NV Series FM Transmitter - Software Update Procedure

IS09004D

Issue 1.1 ....09 November 2009

IS09004D NV Series FM Transmitter – Software Update Procedure
INFORMATION SHEET

1 INTRODUCTION
The NV Series FM transmitter is a microprocessor controlled unit. Periodically, enhancements or improvements to the operating system are identified and made available. This requires a software update.

1.1 Equipment Affected
This procedure applies to NV series FM transmitters.

1.2 Responsibility for Implementation of Procedure
This procedure should be carried out by qualified station maintenance personnel who are familiar with the NV series FM transmitter.

1.3 Scheduling
This procedure may be implemented at the convenience of station maintenance personnel.

1.4 Manpower Requirements
It is estimated that implementing this modification will require 30 minutes to complete. Note that it is necessary for the transmitter to be placed in an off-air status for the duration of this procedure.

1.5 Special Tools/Test Equipment
Along with standard hand tools (screwdriver, nutdriver, etc.) the following test equipment is required:

- laptop (i.e., local computer for direct connection) or network computer with Windows and Internet Explorer Web browser

- CAT5 Ethernet cable

- software for transmitter (***.tgz**) file

2 PRELIMINARY CHECKS

(a) Determine the current software revision installed. Via the advanced user interface (AUI) screen, go to **Menu** / **Software Configuration** / **Upgrade Software**. Select the ***.tgz** file from the boot image list (should highlight in blue) and press **About**. Record the current software revision for *AUI*, *Server*, *Controller*, *Exciter* and *Cubes*.

(b) Contact Nautel for the most recent software revision and receive a new compact flash card (which contains upgrade ***.tgz** file) or download ***.tgz** file to a laptop or network location.

NOTE
If a new compact flash card was received, continue to paragraph 3. If not, proceed to paragraph 4.

3 COMPACT FLASH CARD SWAP
If a new compact flash card was received with the upgrade ***.tgz** file, swap the current card with the new card as follows:

(a) From the transmitter AUI, go to **Menu**/ **Software Configuration** / **Network Setup**, and record your current network settings (IP address, Subnet Mask, Default Gateway).

(b) Unplug the single board computer's (SBC) power connector P8 – located behind a cover on the rear of the door (use 7 mm nut-driver – M4 hardware).

(c) Remove the current compact flash card – bottom edge of SBC. Note the orientation of the card.

(d) Install the new card (noting orientation) and plug in SBC power connector P8.

(e) The AUI should boot up and the transmitter login screen should appear (or the main screen – depending if *Auto Login* was enabled for the active user).

(f) Proceed to paragraph 5.

4 TRANSFERRING UPGRADE FILE

The following steps assume either the laptop will be used to connect directly to the transmitter *OR* the transmitter and network computer are currently connected to the same network.

4.1 Transmitter IP Configuration

(a) From the transmitter AUI, go to **Menu**/ **Software Configuration** / **Network Setup**.

(b) Record your current network settings (IP address, Subnet Mask, Default Gateway).

(c) If connecting to the transmitter directly with a laptop, select '*Static IP*' and set as follows:

IP Address: **10.10.10.2**
Subnet Mask: **255.255.255.0**
Default Gateway: **192.168.1.2**

Press **Apply** then **Reboot Now**.

(d) Set the transmitter for **Remote** control.

4.2 Laptop IP Setup

The following steps assume the operating system is *Windows XP*; adapt as required for computers with different operating systems.

(a) On the laptop, go to **Start Menu** / **Control Panel** / **Network Connections** / **Local Area Network**.

(b) In the Local Area Network Status, open the **General** tab and choose **Properties**. Scroll down and highlight **Internet Protocol (TCP/IP)**. Choose **Properties**.

(c) In the *Internet Protocol (TCP/IP) Properties* window, select **Use the following IP address**.

(d) Enter the following settings:

IP Address: **10.10.10.1**
Subnet Mask: **255.255.255.0**
Default Gateway: **192.168.1.2**

(e) In the *Internet Protocol (TCP/IP) Properties* window, select **OK**.

(f) In the *Local Area Connection Properties* window, select **OK**.

(g) In the *Local Area Connection Status* window, select **Close**.

(h) Close the *Network Connections* window.

4.3 Transfer software upgrade file to Transmitter

(a) If using a laptop, connect the laptop network interface card to the transmitter LAN port (A1J21 on the control/interface PWB) using a CAT5 Ethernet cable. Open Internet Explorer and search for 10.10.10.2. The transmitter login screen should appear.

(b) If using a network computer, open Internet Explorer and search for the IP address recorded in step 4.1 (b). The transmitter login screen should appear.

(c) At the transmitter login screen enter:

> User: Nautel or ****
> Password: *none* (default) or ****

**** denotes an alternate user assigned password and user name of an account that has Super User or Read/Write permission level.

(d) Navigate through the AUI to **Menu** / **Software Configuration** / **Upgrade Software** and press **Browse**. Locate the software update ***.tgz** file and press **Upload** to load the file into the transmitter boot image list.

(e) Proceed to paragraph 5.

5 FLASHING TRANSMITTER WITH UPGRADE SOFTWARE

(a) Set the transmitter to its **RF Off** state.

(b) Set the transmitter for **Local** control. Perform the following steps locally (in front of the transmitter AUI).

(c) Go to the AUI **Menu** / **Software Configuration** / **Upgrade Software** screen and select the update ***.tgz** file from the boot image list (should highlight in blue) and press **Begin Flash**.

CAUTION
Note the red warning text at the top of the AUI screen – do not leave this page until the flash process is complete.

(d) After a successful load (*boot status indicates 100% complete and notes that cubes should be reset*) press **Reset** and go to the **Maintenance** screen in **Menu** / **Software Configuration** and select **Reboot AUI**.

(e) This completes the software upgrade. Restore the former network settings on the transmitter and laptop as required [see step 4.1 (b)].

(f) From the transmitter AUI, go to **Menu**/ **Software Configuration** / **Network Setup**, and set the network settings (IP address, Subnet Mask, Default Gateway) recorded in step 3 (a).

(g) Login and repeat step 2 (a) to determine if the current version is the same as the upgrade version – this confirms the upgrade was successful.

(h) If the upgrade was not successful, repeat steps 5 (a) through 5 (g), except in step 5 (d), cycle the ac power (switch off, then on) instead of selecting **Reboot AUI**. If still unsuccessful, contact Nautel.

6 CONFIGURATION CHANGE

Perform the referenced procedures on NV series transmitters that upgrade to software version 2.7 or greater.

For transmitters that were received equipped with software version NV SW 2.3 or previous, perform the following procedures:

- *RF Drive Sample Calibration* (see 6.1)
- *Exciter HD Calibration* (see 6.2)
- *LUT Re-Saving* (see 6.3)

For transmitters that were received equipped with software version NV SW 2.6, perform only:

- *RF Drive Sample Calibration* (see 6.1)

NOTE
Operate the transmitter in FM mode at the assigned power level for at least 15-20 minutes prior to making measurements or adjustments. This will allow the transmitter to warm-up, when adjustments should be made, versus when the transmitter is cold.

6.1 RF Drive Sample Calibration

(a) With RF off, go to the AUI **Menu** / **Hardware Configuration** / **Scaling** screen. Select "RF Drive Power" from the pull-down menu, and change the scale factor to 1.000. Press the **Apply** button.

(b) Operate the transmitter (*RF On*) in an FM mode preset at the licensed analog power level (or rated power), with exciter A as active.

NOTE
*If any RF drive related alarms occur (cycles between high and low) temporarily reduce the active FM Preset's Exciter Power setting – in the AUI's **Menu / Preset** screen – to half its current value (record the original value). Press the **Activate** button. Continue reducing this setting if these symptoms continue.*

(c) Go to the AUI **Menu** / **System Review** screen. Press the **i** button in the Controller line. Record the RF Drive Power.

(d) From the same AUI screen, press the **i** button in the Exciter A line. Record the exciter's Forward Power.

(e) If exciter B is installed, manually change over to exciter B (using the AUI **Menu** / **Changeover** screen), then go to the AUI **Menu** / **System Review** screen. Press the **i** button in the Exciter B line. Record the exciter's Forward Power.

(f) Calculate the average exciter forward power level between exciters A and B using the power levels recorded in steps (d) and (e). The transmitter's RF Drive Power reading will be re-calibrated to the average exciter forward power.

(g) Go to the AUI **Menu** / **Hardware Configuration** / **Scaling** screen. Select "RF Drive Power" from the pull-down menu. Change the scale factor until the Meter Value matches the average exciter forward power calculated in step (f). Press the **Apply** button.

(h) If the preset's *Exciter Power* setting was adjusted, set it back to the original value recorded in the note above. Press the **Activate** button. Repeat steps (b) through (g) until the "RF Drive Power" meter value matches the average exciter forward power calculated when the preset's *Exciter Power* setting is equal to its original value (if necessary, only reduce the setting by a smaller amount each subsequent time). Record the new Scale Factor.

(i) If necessary, proceed to *Exciter HD Calibration*; if not, select the desired preset or operating mode. Note that for any FM+HD mode, the power level displayed in the AUI's Presets page is the desired analog power setting (TPO). The power reading at the top of the home page is also the analog portion of the FM+HD output.

(j) The procedure is complete. Nautel recommends that you retain at the site the new RF Drive Power Scale Factor from step (h). Also, email the data to Nautel (support@nautel.com).

(k) For future reference, if the NAPC156 Control Interface PWB requires replacement, you will need to manually re-enter the new RF Drive Power Scale Factor after the original factory EEPROM is loaded into the replacement PWB.

6.2 Exciter HD Calibration

NOTE
This calibration procedure addresses all IBOC modes (FM+HD and HD) of operation.

(a) Operate the transmitter (*RF On*) in an FM mode preset at the licensed analog power level (or rated power), with exciter A as active.

(b) Go to the AUI **Menu** / **Hardware Configuration** / **HD Settings** screen.

(c) Press the **Calibrate** button next to *Exciter HD Power Calibration*.

(d) Almost immediately the Calibration Value shall change from a nominal 1.000 to a value typically near or between 0.900 and 1.100. Record the calibration value.

(e) If exciter B is installed, manually change over to exciter B (using the AUI **Menu** / **Changeover** screen) and repeat steps (b) through (d). When complete, change over to exciter A (making it active again).

(f) Proceed to paragraph 6.3, *LUT Re-Saving*.

6.3 LUT Re-Saving

NOTE
This procedure applies to IBOC transmitters only (FM+HD and HD).

LUT is an acronym for Look-Up Table.

(a) With RF Off and exciter A active, go to the AUI **Menu** / **Hardware Configuration** / **HD Settings** screen and record the "Default LUT Height" value. Exciter A and B have independent "Default LUT Height" values; the value displayed on the AUI represents that value stored in the active exciter.

(b) Go to the **AUI Menu / Hardware Configuration / LUT Storage** screen and record the stored Index details vs. the Index # in the table, for example Figure 1 shows index 1 having a mode of FM+HD, a power of 3.65 kW, a frequency of 98.1 MHz and it is exciter A. The associated Preset will also have this *LUT Index* # selected under the **Other Audio Settings** sub-menu. In this example, index 1 is the only index to have a LUT stored. If others were stored in exciter A, they would appear under index 2, 3, etc., and may have different modes (FM+HD or HD), power levels, frequencies and even injection levels (default is -20 dB if not shown). The table shows the stored indexes for the active exciter; exciter B indexes will have \B at the end in place of \A and there should exist an equivalent B index for every A index (same index # and description).

(c) Sub-steps (c1) through (c7) involve turning the transmitter on and off while monitoring its behavior. The optimal "Default LUT Height" value will be determined and then the new LUT will be saved. Repeat steps (c1) through (c7) until the transmitter:

- does not overshoot, and
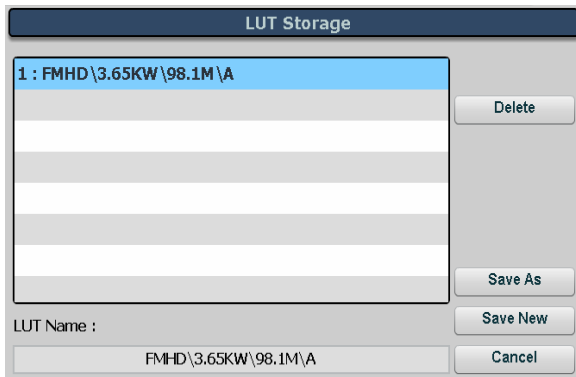- ramps up quickly and smoothly without alarms.

Figure 1: LUT Storage Sub-Menu

(c1) Activate the preset associated with LUT Index 1 (same mode, power level, frequency). This preset should correlate to the customer's licensed mode/power level/frequency.

(c2) Within the preset, under **Other Audio Settings**, change the *LUT Index* to **Flat**. Press the **Activate** button.

(c3) Go to the Main screen and press **RF On** while monitoring the transmitter behavior.

- Does the transmitter output power overshoot? If so, press **RF Off** immediately and decrease the "Default LUT Height" by 0.01, press the **Set** button and repeat **RF Off**/**On**.

- Does the transmitter power ramp up quickly (i.e., achieve 70%-100% of power in less than 30 s) and smoothly without alarms (PA/Module Failures or Foldback)? If not, fine tune the ramp-up performance as detailed in paragraph 6.3.1.

(c4) Record the new "Default LUT Height".

(c5) With the transmitter operating at the preset power level and with all objectives satisfied, go the **LUT Storage** sub-menu (see the example in Figure 1), select the associated LUT index (the line should turn blue and the *LUT Name* field should update to show the same name, see example above). Press **Save As** button to overwrite the existing stored LUT.

(c6) In the currently active Preset, change the **Other Audio Settings** -> *LUT Index* value back to the original number (e.g., **1** in this case). Press the **Activate** button.

(c7) Press **RF Off** then **RF On**. The transmitter should satisfy the requirements of step (c).

(d) If the **LUT Storage** sub-menu suggests there are other indexes stored, repeat only step (c5) while operating in the applicable preset. Do not further change the "Default LUT Height" value; only overwrite the existing stored LUT. If the transmitter will only operate at the licensed mode/power level/frequency (typical), only one LUT is required. Delete the remaining stored LUTs to prevent inadvertent selections by highlighting them (the line should turn blue) and pressing the **Delete** button. LUTs can be saved at any time, and used for a given Preset by configuring the *LUT Index* for the associated stored index.

(e) If exciter B is installed manually change over to exciter B (using the AUI **Menu** / **Changeover** screen) and repeat steps (a) through (d) for exciter B. Once complete, manually change over to exciter A.

(f) Select the desired preset or operating mode. Note that for any FM+HD mode, the power level displayed in the AUI's Presets page is the desired analog power setting (TPO). The power reading at the top of the home page is also the analog portion of the FM+HD output.

(g) The procedure is complete. Nautel recommends that you retain at the site the new RF Drive Power Scale Factor from *RF Drive Sample Calibration* [6.1, step (h)], the new Calibration Value from *Exciter HD Calibration* [6.2, step (d)] and the new Default LUT Height from *LUT Re-Saving* [6.3, step (c4)] for both exciters A and B as applicable. Also, email the data to Nautel (support@nautel.com).

(h) For future reference, if the NAPC156 Control Interface PWB requires replacement, you will need to manually re-enter the new RF Drive Power Scale Factor after the original factory EEPROM is loaded into the replacement PWB.

6.3.1 IMPROVING/FINE TUNING RAMP-UP TIME

The following procedure is only necessary to fine tune/improve ramp-up time, as referenced in paragraph 6.3, step (c3). While overshooting of the transmitter power is quite easy to identify, determining optimal ramp-up time is subjective.

NOTE
When making changes to the "Default LUT Height", always ensure that the transmitter output power does not overshoot, and it ramps up quickly and smoothly without alarms.

(a) When the transmitter has settled at power, monitor the AUI's *AM-AM Correction* plot and place the marker on the plot at the Table Index value shown in Table 1, noting that the values are based on the mode/ injection level, and ensure the measured (LUT) Gain falls in the range specified.

NOTE
The Table Index Full Scale value on the AUI's AM-AM Correction plot is actually 255, not 2047.

Table 1: AM-AM Correction Table Index Values and Expected LUT Gain vs. Mode

MODE	TABLE INDEX VALUE	(LUT) GAIN RANGE
FM+HD Low Injection (e.g., -20 dB to -16 dB)	120	0.36 to 0.44
FM+HD High Injection (e.g., -15 dB to -10 dB)	80	
HD All-Digital	30	

(b) If the Gain value in step (a) is greater than 0.44, increase the "Default LUT Height" value (and subsequently decrease the LUT Gain) to:

Current Default LUT Height x Measured Gain/0.44

Example: In step (a), if you measure a Gain value of 0.48 and your "Default LUT Height" value is 0.500, increase the "Default LUT Height" to 0.545 (or 0.500 x 0.48/0.44).

(c) If the Gain value in step (a) is less than 0.36, decrease the "Default LUT Height" value (and subsequently increase the LUT Gain) to:

Current Default LUT Height x Measured Gain/0.36

Example: In step (a), if you measure a Gain value of 0.32 and your "Default LUT Height" value is 0.500, decrease the "Default LUT Height" to 0.444 (or 0.500 x 0.32/0.36).