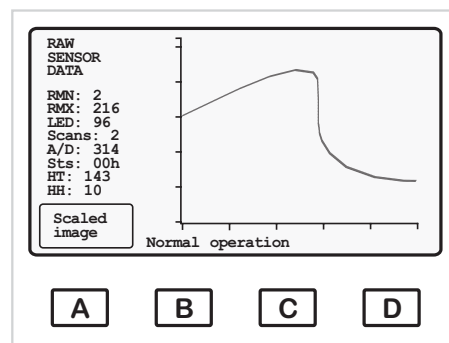


# 1 Troubleshooting and correcting sensor problems

The `Calibrate` branch of the command tree contains a set of consequent displays that can be used to troubleshoot sensor problems. Each display contains some important values that can give you clues to where the problem might be.

## 1.1 LED value

Check the LED value that tells you how the light source in the sensor is doing. The LED value is given in the Optical image display, available through the commands `Calibrate / Optical image`.



**Figure 1.1** Checking the LED value

A **good LED value** is in the **range 20-150**. The most common reason to a **LED value higher than 150** is that prism is coated. It is also possible the prism has been destroyed with an overactive steam wash. Check the wash times and (especially if the wash time exceeds 3 s) the prism surface. Replace the prism if the surface is damaged.

If the process is very hot, it is also possible that the light source LED wears out after many years' constant use and needs replacing. Also leakage into the sensor can destroy LEDs (and everything else inside the sensor housing). However, normally the LEDs last as long as the sensor and high LED values indicate a prism problem.

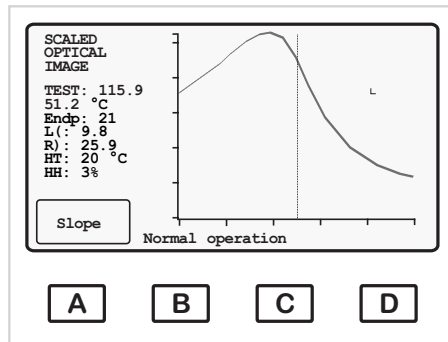
It is very unusual for the LED value to be lower than 20, but in theory this can be caused by light from outside reaching the prism e.g. because the pipe is translucent.

## 1.2 Sensor temperature and humidity

Checking the conditions inside the sensor head will give you an idea whether there's is a real physical problem. The Scaled image (`Calibrate / Optical image / Scaled image`) shows you both the internal sensor temperature and humidity.

The **HT value** gives you the sensor temperature and should be **below 60 °C**. If the value is over this limit, the measurement may not be accurate and the sensor needs to be cooled more effectively.

The **HH value** gives the humidity level inside the sensor and should be **lower than 10 %**. Most commonly a higher humidity level indicates a leak in the sensor. If the sensor is subjected to big temperature changes,



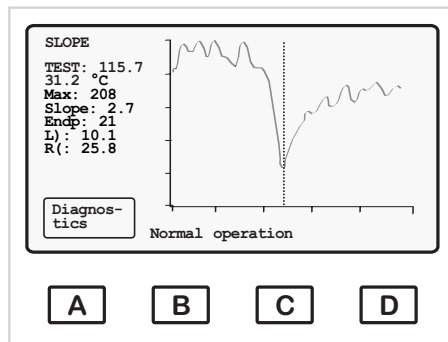
**Figure 1.2** Scaled image

condensate can cause humidity problems. If this is the case, the problem can be solved by replacing the dryer unit inside the sensor.

### 1.3 Slope value

The Slope display (Calibrate / Optical image / Scaled image / Slope) shows you the slope image and also gives the **Slope value** as a number. A **good slope value** is above **1.5**. If the slope value drops **near 1.0**, something is wrong with the prism:

- Prism is coated *or*
- Prism surface is not good *or*
- Prism gaskets leak and process liquid gets in by the prism sides



**Figure 1.3** Slope display

Prism coating can be prevented by good process flow, high process temperature or prism wash. If your system already has prism wash, the wash interval can be decreased.

**Important:** The maximum wash times are given in Table 1.1. Do not use a longer continuous wash time, instead you can try washing more often.

Wash type	Time	Pressure	Recovery	Interval
Steam wash	3-5 sec.	5-6 bar (psi)	20-30 s	20-30 min
High pressure water wash	10-15 sec.	20-30 bar (psi)	20-30 s	10-20 min

**Table 1.1** Recommended prism wash times for the PR-03 sensors

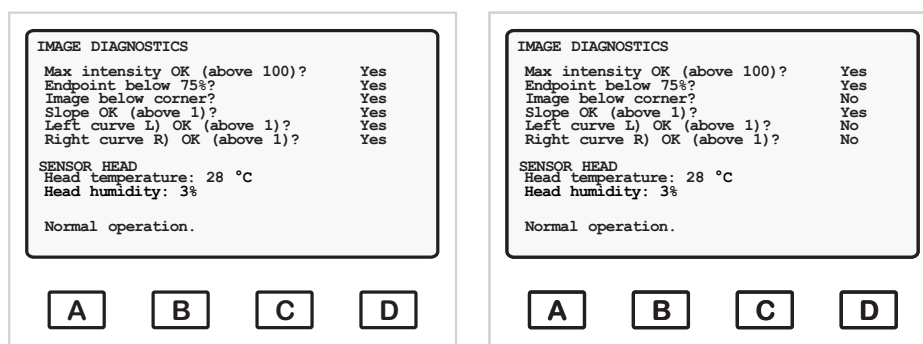
If prism surface is damaged, for example something in the process has abraded the prism or the wash time has been long, replace the prism and adjust the prism wash or other conditions so that the prism doesn't get damaged.

If prism gaskets leak, replace them and all the sensor parts that have been damaged by the process liquid inside the sensor.

## 1.4 Image diagnostics

The last tool in this branch of the selection tree is the Image diagnostics display, available through Calibrate / Optical image / Scaled image / Slope / Diagnostics. If the answer to all the questions in this screen is Yes (Figure 1.4), the sensor head temperature and humidity are below the limits and the message is Normal operation, your refractometer system should be in working order.

**Note:** If the system is offline, some of the image diagnostics questions will get No for an answer even in a working system (Figure 1.4).



Inline image diagnostics (= process).

Offline image diagnostics (= in air).

**Figure 1.4** Image diagnostics display

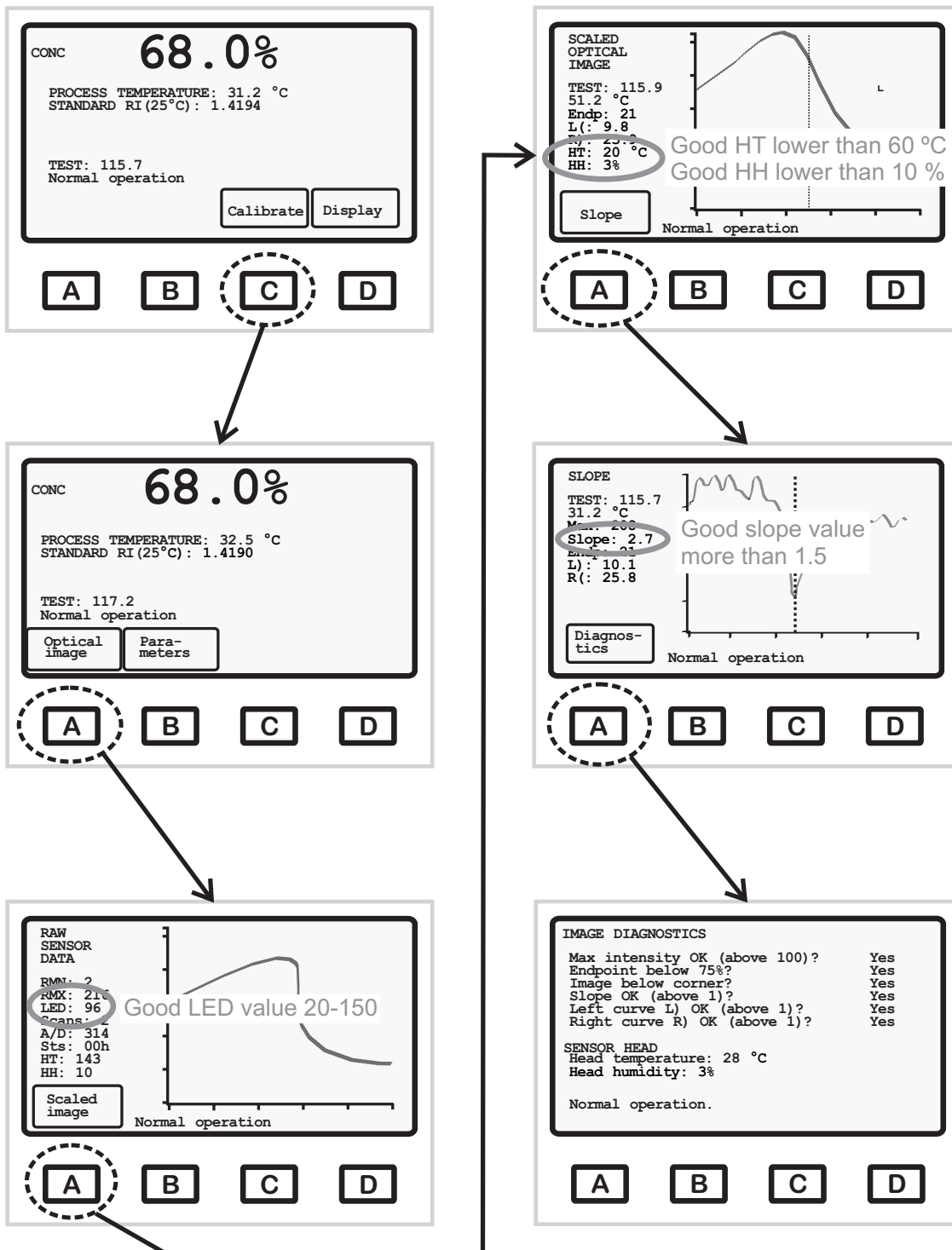


Figure 1.5 Troubleshooting your refractometer system with IT-R