IPac Guide

IPaQ

Initial
Qualification
Package

ReactIR 45P™

METTLER TOLEDO

17 November 2011

Address comments to:
Mettler-Toledo AutoChem, Inc.
7075 Samuel Morse Drive
Columbia, MD 21046
Tel: + 1 866.333.6822
Fax: +1 410.910.8600
www.mt.com/reactir
For technical support, contact: AutoChemCustomerCare@mt.com

In conformance with the European Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE), this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.

If you have any questions please contact the responsible authority or the distributor from which you purchased this device.

Should this device be passed onto other parties for private or professional use, the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

Contents

1

Introduction

ReactIR™ 45P is a dedicated industrial process monitoring system designed to operate safely in the harsh plant environment, while monitoring critical reaction components in real time using *in situ,* mid-infrared measurements. The main control system is a Web application (iC Process) that monitors your chemistry continuously or in batch mode while communicating critical reaction variables to your Distributed Control System (DCS) or OPC-UA external systems. The remote software (iC IR) enables users to connect to the ReactIR 45P base unit for viewing real time, *in situ* reaction monitoring information that can be used to make process decisions or to establish future monitoring strategies.

ReactIR 45P is equally compatible with a laboratory environment to monitor small-scale reactions for better understanding of the chemistry prior to installation in a production environment. In this case, iC IR is the primary control software offering all the benefits of a lab-based ReactIR product.

Note: In a laboratory environment, iC IR can be used alone as the control software.

This document contains instructions for instrument installation and system readiness tests.

If you are viewing this document electronically, click any blue-colored link to go to the related information and instructions.

Should you have questions that are not addressed in this document, please contact your local METTLER TOLEDO office or our Customer Care Department using the information under "Service and Technical Assistance" on page 7.

Related Documents

The following document is related to this manual:

- "ReactIR 45P Pre-Installation Checklist" (MK-VL-0039-AC)—This form is sent to the customer before system installation. The required form must be completed and returned to the Field Service Engineer (FSE) prior to arrival. A sample for is in the "ReactIR 45P Hardware Manual" appendix.

This document and those listed below are in the shipped with the instrument:

- "ReactIR 45P Safety Manual" (MK-PB-0086-AC)
- "ReactIR 45P Hardware Manual" (MK-PB-0085-AC)

The iC IR Documentation Portfolio contains the iC IR installation Guide and Software User Guide, along with user guides for the optional software.

Documents listed below are on the iC Process Documentation Portfolio installed with iC Process software:

- "iC Process Installation Guide" (MK-PB-0072-AC)
- "iC Process Software User Guide (MK-PB-0074-AC)
- "QuickRef-iC Process for Operators (MK-PB-0077-AC)

Symbols in this Manual

To help you recognize information, the following symbols appear throughout this manual. Please pay particular attention to the sections marked by these symbols.

Table 1-1 Warnings, Cautions, and Notes

	**WARNING**—Extremely important safety information—Failure to observe the warning may result in serious personal injury or equipment damage.
	**Caution**—Important information that tells you how to prevent damage to equipment or to avoid a situation that may cause minor injury.
Note:	Information to which you should pay special attention.

General Policies

METTLER TOLEDO equipment is subject to the installation, repair, and computer service policies described below.

Installation Policy

Site preparation for the ReactIR 45P equipment is the end user's responsibility. Structural installation details, particularly for installations in hazardous environments, should be prepared and supervised by a certified and registered professional engineer who is properly qualified to assure a safe installation at your site.

METTLER TOLEDO is not licensed to provide certification of mechanical, structural, or piping designs that may be required for installation of the ReactIR 45P system into specific applications. Such designs must be prepared and supervised by a certified and registered professional engineer in your organization.

Repair Policy

METTLER TOLEDO warrants its products against defects in materials and workmanship for twelve months from the date of installation or fifteen months from the date of shipment. For details, please refer to the warranty provided with the instrument.

For assistance, please contact your Technical Applications Consultant (TAC) or send an email to **AutoChemCustomerCare@mt.com**.

It is recommended that you retain the original packing materials in the event you need to return the ReactIR 45P. If factory service is required, your METTLER TOLEDO service engineer will issue you a Return Material Authorization (RMA) form.

Computer Service Policy

If a computer is included as part of your ReactIR 45P system, it will be from a major manufacturer such as Dell. In the U.S. and some European countries, the manufacturer will provide warranty service if required.

METTLER TOLEDO can assist in diagnosing problems with computers, but the computer manufacturer will provide parts and labor for repairs under the service contract.

Software Upgrades

When applicable, upgrades to the instrument and office software are available for iCare subscribers. When a new release or service pack is available, all iCare subscribers with a valid subscription will be notified via email so they can download the installer from the AutoChem Community Web site, https://community.autochem.mt.com. Access to the site requires a password that you can request from the home page. You can also contact Customer Care or your METTLER TOLEDO Technology and Applications Consultant (TAC) using the information on page 7.

Non-iCare subscribers may request a quote for an upgrade by contacting their local salesperson or Customer Care.

Training Programs

Training for the hardware and software is available through the users' Web site (see link above) and through your METTLER TOLEDO TAC. Use the contact information on page 7.

Service and Technical Assistance

METTLER TOLEDO has offices around the world. Contact the Mettler-Toledo AutoChem, Inc. headquarters in the USA for technical support or service. To arrange for specific application assistance from a METTLER TOLEDO Technology and Applications Consultant or for general assistance, contact Mettler-Toledo AutoChem, Inc. through the toll-free number below.

Mettler-Toledo AutoChem, Inc. (Columbia, MD headquarters)	Tel: **+ 1.410.910.8500** Fax: **+1.410.910.8600** Email: **AutoChemCustomerCare@mt.com** Toll Free: **+1.866.333.6822**

Service and Technical Assistance

2

Installation

This chapter provides procedures to install or reinstall a ReactIR 45P system.

Note: METTLER TOLEDO offers one of the following three ServicePac offerings:

iPac Starter-Pac—Initial Qualification Package (IPac) for basic installation to ensure that the ReactIR 45P meets the manufacturing specifications and quality assurance outlined in the 'IPac Starter-Pac.' This service is included with system installation.

IPac Quality-Pac—Initial Qualification Package (IPac) for additional validation of the instrument and installation. The IPac Quality-Pac is designed for a regulated environment. This service package, sold separately, includes Instrument Performance Assurance (IPA) module.

EQPac Quality-Pac—Equipment Qualification Package (EQPac) for installation in a regulated environment and subject to regulatory compliance guidelines. The EQPac Quality-Pac goes beyond system installation to provide a lifetime qualification record of the installation, operation, performance, and maintenance. This service package, sold separately, provides comprehensive details to meet the requirements for installing ReactIR 45P in a Class I/Division 1 or Zone 1 (ATEX) environment. Includes Instrument Performance Assurance (IPA) module.

This covers the METTLER TOLEDO service package offerings, which include site preparation performed by you and installation performed by a METTLER TOLEDO Field Service Engineer (FSE). The scope of the installation service based on one of the three packages listed above includes:

- Site requirements verification
- Equipment inspection and order validation
- System installation and startup

Acceptance Criteria

The IPac Starter-Pac, IPac Quality-Pac, or EQPac Quality-Pac requires approval signatures from the METTLER TOLEDO AutoChem Field Service Engineer and your organization's 'Responsible User.'

Note: Place the signed ServicePac document in a readily accessible location for reference during system service or maintenance.

Site Preparation (Customer Responsibility)

The ReactIR 45P Pre-Installation Checklist is sent to you when system installation is scheduled. A sample checklist is in the "ReactIR 45P Hardware Manual" appendix.

Permanent or temporary installation of a ReactIR 45P system must include the following:

- Adequate space in area of Intended Use
- Utilities—Electrical supply
- Utilities—Air supply
- Utilities—Communications

A METTLER TOLEDO Field Service Engineer will set up and install the ReactIR 45P system after verifying site preparation. Site preparation requirements must be completed before the scheduled installation.

Installation Instructions

This section describes the procedures for installing the ReactIR 45P system.

1. Confirm Site Requirements

A METTLER TOLEDO Field Service Engineer (FSE) checks the ReactIR 45P installation site in accordance with the product requirements and completes the first section of the IPac Starter-Pac, IPac Quality-Pac, or EQPac (ServicePac offerings). Customers must ensure the site is ready prior to arrival of the FSE based on the "ReactIR 45P Pre-Installation Checklist."

Proceed to the next step only after confirming the site is ready.

2. Verify Hardware Configuration/Order Validation

A METTLER TOLEDO Field Service Engineer will complete the ReactIR 45P ServicePac document after confirmation that the site has been properly prepared for installation. In addition to verifying the site preparation and receipt of ordered parts (including service agreements/programs), the ServicePac document covers all aspects of the final stages of system installation.

NL Configuration

Using the appropriate ServicePac document, perform a visual inspection of the shipment for the items on the order.

Typical NL Configuration

Figure 2-1 Typical NL system configuration

HL Configuration

For a hazardous area installation, METTLER TOLEDO offers a special Equipment Qualification Package (EQPac) service, as noted on page 9. Refer to the "ReactIR 45P Safety Manual," provided with the instrument, for the exact area classification of the ReactIR 45P.

The diagram below (Figure 2-2) shows typical HL configuration, which includes the Purge/ Power/Communications module.

Typical HL Configuration

Figure 2-2 Typical HL system configuration

Sampling Technologies

Sampling Technology components are purchased separately and include options described in the Product Description chapter of the "ReactIR 45P Hardware Manual." Figure 2-1 shows a FiberConduit. Figure 2-2 shows the ReactIR 45P HL base unit without sampling technology.

Complete the sampling technology section with the information specific to the type of technology ordered. Enter N/A (not applicable) for sections that do not apply to the customer order. Record the 'wetted materials' and 'pressure/temperature' specifications for the sampling technology. Any items that are missing should be entered into the non-conformances section of the form with an action plan to resolve.

Optional Hardware

Optional components are the Air Handling Unit, frame, and the Instrument Performance Assurance (IPA) module. Refer to the 'ReactIR 45P Hardware Manual' for details.

Software

ReactIR 45P control software is iC IR alone in a laboratory environment or iC IR and iC Process in a production environment.

Optional Software

Optional software can include iC Quant, ConcIRT Pro, iC Data Share.

Documentation

ReactIR 45P safety manual, hardware manual, and this IPac Guide are shipped with the system. iC Process documentation is in a Documentation Portfolio included on the iC Process software installation media.

Additional software and ReactIR product documents are in a Documentation Portfolio accessible through the iC IR software (Help > Documentation Portfolio).

3. Mount the ReactIR 45P Base Unit

The ReactIR 45P system is available with and without a frame. Both the ReactIR 45P base unit enclosure and frame include mounting tabs. Refer to the "ReactIR 45P Hardware Manual" for dimensional drawings of the base unit with and without the frame.

1. If the instrument is not already mounted, place the base unit in the predetermined location of intended use per the site preparation requirements.
2. Secure the base unit or the base unit frame to the area of intended use.
   - Use four 6mm (1/4 inch) stainless steel bolts (not included).
3. Ensure that the ReactIR 45P base unit or base unit on optional frame is mounted securely.
   - The mounting device must hold the weight of the unit and all accessories that will be added. System weight is in the "ReactIR 45P Pre-Installation Checklist" sent when the installation date was scheduled. A sample form is in the "ReactIR 45P Hardware Manual" appendix.
   - If the mounting device is a rack shelf, it should be as rigid as possible to prevent the system from moving or swaying
4. In addition, place the computer in a suitable work location as follows:
   - NL Configuration—Location that allows connectivity through an Ethernet cable.
   - HL Configuration—Location that allows fiber optic connectivity inside or outside of your Local Area Network (LAN).

4. Confirm Hardware Service Agreement and Software Version

Use the appropriate sections of the ServicePac document to confirm the hardware and software that was ordered is contained in the shipment.

5. Establish System Connections and Initial Setup

Complete the System Connections in the appropriate ServicePac document while progressing through these instructions to ensure all ReactIR system hardware is in the proper location with connectivity to utilities, computer, and sampling technology.

Note: DO NOT proceed with the 'System Start Up' section until all applicable ServicePac documents are complete.

A. Connect Air

Connect clean, dry, instrument quality air to the optional Air Handling Unit (Option A) or to the Option B input on the base unit. With option B, the Air Handling Unit is customer provided. The Air Handling Unit controls air pressure to the TE cooler and to the base unit enclosure.

In Normal Locations (NL)

Connect air line to the optional Air Handling Unit (option A), if purchased.

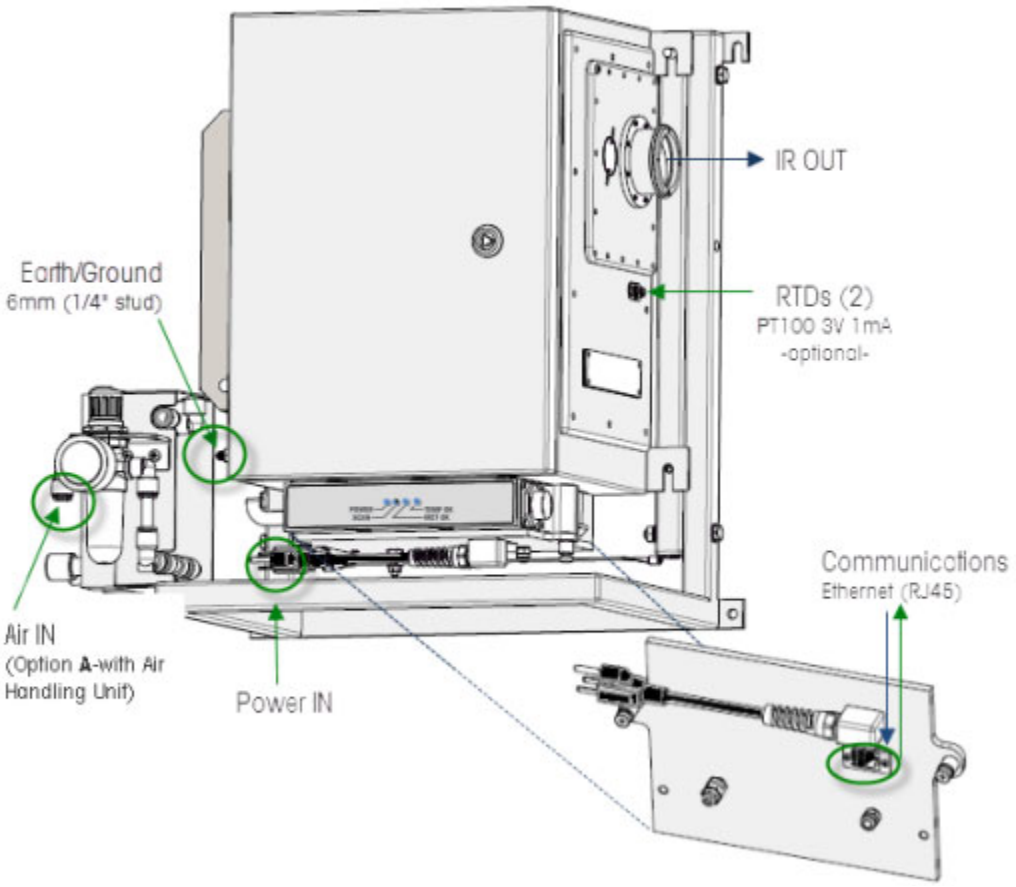


Figure 2-3 Air connection (NL option A)—with Air Handling Unit

If the ReactIR 45P system Air Handling Unit is not purchased, connect the air line to your regulator. Then, run lines from the regulator to inputs for option B—one connection to the air input for the purge at the base of the Power/Communications module and one to the TE cooler input (Figure 2-4).

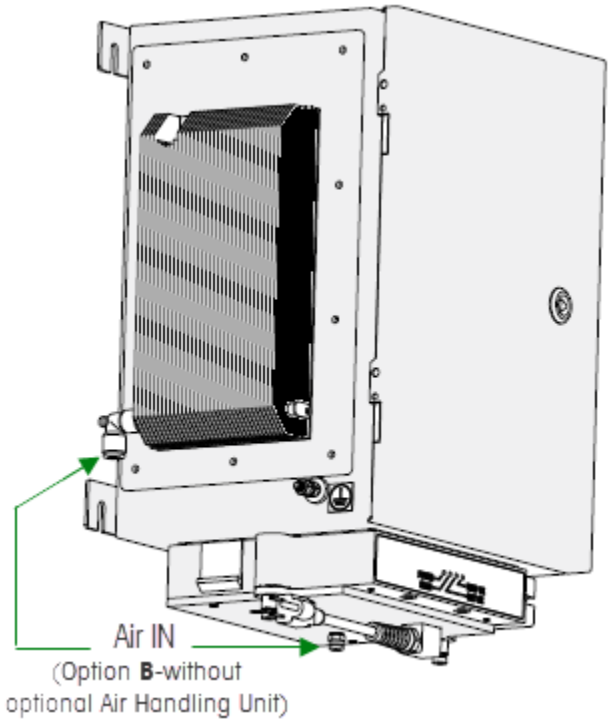


Figure 2-4 Air inputs without Air Handling Unit (NL)

In Hazardous Locations (HL)

Connect air line to the input of the Air Handling Unit, if purchased (Figure 2-5).

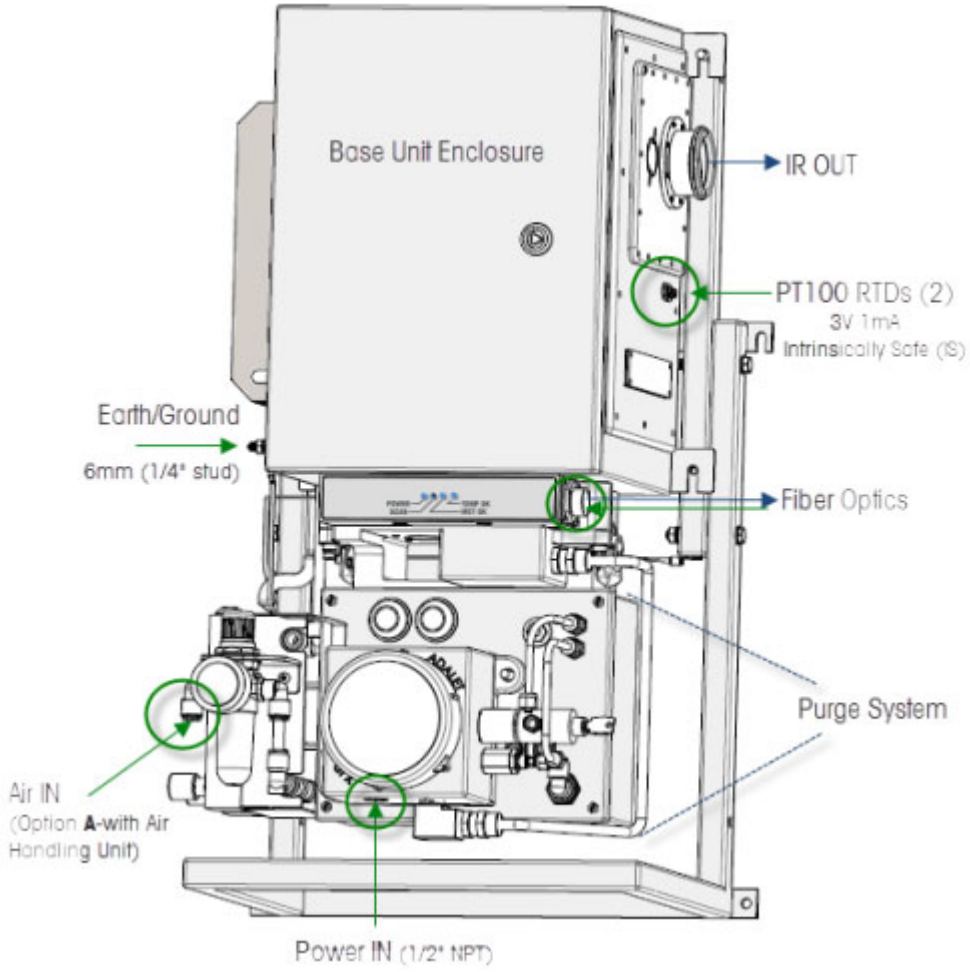


Figure 2-5 Air input on Air Handling Unit (HL)

If the ReactIR 45P system Air Handling Unit is not purchased, connect the air line to your regulator. Then, run lines from the regulator to inputs for option B—one connection to the purge IN and one to the TE cooler input. (Figure 2-6).

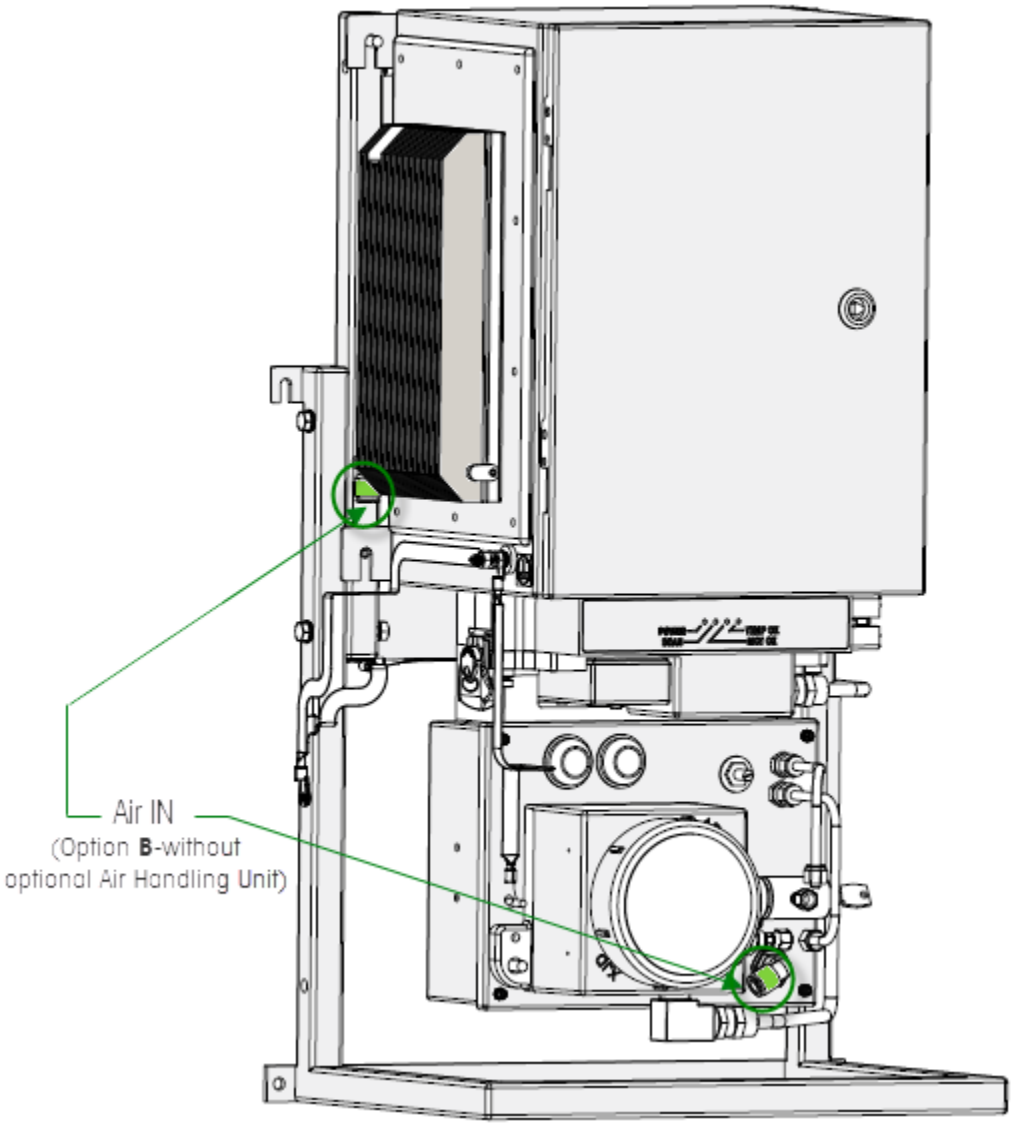


Figure 2-6 Two air inputs without optional Air Handling Unit (customer-supplied regulator)

C. Make Earth/Ground Connection

1. Use a ground strap (customer-provided) with minimum 12AWG.
2. Connect to the earth/ground stud (6mm (1/3in) earth/ground stud on the left side of the ReactIR 45P base unit, below the TE cooler.

Drawings in the 'ReactIR 45P Safety Manual' show the location of the earth/ground stud.

C. Connect Power

Ensure that your power supply meets the specifications in the instrument hardware manual. Hazardous area connection instructions begin on page 18.

In Normal Locations (NL)

For normal locations, connect the country-specific power terminated line cord to an AC outlet. Refer to Figure 2-3 on page 14 for location of power IN cord.

In Hazardous Locations (HL)

For hazardous locations, power is connected to the Purge/Power/Communications module.

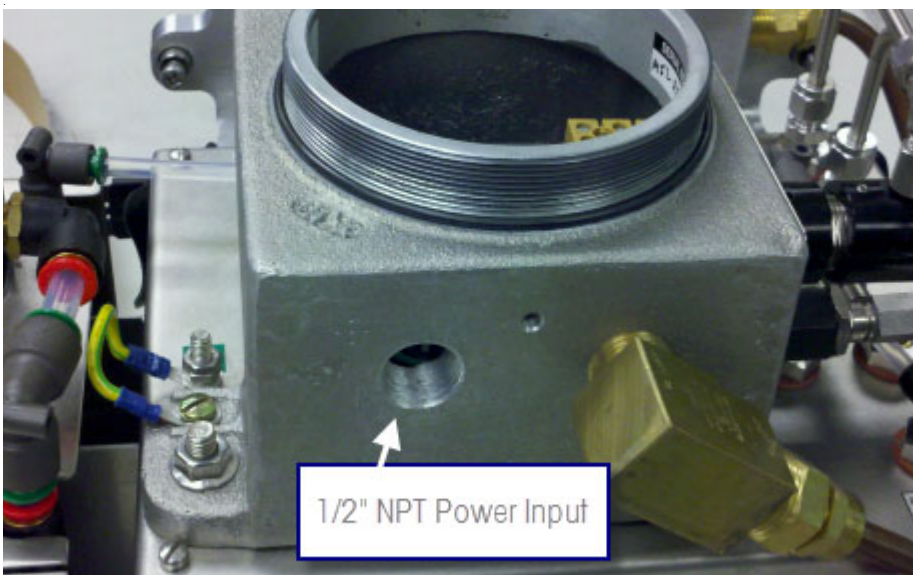


Figure 2-7 Power supply connection to Purge/Power/Communications module

1. Open the ReactIR 45P MiniPurge Control Unit (CU) box.
   A certified METTLER TOLEDO FSE opens the ReactIR 45P HL system and makes the connections during installation and commissioning.

   Caution—There are no user-serviceable parts inside the system. Contact a METTLER TOLEDO FSE for all service needs.

2. Connect external power line through the 1/2″ NPT input.

   Caution—External power connection to the inlet must be made using an appropriately approved and suitably rated cable, gland, or conduit fitting in accordance with country and local electrical codes.

3. Connect the external power to the terminal block inside the Purge/Power/Communications module (Figure 2-7).

4. Refer to Figure 2-8 and connect the power input according to Table 2-1.

Table 2-1 Terminal Block Wiring

	Wire—EU	Wire—NA	Terminal	
1	**Yellow/Green**	**Green**	Ground	GND
2	**Brown**	**Black**	Line 1	1L1
3	**Blue**	**White**	Neutral	3L2

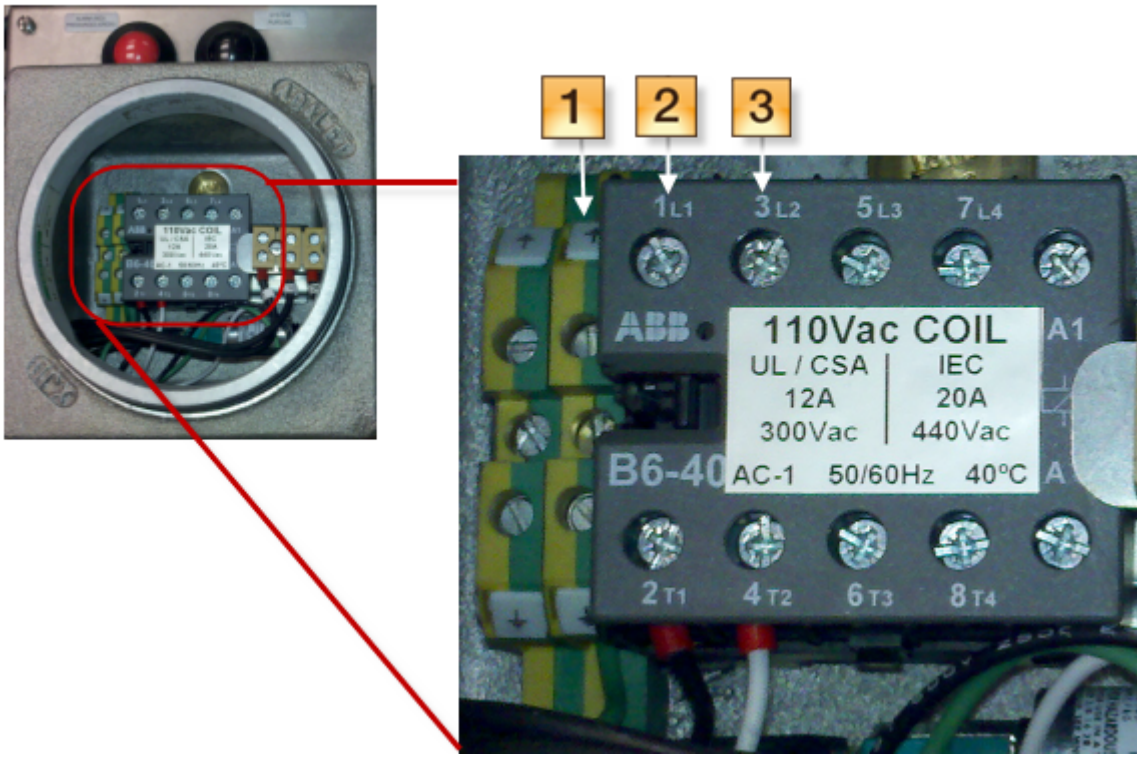


Figure 2-8 Power connection (ReactIR 45P HL)—terminal block wiring

5. Close the purge control unit.

D. Connect Communications

The ReactIR 45P can be connected to your communications network by Ethernet cable for NL configurations and by Fiber Optic cable for HL configurations.

Caution—External communications connection from your communications network must be made using appropriately approved and suitably rated connectors, switches, media converters, and cables in accordance with local and national standards for the zone of installation.

In Normal Locations (NL)

Connect Ethernet cable to RJ45 connector located on the bottom of the system LED panel below the base unit.

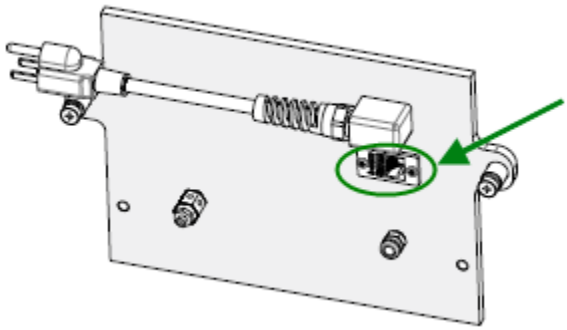


Figure 2-9 RJ45 Ethernet connection (NL)

In Hazardous Locations (HL)

1. Remove the cover from the Fiber Optic input on the right side of the ReactIR 45P Purge/Power/ Communications module.
2. Use a tool to remove the cap from the LC fiber optic connection located on the right side of the HL Purge/Power/Communications module.
   a. Insert the tool in the slot shown in Figure 2-10, and turn the cap counterclockwise to loosen it.

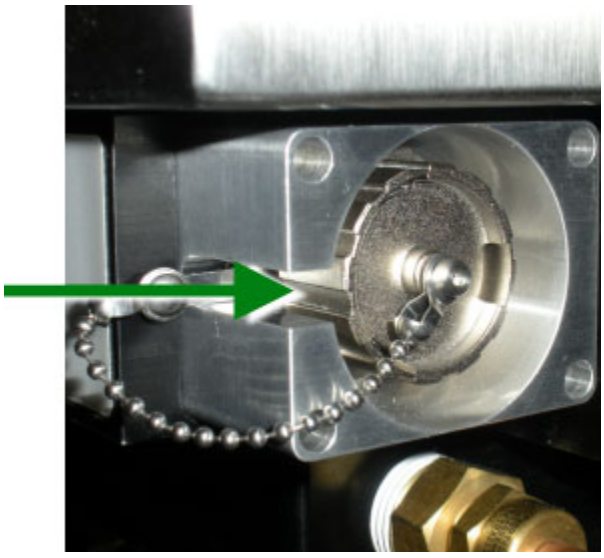


Figure 2-10 Fiber optic connection (HL) —Remove cap

b. Remove the cap and connect the Fiber Optic cable to the LC fiber connector.

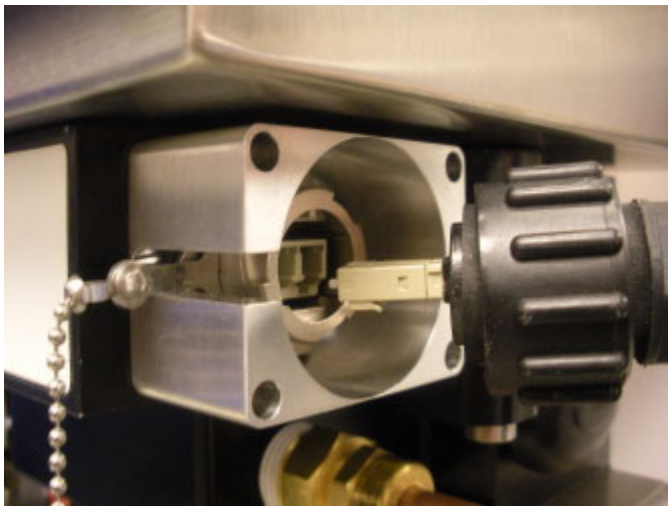


Figure 2-11 Fiber optic connection (HL) —Inserting cable

Note: A media converter may be required if you will be connecting directly to the control computer rather than to a network connector. Refer to the 'ReactIR 45P Hardware Manual' for the optional converter available from METTLER TOLEDO.

6. Install IPA Option (if applicable)

The optional Instrument Performance Assurance (IPA) module is internal in a ReactIR 45P instrument. If the IPA option was purchased, an FSE implements the validation and calibration module.

NL configuration—Install internal IPA module.

HL configuration—Install polystyrene film.

7. Connect Sampling Technology to ReactIR 45P

Follow the procedure below for the type of sampling technology configuration to be used.

Mirror Conduit Configuration

In a K4 or K6 configuration, the order of installation is (1) Base unit, (2) K4 or K6 Mirror Conduit, (3) Stand-off, for K4 only, and (4) Sentinel or probe.

1. Start with the base unit. Allow enough room to connect and manipulate the Mirror Conduit sampling technology on the base unit Sample Interface Module (SIM) flange.

2. Depending on the type of Mirror Conduit, attach to base unit as follows:

   K4

   a. Attach K4 mirror conduit to base unit SIM flange, using clamp provided.
   b. Attach stand-off to K4 using the clamp provided.
   c. Attach the Sentinel to the stand-off using the clamp provided.

   K6

   a. Attach K6 mirror conduit to base unit SIM flange, using clamp provided
   b. Attach the probe to the last knuckle of the conduit using the clamp provided.

3. Check that the each clamp is secure.

DS FiberConduit Configuration

DS FiberConduit configurations include an integrated probe model and a Fiber-to-Sentinel model.

Fiber Probe

1. Attach optical interface to SIM flange with the clamp provided.
2. Install the DS FiberConduit probe and secure with thumbscrews.

FiberConduit-to-Sentinel

Note: A FiberConduit-to-Sentinel configuration does not use a stand-off between the fiber and the Sentinel.

1. Attach optical interface to SIM flange with the clamp provided.
2. Install the DS FiberConduit and secure with thumbscrews.
3. Install the Sentinel on to the conduit with the clamp provided.

DS Micro Flow Cell Configuration

1. Attach single optical interface to SIM with the clamp provided.
2. Install the DS Micro Flow Cell and secure with thumbscrews.
3. Using Omnifit-style connectors, connect flow tubing.

8. Establish Sampling Technology Conduit Purge (if applicable)

If you are using a K4 or K6 Mirror Conduit sampling technology or a FiberConduit-to-Sentinel, supply clean, dry, instrument quality air to the conduit.

1. Attach a filtered, pressure-controlled air supply to the sampling technology.
2. Attach the METTLER TOLEDO-supplied fitting to the sampling technology as shown in Figure 2-12.

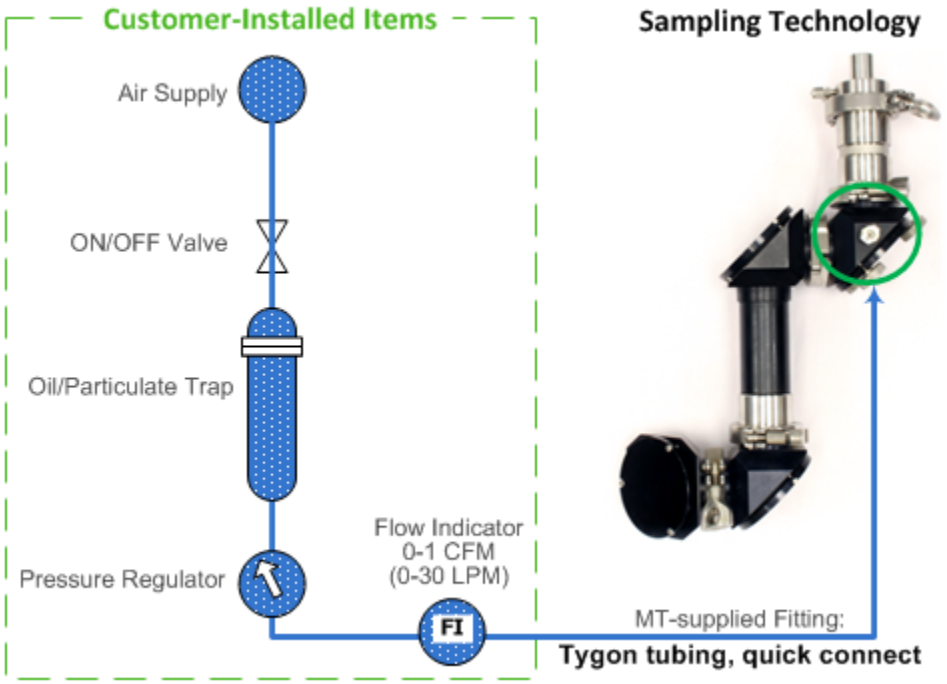


Figure 2-12 Purge-to-sampling technology flow diagram

3. Ensure that all sampling technology clamps are tight.

Verify that a purge supply of 5–10psig at a minimum flow rate of 0.5CFM (14L/min) is applied to the sampling technology conduit.

Caution—Above 40 psig (2.75 barg), damage can occur to the sampling technology.

9. Install Software and Confirm System Communications

Before setting up the communications between a computer and the ReactIR 45P, verify that the PC meets the specifications in the "iC IR Installation Guide" and the "iC Process Installation Guide," if applicable. You will need the iC IR Instrument License, included with your order, to operate the ReactIR 45P.

The ReactIR 45P system uses your network communications for data input and output between the instrument and the iC Process software. This link then allows connectivity to the PC workstations and Distributed Control Systems of your organization.

- **iC IR software**—A ReactIR 45P instrument can be controlled by iC IR software in a laboratory environment. This manual primarily uses iC IR software for installation and initial service setup.

- **iC Process software**—A ReactIR 45P instrument can also be controlled by iC Process software. When iC Process is the control software, iC IR is required to define the template experiment that will be part of the production '"method.' Refer to the "iC Process Software User Guide" for details.

Note: **IMPORTANT**: A ReactIR 45P instrument can only be controlled by one software system at the same time. Refer to "Switching Control Software" on page 73 for details.

Installing iC IR Control Software

1. Insert the iC IR installation CD in the PC and click Install iC IR #.# (setup.exe) from the welcome page.
2. Install the software according to the wizard-guided steps.
   Refer to the "iC IR Installation Guide" (4.3 or higher) for additional installation information on administering preferences, licensing, and sharing data between iC/iControl software applications. iC IR can control a ReactIR 45P instrument alone, or be used with iC Process software in a production environment.

Installing iC Process Control Software

Establishing and maintaining iC Process communications is the responsibility of the customer's IT department or other responsible party with qualifications. METTLER TOLEDO will assist the IT personnel in the process. Instrument configuration is also performed in iC Process, which also has a service mode.

If applicable, refer to the "iC Process Installation Guide" (4.3 or higher) and install the control software designed for production. Below is an overview of the process:

"A. Install iC Process Web Application" on page 24

"B. Verify User Security Setup by Your IT Department" on page 25

"C. Access iC Process through a Client and Add the Instrument" on page 25

"D. Install iC IR Software and the 'Process' Task Pane" on page 25

"E. Communicate to iC Process Software" on page 25

"F. Connect to ReactIR 45P from iC IR "Process" Task Pane" on page 26

A. Install iC Process Web Application

The control machine for the ReactIR 45P instrument runs the iC Process Web application software to control the instrument. Your IT department and the METTLER TOLEDO Field Service Engineer must have the software installed and user/group authentication set up according to the "iC Process Installation Guide."

Get the URL for the iC Process Web application from your IT department so you can access the software.

B. Verify User Security Setup by Your IT Department

Before a client can access the iC Process Web application, user/group security must be set up by your IT department. Access to iC Process is based on your network login ID. Depending on the setup, you may or may not have to log on.

C. Access iC Process through a Client and Add the Instrument

The client can be on the same computer where iC Process is installed (LocalHost) or it can be on a remote PC. The computer name in the URL will either be "LocalHost" or the machine name provided by your IT department.

1. Access iC Process via the URL (provided by your IT department).
2. Add the ReactIR 45P instrument and record the instrument IP Address (requires Administrator or Technician user role).

D. Install iC IR Software and the 'Process' Task Pane

iC IR software experiments created for ReactIR 45P instruments are saved as a template as the first step in creating a method for iC Process batch or continuous processing. In addition, a Process task pane in the iC IR Toolbox enables remote users to connect to the ReactIR 45P instrument and view real-time or post-processing results for analysis.

To install the task pane:

1. Ensure that the iC IR software has been installed on a remote PC according to the "iC IR 4.3 (or higher) Installation Guide." The PC must the specifications in the installation guide.
2. Start the iC IR software and verify the Process task pane appears in the iC IR Toolbox on the right side of the main window. If it does not, select Help > Preferences > Show iC Process task pane.

E. Communicate to iC Process Software

After power and communication has been connected to the ReactIR 45P instrument, the next step is to communicate with the ReactIR 45P through the iC Process Web application and connect to the iC IR software through the Process task pane.

1. Apply power to the ReactIR 45P base unit.
2. Open Internet Explorer and enter the iC Process URL provided by your IT department.
   http://<computer name>**/#/Home**
   Replace <computer name> with the name of the control machine where iC Process is installed, or replace it with "LocalHost" if the server and client are on the same computer.
3. Refer to the "iC Process Software User Guide" for details on how an Administrator or Technician adds and configures a ReactIR 45P instrument. As part of the configuration, an Administrator or Technician records the IP address of the ReactIR 45P instrument.

F. Connect to ReactIR 45P from iC IR "Process" Task Pane

After iC Process has been installed and configured for the instrument, authorized users can connect to the instrument and view real-time process data or import archive files for post-processing analysis.

Note: Before ReactIR 45P instrument can monitor a batch or continuous process, an Administrator must create a method based on a template imported from iC IR. Refer to the "iC Process Software User Guide" for detailed instructions on creating a method, the options to consider when creating an iC IR template, and how to export the template.

Refer to the "iC Process Installation Guide" and the "iC Process Software User Guide" for complete instructions on how to install the "Process" task pane in iC IR and connect to a ReactIR 45P instrument. Below are the overall steps to connect to the ReactIR 45P through iC IR software "Process" task pane.

1. Start the iC IR software by clicking a desktop icon.

2. From the software Toolbox on the right side of the Start Page, click the **Process** task pane.
3. In the **Server Name** box, enter the machine ID of the network computer where the iC Process Web application is running. (After successful connection, the name will appear in a drop-down list for ease of selection the next time you want to connect.)

   Note: A METTLER TOLEDO service engineer works with your IT personnel in the initial installation and guides the establishment of user authentication as mentioned in the appropriate ServicePac document.

4. Click **Connect**.
5. In the **Instrument** box, select the specific ReactIR 45P instrument to which you want to connect.

Accept or Change Computer System Settings

Verify the system date and time. If applicable, change the system language to the local language.

Optional Software

Install all optional software that is part of the order.

Mark the appropriate section of the ServicePac document after software installation and again after system startup confirms that the software launches.

10. Start Up System

Start up the ReactIR 45P as follows, based on the configuration.

Starting Up a ReactIR 45P NL

1. Verify the enclosure door is securely locked.
2. Apply 4.1–6.9 barg (60-100psig) of clean dry instrument air.

Caution—Pressure shall not exceed 6.9barg (100psig).

3. Regulate the air flow to the enclosure at 5SCFH and to the TE cooler at 4SCFM.
4. Connect the ReactIR 45P system country-specific power cord to the power supply.

The ReactIR 45P system is ready for software configuration.

Starting Up a ReactIR 45P HL

1. Verify the ReactIR 45P system enclosure and the purge/pressurization control unit are locked.
2. Apply 4.1–6.9 barg (60–100 psig) of clean, dry instrument quality air to the system.

Caution—Pressure shall not exceed 6.9barg (100psig).

3. Regulate air flow to the enclosure at 8SCFM and to the TE cooler at 4SCFM.
4. Apply power to the ReactIR 45P system and observe the MiniPurge indicators (Figure 2-2).
   As the system goes through rapid exchange of enclosure air, the indicators change to green followed by yellow and green.

Table 2-2 Purge System Indicator States

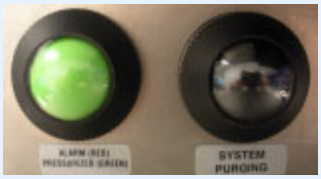
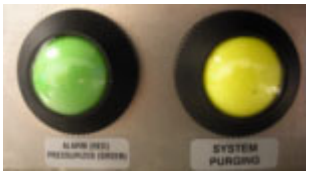
	Indicators	State
1		**Unpressurized/Alarm condition** No flow to base unit enclosure. The base unit enclosure is not pressurized. No pressure (0 psig), No Flow (OFF)
2		**Purging—Low Flow Prior to Rapid Exchange** Pressure (>60 psig), Low Flow (below 4 SCFM)

Table 2-2 Purge System Indicator States (continued)

	Indicators	State
3		**Purging—Rapid Exchange mode** The purge/pressurization process takes approximately five (5) minutes and no longer than 10 minutes. The right indicator changes to yellow when rapid exchange is in process. Pressure (60 psig), Flow (approximately 4 SCFM)
4		**Pressurized—Leakage Compensation Mode (Operating State)** Purge complete. This is the operating state. Pressure (60 psig), Flow (above 0.5 SCFM)

5. Continue to observe the purge indicators. The enclosure is fully purged and pressurized when the left indicator is green and the right indicator is black. Proceed to step 6.

> **Note:** If the right indicator changes to yellow immediately after rapid exchange, leakage compensation is inadequate. Proceed to step a.

a. If leakage compensation is inadequate, open leakage compensation valve one full turn counterclockwise. Then, repeat step 5.

b. If the right indicator is still yellow, repeat the compensation valve opening followed by step 5 until the ReactIR 45P system powers ON. If the system does not attain the fully pressurized operating state, contact METTLER TOLEDO.

6. After the purge/pressurization completes and the enclosure is fully pressurized, the EXPO MiniPurge Interface Unit (MIU) releases power to the ReactIR 45P system.

The ReactIR 45P system is ready for instrument configuration through the control software.

ReactIR 45P LED Indicators

Four LED indicators (Figure 2-13) on the panel below the ReactIR 45P base unit enclosure show the status of the instrument as it relates to power, scanning/communication, and system readiness. A fully functional instrument will yield solid blue Power, Temp OK, and MCT OK indicators and a flashing blue Scan indicator.

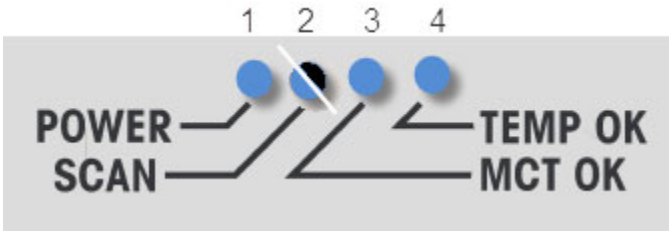


Figure 2-13 ReactIR 45P LED Indicators (fully functional status)

Table 2-1 ReactIR 45P LED Indicators

LED		Status	Description
1	Power	**OFF**	ReactIR 45P is without power.
		Blue—Solid	System is powered.
2	Scan	**OFF**	System not scanning.
		Blue—Flashing	System is scanning and sending data to software application. Scanning occurs when the instrument is powered and the driver has been recognized.
3	MCT OK	**Blue**—Solid *	Stirling MCT temperature has reached its set point. Time required is several minutes.
		OFF	Fault condition (MCT detector). Normal (DTGS detector)
4	Temp OK	**Blue**—Solid	Modulator temperature has reached its set point. Time required may be up to four (4) hours.
		OFF	Fault condition.

***** Not applicable with DTGS detector.

LED statuses that are highlighted in Table 2-1, above, indicate a fully operational system. Refer to the Troubleshooting chapter in the system hardware manual for tips on things to check to achieve operational LED status.

11. Configure Instrument in Control Software

Perform instrument configuration in iC IR software to take advantage of the alignment tools. Then, configure the ReactIR 45P instrument in the iC Process software. Record the configuration settings in the appropriate ServicePac document.

Configuration in iC IR

1. Click **Configure Instrument** from the iC IR Start Page.

2. Click **Connect** in the FTIR Instrument Initialization Failed message.

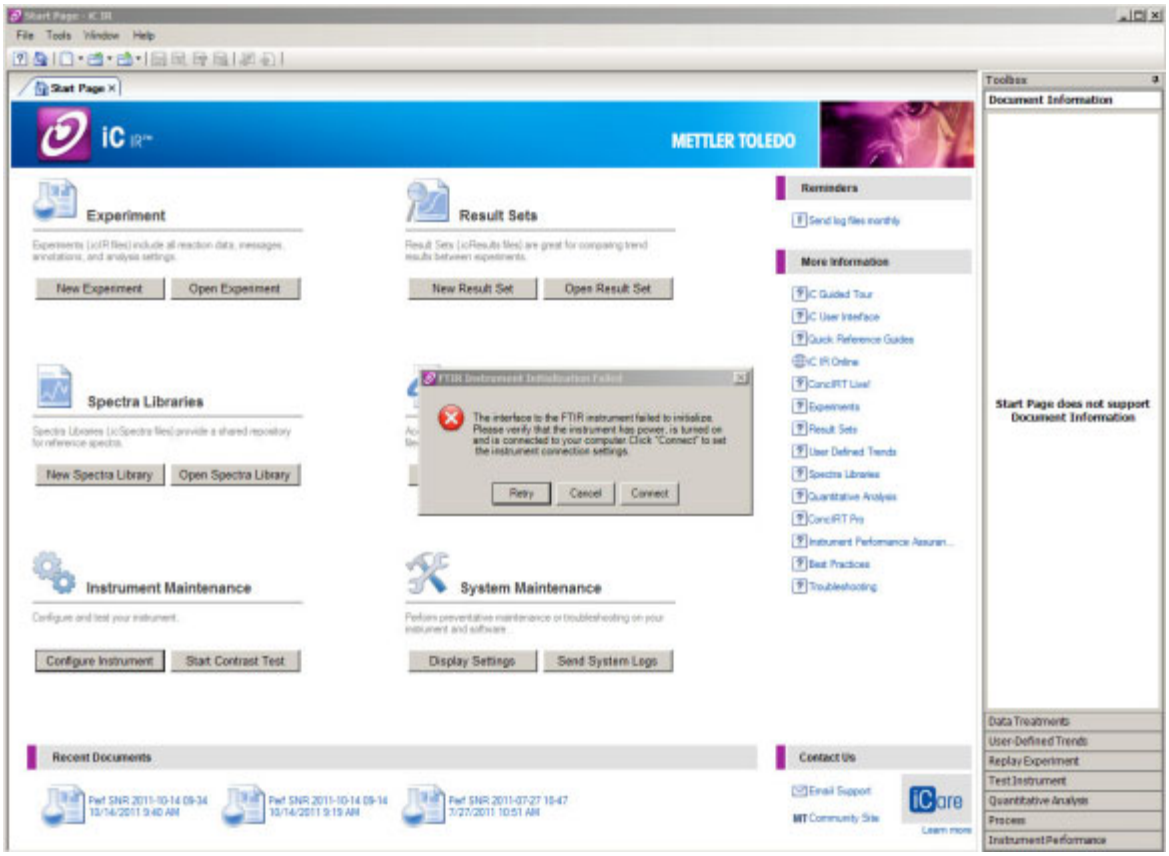


Figure 2-14 iC IR Start Page—Configure Instrument prompt to connect

3. Enter the instrument URL in the Ethernet Settings text box.

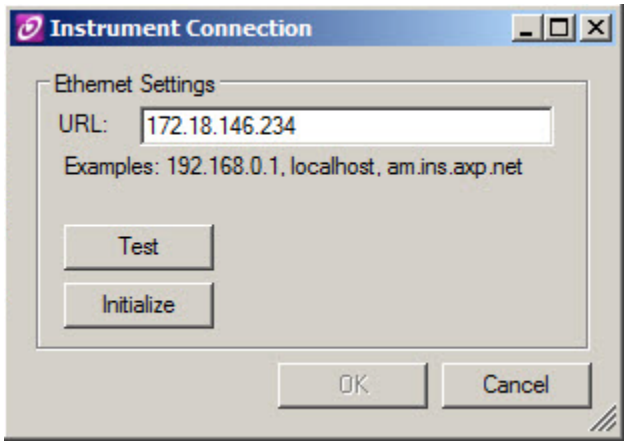


Figure 2-15 Instrument Connection dialog box

4. Click **Test** to verify communication connection to the ReactIR 45P.

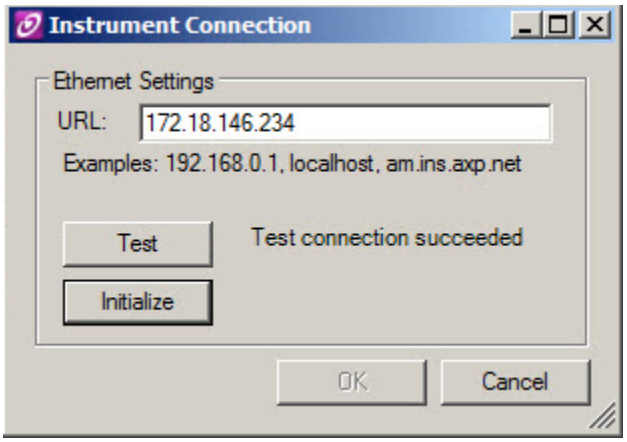


Figure 2-16 Instrument Connection—Test and initialize

5. Click **Initialize**.
6. Click **OK** after successful initialization. The Configure Instrument wizard appears.

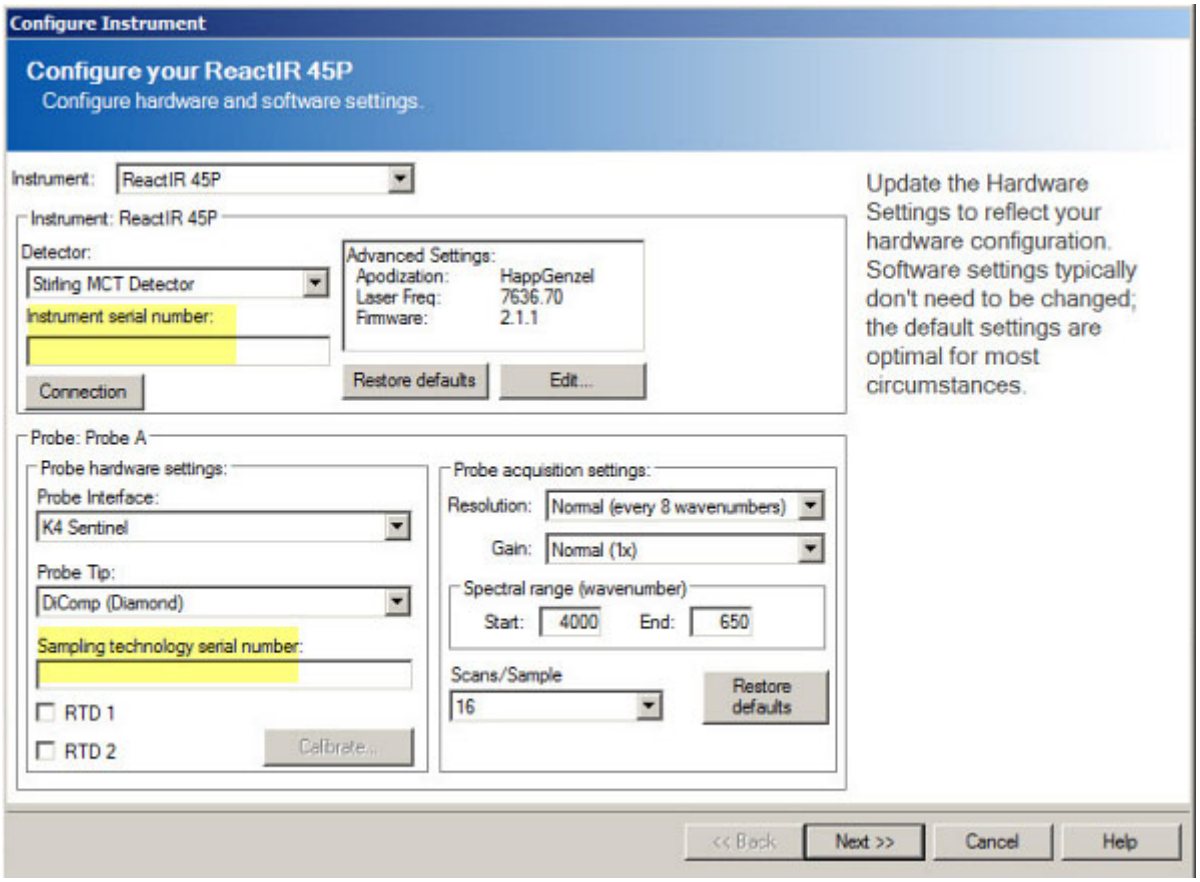


Figure 2-17 Configure Instrument wizard

7. Select the ReactIR 45P instrument, verify the detector, and enter the serial number. In the Advanced Settings text window, notice the Laser Frequency value and the Firmware version.
8. Identify the sampling technology by selecting from the following drop-down lists:
   Probe Interface
   Probe Tip
9. Enter the sampling technology serial number.

The procedure in the next step documents the steps required to calibrate the built-in sampling technology RTDs. This calibration process will require the use of an external calibrated temperature monitoring device such as a thermocouple.

10. If the RTD interface module option is included for DS FiberConduit probes, select RTD 1 and click **Calibrate**.to launch the RTD calibration wizard.

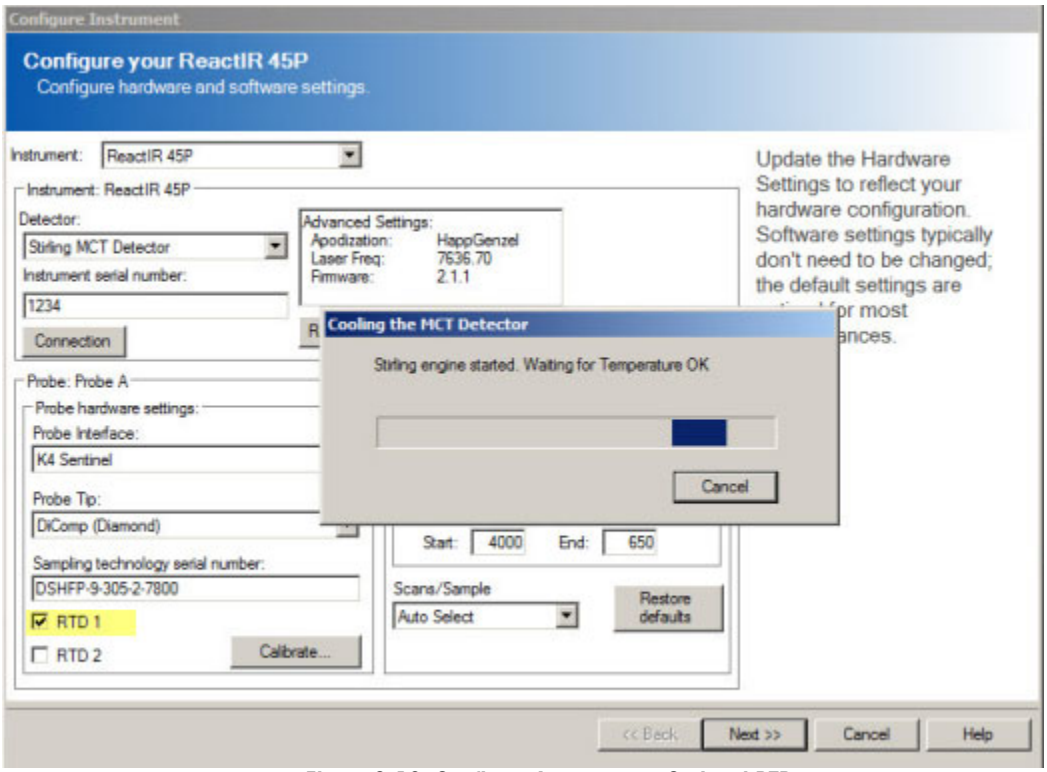


Figure 2-18 Configure Instrument—Optional RTD

a. Select the RTD1 row and highlight the RTD Device.
   - Select 'new' using the drop-down arrow and create a new name for the RTD.
   - Click **Next**.
   - Select the two-point calibration and click **Next**.

b. Perform the cooling calibration for RTD 1, as follows:

- Connect the RTD to the appropriate RTD connector on the side panel of the ReactIR 45P base unit. (Refer to Figure 2-3 for location of RTD connector inputs on NL field unit and Figure 2-5 for location on HL base unit.)
- Cool the probe/RTD along with the calibrated temperature monitoring device to as close to 0°C as possible.
- Wait for the system to stabilize by observing a constant value at the temperature monitoring device.
- In the Reference Temperature section of the calibration wizard, enter the actual value from the calibrated temperature monitoring device and click **Next**.
- Click **Save** to record the calibration.

c. Perform the heating calibration for RTD 1, as follows:

- Heat the probe/RTD along with the calibrated temperature monitoring device to as close to 100°C as possible.
- Wait for the system to stabilize. In the Reference Temperature section enter the actual value from the calibrated temperature monitoring device and click Next.
- Click **Save** to record the calibration.

d. Repeat steps to calibrate RTD 2, making sure you use the appropriate connector on the side panel.

11. Accept the remaining configuration default settings and click **Next**.

12. The wizard displays an image of a ReactIR 45P HL (Hazardous Location) system with the specified sampling technology and a prompt to clean the probe. Click **Next** when the probe is ready for alignment procedure.

Figure 2-19 Configure Instrument—Prompt to prepare probe for alignment

13. Observe the Peak Height and Contrast. If the bars are not blue, indicating peak height is below 20,000, adjust the alignment as described under section "1. Check Alignment (Contrast and Align)" on page 43.

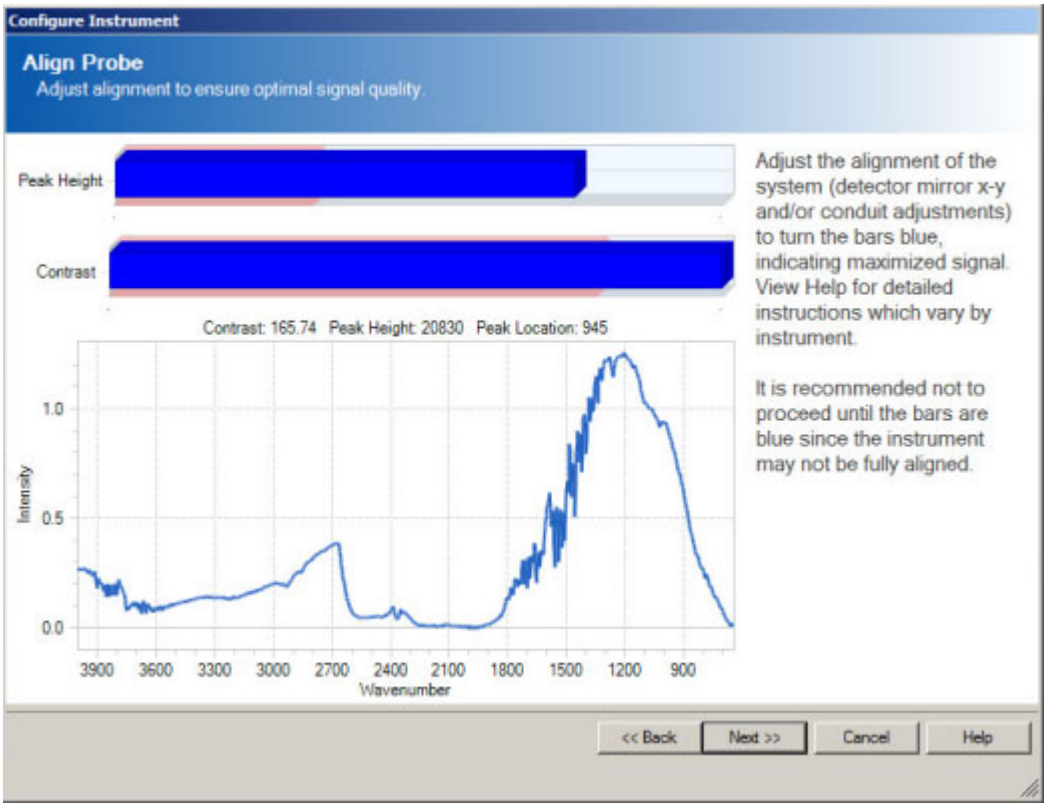


Figure 2-20 Configure Instrument—Align Probe

Configuration in iC Process

The process to add and configure a ReactIR 45P is summarized below. Refer to the "iC Process Software User Guide" for detailed instructions.

1. Go to the iC Process Home page.
   If a login prompt appears, enter your network login ID and password. (A login may or not be required depending on how your IT department chose to implement the iC Process Web application.)

2. Add the ReactIR 45P instrument to the system by entering a name in the 'Add new instrument' box. The name cannot be changed, so take care to enter the name that the customer wants to identify the instrument.

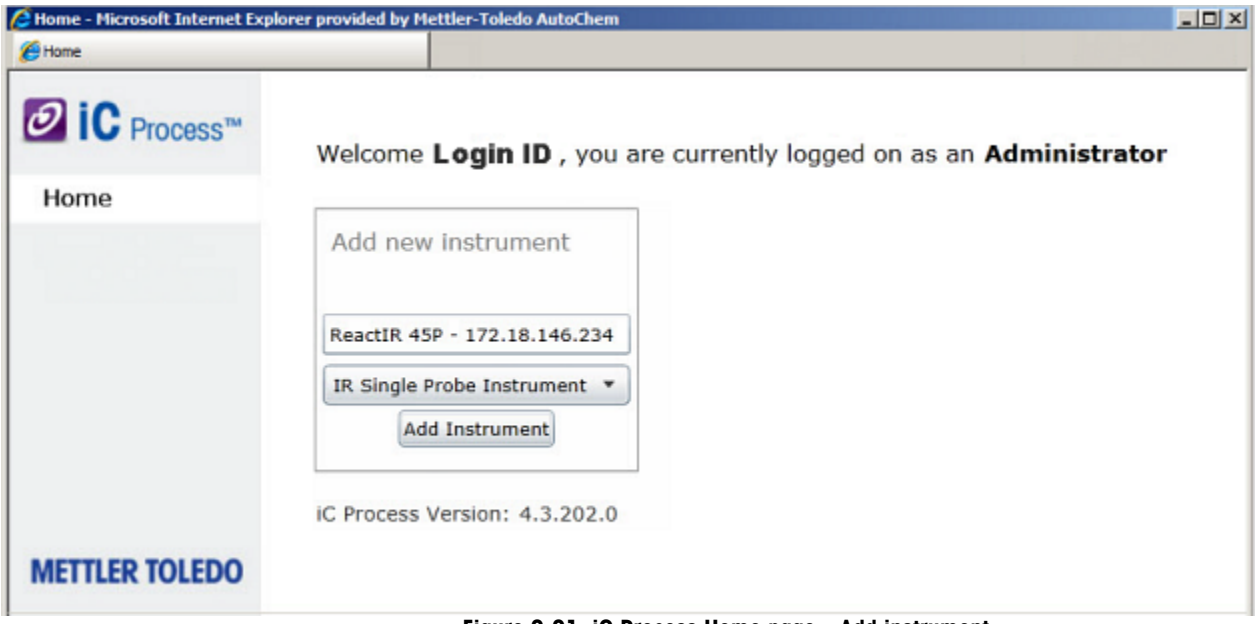


Figure 2-21 iC Process Home page—Add instrument

After you add an instrument, it appears on the Home page.

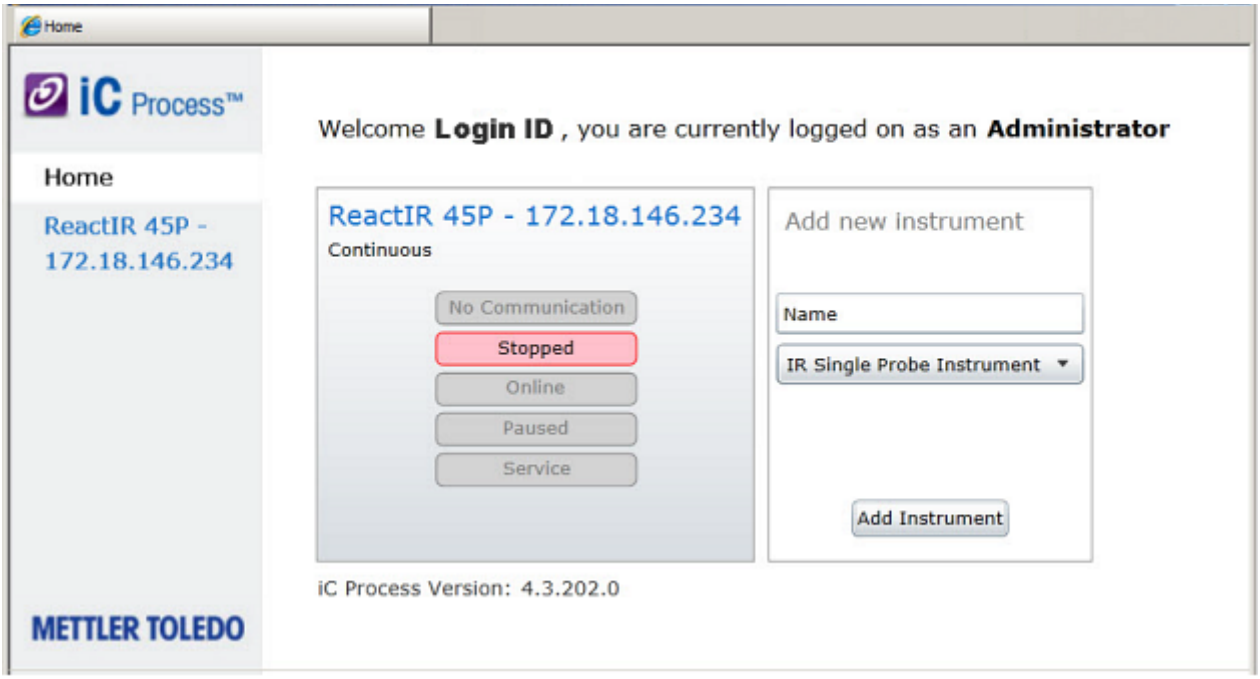


Figure 2-22 iC Process Home page

3. Select the ReactIR 45P instrument name from the Home page left navigation frame or by clicking the instrument box on the main page.
   The main iC Process page appears (not shown).
4. Click **Configuration** from the left navigation submenu for the instrument.

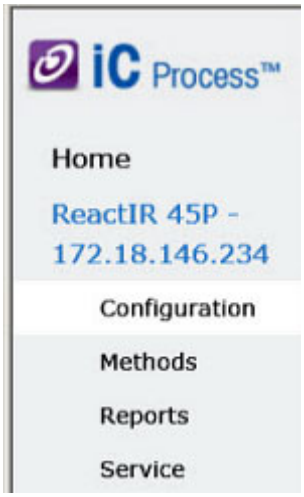


Figure 2-23 iC Process left navigation submenu

5. Complete the configuration settings (Figure 2-24).

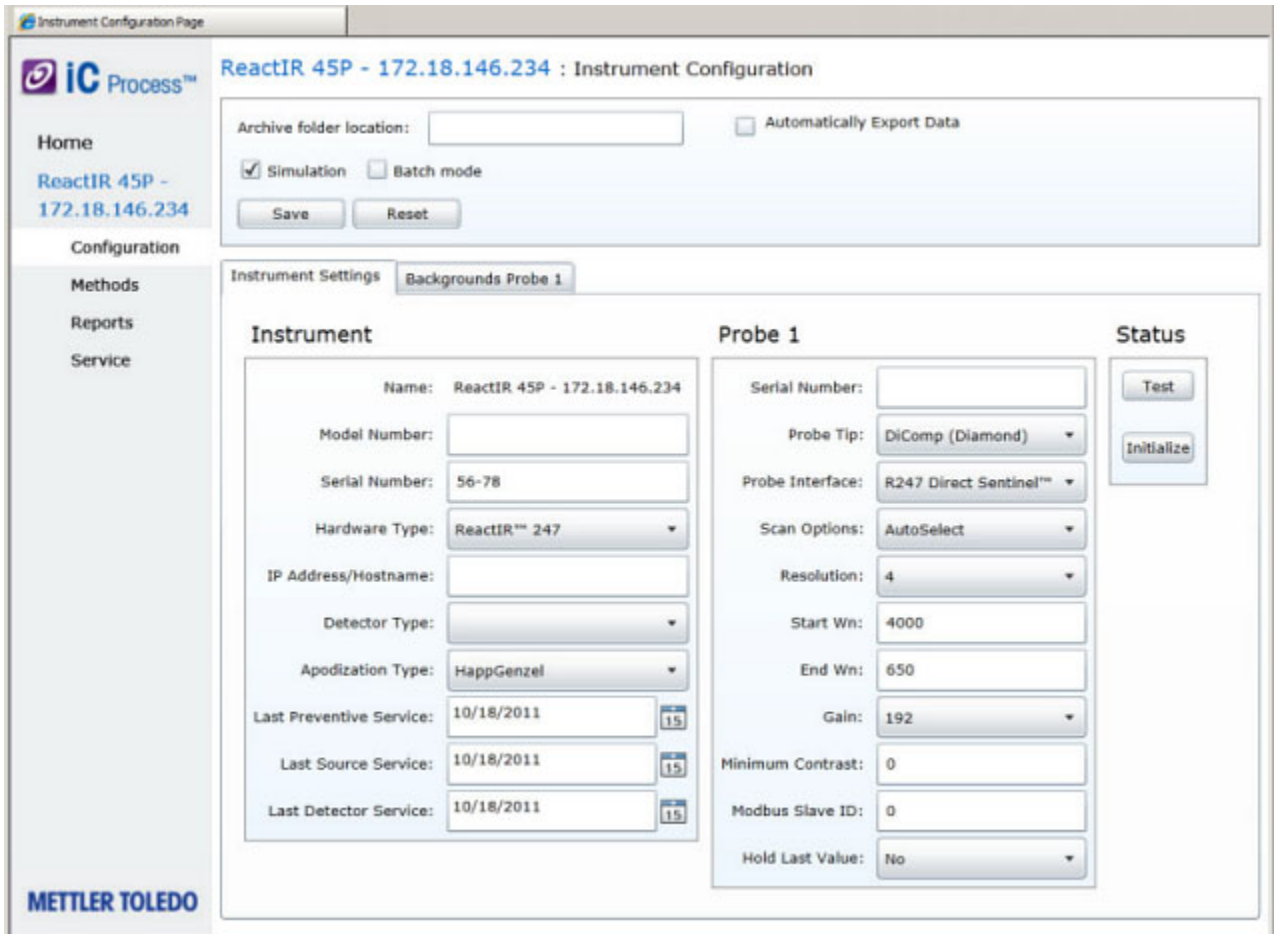


Figure 2-24 iC Process Configuration—Instrument Settings tab

Refer to the "iC Process Software User Guide" for details.

Note: After an administrator imports an iC IR experiment template required to define an ReactIR 45P method, several of the instrument setting fields will be compared to the template. If incompatibilities exist, messages appear that describe the differences. Refer to the "iC Process Software User Guide" for details.

Below are the required steps:

a. **Archive folder location**: Specify the place where batch or continuous process files will be stored as iC IR experiments.

b. **Simulation**—Remove the check mark.

c. **Hardware Type**—Select ReactIR 45P.

d. **IP Address/Hostname**—Enter the IP address for the ReactIR 45P provided by your IT department.

e. **Detector Type**—Select the type of detector purchased with the instrument. MCT is the default (Stirling MCT). DTGS is an option.

f. **Probe Interface**—Select the type of sampling technology connected to the instrument.

g. Status: **Test** and **Initialize**—After the required entries have been made, press the **Test** button to verify the communication between the software and the instrument IP address. After a successful test, press the **Initialize** button to take control of the ReactIR 45P instrument.

Complete the following entries:

a. **Batch Mode**—mode—If the instrument will process chemistry in batches rather than in continuous mode, mark this box.

b. **Automatically Export Data**—If you want the software to export samples to a

c. specified location after every sample collection, select this box.

d. **Model Number (Instrument)**—Enter the ReactIR 45P model number (METTLER TOLEDO part number).

e. **Serial Number**—Enter the ReactIR 45P instrument serial number from the enclosure label.

f. **Serial number (Probe 1)**—Enter the serial number that uniquely identifies the sampling technology connected to the instrument.

System Diagrams

The following diagrams show a typical ReactIR 45P NL and HL system after installation:

Typical NL System

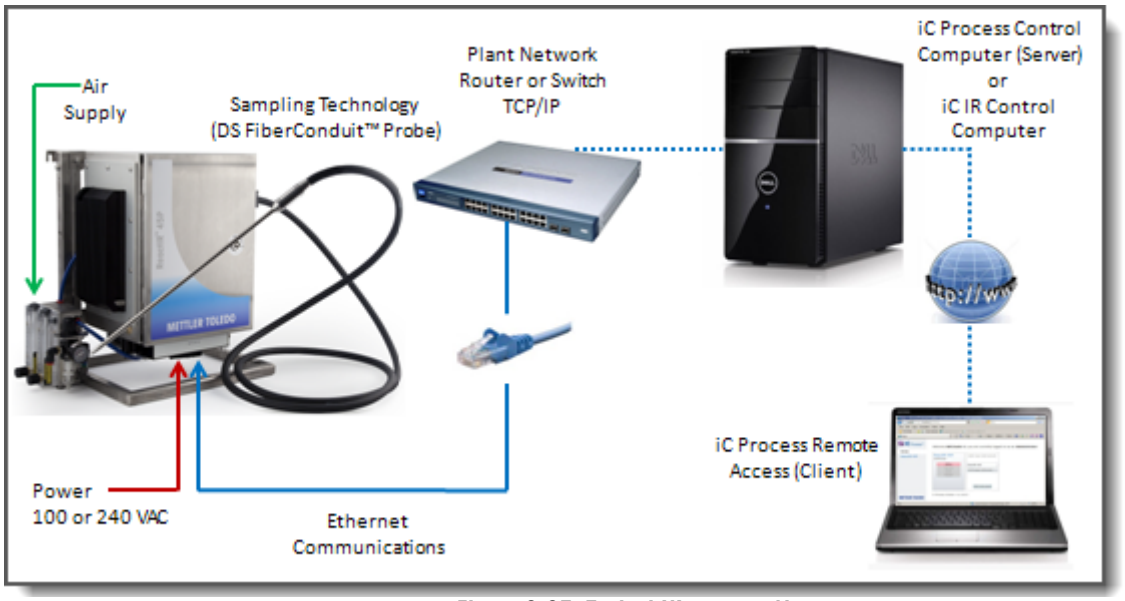


Figure 2-25 Typical NL system diagram

Typical HL System

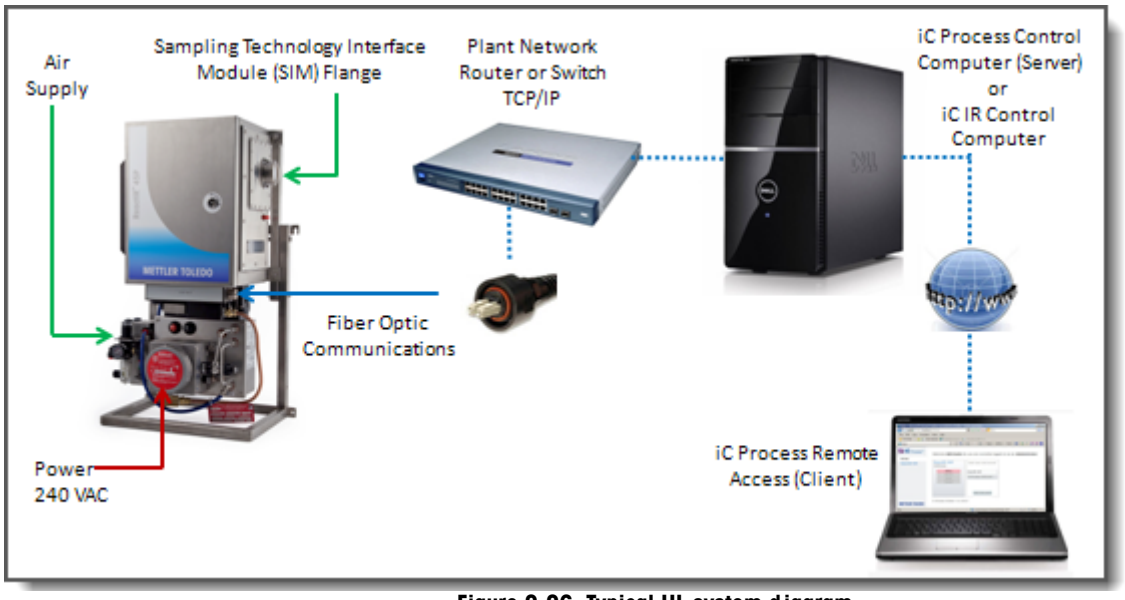


Figure 2-26 Typical HL system diagram

System Diagrams

3

System Readiness

This chapter describes the procedures for system readiness in the following sections:

Caution—If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Preparing for ReactIR 45P Functional Tests

The second phase of system installation consists of performance tests of the ReactIR 45P with its sampling technology. This phase follows system installation, so the system is assumed to be powered on and communicating with the control software.

1. Ensure that Instrument Configuration is completed as described under section "11. Configure Instrument in Control Software" on page 29.
2. Verify the ReactIR 45P LEDs (page 28) are in the fully operational state: Scan light is flashing and the MCT (if applicable) and Temperature lights are illuminated, indicating all functions are operational.
3. Ensure the ReactIR 45P system has been powered ON for four (4) hours.

   Note: Please follow the test procedures completely to ensure the correct and comprehensive results.

4. If you plan to run functional tests using the software that is **not** currently controlling the ReactIR 45P instrument, you must change the control to the software of choice. See instructions under "Switching Control Software" on page 73.

As needed, review the terminology below to become familiar with functional tests.

Definitions

The functional tests use the following terminology:

iC IR is the software that enables a user to monitor real-time chemistry in a lab with capabilities to analyze and review the result sets.

iC Process is the Web application software on a control computer that enables a user to monitor real-time process chemistry in a production environment and review the status of the diagnostics and process variables on the ReactIR 45P.

Administrator role is a system administrator access level in iC Process with permissions to add and configure instruments and define and approve process methods.

Operator role is an iC Process user with access to start/stop or pause/resume a batch or continuous process after selecting an approved method. An operator can view the status of the ReactIR 45P and process variables, but may not alter these.

Technician role is an iC Process user with access to all the actions that an Administrator can perform regarding an instrument, with no access to create or approve methods. Technicians can access the Service submenu to perform Contrast, Stability, and Performance tests for an instrument.

Sampling Technology is the type of sensor and conduit combination placed on the system (refer to the "ReactIR 45P Hardware Manual" for descriptions of the sampling technology configurations).

Signal-to-Noise Ratio (SNR) is a measure of ReactIR 45P base unit performance. This value represents a specific method of measurement at METTLER TOLEDO that historically defines performance according to the original design specification.

Acetone Peak Height (Acetone Absorbance) is another measure of ReactIR 45P performance. This value indicates sensor integrity in the Sentinel probe by measuring the absorbance of neat acetone with your sampling technology.

Acetone-to-Noise Ratio (ANR) is a holistic measurement of ReactIR 45P performance through a calculation using Signal-to-Noise and Acetone Peak Height. Knowing the energy throughput of the system (Signal-to-Noise) and sensor path length (Acetone Peak Height), we can calculate a value that best represents the performance across all ReactIR 45P base units and applicable sampling technology. What the value actually provides is assurance of chemistry monitoring that affords detection of reaction start, progress, and end-point. Infrared fingerprints (data) over time will yield absorbance trends of key reaction species (information) at concentrations possible with the ANR value. The higher the ANR, the lower the detection limit of the ReactIR 45P. You can purchase a variety of sampling technologies for attaining an ANR that fits the concentration levels to monitor in your chemistry.

Conducting Functional Tests Using iC IR

If the ReactIR 45P is solely controlled by iC IR software use the procedures in this section. If iC Process is the control software, follow the instructions under "Conducting Functional Tests Using iC Process" on page 61. Perform functional tests in the following sequence:

"1. Check Alignment (Contrast and Align)" on page 43

"2. Check Diagnostics" on page 47

"3. Check System Performance" on page 48

"4. Check System Stability" on page 54

"5. Perform IPA Validation/Calibration (if applicable)" on page 56

1. Check Alignment (Contrast and Align)

Note: If you use iC Process to control the ReactIR 45P instrument and you want to run the functional tests using iC IR, an Administrator must change control of the instrument (see instructions on page 74).

1. Select the **Test Instrument** task pane from the iC IR Toolbox.

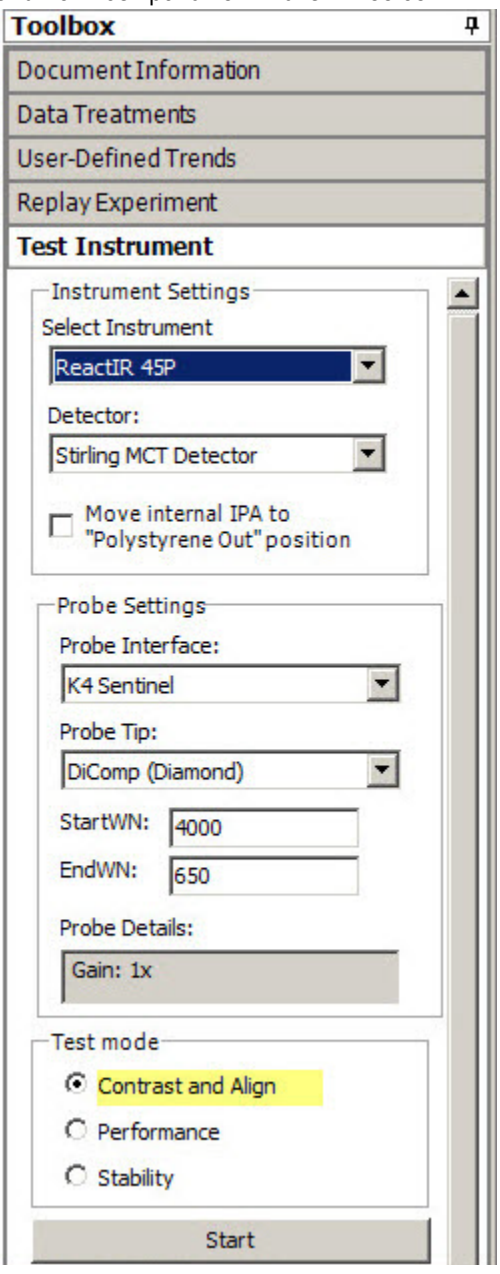


Figure 3-27 Contrast and Align test from iC IR Test Instrument task pane

2. Select appropriate Instrument and Detector.
3. Select applicable Probe Settings.
4. Select **Contrast and Align** from the Test mode section (Figure 3-27).
5. Click **Start**. Align window opens showing contrast, peak height, and peak location.

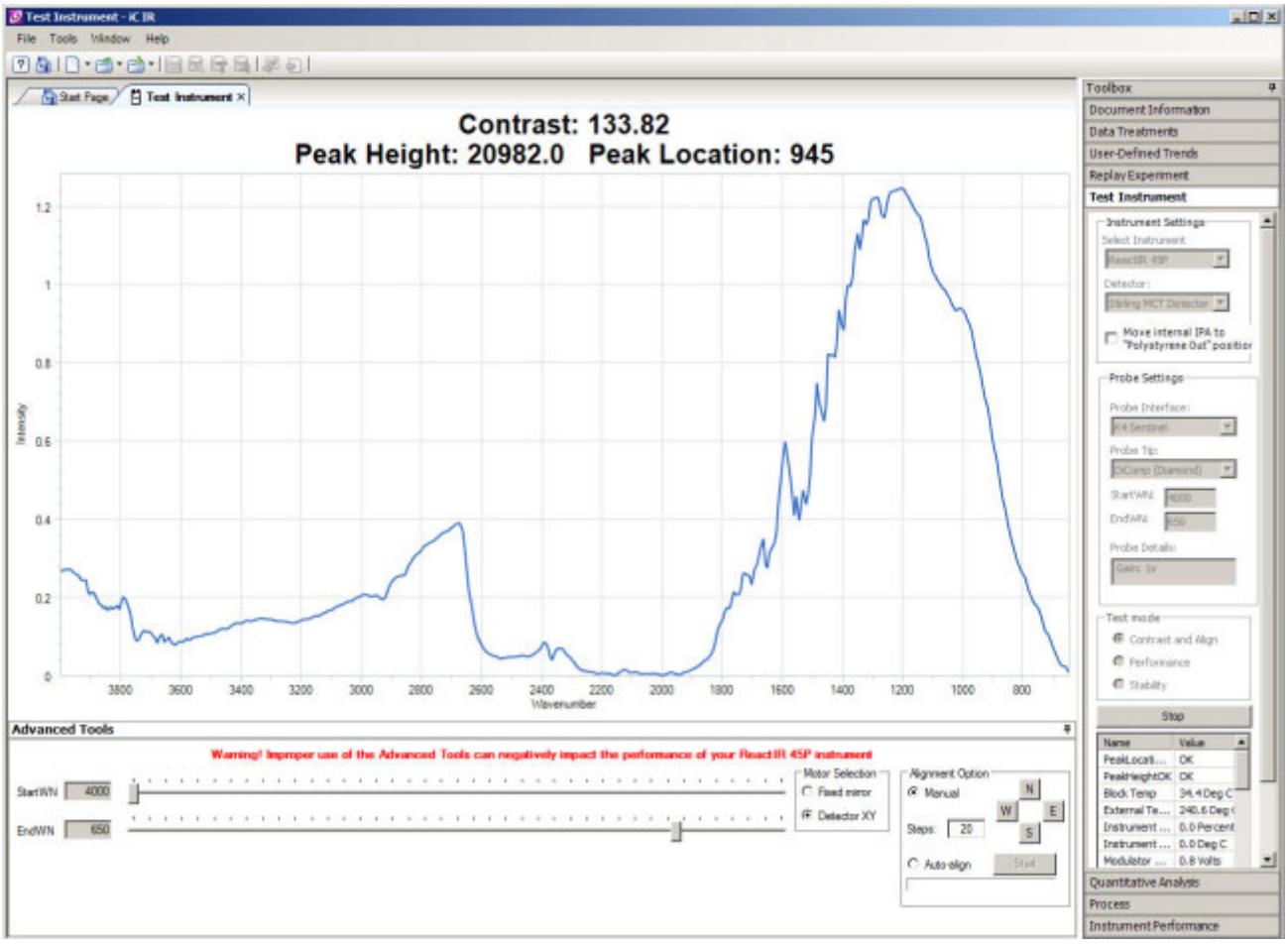


Figure 3-28 Contrast, peak height, and peak location in iC IR

6. Record peak height and contrast test values in the appropriate ServicePac document.

Note: Do not proceed with functional tests until optimal alignment exists. Follow advanced adjustment features (page 45), if necessary.

Advanced Adjustment Features

When the Peak Height value is within the specified range, no alignment should be necessary. If optimal Peak Height and Contrast are not achieved, perform advanced procedures to adjust the detector mirror and/or gain. The advanced alignment procedures are only necessary if the Peak Height value is outside of 16,000—24,000 counts with a fully functional instrument. This might be needed if sampling technology is changed.

Follow the procedure below for the type of sampling technology that is connected to the ReactIR 45P system.

Auto-Align Detector XY through iC IR Software

If the Contrast and Align test does not result in an optimal Peak Height and Contrast, adjust the Detector X-Y mirror.

ReactIR 45P Alignment Procedure (DS Fiber Probe & DS Micro Flow Cell Technology)

Note: Ensure the probe window is clean prior to making any adjustments.

1. Open the Test Instrument task pane in the iC IR Toolbox.
2. Select the Contrast and Align Test Mode option and click **Start**.
3. If the Peak Height value is out of range (16,000-24,000), go to the Advanced Tools section at the bottom of the window.
   - Select Detector XY in the Motor Selection.
   - Select Auto-align from the Alignment Option.
   - Click the **Start** button.
4. If the Peak Height value is low after completion of Auto-align, adjust the Gain potentiometer on the detector Preamp to bring the Peak Height value as close as possible to 20,000 counts (see "Adjusting Gain" on page 46).
5. Run a Performance Test to verify the SNR value meets specification to ensure optimal alignment.

ReactIR 45P Alignment Procedure (DS Fiber-to-Sentinel Technology)

Note: Ensure the probe window is clean prior to making any adjustments.

1. Open the Test Instrument task pane in the iC IR Toolbox.
2. Select the Contrast and Align Test Mode option and click **Start**.
3. If the Peak Height value is out of range (16,000-24,000), go to the Advanced Tools section at the bottom of the window.
   - Loosen the clamp and rotate the sensor on the last knuckle of the conduit to optimize the Peak Height and Contrast values.
   - Select Detector XY in the Motor Selection.
   - Select Auto-align from the Alignment Option.
   - Click the **Start** button.

4. If the Peak Height value is low after completion of Auto-align, adjust the Gain potentiometer on the detector Preamp to bring the Peak Height value as close as possible to 20,000 counts (see "Adjusting Gain" on page 46).
5. Run a Performance Test to verify the SNR value meets specification to ensure optimal alignment.

ReactIR 45P Alignment Procedure (Mirrored Conduit—K4, K6)

Note: Ensure the probe window is clean prior to making any adjustments.

1. Open the Test Instrument task pane in the iC IR Toolbox.
2. Select the Contrast and Align Test Mode option and click **Start**.
3. If the Peak Height value is out of range (16,000-24,000), go to the Advanced Tools section at the bottom of the window.
   - Loosen the clamp and rotate the sensor on the last knuckle of the conduit to optimize the Peak Height and Contrast values.
   - Adjust the three (3) thumbscrews on the last knuckle of the conduit to optimize Peak Height and Contrast values.
   - Select Detector XY in the Motor Selection.
   - Select Auto-align from the Alignment Option.
   - Click the **Start** button.
4. If the Peak Height value is low after completion of Auto-align, adjust the Gain potentiometer on the detector Preamp to bring the Peak Height value as close as possible to 20,000 counts (see "Adjusting Gain" on page 46).
5. Run a Performance Test to verify the SNR value meets specification to ensure optimal alignment.

Adjusting Gain

If the Peak Height value is low after completion of Auto-align, adjust the Gain potentiometer on the detector Preamp to bring the Peak Height value as close as possible to 20,000 counts. The Preamp circuit board is inside the enclosure.

WARNING—There are no user-serviceable parts inside a ReactIR 45P system. Contact your METTLER TOLEDO Field Service Engineer (FSE) for all service needs.

WARNING—For a ReactIR 45P HL system under purge/pressurization, observe the WARNING PRESSURIZED ENCLOSURE label on the enclosures.

Although each control software has a gain setting field in the instrument configuration, the recommend process is to manually adjust the gain, if needed, during initial system readiness. Gain adjustment is also necessary when switching sampling technologies to achieve optimal Peak Height and Contrast.

1. Power down the instrument.
2. Unlock and open front door of the enclosure.
3. Adjust the potentiometer labeled "Gain" with a flathead screwdriver to set the Peak Height to approximately 20,000 counts.
   - Clockwise rotation increases Peak Height.
   - Counterclockwise rotation decreases Peak Height.

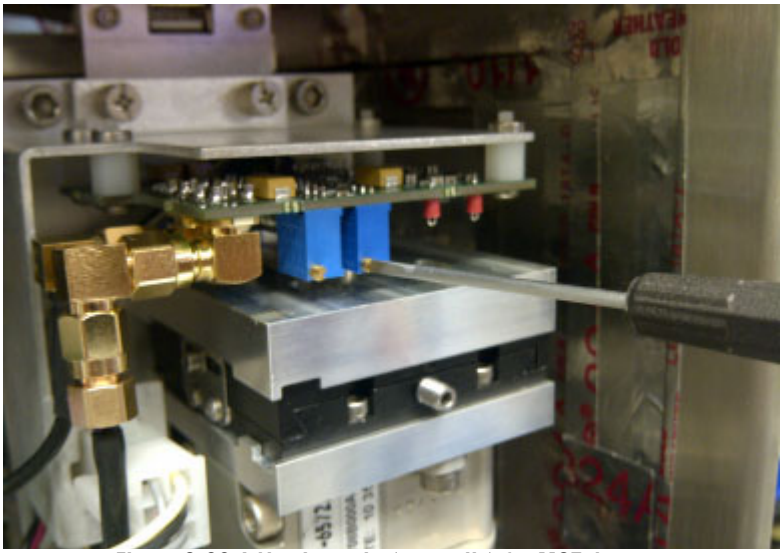


Figure 3-29 Adjusting gain (manually) for MCT detector

Note: The DTGS Preamp board has one potentiometer.

4. Observe Peak Height and Contrast in the iC IR Test Instrument window (Figure 3-28). If the optimal values are not yet attained, contact METTLER TOLEDO.
5. Run a Performance Test to verify the SNR value meets specification to ensure optimal alignment.

2. Check Diagnostics

Diagnostics must be checked by an FSE.

1. Access on the instrument diagnostics in the proprietary service software.
2. Verify the diagnostics are within tolerance.

3. Check System Performance

Note: If you use iC Process to control the ReactIR 45P instrument and you want to run the functional tests using iC IR, an Administrator must change control of the instrument (see instructions on page 74).

ReactIR 45P system performance is a combination of the following tests (see definitions on page 41):

- "Signal-to-Noise Ratio (SNR)" on page 48
- "Acetone Peak Height" on page 51
- "Acetone-to-Noise Ratio (ANR)" on page 70

Signal-to-Noise Ratio (SNR)

1. Ensure the sensor is clean and dry, and void of any potential contact with solvent or reaction mixture.
2. Select the **Test Instrument** task pane from the Toolbox.

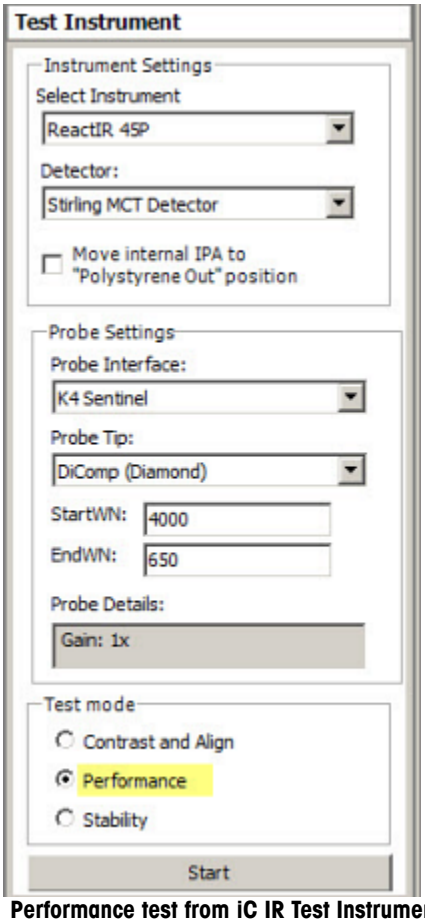
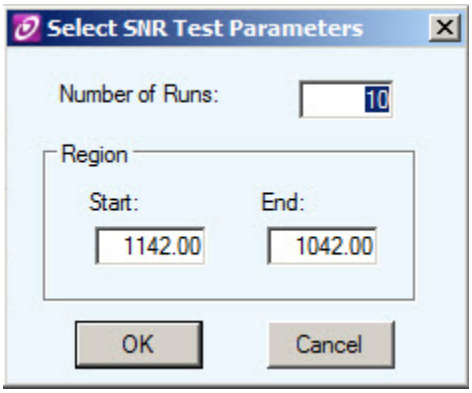


Figure 3-30 Performance test from iC IR Test Instrument task pane

3. Select appropriate Instrument and Detector.
4. Select applicable Probe Settings.
5. Select **Performance** from the Test mode section (Figure 3-30).
6. Click **Start**.
7. Enter **10** as the number of runs, and click **OK**.



The Performance test window (Figure 3-31) opens to display trend chart and values as the system collects 10 background / sample pairs. The parameters used for collection are 1 minute scan time and 4 cm^{-1} resolution.

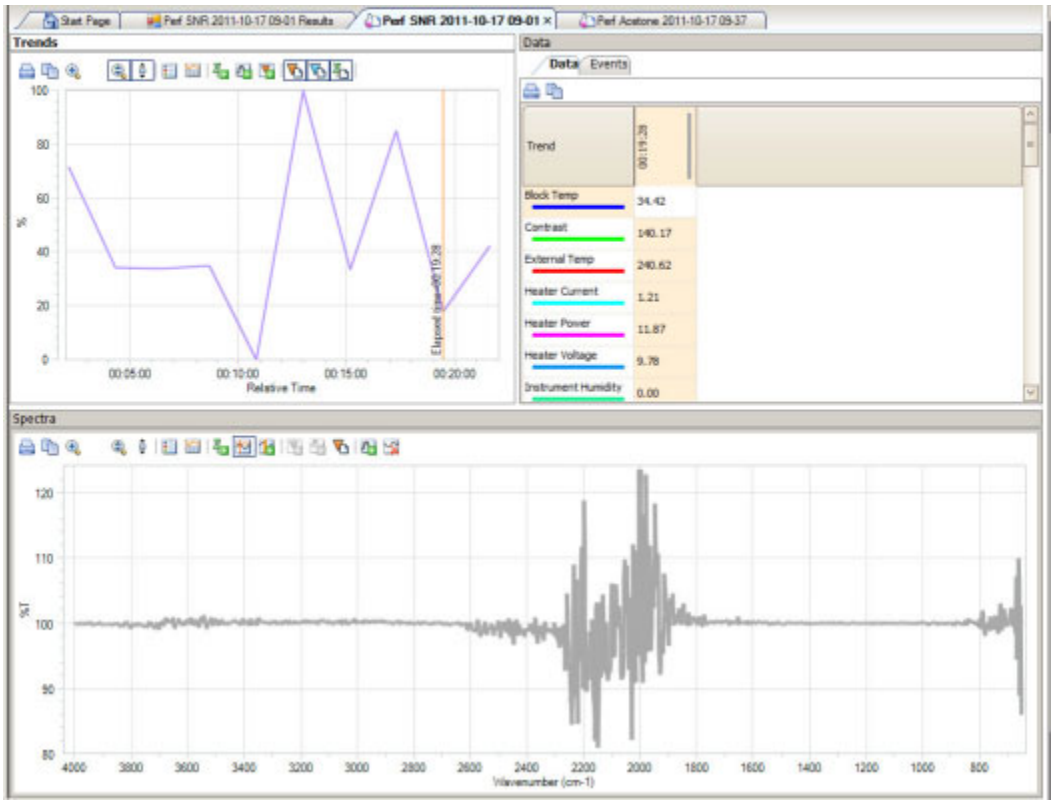


Figure 3-31 Performance SNR test in iC IR

8. Wait for test to complete and select the Results tab (Figure 3-32).
9. Record the Average SNR from the 'Perf SNR' tab in the 'Performance Test Values' section of the appropriate ServicePac document.

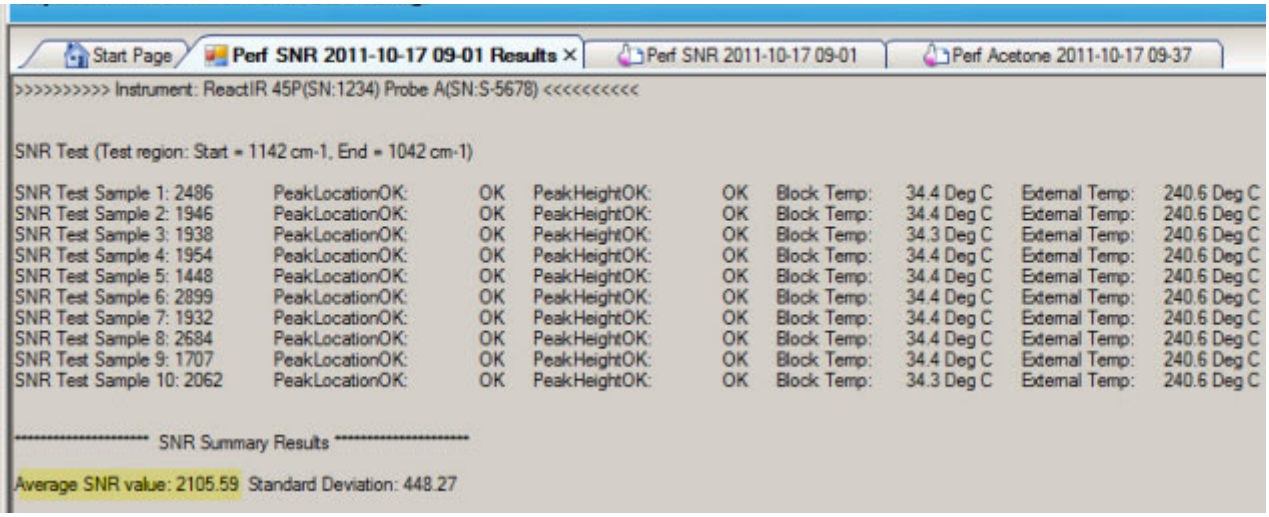


Figure 3-32 Performance test results—SNR

10. Check the results against the factory specification criteria for your sampling technology in Table 3-2.

Table 3-2 Signal-to-Noise (SNR) Factory Specifications

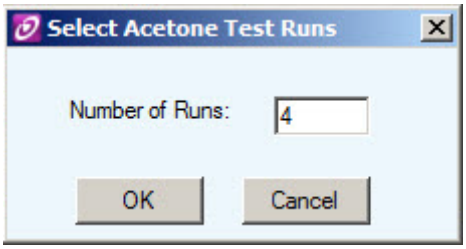
Sampling Technology	Factory Specification—SNR Greater Than:
DiComp 6.3mm DS FiberConduit	**1700**
DiComp 9.5mm DS FiberConduit	**1700**
DiComp 16mm with K6 Mirror Conduit	**2400**
DiComp K4 Mirror Conduit to Sentinel	**4800**
DiComp Fiber-to-Sentinel	**3000**
DiComp DS Micro Flow Cell	**4000**
SiComp 6.3mm DS FiberConduit	**1000**
SiComp 9.5mm DS FiberConduit	**1700**
SiComp 16mm with K6 Mirror Conduit	**1200**
SiComp K4 Mirror Conduit to Sentinel	**3000**
SiComp Fiber-to-Sentinel	**2200**
SiComp DS Micro Flow Cell	**1500**
Special	**See Factory Test Records**

11. Record the value in the SNR box in the appropriate ServicePac document. If the measured value is greater than the acceptable value in Table 3-2, document the non-conformance in the ServicePac document.
12. Proceed to Acetone Peak Height test.

Acetone Peak Height

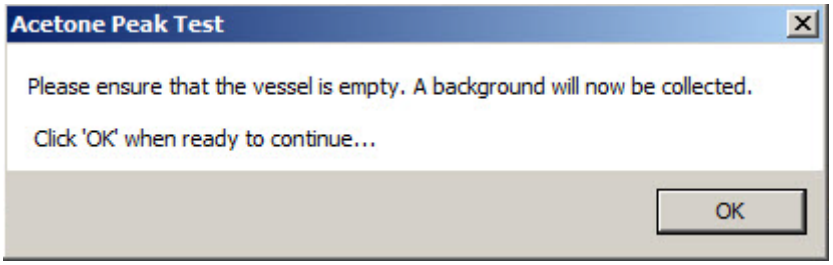
The Select Acetone Test Runs window will appear immediately following completion of the SNR test. The Acetone Peak Height test checks sampling technology performance by measuring the peak height with acetone on the sensor.

1. Enter **4** in the number field for the number of tests.

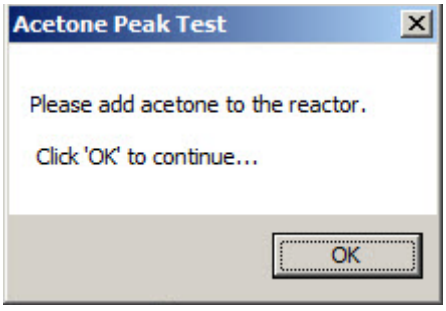


This step instructs the system to collect four acetone spectra.

2. Ensure the sensor is clean and dry. Take note of the precaution in the Acetone Peak Test window.



3. Click **OK**. Wait until the background is collected and the following message appears.



4. Dip the probe into a vessel, vial, or beaker that contains neat acetone. Make sure the liquid completely covers the sensor surface.
5. Select **OK**.

The system will collect the requested number of acetone spectra.

6. After the test completes, 'Perf SNR' Results tab provides summarized values (Figure 3-33).

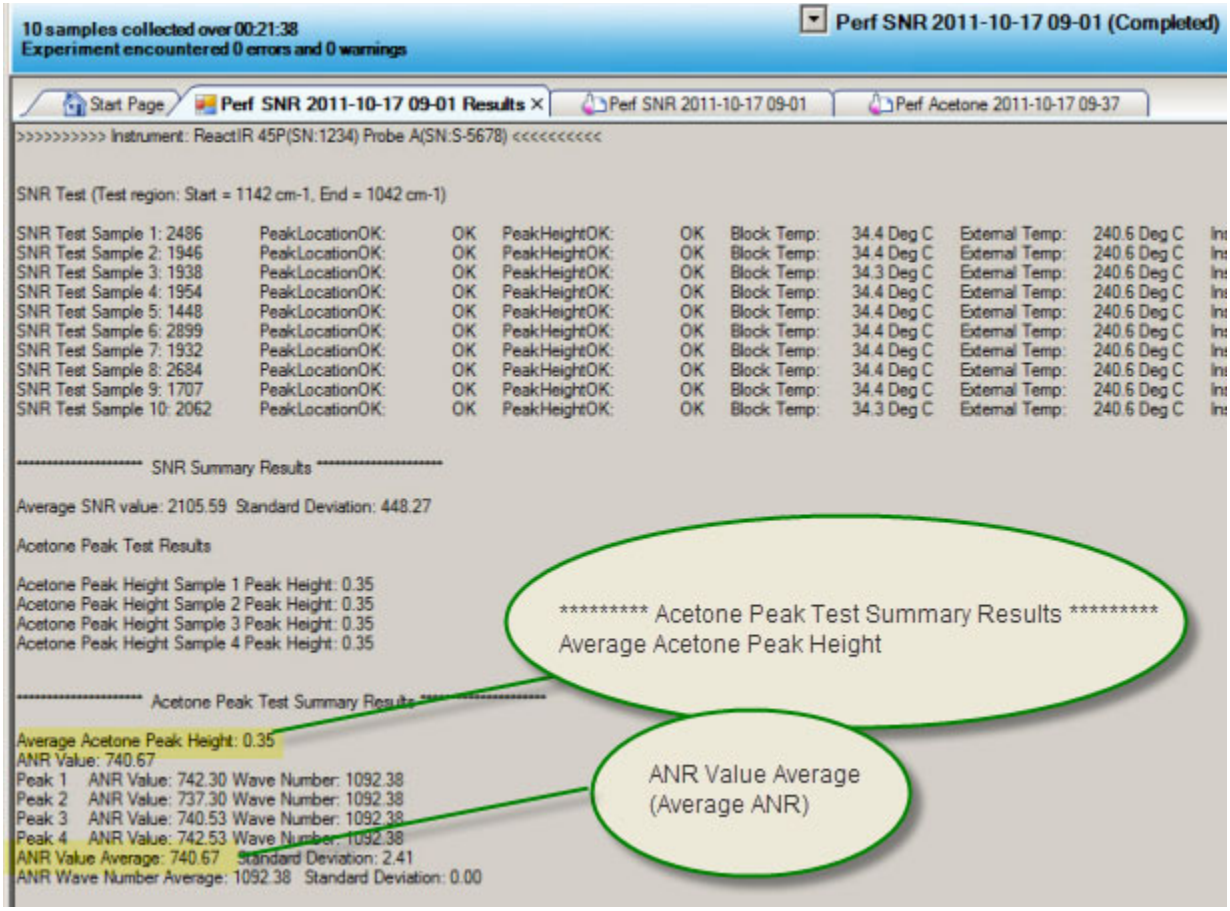


Figure 3-33 Performance SNR results in iC IR

7. Record the **Average Acetone Peak Height** and **Average ANR** in the 'Perf SNR' tab in the 'Performance Test Values' section in the appropriate ServicePac document.
8. Check the Average Acetone Peak Height results against the following criteria for your sampling technology:

Table 3-3 Acetone Peak Height (APH) Criteria

Sampling Technology	Acetone Peak Height Greater than or equal to:
DiComp 6.3mm DS FiberConduit	**0.17**
DiComp 9.5mm DS FiberConduit	**0.17**
DiComp 16mm with K6 Mirror Conduit	**0.17**
DiComp K4 Mirror Conduit to Sentinel	**0.22**

Table 3-3 Acetone Peak Height (APH) Criteria (continued)

Sampling Technology	Acetone Peak Height Greater than or equal to:
DiComp Fiber-to-Sentinel	**0.22**
DiComp DS Micro Flow Cell	**0.20**
SiComp 6.3mm DS FiberConduit	**0.30**
SiComp 9.5mm DS FiberConduit	**0.17**
SiComp 16mm with K6 Mirror Conduit	**0.24**
SiComp K4 Mirror Conduit to Sentinel	**0.30**
SiComp Fiber-to-Sentinel	**0.30**
SiComp DS Micro Flow Cell	**0.30**

9. Record the Acetone Peak Height (APH) value in the 'Performance Test Values' section of the ServicePac document. If the Peak Height is less than the value shown in Table 3-3, record a non-conformance for the test.

Note: Acetone-to-Noise Ratio (ANR) is the product of SNR and Acetone Peak Height. For reference purposes, an ANR of approximately 1200 indicates a detection limit of approximately 0.1 wt% for a moderate infrared absorbance feature specific to your reactant or product.

4. Check System Stability

Note: If you use iC Process to control the ReactIR 45P instrument and you want to run the functional tests using iC IR, an Administrator must change control of the instrument (see instructions on page 74).

Prior to checking stability, ensure the ReactIR 45P was powered for at least four (4) hours. The Power and Scan LEDs should be blue, indicating a fully functional state (see "ReactIR 45P LED Indicators" on page 28). If the LED lights show anything other than fully functional do not proceed. Contact METTLER TOLEDO Customer Care using the information page 7.

1. Select the **Test Instrument** task pane from the iC IR Toolbox.
2. Select appropriate Instrument and Detector.
3. Select applicable Probe Settings.
4. Select **Stability** from the Test mode section (Figure 3-34).
5. Click **Start**.

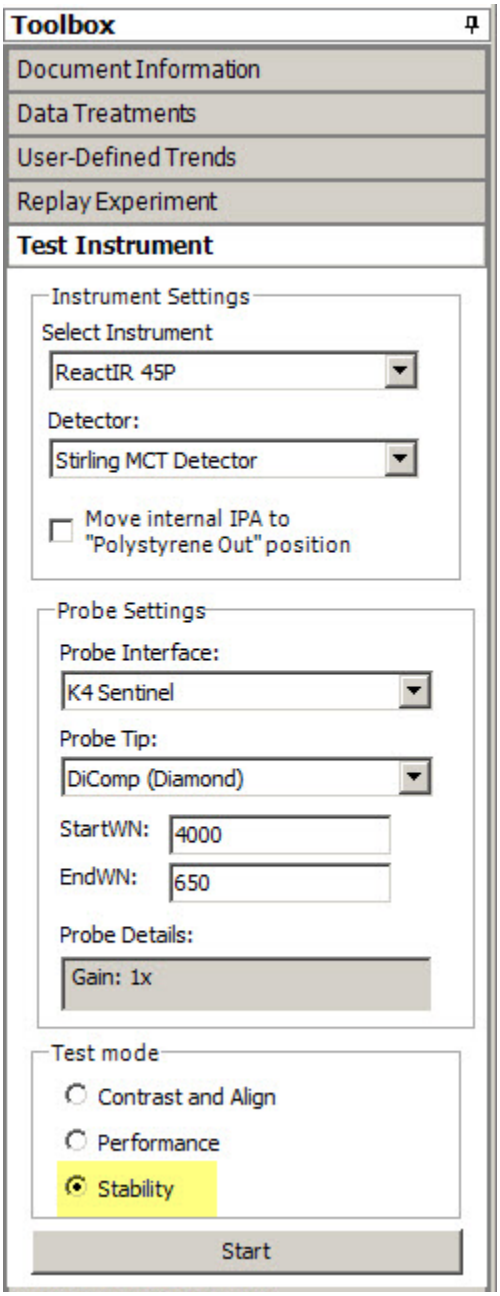


Figure 3-34 Stability test selected from iC IR Test Instrument task pane

A Stability Test window prompts you to enter test Duration and Interval.

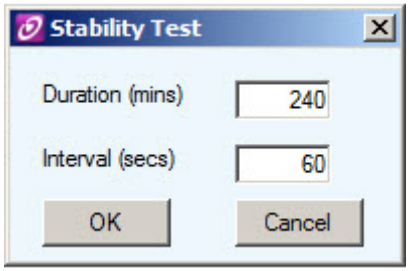


Figure 3-35 Stability test duration and interval entries

6. Enter **240** minutes in the Duration field and **60** in the Interval field and click **OK**. These parameters correspond to a 10-minute test that collects a spectrum every 60 seconds. The stability test starts by collecting a background and then successive sample spectra over the 10-minute period. The software automatically measures and plots the %Transmittance value at the wavenumbers that correspond to the sampling technology.
7. Wait for the test to complete.Then, values appear in the 'Stability Test Results' tab under ******Summary Results****** (Figure 3-36). Pass criteria is **plus/minus 3%T**.

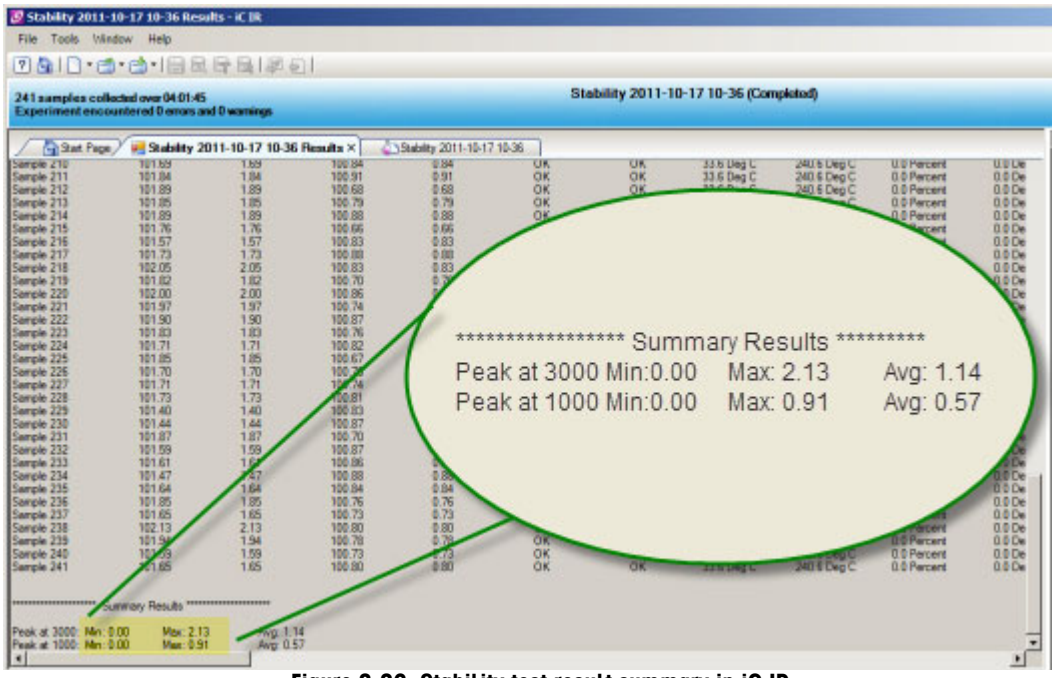


Figure 3-36 Stability test result summary in iC IR

Record the **minimum** and **maximum** %Transmittance (%T) values for each peak in the Stability section of the 'Performance Test Values' section of the ServicePac document under Stability. If the pass criteria is not met, document the non-conformance ServicePac document.

5. Perform IPA Validation/Calibration (if applicable)

The Instrument Performance Assurance (IPA) module is included with the Quality-Pac service offerings (IPac Quality-Pac or EQPac Quality-Pac). If the IPA module is installed, as described in section "6. Install IPA Option (if applicable)" on page 21, perform an IPA validation and, if necessary, a calibration.

1. Select the **Instrument Performance** task pane from the iC IR Toolbox.

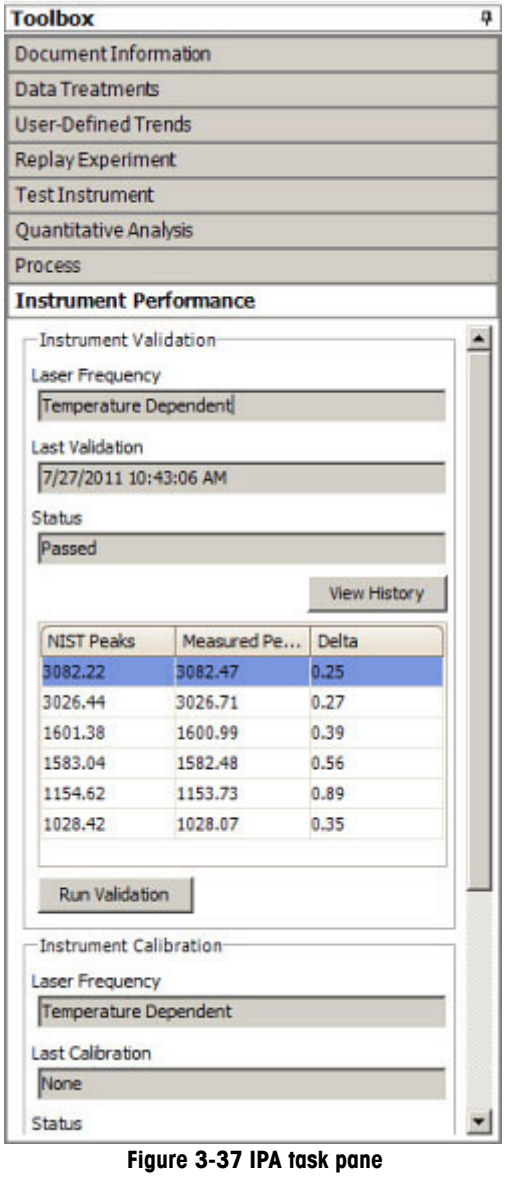


Figure 3-37 IPA task pane

2. Click **Run Validation**.

3. Click **Next** in the Instrument Validation Wizard.

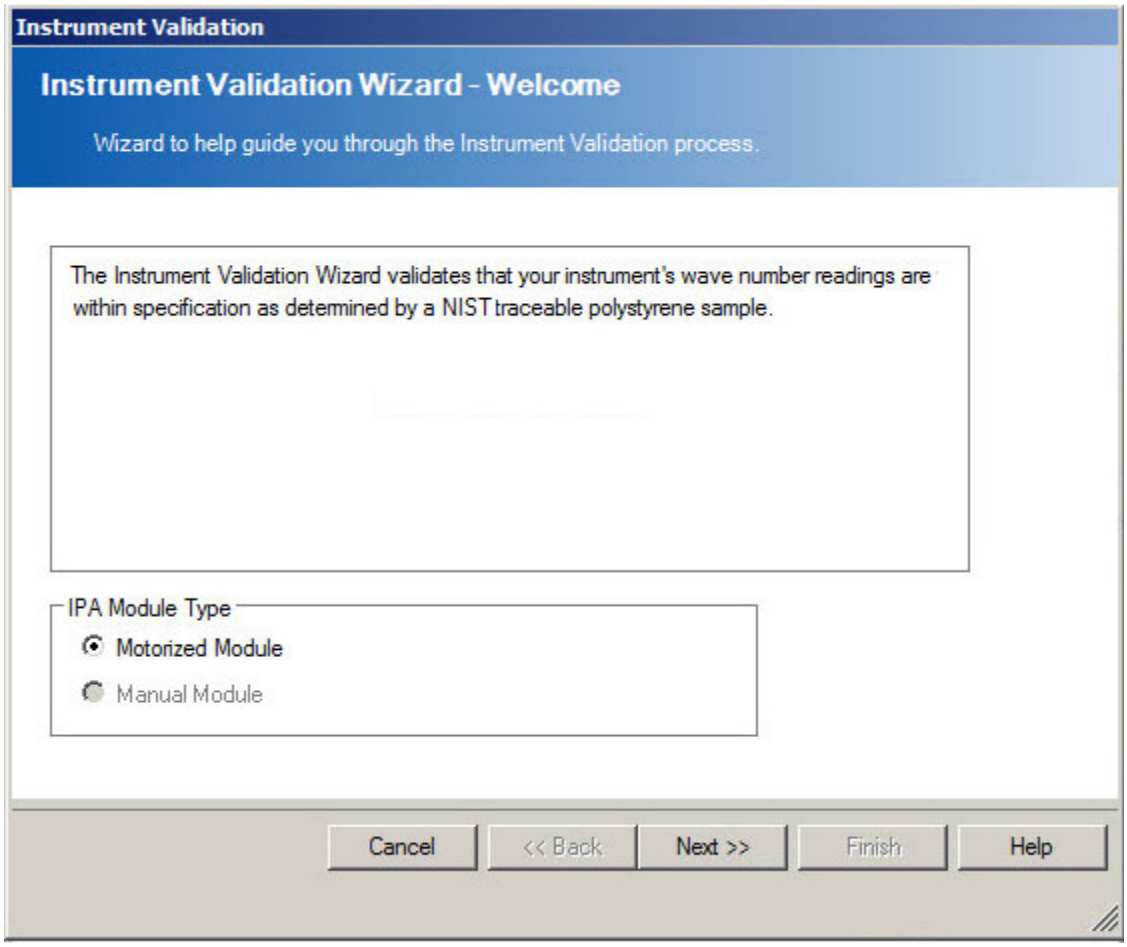


Figure 3-38 IPA Validation wizard

4. Click **Collect Background**.

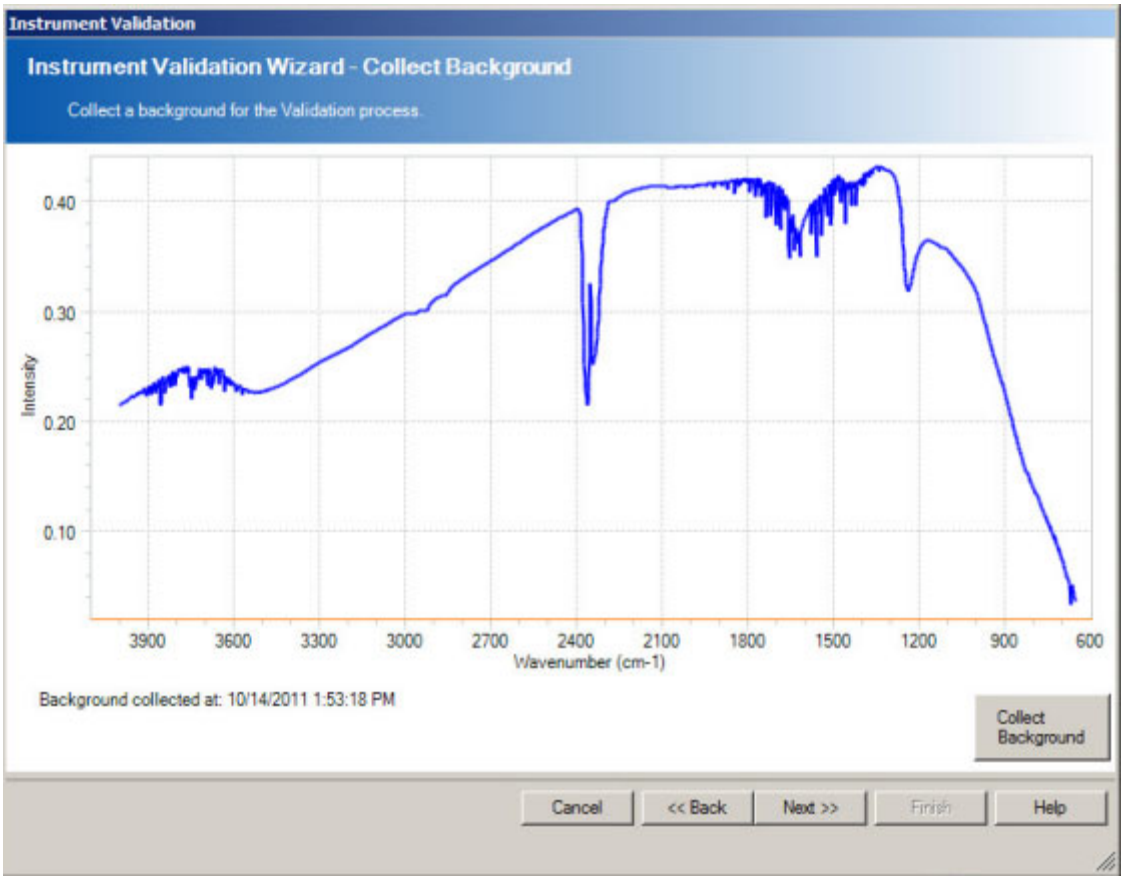


Figure 3-39 IPA—Collect background

5. When the Collect Polystyrene Samples window appears, click **Collect Sample** to begin the validation

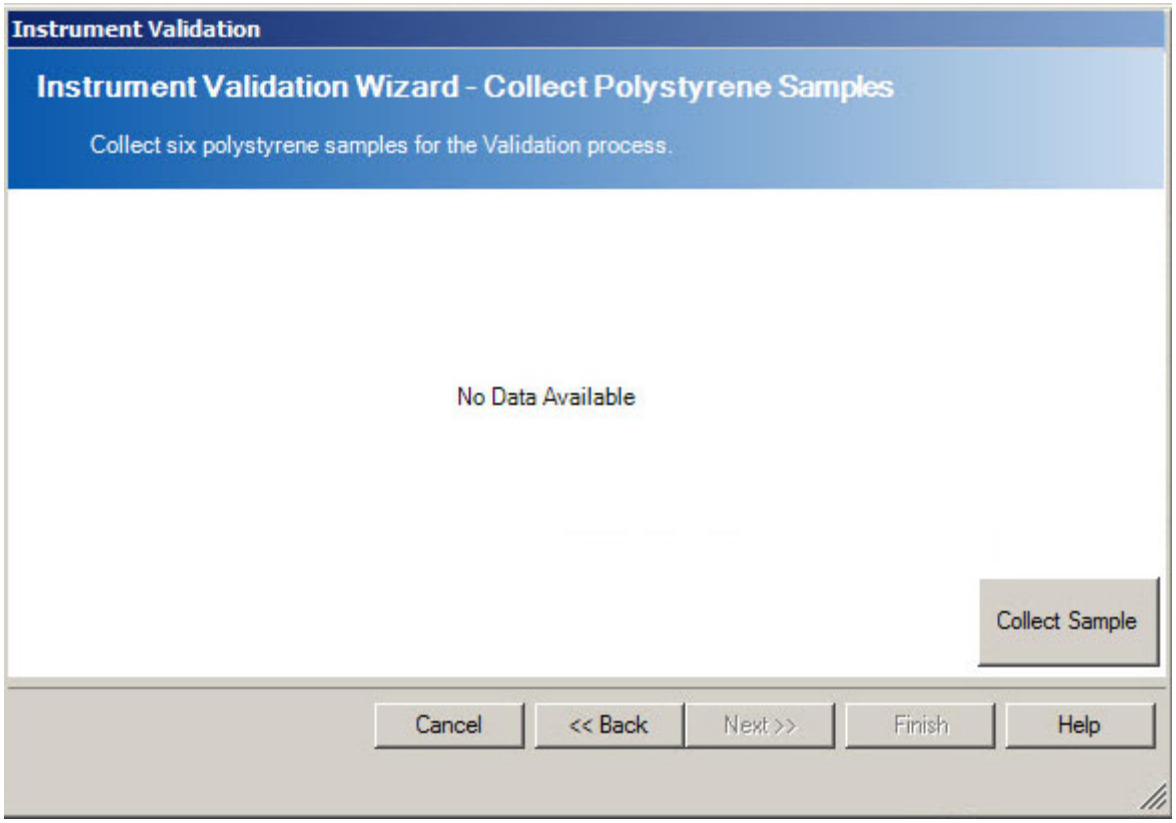


Figure 3-40 IPA—Ready to collect polystyrene samples

6. Observe the collection of six samples.

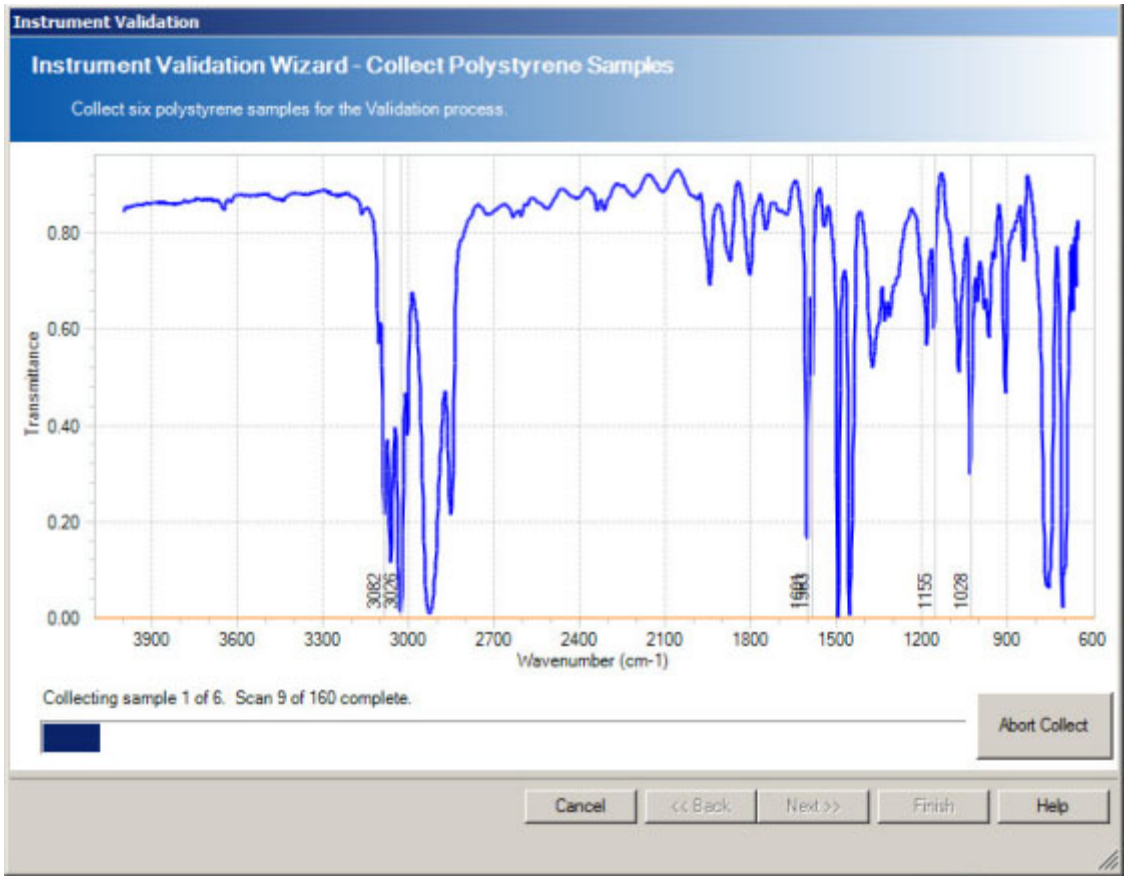


Figure 3-41 IPA—Collecting validation samples

7. Observe the results and click **Finish**.

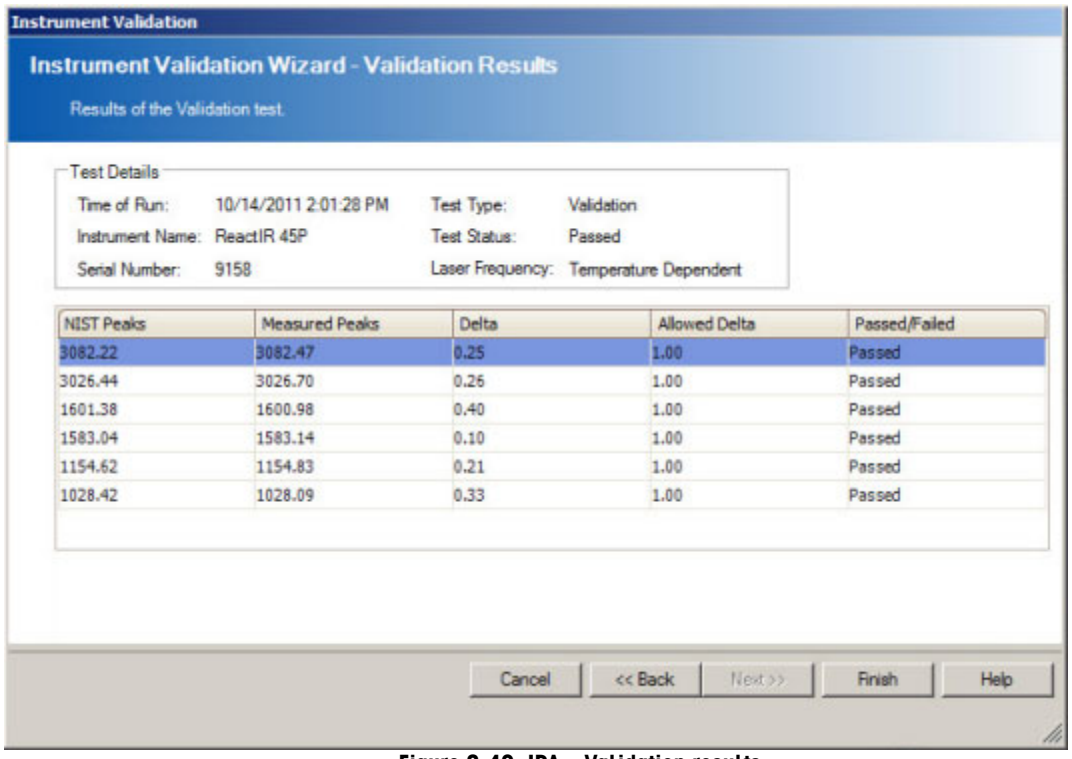


Figure 3-42 IPA—Validation results

If the validation does not pass, the wizards prompts you to proceed with a calibration. A calibration follows the same process as the validation, except the laser frequency of the instrument will be calibrated.

To see the history of validation/calibration runs, click **View History** from the Instrument Performance task pane. Select a run and click **View Test Details**. From the Details window, you can choose to **Print Test Results**.

Refer to the iC IR software online Help or the "IPA Software User Guide" for more information.

Conducting Functional Tests Using iC Process

If the ReactIR 45P is solely controlled by iC Process software, use the procedures in this section. If iC IR is the control software, follow the instructions under "Conducting Functional Tests Using iC IR" on page 42.

Perform functional tests in the following sequence:

"1. Check Alignment (Contrast)" on page 62

"2. Check Diagnostics" on page 64

1. Check Alignment (Contrast)

Note: If you use iC IR to control the ReactIR 45P instrument and you want to run the functional tests using iC Process, an Administrator must change control of the instrument (see instructions on page 76).

This procedure requires the Administrator or Technician role in iC Process.

1. Select instrument.
2. Enter Service Mode by clicking the service icon.

Figure 3-43 Service Mode button on main iC Process window

3. Select **Service** from the left navigation frame. (The Service submenu only appears for user IDs that have the Administrator or Technician authorization.)
4. Keep the default **Contrast** test option from the Service drop-down list.

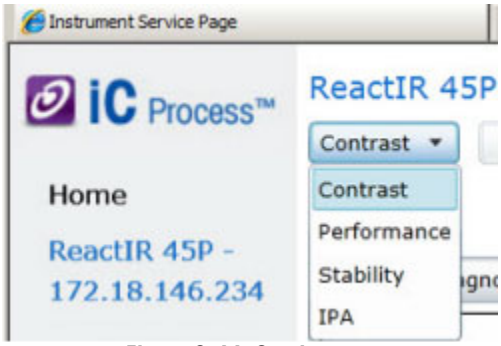


Figure 3-44 Service menu

5. Click **Start Contrast**. Contrast, Peak Height, and Peak Location values appear as the test proceeds.

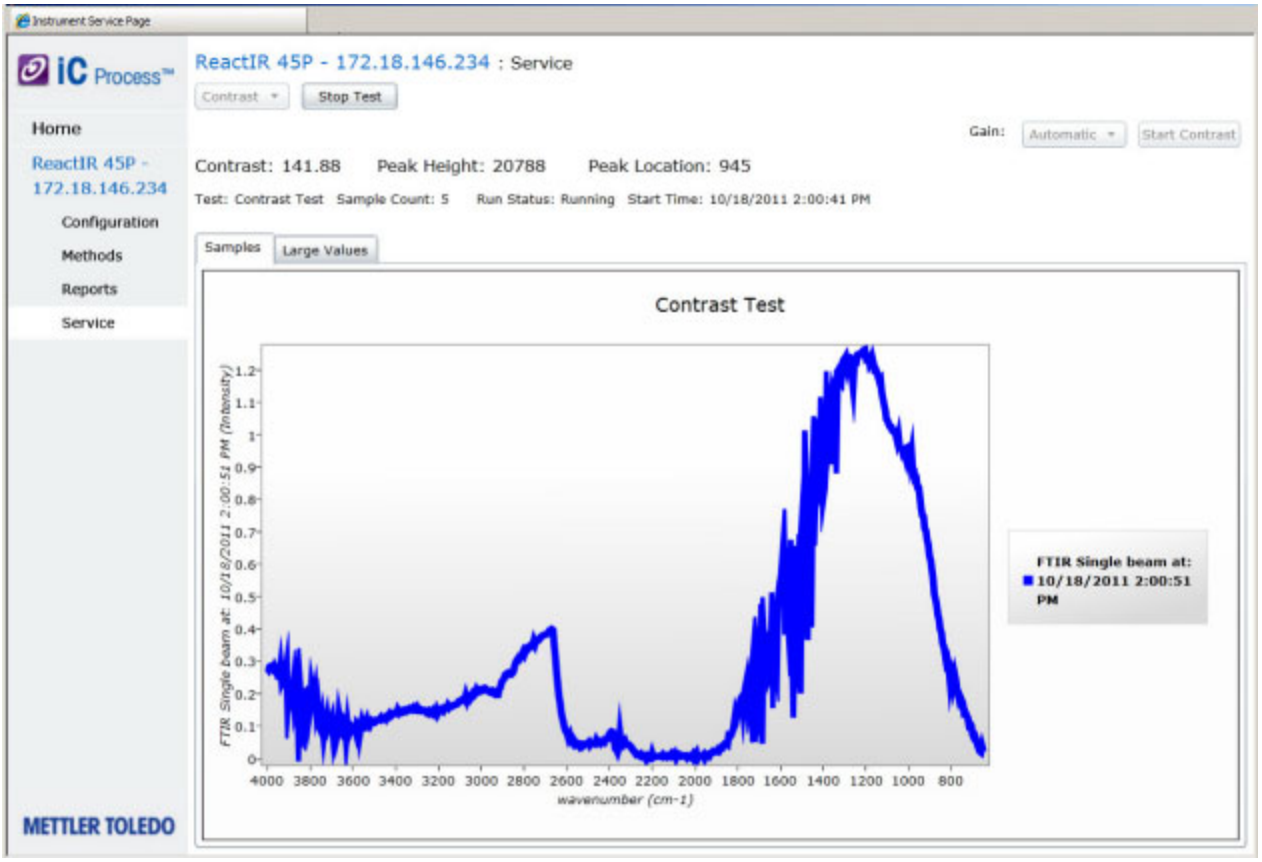


Figure 3-45 Contrast, peak height, and peak location in iC Process

6. To view specific values, select the Large Values tab.

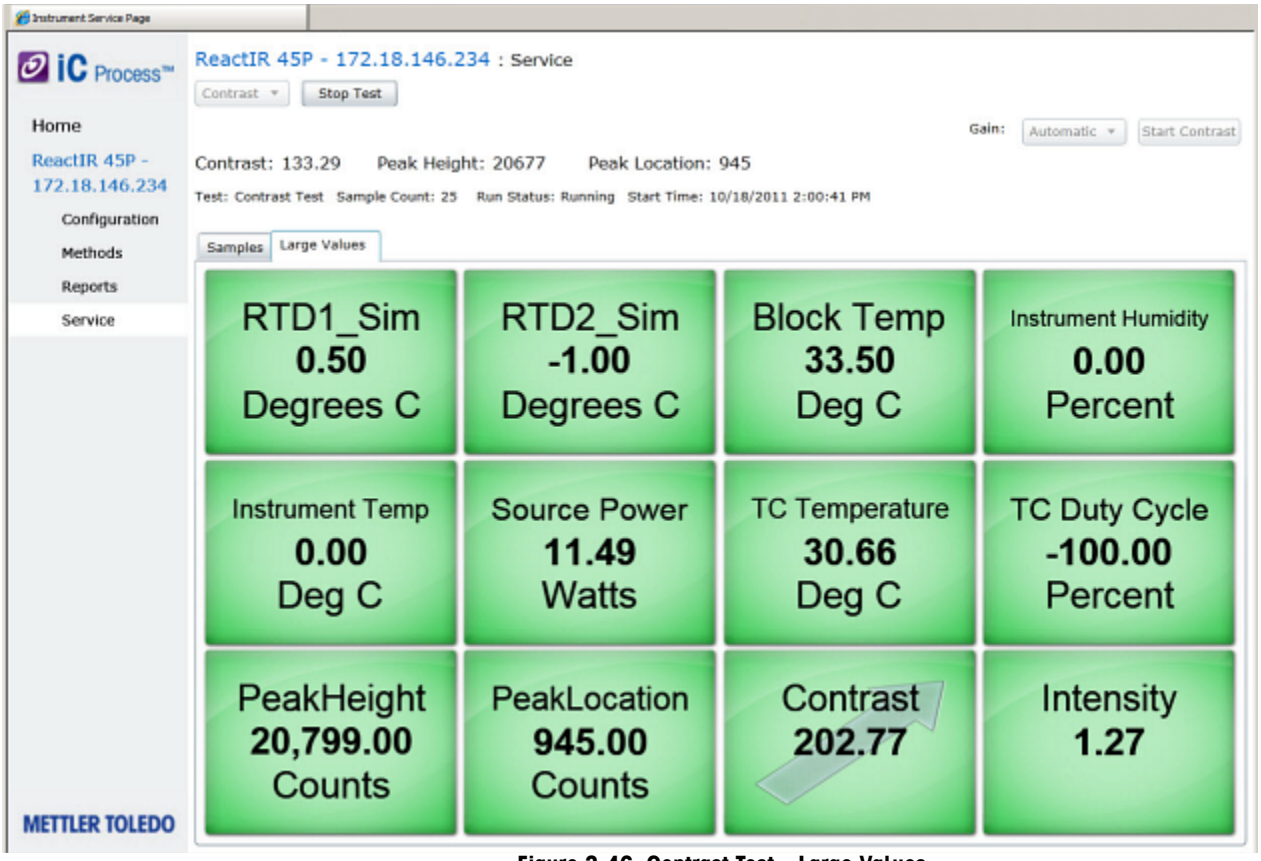


Figure 3-46 Contrast Test—Large Values

7. Adjust alignment of sampling technology, if applicable, to maximize contrast and peak height.

   Adjusting Gain or Detector Mirror

   If the Contrast test does not attain optimal Peak Height and Contrast, follow the steps under "Adjusting Gain" on page 46 or "Auto-Align Detector XY through iC IR Software" on page 45 in the iC IR section.

8. Record peak height and contrast test values in the appropriate ServicePac document. If the pass criteria is not met, document the non-conformance.

2. Check Diagnostics

Diagnostics must be checked by an FSE.

1. Access on the instrument diagnostics in the proprietary service software.
2. Verify the diagnostics are within tolerance.

3. Check System Performance

Note: If you use iC IR to control the ReactIR 45P instrument and you want to run the functional tests using iC Process, an Administrator must change control of the instrument (see instructions on page 76).

ReactIR 45P system performance is a combination of the following tests (see definitions on page 41):

- "Signal-to-Noise Ratio (SNR)" on page 48
- "Acetone Peak Height" on page 51
- "Acetone-to-Noise Ratio (ANR)" on page 70

Signal-to-Noise Ratio (SNR)

This procedure requires the Administrator or Technician role in iC Process.

1. Select instrument from the iC Process HOME page.
2. Enter Service Mode by clicking the service icon.

Figure 3-47 Service Mode button on main iC Process window

3. Select **Service** from the left navigation frame.
4. Select **Performance** from the Service drop-down list.
5. Enter ten (**10**) for the Number of Runs.
6. Check the box for 'Run ANR.'
7. Click **Start Performance Test**.

The Performance Test shows sample spectrum.

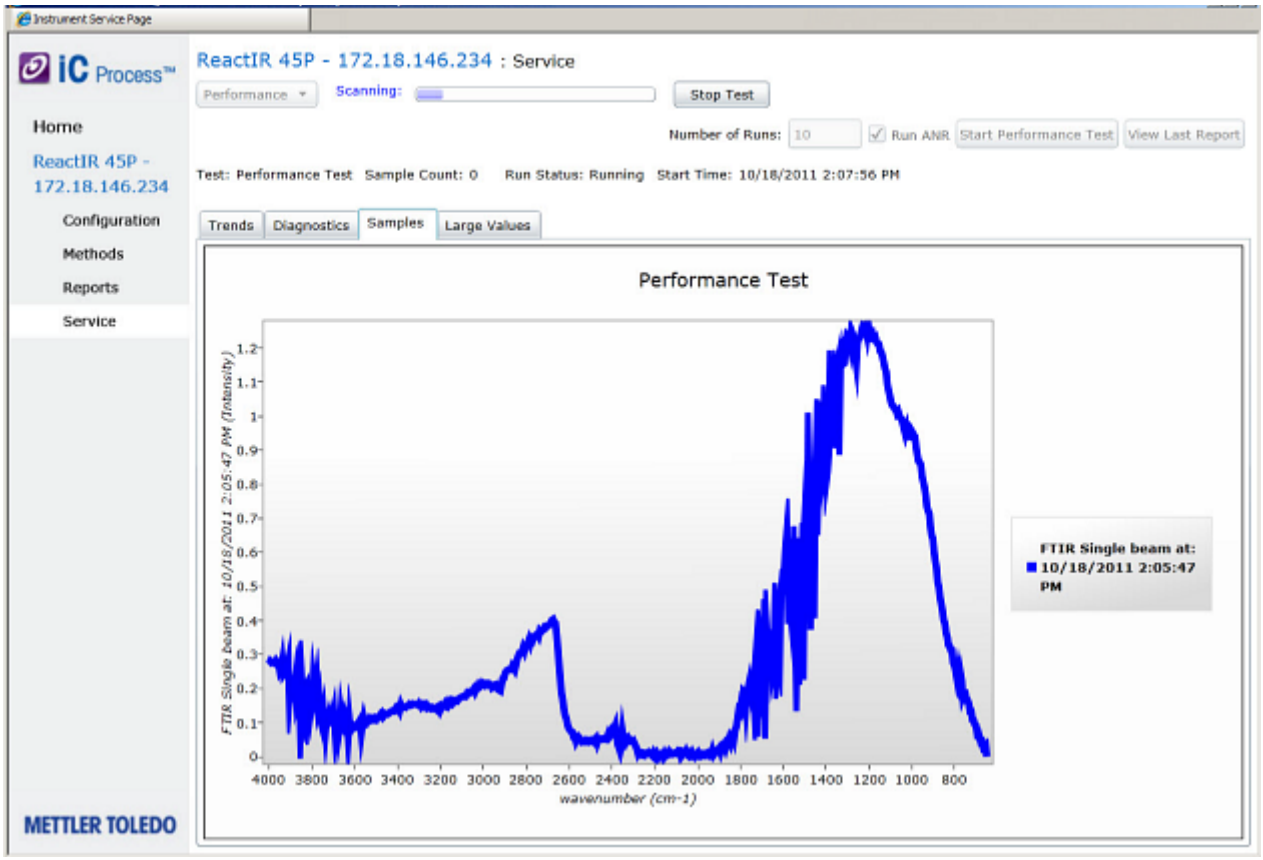


Figure 3-48 Signal-to-Noise Ratio (SNR) sample spectrum

8. Wait for test to complete.

9. Click the Large Values tab and check the results.

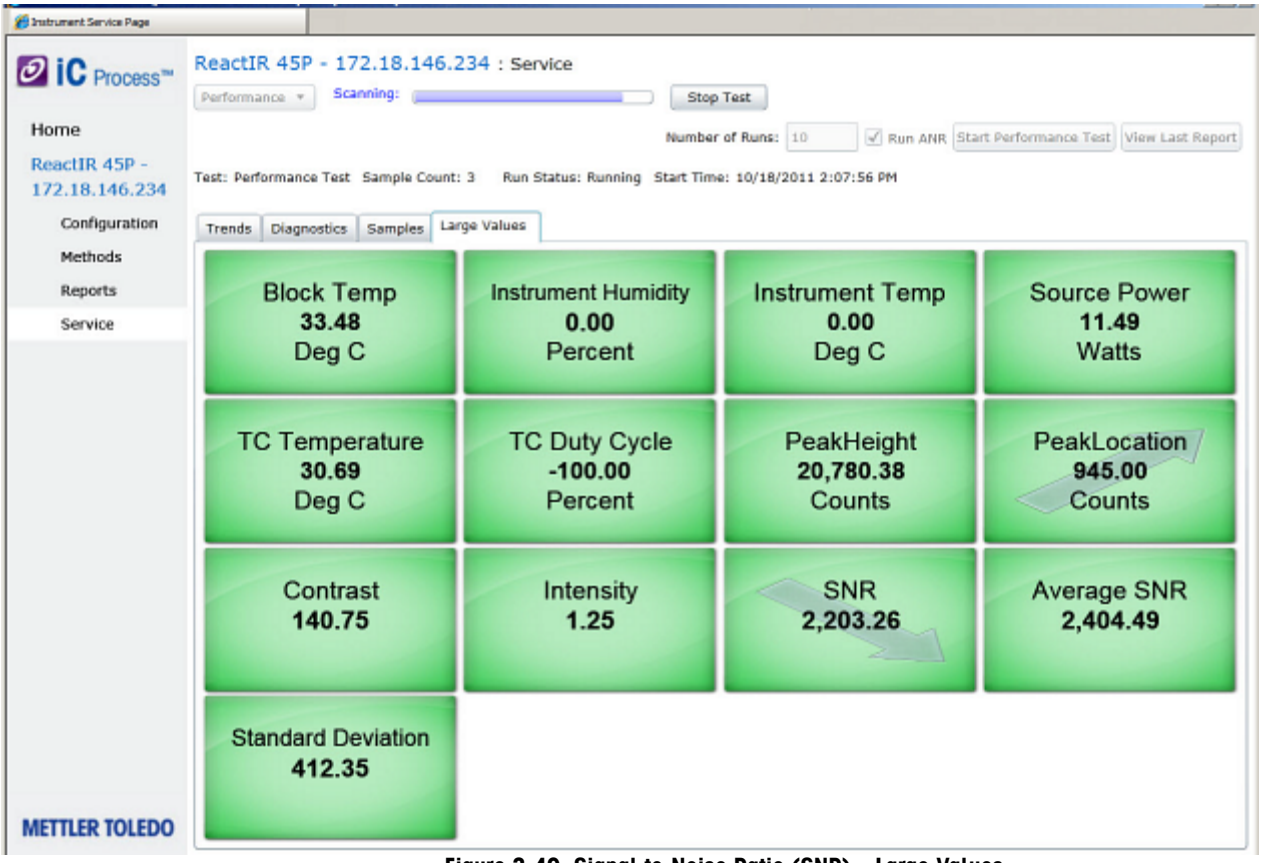


Figure 3-49 Signal-to-Noise Ratio (SNR)—Large Values

10. Record instrument Average Signal-to-Noise (SNR) performance test value in the appropriate ServicePac document.
11. The Average SNR should be greater than the factory specification in Table 3-4. If the value is not greater, record a non-conformance for the test, and proceed to Acetone Peak Height test.

Table 3-4 Signal-to-Noise (SNR) Factory Specifications

Sampling Technology	Factory Specification—Average SNR Greater Than:
DiComp 6.3mm DS FiberConduit	**1700**
DiComp 6.3mm DS FiberConduit	**1700**
DiComp 9.5mm DS FiberConduit	**1700**
DiComp 16mm with K6 Mirror Conduit	**2400**
DiComp K4 Mirror Conduit to Sentinel	**4800**
DiComp Fiber-to-Sentinel	**3000**

Table 3-4 Signal-to-Noise (SNR) Factory Specifications (continued)

Sampling Technology	Factory Specification—Average SNR Greater Than:
DiComp DS Micro Flow Cell	**4000**
SiComp 6.3mm DS FiberConduit	**1000**
SiComp 9.5mm DS FiberConduit	**1700**
SiComp 16mm with K6 Mirror Conduit	**1200**
SiComp K4 Mirror Conduit to Sentinel	**3000**
SiComp Fiber-to-Sentinel	**2200**
SiComp DS Micro Flow Cell	**1500**
Special	**See Factory Test Records**

Acetone Peak Height

The Acetone Peak Height test checks sampling technology performance by measuring the peak height with acetone on the sensor. The software calculations Acetone Peak Height by the following equation:

Absorbance$_{1092}$ cm^{-1} – Absorbance $_{1018}$ cm^{-1} = Acetone Peak Height

After the SNR test completes, the software prompts you to add acetone for the absorbance test.

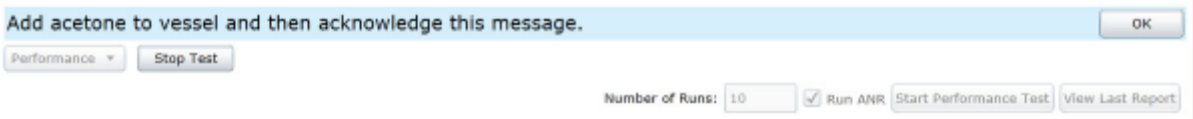
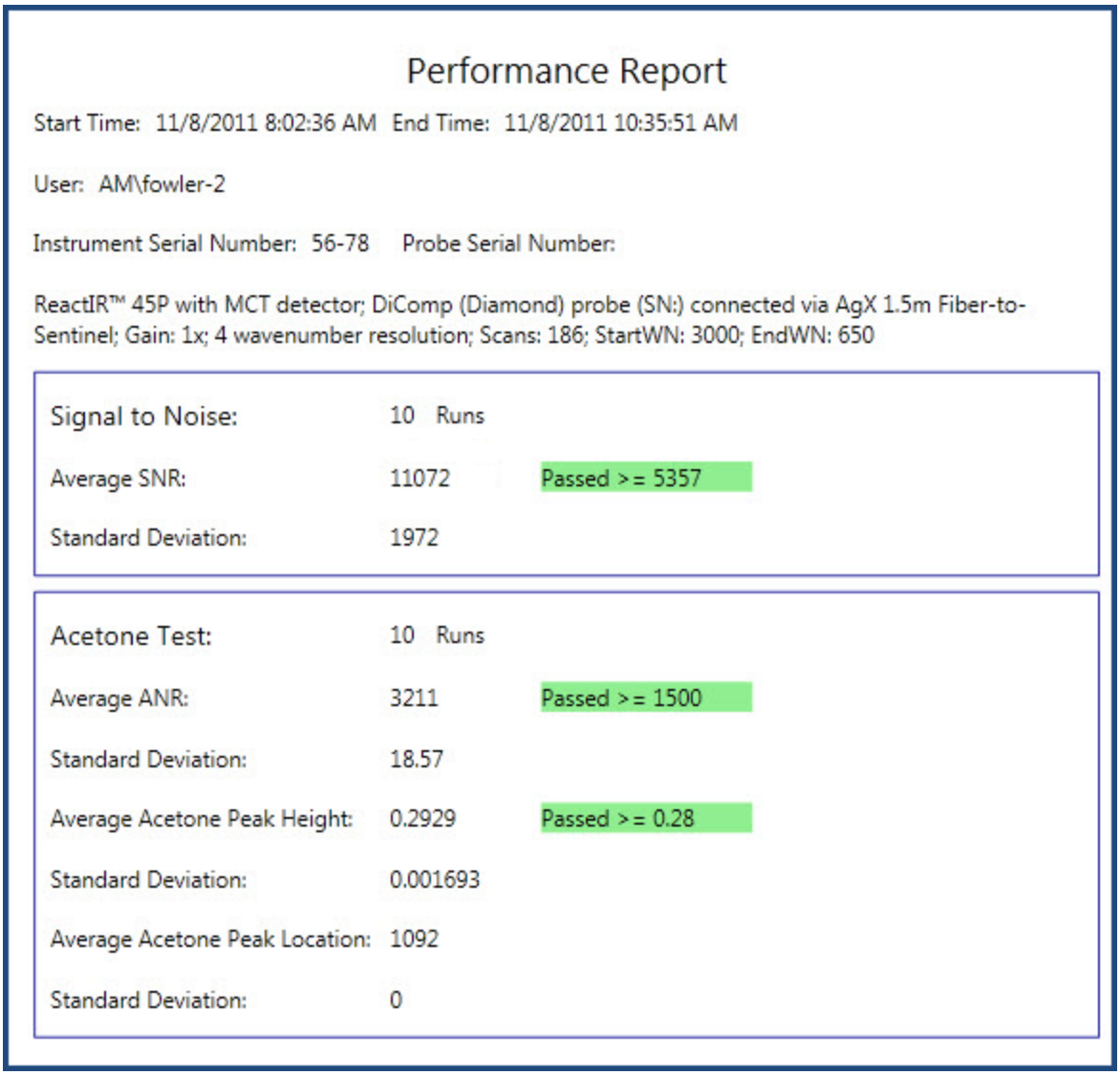


Figure 3-50 Prompt to add acetone

1. Place acetone on the sampling technology sensor after the "Add acetone" message appears.
2. Click **OK** and allow test to complete.

> **Note:** The Large Values remain for one minute following completion of the acetone test. View the Performance Test report (step 3).

3. Click **View Last Report**.



Performance Report

Start Time: 11/8/2011 8:02:36 AM End Time: 11/8/2011 10:35:51 AM

User: AM\fowler-2

Instrument Serial Number: 56-78 Probe Serial Number:

ReactIR™ 45P with MCT detector; DiComp (Diamond) probe (SN:) connected via AgX 1.5m Fiber-to-Sentinel; Gain: 1x; 4 wavenumber resolution; Scans: 186; StartWN: 3000; EndWN: 650

Signal to Noise:	10 Runs	
Average SNR:	11072	Passed >= 5357
Standard Deviation:	1972	

Acetone Test:	10 Runs	
Average ANR:	3211	Passed >= 1500
Standard Deviation:	18.57	
Average Acetone Peak Height:	0.2929	Passed >= 0.28
Standard Deviation:	0.001693	
Average Acetone Peak Location:	1092	
Standard Deviation:	0	

Figure 3-51 Performance report with acetone test

4. Check the results in the report against the following factory specification criteria for your sampling technology:

Table 3-5 Acetone Peak Height Criteria

Sampling Technology	Acetone Peak Height Greater than: or equal to
DiComp 6.3mm DS FiberConduit	**0.17**
DiComp 6.3mm DS FiberConduit	**0.17**
DiComp 9.5mm DS FiberConduit	**0.17**
DiComp 16mm with K6 Mirror Conduit	**0.17**
DiComp K4 Mirror Conduit to Sentinel	**0.22**
DiComp Fiber-to-Sentinel	**0.22**
DiComp DS Micro Flow Cell	**0.20**
SiComp 6.3mm DS FiberConduit	**0.30**
SiComp 9.5mm DS FiberConduit	**0.17**
SiComp 16mm with K6 Mirror Conduit	**0.24**
SiComp K4 Mirror Conduit to Sentinel	**0.30**
SiComp Fiber-to-Sentinel	**0.30**
SiComp DS Micro Flow Cell	**0.30**

5. Record the average Acetone Peak Height (Acetone Absorbance) in the appropriate ServicePac document.
6. If the Peak Height is equal to or greater than the factory specification in the "Acetone Peak Height Greater than or equal to" column in Table 3-5, proceed to test system stability.

Note: Acetone Noise Ratio (ANR) is the product of SNR and Acetone Peak Height. For reference purposes, an ANR of approximately 1200 indicates a detection limit of approximately 0.1 wt% for a moderate infrared absorbance feature specific to your reactant or product.

Acetone-to-Noise Ratio (ANR)

ANR is an automatic calculation in the software using the following formula:

(Acetone Peak Height) x (Signal to Noise) = ANR

From the Performance Report (Figure 3-51), record the **Average ANR** value in the Performance Test Values section of the ServicePac document.

4. Check System Stability

Note: If you use iC IR to control the ReactIR 45P instrument and you want to run the functional tests using iC Process, an Administrator must change control of the instrument (see instructions on page 76).

Prior to checking stability, ensure that the ReactIR 45P was powered for at least four (4) hours. The Power and Scan LEDs should be blue, indicating a fully functional state (see "ReactIR 45P LED Indicators" on page 28).

This procedure requires the Administrator or Technician role in iC Process.

1. From the iC Process Home page, select the ReactIR 45P instrument.
2. Enter Service mode by clicking the service icon.

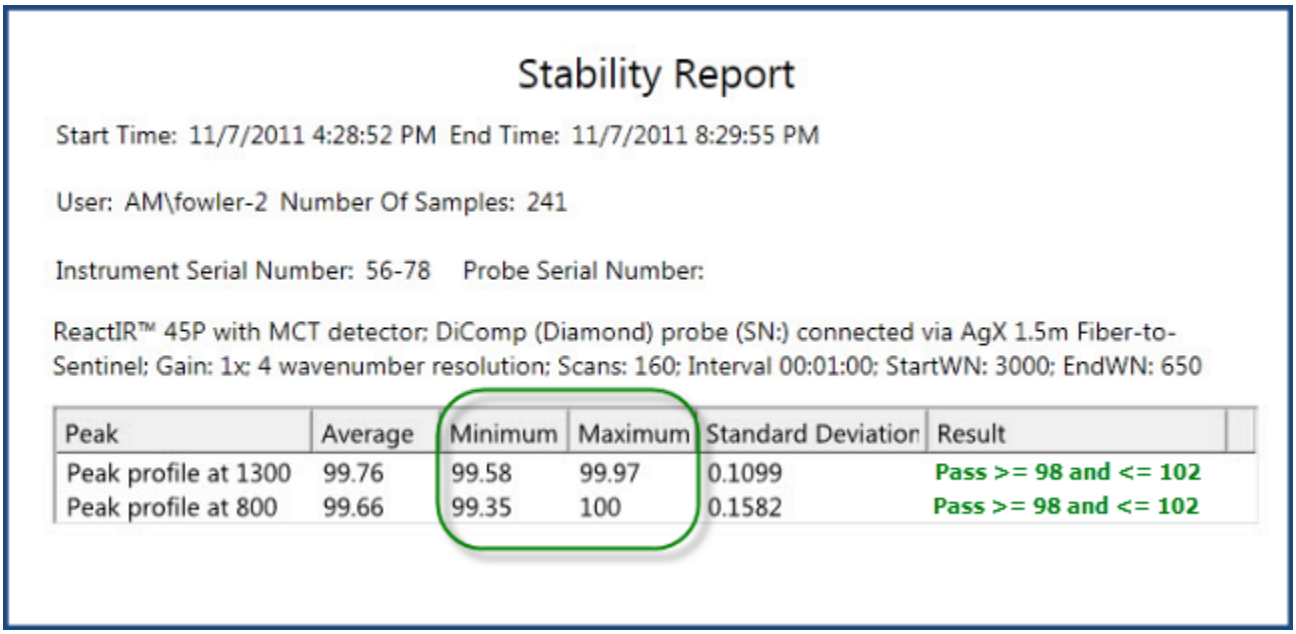
Figure 3-52 Service mode button on main iC Process window

3. Select **Service** from the left navigation frame. (The Service submenu only appears for user IDs that have the Administrator or Technician authorization.)
4. Select **Stability** from the Service drop-down list.
5. Enter the following settings (in minutes):
   Duration: **240**
   Interval: **1**
6. Click **Start Stability**.

7. Select the Large Values tab to observe the values during the test.

Figure 3-53 Stability test—Large Values

8. Wait for test to complete and click **View Last Report**.



Stability Report

Start Time: 11/7/2011 4:28:52 PM End Time: 11/7/2011 8:29:55 PM

User: AM\fowler-2 Number Of Samples: 241

Instrument Serial Number: 56-78 Probe Serial Number:

ReactIR™ 45P with MCT detector; DiComp (Diamond) probe (SN:) connected via AgX 1.5m Fiber-to-Sentinel; Gain: 1x; 4 wavenumber resolution; Scans: 160; Interval 00:01:00; StartWN: 3000; EndWN: 650

Peak	Average	Minimum	Maximum	Standard Deviation	Result
Peak profile at 1300	99.76	99.58	99.97	0.1099	Pass >= 98 and <= 102
Peak profile at 800	99.66	99.35	100	0.1582	Pass >= 98 and <= 102

Figure 3-54 Stability report

9. Record the Minimum and Maximum %T values for each peak in the appropriate ServicePac document.
10. If the report does not show a 'pass' result, document the non-conformance in the appropriate portion of the ServicePac document.

5. Perform IPA Validation/Calibration (if applicable)

The Instrument Performance Assurance (IPA) module is included with the Quality-Pac service offerings (IPac Quality-Pac or EQPac Quality-Pac). If the IPA module is installed, as described in section "6. Install IPA Option (if applicable)" on page 21, perform an IPA validation and, if necessary, a calibration.

In iC Process, refer to the "iC Process Software User Guide."

Note: **User roles in iC Process**—An Operator can perform a validation, however only an Administrator or Technical can perform the calibration in iC Process.

Functional Test Overall Results

If all functional tests met the criteria to pass, mark the appropriate section of the ServicePac document that indicates the ReactIR 45P system functions in accordance with METTLER TOLEDO Test Specifications.

If any test did not meet the criteria, each non-conformance must be documented in the ServicePac document along with the action to resolve.

Acceptance Criteria

The ServicePac document requires approval signatures from the METTLER TOLEDO AutoChem Field Service Engineer and your company's responsible ReactIR 45P user.

Complete the signatures ion the appropriate ServicePac document. The ReactIR 45P warranty and service contracts officially start at this point.

Note: Place the signed ServicePac document in a readily accessible location for reference during system service or maintenance.

In EQPac service installations, the package described on page 9, includes several documents that require approval signatures from the METTLER TOLEDO Field Service Engineer and your company's responsible ReactIR 45P user.

Refer to the "ReactIR 45P Hardware Manual" for specifications, routine operations, care and maintenance, troubleshooting, and best practices.

Functional Test Overall Results

A

Switching Control Software

Note: Even though a ReactIR 45P instrument can be controlled by iC IR or iC Process software, only **one software system can control the instrument at the same time**.

iC Process is the primary control software for a ReactIR 45P instrument. However, iC IR software can be used in the laboratory to develop models and trends that transfer Critical Control Parameters (CCP) from the laboratory to the production environment. Use the procedures in this appendix to switch control between the two software systems, if applicable.

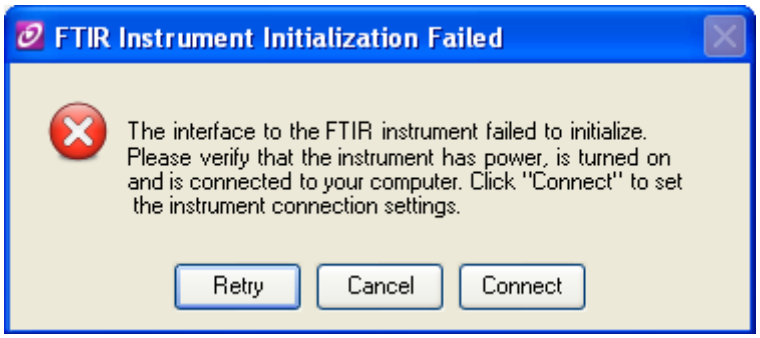
Switch from iC Process to iC IR

To switch control of the ReactIR 45P from iC Process software to iC IR, it is necessary to stop the iC Process service and connect to the instrument through iC IR.

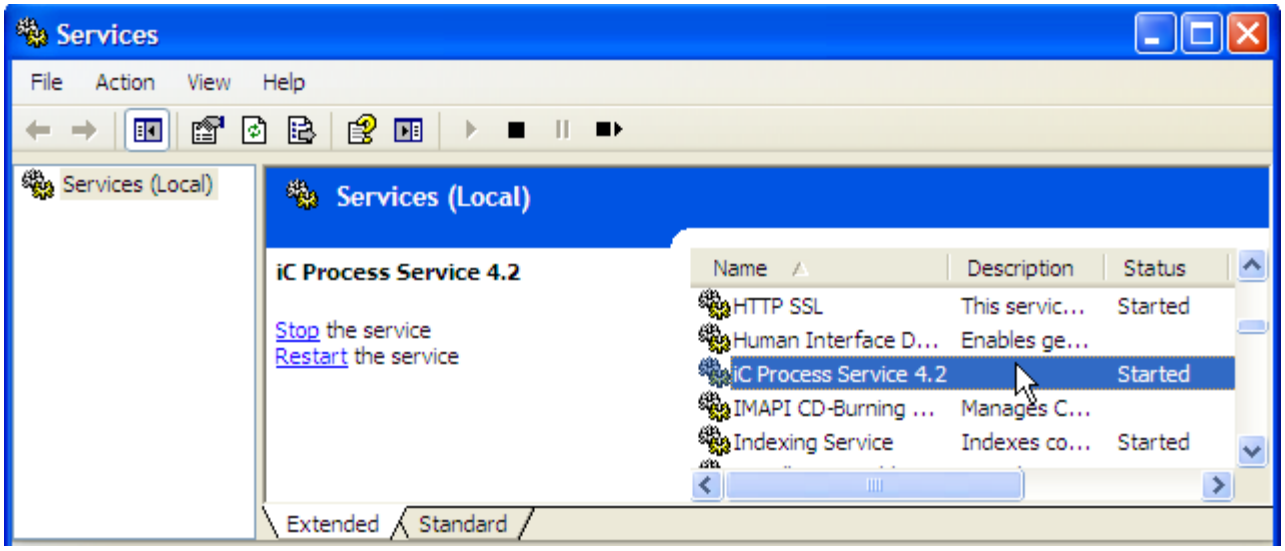
Follow the procedures to switch control to iC IR software.

Note: You will need the IP address of the ReactIR 45P instrument to transfer control. Refer to the iC Process Instrument Configuration page.

The following message appears in iC IR when you attempt to control a ReactIR 45P instrument currently under iC Process control. Leave this message open and proceed to Administrative tools to stop the iC Process Service.

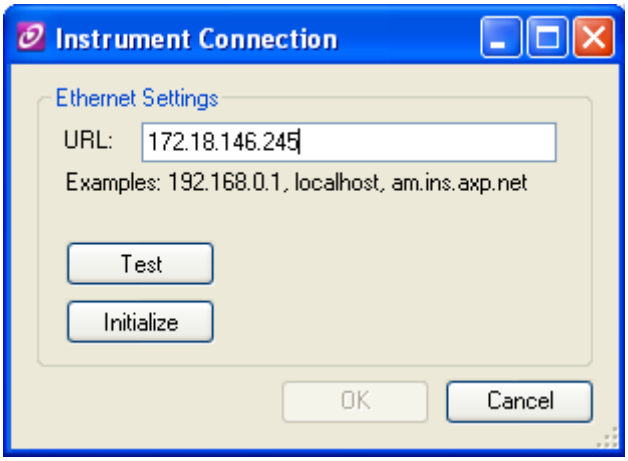


1. Go to the Services for the iC Process control computer. (In WIndows XP, the location is Control Panel > Administrative Tools > Services.)
2. Select iC Process Service 4.x.
3. Click **Stop**.



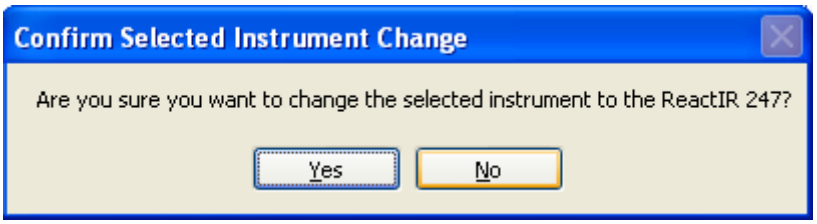
4. Return to the open iC IR "FTIR Instrument Initialization Failed" message.

5. Click **Connect** and enter the instrument's IP address in the URL field.



   g. Click **Test** to 'ping' the instrument at the specified address.
   h. Then, click **Initialize** to take control of the instrument in iC IR.

6. Click **Yes** in the confirmation box.

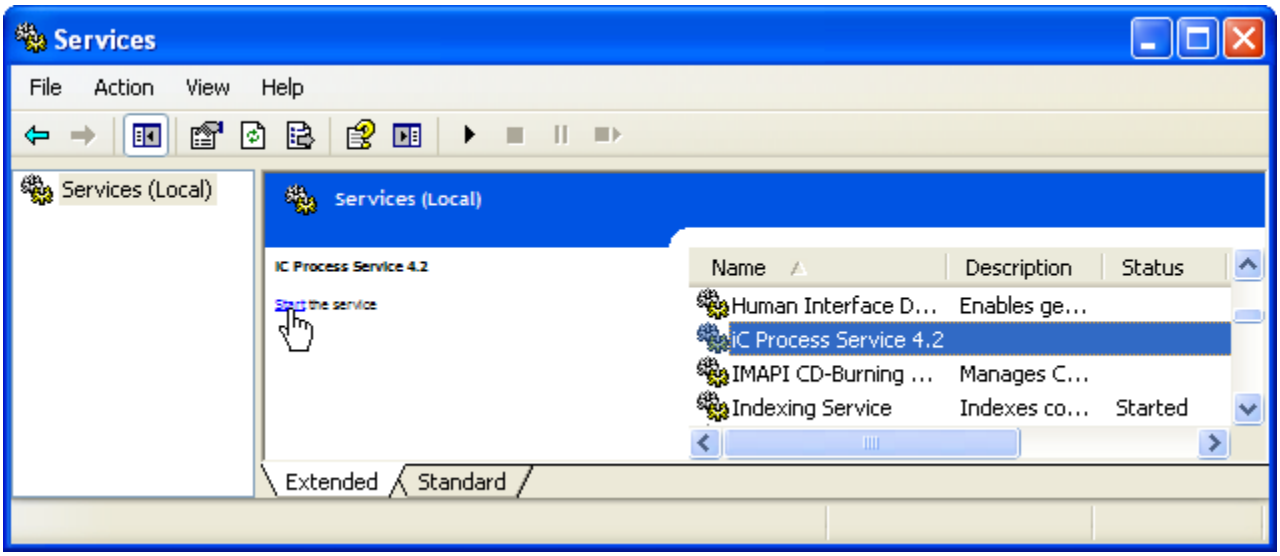


Switch from iC IR to iC Process

If the ReactIR 45P is under the control of iC IR and you want to change to control by iC Process, follow the procedure below.

Note: This instruction assumes the ReactIR 45P instrument has already been added to iC Process and configured. Refer to the "iC Process Software User Guide or the iC Process Installation Guide."

1. Close the iC IR software application.
2. Go to the Services for the iC Process control computer. (In WIndows XP, the location is Control Panel > Administrative Tools > Services.)
3. Select iC Process Service 4.x.
4. Click **Start**.



5. Proceed to your Web browser to connect to iC Process as a client.

Index