tuning Knob

Some DE1103 owners reported that the tuning knob mechanism became jumpy. This manifests itself as sudden "jumps" of several steps during the slow rotation of the tuning knob, by gaps in tuning frequency or tuning in the wrong direction. There is no precise information about the occurrence rate of this defect. In certain tuning knob cases it began to fail soon after the receiver was purchased, while in others (including the author) it works a long time without any failures. It must be pointed out that the manufacturer reacted rapidly to the complaints received and conducted reliability spot checks on the tuning knob problem. After simulating intensive use (rotation at high speed, a total number of approximately 5 million revolutions.) the tuning knob remained operable.

Today when the tuning knob interference occurs, it is recommended that it be dismantled and its mechanism be cleaned. It will operate after the clean mechanism is filled with tuning knob with silicone lubricant. At this point it is unknown for how long this repair will last. The process of dismantling and cleaning of manufacturer's tuning knob was repeatedly discussed on the forum.

Another solution to the manufacturer's tuning knob problem is its replacement. Here we become acquainted with and provide details of one of these upgrade versions.

Increasing the battery charging current

The DE1103 allows to recharge the batteries while they are inside the receiver. This was already mentioned in the first review. The battery charger features a programmable timer for the charging time, which is convenient in comparison with simpler devices.

Unfortunately, automatic turnoff is not provided when the batteries are fully charged. It is said that this feature will be provided in future models of the receiver. Manually choosing the charging time after a simple calculation based on the battery capacity data and the charging current, allows to keep the batteries “in shape” and preserve them.

The charging current measured in several different receivers was calculated to vary from 80 to 115 mA. The receiver manual states that the nominal charging current is 100 mA.

The DE1103 receiver set comes with a set of four 1300mA/h rechargeable batteries. Consequently, to completely charge the battery with the provided battery charger requires about 18 hours. The charge timer allows to set the charge time in 1 hour steps, up to a maximum duration of 23 hours. Thus, it is possible to completely charge storage batteries having a maximum capacity of about 1600 mA/h, for which is almost 24 hours is required. It is inconvenient not only from the point of view of time spent, but also impossibility to completely charge contemporary storage batteries of greater capacity. Some receiver owners use batteries with capacity of more than 2000 mA/h, which require repeated cycles to completely charge them, and total charging time of up to one-and-a-half days!

The proposed simple modification allows to more than double the charging current. Accordingly, the minimum charging time to charge the manufacturer provided batteries is reduced by half , and it is possible to charge a maximum battery rated at 3200mA/h during a one time (23 hours) period.

On the reverse side of the PCB next to the switch jaw contacts for the battery, you will find two resistors (on the photo they are marked 1 and 2).

Resistor №2 should be removed from the circuit, while resistor №1 shunted by cross connection.

After the modification, the initial charging current in my receiver increased from 85 to 205 mA. Toward the end of the charge cycle the current falls to 180 mA. I recommend the described change in the charging circuit only with the use of quality storage batteries. If you are using doubtful or regular storage batteries, or batteries which were repeatedly charged using "fast" chargers, resistor №1 should be left in without the changes (not shorted). The charging current will only double (in my case to 155 mA), but this lowers the risk of failure to the key transistor Q26 because of immediate short circuits in several battery elements (very rare phenomenon).

After the modification it is desirable to measure the charging current used to calculate the new battery charging time.

The DE1103 charging method remains “slow” as before, which allows not to be afraid of recharging in the case when a small error in selecting a greater charge time than is required is made.

We show you how to receive signals below 100 kHz and above 30 MHz

Interesting information about possibility of the DE1103 receiver to receive signals below 100 kHz circulated on the Internet. The discussion centered on this, and on our pages (moreover, the method to receive signals above 30MHz was found separately by forum member luv). The receiver designers designed a hidden capability into their creation, whose secret was quickly found because of the world wide web. The pleasant side of this modification is the you only need to use the receiver’s keyboard, without requiring any disassembly. The method to obtain an extended range on the DE1103 is interesting by itself, and leads us to believe that this was probably implemented by the engineers as a joke, to allow to widen the DE1103 reception range. Many receiver owners among the site have successfully extended the range of their receivers.

The instructions on how to extend the frequency range below 100 kHz is given below.

1. Turn the receiver ON and tune it to frequency 21951 kHz by typing it on the digital keyboard (2-1-9-5-1- "BAND+").

2. Simultaneously press two buttons: "BAND -" and "BAND+" before the beginning to scan downward in frequency.

3. Wait for the approximation of the current scanning frequency to lower boundary of 100 kHz frequency (this is engaged itself decent time). Do not touch the tuning knob during all this time – touching it will stop scanning and it will be necessary to repeat the procedure anew. When scanning reaches the lower boundary of 100 kHz and passes it, be attentive. You now need to stop scanning by pushing any button or by turning with the knob. The frequency indication below 100 kHz will be three-digit, for example, for 50 kHz:

4. Store this frequency or any other below 100kHz into memory: push the "STORE" button, select the storage address with the tuning knob, release it and once again press "STORE". It is better to use an address at the beginning of the bank - this is more

convenient for future selection. Attention: to choose the stored frequency (to be tuned to it) you only need to choose the tuning knob.

To extend the tuning range above 30 MHz do the following:

1. Turn on the receiver and tune it to frequency 21951 kHz by typing it on the digital keyboard (2-1-9-5-1- "BAND+").
2. Simultaneously press two buttons: "BAND -" and "BAND+" at the moment of beginning a downward frequency scan.
3. You will stop scanning by pushing any knob, then press the "BAND+" button and keep it pressed prior to beginning an upward frequency scan.
4. Wait to reach a frequency above 29950 kHz and stop scanning. Store the frequency stopped at into any storage cell.
5. Recall the stored frequency by pressing the "M/F" button and go into manual tuning mode by repeatedly pushing this knob. On the display there will be the frequency stored earlier, and the “MEM” inscription on the right side of the display will be replaced on "VOL".
6. You will not scan upward in frequency by pressing and by keeping the “BAND+” button pressed. Scanning will pass the 30 MHz frequency (the display will indicate the form "b0000", where the first symbol – is the inverted letter B). Attention: you will have to stop scanning when the indication is between “b0001” and “b0009” (30.001-30.009 MHz).

Now it is possible to tune the receiver with the tuning knob. The main thing is to have time to stop scanning in the space indicated, and then use the knob to receive frequencies above "B00y0". If we do not do this and do not stop scanning, then immediately after the frequency "b00y0" (30.010 MHz) the receiver goes to the FM band. You will have to repeat the steps above from the beginning to receive frequencies above 30MHz.

7. Now it is possible to tune above 30MHz with the tuning knob. The main thing is to have time to stop scanning before the frequency reaches “b0009”, store it into memory, and the afterward you can dial in frequencies above “B0010” with the tuning the knob.

Now your DE1103 can receive below 100 kHz and above 30 MHz. But tuning for these frequencies differs from the usual DE1103 tuning methods. The frequencies of the extended range cannot be received by direct keyboard entry. You also cannot go to the extended ranges by pushing the “BAND-“ or “BAND+” buttons. You can only use the previously memorized frequencies with any "opened" frequency below 100 kHz or above 30.010 MHz and by pushing of the "M/F" knob to pass into the manual tuning mode. By turning the knob or by starting a scan it is possible to reach the desired frequency, but if the difference between the start frequency in the memory and the tuning frequency is great, you will have to wait a considerable time to reach it. Therefore, I recommend to store several "round" frequencies into the receiver memory (for example B0000 "," B1000 "," B2000 "...) for convenience and speed of future tuning.

Is the extended range generally necessary in the DE1103? Each DE1103 owner can answer that for himself. In populated area at frequencies above 30 MHz, it is possible to hear everyday radiotelephones, which work with narrow-band CHM. With the small detuning it is possible to legibly take this modulation form in AM mode. In outlying regions were preserved the "national-economic" transmitters in the 33-38 MHz band, which also use narrow CHM.

Below 100 kHz you can actually hear, perhaps, only one "site" - the standard time signals station at frequency 66, (6) kHz for this it is necessary to connect external antenna into the antenna jack.

Randomly it was possible to reveal that after conducting the extended frequency procedure, at 100 kHz it is possible to select the type antenna used at frequencies up to 1710 kHz - internal ferrite or whip antenna.

Originally in the factory version, when tuning below 1710 kHz the ferrite antenna is always connected, the whip antenna in this case is disconnected. The same rule remains in "the opened" DE1103 when tuning frequencies under 1710 kHz in the usual manner (straight frequency recall from memory or using the range change buttons). But if we "enter" the extended frequency below the 100 kHz range via the memory recall at the "low" frequency, then going into manual tuning by repeatedly pushing the "M/F" knob, as it was described above, this tuning method will use the whip antenna. Then by tuning using the knob to raise the frequency, the whip antenna remains connected. However, the radio goes back to the ferrite antenna when you tune at frequencies below 1710kHz using the normal method (by recalling memory or by changing the range.

I note that in the "old" DE1103 when the ferrite antenna is connected (at frequencies below 1710 kHz) at any moment it is possible to switch to the external antenna by simply inserting in the antenna jack. Also it is possible to enter also in the "new" DE1103 with the antenna jack. But to here in the incomplete plant receiver of new version use external antenna below 1710 kHz will not come out. Only after extending the range below 100 kHz in the "new" DE1103 appears the possibility of replacing the ferrite antenna with the whip antenna using method described above, and only then it is possible to pick up signals upon the external antenna, connected into the jack instead of the whip. As we see, connecting the external LW/MW antenna is more complex in practice, to say nothing of the deliberately sad behaviour of the "new" factory DE1103 with the external antenna.

Measurement Results

To conclude the article we provide the measurement results of the separate receiver parameters with comments.

Two receiver versions underwent measurements and modifications:

-DEGEN DE1103 Factory serial number AI017885 - new version,

- DEGEN DE1103 factory serial number AI014128 - old version,
- Two additional DE1103 receivers passed quick checks according to the instruments to the object of fitness for work, the results were similar

After the upgrades both versions had very close characteristics.

Sensitivity in regime AM on the antenna joint (SINAD 10 dB), μV,:

Frequency, MHz	DE1103, old version	DE1103, new version	DE1103-RS (RadioScanner)
0.500	2,3	-	2,3
1.000	1,4	-	1,5
2.000	1,1	1,4	1,2
3.000	1,1	1,1	1,1
4.000	0,9	1,1	1,1
5.000	1,0	1,1	1,1
6.000	0,8	1,0	1,0
7.000	0,8	0,9	1,0
8.000	0,9	0,9	1,0
9.000	0,7	0,9	1,0
10.000	0,7	0,9	1,0
11.000	0,7	0,9	1,1
12.000	0,7	0,8	1,1
13.000	0,8	0,8	1,1
14.000	0,8	0,7	1,2
15.000	0,9	0,8	1,2
16.000	0,9	0,8	1,2
17.000	0,9	0,9	1,2
18.000	0,9	0,9	1,2
19.000	0,9	0,9	1,2
20.000	1,3	1,0	1,2
21.000	1,4	1,1	1,2
22.000	1,4	1,1	1,2
23.000	1,6	1,1	1,1
24.000	1,6	1,1	1,1

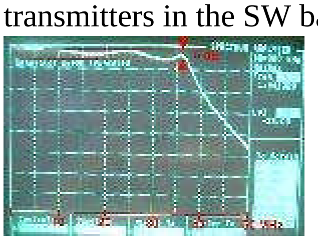
25.000	1,8	1,1	1,0
26.000	1,8	1,1	1,0
27.000	2,0	1,1	1,0
28.000	2,2	1,2	1,0
29.000	2,8	1,6	1,2
29.999	3,1	2,3	1,2

SSB reception response is better than the corrected values for AM on 11 dB, i.e., 3,5 times. This dependence remains at any point of the receiver range. At the frequency of 5 MHz the sensitivity in the one-band regime is 0,3 μV.

The absence of sensitivity values in the beginning of table for the "new" version is explained by the automatic cut-in of the ferrite antenna when it is tuned below 1710 kHz. In the "old" DE1103 the antenna jack works constantly in the entire SW range.

In the "new" factory DE1103, the sensitivity on the antenna jack is equal to the sensitivity on the whip antenna (as it was said earlier, the whip and external antennas here are switched in the jack and the signal from the antenna always enters the OF HF amplifier input). The amplifier slightly improves the laboratory sensitivity numbers of the "new" DE1103 in comparison to the "old", whose amplifier was not connected with the connection to the jack. We are already aware of the benefit of the preamplifier in the “new” DE1103 by using the external antenna. Therefore, the sensitivity number of the new version factory receiver is related only to tuning with the whip antenna, while the merit of the “old” DE1103 in the factory version is related to the external antenna.

It is evident from the table that the input filter modification led to an improvement in the sensitivity above 20 MHz. Not only this, the suppression of the mirror channels on SW on first IF Filter also increased to 50... 70 dB of the region of the mirror channels DE1103 they are located in FM ranges (on the fundamental harmonic of heterodyne) and in the "Soviet" VHF band (on the second heterodyne harmonic). Therefore the importance of suppressing these sections is important from the point of view of the decrease of VHF interferences - transmitters in the SW band to the external antenna.



The nonuniformity of new input filter characteristic is not more than 5 dB, but the upper band edge of transmission is 37 MHz and is calculated for the above 30 MHz extended version of the receiver. Therefore the sensitivity of over 30MHz extended receiver remains high.

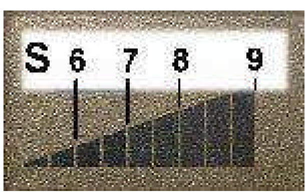
Sensitivity in the AM band (SINAD 10 dB), V, on the antenna jack.

Freq., MHz	DE1103-RS (RadioScanner)
31	1,4
32	1,6
33	1,8
34	1,8
35	1,8
36	1,2
37	1,0

In my receiver version the highest tuning frequency was 37.100 MHz. The synthesizer stopped working above this frequency and tuning stopped. Depending on the receiver version (tuning and the parameters of concrete GUN) of the boundary of steady method after the extensiont lies within the 33... of 38 MHz range, and synthesizer control remains up to 39.999 MHz ("B9999")

We measure the threshold of the **signal level indicator** segments, as follows (with an increase, of the tuning frequency of 10.000 MHz):

-92 dBm (5,5 µV)
-87 dBm (10 µV)
-81 dBm (20 µV)
-75 dBm (40 µV)



The difference between the starting levels of the adjacent indicator segments in the receiver I verified 5... 7 dB, i.e., in average 6 dB or one mark according to S- scale. In my receiver the level of complete display scale almost coincided with the accepted S9 level; therefore the signal strength indicator levels can be designated in the following form:

Dynamic range on the blocking of the receiver of old version and the finished "new" DE1103 from the antenna joint was 79... 80 dB. The dynamic range measurement was not produced because of the absence of the necessary equipment. On the basis of the obtained values of **BDR** the contributor approximately evaluates intermodulation stability according to the products of the third order with the number of 65-70 dB.

The suppression of the mirror IF channels in the second intermediate frequency (signal on 900 kHz higher than frequency of tuning) in the regimes AM and SSB was -42 dB in the plant version even -45... -48 dB in the finished receivers.

The DE1103 **Attenuator** only works in the LW/MW/SW bands. According to the measurement results, the attenuator vnosimoye lowers them by 14... 17 dB depending on the receiver version and the frequency band.

The measurements of **adjacent-channel selectivity** in AM reception mode confirmed the what we estimated by listening to the DE1103. Measurements

Filter set at	Suppression of the adjacent band channel -5 kHz, dB	Suppression of the adjacent band channel +5 kHz, dB
Wide	-19	-17
narrow	-51	-51

For another standard value of the carrier frequencies between the adjacent channels in 9 kHz the results of selectivity came out by the following:

Filter Set at	Suppression of the adjacent frequency channels of -9kHz, dB	Suppression of the adjacent frequency channels of +9kHz, dB
Wide	-60	-56
narrow	-61	-63

For another standard value of the carrying of frequencies between the adjacent channels in 9 kHz the results of selectivity came out by the following: -3 dB and – 60dB and – 70dB:

Filter Set at	Passband, kHz (- 3 dB)	Passband, kHz (- 60 dB)	Passband, kHz (- 70 dB)
Wide	-3,6…+3,1	-9,5…+9,1	-28…+22
Narrow	-2,2…+2,6	-7,5…+8,0	-18…+18

It is necessary to provide an explanation here. The selectivity tables do not provide the "correct" characteristics of the receiver filters used, which usually are taken on the basis of measured Low Pass Filter filter. DE1103 was measured in this case as a "black box" with the antenna input and the S-meter indications as the output parameters. The difference of the given levels corresponds to the relation of the unmodulated carrier levels at the central tuning frequency and in the side from it, that cause the identical start of the first segment S- meter. Came out the summary "through" selective characteristic of circuit, which includes Low Pass Filters of the first and second intermediate frequencies. The regime of measurement at the level of low signals almost excludes here the influence of system AGC and it is possible to speak about the nature of the filters of basic selection. Frequently in practice to it is more important know the precisely "living" ability of receiver, which does not completely correspond to the possibilities of the components used in it.

The analysis of results obtained in the tables allows us to select the best filter setting on the DE1103. On the crowded VHF broadcasting bands, where the adjacent stations are separated only by five kilohertz, it is necessary to set the filter setting to "narrow". On the long and medium-frequency waves, where the frequencies are separated by 9kHZ, it is possible to set the filter to “narrow". The filters almost make no difference for the carrier frequencies, the connection of narrow filter on LW and MW only makes sense in cases of high general or stationary interference situation. Certainly, the qualitative side of LW and MW reception is also determined by the selected filter and the narrow filter noticeably limits the frequency range of the signals heard. It remains to again note the successful parameters of the switched passbands in DE1103.

The working range of the system of the **automatic gain control** according to the results of measurements was 43 dB. I note that the system was well selected and as a whole is quite effective. The AGC begins stabilizing the output signal amplitude when the useful input signl level is - 90 dBm (7 V), in this case the amplitude of output Lf- signal changes only 1,15 times (on 1,2 dB) with the growth of the signal level at the input to -47 dBm (1 mV). Further increases of the useful signal level at the receiver input is no longer checked by the circuit, the cascades of strengthening approach saturation and with the level near - 30 dBm (7 mV) begin distorting. Altogether, about 60 dB of the range of a change in the useful signal level with the comfortable hearing - not a bad result for a receiver of this class.

The upgrades did not affect the FM tuning circuit, with factory characteristics remaining unchanged.

Sensitivity in the range FM at the entrance of whip antenna,

Freq., MHz	SINAD 12 dB	SINAD 20 dB
76,00	0,8	1,0
99,50	0,5	0,7
108,00	0,6	0,8

In the FM range the DE1103’s heterodyne frequency is located below the chosen frequency, the intermediate frequency standard of 10,7 MHz. Therefore the mirror channels in FM mode falls within the range of the "Soviet" VHF band, which, until today is still used in many cities. The sound channel of the 3rd meter television channel falls here (83,75 MHz). As a result of interference from the powerful transmitters in these ranges, their broadcasts can be heard on neighboring receivers at the frequency of +21,4 MHz relative to frequencies.

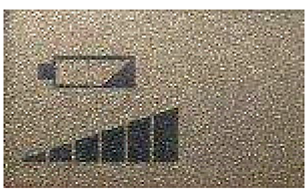
Suppression of IF mirror channels in the different FM sections (measurement at the whip antenna connection point):

Frequency of method (frequency of mirror channel), MHz	Suppression of mirror channel, dB

87,4 (66,0)	70
96,4 (75,0)	60
101,4 (80,0)	48
108,0 (86,6)	45

As can be seen from the table, weakening the mirror channel in the range of "Soviet" VHF range is more than 60 dB, usually this is sufficient, if VHF transmitter is not located hereabout. Fear can cause only the possibility of the "leakage" of the sound channel of the third television channel with tuning of receiver on 105,15 MHz (105,15 - 21,4 = 83,75 MHz). Muscovites can hear this interference in the days of performing preventive work on Fm- radio station c with the frequency of 105,2 MHz, when its transmitter is switched off.

And in conclusion - about the indications of the indicator of the battery

	4,0 V < Vbat. < 4,3 V (Battery icon blinks)
	4,3 V < Vbat. < 4,6 V
	4,6 V < Vbat. < 4,9 V
	Vbat. > 4,9 V

The receiver automatically shuts off when the battery voltage drops below 4 volts.

After this, include receiver is possible will be only with accumulator voltage of higher than 4,2 v.

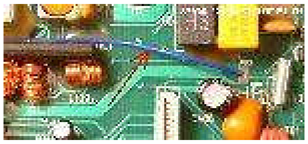
Other Information

Here answers to some questions from our considerations DE1103 on the forum.

Extending the FM range below 76 MHz is not known today.

Differences in the new and old versions. Much has already been discussed in this article. I will add to this that in the "new" DE1103 PCB has three explicit differences, which are noticeable by comparing the "old" version PCB - the presence of the new trimmer capacitor (on the photo it is designated by the first number) and the jumper (number 2),

and also there is a new dark-blue conductor – amplifier branch AGC of the ferrite antenna. This is not seen in the old version.



The jumper is used to bypass a cut in the PCB trace of the signal between the second IF input 450kHz filter and the output of the second mixer. In other words, this is the input point of circuit AM-.SSB on last IF. The removal of the jumper leads to the curtailment of AM and SSB tuning. Why there is a jumper in the new version 4, I do not know. Most likely, it is these to simplify adjusting the receiver at the factory. An additional trimmer capacitor in the new version makes it possible to regulate the accuracy of the installation of the value of the tuning step in the SW range. This is a 1kHz difference between the two sweep frequencies of the second (quartz) heterodyne: 55.395 MHz and 55.396 MHz. In the old receiver version this element was not there, the shift between the frequencies was determined by a fixed capacitor. Therefore, because of the tolerances in circuit parameters of the second heterodyne the frequency installation error for the odd values of the frequency of tuning could reach + -200 Hz. generally, the "new" DE1103 proved to be a completely good successor of the 1103 model. If not for the annoying engineering error with the antenna jack circuit, the rest clearly went for the benefit to receiver - clean tuning in SSB mode, the accuracy of the installation of heterodyne, additional AGC on the long and medium-frequency tuning ranges.

To a question about the possibility of connecting an external switch S- meter. In the AM-SSB modes the stress on the output of 7 IF microcircuits is proportional to the received signal level. At the same output capacitor C206 (see the section which describes the changing the AGC system), is connected. Voltage changes approximately from 50 mV in the absence of signal to 550 mV and more when the maximum signal enters the processor - for the signal level indication display and the solutions about stopping scanning when a station is present. This voltage can be used for the external purposes, but you must use a high-impedance input circuit.

Acoustic properties DE1103 and Lf- distortion. In my modifications this side is not touched for several reasons. First, I consider the quality of factory loudspeaker together with the of low-frequency circuit amplification to be acceptable. The sound is normal (taking into account the overall size and class of the receiver) at average loudness levels, with output signal distortions at high volumes where the dynamics become noticeably greater. Using the DE1103 to fill large rooms was clearly not the intent of the designers, nor for the owners. The case dimensions, loudspeaker diameter and a sharp increase in the current comsumed, limit the possibilities DE1103 on the loudness. The questions from owners who participate in the forum about the frequency picture of sound reproduction left an indeterminate impression. Some noted the predominance of low-frequency components, someone on the contrary requested "to remove the tops". In any event this question is individual and to independently correct Lf- circuit in the alignment to the "collective ear" is thoughtless. In my view, it is sufficient to move the tone switch from “NEWS-MUSIC” in FM mode to change the tone. The LINE OUT jack allows to connect external components and process the sound. The version of the acoustic correction of the internal volume of receiver at the loudspeaker head arrangement is seen by that not studied and at the same time promising. Here large range for the creation and enthusiasts from the number of owners can try to realize their ideas with respect to sound change in DE1103.

The study of receiver DEGEN DE1103 and the enumeration of its modifications are completed with this. I hope, many owners DE1103 this article will help in the tendency to possess the even better radio receiver.

From my side I thank associates for the forum for the exchange of councils and of considerations. We discussed and we continue to discuss this theme on the site, and also other interesting questions.

I would like to express my personal appreciation to Vladimir, who provided his new receiver for the study and modernizations, assumed as the basis of this material.
IRIS

The first review of the DEGEN 1103 Receiver can be found here:
In English: http://www.radioscanner.ru/receivers/review/degen1103_eng.html
Original Russian version: http://www.radioscanner.ru/receivers/review/review001.html