

18-11-2014; 2 x Philips PRO-12 on e-market

I was looking on an e-market place for some Christmas presents for myself (smile). I wanted to buy two ReVoX reels for my recently refurbished A77 MKIV 2-track. The Quest ran into nothing and to please myself I ran through the tape deck section of the market place. There I came across the ad of 2 pcs Philips PRO-12 recorders 1 copy was put in the attic (operating) 20 years ago and the other copy was for parts. I've always wanted to have a PRO-12 but the high prices asked for the PRO-12 has always stopped me from buying one. I sent the provider an e-mail and waited for a response. A week long no message or comment received. I had already given up hope it would work out to something. Suddenly a message from the provider arrived. The provider reports he wants to sell the recorders to me because he likes the idea selling the recorders to an enthusiast. Immediately I sent an answer and made an appointment to pick up the recorders.

20-11-2014; research on the internet

In the mean time doing some research on the internet, there is not much to find. Some YouTube movies and a small number of topics on forums. The PRO-12 would have been in production from 1969 to 1971. On UK Vintage radio repair I found a topic created by a former employee of a workshop facility in Waddon (UK). He carried out the maintenance of some PRO-12 recorders of the EMI studios in the early 1970s. Also some information on http://www.makarateyp.com/MG/Pro12/pro12_1.htm with some great pictures and, turned out later, useful information. For the rest the well-known sites with only common information.

23-11-2014; picking up the PRO-12 in The Hague



Today I picked up the two PRO-12 recorders in the Hague. I was welcomed with a cup of coffee and talked for almost an hour with the owner about the recorders and music. I am always curious about the story of the recorders I buy. The good PRO-12 had been bought by the owner himself. An uncle bought the PRO-12 for him at the Philips staff shop in Eindhoven. That's why the PRO-12 was affordable for him at that time. It cost about 1200 Dutch guilders in 1972 as I remember correctly, still a significant amount of money at that time. The recorders were expensive and built for the semi-professional market. The dust cover is customized with a Plexiglas window, neatly executed. The original dust cover was a closed cover. Nice detail on the Plexiglas window is a typical sticker from the seventies. It's not original but I find it pretty so it will be left on. The recorder is probably one of the last copies produced by Philips. That probably explains the reason the recorder was sold at the Philips staff shop. The owner had experience with the PRO-12, he had a job at the municipal fire department where the PRO-12 was used to record the incoming phone calls in the control room. Nice to know the PRO-12 was used as a professional recorder that way. The good recorder was only used for own recordings. However, the owner switched to a 4-track recorder (AKAI) and the PRO-12 moved to the attic. And those PRO-12 recorders, 23 (Kg) each, including some tapes, cables and the original Service Manual would come home with me. So with about 50 (kg) industrial heritage in the car boot I felt a happy collector. We exchanged email addresses and I promised I would send a report of the restoration.

28-11-2014; start of the restoration

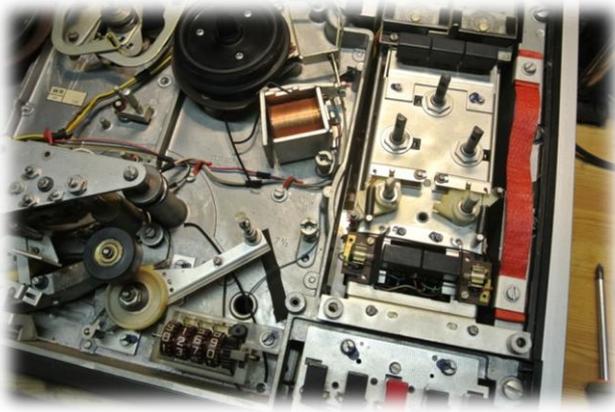


It has taken a while before I started with the PRO-12. I first had to service two Philips MFB544 speakers for a fellow enthusiast. But today is the big day. The first findings of the PRO-12: the recorder still looks neat, dusty though but clean, lettering is all present no missing pieces, everything seems to be original. Next I removed the cover plates: counter belt has dried up, heads still on factory settings, tape path and heads are very dirty there has been used tape of bad quality. The tape path reminds me of the ReVoX a77, using a circular guide roller with ball-bearing on the left and on the right side a rigid one. The construction of the tape guides are more solid than the often small tape guides on the Philips Consumer recorders.

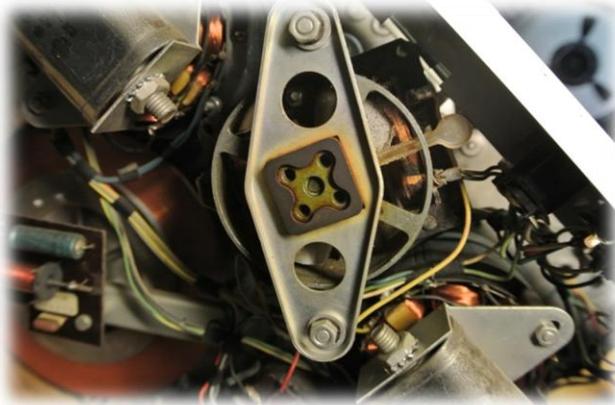
28-11-2014; removing the recorder from its cabin



I now begin to understand why these "small" recorder weighs so heavily. A one-piece moulded aluminium frame, everything is just a bit heavier than the Philips Consumer recorders that I know. The frame has two handy straps at both sides of the frame to lift out of the recorder. The PCB's are all good accessible by a way of unfolding them and repairs can be made easily. It's is always pleasant to see that there has been thought about performing service work. Drive belt of the capstan has turned in to rubber sludge. Fortunately it is not throughout the whole recorder. The rest looks fairly clean at the inside.



What also stands out are the winding motors, big alternating current types. I have never seen these in consumer recorders from Philips. They also ensure some extra weight. The capstan motor looks familiar and resembles the capstan motor of the Philips consumer recorders such as the N4407.



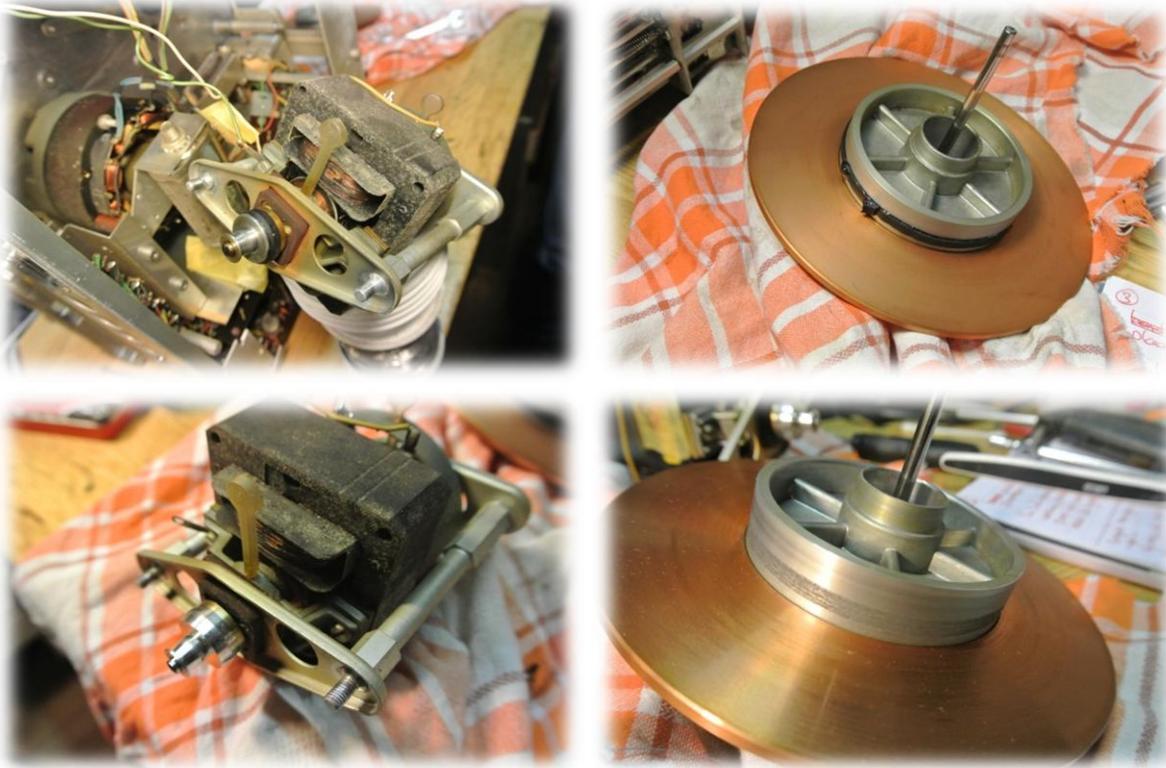
28-11-2014; unknown construction

At the rear view immediately the remarkable large flywheel attracts the attention. The flywheel is provided with a kind of copper (coloured) disk which runs between two permanent magnets. These two magnets are mounted on a bracket which is connected to the speed control lever. The position of the bracket depends on the position of the speed control lever. Everything seems to be mechanical. No wires connected to electronics. I do not understand the exact function but I am sure I will find out later.



28-11-2014; disassembling flywheel en capstan motor

The capstan is driven by using a flat belt. Because the old belt completely went to a rubber sludge (often the case in Philips recorders) the drive pulley of the capstan motor and the flywheel were smeared with the rubber sludge. To clean this properly I have disassembled the capstan motor and the flywheel. The information from the internet was handy in this case. The bracket with the magnets should be slightly pushed back to get the flywheel out.



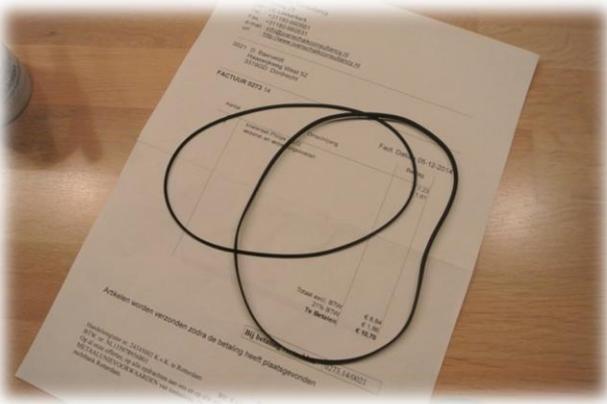
After disassembling I cleaned everything in the recorder. Next thing is to find and order the right belts.

30-11-2014; searching the right belts

Searched today on the internet for a belt set for the PRO-12. Thomas of <http://www.mfbfreaks.com/> does not have them in the online store. Frits of www.bandrecorder.be has them either but refers me to www.electro-andijk.nl. A few pages further I found the belt set at <http://www.jvanschaikconsultancy.nl/> placed an order and now it's just waiting for the delivery.

On the site of http://www.tonband.net/tech_riemen.php I found the dimensions of the capstan belt: width 5(mm); double folded length 207(mm); thick 0,6(mm). I made a calculation with a calculation tool on the internet and based on the Pulley diameters and axes distance the diameter should be about 136 (mm) with a corresponding stretch of approximately 8%.

18-12-2014; received the belts



It took a while before the belts arrived but nevertheless I was pleased to have them. Now I can start installing them and check if the recorder is still working. The construction for the adjustment of the belt in order to change the speed is a piece of fine mechanical art to me. I have never seen this construction before in a tape recorder of any brand. When operating the speed control lever the drive belt is picked up by two little rolling guides on brackets. Next the belt is "folded" open and moved to the other pulley diameter on the capstan motor. All this happens in one movement caused by the speed control lever. The capstan motor turns always at just one speed. Speed of the capstan is adjusted by the different pulley diameters on de capstan motor.

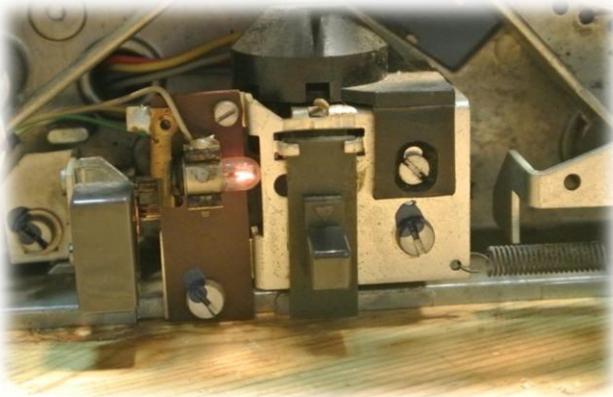
On the pictures you can see the two rolling guides in closed situation (left) and halfway (right)



20-12-2014; mounting the capstan belt

First I have lubricated the capstan motor. Next I soldered the wires back to the capstan motor I always mark the wires and the connection to be sure the wires are on the right connection again. I Assembled the new belt on the motor pulley and mounted the capstan motor back on the frame. After the capstan motor was mounted I put the belt around the flywheel and applied the flywheel back in its bearing after lubricating the axis. Don't forget to apply the plastic ring on the axis of the capstan on the front side. Finally I replaced the bracket with the little nylon bearing behind the flywheel axis and the job has been done. Capstan motor and flywheel are rotating as new. I cleaned and greased the speed control mechanism and checked functioning. Al works fine and now we can check if the recorder is still working, this is always an exciting moment to me.

20-12-2014; first power up after approximately 20 jaar



At first I changed the power carousel to 245(V). The average voltage of the contemporary electricity connections of our homes is about 230(V) nowadays. The setting of the power carousel on 220(V) is too low, it could damage the old electronic components.

A start up of an audio device which has been sleeping for so many years has to be done on a easy and controlled way just to wake up the electronic components again. For this purpose a variac (variable transformer) is used. A 220(V) light bulb is connected in series with the variac. When there is any short circuit the 220(V) light bulb will light up strongly. In that case power off and you will have to repair the cause of the short circuit first.

I Connected the PRO-12 to the variac with the 220(V) light bulb in series and increased the voltage until 80(V). The light bulb of the power ON switch lights up a little. The light bulb in series with the variac does not light up so there seems to be no short circuit. After about 10 minutes I increased the voltage to 120(V). The capstan motor starts rotating slowly. I Increased the voltage again after 10 minutes to 180(V). The light bulb in series with the variac is now starting to light up a little bit but it seems logical to me as a result the recorder now consumes the necessary power. After 10 minutes I increased the voltage to 220 (V). Capstan motor is running fine, electro magnets are functioning, no strange symptoms, everything seems to be fine. This PRO-12 is back alive after some 20 years retirement...!! I Removed the variac after 20 minutes and connected the recorder directly to the net. Next we will start testing the condition of the rest.

20-12-2014; first tests

I put an old tape on the PRO-12, connected the monitor output to an Philips 22AH561 amplifier and activated the play button. Yes....., after 20 years of silence there was sound produced by the old PRO-12. Sometimes there are sound drop outs. After messing around with the switches and potentiometers the sound returns again, an IPA treatment is necessary. Winding clockwise and anti clockwise is also going well. Winding is going really fast and when the stop button is activated the reels almost stop immediately, I am impressed. Everything runs quite silently and smooth. The axis of the pinch roller arm needs to be lubricated but that seems to be the only problem. If that's all this becomes an easy restoration.



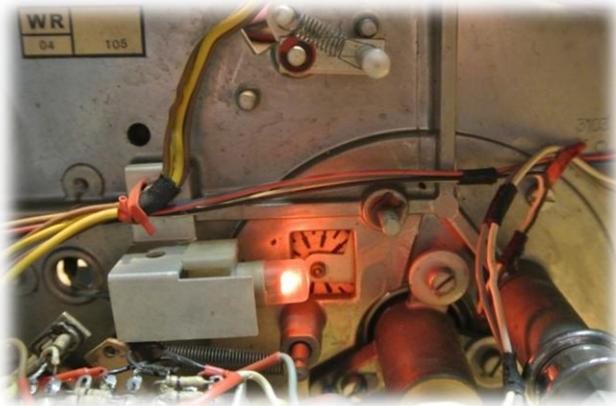
I Connected a CD-player to see if recording also still works. That took some time because the PRO-12 has separated DIN connectors for the left and right channel so I had to make some DIN / ¼" jack split cables. I had to consult the manual first to find out how all the knobs and switches had to be set because the PRO-12 has a lot of possibilities to create and play back recordings .You can set the recording level and play back level independently of each other. In this way you can control the input level of the source (Before tape control) and the recording level (After tape control). By using the VU-meters the set up can be controlled independently and set on an equal level.



I made some recordings from a CD of by Tiësto. The recordings, sounds good, Before as well as After-tape. It sounds, based on my hearing, quite well. I had the idea to do an elco-replacement right away but given the results I will first use the PRO-12 for a while and then decide for an elco replacement later. First I will perform the remaining work. The recorder works and sounds alright for me.

21-12-2014; speed control mechanism

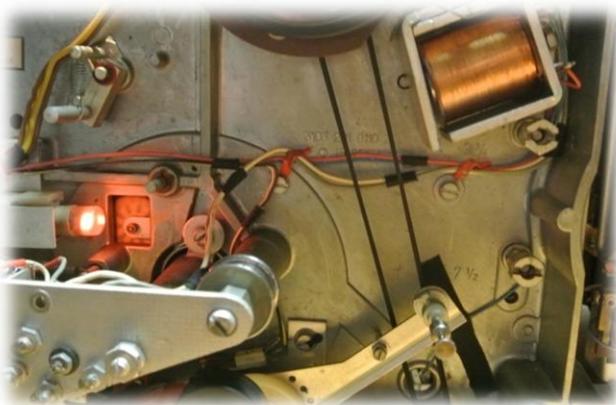
The speed of the PRO-12 can be set on the basis of a small built-in tacho disc. Above the tacho disc a light bulb has been mounted. This tacho disc can be pressed against the capstan with a lever. The tacho disc indicated that the speed was not entirely correct. The speed control is purely mechanical. The (fine) speed correction can be made by changing the position of the magnets which are located on either side of the copper (coloured) disc on the flywheel. The magnets influence the speed of the flywheel. By mechanical setting, the magnets can be placed with more or less surface above and below the copper (coloured) disc. A special construction that I've never seen before.



21-12-2014; Speed correction

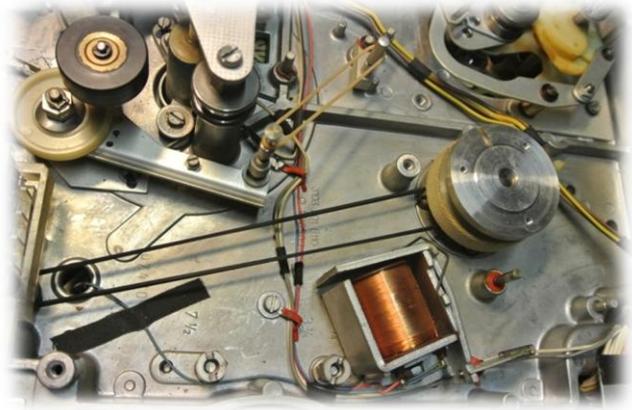
I adjusted the speed with the adjustment screws on the chassis. For the speed $3\frac{1}{4}$ (inch/s) the image of the tacho disc kept standing still. For the speed $7\frac{1}{2}$ (inch/s) I could not manage to get the image standing still it kept elapsing a little bit. I discovered that the adjusting lever for speed also adjust some switches on the circuit board. This concerns the speed independent adjustment of correction filters, the bias and the frequency response.

I also applied new foam between the metal plates for covering the playback head when the pressure roller is in play mode.



21-12-2014; mounting the new counter belt

In case of mounting a new counter belt the reel disk and the brake unit of the right winding motor have to be removed. Next the counter belt can be placed around the aluminium adapter of the reel disk. The other end of the counter belt can be placed around the pulley of the counter. Reassemble the brake unit and reel disk, and the result is a rotating counter. Another step closer to a good functioning PRO-12



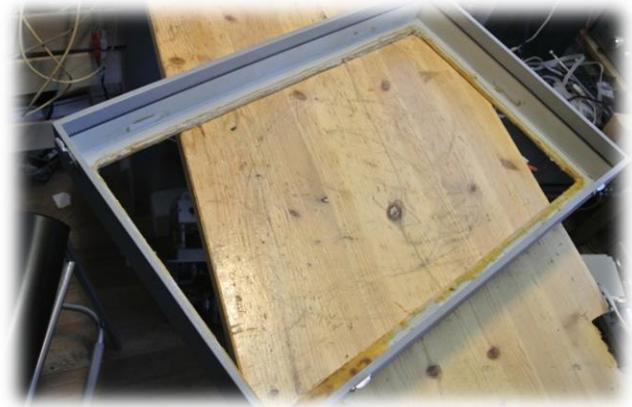
22-12-2014; IPA treatment of switches and potentiometers

In terms of performing maintenance you can see that this is PRO there has been done really good thinking about maintenance for this recorder. The control panel can be opened like the hood of a car and secured with a little bracket in stand up position. The PCB's can be "folded" out to both sides so the PCB's are easily accessible for maintenance. All switches are given an IPA treatment. I checked if there were no strange situations or markings (heat, leaking elco's) on the PCB's but everything seems to be in order. The PCB's were "folded" back in there position and the control panel was lowered back in the recorder. Pay attention to the position of brackets and levers of the switches on the control panel when "folding" the PCB's. If they are not in the right position you might have to open the control panel for a second time.



23-12-2014; cosmetic works

Unless the recorder was still looking good from the outside I had to do some work on the cabinet and cover. All the loose leatherette as well as a loose aluminium edge were glued again. The Plexiglas window in the cover was placed again with double sided tape. The handle was tightened again. Cabinet and cover were thoroughly cleaned and waxed. The Cabinet and cover are looking great again.



23-12-2014; reassembling recorder and cabin

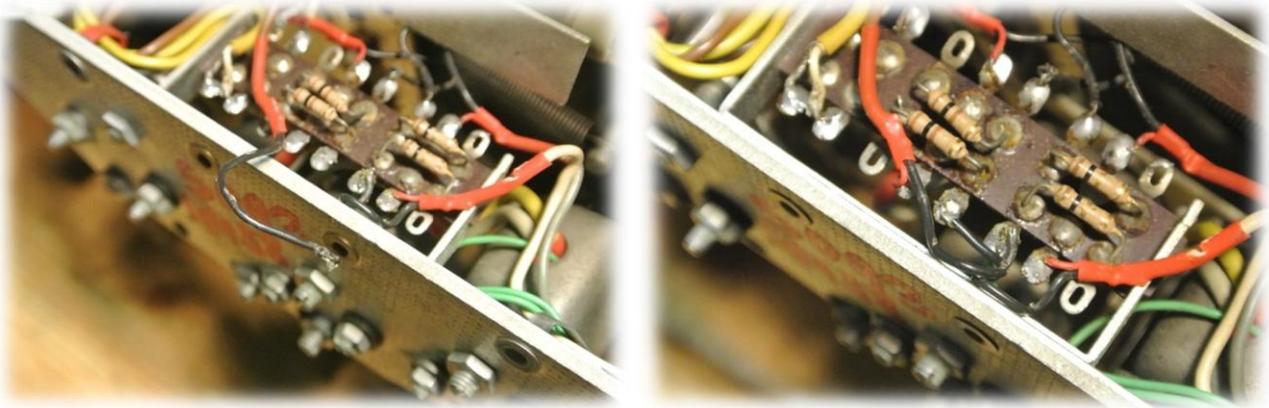
Today I placed the recorder back in its cabin. Do not forget to connect the wires of the monitor speaker. I cleaned the front panels and mounted them again. Finally I cleaned the knobs with a tooth brush and put them back on their position. The job has been done, I love the results the PRO-12 is looking great and I am proud of it.



24-12-2014; problems

After the recorder neatly had been assembled completely I put another tape on it to have a final check of all the functions again. Unfortunately not everything was working anymore....., too bad. Recording on the left channel stopped functioning. There was signal input (before tape) but the signal was not recorded on tape (after tape). I will check this out later. First I am going to celebrate Christmas with my family.

29-12-2014; loose connection



The recorder was placed again on my Workbench today. The front panels were disassembled again. The problem was quickly found there was a loose connection behind the heads. I soldered the wire back on and tested the recorder again. The signal of the left channel had returned on the tape....., I am happy. The front panels were mounted again and I made another test tape with music by Tiësto. I'm listening to that recording right now with my Philips N6330 headphones. It sounds good over the entire frequency range, bright, all details are displayed correctly and a good stereo image. This is a really good recorder. I'm happy with it and still have a lot of fun to go with this PRO12. On to the next project.

29-12-2014; de last detail pictures

