

User Guide

Field Communicator
FC-11

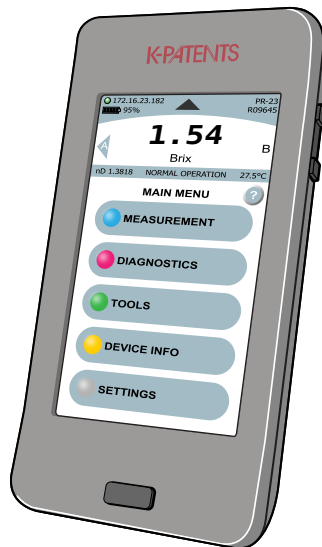


Table of contents

1	Description	1
1.1	Kit contents	2
1.2	FC-11 parts	3
2	Connecting to the refractometer system	4
2.1	Connecting to a PR-43 refractometer	4
2.2	Connecting to a PR-33-AC refractometer	5
2.3	Connecting to a PR-33-S refractometer	5
2.4	Connecting to an Indicating transmitter DTR / a PR-23 system	5
2.5	Connecting to a Divert Unit / a DD-23 system	6
2.6	Connecting to a computer via USB	6
2.6.1	Accessing data on FC-11	7
2.7	Connecting to a network	7
2.8	Initiating the connection	7
3	Functionality	9
3.1	Using FC-11	9
3.1.1	Powering on and off	9
3.1.2	Battery and charging	9
3.1.3	Touch screen display	10
3.1.4	Command structure	11
3.2	Viewing and logging process data	12
3.2.1	View measurement	12
3.2.2	View optical image	13
3.2.3	Logging process data	14
3.3	Viewing and changing the instrument(s)	16
3.3.1	Instrument diagnostics	16
3.3.2	Changing instrument parameters	16
3.3.3	Instrument verification	17
3.3.4	Instrument hardware and software information	17
3.3.5	Instrument backup and restore	17
3.3.6	Field calibration	18
3.4	FC-11 settings	18
3.5	Service mode	19

3.5.1	Entering service mode	19
3.5.2	Instrument program update	20
3.5.3	Exiting service mode	20
4	Maintenance and troubleshooting	21
4.1	Maintenance	21
4.1.1	Updating FC-11 software	21
4.2	Troubleshooting	22
4.3	Disposal	22

1 Description

FC-11 Field Communicator is a hand terminal for controlling Vaisala K-PATENTS® process instruments remotely. Field Communicator is a perfect solution when you want to view and log the measurement or diagnostics data or trends, or need to configure or verify your refractometer in field environment. The device has a touch screen and the user interface is like that of smartphones.

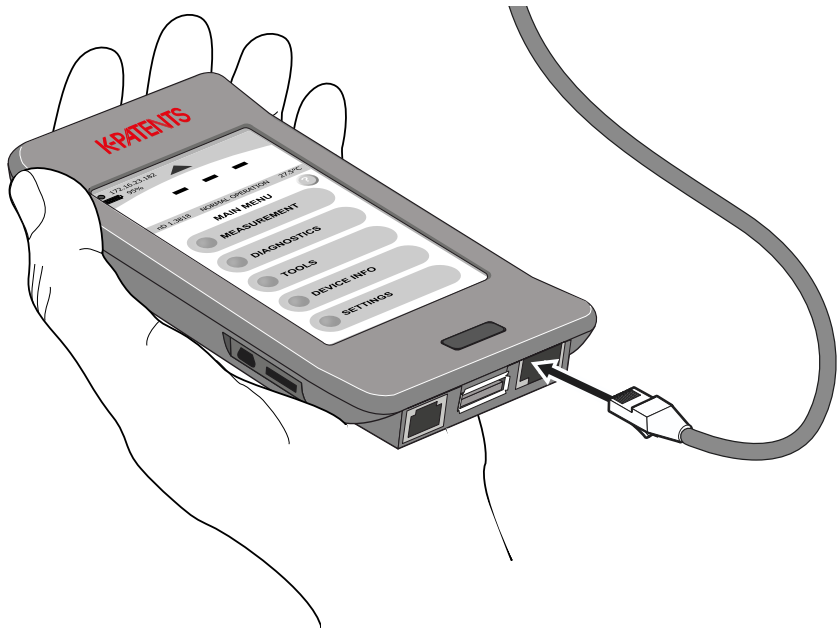


Figure 1.1 Using FC-11

1.1 Kit contents

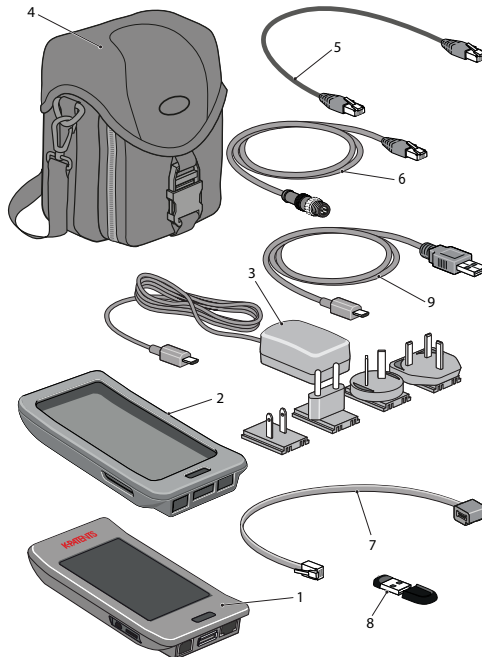


Figure 1.2 FC-11 kit contents

1. FC-11 Field Communicator
2. PR-8817 Protective rubber cover
3. PR-8815 Micro-USB charger
4. PR-8812 Carrying case for FC-11 Field Communicator
5. PR-8814 Ethernet cable, RJ-45 10/100, 0.5 m / 1.6 ft
6. PR-8330-001 Ethernet cable for PR-33-AC, 1 m / 3.3 ft
7. PR-8811 Power adapter cable for PR-23 Indicating transmitter DTR
8. PR-8818 USB memory stick
9. PR-8813 Standard USB to micro-USB cable, 0.5 m / 1.6 ft

All kit items are also available as spare parts.

1.2 FC-11 parts

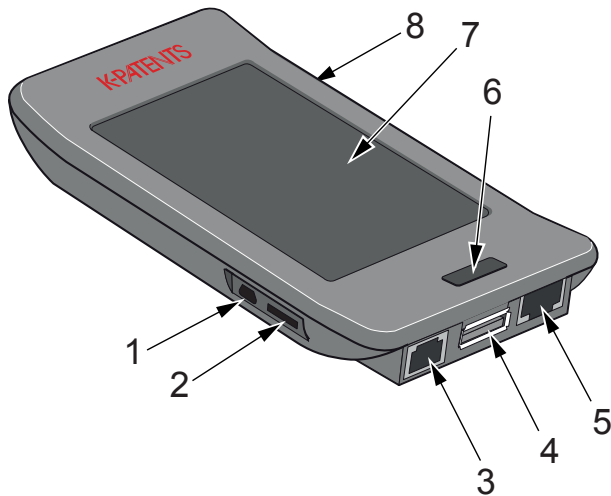


Figure 1.3 FC-11 parts

1. Micro-USB connector (for charging and connecting to a computer)
2. *not in use*
3. DTR power connection
4. USB connector (for a memory stick)
5. Ethernet connector
6. Button
7. Touchscreen
8. *not in use*

2 Connecting to the refractometer system

Field Communicator FC-11 can be connected and disconnected without shutting down either the refractometer system or the communicator.

2.1 Connecting to a PR-43 refractometer

If connecting directly to a PR-43 refractometer, use Split Cable PR-8444. If the refractometer is connected to a network, connect via a network hub/switch with a standard RJ-45 Ethernet cable. If you want to connect to a Compact user interface CI or to a Multichannel user interface MI, Ethernet Cable for Interfaces PR-8330 is needed.

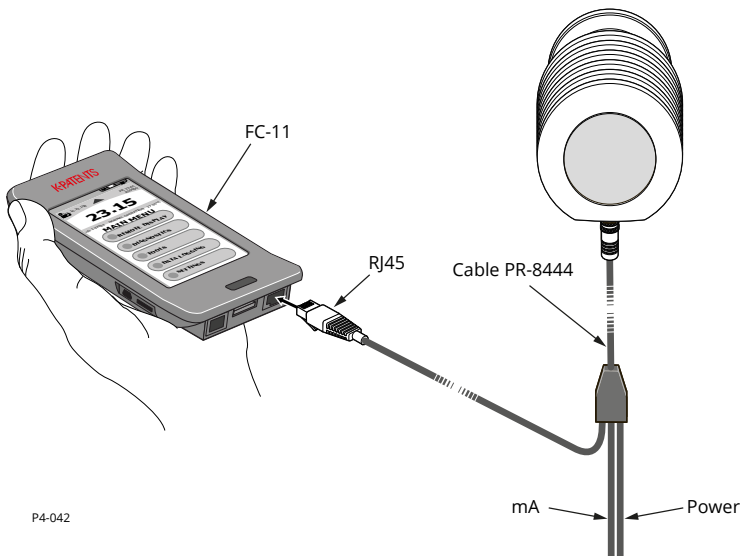


Figure 2.1 Connecting to a PR-43 refractometer

In a Vaisala K-PATENTS junction box Ethernet Cable PR-8822 is used to connect with FC-11. A Power Cable PR-8819 can be used to power the FC-11 from the junction box and there's a cradle where FC-11 can be placed and left to log inside the junction box (see the junction box manual for further information).

2.2 Connecting to a PR-33-AC refractometer

The connection is made over ethernet with the PR-8330-001 cable for the PR-33-AC refractometer. If you want to keep the PR-33-AC connected to another device or network, the connection can also be made to a network hub/switch with a standard RJ-45 Ethernet cable.

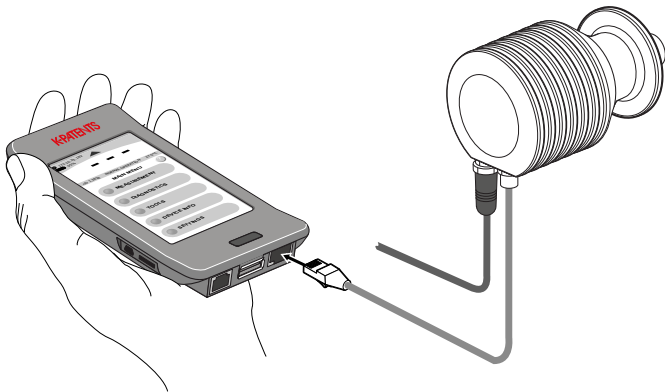


Figure 2.2 Connecting to a PR-33-AC refractometer

2.3 Connecting to a PR-33-S refractometer

With stand-alone installations, connect the Field Communicator with a standard ethernet cable to the PoE switch that powers the refractometer(s). If your refractometer(s) are in a factory network, connect to the network with a standard ethernet cable.

2.4 Connecting to an Indicating transmitter DTR / a PR-23 system

The connection is made with a standard ethernet cable. One end of the cable is plugged into your transmitter's ethernet output, the other end goes into the FC-11.

Power Adapter PR-8811 is connected to (3) on the handset and to the EXTENSION connector in the DTR.

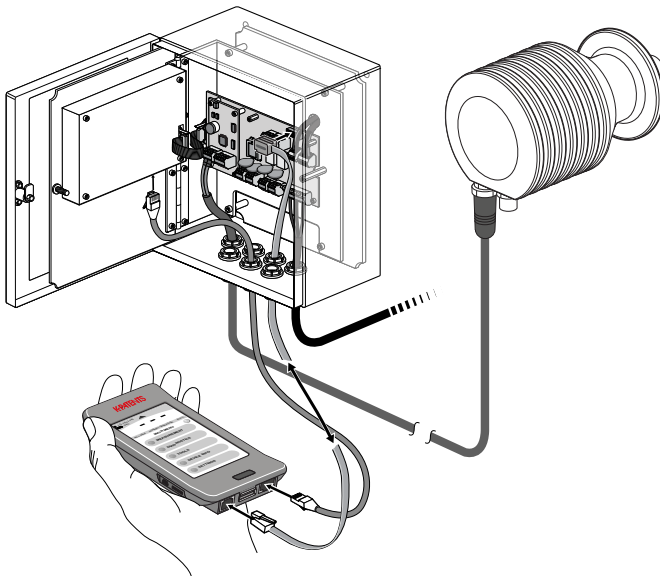


Figure 2.3 Connecting FC-11 to a DTR

Note: The FC-11 fits inside the PR-23 Indicating Transmitter enclosure even when connected and can be left inside the DTR enclosure e.g. to log data.

2.5 Connecting to a Divert Unit / a DD-23 system

Connect the FC-11 with a standard ethernet cable to the ethernet output connector in the DD-23 Divert Unit. **Note:** Some of the FC-11 features are not accessible when it is connected to a Divert Unit.

2.6 Connecting to a computer via USB

When connected to a computer with a standard USB to micro-USB cable, the FC-11 Field Communicator becomes visible as an external hard disk. It works with most commonly used operating systems, e.g. Windows 7 or newer and Mac OS X 10.4 or newer. The cable also charges the FC-11 from the computer.

The FC-11 shows up on the computer as an external hard disk, allowing for easy downloading of log and data files. **Note:** Logging must be stopped before FC-11 is connected to a computer; it doesn't show up if logging is in process.

Note: If the use of USB devices is limited or blocked on the computer in question, the Field Communicator charges, but data cannot be accessed until the connection is allowed.

2.6.1 Accessing data on FC-11

The FC-11 prioritizes USB memory stick as data storage for logs, backups and updates. The internal memory is used only when there's no USB memory stick present.

To get access to FC-11's internal memory, connect the device to a USB slot on your computer with a standard USB to micro-USB cable. Plug the smaller connector (micro-USB) in the micro-USB slot (1) on the handset, then plug the USB connector into your computer. The FC-11 memory comes up as an external memory and you get access to all data in it.

Note: Remember to stop logging before you plug in the USB connector, or the FC-11 won't show up on your computer.

Once the USB connection has been established, you have access to all files on the FC-11 and can move, copy and delete files located in the instrument internal memory; you can also copy information, e.g. instrument update zips, to the FC-11. The folder and file names for instrument data always contain the instrument serial number for easy identification.

2.7 Connecting to a network

Use a standard ethernet cable to connect the FC-11 to a network hub/switch or a ethernet wall socket. Remember to plug in the charger.

2.8 Initiating the connection

If the FC-11 is not powered yet, turn it on by pressing the button (6) until the light turns red. When started, the Field Communicator automatically looks for an instrument in its default location. This works if the FC-11 is connected directly to a DTR or a PR-33

refractometer or a PR-43 refractometer. If no instrument answers communication attempts at the default location, a screen for setting a different IP appears, allowing you to set manually the IP address you want to connect to (e.g. an instrument in a factory network). A number pad appears on the touch screen for writing the IP address.

Note: If you restart the FC-11, it forgets the IP settings and a manually given IP address must be entered again.

3 Functionality

3.1 Using FC-11

3.1.1 Powering on and off

To turn on the FC-11, press the button (on the front) until the light around the button lights up.

Note: If the FC-11 is turned on, but doesn't get any other commands within 60 seconds, it shuts down. This prevents it from turning on accidentally.

To turn off the FC-11, press the button until the light around the button turns off. **Note:** You do not need to turn off the FC-11 to connect it to an instrument or a computer.

3.1.2 Battery and charging

The battery operation time is in active use around 2 hrs, longer when the screen is turned off most of the time (e.g. while logging data). The battery can be charged via micro-USB cable from a computer (see Section 2.6) or with the PR-8815 micro-USB charger from a wall outlet. When the Field Communicator is used with a PR-23 transmitter, it can be powered and charged with a PR-8811 power adapter cable directly from the transmitter. When a FC-11 is docked in a junction box, it can be powered from the junction box with a PR-8819 power cable. **Note:** The Field Communicator can not charge via the ethernet connector, not even when connected to a PoE switch.

3.1.3 Touch screen display

Field Communicator FC-11 has a fully functional touch screen display. Everything can be performed by tapping the screen, eliminating the need for an external input device. To advance in the menu tree (see section 3.1.4), tap a command. To go back to the previous menu, tap the little triangle on top of the screen or press the button briefly.

When the FC-11 is connected to an instrument, measurement values for the refractometer(s) and information about the connection are displayed at all times.

The IP address of the connected instrument is displayed in the upper left corner. The color of the light in front of the IP address indicates the status of the connection. Green light indicates that the FC-11 is connected to an instrument, yellow light indicates that the FC-11 is searching for an instrument and red light indicates that the FC-11 is disconnected. When the FC-11 is disconnected, the light around the button turns blue.

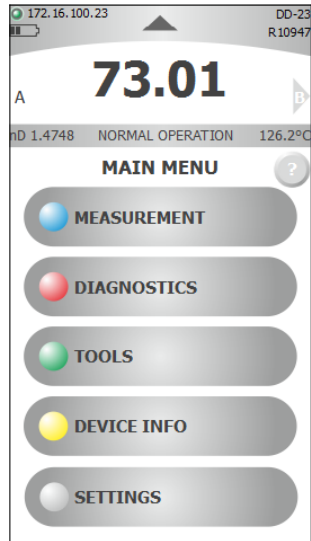


Figure 3.1 Main menu

In the upper right corner, the name and number of the connected instrument is displayed. If FC-11 is connected to a DTR with two sensors, it is possible to display values for each sensor by tapping A or B on either side of the measurement info. Concentration, refractive index n_D and temperature are displayed for the selected refractometer.

Refractometer status message is also displayed. If the process pipe is full, the message should be NORMAL OPERATION. NO SAMPLE indicates that the pipe is empty. For any other message, see the instruction manual for your instrument.

The FC-11 help is located on the right side of the page next to the menu name. The help symbol has the shape of a pushbutton with a questionmark.

3.1.4 Command structure

By default Field Communicator uses **general mode**. This is the command structure of the general mode:

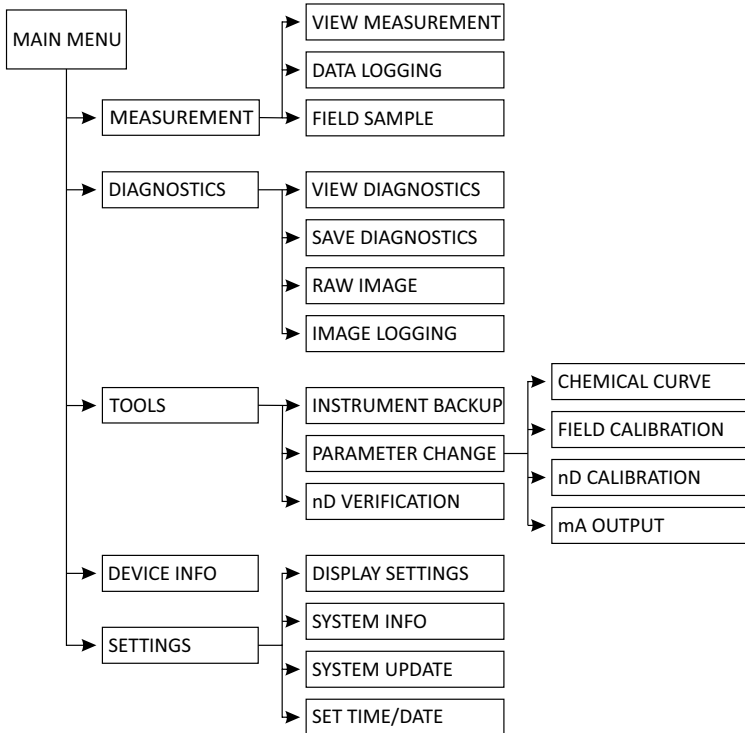


Figure 3.2 FC-11 command tree

Note: Depending on what type of instrument the FC-11 is connected to and what it is set to do, some functions may be unavailable.

3.2 Viewing and logging process data

3.2.1 View measurement

To view the real-time measurement, choose MEASUREMENT in the main menu, then go to VIEW MEASUREMENT.

The plotted measurement value can be changed by touching the grey area of the y-axis. The plotted measurement value can be either CALC, CONC, T or nD. CALC is the calculated concentration value without Field calibration adjustment, CONC is the final concentration value including field calibration adjustment. T indicates temperature, while nD is the refractive index value n_D of the refractometer.

The graph is automatically scaled based on measurement values. Time scale for the graph can be set to 3, 10 or 30 minutes. The time scale can be altered by touching on the grey area of the x-axis. The image can be dragged horizontally to see older data values.

Note: Measurement values older than 2 hrs are discarded from the real-time view.

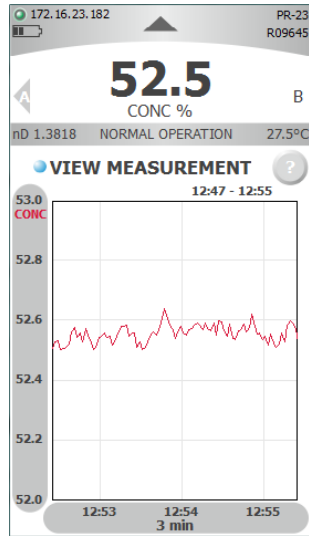


Figure 3.3 Measurement plot

3.2.2 View optical image

To view the optical image, choose DIAGNOSTICS in the main menu, then go to RAW IMAGE.

The raw image display shows the optical image of the refractometer on all CCD photocells. Use the + and - buttons to zoom. Areas outside the boundaries of the zoom area box can be displayed by dragging the image.

Tap the refresh button (left of + and -) to load the latest image from the refractometer. If you hold the refresh button for over 1 second, the FC-11 goes into **autoload mode**, in which new raw images are loaded as quickly as possible; the autoload speed depends on your refractometer system.

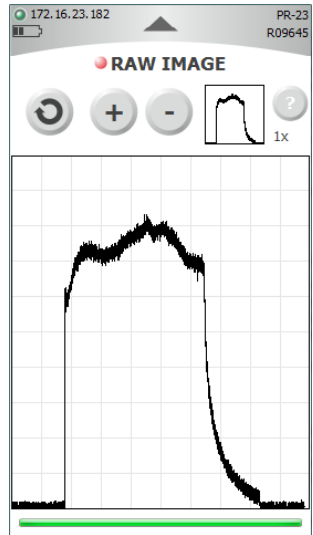


Figure 3.4 Raw image

3.2.3 Logging process data

You can log both process data and optical image information.

To log process data, choose MEASUREMENT in the main screen, then DATA LOGGING. Before starting the data logging, set the INTERVAL by touching the grey area. Default value for the interval is 10 seconds. Start logging by touching the START button.

The data is saved into a text file in the FC-11's internal memory, or on a USB stick, if available. If a USB stick is connected, data is automatically saved on it. If a USB stick is used, a blinking red line appears on the bottom of the display above the button.

Important: Do not disconnect an external memory (USB stick) while logging or you risk losing the log.

Note: If data logging is in process some functions are disabled, e.g. the TOOLS menu.

See section 2.6.1 for information on how to access logged data stored in the internal memory.

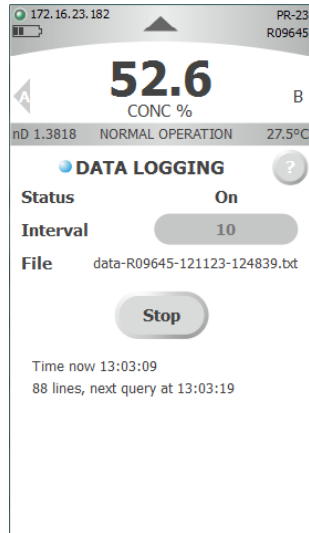


Figure 3.5 Ongoing data logging

Optical images can also be logged into text files. Go to DIAGNOSTICS in the main menu, then choose IMAGE LOGGING. Set the INTERVAL by tapping on the grey area. Default value for the interval is 10 seconds. Select the image type you want to log by tapping on the grey area next to the image type. Three types of images are available. It is only possible to select one image at a time. Start the logging by tapping START.

If a USB stick is connected to FC-11, the image files are saved on the stick. Otherwise the data is stored in the internal memory and can be accessed by connecting FC-11 to a computer, see Section 2.6.1. You can use for instance Excel to create a line graph from the text file (an optical image is simply a column of numbers).

Note: Minimum usage interval for raw image on a PR-23 is 4 seconds.

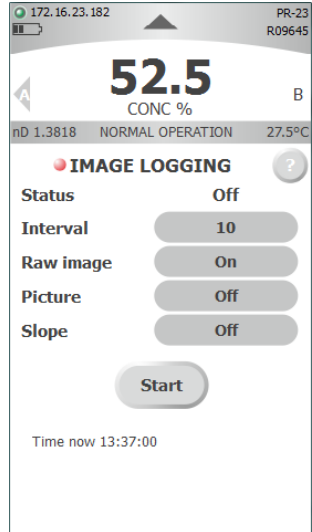


Figure 3.6 Image logging

3.3 Viewing and changing the instrument(s)

3.3.1 Instrument diagnostics

Instrument diagnostics (and optical image) can be viewed by going first to **DIAGNOSTICS** in the Main menu and then to **VIEW DIAGNOSTICS**. The following information is displayed:

- **NORMAL OPERATION** or **NO SAMPLE** (or other refractometer status message) is displayed depending on the status of the refractometer.
- **CONC** is the final concentration value including field calibration adjustment.
- **CALC** is the calculated concentration value without field calibration adjustment.
- **nD** is the refractive index value n_D of the refractometer.
- **CCD** gives the position of the shadow edge on CCD in %.
- **LED** is a measure of the amount of light from the light source in % . Should be below 100 %.
- **HD temp** is the refractometer head temperature.
- **HD humidity** is the refractometer head humidity.
- **QF** or **Quality Factor** is a value in the range 0–200. It measures the image sharpness, a typical good value is 100. A QF value below 40 usually indicates prism coating.

The Diagnostics menu option **SAVE DIAGNOSTICS** can be used to save the values into a zip file. If a USB stick is connected to FC-11, the diagnostics file is saved on the stick. Otherwise the data is stored in the internal memory and can be accessed by connecting FC-11 to a computer, see Section 2.6.1.

3.3.2 Changing instrument parameters

To change instrument parameters, go to **TOOLS** in the Main menu, then choose **PARAMETER CHANGE**.

The instrument parameters can be changed by selecting the corresponding button. Buttons available are **CHEMICAL CURVE**, **FIELD CALIBRATION**, **nD CALIBRATION** and **mA OUTPUT**. To get more information about instrument parameters, consult the instruction manual for your instrument.

Note: The CHEMICAL CURVE parameters are specific to the given process medium and given by Vaisala. They may only be changed when switching to a different process medium.

3.3.3 Instrument verification

To complete a n_D verification, select TOOLS, then n_D VERIFICATION. Follow the instructions on the screen to complete verification procedure, and consult the instruction manual for your instrument.

3.3.4 Instrument hardware and software information

To view instrument information, go to DEVICE INFO in the main menu. Serial number for the device, serial number for the processor card and program version are shown.

3.3.5 Instrument backup and restore

It is possible to make backups of sensor(s)/refractometer and transmitter. A complete backup of the instrument settings (parameters and system) is saved into a zip file on a USB stick (if present) or in the FC-11's internal memory.

Go to TOOLS in the main menu, then INSTRUMENT BACKUP, then choose the instrument you want to back up.

To restore the instrument using a backup file use RESTORE in the instrument backup menu, then choose which instrument you want to restore. FC-11 looks for a backup file on a USB stick, or if that isn't present, in the internal memory. The chosen instrument is then restored, all parameters and system is retrieved from the backup file. **Note:** The serial number of the restore file must match the serial number of your instrument.

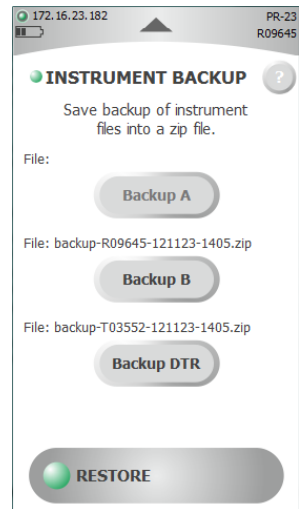


Figure 3.7 Instrument backup page

3.3.6 Field calibration

Vaisala provides a field calibration service that adapts the instrument calibration to the factory laboratory determination. Field calibration requires a report with 10-15 data points that are sent to Vaisala or your local representative. To take field samples, go to MEASUREMENT menu in the Main screen, then choose FIELD SAMPLE. Take the first sample point by tapping the FIELD SAMPLE menu item, then record subsequent points with NEW POINT. The field sample points are recorded into a text file on a USB stick (if available) or internal memory.

Note: The refractometer measurement status must be NORMAL OPERATION during each sample point.

3.4 FC-11 settings

Go to SETTINGS in the Main menu to changed the settings for the FC-11.

DISPLAY SETTINGS can be adjusted to save power.

BACKLIGHT brightness cannot be set below 3% as this would turn the light off and the system would be very hard to use.

If the user interface is not used for DIM TIME the screen saver is activated and the backlight is reduced to 1/3 of the value originally set.

If the user interface is not used for OFF TIME the backlight is turned off.

DIM TIME cannot be set longer than OFF TIME.

To resume normal operation, tap the display or press the button.

In the Field Communicator Settings menu, SYSTEM INFO contains information on the connection and battery status.

SET TIME/DATE allows you to (re)set the instrument date and time. Time is set by inputting a certain amount of digits. Possible inputs are 4, 6, 8 and 12 digits. To set hours and minutes,

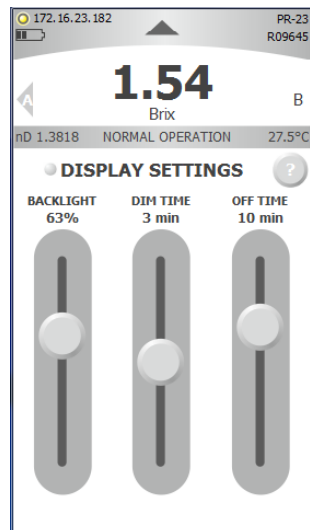


Figure 3.8 Display settings

input 4 digits. To set day of month and time input 6 digits. To set month, day and time input 8 digits. To set year, month, day and time input 12 digits. In all cases seconds can be set by separating them with a dot. The format is:

```
[[ [YYYY]MM]DD]hhmm[.ss]
```

If the FC-11 has lost all power e.g. during delivery, the clock resets to midnight January 1st 1970. In this case the FC-11 asks for date and time when turned on.

3.5 Service mode

Service mode is only for Vaisala personnel and Vaisala authorized service representatives. By default the Field Communicator starts in general mode and additional steps are needed to enter the service mode. **Note:** The Field Communicator remembers which mode it was in when turned off. If you turn off the Field Communicator in service mode, it also starts in service mode.

3.5.1 Entering service mode

Go to TOOLS. Press and hold anywhere *on the white area of the display* for 5-10 seconds to activate the service mode. When you release the pressure, two new commands should appear in the Tools menu. If not, try pressing the white area again without moving your finger while holding it down.

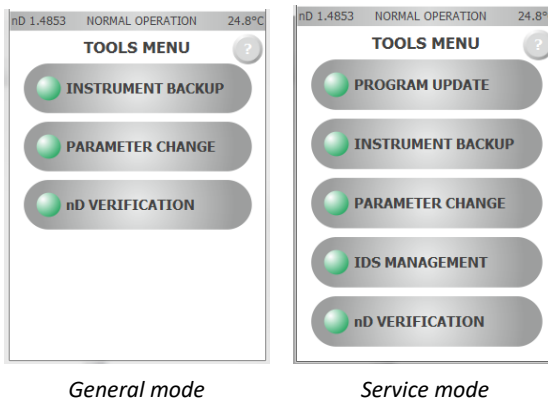


Figure 3.9 The Tools menu in different modes

Besides the two commands in the Tools menu, in the Parameter change menu a new command is added, SERVICE.

3.5.2 Instrument program update

You can update a 23 sensor, a DTR, a PR-33 refractometer and a PR-43 refractometer.

Note: The program update command is only available in service mode.

1. Download latest instrument program zip from www.kpatents.net (or contact your supplier for an update). Software for sensor/refractometer and transmitter are separate files. Save the update files onto your computer.
 2. Connect the FC-11 to your computer (see section 2.6.1). Open the disk that is FC-11, then go to folder ProductSoftware.
 3. Copy the instrument program zips into the appropriate subfolders (dtr/sensor23/sensor33/sensor43) on the FC-11. Now you may disconnect the FC-11 from your computer.
 4. Connect the FC-11 to your instrument.
 5. In FC-11, go to TOOLS, then PROGRAM UPDATE. Choose the instrument to be updated and tap Update.
- ! **Warning!** Do not disconnect the FC-11 from the instrument while update is in progress!
6. After the update is finished, restart the instrument that was updated.

3.5.3 Exiting service mode

To exit the service mode, go to the Tools menu and press and hold anywhere on the white area for 5-10 seconds. When you release the pressure, the service mode commands disappear from the Tools menu and you are back at general mode. As the Tools menu is quite full in service mode, it may be easiest to press the white area left of the text TOOLS MENU to exit service mode.

4 Maintenance and troubleshooting

4.1 Maintenance

The FC-11 hardware is maintenance free. Connection cables and chargers are available as spare parts, see Section 1.1 for product codes.

4.1.1 Updating FC-11 software

1. Download latest instrument program file from *www.kpatents.net* (or contact your supplier for an update). Rename the file to FC-11.zip.
2. Connect the FC-11 to your computer (see section 2.6.1). Open the disk that is FC-11, then go to folder ProductSoftware and there to folder FC-11.
3. Copy the downloaded FC-11.zip into the FC-11 folder. **Note:** If you have older program zips in the folder, delete them.
After you've copied the program update file into the FC-11 folder (and removed older versions), you may disconnect the FC-11 from your computer.
4. On FC-11, go to SETTINGS, then SYSTEM UPDATE. Tap Update to start the update process.
5. At the end of the updating the FC-11 restarts. After that it is ready to be used.

Software versions

New features are introduced to FC-11 with system software updates.

Version 1.20:

- system parameter update from zip file available for all refractometer types
- PR-43-IA support
- PR-43 boot update
- new layout for P4 refractometer update page

Version 1.19:

- General mode
- Available program versions shown without cable connection

- MI support
- PR-43 support additions

Note: You can check the current system software version by going to the System update display, see above.

4.2 Troubleshooting

When inactive, the FC-11 is programmed to dim and later turn off the display to conserve energy. Tap anywhere on the screen or press the button to show the display. The DIM TIME and OFF TIME can be changed in SETTINGS menu, see section 3.4.

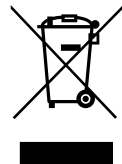
When the FC-11 is used on battery power, it shuts down when the battery is empty. After plugging in the power, restart the device by pressing the button until the light turns red. Then re-enter date and time with the SET TIME/DATE command in the SETTINGS menu. Make sure the current date and time are entered before resuming any logging operation. **Note:** If the IP address is entered manually to FC-11, you have to reenter it to connect to your instrument.

Some commands are not available when connected to a Divert Control System DD-23. Also, when the FC-11 is logging, some commands like the Tools menu are unavailable.

If you connect the FC-11 to a computer, but the FC-11 does not show up as an external disk as it should, that may be because logging is on. Stop logging first, then connect to the computer. If the use of USB is limited or forbidden on your computer, FC-11 charges through the micro-USB to USB cable, but does not show as an external disk. Contact your system administration about allowing the connection.

4.3 Disposal

When wishing to dispose of a FC-11, please observe local and national regulations and requirements for the disposal of electrical and electronic equipment.



VAISALA

www.vaisala.com