Infratec™ 1241 Grain Analyzer
Service Manual

1001 5015 / Rev. 2

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FOSS

Information may be changed or updated without notice. The latest version is found at www.foss.dk.

Revision	Date of Issue	Revised Material
Rev. 1	2011-03-18	First issue
Rev. 2	2012-11-09	Service procedure updated

NOTE: Please note that all information is liable to change without prior notice.

Please inform Market Communication Dpt - Technical Communication Team at the address given below, if you have any opinions about or proposals for changes to this manual.

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Table of Contents

1 Important Instructions

1.1 General

This Service Manual contains descriptions, installation instructions, maintenance instructions, troubleshooting, specifications and schematics for the Infratec™ 1241 ISW 5.xx. Service of Infratec™ 1241 should only be done by authorized personnel.

NOTE: This manual covers the Infratec 1241 Generation 2 and 3 only. For reference to the Infratec 1241 Generation 1 and Infratec 1256 use Service Manual p/n 10012177.

1.2 Service Documents

This Service Manual is a part of the Service Binder and (if available) the Service CD, which both contains the complete support documentation for this product. The Service CD may contain additional information in the form of animations for the purpose of illustrating and explaining e.g. working principles, process flows and service and adjustment procedures.

1.3 Self-Service Support

The Customer Support Toolbox (CST) on FOSS Intranet (www.foss.dk) contains all available support information. Please visit the CST at regular intervals for latest updates of documents and software.

1.4 Contacting Customer Support

For support on this product, please contact the responsible Technical Support engineer at FOSS or file a support request in the Global HelpDesk on FOSS Intranet.

1.5 ESD Information

Parts of this instrument, e.g. PCBs, are sensitive to Electro Static Discharge (ESD). All sensitive parts should be handled using ESD protection.

Follow these rules for effective ESD protection:

- Handle all ESD sensitive parts with an ESD wrist band connected to earth.
- Transport all ESD sensitive parts in ESD protected bags or boxes.
- Check your ESD protection at regular intervals to secure its function and quality.

The following ESD protection material is available from FOSS:

- 436220 Field-ESD service kit including wrist band
- 463238 Blue table mat with wrist strap and ground wire
- 436246 Coiled wire, 360 cm with stretch-wrist band
- 436261 Wrist-strap tester

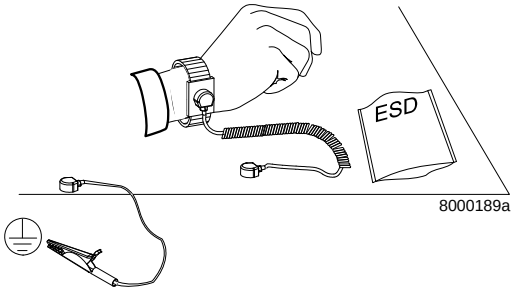


Fig. 1:1 ESD equipment

1.6 Precautions

The layout of safety symbols used in this manual is described below. Symbols are used whenever a safety related message is written to warn the reader of potential hazards.

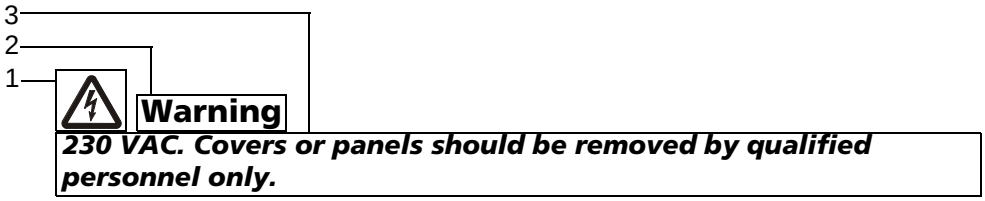


Fig. 1:2 Example of warning

1	Safety symbol	3	Safety text
2	Signal word		

The safety symbol indicates the type of hazard. All safety messages that follow a safety symbol should be obeyed to avoid possible harm.

The signal words indicate the degree of hazard:

- **Warning** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

2 Technical Description

2.1 History

The Infratec 1241 was first launched in the year 2000. It was then equipped with a black & white display and a diskette drive as means of importing and exporting data to the instrument. These instruments are now referred to as Generation 1.

In 2007 the Infratec 1241 was hardware and software wise redesigned. It was then equipped with a color display and USB ports for importing and exporting data. The "Basic concept" was also introduced which made it possible to limit the amount of calibrations on the instrument and thus reduce the selling price. These instruments are now referred to as Generation 2.

In 2010 the exterior was redesigned to match the EyeFoss image analyzer design. Few internal parts where altered. These instruments are now referred to as Generation 3.

Model	Display	Data	ISW version
Generation 1	Black & white	Diskette	3.xx
Generation 2	Color	USB	5.xx
Generation 3	Color	USB	5.xx

The Infratec 1256 is electronically and technology wise almost identical to the 1241.

Over the years different hardware and software features have been continuously introduced, e.g. TCP/IP, calculated constituents. Many of these can be added to older instruments. Upgrade of ISW is always free of charge.

The Basic Concept

Model	# of allowed AppM's	# of allowed parameters
Full	Many	Many
Basic 1	One	Three
Basic 2	Two	Three per AppM
Basic 3	One	Six
Basic 4	Two	Four per AppM
Basic 5	Five	Four per AppM
Basic 6	Six	Four per AppM

Related Information

Service personnel should be familiar with the following documentation:

- User Manual; for function descriptions, maintenance and operating instructions
- Spare Parts Manual; for spare part illustrations and spare part numbers
- Quick Guide; for a quick start instruction

Also see chapter 8 Document References.

Abbreviations

Explanation of abbreviations used in this manual.

ADC	Analog to Digital Converter
DIB	Display Interconnection Board
DSP	Digital Signal Processing
EID	Electronic ID
GA	Grain Analyzer
I2C	Standardised serial interface (Inter Integrated Communication)
I/O	Input/Output
ISW	Instrument Software
LIMS	Laboratory Information and Management System
MU	Measuring Unit
OS	Operating System
PCB	Printed Circuit Board
PSM	Power Supply Module
RTOS	Real Time Operating System
STM	Sample Transport Module, optional
TWM	Test Weight Module, optional

2.2 Component Descriptions

Compatibility with previous version

Module	Compatible	Comments
PSU	Yes	All versions
Detector	Yes	All versions
Monochromator	Yes	All versions
MU	Yes	All versions
TWM	Yes	All versions (TN 1234)
STM	Yes	
LCD Display	No	See Spare Parts Manual
PC module DSP PC- board Compact Flash Floppy disk	No No No No/Yes No	 Requires OS vers 5.01 or higher Requires OS vers 5.01 or higher Dependency. Requires ISW 5.xx Disabled in BIOS, USB Floppy disk support
Cable Stalk	No	
Interface	No	USB
Chassis	Yes	

System Overview

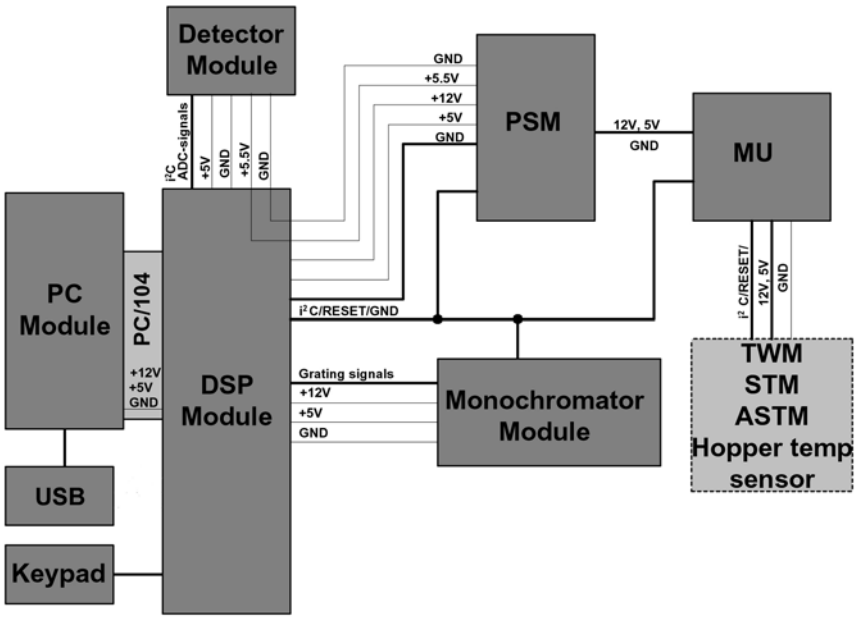


Fig. 2:1

2.2.1 PC-Module

The PC-module is a PC104 embedded hardware platform with QNX real-time operating system (RTOS). PC104 is a popular standardized form-factor for small computing modules typically used in embedded system. A system composed of PC/104 modules is often referred to as a "stack".

The PC module "stack" assembly consists of:

- Mounting plate
- Processor board, that acts as a controller for the peripheral components
- DSP board, that acts as an extension Processor board and is also used as an I/O system

Communication between the PC-module and the instrument modules is routed via the DSP board I^2C bus, which is a simple standard 2-wire connection where the DSP acts as the master device.

NOTE: Due to the QNX software platform, USB plug & play is not supported. An USB-floppy drive solution may however work.

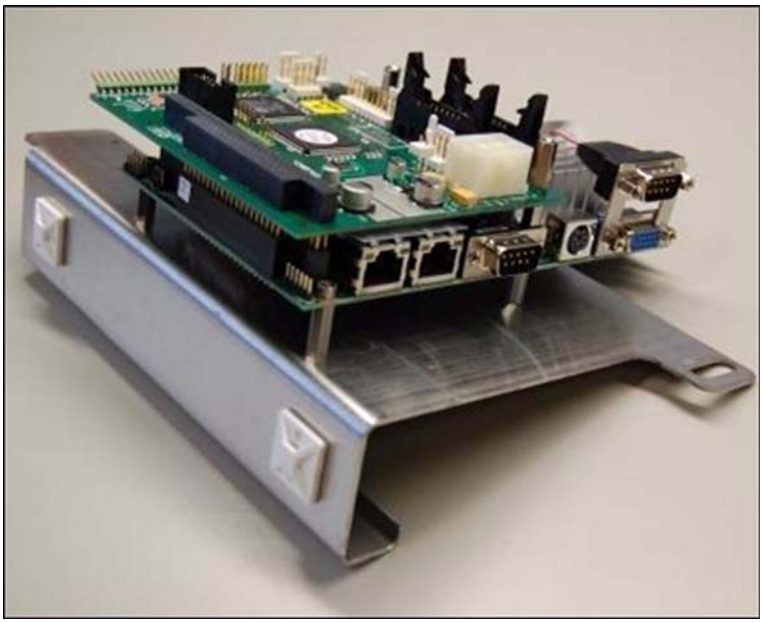


Fig. 2:2 PC-Module

2.2.2 Processor Board

The processor board is a single board processor (SBC) with an onboard CPU processor. Processor board acts as a controller for the peripheral components. The processor board communicates with the DSP board via the PC/104 bus.

The processor board has three main interfaces:

- DSP board PC/104 bus
- TFT LCD display
- Connectors to chassis Interface panel, providing access to external keyboard, USB, comm. ports, LAN etc

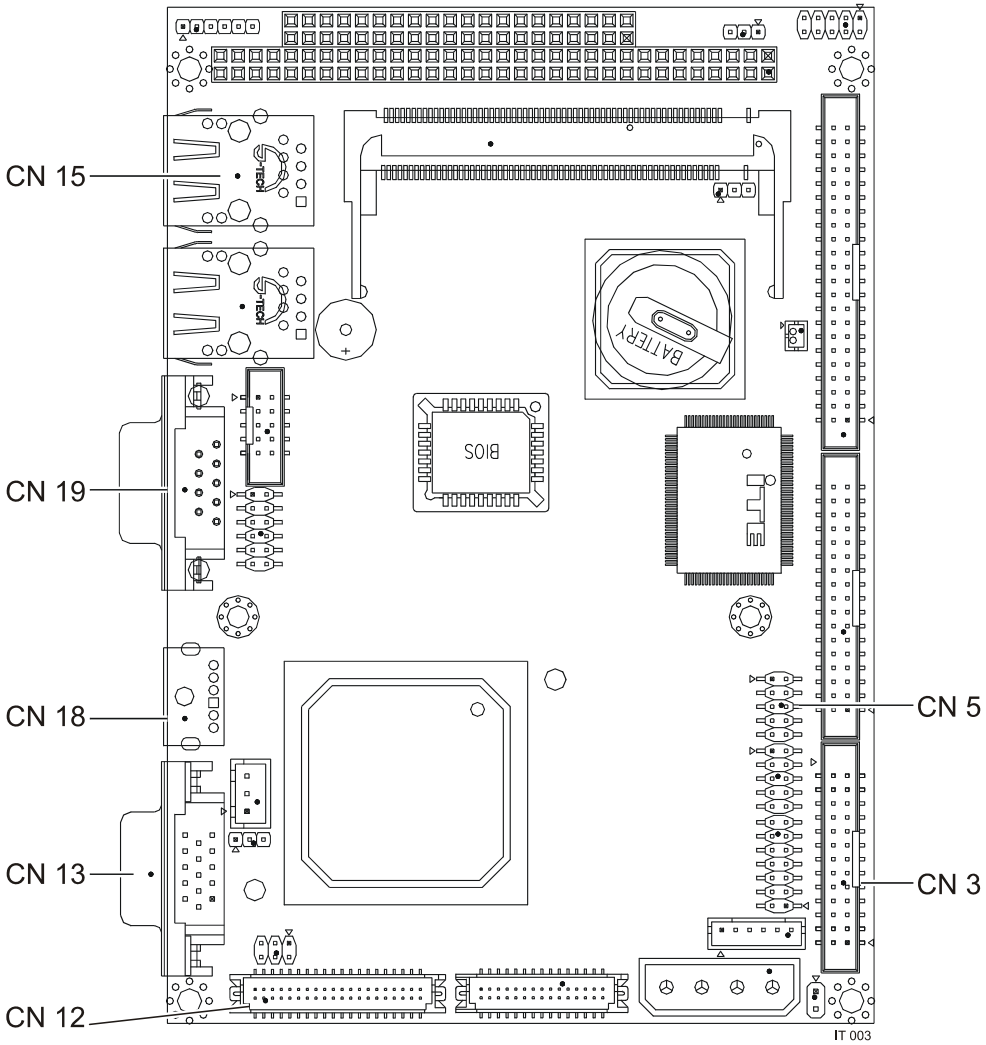


Fig. 2:3 Processor Board

CN3	Printer Interface (LPT1)	CN15	LAN/Ethernet Interface
CN5	USB Interface (0&1)	CN18	Keyboard/Bar code Interface
CN12	LCD Display	CN19	COM1 Interface
CN13	COM2 Interface	CN20	CRT Monitor Interface

The Processor Board has replaceable external CMOS battery.

Fig. 2:4 Processor Board

2.2.3 DSP Board

The DSP module is accessed from the ISW via the PC/104 bus interface (P3) and acts as slave under the ISW.

The DSP software acts as an extension of the ISW and is also used as an I/O system. The PC-module makes it possible for the ISW to have control over the different HW modules.

There is no ROM memory on the DSP Board. For this reason, the DSP software is uploaded from the processor board by ISW during start-up. The ISW installation package contains and installs the latest and matching DSP software version.

The DSP has an I^2C bus interface, implemented as a SW driver in the DSP software and is used for communication between devices inside the instrument. I^2C is a two-wire serial bus, as shown in Fig. 2:5.

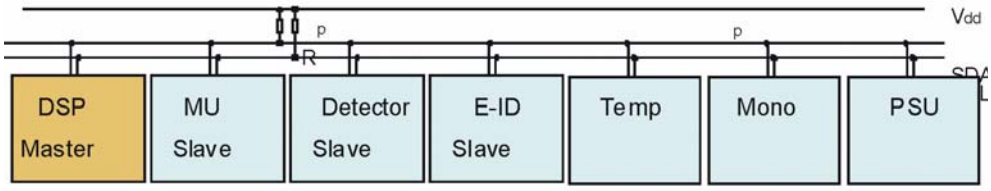


Fig. 2:5

There are a number of on board LEDs on the DSP Board. These LEDs provide information as to the status of the DSP Board.

LED	Function	Color
D3	Power On	Green, constant
D4	DSP-ISW communication	Red, flashing when active
D1	DSP running	Red, constant after boot-up
D2	Monochromator motor direction	Red, blinking

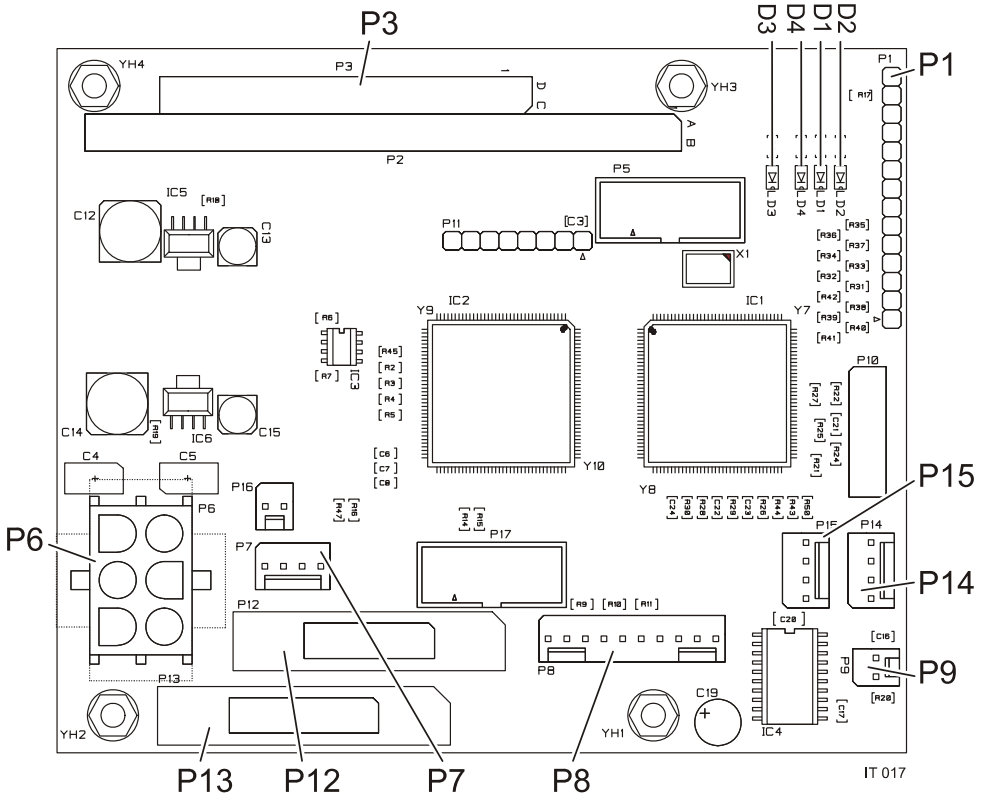


Fig. 2:6 DSP Board

P1	Keypad	P13	Detector
P3	PC/104 Bus	P14	I2C Bus
P6	Power Supply	P15	I2C Bus
P7	Inverter Interface Board	D1	DSP running (red LED)
P8	Monochromator	D2	Monochromator (red LED)
P9	Monochromator	D3	Power On (green LED)
P12	Monochromator	D4	I2C communication (red LED)

DSP Board		
From	**Designation**	**To**
P1	Keypad overlay	
P3	PC/104 Bus Interface	Processor Board
P6	Power Supply	Power Supply Board (P7)
P7	Backlight Power	Display Interconnection Board
P8	Encoder Connector	Monochromator
P9	Grating Motor Connector	Monochromator
P12	Shutter Board Connector	Monochromator
P13	Detector Signal	Detector
P14	I^2C Bus	Measuring Unit
P15	I^2C Bus	Power Supply Board

2.2.4 CompactFlash Disk

Type II CompactFlash™ Memory

The CompactFlash memory is preinstalled with latest OS version and ISW software. As spare part it is available as Basic 1 configuration only.

The Flash Disk is an electronic memory mounted in a slot on the Processor Board. Due to market conditions you may find different sizes in the instruments over the years. There is no problem upgrading the Flash Disk to a larger size. The disk is partitioned in three parts, 5 Mb for the operative system, 5 Mb for ISW. The remaining space is for data.

The Basic Concept

Model	# of allowed AppM's	# of allowed parameters
Full	Many	Many
Basic 1	One	Three
Basic 2	Two	Three per AppM
Basic 3	One	Six
Basic 4	Two	Four per AppM
Basic 5	Five	Four per AppM
Basic 6	Six	Four per AppM

2.2.5 Monochromator

The Monochromator is developed and manufactured by FOSS. It is to be considered a closed, factory calibrated box. There is under no circumstance any reason to open it for maintenance, inspection or other purpose. On the contrary an opened monochromator will not be covered by warranty, neither will it be accepted in the exchange part system. The monochromator is the only spare part in the Infratec that is enrolled on the spare part exchange system.

In the Infratec the monochromation of the "white light" from the lamp is done before the sample. This technology is called pre-dispersive monochromation. This is optimal when using transmission of light through the sample, e.g. for grain analysis. A disadvantage of this technology is that the system becomes very sensitive to stray light from the environment, e.g. sunlight and fluorescent light from the ceiling.

In the Infratec the light from the light source (the instrument lamp) is transported in an optic fiber bundle into the heart of the monochromator. This fiber bundle consists of thousands of randomized fibers. A lamp change will therefore not affect the output of the fiber bundle and thus makes it un-necessary to linearize after the lamp is change. The fibre optic cables are sensitive to sharp bends and should be treated with care.

Inside the monochromator the lamp light is split up (monochromated) in a diffraction grating. The grating is turned by a motor so that only one wavelength is exiting the monochromator at any given time. The grating is producing a spectrum covering the wavelength range from 570 to 1100 nm. The bandwidth is 7 nm.

At the out put there is a second fiber bundle to transport the monochrome light over to the right side of the instrument where the sample cell is located.

Before the monochromator output there is a shutter with 3 positions, Open, Closed and Filter. The closed position is used to block the light during the offset measurement which is done prior to scanning the sample. Open position is used during the sample scanning and Filter position is used during performance tests to determine the wavelength accuracy compared to the factory status.

The monochromator is supplied with an EEPROM which stores the O- and P-constants. These constants are obtained from the factory calibration and cannot be altered or re-calibrated in the field. The EEPROM resides on a PCB underneath the monochromator base plate. This PCB is therefore a unique part dedicated for each monochromator and cannot be changed.

NOTE: The Monochromator is sealed and it is absolutely forbidden to open it by other than FOSS personnel.

Fig. 2:7

1	Lamp fiber	4	Output fiber
2	Grating	5	Motor/Encoder
3	Shutter	6	PCB with EEPROM

2.2.6 Lamp Module

The Infratec 1241 light source solution is accommodated in a heat sink aluminium housing. It has no internal electronics other than the power supply cable and light bulb. The module includes:

- Aluminium housing as heat sink
- Lamp Holder
- Lamp
- Aperture (if applicable)
- Optic Fibre connection

Lamp holder

Three versions of lamp holders have been manufactured for Infratec 1241. The latest version, introduced 2008-10-17, has socket screw terminals to secure firm contact. See picture below. Previous versions are exposed to oxidation coating causing bad contact between lamp and terminals. It is recommended to replace the previous versions with P/N 10013351 which is the latest version (see picture below).

Infratec 1241, InfraXact and FoodScan analysers all have the same lamp holder.

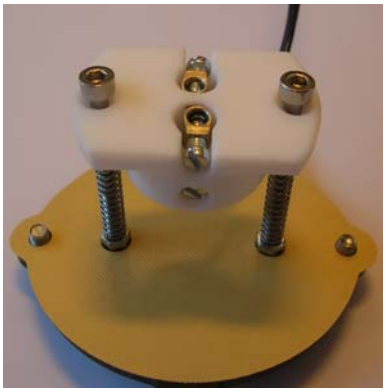


Fig. 2:8 Lamp Holder

Lamp source

The halogen lamp is FOSS custom manufactured and can not be substituted with regular lamps. Use P/N 60023564 to order.

Aperture

Exchangeable apertures are used to adjust the amount of light admitted to the monochromator inlet fibre. Monochromator replacement requires that light intensity is checked due to dispersion variation in the Monochromator Optical Fiber.

Exchangeable apertures are available in fixed openings of 5, 5.5, 6, 6.5, 7 and 7.5 mm diameter. An Aperture Kit (P/N 60023539) with a full range of apertures is supplied with replacement monochromators. Please refer to TN1355 for replacement instructions.

2.2.7 Detector

The detector converts light energy input to digital data output. It is constructed in a sealed and shielded box with a window for light input and a connector for digital input and output. The analog electronics inside the box are galvanic isolated (opto coupled) from all I/O signals.

The detector and the DSP communicate with each other in two ways. The I^2C bus is used to transfer commands from the DSP to the detector, while a high speed serial channel is used to transfer data from the detector's A/D converter.

The detector module has an I^2C expander on board that is accessed from the DSP and is used to set the detector gain to values specified by the ISW. It also has a temperature sensor from which ISW reads current temperature inside the detector and it's accessed via the I^2C interface as well.

An E^2PROM onboard the detector module contains the detector constants (e.g. serial number).

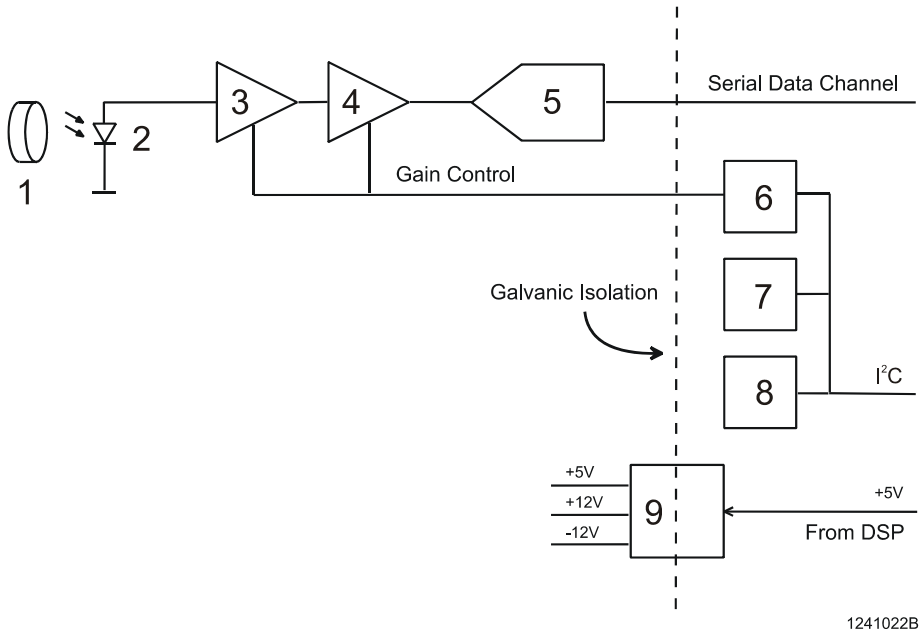


Fig. 2:9 Detector Block Diagram

1	Front end optics	6	I/O expander for control signals
2	Large area silicon detector diode	7	Temperature sensor
3	Pre-amplifier stage 1 with selectable gain	8	EEPROM for calibration data storage
4	Pre-amplifier stage 2 with selectable gain	9	Isolated DC/DC converter
5	16 bit 100 ksamp/sec A/D-converter		

2.2.8 Power Supply

The Power Supply takes the 24V AC power it receives from the transformer and converts it to a variety of DC voltages (+ 5.5V, +5V, +12V, -12V, and +10.5V). These voltages are used by a variety of instrument components, including the PC module, measuring unit, lamp, display, and optional equipment (TWM, STM etc.).

The Power Supply receives command signals from the DSP Board via the I^2C bus. The I^2C decoder processes these signals and controls the lamp and display accordingly. For example, the lamp and display backlight can be placed in power saving stand-by modes, the display itself can be extinguished during certain sequences such as the initial instrument boot-up procedure.

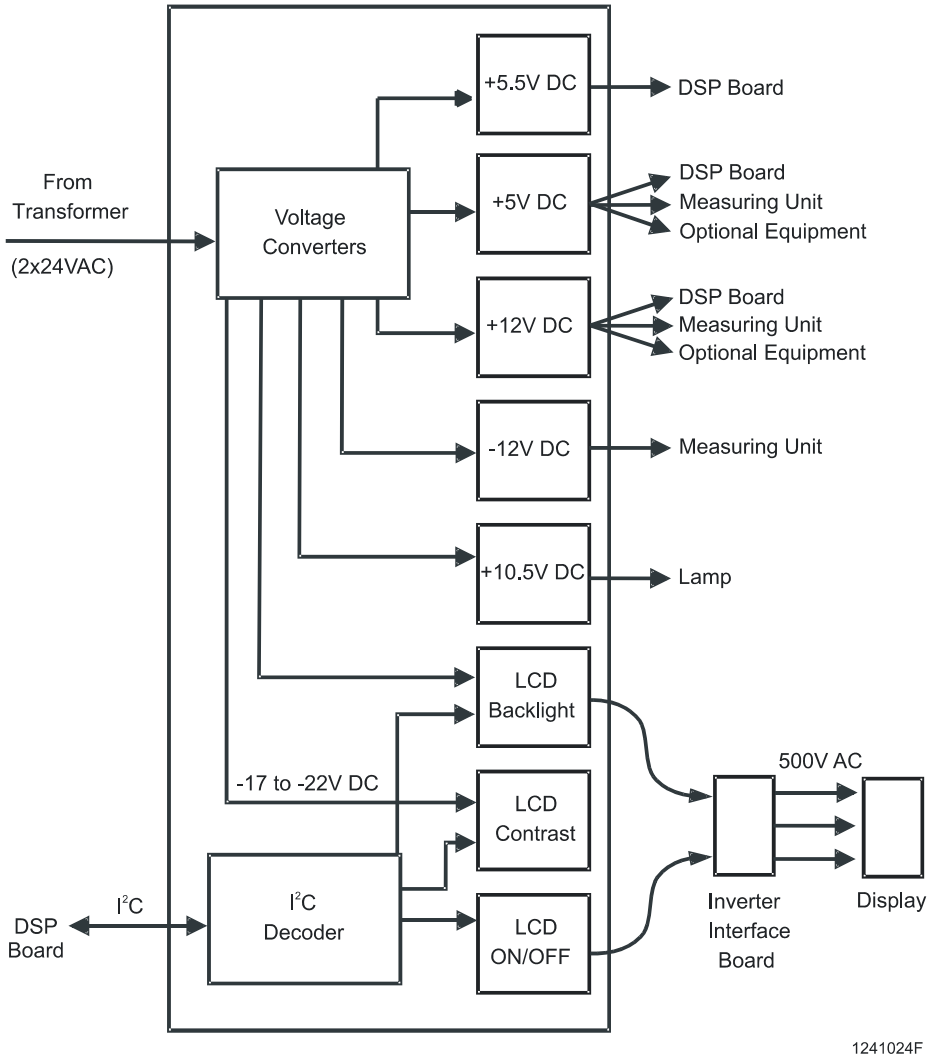


Fig. 2:10 Power Supply Block Diagram

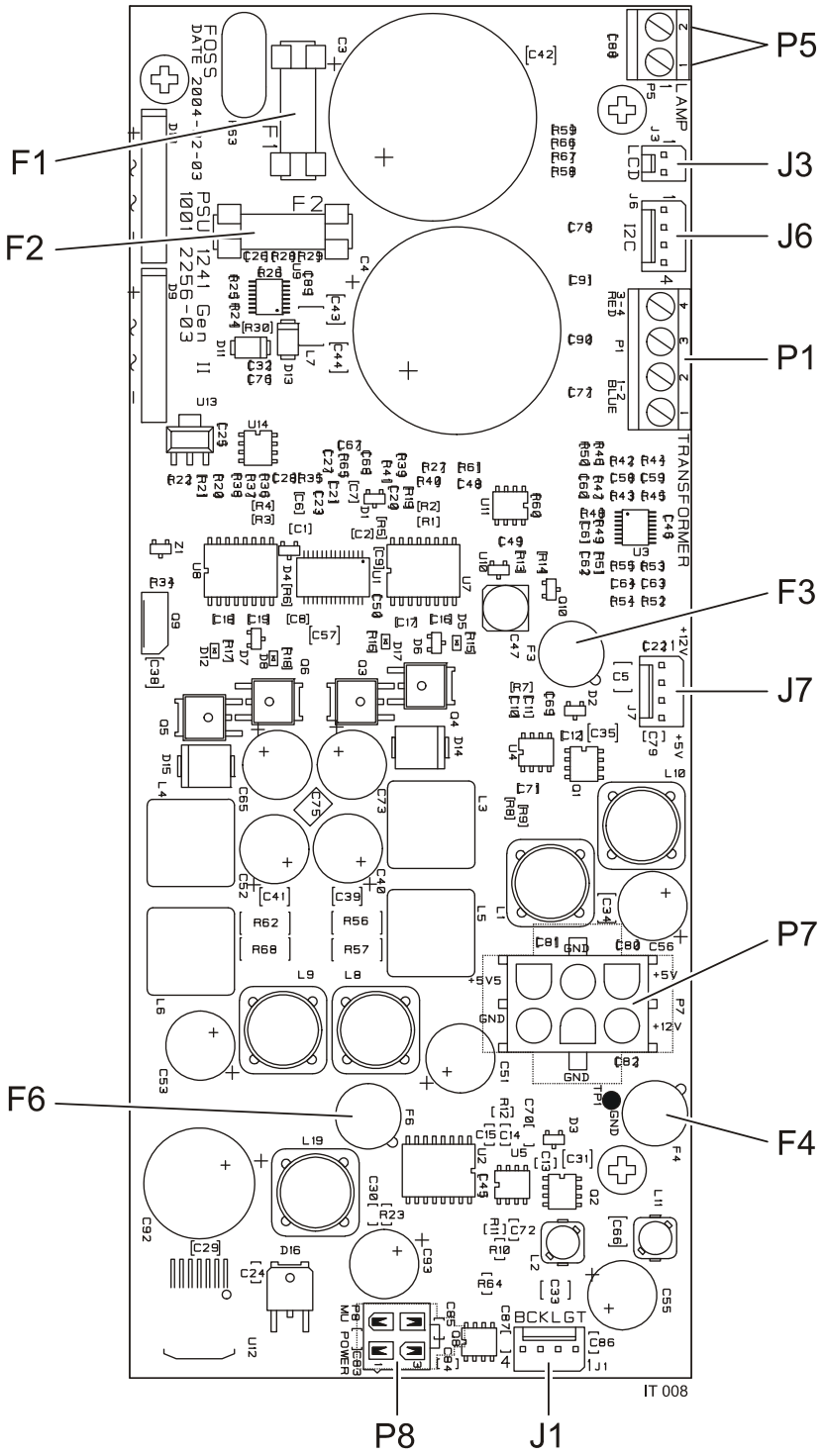


Fig. 2:11 Power Supply Board

J1	LCD Backlight	P8	Measuring Unit Power
J3	LCD	F1	Fuse 6.3 AT M
J6	I2C Bus	F2	Fuse 1.25 AT T
J7	Remote I/O Power (optional)	F3	Fuse 4.0 AT
P1	From Transformer	F4	Fuse 500 mAT
P5	Lamp	F6	Fuse 4.0 AT
P7	DSP Board Power		

2.2.9 LCD Display

The display is a 6.4 inch color active matrix LCD module, VGA 640 x 480 pixel resolution, incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuits, power circuits and a backlight unit.

Other features include a wide viewing angle with the best angle at 6 o'clock, high contrast, anti glare polarizing filter, normally white display mode that produces natural colors.

The display needs voltage from three sources to be operational:

- 5VDC from the Processor Board (the display on/off signal)
- Display backlight from the Display Interconnection Board
- Contrast voltage

The LCD Display is not repairable, it has to be replaced if a failure occurs.

The keypad is a passive matrix (7´4) with an LED power indicator. It is sometimes here referred to as the keypad overlay.

2.2.10 Display Interconnection Board

The Display Interconnection Board is connected between the Power Supply Board, DSP Board and the Display. It functions as a switch whereby ISW controls LCD Backlight and LCD Display by on/off function.

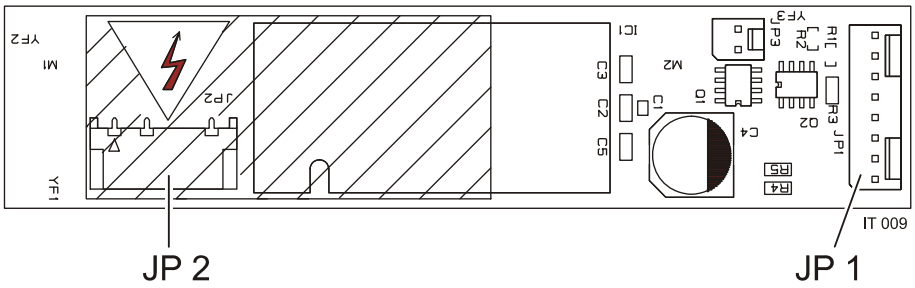


Fig. 2:12 Inverter Interface Board

JP1	I2C Bus	JP2	LCD Display

The Display Interconnection Board is powered by DSP Board P7 socket.

NOTE: Backlight. Actually 600 V AC, supplied by a DC/AC converter.

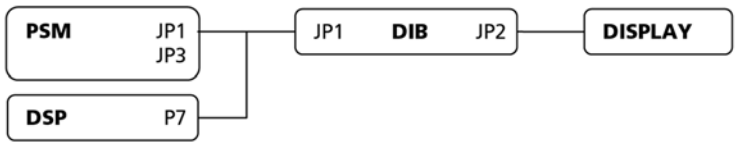


Fig. 2:13

DIB		
Connector	**Designation**	**To / From**
JP1/1-4	+5V, GND, +12V	DSP Board (P7)
JP1/5	Not used	
JP1/6-7	LCD Backlight On/Off	Power Supply Board (J1)
JP1/8	LCD On/Off	Power Supply Board (J3)
JP2	Output 600 VAC	LCD Display

2.2.11 Electronic ID

The Electronic ID is installed as factory standard and enables the extended wavelength range needed for predictions in the area 570 nm - 850 nm.

The effective wavelength range of the instrument will be 570 nm-1098 nm. This range will be activated when using an Application Model with extended range.

2.2.12 TWM (Optional)

Test Weight Unit (TWU)

The device which performs the actual weighing of the sample. It consists of the following basic items;

- A load cell (balance).
- Control electronics PCB. Referred to as the TWM PCB.
- A wiper arm to level of the cuvette.
- Level sensor to detect when the cuvette is full.
- A shutter to allow emptying of the cuvette after measurement.

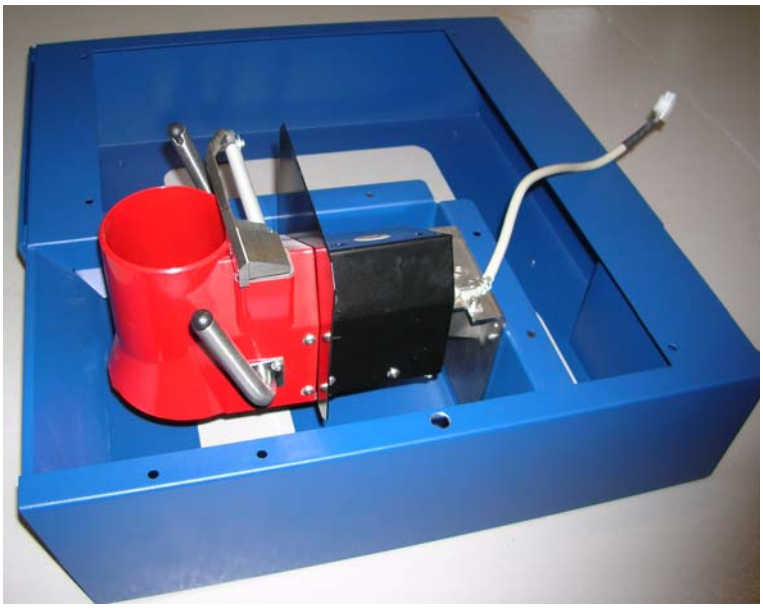


Fig. 2:14 Test Weight Module

See the Spare Part manual for more detailed information on available spare parts.

Test Weight Module (TWM)

TWM is the terminology used for the entire assembly, including the TWU and chassis. This module is an optional device that can be fitted to any existing Infratec 1241. To measure the test weight of a sample the used Application model must have support for the TWM.

The Infratec software (ISW) will during boot-up detect if a TWM is electrically connected to the instrument.

The TWM is connected to the Infratec through the TWM power/ communication cable and the drawer sensor cable. The TWM power/ communication cable can be connected in either of the two optional contacts on the Measuring Unit. The TWM then receives commands from the ISW. The weight is mathematically converted to a density and the completed result is presented on the display as a bulk density.

The instrument handles both metric units and imperial units making it possible to present test weight in both kg/hl and lbs/bu. More information can be found in the User Manual for Infratec 1241 Modules, p/n 60043623.

The TWU is designed to receive sample from the Infratec in small sub-samples into a measurement cuvette. The surface of the measurement cuvette is then skimmed flat with a wiper arm and the measurement taken.

The TWU then discharges the sample into the sample drawer. The commands to operate the TWU originate from the DSP board. All commands come over the I2C serial bus. The I2C is a 2-wire serial bus consisting of data and clock. There are two buses of this type on the TWU PCB, one to the DSP and the other to the EEPROM.

The EEPROM fitted on the TWM PCB is provided to hold the mass calibration constants. The control of the wiper arm is done with a step motor with an encoder. At start-up the wiper arm moves between the physical end positions. Then a couple of pulses are taken away in each end. The calculated positions are HOME and FAR positions.

Below is a description of the weighing process for Infratec 1241 Test Weight Module:

1. Activate the Test Weight Unit.
   Check in the User menu under Application models/Test Weight/Setup/General settings, that "Enabled" is set to ON.
2. Choose an Application model that include test weighing. It's important that the twm.ini file is included. It is also possible to create a new Application model. Go into the User menu and choose Application models/Test Weight/Setup/Test Weight Models.
3. Pour the sample into the hopper.
4. Press the analyse button (or use F´9 on the external keyboard)
   The empty weight of the test cell is first measured. Then the conveyor in the Infratec Measuring Unit deposits sub-samples in the sample cell, where NIT analysis takes place. After analysis of each sub-sample, the bottom shutter of the sample cell opens, depositing the grain in the cuvette of the Test Weight Unit. A level sensor detects when the TWU cuvette has been filled and analysis of the remaining NIT sub-samples are temporarily halted.
   A wiper arm levels off the test cell to ensure proper cell packing and consistent sample volume. The weight of the grain in the test cell is then determined as the difference between the full measurement and the empty measurement after which the Infratec makes all necessary calculations and adjustments. The shutter at the bottom of the test cell is then opened, allowing the grain to fall into the sample collection drawer, and the analysis of the remaining NIT subsamples is resumed. The grain from these sub-samples simply passes directly through the TWU cuvette).
5. The NIT results, along with test weight, are then presented on the LCD display of the Infratec.

2.2.13 STM (Optional)

The Sample Transport Module is an optional device used for samples that are not fit to be taken through the Measuring Unit sample cell, e.g. moist samples or even liquids. Such samples may be green-malt, beer, boiled rice etc. Several different cuvette models and sizes are available for different kinds of sample types.

The STM consist hardware wise of an Elevator Unit which includes a motor that drives the sample cuvette down in front of the detector and electronics to communicate commands to the DSP. The position of the cuvette is detected by two magnet sensors in the elevator unit.

Electrically the STM is connected to either of the two ports on the measuring Unit.

For installation and usage see the User Manual for Infratec 1241 Modules, p/n 60043623

2.2.14 Remote I/O (Optional)

Introduction

This document describes the I/O Interface and specifies the physical interfaces used for connecting it to an Infratec 1241 or Infratec 1256. The Infratec is assumed to be prepared for this hardware such that the back plate has got place for a High Density DSUB15 connector for this purpose.

Connections

The I/O Board has three different interfaces:

- The 5-pin I2C/Power interface. The cable connecting to this interface has a 4-way, 2-wire I²C connector that should be connected to an available I²C connector inside the Infratec 1241/1256. The 4-way, 3-wire power connector should be connected to an available power connector inside the Infratec 1241/1256.
- The 3-pin sensor interface could be used for connecting a "trigger"-sensor inside the instrument.
- The 15-pin High Density DSUB15 is the interface to the outside world and is mounted on the I/O Board and should be fastened at the back of the instrument.

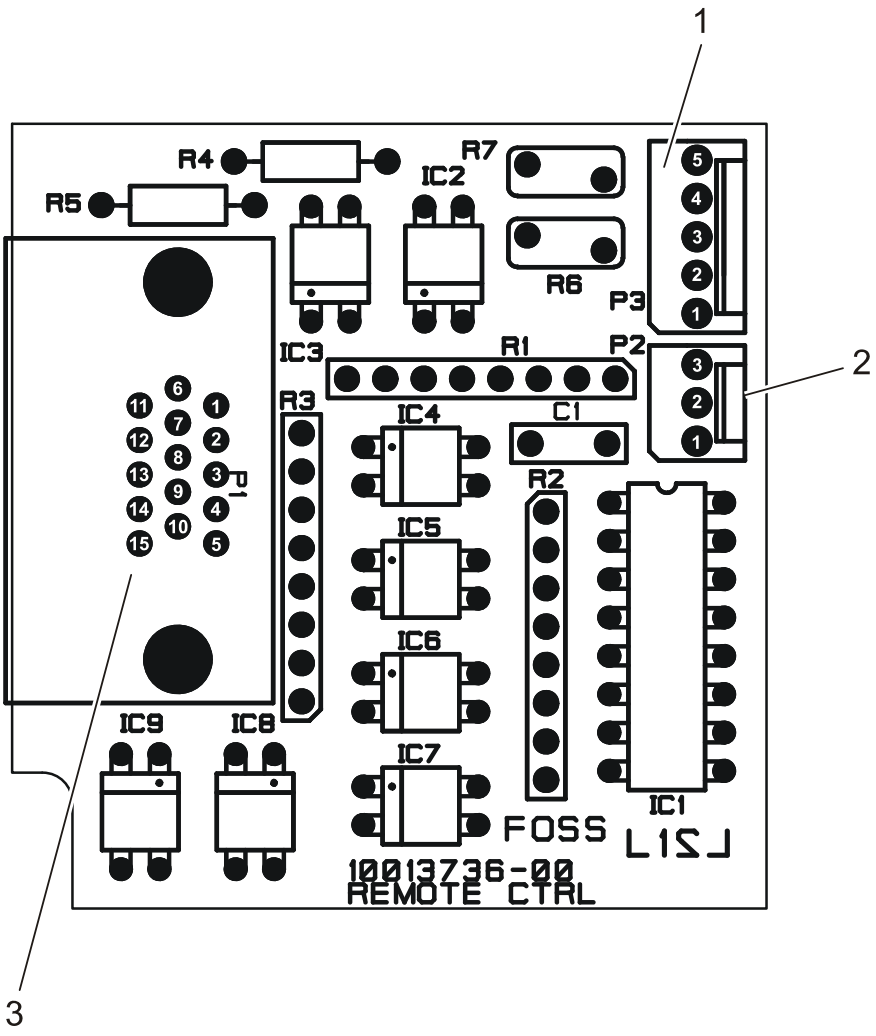


Fig. 2:15 I/O Board

1	I2C/Power interface (P3)	3	DSUB15 interface (P1)
2	Sensor interface (P2)		

Pin description

Item	Pin	Name	Description
I2C/ Power	1	SDA	I²C Serial Data
	2	SCL	I²C Clock
	3	GND	
	4	5V	
	5	12V	
Sensor	1	12V	12V supply to external sensor
	2	Trigger IN	Trigger input used to start analysis
	3	GND	GND to external sensor
DSUB15	1	IO0 - Busy	Indicates that the Infratec 1241/1256 is busy analysing
	2	IO1 - Connected	Indicates that the Infratec 1241/1256 is connected
	3	IO7 - Trigger	Trigger input used to start analysis
	4	IO6 - Reserved	Not used
	5	GND	
	6	IO2 - AM Selection 0	Bit 0 of the 4 bit nibble used for selecting the application model
	7	IO3 - AM Selection 1	Bit 1 of the 4 bit nibble used for selecting the application model
	8	IO4 - AM Selection 2	Bit 2 of the 4 bit nibble used for selecting the application model
	9	IO5 - AM Selection 3	Bit 3 of the 4 bit nibble used for selecting the application model
	10	GND	GND to external sensor
	11	12V Output	12V supply to external sensor
	12	NC	NC
	13	NC	NC
	14	NC	NC
	15	10-24V Input	External power 10-24V for opto-couplers

Hardware

The hardware of the I/O Board is basically an I²C controlled 8 bit I/O expander where 2 pins are allocated as outputs (IO0, IO1) and 6 pins as inputs (IO2-IO7). All I/O:s are protected with opto-couplers and the external part of the opto-couplers are powered with 12/24V from the outside.

One pin on the connector is connected to the Infratec 1241/1256 12V supply to enable connection of an external sensor without extra hardware.

Software

The functionalities for the I/O Board require at least ISW 3.40. In this version there are however some bugs regarding the statuses 'Busy' (not reported correct at all times) and 'Connected' (not enabled). This will be fixed in ISW 3.41 that will be released in 2006.

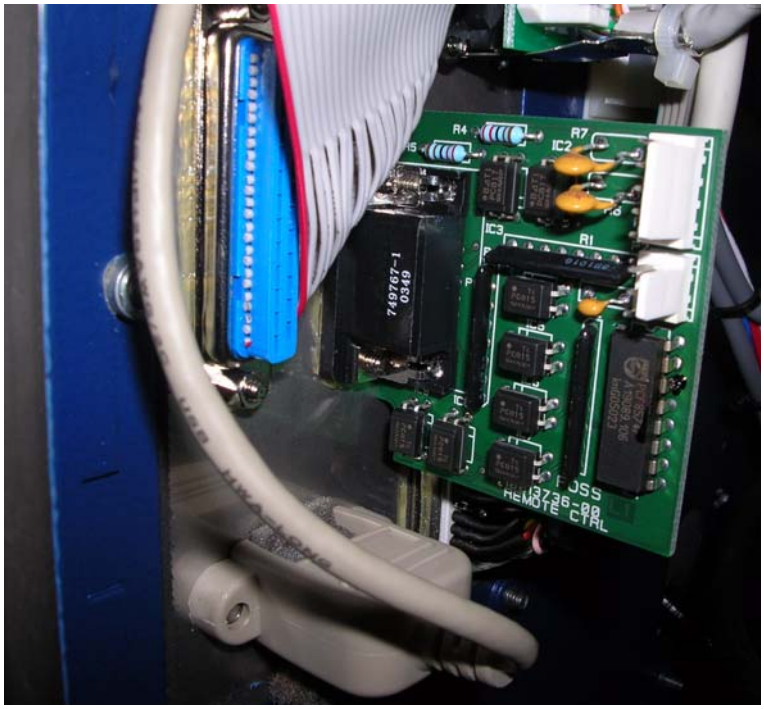


Fig. 2:16

2.3 Software Description

The operative system used in the instrument is QNX which is a commercial Unix-like real-time operating system (RTOS), aimed primarily at the embedded systems market.

The DSP software acts as an extension of the instrument software (ISW) and is located as an IO module to the PC board. The DSP software is accessed via the standard PC/104 bus on the PC board. The DSP module makes it possible for the ISW to have control over the different components of the instrument. This document describes the interface (IF 1) between the ISW (SW 1) and the DSP software (SW 2).

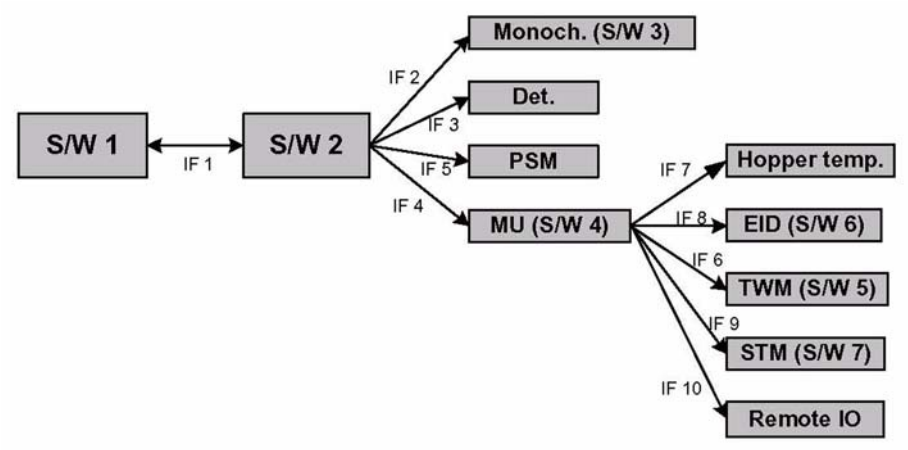


Fig. 2:17

SW 1: Instrument software system (ISW) (10008304)

PC-software located in the instrument. It contains functions for analysing samples, predicting results, creating scan files for mathematical treatment.

SW 2: DSP software system (10008494 & 10014320)

Software located in the DSP. Containing functions for Detector, Monochromator, MU, TWM and PSM communication.

SW 3: Monochromator microcontroller software

PIC microcontroller software to control the monochromator shutter functions and the E2PROM access on the monochromator board

The O and P constants are stored together with the monochromator module serial number in an E2PROM onboard the monochromator PCB.

SW 4: Measuring Unit (MU) microcontroller software

PIC microcontroller software to control the MU functions.

SW 5: Test Weight Module (TWM) microcontroller software

PIC microcontroller software to control the TWM functions.

SW 6: Electronic ID (EID) microcontroller software

PIC microcontroller software to control the EID functions.

SW 7: Sample Transport Module (STM) microcontroller software

PIC microcontroller software to control the STM functions.

IF 1: Instrument Software/DSP gen II (10014320)

Interface between the Instrument software and the DSP software.

IF 2: DSP/Monochromator

I2C interface between the DSP and the monochromator microcontroller.

IF 3: DSP/Detector Module

I2C interface between the DSP and the detector module E2PROM, I2C expander and temperature sensor.

IF 4: DSP/MU

I2C interface between the DSP and the MU microcontroller and temperature sensor.

IF 5: DSP/PSM

I2C interface between the DSP and the PSM I2C expander.

The signals used to adjust the contrast of the display, the display on/off function, to set the display backlight on/off and the monochromator lamp in standby mode is sent to the power supply module via the i2C bus interface. This connector is identical to the connector interfacing the STM.

IF 6: DSP/TWM

I2C interface between the DSP and the TWM microcontroller via the MU board.

IF 7: DSP/Hopper Temp.

I2C interface between the DSP and the hopper temperature sensor via the MU board.

IF 8: DSP/EID

I2C interface between the DSP and the EID microcontroller via the MU board.

IF 9: DSP/STM

I2C interface between the DSP and the STM microcontroller via the MU board.

IF 10: DSP/Remote IO

I2C interface between the DSP and the IO expander circuit on the remote IO board via the MU board.

3 Installation

3.1 General

See User Manual - Infratec™ 1241 Grain Analyzer.

Information about installation of Sample Transport Module and Flour Module can be found in User Manual - Infratec™ 1241 Modules, P/N 60043623.

Site Preparation

The site preparation is intended to be carried out prior to the installation of the instrument at the customer site. The site preparation documents can be found at FOSS Intranet – Customer Support Toolbox.

Filling Out Installation Documents

Each instrument is delivered with an Owners Guide binder where you will find all installation documents to be filled out.

3.2 Installation of Test Weight Module on Infratec 1241 Generation 2

The installation of the Test Weight Module occurs in the three steps:

1. Preparation of the Infratec for assembly
2. Preparation of the Test Weight Module for assembly
3. Final assembly of Infratec and Test Weight Module into a complete assembly

3.2.1 Preparation of the Infratec for assembly

To prepare the Infratec for assembly to the Test Weight Module, perform the following steps:

1. Remove the screw on the back of the instrument's lower right hand side using a 3 mm (2,5 mm for later models) allen wrench, see Fig. 3:1 below.

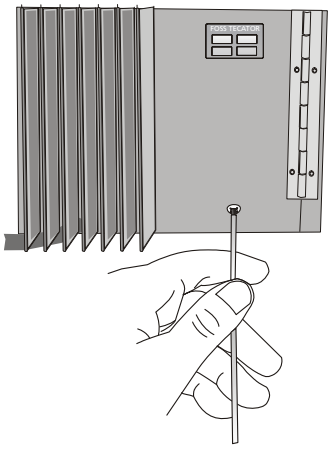


Fig. 3:1 Screw on backside of instrument

2. Disconnect the collection drawer sensor cable connector (1) from the Measuring Unit, see Fig. 3:2 below.

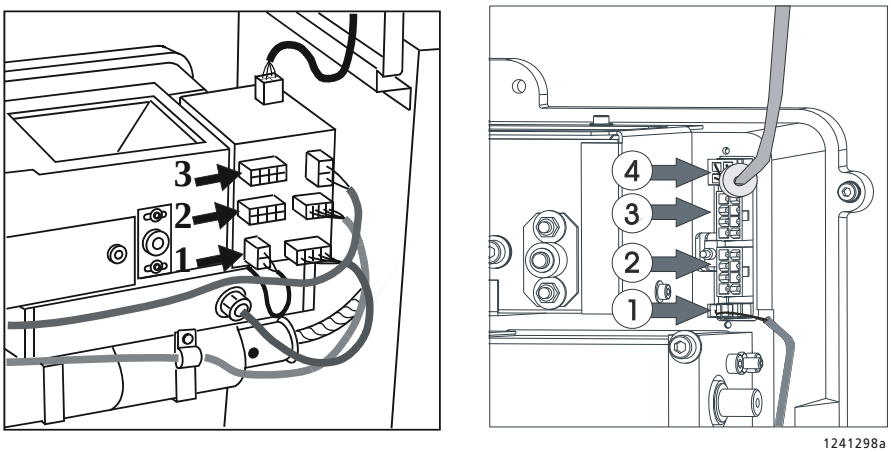


Fig. 3:2 Collection drawer sensor cable, Measuring Unit Gen. I (left) and Measuring Unit Gen. II (right)

The next step requires that the instrument be tilted on its left side. Before this can be done, there must be adequate workbench space and a soft padding (or equivalent) must be laid where the instrument will be tilted on its side.

⚠ Warning

The tilting of the instrument must be performed by <u>two</u> persons.

3. Gently tilt the instrument and lay it to rest on its left side.
4. Remove the sample collection drawer from the instrument.

⚠ Caution

Open the right-hand door carefully when the instrument is in tilted position. The door may brake if incautios.

5. Lift the hopper section to its fully upright position and then open the right-hand door, see Fig. 3:3 below.

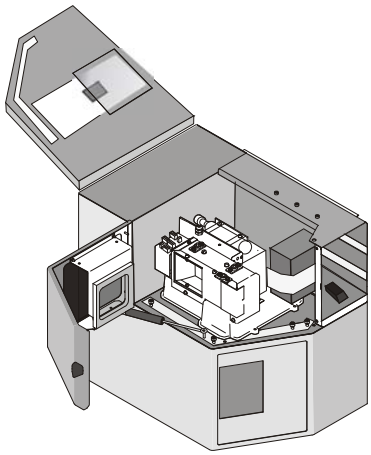


Fig. 3:3 Right hand door opened

6. Remove the bottom plate by loosening the four screws with a 3 mm allen wrench, see Fig. 3:4 below.

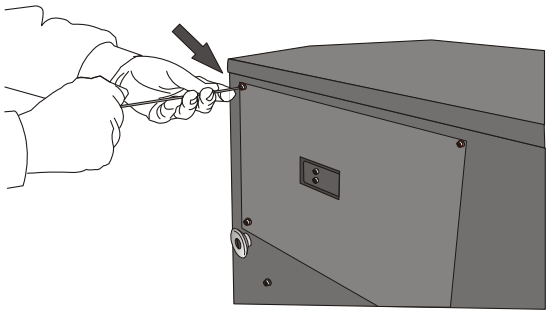


Fig. 3:4 Bottom plate

7. Remove the collection drawer guides (two on each side). This is done by unscrewing the screws with a 4 mm allen wrench, see Fig. 3:5 below. Remount four short screws in the holes on the left side (the instrument side). This is to prevent dirt from getting into the Infratec.

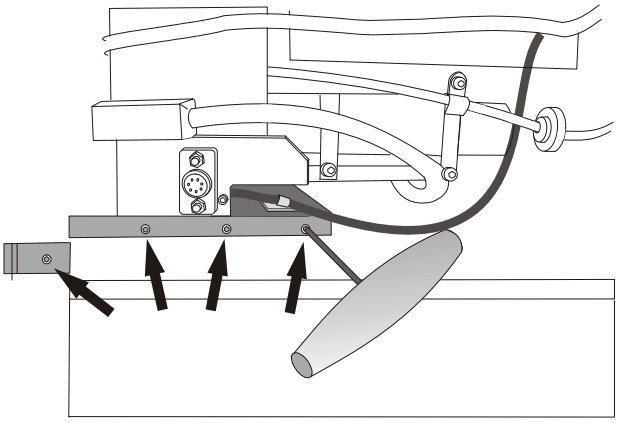


Fig. 3:5 Collection drawer guides

8. Close the right-hand door and lower the hopper section to its fully closed position.

3.2.2 Preparation of the Test Weight Module for assembly

To prepare the Test Weight Module for assembly, perform the following:

1. Place the Test Weight Module on a workbench. The workbench should be as level as possible. The workbench should also be as free from vibrations as possible.
2. Adjust the four feet under the plinth, see Fig. 3:6 below. Use a level guide to level the Test Weight Module.

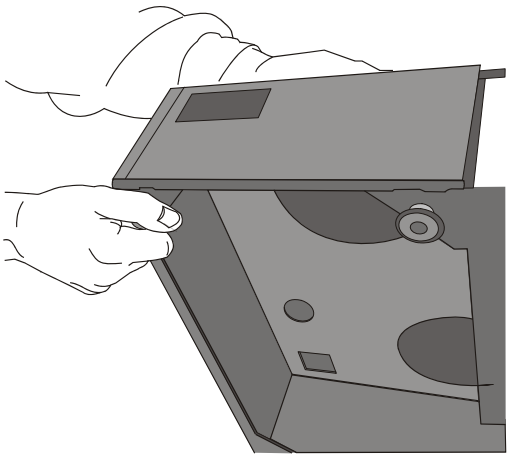


Fig. 3:6 Adjustment of feet

3. Loosen the three letter screws on the Front Transport Securing Device, see Fig. 3:7 below. Store them in the extra holes on the Front Transport Securing Device.

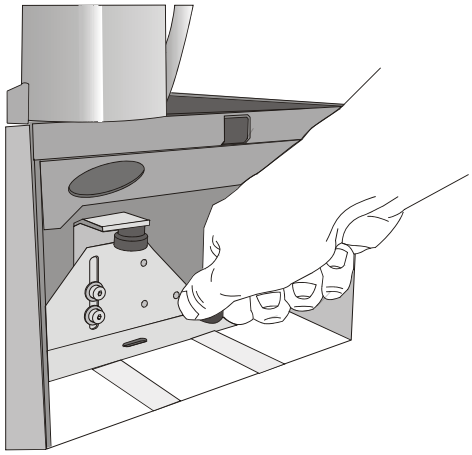


Fig. 3:7 Letter screws on Front Transport Securing Device

4. Loosen the two letter screws on the Back Transport Securing Device and grip the Test Weight Module at the same time so that it will not fall, see Fig. 3:8 below. Use the two letter screws to fasten the Front Transport Securing Device on the block situated behind the Test Weight Module.

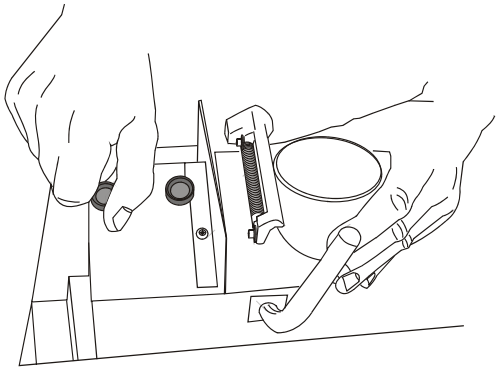


Fig. 3:8 Screws on Back Transport Securing Device

⚠ Warning

Never perform step 5 with the Back Transport Securing Device tightened.

5. Fasten the two allen screws hard with a 4 mm allen wrench, see Fig. 3:9 below. Grip the Test Weight Module at the same time so that you can feel that it is getting positioned.

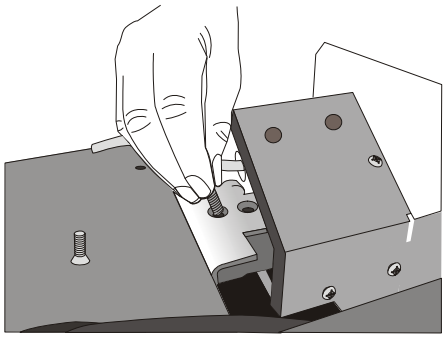


Fig. 3:9 Allen screws

6. Use the enclosed labels to cover the two holes from the letter screws.

3.2.3 Final assembly of Infratec and Test Weight Module into a complete assembly

The Infratec and Test Weight Module should be assembled into a complete assembly as follows:

1. Tilt the Test Weight Module so that it can be introduced in the Infratec.

⚠ Caution

Extreme caution should be used when mounting the Test Weight Module to the Infratec. The test cell of the Test Weight Module is a very delicate and sensitive item. There should be no contact whatsoever with this item during the mounting process.

⚠ Caution

Open the right-hand door carefully when the instrument is in tilted position. The door may brake if incautios.

2. Lift the hopper section to its fully upright position and then open the right-hand door.
3. Mount the screw on the back side of the Infratec using a 3 mm (2,5 mm for later models) allen wrench, see Fig. 3:10 below.

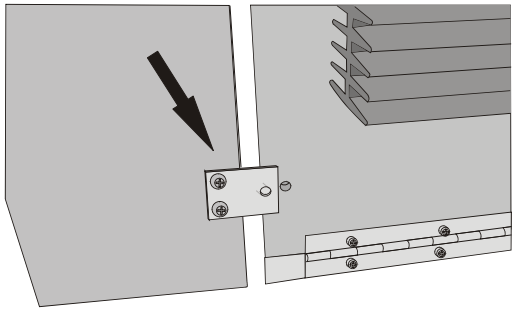


Fig. 3:10 Screw on back side of instrument

4. Mount the two screws located on either side of the collection drawer opening using a 3 mm allen wrench, see Fig. 3:11 below.

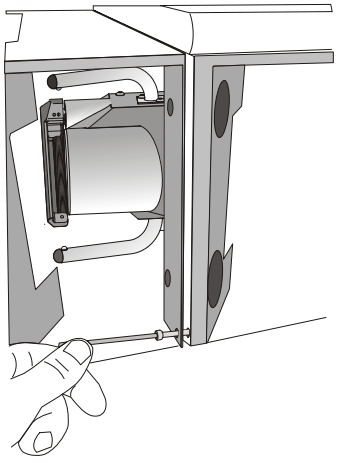


Fig. 3:11 Screws at collection drawer opening

5. Fasten the guiding bracket on the right side of the Test Weight Module. Use the holes market with arrows in Fig. 3:12 below and Fig. 3:13 on page 3:7. Attach bracket with two short screws using a 3 mm allen wrench.

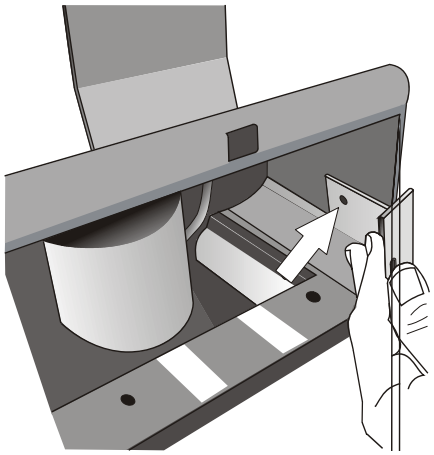


Fig. 3:12 Guiding bracket hole

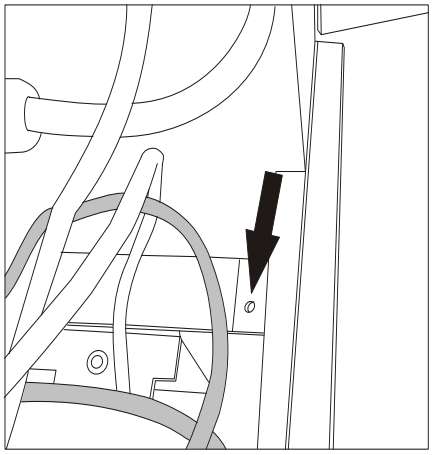


Fig. 3:13 Guiding bracket hole

⚠ Caution

Steps 6-8 are extremly important for the instrument to be EMC approved.

6. To earth the TWM at least one of the holes marked with arrows in Fig. 3:14 below, has to be scraped. Use an 8 mm plane countersink.
7. Plane countersink the corresponding hole on the TWM.

8. Position the cover plate assembly in the collection drawer opening of the Infratec, see Fig. 3:14 below. Fasten the cover plate assembly with two long screws using a 3 mm allen wrench.
   Note! Fasten a toothed plate connector in the plane countersinked hole.

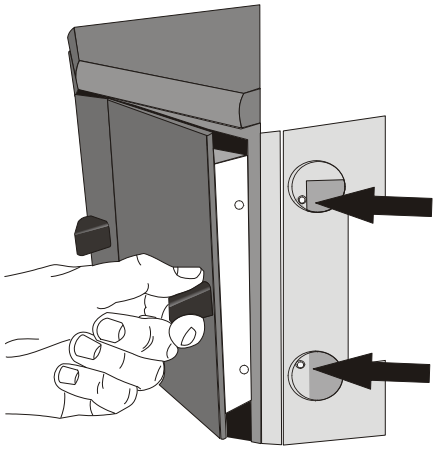


Fig. 3:14 Scrape at least one of these holes

9. Close the right-hand door and lower the hopper section to its fully closed position. Tilt the complete instrument back to upright position.
10. Mount the block ment to hold the Front Transport Securing device behind the TWM. Dry off the space behind the TWM with alcohol to make the self-adhering tape adhere better, see Fig. 3:15 below.

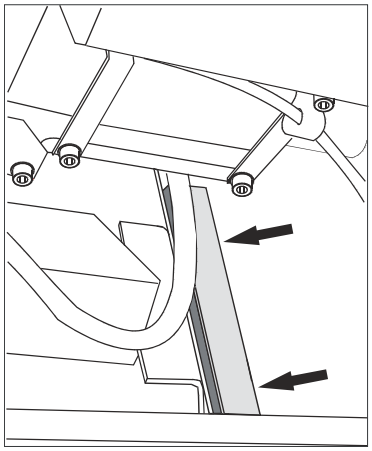
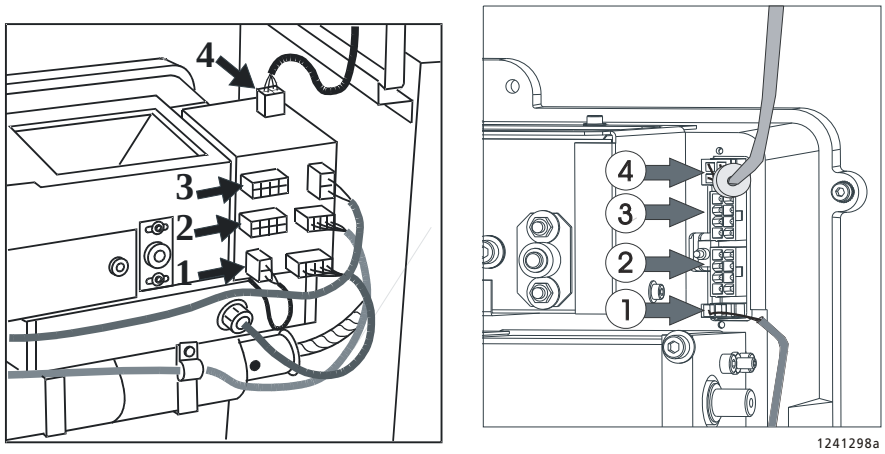


Fig. 3:15 Self-adhering tape

11. Connect the drawer sensor cable and the Test Weight Module power cable to the Measuring Unit, see Fig. 3:16 below. The Test Weight Module power cable can be connected in either of the two optional contacts 2 or 3.



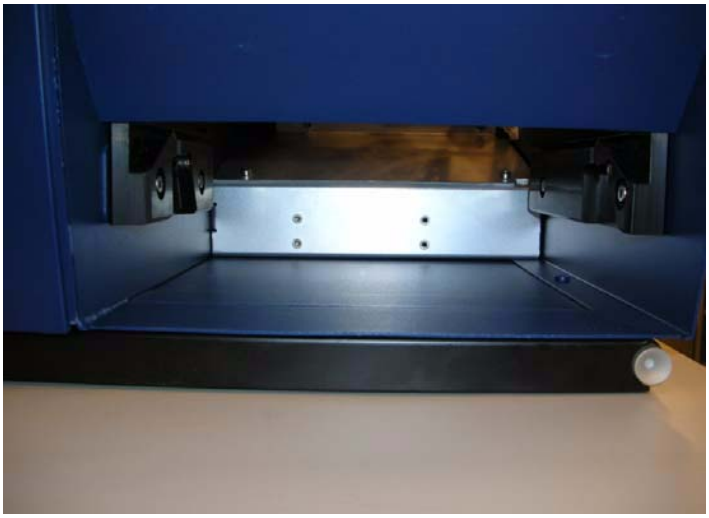
1. Drawer sensor cable
2. Optional
3. Optional
4. Hood temp sensor cable

Fig. 3:16 Connections on the Measuring Unit, Measuring Unit Gen. I (left) and Measuring Unit Gen. II (right)

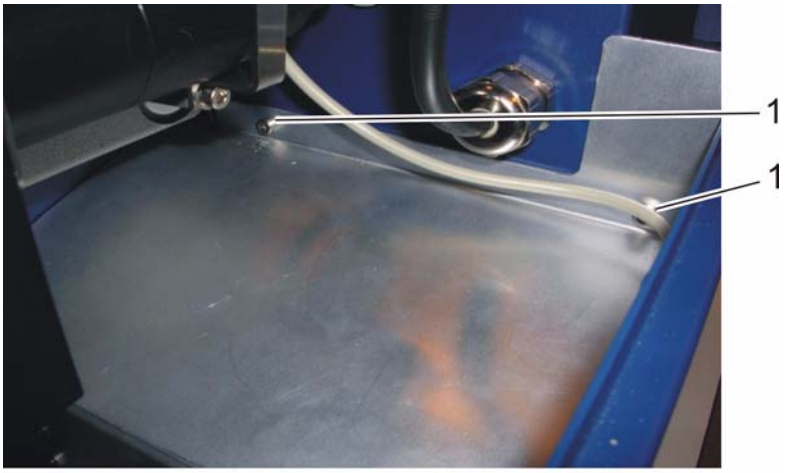
12. Install the Test Weight ini-file. First of all put the diskette into the diskette holder of the instrument. From the User Menu, choose **Read disk**. The Test Weight ini-file will be imported to the instrument, see User Manual.
13. Replace the sample collection drawer.

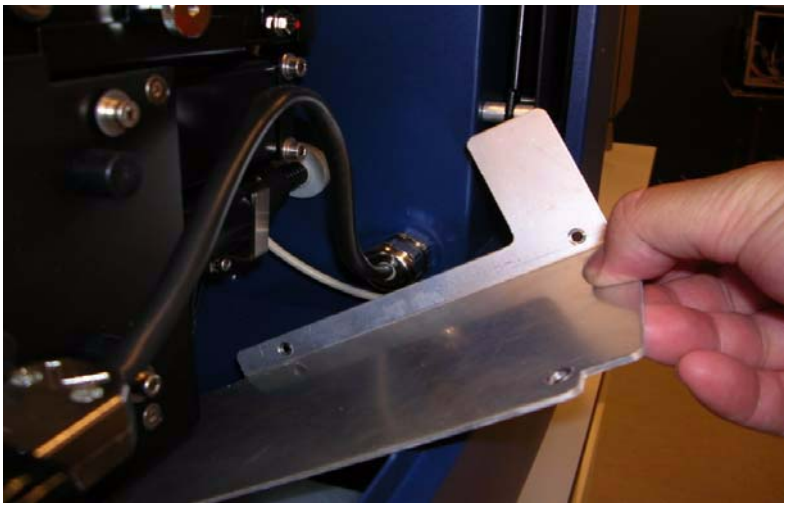
3.3 Installation of Test Weight Module on Infratec 1241 Generation 3

1. Remove the two plastic slides for the drawer. They should be moved to the TWM later.



2. Remove the metal plate covering the drawer sensor by loosen the four screws.



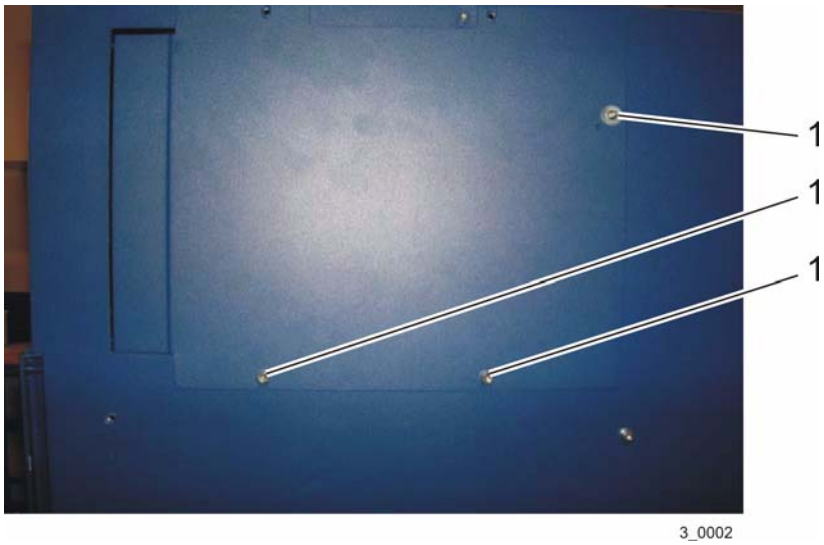


3. Turn the Infratec on the left side. Place some soft material on the table to prevent scratches.

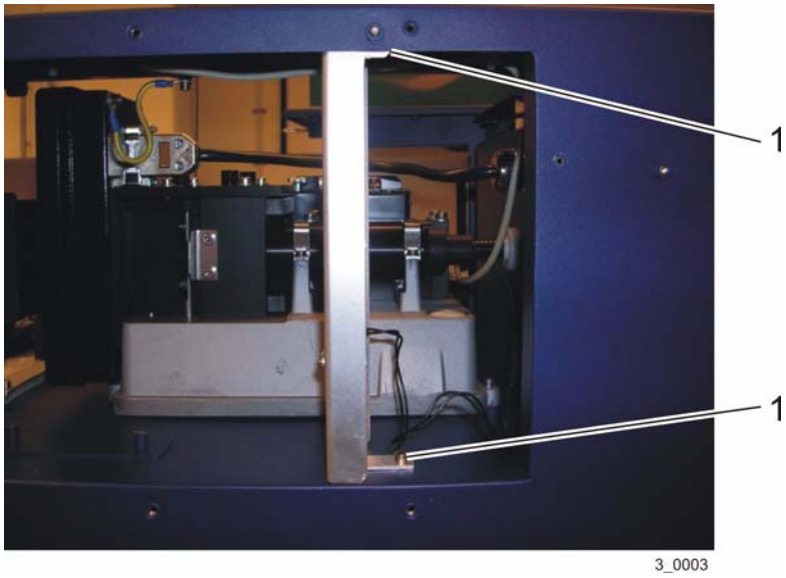
4. Remove three of the four feet.

5. Remove the two beams **1** and **2** by loosen the screws.

6. Remove the bottom plate by removing the three screws **1**.
   Keep the screws because they are needed later.

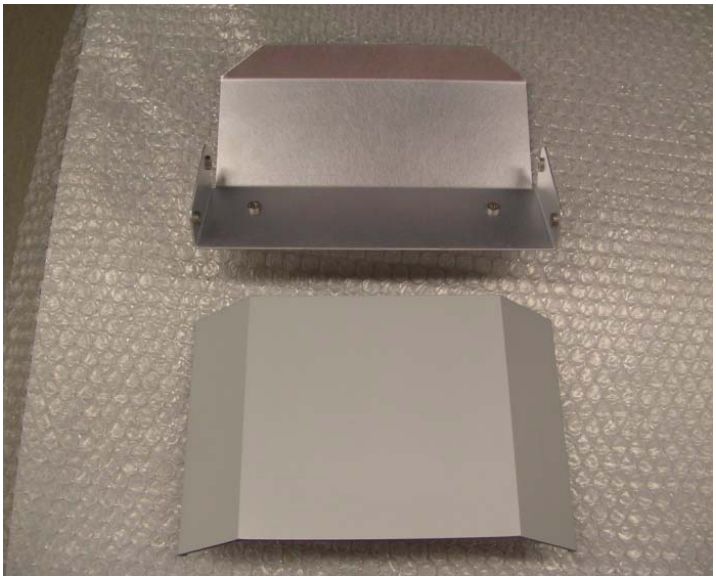


7. Disconnect the drawer sensor and remove the sensor plate by removing the two screws **1**.

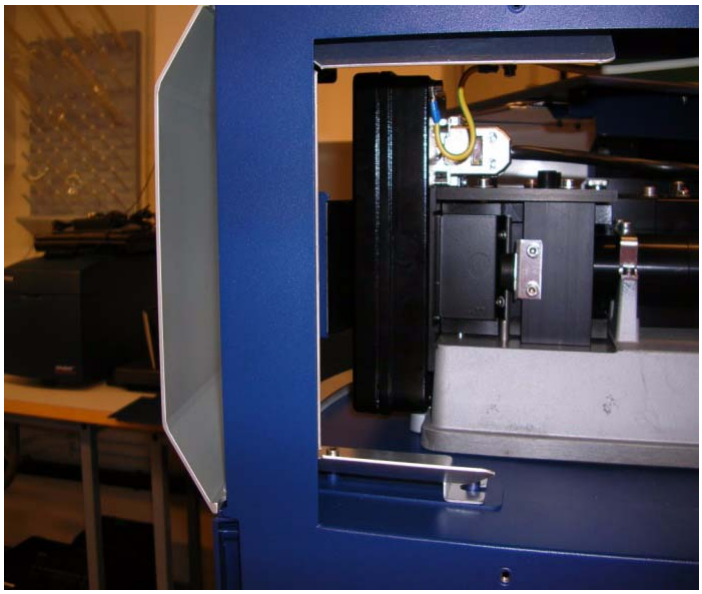


8. Prepare the grain deflector (p/n 60039237) by putting the adhesive (p/n 10014399) on the outside of the right part of the deflector (see arrow below). It is used to hold it in place before it is fasten by the screws later in the assembly.
9. Mount the grain deflector at the front by using four screws (p/n 55320017). Just fix it don't fasten it yet.

10. Put together the front cover (p/n 60034842) and cover bracket (p/n 60039398) by using the four screws (p/n 15320098).

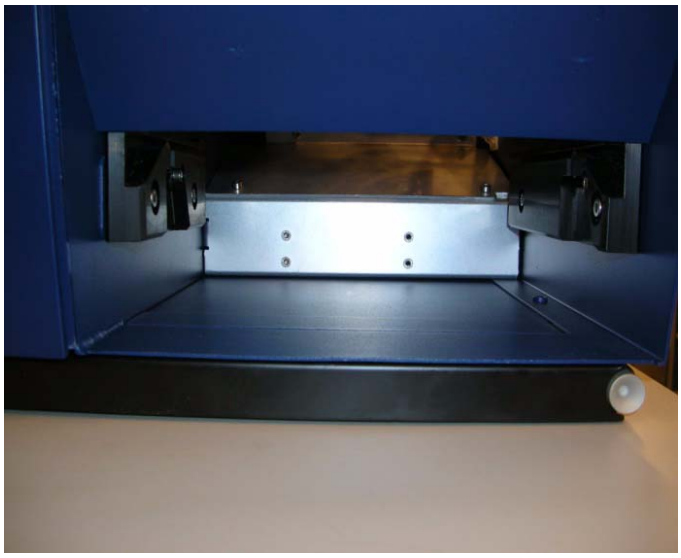


11. Fasten the cover plate to the deflector and adjust. Then fasten the screws holding the deflector.

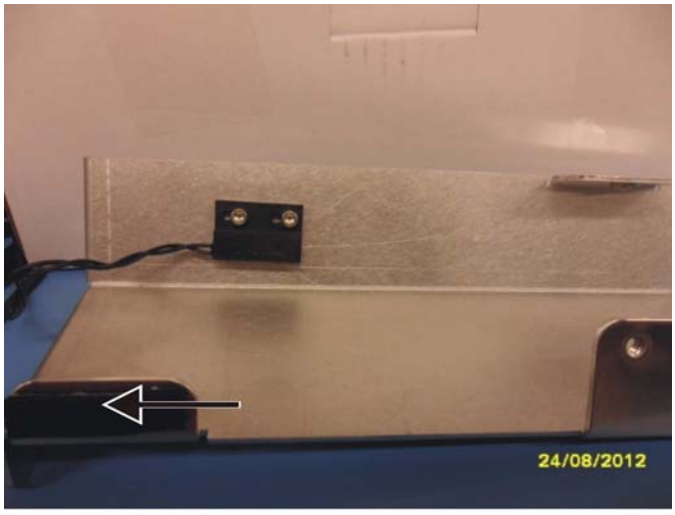


12. Use the three screws that were holding the bottom plate to cover the screw holes (one screw is not shown below).

13. Prepare the Test Weight Unit by mounting the two plastic slides from the Infratec.

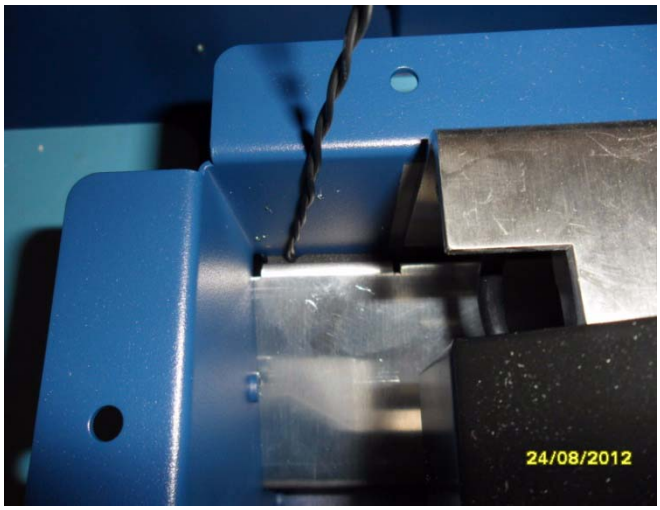


14. Transfer the drawer sensor from the holder that you have taken out from the Infratec (removed in step 7) to the holder for TWM (p/n 60039395). Put the sensor as much to the left as possible. Also put the rubber sealing (p/n 15420126) onto the left wing (see arrow below).



7_0002

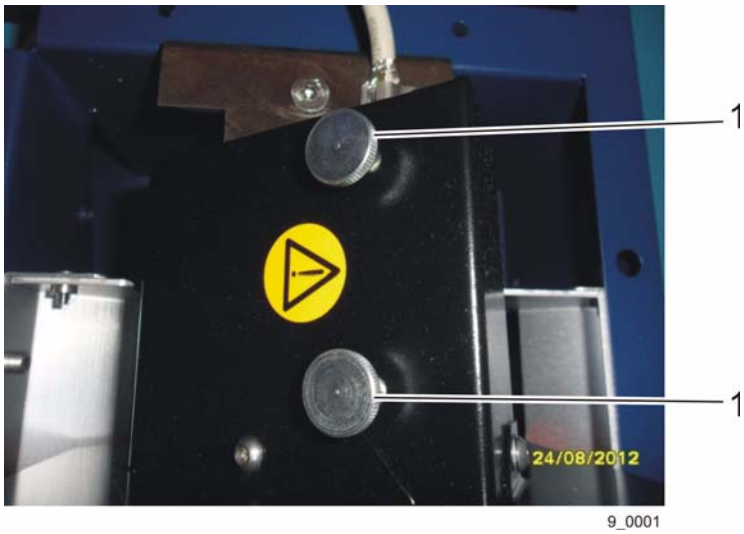
15. Put in the holder into the TWM. Note that the cable from the drawer sensor should be placed between the rubber sealing and the chassis. Fasten with three screws (p/n 55320017).



16. Loosen the three letter screws **1** on the Front Transport Securing Device. Store them in the extra holes on the Front Transport Securing Device.

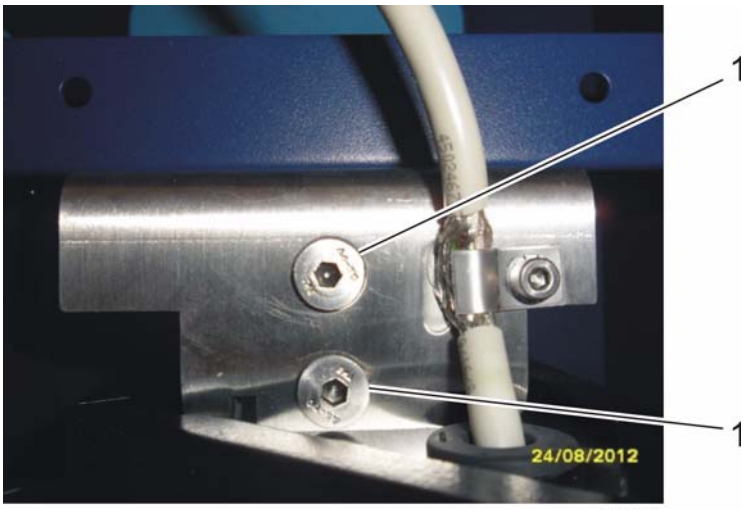
8_0002

17. Loosen the two letter screws **1** on the Back Transport Securing Device and grip the Test Weight Module at the same time so that it will not fall. Store them as well in the holes in the Front Transport Securing Device.



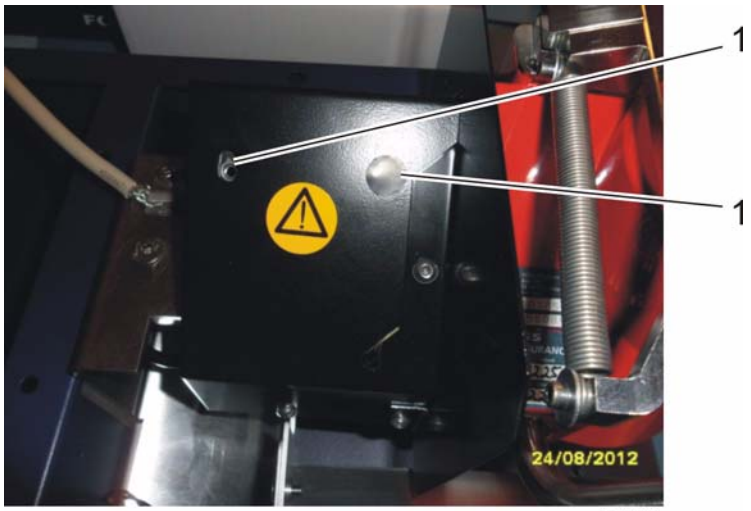
9_0001

18. Fasten the two allen screws **1** hard with a 4 mm allen wrench. Grip the Test Weight Module at the same time so that you can feel that it is getting centered.



9_0002

19. Use the enclosed labels **1** (p/n 10009083) to cover the two holes from the letter screws.



10_0001

20. Take the Test Weight Unit and connect it to the Infratec. Place the balance behind the deflector so that the level sensors don't touch the deflector.

21. Secure the TWM to the Infratec by using eight screws **1** (p/n 55320017) (six screws are not shown below).

22. Refit the two beams **1** and **2** and the three feet. Place the Infratec into standing position.

23. Connect the TWM to the measuring unit. Make sure that no cables are touching the balance.

24. Swich on the Infratec.
25. Enable the TWM function of the Infratec 1241 according to User Manual Infratec 1241 Modules (p/n 60043623).

3.4 Installation of Sample Transport Module

Software Options

In the Service Menu there is an option in “3 Manual Tests” called “7 STM” which offers three options.

1. Position settings
2. Service
3. Exercise

Position settings can be used to run the cuvette holder up and down manually. It can also be used to step between the sub sample positions. It is easy to use and stops when it comes to the end position.

Service, displays the position sensors value and gives an option of running the motor Up/ Down/ Off.

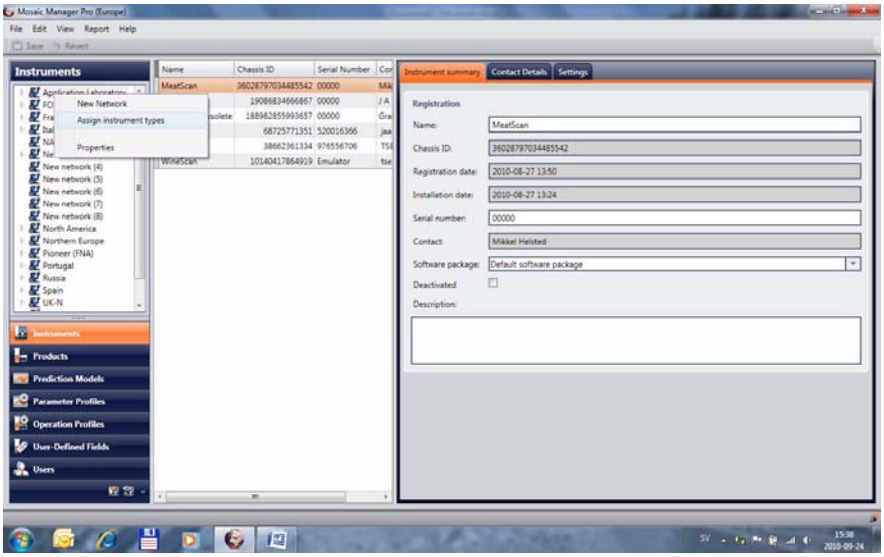
Note: It will not stop in the end position so be very careful.

Exercise, will only continuously run the cuvette holder up and down, no real use for this option.

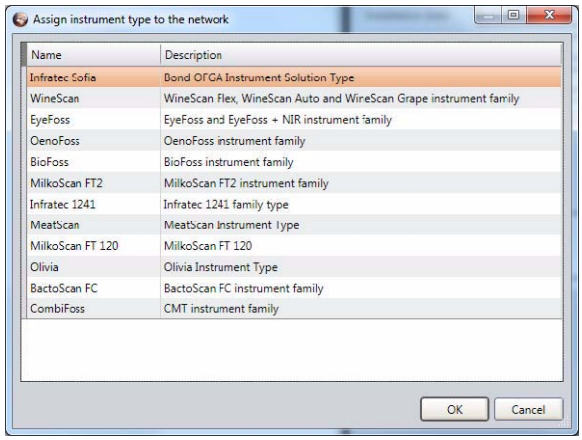
3.5 Mosaic Connection

Assigning Instrument type to Network

1. The instrument type must be assigned to the Network. Right click on Network Name. Select “Assign instrument types” from the context menu.

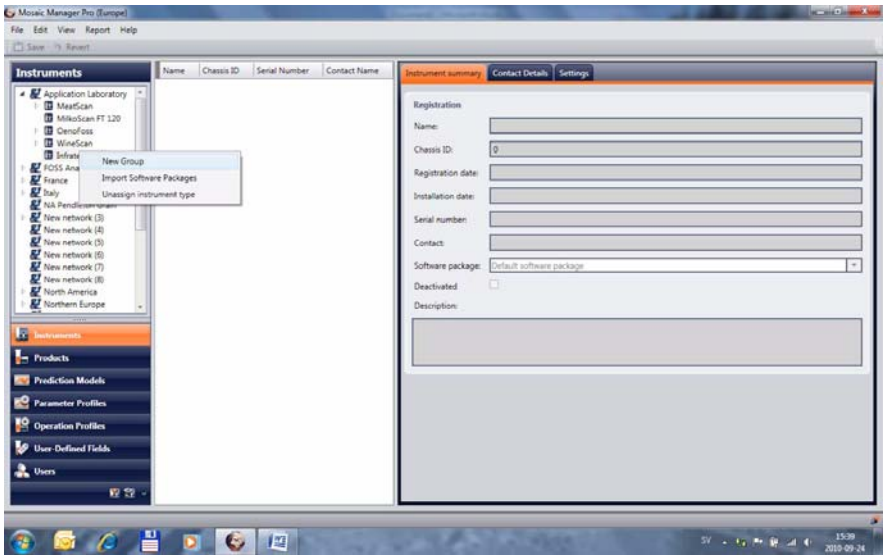


2. Highlight the instrument type that should be assigned and click “OK”.

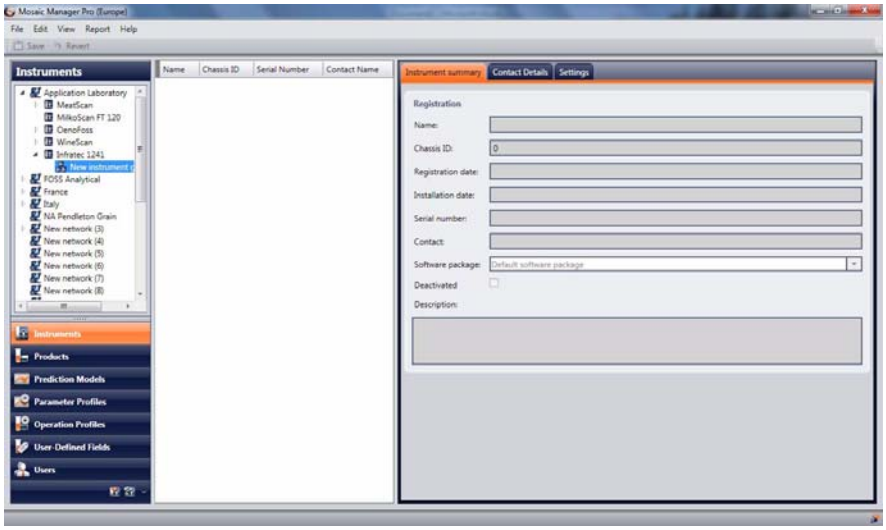


Add New Group to Instrument type

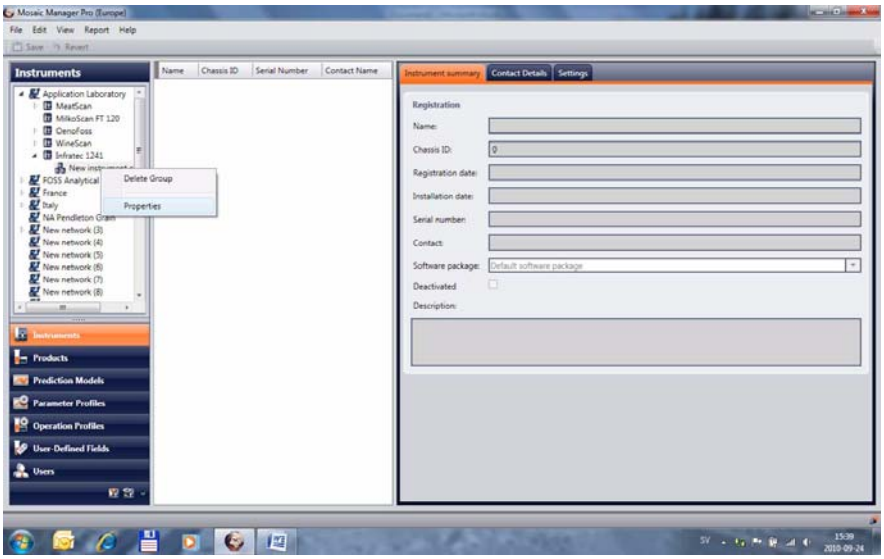
3. Add an instrument group to the instrument type by right clicking on instrument type, select New Group from the context menu. In the example a New Group is added to Infratec 1241.



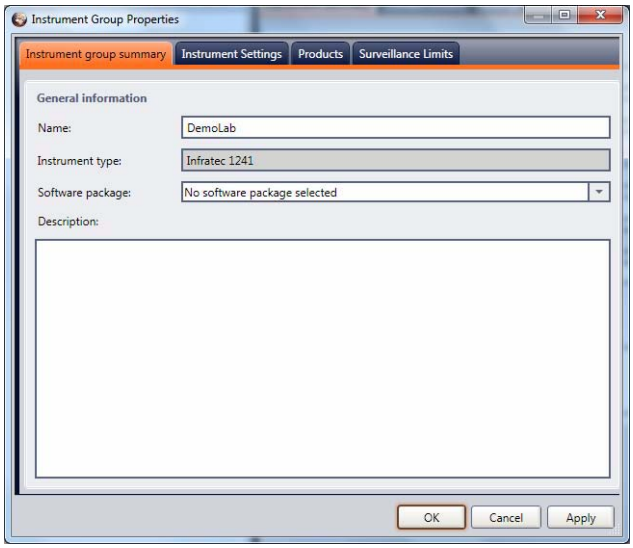
4. New instrument group will show up:



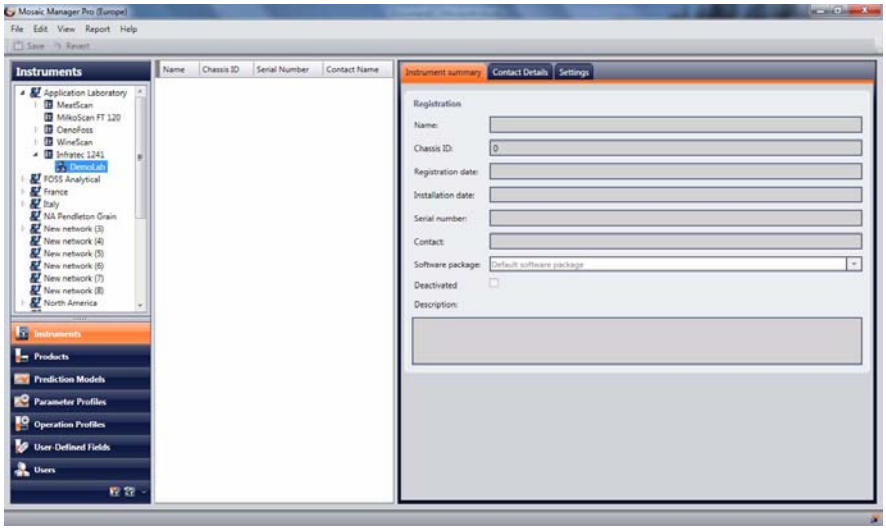
5. Right click on the New instrument group and select Properties from the context menu.



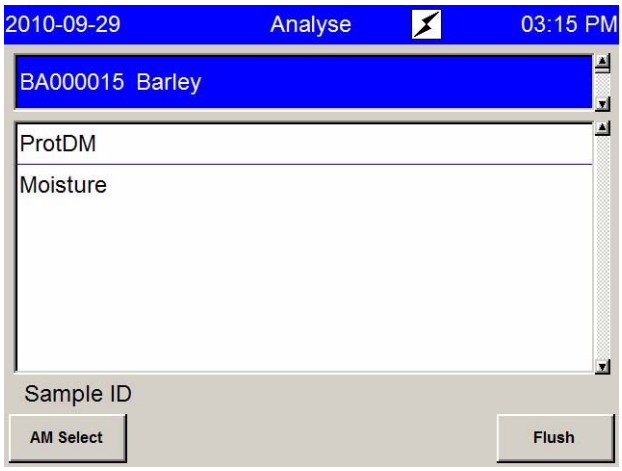
6. Give the Instrument group a new Name, for example customer name, site, factory or similar. Click OK.



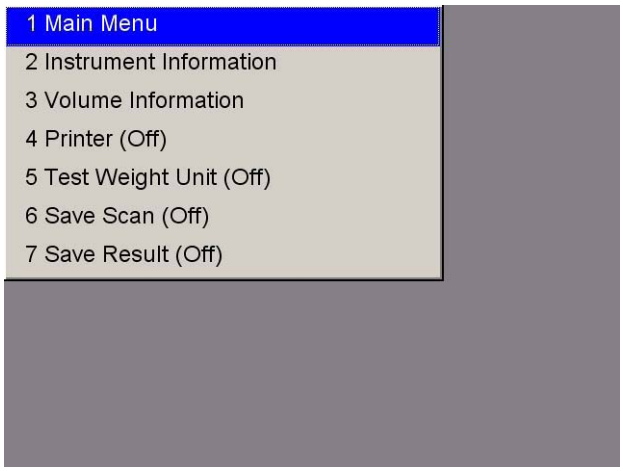
7. The new Instrument Group Name will appear under the instrument type.



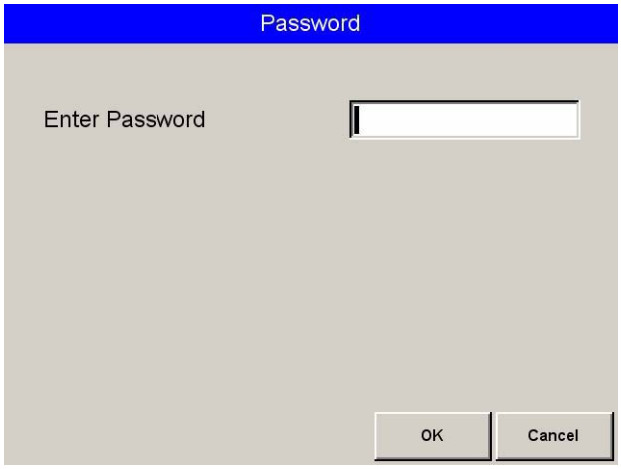
Connect Infratec 1241 to Mosaic Server



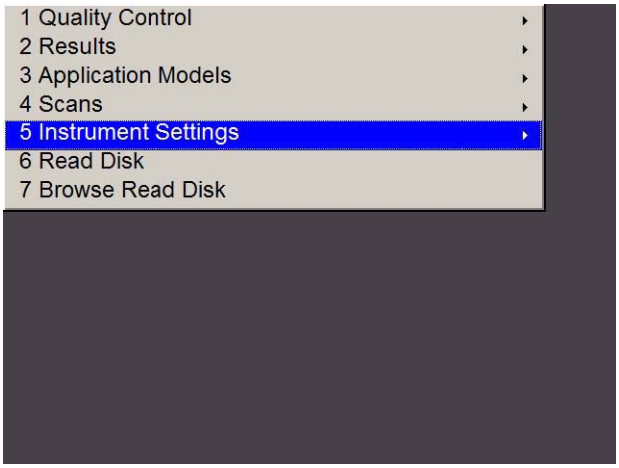
8. In analyze mode click on the Menu button.
   Select 1 Main Menu.



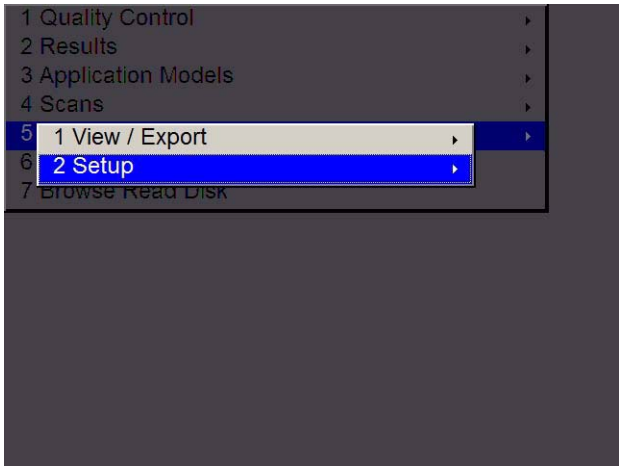
9. Enter password. Default password is 123456.



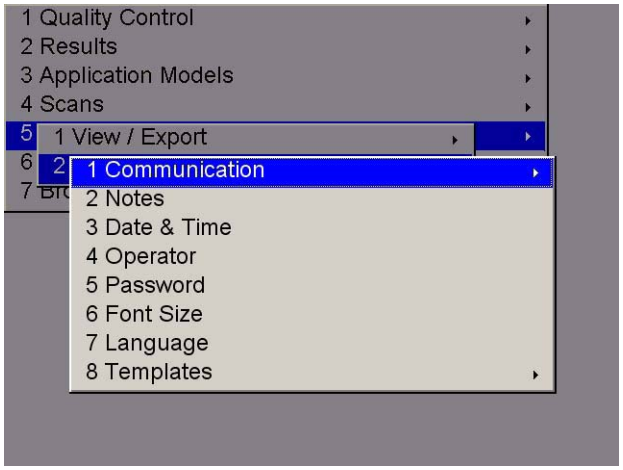
10. Select 5 Instrument Settings.



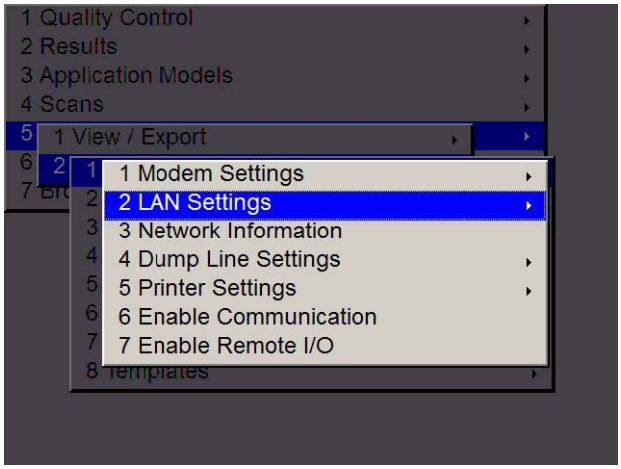
11. Select 2 Setup.



12. Select 1 Communication.

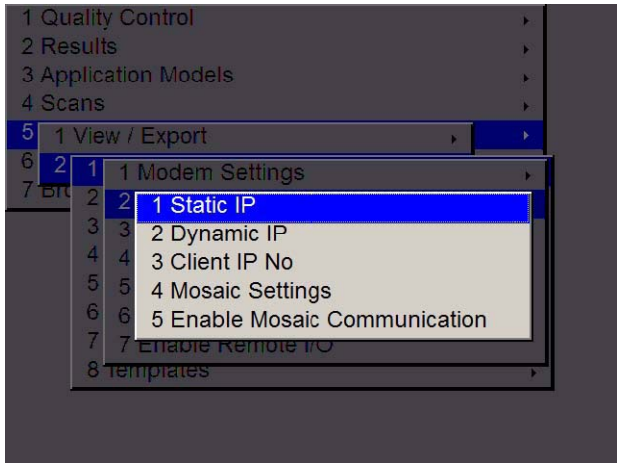


13. Select 2 LAN Settings.

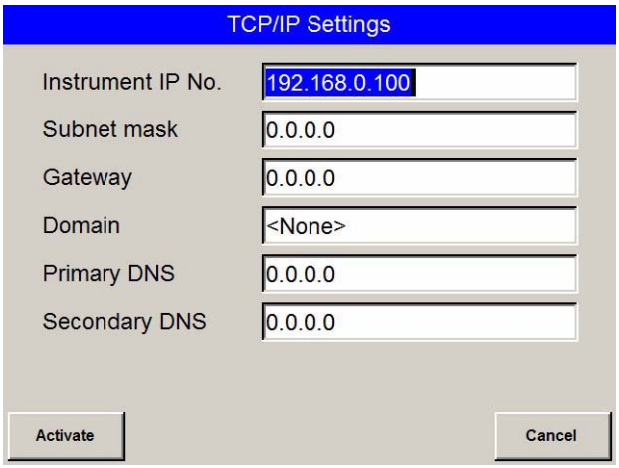


The customer IT department will assign if Static or Dynamic IP should be used. The IT department should also supply all information needed.

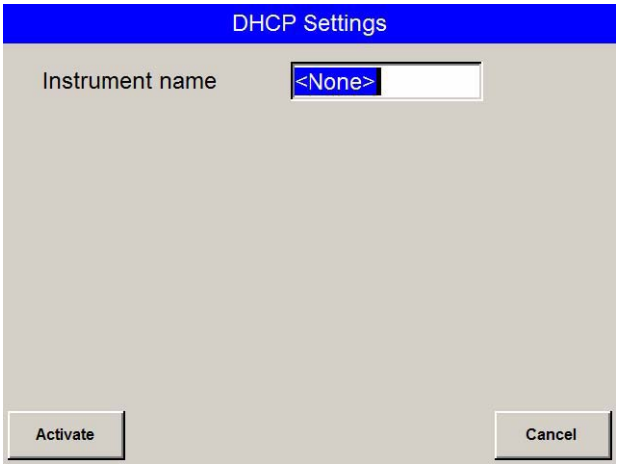
14. If the instrument will have a Static IP select 1 Static IP.
    If using Dynamic IP please select 2 Dynamic IP.



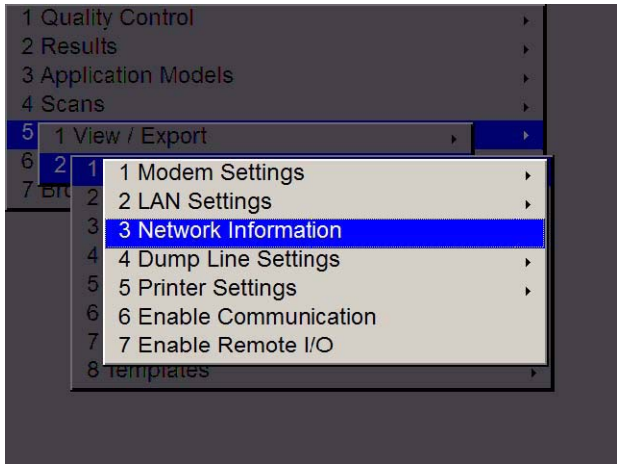
15. Static IP: Enter at least the Instrument IP No., Subnet Mask and Gateway which the customer IT department has assigned for the instrument. Press Activate.



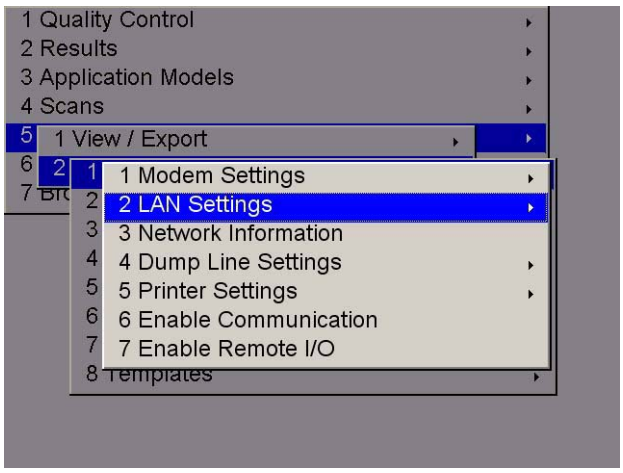
16. Dynamic IP: Enter Instrument Name assign by Customer IT department. Press Activate.



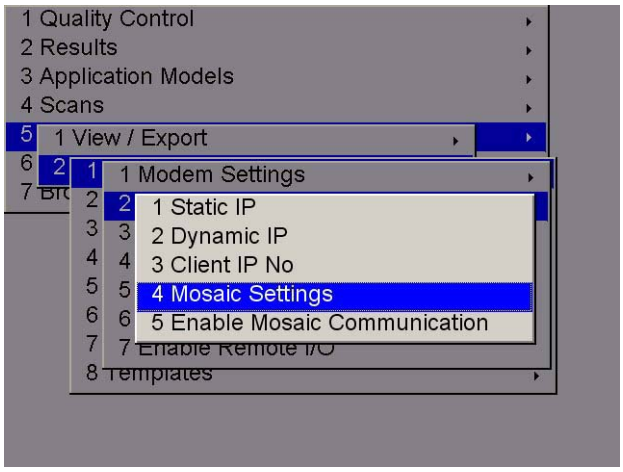
17. Select Network Information to check the LAN settings is correct in Infratec.



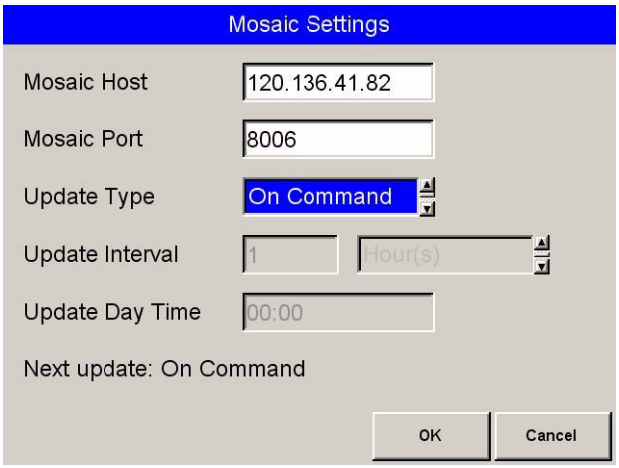
18. Select 2 LAN Settings.



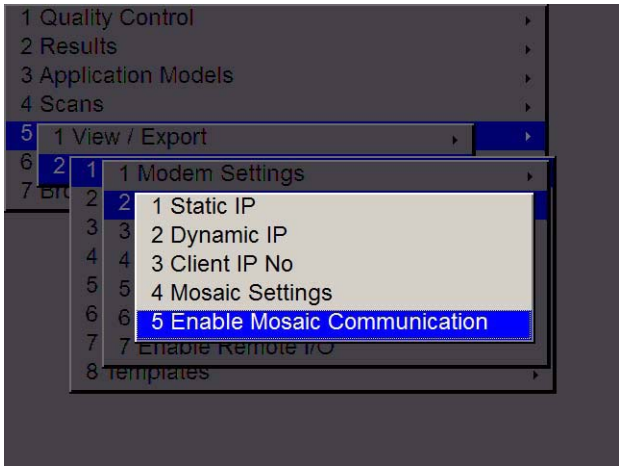
19. Select 4 Mosaic Settings to enter the Mosaic server settings.



20. Type in the IP number to the Mosaic Server in Mosaic Host field. Remember that Infratec software cannot resolve DNS name, therefore use IP number to Mosaic server. Enter the right port for the Infratec to connect. Select Update type On Command or On Timer. Select OK. In selecting On Command the customer needs to go into menu to be able to synchronize, see next picture. Easiest way for the customer is to have Update Type On Timer.



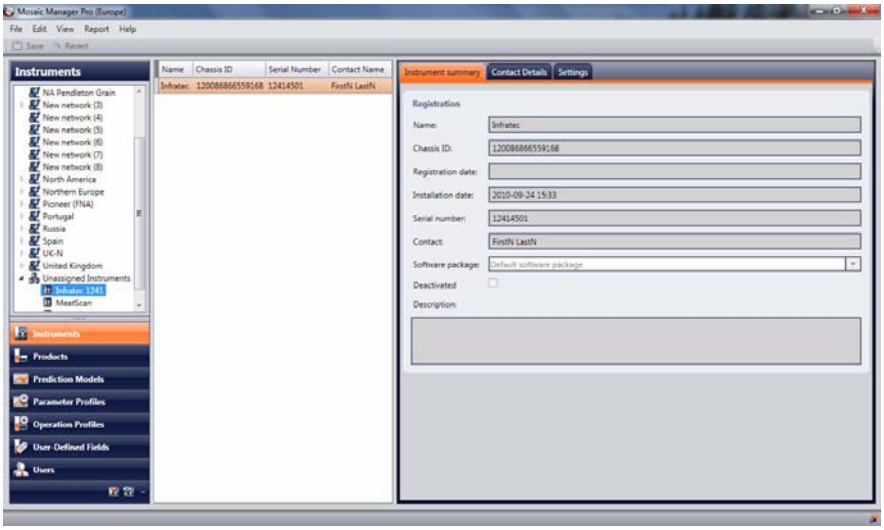
21. Select 5 Enable Mosaic Communication to start synchronizing with the Mosaic System.



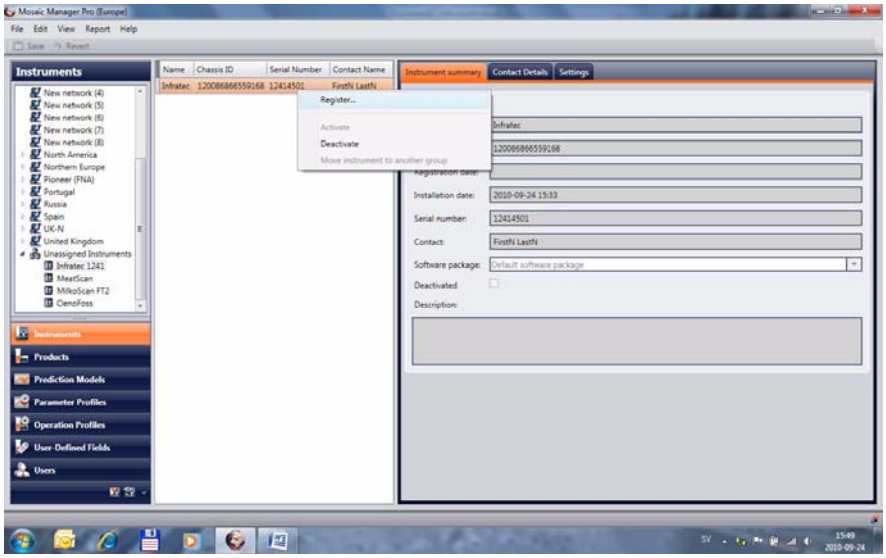
22. When the first synchronization is done with Mosaic server the message Instrument is waiting registration by Mosaic Manager will appear if the synchronization was successful. Continue to register the instrument in Mosaic.

Connect Infratec to Network in Mosaic

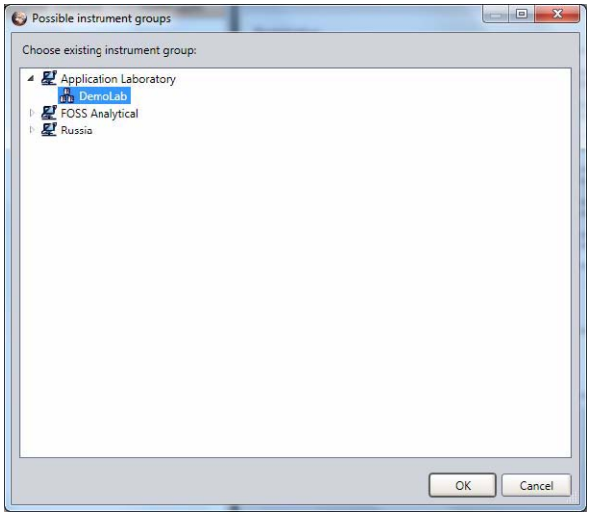
23. In Unassigned Instrument the newly synchronized Infratec 1241 will appear.

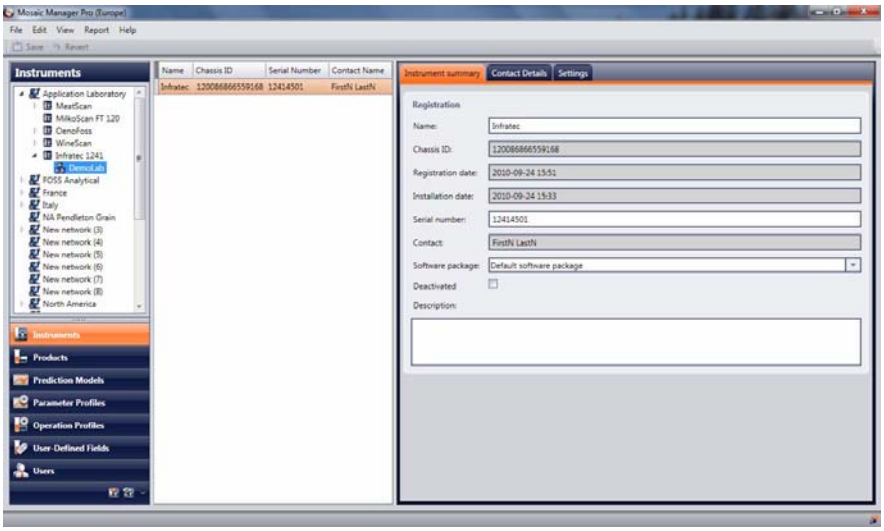


24. Right click on the Instrument and select Register… from the context menu.



25. Select the Network and Instrument group that the instrument should be assigned to and click OK.




Mosaic Manager Pro (Europe)
File Edit View Report Help
Instruments
Application Laboratory
MeatScan
MilkoScan FT 120
OenoFoss
WineScan
Infratec 1241
DemoLab
FOSS Analytical
France
Italy
NA Pendleton Grain
New network (3)
New network (4)
New network (5)
New network (6)
New network (7)
New network (8)
North America
Name
Chassis ID
Serial Number
Contact Name
Infratec 120086866559168 12414501 FirstN LastN
Instrument summary
Contact Details
Settings
Registration
Name: Infratec
Chassis ID: 120086866559168
Registration date: 2010-09-24 15:51
Installation date: 2010-09-24 15:33
Serial number: 12414501
Contact: FirstN LastN
Software package: Default software package
Deactivated
Description:
Instruments
Products
Prediction Models
Parameter Profiles
Operation Profiles
User-Defined Fields
Users

4 Diagnostics and Troubleshooting

4.1 General

As a Service technician you should try to gather as much information as possible before proceeding with a course of action when a customer calls to you with an instrument problem. The majority of problems that the customer experiences can be divided into two main categories, "poor" results or instrument faults. Instrument faults express themselves in error codes or that the instrument does not work at all.

Further, a problem reported may be a repeatable problem or an intermittent problem. The later requires more information to be pinpointed. You should then ask the user questions like;

- When in time did the problem occur first?
- How frequent is it?
- Did it occur in conjunction with any other event, e.g. relocating the instrument, adding new hardware, adding new software etc?
- Has it escalated?
- Does the problem happen when certain events (keystrokes, selecting things etc) happen?
- Try to think "outside the box" when you ask questions. Consider the environment, e.g. vibrations, temperature, straylight, electricity, user log-in, time in the day/week or anything else relevant that may cross your mind.
- Has the user himself observes anything that is out of the ordinary?

Consider the first contact with the customer as a golden opportunity to get more information by asking questions like the ones above. A telephone call is a duplex communication and many times you will get closer to the root cause even if you may not be able to pinpoint the exact cause of the problem.

A very good way of getting closer to a solution is to learn how a working system behaves. Learn how "normal" logfiles and scans look like. Look at a normal startup and learn the procedure for the hardware like LED´s, beeps, hardware movements, software messages etc. A deviation in this kind of information may also give clues to a solution.

Discussing "poor results" may be the most difficult situation due to the fact that the customer´s expectations can sometimes exceed the typical specified performance of the instrument. For NIR instruments, which always is an in-direct method of measurement, you must consider the robustnes of the application, the sample itself and perhaps environmental influence. This without saying that the problem might be related to hardware or software in the system.

If you wan't to escalate a support incident to the 2nd line support please always add all the information you have gained during your first attempts to troubleshoot. Also describe the action you may have taken and the effect of those actions, if any. For the Infratec 1241 ALWAYS supply the complete set of log files from the instrument.

This chapter helps you to quickly find the explanation and likely cause to most of the error messages and faults. The beginning of the chapter includes questions that help you to sort out what kind of problem that has occurred.

4.1.1 Poor Results

The points listed below can be considered as a check list for trouble shooting “poor” results. The reasons for “poor” results can be divided into:

- User problems
- Poor calibrations
- Outliers
- Poor reference data
- Instrument problems (Time for cleaning? see User Manual)

4.1.2 User Problems

- Are they using the right calibration?
- Has there been an adjustment to the slope or intercept in the calibration?
- Are they sure that the moisture basis of the Infratec results is the same as that of the reference results?
- Do they use adjustment to dry content or constant moisture content?
- How many sub-samples are used?

4.1.3 Poor Calibrations

- Was the calibration developed for this type of sample?
- Was there sufficient data to develop the calibration?
- Was the calibration stabilised for instrument and temperature differences?

4.1.4 Outliers

Results with outliers should always be confirmed by a second analysis.
A sample may be classified as an outlier for a number of reasons:

- The constituent concentration is outside of the calibration range.
- The sample is of a variety for which the NIT spectrum differs greatly from the samples in the calibration set.
- The product is analysed with wrong AM.
- There is too much foreign material in the sample.
- Movements of the sample during the scan.
- Too high absorbance.
- Packing of sample not good

For each constituent, an outlier will be displayed as a letter (A-E) and a number (1-5). The letter indicates what kind of outlier it is, as described below, and the number describes the severity (the higher the number, the stronger the outlier).

A-outlier (residual) and B-outlier (leverage)

An outlier denoted by the letters A and B indicate how closely the NIT spectra of the sample correlate with the spectra in the calibration set.

C-outlier (sub sample deviation)

An outlier denoted by the letter C indicates that the standard deviation between the sub predicted values from the individual sub samples is above the set limit.

D-outlier (out of range)

An outlier denoted by the letter D indicates that the low or high limit for the constituent has been exceeded by the predicted value of at least one of the sub samples. This means that it is possible to get a D-outlier even if the average result on the display is within the calibration range.

E-outlier (difference between sample and ambient temperature)

An outlier denoted by the letter E indicates that the difference between the sample temperature and the ambient temperature is outside the set limits.

Sensitivity of outlier detection

The sensitivity for detection of outliers can be set in the instrument software, see User Menu, Application Models®Setup®Outlier limits. For the outlier constants, it is important that a relevant value is set, so only real outliers will be indicated. If the value selected is too low, samples that are not real outliers will be indicated as such. If the value is set too high, some real outliers may be missed.

The sensitivity setting for C is the maximum acceptable standard deviation for each set of sub samples. The appropriate value for this parameter, as well as the appropriate values for A and B parameters, are determined when the calibration is developed. Values for the A,B, and C constants will be recommended for AMs supplied by Foss Analytical.

The low and high limits for D should be set according to the range for each constituent in the actual AM.

The following are some questions that should be asked concerning the outlier:

- How many of the samples give outliers?
- In which positions are the outliers (A, B, C, D or E)?
- What is the value of the outlier (1-5)?
- Have they had outlier indications on that type of sample before?
- Are the outlier indications reproducible?
- Is the used calibration the correct one?

8.1.4.1 Conditions that will cause a sample to be flagged as an outlier

- Scan data does not fit with the calibration
- The sample differs from the typical samples in the calibration
- Standard deviation between sub-sample predictions outside preset limit
- Sample outside calibration range

8.1.4.2 Possible causes for outliers

- Wrong sample analysed
- Variety not included in the calibration
- Extreme chemical composition
- Impure sample (has too much foreign material)
- Instrument error
- Sample too hot or too cold (i.e. sample is frozen)

8.1.4.3 Corrective actions in the event of an outlier

- Re-run the analysis and verify it to be a true outlier
- Check to see if the sample meets any of the criteria mentioned in section 8.1.4.2 Possible causes for outliers above. If so, take corrective measures.
- Use reference method (Wet chemistry) instead

4.1.5 Poor Reference Data

- Which laboratory was used?
- Was more than one laboratory used, and if so, were there level differences?
- Are there systematic errors lab to lab bias?
- What reference method was used?
- Were determinations made induplicated?
- How was sample selection performed?
- Was grinding performed?
- What is the reference methods reproducibility?
- Is the moisture basis the same in the laboratory results as in the Infratec results?

4.1.6 Instrument Problems

- The Measuring Unit compartment of the instrument should be kept as clean as possible. Do not forget to sometimes also clean the Detector Window on the Cell House and the Cell Window. By cleaning the instrument regularly you avoid excessive dust build-up and thereby you lower the risk of stoppage. For cleaning instructions, see User Manual.
- Do they have a reference set of samples that they measure frequently on the instrument? This should be done to see if the instrument has changed! What changes?
- How is the sub-sample standard deviation for each constituent?
- Does it change during the day?
- Do the results drift during the day? If so, how much and does this occur every day?

4.1.7 I²C trouble shooting

Infratec 1241 is basically a PC with some extra hardware to perform analysis. The hardware is connected to the PC via a two-wire bus called the I2C. This is a Phillips developed bus.

All communication (commands, analytical data, error messages) is performed through the bus. Fig. 4:1 shows the bus and all connected equipment. Note that some equipment is separate but connected to the bus. When the extra modules are connected the bus will detect the extra nodes (addresses) and open up the software to control them.

The instrument software can be divided into three levels, not counting the BIOS and the operating system. The top level is the ISW (instrument Software), which is handling all information to for example the display. The DSP software is controlling the I2C communication as well as being a co processor for mathematical treatment of the data signal. In certain modules there are software (firm ware) controlling low level tasks like opening and closing the shutter in the Measuring Unit.

When the power is turned on the BIOS at the processor starts working. After some seconds there is a beep as in a normal PC and then the operative system QNX (UNIX type) starts working. After some initiation the ISW starts and the DSP software is down loaded from the flash disc to the DSP processor and starts to run. About this time the signal to turn on the display is sent to the power supply via the I2C bus and information starts to flow showing the start up procedure.

This table gives the approximate times for these events.

Time (secs)	Activity	Beeps	DSP LED			
			Power On	COMM (ISW/DSP)	Running (DSP)	DIR (Grating)
0	Power on		x			
10	BIOS	1	x			
	QNX (OS)		x			
	init (GUI)		x			
20	ISW running		x			
25	DSP download	1-4	x			
45	DSP running		x		x	
45	DSP init sequence				x	
	Init DSP SW variables					
	Init MU					
	Init EID					
	Init Detector		x			
	Init temperature sensors					
	Init PSU (display, lamp and backlight)					
	Init Grating motor/encoder					x
	test IP mode					x
55	DSP ready for command		x	x	x	x
65	ISW Start-up procedure		x			
	1 ADConverter(ScanMode::standard)		x			
	2 Communication_Monoch		x			
	3 Hardware_Monoch		x			
	4 Monoch_Checksum		x			
	5 Communication_Detector		x			
	6 Hardware_Detector		x			
	7 Detector_Checksum		x			
	8 Communication_Ambient		x			
	9.a If STM….		x			
	1. Communication_Elevator		x			
	2. Hardware_Elevator		x			
	3. checkElevatorCell		x			
	4. Communication_MU		x			
	5. checkDrawerIsInserted		x			
	6. Hardware_MU		x			
	7. setPathLength(33)		x			
	9.b else MU		x			
	1. Communication_MU		x			
	2. checkDrawerIsInserted		x			
	3. Hardware_MU		x			
	10 If TWM		x			
	1. Communication_TWM		x			
	2. Hardware_TWM		x			
	11 Communication_PSM		x			
	12 Hardware_PSM		x			
	13 If newPowerSupply TEST_Voltages		x			
	14 Monoch		x			
	15 Detector		x			
	16 Monoch_ADC		x			
	17 LampCheck (Gain 1*2)		x			
	18 Stability		x			
	19 Monoch_WaveLengthStability		x			

If the bus is corrupted in any way, the communication will not work. It is therefore possible to have a black display, when the error is actually in the I2C communication.

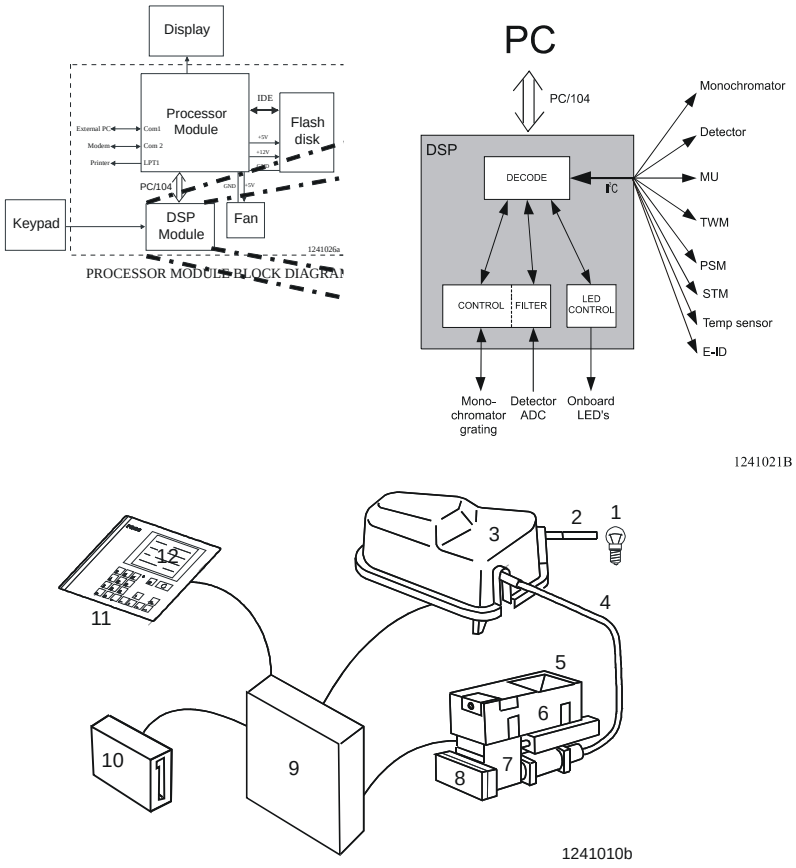


Fig. 4:1 I^2C Communication

1	Lamp	7	Sample Cuvette
2	Lamp fiber (input)	8	Detector
3	Monochromator	9	PC Module
4	Output fiber	10	USB input/output
5	Measuring Unit	11	Keyboard
6	Conveyor Belt	12	Display

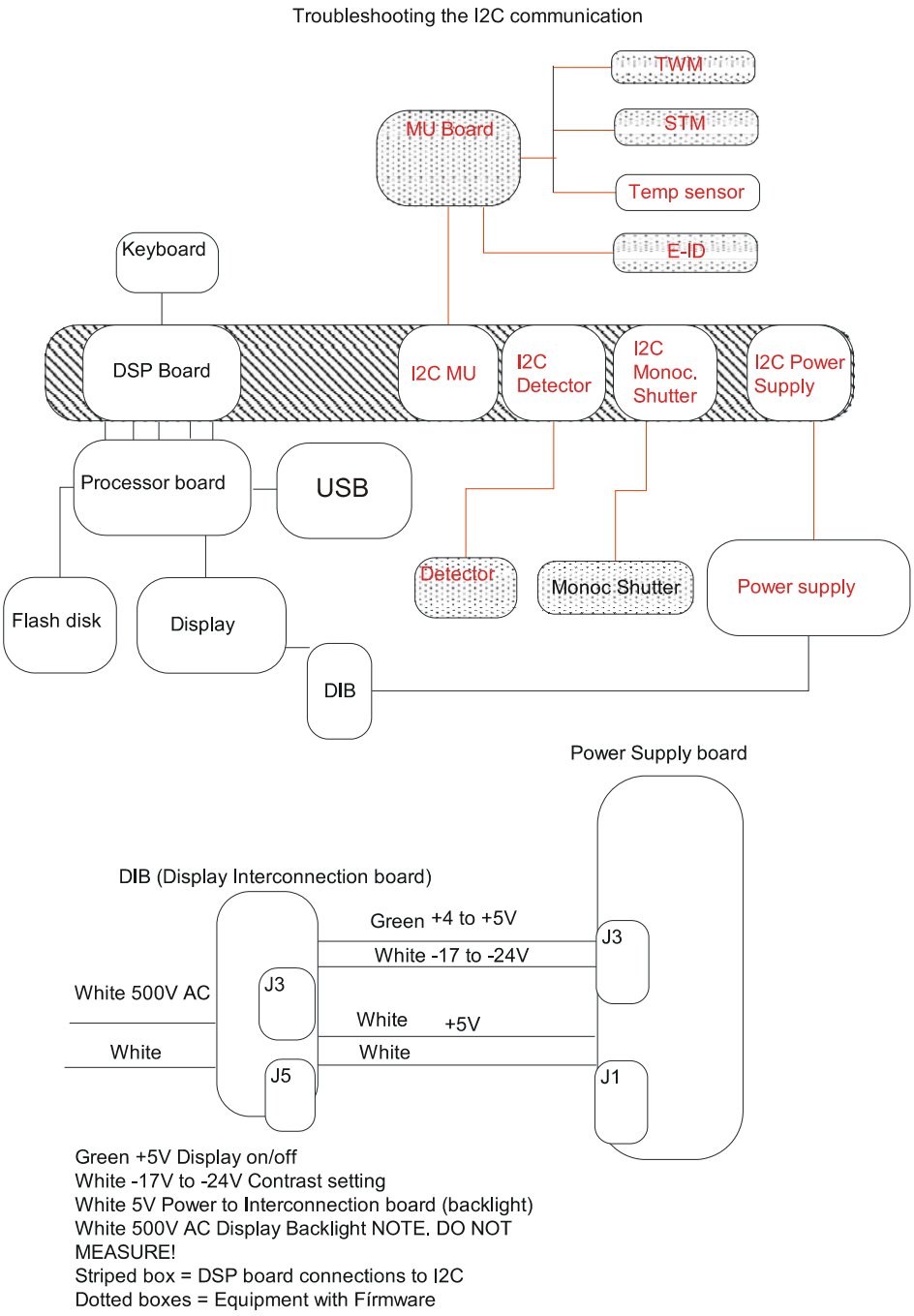


Fig. 4:2 Troubleshooting the I^2C communication

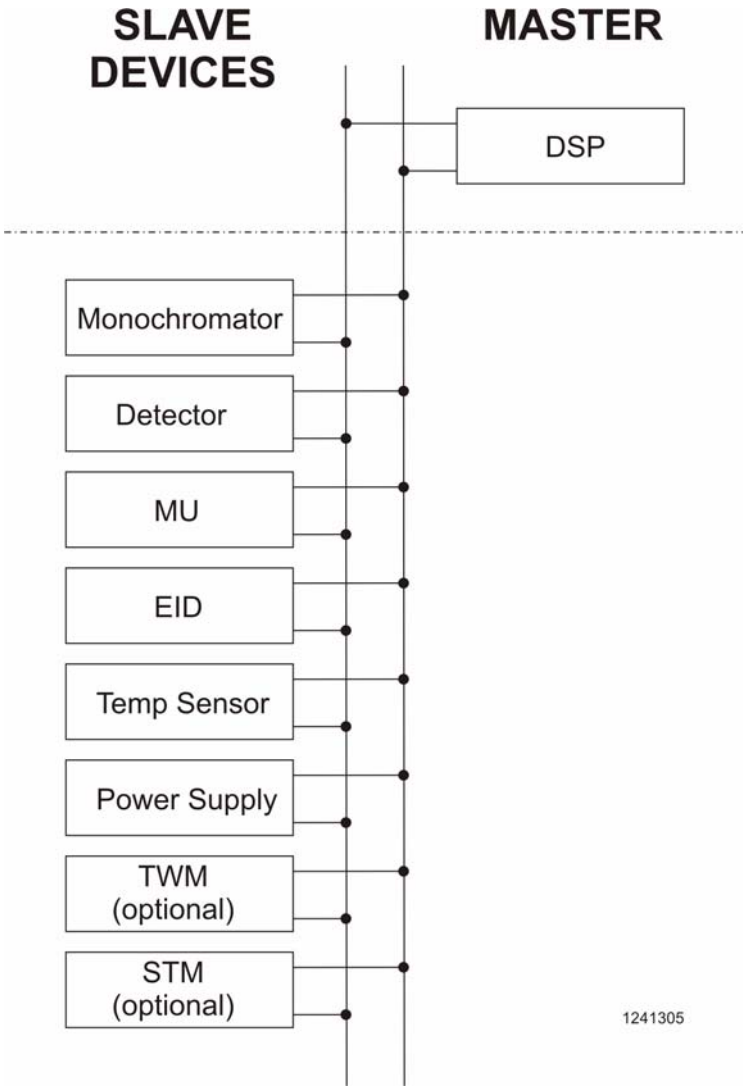


Fig. 4:3 I^2C Bus in Infratec 1241

The following troubleshooting scheme is suggested.

Situation: A black display or an error log with information pointing in different directions.

1. Disconnect all external equipment (STM, TWM) if present.
2. Disconnect the i2c cable from the PSU, monochromator, detector and MU to the DSP board. Attach a jumper on the open connector on the Display interconnection board or use an external monitor. Start the instrument and if the display starts up you should get 4 beeps and the following error message:
   Error in Power Supply 32768(0505)
   and in the hardware error log:
   HL/12416729/2010-04-07 07:09:02/Name=String, "8000 - 505/fc0/0/1/2000/0/0/503".
   Any other error message indicates an error in the DSP board. If the display stays black go to step 8.
3. Reattach the PSU i2c cable, remove the jumper on the display interconnection board and restart the instrument. The following error message should appear:
   Checking Monoch. Comm failed selftest.
   and in the hardware error log:
   HL/12416729/2010-04-07 07:11:29/Name=String, "8000 - 105/fc0/0/1/2800/0/0/503"
   Any other error message indicates an error in the PSU. A black display at this stage indicates a faulty display or interconnection board.
4. Reattach the monoc i2c cable and restart the instrument. The following error message should appear:
   Checking Detector Comm failed selftest.
   and in the hardware error log:
   HL/12416729/2010-04-07 07:23:27/Name=String, "8000 - 202/fc2/0/1/2000/0/0/503"
   Any other error message indicates an error in the monocromator.
5. Reattach the detector i2c cable and restart the instrument. The following error message should appear:
   Checking Ambient Sensor Comm failed selftest.
   and in the hardware error log:
   HL/12416729/2010-04-07 07:28:27/Name=String, "8000 - 12/fc3/0/1/2000/0/0/503"
   Any other error message indicates an error in the detector.
6. Reattach the MU i2c cable and restart the instrument. If you get an error message at this stage disconnect the ambient senor and the E-id from the MU and restart the instrument.
7. Reconnect STM and TWM one at a time if present. Restart the instrument and check for errors.
8. Measure the voltage on the connection JP3 blue wire on the power supply. It should be more then 4V. If the voltage is over 4V and the display still is black there is a problem in the display or the display interconnection board.

4.2 Service Menu

In order to troubleshoot an instrument, Service technicians will have to access the Service Menu. The Service Menu assume a more detailed knowledge about the Infratec 1241 Grain Analyzer. The Service Menu is therefore password protected. Password is only given to personnel approved by FOSS.

Most of the headings in the Service Menu have sub menus, see menu structure on next page.

Service menu for Infratec 1241

Level 1	Level 2	Level 3	Level 4	Comments
1 Quality Control				
	1 Self Test			
		1 Run Self-Test		Run a Self-Test
		2 Export		Copy Start-Up test result or Self-Test result to a USB stick
		3 Print		Print Start-Up test result or Self-Test result
	2 Clean Measuring Unit			Prepare the cell for cleaning
	3 Audit Log			View latest log by user
	4 Software Error Log			View latest Software Error Log
	5 Hardware Error Log			View latest Hardware Error Log
	6 Export Logs and Configuration			View error logs or copy them to a USB stick
	7 Wavelength Stability			Testing the Monochromator Wavelength Stability
	8 Lamp Check			Checks the condition of the Monochromator lamp
2 Automatic Tests				
	1 Detector			
		1 ADC No Missing Codes		
		2 Offset with Empty Cell		
	2 Monochromator			
		1 Grating System		
		2 Air Stability		
		3 Shutter		
		4 Internal BG20		
		5 External BG20		
		6 Reference Scan		
		7 Encoder Information		
	3 I/O			
		1 COM 1		
		2 COM 2		
		3 Lpt 1		
		4 Keyboard		
		5 External Keyboard		
3 Manual Tests				
	1 Detector			
	2 Monochromator			
	3 Measuring Unit			
		1 Position Setting		
		2 Sensors		
		3 Set Ambient Temperature		
	4 Display			
	5 Scan			
	6 Test Weight			*Greyed out if not installed*
		1 Position Settings		

Level 1	Level 2	Level 3	Level 4	Comments
		2 Calibrate		
			1 Balance Control	
			2 Mass Calibration	
			3 Adjust Balance	
		3 Test Weight Cycle		
		4 AD Values		
		5 Flush		
	7 Sample Transport Module			*Greyed out if not installed*
		1 Position Settings		Possibility to manually position the Cuvette Holder
		2 Service		Test of sensors and motor
		3 Exercise		
	8 Bottle Unit			***Greyed out on 1241***
		1 Position settings		*Possibility to manually position the Bottle Unit*
		2 Sensors		*Possibility to check the Bottle Unit position sensors*
4 Manual Analysis				Lengths, Speeds, Shutter Positions etc. can be set manually from here
	1 Settings			
	2 Fill Sample Cell			
	3 Scan			
	4 Offset			
	5 Empty Sample Cell			
	6 Flush Sample Cell			
5 Instrument Info				
	1 Hardware			Instrument version of DSP, Monochromator, Detector etc.
	2 Software			Software version
	3 Bios			Bios version
	4 Monochromator Constants			The O- and P-constants
	5 Operating Temperature			Min. and Max. operating temperature
	6 Volume Information			View available space on the database disk
	7 Voltage Information			
6 Clone Instrument				Export of configuration for modem, menu and language
7 Settings				
	1 Default Settings			Resets the instrument to its default settings
	2 Scan Mode (Standard)			
8 Read Disk				Read contents of USB stick and install possible options e.g. AM-s or programs

4.3 Quality Control

4.3.1 Self-test

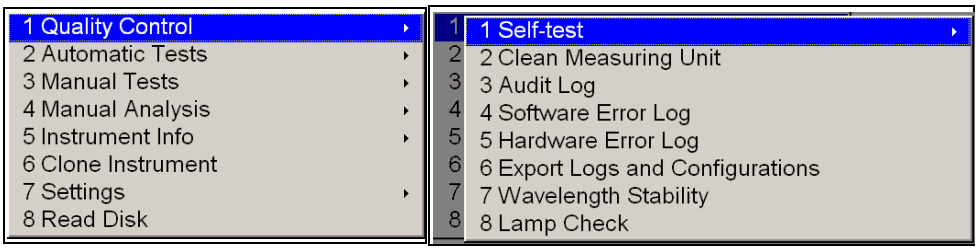


Fig. 4:4 Self-test sub-menus

When the instrument is powered-up or when manually chosen, a Self-test is executed. The different tests take place in the order as they are specified in this section.

Screen Display

The PC-board is not capable to send screen display to both LCD and CRT. The default screen mode is LCD.

The LCD backlight is intentionally disabled at boot-up. It is enabled at the end of the DSP initialization where the PSU initialization activates the IIB..

For troubleshooting purpose you can bypass the disabled backlight buy short-circuiting the jumper JP3 on the Display Interconnection Board.

PC Board System Test and Initialization

These routines test and initialize PC board hardware. If the routines encounter an error during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors. Non-fatal error messages usually appear on the screen along with the following instructions:

Press <F1> to RESUME

Write down the message and press the F1 key to continue the boot up sequence.

PC Module System configuration verification

These routines check the current system configuration against the values stored in the CMOS memory. If they do not match, the program outputs an error message. You will then need to run the BIOS setup program to set the configuration information in memory.

There are three situations in which you will need to change the CMOS settings:

1. You are starting your system for the first time
2. You have changed the hardware attached to your system
3. The CMOS memory has lost power and the configuration information has been erased.

The PC-board memory has an external lithium battery backup for data retention.

Power-up beeper and DSP LEDs

When the instrument is powered-up, there is a beeper function to notify if a failure in the instrument software start-up routine, or DSP software loading, has occurred:

- 1 beep OK
- 2 beeps Could not open DSP device
- 3 beeps DSP communication failure
- 4 beeps LCD display enable failure (see Trouble Shooting scheme)

LEDs on the DSP

First the power (green) is lit. After some time the LED 1 is lit. The DSP software is now running. When the DSP software is communicating the LED 4 is flashing rapidly. At this state the display should be lit. For more information regarding the DSP LEDs see Technical Description.

Communication

Communications between the instrument software and the DSP board are first checked when the instrument is powered-up. Failure in the instrument software to DSP communication is notified by a beeper signal, as described above. Then the I^2C communications from the DSP to each hardware module (Monochromator comm., Detector comm., Measuring Unit comm. and PSM comm.) are tested. The detector temperature sensor and the ambient temperature sensor (placed on the hood) are also tested and reported as “True” or “False”.

NOTE! The "1241xxxx" written on each line symbolise the serial number of the instrument.

Line description including typical value	Units	Min. limit	Max. limit
SelfTest/1241xxxx/Monoch./SerialNumber=String, T9010017			
SelfTest/1241xxxx/Monoch./Comm=Bool, True	bool		
SelfTest/1241xxxx/Detector/SerialNumber=String, 00000015			
SelfTest/1241xxxx/Detector/Comm=Bool, True	bool		
SelfTest/1241xxxx/TempSensor/ Comm=Bool, True	bool		
SelfTest/1241xxxx/MU/Comm=Bool, True	bool		
SelfTest/1241xxxx/PSM/Comm=Bool, True	bool		

Checking hardware

The check of communication and hardware is separated.

Voltage check

After checking the PSU hardware, a voltage check is performed.

Line description including typical value	Units	Min. limit	Max. limit
SELFTEST/12411615/VoltageTest/+5=Number,4.96	Volt	4.5	5.5
SELFTEST/12411615/VoltageTest/+5.5=Number,5.58	Volt	5.0	6.0
SELFTEST/12411615/VoltageTest/+12=Number,11.95	Volt	11.2	12.8
SELFTEST/12411615/VoltageTest/-12=Number,-11.84	Volt	-12.8	-11.2
SELFTEST/12411615/VoltageTest/+10.5=Number,3.11	Volt	10.0	11.0
SELFTEST/12411615/VoltageTest/Contrast=Number,-30.75	Volt	-25	-15
SELFTEST/12411615/VoltageTest/Input=Number,29,87	Volt	20	45
SELFTEST/12411615/VoltageTest/Passed=Bool,True	bool		

This check is using the same accuracy as the voltage display in the service menu 5.7.

Monochromator

Grating system

The grating system functionality test checks the functionality of the grating shaft encoder. The test results report the maximum (positive) and the minimum (negative) encoder unlinearity when the grating makes a complete scan, and the total difference (i.e. max-min). The number of encoder pulses to complete a single revolution (forward and reverse) of the grating is also recorded, along with the time to complete the scan. The following table lists the names, typical values and limits for the above parameters.

Line description including typical value	Units	Min. limit	Max. limit
SelfTest/1241xxxx/Monoch. /SerialNumber=String, T9010017			
SelfTest/1241xxxx/Monoch. /Min=Number, -1.2	%	>-22%	
SelfTest/1241xxxx/Monoch. /Max=Number, 1.2	%		<+22%
SelfTest/1241xxxx/Monoch. /Diff=Number, 2.4	%		50%
SelfTest/1241xxxx/Monoch. /PulseCount=Number, 2880	real	2800	3400
SelfTest/1241xxxx/Monoch. /CycleTime=Number, 2.605	S	2.000	3.000

Checksum test of monochromator EEPROM

This test validates O- and P-constants, serial number of the Monochromator and peak value for internal BG20 filter. If the checksum does not match what is stored in the EEPROM, an error occur and the instrument will be unable to analyse.

Line description including typical value	Units	Min. limit	Max. limit
SelfTest/1241xxxx/Monoch. /Checksum=Bool, True	bool		

Detector

ADC No Missing Codes

This test checks the ADC unlinearity and the missing codes. The result is presented as "True" or "False".

Line description including typical value	Units	Min. limit	Max. limit
SelfTest/1241xxxx/Detector/SerialNumber=String, 00000015			
SelfTest/1241xxxx/Detector/ADCNo MissingCodes=Bool, True	bool		

Detector Offset Test

Measures the offset voltage at the ADC input with no light falling on the detector, e.g. monochromator shutter closed. The detector gain is stepped up from 1*1 to 1000*16 with the minimum, maximum, mean ADC signal and standard deviation recorded for each gain setting, as shown in the table below. The detector temperature is recorded together with the ADC data.

Line description including typical value	Units	Min. limit	Max. limit	Comments
SelfTest/1241xxxx/Detector/SerialNumber=String, 00000015				One measurement (with closed shutter and lamp turned off) per gain step is performed, where 5000 points are read. The criteria for this test is that the mean value in all steps should be between 50-2000. Measurements are made in 15 steps. The standard deviation should be max.(see highlighted values).
SelfTest/1241xxxx/Detector/gain1/Min=Number, 499	bits	5		
SelfTest/1241xxxx/Detector/gain1/Max=Number, 500	bits			
SelfTest/1241xxxx/Detector/gain1/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain1/StdDev=Number, **0.4943**	bits		**2.0**	
SelfTest/1241xxxx/Detector/gain1/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain2/Min=Number, 499	bits	5		
SelfTest/1241xxxx/Detector/gain2/Max=Number, 500	bits			
SelfTest/1241xxxx/Detector/gain2/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain2/StdDev=Number, **0.4943**	bits		**2.0**	
SelfTest/1241xxxx/Detector/gain2/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain3/Min=Number, 499	bits	5		
SelfTest/1241xxxx/Detector/gain3/Max=Number, 500	bits			
SelfTest/1241xxxx/Detector/gain3/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain3/StdDev=Number, **0.4943**	bits		**2.0**	
SelfTest/1241xxxx/Detector/gain3/Temp=Number, 24	real	0		
SelfTest/1241xxxx/Detector/gain4/Min=Number, 499	bits	5		
SelfTest/1241xxxx/Detector/gain4/Max=Number, 500	bits			
SelfTest/1241xxxx/Detector/gain4/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain4/StdDev=Number, **0.4943**	bits		**2.0**	
SelfTest/1241xxxx/Detector/gain4/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain5/Min=Number, 498	bits	5		
SelfTest/1241xxxx/Detector/gain5/Max=Number, 502	bits			
SelfTest/1241xxxx/Detector/gain5/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain5/StdDev=Number, **0.4943**	bits		**2.0**	
SelfTest/1241xxxx/Detector/gain5/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain6/Min=Number, 498	bits	5		
SelfTest/1241xxxx/Detector/gain6/Max=Number, 502	bits			
SelfTest/1241xxxx/Detector/gain6/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain6/StdDev=Number, **0.4943**	bits		**2.0**	
SelfTest/1241xxxx/Detector/gain6/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain7/Min=Number, 498	bits	5		
SelfTest/1241xxxx/Detector/gain7/Max=Number, 502	bits			
SelfTest/1241xxxx/Detector/gain7/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain7/StdDev=Number, **0.4943**	bits		**2.0**	
SelfTest/1241xxxx/Detector/gain7/Temp=Number, 24	real	0	60	

Line description including typical value	Units	Min.	Max.	Comments
SelfTest/1241xxxx/Detector/gain8/Min=Number, 495	bits	5		One measurement (with closed shutter and lamp turned off) per gain step is performed, where 5000 points are read. The criteria for this test is that the mean value in all steps should be between 50-2000. Measurements are made in 15 steps. The standard deviation should be max.(see highlighted values).
SelfTest/1241xxxx/Detector/gain8/Max=Number, 505	bits			
SelfTest/1241xxxx/Detector/gain8/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain8/StdDev=Number, **0.8220**	bits		**3.0**	
SelfTest/1241xxxx/Detector/gain8/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain9/Min=Number, 495	bits	5		
SelfTest/1241xxxx/Detector/gain9/Max=Number, 505	bits			
SelfTest/1241xxxx/Detector/gain9/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain9/StdDev=Number, **0.8220**	bits		**3.0**	
SelfTest/1241xxxx/Detector/gain9/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain10/Min=Number, 495	bits	5		
SelfTest/1241xxxx/Detector/gain10/Max=Number, 505	bits			
SelfTest/1241xxxx/Detector/gain10/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain10/StdDev=Number, **0.8848**	bits		**4.0**	
SelfTest/1241xxxx/Detector/gain10/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain11/Min=Number, 492	bits	5		
SelfTest/1241xxxx/Detector/gain11/Max=Number, 508	bits			
SelfTest/1241xxxx/Detector/gain11/Mean=Number, 500	bits	50	2000	
SelfTest/1241xxxx/Detector/gain11/StdDev=Number, **1.0310**	bits		**5.0**	
SelfTest/1241xxxx/Detector/gain11/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain12/Min=Number, 490	bits	5		
SelfTest/1241xxxx/Detector/gain12/Max=Number, 525	bits			
SelfTest/1241xxxx/Detector/gain12/Mean=Number, 510	bits	50	2000	
SelfTest/1241xxxx/Detector/gain12/StdDev=Number, **3.0721**	bits		**9.0**	
SelfTest/1241xxxx/Detector/gain12/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain13/Min=Number, 525	bits	5		
SelfTest/1241xxxx/Detector/gain13/Max=Number, 650	bits			
SelfTest/1241xxxx/Detector/gain13/Mean=Number, 575	bits	50	2000	
SelfTest/1241xxxx/Detector/gain13/StdDev=Number, **6.1721**	bits		**17.0**	
SelfTest/1241xxxx/Detector/gain13/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain14/Min=Number, 525	bits	5		
SelfTest/1241xxxx/Detector/gain14/Max=Number, 750	bits			
SelfTest/1241xxxx/Detector/gain14/Mean=Number, 650	bits	50	2000	
SelfTest/1241xxxx/Detector/gain14/StdDev=Number, **18.6891**	bits		**30.0**	
SelfTest/1241xxxx/Detector/gain14/Temp=Number, 24	real	0	60	
SelfTest/1241xxxx/Detector/gain15/Min=Number, 500	bits	5		
SelfTest/1241xxxx/Detector/gain15/Max=Number, 1000	bits			
SelfTest/1241xxxx/Detector/gain15/Mean=Number, 700	bits	50	2000	
SelfTest/1241xxxx/Detector/gain15/StdDev=Number, **25.6891**	bits		**60.0**	
SelfTest/1241xxxx/Detector/gain15/Temp=Number, 24	real	0	60	

Checksum test of detector EEPROM

This test validates the serial number and gain settings. If the checksum does not match what is stored in the EEPROM, an error occur and the instrument disables analysis.

Line description including typical value	Units	Min. limit	Max. limit
SelfTest/1241xxxx/Detector /Checksum=Bool, True	bool		

Air stability

This test checks the stability of the air reference scans after power-up.
The test checks the level of the reference scan and reports test “Failed” if it is outside limits (15000<Max level<65280). If the test fails due to the reference scan limits, the result will only show one row displaying the ADC level.

The difference between two succeeding groups of 6 scans are calculated and should not exceed the limit 100. The first rows indicate the level of the reference scan at the start of the test, because the first differences are calculated against a zero value. If the difference is >100 another group of 6 scans are calculated against the previous group and again the difference should be below 100. There is always a 10 second delay between the groups. This continues until the difference is less than 100 or a time limit of 20 minutes is reached. The minimum number of steps is 13.

Line description including typical value	Units	Min.	Max.
SelfTest/1241xxxx/Stability/1/MaxDiff=Number, **56532**	bits	15000	65280*
SelfTest/1241xxxx/Stability/1/MaxDiff=Number, **56512**	bits	15000	65280
...more	bits	15000	65280
SelfTest/1241xxxx/Stability/2/MaxDiff=Number, 450	bits		100
SelfTest/1241xxxx/Stability/3/MaxDiff=Number, 225	bits		100
SelfTest/1241xxxx/Stability/4/MaxDiff=Number, 120	bits		100
SelfTest/1241xxxx/Stability/5/MaxDiff=Number, 90	bits		100

* Level of reference scan, calculated against zero vector.

Monochromator Wavelength Stability

Wavelength stability is measured by calculating the 2nd absorbency peak from the internal BG20 filter. Measurements are made on ten subsamples.
The mean value of the peaks is then compared to the one stored in the monochromator EEPROM. The mean, maximum, minimum, standard deviation and difference are displayed on the screen. The difference between the measured wavelength and the stored wavelength is presented as Peak2Diff. The maximum limit is +/- 1nm (one), if the value is outside the limits, an error message is created.

Line description including typical value	Units	Min.	Max.
SelfTest/1241xxxx/Monoch. /SerialNumber=String, T9010017			
SelfTest/1241xxxx/Monoch. /I/Peak2Mean=Number, 879.82	real		
SelfTest/1241xxxx/Monoch. /I/Peak2Min=Number, 879.61	real		
SelfTest/1241xxxx/Monoch. /I/Peak2Max=Number, 879.90	real		
SelfTest/1241xxxx/Monoch. /I/Peak2Std=Number, 0.02	real	-1nm	+1nm
SelfTest/1241xxxx/Monoch. /I/Peak2Diff=Number, 0.07	real	-1nm	+1nm

Test Results report

Once the Self-test is completed a report line is given the overall "Passed/Failed" status of each of the communication, monochromator, detector, air stability and monochromator wave length tests.
The date and time of the Self-test is also shown. There will be a report on the screen with the test result as below.

The details from each test could be viewed by choosing one of the individual tests. When the Self-test is done at start-up, the test report will only be shown if one or more of the tests have "Failed". For detailed information of the Self-test, the test must be exported.

Line description including typical value	Units	Min.	Max.
SelfTest/1241xxxx/Name=Date, 1999-12-16 16:43:31	date		
SelfTest/1241xxxx/MonochromatorTest=Bool, True	bool		
SelfTest/1241xxxx/DetectorTest=Bool, True	bool		
SelfTest/1241xxxx/StabilityTest/Number=Bool, True	bool		
SelfTest/1241xxxx/WavelengthStabilityTest/Number=Bool, True	bool		

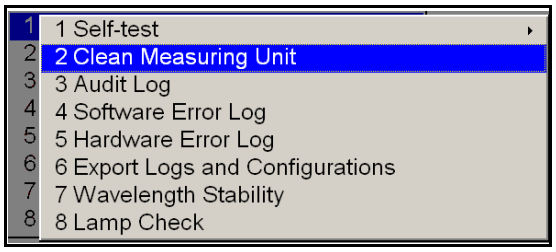


Fig. 4:5 Clean Measuring Unit

4.3.2 Clean Measuring Unit

Makes the instrument run a sequence for cleaning of the cell. This should be done on daily basis. This function can also be reached from the User Menu.

4.3.3 Audit Log

Displays the audit trail log. When choosing the **Export Logs and configuration** option an "1241xxxx.al" file is created, see Appendix "Logs Description" in User Manual.

4.3.4 Software Error Log

Displays the software Error log. The information in the software log file is basically the messages that the operator sees on the display. The time stamps in this log can many times be matched to the timestamps in the hardware log and thus give more information when you are troubleshooting. Note that the software log information is always in English despite the selected language.

When choosing the **Disk** option an "xxxxxxxx.sl" file is created.

4.3.5 Hardware Error Log

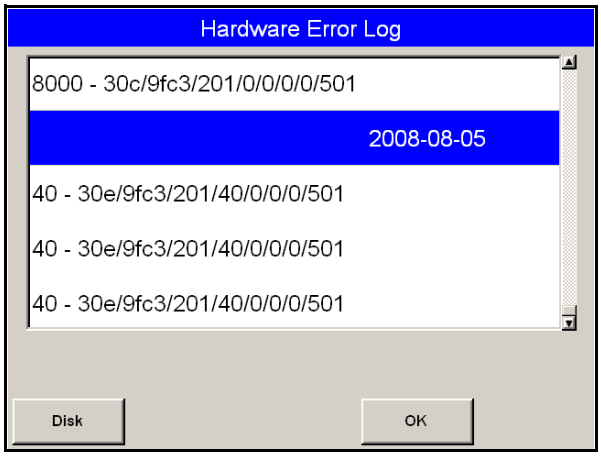


Fig. 4:6

Displays the hardware Error log. When choosing the **Disk** option an "xxxxxxxx.hl" file is created. For decoding of the Hardware error log, see 4.12 Hardware Error Log (xxxxxxxx.HL) on page 4:39.

4.3.6 Export Logs and Configuration

Exports the record of errors that occurred during analysis, and the instrument configuration, to a USB memory stick. For decoding of the Export logs, see 4.13 Export Logs and Configuration on page 4:50.

4.3.7 Wavelength Stability

Tests and displays the monochoromator wavelength stability, see 4.3.1 Self-test on page 4:14.

4.3.8 Lamp Check

Displays the intensity of the lamp. Measured value is presented for gain 1x2.

4.4 Automatic Tests

From here all of the tests carried out in the Self-test routine can be executed individually. The test results are presented in the same way as described in section Self-test, with an option to save to disk.

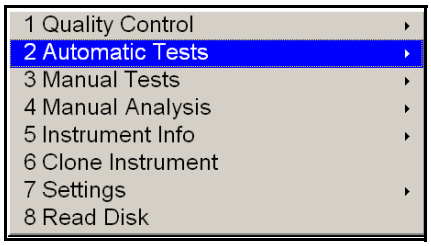


Fig. 4:7 Automatic Tests

4.4.1 Detector

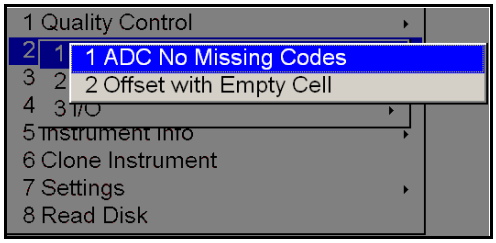


Fig. 4:8 Detector Tests

ADC No Missing Codes

Identical to the "ADC No Missing Codes" test carried out in the Self-test routine.

Offset with Empty Cell

Identical to the "Detector Offset" test carried out in the Self-test routine.

4.4.2 Monochromator

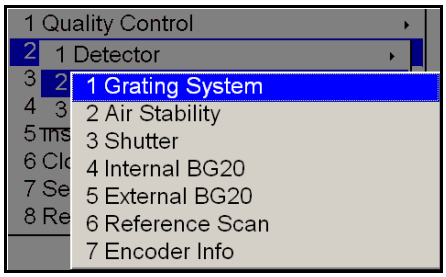


Fig. 4:9 Monochromator Tests

Grating System

Identical to the "Grating System" test carried out in the Self-test routine.

Air Stability

Almost identical to the "Air stability test" test carried out in the Self test routine, with one exception: This test has an option to break the test by using the Stop function that makes it possible to go on measuring stability after the test has passed. On the screen the maximum difference values are shown together with the incremental values and the scan peak value.

Shutter

The Shutter test consists of two parts: The first is checking the repeatability of the shutter positioning and the second is measuring the light leakage.
For the shutter repeatability positioning, a reference scan is taken with the lamp on and shutter open. A new scan is taken after the shutter is closed. Then a third scan after the shutter is reopened again. The difference between the first and third scan has to be below limit. Failure can be viewed on screen and logged to Error log.

For the Light Leakage test the shutter is now closed again and a fourth scan is taken. The second and fourth scans must also be within limits.
The max. and min. levels of the second and fourth scans must also be within limits.
The lamp is then turned off (shutter still closed) and a fifth scan is taken. The difference between the fourth and fifth scan must be within limits. Failure can be viewed on screen and logged to Error log.

Line description including typical value	Units	Min.	Max.
SelfTest/1241xxxx/Monoch./SerialNumber=String, T9010017			
SelfTest/1241xxxx/Monoch./Ref/Max=Number, 56532	bits		
SelfTest/1241xxxx/Monoch./ShutterOpen/Diff=Number, 10	bits	-100	100
SelfTest/1241xxxx/Monoch./ShutterClosed/Diff=Number, 15	bits	-100	100
SelfTest/1241xxxx/Monoch./ShutterClosed/Level=Number, 510	bits	50	2000
SelfTest/1241xxxx/Monoch./ShutterLeakage/Diff=Number, 15	bits	-100	100

Internal BG20

Identical to the "Monochromator Wavelength Stability" test carried out in the Self-test routine.
The same limits are used.

External BG20

With this test it is possible to compare one master BG20 filter with the results from the internal BG20 filter test. Insert a permanent sample with a BG20 glass filter in the measuring unit when prompt for. Ten sub samples are taken and the 2nd peak is detected and displayed on the screen.

Line description including typical value	Units	Min.	Max.
SelfTest/1241xxxx/Monoch./SerialNumber=String, T9010017			
SelfTest/1241xxxx/Monoch./E/Peak2Mean=Number, 879.82	real		
SelfTest/1241xxxx/Monoch./E/Peak2Min=Number, 879.61	real		
SelfTest/1241xxxx/Monoch./E/Peak2Max=Number, 879.90	real		
SelfTest/1241xxxx/Monoch./E/Peak2Std=Number, 0.02	real		
SelfTest/1241xxxx/Monoch./E/Peak2Diff=Number, 0.07	real		

Reference Scan

A reference scan is taken and the maximum level of the scan is displayed.
No software error indication on a scan level failure. The raw data values can be exported to disk by choosing the **Disk** option.

Line description including typical value	Units	Min.	Max.
SelfTest/00000000/Monoch./Ref/Max=Number, 56532	Bits	30000	65536

4.4.3 I/0 (Input/Output)

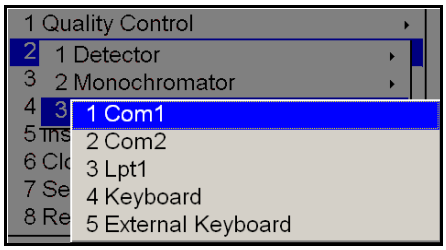


Fig. 4:10 Input/Output Tests

COM1 / COM2 / LPT1

It is possible to test communication ports and parallel ports by using loop-back connectors.

1001 0301	Loop-back connector Serial
1001 0302	Loop-back connector Parallel (printer)

For COM 1 and COM2 always make sure that you use the standard (Default) settings for modem and serial line before starting this test.
This is changed in User Menu: Instrument settings → View → Communication → Communication settings (1 Set Modem) (2 Set Serial). Choose “Default Modem RS232“ in Set Modem. Restart the instrument before starting the loop-back test. Choose “Default Direct RS232“ in Set Modem. Transmitted data values are 0x00-0xFF.

LPT1 One byte written and read back.

The test runs the ports individually as chosen in the "I/0" menu. If any error occur this is reported to screen and Error log.

Line description including typical value	Units	Min.	Max.
SelfTest/00000000/PCBoard/COMParallel=Bool, True	bool		
SelfTest/00000000/PCBoard/COM1Serial=Bool, True	bool		
SelfTest/00000000/PCBoard/COM2Serial=Bool, True	bool		

Keyboard

The test is going through every key from upper left to down right by stating which key to press. When the correct key is pressed the next key is stated.
If no key is detected within 10 seconds from last pressed key, the test aborts. If aborted, this will be logged to Error log with the message on which key that should be pressed when the sequence was aborted.

External Keyboard

The test shows which key on the external keyboard that is pressed at the moment. If no key is detected within 10 seconds after the last pressed key,
the test aborts without any Error log message.

4.5 Manual Tests

To exercise all of the instrument low-level hardware commands. All the tests below are addressed one by one and performed in manual order.

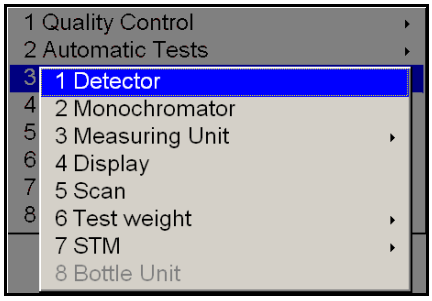


Fig. 4:11 Manual Tests

4.5.1 Detector

Available options:

- Set Gain value
- Read Gain value
- Read detector temperature

Gain	Pre Gain	Main Gain	Total Gain
1	1	1	1x1
2	1	2	1x2
3	1	4	1x4
4	1	8	1x8
5	1	16	1x16
6	31	1	31x1
7	31	2	31x2
8	31	4	31x4
9	31	8	31x8
10	31	16	31x16
11	1000	1	1000x1
12	1000	2	1000x2
13	1000	4	1000x4
14	1000	8	1000x8
15	1000	16	1000x16

4.5.2 Monochromator

Available options:

- Set shutter position
- Read shutter position
- Set lamp On/Off
- Set grating motor On/Off

4.5.3 Measuring Unit

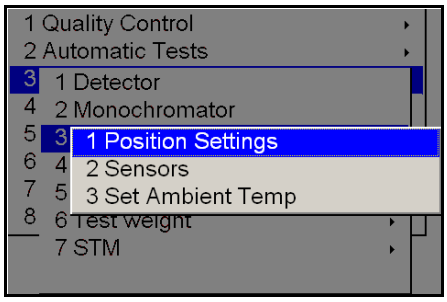


Fig. 4:12 Measuring Unit Tests

Position Setting

Available options:

- Set path length
- Set bottom shutter Open/Closed
- Set top shutter Open/Closed
- Set conveyor belt On/Off

Sensors

Available options:

- Read ambient temperature (Calculated using the ambient temp. sensor in the hood together with the detector temp. sensor)
- Read speckle detectors
- Read drawer sensor
- Read internal temperature (Using the temp. sensor on the Measuring Unit board)

Set Ambient Temperature

Possibility to force the ambient temperature input to an arbitrary value.
The ambient temperature value will return to real values if the "Set Ambient temperature" is set to "0.0" or if the "Default Settings" command is executed or if the instrument is restarted. Used to temporarily bypass the calculations mentioned under *Position Settings* and *Sensors*.

4.5.4 Display

Available options:

- Set display On/Off
- Set back-light On/Off
- Adjust display contrast value

4.5.5 Scan

To collect a scan with the present settings and return the maximum value together with the option to save scan data values on disk or cancel. The raw data values can be exported to disk by choosing the **Disk** option.

4.5.6 Test Weight

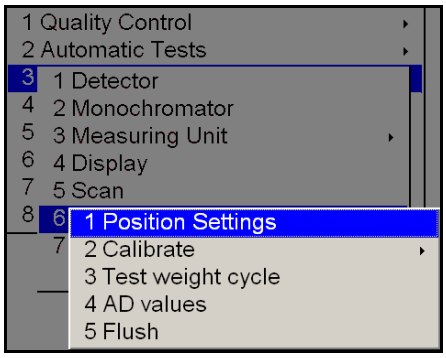


Fig. 4:13 Test Weight

Position Settings

This function is for testing of the Wiper, Shutter and Sensor.

Calibrate

– Balance Control; This function can also be reached from the User Menu. Instructions given on the display.
– Mass Calibration; Instructions given on the display. Use two weights with good accuracy and two decimals. The result is stored in the EEPROM of the TWM.
– Adjust Balance; Should only be used after discussion with Product specialist at FOSS.

Test Weight Cycle

This function runs a complete Test weight cycle (sequence) but with possibilities to check part sequences and continue. The raw data will be presented on the display together with the calculated value. It is possible to catch the sample in the cuvette and measure on another scale of sufficient accuracy.

AD Values

Continues reading of AD values with an interval of 10 seconds.

Flush

This function empties the hopper content into the drawer.

4.5.7 Sample Transport Module

Position Settings

Possibility to manually position the Cuvette Holder.

Service

Test of sensors and motor. Can be used to run the motor up and down.

Exercise

No use for this option on the field.

4.6 Manual Analysis

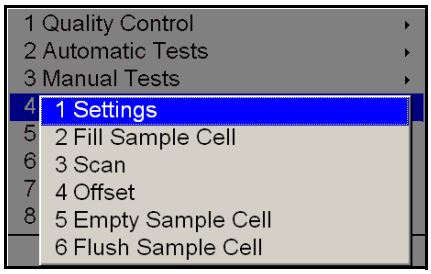


Fig. 4:14 Manual Analysis

4.6.1 Settings

The parameters used in the manual analysis sequence:

- Set path length
- Set fill speed
- Set flush speed

4.6.2 Fill Sample Cell

Fills the measuring unit sample cell at the speed pre-set in settings.

4.6.3 Scan

Collects a scan at a gain and a shutter position chosen in the window popped up when choosing **Scan**. When scanning is finished the maximum value of the scan will be displayed together with options to save the scan data values on **Disk** or **Cancel**.

4.6.4 Offset

Calculates the offset at the present gain. The gain can be set manually in Manual Tests→Detector. The offset value is displayed with the present settings, together with the maximum, minimum, standard deviation and detector temperature. There is an option to save the offset value to **Disk** or **Cancel**.

4.6.5 Empty Sample Cell

Empties the measuring unit sample cell.

4.6.6 Flush Sample Cell

Flushes the measuring unit sample cell and the hopper at the speed pre-set in settings.

4.7 Instrument Info

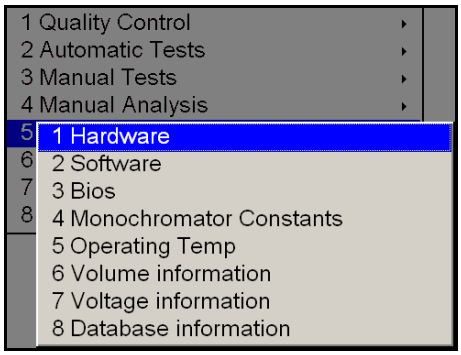


Fig. 4:15 Instrument Info

4.7.1 Hardware

Displays the following:

- DSP software version
- Monochromator software version and serial number
- Detector serial number
- Measuring unit software version
- Optional module and serial number

4.7.2 Software

Displays the different instrument software module versions.

4.7.3 BIOS

Displays the BIOS information.

4.7.4 Monochromator Constants

Displays the O- and P-constant and internal BG20 peak values on the screen.

4.7.5 Operating Temperature

Displays the min. and max. operating temperatures which the instrument is intended to work within. The digits can not be changed.

4.7.6 Volume Information

The Flash disk is partitioned in three parts, 5 Mb for the operative system, 5 Mb for the ISW. The remaining space is for data.

4.7.7 Voltage Information

See Voltage Check in section 4.3.1 Self-test on page 4:14.

4.8 Clone Instrument

For copying of an instrument´s settings and transfer them to another instrument. Put a USB stick in the disk drive of the instrument which settings you wish to copy. After finished copying, put the USB stick in the other instrument and run function **Read Disk**. A script file will automatically adjust its settings to the ones on the USB stick. IP number and TWM calibration will only be cloned to disk (not copied to the next instrument). These settings has to be handled in other ways.

4.9 Settings

4.9.1 Default Settings

To be able to return to a normal instrument status the "Default Settings" command sets the instrument to the following status:

Monochromator lamp	On
Grating motor	On
Shutter	Open
Detector gain	1x1
Initialise Measuring Unit	
Set Ambient temperature	0.0

4.9.2 Scan Mode (Standard)

Switches to the extended wavelength mode. Allows measurement in the wavelength range 570 - 1100nm.

4.10 Read Disk

Import updates and application models from an USB memory stick.

4.11 Error Codes in Software Log (SL) and Hardware Log (HL)

When reviewing the SL and HL log files it's a good idea to look at the two files simultaneously. Try to compare the entries using the time stamps. This way you will many times get a better understanding because you can see both what the customer reported (SL) and what command was sent at the same time. In the HL file you will also see the status reported back by the module that was addressed.

SL Error	HL Error	Message to the User (What possibly can be done before contacting Service)	Comments	Note
32768	0x8000	Hardware error.		See 4.11.7
33025	0×8101	Grating motor error.	Monochromator Motor cannot move.	
33026	0×8102	Monochromator EEPROM error.	The Monochromator was not able to save constants in its EEPROM.	
33027	0x8103	Monochromator EEPROM error.	Problems to read/write.	
33028	0x8104	Detector EEPROM error.		
33029	0x8105	Monochromator EEPROM error.	Data in PROM outside limits.	
33283	0x8203	Offset (darkness) is too high. Make sure the right hand Door and the Hopper are closed and retry analysis.	Max offset error > 2000 bits.	
33284	0x8204	Offset (darkness) is too low. Contact support.	Min offset error < 50 bits in offset.	
33285	0x8205		Number of ADC reads in error	
33287	0x8207	Overrun error	The gain of the signal amplification is exceeding the highest possible gain at some occasion during the scan.	
33289	0x8209		Gain is stepped too far down (i.e. Tries to go be low gain 1*1).	
33291	0x820B	Analysis cancelled, Max time exceeded.	Instrument time out error.	
33292	0x820C	Reference scan light level is too low. Check the lamp and clean the Cell. More information is to be found in User Manual	Reference scan is below its limits (<15000 at gain 1*1, <30000 at gain 1*2).	See 4.11.8
33293	0x820D	Too few valid samples collected.		See 4.11.9
33294	0x820E	Monoc shutter error	Monochromator shutter cannot move.	See 4.11.10
33538	0x8302		TWM operation mode switch.	

SL Error	HL Error	Message to the User (What possibly can be done before contacting Service)	Comments	Note
33539	0x8303	TWM EEPROM error	Problems to read/write the data in the PROM	
33540	0x8304	TWM EEPROM error	Slope data outside limits. try to re calibrate the balance.	
34050	0x8502	Lamp On/Off error.		
34051	0x8503	Set display On/Off error.		
34052	0x8504	Set back light On/Off error.		
34053	0x8505	Set contrast On/Off error.		
1	0x0001	Instrument communication error.		
2	0x0002	Detector ADC error	There is no signal from the Detector Board.	
4	0x0004	Monochromator grating error.		See 4.11.1
22	0x0016	Measuring Unit TWM data range error (invalid data)		See 4.11.2
32	0x0020	Cell blocked error	Sample Cell is dirty. Analysis cancelled. Empty and clean the Cell using the flush function on the Task Bar. More information is to be found in User Manual	See 4.11.3
64	0x0040	More sample required. More sample is needed to fill up the Sample Cell.	Displayed if the Application Model allows refill.	
128	0x0080	Path Length error.		See 4.11.4
512	0x0200	Speckle function error.		See 4.11.5
1024	0x0400	Warning! Drawer not in place.	If the drawer is in place and you still get this warning, then check the Drawer sensor.	
2048	0x0800	TWM shutter error.		
4096	0x1000	TWM wiper error.		
8192	0x2000	TWM not full.		
16384	0x4000	TWM load cell error.		See 4.11.6
32768	0x8000		TWM EEPROM error.	
		Failed to read Hopper temperature sensor.		
4242	0x1092		User abort	

SL Error	HL Error	Message to the User (What possibly can be done before contacting Service)	Comments	Note
4243	0x1093	No cup detected.	The speckle function is not used. The cup is detected by the difference in absorbance between the reference scan and the first sub-sample. Due to that, it is not possible to run a scan with an empty cup.	
4244	0x1094		Extended range not allowed.	
4245	0x1095		Unknown Scan Mode.	
4246	0x1096	Sample Transport Module makes too many steps.	Sample Transport Module tries to make more than 10 steps.	
		Balance check failure. Clean the Test Weight Module. If the problem persists contact service. To analyse without Test Weight results: Disable Test Weight on Task Bar.	Occurs when the difference between the tar weight of the present measurement compared with the previous measurement is higher than the value stated in the twm.ini file. Empty Check Limit (Default 100).	

4.11.1 Error 4, Grating Motor Error

This error indicates that the Monochromator Grating is not able to move.

Enter the Service Menu, go to Manual tests/ Monochromator and try to manually start the Grating Motor by setting it to On/Off. If the error occur again while doing this, open the left side Door and observe the LED marked "DIR". A flashing light indicates that the Grating is moving, a continuous light the opposite. Check the connections on the DSP Board and on the Monochromator. If this did not solve the problem the Monochromator has to be replaced.

4.11.2 Error 22, MU/TWM Data Range Error

This is an error that may appear if a command was sent with data outside the valid range. For example if the Variable Cell was instructed to move to 4 mm, then an error 22 will be given, as the lowest accepted value is 5 mm. (invalid data received).

4.11.3 Error 32, Speckle Signal blocked

This error indicates that there are still sample in the Cell. When the error occurs the user will get an instruction to clean the Sample Cell by using the command "Flush cell". If the problem is not solved by this the Speckle function is faulty.

Enter the Service Menu, go to Manual tests/ Measuring Unit/ Sensors. When the Sample Cell is empty the Speckle Sensors should indicate 1 1 1 1. If this is not indicated use a flash light to light up the inside of the Sample Cell.

If this causes 1 1 1 1 to be displayed then there is a fault with the Speckle Emitter Board and it will need to be replaced.

If you do not receive this response, then the Speckle Detector Board is faulty. This board is located inside the Cell House so the complete Cell Body has to be replaced see instruction "Cell House (Generation I)" on page 9:26.

4.11.4 Error 128, Path Length Error

This error occurs when the movable cell in the Cell Body is not able to move or when the right path length was not archived during a certain time (time out).

Enter the Service Menu, go to Manual tests/ Measuring Unit/ Position settings. Enter 6 mm path length and press "SET". If you by doing this still was not able to move the Cell and received Error 128 the following things have to be checked:

- Check for dust between the Cell walls and the Cell House.
- Did you hear any noise like the Motor tried to move the Cell House? If you did, it indicates that the Motor received power. If not, check for mechanical obstructions.

4.11.5 Error 512, Speckle Function Error

Every time the Variable Cell is instructed to move, the firm ware in the Measuring Unit Board's EEPROM, checks for an empty Cell. If the Cell is not empty, Error 32 will be displayed. In this case the firm ware will try to move the Cell. If that fails within a certain time limit, Error 128 will be displayed. After a new Path Length is set, the intensity of light on the Speckle Emitters is adjusted. Different Path Lengths demand different intensity levels to ensure that the Detector Gain is not too high. If this adjustment is not possible, Error 512 will be displayed.

4.11.6 Error 16384, Strain Gauge Failure (Load Cell)

This error could mean two different things. It could be a defect Load Cell usually caused by mechanical obstruction. The most common case seen where the Load Cell has been defect is when you install the TWM on the instrument by assembling the instrument on top of the Test Weight and by doing this you place the instrument on top of the Test Weight Balance. According to the instruction the instrument should be positioned on the side before assembling the Test Weight Module. See User Manual for Infratec 1241 Modules, p/n 60043623

The other and second most common reason for this error is vibrations The instrument should be placed on a stable work space. Before the analyse starts the empty weight is measured and when the Sample Cuvette is full the full weight is measured. During these measurements the instrument has to be free from vibrations.

Also banging on the instrument keypad during the empty weight measurement can be dangerous.

4.11.7 Error 32768, Hardware Error

This error can occur whenever there is a problem with any of the modules in the instrument. To be able to find out more about the problem, enter the Service Menu, go to Quality Control/ Hardware Log. By doing this the error log is displayed. The log is presented by date in Hex Code. Mark the actual error by using the arrow key and press enter.

By doing this the error will be translated and presented together with the command that was sent out from the DSP when the error occurred.

By using the function "Export logs & configuration" you are able to get the hardware log on a diskette. This could be useful when you are not present and want to know where the problem might be before you make your service visit.

Export logs & configuration can be done from the User Menu and the operator can send the log files by e-mail to you. These files will only be presented in Hex Code and you will need the HL Translator to be able to read the error as text. The HL Translator can be downloaded from the FOSS Intranet/Internal Knowledge.

4.11.8 Error 33292, Reference Scan too low

During Start up Test or before analyse the lamp intensity is checked by setting the Detector Gain to 1*1 and performing a scan. The received value from the Detector should be more than 15000 bits. If not, this error will be displayed. The operator will be instructed to check the lamp and clean the Sample Cell.

If the problem is not solved by these actions the following should be done:

Enter the Service Menu, go to Manual tests/ Detector. Set the Gain to 1*1 and perform a scan to confirm that the received value over 15000 bits. If the received value is around 400 this means that there is no light at all reaching the Detector. Check the Monochromator Shutter from the Service Menu. Confirm that the Shutter is open. If not, try to open it by changing its position from the Service Menu.

4.11.9 Error 33293, Too few valid Sub samples collected

In the Application Models there are settings for maximum and minimum absorbance and also a "number of required sub samples". Sub samples that are outside the absorbance limits are not included in the predictions and if fewer than "number of required sub samples" remain, the warning "Too few valid sub samples" will appear.

- Low absorbance: Pinhole problems or path length too narrow.
- High absorbance: Dark sample, foreign materials, path length too wide.

4.11.10 Error 33294, Monochromator Shutter not able to move

The shutter has three positions: Closed, Open and internal BG 20 filter. If the Shutter position does not respond when a command is sent to change the position, then error 33294 will appear. The Shutter can be set manually from the Service Menu (Manual Tests/ Monochromator). If this solves the problem the instrument should be re-analysed to make sure that it was a temporary problem. If however the message appears again you should then replace the Monochromator.

4.12 Hardware Error Log (xxxxxxxx.HL)

4.12.1 Error Word

Presents the error that was received when the command was executed.

Position in instrument Hardware Error Code in bold:
E.g. "**20** - 304/1ef3/201/20/0/0/0/450".

Hardware Errors	
0001	Instrument hardware communication error
0002	Detector ADC error
0004	Monochromator grating motor start-up error
0010	MU/TWM data range error
0020	Cell blocked error
0040	More sample required
0080	Path length error
0200	Measuring unit speckle detector error
0400	Drawer out
0800	TWM shutter error
1000	TWM wiper error
2000	TWM not full
4000	TWM loadcell error
Software Errors	
8000	Hardware Communication error
8101	Monochromator grating motor error
8102	Save monochromator constant error
8103	Monochromator HW EEPROM error
8104	Detector EEPROM error
8105	Monochromator SW EEPROM error
8203	Max offset error
8204	Min offset error
8205	Number of ADC reads error
8207	Overrun error
820C	Reference scan too low
820D	Too few valid samples collected
820E	Monochromator shutter not moving
8302	TWM
8303	TWM HW EEPROM error
8304	TWM SW EEPROM error
8502	Lamp on/off error
8503	Display on/off error
8504	Backlight on/off error
8505	Contrast on/off error

4.12.2 Commands

Presents which command that was sent out before the error occurred.

Position in instrument Hardware Error Code in bold:
E.g. "20 - **304**/1ef3/201/20/0/0/0/450".

DSP Module Commands		
Id (hex)	**Name**	**Note**
0001	GetDSPStatus	Read HW status and error words. Updates the TWM, STM, EID and ASTM installed bit.
0002	GetScanVector	Collect vector.
0003	GetSampleVector	Collect specified number of ADC values with sample interval as specified in the command. Sample interval 1 means the highest rate (10 s interval).
0004	SetGratingMotor	Set grating motor on/off
0005	SetGratingMotorConf	Set speed of grating motor
0006	GetGratingMotorConf	Get speed of grating motor
0007	GetMonochromatorEncoder	Read encoder signals
0008	GetFlybackScan (IP mode only)	If not in 'Flyback' mode: Collects a scan with the present gain, enters 'Flyback' mode and waits at the end of the grating cycle.
		If in 'Flyback' mode: Calculates new gain on the way back and sets and collects a scan at this gain.
000A	LeaveFlybackMode (IP mode only)	Forces the DSP to leave the 'Flyback' mode.
0010	GetGratingInfo	Returns length of grating cycle, both the numbers of pulses and time. Also returns a time vector containing the time intervals between increments.
0011	GetGratingPwm	Returns length of grating cycle, both the numbers of pulses and time. Also returns a time vector containing the time intervals and PWM levels between increments. The time/ PWM values are returned as follows: speed,pwm,speed,pwm
0012	GetHopperTemp	Get the hopper temp sensor value.
0013	GetADCNoMissingCodes	Get ADC no missing codes test result.
001A	GetEncoderInfo	Runs motor at fixed PWM and gets information about pulses for encoderA, encoderB and index.
001B	SetGratingScanRange	Sets scan range for the grating in idle mode to Normal Exercise: -1000 to 2000.
001C	SetGratingAnalyseMode	Sets scan range to normal mode and sets grating motor on
0020	SetIPMode	Set the mode.
0030	IoPortSetByte	Set bits in external port
0031	IoPortGetByte	Get bits from external port

Monochromator module commands

The communication between the DSP and the Monochromator module is done via an I^2C bus interface to the Monochromator board PIC microcontroller. The Microcontroller handles the filter/shutter movement and the onboard E^2PROM, which can be accessed from the ISW.

The lower part of the command 'Id' is sent to the monochromator microcontroller along with its parameters to be decoded.

Monochromator Commands		
Id (hex)	**Specification**	**Action**
0101	GetFilterPosition	Read current filter position
0102	SetFilterPosition	Set filter position
0103	GetMonochPage	Read the value at a specified page in E^2PROM.
0104	SetMonochPage	Store the value at the specified page in E^2PROM.
0105	GetMonochVersion	Reads the monochromator firmware version

Detector module commands

The detector module has an I^2C expander on board that is accessed from the DSP and is used to set the detector gain to values specified by the ISW. It also has a temperature sensor from which ISW reads current temperature inside the detector and it's accessed via the I^2C IF as well.

An E^2PROM onboard the detector module contains the detector constants (e.g. serial number). These values are read/written in 4 byte packages with their page number specified. The I^2C expander also contains the write enable to the E^2PROM.

Detector Commands		
Id (hex)	**Specification**	**Action**
0201	SetGainValue	Set new gain value
0202	GetGainValue	Read current gain value
0203	GetDetPage	Read the value at a specified page in the E^2PROM.
0204	SetDetPage	Store the value at the specified page in the E^2PROM.
0205	GetDetTemp	Reads current temperature

Measuring Unit (MU) commands

The communication between the DSP and the MU is done via an I^2C IF to the MU board PIC microcontroller. There is also a temperature sensor at the MU PCB which also is accessed via the I^2C IF.

Measuring Unit Commands		
Id (hex)	**Specification**	**Action**
0301	GetMUStatus	
0304	SetMUInitial	
0305	RunMotor	Run the conveyor motor.
0306	FireSolenoid	Fire the MU solenoids
0307	GetMUSensors	Read the MU sensors: Speckle and Drawer sensor
0308	MoveCell	Move the adjustable cell.
030B	GetMUTemp	Read MU temperature sensor
030C	EmptyMUCell	Open the bottom solenoid to empty the sample cell.
030D	SetPathlength	Set the adjustable cell to specified value.
030E	FillCell	Run the conveyor and open top solenoid to fill the sample cell.
030F	FlushCell	Run the conveyor and open both solenoids to flush the sample cell.
0312	CheckDrawer	Check for presence of drawer
0313	GetMUVersion	Get version of firmware
0314	ResetDrawerDetection	Reset firmware drawer move detection.
0315	ReadDrawerDetection	Read back if drawer have moved since last reset setting.

Test Weight Module (TWM) commands

The communication between the DSP and the TWM is done via an I^2C bus interface to the TWM board PIC microcontroller.

Test Weight Module Commands		
Id (hex)	**Specification**	**Action**
0401	GetStatus	
0404	SetInitial	Set TWM settling time and Intervals. Interval is number of readings for empty/full measurements.
0405	MoveWiper	
0406	MoveShutter	
0407	ReadSensors	Wiper and shutter positions
0408	ReadLoadCell	
0409	MeasureEmpty	
040A	TestFull	
040B	MeasureFull	
040C	Empty	
040D	SetMode	Sets the TWM in service mode
040E	GetVersion	Get TWM version number
040F	GetPage	Get TWM page data
0410	SetPage	Set TWM page data
0411	TestLoadCell	

Power Supply Module (PSM) commands

The PSM has an I^2C expander on board that is accessed from the DSP and is used to set the values of the display, lamp and backlight controls.

Support for new Power Supply Unit (PSU) was implemented 2002-10. The new PSU is identified with a '0' in bit four of the PSM byte and the PSU has got new functionality such as 63 steps for display contrast and the ability to measure all voltages on the board.

Power Supply Unit Commands		
Id (hex)	**Specification**	**Action**
0501	SetContrast	Set LCD display backlight to specified value
0502	SetDisplay	Set display on/off
0503	SetLamp	Set monochromator lamp on/off
0504	SetBacklight	Set display backlight on/off
0505	GetByte	Get current PSM status
0506	GetVoltages	Get all PSM voltages

Sample Transport Module (STM) commands

The communication between the DSP and the STM is done via an I^2C bus interface to the STM board PIC microcontroller.

Sample Transport Module Commands		
Id (hex)	**Specification**	**Action**
0601	GetSTMStatus	
0605	LoadSTMCell	Put Cell in first scan position (i.e. lowest position)
0606	UnloadSTMCell	Terminate, release Cell
0608	MoveSTMCell	Move the Cell max no of subsamples
0612	CheckSTMCell	Verify that a Cell is in reference scan position
0613	GetSTMVersion	Get STM version number
0615	RunSTMMotor	Activates motor: Off, Up or Down
0616	GetSTMSensor	Reads: Cup up, speed and cup down

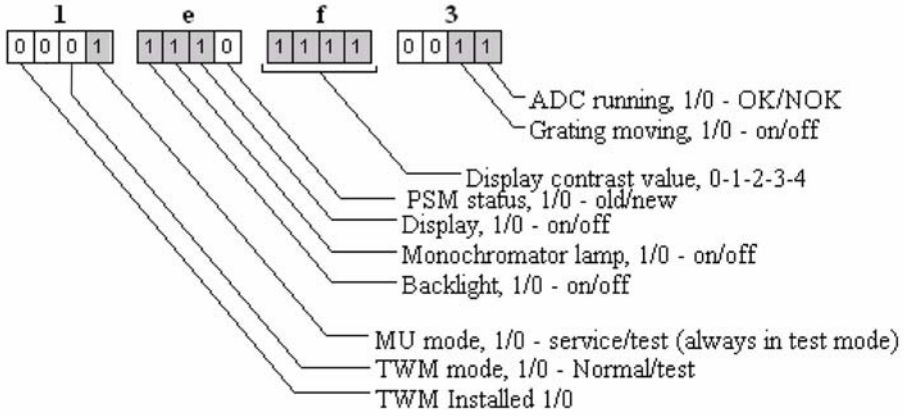
Electronic ID Module (EID) commands

The communication between the DSP and the EID is done via an I^2C bus interface to the EID board PIC microcontroller.

Electronic ID Commands		
Id (hex)	**Specification**	**Action**
0701	GetEIDNumber	Get electronic ID data.

4.12.3 Status Word 1

Presents the status of the system when the error occurred.



Position in instrument Hardware Error Code in bold:
E.g. "20 - 304/**1ef3**/201/20/0/0/0/450".

Id (hex)	Specification	Note	Source
0001	ADCRunning	ADC communication is OK	ADC
0002	GratingMotorEnable	Grating motor: 0/1 - off/on	DSP
0004	ExerciseModeEnable	Exercise ball bearing in grating motor: 0/1 - off/on	DSP
00F0	DisplayContrastValue	Contrast of display	PSM
0100	PSM status	0/1 - old/new	PSM
0200	DisplayEnable	Display: 0/1 - off/on	PSM
0400	LampEnable	Monochromator lamp: 0/1 - off/on	PSM
0800	BacklightEnable	Backlight: 0/1 - off/on	PSM
1000	MUMode	Mode of MU, 0/1 - normal/test	MU
2000	TWMMode	Mode of TWM, 0/1 - normal/test	TWM
4000	AbortedCommand	Aborted command indication	MU/TWM
8000	TWMInstalled	Test Weight Module is installed	DSP

4.12.4 Status Word 2

"Sub-error", presents more detailed information about what went wrong when the error occurred.

Position in instrument Hardware Error Code in bold:
E.g. "20 - 304/1ef3/**201**/20/0/0/0/450".

Id (hex)	Specification	Note	Source
0001	MU board status	0/1 - old/new	MU
0002	MU SW status	0/1 - old/new	MU
0004	Monochromator board status	0/1 - old/new	Monoch.
0008	Monochromator SW status	0/1 - old/new	Monoch.
0010	TWM board status	0/1 - old/new	TWM
0020	TWM SW status	0/1 - old/new	TWM
00C0	Not used	-	-
0100	STM installed	Sample Transport Module is installed	STM
0200	EID installed	Electronic ID is installed	EID
0400	ASTM installed Not used	Asterix STM is installed	ASTM
7C00	Not used	-	-
8000	IPMode	0/1 - SP/IP	DSP

4.12.5 Error Word 1

"Main error", presents a more detailed information about what went wrong when the error occurred.

Position in instrument Hardware Error Code in bold:
E.g. "20 - 304/1ef3/201/**20**/0/0/0/450".

Id (hex)	Specification	Note	Source
0001	SystemCommunicationError	DSP communication error	DSP
0002	DetectorError	Detector error	Detector
0004	GratingError	Grating motor error	DSP
0008	MUAbortedCellBlocked	Cell blocked and aborted	MU
0010	MUDataRangeError	Data out of range	MU/TWM
0020	MUCellBlockedError	NIR cell blocked error	MU
0040	MUNoSampleError	NIR no sample error	MU
0080	MUPathlengthError	Path-length error	MU
0100	Not used	-	-
0200	MUSpeckleDetectorError	Speckle detector error	MU
0400	NoDrawerError	No drawer indication	MU/TWM
0800	TWMShutterError	TWM shutter error	TWM
1000	TWMWiperError	TWM wiper error	TWM
2000	TWMNotFull	TWM not full	TWM
4000	TWMStrainGaugeError	TWM strain gauge fail	TWM
8000	TWM E^2PROMError	TWM E^2PROM error	TWM

Hex. Code	Description	Explanation/Action
0×0800	TWM shutter error	Error while moving the TWM bottom shutter. o Check if the shutter is jammed. o Check if it is possible to move the shutter in the service menu 3. o Check the step motor + encoder controlling the movement of the shutter.
0×1000	TWM wiper error	Error while moving the TWM wiper arm. o Check if kernels in some way are obstructing the movement of the wiper arm. Clean if necessary. o Check if the wiper is jammed. o Check if it is possible to move the wiper arm in the service menu. o Check the step motor + encoder controlling the wiper arm movement.
0×2000	TWM not full	The TWM is indicating a not full status. o Use the service menu to check the level sensors. Block with a finger or paper.

4.12.6 Error Word 2

"Sub-error", presents a more detailed information about what went wrong when the error occurred.

Position in instrument Hardware Error Code in bold:
E.g. "20 - 304/1ef3/201/20/**0**/0/0/450".

Id (hex)	Specification	Note	Source
0001	SystemCommandFailed	Unknown command	All modules
0002	ISWIllegalCommand	Illegal command from ISW	All modules
0004	ISWUnknownCommand	Unknown command	DSP
0008	ISWChecksumError	Checksum error	DSP
0010	ISWCommandHeadError	Command header error	DSP
0020	ISWCommandTailError	Command tail error	DSP
0040	MonochromatorTimeOut	Monochromator comm. timed out	Monoch.
0080	DetectorADCFailed	ADC failed	Detector
0100	MUTimeOut	MU communication timed out	MU
0200	TWMTimeOut	TWM communication timed out	TWM
0400	GratingStartupFailed	Grating startup procedure failed	DSP
0800	Timeout	I^2C timeout	All Modules
1000	I^2C Locked	I^2C bus line locked	I^2C - modules
2000	I^2C NoAck	No I^2C acknowledge from slave	I^2C - modules
4000	I^2C ChecksumError	I^2C checksum error	I^2C - modules
8000	CommandFailed	Communication failed	DSP

4.12.7 Error Word 3

"Sub-error", presents a more detailed information about what went wrong when the error occurred.

Position in instrument Hardware Error Code in bold:
E.g. "20 - 304/1ef3/201/20/0/**0**/0/450".

Id (hex)	Specification	Note	Source
0001	MonochromatorFailed	Monochromator command failed	Monoch.
0002	MonochromatorUnknown	Unknown monochromator command	Monoch.
0004	MUIllegalCommand	Illegal command sent to MU	MU
0008	MUUnknownCommand	Unknown command sent to MU	MU
0010	TWMIllegalCommand	Illegal command sent to TWM	TWM
0020	TWMUnknownCommand	Unknown command sent to TWM	TWM
0040	DetectorMaxGainSet	Maximum gain set when scanning	DSP
0080	EIDFailed	EID command failed	EID
0100	EIDUnknown	Unknown EID command	EID
0200	EIDTimeOut	EID communication timed out	EID
0400	STMFailed	STM command failed	STM
0800	STMUnknown	Unknown STM command	STM
1000	STMTimeOut	STM communication timed out	STM
2000	SPORTFailure	Serial port communication failure	DSP
C000	Not used	-	-

4.12.8 Error Word 4 bit encoding (0x0108)

(Bit 0=LSB).

Position in instrument software error code: "8000-103/1ef3/0/1/0/1/**1**"

Id (hex)	Specification	Note	Source
00FF	I^2C ModuleErrorDebug	HW I^2C module debug data	I^2C - modules
FF00	I^2C ModuleErrorByte	HW I^2C module error byte	I^2C - modules

4.12.9 DSP Version

The last figure shows the DSP version.
E.g. "20 - 304/1ef3/201/20/0/0/0/**450**", where 450 means DSP Version 4.50.

4.13 Export Logs and Configuration

This feature can either be used from the Service Menu 1.6. or from the User Menu 1.4. When doing it you will get a complete set of log files exported from the Infratec to a USB memory. Getting the log files is almost always the first thing to ask for during troubleshooting. A customer can easily obtain the files and send them to you by email. When reporting an Infratec Support Incident into the Global Helpdesk at FOSS Analytical it's mandatory to include the log files. The files will always be named xxxxxxxx.ext, where xxxxxxxx equals the 8 digit s/n of the Infratec instrument and ext equals the file extension according to the list below.

This is a list of all files exported:

xxxxxxxx.AL Audit Log

Describes all events that has taken place on the instrument.

Example:

;0062,0255,0062,1000

AL/12416305/2009-05-27 22:58:43/Name=String, "000/05/1500.00/1676.01/0000000000"

AL/12416305/2009-05-27 22:58:43/Name=String, "001/06/0.50000/0.34588/0000000000"

AL/12416305/2009-05-2722:59:40/Name=String,"002/25/0000000000"

AL/12416305/2009-05-27 23:00:47/Name=String, "003/43//1241 Basic 1 (1x3)/0000000000"

AL/12416305/2009-05-27 23:17:11/Name=String, "004/01/WH000003/0000000000"

AL/12416305/2009-06-2222:17:40/Name=String,"005/25/0000000000"

AL/12416305/2009-06-22 22:18:50/Name=String, "006/43/1241 Basic 1 (1x3)/1241 Standard/0000000000"

AL/12416305/2009-06-2222:23:50/Name=String,"007/25/0000000000"

AL/12416305/2009-06-22 23:21:38/Name=String, "008/02/wh000003/0000000000"

AL/12416305/2009-06-22 23:21:47/Name=String, "009/01/RA151822/0000000000"

AL/12416305/2009-06-22 23:21:52/Name=String, "010/01/AW273105/0000000000"

AL/12416305/2009-06-22 23:21:55/Name=String, "011/01/AT273100/0000000000"

AL/12416305/2009-06-22 23:21:57/Name=String, "012/01/AR270001/0000000000"

AL/12416305/2009-06-22 23:22:00/Name=String, "013/01/AM070002/0000000000"

AL/12416305/2009-06-22 23:22:02/Name=String, "014/01/AH120001/0000000000"

xxxxxxxx.I Instrument Log

Specific instrument related information

Example:

I/12416305/SerialNumber=String,"12416305"

I/12416305/OConstant=Number,1676.29

I/12416305/PConstant=Number,0.348120

I/12416305/LargeFont=Bool,False

I/12416305/InstrumentModel=String,"1241 GA"

I/12416305/SoftwareVersion=String,"v5.52"

I/12416305/InstrumentType=String,"1241 Standard"

I/12416305/AnalyseCounter=Number,2168

I/12416305/Password=String,"123456"

I/12416305/
RestrictedPassword=String,"a3fd,0100080903080c030b0a150e0d0e090a08150b09
080914090014080e"

I/12416305/DisplayOutlier=Number,0

I/12416305/Printer=String,""

I/12416305/PrinterTemplate=String,""

I/12416305/DailyPrinterTemplate=String,""

I/12416305/Modem=String,""

I/12416305/Contrast=Number,32

I/12416305/PrintResult=Bool,True

I/12416305/Language=String,"Deutsch"

I/12416305/DateTimeFormat=String,""

I/12416305/NumericFormat=String,""

I/12416305/SaveScanOverride=Bool,False

I/12416305/SaveResultOverride=Bool,False

I/12416305/DisableTWM=Bool,False

I/12416305/SaveResultIfOutlierOverride=Bool,False

I/12416305/MinOperatingTemp=Number,0.0

I/12416305/MaxOperatingTemp=Number,42.0

I/12416305/UseFlyback=Bool,True

I/12416305/DumpMedia=String,"Serial"

I/12416305/DumpIPAddress=String,"0.0.0.0"

I/12416305/DumpIPPort=String,"55556"

I/12416305/Operator=String,""

I/12416305/Font=String,"Swiss721 BT"

I/12416305/NetworkConfig=Number,1

I/12416305/IPAddress=String,"192.168.0.100"

I/12416305/ClientIPAddress=String,"0.0.0.0"
I/12416305/MachineName=String,""
I/12416305/SubnetMask=String,"0.0.0.0"
I/12416305/Gateway=String,"0.0.0.0"
I/12416305/PrimaryDNS=String,"0.0.0.0"
I/12416305/SecondaryDNS=String,"0.0.0.0"
I/12416305/Domain=String,""
I/12416305/SaveSubsampleResults=Bool,False
I/12416305/DumpScans=String,"none"
I/12416305/DumpResults=String,"none"
I/12416305/Note1/Name=String,"Note 1"
I/12416305/Note2/Name=String,"Note 2"
I/12416305/Note3/Name=String,"Note 3"
I/12416305/Note4/Name=String,"Note 4"
I/12416305/Note5/Name=String,"Note 5"
I/12416305/Note6/Name=String,"Note 6"
I/12416305/Note7/Name=String,"Note 7"
I/12416305/Note8/Name=String,"Note 8"
I/12416305/Note9/Name=String,"Note 9"
I/12416305/Note10/Name=String,"Note 10"

BIOS Log (xxxxxxxx.BI)

Information about the CPU BIOS version.

Example:
Phoenix - AwardBIOS v6.00PG
GENE-5312 BIOS REV 1.41 for FOSS (04/10/2007)
Ltd 10/02/2006-AMD-GX2-6A439ac9C-00

Hardware Versions Log (xxxxxxxx.HV)

Information about the hardware modules.

Example:

HV/12416305/DSP/Version=String,"5.02"

HV/12416305/Monochromator/Version=String,"5.5"

HV/12416305/Monochromator/SerialNumber=String,"T5114585"

HV/12416305/Detector/SerialNumber=String,"000813"

HV/12416305/MU/Version=String,"3.1"

HV/12416305/TWM/Version=String,"2.1"

HV/12416305/TWM/SerialNumber=String,"21436587"

HV/12416305/Eid=String,"64e7780e00c0"

Software Log (xxxxxxxx.SL)

Logs the messages shown on the display to the operator.

Example:

;0019,0255,0019,1000

SL/12415238/2007-10-1620:04:41/Name=String,"Error\tSelfteststopped."

SL/12415238/2007-10-18 13:34:09/Name=String, "Error\t Sample in the cell\t Empty and clean the cell using the\t flush function on the taskbar\t More information in the user manual. "

SL/12415238/2007-10-18 13:36:44/Name=String, "Error\t Analysis Failed\t Error in Measuring Unit\t Please note Code 128 (030d)\t for support"

SL/12415238/2007-10-18 16:10:36/Name=String, "Error\t Sample in the cell\t Empty and clean the cell using the\t flush function on the taskbar\t More information in the user manual. "

SL/12415238/2008-02-08 14:19:56/Name=String, "Error\t Verifying Monoch Checksum\t failed selftest\t Do you want to continue the self test?"

SL/12415238/2008-02-08 14:27:00/Name=String, "Error\t Self test failed.\t Check test results for further information \t See the User Manual"

SL/12415238/2008-02-21 10:34:43/Name=String, "Error\t Verifying Monoch Checksum\t failed selftest\t Do you want to continue the self test?"

SL/12415238/2008-02-21 10:35:30/Name=String, "Error\t Self test failed.\t Check test results for further information \t See the User Manual"

SL/12415238/2008-05-27 15:24:47/Name=String, "Error\t Manual Scan Failed.\t Error in Measuring Unit\t Please note Code 32768 (030e)\t for support"

Hardware Log (xxxxxxxx.HL)

Logs the command and response between the DSP and hardware I2C devices. This file is by far the most useful during troubleshooting.

Example:

;0053,0255,0053,0100

HL/12415238/2007-10-17 10:29:42/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2007-10-18 13:34:02/Name=String, "20 - 30c/1fc3/201/20/0/0/0/501"

HL/12415238/2007-10-18 13:34:06/Name=String, "20 - 30c/1fc3/201/20/0/0/0/501"

HL/12415238/2007-10-18 13:34:09/Name=String, "200 - 30d/1fc3/201/200/0/0/0/501"

HL/12415238/2007-10-18 13:36:40/Name=String, "80 - 30d/1fc3/201/80/0/0/0/501"

HL/12415238/2007-10-18 16:10:29/Name=String, "20 - 30c/1fc3/201/20/0/0/0/501"

HL/12415238/2007-10-18 16:10:32/Name=String, "20 - 30c/1fc3/201/20/0/0/0/501"

HL/12415238/2007-10-18 16:10:35/Name=String, "200 - 30d/1fc3/201/200/0/0/0/501"

HL/12415238/2008-01-22 13:29:10/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-01-22 15:55:56/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-01-30 16:39:12/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-01-31 16:50:25/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-01-31 16:50:40/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-01-31 16:57:25/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-01-31 16:57:35/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-01-31 16:58:14/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-02-14 13:07:23/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-02-18 14:25:21/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-02-18 14:35:33/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-02-19 12:33:04/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-02-21 13:02:42/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-02-21 13:17:07/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-05-22 16:41:15/Name=String, "40 - 30e/1fc3/201/40/0/0/0/501"

HL/12415238/2008-05-27 15:24:43/Name=String, "8000 - 30e/1fc3/201/0/0/0/0/501"

HL/12415238/2008-05-27 18:11:52/Name=String, "8000 - 30/1fc7/201/1/2000/0/0/501"

Start Up Log (xxxxxxxx.SU - xxxxxxxx.SU5)

The five latest failed start-up tests will be saved and named xxxxxxxx.SU1 - xxxxxxxx.SU5. The files are automatically renamed so xxxxxxxx.SU1 is always the latest.

The latest start-up test (failing or not) is named xxxxxxxx.SU.

Example:

SECTION 1 SUMMARY

SELFTEST/12417132/START/2011-01-18 15:42:11

SELFTEST/12417132/Software/Version v5.11

SELFTEST/12417132/PSM/Comm=Bool,True

SELFTEST/12417132/PSM/Hardware=Bool,True

SELFTEST/12417132/VoltagesTest=Bool,True

SELFTEST/12417132/Monochromator/Comm=Bool,True

SELFTEST/12417132/Monochromator/HardwareTest=Bool,True

SELFTEST/12417132/Monochromator/Checksum=Bool,True

SELFTEST/12417132/Detector/Comm=Bool,True

SELFTEST/12417132/Detector/HardwareTest=Bool,True

SELFTEST/12417132/Detector/Checksum=Bool,True

SELFTEST/12417132/TempSensor/Comm=Bool,True

SELFTEST/12417132/MU/Comm=Bool,True

SELFTEST/12417132/MU/HardwareTest=Bool,True

SELFTEST/12417132/MonochromatorTest=Bool,True

SELFTEST/12417132/DetectorTest=Bool,True

SELFTEST/12417132/Detector/ADCNoMissingCodes=Bool,True

SELFTEST/12417132/LampCheck=Bool,True

SELFTEST/12417132/StabilityTest=Bool,True

SELFTEST/12417132/WaveLengthStabilityTest=Bool,True

SELFTEST/12417132/END/2011-01-18 15:46:33

SECTION 2 DSP STATUS

SELFTEST/12417132/START DSP STATUS/2011-01-18 15:42:11

SELFTEST/12417132/DSP Status, ADC communication, OK

SELFTEST/12417132/DSP Status, Grating motor, Off

SELFTEST/12417132/DSP Status, Exercise ball bearing in grating motor, Off

SELFTEST/12417132/DSP Status, Display contrast value, 1100

SELFTEST/12417132/DSP Status, PSM Status, New

SELFTEST/12417132/DSP Status, Display, On

SELFTEST/12417132/DSP Status, Monochromator lamp, On

SELFTEST/12417132/DSP Status, Backlight, On

SELFTEST/12417132/DSP Status, MUMode, Normal
SELFTEST/12417132/DSP Status, TWMMode, Normal
SELFTEST/12417132/DSP Status, Not aborted command indication
SELFTEST/12417132/DSP Status, TWM, Not installed
SELFTEST/12417132/DSP Status, MU board, New
SELFTEST/12417132/DSP Status, MU software, Old
SELFTEST/12417132/DSP Status, Monochromator board, Old
SELFTEST/12417132/DSP Status, Monochromator software, Old
SELFTEST/12417132/DSP Status, TWM board, Old
SELFTEST/12417132/DSP Status, TWM software, Old
SELFTEST/12417132/DSP Status, STM, Not installed
SELFTEST/12417132/DSP Status, EID, Installed
SELFTEST/12417132/DSP Status, Mode, SP
SELFTEST/12417132/DSP Status, Numeric: 4033 513
SELFTEST/12417132/DSP Version, 5.11
SELFTEST/12417132/DSP has support for extended range.
SELFTEST/12417132/END DSP STATUS/2011-01-18 15:42:11

SECTION 3 HARDWARE AND COMMUNICATION TEST
SELFTEST/12417132/START VOLTAGE TEST/2011-01-18 15:42:16
SELFTEST/12417132/VoltageTest/+5=Number,5.1 (>=4.5 , <=5.5)
SELFTEST/12417132/VoltageTest/+5.5=Number,5.4 (>=5 , <=6)
SELFTEST/12417132/VoltageTest/+12=Number,11.9 (>=11.2000 , <=12.8000)
SELFTEST/12417132/VoltageTest/-12=Number,-12.0 (>=-12.8000 , <=-11.2000)
SELFTEST/12417132/VoltageTest/+10.5=Number,10.4 (>=10 , <=11)
SELFTEST/12417132/VoltageTest/Contrast=Number,-19.4 (>=-25 , <=-15)
SELFTEST/12417132/VoltageTest/Input=Number,27.8 (>=20 , <=45)
SELFTEST/12417132/VoltageTest/Passed=Bool,True
SELFTEST/12417132/END VOLTAGE TEST/2011-01-18 15:42:16

SELFTEST/12417132/START LAMP TEST/2011-01-18 15:43:14
SELFTEST/12417132/Check Lamp and Grating Motor = Instrument No Error
SELFTEST/12417132/LampCheck/Passed=Bool,True
SELFTEST/12417132/LampCheck/Measured value=Number,65535
SELFTEST/12417132/END LAMP TEST/2011-01-18 15:43:16

SECTION 4 DIAGNOSTIC TEST
SELFTEST/12417132/START MONOCHROMATOR TEST/2011-01-18 15:42:53
SELFTEST/12417132/Check Lamp and Grating Motor = Instrument No Error

SELFTEST/12417132/Monochromator/SerialNumber=String,E0113281
SELFTEST/12417132/Monochromator/PulseCount=Number,2884 (>2800 , <3400)
SELFTEST/12417132/Monochromator/CycleTime=Number,2.74 (>2.0 , <3.2)
SELFTEST/12417132/Monochromator/Min=Number,-4.7 (>-22)
SELFTEST/12417132/Monochromator/Max=Number,5.6 (<22)
SELFTEST/12417132/Monochromator/Diff=Number,10.3 (<50)
SELFTEST/12417132/END MONOCHROMATOR TEST/2011-01-18 15:42:56

SELFTEST/12417132/START DETECTOR TEST/2011-01-18 15:43:03
SELFTEST/12417132/Detector/SerialNumber=String,001601
SELFTEST/12417132/Detector/Gain1/Min=Number,688 (>=5)
SELFTEST/12417132/Detector/Gain1/Max=Number,689
SELFTEST/12417132/Detector/Gain1/Mean=Number,688.3450 (>50 , <2000)
SELFTEST/12417132/Detector/Gain1/StdDev=Number,0.4754 (<= 2)
SELFTEST/12417132/Detector/Gain1/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:03

SELFTEST/12417132/Detector/Gain2/Min=Number,687 (>=5)
SELFTEST/12417132/Detector/Gain2/Max=Number,688
SELFTEST/12417132/Detector/Gain2/Mean=Number,687.4498 (>50 , <2000)
SELFTEST/12417132/Detector/Gain2/StdDev=Number,0.4975 (<= 2)
SELFTEST/12417132/Detector/Gain2/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:03

SELFTEST/12417132/Detector/Gain3/Min=Number,685 (>=5)
SELFTEST/12417132/Detector/Gain3/Max=Number,686
SELFTEST/12417132/Detector/Gain3/Mean=Number,685.7570 (>50 , <2000)
SELFTEST/12417132/Detector/Gain3/StdDev=Number,0.4289 (<= 2)
SELFTEST/12417132/Detector/Gain3/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:04

SELFTEST/12417132/Detector/Gain4/Min=Number,681 (>=5)
SELFTEST/12417132/Detector/Gain4/Max=Number,683
SELFTEST/12417132/Detector/Gain4/Mean=Number,681.8250 (>50 , <2000)
SELFTEST/12417132/Detector/Gain4/StdDev=Number,0.3883 (<= 2)
SELFTEST/12417132/Detector/Gain4/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:04

SELFTEST/12417132/Detector/Gain5/Min=Number,673 (>=5)
SELFTEST/12417132/Detector/Gain5/Max=Number,675
SELFTEST/12417132/Detector/Gain5/Mean=Number,674.0966 (>50 , <2000)
SELFTEST/12417132/Detector/Gain5/StdDev=Number,0.4810 (<= 2)
SELFTEST/12417132/Detector/Gain5/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:04

SELFTEST/12417132/Detector/Gain6/Min=Number,689 (>=5)
SELFTEST/12417132/Detector/Gain6/Max=Number,690
SELFTEST/12417132/Detector/Gain6/Mean=Number,689.4406 (>50 , <2000)
SELFTEST/12417132/Detector/Gain6/StdDev=Number,0.4965 (<= 2)
SELFTEST/12417132/Detector/Gain6/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:05

SELFTEST/12417132/Detector/Gain7/Min=Number,689 (>=5)
SELFTEST/12417132/Detector/Gain7/Max=Number,690
SELFTEST/12417132/Detector/Gain7/Mean=Number,689.4748 (>50 , <2000)
SELFTEST/12417132/Detector/Gain7/StdDev=Number,0.4994 (<= 2)
SELFTEST/12417132/Detector/Gain7/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:05

SELFTEST/12417132/Detector/Gain8/Min=Number,688 (>=5)
SELFTEST/12417132/Detector/Gain8/Max=Number,690
SELFTEST/12417132/Detector/Gain8/Mean=Number,689.3686 (>50 , <2000)
SELFTEST/12417132/Detector/Gain8/StdDev=Number,0.5099 (<= 3)
SELFTEST/12417132/Detector/Gain8/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:05

SELFTEST/12417132/Detector/Gain9/Min=Number,687 (>=5)
SELFTEST/12417132/Detector/Gain9/Max=Number,691
SELFTEST/12417132/Detector/Gain9/Mean=Number,689.1770 (>50 , <2000)
SELFTEST/12417132/Detector/Gain9/StdDev=Number,0.8731 (<= 3)
SELFTEST/12417132/Detector/Gain9/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:06

SELFTEST/12417132/Detector/Gain10/Min=Number,684 (>=5)
SELFTEST/12417132/Detector/Gain10/Max=Number,694
SELFTEST/12417132/Detector/Gain10/Mean=Number,689.0166 (>50 , <2000)
SELFTEST/12417132/Detector/Gain10/StdDev=Number,1.5825 (<= 4)

SELFTEST/12417132/Detector/Gain10/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:06

SELFTEST/12417132/Detector/Gain11/Min=Number,680 (>=5)
SELFTEST/12417132/Detector/Gain11/Max=Number,693
SELFTEST/12417132/Detector/Gain11/Mean=Number,686.1520 (>50 , <2000)
SELFTEST/12417132/Detector/Gain11/StdDev=Number,2.2264 (<= 5)
SELFTEST/12417132/Detector/Gain11/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:06

SELFTEST/12417132/Detector/Gain12/Min=Number,674 (>=5)
SELFTEST/12417132/Detector/Gain12/Max=Number,694
SELFTEST/12417132/Detector/Gain12/Mean=Number,683.8184 (>50 , <2000)
SELFTEST/12417132/Detector/Gain12/StdDev=Number,3.6825 (<= 9)
SELFTEST/12417132/Detector/Gain12/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:07

SELFTEST/12417132/Detector/Gain13/Min=Number,659 (>=5)
SELFTEST/12417132/Detector/Gain13/Max=Number,700
SELFTEST/12417132/Detector/Gain13/Mean=Number,679.0270 (>50 , <2000)
SELFTEST/12417132/Detector/Gain13/StdDev=Number,7.1906 (<= 17)
SELFTEST/12417132/Detector/Gain13/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:07

SELFTEST/12417132/Detector/Gain14/Min=Number,622 (>=5)
SELFTEST/12417132/Detector/Gain14/Max=Number,716
SELFTEST/12417132/Detector/Gain14/Mean=Number,672.6418 (>50 , <2000)
SELFTEST/12417132/Detector/Gain14/StdDev=Number,14.4566 (<= 30)
SELFTEST/12417132/Detector/Gain14/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:07

SELFTEST/12417132/Detector/Gain15/Min=Number,580 (>=5)
SELFTEST/12417132/Detector/Gain15/Max=Number,727
SELFTEST/12417132/Detector/Gain15/Mean=Number,655.8832 (>50 , <2000)
SELFTEST/12417132/Detector/Gain15/StdDev=Number,26.7063 (<= 60)
SELFTEST/12417132/Detector/Gain15/Temp=Number,34.0 (>25.0 , <65.0)
SELFTEST/12417132/2011-01-18 15:43:08

SELFTEST/12417132/END DETECTOR TEST/2011-01-18 15:43:08

SELFTEST/12417132/START STABILITY TEST/2011-01-18 15:43:18
SELFTEST/12417132/Check Lamp and Grating Motor = Instrument No Error
SELFTEST/12417132/Stability/Max=Number,47222 (>30000)
SELFTEST/12417132/Stability/Max=Number,47124 (>30000)
SELFTEST/12417132/Stability/Max=Number,47059 (>30000)
SELFTEST/12417132/Stability/Max=Number,47014 (>30000)
SELFTEST/12417132/Stability/Max=Number,46979 (>30000)
SELFTEST/12417132/Stability/Max=Number,46951 (>30000)
SELFTEST/12417132/Stability/Max=Number,46928 (>30000)
SELFTEST/12417132/Stability/Max=Number,46910 (>30000)
SELFTEST/12417132/Stability/Max=Number,46894 (>30000)
SELFTEST/12417132/Stability/Max=Number,46879 (>30000)
SELFTEST/12417132/Stability/Max=Number,46866 (>30000)
SELFTEST/12417132/Stability/Max=Number,46854 (>30000)
SELFTEST/12417132/Stability/Max=Number,46836 (>30000)
SELFTEST/12417132/Stability/Diff=Number,-170.34
SELFTEST/12417132/Stability/Max=Number,46829 (>30000)
SELFTEST/12417132/Stability/Diff=Number,-136.67
SELFTEST/12417132/Stability/Max=Number,46821 (>30000)
SELFTEST/12417132/Stability/Diff=Number,-114.33
SELFTEST/12417132/Stability/Max=Number,46814 (>30000)
SELFTEST/12417132/Stability/Diff=Number,-98.67
SELFTEST/12417132/END STABILITY TEST/2011-01-18 15:45:56

SELFTEST/12417132/START BG20FILTER TEST/2011-01-18 15:45:58
SELFTEST/12417132/Check Lamp and Grating Motor = Instrument No Error
SELFTEST/12417132/Monochromator/I/SerialNumber=String,E0113281
SELFTEST/12417132/Monochromator/I/Peak2Mean=Number,880.01
SELFTEST/12417132/Monochromator/I/Peak2Min=Number,880.01
SELFTEST/12417132/Monochromator/I/Peak2Max=Number,880.01
SELFTEST/12417132/Monochromator/I/Peak2Std=Number,0.00
SELFTEST/12417132/Monochromator/I/Peak2Diff=Number,-0.14 (>=-1.0 , <=1.0)
SELFTEST/12417132/END BG20FILTER TEST/2011-01-18 15:46:31

Self Test Log (xxxxxxxx.ST1 - xxxxxxxx.ST3)

The three latest self tests will be saved and named xxxxxxxx.ST1 - xxxxxxxx.ST3. The files are automatically renamed so xxxxxxxx .ST1 is always the latest.

Example:

SELFTEST/12417147/Monochromator/SerialNumber=String,E0103165

SELFTEST/12417147/Monochromator/PulseCount=Number,2884

SELFTEST/12417147/Monochromator/CycleTime=Number,2.72

SELFTEST/12417147/Monochromator/Min=Number,-5.2

SELFTEST/12417147/Monochromator/Max=Number,4.8

SELFTEST/12417147/Monochromator/Diff=Number,10.0

SELFTEST/12417147/Detector/SerialNumber=String,001594

SELFTEST/12417147/Detector/Gain1/Min=Number,684

SELFTEST/12417147/Detector/Gain1/Max=Number,685

SELFTEST/12417147/Detector/Gain1/Mean=Number,684.9628

SELFTEST/12417147/Detector/Gain1/StdDev=Number,0.1893

SELFTEST/12417147/Detector/Gain1/Temp=Number,54.5

SELFTEST/12417147/Detector/Gain2/Min=Number,683

SELFTEST/12417147/Detector/Gain2/Max=Number,684

SELFTEST/12417147/Detector/Gain2/Mean=Number,683.9352

SELFTEST/12417147/Detector/Gain2/StdDev=Number,0.2462

SELFTEST/12417147/Detector/Gain2/Temp=Number,54.5

SELFTEST/12417147/Detector/Gain3/Min=Number,681

SELFTEST/12417147/Detector/Gain3/Max=Number,682

SELFTEST/12417147/Detector/Gain3/Mean=Number,681.8420

SELFTEST/12417147/Detector/Gain3/StdDev=Number,0.3648

SELFTEST/12417147/Detector/Gain3/Temp=Number,54.0

SELFTEST/12417147/Detector/Gain4/Min=Number,676

SELFTEST/12417147/Detector/Gain4/Max=Number,678

SELFTEST/12417147/Detector/Gain4/Mean=Number,677.3968

SELFTEST/12417147/Detector/Gain4/StdDev=Number,0.4946

SELFTEST/12417147/Detector/Gain4/Temp=Number,54.0

SELFTEST/12417147/Detector/Gain5/Min=Number,668

SELFTEST/12417147/Detector/Gain5/Max=Number,670

SELFTEST/12417147/Detector/Gain5/Mean=Number,668.8676

SELFTEST/12417147/Detector/Gain5/StdDev=Number,0.4636

SELFTEST/12417147/Detector/Gain5/Temp=Number,54.0

SELFTEST/12417147/Detector/Gain6/Min=Number,685

SELFTEST/12417147/Detector/Gain6/Max=Number,687

SELFTEST/12417147/Detector/Gain6/Mean=Number,686.1154
SELFTEST/12417147/Detector/Gain6/StdDev=Number,0.3342
SELFTEST/12417147/Detector/Gain6/Temp=Number,54.0
SELFTEST/12417147/Detector/Gain7/Min=Number,685
SELFTEST/12417147/Detector/Gain7/Max=Number,688
SELFTEST/12417147/Detector/Gain7/Mean=Number,686.2666
SELFTEST/12417147/Detector/Gain7/StdDev=Number,0.4556
SELFTEST/12417147/Detector/Gain7/Temp=Number,54.5
SELFTEST/12417147/Detector/Gain8/Min=Number,685
SELFTEST/12417147/Detector/Gain8/Max=Number,688
SELFTEST/12417147/Detector/Gain8/Mean=Number,686.6090
SELFTEST/12417147/Detector/Gain8/StdDev=Number,0.6775
SELFTEST/12417147/Detector/Gain8/Temp=Number,54.5
SELFTEST/12417147/Detector/Gain9/Min=Number,684
SELFTEST/12417147/Detector/Gain9/Max=Number,690
SELFTEST/12417147/Detector/Gain9/Mean=Number,687.0134
SELFTEST/12417147/Detector/Gain9/StdDev=Number,1.1627
SELFTEST/12417147/Detector/Gain9/Temp=Number,54.0
SELFTEST/12417147/Detector/Gain10/Min=Number,683
SELFTEST/12417147/Detector/Gain10/Max=Number,695
SELFTEST/12417147/Detector/Gain10/Mean=Number,688.2688
SELFTEST/12417147/Detector/Gain10/StdDev=Number,2.3076
SELFTEST/12417147/Detector/Gain10/Temp=Number,54.0
SELFTEST/12417147/Detector/Gain11/Min=Number,662
SELFTEST/12417147/Detector/Gain11/Max=Number,685
SELFTEST/12417147/Detector/Gain11/Mean=Number,675.9810
SELFTEST/12417147/Detector/Gain11/StdDev=Number,3.7671
SELFTEST/12417147/Detector/Gain11/Temp=Number,54.5
SELFTEST/12417147/Detector/Gain12/Min=Number,649
SELFTEST/12417147/Detector/Gain12/Max=Number,690
SELFTEST/12417147/Detector/Gain12/Mean=Number,666.9090
SELFTEST/12417147/Detector/Gain12/StdDev=Number,6.9855
SELFTEST/12417147/Detector/Gain12/Temp=Number,54.5
SELFTEST/12417147/Detector/Gain13/Min=Number,608
SELFTEST/12417147/Detector/Gain13/Max=Number,702
SELFTEST/12417147/Detector/Gain13/Mean=Number,650.3872
SELFTEST/12417147/Detector/Gain13/StdDev=Number,14.4718
SELFTEST/12417147/Detector/Gain13/Temp=Number,54.5
SELFTEST/12417147/Detector/Gain14/Min=Number,531

SELFTEST/12417147/Detector/Gain14/Max=Number,685
SELFTEST/12417147/Detector/Gain14/Mean=Number,617.3802
SELFTEST/12417147/Detector/Gain14/StdDev=Number,26.1666
SELFTEST/12417147/Detector/Gain14/Temp=Number,54.0
SELFTEST/12417147/Detector/Gain15/Min=Number,397
SELFTEST/12417147/Detector/Gain15/Max=Number,766
SELFTEST/12417147/Detector/Gain15/Mean=Number,552.2060
SELFTEST/12417147/Detector/Gain15/StdDev=Number,59.2260
SELFTEST/12417147/Detector/Gain15/Temp=Number,54.0
SELFTEST/12417147/Detector/SerialNumber=String,001594
SELFTEST/12417147/Detector/ADCNoMissingCodes=Bool,True
SELFTEST/12417147/Monochromator/I/SerialNumber=String,E0103165
SELFTEST/12417147/Monochromator/I/Peak2Mean=Number,879.98
SELFTEST/12417147/Monochromator/I/Peak2Min=Number,879.97
SELFTEST/12417147/Monochromator/I/Peak2Max=Number,879.98
SELFTEST/12417147/Monochromator/I/Peak2Std=Number,0.00
SELFTEST/12417147/Monochromator/I/Peak2Diff=Number,-0.05
SELFTEST/12417147/VoltageTest/+5=Number,5.0
SELFTEST/12417147/VoltageTest/+5.5=Number,5.4
SELFTEST/12417147/VoltageTest/+12=Number,12.0
SELFTEST/12417147/VoltageTest/-12=Number,-11.7
SELFTEST/12417147/VoltageTest/+10.5=Number,10.4
SELFTEST/12417147/VoltageTest/Contrast=Number,-19.0
SELFTEST/12417147/VoltageTest/Input=Number,28.7
SELFTEST/12417147/VoltageTest/Passed=Bool,True
SELFTEST/12417147/Name=Date,2011-01-26 14:38:15
SELFTEST/12417147/LampCheck/Passed=Bool,True
SELFTEST/12417147/LampCheck/Measured value=Number,65535
SELFTEST/12417147/Name=Date,2011-01-26 14:37:25
SELFTEST/12417147/Monochromator/Comm=Bool,True
SELFTEST/12417147/Monochromator/HardwareTest=Bool,True
SELFTEST/12417147/Monochromator/Checksum=Bool,True
SELFTEST/12417147/Detector/Comm=Bool,True
SELFTEST/12417147/Detector/HardwareTest=Bool,True
SELFTEST/12417147/Detector/Checksum=Bool,True
SELFTEST/12417147/TempSensor/Comm=Bool,True
SELFTEST/12417147/MU/Comm=Bool,True
SELFTEST/12417147/MU/HardwareTest=Bool,True
SELFTEST/12417147/PSM/Comm=Bool,True

SELFTEST/12417147/PSM/Comm=Bool,True

SELFTEST/12417147/VoltagesTest=Bool,True

SELFTEST/12417147/MonochromatorTest=Bool,True

SELFTEST/12417147/DetectorTest=Bool,True

SELFTEST/12417147/Detector/ADCNoMissingCodes=Bool,True

SELFTEST/12417147/LampCheck=Bool,True

SELFTEST/12417147/WaveLengthStabilityTest=Bool,True

5 Service and Maintenance

This chapter provides instructions for repair and guidance for maintenance of the Infratec 1241.

5.1 Special Tools

- P/N 1591 0019 Allen Key 2x225mm (For Monochromator feet)
- P/N 1001 0743 Path Length Adjustment Kit
- P/N 1001 1779 Test Weight Control Kit
- P/N 6002 3294 Level Sensor Centring Tool TWM

5.2 Service Procedures

5.2.1 Replacement of Display Kit

Additional Tools: 5 mm box spanner

NOTE! Use ESD protection when handling circuit boards.

1. Switch off the instrument.
2. Carefully remove the covers for the five holes in the left-hand door with a screwdriver.
3. Open the left-hand door.
4. Fit the two ferrites **1** on the new display cable.

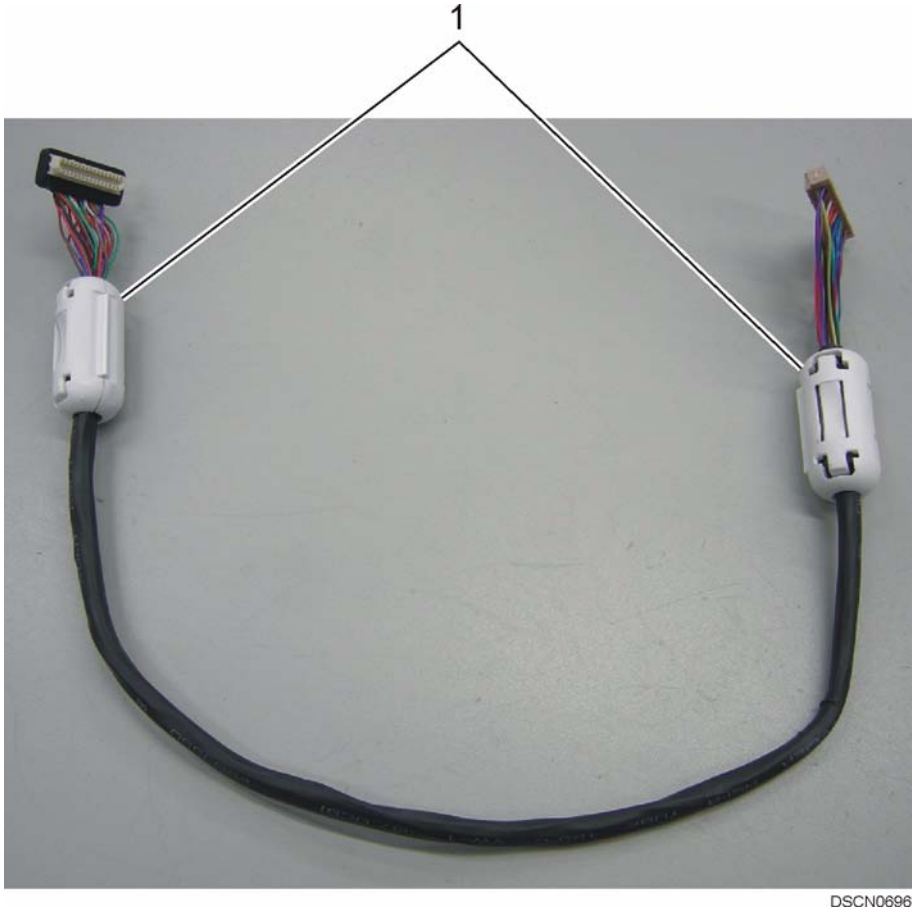


Fig. 5:1 New Display Cable

1 Ferrites

5. Disconnect the **P1** cable from the DSP Board.

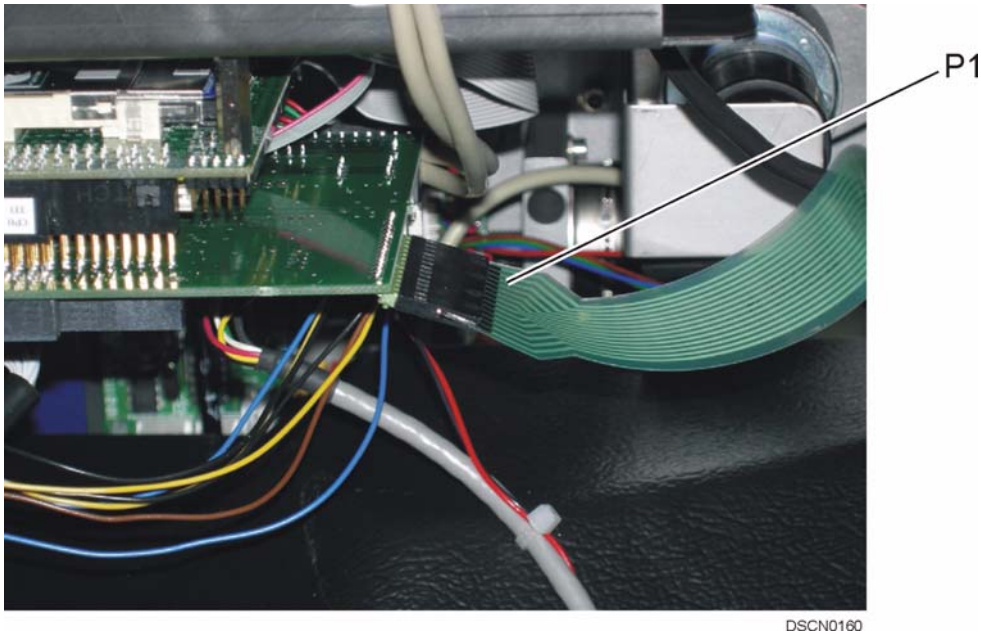


Fig. 5:2 DSP Board

P1 Keypad

6. Disconnect the display cable from **CN1** on the LCD Display.

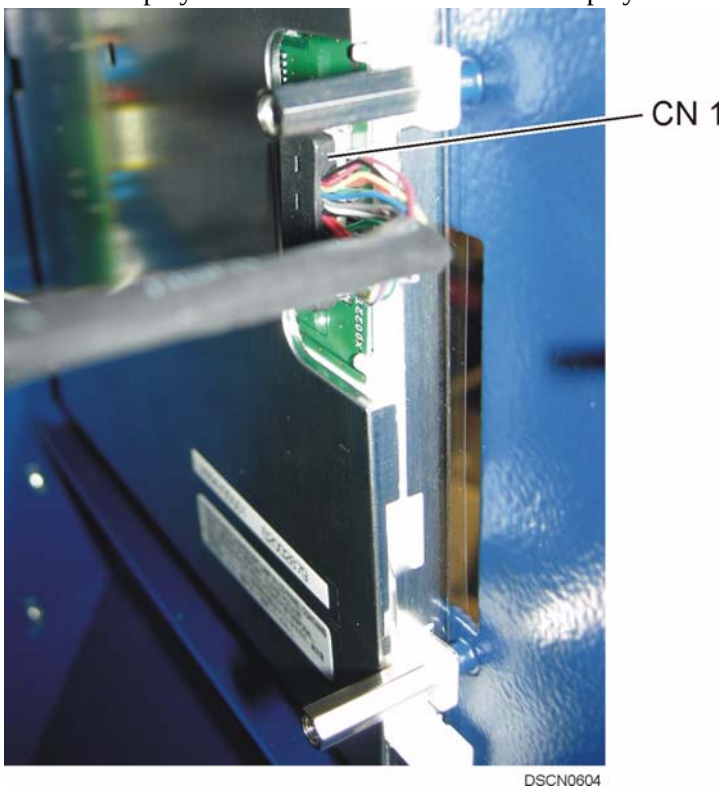


Fig. 5:3 LCD Display

CN1 Processor Board

7. Disconnect the **JP1** and **JP2** cables from the Display Interconnection Board.

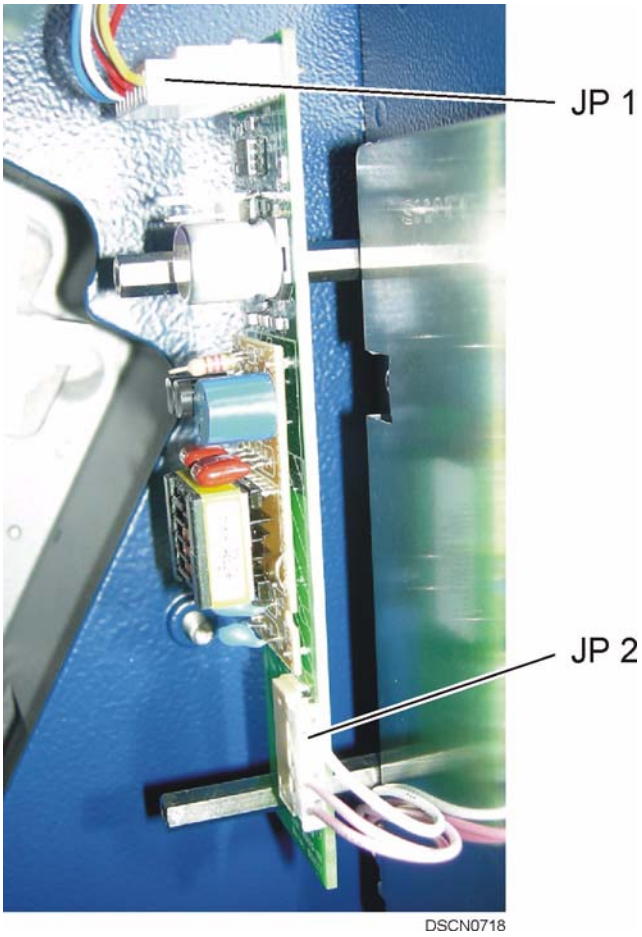


Fig. 5:4 Inverter Interface Board

JP1	I2C Bus	JP2	LCD Display

8. Remove the two distance bolts together with the two nylon washers and carefully lift away the Display Interconnection Board.

9. Remove the four distance bolts together with the two tooth lock washers and carefully lift away the LCD Display.

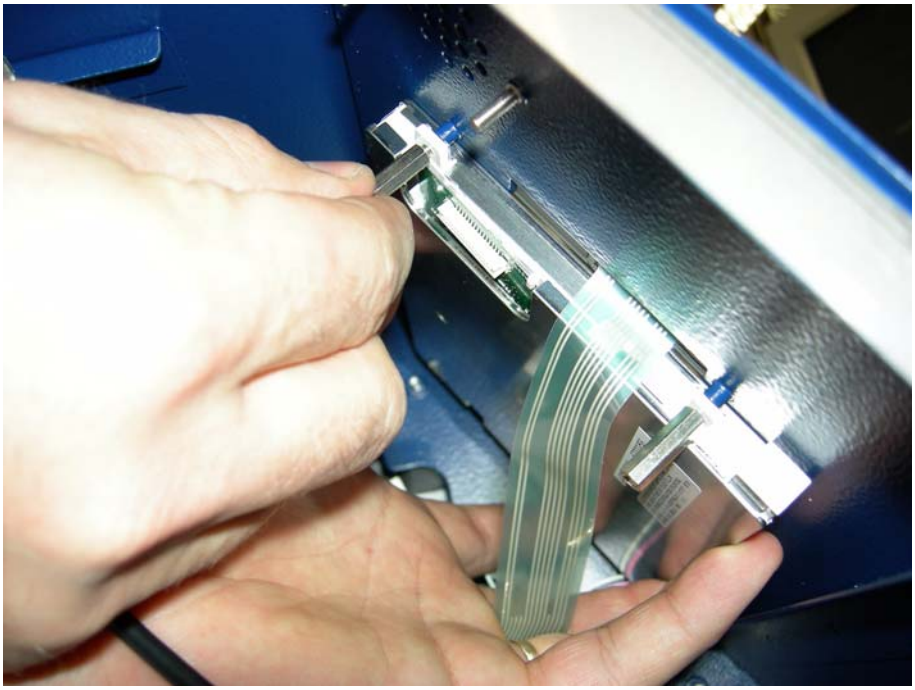


Fig. 5:5 Removing LCD Display

10. Remove the two locking nuts **1** (one hidden) holding the PC Module and tilt down the PC Module.

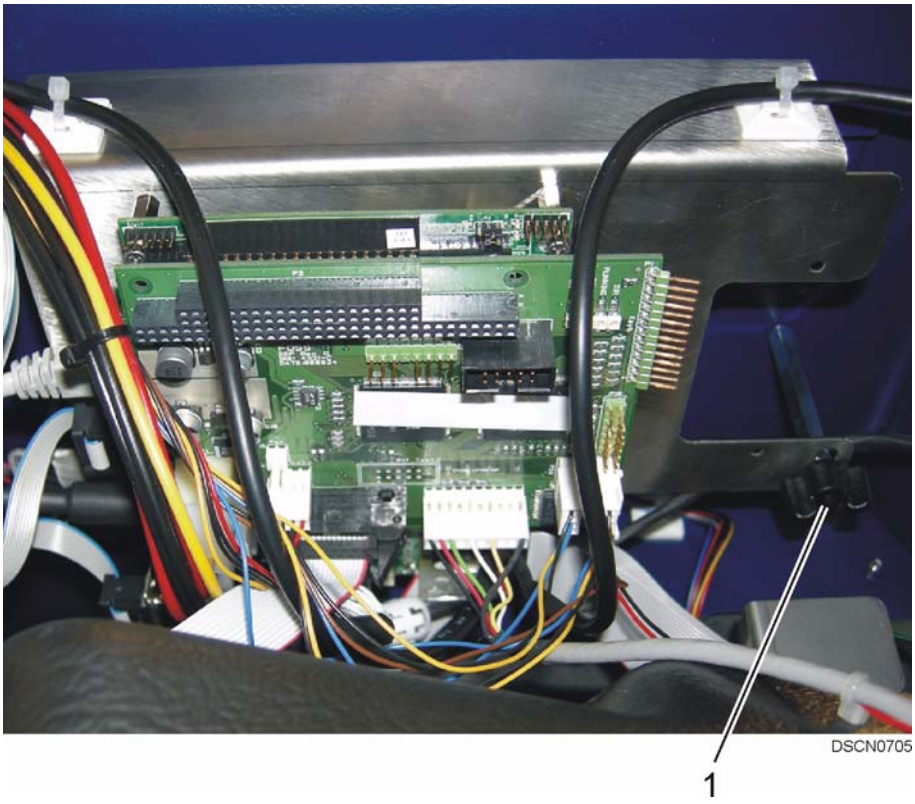


Fig. 5:6 PC Module

1 Locking Nut

11. Remove the display cable from **CN12** on the Processor Board.

NOTE! Observe the display cable orientation.

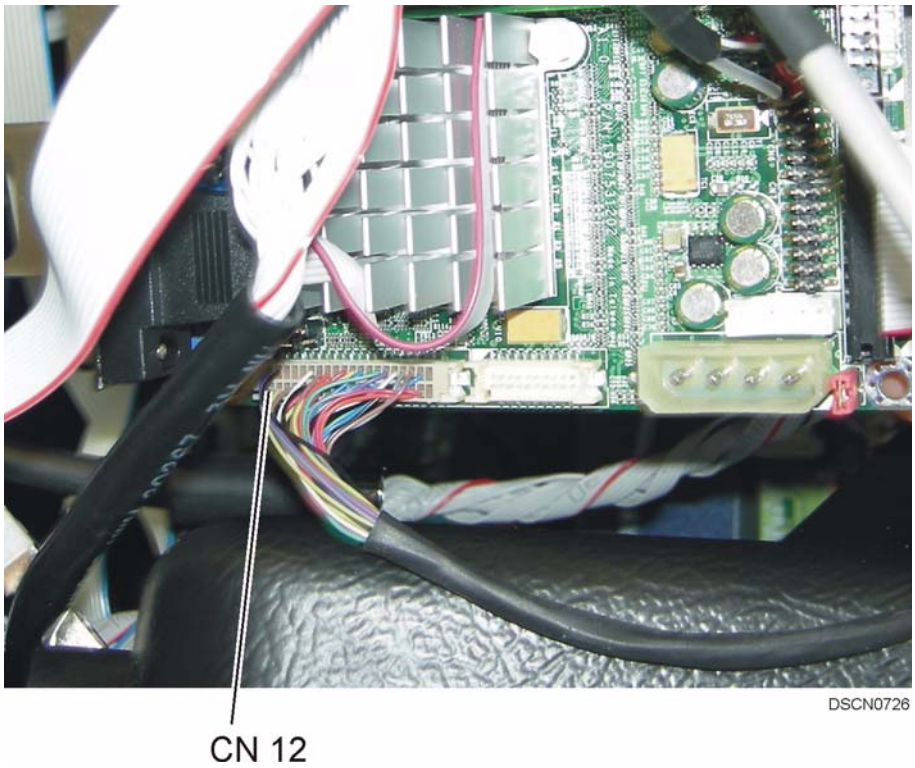


Fig. 5:7 Processor Board

CN12 LCD Display

12. Fit the new display cable to CN12 on the Processor Board.

NOTE! The display cable should be placed as before on the upper side of the PC Module.

13. Tilt up the PC Module and fit the two locking nuts holding the PC Module.
14. Fit the new LCD Display with the four distance bolts together with the two tooth lock washers. Place the tooth lock washers where the Inverter Interface Board should be mounted.
15. Fit the new Inverter Interface Board with the two distance bolts together with the two nylon washers.
16. Connect the JP1 and JP2 cables to the Inverter Interface Board.

NOTE! Use extreme care when connecting these cables.

17. Connect the display cable to CN1 on the LCD Display.
18. Connect the P1 cable to the DSP Board.
19. Close the left-hand door and fit the new covers. Switch on the instrument.

5.2.2 Replacement of Keyboard Overlay

(P/N 1001 4765 Gen. 2 / P/N 6004 4142 Gen. 3)

NOTE! Removing the keyboard overlay reduces the effectiveness of the adhesive. We strongly recommend that you do not reuse the keyboard overlay.

1. Remove the Keyboard Overlay.
   Lift up a corner and slowly pull the overlay off. Use isopropyl alcohol to remove any residual adhesive.
2. Grasp the tab and partially peel back the protective layer covering the overlay from the left short side.
3. Hold the peeled-back portion of the protective layer out of the way as you perform the next step.
4. Center the keyboard overlay on the chassis and carefully position the exposed adhesive surface on the chassis.

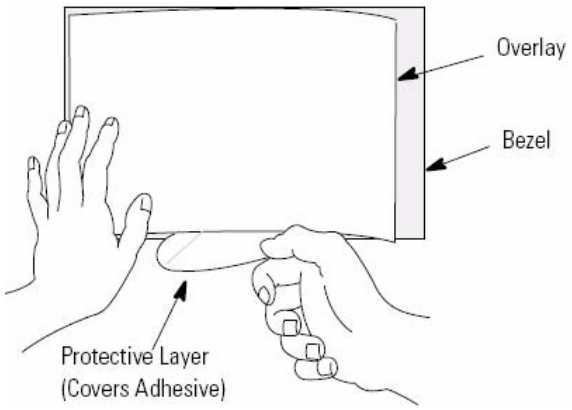


Fig. 5:8

5. While the protective layer is still covering the rest of the overlay, verify that the overlay is properly centered.
6. Slowly peel off the rest of the protective layer, while using a soft cloth to press the keyboard overlay on the screen. Make sure that the overlay lies flat with no bubbles or warps.
7. With a soft cloth or the flat surface of a fingernail, press around the edges of the overlay to completely seal it, and remove any air bubbles trapped in the adhesive.
8. Connect the **P1** cable to the DSP Board.

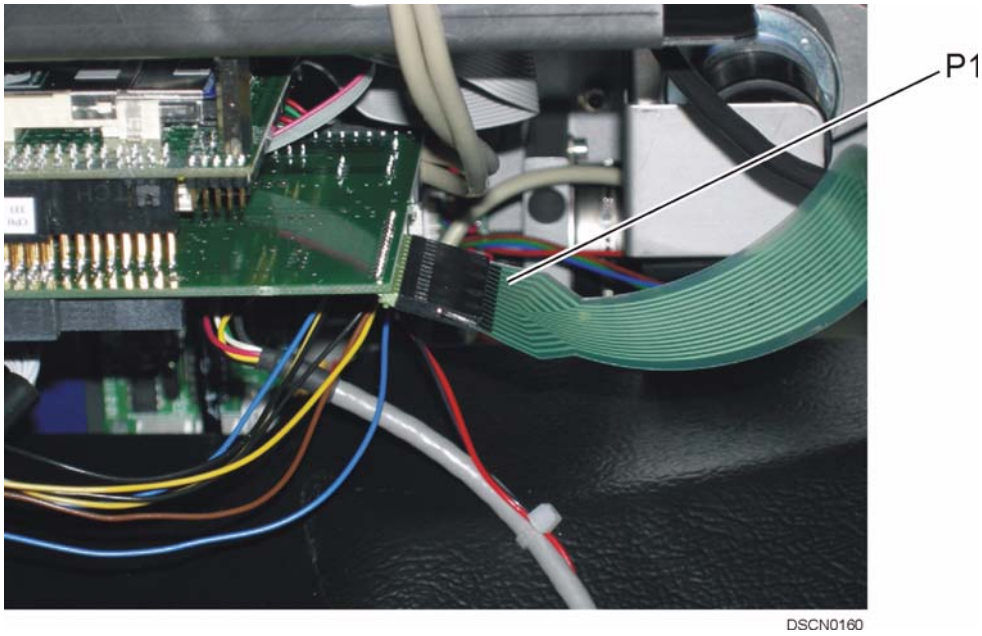


Fig. 5:9 DSP Board

P1 Keypad

5.2.3 Replacement of Detector Unit Complete

(P/N 1000 9777)

1. Turn off the instrument and remove the mains cable.
2. Lift up the hopper section and open the right-hand door.
3. Disconnect the detector cable by unscrewing the screws on either side of the connector and pulling it straight backwards.
4. Remove the screw on the lower right side of the detector which fastens it to the main chassis. The lower right side is also functioning as a grounding plate. It can be exchanged for a grounding cable. It is extremely important that this grounding function is maintained i.e. use tagged washers on both sides of the cable/plate.

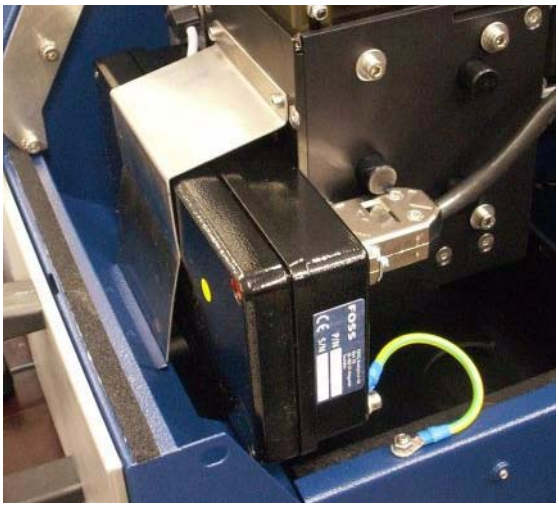


Fig. 5:10 Detector

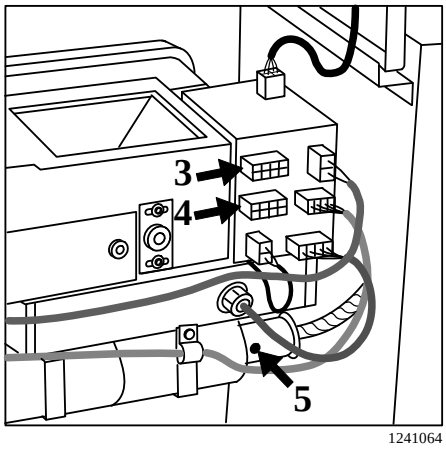
5. Remove the two screws which hold the spring plate over the detector. While holding the detector, remove the spring plate by pulling it straight upwards.
6. Gently pull the detector straight outward towards you.
7. Assemble the new detector in the reverse order. Be careful to get the grounding correct. If using the grounding plate, make sure it does not distort the Measuring Unit, which will create problems with movability of the lower shutter.

5.2.4 Replacement of Monochromator Complete

NOTE! Use ESD protection when handling circuit boards.

NOTE! After changing the Monochromator, perform an Intensity Test according to 5.2.6 Use of the Aperture Kit (p/n 60023539) on page 5:14.

1. Turn off the instrument and remove the mains cable.
2. Penetrate the covers for the five holes in the left-hand door with a screwdriver. Do not try to pinch because the door is easily miscoloured. Unscrew the screws in the left-hand door and open it.
   When re-assembling, do not forget to replace the five covers.
3. Disconnect all cables from the PC-module.
4. Unscrew the two screws securing the PC-module's mounting plate. Remove the PC-module and mounting plate.
5. Loosen the stop screw (5) to the fibre optic cable protector and slide it backwards, see fig below.



3) Optional

4) Optional

5) Stop screw on protector

Fig. 5:11 Stop screw (pos 5)

6. Now uncovered by the protector, loosen the stop screw to the fibre optic cable itself and remove it from the Measuring Unit. Pull from inside the compartment.
7. Remove the four screws on the backside of the instrument which fasten the power supply module to the main chassis.
8. Pull the entire power supply module straight outwards and place the power supply module on a table.
9. Loosen all screws and nuts to the fasteners which secure the ingoing and outgoing fibre optic cables of the monochromator. Remove the fasteners.
10. Standing behind the instrument: Pull (but do not bend!) the outgoing fibre optic cable (cable to MU) straight backwards and into the inside of the instrument.

NOTE! Just loosen the stop screw, do not remove. Max. one and a half turns.

11. Remove the covers crew located in the centre of the cooling flange located on the back side of the instrument. Place a 2 mm allen key in the exposed hole in the flange and loosen the stop screw inside.
12. Remove ingoing fibre optic cable from cooling flange.
13. Loosen the stop screws located in the three feet of the monochromator.
14. Lift the monochromator straight upward and remove it from the instrument.
15. Place the new monochromator on the three studs in the instrument and tighten the stop screw in each of the three feet.
16. Thread the cable fasteners on the fibre optic cables.

Mounting Fibre Optic Cable to Measuring Unit

17. Push (but do not bend!) the outgoing fibre optic cable through the through-connection (rubber grommet) into the measuring unit compartment.
18. Being two persons will simplify this task: Slide the fibre optic cable protector over the outgoing fibre optic cable and align the cable in the collimator. Ensure that the fibre optic cable reach the bottom before tightening the screw. Use a torch lamp to see the fibre optic cable come flush with the collimator. Otherwise the screw may cause heavy scratches on the end of the fibre optic cable.
19. Tighten the stop screw.
20. Slide the fibre optic cable protector forward so that it is flush with the collimator. Tighten the stop screw.

Mounting Fibre Optic Cable to Lamp

21. Loosen the two screws to the upper cover plate of the cooling flange and remove it. Remove the lamp assembly. Remove the bottom cover plate as well.
22. Being two persons will simplify this task: Push (but do not bend!) the ingoing fibre optic cable into the cooling flange. Place a hand in the lower opening of the cooling flange to help guide the ingoing fibre optic cable into the lens holder located in the middle of the cooling flange. Look from the lamp position. Ensure that the end of the fibre optic cable is flush with the surface of the lens holder before tightening the stop screw. Otherwise the stop screw may cause heavy scratches on the end of the fibre optic cable.
23. Place a 2 mm allen key in the hole located in the middle of the cooling flange and tighten the stop screw which secures the fibre optic cable.
24. Replace cover screw in the middle of the cooling flange.
25. Replace lamp assembly and re-secure the upper cover plate to the cooling flange.
26. Re-secure the lower cover plate to the cooling flange.
27. Secure the fibre optic cable fasteners with their respective screws and nuts. Make sure the fibre optic cable is mounted in a way that it is not touched by the door.
28. Remount the PC-module.
29. Re-connect all cables.

5.2.5 Replacement of Halogen Lamp for Monochromator

Hot Surface

The cover plate and the complete cooling flange for the lamp assembly both get hot due to the very high lamp temperature. Be very careful when replacing the lamp so that you avoid burns.

Caution

Do not touch the lamp glass or reflector or let any rough surface come in contact with the lamp glass. A microscopic scratch in the glass might cause a lamp explosion later.

Replace the halogen lamp as follows:

1. Switch off the Infratec 1241 Grain Analyzer. Disconnect from mains.
2. The cover plate to the lamp assembly is located on the top of the cooling flanges on the back side of the instrument, see Fig. 5:12. Unscrew the two screws **1** fastening the cover plate using the supplied 3 mm allen key.

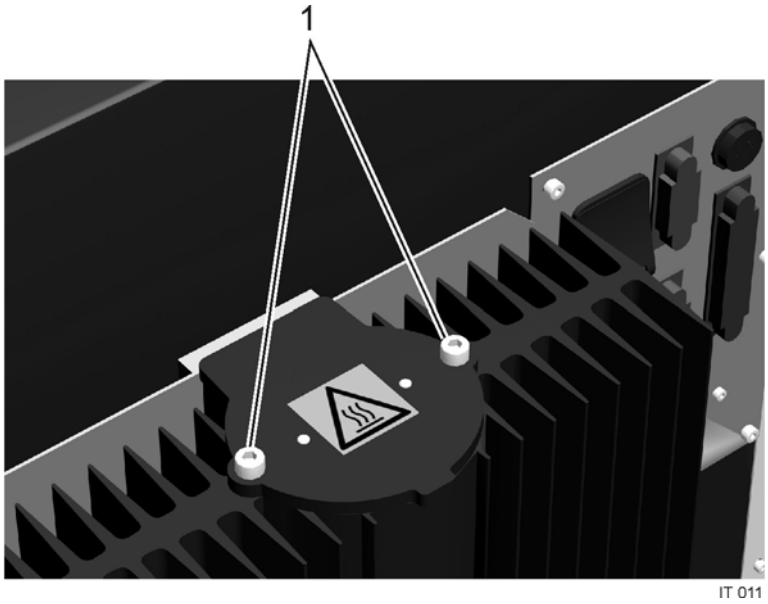


Fig. 5:12 Cover plate to lamp assembly

1 Screws

3. Use a flat bladed screwdriver to loose the two screws holding the lamp.

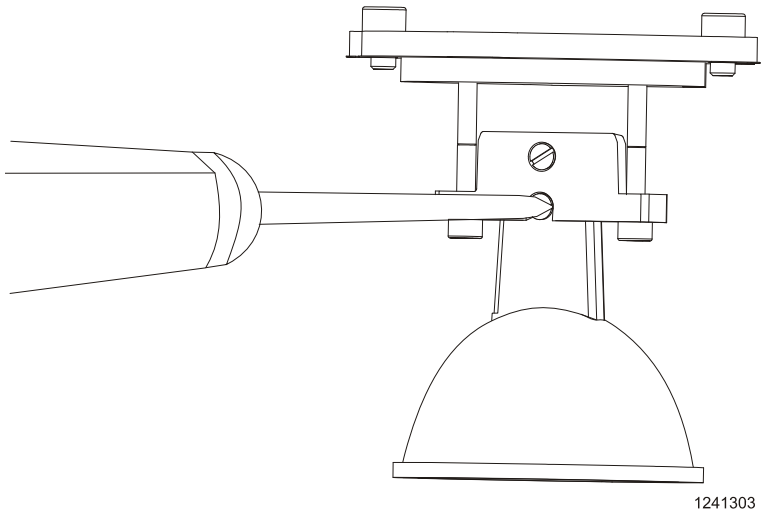


Fig. 5:13 Removing lamp from holder

4. Fit the new lamp and assemble in reverse order.
5. After changing lamp let it burn in at least 2 hours.
6. See 5.6.2 Lamp Holder on page 5:72.

5.2.6 Use of the Aperture Kit (p/n 60023539)

General

The optical characteristics of each individual instrument are slightly different. Therefore it's sometimes necessary to reduce the amount of light energy from the lamp onto the fibre bundle located just below the lamp. This describes the procedure to determine which aperture size to use and the way to fit it in the instrument.

Hot Surface

The Cover Plate and the complete Cooling Flange for the Lamp Assembly both get hot due to the very high Lamp temperature. Be very careful when replacing the Lamp so that you avoid burns.

Content of the Aperture Kit

- Screw, MFX M3x8 (2 pcs.)
- Aperture 7.5 mm
- Aperture 7.0 mm
- Aperture 6.5 mm
- Aperture 6.0 mm
- Aperture 5.5 mm
- Aperture 5.0 mm
- Technical Note 1355

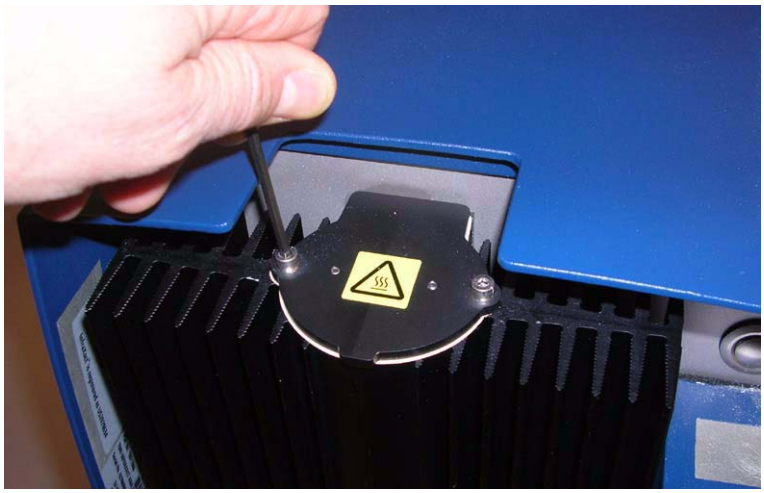
Additional tools needed that are not included in the Aperture Kit

- 3 mm allen key
- Retriever claw
- Philips screwdriver

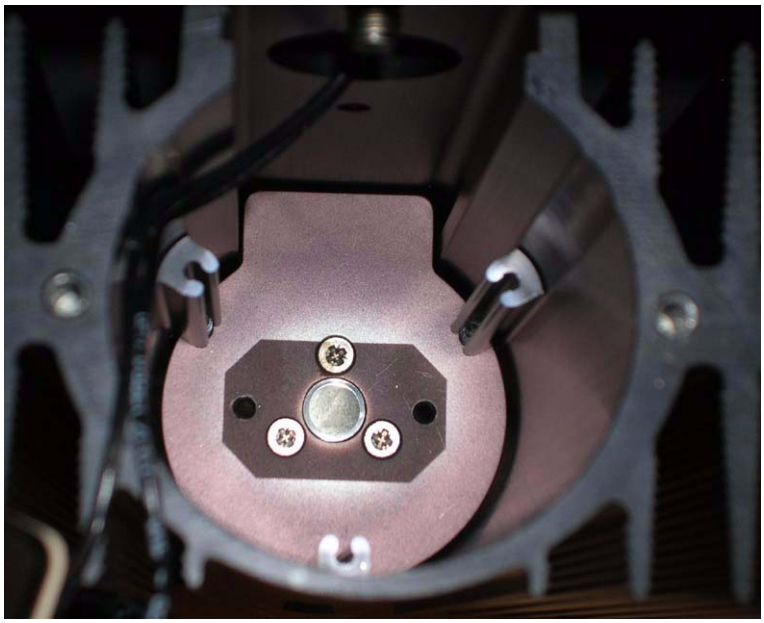
Procedure

Aperture, Installation

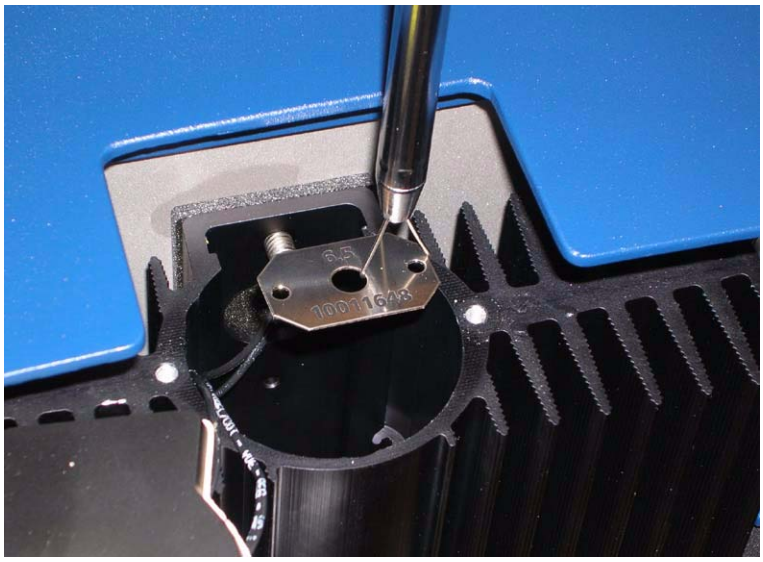
1. Switch off the instrument.
2. Remove the screws securing the lamp cover and lift up the lamp and lamp holder assembly.



3. Inspect if an aperture already is fitted in the lamp housing. Usually not, which is the case in the picture below.



4. Usually the high limit is exceeded as described in the previous section and then you need to install a suitable aperture. In such a case we recommend to select the 6.5 mm size aperture as your first choice.
5. When fitting the aperture, great care have to be taken not to touch or damage the surface of the fiber bundle. Preferably a retriever claw (see picture below) can be used to both lower the aperture into the lamp housing as well as get the screws in position before you tighten them.



How to determine the need for an aperture

Start with making a test of the Max value. Go into the Service Menu: 2 Automatic Tests/

2 Monochromator/ 6 Reference Scan.

The Max value should be somewhere between 45000 and 55000 ADC bits.

Aperture, Installation

1. Follow steps 1-5 in the above section.
2. Assemble the Monochromator Lamp and redo the test.
3. If the Max value is not satisfying - redo the whole procedure once again.

5.2.7 Replacement of Power Supply Board

(P/N 1001 2810)

Additional tools: Thermal paste (to be applied on transistors facing the heatsink)

Removal of Power Supply Board

1. Remove the Power Supply Module.
2. Remove the Spring Plate **4** by unscrew screws **1** to **3**.
3. Unscrew the screws **5** and **6** and remove the Power Supply Board.

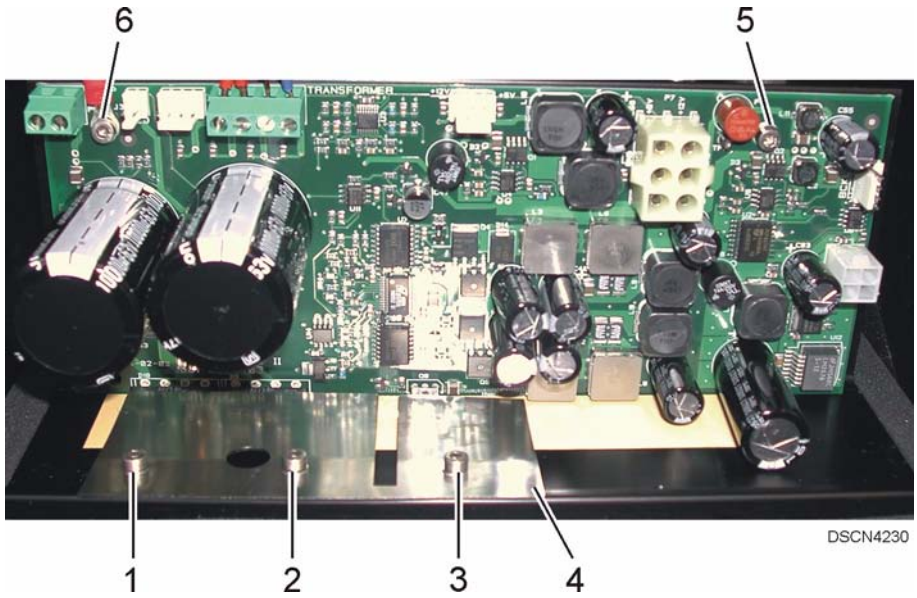


Fig. 5:14 Power Supply Board

4. Remove old thermal paste from the Cooling Flange.
5. On the new PCB, apply a thin layer of thermal paste on the transistors facing the Cooling Flange.

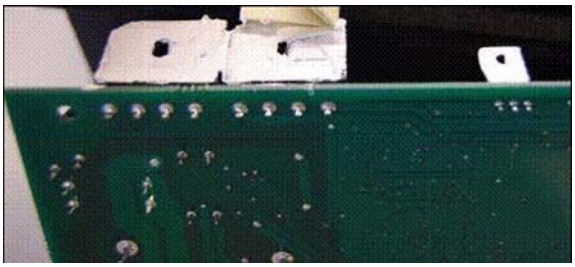


Fig. 5:15

Mounting Power Supply Board

6. Mount the new Power Supply Board into pre-scored groove on the Cooling Flange.
7. Insert right screw **5** and washer slightly for prepositioning purpose.
8. Insert left screw **6** with earth cable shoe and washer for prepositioning.

Fig. 5:16

9. Mount the Spring Plate **4** over the transistors and to the main cooling flange with the screws **1** to **3**.
10. Tighten screws **5** and **6**.
11. Reconnect cables and refit the Power Supply accordingly.

5.2.8 Replacement of Interface Complete

NOTE! Use ESD protection when handling circuit boards.

1. Switch off the instrument.
2. Carefully remove the covers for the five holes in the left-hand door with a screwdriver.
3. Open the left-hand door.
4. Disconnect the **P1** cable from the DSP Board.

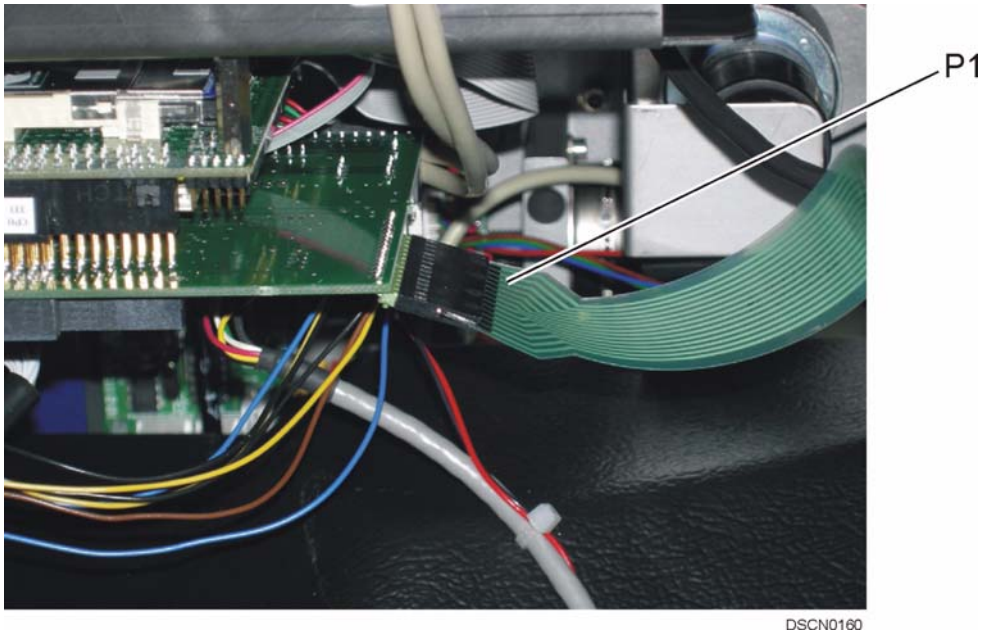


Fig. 5:17 DSP Board

P1 Keypad

5. Remove the two locking nuts **1** (one hidden) holding the PC Module and tilt down the PC Module.

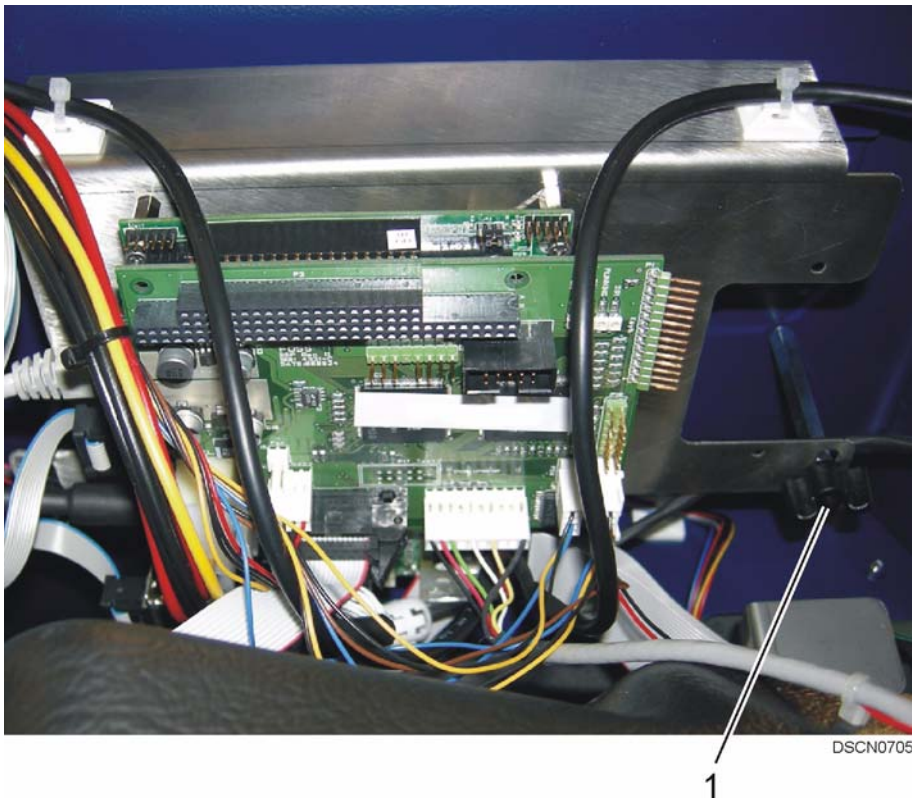


Fig. 5:18 PC Module

1 Locking Nut

6. Disconnect the four interface cables that are on the left side of the PC Module.

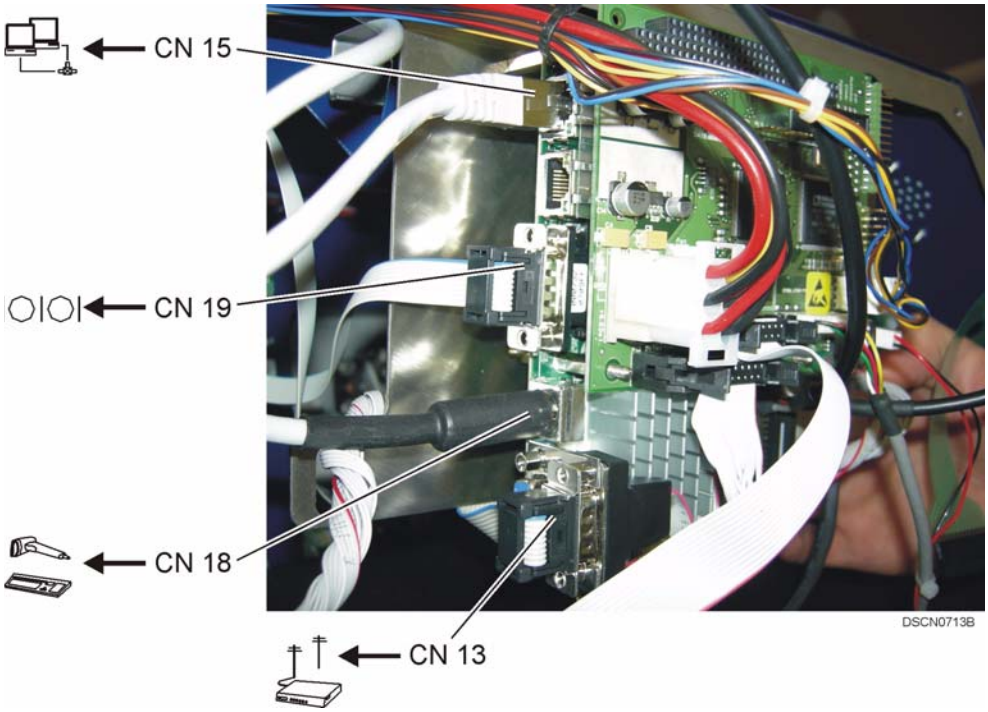


Fig. 5:19 PC Module

CN13	COM2 Interface (modem)	CN18	Keyboard/Bar code Interface
CN15	LAN/Ethernet Interface	CN19	COM1 Interface (external PC)

7. Carefully disconnect the two interface cables from the Processor Board.

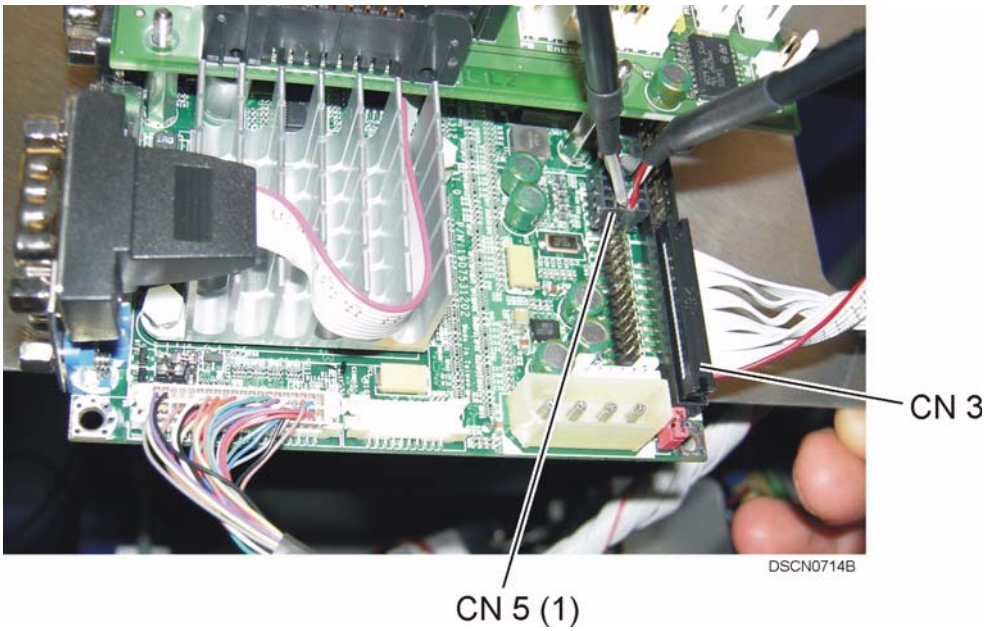


Fig. 5:20 Processor Board

CN3	Printer Interface	CN5(1)	USB Interface

8. Remove the six screws **1** together with the washers and lift away the Interface Module.

Fig. 5:21 Interface Module

1 Screw

9. Fit the new Interface Module with the six screws together with the washers.
10. Carefully connect the two interface cables to the Processor Board.
11. Connect the four interface cables that are on the left side of the PC Module.
12. Tilt up the PC Module and fit the two locking nuts holding the PC Module.
13. Connect the P1 cable to the DSP Board.
14. Check that all cables are tightly into place.
15. Close the left-hand door and fit the new covers.
16. Switch on the instrument.

5.2.9 Replacement of PC Module Complete w/o Flash Disc

NOTE! Use ESD protection when handling circuit boards.

1. Switch off the instrument.
2. Carefully remove the covers for the five holes in the left-hand door with a screwdriver.
3. Open the left-hand door.
4. Disconnect the **P1** cable from the DSP Board.

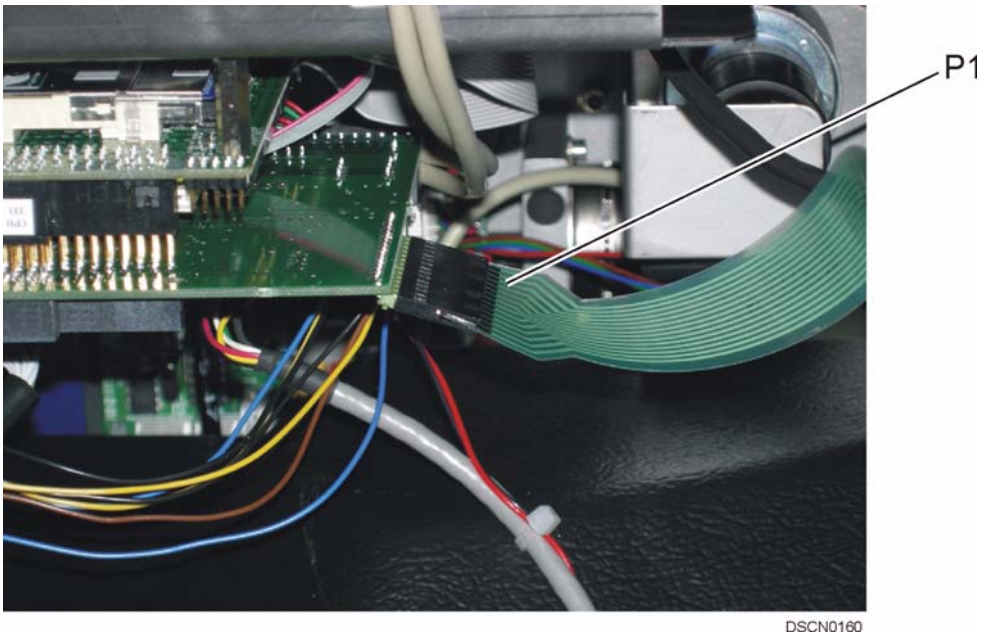


Fig. 5:22 DSP Board

P1 Keypad

5. Remove the two cable ties **1** securing the USB cables.
   Remove the two locking nuts **2** (one hidden) holding the PC Module and tilt down the PC Module.

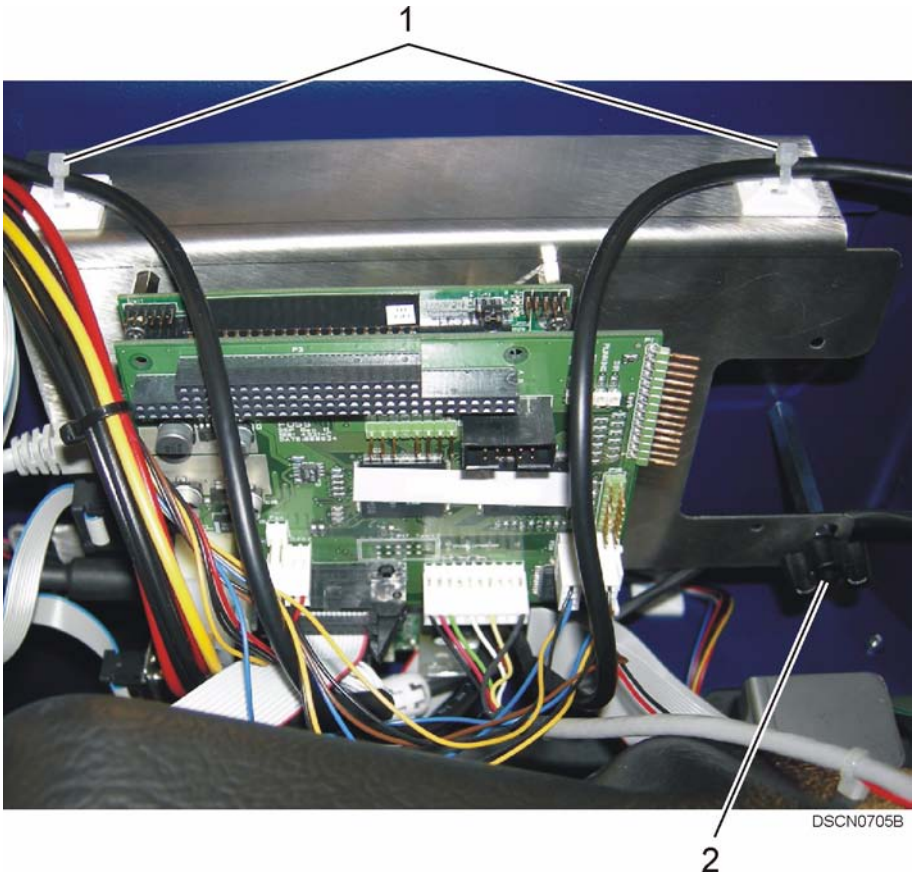


Fig. 5:23 PC Module

1	Cable Ties	2	Locking Nut

6. Disconnect the four interface cables that are on the left side of the PC Module.

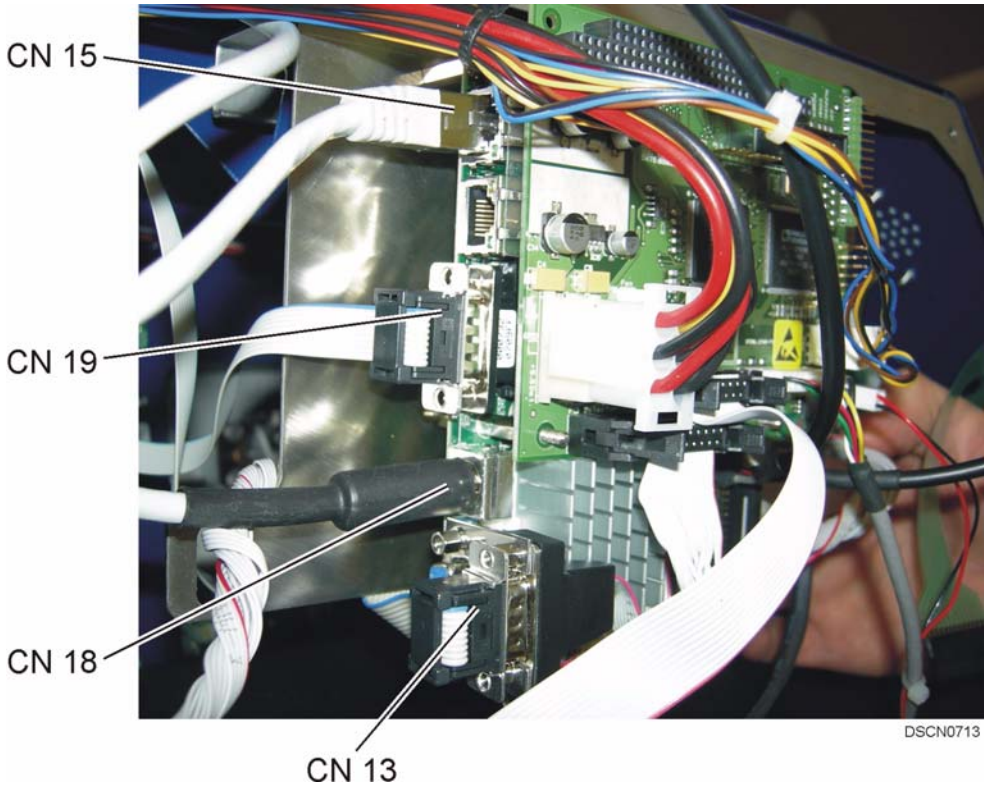


Fig. 5:24 PC Module

CN13	COM2 Interface (modem)	CN18	Keyboard/Bar code Interface
CN15	LAN/Ethernet Interface	CN19	COM1 Interface (external PC)

7. Disconnect the eight cables from the DSP Board.

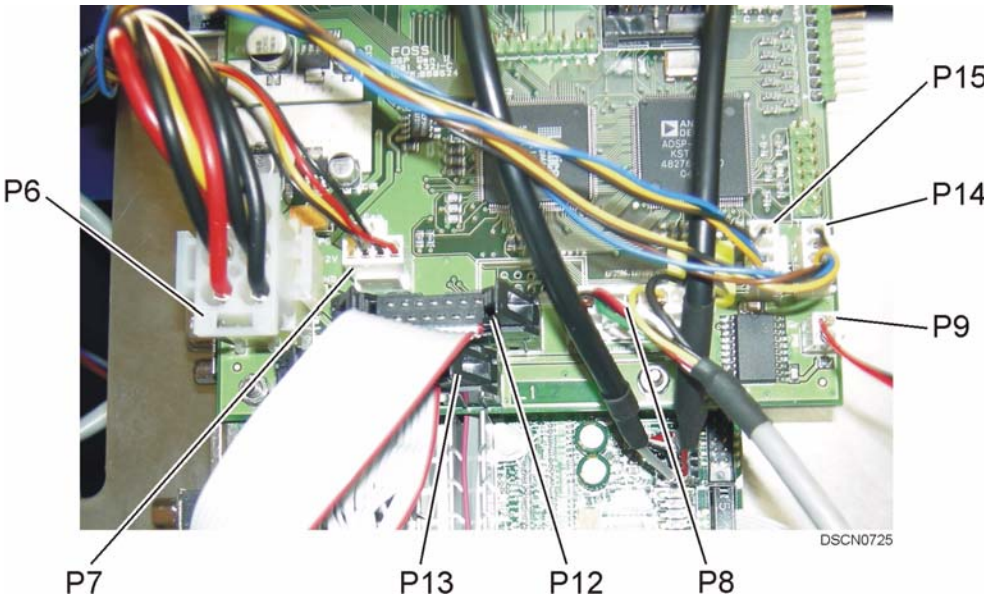


Fig. 5:25 DSP Board

P6	Power Supply	P12	Monochromator Shutter Board
P7	Inverter Interface Board	P13	Detector
P8	Monochromator Encoder	P14	I2C Bus
P9	Monochromator Grating Motor	P15	I2C Bus

8. Carefully disconnect the four cables from the Processor Board.

NOTE! The display cable at CN12 is extremely sensitive. Do not pull the wires. Make sure you pull the connector.

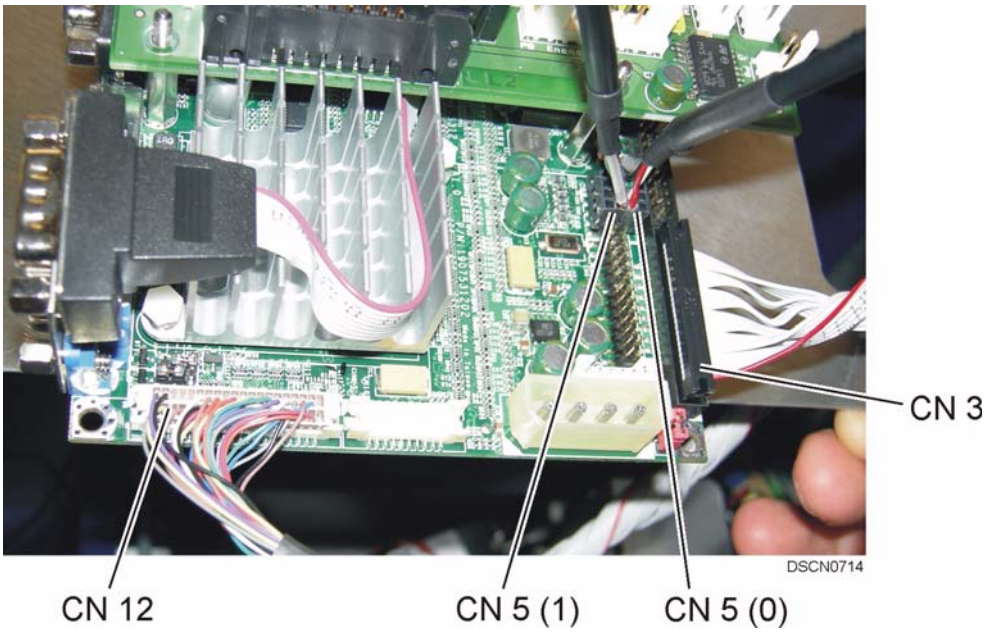


Fig. 5:26 Processor Board

CN3	Printer Interface	CN5(1)	USB Interface
CN5(0)	USB Interface	CN12	LCD Display

9. Remove the PC Module.

10. Transfer Flash Disk from old to new PC Module or install a new Flash Disk. For localization of Flash Disk, see figure below.

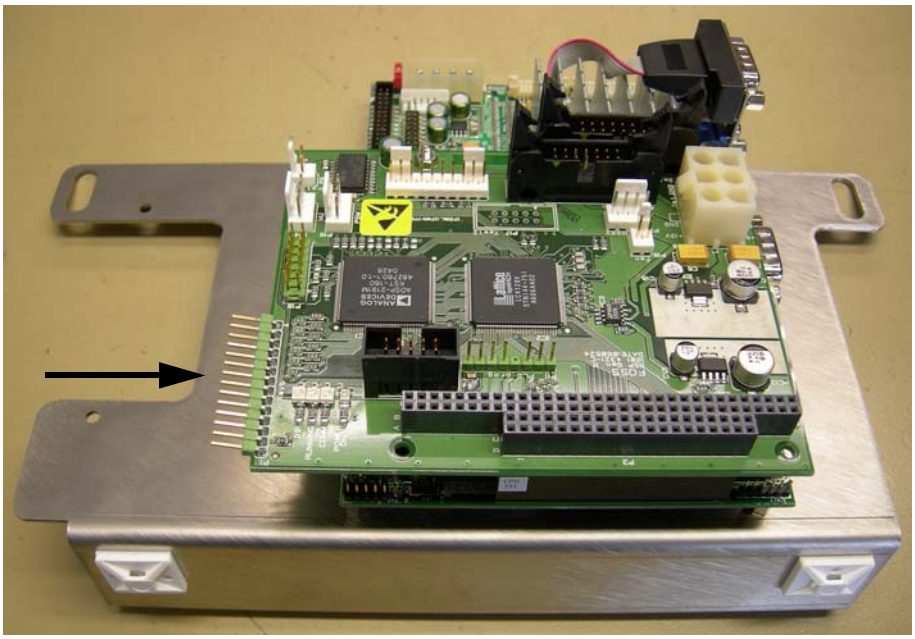


Fig. 5:27 PC Module

11. Fit the new PC Module.
12. Carefully connect the four cables to the Processor Board.
13. Connect the eight cables to the DSP Board.
14. Connect the four interface cables that are on the left side of the PC Module.
15. Tilt up the PC Module and fit the two locking nuts holding the PC Module.
16. Fit two new cable ties to secure the USB cables.
17. Connect the P1 cable to the DSP Board.
18. Check that all cables are tightly into place.
19. Close the left-hand door and fit the new covers.
20. Switch on the instrument.

5.2.10 Replacement of DSP Board

NOTE! Use ESD protection when handling circuit boards.

1. Switch off the instrument.
2. Carefully remove the covers for the five holes in the left-hand door with a screwdriver.
3. Open the left-hand door.
4. Disconnect the **P1** cable from the DSP Board.

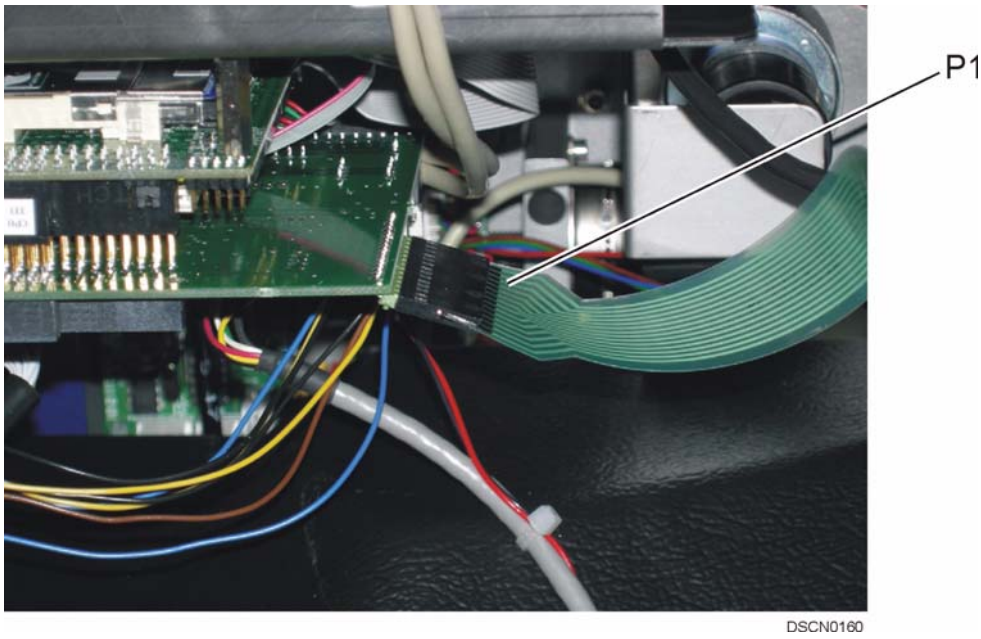


Fig. 5:28 DSP Board

P1 Keypad

5. Remove the two cable ties **1** securing the USB cables.
Remove the two locking nuts **2** (one hidden) holding the PC Module and tilt down the PC Module.

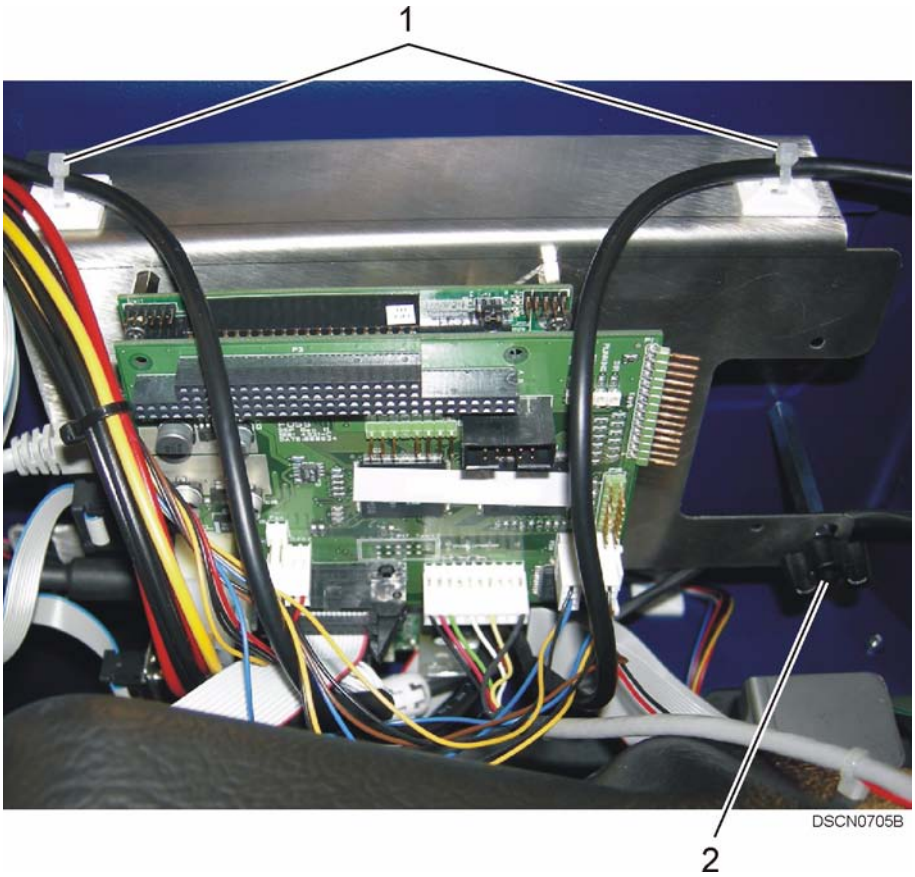


Fig. 5:29 PC Module

1	Cable Ties	2	Locking Nut

6. Disconnect the four interface cables that are on the left side of the PC Module.

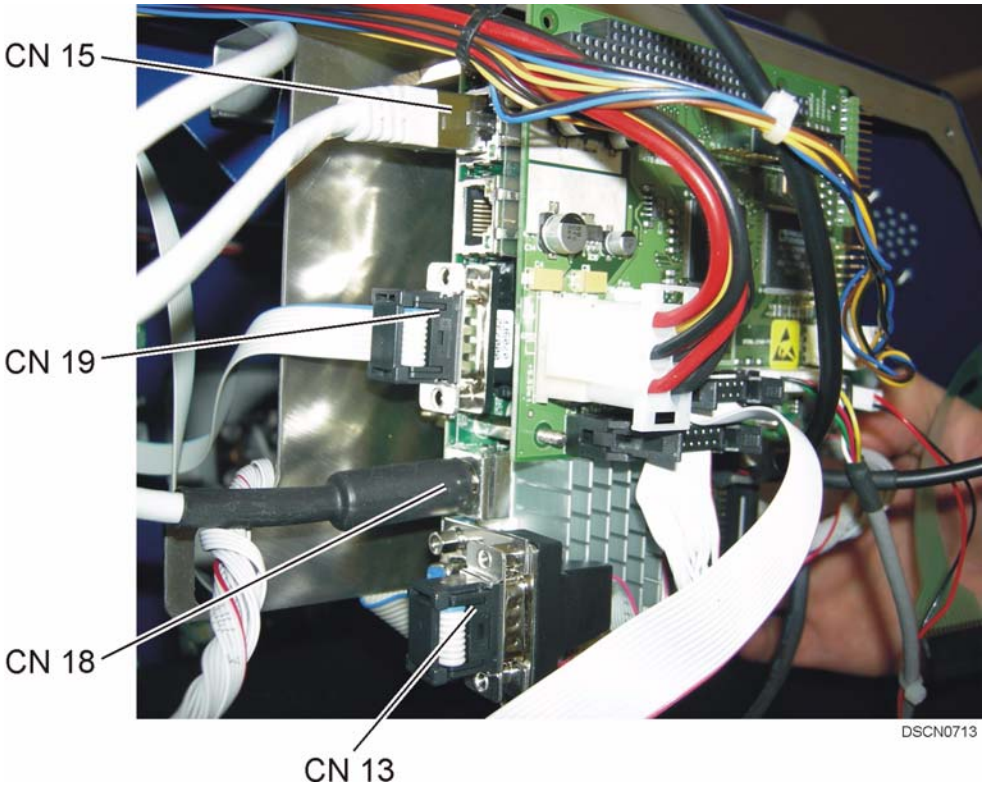


Fig. 5:30 PC Module

CN13	COM2 Interface (modem)	CN18	Keyboard/Bar code Interface
CN15	LAN/Ethernet Interface	CN19	COM1 Interface (external PC)

7. Disconnect the eight cables from the DSP Board.

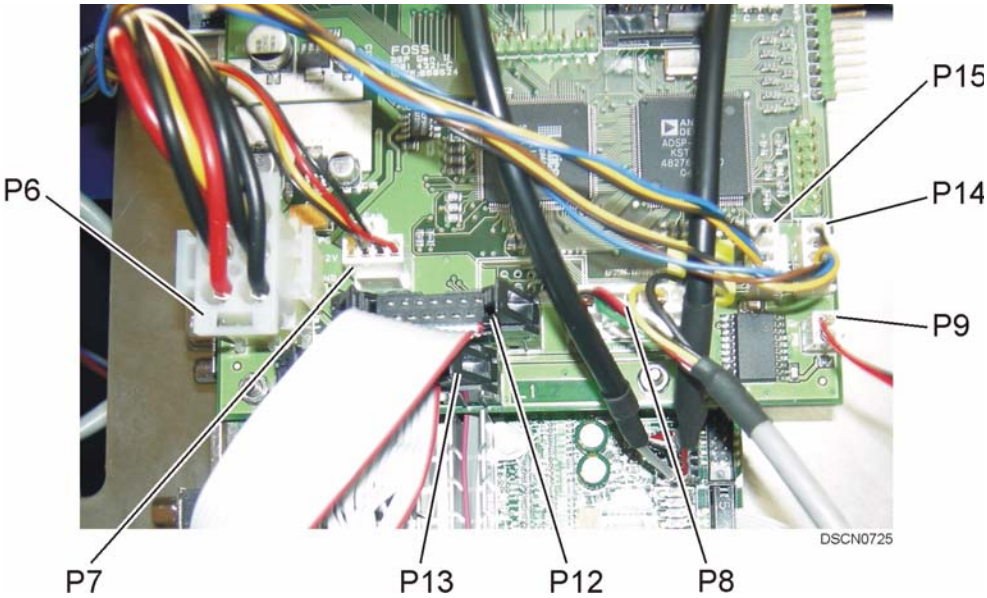


Fig. 5:31 DSP Board

P6	Power Supply	P12	Monochromator Shutter Board
P7	Inverter Interface Board	P13	Detector
P8	Monochromator Encoder	P14	I2C Bus
P9	Monochromator Grating Motor	P15	I2C Bus

8. Carefully disconnect the four cables from the Processor Board.

NOTE! The display cable at CN12 is extremely sensitive. Do not pull the wires. Make sure you pull the connector.

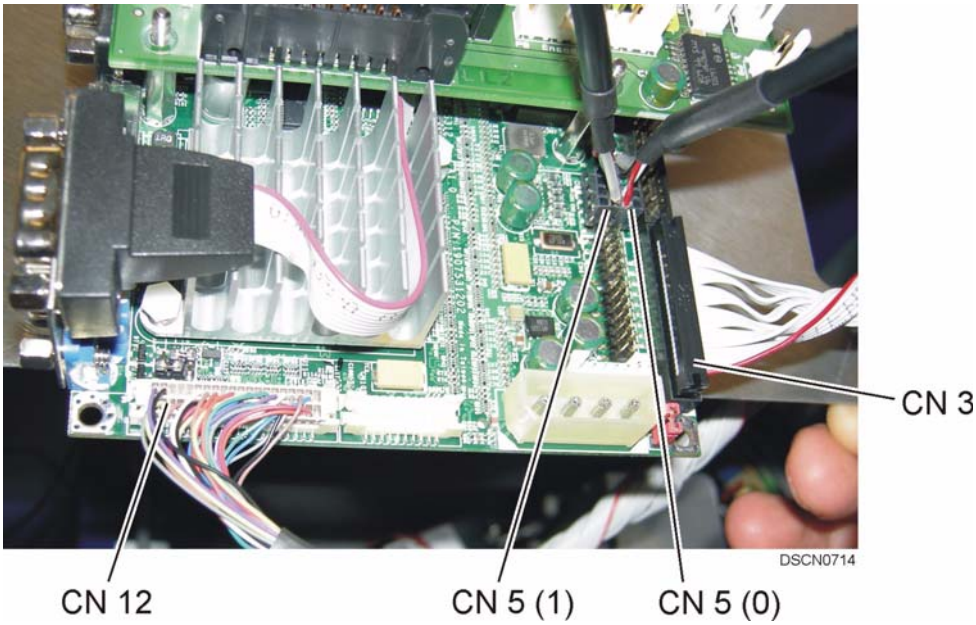


Fig. 5:32 Processor Board

CN3	Printer Interface	CN5(1)	USB Interface
CN5(0)	USB Interface	CN12	LCD Display

9. Remove the PC Module.

10. Remove the two distance bolts **1** together with the two washers and carefully lift away the DSP Board.

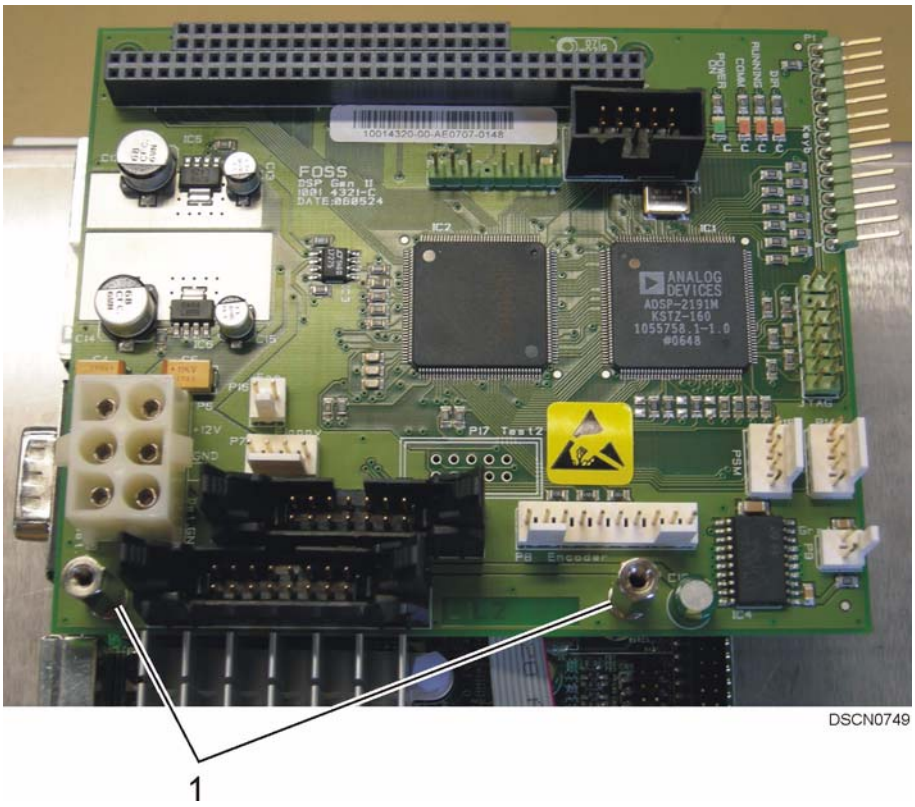


Fig. 5:33 DSP Board

1 Distance Bolts

11. Fit the new DSP Board with the two distance bolts together with the two washers.
12. Fit the PC Module.
13. Carefully connect the four cables to the Processor Board.
14. Connect the eight cables to the DSP Board.
15. Connect the four interface cables that are on the left side of the PC Module.
16. Tilt up the PC Module and fit the two locking nuts holding the PC Module.
17. Fit two new cable ties to secure the USB cables.
18. Connect the P1 cable to the DSP Board.
19. Check that all cables are tightly into place.
20. Close the left-hand door and fit the new covers.
21. Switch on the instrument.

5.2.11 Replacement of Compact Flash Disc

NOTE! Use ESD protection when handling circuit boards.

1. Switch off the instrument.
2. Carefully remove the covers for the five holes in the left-hand door with a screwdriver.
3. Open the left-hand door.
4. Remove the Flash Disk **1**.

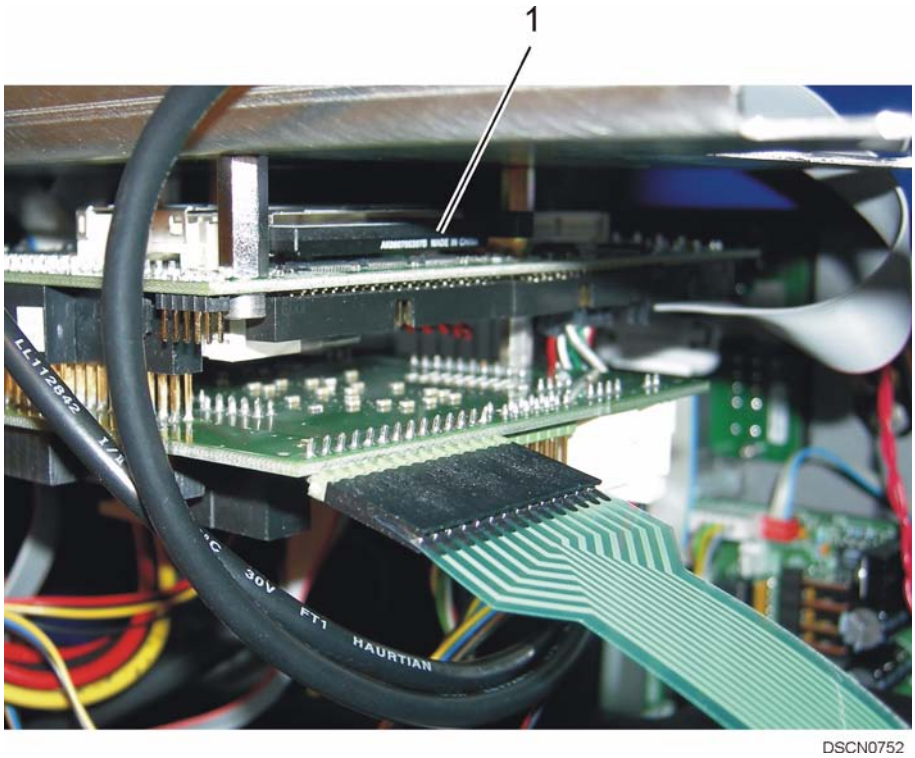


Fig. 5:34 PC Module

1 Flash Disk

5. Fit the new Flash Disk.
6. Close the left-hand door and fit the new covers.
7. Switch on the instrument.

5.3 Measuring Unit

5.3.1 General

The following pages describes how to maintain/clean and replace parts in the Measuring Unit module. Any kind of service that may affect the path length of the sample kuvette is after completion subject to a perfect control and possible adjustment of this path length.

The procedure for this adjustment is described under Preventive Maintenance Procedures Chapter 5.7.

5.3.2 Replacement of Measuring Unit Complete

NOTE! Use ESD protection when handling circuit boards.

1. Turn off the instrument and remove the mains cable.
2. Penetrate the covers for the five holes in the left-hand door with a screwdriver. Do not try to pinch because the door is easily miscoloured. Unscrew the screws in the left-hand door and open it.
   When re-assembling, do not forget to replace the five covers.
3. Lift the hopper and open the right-hand door.
4. Remove the Detector Cable from the DSP Board.
5. Remove Optional Equipment Power Supply Cable from the Power Supply Module, see Fig. 5:35 below.
6. Remove the Detector in accordance with steps 1-6 of 5.2.3 Replacement of Detector Unit Complete on page 5:9.
7. Disconnect the Drawer Sensor Cable (4), Speckle Emitter Cable (5) and any Optional Equipment (2) or (3) connected to the Measuring Unit, see Fig. 5:35 below.
8. Disconnect the Drawer Sensor itself from its placement on the Guide.

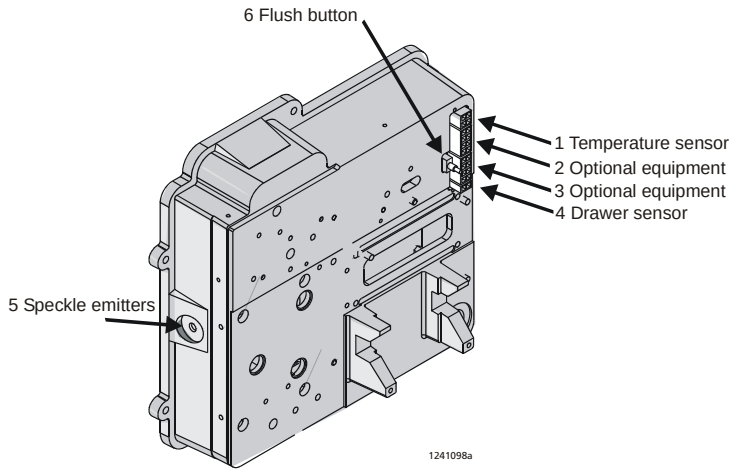
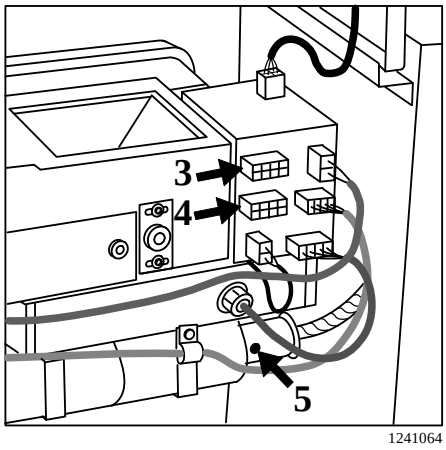


Fig. 5:35 Connections on the Measuring Unit

9. Loosen the Stop Screw to the Fibre Optic Cable Protector and slide it backwards, see fig below.



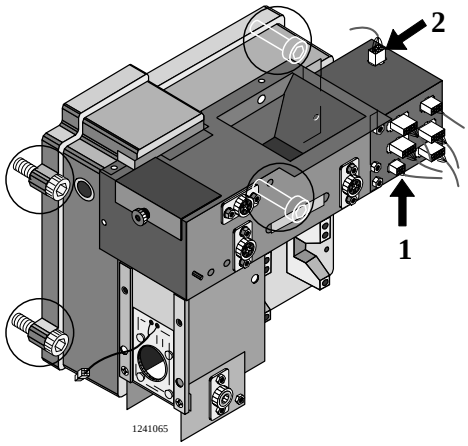
3) Optional

4) Optional

5) Stop screw on protector

Fig. 5:36 Stop screw (pos 5)

10. Now uncovered by the Protector, loosen the Stop Screw to the Fibre Optic Cable itself and remove it from the Measuring Unit. Pull from inside the compartment.
11. Loosen the four screws which fasten the Measuring Unit to the main chassis, see fig below.



1) Drawer sensor cable

2) Ambient temperature sensor cable

Fig. 5:37 Cables to disconnect on the MU

12. From inside the compartment: Slide the Measuring Unit off the hinge and disconnect the cable from the Power Supply and the I^2C cable from the DSP.
13. Exchange the Measuring Unit and install in reverse order.

5.3.3 Replacement of Upper Solenoid

Note: The replacement is carried out with the Measuring Unit standing apart.

1. Disconnect the Upper Solenoid Cable from the Measuring Unit Board.
2. Remove the two screws holding the Upper Solenoid.
3. Exchange the Upper Solenoid and assemble in reverse order.

5.3.4 Replacement of Lower Solenoid

Note: The replacement is carried out with the Measuring Unit standing apart.

1. Disconnect the Lower Solenoid Cable from the Measuring Unit Board.
2. Remove the two screws holding the Lower Solenoid.
3. Exchange the Lower Solenoid and assemble in reverse order.

5.3.5 Replacement of Lower Linkage Shutter Assembly

Note: The replacement is carried out with the Measuring Unit standing apart.

Note: You have to switch over the plunger.

1. Disconnect the Lower Solenoid Cable from the Measuring Unit Board.
2. Remove the two screws holding the Lower Solenoid and remove the Lower Shutter.
3. Remove the two screws holding the Lower Linkage, see fig below, and remove it.

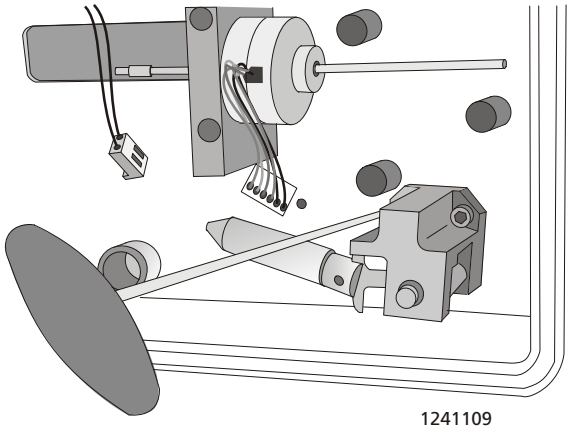


Fig. 5:38 Screws holding the Lower Linkage

4. Exchange the Lower Linkage and assemble in reverse order.

5.3.6 Replacement of Upper Linkage Shutter Assembly

Note: The replacement is carried out with the Measuring Unit standing apart.

Note: You have to switch over the plunger.

1. Disconnect the Upper Solenoid Cable from the Measuring Unit Board.
2. Remove the two screws holding the Upper Solenoid and remove the Upper Shutter.
3. Remove the two screws holding the Upper Linkage and remove it. Equivalent screws as for the Lower Solenoid, see fig below.

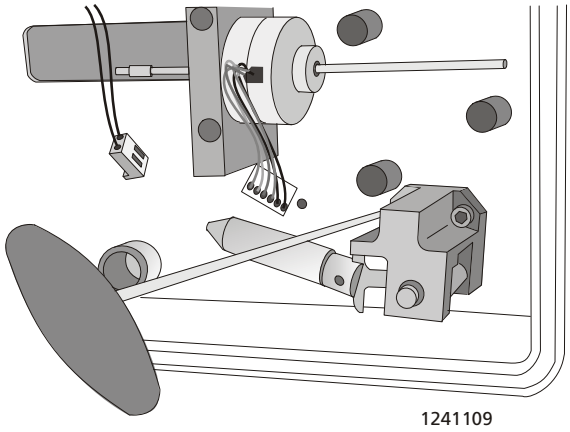


Fig. 5:39 Screws holding the Lower Linkage

4. Exchange the Upper Linkage and assemble in reverse order.

5.3.7 Replacement of Connection PCB Complete

Note: The replacement is carried out with the Measuring Unit standing apart.

1. Disconnect the Measuring Unit Card cable from the Measuring Unit Board.
2. Remove the Measuring Unit Card by removing the two screws holding the Measuring Unit Card, see fig below.

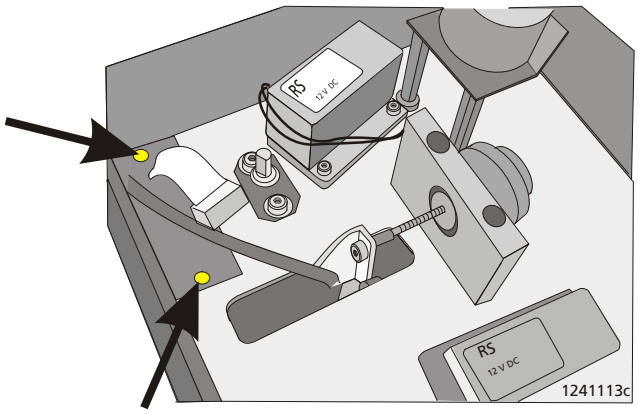


Fig. 5:40 MU Card

3. Exchange the Measuring Unit Card and assemble in reverse order.

5.3.8 Replacement of Measuring Unit PCB

Note: The replacement is carried out with the Measuring Unit standing apart.

Note: Use electrostatic discharge (ESD) protection when handling circuit boards.

1. Disconnect cables and remove the Measuring Unit Board.
2. Mount the new Measuring Unit Board and connect the cables according to fig below.

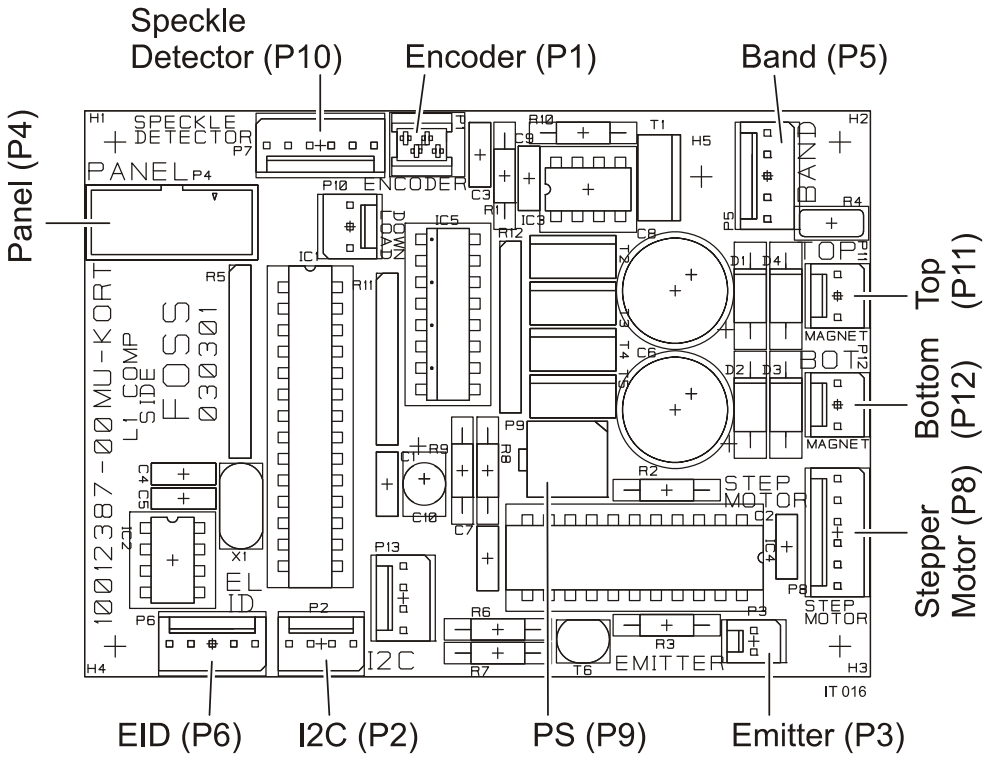


Fig. 5:41 Connections on the MU Board

5.3.9 Replacement of Variable Motor

Note: The replacement is carried out with the Measuring Unit standing apart.

Caution

If you do not have the knowledge or the necessary tools to adjust the path length use one of the service options stated in the service policy.

1. Remove the Measuring Unit Board according to instruction “Replacement of Measuring Unit PCB” on page 44.
2. Remove the nut on the plate connecting the Variable Cell Motor with the Cell House Shaft, see Fig. 5:42 below.
3. Remove the two screws holding the Variable Cell Motor, see fig below.

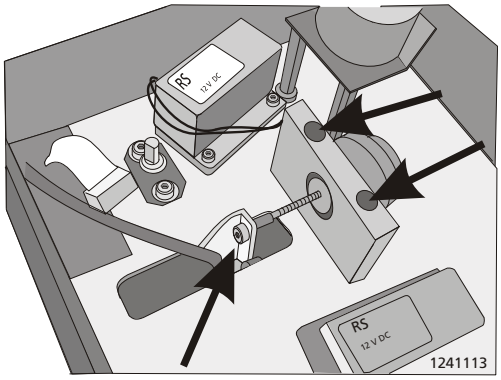


Fig. 5:42 Nut and screws

4. Exchange the Variable Cell Motor and assemble in reverse order.

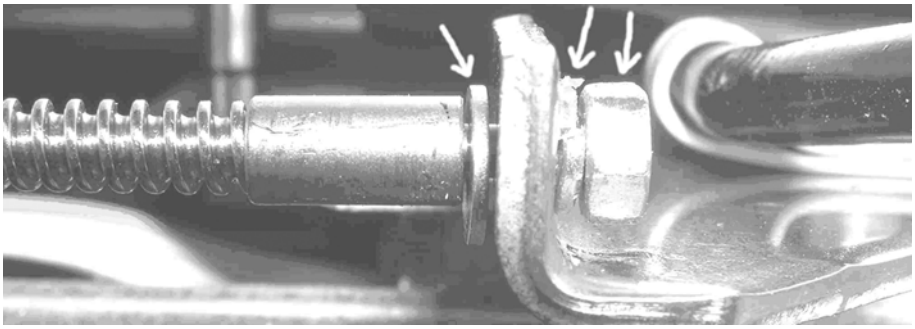


Fig. 5:43

5.3.10 Replacement of Conveyor Motor

Note: The replacement is carried out with the Measuring Unit standing apart.

1. Disconnect the Conveyor Motor Cable from the Measuring Unit Board.
2. Remove the three screws holding the Conveyor Motor.
3. Exchange the Conveyor Motor and assemble in reverse order.

5.3.11 Replacement of Cell Wall Front with Speckle Emitter PCB

1. Remove the two screws which hold the spring plate over the detector. While holding the detector, remove the spring plate by pulling it straight upwards.
2. Gently pull the detector straight outward towards you.
3. Disconnect the Speckle Emitter Board connector.
4. Remove the four screws holding the Cell Wall Front, see fig below.

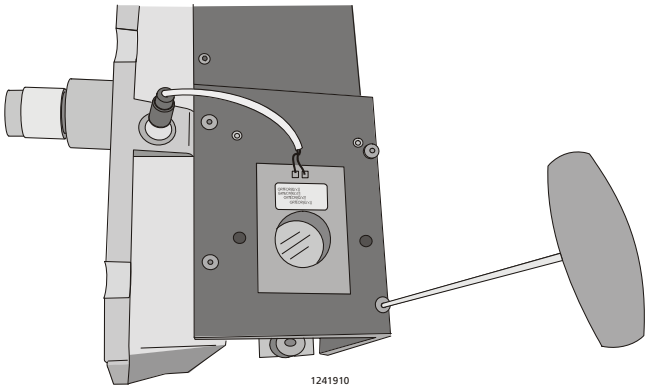


Fig. 5:44 Screws holding the Cell Wall front

5. Assemble the new Cell Wall Front.
6. Connect the Speckle Emitter Board connector.
7. Reassemble Detector and spring plate.
   Be careful to get the grounding correct. It is extremely important that this grounding function is maintained i.e. use tagged washers on both sides of the cable/plate.
8. Check/ Adjust path length according to instruction Adjustment of Path length.

5.3.12 Replacement of Cell Block Complete and Path Length Encoder

Caution

If you do not have the knowledge or the necessary tools to adjust the path length use one of the service options stated in the service policy.

1. Remove the Measuring Unit Board according to instruction “Replacement of Measuring Unit PCB” on page 44.
2. Remove the nut on the plate connecting the Variable Cell Motor with the Cell Block, see fig below. Store the two washers and the nut.

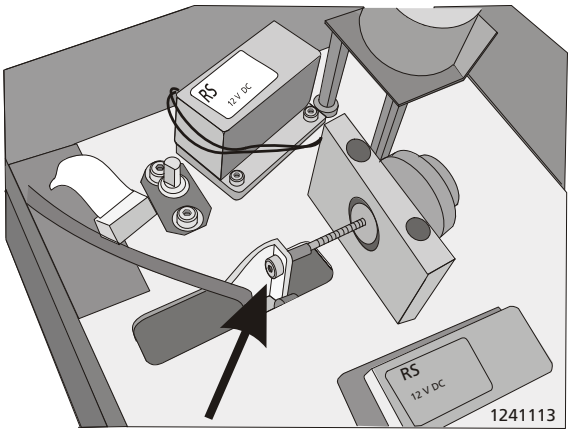


Fig. 5:45 Remove this nut

3. Remove the four screws and then remove the Encoder Shield, see fig below

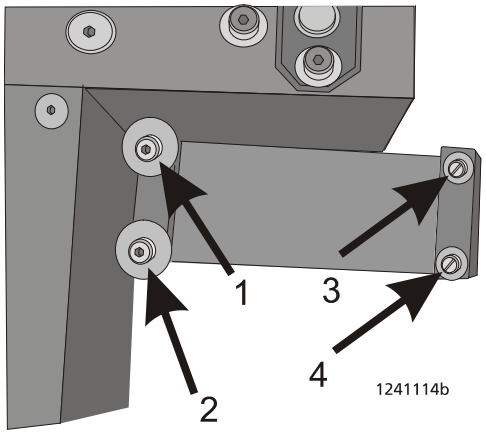


Fig. 5:46 Encoder Shield

4. Remove the Cell Side by unscrewing the three screws, see fig below.

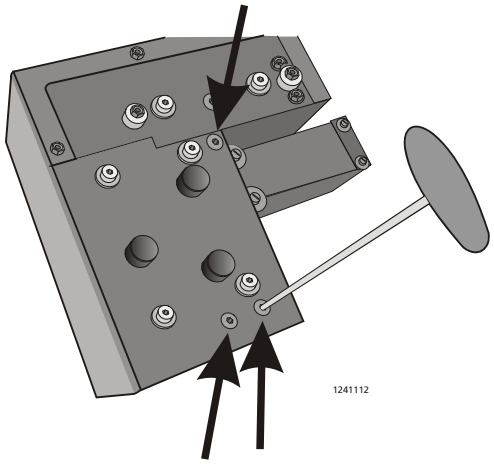


Fig. 5:47 Cell Side

5. Remove the path length encoder assembly.
6. Remove the Cell Block assembly by lifting it upwards.
7. Turn the MU around and manually move the variable cell motor shaft away. This is to protect it in the next step.
8. Put in the new Cell Block assembly and make sure the cable is routed through the chassis.
9. Fit the two screws **1** and **2** lightly (see Fig. 5:46).
10. Refit the path length encoder assembly.

NOTE! Be careful and make sure the encoder plate moves freely in the centre of the encoder fork sensors.

11. Fit the two screws **3** and **4** and tighten them (see Fig. 5:46).
12. Refit the encoder shield. Make sure the shield is well sealed so that dust can not enter the encoder compartment.
13. Refit the cell side and tighten the five screws.
14. Manually turn the variable cell motor shaft and connect it to the cell block assembly with the two washers and the nut. Preferably use a fixed 6.5 mm box spanner. For older units it was 5.5 mm. The exact measure is 1/4”.
15. Refit the MU PCB and connect all cables.
16. Proceed with the path length adjustment.

5.3.13 Replacement of Cell Cover Outer

1. Remove the five screws according to fig below.

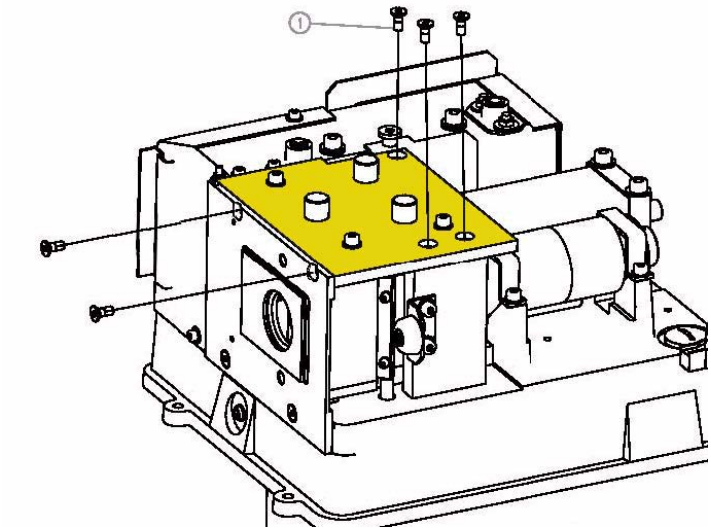


Fig. 5:48 Remove five screws

2. Mount the new Cell Side with the three screws.

5.3.14 Checking movement of the Variable Cell

1. Use a Multi meter tool and check between pins 6 (brown) and pin 9 (grey). The reading should be low (close to 0 V).
2. Issue a command to move the Cell via the Service Menu; Manual Tests /Measuring Unit/ Position Settings. The reading should flicker between low (about 0 V) and high (about 5 V). When the Cell has stopped the reading should be low again. This test indicates if the pulses are sent out to the motor.

Designation of Variable Cell Motor Pin Out

1	Red	Step motor
2	Green	Stepper motor
3	White	Stepper motor
4	Yellow	Stepper motor
5	Not used	Not used
6	Brown	GND
7	Pink	LEDs in encoder
8	Not used	Not used
9	Grey	Step
10	Blue	Home

5.3.15 Drawer Sensor Cable, rerouting

NOTE! It is very important that the test weight balance assembly is free from cables.

1. Switch off the instrument.
2. Lift up the hopper section and open the right-hand door.
3. Disconnect the drawer sensor cable **1** from the lower socket.

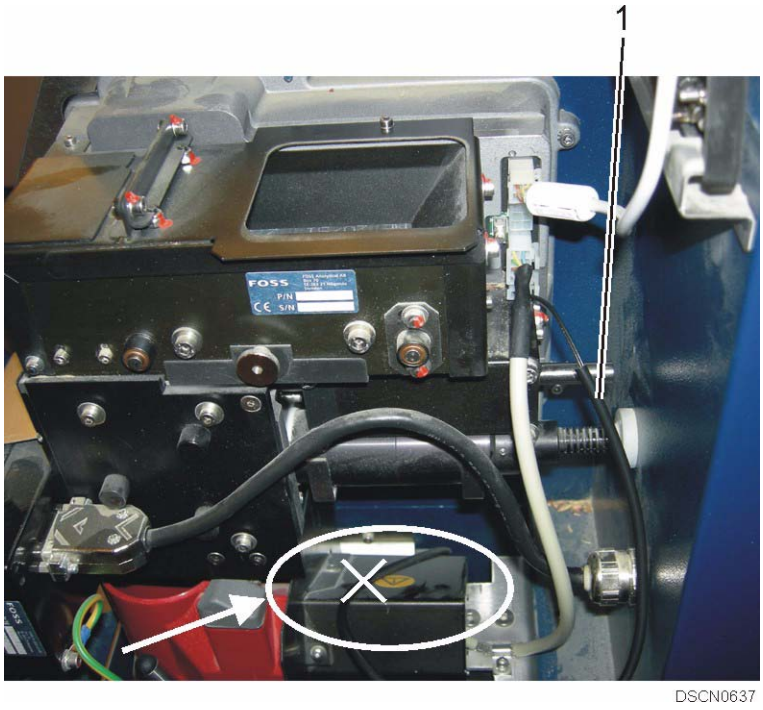


Fig. 5:49 Test Weight Balance Assembly

1 Drawer sensor cable

4. Wrap the drawer sensor cable around the other cables according to figure and connect the drawer sensor cable. Check that the test weight balance assembly is free from cables.

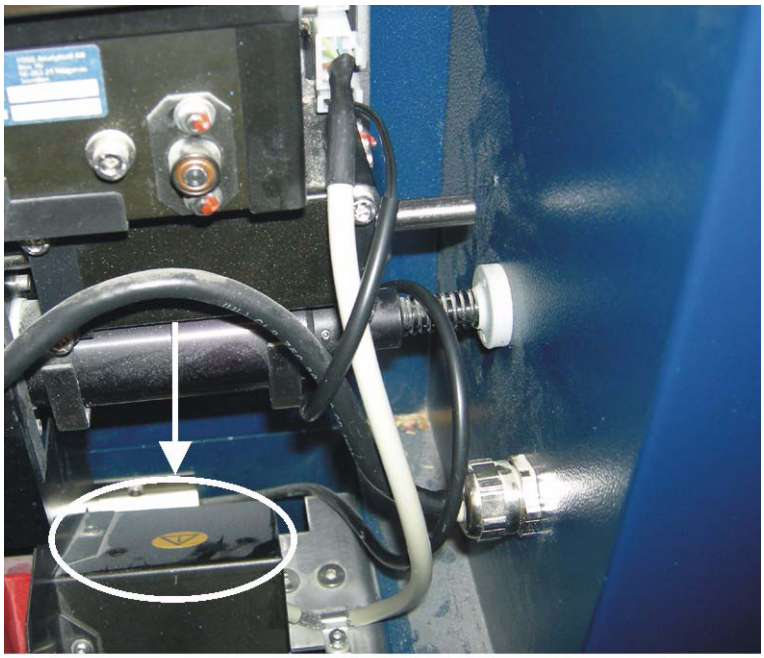


Fig. 5:50 Test Weight Balance Assembly

5.4 Test Weight Module

5.4.1 Replacement of Test Weight Balance Complete

Test Weight Control Kit P/N 1001 1779

1. Disconnect the TWM from the Infratec. Use the installation description in User Manual for Infratec 1241 Modules, p/n 60043623, in the reverse order. Unfortunately it is necessary to do this due to two constraints;
   – it is a Balance and the support should be steady
   – the total height of the combined instrument should not exceed the normal length of an operator when placed on an ordinary laboratory table.
2. Dismantle the Test Weight Balance from the cabinet. Four screws must be removed.
3. Replace the Test Weight Balance and remount the TWM on the Infratec according to the installation procedure in the User Manual.
4. Check the Balance from the User Menu, go to Application Model/ Test Weight/ Balance Control. Follow the instructions given on the display. ??
5. Start up the instrument and let it go through the Startup Test.
6. Perform a TWM balance calibration, see 5.7.2 TWM balance calibration on page 5:77.

5.4.2 Replacement of Wiper Arm Complete

(P/N 6002 4272)

Additional tools:

- 2 mm allen key
- 2.5 mm allen key
- Test Weight Control Kit P/N 1001 1779

NOTE! It is very important not to put weight on the load cell in the TWM balance.

1. Switch off the instrument.
2. Lift up the hopper section and open the right-hand door.
3. Remove the drawer.
4. Remove the two screws and lift away the cover plate.

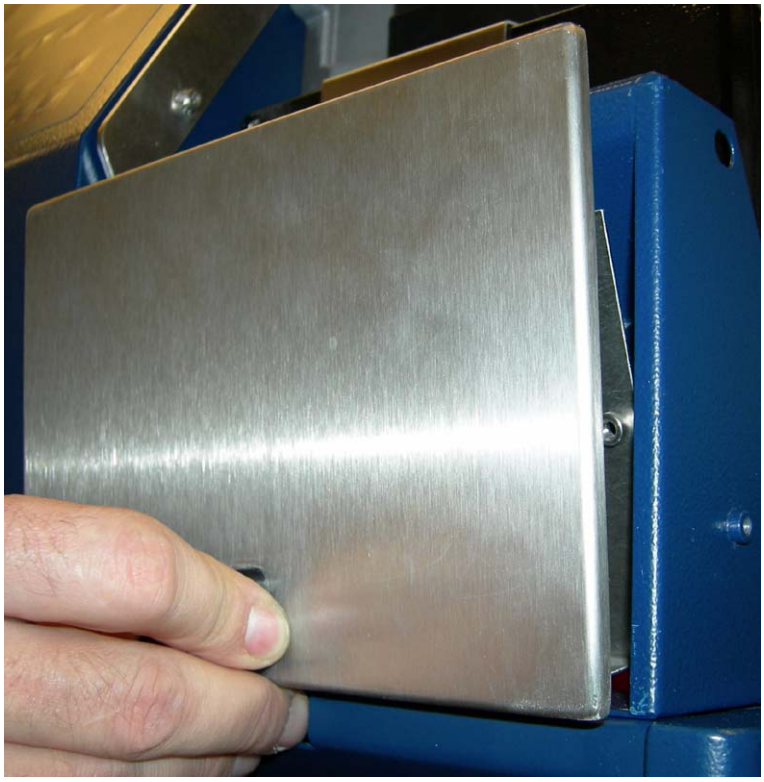


Fig. 5:51 Removing cover plate

5. Remove the old wiper arm together with the screw **1** using a 2 mm allen key.

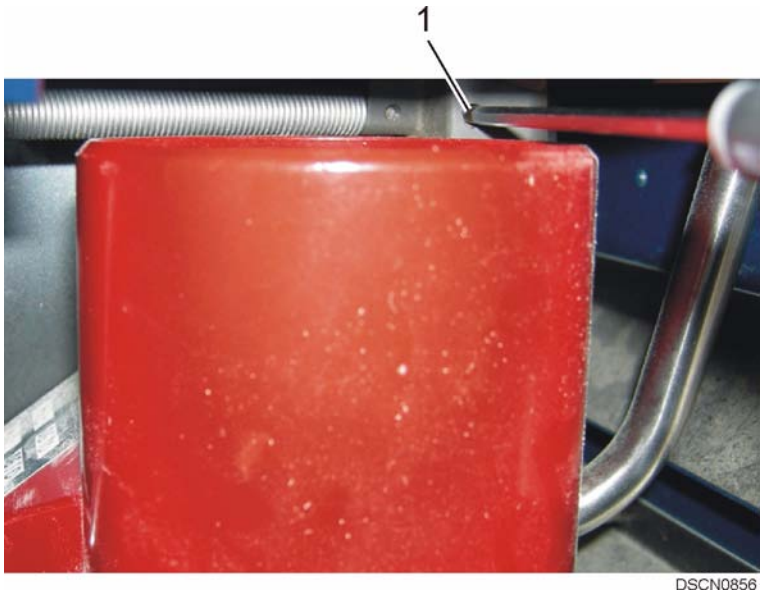


Fig. 5:52 Removing old wiper arm

1 Screw

6. Fit the new wiper arm with the screw **1** using a 2.5 mm allen key.

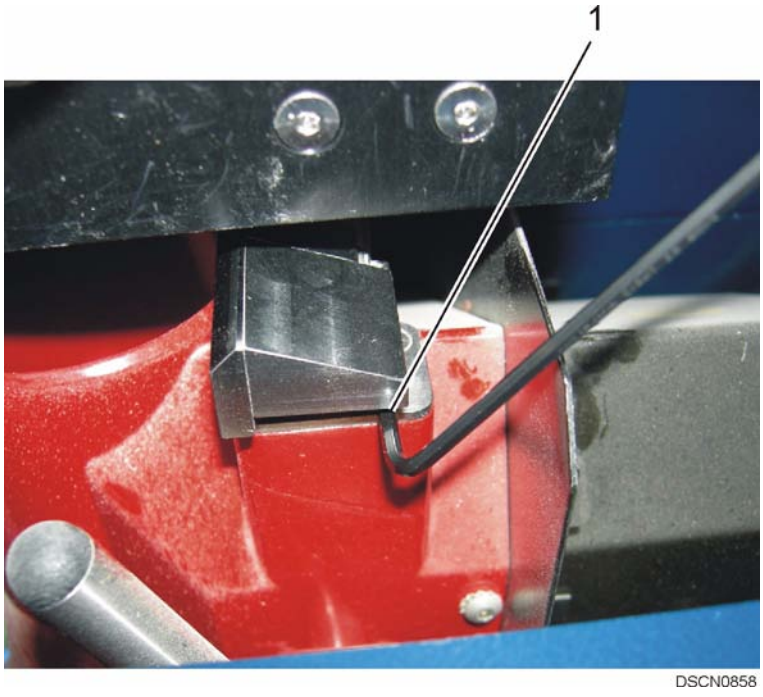


Fig. 5:53 Installing new wiper arm

1 Screw

7. Adjust so the wiper arm is moving just above the edge of the red cuvette without any noise. Operate the wiper arm from the Service Menu; 3 Manual Tests/ 6 Test Weight/ 1 Position Setting. Fit the wiper arm with the two screws **1**.

NOTE! It is important that the wiper arm lies flat without scraping.

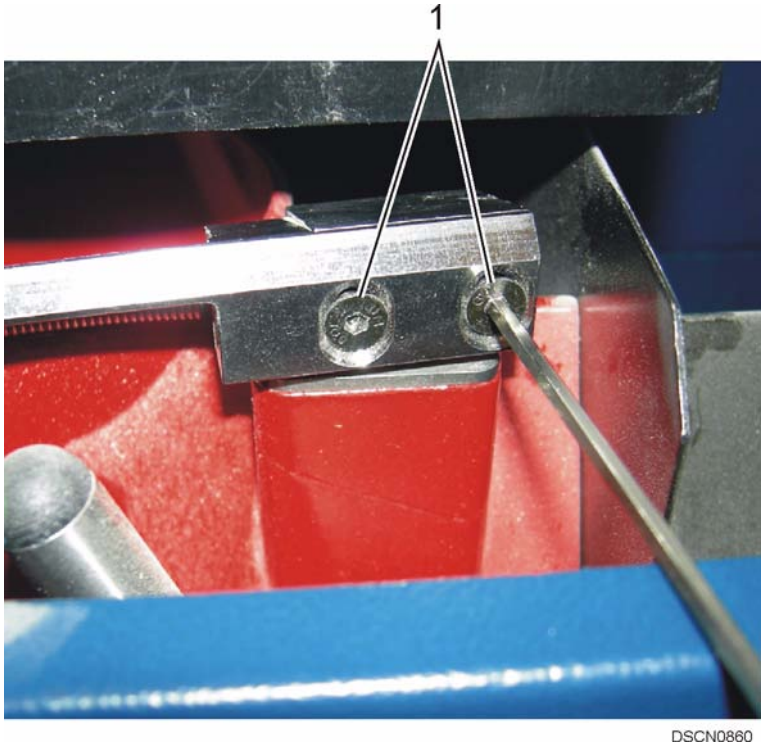


Fig. 5:54 Installing new wiper arm

1 Screws

8. Assemble in reverse order.
9. Start up the instrument and let it go through the Startup Test.
10. Perform a TWM balance calibration, see 5.7.2 TWM balance calibration on page 5:77.

5.4.3 Replacement of TWM PCB

Test Weight Control Kit P/N 1001 1779

Warning

Disconnect the incoming mains supply before removing any cover.

NOTE! Use electrostatic discharge (ESD) protection when handling circuit boards.

Separating the Infratec and the Test Weight Module

1. On the rear of the instrument, remove the top screw from the plate connecting the Infratec and the TWM.
2. Open the right hand door and disconnect the TWM cable and drawer sensor cable. Remove the screw inside the compartment holding the TWM and the guiding bracket, see Fig. 5:55.

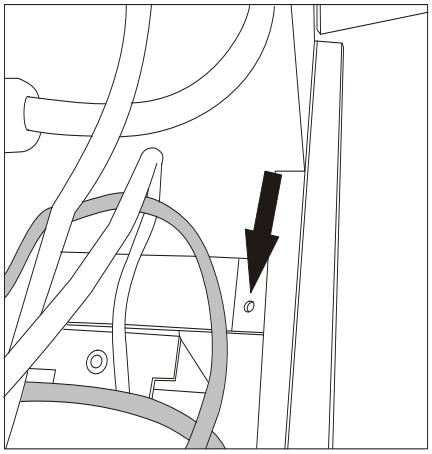


Fig. 5:55

3. Tilt the instrument to the left onto a blanket or another soft cloth.
4. Remove the screws holding the Cover Plate and the screws holding the TWM, see Fig. 5:56 and Fig. 5:57.

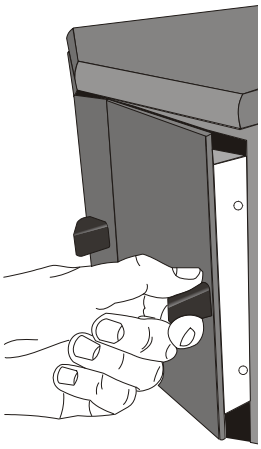


Fig. 5:56

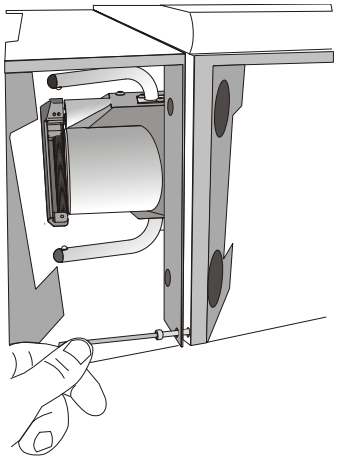


Fig. 5:57

5. Slide the TWM out from the instrument.
6. Remove the four screws holding the TWM balance.

Changing the TWM PCB

7. Remove the six screws holding the black roofcover of the TWM balance and slide it off.
8. Disconnect all the cables from the PCB, except the flat cable.
9. Remove the four screws holding the PCB to the TWM balance.
10. Lift out the PCB. The flat cable has a special locking device. Open the locking device and disconnect the cable from the PCB. Remove the PCB from the TWM balance.
11. Make sure that the new PCB has the PROM marked 2.1. Connect the flat cable to the PCB, make sure that it is secured with the locking device.
12. Mount the PCB to the TWM balance with the four screws.
13. Connect the cables to the PCB.
14. Slide on the black roofcover to the TWM balance and secure it with the six screws.
15. Mount backRefit the TWM in the reversed order.

Reboot and calibration

16. Start up the instrument and let it go through the Startup Test.
17. Perform a TWM balance calibration, see 5.7.2 TWM balance calibration on page 5:77.

5.4.4 Replacement of Wiper/Shutter Motor

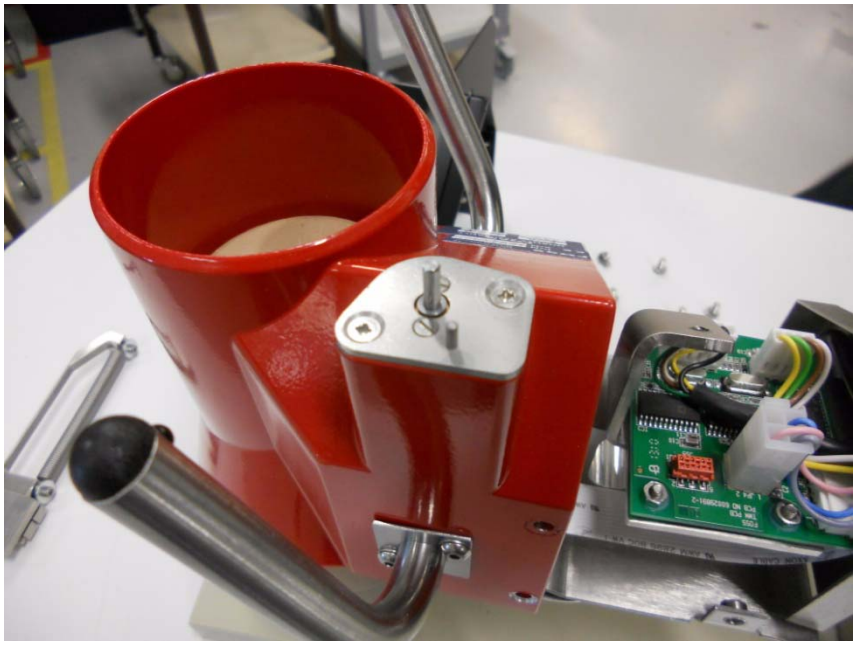
Test Weight Control Kit P/N 1001 1779

Instruction for wiper motor replacement in the 1241 TWM

1. Separate the TWM from the Infratec.
2. Take out the TWM module. Don't stress the load cell and handle the module with care.
3. Remove the three screws **1** (2.5mm) on both sides (see picture).

4. Lift of the black cover.
5. Remove the wiper arm.
6. Disconnect the motor cable from the interconnect PCB.

7. Remove the two Philips screws and lift out the motor.



8. Move the motor bracket to the new motor. The orientation is not important.
9. Fix the new motor assembly. Make sure the cable falls behind the interconnect PCB.
10. Put the wiper arm back and fix it with the grub screw. The orientation is not important.
11. Connect the TWM module to the Infratec and start the instrument.
12. During start up the wiper will move to the physical stop and calibrate that encoder value to represent the home position.
13. Perform a TWM balance calibration, see 5.7.2 TWM balance calibration on page 5:77.

Instruction for shutter motor replacement in the 1241 TWM

1. Take out the TWM module. Don't stress the load cell and handle the module with care.
2. Remove the three screws **1** (2.5mm) on both sides (see picture).

3. Lift of the black cover.
4. Turn the TWM upside down and remove the 2 allen screws from the side. The bracket is spring loaded so pay attention when the second screw is removed.
5. Disconnect the motor cable from the interconnect PCB.
6. Remove the 2 Phillips screw and lift out the motor with the bracket.
7. This step is critical. The 2 grub screws holding the so called shutter shaft (see the Spare Part Manual for reference) are secured with loctite. Heating may have to be applied to loosen these screws. If the screws are damaged you can use a Shutter Replacement Kit (p/n 10011744) which includes all parts needed in addition to the motor.
8. Fit the new motor in the reverse order. Make sure the motor cable falls behind the interconnect PCB and that the both motor cables are secured with a new tie wrap.
9. No cable must touch the load cell!
10. Connect the TWM module to the Infratec and start the instrument.
11. During start up the shutter will move to the physical stop and calibrate that encoder value to represent the home position.
12. Perform a TWM balance calibration, see 5.7.2 TWM balance calibration on page 5:77.

5.4.5 Replacement of Locking Guide

Test Weight Control Kit P/N 1001 1779

Additional tools:

- 2 mm allen key
- 2.5 mm allen key

1. Remove the drawer.
2. Remove the old locking guide together with the screw **1** using a 2.5 mm allen key.

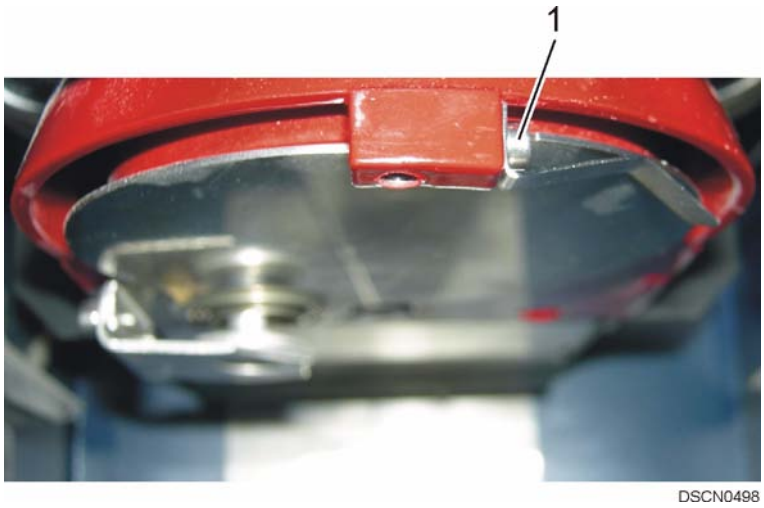


Fig. 5:58 Removing old locking guide

1 Screw

3. Log into the service menu. Open the bottom shutter.
4. Apply locking compound on the new screw. Fit the new locking guide using a 2 mm allen key. Do not tighten the screw yet.
5. Close the bottom shutter from the service menu.

6. Place the 0.1 mm shim between the bottom shutter and the locking guide, press the locking guide to the bottom shutter and tighten the screw **1**.

NOTE! It is very important that the bottom shutter lies flat with a 0.1 mm gap when closed.

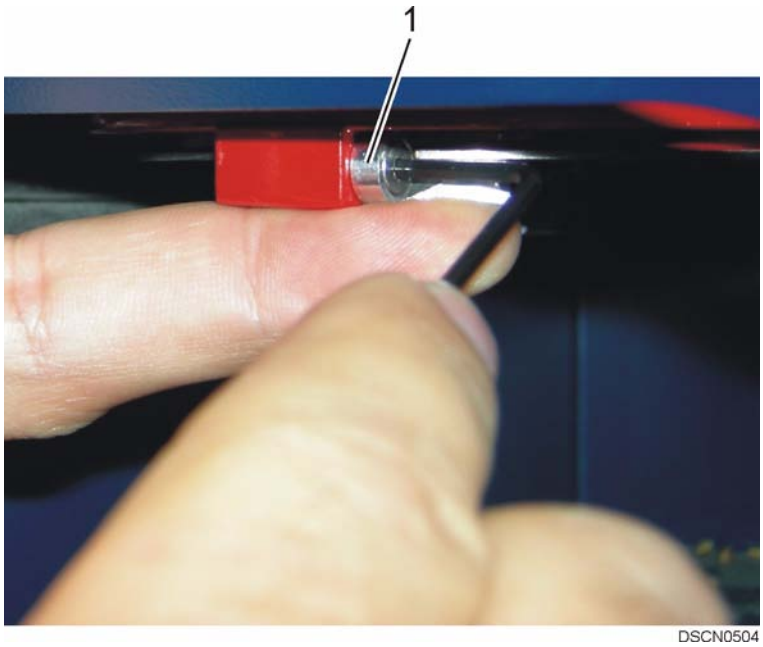


Fig. 5:59 Installing new locking guide

1 Screw

7. Open and close the bottom shutter from the service menu to check the function. Do this a couple of times. Ignore any error messages (until a complete Startup Test has passed).

Fig. 5:60 New locking guide in place

8. Start up the instrument and let it go through the Startup Test.
9. Perform a TWM balance calibration, see 5.7.2 TWM balance calibration on page 5:77.

5.4.6 Checking/Adjusting TWM Level Sensors

(P/N 6002 3294)

Level Sensor Centring Tool TWM P/N 6002 3294

Test Weight Control Kit P/N 1001 1779

1. Remove the two screws and lift away the cover plate.

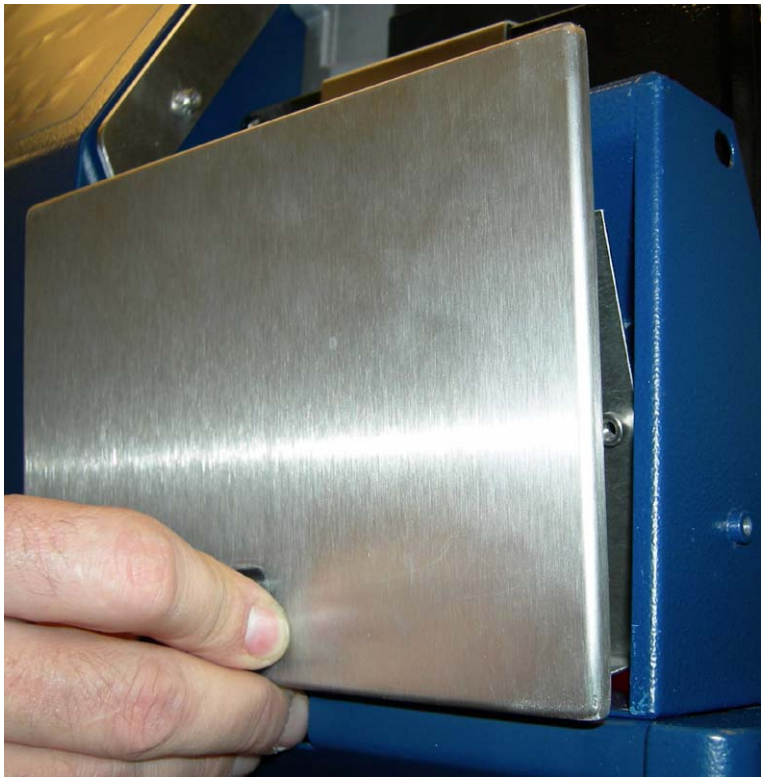


Fig. 5:61 Removing cover plate

2. Check the position of the two level sensors using the special tool. The special tool should point directly to the center of the LED´s according to figure.

Fig. 5:62 Special Tool "Level Sensor Centring Tool TWM"

3. If level sensor is in wrong position - loosen the screws **1**. Adjust the level sensor to correct position and tighten the screws **1**.

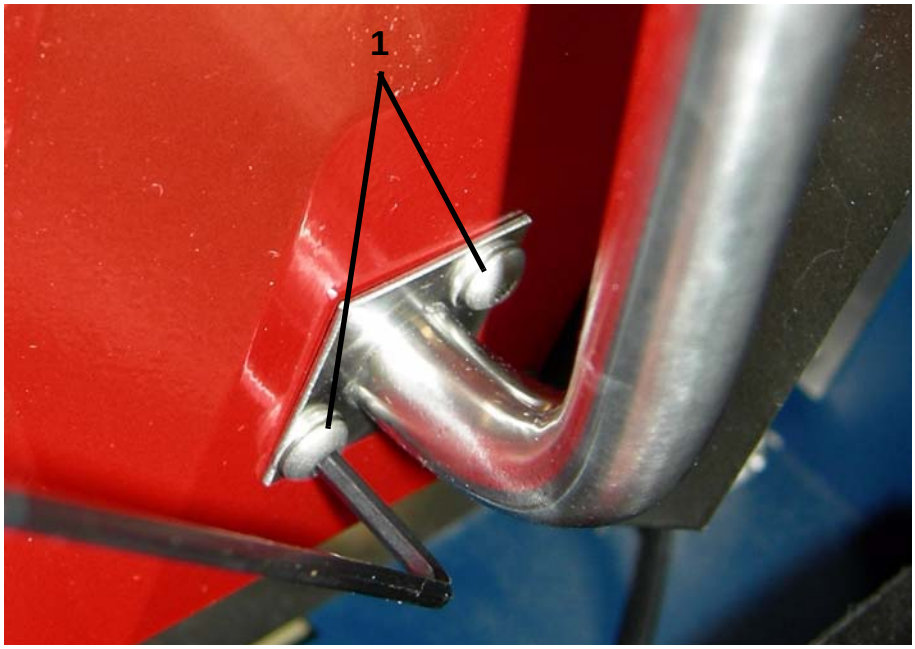


Fig. 5:63 Adjusting level sensor

1 Screws

4. Assemble in reverse order.
5. Start up the instrument and let it go through the Startup Test.
6. Perform a TWM balance calibration, see 5.7.2 TWM balance calibration on page 5:77.

5.5 Sample Transport Module

5.5.1 Replacement of Cuvette Glass Kit

Applicable to:	
1001 2122	Cuvette bottom part
1001 2123	Cuvette top part 6 mm
1001 2124	Cuvette top part 10 mm
1001 2125	Cuvette top part 18 mm
1001 2126	Cuvette top part 25 mm
1001 2127	Cuvette top part 29 mm
1001 3213	Top loaded cuvette 6/10/18 mm

If the cuvette glass is broken or needs to be exchanged for other reasons, follow the procedure below:

1. Remove glass and adhesive remains from the cuvette.
2. Clean the cuvette and wipe it dry.
3. Tear of the protective tape from the adhesive and glue the new glass to the cuvette.

5.5.2 Replacement of STM Cuvette Cam Thread

This instruction is valid for STM cuvette part no:

- 10012592 (type 1)
- 10013213 (type 1)
- 10014163 (type 1)
- 10011075 (type 2)

Replacement - type 1

1. Remove the two grub screws **1**, see Fig. 5:64.

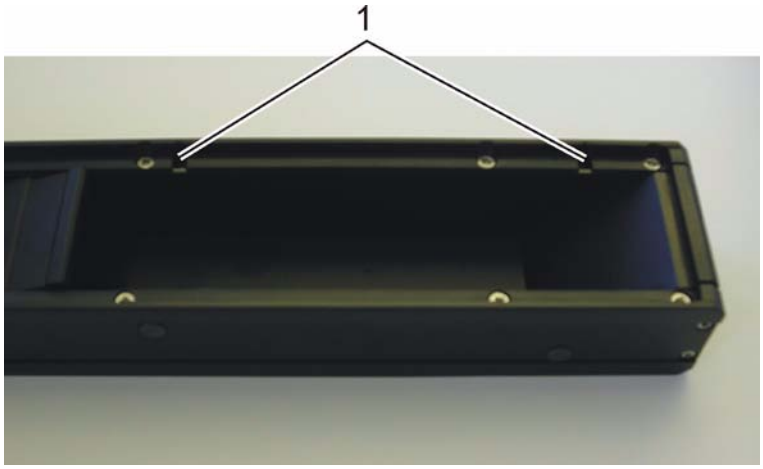


Fig. 5:64 STM cuvette

2. Remove the old cam thread **1**, see Fig. 5:65, by sliding it down and out through the open end. If the cam thread is stuck use a screwdriver and a hammer to gently knock it loose.

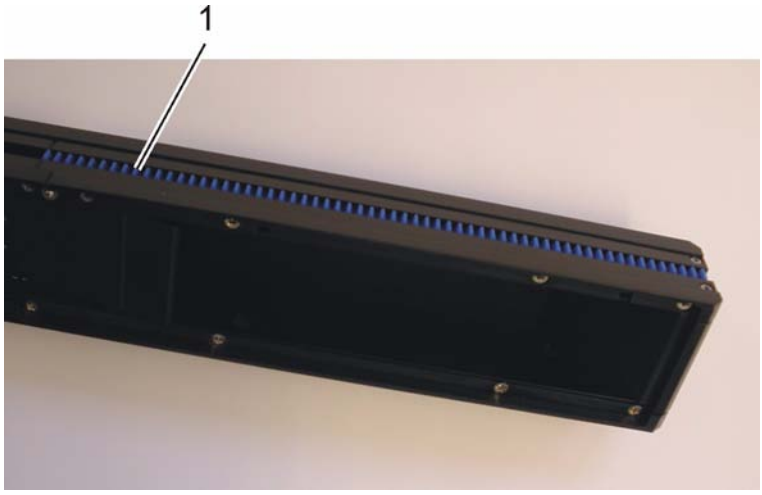


Fig. 5:65 Removing cam thread

3. Slide in the new cam thread through the open end.
   The lower end of the new cam thread should align with the groove in the cuvette see Fig. 5:66.

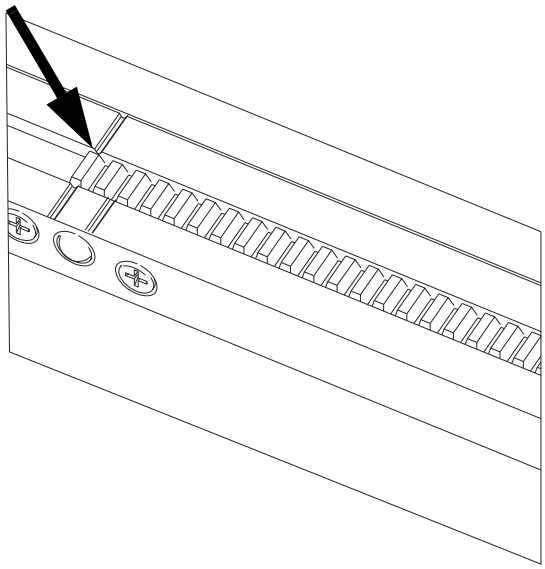


Fig. 5:66 Installing cam thread

4. Fit the two grub screws. Be careful not to overtighten the screws since the cam thread is made of a soft material.

Replacement - type 2

1. Unscrew the two grub screws **1**, see Fig. 5:67.
2. Unscrew the two screws holding the bottom plate **3**.
3. Remove the old cam thread **2** by sliding it down and out through the open end. If the cam thread is stuck use a screwdriver and a hammer to gently knock it loose.
4. Cut the new cam thread to a length of 160 mm.
5. Slide in the new cam thread through the open end

6. The lower end of the new cam thread **2** should be placed 191mm from the top part of the cuvette see Fig. 5:67.
7. Refit the bottom plate **3** and tighten the grub screws **1**. Be careful not to over tighten the screws since the cam thread is made of a soft material.

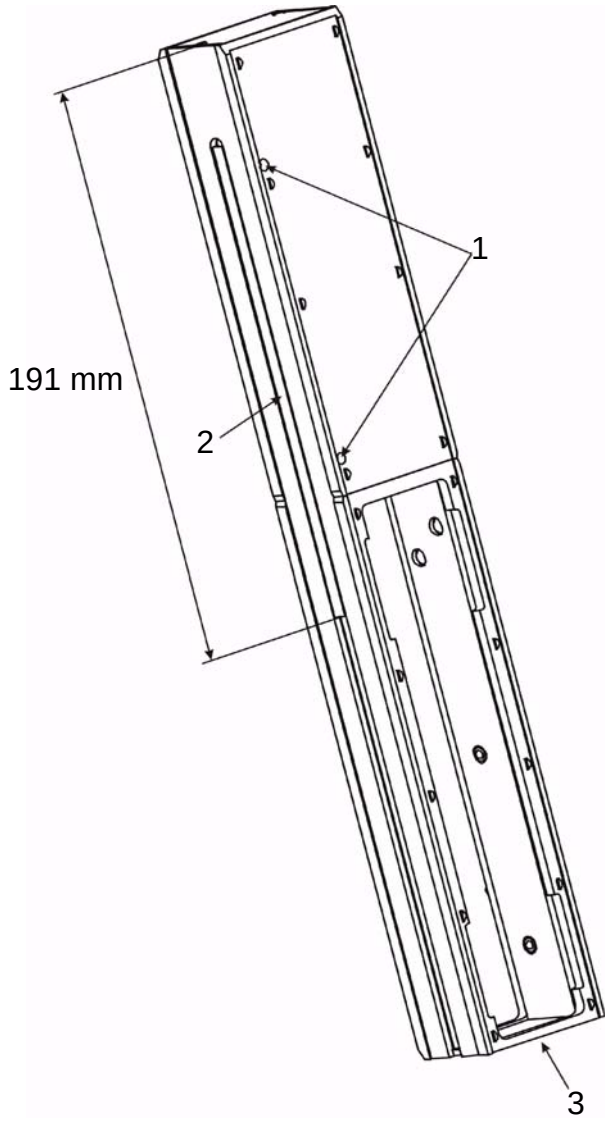


Fig. 5:67 STM cuvette

1	Screw	3	Bottom plate
2	Cam thread		

5.5.3 Checking STM Cuvette Cam Thread

There are no parts that require regular maintenance. It is recommended though that the blue Cam Thread is checked for wear and positioning.

The two sensors on the left side of the Elevator Unit should be lit when the Cuvette Holder is in place and they should have a tolerance of a few millimetre when moving the Cuvette Holder up and down. The sensors are marked **1** and **2**, see Fig. 5:68 below.

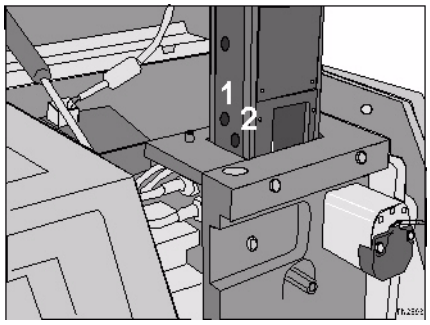


Fig. 5:68 Sensors on the side of the Cuvette Holder

If the two sensors do not light, do as follows.

1. Loosen the two grub screws on the side and move the blue Cam Thread slightly downwards (arrow direction), see Fig. 5:69 below.
2. Tighten the grub screws.
3. Test if the positioning is working properly. If not, redo the adjustment.

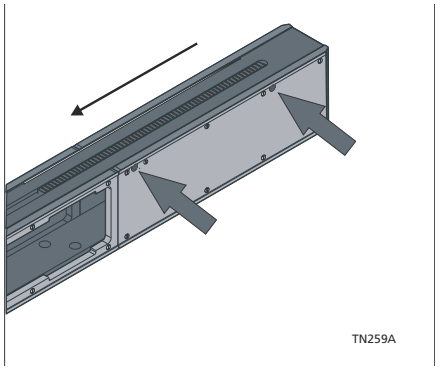


Fig. 5:69 Group Screws on the Cam Thread

5.6 Corrective Maintenance Procedures

Please note that the below instructions regards the new 1241-002 model only.

5.6.1 Cable stalk Kit

To strengthen the I2C signal integrity, all I^2C bus cabling is now shielded, with shield potential connected to logic ground at one end of the cable only.

An upgrade Cable Stalk kit P/N 60028013 is introduced for replacement of I^2C cabling in existing Cable Stalk. Infratec 1241-002 delivered prior to 2008-01-01 is subject for upgrading existing cables.

It is recommended to install the upgrade at next service visit.

5.6.2 Lamp Holder

New Lamp Holder Socket was introduced 2008-01-01 that has socket screw terminals to secure firm contact. Previous version is exposed for oxidation coating causing bad contact between lamp and terminals. Typical symptom is Air Stability Test failure.

Latest revision of 10013351 Lamp Holder Cpl employs the update.

It is recommended to install the update at next service visit.

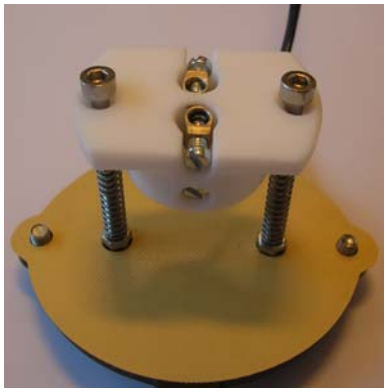


Fig. 5:70 New lamp holder

5.6.3 DSP board

DSP schematics updated with improved; PLD FW, reset control, filtering on Detector interface and motor drive protection. Infratec 1241-002 delivered prior to 2008-01-01 is subject for replacement of supplied DSP Board.

Latest revision of P/N 60023758 DSP Board employs the update.

It is recommended to install the update at next service visit.

5.6.4 TWM PCB

Updated Test Weight Module hardware, P/N 10012790 TWM PCB, has been introduced in production 2008-01-01.

Several Support Incidents in November/December 2007 reported analysis failures showing error message "Reference scan light level too low". The root cause has been located to the Test Weight Module (TWM), see detailed description below.

The problem regards TWM used with limited numbers of Infratec 1241-002 new model, ranging from S/N 12415000 to approx 12415400. More specific; the first batch of new Infratec model produced prior to 2008-01-01.

Detailed description

TWM shutter motors can cause I2C cable crosstalk noise resulting in that an unexpected reset signal is sent to the Monochromator shutter. The reset signal positions the monochromator shutter in "closed" position, which is the default state. If it occurs during analysis then the light source may unexpected be blocked resulting in displayed message "ERROR Reference scan light level is too low", i.e. no light falling on the detector.

The cross cable talk originates in that the TWM shutter motor causes voltage spikes generated from the inductive load. The cable crosstalk noise has been eliminated on the TWM side by new revision of TWM PCB that has been updated with a capacitive decoupling on the reset signal.

The updated TWM PCB (10012790) was implemented in production 2008-01-01.

Compatibility

It is not necessary to update existing TWM's or Infratec unless it shows the error message described above.

Unaffected versions:

- Infratec 1241-001 model has sufficient motor drive protection
- Infratec 1241-002 model delivered after 2008-01-01, has updated HW that provides improved motor drive protection (Ref. TN 1234)
- TWM 1241-050 delivered after 2008-01-01 is updated with HW described in this TN.

Affected versions:

- Infratec 1241-002 model delivered prior 2008-01-01, to be updated with below listed HW (Ref TN 1234):
  - P/N 60023758 DSP Board
  - P/N 60028013 Cable stalk Kit
- TWM 1241-050 delivered prior 2008-01-01 needs to be updated with TWM PCB (10012790) as described in this TN.

5.7 Preventive Maintenance Procedures

Preventive Maintenance of the Infratec 1241 consists of a series of checks that are performed periodically to detect and prevent impending failures, see PM Protocol part no. 1001 4569.

5.7.1 MU Adjustment of Path length

The path lengths must be verified, and if needed adjusted, after having made any changes or repairs to the Measuring Unit. The valid tolerance for 6 mm path length is 6.0 -0.0/+0.2 (mm).

The PathLength Adjustment Kit includes a Go/NoGo ball gauge that is used for simple pass/fail inspection. Basically there are two separate gauges GO (6.00 mm) and NO GO (6.20 mm). The 6.0 mm gauge must fit inside the path length, and the 6.2 must not. If the 6.0 mm gauge does not fit, the tolerance is below the minimum path length tolerance. If the 6.2 mm gauge goes, the path length is above the maximum tolerance.

The PathLength Adjustment Kit also includes an "Adjustment Tool" which is for use on MU generation I only, i.e. not to be used in this instruction.

Tool needed for the adjustment of path length is:

- Go/no go ball gauge (Part. no. 1001 0661)

Checking pathlength at 6 mm

Start with checking path length at 6 mm before any adjustments are made. This is to make sure that the adjustment is needed, i.e. that the measured path length is outside the tolerance limits. If adjustment is required then follow the instruction under "Adjustment", herein.

1. From the Infratec 1241 Service Menu (Manual Tests/Measuring Unit/Position Settings) set the path length to home position at 33 mm.
2. Now, set the path length to 6 mm.
3. Slip the GO gauge (6 mm side) in the chamber, between the middle of the detector glass and the glass on the cell housing, and slowly rotate the cylinder. The gauge should rotate past the raised section with no drag.

Fig. 5:71

Next, place the NO-GO gauge (6.2 mm side) in the chamber and repeat the test. The gauge should stop the cylinder's rotation. It should not be possible to rotate the 6.2 mm top!

4. If condition in step 3 is true then continue with step 10 else continue with step 5.

Adjustment

5. If adjustment is required then use an 7 mm spanner on the adjustment nut. Turning adjustment nut clockwise increases pathlength and anticlockwise decreases it. The incline rising gradient is 0.5 mm/rotation.
6. Turn the adjustment nut (1) a 1/4 turn in the adjustment direction to begin with and repeat step 1-4.

Fig. 5:72

7. To release tension in the path lenght mechanisms then gently retract and release the adjustment nut with a plier.

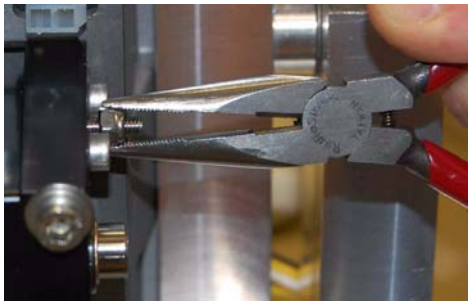


Fig. 5:73

8. After adjustment, the path length must be set to 33 mm for the setting to take effect.
9. Go to step 1.

Verifying

10. Visually inspect and verify the path length adjustment by exercising setting from 5 mm to 33 mm and thereafter to 6 mm. By repeating step 1 to 4 the adjustment is completed.

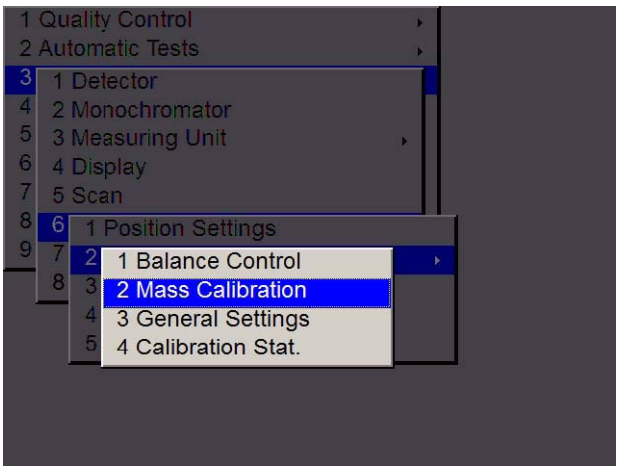
5.7.2 TWM balance calibration

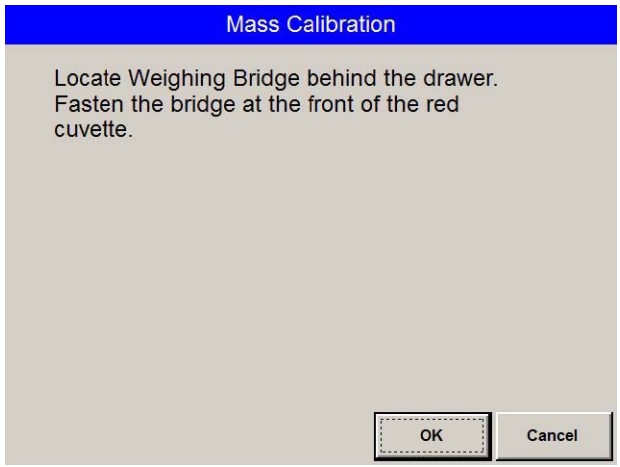
For the calibration you need the Test Weight Control Kit, p/n 10011779.

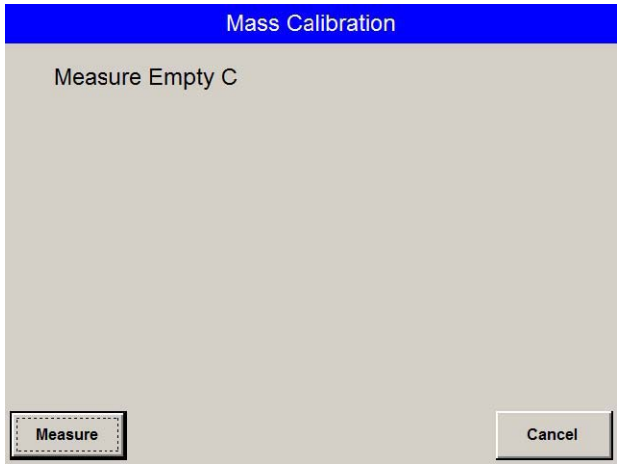
The content of the kit is:

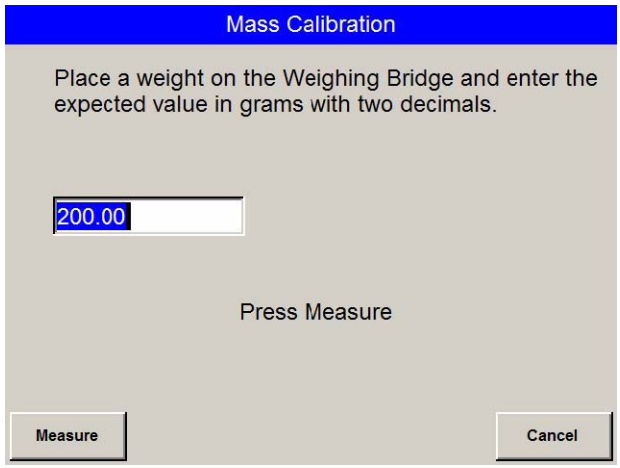
- 2pcs of crowned 200g weight
- 1pcs weighing bridge with fastening nut.

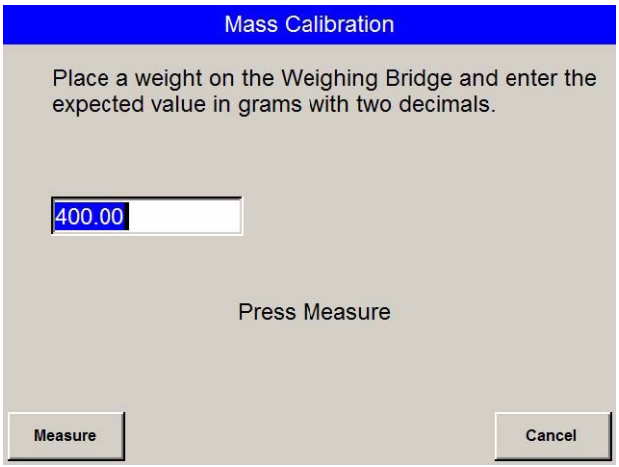
1. Log in on the Service menu. The password is **3677**. A hint to remember this password is to type "FOSS" on you mobile phones keyboard.
2. Select Manual Tests/ Test weights/ Calibration/ Mass calibration (3.6.2.2).
3. Basically just follow the instructions given on the display.



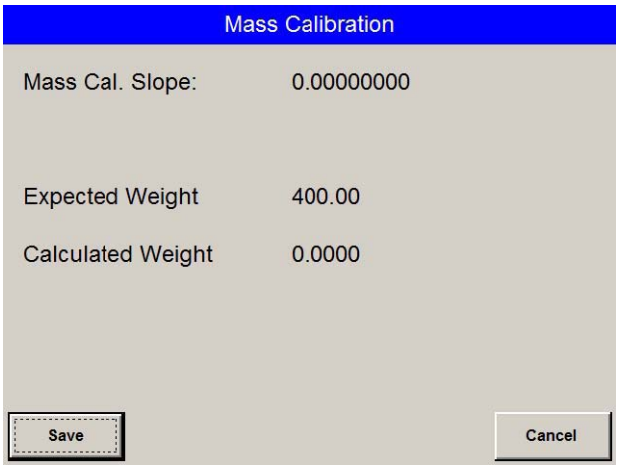

Mass Calibration
Locate Weighing Bridge behind the drawer.
Fasten the bridge at the front of the red
cuvette.
OK
Cancel


Mass Calibration
Measure Empty C
Measure
Cancel


Mass Calibration
Place a weight on the Weighing Bridge and enter the
expected value in grams with two decimals.
200.00
Press Measure
Measure
Cancel

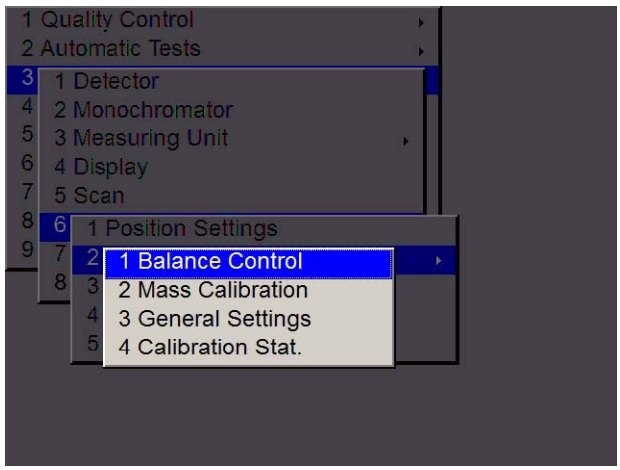


4. The next picture is taken from the emulator software. The normal slope is close to 1 and the Calculated weight is close to 400.



5.7.3 TWM balance control

1. Select Manual Tests/ Test weights/ Calibration/ Balance Control (3.6.2.1).



2. Follow the instructions on the display. After completion the Software will answer the question "Balance OK?" with either Yes or No. If the Expected and Calculated value differs more than +/- 0.2 the answer is No.

   In this case check the following;

- That no vibrations are present.
- That no cables or other objects are touch the exterior of the balance.
- If service was done on internal parts make sure nothing is touching the balance.

6 Schematics

N/A

7 Technical Specifications

See User Manual - Infratec™ 1241 Grain Analyzer.

Infratec™ 1241 Fuses	
Internal fuses	T 8.0 AT (pos. F1 on PSU) TT 1.25 AT (pos. F2 on PSU) 4 AT (pos. F3 on PSU) 500 mAT (pos. F4 on PSU) 2 AT (pos. F5 on PSU) 4 AT (pos. F6 on PSU)
External fuses	T 2.5 A x 2 (220-240 V) / T 5 A x 2 (110-120 V)

8 Document References

- 6002 4902 Spare Parts Manual Infratec™ 1241 Grain Analyzer (Gen. 2 and 3)
- 6002 2992 User Manual Infratec™ 1241 Grain Analyzer (Gen. 2)
- 6004 0772 User Manual Infratec™ 1241 Grain Analyzer (Gen. 3)
- 1001 5017 Quick Guide Infratec™ 1241 Grain Analyzer (Gen. 2)
- 6004 0776 Quick Guide Infratec™ 1241 Grain Analyzer (Gen. 3)
- 6004 3623 User Manual Infratec™ 1241 Modules (Gen. 2 and 3)
- 1001 0694 Software Manual Infratec™ File Tool
- 6002 2638 Installation Manual Infratec™ Data Logger
- 6003 9725 Software Manual FOSS Data Link