# NORMARC 7710 NAV ANALYZER
# User Manual

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Limitations of use:    The use of this manual is limited to the operation and maintenance of the system stated in the Title Page. It shall not be used for purposes of product manufacture.

# STATUS

| Issue | PR/CO | Date/Year | Author | Based on document |
|---|---|---|---|---|
| Rev. 1.0 | - | 13-Dec-04 | JDA/SKR/BGR | New |
| Rev. 1.1 | - | 03-Jan-05 | JDA/SKR/BGR | Rev. 1.0 |
| Rev. 1.2 | - | 10-Mar-05 | SKR/JEH/BGR | Rev. 1.1 |
| Rev. 1.3 | - | 01-Sep-05 | TBR/BGR | Rev. 1.2 |
| Rev. 1.4 | 4287_6 | 21-Feb-06 | TBR/BGR | Rev. 1.3 |
| Rev. 1.5 | 4520/4439 | 21-Feb-08 | JDA | Rev. 1.4 |
| Rev. 1.6 | 4498 | 10-Jul-09 | BGR | Rev. 1.5 |

Changes Incorporated

| Issue | Paragraph | Paragraph Heading/Description of Change |
|---|---|---|
| Rev.1.1 | General Corrections | Drawings and text corrected. |
| Rev. 1.2 | 4.2, 5.6 and 7.1 | New text and diagrams added and general corrections. |
| Rev. 1.3 | 7.2 | Added Calibration text. (E<CR 2127) |
| Rev. 1.4 | 7.1.2 | Added Charging, maximum temperature text. (PR 2209) |
|  | 3.2 | Added description |

## Changes Incorporated (Continue)

| Issue | Paragraph | Paragraph Heading/Description of Change |
|---|---|---|
| Rev. 1.5 | General, 5.3.3 | Added new functionality, updated pictures New (DDM LP description) |
| Rev. 1.6 | All | New company name |

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# 1 Specifications

| PARAMETERS | Localizer | Glide Path | VOR | Marker Beacon |
|---|---|---|---|---|
| Frequency range | 108.1-111.95 MHz | 329.15-335.0 MHz | 108.0-118 MHz | 75 MHz |
| Channel spacing | 50 kHz | 150 kHz | 50 kHz | |
| Frequency tolerance | 0.0004% | 0.0004% | 0.0004% | 0.0004% |
| RF level dynamic range | 0 dBm to -80 dBm | 10 dBm to -70 dBm | 0 dBm to -80 dBm | 0 dBm to –70 dBm |
| DDM range | 0-40% | 0-80% | - | - |
| DDM/Bearing error | Centring: 0.07% DDM<br>Deviation: 0.07% DDM<br>± 1.25% of DDM-reading | Centring: 0.15% DDM<br>Deviation: 0.15% DDM<br>± 1.25% of DDM-reading | 0.3° | - |
| SDM/Mod. depth range | 0-95% | 0-95% | 10-50% | 80-100% |
| SDM/Mod depth error Subcarrier | 0.5% SDM | 1% SDM | 0.5% Mod depth<br>1.0% Mod depth | 0.5% Mod depth |

| PARAMETERS | Localizer | Glide Path | VOR | Marker Beacon |
|---|---|---|---|---|
| Subcarrier 30 Hz FMI | - | - | 0.1 | - |
| Ident/Voice freq. range | 300-3000 Hz | | 300-3000 Hz | - |
| Ident/Voice depth of modulation range | 1-55% | 1-55% | 1-55% | - |
| Ident depth of modulation error | 1% mod. depth | | 1% mod. depth | |
| Ident decoding | Morse code decoded to letters | | Morse code decoded to letters | |
| Low Frequency error, navigation tones | 0.1 Hz | 0.1 Hz | 0.06 Hz (30 Hz) 20 Hz (9960 Hz) | 1 Hz |
| Low Frequency error, Ident tones | 5 Hz | - | 5 Hz | - |
| LF phase 90 Hz vs. 150 Hz | 0.1° | 0.1° | - | - |
| Harmonic distortion 90 Hz and 150 Hz | 2., 3. and total distortion | 2., 3. and total distortion | | |

| PARAMETERS | Localizer | Glide Path | VOR | Marker Beacon |
|---|---|---|---|---|
| Harmonic distortion error | 0.5% | 0.5% | - | - |
| RF-level error | 2 dB<br>1 dB<br>for a signal with<br>RF-level –50 dBm to -20 dBm<br>and temp. range 10 to 30°C | 2 dB | 2 db | 2 dB |
| Resolution modulation | 0.01%<br>(0.1 % for Ident) | 0.01% | 0.1% | 0.1% |
| Resolution LF phase | 0.1° | 0.1° | | - |
| Resolution LF frequency | 0.1 Hz | 0.1 Hz | 0.1 Hz | 0.1 Hz |
| Resolution RF frequency | 0.1 kHz | 0.1 kHz | 0.1 kHz | 0.1 kHz |
| Resolution 30 Hz and subcarrier frequency | - | - | 0.01 Hz<br>1 Hz | - |

| PARAMETERS | Localizer | Glide Path | VOR | Marker Beacon |
|---|---|---|---|---|
| Resolution VOR Bearing and FMI | - | - | 0.1°<br>0.1 | - |
| Resolution RF level | 0.1 dBm | 0.1 dBm | 0.1 dBm | 0.1 dBm |
| Range user defined averaging | 1 to 10 seconds in 1 second step | | | |
| Sensitivity, 20 dB SINAD in 3 kHz BW | -80 dBm | -70 dBm | -80 dBm | -80 dBm |
| Selectivity | < 3 dB @ 12 kHz<br>> 60 dB @ 50 kHz | < 3 dB @ 25 kHz<br>> 70 dB @ 150 kHz | < 3 dB @ 24 kHz<br>> 60 dB @ 75 kHz | < 3 dB @ 12 kHz<br>> 60 dB @ 50 kHz |
| Receiver image rejection | > 80 dB | > 100 dB | > 80 dB | > 80 dB |
| Audio output noise level | < 180 mV rms | - | < 180 mV rms | < 180 mV rms |
| Low pass filter | Acc. to ICAO Doc 8071 vol 1 para 4.2.9 | - | - | - |
| Measurement rate | 10 samples per second | | | |

| PARAMETERS | Localizer | Glide Path | VOR | Marker Beacon |
|---|---|---|---|---|
| Data storage capacity | One hour of continuous measurements | | | |
| Tuning | Automatic | | | |
| Input impedance SWR ref 50 ohm | <1.5 | | | |
| Inputs and Outputs | RF-input (BNC socket) | | | |
| | LAN interface (RJ45 100Base T) with DHCP server | | | |
| | RS-232 serial data (9-pins Sub-D-socket) | | | |
| | Event button input | | | |
| | LF or IF output (selectable) | | | |
| | Ident / Voice audio-jack | | | |
| GPS interface | Used for LLZ center line run and crossover run | | | |
| | Protocol according to NMEA-standard | | | |
| | RS232-connection: CTS used for GPS Rx and RTS used for GPS Tx | | | |
| Tachometer interface | Used for LLZ center line run | | | |
| | RS232-connection: CTS used for tachometer pulses | | | |
| | RS232-levels and TTL-levels (Vol < 0.6V, Voh >2.4V) | | | |

| PARAMETERS | Localizer | Glide Path | VOR | Marker Beacon |
|---|---|---|---|---|
| User Interface | Graphical colour 5.5" LCD | | | |
| | Keys for selecting function and parameter | | | |
| Power supplies | NiMH rechargeable battery, (min. 6 hours use) | | | |
| | External charger, 110-240V,/ 47-63 Hz AC | | | |
| Power input | 10.8VDC to 30VDC | | | |
| Battery charging time | 4 hours | | | |
| Power indicators | Low battery voltage, Battery or charging, Sleep Mode by Power button | | | |
| Night use | Backlight on LCD | | | |
| Dimensions (WxHxD) | 240 x 160 x 140 mm | | | |
| Weight | 4.5 kg | | | |
| Antenna type | Dipole, telescopic | | | |
| Antenna return loss vs. 50 ohm | > 10 dB | > 6 dB | - | - |
| Antenna mast height | 2.9 m (1.6 m retracted) | | | |

| PARAMETERS | Localizer | Glide Path | VOR | Marker Beacon |
|---|---|---|---|---|
| Antenna alignment indicator | | Level | | |
| Antenna cable | | Coaxial; 4 m | | |
| Temperature range, operating and storage | | -10°C to +50°C / -30°C to +80°C | | |
| Protecting case | | Nylon bag with carrying strap | | |
| Weatherproofness | | IP54 | | |
| Data logging | | Software (optional) to be installed on a PC | | |

# 2      Introduction to the NORMARC 7710 NAV Analyzer

The NORMARC 7710 NAV Analyzer is used to adjust, verify and record parameters of ILS (Localizer, Glide Path, Marker Beacon) and VOR ground systems. The NAV Analyser's functionality substitutes instruments like ILS/VOR receivers, modulation meters and frequency counters. It incorporates all ILS and VOR channels selectable without any tuning or equipment changes. It facilitates measurement of

- ILS: Modulation Depth (DDM and SDM), RF level and Ident modulation level, Carrier and Audio frequencies, 90Hz to 150Hz phase and harmonic distortion, Ident decoding
- Marker: Depth of modulation, Modulation frequency, RF level, Carrier frequency
- VOR: Bearing, Depth of modulation 30Hz, Depth of modulation 9960Hz, Ident modulation, RF level, Frequency modulation index, Carrier frequency, subcarrier frequency, Ident decoding

The NAV Analyzer is a portable, battery-operated weatherproof unit to be used outdoors, in a vehicle or inside the equipment shelter. It is supplied with a dipole antenna with a unipod support and coaxial cable. The analyzer has a rough outdoor design and is protected against damage during transport.

The NAV Analyzer uses a digital radio with demodulation based on digital signal processing and with storage functions. Full control from a remote system (typically a PC) by use of network technology is possible.

The user interface is a graphical display (GUI) with a corresponding keyboard on the front panel of the instrument. Night condition is supported. Audio jack for Identity / Voice monitoring is incorporated.

It has a GPS and tachometer interface for ILS Localizer runway measurements.

# 3       Setting up the NAV Analyzer for the first time

## 3.1   Package contents

The package contents include the following items:

- NORMARC 7710 NAV Analyzer
- Battery charger w/std. European plug
- Handheld antenna mast with selectable dipoles
- Coax cable for the antenna
- Crossed network cable
- Soft bag for instrument and soft bag for accessories

## 3.2   Charging the batteries

The first thing to do is to charge the internal battery. Connect the battery charger to an electrical outlet, and plug the other end into the rear of the NAV Analyzer.

Observe that the Power led after flashing quickly for a few minutes (trickle charge) changes to continues ON status (charging battery).

If the led starts to blink the Morse code letter "S" ⊓_⊓_⊓___⊓_⊓_⊓___⊓_⊓_⊓ - the voltage of the battery cells is too low to start full charging. In this case, restart the charge cycle once every five minutes by turning off and on again the external power until full charging starts.

Leave the instrument on full charge for at least 10 hours.

## 3.3 Connecting to RF signal

### 3.3.1 Using the supplied antenna

Connect one end of the coaxial cable to the antenna and the other end to the rear of the NAV Analyzer. Select the correct dipole according to what you are measuring.

### 3.3.2 Using another RF source

Connect the source to the RF input at the rear side of the NAV Analyzer through an appropriate cable. Use the supplied coax cable if suitable.

***NOTE!*** *Be sure not to overload the input. The specification for the input is max 0.1W (20dBm).*

## 3.4 Turning the instrument on

   a.   Make sure that the battery is charged, or that the charger is connected
   b.   Turn on the power switch at the rear of the NAV Analyzer
   c.   Press and hold (1 sec) the [ Power ] – button on the front panel


## 3.5 Turning the instrument off

The instrument can be turned off into two different modes.

1. Totally off (Power LED is off)
   a.   Use the power switch at the rear of the instrument or
   b.   Press the [Power]-button and select the [Off]-button from the sub-menu

In this mode the instrument does not use any power.
**This is the preferred mode if the instrument is not going to be used for several hours**.

2. Sleep mode (Power LED flashes slowly)
   a.   Press and hold (2 sec) the [Power]-button until the screen turns off or
   b.   Press the [Power]-button and select the [Sleep]-button from the sub-menu
In this mode the instrument uses power to keep the main functions active. This allows for a much quicker restart and for reactivating the menu that was active when the instrument was put into Sleep mode. A fully charged battery will last for >18 hours in this mode.
This is the preferred mode during a measuring sequence when the instruments have to be turned off for moving to a new measuring Location.
To turn the instrument back on again, press and hold (2 sec) the [Power]-button until the screen turns on.

## 3.6   Screen saver

To save power and thereby increasing the time the instrument can be used on battery, a screen saver is built-in.
To activate it;
   a.   Press the [Setup]-button and then select the [Screen...]-button from the sub-menu
   b.   Use the wheel (or up/down navigation buttons) to select how long to wait before it activates (1-120 minutes)
   c.   Set it to 0 minutes to disable it

When the screen saver activates, the screen will be blank but the Power LED will be on.
Any button or use of the wheel will bring the screen back on. Storing of data continues as normal when the screen saver is activated.

## 3.7   Backlight

The intensity of the screen backlight can be set to suit the light of the surroundings.
   a.   When no input field is active, use the wheel on the front or
   b.   Press the [Power]-button and select the [Backlight inc] / [Backlight dec] / [Backlight off] buttons from the sub-menu (Backlight off is the same as activate screen saver)

## 3.8   Connecting a computer to the NAV Analyzer

A computer (PC) may be connected to the NAV Analyzer for textual and graphical display of measurements, storage of log files and maintenance of the instrument.

The connection can be made using the standard network connector, Located at the rear of the instrument.

To connect directly to a PC, use the included standard crossed network cable.

If using a network switch or router between the computer and the instrument, you may use a ordinary network cable, since most switches/routers have auto-sensing for the network connection.

For setting up the instrument refer to 5.6

# 4      How to operate the instrument

**Figure 1 The front of the NAV Analyzer**
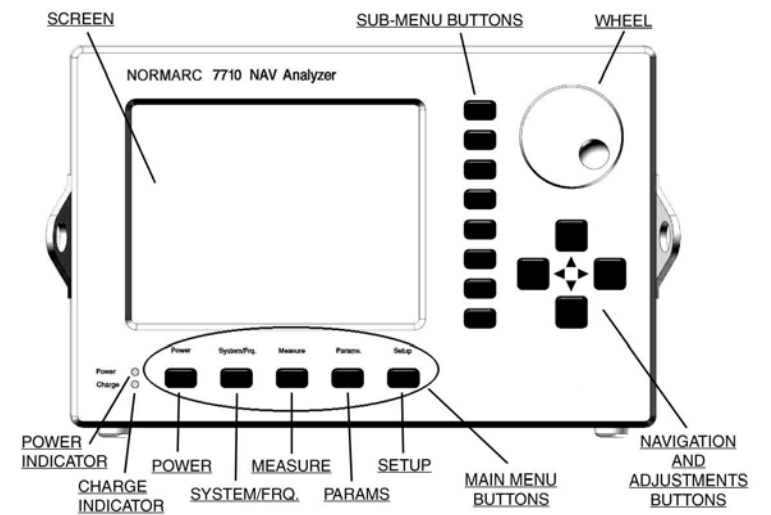
**Figure 2 The rear of the NAV Analyzer**

RS232/AUDIO CONNECTOR  LAN CONNECTOR  POWER IN 10.8-30V DC  POWER SWITCH  RF INPUT CONNECTOR

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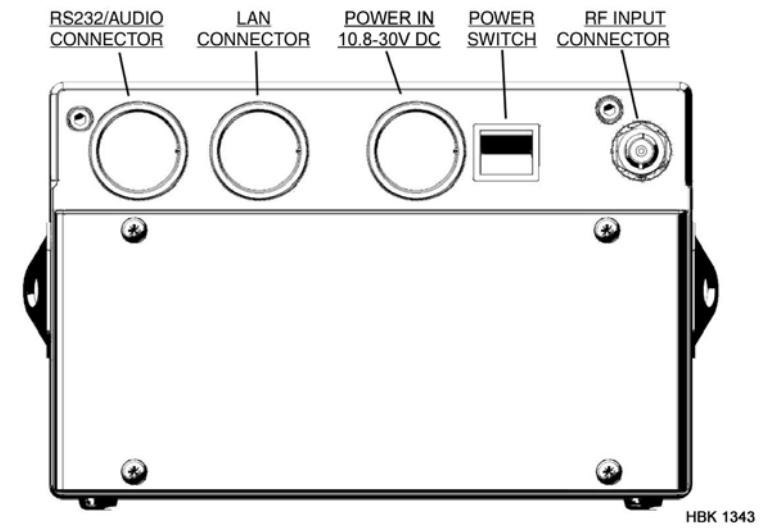
## 4.1   Using the pushbuttons and the wheel

When all external connections are made, the NAV Analyzer is operated through the use of pushbuttons and the adjustment wheel.

Below the screen are five menu buttons for selecting the main functionality. The main functionality includes Power on/off, setup and measurements.

Once the main operating mode is selected, further functionality can be controlled through the buttons to the right of the screen. The function of each button is different for each operating mode. The descriptions of these buttons are shown on the screen beside the buttons themselves. See an example in Figure 3.

The wheel and left/right/up/down buttons are used to adjust values.
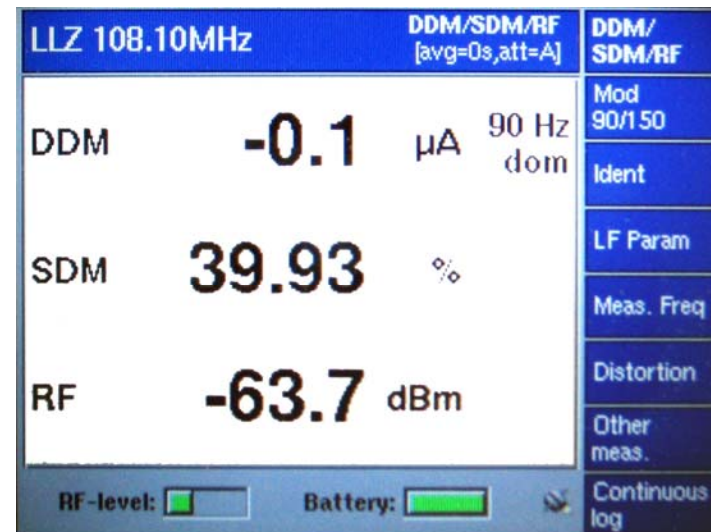
**Figure 3 Example screenshot with sub menu**

## 4.2  Indicators

Power indicator (green LED)
   a.  ON – instrument on
   b.  ON and blank screen – screen saver activated
   c.  Blinking slowly – instrument in Sleep mode
   d.  Off – instrument off

Charge indicator (yellow LED)
   a.  OFF – no charging
   b.  Blinking quickly ⎍⎍⎍⎍⎍⎍⎍⎍⎍⎍⎍⎍⎍ - full charge is pending.
       Instrument has just been put on charge and is slowly charged until the cell voltage reaches 1V. If the
       instrument was off when it was put on charge, it can not be turned on while charge is pending
   c.  ON – instrument on full charge
   d.  Blinking slowly ⎍__⎍__⎍__⎍__⎍__ - top-off slow charging (trickle charge –
       10h)
   e.  Blinking Morse "I" ⎍__⎍____⎍____⎍___⎍ - temperature of the battery cells are
       outside their limits (0°-50°). Reduce (or increase) the temperature of the instrument!
   f.  Blinking Morse "S" ⎍⎍__⎍⎍___⎍⎍ - the voltage of the battery cells is too
       low to start full charging (see 7.1.2).

RF-level indicator (bottom left parameter on all screens)
   a.  Red square around text and no bar – input level is not present / too low
   b.  Green bar – input level is within dynamic range

    c.    Red square around text and a full red bar – input level is too high

Battery indicator (bottom right parameter on all screens)
The battery indicator shows the status of the 12V-level by monitoring the individual battery cells. It is the cell with the lowest voltage that is shown. The range is scaled as 0-100%, corresponding to battery cell voltage from 1.0-1.3V
    a.    A green bar – the battery voltage is better than 20%
    b.    Red square around text and a red bar – the battery voltage is less than 20%
    c.    A blue full bar – The battery is being charged

# 5 Operating instructions

## 5.1 How to select NAV system type

### 5.1.1 Manual selection
1. Select the menu button [ System/Frq ]
2. Select the submenu button [ Choose system ]
3. Select LLZ, GP, MKR or VOR
4. Select frequency
5. Optionally Add/Replace/Delete shortcuts

### 5.1.2 Automatic selection
1. Select the menu button [ System/Frq ]
2. Select [ Scan freq. ] to scan for any input
3. All frequencies with a detectable RF signal will then be shown
4. Select the frequency corresponding to the one you want to use

### 5.1.3 Select using shortcuts

1. Select the menu button [ System/Frq ]
2. Select the corresponding shortcut button for the NAV system type/frequency you want to look at
3. If there are more shortcuts than there are buttons available, the lower right button is named [ More ]. Select this button to see more shortcuts. When the desired NAV system type/frequency is found, select the corresponding button

### 5.1.4 Adding shortcuts in the instrument

For adding shortcuts through the instrument, do this:
1. Select the menu button [ System/Frq ]
2. Select the submenu button [ Choose system ]
3. Select LLZ, GP, MKR or VOR
4. Select frequency
5. Optionally Add/Replace/Delete shortcuts
   Or through the web interface do this:
6. Log on to the instrument (see 5.6)
7. Select the [ Administration ] link, then the [ Shortcuts ] link in the left side menu
8. Select a source type and select [ New shortcut ]
9. Set a name for the shortcut and select a frequency
10. Select [ Save shortcut ]

## 5.2  How to do measurements

### 5.2.1 Standard measurements
1. If not already done, select the correct operating mode of the instrument (see 5.1)
2. Select the menu button [ Measure ]
3. Select what to measure on the submenu buttons on the right side

### 5.2.2 Audible ident
1. If not already done, select the correct operating mode of the instrument (see 5.1)
2. The ident signal is available on the audio output connector at the rear side of the instrument
3. You may adjust the output level of the audio. Select the menu button [ Setup ], select the sub menu button [ Audio… ] and adjust the output level with the wheel

### 5.2.3 Audio/Baseband signal
The baseband signal contains the low frequency parts of the antenna input signal, without the carrier frequency. The signal is available at pin 4 on the RS-232 connector (9-pin D-Sub) at the rear of the instrument. This pin is also used for the IF signal. The procedure below shows how to route the baseband signal to this output. The baseband signal is selected by default when the instrument boots.
1. If not already done, select the correct operating mode of the instrument (see 5.1)
2. Select the menu button [ Setup ]
3. Select the sub menu button [ Aux… ]
4. Select the sub menu button [ Audio ]

### 5.2.4 IF signal

The IF signal is a translated RF channel signal with carrier frequency of 200kHz. The signal is available at pin 4 on the RS-232 connector (9-pin D-Sub) at the rear of the instrument. This pin is also used for the Baseband signal. The procedure below shows how to route the IF signal to this output.

1. If not already done, select the correct operating mode of the instrument (see 5.1)
2. Select the menu button [ Setup ]
3. Select the sub menu button [ Aux… ]
4. Select the sub menu button [ IF ]
5. If necessary adjust the IF output level by using the wheel or arrow buttons

## 5.3 Various settings

### 5.3.1 How to select $\mu$A/% for DDM

1. Select the menu button [ Params ]
2. Select the button [ $\mu$A ] for viewing DDM as $\mu$A, or the button [ % DDM ] for viewing DDM in percent

### 5.3.2 How to define 90Hz/150Hz dominance for DDM

DDM may be shown as 150Hz – 90 Hz, or 90Hz – 150 Hz. This menu selection enables you to determine the algorithm you want to use.

1. Select the menu button [ Params ]

2.   One of the submenu buttons is named [ 150Hz dom ] or [ 90Hz dom ], and denotes the dominance algorithm currently defined. If you want to change the setting, press the button and then the button for the desired dominance setting

### 5.3.3 How to set up lowpass filter for DDM
1.   Select the menu button [ Params ]
2.   Select the submenu button [ DDM LP... ]
3.   Use the wheel or up/down-buttons to set the Time Constant in the filter. When done, select [ Set ]. To turn off DDM filter set Time Constant to 0.0, or select [ Off ].

Note: When set to a value > 0.0s, the DDM lowpass filter overrides the averaging function described below. When set to 0.0s (off), DDM is calculated using the average algorhitm if the average time is > 0s.

### 5.3.4 How to set up averaging when doing measurements
4.   Select the menu button [ Params ]
5.   Select the submenu button [ Avging… ]
6.   Use the wheel or up/down-buttons to set the number of seconds for averaging. Example: When selecting 2 in the "Average"-field, the calculations shown, and stored in log files, are based on the average of the two last seconds. Select the [ Set ] – button to do the actual setting of the averaging. Select the [ Off ] – button if you do not want any averaging

Note: The averaging applies to all parameters except for DDM when DDM LP Time Constant is > 0s. If DDM LP Time Constant is 0.0s, averaging also applies to DDM.

### 5.3.5 How to set the correct attenuation

1. Select the menu button [ Params ]
2. Select the submenu button [ Atten… ]
3. Select any of the predefined attenuator settings, or select [ Auto ] if you want the instrument itself to determine how much attenuation is needed

## 5.4   How to do procedure measurements

A procedure consists of parameter data sets and marks, all marked with timestamps that are stored in the instrument. Procedures are either of run-type or measure-type.

- The run-type (i.e. CL Run) is used when measuring continuous data
- The measure-type procedures are used when you want to store data only at specified marks

The procedures should be defined prior to running it (default procedures exist in the instrument). This must be done via the built in WEB server, see 5.4.1.

CL-run (10 samples/sec): To be used when carrying out a DDM recording along the centre line of the RWY. When the recording starts, the speed of the car must be selected. This is to make it possible to do post processing of the measurement accordingly to the ICAO recommendations. Recommended speed is 60 km/h.

Predefined marks for indication of the position on the RWY should be put in.

The raw data is being stored.

CL meas: To be used for making spot measurements along the centre line.

CrossOver-run (10 samples/sec): When a continuous recording of a crossover can be carried out this is the procedure to be used. Predefined marks for different azimuth angles can be used to indicate the position. Recommended speed to capture all information is 5-10 km/h.

CrossOver meas: To be used when carrying out ground plots for LLZ at predefined points. The marks should be defined before carrying out the procedure.
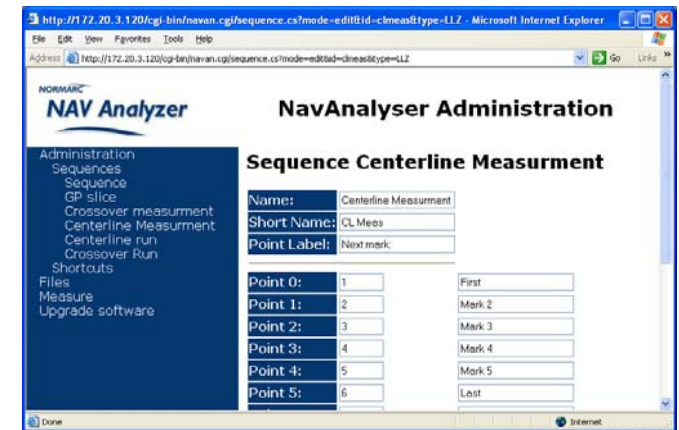


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GP slice: To be used if an erectable antenna for measuring the GP signal at different heights at threshold is available. The different heights should be defined as marks before the procedure is carried out.

### 5.4.1 To define a procedure

1. Connect the NAV Analyzer to a computer (see 5.6)
2. When connected, select "Sequences" on the left side menu
3. Select a procedure, i.e. CL Run (Centreline run)
4. Define name, label and points (predefined marks)

5.  Select the [ Save sequence ] to store the procedure

### 5.4.2 To run a procedure

1. Select the correct operating mode of the instrument (see 5.1)
2. Select the submenu button [ Other meas. ]
3. Select the wanted procedure
4. Select the [ Start ] – button to start the procedure
5. Insert marks according to the procedure by hitting the [ Store ] – button
6. End the procedure by selecting the [ Stop ] – button
7. To skip a mark select the [ Skip ] – button

### 5.4.3 File format of procedures

The saved file is an ASCII file with the following formats.

```
CL-run:
# speed=-1 interval=1 ms=MeasureSource: "LLZ" freq = 110300, att = -1, avg = 0, icao_tc = 1.542000,
wheel_length = -1, posref = 3
2007-11-20 12:55:07.27 ddmai=0.000;sdm=12.666;rf=-104.147;
2007-11-20 12:55:07.37 ddmai=0.000;sdm=12.179;rf=-103.806;
2007-11-20 12:55:07.47 ddmai=0.000;sdm=12.459;rf=-104.004;
2007-11-20 12:55:07.57 ddmai=0.000;sdm=11.656;rf=-103.425;
2007-11-20 12:55:07.67 ddmai=0.000;sdm=12.582;rf=-104.089;
2007-11-20 12:55:07.77 ddmai=0.000;sdm=12.025;rf=-103.696;
2007-11-20 12:55:07.87 ddmai=0.000;sdm=13.013;rf=-104.382;
2007-11-20 12:55:07.97 ddmai=0.000;sdm=12.969;rf=-104.352;
```

The file can easily be imported in to a spreadsheet for making curves of the logged data.

## 5.5   How to log data to a file

1. Select the correct operating mode of the instrument (see 5.1)
2. Select [ Measure ]
3. Select [ Continuous log ]
4. Select the [ Interval ] – button to set the interval between each record measured.  The number specifies the interval between logging to the log file. By using the wheel, you may select 0-2 seconds interval in 0.1s steps, 2-10 second intervals in 1s steps, 10-60 second intervals in 10s steps or 60-600 second intervals in 60s steps
5. Select parameters for logging. Use the wheel or the up/down-buttons to select parameter, and then select the [ Log ] – button to enable/disable logging of that parameter. For viewing the parameter live on the screen while logging, use the [ Show ] –button
6. The log files are named as follows:
   <System>-<Frequency>-<Date>-<Serial number>.
   Example: LLZ-110.300-2004-08-20-2
7. Select [ Start ] to start logging to the log-file
8. Select [ Stop ] to stop logging to the log-file
9. Selecting [ Start ] again starts recording to another file with the following serial number according to the naming convention described above

## 5.6 How to connect to a computer through the network interface

The instrument has a built-in web server that can be accessed through the LAN connector at the back.
A connection can either be done directly to a computer or to a computer via a network with DHCP server. When connecting directly to a computer, the NORMARC 7710 may be set up as a DHCP-server, thereby simplifying the connection.

The following two paragraphs describe the setup for the instrument and the computer. Please refer to the paragraph that is relevant for your setup.

### 5.6.1 Connecting to a computer (Win XP) with NORMARC 7710 as DHCP-server

This connection procedure should only be used when not connected to any existing network. The reason for this is that there should only be one DHCP-server in a network. The computer must be turned on when setting up the NORMARC 7710 as server.

1. Turn on the instrument
2. Connect the instrument to the computer with the crossed network cable. You may also use a switch between the instrument and the computer
3. Press the [ Setup ] – button
4. Press the [ Network ] – button
5. Press the [ Enable server ] – button
6. Within approx. 15s the instrument should enter the DHCP-server role with IP-address 172.16.16.150
7. After a while the connected computer should get an IP-address from the DHCP-server in the instrument
8. If an existing network with a DHCP-server is detected, you will get an error message and the DHCP-server will not start

### 5.6.2 Connecting directly to a computer (Win XP)

1. In the browser used for connecting to the instrument, turn off the use of Proxy servers.

   In IE this can be done by Tools – Internet Options – Connections – LAN Settings... and deselecting the Proxy server box.

   See figure on next page

Disable this option
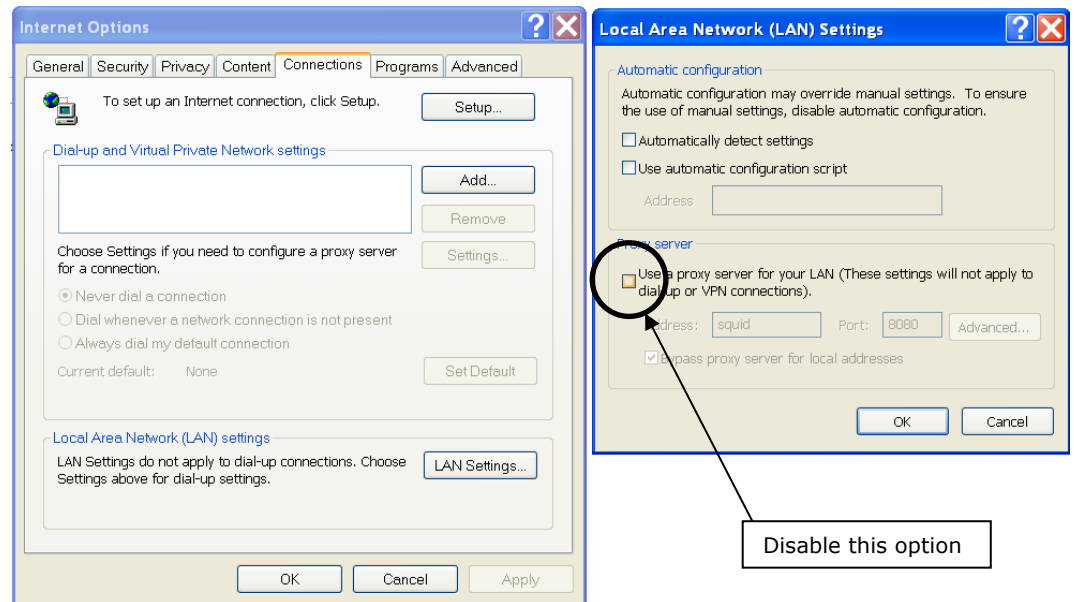
2. Turn on the instrument
3. Connect the instrument to the computer with the crossed network cable
4. Press the [ Setup ] – button
5. Press the [ Network ] – button
6. Check that the instruments IP-address is within the APIPA (Automatic Private IP Addressing) range (169.254.0.0-169.254.255.255). If necessary the address can be set by using the navigation buttons and wheel on the right side of the instruments front panel.
   Proposed address: 169.254.1.200
7. Check that the instruments Subnet mask is 255.255.0.0. If necessary set it.
8. Check that the Gateway mask is 0.0.0.0. If necessary set it.
9. If any of the above settings have been changed, press [ Init network ]
   The instrument will show "Gateway not found" – this is normal
10. It may take up to three minutes from a LAN cable is connected between the instrument and the computer and until XP has reset its IP address to an address in the APIPA (Automatic Private IP Addressing) range (169.254.0.0-169.254.255.255). An communication can not be established before this is done.
    The IP address of the computer can be checked by the following method:
    a. Go to Start menu and select "Run"
    b. Start a Command Prompt window by typing *cmd* and click OK
    c. At the command prompt, type *ipconfig* and press Enter
11. After the computer has got the correct IP address, start the web browser in the computer
12. In the address field of the browser, type the *<IP address of the instrument>*. Example: 169.254.1.200
13. The browser should show the page "NavAnalyser Administration" See picture on next page.

### 5.6.3 Connecting via network with DHCP server

1. Turn on the instrument
2. Connect the instrument to the computer with a normal network cable (not supplied)
3. Press the [ Setup ] – button
4. Press the [ Network ] – button
5. Press [ Dhcp on ] and then [ Init network ]. The IP-address assigned by the DHCP server will in a few seconds be shown in the address field
6. By using another computer in the network, start a web browser
7. In the address field of the browser, type *<IP address of the instrument>*.
8. The browser should show the page "NavAnalyser Administration"



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## 5.7   File management

1.   Press the menu button [ Setup ]
2.   Press the submenu button [ File… ]
3.   Highlight a file
4.   To delete the file, press the submenu button [ Delete ]
5.   To view marks set in a file, press the button [ View Marks ]

## 5.8   How to upgrade the NAV Analyzer software

Se section 7.3

# 6        Menu reference

The buttons for selecting the main functions are Located below the screen. Each main function has one menu on the right side of the screen. When the menu commands exceed the number of available menu items, there might be a [ More… ]-button for accessing the rest of the menu items. In addition some menu items lead to sub menus when pressed.

## 6.1   Power menu

Pressing the **Power** button below the screen accesses the power menu. The menu items are:

| 1 | [ Off ] | Turning off the instrument |
|---|---|---|
| 2 | [Sleep ] | Let the instrument go into sleep mode |
| 3 | [Backlight Inc ] | Increase the screen backlight intensity |
| 4 | [Backlight Dec ] | Decrease the screen backlight intensity |
| 5 | [Backlight Off ] | Turn off the screen backlight |
| 6 | | Not used |
| 7 | | Not used |
| 8 | | Not used |

## 6.2   System selection and frequency setup

Pressing the **System/Frq** button below the screen accesses the system selection and frequency setup menu.
 The menu items are:

| 1 | [ Choose system ] | Choose if you want to measure LLZ, GP, MKR or VOR. Subsequently you will be asked for the frequency for the selected system. |
|---|---|---|
| 2 | [ Scan freq. ] | Let the instrument scan through the frequency range to find a used frequency |
| 3 | * | * Available for user-defined setup shortcuts |
| 4 | * | * Available for user-defined setup shortcuts |
| 5 | * | * Available for user-defined setup shortcuts |
| 6 | * | * Available for user-defined setup shortcuts |
| 7 | * | * Available for user-defined setup shortcuts |
| 8 | [ More … ] | Show more user-defined setup shortcuts if more than can be fitted into this page |

## 6.3 Measurements

The submenus here depend on what type of signals you have set up (see. 6.2)

### 6.3.1 When measuring LLZ

If you select the Localizer (see. 6.2), by pressing the **Measure** button below the screen, the LLZ measure menu is accessed. The submenus at the right side of the screen are:

| 1 | [ DDM/SDM ] | Measure primary parameters DDM/SDM |
|---|---|---|
| 2 | [ Mod 90/150 ] | Measure level of each modulation tone and RF-level |
| 3 | [ Ident ] | Measure the ident modulation level, the ident code and the ident frequency. |
| 4 | [ LF Param ] | Measure phase difference between LF tones |
| 5 | [ Meas. Freq ] | Measure 90/150Hz freq., carrier frequency offset from nominal value and ident freq. |
| 6 | Distortion | Measure 2. harm, 3. harm and THD for 90Hz and 150Hz |
| 7 | [ Other meas. ] | Access the stored procedure measurements (like CL run, crossover etc.) |
| 8 | [ Continuous log ] | Start logging continuously |

When [ Other meas. ] is pressed you can select the stored procedures for the LLZ system.
These procedures may look like the following:

| 1 | [ CL Run ] | Centreline run |
|---|---|---|
| 2 | [ CL Meas ] | Centreline measurement |
| 3 | [ Cross Meas. ] | Crossover measurement |
| 4 | [ Cross Run ] | Crossover run |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |

### 6.3.1.1    CL Run – Selecting position reference

If you have selected CL Run, you must select what kind of position reference you will use for distance measurements. The choices are Fixed speed, Tachometer and GPS.

| 1 | Set speed | Use this when you will drive the CL run at a fixed speed. Select the speed (km/h) by the use of the wheel or the up/down button before selecting Set speed |
|---|---|---|
| 2 | Use Tachometer | Use this option when you have connected a tachometer to the AUX-port on the rear of the NORMARC 7710. After selecting this option, you will be requested for the corresponding distance (mm) between each pulse from the tachometer. The pins used are:<br>Pin 5 : GND<br>Pin 8 : Tachometer signal in (note that this pin is also used when connecting a GPS-receiver)<br>Tachometer signal requirements:<br>  - TTL-compatible (Vol<0.6V, Voh>2.4V)<br>  - Minimum pulse length: 1ms<br>  - Signal frequency range: 5-50Hz |
| 3 | Use GPS | Use this option when you have connected a GPS-receiver to the AUX-port on the rear of the NORMARC 7710. The pins used are:<br>Pin 5 : GND<br>Pin 7 : TxD – RS232 data out from NORMARC 7710<br>Pin 8 : RxD – RS232 data in to NORMARC 7710 (note that this pin is also used when connecting a tachometer unit) |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | Cancel | |

## 6.3.2 When measuring GP

If you select the Glide Path (see. 6.2), by pressing the **Measure** button below the screen, the GP measure menu is accessed. The submenus at the right side of the screen are:

| 1 | [ DDM/SDM ] | Measure DDM/SDM |
|---|---|---|
| 2 | [ Mod 90/150 ] | Measure level of each modulation tone and RF-level |
| 3 | [ LF Param ] | Measure phase difference between LF tones |
| 4 | [ Meas. Freq ] | Measure 90/150Hz freq., carrier frequency offset from nominal value and ident freq. |
| 5 | Distortion | Measure 2. harm, 3. harm and THD for 90Hz and 150Hz |
| 6 | | |
| 7 | [ Other meas. ] | Access the stored procedure measur |
| 8 | [ Continuous log ] | Start logging continuously |

When [ Other meas. ] is pressed you can select the stored procedures for the GP system.
These procedures may look like the following:

| 1 | [ GP slice ] | Same as CL Meas, but data is logged at certain positions on a vertical axis. |
|---|---|---|
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |

### 6.3.3 When measuring MKR

If you select the Marker Beacon (see. 6.2), by pressing the **Measure** button below the screen, the MKR measure menu is accessed. The submenus at the right side of the screen are:

| 1 | [ Mod depth ] | Measure modulation depth for 400Hz, 1300Hz and 3000Hz in addition to RF Level |
|---|---|---|
| 2 | [ Meas. Freq ] | Measure the 400Hz, 1300Hz, 3000Hz and carrier frequency offset from nominal value (75MHz). |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | [ Continuous log ] | Start logging continuously |

## 6.3.4 When measuring VOR

If you select the VOR (see. 6.2), by pressing the **Measure** button below the screen, the VOR measure menu is accessed. The submenus at the right side of the screen are:

| 1 | [ FMI/Bearing ] | Measure primary parameters FMI and bearing |
|---|---|---|
| 2 | [ Mod depth ] | Measure modulation depth for 30Hz and 9960Hz in addition to RF Level. |
| 3 | [ Ident ] | Measure ident modulation and frequency |
| 4 | [ Meas. Freq ] | Measure frequencies (9960Hz, carrier offset from nominal value, 30Hz and 30Hz subcarrier) |
| 5 | | |
| 6 | | |
| 7 | [ Other meas. ] | Access the stored procedure measur |
| 8 | [ Continuous log ] | Start logging continuously |

When [ Other meas. ] is pressed you can select the stored procedures for the VOR system.
These procedures may look like the following:

| 1 | [ VOR Seq ] | Define points in sequence, and run sequence procedure |
|---|---|---|
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |

## 6.4  Parameter setup

Pressing the **Params** button below the screen accesses the parameter setup menu. The submenus at the right side of the screen are:

| 1 | [ µA ] | |
|---|---|---|
| 2 | [ % DDM ] | |
| 3 | | |
| 4 | | |
| 5 | [ 150Hz dom ] | Select whether to calculate SDM as Mod150Hz-Mod90Hz, or as Mod90Hz-Mod150Hz. Pressing this button will start a screen where you can select 150Hz or 90Hz dominance |
| 6 | DDM LP... | Brings up the DDM low pass filter settings where you may set the time constant for the low pass filter. The range is from 0.0s (off) to 60.0s, and the resolution is 0.1s from 0.0-10.0s and 1.0s above 10s. The DDM filter applies to DDM only, and only when the value is greater than 0.0s. This filter overrides the average filter when the settings is greater than 0.0s |
| 7 | [ Avging... ] | Brings up the averaging screen where you may set the number of seconds to calculate parameter average from. I.e. 2 means that the parameters shown/logged is based on the average of the last two seconds. This filter works on all parameters except for DDM when the DDM LP time constant is greater than 0.0s |
| 8 | [ Atten... ] | Brings up the attenuation screen where you may select attenuation as Auto or 0-30dB in steps of 10dB |

## 6.5 System

Pressing the **Setup** button below the screen accesses the system setup menu. The submenus at the right side of the screen are:

| 1 | [ Set ] | The actual setting of the date/time set by the up/down/left/right arrows and the wheel. |
|---|---------|------------------------------------------------------------------------------------------|
| 2 | | |
| 3 | [ File… ] | Enter the file menu where you may do file operations like deleting log-files etc. |
| 4 | [ Screen ] | Set the screen blank-out time |
| 5 | [ Audio ] | Set audio out level for audio connector on rear panel |
| 6 | [ Aux ] | Select signal out on audio test pin (pin 4 on RS-232 connector). The options are audio (DC-coupled audio without high pass filter) and IF (band pass filtered and decimated, 200kHz). The IF signal level can be adjusted in this submenu. |
| 7 | [ Serial… ] | Brings up the serial port setup screen where you may set baud rate, parity etc. |
| 8 | [ Network… ] | Enters the network screen where you can select DHCP, IP-address, server mode, Netmask and Default Gateway. |

# 7 Maintenance, calibration and software updates

## 7.1 Maintenance

### 7.1.1 Batteries

The battery pack is rechargeable. When the batteries are worn out or damaged, they should be replaced. To do this, remove the back cover (see fig) and replace the batteries with equivalent types (NiMH, size D, rechargeable 10.000mAh).

### 7.1.2 Charging, maximum temperature

The instrument does not accept charging of the batteries for an ambient temperature above 35 deg C for a longer time due to the function of the battery protection circuit.

### 7.1.3 Charging problems

If the instrument does not turn on (even with the external power connected) or if the experienced battery time is much shorter than expected it might be that one or more of the battery cells have a too low voltage. There are several reasons for this to happen:
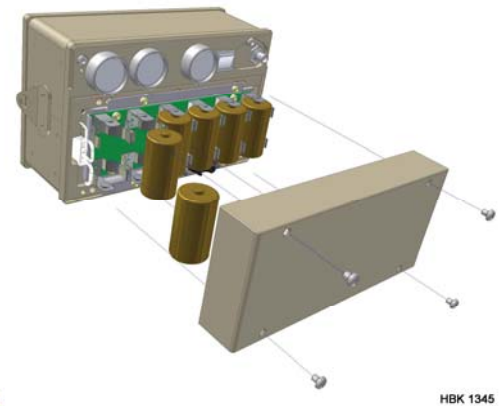
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**Self discharge**
When NiMH batteries have not been used for a long time they will self-discharge. The voltage on the cells will typically be < 1.0V. To fix this, restart the charge cycle once every five minutes a few times. Turning off and on again the external power restarts the charge cycle. If the cell voltage is still < 1.0 volt, replacing the batteries should be considered.

**Overcharged**
Batteries that are overcharged will be damaged, causing the cell voltage to drop quickly.

**Aging**
The battery life is limited. The battery capacity decreases little by little as it's been used, and when time passes. The battery life varies depending on storage, operating conditions and environment, and is different for each battery.

## IMPORTANT NOTE!!!

- **Do not charge the batteries at high temperatures. This will reduce the life time and capacity of the batteries**

- **Do not charge fully charged batteries. Every time the external power is connected, a new charge cycle will be initiated. If the batteries are never discharged, this repeated new charge cycle will eventually over-charge and damage the batteries. It is recommended to disconnect the battery connector (white connector on the figure above) on the battery board if the batteries are never discharged (e.g. when always installed in a car.)**

- **Do not mix new and old batteries. When replacing the batteries, replace all of them**

- **Alkaline batteries can be used instead of the supplied rechargeable NiMH batteries. Do not charge alkaline batteries!**

**If these recommendations are not followed there are a danger of leaks, excessive heat, explosions and electric shock.**

### 7.1.4 Use of alkaline batteries

Alkaline batteries have normally lower capacity compared to the supplied NiMH batteries.
The supplied NiMH-batteries have a capacity of 10.000mAh.
Battery performance differs greatly depending on the manufacturer and the type of battery. The battery life may be very short, especially at low temperatures.
The battery indicator on the instrument does not display the correct information when using alkaline batteries.
**Do not charge alkaline batteries!**

### 7.1.5 Corrective maintenance

Except for replacement of batteries, Northrop Grumman Park Air Systems should do all corrective maintenance.

## 7.2   Calibration

The instrument as delivered from factory is ready for use.

The only adjustable setting is for RF level for each of the frequency bands MB, LLZ/VOR and GP. No other parameters are subject to adjustment.

Northrop Grumman Park Air Systems recommend a 36-months (three years) calibration interval. A Test Record Form for calibration can on request be obtained from Northrop Grumman Park Air Systems.

## 7.3   Software Updates

New functions and enhanced functionality may be added to the instrument by upgrading the software. Information about software versions and how to download them can be found on the company's web page or by sending a request to support at:

normarc.support@no.parkairsystems.com

The procedure for upgrading the software is as follows. This procedure assumes that the new software is already located on your computer.

1.  Make sure that the batteries are fully loaded, or connected to the charger
2.  Connect the NAV Analyzer to the computer (see How to connect to a computer through the network interface)
3.  Select the "Upgrade software" link on the left side of the computer (PC) browser screen
4.  Select the "Browse"-button to Locate the new software
5.  Select the "Upgrade"-button to do the upgrade
6.  Wait until a message like "Upgrade of NAV Analyzer was successful" appears together with an upgrade log
7.  Turn the instrument off and on again

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