

1-WATT PLL PRO III

HI GAIN

PROFESSIONAL EXCITER

CONSTRUCTION GUIDE

OVERVIEW

The PLL PRO III High-Gain is a very high quality phase-locked-loop based transmitter. Frequency stability and spectral purity were major factors in the design process and achieve the highest standards. NRG have a policy of continual design and development, and this unit is the product of an extensive design process and exhaustive testing.

The circuit can be examined in the attached schematic diagram. You will see that there are essentially two sections – the transmitter and the logic. The transmitter has a unique oscillator design, which eliminates the need for a separately aligned frequency multiplier stage, even though signal generation is at half of the output frequency, which eliminates RF feedback and hum problems associated with “at frequency” designs. The next two stages are amplifiers. A lowpass filter follows the output stage to ensure exceptional spectral purity. The logic side of the board is a phase-locked-loop with a pre-settable divider for output frequency setting. A new additional function of this model is out - of -lock power down.

The printed circuit board layout has been carefully designed to give reliable and consistent results. If you follow the simple construction details accurately, you'll easily build this high specification FM transmitter.

Please read fully before construction starts

First, check that the kit contains all the parts detailed in the component list. If any parts are missing or damaged, contact us immediately. Next, is your soldering of a reasonable standard and have you got a soldering iron with a tip size of 2.5 mm or smaller? Only proceed if your answer is yes! Remember that you can change your kit for a ready built unit at this stage if you are unsure. (*You only pay the price difference*).

The tools you'll need are:

Side Cutters; Long Nose Pliers; Screwdrivers; Soldering Iron; Solder; Please note that you'll get better results using thin 22 SWG solder rather than the thicker 18 SWG type.

The printed circuit board (PCB) has a silk screen print on the top side. You can see **component shapes** and their **identification numbers**. With this, and the component parts list you have all you need to identify components and fit them correctly into the PCB. Take care and time to make certain that all components are correctly placed.

Some ICs may be static sensitive, so ensure that your soldering iron is properly earthed, and avoid handling the logic ICs any more than is necessary. We always use anti-static wrist straps connected to an earth point when we're constructing projects, though touching an earthed object just prior to handling an IC will discharge any static build-up on your body, and is almost as effective!

BUILDING STARTS HERE!

GENERAL: Separate the pages of this manual so you can clearly see this sheet, the component fitting guide, the component list and the large photograph, all at the same time. Fit the smaller components first and work your way through progressively larger components.

Remember: All components must be pushed down flat to the PCB, (unless stated otherwise). The reliability and repeatability of this unit depend upon your accuracy of construction!

Use the photograph and the component-fitting guide to help you further.

1. Fit and solder the **resistors** (R1 – R69). Identify and insert a few at a time. We have given you the colour code for each part in the Components List. When you have soldered a few components, use your Side Cutters to trim back the excess leads. Resistors can be fitted either way round. The two **thick film resistor packs** (TFR1 & TFR2) should now be fitted. They each have nine pins, and **must** be fitted so that the grey/white spot on the component lines up with the large white dot on the board.
2. **Diodes** (D1 – D7) and **Zener Diodes** (ZD1– ZD4) are next. **Make sure you fit these the right way round.** The 4 Zener diodes have a white mark on them. Remember, make sure you are still fitting the components flat down to the PCB.
3. Fit and solder the **integrated circuits** (ICs) IC1 – IC5. They **must** be fitted the right way round with the notch on the IC lining up with the notch on the PCB silk screen-print. **Double check they are correct before you start to solder.** Solder these items carefully to avoid bridging pins with solder. Do not handle the ICs more than you need to because they are static-sensitive. You should leave fitting IC6 until after all the other parts, as it

is easily broken off at the legs once soldered in place. You should fit **DIL switches** SW1 and SW2 next.

4. **Transistors** TR6 and TR8 next. These components have **absolutely got to be flat the PCB**. TR6 is a 2N4427 type and TR8 is a 2N3553. All the other transistors cannot push down fully flat to the board, but leave them no higher than 5mm (see component fitting guide). Take great care in identifying the part numbers of the small transistors – there are four different types used, and they all have the same package outline. Fit the **LEDs** next and line up the flat section on the devices with that on the PCB silk screen. All components in this section, up to now, *must* be fitted the correct way round. An error could damage some parts, and the unit would certainly not work. Fit **VCD1** next noting that this item *can* actually fit either way round.
5. At this stage hold the board under bright light and check that you have soldered every component connection so far in the PCB. Also check that connections close to each other aren't bridged with solder. Are all the parts flat to the board?
6. Now fit the **variable resistor** VR1, followed by the **capacitors** C1 – C70. Have a look at the component-fitting guide for help on fitting capacitors to the PCB. **Remember**, fit the parts flat (or very close to) the PCB. Make sure that you fit all the **electrolytic** capacitors the correct way round – they have polarity identification markings.
7. Fit the **coils** L1 – L7 next. We again have to remind you: as with most other parts, push these coils fully down to the PCB. Take care with the fragile coils L2 and RFC1 though. RFC1 must have a ferrite bead slipped over each lead prior to fitting it to the board – the RFC wires just go through the middle of the beads, so it stands a little way off the board.
8. Right, it's time to hold the PCB under the bright light again and check your work carefully for joints you have missed with your iron and also solder splashes.
9. Now fit and solder the rest of the parts, taking a regular glance at the component fitting guide pictures. **Please ignore component location J3, no part is fitted**. The two **fuse holder clips** have to be fitted the correct way round or the fuse won't fit. Take care with the **Trimmer Capacitor** VC1. Be careful that you do not catch your soldering iron on the thin film separating the vanes on this part, it is easily done. Solder the **red & black wire** to the + and – pads (underside and close to FB1 & FB2) with the red wire to +. The last part to fit is **IC6**, a 3 pin IC. It cannot push flat to the board because of steps in the legs. Do not bend this component on the legs, as the legs are brittle.
10. Now check the finished PCB by holding it up to the bright light. If you can see light shining through component holes it means you have not soldered that particular component properly, if at all. All the soldered joints should be bright and shiny – a dull joint usually indicates a "dry" joint. Check all the ICs to make sure they are in the right places and the right way round. Check that all the electrolytic capacitors are the correct way round and also double-check the transistors and diodes. If a soldered component, like an IC has to be removed, you will need a de-soldering pump to do it correctly.

11. You can now fit the heatsink to the output transistor TR8. Look at picture 1 on the component-fitting guide. Make sure you push the heatsink vertically down onto TR8, **with no sideways pressure**. This transistor can be a little fragile, so please take care. That's it.
12. Now, does your finished PLL PRO III look anything like the one in the large photograph? Well, we hope so!

Note: NEVER operate your transmitter without a proper load connected to the output – either a dummy load or a correctly matched aerial. Failure to do so could result in the destruction of your output transistor!

SWITCH ON TIME

1. Connect the Plug type 50-ohm dummy load (supplied with this kit) to the RF output SO239 socket. Set the trimmer capacitor and VR1 to their mid positions with a small flat blade screwdriver.
2. Set the two 8-way DIL switches to the required frequency using the look-up tables.
3. Connect the red/black power input wire to a regulated 13.8-volt supply. Absolute maximum supply voltage is 15volts.
4. Adjust VC1 until the red LED2 (unlock) starts to dim. Continue until the green LED3 suddenly illuminates and the red LED goes out altogether. The unit is now locked on your programmed frequency. A few seconds later, LED1 will light indicating RF output. Turn the power off for a few seconds, and then re-apply the power. Re-adjust VC1 if the unit does not lock when you switch back on. Lock up should take 3 – 6 seconds from switch on.

Note: You can bypass the out-of-lock power-down by fitting J2.

There will be no output power indication until the PLL locks, unless J2 is fitted. This is a protection feature, which prevents the transmitter operating on the wrong frequency. The RF output power LED will illuminate about 5 seconds after the green 'lock' LED comes on.

5. Connect audio at line level to the phono socket. Whilst listening on a FM radio, adjust VR1 for the correct sound level – you can compare with other stations.
6. An aerial can now be connected to the RF output socket and your signal will be radiated. The aerial should have an impedance of 50 ohms at the frequency you want to use, and the feeder should also be a 50 ohm type. You can consult us if you need help or advice about aerials.
7. Finally, a note on pre-emphasis. You have three choices with this unit – **75 uS** for the Americas, **50 uS** for the rest of the world, and '**none**' if you use a stereo coder and/or a limiter compressor unit with the PLL PRO III. You can make your selection with the push – fit jumper J1 near to VR1.

PROBLEMS?

If the unit does not work when you first switch on, then the first thing to do is to carefully re-check your entire construction and component placement. It is unlikely that any parts supplied were faulty to start with, although not unheard of.

- 1. No Life in the unit at all.** It could be your power supply unit – is the power LED lit? Check that the red/black power supply wire is wired to the PCB correctly with the red wire going to positive terminal pin – reverse connection will blow the fuse. Finally, try fitting a replacement 1 amp fuse.
- 2. Buzz on the sound.** This is probably RF getting into your audio equipment from the transmitting aerial. The transmitting aerial must be above the building and not inside the building. If you disconnect the audio source from the PLL and the buzz goes away then the audio equipment is certainly picking up RF. If the buzz is still there, then your power supply probably has a lot of ripple on its output. Try another power supply. Also realise that some receivers buzz anyway when they are close to a transmitter, due to overloading. A good car radio is often best for checking for buzzing.
- 3. Unstable Performance.** Too many components stood up on long legs above the PCB. Dry soldered joints or joints missed completely.

COMMON CONSTRUCTION ERRORS

1. One or more LEDs fitted wrong way round.
2. One or more Diodes fitted wrong way round
3. Transistors fitted in wrong location
4. ICs fitted in wrong location
5. IC pins bridged with solder
6. Centre pin of SO239 not soldered.
7. Joints not soldered at all
8. Very poor soldering quality
9. Solder splashes

You can check the soldered joints better with a magnifying glass and also find shorted tracks. A multimeter is also very handy at locating shorted or broken tracks.

This is a complex circuit, so if it is not working correctly after you have built it, please do not panic! Give us a call for advice on what to do next.

THE NEXT STEP

We would recommend that any transmitter be properly cased in a metal box. This ensures that the unit cannot suffer from interference from local sources, and protects against damage. There are mounting holes provided in the corners of the PCB, to make assembly into a case easy.

You will have to use appropriate audio, power and RF sockets. We would recommend keeping the power supply separate, as this prevents the problems associated with power supplies in the same box as a transmitter!

If you need advice about mounting your transmitter into an enclosure, you can contact us.

Check our website, or contact us for details of new products and add-ons to your transmitter. **NRG** continually develop new products, and improve existing ones – modifications will be posted to the website.

**PLEASE NOTE THAT YOU
MAY NEED A LICENCE TO
OPERATE A RADIO
TRANSMITTER.**

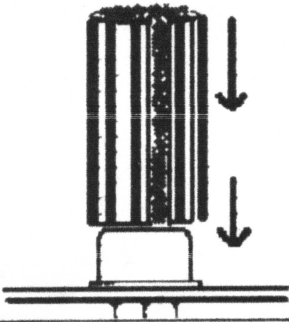
NEW COMPONENT LIST FOR 1WATT PLL PRO3xxx

| | | | | | | | |
|------|---------------------------|-----|-----------|---------------------|--------------------------------|----------------|-------------------|
| 47R | yellow purple black gold | C1 | 100pF | 101J | VC1 | 40pF | Purple Trimmer |
| 33K | orange orange orange gold | C2 | 1.5nF | 152 | VR1 | 10K | Variable Resistor |
| 8K2 | grey red red gold | C3 | 2.2nF | 222 | 4060B | 4060B | |
| 10K | brown black orange gold | C4 | 10uF | 10Uf 16V | 74LS76 | 74LS76 | |
| 3K3 | orange orange red gold | C5 | 47uF | 47uF 16V | 74LS86 | 74LS86 | |
| 100K | brown black yellow gold | C6 | 100pF | 101J | 74ALS74 | 74ALS74 | |
| 6K8 | blue grey red gold | C7 | 56pF | 56J | HC4059E | HC4059E | |
| 4K7 | yellow purple red gold | C8 | 56pF | 56J | L7805 | 7805 | |
| 4K7 | yellow purple red gold | C9 | 22pF | 22J | BC558B | C558B | |
| 270R | red purple brown gold | C10 | 22pF | 22J | BF199 | F 199 | |
| 270R | red purple brown gold | C11 | 1.8pF | 1.8C | BF199 | F 199 | |
| 68K | blue grey orange gold | C12 | 1.8pF | 1.8C | BF245 | 245C | |
| 68K | blue grey orange gold | C13 | 22pF | 22J | BF245 | 245C | |
| 1M | brown black green gold | C14 | 27pF | 27J | 3866 CEN | 3866 CEN | |
| 560R | green blue brown gold | C15 | 1nF | 102 | BC548B | C548B | |
| 1M | brown black green gold | C16 | 1nF | 102 | 2N3553 | 2N 3553 | |
| 560R | green blue brown gold | C17 | 27pF | 27J | BC548B | C548B | |
| 0R | single black band | C18 | 22pF | 22J | BC548B | C548B | |
| 0R | single black band | C19 | 1nF | 102 | BC558B | C558B | |
| 120R | brown red brown gold | C20 | 220uF | 220uF 16V | BC548B | C548B | |
| 2M7 | red purple green gold | C21 | 27pF | 27J | BC558B | C558B | |
| 0R | single black band | C22 | 1nF | 102 | 1N4148 | 4148 | |
| 0R | single black band | C23 | 10nF | 103 | 1N4148 | 4148 | |
| 2M7 | red purple green gold | C24 | 1nF | 102 | 1N5402 | 1N5402 | |
| 10R | brown black black gold | C25 | 47uF | 47uF 16V | 1N4148 | 4148 | |
| 10K | brown black orange gold | C26 | 10nF | 103 | 1N4148 | 4148 | |
| 3K3 | orange orange red gold | C27 | 1nF | 102 | 1N4148 | 4148 | |
| 15K | brown green orange gold | C28 | 100pF | 101J | 1N4148 | 4148 | |
| 15R | brown green black gold | C29 | 1nF | 102 | KV1330 | 330 | |
| 680R | blue grey brown gold | C30 | 220pF | 221J 100v | BZX7V5 | 7V5 white spot | |
| 120R | brown red brown gold | C31 | 33pF | 33J | BZX7V5 | 7V5 white spot | |
| 10R | brown black black gold | C32 | 1nF | 102 | BZX7V5 | 7V5 white spot | |
| 0R | single black band | C33 | 1nF | 102 | BZX7V5 | 7V5 white spot | |
| 330R | orange orange brown gold | C34 | 10nF | 103 | GREEN | 5mm green LED | |
| 2K7 | red purple red gold | C35 | 100pF | 101J | RED | 5mm red LED | |
| 0R | single black band | C36 | 47pF | 47J | RED | 5mm red LED | |
| 33R | orange orange black gold | C37 | 33pF | 33J | GREEN | 5mm green LED | |
| 0R | single black band | C38 | 56pF | 56J | AEL.6.4000 MHz CRYSTAL | | |
| 0R | single black band | C39 | 33pF | 33J | 8 way DIL switch | | |
| 0R | single black band | C40 | 56pF | 56J | 8 way DIL switch | | |
| 0R | single black band | C41 | 27pF | 27J | | | |
| 0R | single black band | C42 | 1nF | 102 | 5 turn Ferrite Bead | | |
| 0R | single black band | C43 | 1.8pF | 1.8C | 5 turn Ferrite Bead | | |
| 4K7 | yellow purple red gold | C44 | 1.8pF | 1.8C | 5 turn Ferrite Bead | | |
| 4K7 | yellow purple red gold | C45 | 1nF | 102 | 5 turn Ferrite Bead | | |
| R46 | 1K5 | C46 | 1nF | 102 | Loose Ferrite Bead | | |
| 470R | yellow purple brown gold | C47 | 1nF | 102 | RF CHOKE | | |
| 100K | brown black yellow gold | C48 | 2.2uF | 2.2uF 63V | 6 x 2 turn coil 5mm i.d. | | |
| R49 | 1K5 | C49 | 2.2uF | 2.2uF 63V | 6 turn small enamelled coil | | |
| 12K | brown red orange gold | C50 | 100nF | .1K63 or 100nK63 | 4 turn coil 5.5 mm i.d. | | |
| 5K6 | green blue red gold | C51 | 220uF | 220uF 16V | 4 turn coil 5.5 mm i.d. | | |
| R52 | 1K5 | C52 | 10nF | 103 | 5 turn coil 6mm i.d. | | |
| R53 | 1K5 | C53 | 1nF | 102 | 5 turn coil 6mm i.d. | | |
| 10K | brown black orange gold | C54 | 100nF | .1K63 or 100nK63 | 5 turn coil 6mm i.d. | | |
| 22K | red red orange gold | C55 | 100nF | .1K63 or 100nK63 | 2 x 20mm fuse clips + 1A fuse | | |
| 12K | brown red orange gold | C56 | 100nF | .1K63 or 100nK63 | PCB phono socket | | |
| 270R | red purple brown gold | C57 | 1nF | 102 | 2 x Terminal Pin | | |
| 560R | green blue brown gold | C58 | 100nF | .1K63 or 100nK63 | 3 pin Pre-emphasis Jumper | | |
| 33R | orange orange black gold | C59 | 100nF | .1K63 or 100nK63 | 2 pin Jumper | | |
| 56R | green blue black gold | C60 | 33pF | 33J | | | |
| 15R | brown green black gold | C61 | 100pF | 101J | PLLPRO 3 printed circuit board | | |
| 18K | brown grey orange gold | C62 | 4.7nF | 4n7K100 or 4n7J 100 | PL259 Dummy Load | | |
| 10K | brown black orange gold | C63 | 220nF | .22K63 or 220nK63 | Heatsink for TR 8 | | |
| 1K5 | brown green red gold | C64 | 10nF | 10nK63 or 10nK100 | 1 metre Red/Black Wire | | |
| 2K2 | red red red gold | C65 | 220nF | .22K63 or 220nK63 | SO239 square socket | | |
| 5K6 | green blue red gold | C66 | 100nF | .1K63 or 100nK63 | 4 screws + washers + nuts | | |
| 47K | yellow purple orange gold | C67 | 10nF | 103 | | | |
| R68 | 15R | C68 | 220uF | 220uF 16V | | | |
| R69 | 15R | C69 | 1000uF | 1000uF 10V | | | |
| TFR1 | 2K2 | C70 | 220uF | 220uF 16V | | | |
| TFR2 | 2K2 | | x 8 222 J | | | | |

TR 6 3866 CEN
NOW 2N 44 27.

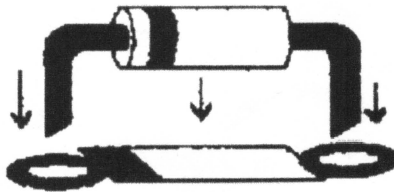
1 HEATSINK

Push the heatsink vertically onto the output transistor (TR8)



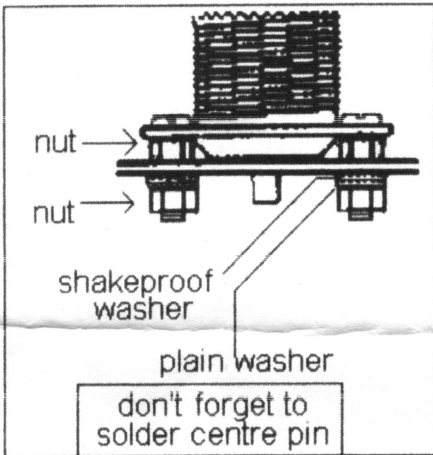
4 DIODES & ZENER DIODES

MUST BE FITTED THIS WAY IN PCB



PUSH FLAT TO PCB

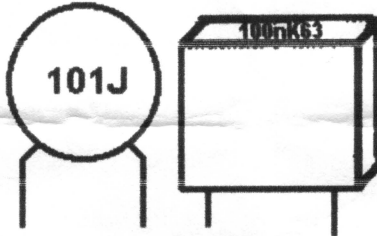
2 MOUNTING SO239 TO PCB



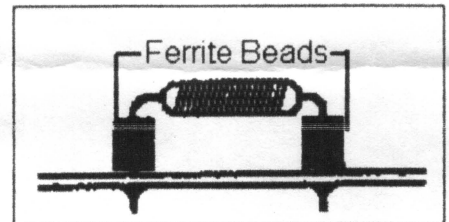
5 CAPACITORS

these are fitted flat to the pcb but can fit either way in the PCB holes

ceramic disc capacitor polyester capacitor

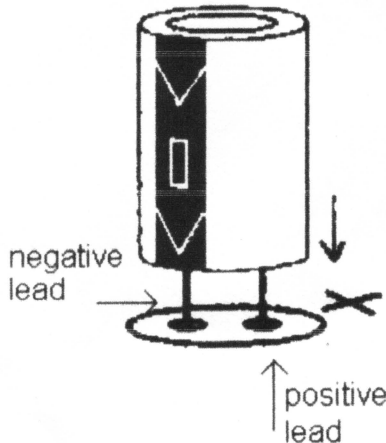


RF CHOKE (RFC1)



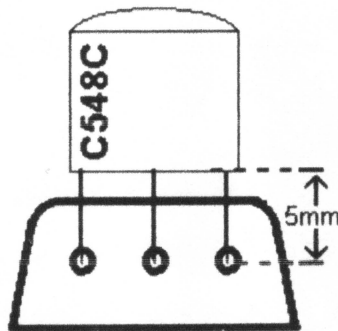
3 ELECTROLYTIC CAPACITORS

FIT IN PCB LIKE THIS AND MUST BE PUSHED DOWN FLAT TO PCB.



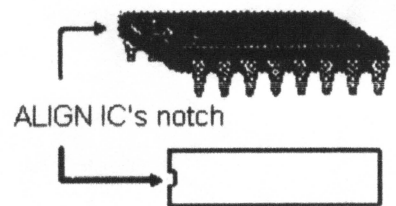
6 SMALL TRANSISTORS

MUST BE FITTED THE CORRECT WAY ROUND IN THE PCB. THE TRANSISTOR BODY SHOULD BE WITHIN 5mm OF THE PCB



INTEGRATED CIRCUITS

MUST BE FITTED CORRECT WAY ROUND



NRG PLL PRO III Hi-Gain Frequency Look Up

| MHz | Switch 1 | | | | | | | | Switch 2 | | | | | | | |
|------|----------|----|----|----|-----|----|----|-----|----------|-----|-----|-----|-----|-----|-----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 87.5 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | off | off | ON | off | ON | off |
| 87.6 | ON | ON | ON | ON | off | ON | ON | ON | ON | ON | off | off | ON | off | off | ON |
| 87.7 | ON | ON | ON | ON | off | ON | ON | ON | ON | ON | off | off | ON | off | off | off |
| 87.8 | ON | ON | ON | ON | off | ON | ON | ON | ON | ON | off | off | off | ON | ON | ON |
| 87.9 | ON | ON | ON | ON | off | ON | ON | ON | ON | ON | off | off | off | ON | ON | off |
| 88.0 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | ON | ON |
| 88.1 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | ON | off |
| 88.2 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | ON | off |
| 88.3 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | off | off |
| 88.4 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON |
| 88.5 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON |
| 88.6 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | off | off |
| 88.7 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | ON | off | off |
| 88.8 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | off | ON | ON |
| 88.9 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | ON | off | ON | ON |
| 89.0 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON |
| 89.1 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off |
| 89.2 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off |
| 89.3 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off |
| 89.4 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON |
| 89.5 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON |
| 89.6 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON |
| 89.7 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | ON | off | off |
| 89.8 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON |
| 89.9 | ON | ON | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON |
| 90.0 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON |
| 90.1 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | off |
| 90.2 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | ON | off | ON |
| 90.3 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | ON | off | off |
| 90.4 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | off | ON | ON |
| 90.5 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | off | ON | off |
| 90.6 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | off | off | ON |
| 90.7 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | off | off | off |
| 90.8 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON | off | ON | ON |
| 90.9 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | ON | off | ON | ON | off |
| 91.0 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | ON | ON | ON |
| 91.1 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | ON | ON | off |
| 91.2 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | ON | off | ON |
| 91.3 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | ON | off | off |
| 91.4 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | off | ON | ON |
| 91.5 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | off | ON | off |
| 91.6 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | off | off | ON |
| 91.7 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON | off | off | off |
| 91.8 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | off | ON | ON | ON |
| 91.9 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | ON | off | off | ON | ON | ON |
| 92.0 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | ON | ON | ON |
| 92.1 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | ON | ON | off |
| 92.2 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | ON | off | ON |
| 92.3 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | ON | off | off |
| 92.4 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON |
| 92.5 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | off | ON | off |
| 92.6 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | off | off | ON |
| 92.7 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | ON | off | off | off |
| 92.8 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON |
| 92.9 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | ON | off | ON | ON | off |
| 93.0 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON |
| 93.1 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | ON | ON | off |
| 93.2 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | ON | off | ON |
| 93.3 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | ON | off | off |
| 93.4 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | off | ON | ON |
| 93.5 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | off | ON | off |
| 93.6 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | off | off | ON |
| 93.7 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | ON | off | off | off |
| 93.8 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | off | ON | ON | ON |
| 93.9 | ON | ON | ON | ON | off | ON | ON | off | ON | ON | off | off | off | ON | ON | off |
| 94.0 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | ON | ON | ON |
| 94.1 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | ON | ON | off |

| MHz | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
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| 94.2 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | ON | off | ON |
| 94.3 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | ON | off | off |
| 94.4 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | off | ON | ON |
| 94.5 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | off | ON | off |
| 94.6 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | off | off | ON |
| 94.7 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | ON | off | off | off |
| 94.8 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | off | ON | ON | ON |
| 94.9 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | ON | off | ON | ON | off |
| 95.0 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | ON | ON | ON |
| 95.1 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | ON | ON | off |
| 95.2 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | ON | off | ON |
| 95.3 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | ON | off | off |
| 95.4 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | ON | off | ON |
| 95.5 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | off | ON | off |
| 95.6 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | off | off | ON |
| 95.7 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | off | off | off |
| 95.8 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | off | ON | ON | ON |
| 95.9 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | off | ON | ON | off |
| 96.0 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | ON | ON | ON | ON |
| 96.1 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | ON | ON | ON | off |
| 96.2 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | ON | ON | off | ON |
| 96.3 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | ON | ON | off | off |
| 96.4 | ON | ON | ON | ON | off | ON | ON | off | ON | off | ON | off | ON | off | ON | ON |
| 96.5 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | ON | off | ON | off |
| 96.6 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | ON | off | off | ON |
| 96.7 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | ON | off | off | off |
| 96.8 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | off | ON | ON | ON |
| 96.9 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | ON | off | ON | ON | off |
| 97.0 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | ON | ON | ON |
| 97.1 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | ON | ON | off |
| 97.2 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | ON | off | ON |
| 97.3 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | ON | off | off |
| 97.4 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | off | ON | ON |
| 97.5 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | off | ON | off |
| 97.6 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | off | off | ON |
| 97.7 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | ON | off | off | off |
| 97.8 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | off | ON | ON | ON |
| 97.9 | ON | ON | ON | ON | off | ON | ON | off | ON | off | off | off | off | ON | ON | off |
| 98.0 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | ON | ON | ON |
| 98.1 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | ON | ON | off |
| 98.2 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | ON | off | ON |
| 98.3 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | ON | off | off |
| 98.4 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | off | ON | ON |
| 98.5 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | off | ON | off |
| 98.6 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | off | off | off |
| 98.7 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | ON | off | off | off |
| 98.8 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | off | ON | ON | ON |
| 98.9 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | ON | off | ON | ON | off |
| 99.0 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | ON | ON | ON |
| 99.1 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | ON | ON | off |
| 99.2 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | ON | off | ON |
| 99.3 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | ON | off | off |
| 99.4 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | off | ON | ON |
| 99.5 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | off | ON | off |
| 99.6 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | off | off | ON |
| 99.7 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | ON | off | off | off |
| 99.8 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | off | ON | ON | ON |
| 99.9 | ON | ON | ON | ON | off | ON | ON | off | off | ON | ON | off | off | ON | ON | off |
| 100.0 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| 100.1 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | off |
| 100.2 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | off | off |
| 100.3 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | off | ON |
| 100.4 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | off | ON | off |
| 100.5 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | off | ON | off |
| 100.6 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | off | off | ON |
| 100.7 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | ON | off | off | off |
| 100.8 | ON | ON | ON | off | ON | ON | ON | ON | ON | ON | ON | ON | off | ON | ON | ON |
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PLL PRO III Hi-Gain 1-WATT VERSION

