NCE's Generation 3 Radio
Unrivalled Performance

NCE has released **Generation 3** radio (also know as Version 1.5), delivering improvements over the previous 2nd Generation radio (RB02 &repeaters release), that provides unrivalled performance with the following:

- **Increased response:** The key press response is greatly improved, almost the same as being "plugged in". No more having to be "deliberate", as per previous suggestion to improve key stroke "transmission". Acquiring locos with the Cab04s and the ProCab happens every time. No delay in the horn and the horn goes off after the button has been released.

- **Consistent performance:** Communications with the RB01/2/RPT1 is consistent and people in the train room will not affect radio performance as they used to. The need for repeaters will only be necessary on the largest layouts and/or if you use 2 inch antennas. Unobstructed view to an RB01/RB02/RPT1 in many situations is no longer necessary.

- **Increased range.** Throttle range has been increased to over 100 feet, depending on the antennas used.

How to upgrade to 3rd Generation radio. The throttles will have to be sent to NCE or authorized radio upgrade facility for the upgrade. Contact NCE or authorized radio upgrade facility to co-ordinate your throttle upgrades (see the Generation 3 page on the NCE web site).

FAQs about NCE new 3rd (V1.5) Generation Radio.

Thanks to Mark Schutzer, Mark Gurries and Marcus Ammann for putting together this FAQ.

A special thank you to Mark Schutzer for all his technical help improving the radio reception of the V1.5 upgrade.

How do I know if I have version 1.5 of the radio? For ProCabs, you will have version 1.5 of the radio, when "V1.5" shows briefly at the **second "VX.X"** when the cab is turned on, prior to the "normal" operating throttle display. The **first VX.X** shows the ProCab's software version.
With Cab04's or Cab05's you cannot externally identify the radio version, but a simple test will tell you if you have the upgraded version. Take your cab 50 ft away from your base station and look at the polling LED on top,if it is still flashing then it already has version 1.5.

When was Version 1.5 first released? Version 1.5 started to be shipped late Oct 07.

What will be modified? Only the Throttle/Cab radio boards. There are no changes or modifications to the Command Station, RB01, RB02 or RPT1 Repeaters.

Do I need the 1.5 Radio Upgrade? -NO. Many users of NCE radio have had good performance with their existing radio system. These users have no need to have their throttles upgraded.

Do I need to upgrade the Command Station software to the latest version? -NO. The version of software you have now will continue to work.

Is there any benefit to upgrading the Command Station software for radio? -YES. Although it is not related to the V1.5 upgrade, NCE has a "Radio Fix" option to address potential "train runaway" issues with radio in the 2004 or newer NCE Command Station software.

Do users of the original RB01 have improved performance with 1.5 cabs? -YES. All base stations will operate with version 1.5 radio.

Can the Older radio throttles and the new V1.5 throttles work together? –YES. Both will work together. However, much of the benefit that the1.5 Radio Upgrade brings to the layout will be slightly reduced by any active V1.4 or less throttles. The more V1.4 or older throttles that are active, the further reduction in overall radio responsiveness can occur. However, it will not be any worse than before the upgrade was offered.

What is the range of the radio now? Tests have confirmed with just an RB02, throttle range can be greater than 100 feet with the 7 inch 1/2 wave antennas. With this improvement in range small 2 inch “loaded” antennas can be used providing the user with a much more “user friendly” throttle with marginal reduction in range.

Has the transmitter output power been affected? – It has been slightly reduced to further improve battery life.

Do I need to use repeaters? The need for repeaters is greatly reduced if all throttles have the 1.5 Upgrade. Before buying any repeaters, you should try the radio without one first. There is benefit to buying one repeater if you have any dead spots. However with V1.5, repeaters are really only needed for large layouts.

Does the old recommended “deliberate” button pressing, still apply? -NO. Operate all the buttons just as you were plugged in. You can feel confident about doing any task you want with the radio such as programming, building/breaking consists etc, anywhere on the layout.

Does the Horn/Whistle get stuck on anymore? - NO. Once operated, there is no appreciable delay in the sounding of the Horn/Whistle and it will stop sounding as soon as the Horn/Whistle button is released. No more horn/whistle still blowing un-commanded.

Can I “positively” SELECT A LOCO, with the Cab04s? - YES. Acquiring a loco with Cab04s is similar to being plugged in. A beta test of a Cab04PR, 30 feet from the RB02, using a 2 inch antenna, selecting 5 locos 40 times each and blowing the horn with the horn stopping after the button was released, a total of acquiring a loco 200 times (1400 button presses) for just a couple of misses to acquire a loco.

FAQs about NCE radio in general.

The following information is not specifically related to the V1.5 upgrade.

If too close to the RB02, what happens? Operating within 2 to 3 feet of the RB02, the RB02 can get overloaded resulting in poor operation. Operating with smaller antennas allows closer operation.

Do people absorb the 916.5 MHz signal? People still absorb the 916.5 MHz signal. But due to the increased receiver sensitivity, the impact of many operators will be much less and in a lot of cases the radio will work the same as if only one person is operating the layout. Standing between the throttle and the RB02 creates few problems up to about 70 feet. Operating with 5 people in a 25'x 25' layout room using 2 inch antennas and one RB02 provided trouble free radio operations.

How do you turn the radio cabs on? There is no "external" power switch on any of the radio cabs. To turn on:

- **ProCabs** –Press the EMERGENCY STOP button, momentarily. The slight difficulty with turning on the ProCab, can be fixed by a small modification to the main circuit board, that can be fixed, if the complete ProCab is sent to NCE, or by **modifying the ProCab's circuit board.**

- **ProCabs** –Press and hold down the ENTER key while momentarily pressing the EMERGENCY STOP key.

- **Cab04/05 Engineer Cabs –** A momentary press of the HORN button, then wait 5 to 10 seconds till the polling (top) LED starts blinking. No need to hold down the HORN button.

All cabs turn off **automatically** after a period of cab inactivity. The default is 10 minutes. The timeout period can be adjusted, **see below.**

Radio Cab Addresses. Just as each loco needs a different address, so do the cabs. When you purchase a second or subsequent cab, change the cab address accordingly:

- **ProCab: 2 to 17** –default 2. Problems have occurred with Address 8 avoid using it.

- **Engineer Cabs – Cab04 etc. 19 to 48** -default 5. Don't use #49. See below.

Note 1: Cab Addresses 0, 1 and 18 have been reserved.
Note 2: The display update information is included in addresses 2 to 17. ProCabs operated out of this range, will not have a display update. Engineer cabs can be operated in "2 to 17" range, but are taking the place of a ProCab. Not a problem if you have only a few ProCabs.

These cab address restrictions are ONLY for radio equipped cabs. Tethered cabs have no restrictions.

Has Cab04/05 Address 49 been fixed? – NO. Using cab address 49 locks up the radio system.

When do I know when I need a repeater? As before, the layout area should be "mapped out" using the top LED of the throttle to locate dead spots and range limits. If there any dead spots or the range becomes an issue, use a repeater.

What does "mapping/mapped" mean? Walk around your layout with a throttle, the top LED (adjacent to the antenna) should continuously flash. Anytime the LED is extinguished, this "location" has poor or no radio reception and is called a "dead spot". Walking away from the RB01/02 until this LED extinguishes, determines the range of the radio.

Where should the RB01/02 be located? Experiments have found these can be located almost anywhere for successful operation. No more placing them on the roof etc. A central location is recommended, but experimenting with the location may eliminate any dead spots found during "mapping" of the layout.

What to do with "dead spots" with a RB01. The RB01 does not support repeaters, so if you have any dead spots, experiment with the location of the RB01, until they are at a minimum or eliminated. If operation of the radio cannot be improved by moving the RB01, then an RB02 and repeaters will be necessary.

Can shorter antennas be used on the cabs? –Yes. Especially with the V1.5 radio upgrade. The 6 inch 1/2 wave antennas provide the advertised maximum range. However, with this increased performance, smaller antennas can be used providing a more "user friendly" throttle but there will be a marginal drop in range that can be offset by the use of a repeater. Suitable 1/4 wave antennas, available from **Digi-key** (www.digikey.com) are:
ANT-916-CW-QW A 3.125 inch antenna originally supplied by NCE on the first radio cabs.
ANT-916-CW-RH A 2 inch "loaded" antenna. I have fitted these to my cabs and have got over 50 feet of range.
As usual, "mapping" out of the layout will determine if any repeaters are required. Adding a repeater or two is certainly worth the benefit of operating with the small 2 inch antennas.

What size antenna should be used on the RB01/02/RPT1? Use the larger 6 inch 1/2 wave antenna.

Bad Antenna Connections. Many early reported issues with the radio were indeed due to bad antenna connections to the radio board when modelers installed the previous separately available Radio Upgrade Kit to their existing "plug in" throttles. This is why the Upgrade Kits are no longer available. Now you have to return you cabs to NCE or an authorized installer to upgrade your existing throttles to convert them to radio, or purchase factory installed radio throttles.

Broken antenna connectors: A few users have reported breaking the antenna connection by dropping the throttles or by the excessive "whip" created by the 6 inch 1/2 wave antennas and the lack of antenna support in the original design. A suitable **replacement connector** is the CONREVSMA006.031 from **Digi-key** (www.digikey.com).

Should the Radio Fix be ON? - YES. Under the Command Station settings, ENABLE the Radio Fix. The default setting is "ENABLED".

Does Layout I.D. work? Layout I.D. for the throttles works but the separations of the RB02s must be sufficient, at least 300 to 400 feet to eliminate any communications between the RB02s. With this arrangement, an operator on Layout 1 will not interfere with Layout 2, if the Layout I.D. is appropriately set in ALL the cabs and RB02. No system can be on the default "0" for this feature to work. Note: The separation distance could be marginally reduced, if the use of smaller antennas on the RB02s.

How to adjust the radio "Time OutPeriod"? The time the radio and cab remain powered after a period of "inactivity" can be programmed by selecting between "0 and 9" that gives **"X 2" minutes**. This was changed in the version 1.4 radio, from 1 to 9 minutes to 2 to 18minutes. Selecting "0", the radio is powered on all the time.

The default is "5"that will provide a "time out" period of 10 minutes for V1.5 and 5 minutes for V1.4 and earlier.

To adjust the timeout period from the default time, do this:

- **ProCabs:** Press "EXPN" then "2 = SETUP RADIO" and shows "AUTO POWER OFF TIMER (0 - 9).Enter a value that provides **2 times the value shown in minutes.**

- **Cab04 etc:** This is a little harder. See **Cab04Time Out Period.**

Note: If "0" is set in any of the cabs, the cab will NOT power off during an operating session and you will have to manually turn your radio cabs off either by plugging in to the Cab Bus for any cab or "EXPN + 1" for ProCabs.

Suggestions for Time Out Period: Set all cabs from "5 to 9" (10 to 18 minutes) for normal day to day running and for a full operating day, change to "0". At the end of the operating day, set this setting back to "9". This way all visitors will be happy as all throttles will be working ALL the time. This is easy to do for the ProCabs, see above, but for the Cab04, a little more difficult. See the above link.

How much current do the radio throttles draw from batteries?

- **ProCab –** 18mAs with the back light OFF. 58 mAs with the back light ON.

- **Cab04** – 40mAs

The reason Cab04s draw more current than a ProCab under normal operation (back light off), is that Cab04s only use two batteries for a total of 2.4 to 3.0 volts and the ProCab uses 4 batteries for a total of 4.8 to 6.0 volts. For both throttles, this is a "power requirement" of approximately 0.1 watt.

Can you use rechargeable batteries. Any AAA battery type can be used to power the radio board, due to the special "Sepic" regulator being used. So long as the batteries can supply the required current, the regulator supplies the correct voltage to the board. This allows the use of the lower 1.2volt NiCd or NiMH rechargeable batteries, instead of the 1.5 volt dry cells. The Cab04 only use 2 cells and a voltage of 2.4 volts is ok.

NiMH batteries now are available in the 700to 900 mAH, which makes them very suitable for use in NCE throttles.

Rechargeable batteries when compared to dry cells, have a lower “capacity” and a higher “self discharge” rate (throttle off), so these batteries will require charging more often, compared to the replacement of dry cells (alkalines).

Mark Gurries said, “Self Discharge is the current the battery consumes by itself just standing there not connected to anything. All rechargeable batteries have a very high self discharge rate compared to non-rechargeable batteries. In a 3 YEAR period, an Alkaline will retain over 90%+ of it original capacity. A NiCd or NiMH will have about 60% of its original capacity in 3 MONTHS”.

New generation NiMH batteries can keep their charge for years. See: http://www.eneloop.info/ or Google "Sanyoeneloop NiMH batteries" for a suitable vendor.

How long will rechargeable batteries last between “charges” Using 800 – 900 mAH NiMH batteries:

- Cab04 drawing 40 mAs will operate for approximately 20 hours (800/0.04).
- ProCab drawing 20 mAs will operate for 40 hours.

In each case, when the LED illuminates on a Cab04 or when the screen back light is illuminated on a ProCab, there will be more current drawn (Cab04 – 10 mAs and ProCab 40 mAs) that will effect the amount of time, but since these two modes of operation are only on for about 5 to 10% of the time, this will only reduce the time by approximately 1 – 2 hours.

Self Discharge (see above) will impact on battery life.

Can the “time” of illumination of the ProCab’s Back Light be adjusted? NO. For purposes of conserving power, the backlight is turned off automatically after 5 seconds. Operating the “Shift” button at any time will illuminate the back light for another 10 seconds.

Fit an “On Board” Charger to the Throttles. Mark Schutzer describes how to fit an “on board” charger that charges the batteries as soon as the throttle is plugged into the Cab Bus. This eliminates the removal of the batteries to charge them. The components used, are “surface mount” parts that will require a steady hand and good soldering skills. Select the “NCE Articles” in the left hand column on **Mark’s web site** (http://www.markschutzer.com/).
Warning: As usual, any modification to the throttles will void the NCE warranty.

With this modification, the charge rate has been set at 50 mAs. The Cab Bus will need to be powered for about 24 hours, for 800 mAs batteries, if you let them go flat.

A 12 Volt DC 1.0 Amp Wall Wart plugged into the first UTP, provides power to the Cab Bus that can be powered independently of the DCC system. This allows charging overnight or longer, without the DCC system being on, thus no track power. All NCE UTPs come with the DC power receptacle and when connected as per the instruction manual, when the Wall Wart is connected, the Command Station no longer powers any throttle plugged into this UTP and other “downstream” UTPs.