ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION

PGC5000 Generation 2

Process gas chromatograph

Measurement made easy

Further information

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This document shall serve for informational purposes only, no legal obligations are substantiated by any regulations.

Contents

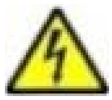
1 Glossary

ACL	Access Control List
ANSI	American National Standards Institute
AOC	Absence of Condition
ARV	Atmospheric Reference Vent
CAN	Controller Area Network
Config	Configuration
DSP	Digital Signal Processing
DTC	Digital Temperature Controller
DVM	Digital Valve Module
EPC	Electronic Pressure Controller
ESD	Electrostatic Discharge
FID	Flame Ionization Detector
FPD	Flame Photometric Detector
I/O	Input / Output
IP	Internet Protocol
ISA	International Standards Association
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LSV	Liquid Sample Valve
LUI	Local User Interface (operational software interface located on the Master Controller)
MAC	Machine Address Code
MC	Master Controller
NIC	Network Interface Controller or Card
OPC	Open Productivity and Conductivity
PC	Personal Computer
PCB	Printed Circuit Board
PGC	Process Gas Chromatograph
PIC	Programmable Integrated Circuit
RAM	Random Access Memory
RT	Retention Time
RUI	Remote User Interface (a PC running remote user interface software)
SBC	Single Board Computer
SHS	Sample Handling System
STAR DMS	STAR Data Management System
TCD	Thermal Conductivity Detector
TCF	Time Coded Function
TOD	Time of Day
USB	Universal Serial Bus

2 Safety and symbols

The following symbols are used in this manual to alert the user to possible hazards and to provide additional information.

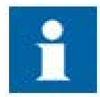
Indicates that the referred item can be hot and should not be touched without care.



Indicates that a risk of electrical shock and/or electrocution exists.

Indicates a potential hazard which could cause serious injury and/or death, or indicates the presence of a hazard which could result in corruption of software or damage to equipment or property.

Indicates that referenced items are susceptible to Electrostatic Discharge (ESD) damage and should not be touched without ESD safe handling tools.



Alerts the user to pertinent facts and conditions.

3 Introduction

3.1 General

The PGC5000 Generation 2 Process Gas Chromatograph (analyzer) separates and measures the individual components of gas or liquid samples. It automatically samples and analyzes process streams, using an appropriate interface to control analytical functions. This interface may be a Local User Interface (LUI) that utilizes operational software located on the Master Controller, or it may be a Remote User Interface (RUI) that has the same operational software on a PC. When the text uses the term “user interface,” it refers to either the LUI or RUI, whichever applies to the particular system.

The PGC5000 Generation 2 analyzer is compatible with version 4.2.1, and greater, of the STAR Data Management System.

Each analyzer has a temperature code (T-Rating) listed on the nameplate. This T-Rating indicates the temperature classification of the area in which the analyzer has been designed to operate. T-Ratings and area classifications for analyzer locations are determined and supplied by the customer.

The standard analyzer consists of a Master Controller and associated ovens. This configuration has the Master Controller connected to the ovens through an Ethernet switch (see Figure 3.1).

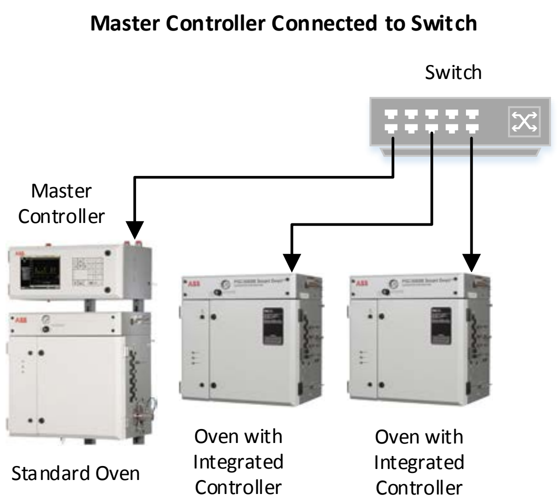


Figure 3.1. Standard PGC5000 with Ovens Connected by Switch

Ovens with Integrated Controllers consist of only the associated ovens. For this configuration there is no Master Controller, and the user interface is accessed remotely (see Figure 3.2).

Windows Device Connected to Switch

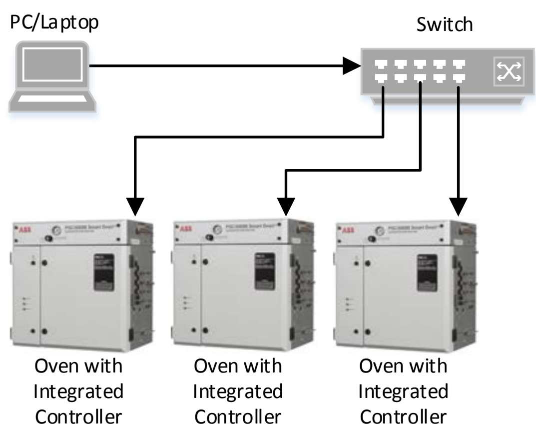


Fig. 3.2. Oven with Integrated Controller Connections

An Important Documents CD-ROM comes with the analyzer. Included on this CD are data sheets, installation drawings, and replacement parts lists needed to support installation and operation of the analyzer. This manual refers to these data sheets and drawings as the “Data Package.”

3.2 Drawings

Since analyzer configuration depends on the particular application, this manual does not contain generic engineering drawings and diagrams. You should utilize the drawings, diagrams and replacement parts lists provided on the Data Package supplied with your analyzer to ensure you are using the correct ones for your system.

3.3 Master controller

The Master Controller can support up to four ovens, in any combination of Class B and Class C ovens, depending on detector configurations. If internal I/O modules are utilized, the maximum number of ovens per Master Controller is limited to three.

The Master Controller contains a Mounting Plate with a Single Board Computer (SBC) PCB, a Power Supply, one or more SBC CAN Interface Cards, and optional Wago input/output modules. The front panel assembly has a touchscreen, liquid crystal display (LCD), keypad, and front panel board.

No Master Controller is required for the Oven with Integrated Controller. The Oven with Integrated Controller can support up to four ovens, in any combination of Class B and Class C Ovens, depending on detector configurations. The user interface is accessed remotely, as described in Section 5.7.

3.4 Class B oven

The Class B Oven, which comes in liquid and vapor versions, houses an isothermal oven which contains the analytical columns, detector, detector amplifier, temperature controller, control valves, and sample valve. The Class B Oven has one detector and a maximum of four valves.

The PGC5000 Generation 2 Master Controller can also act as a stand-alone RUI. In this configuration, the Master controller will not be connected to an oven, and it will not contain SBC CAN Interface Cards or Wago input/output modules. It will be connected to the analyzer network via Ethernet and can connect to any PGC5000 Generation 2 device that is supported.

3.4.1 Liquid version

The liquid version incorporates a liquid sample valve (LSV) as the input to the analysis. The duration of an analysis depends on the application and consists of the following:

- The liquid sample valve injects a fixed volume of sample into a vaporizing chamber.
- “Sweep gas” transports sample out of the vaporizing chamber.

- Carrier transports the vaporized sample into the column.
- The column then separates the components and passes them into the detector.
- The detector measures the sample across the range of high to low concentration.

The liquid sample valve is externally mounted on the right side of the Oven Compartment and extends through the isothermal oven, allowing direct injection. It is actuated by a solenoid valve located in the Oven Electronics Compartment. The liquid sample valve captures a specific volume of liquid sample below its bubble point, injects it into a temperature controlled (vaporizing) chamber of the LSV, which then sends the vaporized sample into the oven.

3.4.2 Vapor version

The vapor version has a vapor input to the analysis, so it does not require a liquid sample valve. The duration of an analysis cycle depends on the applications and consists of the following:

- Carrier gas transports the vaporized sample through the columns.
- The column then separates the components and passes them into the detector.
- The detector measures the sample across the range of high to low concentration.

3.5 Class C oven

The Class C Oven contains the same components as the Class B Oven, but it has the capability to handle more oven components. The Class C Oven has a maximum of two detectors and a maximum of six valves.

3.6 Oven with integrated controller

The Oven with Integrated Controller can be either a Class B Oven or a Class C Oven. The distinguishing feature is that an Oven with Integrated Controller has the Single Board Computer (SBC) PCB installed in the oven’s electronics compartment.

3.7 Air purge systems

The analyzer is suitable for a Class 1 Division 2 hazardous location, or an Ex Zone 2 area, without purge and pressurization protection. Purge and pressurization protection of the electronics enclosure is required for a Class 1 Division 1 location, or an Ex Zone 1 area. Refer to the analyzer nameplate for purge and pressurization specifications.

3.8 System variations

This manual supports the basic PGC5000 Generation 2 analyzer. An appendix to the main manual presents additional instruction for special applications such as PGC5000TPGC (temperature programmed GC), PGC5007 (fuel sulfur GC), and PGC5009 (fast GC).

4 Installation

4.1 Safety considerations

Before starting to install the analyzer, read the safety information below.

Before beginning installation, repair, or maintenance on the analyzer, contact the local Safety Department to ensure that all safety guidelines, regulations and procedures are followed. This includes obtaining the proper work permits.

The user is responsible for being familiar with and complying with all safety and health guidelines, regulations and procedures at the analyzer location. Consult Material Safety Data sheets for safety requirements.

When working on the analyzer there is the possibility of exposure to hydrogen, nitrogen, and other compressed gases. All appropriate precautions and extreme care should be taken when working with all compressed gases.

Become familiar with the application specifications before working on the analyzer.

Wear protective clothing and equipment, such as rubber gloves and goggles or safety glasses with side shields.

Before opening analyzer enclosure doors, be sure the area is safe from hazardous gases and will remain so the entire time the analyzer is open.

When handling electronic parts and assemblies, it is necessary that proper electrostatic discharge (ESD) precautions be taken (i.e., wear an ESD wrist strap with a grounding cable and use an ESD shielded bag to protect items removed).

4.2 Analyzer location

The analyzer should be located as close as is practical to the sample stream. The analyzer must be installed in a shelter or area protected from direct sunlight and harsh weather. It is recommended that a minimum clearance of six inches be allowed on each side of the analyzer panel to allow for making the necessary connections.

The analyzer must be mounted so that it is level.

The analyzer should be adequately supported during mounting, since its approximate weight is 90 kg (200 pounds). Connections should not be made to the analyzer until it is mounted securely in place.

The atmospheric exhaust (detector cell vent) must be an atmospheric vent.

4.2.1 Master controller

The Master Controller contains a Mounting Plate with a Single Board Computer (SBC), a Power Supply, one or more SBC CAN Interface Cards, and optional Wago input/output modules. The front panel assembly has a liquid crystal display (LCD), keypad, and front panel board.

The Master Controller can be located up to 100 meters (305 feet) from the associated oven. The Master Controller communicates with the oven through a fiber optic cable. The customer is responsible for locating the Master Controller in accordance with the customer-specified area classification indicated on the nameplate.

When you are determining where to install the Master Controller, include the following location criteria:

- Installation must be a pollution degree 2 environment or better
- Electromagnetic compatibility
- Area classification indicated on the nameplate
- Equipment ingress protection is IP54
- Protection from rain, direct sunlight, temperature extremes

- Ambient operating temperature is 0 to 50 degrees C (32 to 122 degrees F)
- Avoiding exposure to corrosive gas
- Not intended for a combustible dust environment
- Not intended for below surface mining applications
- Free from dust and static electricity
- Space of at least 152 mm (6 inches) to the right side of the Master Controller, if purge equipped
- Space of at least 610 mm (24 inches) in front of the Master Controller, for servicing
- Space of at least 279 mm (11 inches) above the Master Controller, if x-purge is utilized

4.2.2 Master controller as a RUI

The Master Controller as a RUI contains a Mounting Plate with a Single Board Computer (SBC), a Power Supply, with no SBC CAN Interface Cards, and no Wago input/output modules. The front panel assembly has a liquid crystal display (LCD), keypad, and front panel board.

The Master Controller as a RUI can be located anywhere that has access to an Ethernet connection. The customer is responsible for locating the Master Controller in accordance with the customer-specified area classification indicated on the nameplate. When you are determining where to install the Master Controller as a RUI, use the same location criteria as a regular Master Controller.

4.2.3 Ovens

Locate the ovens as close as practical to the stream to be sampled. The customer is responsible for locating oven(s) in accordance with the customer-specified area classification indicated on the nameplate.

When you are determining where to install the oven, include the following location criteria:

- Installation must be a pollution degree 2 environment or better
- Electromagnetic compatibility
- Area classification indicated on the nameplate
- Equipment ingress protection is IP54
- Protection from rain, direct sunlight, temperature extremes
- Ambient operating temperature is 0 to 50 degrees C (32 to 122 degrees F)
- Avoid exposure to corrosive gas
- Not intended for a combustible dust environment
- Not intended for below surface mining applications
- Free from dust and static electricity
- Space of at least 450 mm (18 inches) to each side of the oven for various customer connections and servicing
- Space of at least 406 mm (16 inches) in front of the oven, for servicing

The Oven with Integrated Controller can be located up to 100 meters (305 feet) from any associated oven. The Oven with Integrated Controller communicates with associated ovens through fiber optic cables.

4.2.4 Precautions

Review the following precautions during installation and before starting the analyzer.

- Temperature of protective air for purge/pressurization must not exceed 40 degrees C (104 degrees F).
- Inspection required for accumulated dust before applying electric power.
- Clean display with damp cloth only.
- Conduit entries not used must be sealed with an approved blanking plug.
- Main power supply must not exceed ±10% of the equipment rated voltage.
- Observe and take note of all caution tags attached to the analyzer.

4.3 Preparing for installation

Since Analyzer configuration depends on the particular application, this manual contains only generic engineering drawings and diagrams. You should utilize the drawings, diagrams and replacement parts lists provided in the Data Package supplied with your analyzer to ensure they are the correct ones for your system.

After unpacking the analyzer, inspect it for damage. Also check the packing list provided with the analyzer to make sure all equipment is included. The packing list, which is taped on the box or crate, contains a list showing how many cartons were shipped and what each box or crate contains.

4.3.1 Installation tools and equipment

The recommended standard tools and equipment for installation are:

- 5/32 inch hex key wrench (supplied)
- 5/16 inch hex key wrench (supplied)
- 7/16 inch open end wrench (2)
- 6 inch flat blade screwdriver
- 9/16 inch wrench
- 5/8 inch wrench
- 8 inch adjustable wrench
- Wire strippers
- Digital flow meter
- Leak detection solution

4.3.2 Plumbing installation

All plumbing connections enter at the right side of the Oven and Master Controller cabinets. Be careful to avoid damaging fittings and to ensure tight connections. Refer to the Data Package for specific plumbing information.

For brass and stainless steel pipe fittings, wrap the threads with PTFE tape or a suitable thread sealant. Make all connections and then tighten them appropriately. Leak check each connection as described in the “Leak Check” paragraphs in Section 5.

4.3.3 Gas requirements

The following information represents general requirements. Due to differences in applications, refer to the Data Package for application-specific requirements for each analyzer.

- Instrument air: instrument grade air
- Burner air: ISA hydrocarbon free grade with hydrocarbon content less than 1 ppm and dew point less than -40 degrees C (FID and FPD applications only).
- Carrier gases: varies with the application; the lower the levels of components being measured, the higher the necessary carrier gas purity.
- TCD: for percent level measurements, gases of 99.99% purity; for ppm measurement ranges, 99.995% purity.
- FID: for measurements down to 5 ppm, gases of 99.995% purity; lower ranges require higher levels of purity.

4.3.4 Calibration sample

A primary factor in determining the accuracy of the analyzer’s calibration is the quality and precision of the calibration sample. Regardless of the sample composition or number of complete analysis components, generally only measured components are in the calibration sample.

4.3.5 Purge air alarm

To meet Area Classification requirements, some analyzers are equipped with air purge. The analyzer system detects the loss of purge at the Master Controller and/or oven(s) and generates alarm signals. The customer has the responsibility to connect the purge alarm to a visual or audible enunciator located in a constantly monitored area, in accordance with the conformity standard for purge and pressurization protection.

4.4 Equipment mounting

Depending on the configuration of the Oven, it can weigh from 80 to 120 pounds. You should have one or more person help you lift it and move it.

Unpack the system near the installation site and move it with a transportation machine. Handle the analyzer carefully so that it does not fall. For floor-mounted units, secure the Master Controller and Oven dolly bolts. Secure wall-mounted units appropriately. Refer to the Outline and Mounting Dimensions drawing in the Data Package for specific mounting information.

4.5 Connections

4.5.1 Tubing
Refer to the applicable drawings in your Data Package for specific tubing and connection information while observing the following:

- Do not remove the tube caps, provided at the analyzer tubing ports to prevent deterioration of the columns, until immediately before making each connection.
- Ensure use of proper size tubing and pipe; refer to the Outline and Mounting Dimensions Diagram contained in the Data Package included with your equipment.
- Use tubing and fittings free of interior contamination from grease, oil or other substances. Before connecting these lines, completely air-purge their interiors.
- After connecting the tubing, perform a leak check as described in the "Leak Check" paragraphs in Section 5.

4.5.2 Instrument air
The air supply is connected to the fitting marked Instrument Air Inlet.

4.5.3 Carrier gas
The carrier gas is connected to the fitting marked Carrier In.

Carrier gas dryer is recommended for capillary column applications.

4.5.4 Burner fuel
The burner fuel, when used, is connected to the fitting marked Burner Fuel.

4.5.5 Burner air
The burner air, when used, is connected to the fitting marked Burner Air.

4.5.6 Sample
The methods used for transporting the sample from the process stream to the analyzer, or from the calibration sample to the analyzer, are critical to the operation of the analyzer. Refer to the system drawings in the Data Package for specific system connections.

4.5.7 Hydrogen gas

Hydrogen is highly explosive. Follow applicable safety precautions and use extreme care in making connections.

The analyzer uses hydrogen gas as a burner fuel with flame cell detectors (FID or FPD) and sometimes uses it as a carrier gas. Verify that the hydrogen gas meets the criteria of the gas requirements listed in the Data Package. Also refer to the Data Package for specific connection information.

4.5.8 Vents
All vent lines must be at atmospheric pressure unless otherwise specified in the Data Package. The vent lines should slope down from the analyzer so that condensation will not collect in the analyzer or cause backpressure in the external tubing. Refer to the Data Package for specific connection information.

4.5.9 Liquid sample valve
The Liquid Sample Valve (LSV) is used only with liquid applications. The Oven Enclosure has sample lines connected to a mounting plate attached to the LSVs mounting flange.

The LSV has the sample lines connected to the mounting plate attached to the LSVs mounting flange, as shown in Figure 4.1.

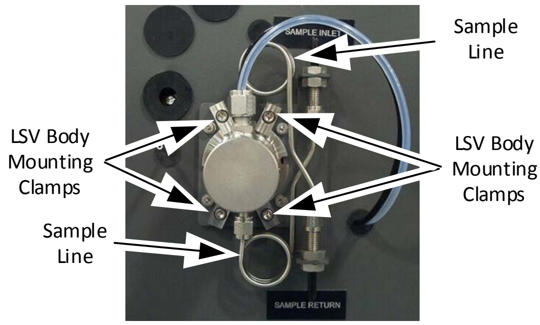


Fig. 4.1 Liquid Sample Valve

It is important to use two wrenches when tightening the sample line connections at the LSV sample chamber. One wrench must be used to back up the force applied to tighten the fitting (direct wrench force may bend the stem or damage the valve seals).

To ensure the integrity of the components within the Liquid Sample Valve, use the tools in LSV Tool Kit 791K009-1 when assembling of disassembling the LSV.

4.6 Electrical

The analyzer must be installed according to all applicable codes. If it is in a hazardous area, the wiring method must conform to the applicable requirements.

Install signal wiring and power wiring in separate conduit pipes or cable trays to reduce noise and crosstalk.

A grounding (earthing) connection is required. Connect minimum 12 gauge (3.31 mm^2) ground wire to the Earthing Connection on the Oven Compartment and on the Master Controller.

4.7 Setting up the master controller

The Master Controller (see Figure 4.2) must be installed according to all applicable codes. If it will be in a hazardous area, the wiring method must conform to the applicable requirements.

- Power wiring (circuit breaker protection must be supplied by the customer); refer to the installation wiring drawing provided in the Data Package for details.
- Signal fiber between the Master Controller and the Oven(s).
- Alarm contact outputs; refer to the installation drawing in the Data Package for details.
- Ground (earth) connections must be at earth (0 volts) potential.

Failure to maintain earth (0 volts) potential at ground connection points constitutes a serious safety hazard.

Figure 4.2. Inside the Master Controller

Refer to the applicable drawings in your Data Package for specific interconnection wiring information.

4.7.1 Single board computer pcb

The Master Controller and the Oven with Controller contain a Single Board Computer (SBC). The SBC has built in redundant Ethernet Network Interface Connections (NICs) located at the top center of the SBC, labeled J6 and J8. Note that Ethernet 1 is to the right and Ethernet 2 is to the left.

The SBC has an SBC CAN Interface Card for each oven, labeled 1 through 4 from left to right. This module communicates with the oven via fiber optic cables attached to the board by two connectors. The fiber optic cables utilize two type ST connectors. The customer is required to install all fiber optic connections.

Sharp bends in a fiber optic cable can cause signal attenuation or the optical fiber to break.

The ST connectors have a bayonet mount and a long cylindrical 2.5 mm ceramic or polymer ferrule to hold the fiber. They are spring-loaded and keyed with slots and alignment nubs. Always “Stab and Twist” to make sure the ST connectors seat properly.

If you have signal loss, remove and reconnect to see if this eliminates the problem.

Optical fiber consists of a core, cladding, and a protective outer coating, which guides light along the core by total internal reflection.

4.7.2 Purge air alarm

The Purge Air Alarm must be monitored if the analyzer is equipped with pressurization protection. Connect the Purge Air Alarm wiring to connector J19, pins 1 to 3, on the Single Board Computer. Refer to the Data Package for more detailed information.

The alarm contact is set in normally-open configuration for failsafe operation. The Purge Alarm input must be configured to indicate a non-alarm condition when the contact is closed. The Purge Air Alarm is a dry contact rated for a maximum of 5W at 30 Vdc or 0.25 A maximum.

The Common Malfunction alarm connections use J19 pins 4 to 6. Refer to the Data Package for more detailed information.

4.8 Setting up the ovens

Each oven must be installed according to all applicable codes. If it will be in a hazardous area, the wiring method must conform to the applicable requirements.

- Power wiring (circuit breaker protection must be supplied by the customer); refer to the installation wiring drawing provided in the Data Package for details.
- Signal fiber between the Master Controller and the Oven(s).
- Alarm contact outputs; refer to the installation drawing in the Data Package for details.
- Ground (earth) connections must be at earth (0 volts) potential.

Failure to maintain earth (0 volts) potential at ground connection points constitutes a serious safety hazard.

Refer to the applicable drawings in your Data Package for specific interconnection wiring information.

Connect the oven purge alarm to connector J10 pins 1 (NC), 2 (C), and 3 (NO) on the DTC Digital PCB. Refer to the Data Package for more detailed information.

The General Purpose alarm connections use pins 5 and 6 of the mating connector and connect to J10 on the DTC Digital PCB. Refer to the Data Package for more detailed information.

The Oven with Integrated Controller contains an SBC (see Section 4.7.1 for additional information). The Purge Air Alarm function on the SBC is not used in the Oven with Integrated Controller.

5 Start-up

5.1 Introduction

The application configured at the factory establishes the operational baseline and expected results as requested by the customer. The analyzer can be controlled at either the Local User Interface (LUI), if provided, or the Remote User Interface (RUI). While these interfaces can work simultaneously on an analyzer, they work independently of each other. The last function to save data is the one effective on the analyzer.

5.2 Master controller controls and indicators

Normal operation of the analyzer is controlled from the Master Controller front panel (see Figure 5.1, which has the touchscreen display and keypad.

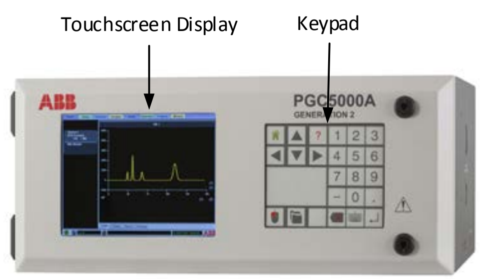


Fig. 5.1. Master Controller

5.2.1 Touchscreen layout

Figure 5.2 illustrates the basic Master Controller display layout and functionality.

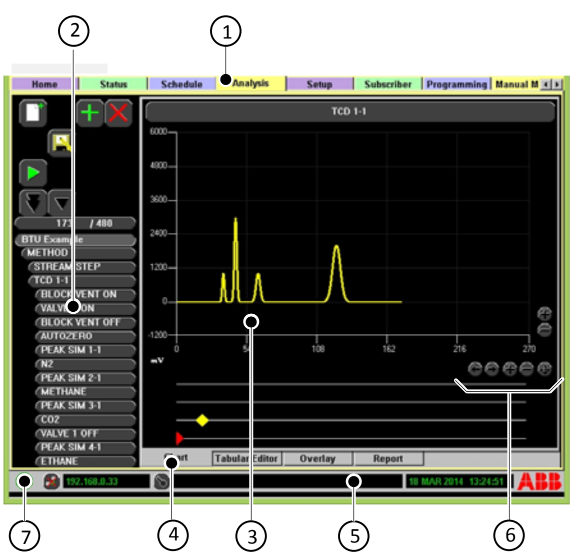


Fig. 5.2. Basic Analyzer Screen Layout

1. Tabs – select a tab using the cursor to navigate between system operational and configuration displays.
2 Function Selectors – displays buttons and action icons relative to the selected tab.
3. Subtab Display Area – provides specific information relating to the tab and/or subtab selected.
4. Subtabs – each subtab displays additional information applicable for the main tab selected.
5. System Information Bar – displays current analyzer information.
6. Zoom Control – increases and decreases the scale of the display.

5.2.2 Action icons

Action icons are small pictures that represent action commands. In this manual the text will utilize the meaning/function shown below in referring to the icons. Figure 5.3 shows the action icons and provides a brief description of each one.

Icon	Meaning/Function	Icon	Meaning/Function
	Power Failure Recovery Setup (Schedule Tab)		USB Flash Drive Operation (Setup Tab)
	Maintenance Mode (Schedule Tab)		Restore Settings (Setup Tab)
	Schedule Abort (Schedule Tab)		Start
	Schedule Stop (Schedule Tab)		Delete/Remove
	Save – Replaces saved information after editing		Apply Response Factor (Setup Tab > Component)
	Save As – Saves as a new file		Pause – Pauses schedule execution
	Add New – Creates new		Routing Table Configuration (Setup > Network Adapters)
	Add – Adds existing item from library		Line Up; Page Up
	Page Down; Line Down		Access Control List

Fig. 5.3. Action Icons

5.2.3 Function/navigation buttons

Function/navigation buttons complete an action. In this manual the text will utilize the meaning/function shown below in referring to these buttons. Figure 5.4 shows the function/navigation buttons and provides a brief description of each one.

Icon	Meaning/Function	Icon	Meaning/Function
	Add to a scope (Status Tab)		Run analysis on demand
	Accept		Abort – Cancel Entry
	Reset – Resets single indicator		Reset – Reset all displayed indicators
	Disconnect from remote Master Controller		Connect to a remote Master Controller
	Go Back – Returns to the last input		Next
	Shift Down – Virtual Keyboard Control		Unlock a locked chromatogram
	Login to a Master Controller		Lock a chromatogram

Fig. 5.4. Function/Navigation Buttons

5.2.4 System information bar

The System Information Bar (see Figure 5.5), which is located along the bottom of the screen, gives a variety of information as noted in the following list.

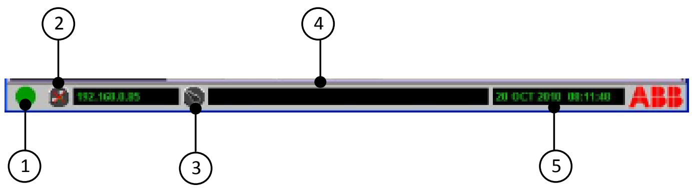


Fig. 5.5. System Information Bar

1. System Status Indicator – this light reflects indicators assigned to the overall health of the system. If the light is anything other than green check the Status tab. The indicator colors signify the following:
   Green = Normal
   Yellow = Warning
   Red = Alarm
   Blue = Information Only
2. Network Connect Icon – this icon allows connecting to a Master Controller from the RUI or from the Master Controller to another Master Control by entry of an IP address or the selection of the name of a remote Master Controller.
3. Security Login – provides means for logging into the analyzer.
4. Information Area – provides system messages.
5. Date and Time – shows date and time information used in reports.

5.2.5 Naming conventions

The following special characters MAY NOT BE USED in any software edit fields (e.g., component names, Master Controller name):

Special Character	Identification
.	Period
/	Forward Slash
\	Back Slash
&	Ampersand
~	Tilde
“	Double Quote (Quotation Mark)
‘	Single Quote (Apostrophe)
,	Comma
?	Question Mark
!	Exclamation Point
@	At Symbol
$	Dollar Sign

When you are using the analyzer with a STAR server, all special characters other than “_” (underscore), “-“ (minus or hyphen), or “+” (plus sign) will be converted to “_” (underscore) for storage in the STAR server.

5.2.6 Keypad

The keypad is used for numerical input and cursor movement (see Figure 5.6). From this keypad, which is located to the right of the display, navigation is accomplished by either pressing symbol keys or using the touch pad. The function of the keys is explained below.

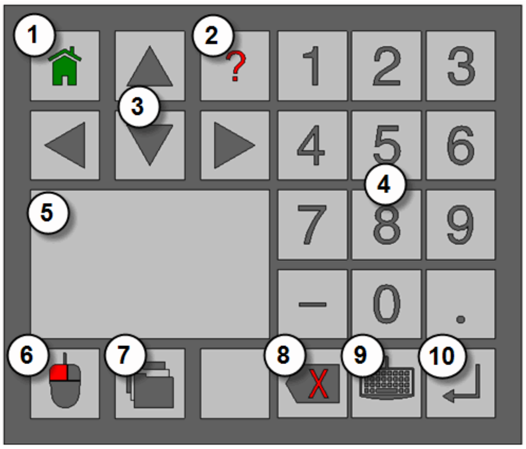


Fig. 5.6. Master Controller Keypad

1. Home – Returns to the default screen (Home tab).
2. Help – Jumps to the Quick Help screen.
3. Cursor Arrows – Move any direction on the subtabs.
4. Numeric Keypad – Inputs numeric data where needed.
5. Touch Pad – Moves the cursor on the screen (use a stylus or fingernail for best results).
6. Mouse Button – Indicates the mouse selection when needed.
7. Folder Selection – Moves left to right between screen tabs.
8. Destructive Backspace – Moves back one space at a time, deleting characters.
9. Virtual Keyboard – Displays the keyboard on the screen for inputting text characters.
10. Carriage Return – accepts data.

5.2.7 Keyboard

The virtual keyboard (see Figure 5.7), accessed from the keypad, allows text input from the Local User Interface. Use the touch pad to select individual letters and numbers. Uppercase letters are available by pressing the Shift Up button on the left side of the space bar. Press the Go Back button to delete characters. Press the Accept button to save the changes, or press the Abort button to cancel. The number of characters differs depending on the field Max.

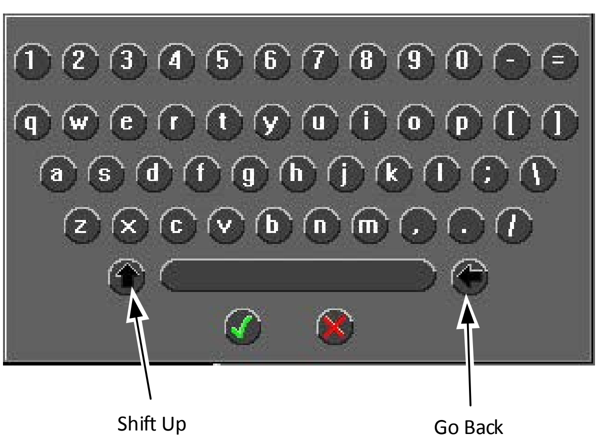


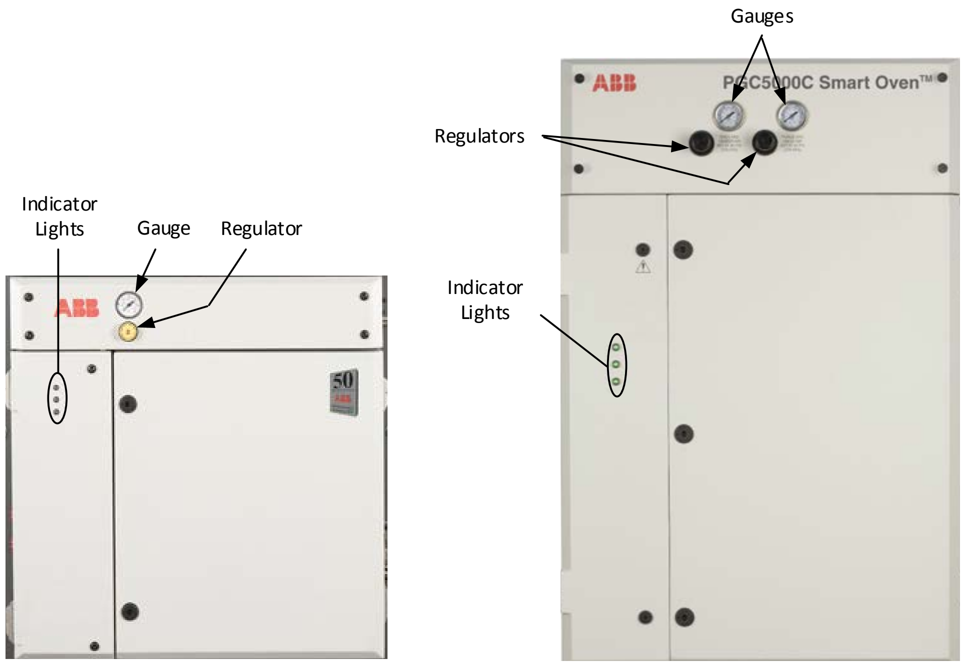
Fig. 5.7. Virtual Keyboard (lower case view)

5.2.8 Master controller as a RUI

The Master Controller as a RUI contains many of the functions described above. However, since it will not have ovens or Wago input/output modules attached, some of the functions and features will not be available on the unit.

5.3 Oven controls and indicators

Figure 5.8 shows the controls and indicators for a typical oven. Both the Class B Oven and the Class C Oven have the same controls and indicators.



CLASS B OVEN

CLASS C OVEN

Fig. 5.8. Typical Ovens

5.3.1 Oven LED indicators

Each oven has three LED indicators (see Figure 5.8) which show the current status of the oven.

- If the LEDs are not lighted, check power to the unit.
- If the top LED is green and flashing, the system is initializing.
- For all other situations use the following table:

LED	Red	Amber	Green
Top	Oven Idle	Future Use	Executing Analysis
Middle	DTC Malfunction	Low Oven Air and/or Carrier Gas Alarm	DTC Operation Normal
Bottom	FID/FPD Flame Out	Future Use	FID/FPD Flame Lit

5.3.2 Oven regulators and gauges

If there is one pair of regulators and gauges, they control both oven and heater air.

If there are two pairs of regulators and gauges, one pair controls oven and heater air and the other pair controls purge and valve air.

5.4 Starting the analyzer

1. Visually inspect the analyzer for inoperative or damaged gauges, loose or damaged connections, and overall condition.
2. Turn on the instrument air at its source.

Refer to the Data Package to ensure that air supply at the specified pressure is provided to the INSTRUMENT AIR inlet. The purge air and heater air pressures should be as specified on the label below the corresponding regulator.

3. Turn on carrier gas at its source.

Refer to the Data Package to ensure that the specified carrier gas is provided at the specified pressure to each CARRIER inlet.

If the analyzer is equipped with enclosure purge, refer to the sales order tag for specified flow rate and purge time before applying electrical power.

4. Turn the power ON at the external circuit breaker or switch.
5. Verify any auxiliary gases in the same manner as the Carrier gas.
6. Check for leaks. If a leak occurs during start-up, perform the leak checks described in paragraphs 5.4.1 and 5.4.2.
7. Allow sufficient time for oven warm-up. (Temperatures are set during installation). The oven should stabilize at the temperature indicated in the Data Package. If adjustments are required, adjust the Digital Temperature Controller as described on the Setup Tab > DTC "Digital Temperature Controller."

5.4.1 Leak check oven

This is recommended at startup or if an internal carrier gas leak is suspected. Perform a simple leak check on the oven section as follows (see Figure 5.9):

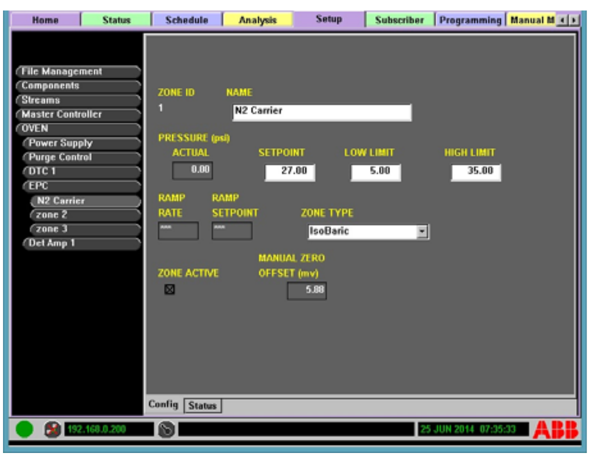


Fig. 5.9. Leak Check Oven Example

1. Plug all oven carrier gas vents as applicable: backflush vent(s), selector vent, detector vent(s) and splitter vent.
2. Under the Setup tab at the user interface, disable burner air and hydrogen fuel zones if applicable.
3. Set carrier pressure to factory settings.
4. Wait five minutes for pressure to equilibrate.
5. Set carrier pressure to zero psig.

You may observe an initial drop in pressure when setting the carrier pressure to zero psig. After the initial drop record the reading and wait 30 minutes. The pressure should hold and any decline is excessive and indicates a potential leak.

6. Check for leaks using a suitable leak detection solution. Starting at the inlet to the detector, work back to the carrier gas supply, plugging the exit of each valve or column to locate the leak.

5.4.2 Leak check carrier gas supply lines

Check for leaks during initial installation by performing a simple leak check on the utility gases as applicable:

1. Ensure all power is off.
2. Pressurize all lines to 90 psig.
3. Wait five minutes for pressure to equilibrate.
4. Set supply regulator to zero (0) psi.
5. If pressure bleeds off, repeat steps 1 to 4 and use a suitable leak detection solution to check for leaks between carrier gas supply and the ovens.

5.5 Calibrating the analyzer

Use the Setup tab to enter the calibration concentration for all components being calibrated. Follow the steps below to calibrate using either the LUI or RUI.

1. Navigate to the Setup tab (see Figure 5.10).

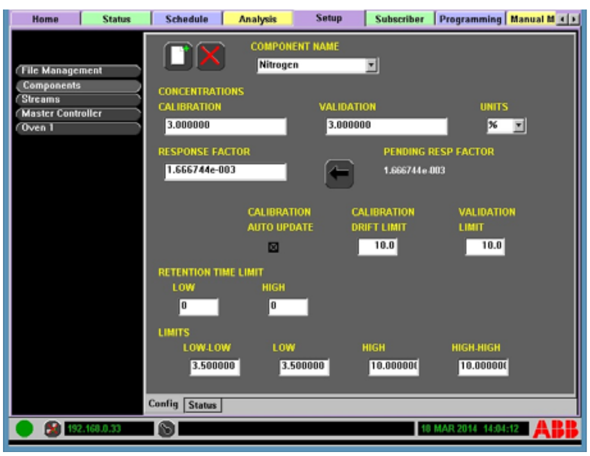


Fig. 5.10. Setup Tab, Showing Calibration Concentration

2. Select the **Components** button from the Function Selectors list.
3. Verify that the Config subtab at the bottom of the screen is selected.
4. Select the component to calibrate from the COMPONENTS NAME drop down menu.
5. Enter the concentration and unit information into the CONCENTRATIONS CALIBRATION and UNITS fields. (Example: Enter 20 in the Calibration field and % in the Units field for 20%; ppm and ppb are also available).
6. Turn on the Calibration sample.
7. Select the **Schedule** tab and verify that the Demand subtab is selected.
8. Select the **Run** button to run the Calibration.
9. On successful completion, return to the Setup tab and select the **Components** button.
10. Ensure the current component name is selected; the PENDING RESP FACTOR appears.
11. Select the **Apply Response Factor** button (left arrow next to PENDING RESP FACTOR) to insert the pending response factor as the current response factor.
12. To automatically update response factors, select the CALIBRATION AUTO UPDATE box.

5.6 Validation run

Follow the steps below to initiate a Validation Run, using either the LUI or RUI:

1. Navigate to the **Schedule** tab and select the **Step** or **Demand** Subtab.
2. Select the **Add** button.
3. On the drop down screen, choose the validation stream and select the **Next** button to continue.
4. On the drop down screen, choose the desired analysis and select the **Next** button to continue.
5. To confirm the choice select the **Accept** button. The validation analysis is now listed in the Step > Demand subtab.
6. Turn on the Validation sample and set the flow.
7. Either add to the schedule by selecting the analysis **Active** box in the Step subtab screen, or select the **Start Schedule** button to execute one time.

5.7 Connecting to the network (optional)

5.7.1 Factory default IP addresses

When a PGC5000 Generation 2 analyzer is shipped from the factory, the default IP address of the primary Network Interface Card (NIC) will be 192.168.99.99 and the IP address of the secondary NIC will be 0.0.0.0.

If the customer has requested specific IP addresses, these will be configured at the factory.

When the analyzer arrives at the customer site or Integration House, connect a PC/laptop, running a STAR Client, directly to the primary port of the analyzer and boot the analyzer. When the analyzer boots up, the PGC5000 Generation 2 will appear in the device list of the STAR Client where you can display the configured IP addresses. To launch a RUI, the PC/laptop must be on the same subnet (i.e., 192.168.99.xx) as the analyzer. From the RUI you will be able to change the IP addresses to the site specifications. Once the changes have been made with the correct IP addresses, a Network Save operation will save the IP addresses and reboot the analyzer. The STAR Client will see the "new" devices appear in the list with the changed IP addresses.

Once the analyzer is rebooted, you will not be able to reconnect to the analyzer with a RUI unless you change the PC/laptop IP address to the same subnet as the analyzer.

5.7.2 All analyzer versions

The PGC5000 opens the following ports, which must be opened through network gear and firewalls:

58921 TCP – Communication Port
58921 UDP – Utility Port
502 TCP – Modbus

The PGC5000 Generation 2 analyzer supports standard Ethernet connectivity. After the connections are physically attached and verified, configure the analyzer in accordance with network policies.

A Master Controller's LUI can be temporarily replaced with the RUI of another PGC5000 Generation 2 analyzer on the same network. This feature is particularly useful when working with an Oven with Integrated Controller.

The Network Connect button is located in the system information bar at the bottom left of the display, showing two boxes connected by a green line (see Figure 5.11). If you launch the RUI from the STAR Client, the IP Address will appear in the box next to the Network Connect button.

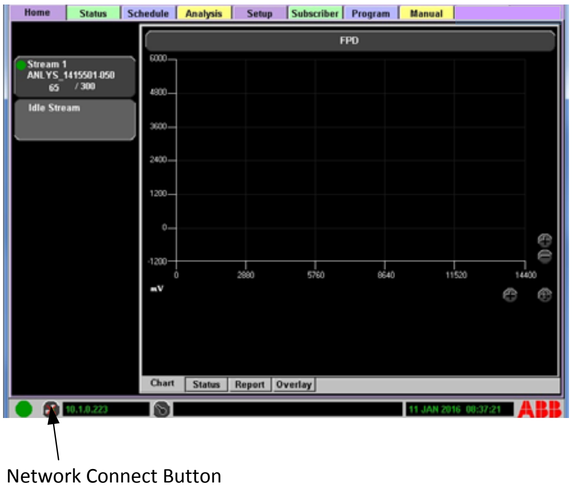


Fig. 5.11. Home Screen, Showing IP Address

If you call up the RUI by launching the RUI application from a shortcut or Windows foler, you will get **Local** in the box next to the Network Connect button (see Figure 5.12).

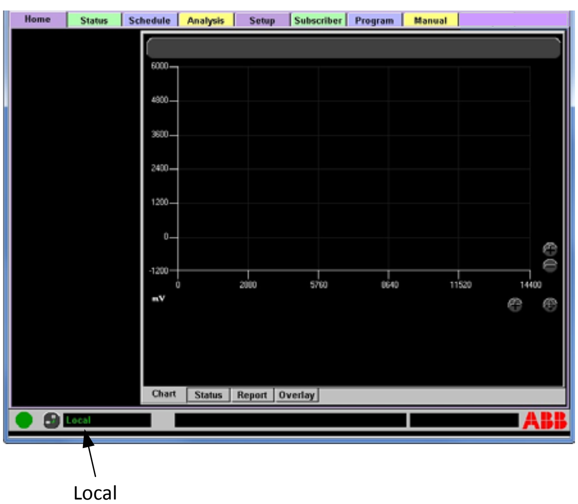


Fig. 5.12. Home Screen, Showing "Local"

5.7.3 Early versions of the analyzer

If you click on the Network Connect button again, you will get the IP Address Dialog Box, which will allow you to enter the desired IP address (see Figure 5.13). After you enter the desired IP Address, click on **Accept** to save the entry or click on **Abort** to retain the original settings.

Fig. 5.13. Home Screen, Showing IP Address Dialog Box

If you then click on the Network Disconnect button (see Figure 5.14), you will get Local and a Logged Out message.

Fig. 5.14. Network Disconnect Button

5.7.4 Analyzers with version 4.2.2.0 and later

The Identify feature applies only to PGC5000 Generation 2 version 4.2.2.0 and later. The oven LED flashing requires the analyzer having DTC2 (852A028) hardware. The "identify" feature requires a healthy connection between the PGC5000 Master Controller and the associated PGC5000 Oven(s).

When you press the Network Connect Button, the Connect Dialog box will display a list of compatible analyzers (see Figure 5.15). Choosing an analyzer from the list will display its IP address. Optionally, an IP address may be entered manually. Pressing the connect button initiates a remote connection. Pressing the cancel button closes the dialog box.

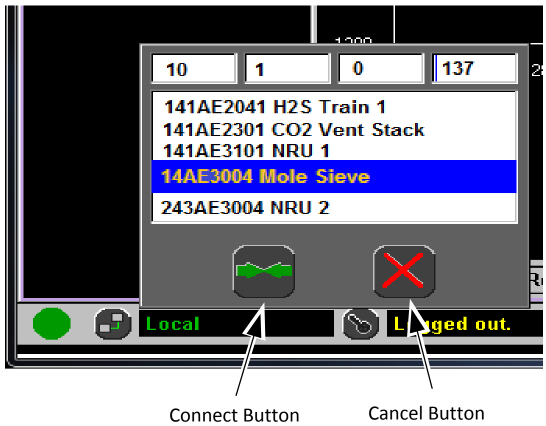


Fig. 5.15. Connect Dialog Box

When a remote connection is successful, the three Status LED's on each of the associated PGC5000 Smart Ovens will flash green five times in unison. If available, the Analyzer name will appear in the Connected To text box (see Figure 5.16). If the analyzer name is not available the IP address will appear.

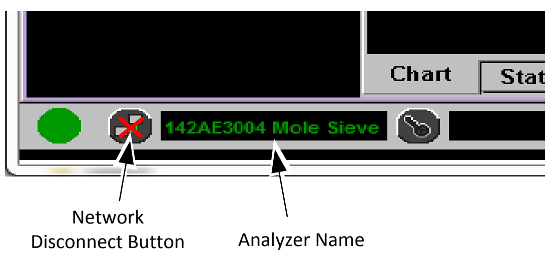


Fig. 5.16. Connect Dialog Box, Showing Analyzer Name

When you press the Network Disconnect Button, the Disconnect Dialog will appear (see Figure 5.17). Pressing the Identify button will cause all three Status LED's of the remotely connected oven to flash green five times in unison. Pressing the Disconnect button will return to the local connection when using the Local User Interface or disconnect when using the Remote User Interface. Pressing the Cancel button closes the dialog.

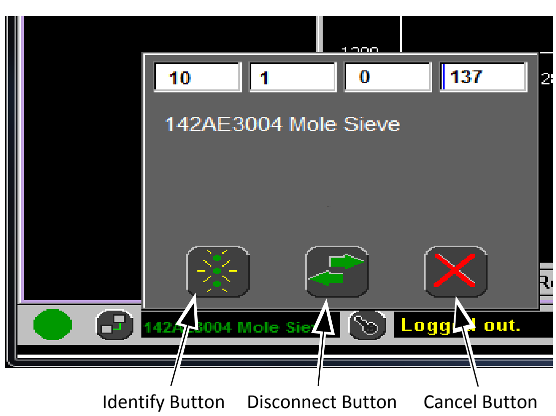


Fig. 5.17. Disconnect Dialog Box

5.7.5 Master controller as a RUI

When addressing a Master Controller as a RUI, the Status tab will not contain the idle stream button. The Setup tab will only include the Network Adapters and Clock options. When the Network location in the System Information Bar indicates "Local," the Master Controller as a RUI is not connected to an analyzer.

When connected to a Remote analyzer, the messages that are displayed are for the remote device.

5.8 Using the access control list

When the analyzer is shipped from the factory there are no users configured. If the analyzer is added to an existing network with other PGC5000s or a STAR DMS, the analyzer's access control list (ACL) will be populated by another node in the network. If no other PGC5000s or STAR DMS servers exist in the network, the user can add a user if desired. The first user MUST be added as a Supervisor level user. User passwords should be strong passwords. You should always take great care when you select a password. A strong password has the following characteristics:

- Is between 8 and 20 characters long;
- Combines letters, numbers and symbol characters within the password;
- Is not found in a dictionary;
- Is not the name of a person;
- Is not the name of a user;
- Is not the name of a computer;
- Is changed regularly;
- Is significantly different from previous passwords.

Passwords should be changed regularly—at least every 90 days. User names and passwords should be limited to English keyboard characters, as some special characters are not visible on the LUI and RUI.

5.8.1 Logging into the PGC5000 generation 2 analyzer

Access to the analyzer is controlled by creating authorized user name with passwords. To log into the analyzer through the LUI, perform the following steps.

1. Log into the analyzer by selecting the **Log In** button and selecting a User name from the list (see Figure 5.18).

Fig. 5.18. Selecting a User Name

2. Enter your assigned password and select the **Accept** button to accept.
3. The information bar at the bottom of the screen displays your access level.
4. The Log In button becomes a Log Out button upon log in. To log out, select the Log Out button.

5.8.2 Access levels (optional)

Access levels are set using the user interface, STAR Client, or optional VistaNET Name Service Application (VNSA) interface. The user name/password information is maintained in a distributed Access Control List (ACL).

The ACL also stores the access level for each user of the analyzer and STAR Data Management System (STAR DMS). Refer to the STAR Data Management System (DMS) Operating Instructions for a detailed description of ACL. There are three levels of access:

- Supervisor: Can modify the ACL.

- Read/Write (Normal): Can modify all tables with the exception of the ACL.
- Read Only (Limited): Can view, but not modify, any table of any device.

All Supervisors have the ability to determine each user's required access level and enter the information into the ACL.

If the Information Bar states 'Login access Unsecured,' all users have full access (Supervisor level).

5.8.3 Subscriber list

The Subscriber Tab allows analysis results, status change and analyzer events reporting to the Reporter, the OPC, and the STAR Server. Their addresses must be entered in the Subscriber List. Instructions for adding new or editing existing subscribers are covered in the Operations section under the Subscriber Tab.

5.8.4 RUI

Use the following procedure to connect remotely from a PC.

1. Install the STAR core software on a Personal Computer (PC) attached to the same network as the analyzer.
2. Launch the RUI from the STAR Client.

Use the following procedure to connect from a RUI shortcut.

1. Launch the RUI from a shortcut.
1. Select the **Network Connect** button (see Figure 5.11).
2. When the Network Dialog Box appears, enter the IP address of the analyzer to observe and/or control (see Figure 5.13).
3. Select the **Accept** button to continue or select the **Abort** button to close the network box.

For Version 4 analyzers, you can launch the RUI from the STAR Client.

5.9 Analyzer shutdown

The Analyzer may need to be shut down for a variety of reasons: valve replacement, preventive maintenance, or temporary plant shutdown.

The recommended steps for analyzer shutdown are:

1. Go to the Schedule Tab and stop all schedules (see Operation > Schedule Tab in Section 6 for instructions).
2. Block out and tag out sample to the ovens.
3. Purge sample from oven as necessary.
4. Decrease analytical oven temperature to ambient temperature (refer to Setup tab for instructions) and allow columns to cool.
5. Block out and tag out carrier gases, burner air and burner fuel as necessary.
6. Lockout/tag out power to the oven.
7. Lockout/tag out instrument air supply.
8. Power down and tag out per company established safety procedures.

6 Operation

6.1 Introduction

The PGC5000 Generation 2 analyzer operates from a series of tabs at the top of the screen. All functions of the analyzer are accessed from these tabs and their subtabs, which are located at the bottom of the screen.

6.2 Home tab

The Home tab is the user interface's default screen displayed when the system starts. It displays a quick overall health status and performance snapshot of the analyzer. General features include:

- View current chromatograms
- Overlay chromatograms
- Zoom and pan chromatogram
- Color-coded Indicator Status Icons
- Reports

6.2.1 Chart subtab

The Home >Chart subtab displays the general operation overview and conditions of the analyzer (see Figure 6.1).

Fig. 6.1. Chart Subtab

1. Analysis Buttons –Displays the indicator level and analysis progress for all active analyses. The "Idle Stream" is included for review of chromatograms or reports not currently running.
2. Analysis Graphics – Displays the currently selected analysis (button depressed at left) and overlays.
3. Chart Controls – Increase or decrease X & Y axes for viewing.
4. Subtabs – Displays information and setup relative to the selected analysis.

Selecting the chart controls allows zooming and/or panning of the current chromatogram.

To zoom an area, use the cursor to select a point on the chart as a starting point (see Figure 6.2). Hold the mouse button down and drag the box over the desired viewing area. Release the mouse button to complete the zoom. To return to the default view, select the crossed arrow button, in the lower right corner of the screen.

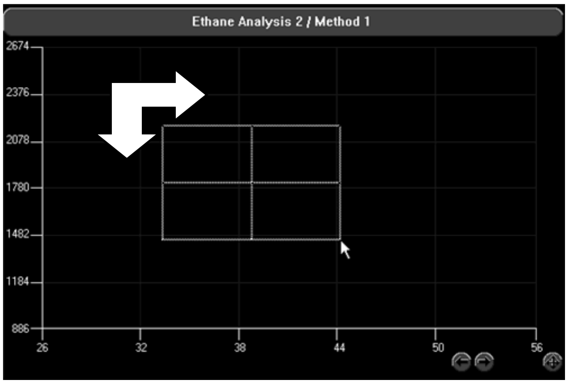


Fig. 6.2. Zooming an Area

To zoom an area on the touchscreen at the LUI, use your finger (or other type of touchpad stylus) and touch the screen at the starting point of where you want to have your zooming window begin. Keep your finger/stylus pressed gently on the screen and drag the zooming box over the desired viewing area. Release your finger/stylus from the touchscreen to complete the zoom. To return to default view, select the crossed arrow button.

6.2.2 Status subtab

The Home>Status subtab displays all triggered active assigned indicators for the selected analysis button, and the date and time the indicator triggered (see Figure 6.3).

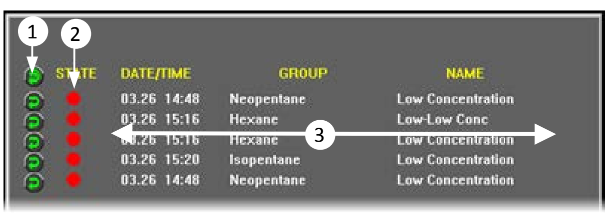


Fig. 6.3. Home>Status Screen

1. Indicator Reset – Reset one or all displayed indicators.
2. Indicator State – The triggered indicator's alert level: green (normal), yellow (warning), red (alarm), or blue (information only).
3. Information Area – Date/time indicator triggered, indicator group and name.

Only triggered indicators assigned to a Stream, Analysis or Components are displayed. The colored dot (light) represents the current indicator state and the date/time of indication.

To reset an individual indicator:
1. Locate the indicator to reset.
2. Select the **Indicator Reset** button to the left of the indicator to reset.

If the indicator stays the same color but the date matches the current analyzer time, the condition which triggered the indicator may still be present.

To reset all triggered indicators currently displayed, select the Indicator Reset button in the header row.

6.2.3 Report subtab

The Home>Report subtab displays the analysis information (see Figure 6.4).

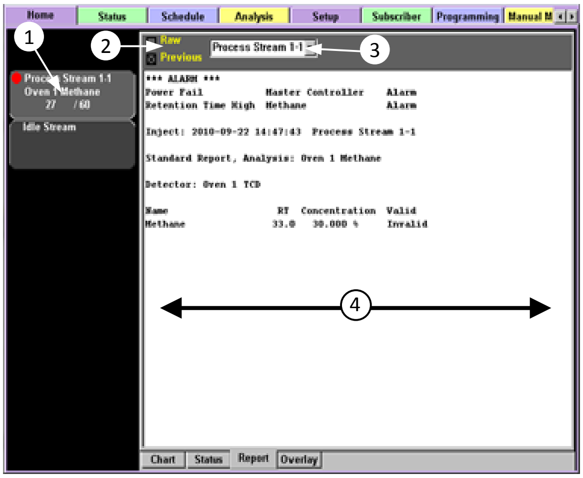


Fig. 6.4. Home>Report Subtab

1. Analysis Buttons– Displays the indicator level and analysis progress for all active analyses. The "Idle Stream" is included for review of analyses not currently running.
2. Report Type – Select Raw to display reports in raw data format. Select Previous to display last saved report for the selected stream.
3. Report Selection Criteria – Select Stream.
4. Report Area – Report data displayed in the selected format.

The analyzer stores up to a week's worth of analysis stream data for a standard application. Reports and Chromatograms for each stream include the last five:

- Calibration stream reports and chromatograms.
- Validation stream reports and chromatograms.
- Alarm reports and chromatograms for each stream.

There is a "Locked" folder that can contain any number of Saved reports and chromatograms, and there are "Reprocessed" and "alarm" folders that can contain the last five reports of each.

The operator has the option of viewing the previous report for the selected stream or any of the automatically saved reports.

Two report formats are available: Standard and Raw.

The report format selected also selects the type of report that can be sent to an optional Reporter.

The reports and chromatograms are stored on a removable SD card located on the Single Board Computer PCB (SBC). This SD card can be removed to transfer data to a PC. A reliable, high grade SD card is provided with the Master Controller and is available as a spare part. The SD card must be installed before analyzer start-up for the SD card to be utilized, as it will not recognize the device until the next power cycle during which the SD card is present. To remove the SD card from the SBC, select the Eject SD card button on the Setup tab screen.

When the SD card is not in the SBC, the reports and chromatograms are stored on the RAM disk, allowing uninterrupted data collection. When the RAM disk is full, the oldest files are removed to allow storage of new data, allowing continual data collection. The RAM disk stores several hours of data for a standard application. When the SD card is returned to the SBC, storage of subsequent data is directed to the SD card. Data stored on the NAND flash is not transferred to the SD car but can be downloaded through Ethernet by the user. When the SD card is full, the oldest files are removed to allow storage of new data, allowing continual data collection. The last five calibration, validation and alarm reports are retained, independent of time stamp.

1. The standard report (see Figure 6.5) displays inject time, sample stream, analysis name, report type, detector, component Name / Retention Time / Concentration and validity of the component.

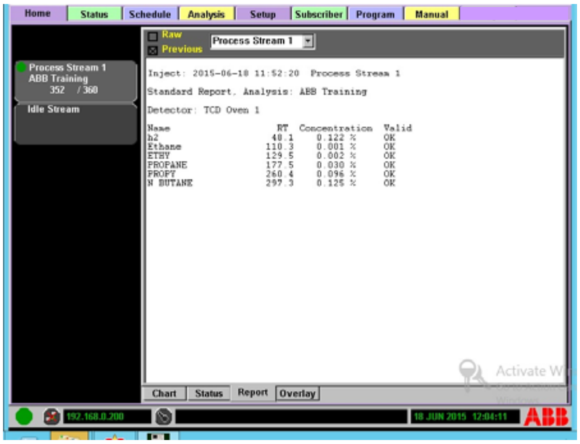


Fig. 6.5. Standard Report Format

2. The raw data report (see Figure 6.6) displays the actual value of software determined points on the chromatogram, in addition to the information displayed in the standard report format. The times shown are in seconds from the start of the method. The amplitudes are in 0.1 microvolt units. The Start of Baseline / End of Baseline amplitudes are relative to electrical zero. The other amplitudes are relative to the computed baseline. Areas are in millivolt-sec units.

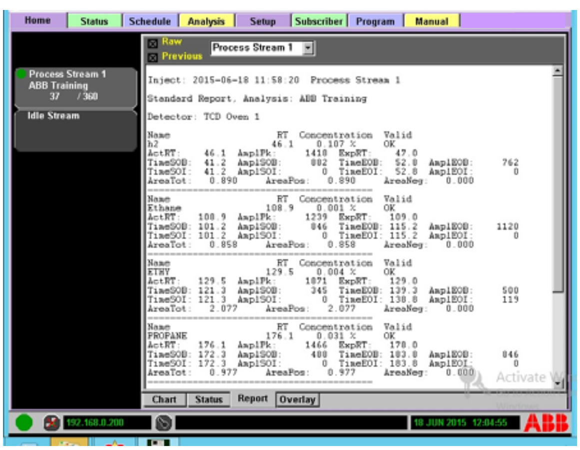


Fig. 6.6. Raw Data Report Format

Use the following steps to view the last saved report by stream.

1. Select the analysis from the list on the left.
2. Select the previous report box.
3. Select the stream.
4. View the report.
5. Select **Raw** to view in raw data format.

Use the following steps to view a stored report.

1. Ensure the **Previous** box is unchecked and select the RAW box if raw data is preferred.
2. Select the Stream from the first drop down list.

3. Select the timeframe from the second drop down list. Standard analysis data is saved in hourly folders in Year/Month/Day and Hour format or alarm reports for the select stream.
4. Select report inject time to view. Reports are saved by inject time in the following format: TYPE/Year/Month/Day/Hour/Minute/Second (STD201507301629).
5. View the data (see Figure 6.6).

6.2.4 Overlay subtab

The analyzer supports the overlaying of stored chromatograms on the screen for use as a reference. A maximum of two stored chromatograms can be viewed simultaneously on the Chart Subtab, plus the active stream.

If the analysis is not currently running, select 'Idle Stream' to retrieve data about that analysis.

The Home>Overlay subtab displays the choice of Overlay 1 and/or Overlay 2. Both overlays allow selection of chromatograms saved on the SBC (see Figure 6.7).

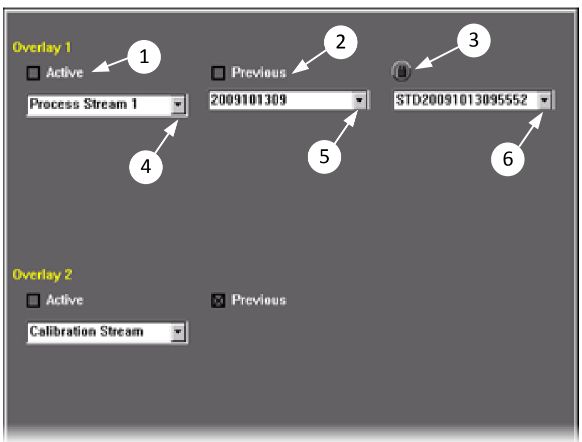


Fig. 6.7. Home>Overlay Subtab

1. Active – Mark to make overlay viewable on chart screen.
   Overlay 1 - Green
   Overlay 2 - Red
2. Previous– Selects chromatogram from the selected stream's last completed analysis.
3. Locked– If depressed, locks selected chromatogram (keeps chromatogram from being overwritten).
4. Stream Selection – Select stream to display: Calibration, Validation, or Named Stream.
5. Group Selection – Select locked, alarm, reprocessed, or by time frame.
6. File Selection – Select file by inject time.

To select a chromatogram to overlay:

1. Select the **Home>Overlay** subtab.
2. Either select **Previous** for the last completed analysis or unmark the **Previous** box to select a stored chromatogram.
3. Select the year (YYYY), month (MM), day (DD) and hour (HR). (Format: YYYYMMDDHR).
4. Select the File from the last drop down menu. (Format: YYYYMMDDHRXXXX where XXXX is the minute and second the cycle started).
5. Mark the **Active** box.
6. Repeat steps for the second chromatogram, if desired.
7. Return to the Home>Chart subtab to view the overlays.

Overlay 1 (top) displays in green; Overlay 2 (bottom) in red.

To turn off the overlay display, unmark the Active box on the Overlay Subtab.

The SBC stores analysis data continuously for a maximum of seven days. Report files are overwritten after seven days or when the storage media is filled.

To manually save a chromatogram:

1. Select the **Lock** button above the chromatogram file name.
2. Unmark the Previous box and from the drop down menu select the 'Locked' item (see Figure 6.8).

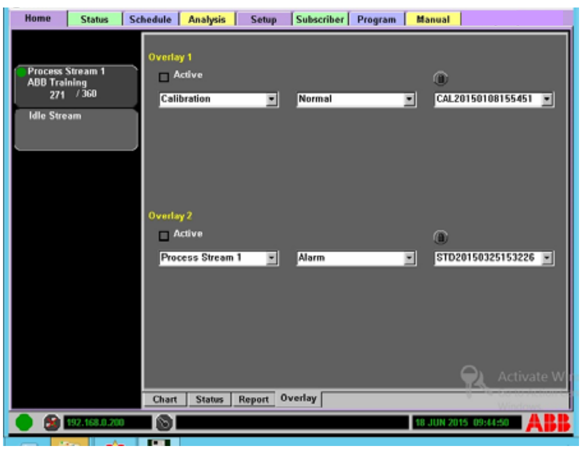


Fig. 6.8. Locked Overlay

3. Select the desired chromatogram file from the third (rightmost) drop down menu.
4. Unlock the file by highlighting the file name and selecting the **Unlock** button above the chromatogram file name.

6.3 Status tab

The Status Tab screen (see Figure 6.9) displays a hierarchy of equipment levels and all indicators. Status alerts, such as overall health, process limits, and alarms are visible through the color-coded Indicator Status icons.

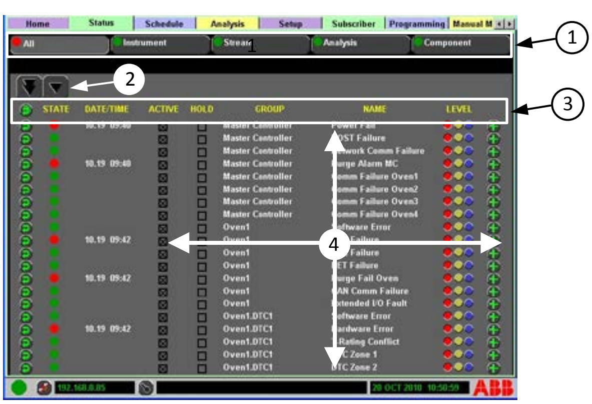


Fig. 6.9. Status Screen Example

1. Scopes– Used to navigate between the All and the user configured scopes.

2. Page Up/Down – Line Up/Down – Select buttons to move vertically through indicators. Depending on location or size of list, movement arrows may not be shown. (Example: top of list, page up arrows will not be shown.)
3. Headings, from left to right of screen, are described in Figure 6.10.

Heading	**Function/Use**
	Reset all indicators and time stamps display. Reset single indicator and time stamp.
State	The current state of the active indicator is represented by the color-coded status button.
Date/Time	Displays date and time the indicator was triggered; date in Month/Day/Year format and time in 24 hour format.
Active	User selectable; indicator is active if marked, inactive if not marked.
Hold	User selectable; if marked, indicator holds value until manually reset; if not marked, indicator holds until the absence of condition that triggered the indicator or until manually reset.
Group	Name of indicator's hardware or software group. Note that "Master Controller" is shown for SBC-related indicators, whether the SBC is located in a PGC5000A Master Controller or in an Oven with Integrated Controller.
Name	Name of the indicator.
Level	User selectable level button: Red = Alarm, Yellow = Warning, Blue = Information Only.

Fig. 6.10. Status Tab Functions

4. Indicators– Display individual indicator information including current state, name, and group. The user can reset, activate/de-activate indicators, set indicators to hold until manually reset and change alert level. All available indicators are configurable to one or more of the Condition Monitoring System scopes. Indicator colors signify the status of the indicator: green (normal), yellow (warning), red (alarm), or blue (information only).

The Status Tab gives access to configuration, evaluation, and monitoring of the PGC5000 Condition Monitoring System.

The Status Tab is used to collect additional information of the analyzer system's Condition Monitoring System. The analyzer system reports indicators through multiple means including: visual, color coded indicator status icons, analysis reporting, OPC servers, and other communication media.

The All subtab is a complete listing of available indicators for that specific analyzer's Condition Monitoring System. The four remaining subtabs: Instrument, Stream, Analysis and Component are user configurable scopes.

6.3.1 User configurable scopes

The analyzer scopes represent a collection of indicators directly related to the hardware or software within the analyzer system (see Figure 6.11). Each scope allows assignment of configurable indicators to optimize the Condition Monitoring System for each installation. Indicators are assigned reporting levels depending on the user need. All Indicators can be set to Alarm, Warning or Information Only levels. Indicators set to a Warning or Information Only level do not invalidate data reported to the subscribers.

Fig. 6.11. Scope Indicators

Instrument – The only scope where indicators set to an alarm level do not invalidate the reported data.

Master Controller Sub-scope – Any active, triggered, alarm-level indicator activates the common malfunction relay contact closure for the Master Controller; it also sets the Master Controller rollup out to the Modbus link. The "Master

Controller" nomenclature is used whether the SBC is located in a PGC5000A Master Controller or in an Oven with Integrated Controller.

Oven Sub-scope– Any active, triggered, alarm-level indicator activates the common malfunction relay contact closure for the associated oven.

Stream – Any active, triggered, alarm-level indicator invalidates the analysis data reported to all subscribers for that stream. (This may span multiple analyses.) It also sets the Is Valid indicator.

Analysis – Any active, triggered, alarm-level indicator invalidates the analysis data reported to all subscribers for the analysis. It also sets the Is Valid indicator.

Component – Any active, triggered, set alarm-level indicator invalidates the component data reported to all subscribers for the component to which it is assigned. It also sets the Is Valid indicator.

6.3.2 Configuring indicators

Figure 6.11 shows each scope with a color-coded indicator status icon. This icon represents the highest level triggered indicator configured and activated for the scope. Indicators may be assigned to multiple scopes. Changes made to an indicator's activation criteria take effect immediately. To assign an indicator and level of an indication to a scope, follow these directions:

1. Locate the desired indicator in the **All** list.
2. Set the desired indicator level by selecting the appropriate indicator level (color) at the right of the screen.
3. Press the **Add** button at the right of the indicator.
4. Choose the scope and sub-scope categories.
5. Select the **Next** button to continue.

Instrument Scope will not invalidate data.

---

6. Verify choices and press the **Add** button to accept the changes, or press the **Abort** button to cancel the operation.
7. Select the **Active** Box. (Indicators must be marked Active to be monitored and reported.) Mark the **Hold** box to retain the indicator's triggered level until manual reset.

6.3.3 Status indicator reset

To reset a single indicator state and date/time, press the Reset button at the far left of the indicator line. To reset the state and date/time on all activate indicators shown on the displayed page, press the Reset All button at the top left of the indicator list.

If an indicator is persistent, clearing the indicator may appear as if not cleared (no color change), however the time and date will change.

6.4 Schedule tab

The Schedule Tab allows the user to define the stream, Step order, TOD (time-of-day) requests, and Demand (Ad Hoc) requests. Additionally, the user defines which analysis to use when analyzing a stream.

General functions include:

- A live list of analyses in Queue.
- Color-coded queued analyses identifying streams currently being analyzed, in purge, next to purge and pending.
- Option to Start, Stop, Abort, or Pause the schedule.

Schedule operation priorities:

1. Step Schedule Elements are the lowest priority and can be pre-empted by either Demand or TOD requests.
2. AdHoc requests pre-empt Step Schedule elements, but not TOD requests.
3. TOD requests pre-empt both Demand and Step table Schedule requests

No Schedule Element type can pre-empt its own type (e.g.: a TOD in the Schedule Queue can't be pre-empted by the next TOD Schedule Element added to the Schedule Queue).

6.4.1 Maintenance mode icon

The Maintenance Mode icon sets the selected schedule's maintenance indicator. If desired, the maintenance mode indicator may be placed in a scope at a level that invalidates reported data.

6.4.2 Power failure recovery icon

This software offers automatic, independent system control for planned or inadvertent power failure. This allows the user to customize and control the process analyzer's schedules, returning them to a ready state after an outage. These are used to:

- Protect the analytical hardware from introduction of process samples before the oven reaches its operational temperature
- Separate and configurable power failure settings for all multiple oven configurations, including simultaneous and parallel oven applications.
- Automatic synchronization of all analytical hardware to their operational state.

Power Failure Recovery defines a schedule's recovery mode after an unexpected power outage. These modes are defined as:

- Continue – Restarts the schedule at the last analysis that was running when power was lost.
- Restart – This mode can be configured to recover two ways.
  1. Delete the analyses in the queue and Restart the schedule from the first active stream defined on the Step subtab.
  2. Delete the analyses in queue, run a "Clearing Analysis" and then restart the schedule. (The Clearing Analysis is an optional analysis executed as the first analysis used to purge or condition the system if the analyzer comes up in Restart mode. Each schedule has only one Clearing Analysis defined for the schedule.)
- Abort Mode– Stops the schedule and deletes all analyses in the queue.

To ensure that a Clearing Analysis is not defined, select 'None' in the drop down list box (either the Analysis Name or the Stream Name.)

Which mode the analyzer executes is determined by comparing the actual time the analyzer is ready to the user set times: 'Time Continue' and 'Time Restart.'

- Analyzer Ready is defined as the number of minutes from when the analyzer lost power until the time the schedule is ready to run its first analysis for a given Schedule. (This includes analyzer boot time and time for oven(s) associated with the analysis to reach the low temperature limit).
- Continue Time is the user defined time period, in minutes, in which the analyzer comes up in Continue mode.
- Restart Time is the user defined time period, in minutes, in which the analyzer comes up in Restart mode. Additionally, this mode allows assignment of a Clearing Analysis. The Clearing Analysis is an optional analysis executed as the first analysis used to purge or condition the system if the analyzer comes up in Restart mode. Each Schedule has only one Clearing Analysis defined in that Schedule.

The Restart mode can be disabled by setting Time Restart to a value less than the value for Continue Time. If the Restart mode is disabled, the Clearing Analysis is disabled.

If both values in the Power Failure Recovery Option are set to zero, the schedule restarts in an idle mode.

Upon recovery, the SBC compares the actual time to Analyzer Ready to the user defined values.

Modes are determined as follows:

- If the Analysis Ready time is less than the user defined Continue Time, then the analyzer comes up in Continue mode.
- If the Analysis Ready time is less than Time Restart and Time to Ready is greater than Continue Time, then the analyzer comes up in Restart mode.

- If the Analysis Ready time is greater than Time Restart and Time Ready is greater than Continue Time, then the analyzer comes up in Abort mode.
- If the Analysis Ready time is greater than Continue Time and Time Restart is less than Continue Time, then the analyzer comes up in Abort mode.
- If the Time Continue and Time Restart = 0, then the Schedule comes up in the STOPPED/IDLE state.

Figure 6.12 illustrates the determination of the schedule recovery modes.

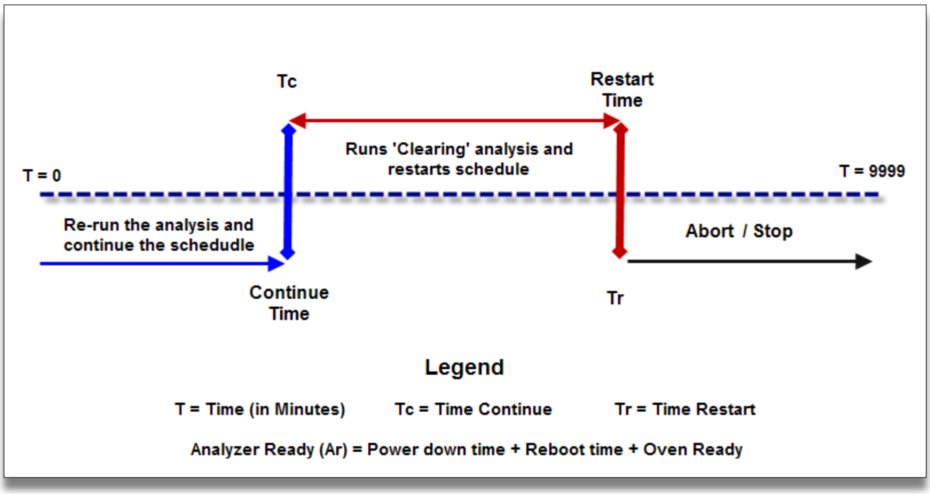


Fig. 6.12. Power Recovery Options

6.4.3 Multiple oven and schedule relationship

Each schedule can use the oven hardware in more than one oven, allowing more than one oven association with a single schedule. Each oven operates independently in the system. If an oven goes offline it impacts only the schedules associated with the assigned oven. Figure 6.13 provides an example of a schedule/oven assignment and Figure 6.14 illustrates a typical multi-oven and schedule relationship.

Schedule Assignment	Oven 1	Oven 2	Oven 3	Oven 4
Schedule 1		X	X	X
Schedule 2	X	X		
Schedule 3	X			
Schedule 4				X

Fig. 6.13. Schedule/Oven Assignment Example

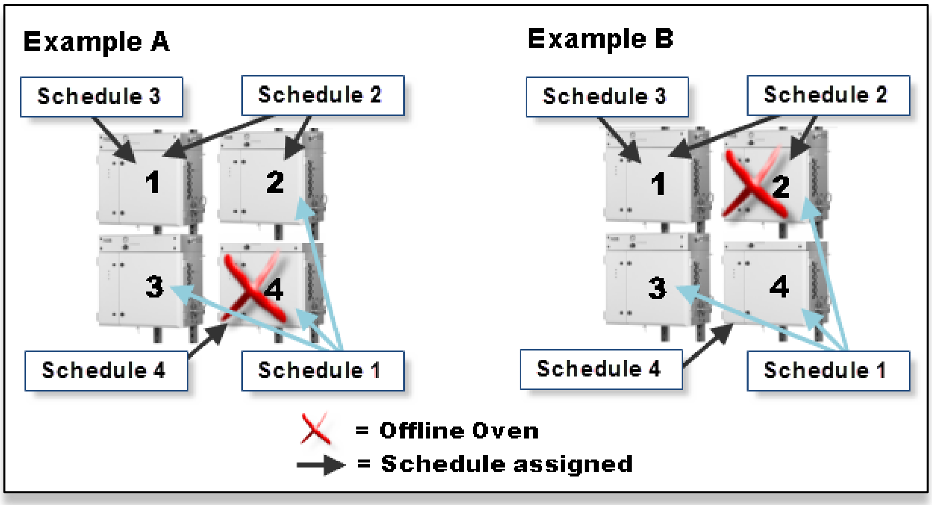


Fig. 6.14. Multi-Oven and Schedule Relationship.

In each example, an X represents an offline oven (the offline condition may be initiated for maintenance, power failure or possible associated equipment failure). In Example A, Oven 4 has gone offline. Only schedules 1 and 4 are impacted. In Example B, Oven 2 is offline and impacts only schedules 1 and 2. These schedules react and restart as described in the Power Failure recovery paragraph of this manual.

6.4.4 Queue subtab

The Schedule>Queue subtab displays the order of the current and upcoming analyses (see Figure 6.15). Schedules may be created, started, stopped, paused or deleted.

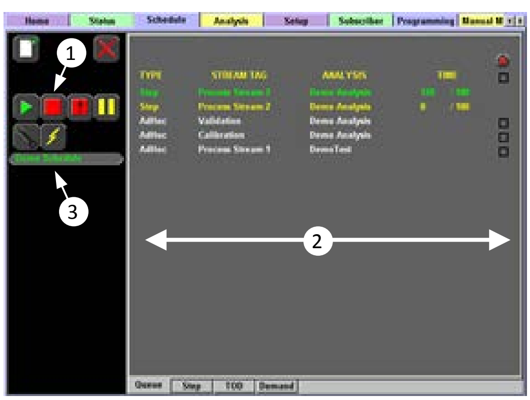


Fig. 6.15. Schedule>Queue Display

1. Action Icons – Create, edit and control schedules (Table of Action Icons in Section 5 lists each icon).
2. Queue Display– Lists live analyses associated with selected schedule (left-hand column).
3. Schedule List – List of schedules.

A GREEN entry represents the current running analysis in the selected schedule. Total analysis time and time into analysis are displayed under the TIME heading. A YELLOW entry identifies the sample that is purging for the next analysis. A BLUE entry identifies the stream which is next to be purged. A WHITE entry identifies any additional Time of Day (TOD) or Demand request in the order of analysis.

The TYPE of stream analysis displayed is defined as follows:

- Step – The sequence of stream analyses defined on the Step subtab.
- Time of Day (TOD) – Scheduled stream analyses defined on the TOD subtab.
- Demand (Ad Hoc) – Demand stream analysis requests.

Any stream analysis which is BLUE or WHITE can be deleted from the queue using the selection box and Delete button on the right hand side of the screen.

When a Schedule goes off-line the associated Schedule button behaves as follows:

- STOPPED Schedules blink letters WHITE and RED; when the Schedule comes on-line the button letters turn RED.
- RUNNING Schedules blink letters WHITE and GREEN; when the Schedule comes on-line the button letters turn GREEN.
- PAUSED Schedules blink letters WHITE and YELLOW; when that Schedule comes on-line the button letters turn RED.

6.4.5 Step subtab

Figure 6.16 shows the Step subtab display. It allows the user to add steps to a schedule.

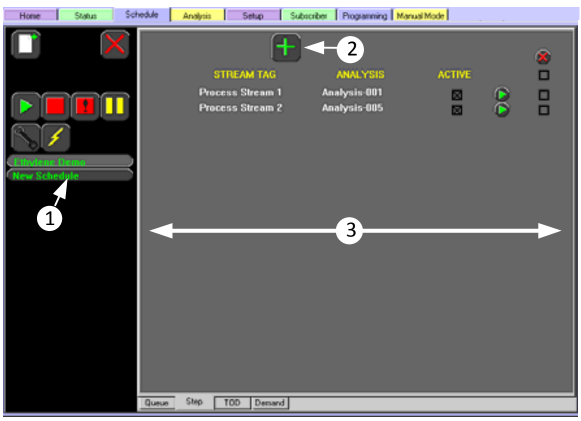


Fig. 6.16. Schedule>Step Display

1. Schedule Select – Select schedule to show detail.
2. Add Action Icon – Select the Add icon to add an analysis.
3. Analysis Control Area – Add, Delete, Run and Activate.

The following illustrates the basic procedure for adding an analysis.

1. Select the **Add** icon.
2. Select the stream and press the **Next** button to continue.
3. Select the analysis and press the **Next** button to continue. Press the **Go Back** button to go back or press the **Abort** button to cancel.
4. Press the **Accept** button to accept the selection. Press the **Go Back** button to go back or press the **Abort** button to cancel.

When accepted, the analysis will be added to the schedule on the Step screen. Mark the ACTIVE box with an **X** to activate.

6.4.6 Time of day subtab

The Schedule>TOD subtab displays the currently configured analyses, the streams they use, the frequency at which they run and whether they are actively being used (see Figure 6.17). It allows frequency configuration at monthly, weekly, daily, hourly, minute or second intervals.

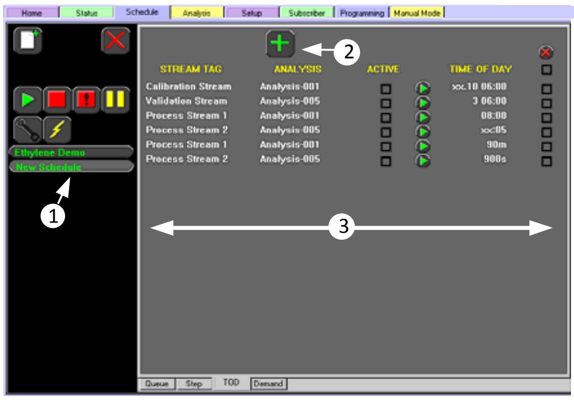


Fig. 6.17. Schedule>TOD Display

1. Schedule Select – Displays Schedule detail.
2. Add Action Icon – Selects and adds streams by selecting the Add button.
3. Analysis Control Area – Add, Delete, Run and Activate.

The TOD subtab sets scheduled validations, calibrations and stream analyses. The steps to add a TOD analysis are:

1. Select the **Add** button at the top of the subtab display and a selection list appears.
2. Select a stream from the list and press the **Next** button to continue.
3. Select the analysis from the list and press the **Next** button to continue. If needed, return to the previous screen by pressing the **Go Back** button.
4. Select the frequency from the list and press the Next button to continue.
5. Depending on the last selection, select the day of the month or day of the week, and press the **Next** button ton continue.
6. Enter the time of day the analysis is added to the queue (hour and minute) and press the **Next** button to continue. (The clock uses a 24-hour format.)
7. Review the information and press the **Accep**t button to accept the entries, or press the **Abort** button to discard them. If they are accepted, the analysis will be added to the TOD schedule. If needed, press the **Go Back** button to return to the previous screen to change any information.
8. Activate the analysis by selecting the **Active** box.

6.4.7 Demand subtab

The Schedule>Demand subtab is used to develop analyses which a user wants to run at unspecified intervals. These analyses may be used for maintenance, troubleshooting, validation and calibration. Select the Run button to add the analysis to the queue manually. Figure 6.18 provides an example of the Demand Analysis Addition.

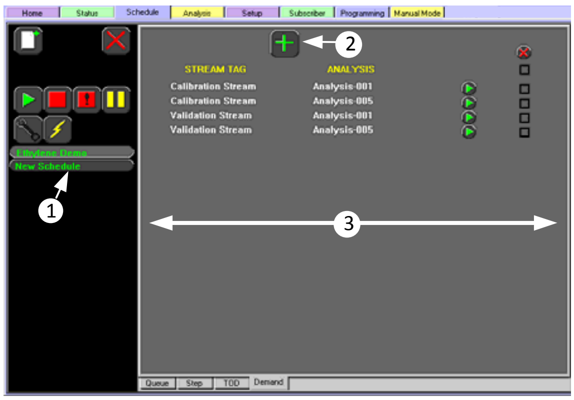


Fig. 6.18. Schedule>Demand Subtab

1. Schedule Select – Select Schedule to be displayed.
2. Add Action Icon – Select to add analyses.
3. Analysis Control Area – Add, Delete and Run Demand Analyses.

The steps for creating a demand analysis are:

1. Select the **Add** icon at the top of the subtab display and a selection list appears.
2. Select the desired stream from the list and press the **Next** button to continue.
3. Select the analysis from the list and press the **Next** button to continue. If needed, press the **Go Back** button to return to the previous screen.
4. Review the information and press the **Accept** button to complete the request, or press the **Abort** button to discard. If needed, press the **Go Back** button to return to the previous screen.
5. To add the analysis to the queue, press the **Run Analysis on Demand** button associated with the name of the analysis.

The analysis is placed as close as possible to the top of the queue. A Demand request does not replace the current or purging stream analysis in a running schedule.

6.5 Analysis tab

The Analysis Tab presents the tools for creating and editing analyses by using either text or graphic techniques.

The Analysis Tab consists of three subtabs: Chart, Tabular Editor, Overlay and Report (only for reprocessed reports). It is the focal point of building, editing and saving analyses and their building blocks.

6.5.1 Chart subtab

The Analysis>Chart subtab is used to display and edit analyses graphically (see Figure 6.19). The parallel lines with the colored symbols at the bottom of the chart screen graphically identify analysis objects.

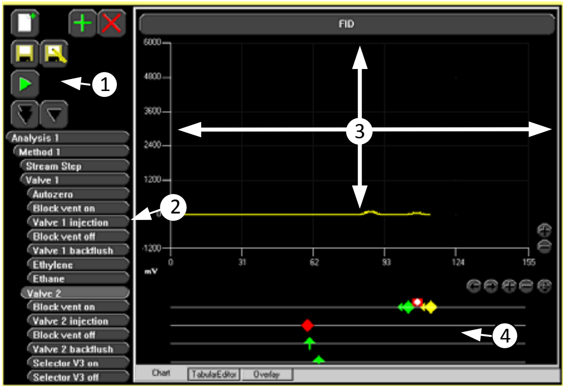


Fig. 6.19. Analysis>Chart Subtab

The Chart subtab display consists of:

1. Action Icons – Used for retrieving saved analyses, and editing the displayed analysis.
2. Function Select Buttons – User created analysis objects.
3. Chromatogram Display – Displays current chromatogram and/or overlay.
4. Graphic Edit Area – Drag and drop objects to edit the selected object's timing.

Enable the graphical editor by selecting the Chart Subtab (see Figure 6.19). This editor allows analysis timing adjustment using a pointing device with the drag and drop function. Refer to the Time Coded Function (TCF) section of the manual for a complete list of TCFs and their functions.

To edit an analysis graphically:

1. Select the **Add** icon to load an analysis from the library. (The analysis is displayed in the Function Select buttons.)
2. If needed, select the detector from the drop down button at the top of the chromatogram display area.
3. Select an element of the analysis. (The symbol for the selected element is always displayed on the second horizontal line from the top, below the chromatogram display area.)
4. Select the object to adjust by placing the cursor on the symbol.
5. Hold the cursor button at the LUI (left mouse button at the RUI) and move the object to the desired location and release the cursor button.

To see the object's timing represented numerically select the Tabular Editor subtab.

Use caution when editing preconfigured Analyses, Methods, and Sequences. "Save As" under a different name prior to testing as changes made and saved affect all analyses, methods and sequences using that named object.

Figure 6.20 shows the corresponding placement of symbols on the Chart subtab in relation to the numbers entered from the Tabular Editor subtab. Placement of the symbols can be edited from either subtab.

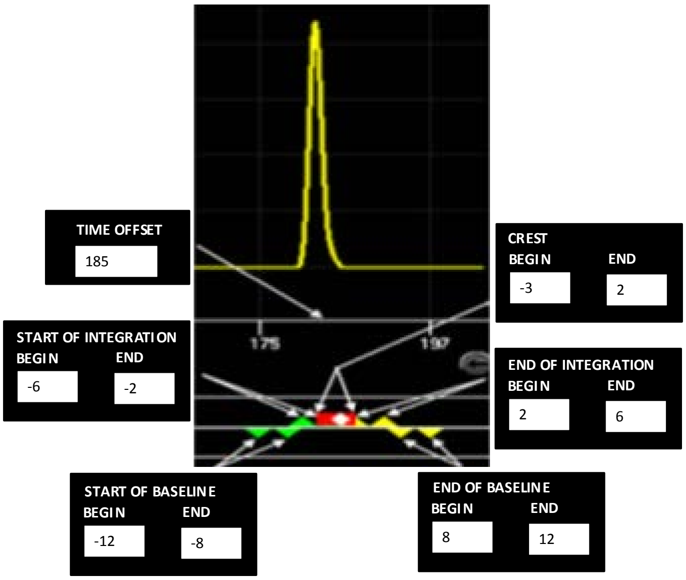


Fig. 6.20. Graphic Editor/Tabular Editor Map

6.5.2 Tabular editor subtab

The Analysis>Tabular Editor subtab is used to display and edit analytical data (see Figure 6.21).

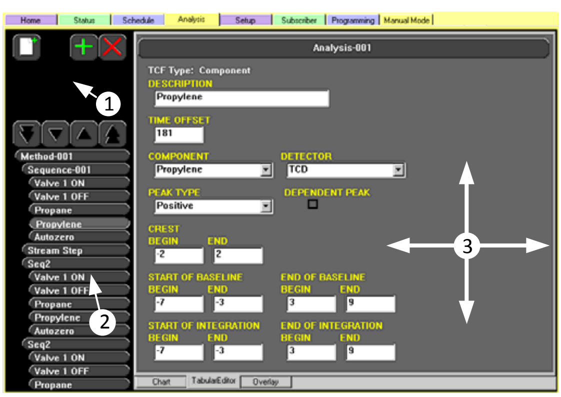


Fig. 6.21. Analysis>Tabular Editor subtab

1. Action Icons – Create, Add, Delete or Save objects.
2. Function Select Buttons – User created Analysis objects
3. Editing Area – Used to display and edit selected object

Refer to the Time Coded Function (TCF) section of the manual for a complete list of TCFs and their functions.

6.5.3 Normalization

Normalization is the adjustment of measured component peak areas such that the total volume of measured components is mathematically equal to 100%. It is a technique used for quantitatively assessing a chromatogram to provide a quantitative analysis of the mixture being measured. The quantitative results are obtained by expressing the area of a given peak as a percentage of the sum of the areas of all the peaks. Normalization applies to analyses where the quantitative response of the detector is the same for all the eluted components.

By default, the PGC5000 does not normalize component results. However, there is an option in the Analysis tab to normalize the Analysis results. From the Analysis tab, load a saved Analysis and select the first tab of the Analysis on left hand side. Select Tabular Editor at bottom of Analysis screen to setup the normalization feature (see Figure 6.21).

From this tab, you can set the Normalize option to Active by selecting the Normalize check box in middle of viewing window (see Figure 6.22). This will normalize the Analysis results on the Report.

Fig. 6.22. Selecting the Normalize Option

You can also assign a component to display an un-normalized value for Analysis results in the Report. This is useful to see the un-normalized total component concentration for all components as well as having the normalized results displayed. You can assign the un-normalized results to an existing component, or create a new component to display the un-normalized results (see Figure 6.23).

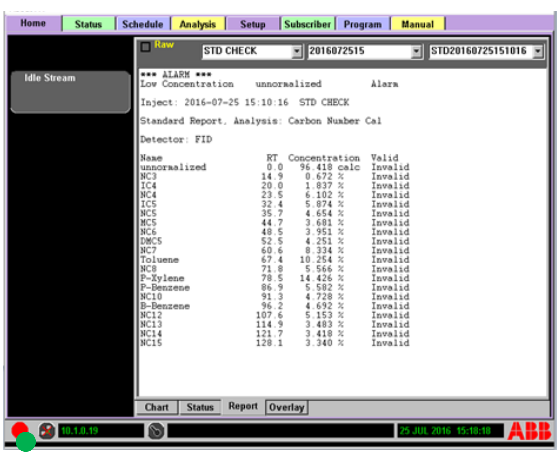


Fig. 6.23. Normalized Report

6.5.4 New analysis

The analyzer analyzes components by using established methods built from a sequence of TCFs such as valve functions. Examples are:

- Analysis - Consists of one or more methods (maximum of one per oven), which produces a measurable, displayable chromatogram.
- Sequence - Consists of timed valve functions (On or Off), TCFs and sample injections. A sequence is under a method.
- Method- Consists of one or more sequences and may be assigned to an analysis. A method is under an analysis and linked/tied to an oven.

Analyses, methods and sequences are created using menu selections. The following steps use the Analysis>Tabular Editor subtab to create a new analysis including a method and a sequence. (A method and sequence is automatically generated when creating a new analysis.)

When a new TCF or Add New option is selected, it is inserted below the highlighted tab in the Analysis tab's Function Select list.

1. Select the **Add New** icon when the New Object dialog box opens.
2. Choose the desired object to create and press the **Next** button to continue.
3. Confirm the information shown and press the **Accept** button to create the new Analysis. This automatically creates a new Method and Sequence object under the analysis.
4. Select the **Add New** icon and define a startup purge time. (Purge Time is the amount of time the system purges the sample prior to the initial start of an analysis, with a minimum equal to or greater than one second.)
5. Select the new Method under the new Analysis.
6. Assign a name and cycle time. (The description/name of the object should be something easily recognized for future editing and must be unique to the system.)
7. Select the oven from the drop down list. (The oven name is assigned in the Setup Tab.)
8. Select the new Sequence button on the left (under the Method button) and assign a name and time offset. (The time offset is start time in relation to the start of the method.)
9. With the Sequence button selected, select the **Add New** icon and choose Valve, then select the **Next** button to continue.
10. As needed, change the information in the description box, set the time offset and select the valve name from the drop down list.
11. Next select the **Add New** icon from the Sequence scope.
12. Select a component.
13. Verify and save by pressing the **Accept** button.
14. Fill in the information completely.
15. Select the **Add New** icon.
16. Select TCF-Method Scope.
17. Select Stream Step.
18. Verify and accept by pressing the **Accept** button.
19. Fill in the Stream Step information.
20. Save the new analysis to Analysis Config. The Analysis button must be selected when saving.
21. Select the **Save As** icon to save as a new analysis.
22. Name and save to Analysis Config (for immediate use) and/or to Analysis Library for future use.

The Analysis must be saved to Analysis Config before it can be added to a schedule.

An analysis can be modified after it is saved. Select the object to modify, make the changes and save the analysis.

6.5.5 Analysis error messages

The following error messages display on screen when an error is found prior to the SBC sending the method to the oven.

Message	Issue / Fix
Analysis not found (e.g.: Name mismatch)	An Analysis has a trailing space on the end of name that has gone undetected. One example: Remove space at end of Analysis Name.
TCF is outside Method	A TCF non-End of Analysis script precedes the start of the first Method defined in the Analysis
Component TCF - Begin crest time > 0	A Component TCF has a 'Crest Begin' time offset that is less than zero
Component TCF - Begin time >= End time	A Component TCF cannot have a 'Crest Begin' time offset greater than or equal to its 'Crest End' time offset
Component TCF: 0 length Component Name	A 'Component' TCF can't have an empty Component Name
Bad oven address for [DeviceName]	For a given TCF the associated oven name could not be found in the device lookup collection

Message	Issue / Fix
(Method's oven = [Oven_Id]) != (TCF [Sbst].[Node] .[Type].[Chan])	Analysis has a Method assigned to one oven, containing a TCF referring to a device in another oven
Component TCF: 0 length Detector Name	A 'Component' TCF can't have an empty 'Detector' name
Non Sequence/TCF after DoNext/SkipNext	Conditional TCF types must be followed by a legitimate TCF type (e.g.: Not a Method or a Sequence)
DoNextIf is the last TCF in Analysis	A 'Do Next' TCF type cannot be the last TCF in an Analysis
DoNextIf TCF precedes Component TCF	A 'Do Next If' TCF cannot precede 'Component' TCF
DoNextIf TCF precedes DoNextIf TCF	A 'Do Next If' TCF cannot precede another 'Do Next If' TCF
DoNextIf TCF precedes TcfSkipNextIf	A 'Do Next If' TCF cannot precede a 'Skip Next If' TCF
DoNextIf TCF precedes StreamStep Tcf	A 'Do Next If' TCF cannot precede 'Stream Step' TCF
DoNextIf TCF precedes UnknownPeak TCF	A 'Do Next If' TCF cannot precede an 'Unknown Peak' TCF type
Duplicate Component found in same Method	A Component with the same Component Name was found in the same Method
Component TCF - End crest time < 0	A 'Component' TCF has a 'Crest End' time offset less than zero
[Num] Component TCFs, exceeds max spec:[MaxNum]	Too many Components were specified in the Analysis
Too many script TCFs in [Analysis Name]	The count of the Script TCFs in this Analysis exceeds the maximum limit
Invalid min Method TCF StartTime=%d < 0	A TCF at Method scope was found to have a time offset of less than zero seconds
Found more than one Stream Step TCF.	Only one Stream Step is allowed in each Analysis
More than one Stream Step TCF in [AnalysisName]	No Analysis can have more than one Stream Step
Missing Stream Step TCF	Every Analysis must have a Stream Step
NO TCFs in Analysis: "[AnalysisName]"	Analysis did not contain any TCFs
[Method Name] inside prev Method	An Analysis was found containing a Method having no TCFs nor any Sequences
[Sequence Name] in prev Sequence	An Analysis was found containing a Sequence having no TCFs
All active STEP table items have a bad ["Analysis"]	No Schedule Elements in the STEP table were found having a well-formed Analysis
[Component Name] - bad time values	A part of the named 'Component' TCF is outside of its containing Method
Malformed Method -> no oven assignment	Every Method must have an Oven Name specified in that Method
Sequence.TimeOffset >= Method.CycleTime	No Sequence start time can be greater than the containing Method's CycleTime
SkipNextIf is the last TCF in Analysis	A 'Skip Next' TCF type cannot be the last TCF in an Analysis
SkipNextIf TCF precedes Component TCF	A 'Skip Next If' TCF cannot precede Component TCF
SkipNextIf TCF precedes DoNextIf TCF	A 'Do Skip If' TCF cannot precede another 'Do Skip If' TCF
SkipNextIf TCF precedes TcfSkipNextIf	A 'Skip Next If' TCF cannot precede a 'Do Next If' TCF
SkipNextIf TCF precedes UnknownPeak TCF	A 'Skip Next If' TCF cannot precedes an 'Unknown Peak' TCF type
Malformed Analysis: Startup purge < 1	An Analysis's Startup Purge must be greater than zero
[Method Name]:Skip then StreamStep	In the named Method, a skip occurs before the Stream Step
SkipNextIf TCF precedes StreamStep Tcf	A 'Skip Next If' TCF cannot precede a 'Stream Step' TCF
StreamStep TCF starts at time < 1 second	A 'Stream Step' TCF cannot start at a time of less than one second into the CycleTime
(MaxTcfEndTime = [Secs]) > (CycleTime= [Secs])	Some TCF in the Method exceeded this containing Method's CycleTime
Not all TCFs have a valid start time	A TCF's time offset is configured at less than one second before the end of the Cycle Time; **Note:** One exception: 'End-Of-Analysis' scripts
1st TCF not starting at reasonable time	First TCF's time offset is configured to start before one second into the Cycle Time

Message	Issue / Fix
Invalid min Seq TCF StartTime = %d < 0	A TCF at Sequence scope has a time offset of less than zero seconds
[Description] TCF StartTime <= 0	No TCFs are allowed to start at a start time of <= '0' (Inside a Method / Sequence)
Same oven address in 2 Methods found Analysis: "[AnalysisName]"	In one Analysis, two methods are configured to run in the same oven
Same Component in two different Methods	The same Component Name is found in two different Methods

6.5.6 Loading an analysis from the library

The designed application analyses for the system are stored in the analyzer library and/or the analysis configuration.

Only analyses stored in Analysis Config can be added to a schedule.

The following steps present the instructions to retrieve an analysis from the library.

1. Select the Analysis>Chart subtab.
2. Press the **Add to a Scope** button and an object dialog box opens.
3. Select the Analysis Library.
4. Choose the desired analysis you want to load.
5. Press the **Next** button to continue.
6. Review the information listed at the top of the dialog box.
7. If the information is correct, press the **Accept** button to continue.
8. If the information is not correct, press the **Go Back** button to return to the previous dialog box, or press the **Abort** button to cancel the operation.
9. Save the object to the Analysis Configuration for immediate use.

The chosen analysis appears on the left side of the screen, as shown in Figure 6.24.

Fig. 6.24. Library Stored Analysis

6.5.7 Running an existing schedule

Please refer to the Schedule Tab for running a schedule.

6.5.8 Stopping or pausing schedules

Refer to the Schedule Tab for information concerning stopping or pausing a schedule.

6.5.9 Overlay subtab

The Analysis>Overlay function works exactly the same as the Home>Overlay screen. Refer to the Home>Overlay subsection in this section for more information.

6.5.10 Chromatogram reprocessing

This allows the reprocessing of integration events on a completed (saved) Standard chromatogram report without re-running the analysis (see Figure 6.25). The Active box on the left side of the display must be marked for the Reprocessing Action icon at the right of the Analysis>Overlay subtab to display. Reprocessing is allowed on either overlay.

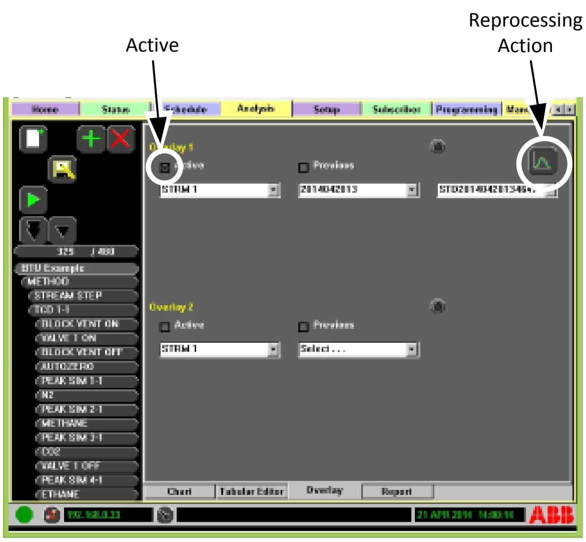


Fig. 6.25. Reprocessing Button

When the chromatogram data is reprocessed, using changed integration parameters, the reprocessed report can be compared to the original report, showing any variation in peak results. If the integration change is satisfactory, the changes can be saved to the analysis for later execution.

The reprocessed reports are saved on the SBC with a copy of the reprocessed report. Please note:

- Scripts contained in the analysis do not run during reprocessing.
- The reprocessed values are not reported to the OPC Server or any subscribers.
- Reprocessed reports are kept indefinitely; however, like the Alarm and Calibration folders, the folder is periodically cleaned (every 10 minutes), leaving the last five files.
- Reprocessed reports are prefixed with "REP."
- Reprocessed reports are backed up with all other available Stream Data by selecting the Copy Stream File Data to USB Drive button on the File Management screen of the Setup tab.

Reprocessing existing chromatograms:

1. Go to the Analysis Tab>Chart subtab.
2. Select the **Add** icon and load an existing analysis.
3. Select the Overlay subtab.
4. On the Overlay subtab, mark the Active box for Overlay 1 or 2 and the Reprocessing Action icon appears. (If it does not appear, refresh the screen by switching on another subtab and returning.)
5. Leave the **Previous** box checked and select the **Reprocessing Action** icon to reprocess the previous chromatogram data. This uses the analysis data you loaded in step 2.
6. Go to the Report subtab and note the data.
7. Go to the Chart subtab and adjust any of the integration parameters (retention time, baseline, etc.).
8. Return to the Overlay subtab and select the **Reprocessing Action** icon again.
9. Return to the Report subtab and note changes in the data displayed.
10. If the changes are acceptable, save the changes by selecting the Save icon. The modified analysis will load and run after the next stream step occurrence.

6.6 Setup tab

The Setup tab allows the user to configure and modify elements of the analyzer (see Figure 6.26). Initial configuration is completed and tested at the factory for application purposes. The Function Select list displays the top level of all objects contained in the analyzer. Select an object button in this list to view and/or edit in the information area. If the object has sub items, those items are displayed below the selected object button. Static and configurable information is displayed in the information area on the right of the screen.

Fig. 6.26. Setup>Config Subtab Example

1. Function Select list – List of all objects in the analyzer.
2. Object Configuration Information – Displays all information available for the selected list item. Including Action Icons (if applicable) and Fields. (Editable fields display with a white background.)
3. Subtabs – Switch views by selecting the desired tab.

6.6.1 File management

The File Management button in the Function Select list allows the user to delete files from the analyzer libraries, restore the analyzer to factory configuration, create a user restore point, restore the analyzer to the user created restore point, backup the analyzer to a USB drive and backup ALL stream files to a USB drive and delete ALL stream files on the SBC.

To delete files from the Analysis Configuration or system Libraries:

1. Press the **Abort** button to open a window displaying the system libraries.
2. Select the file location and press the **Next** button to continue.
3. Highlight the file and then press the **Next** button to continue.
4. Press the **Accept** button to confirm the deletion, or press the **Go Back** button to choose a different file, or press the **Abort** button to cancel the operation.

6.6.2 System restore and recovery

The analyzer has several recovery options and file transfer function available as shown in Figure 6.27. These options allow restore point creation and/or chromatogram data file copy (for offline use) or deletion, as explained below.

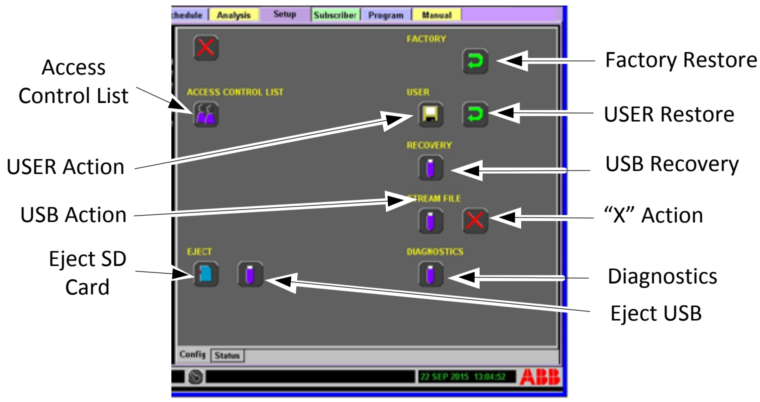


Fig. 6.27. Recovery and Backup Options

If only option names show, you do not have enough rights to use the backup and restore options.

Stop all schedules before creating a recovery USB or backing up the stream files to a USB flash drive.

ACCESS CONTROL LIST – Selecting the Access Control List (ACL) icon displays a dialog box containing a list of users, passwords, and access levels that is distributed, encrypted and persisted at each device. The ACL can be modified from a PGC5000 (LUI or RUI), VNSA, or a STAR Client. If the PGC5000 is secured, any user with supervisory rights can modify the ACL. If the PGC5000 is unsecured, everyone has the ability to modify the ACL.

Stop all schedules before restoring from a recovery USB flash drive.

FACTORY - Selecting the Restore Settings icon restores the analyzer to the factory configuration. All user configuration changes to the system will be lost.

USER – Selecting the Save Icon creates a User Restore point. The system copies all configuration files from the working directory to the Restore directory on the analyzer. You should create a restore point prior to making any changes or updates to the analyzer. Only one restore point is saved. Creating a second restore point will overwrite the initial store point.

Selecting the Restore Settings icon restores the system to the user created restore point. It copies the configuration files from the Restore directory to the Working directory of the SBC and restarts the system.

Creating the Recovery drive takes several minutes. Wait for the "Creation Complete" message before removing the USB drive. Select the Eject USB icon on the Setup screen before removing the Recovery drive. Store the Recovery drive in a safe place.

You must use a USB drive having 32 GB or less. If a USB drive larger than 32 GB is used, the system will appear to write the data to the drive and give a "Creation Complete" message, but no data will be on the drive.

RECOVERY – Selecting the USB Flash Drive Operation icon creates a recovery drive on the USB flash drive inserted in the Single Board Computer (SBC). This operation takes up to thirty minutes to complete depending on system configuration. The user restore directory is NOT saved to the Recovery drive.

To restore the system from an unrecoverable lockup or after replacing the Single Board Computer, install the USB flash drive and apply power to the system. The SBC formats the flash memory and copies all of the files from the USB flash drive to the system's flash memory. Wait for the Upgrade Complete message to appear. Select the USB Eject icon and wait for the Eject Complete message to appear. Remove the USB drive and cycle power to reboot.

STREAM FILE - Selecting the Stream Operation icon copies all stored chromatogram files on the system to the flash drive inserted in the SBC board. Copying the data files will take several minutes. Wait for the Operation Complete message to appear. Select the USB Eject icon and wait for the Eject Complete message to appear and then remove the USB flash drive.

Selecting the Delete icon deletes all saved chromatograms and report files on the system. It does not delete analyses saved in the Analysis Config folder or Analysis Library folder.

DIAGNOSTICS – Selecting the Diagnostic Operation icon will copy all diagnostic files to a USB drive inserted in the SBC board. Diagnostic files are used to diagnose errors and events in software. These files are for factory use and troubleshooting purposes. The copying of the files should take only a few minutes. Wait for the Operation Complete message to appear. Select the USB Eject icon and wait for the Eject Complete message to appear and then remove the USB flash drive.

EJECT – Selecting the Eject SD Card icon allows you to safely eject the SD Card from the Single Board Computer PCB. Wait for the Eject complete message before removing the SD Card. Report storage will automatically revert to RAM disk. When an SD Card is replaced in the SBC, report storage will automatically return to the SD Card.

When an SD Card is inserted, the reports stored on the RAM drive will NOT be copied to the SD card. These reports are no longer available in the system.

Selecting the USB Action icon performs the functions listed above. Always wait for the Eject Complete message before removing a USB drive.

6.6.3 System backup, restore and recovery error messages

The Backup/Restore and Recover options include error diagnostics. Figure 6.28 shows a sample message display.

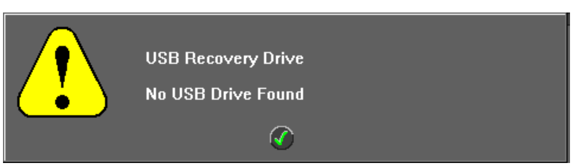


Fig. 6.28. Error Popup Box

The following popup error messages display if an error is found during restore and recovery procedures.

Message	Meaning / Issue / Fix
Factory Configuration Restore\Configuration Missing!	Button pressed, but a Factory Configuration not found
Invalid Configuration Host Mismatch Warning!	Host Name in the configuration does not match the Host Name on the SBC: Call ABB support
Invalid Configuration Model Manager Task not started	There is an error in one of the configuration files: Call ABB support
Restore Point Configuration Capture Complete	Restore Point has been written to the USB flash drive
Stream Data Files Capture Complete	Backup of Stream Data is complete

Message	Meaning / Issue / Fix
Stream Data Files Delete Complete	Stream Files Deleted
Stream Data Files No USB Drive Found	No USB flash drive found. Insert USB flash drive in Single Board Computer (SBC) PCB
Updating Configuration.. Standby for System Restart	System is writing configuration files to USB flash drive
USB Recovery Drive Creation Complete	Recovery data has been saved to the USB flash drive
USB Recovery Drive No USB Drive Found	No USB flash drive found. Insert USB flash drive in SBC PCB
User Configuration Restore No Restore Point Found	USB Flash drive has no Restore point files.

6.6.4 Components

The Components button in the Function Select list displays component information (see Figure 6.29).Components can be added, deleted or edited.

Fig. 6.29. Setup>Components Configuration Display

To edit a component:

1. Navigate to the Setup Tab and select the Components button in the Function Select List.
2. Select the Config subtab at the bottom of the display.
3. Select the Component to edit from the Component Name drop down list.
4. Edit the component as necessary.

COMPONENT NAME - Component names must be unique to all configured components in the analyzer and are selectable from the drop down menu.

CONCENTRATIONS

CALIBRATION – Numeric value representing the component's calibration concentration.

VALIDATION – Numeric value representing the component’s validation concentration.

UNITS – Unit of measure (%, ppm, ppb, calc, blank, none).

RESPONSE FACTOR – Response factor relative to the selected component (may be entered manually).

PENDING RESPONSE FACTOR – Calibration stream calculation. Use the Go Back button to manually replace the current Response Factor with the calculated factor.

CALIBRATION AUTO UPDATE – If the box is marked, the Pending Response Factor automatically updates with the pending response factor if it is within the drift limits entered.

CALIBRATION DRIFT LIMIT – The maximum amount the calibration can drift since the last calibration. The Response Factor will not update if the pending response factor exceeds the drift limit.

VALIDATION LIMIT – Allowable percent of component concentration change during when running a validation.

RETENTION TIME LIMIT – Time into analysis (in seconds):

LOW – Low level limit, in seconds, that the peak crest can shift.

HIGH – High level limit, in seconds, that peak crest can shift

LIMITS – Concentration (Reported Component Values):

LOW-LOW – Sets the Low-Low indicator concentration limit

LOW – Sets the Low indicator concentration limit

HIGH – Sets the high indicator concentration limit

HIGH-HIGH – Sets the high-high indicator concentration limit

The Status subtab displays component's associated indicators, their state and allows reset. (The component indicators must be marked active on the Status Tab to see state color.)

6.6.5 Streams

The Streams button in the Function Select list displays all streams configured for the analyzer (see Figure 6.30). Streams can be created, configured and deleted from this display.

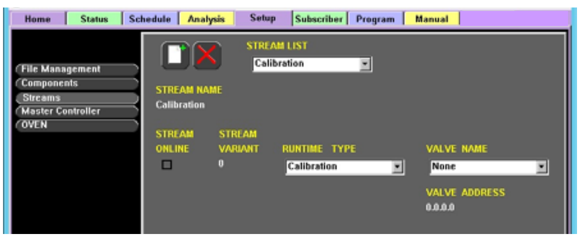


Fig. 6.30. Setup>Streams Configuration

STREAM LIST – Dropdown list of available streams.

STREAM NAME – Reference name of the stream.

STREAM ONLINE – Current status of Stream (Marked = Active/Online). Unmarking (Deactivating) triggers the 'Offline' Indicator.

STREAM VARIANT – Current variant of the stream being used.

RUNTIME TYPE – Dropdown list of selectable stream types.

VALVE NAME – Dropdown list of selectable valve types.

VALVE ADDRESS – Reference Address of the selected valve.

The Status subtab displays the configured indicator's state and date and time of the selected stream.

To create a stream:

1. Navigate to the Setup Tab>Config subtab and select the Streams button in the Function Select list.
2. Select the **Add New** icon and enter a name and a variant for the new stream. (Stream names must be unique in the analyzer.)
3. Confirm the stream creation by pressing the **Accept** button, or cancel the operation by pressing the **Abort** button.
4. Select the RUNTIME TYPE from the dropdown list.
5. Select the VALVE NAME from the dropdown list.
6. Select the STREAM ONLINE box to activate the stream in the schedule

To delete a stream:

1. Navigate to the Setup Tab>Config subtab and select the Streams button in the Function Select list.
2. Select the stream to delete from the STREAM LIST dropdown list.
3. Select the **Delete** icon.
4. Confirm the stream deletion by pressing the **Accept** button, or cancel the operation by pressing the **Abort** button.

6.6.6 Master controller

Selecting the Master Controller button in the Function Select list displays the Config and Status subtabs and all associated cards and peripherals (see Figure 6.31).

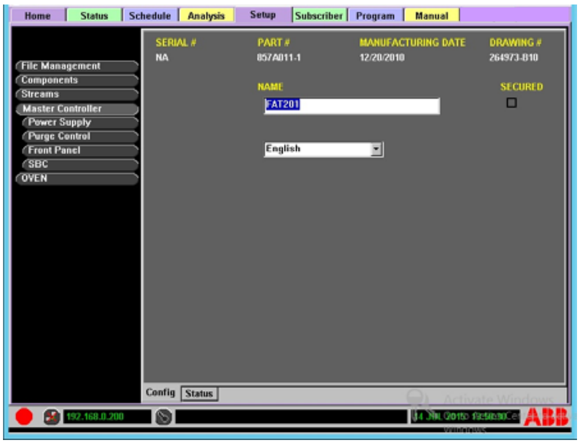


Fig 6.31. Master Controller Configuration

Ovens with Integrated Controllers will show a Master Controller in the Function Select list, even though no physical PGC5000A Master Controller is present. The SBC subtab will be under the Master Controller button. The Power Supply, Purge Control, and Front Panel subtabs will not be shown, as these Master Controller parameters are not needed in the Oven with Integrated Controller.

The associated items in the Function Select list are shown in an indented list under the selected button in the Function Select list. If an associated item or device contains or has a subset of parts or cards, those will be shown in an indented button list below that item or device.

Master Controller Cards: As with the Master Controller button, each associated card in the list has two subtabs: Config and Status. The Config subtab lists relevant or configurable information about the card, while the Status subtab is blank on these items. The table below provides more information.

Button/Peripheral	Config (Displays)
Power Supply	Part number
Front Panel	Part number
Purge Control	Part number
Singe Board Computer (SBC)	Serial and part number; Current version software
Network Adapters	Network Address Settings: See Network Setup in this section
USB Hub	User editable port identification for reference purposes
Clock	System Time and Date Entry: See Clock Setup this section
Malfunction Alarm	Allowsuser editable port identification for reference purposes
Purge Alarm	Contact type and rating. Editable field for reference purposes

Config: This subtab displays the configuration of the selected item.
Status: This subtab displays the state of configured indicators. If triggered (state changed), it displays that event date and time.

Do not mark the SECURED box unless the ACL contains at least one Supervisor user.

When the SECURED box is selected, no changes can be made to the analyzer's functions, unless the user is logged in with Supervisor privileges. Once the analyzer is secured, the SECURED box can only be de-selected by a supervisor.

Setting Display Language: Select the desired language from the dropdown list. The display change is immediate to the user.

Multiple languages can be viewed at the same time from the RUI. However the last language selected for display by either from the LUI or the RUI becomes the default display language when the analyzer is restarted.

Network Setup: The Network Address Settings are located under the SBC button of the Master Controller. The Master Controller is equipped with dual 100 mb Network Interface Card (NIC) Ethernet jacks supporting redundant communications.

If applicable, configure the network address from the Setup>Master Controller>SBC>Network Adapters>Config Subtab by entering the information in the appropriate areas. Figure 6.32 is an example Network Setup.

Fig. 6.32. Network Setup Example

HOST NAME – The network name of the Master Controller (the host name will be the same on both networks.

Port 58921 TCP and Port 58921 UDP are set as the default network ports for a STAR analyzer system. If either port is used by another application, the STAR network port will need to be changed on all networked devices.

STAR Network Port – the port at which the STAR Network is located.

PRIMARY NIC and SECONDARY NIC addresses – Contact the network administrator for available IP Addresses, Subnet Masks and Multicast Addresses. The Multicast address is defaulted to 239.1.1.1 for the primary address and to 239.1.1.2 for the secondary address. If a multicast address must be changed, ensure that all devices that need to communicate are on the correct multicast address.

The network configuration does not support Dynamic Host Configuration Protocol (DHCP.)

If you are configuring both NICs, the IP Address/Subnet Mask MUST ensure IP addresses are on different subnets.

Check the connectivity of the system by loading the RUI and connecting to the Master Controller (see RUI). The MAC address of each network adapter is shown, plus an editable text area for reference purposes.

To set the network address and communication parameters:

1. Navigate to the Setup>Config Subtab.
2. Select Network Adapters from the Function Select list.

Since the HOST NAME and STAR Network Port are configured at the ABB factory, they should not be changed.

3. Enter the Primary NIC and Secondary NIC addresses.
4. Enter the Subnet Mask addresses.
5. Enter Multicast addresses. Default Multicast addresses are provided.
6. Set up routing tables as needed.

The multicast addresses allow messages to be passed through network gear (switches/routers) from subnet to subnet.

Routers must enable multicasting for this functionality to work.

Network Routing: The PGC5000 series has the ability to route through different networks using routing tables. Up to four routes can be configured per network interface.
Configure the routing tables by selecting the Routing Table Configuration icon. The popup entry form allows the creation of a routing table for each network.

Network Addressing: Check with the network administrator to establish IP addresses and network masks to assign to the analyzer. Ensure all network information needed for redundancy and routing, including the network gateways, are available. Verify communication via the network. Refer to the RUI in Section 7.

Saving Network Settings: Saving Network settings will force the Master Controller to re-boot. The screen popup mesage in Figure 6.33 will confirm the procedure.

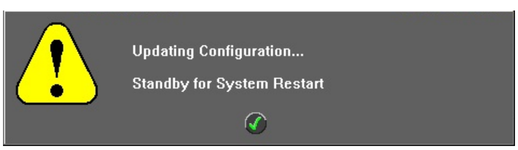


Fig. 6.33. Saving Configuration Popup Message

1. Ensure all schedules are stopped.
2. Press the **Save** icon to save settings.

Clock Setup: The system clock is set in the Setup>Master Controller>SBC>Clock>Config Subtab (see Figure 6.34). The date is displayed in Month/Day/Year format. The clock is displayed in the 24 hour format.

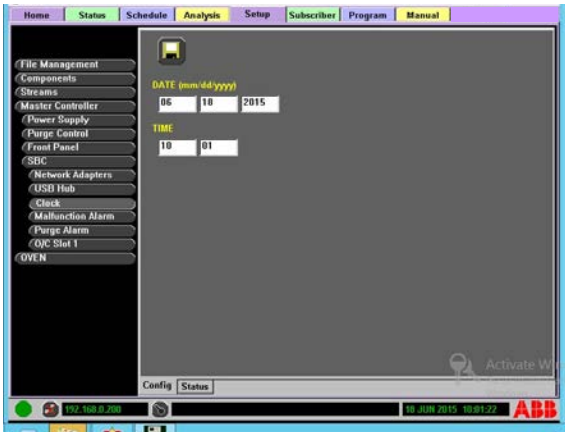


Fig. 6.34. Clock Set Example

To set the date and time:

1. Navigate to the Setup> Master Controller>SBC> Clock>Config Subtab.
2. Adjust the date and time as necessary.
3. Save settings by selecting the **Save** icon at the top of the screen.

6.6.7 Oven configuration

Changing the name will affect OPC and Modbus reporting and any method running on the oven.

Since there may be more than one oven, the Oven button in the Function Select list may indicate the oven number (i.e., Oven 1, Oven 2). The Oven button displays information about the oven selected and lists the oven ancillary items including the Power

Supply, Purge Control, Digital Temperature Controls, Electronic Pressure Controller and the Detector Amplifier (see Figure 6.35). If needed, change the oven name in the space provided, for easy reference.

Fig. 6.35. Setup Oven Configuration

To display information about the oven's ancillary equipment select the associated button.

6.6.8 Oven buttons

As with the Master Controller button, the Oven buttons display each associated card. Each button has two subtabs: Config and Status. Selecting the Oven Setup button displays all configured associated cards and peripherals. These items are shown as selectable buttons in an indented list under the selected button. The Config subtab lists relevant or configurable information about the card, while the Status subtab displays all associated indicators and advanced troubleshooting information if applicable.

Oven>Power Supply>Config displays the part number of the Oven Power Supply.

Oven>Purge Control>Config displays the part number of the purge switch assembly in analyzers with electronics purge.

Oven>DTC 1>Config displays the part number including the node ID number. All ancillary parts associated with the board are displayed below this button.

Oven>DTC 1>Status displays the indicator state of software and hardware, T-Rating issues and the associated DTC zones. Diagnostic information is also displayed. Refer to the PGC5000 Generation 2 Service Instructions SI/PGC5000/GEN2 for more information.

Oven>DTC 1>Malfunction Alarm>Config displays the relay type, contact rating, and connection point.

Oven>Digital Inputs>Config displays a numerical list of the inputs. Each input is configurable, as indicated in the following table.

Functions	Option	Results (When Triggered)
Not configured	*Blank* (Nothing Shown)	N/A
Indicator	Editable	Changes Indicator Status
Maintenance	Available Schedules	Sets Maintenance Mode indicator for selected
Schedule Run	Available Schedules	Runs Schedule
Stream Online	Available Streams	Activates Streams
Script Run	Available Scripts	Runs selected scripts

Configuring digital inputs steps (see Figure 6.36):

1. Identify the digital input to configure.
2. Select DTC>Digital Inputs from the Function Select list.
3. Either enter text or select an option from dropdown list.

Fig. 6.36. Setup Digital Inputs

Digital Input Status: The digital input status subtab displays the current state of the inputs (see Figure 6.37). Some of the inputs are used for factory configuration.

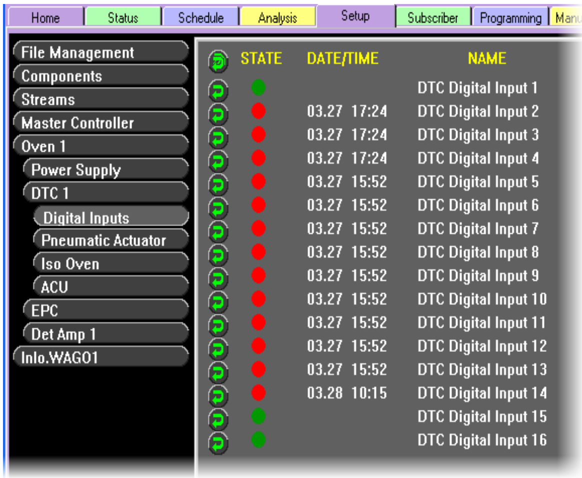


Fig. 6.37. Digital Input Status

Oven>DTC 1>Pneumatic Actuator>Config displays the actuator part number (see Figure 6.38). All factory configured valve outputs are displayed below the pneumatic actuator button, with the color coded indicators displaying the state of all regulated and unregulated valves. Regulated valves are those inside the oven, while unregulated valves are external.

Fig. 6.38. Pneumatic Actuator Configuration

Oven>DTC 1>Valve Driver(#)>Config displays the part and valve number (see Figure 6.39). It includes a valve control button used to manually control the valve.

Fig. 6.39. Valve Driver Configuration

Oven>DTC 1>Valve(#)>Config displays the valve information related to the valve driver with the same number. For internal valves (see Figure 6.40), this screen provides the specific information on the valve type and the configuration of the analyzer. The name of the valve, which is used to identify the valve when creating an analysis, can be changed for reference. The screens for external valves show only the name of the valve.

Fig. 6.40. Valve Configuration

6.6.9 Isothermal oven

Please note that the number of temperature zones is application dependent and each zone is independently listed as a button. Zone temperature set points are set and verified under the Setup>Config Subtab. The temperature setup is configured from the data sheets at the factory.

To configure the Isothermal Oven, enter the NAME, SETPOINT, LOW LIMIT, HIGH LIMIT, ZONE TYPE and then mark ZONE ACTIVE to activate the zone from this screen (see Figure 6.41). The real-time temperature associated with the oven is displayed.

Fig. 6.41. Isothermal Oven Configuration Example

NAME –Since the name is factory configured, changing the name will cause the analysis to fail.
SETPOINT – Normal operatingtemperature.
LOW LIMIT – Minimum Alarm Level.
HIGH LIMIT – Maximum Alarm Limit.
ZONE TYPE – IsoThermal (set at factory).

To adjust the oven temperature:
1. Select the Oven>DTC 1>Isothermal Oven Config subtab.
2. On the Isothermal Oven screen, insert Setpoint and/or Limit values as appropriate.
3. Check and/or adjust the temperature configuration as necessary.

The Schedule will not start until the Low Temp Limit for the Isothermal oven has been met.

The Oven>DTC 1>Isothermal Oven>Status subtab displays the state and date/time of all active indicators in the DTC zone group. Diagnostic information is also displayed.

6.6.10 Electronic pressure control

Please note that the number of pressure zones is application dependent and each zone is independently listed as a button.

The Oven>EPC>Config subtab allows viewing the EPC part number and also displays the NODE ID zone (see Figure 6.42).

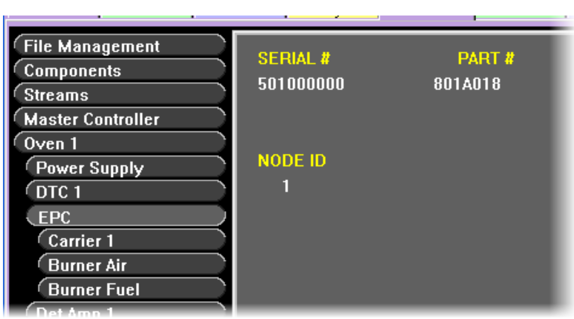


Fig. 6.42. EPC Configuration Subtab

The Oven>EPC> Status subtab displays the state and date/time of all active indicators in the EPC zone's group of indicators (see Figure 6.43). Diagnostic information is also displayed.

Fig. 6.43. EPC Status Subtab

Zone # Configuration: This subtab displays the Zone ID, Name, Actual Pressure, Ramp Rate and Setpoint (see Figure 6.44). Enter the NAME, SETPOINT, LOW LIMIT, HIGH LIMIT, ZONE TYPE and mark ZONE ACTIVE to activate the zone from this screen.

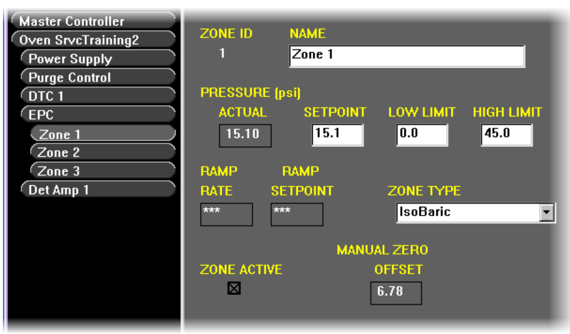


Fig. 6.44. EPC Zone 1 Configuration

NAME – Edit the name for easier reference (Function Selector button reflects new name).
SETPOINT – Normal operation pressure.
LOW LIMIT – Minimum Alarm Level.
HIGH LIMIT – Maximum Alarm Limit.
ZONE TYPE – Isobaric, Programmable (set at the factory).

The Status subtab displays the state and date and time of all active indicators in the EPC's group of indicators. Diagnostic information is also displayed.

6.6.11 Detector amplifier

The Oven>DetAmp subtab displays Serial Number, Part Number, amplifier ID, type and number of channels (see Figure 6.45).

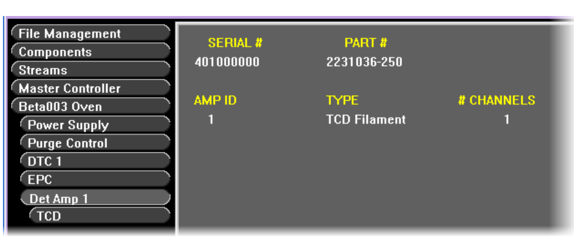


Fig. 6.45. Detector Amplifier Configuration

The Oven>DetAmp>FID Configuration subtab displays the Serial, Part, and Channel number (see Figure 6.46). It also displays the Igniter, Polarizer, Gain factor and Output Voltage. A manual AUTOZERO button is provided. Set the AUTO-IGNITE ACTIVE option and adjust the AUTO-IGNITE PERIOD (seconds) or select MANUAL IGNITE to ignite the detector manually from this screen. The AUTO-IGNITE PERIOD is the time in seconds before you try to re-ignite the burner if the flame is out.

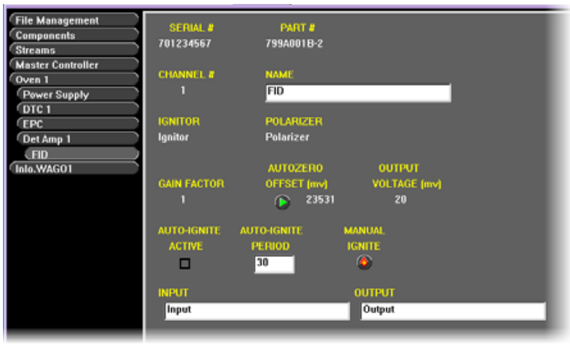


Fig. 6.46. FID Configuration

The Oven>DetAmp>FPD Configuration subtab displays the Serial, Part, and Channel number (see Figure 6.47). It also displays the Igniter, Polarizer, Gain factor and Output Voltage. A manual AUTOZERO button is provided. Set the AUTO-IGNITE ACTIVE option or select MANUAL IGNITE to ignite the detector manually from this screen.

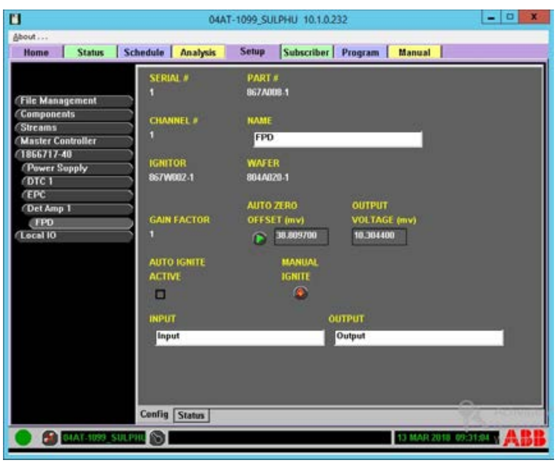


Fig. 6.47. FPD Configuration

The Oven> DetAmp> TCD> Configuration subtab displays the Serial, Part, and Channel number (see Figure 6.48). It also displays the Filament Information, Gain factor and Output Voltage. A manual AUTOZERO button is provided. You can also edit the input and output fields for easy reference from this screen.

Fig. 6.48. TCD Configuration

6.7 Subscriber tab

The Subscriber tab allows the user to designate information collection points for the analyzer information (see Figure 6.49). To automatically send analysis results and analyzer events to network destinations, their addresses and names must be entered in the Subscriber Tab. Use the Subscriber tab to edit the subscriber list from either the Master Controller's front panel or PC based RUI. The Subscriber tab has two subtabs: Config and Modbus Map.

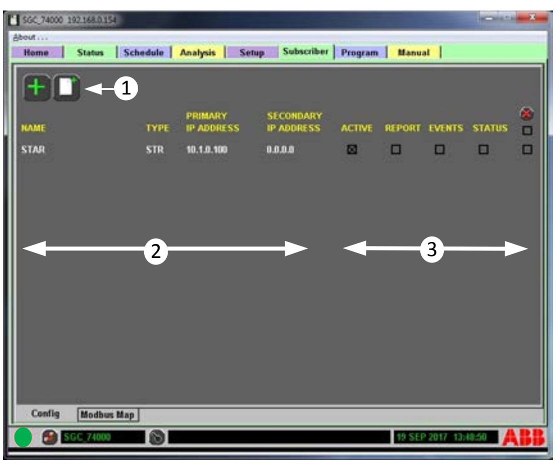


Fig. 6.49. Subscriber Tab Display

1. Action Icons – Add existing or new subscriber.
2. Subscriber Information – Displays subscriber name & information.
3. Option Row – Mark the box(s) to activate and select the type of data to report, or Delete a subscriber as needed.

Figure 6.50 describes the information provided on the Subscriber tab display.

Heading	**Description**
	**Add Device** – Provides a list of applications that can be subscribed.
	**Add New** – Adds new subscriber. Name and IP addresses will have to be manually entered.
NAME	Configurable name of the reporting device.
TYPE	The device type of receiver: OPC (ABB's OPC Server), RD (Report Device) or STR (STAR Server).
IP ADDRESS	Primary IP network address of the report device.
SECONDARY IP ADDRESS	Secondary IP network address of the report device.
ACTIVE	If the box is marked, defined information is sent to the Subscriber list.
REPORT	If the box is marked, defined report information is sent.
EVENTS	If the box is marked, event information is sent to the list.
STATUS CHANGE	If the box is marked, status change message is sent to that Subscriber.
	Delete All/Delete – Choosing the top box will mark all demand configurations for deletion. Choosing the lower box will mark that configuration for deletion.

Fig. 6.50. Subscriber Tab Display

6.7.1 Subscriber config subtab: str/opc/rd

If you select STR, OPC, or RD as the type in the Config subtab, you can create a new subscriber device, add an existing device, identify subscriber events, and support failover (redundancy).

The port for each subscriber type defaults to the type of subscription. The port must be opened at the identified IP address or the Network Comm Failure Indicator will be set. The default ports are:

STAR server 58922
OPC server 58923
RD 109

If the port is changed from the default, the port receiving the data must also be changed.
To add a new subscriber (see Figure 6.51):

1. Select the **Add New** icon.
2. Enter name and IP information.
3. Select TYPE and mark as active (as appropriate)
4. Press the **Accept** button to accept the configuration and add it to the list, or press the **Abort** button to cancel the add operation.
5. Review and mark the appropriate options for the device.

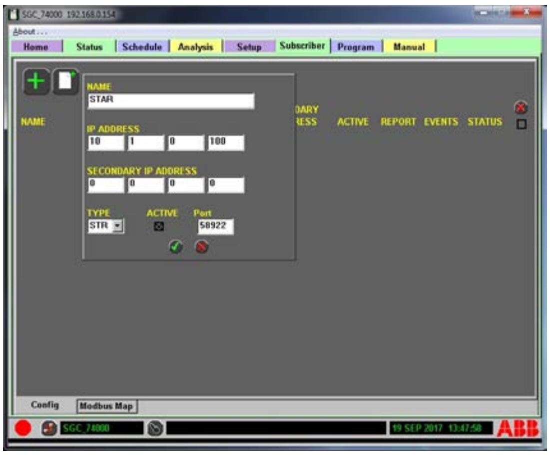


Fig. 6.51. Adding a Subscriber: STR/OPC/RD Type

To add an existing device to the subscriber list:

1. Select the **Add** Icon to open the device setup box.
2. Select the Device from the list.
3. Select the appropriate device type from the drop down list and press the Next button to continue.
4. Press the **Accept** button to accept the configuration and add it to the list or press the **Abort** button to cancel the add operation.
5. Review and mark the appropriate options for the device.

The check box action for each Subscriber Name allows specific reporting configuration features (see Figure 6.52). They are:
ACTIVE – whether it reports data.
REPORT – Sends Analysis data (RAW); applies to STAR, OPC and RD.
EVENTS – See the next paragraph; applies to STAR and RD.
STATUS – Analysis status information is sent to subscriber (Analyzer, Stream and Sample Handling Status); applies to STAR and OPC.

Fig. 6.52. Subscriber Added and Activated Example

The following list identifies all events which trigger output to the defined subscriber lists.

Event	Trigger/Origination Point	Associated Indicator
Power Recovery: <DateTime>	Analyzer completes power up sequence	Report Only
Power Fail: <DateTime>	Detects of loss of power	MC: PowerFail
User Login: <Username>	User logs in to the analyzer	Report Only
User Logout: <Username>	User logs out of the analyzer	Report Only
Stream Online: <StreamName>	Stream set online manually, programmatically (via scripting) or automatically (via DCS call through OPC Server)	StreamActive
Stream Offline: <StreamName>	Stream set offline manually, programmatically or automatically	StreamActive
Schedule Run: <ScheduleName>	Resource Group has been activated manually, programmatically or automatically	Report Only
Schedule Stopped: <ScheduleName>	Resource Group has been deactivated manually, programmatically or automatically	Report Only
Schedule Paused: <ScheduleName>	Resource Group suspended manually, programmatically or automatically	Report Only
On-Line: <ScheduleName>	Schedule runs Analyses	OnLine
Idle: <ScheduleName>	Schedule has no Analyses to Run	OnLine
Calibration Started: <ScheduleName>	Schedule starts calibration	Calibrating
Calibration Competed: <ScheduleName>	Schedule completes calibration	Calibrating
Validation Started: <ScheduleName>	Schedule starts validation	Validating
Validation Completed: <ScheduleName>	Schedule completes a validation	Validating
Maintenance Started: <ScheduleName>	Schedule Maintenance Starts: Maintenance Button Activated	Maintenance
Maintenance Completed: <ScheduleName>	Schedule Maintenance Ends: Maintenance Button deactivated	Maintenance

Event	Trigger/Origination Point	Associated Indicator
Step Table Changed	An entry in a Schedule Step Table has been altered	Report Only
Time of Day (TOD) Table Altered	An entry in a Schedule Time Of Day Table has been altered	Report Only
Ad Hoc Table Altered	An entry in a Schedule Ad Hoc Table is altered	Report Only
Scripting Error: <Script Name>	An error occurs in a scripting program when run.	ScriptError
Network Communication Failure	When communication to a subscriber fails.	CommError
CommFailureOven (1-4)	Oven Controller Heartbeat fails (1-4)	CommFailureOven (1-4)
On-Line After Auto-Calibration	Associated with Simulated Distillation	OnLine
On-Line After Blank Run	Associated with Simulated Distillation	OnLine

The subscriber list supports failover (redundancy). If the secondary network interfaces are configured, the system switches to the secondary network and continues to report data if the primary network fails (activates COM failure indicator).

IP addresses cannot be in the same network subnet.

If the Network is set up to provide data to both a STAR DMS Network and a DCS via Modbus, the STAR DMS should be considered as the primary network, and the DCS Modbus connection as the secondary network.

6.7.2 Subscriber config subtab: mod

If you select MOD as the type in the Config subtab (see Figure 6.53), you can set up a Whitelist for the Modbus.

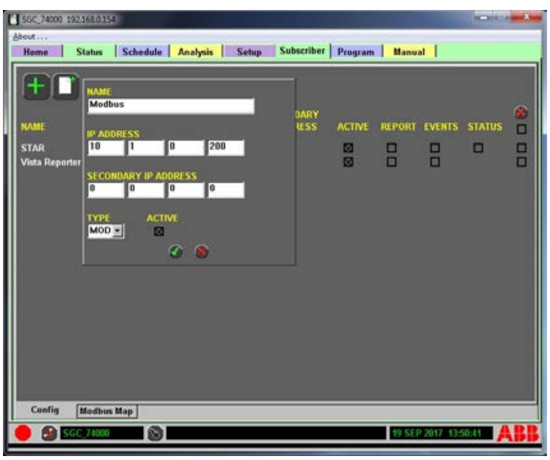


Fig. 6.53. Adding a Subscriber: MOD Type

To add a Modbus device to the subscriber list:

1. Select the **Add** Icon to open the device setup box.
2. Select the Device from the list.
3. Select the appropriate device type from the drop down list and press the Next button to continue.
4. Press the **Accept** button to accept the configuration and add it to the list, or press the **Abort** button to cancel the add operation.

The polling rate from the Modbus Master to the analyzer must be between 1 and 90 seconds for proper operation.

The only check box action for each Modbus entry is ACTIVE, which reports data when selected (see Figure 6.54).

Fig. 6.54. Subscriber Added, MOD Type

6.7.3 Modbus map subtab

The Modbus Map subtab (located at the bottom of the screen) under the Subscriber tab allows the user to test the Modbus mapping on the PGC5000 as well as change ranges in the Modbus map. Users can check/test the Instrument level data tags by selecting which Instrument's tags they want to view from the drop down selection box below the Instrument tab on top left side of screen (see Figure 6.55). To test the Instrument level data tags, input a value into the SET VALUE text box on the right side of the screen and that value will be sent over the network to the Master device. If the value received by the Master device matches the value input into the SET VALUE text box, then Modbus is working for that data tag.

Fig. 6.55. Subscriber Tab, Showing Instrument Tag

Stream level data tags can also be viewed/tested by selecting the Streams tab at top of screen (see “1” in Figure 6.56). Users can check/test the Stream level data tags by selecting which Streams tags they want to view from the drop down selection box below Stream tab at top of screen. Once the desired stream is selected, input a value into the SET VALUE text box at the right side of the screen for the given address and the value will be sent over the network to Master device (see “2” in Figure 6.55). If the user input value matches the value received by the Master device, the Modbus mapping is working for the given Stream tag address.

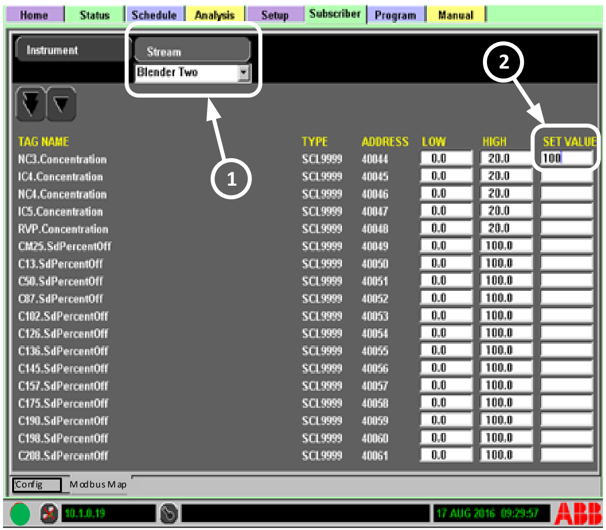


Fig. 6.56. Streams Tab

The SET VALUE text box will not display the current contents of the given Modbus address. The SET VALUE will be written to the internal register. If the PGC5000 overwrites the values prior to the Modbus poll request, the value may not be seen by the Modbus Master.

Users also are able to change the ranges of any given Stream tag address. The LOW and HIGH range value for the Modbus map can be changed at any given time. To change the range simply input a new range value into the LOW or HIGH text box (see Figure 6.57).

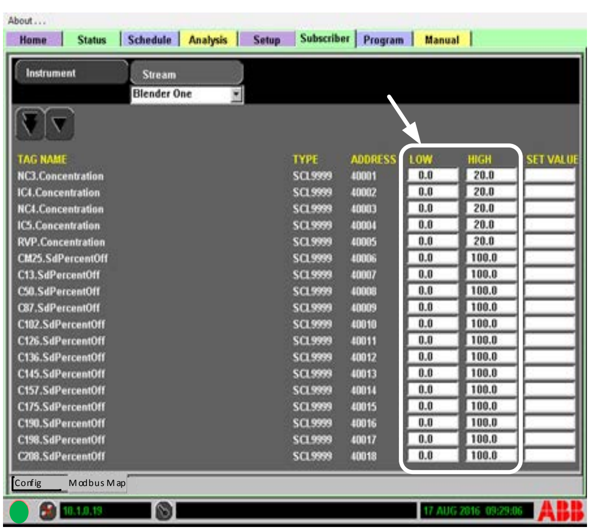


Fig. 6.57. Streams Tab Low/High Ranges

6.8 Program tab

The Program Tab gives the operator a means for programmatic control and calculations in addition to the built-in capabilities. This provides the necessary support to customize operation of the analyzer to support unique requirements.

Section 9 provides detailed information on the scripting process.

6.9 Manual mode tab

The Manual Mode tab (see Figure 6.58) displays up to four hours of continuous chromatogram data. It also allows individual manipulation of the valves and other specific elements of the analyzer.

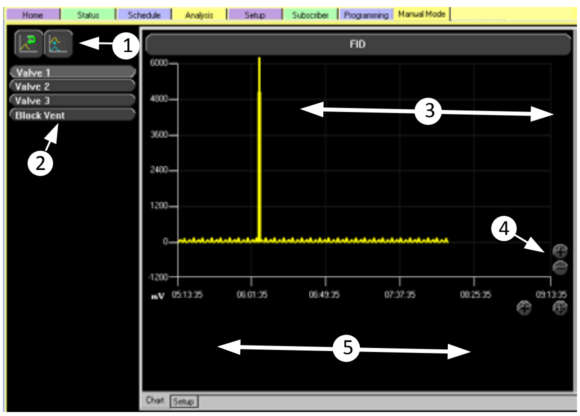
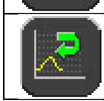


Fig. 6.58. Manual Mode>Chart Example

1. Action Icons –Initiates the Chart Reset and /or Auto zero.
2. Valve List – Lists all available valves configured on the selected analyzer and enables manual control.
3. Chart Display Area – Displays current system results.
4. Zoom Controls – Allows detailed views of the analysis.
5. Setup Display Area – Displays objects from the setup sub tab (Future Use).

Select available valves from the valve list. The valve button depresses (becomes lighter) when active.

Manual Mode Action Icons are as follows:

Icon	Meaning
	Auto Zero – Sets current chart Y axis value to zero.
	Chart Reset – Resets current chart X axis value to current time.

6.10 Sample handling system

The 0 software controls and collects data from a modular, CANopen ANSI/ISA SP76.00.02-2002 standard SHS.

This software includes::

- Digital SHS Valve control with Alarm Status
- Sample Temperature Alarm Status
- Sample Pressure Alarm Status
- Sample Flow Alarm Status
- Filter Differential Pressure Alarm Status
- Reading Analog Inputs

All alarm indicators are configurable for OPC and/or MODBUS data transmission to validate analyses from the PGC and provide overall SHS health.

7 Technical description

7.1 Functional description

Figure 7.1 shows a typical analytical flow system, using the flame ionization detector for illustration. Connections at the right side of the analyzer cabinet provide all gas and air inputs. Sliding plate valves, liquid sample valves, or a combination of both, provide control and measurement of the sample. Each analytical valve is air-actuated by an electrical solenoid valve, which in turn is controlled by the DTC. An operational cycle for the valves consists of three modes: sample purge, sample inject, and backflush. In the sample purge mode, sample flows through the sample loop to vent. In the sample inject mode, the sample valve switches, a plug of sample is swept by the carrier through the column train to the detector. In the backflush mode, the carrier backflushes Column 1 to vent.

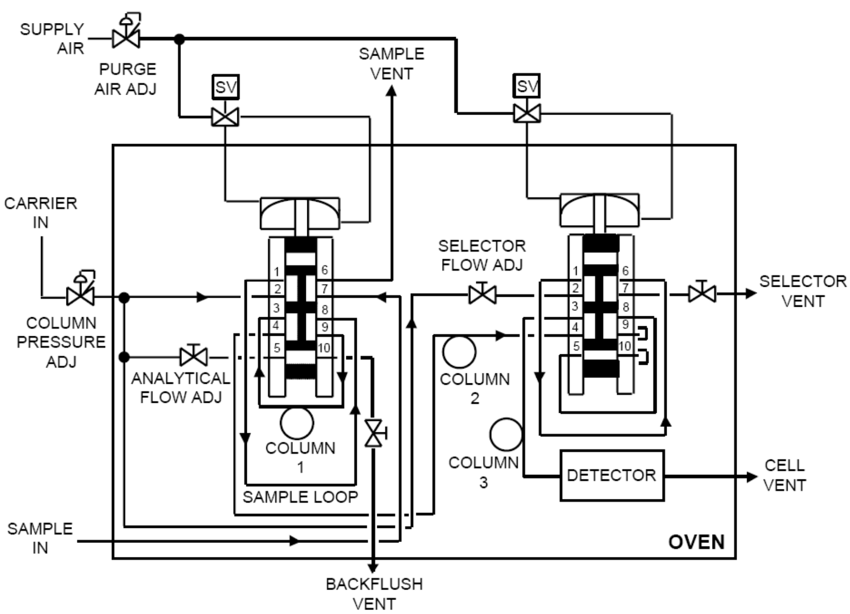


Fig. 7.1. Typical Analytical Flow System Diagram

The volume of sample is determined by the sample loop. When the valve switches, the sample passes into Column 1, to Column 2 and into the detector cell, where it is converted to an electrical signal. Column 1 performs preliminary separation to remove the heavier non-measured components, which are then backflushed to vent. Column 2 separates the components to be measured, which elute sequentially to the selector valve. The selector valve determines which components will be measured. The sample output from Column 2 goes through Column 3 to the detector for measurement. When the valve switches, the sample not being measured is flushed through the Selector to Vent.

The carrier gas has three purposes: to purge the columns and cell prior to introducing a sample, to sweep the sample into the detector cell, and to backflush the backflush column.

The sample system, together with the PGC, controls the calibration sample input. The sample system flow and pressure control depend on the sample system configuration.

7.2 Detectors

Standard detectors are the Flame Ionization Detector (FID), Thermal Conductivity Detector (TCD), and Flame Photometric Detector (FPD). These detectors may be used separately, in combination, or as dual detectors. An optional Discharge Ionization Detector (DID) is also available.

7.2.1 Flame ionization detector

The FID cell reduces the physical sample to an electrical signal. The cell consists of a polarized jet, a collector, and a chamber in which hydrogen fuel and sample are burned in air. A current, whose magnitude is proportional to the concentration of the sample, flows between the jet and the collector. This current goes to the FID Amplifier Assembly.

The FID Amplifier Assembly provides ignition control for the FID cell and amplification of the detector cell output signal prior to routing the signal to the control section for signal processing. It consists of a power supply, igniter assembly, electrometer amplifier, and associated circuitry. The power supply provides the necessary dc voltages for the FID Amplifier Assembly and FID.

The igniter assembly provides control for the igniter in the detector cell. In the event of a flame-out, the thermocouple senses the flame-out, illuminates the Flame-Out LED, and sends a message to the igniter assembly, which re-ignites the flame. The electrometer amplifier takes the FID cell's output, amplifies it, and sends it to the control section for signal processing.

7.2.2 Thermal conductivity detector

The Thermal Conductivity Detector (TCD) works on the principle that a heated body loses heat dependent on the composition of the surrounding gas. Filaments sense the rate of heat loss so that any change in filament current results in a bridge output proportional to the change. The TCD contains a reference filament and a measurement filament. When the reference carrier gas flows across both filaments, the two filaments have the same filament temperature and the bridge has a zero output. During a measurement cycle a sample flows through the measurement filament, changing thermal conductivity and the filament temperature, thereby causing a corresponding change in electrical resistance. The bridge senses this change in current and increases or decreases current flow through the bridge to compensate for the temperature change. The change in current flow sensed by the bridge is proportional to the component concentration in the sample being measured.

A multiport version of the Thermal Conductivity Detector (MTCD) is available to achieve more measurements in a smaller space.

7.2.3 Flame photometric detector

The Flame photometric detector (FPD) works on the principle that when sulfur is burned in a hydrogen-rich atmosphere, luminescence (light) characteristic to sulfur is produced. The FPD cell consists of a burner chamber equipped with a spark ignition system and a photomultiplier tube which is thermoelectrically temperature controlled. A narrow bandpass filter optically connects the burner chamber and the photomultiplier tube. An exponential amplifier conditions and amplifies the photomultiplier tube output to provide a linear output over a wide dynamic range. Sulfur addition permits accurate measurement of low-level sulfur compounds.

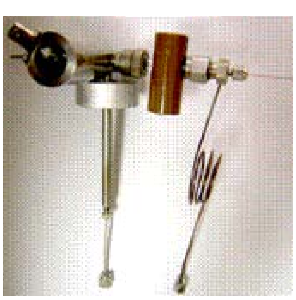
When a sulfur compound passes through the hydrogen-rich flame, strong luminescence occurs between 320 and 460 nm. The narrow band-pass filter allows a sulfur spectra-centered transmission at 394 nm ± 5 nm to achieve a specific ratio of sulfur to non-sulfur compounds between 10,000 and 30,000:1. A photomultiplier tube views the filtered light and outputs a voltage proportional to the intensity of the filtered luminescence. For maximum sensitivity, the detector is optimized with respect to temperature, gas flow rates, and bias voltage on the photomultiplier tube.

Because the amount of sulfur in the sample is very small, a sulfur addition module provides a standard level of sulfur. This keeps the sulfur readings above the noise level within the analyzer. When the analyzer processes a sulfur compound, the sulfur in the sample adds to the standard sulfur, providing a level more easily measured by the photomultiplier tube.

The FPD Electrometer PCB, located inside the electronics compartment of the oven, digitizes the detector output signal for processing. This PCB assembly also provides energy for FPC flame sensing and ignition.

7.2.4 Optional discharge ionization detector

The Discharge Ionization Detector (DID) consists of a detector unit and a power supply (see Figure 7.2).



Detector Unit

Power Supply

Fig. 7.2. Discharge Ionization Detector

The DID is used in the ABB analytical process gas chromatograph for parts-per-billion (ppb) and parts-per-million (ppm) measurements of the following:

- Impurities in high purity gases
- Halogenated hydrocarbons
- Impurities in ethylene
- Low levels of BTX
- Arsine and phosgene
- Ethylene oxide
- Formaldehyde
- Ammonia

A dielectric barrier discharge is a plasma discharge that is obtained using a high voltage alternating current applied to a gas such as Helium or Argon as it flows through a dielectric material such as quartz glass. Two electrodes are arranged within the detector so that when the high voltage is applied to the gas, a breakdown occurs with a subsequent discharge from one electrode to the other. However, the presence of the dielectric barrier behaves as a capacitor in the localized region of the discharge. The dielectric barrier stores a substantial amount of energy for each discharge. This results in the generation of highly excited state molecules and atoms of Helium or Argon, which is referred to as the reaction gas. As the sample components elute from the column they are ionized by the reaction gas. A second set of electrodes in the detector measure the current generated from the ionized components. The output is sent to an electrometer, where it is amplified. Figure 7.3 illustrates this process.

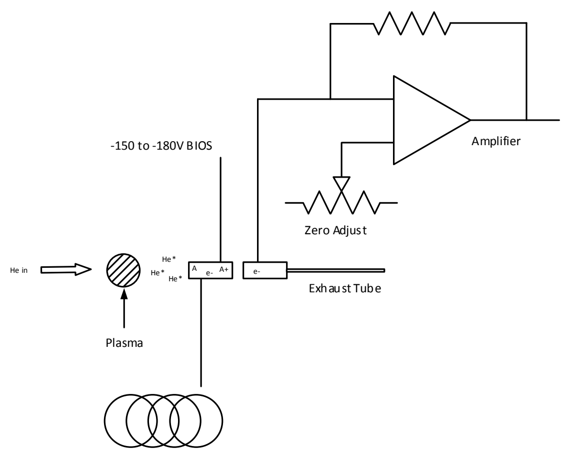


Fig. 7.3. Typical DID Process

7.3 Peak detection

The analyzer utilizes a new method of peak detection called “min-max” detection. In order to understand the new method, this section first reviews the current, or classic, method of detection before explaining the min-max method.

7.3.1 Classic method of peak detection

In the classic mode, two methods of peak detection are offered: “forced gating” and “slope detect.” The forced gating method requires the operator to take full control of the peak definition. The start and end times are manually entered, along with the topology (baseline or valley). Forced gating method makes no assumptions about the shape of the peak, while the maximum point between the start and the end is the “crest.” A single peak is assumed, whether the chromatogram results in single peak or multiple peaks.

The slope detect method assumes that all peaks meet certain criteria based on the slope of the signal. A peak must start with a positive slope, crest and then finish with a negative slope that levels out. A quiet chromatogram is treated as a quiet signal and only peaks meeting the necessary conditions are picked up. Slope detect determines peak crests, start and end times, and topologies automatically.

Each method has pros and cons, but neither method satisfies all application requirements. Slope detect is the preferred method when peaks meet at valley conditions or move around. Forced gating is the preferred method when the peaks are poorly shaped or when slope detect will not give reliable results.

7.3.2 Min-max method overview

The ABB Min-Max method of chromatographic peak detection provides a higher level of accuracy than the classic method. The ultimate goal of the PGC is to provide the end user with a repeatable and accurate determination of component concentrations. Peak detection algorithms are used to scan the chromatogram to determine what part of the signal represents the peaks of interest and their respective concentrations. Typically, this is a two-step process where the first step determines at what times to start and stop integrating of the area under the peak. The second step is baseline correction where the method determines what part of the peak's area is due to not starting and ending at baseline.

7.3.3 Min-Max examples

The Min-Max method is a more reliable and accurate approach to measuring peak area. This method is closer to forced gating than it is to slope detect. Each peak specification includes windows for crest time, start and stop of integration, start and stop baseline correction (see Figure 7.4). The baseline correction window specifies the peak topology for the baseline and valleys. The integration and crest windows allow for offset from a maximum in the analysis.

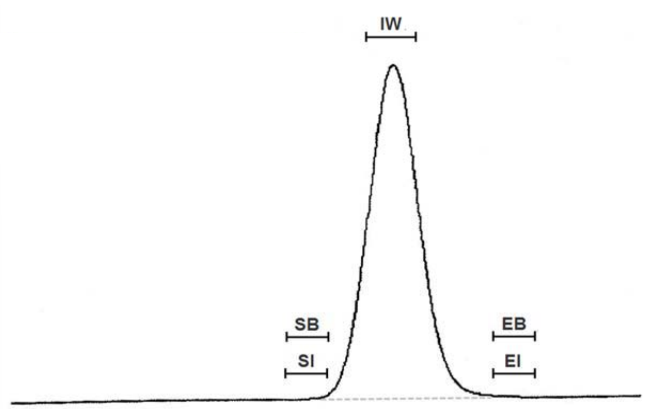


Fig. 7.4. Min-Max, Single Peak

The Min-Max method works strictly on finding minimums and maximums. The Identification Window (IW) area defines the maximum point within the window and the time becomes the crest. The shape of the chromatogram inside the IW is not considered. If the chromatogram shows multiple peaks within the IW, the maximum peak is the crest and only one crest can be determined. The Start of Baseline (SB), End of Baseline (EB), Start of Integration (SI) and End of Integration (EI) areas define the minimum point within the window. The SI and EI determine the beginning and end of peak area integration, while SB and EB determine the beginning and end of baseline correction.

Figure 7.5 is an example of the integration and the baseline correction windows for a peak doublet with a valley between, where only one of the peaks is integrated. The SI and the SB were identical, but the EI and the EB are different. The second peak is not required for the baseline correction of the first peak. In the Min-Max method, each peak is fully defined, so not dependent on any other peak in the analysis.

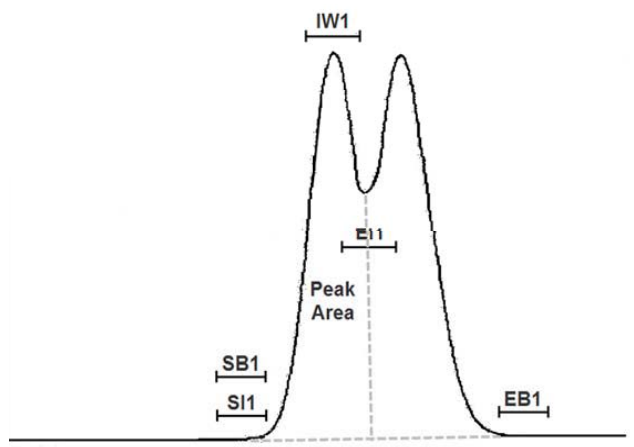


Fig. 7.5. Min-Max, Multiple Peaks

Figure 7.6 defines the integration of two separate peaks and the windows for each peak separately.

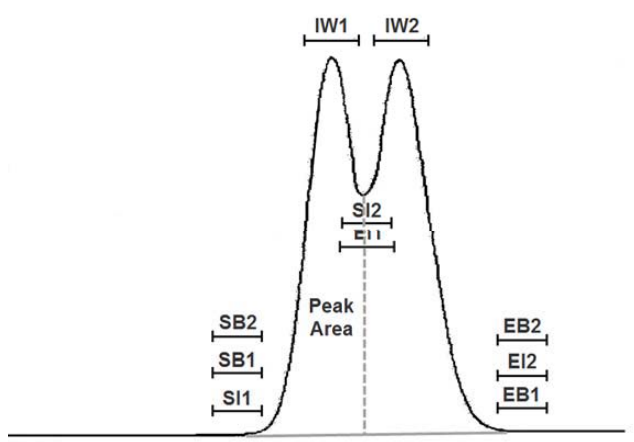


Fig. 7.6. Min-Max, Separate Peaks

7.3.4 Baseline correction, peak lumping

The Min-Max method completely defines the peak but requires careful placement of the windows to cover all situations. The projection of a peak is used when either the SB or the EB are offset from each other, or when no stable place can be found for one of them. A projection is accomplished by setting SB and the EB identically. If the windows occur before the IW, the projection is forward (Figure 7.7, peak 1). If the windows occur after the IW, the projection is backward (Figure 7.7, peak 2).

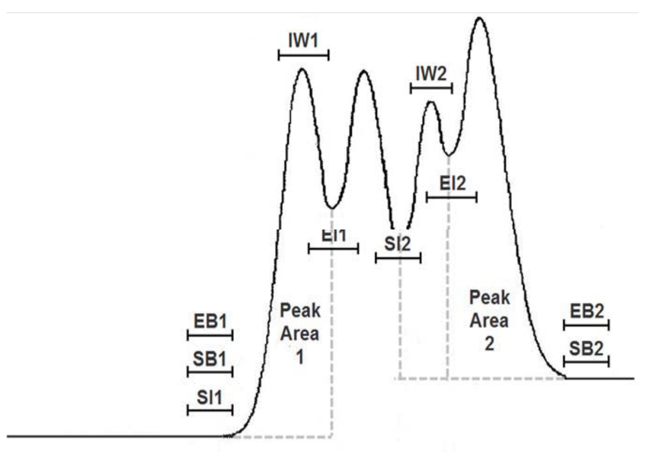


Fig. 7.7. Baseline Correction, Peak Lumping

7.3.5 Baseline correction, tangent skim

A small shoulder on a much larger peak is a “tangent skimmed” peak. The main peak extends beyond the end of the skimmed peak where part of the area under the skimmed peak actually belongs to the main peak. Treating the situation as two fused peaks would give an unreasonably large area to the skimmed peak.

If the tangential skimmed peak were set up as shown in Figure 7.8, the standard baseline correction of drawing a line between the SB and the EB would give the dashed line. This correction subtracts off the area above the chromatogram and if this crescent shaped segment becomes large enough, the final peak area will go negative. Correct placement of the EB and the EI can avoid the problem, but this is not always easily accomplished. Small movements of the tangential skimmed peak have a large effect on the final peak area.

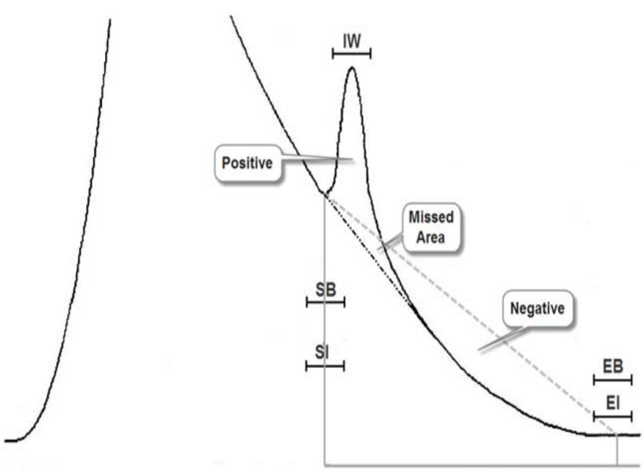


Fig. 7.8. Baseline Correction, Tangent Skim

7.4 Component detection (EZ peak)

The analyzer currently uses min-max peak detection as described in this section. After Version V3.0.2.1 of the PGC5000 analyzer and the PGC5000 Generation 2 analyzer, an EZ Peak feature is included in the software. It allows users to define a peak area by entering only two variables: Component Retention Time (RT) and a Threshold measurement.

EZ Peak requires two Sequence Time-Coded Functions (TCF), Threshold and Component RT:

- The Threshold TCF provides the noise multiplier used to compute the noise threshold. This TCF appears only once and must precede any Component RT TCF. It must be placed in a quiet zone of the signal at least two seconds after an Autozero. At the time specified in the TCF, the threshold is computed from the previous 100 samples.
- The Component RT TCF defines an expected retention time and a window encompassing that time within which a peak is expected. It provides the bounds for the crest only and needs to be wide enough to catch the crest. If there are multiple peaks within the window, the algorithm selects the one closest to the user-defined retention time.

7.4.1 EZ peak calculations

Most chromatographic peaks take on the general form of a classical Gaussian curve and are analyzed mathematically. The graph of a Gaussian curve is a characteristic symmetrical “bell curve” shape that quickly falls off toward plus/minus infinity. EZ Peak detection utilizes a second derivative algorithm to detect the presence of a peak. Derivatives enhance the ability to isolate regions in which peaks occur by allowing the algorithm to search for a change in sign.

While it is visually obvious, locating a peak is not a simple task for a computer. Signal noise complicates the decision of when peaks, valleys, and return to baseline occur. The user sets up five separate windows for each peak: start of baseline, start of integration, crest, end of integration, and end of baseline.

The second derivative measures how the rate of change of a quantity is itself changing and is set using a threshold value. At the curve’s flex point on the leading side of the peak, the second derivative crosses from positive to negative, and at the flex point on the trailing side, the derivative crosses from negative to positive. Between those points a single peak will be found. A curve with multiple crests has two sets of crossover points.

An advantage of the second derivative approach is shoulder detection (i.e., a bump on the side of a large peak caused by an underlying small peak – too small to form a valley between the two crests).

7.4.2 Identifying peaks

At some point, the signal emerges above the noise enough to signify a peak has started. The second derivative does not solve the problem of knowing when the peak actually starts, but it gives a starting position to watch.

The second derivative algorithm measures the noise as a standard deviation in a quiet range of the signal over a one second period (100 samples). The second derivative algorithm requires a minimum of ten consecutive samples above the threshold before it is deemed a peak. As some noise may still stray above this threshold, the user is given the option to multiply this value by a threshold factor. The result gives an envelope above which the second derivative algorithm decides that a peak may be starting. The threshold factor TCF can be adjusted when the sequence TCF is entered. The larger the factor entered at the setup screen, the larger a deviation from baseline is required before a peak is assumed.

7.4.3 Single peak integration range

The integration range of a peak is defined to be the point at which the signal first emerges above the threshold and the point at which it first disappears below the threshold (see Figure 7.9).

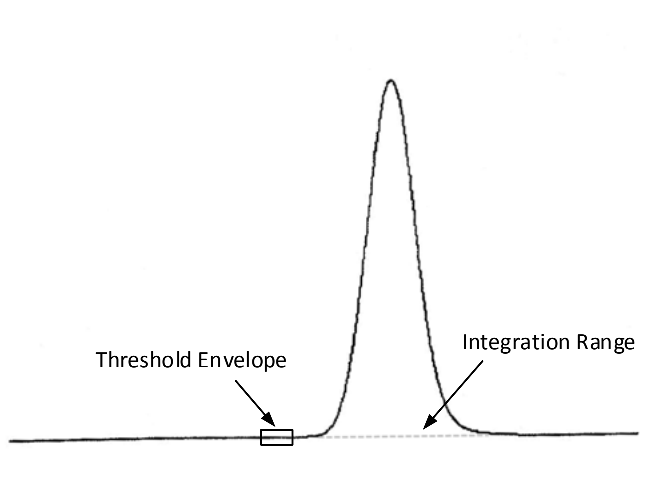


Fig. 7.9. Single Peak

7.4.4 Multiple peak integration range

A multiple peak cluster is where the signal does not drop back to the threshold in the valley between peaks (see Figure 7.10). The peaks are cleaved by a line dropped from the lowest point of the valley perpendicular to the baseline (perpendicular drop). Integration for the first peak of the mountain range is from the emergence point to the first perpendicular drop. A middle peak is integrated from its left perpendicular drop to its right perpendicular drop. The last peak is integrated from its left perpendicular drop to the return to threshold.

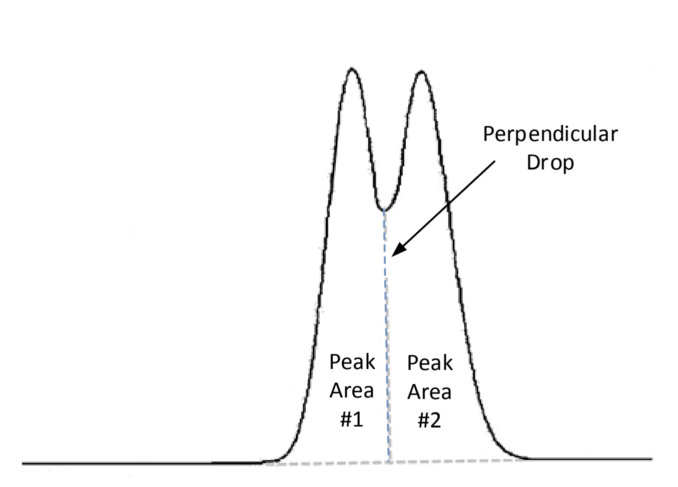


Fig. 7.10. Multiple Peaks

7.4.5 Tangent skim

Whenever a bump or small peak appears on the trailing side of a much larger peak, the smaller peak can be cleaved from the larger by a technique called tangent skim (see Figure 7.11). If a valley is present between the two peaks, a tangential line is drawn from a point of the falling curve near the bottom of the valley before the smaller peak to the first point on the falling curve after the smaller peak that would also be tangential. Tangent skimming is automatically chosen when the ratio of peak heights from the bottom of the valley between them exceeds ten.

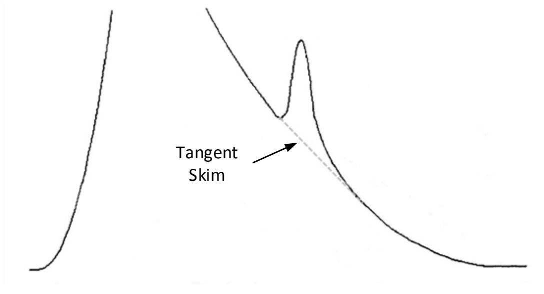


Fig.7.11. Tangent Skim

In the case of a shoulder where there is no valley, tangential points can still be located until the shoulder decreases to a critical size in which it is impossible to separate it from the larger peak. The smaller peak is also referred to as a dependent peak and the peak on which it is attached, the parent or independent peak.

7.4.6 Baseline drift

Baseline drift happens when the signal flat-lines at a level outside the threshold. Flat-lining is detected with the signal's value and its first derivative. If the derivative falls to 0 and the signal is outside the threshold, the baseline is re-anchored when this condition exceeds 100 consecutive signal samples (one second). The peak detection threshold is now relative to the new baseline. The baseline can shift higher or lower.

7.5 Time coded functions

A Time Coded Function (TCF) defines an action performed at a specified time in an analysis. The TCF parameters are the specifications available to the function. TCFs are added to analyses, methods or sequence scopes when creating an analysis using the LUI or RUI. Results of some TCFs may not be reported until the end of an analysis.

Entering a TCF in an analysis, method or script defines an action to perform (e.g. Valve ON) at specific time in the analysis. The following table identifies the TCFs for each scope.

TCF	Analysis	Method	Sequence
Autozero			X
Component MinMax			X
Component RT (EZ Peak)			X
Digital Input Check		X	X
Do Next If		X	X
Peak Threshold			X
Pressure Check		X	X
Pressure Control		X	X
Pressure Default		X	X
Script Control	X	X	X
Skip Next If		X	X
Stream Step		X	
Temperature Check		X	X
Temperature Control		X	X
Temperature Default		X	X
Unknown Peak			X
Valve On			X
Valve Off			X

The following paragraphs list the functions (alphabetically) with descriptions. They include tables with the Parameter name, acceptable Range and Units of measure values. This information is intended as a guide in properly configuring TCFs.

7.5.1 Auto zero

Auto zero supplies an offset which brings the raw baseline signal down to its most sensitive range. An offset voltage setting that is out of range will set an indicator.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Detector Channel	Available from configuration	N/A

7.5.2 Component min/max

There is only one TCF required for min/max detector signal integration. All timings are relative to the time offset.

The sequence offset + the Time offset + the gate value must be > 0 < the cycle time or 14400 (whichever is smaller).

The min/max TCF has the following parameters:

Parameter	Range	Units
Time offset	0 to 14400	Seconds
Start Of Baseline Gate: Begin Time	-14400 to 14400	Seconds
Start Of Baseline Gate: End Time	-14400 to 14400	Seconds
End Of Baseline Gate: Begin Time	-14400 to 14400	Seconds
End Of Baseline Gate: End Time	-14400 to 14400	Seconds
Start Of Integration Gate: Begin Time	-14400 to 14400	Seconds
Start Of Integration Gate: End Time	-14400 to 14400	Seconds
End Of Integration Gate: Begin Time	-14400 to 14400	Seconds
End Of Integration Gate: End Time	-14400 to 14400	Seconds
Crest Gate: Begin Time	-14400 to 14400	Seconds
Crest Gate: End Time	-14400 to 14400	Seconds
Peak Type	Positive, Negative, Tangent, Calculated	N/A

7.5.3 Component RT (EZ Peak)

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Component	Available from configuration	N/A
Detector	Available from configuration	N/A
Peak Type	Positive, Negative, Tangent, Calculated	N/A
Crest Begin	-14400 to 14400	Seconds
Crest End	-14400 to 14400	Seconds

7.5.4 Digital input check

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Digital Input	Available from configuration	N/A
Action	Ignore, Report, Skip, Abort	N/A

7.5.5 Do next if…

This allows execution of the next TCF in the method only if the stream value equals the stream name entered in the method. This function allows adding a specific TCF to a particular stream, but not to every stream.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Stream	Available from configuration	N/A

7.5.6 Peak threshold

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Threshold	1 to 99 (default 6)	Numeric
Detector Channel	Select from configuration	N/A

7.5.7 Pressure check

Pressure check, which is part of the Electronic Pressure Controller, allows for pressure zone variances. A pressure value outside the pressure limit range causes an alarm.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Zone	Available from configuration	N/A
Action	Ignore, Report, Skip, Abort	N/A
Low Limit	0 to 100	PSI
High Limit	0 to 100	PSI

7.5.8 Pressure control

This feature of the Electronic Pressure Controller allows review or modification of the pressure zone set point and ramp rate.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Zone	Available from configuration	N/A
Setpoint	0 to 100	PSI
Ramp Rate	0 to 1000	PSI/min

7.5.9 Pressure default

Returns zone to Setup Tab isobaric setpoint.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Zone	Available from configuration	N/A

7.5.10 Script control

This allows running a programmed script at a defined time into the analysis, method or sequence. A script must be created prior to adding this TCF.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Script Name	Available from configuration	N/A

7.5.11 Skip next if…

This allows skipping the next time-coded function when this stream value equals the stream number entered in the scheduler. This function allows skipping a TCF on a particular stream, usually because that TCF does not apply to that stream.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Stream	Available from configuration	N/A

7.5.12 Stream step

This begins the automatic sample purge of the sample stream being analyzed. It must occur after completion of the sample inject for this stream. This is particularly important when the current stream being analyzed requires multiple sample injections.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds

7.5.13 Temperature check

This evaluates temperature zone variances. A temperature value outside the zone limits initiates an action in response.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Zone	Available from configuration	N/A
Action	Ignore, Abort, Skip, Display	N/A
Low Limit	0 to 1100	° C
High Limit	0 t0 1100	° C

7.5.14 Temperature control

This allows review or modification of the temperature zone set point and ramp rate at a specific time during the analysis.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Zone	Available from configuration	N/A
Setpoint	0 to 1100	° C
Ramp Rate	0 to 1100	°C/min

7.5.15 Temperature default

This returns zone temperature to Setup Tab isothermal setpoint.

Parameter	Range	Units
Description	User definable	Text
Time Offset	0 to 14400	Seconds
Zone	Available from configuration	N/A

7.5.16 Unknown peak

This searches for an Unknown Peak in the specified area.

Parameter	Range	Units
Description	User definable	Text
Time Offset Begin	0 to 14400	Seconds
Time Offset End	0 to 14400	Seconds
Detector Channel	Available from configuration	N/A
Peak Type	Positive/Negative	N/A

7.5.17 Valve on and valve off

Valve On and Valve Off control the operation of a selected valve. Each sequence should contain the valve on and off functions required for the selected stream tap. The first “Valve On” time in an analysis is used in all reports as the “Sample Inject” time.

Parameter	Range	Units
Description	User definable	Text
Time offset	0 to 14400	Seconds
Valve Name	Available from configuration	N/A

7.6 Air purging

When an area classification indicates combustible gases or particles are present in the air, and you have an analyzer containing a possible source of ignition located in this environment, the analyzer may have an air purging system to reduce the degree of risk. The type of air purge used depends on the classification of the analyzer and its environment; the analyzer is labeled accordingly.

This safety purge is part of the basic design of the analyzer and must remain operational.

- Y Purge reduces the internal classification of the analyzer from Division 1 or Zone 1 to Division 2 or Zone 2.
- Z Purge reduces the internal classification of the analyzer from Division 2 or Zone 2 to Nonhazardous/General Purpose.
- X Purge reduces the internal classification of the analyzer from Division 1 or Zone 1 to Nonhazardous/General Purpose.

7.6.1 Y and Z purge

The analyzer has a standard air purge system which will reduce the internal classification by one level. For a Division 1 internal classification, this purge system, labeled Y Purge, reduces the classification to Division 2. For a Division 2 internal classification, this purge system, labeled Z Purge, will reduce the classification to Nonhazardous/General Purpose. Since the Y and Z Purge systems are identical except for nomenclature, the following explanation applies to both.

The purge air enters the analyzer system through a pressure regulator, an orifice, and a gauge used to set purge flow, and then into the electronics housing where purge air flow is maintained until a fault condition exists.

When a purge air alarm condition exists, the PGC will set an *** ALARM *** signal display on the screen and cause a purge alarm contact to switch. A Y or Z Purge alarm alerts you to the condition, but it does not turn off the analyzer.

It is the customer’s responsibility to connect the purge alarm contact to a visual or audible annunciator located in a constantly monitored area, as referenced in NFPA 496 (2003) and IEC 60079-2:2001.

Purge time depends on the application. Refer to the analyzer label or Data Package for specific analyzer purge time.

7.6.2 X purge operation

While X Purge (see Figure 7.12) is an optional feature, some installations specifying certification require it. X Purge reduces risk by two levels and turns off the analyzer when an alarm occurs.

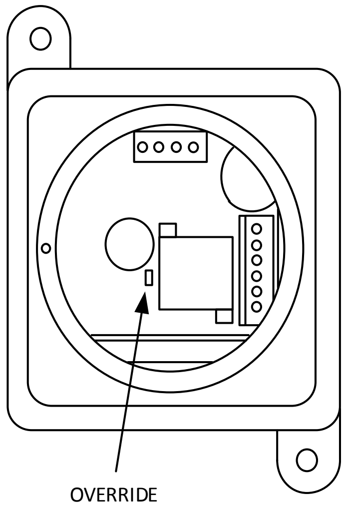


Figure 7.12. X Purge with Cover Removed

When you turn the power ON, X Purge begins monitoring the electronics housing (PGC and Purge Air Panel) air purge pressure. When the air purge pressure reaches the specified level, the X Purge starts a timed cycle. If the air purge pressure remains at the specified level during the timed cycle, X Purge will supply power to the equipment when it completes the timed cycle. If the air purge pressure drops before the X Purge completes the timed cycle, X Purge resets the timer and starts over. It continues to reset the timer until the analyzer achieves and maintains the correct pressure for a complete timed cycle. The X Purge will not supply power to the analyzer until it successfully completes the timed cycle.

The X Purge cycle time depends totally on the application, but it may vary with analyzer configuration and condition. Refer to the analyzer label or Data Package for specific purge specifications. Once X Purge applies power to the analyzer, power continues to the analyzer as long as the electronics housing maintains air purge pressure.

X Purge removes power from the analyzer when the electronics housing air purge pressure drops below specifications. It locks out power to the analyzer and causes a purge alarm contact to switch. The analyzer has connections available to the customer for connecting the purge alarm to a visual or audible annunciator located in a constantly monitored area.

In order to re-start the analyzer after an X Purge alarm, you must first correct the cause of the drop in pressure. Then turn the power OFF at the circuit breaker for at least ten seconds and turn the power back ON. This starts a new X Purge timed cycle, which it must complete before it will supply power to the analyzer. If you do not correct the cause and cannot achieve and maintain pressure, the X Purge will not complete the cycle and will not supply power to the analyzer.

When X Purge removes and locks out power to the analyzer after a drop in electronics housing purge air pressure (or before pressure has initially attained the specified level), you can use Override to provide power to the analyzer for troubleshooting or maintenance purposes. Override does not cancel the X Purge power lockout but temporarily overrides it.

7.6.3 X purge override option

Before you enable X Purge Override to override its control of power to the analyzer, ensure the area where the analyzer is located is safe and hazard free, and remains so for the entire time the X Purge housing cover is removed.

Override must not be left on during regular operation of the analyzer.

Use the X Purge Override Option only for start-up, troubleshooting, and maintenance. Do not leave it on during regular operation of the analyzer. Override requires a well-lighted area to function. A light sensor inside the X Purge housing allows you to enable Override after you remove the X Purge housing cover. When you replace the cover, the light sensor cancels Override.

The following steps describe how to use the override function.

1. Ensure the area is safe and well-lit.
2. Remove the X Purge housing cover and press the Override button (see Figure 7.12) to apply power to the analyzer.

All versions of the X Purge have a set screw in the lid that must be removed before the housing cover can be removed.

3. Perform the necessary maintenance and troubleshooting.
4. When you have completed the maintenance and troubleshooting, replace the X Purge housing cover (and the set screw).
5. To cancel Override safely and properly and to reset X Purge, turn the supply power OFF at the circuit breaker outside the analyzer (for at least ten seconds) and then turn power ON again.
6. With X Purge reset, the air purge timed cycle begins in the electronics housing.

When you use Override during start-up, it overrides the X Purge control of power to the analyzer, but the air purge timed cycle continues. Once the electronics housing has pressurized and X Purge completes its timed purge cycle, the analyzer will have power from the X Purge. If you replace the housing cover without turning the power off at the circuit breaker, the analyzer will still have power because of X Purge.

If the electronics housing pressure drops during Override use and if the timed cycle is complete, the X Purge will lock out its power to the analyzer. Since Override bypasses the X Purge, the analyzer will still have power. If you cancel Override by replacing the housing cover without turning off the power at the circuit breaker, the X Purge power lock out will cause the analyzer to be without power. To restart X Purge, you must correct the cause of the drop in pressure, then turn power OFF (for at least ten seconds), and then ON again. The X Purge must complete its timed cycle before the analyzer will receive power.

7.6.4 X purge override contacts

The X Purge housing has terminals for connecting an override jumper. The customer is solely responsible for connecting and maintaining this jumper, which is only to be used during start-up, maintenance and troubleshooting. The customer must ensure the override jumper is removed when start-up, maintenance and troubleshooting are completed.

7.7 RUI

The PGC5000 Generation 2 analyzer's RUI provides remote access, across an Ethernet network, to a specified analyzer (see Figure 7.13). The RUI can be used on a PC, a tablet, or a PGC5000A, on the same network as the analyzer being accessed. The RUI functions are unique and are only applicable to the analyzer. The RUI also provides access to the Report Viewer program (which is only in version 3 and earlier PGC5000 analyzers). This section provides basic guidelines applicable to this RUI.

Fig. 7.13. RUI

The RUI is particularly useful when working with an Oven with Integrated Controller. These analyzers have no Local User Interface (LUI), so accessing these analyzers through the RUI is an efficient solution.

Refresh the RUI screen to ensure all settings are displayed on the remote screen. Cycling between tabs accomplishes this update.

For proper operation, ensure the RUI version number matches the version running on the analyzer (see Figure 7.14). Locate the version number by selecting the 'About' window on the top menu bar of the RUI and on the Setup> Master Controller> SBC Config subtab.

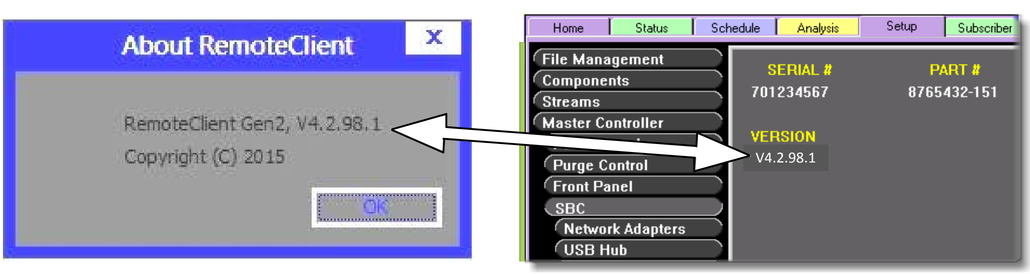


Fig. 7.14. Version Number Comparison

7.8 Remote communications overview

The analyzer allows for communications (data transfer) by Ethernet TCP/IP. The analyzer can act as a Modbus Slave and send data to a Modbus Master. Mapping of Modbus data is performed by using a Comma Separated Value file (.csv). The analyzer can also send data to a STAR Server or an OPC Server.

7.8.1 Subscriber tab configuration

Before the analyzer can communicate externally with a MODBUS client, OPC Server or STAR server, the Master Controller must have a valid IP address entry in its Subscriber tab. This allows transmission of data to the Communication Gateway and the OPC Server program. The analyzer is configured to report to the OPC Server as an OPC device type when added in the Subscriber tab (see Figure 7.15).

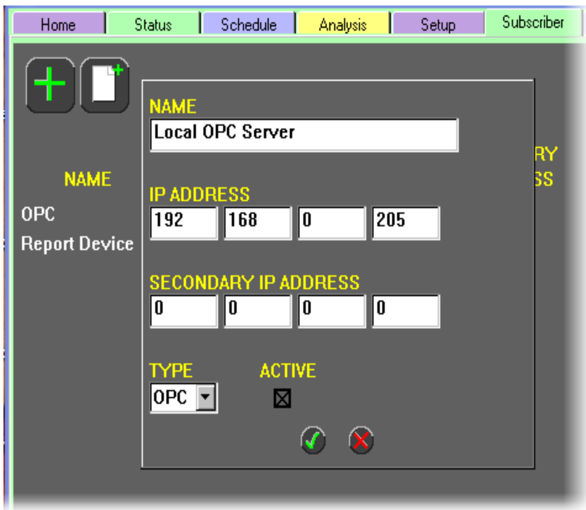


Fig. 7.15. Subscriber OPC Example

7.8.2 MODBUS overview

MODBUS is a communications protocol used with programmable logic controllers (PLCs). It is a de facto standard communications protocol in industry, and is a commonly available means of connecting industrial electronic devices. MODBUS allows for communication between many devices connected to the same network; for example a system that measures temperature and humidity and communicates the results to a computer. MODBUS is often used to connect a supervisory computer with a remote unit in supervisory control and data acquisition (Master/Slave).

7.8.3 PGC5000 MODBUS configuration

The MODBUS interface can be either TCP/IP or RS232, directly from the analyzer or from the Communication Gateway server. The MODBUS software translates data from the ABB analyzer system into the MODBUS RTU format recognizable by standard DCS Communication Gateway devices.

It is beyond the scope of this manual to describe the MODBUS protocol. Consult your DCS documentation for explanation of concepts and terminology that may be unfamiliar to you.

The MODBUS protocol provides a set of rules which allows data to be passed between any two compatible devices. The protocol defines how the data is to be transferred but does not define the contents of the data. In order for the analyzer/DCS interface to operate, both the Communication Gateway (with MODBUS software) and the DCS must be configured to define the functions to implement and the corresponding data addresses to use. The MODBUS interface provides analytical composition data from the analyzer system to the DCS and various status information (e.g. data validity, analyzer and new data availability). The MODBUS interface also accepts limited analyzer control functions from the DCS (e.g., request for calibration, stream activation, etc.).

The analyzer creates data tags supported by MODBUS interface and the OPC Server. The tags not added to the local MODBUS include the string tags ANALYSIS_NAME, COMPONENT.NAME, etc. (shown below) as these strings do not fit within the MODBUS structure of 16-bit data registers.

A .csv file used to map data points must be identical to the one used by the MODBUS client connected to the OPC Server. Each line of the .csv file contains at least three entries, (tag name, MODBUS slave address, MODBUS point address). The MODBUS point address is a five-digit number which implicitly defines the MODBUS data type based on the most significant digit as follows:

00001-09999	STATUS COILS
10001-19999	INPUT STATUS
30001-39999	INPUT REGISTERS
40001-49999	HOLDING REGISTERS

The MODBUS interface differentiates among the four different types of MODBUS data.

The MODBUS map is configured to overlay addresses. Two different data tags can map to the same address, but one tag cannot map to two different addresses. If the latter is implemented, only the first tag in the map is updated. Most of the data tags from the instrument are discrete indications mapped to either input coil or status coil addresses. Tags used for control purposes must be mapped to a status coil address since the MODBUS master cannot write to an input coil. Analog values associated with a component measurement, as well as temperatures, pressures, and set points available from the DTC and EPC, may be represented to the MODBUS in one of four formats as described below:

- The integer portion of the analog value will be placed in a single MODBUS register.
- The IEEE floating-point format is used to store the value in two consecutive MODBUS registers.

The PGC5000 Generation 2 analyzer is a Big-Endian machine. The MODBUS Client operates on a Little-Endian machine, meaning the most-significant and least-significant registers are reversed.

- In the Scaled0-9999 and Scaled0-4095 MODBUS data types, the analog value is scaled between two specified limits and represented as a percentage of either 9999 or 4095 within a single MODBUS register.
- Specify the register format for each tag by appending the keyword followed by the optional scaling limits such as:
  - Analyzer.Schedule.Process Stream.Propane.Concentration,01,31000,INTEGER
  - Analyzer.Schedule.Process Stream.Methane.Concentration,01,31001,FLOAT
  - Analyzer.Schedule.Process Stream.Hexane.Concentration,01,31003,Scaled0-9999,0.0,100.0
  - Analyzer.Schedule.Process Stream.Isobutane.Concentration,01,31004,Scaled0-4095,0.0,100.0

The following analog tags are always represented as INTEGER values:

- Analyzer.Oven.DTC1.ZonesActive
- Analyzer.Oven.DTC2.ZonesActive
- Analyzer.Oven.EPC.ZonesActive
- Analyzer.Schedule.Stream.CycleTime
- Analyzer.Schedule.Stream.LastReportType
- Analyzer.Schedule.Stream.Component.UnitsOfMeasure

The "Analyzer.Schedule.Stream.SampleTime" tag is represented in two different formats by appending the keyword "TIMESTAMP1" or "TIMESTAMP3" to the .csv entry. The "TIMESTAMP1" format uses a single MODBUS register containing the hours in the high byte and the minutes in the low byte. "TIMESTAMP3" uses three registers with the first containing the hours, the second containing the minutes, and the third containing the seconds.

The "Analyzer.Schedule.Stream.NewDataReady" tag is set whenever data is received for the specified stream. It is reset by the MODBUS master prior to the next analysis becoming available or configured to automatically reset after a configured number of seconds. To configure the tag to reset automatically, append a delay counter (in seconds) to the .csv entry.

- Example: Analyzer.Schedule.Stream.NewDataReady,01,11002,5. This results in the 'NewDataReady' bit to reset after five seconds.

7.8.4 MODBUS slave communication

The SBC has the ability to run as a MODBUS slave for communication to Control Systems. This ability allows a DCS to connect through Ethernet TCP/IP and retrieve MODBUS data on demand, directly from the SBC. The communication connection is established by using the assigned TCP/IP (Port 502) address of the SBC and a "MODBUS.csv" file created by the user. The "MODBUS csv" file is created using the Client Configurator software program.

7.8.5 Client configurator

Both the Communication Gateway and the SBC use the Client Configurator software to map analyzer points to MODBUS coils and registers. The .csv file used on the Communication Gateway is modbus_client.csv and on the GC is MODBUS.csv. When creating the files using the Client Configurator, the correct Protocol format option is selected at the top of the Client Configurator.

To create the modbus_client.csv file for the Communication Gateway, the MODBUS option is selected. To create the MODBUS.csv file select the PGC5000 or PGC5000 Generation 2 option.

The Client Configurator's main display is the Configuration Client (see Figure 7.16). From this screen and its subordinates you can perform the entire MODBUS configuration. The 2.1.0.2 or greater version of the ABB Client Configurator includes specific files needed for the SBC.

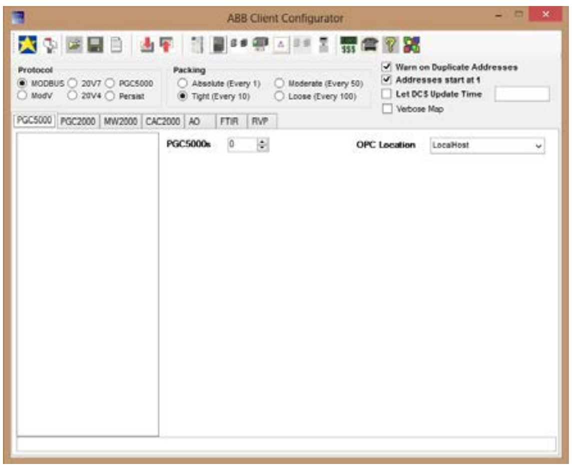


Fig. 7.16. Version 2.1.02 ABB Client Configurator

The Client Configurator is a part of the STAR Software suite. For complete information and instructions of setup and use, refer to the latest STAR Data Management System (DMS) Operating Instructions.

1. Create the MODBUS.csv file using the ABB Client Configurator (see Figure 7.17).

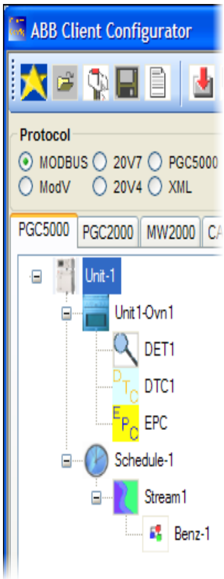


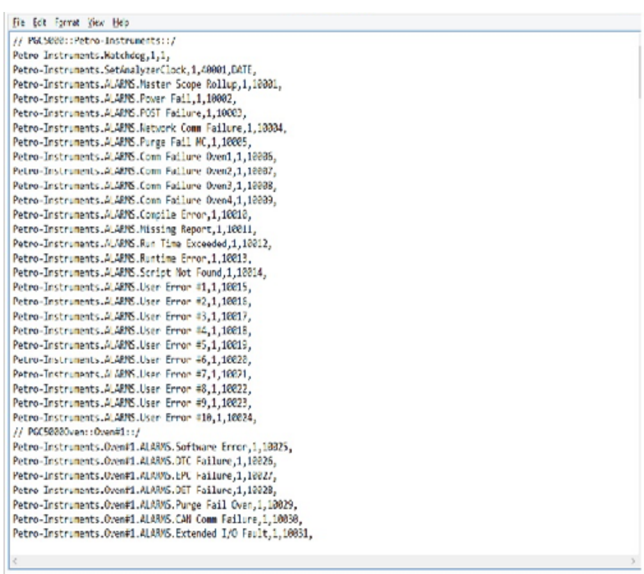
Fig. 7.17. MODBUS Configurator Example

Configuration information requires the following name(s):

- Master Controller
- Oven Name(s)
- Schedules
- Streams
- Component

Note that Ovens with Integrated Controller will show a Master Controller to represent the functions of the Integrated SBC, even though no physical PGC5000A Master Controller is present.

2. Save the csv file on the Configurator system's local PC drive or flash unit.
3. The csv file contains all of the information for the Control system (see Figure 7.18).



```
// PGC5000::Petro-Instruments::/
Petro Instruments.Watchdog,1,1,
Petro-Instruments.SetAnalyzerClock,1,40001,DATE,
Petro-Instruments.ALARMS.Master Scope Rollup,1,10001,
Petro-Instruments.ALARMS.Power Fail,1,10002,
Petro-Instruments.ALARMS.POST Failure,1,10003,
Petro-Instruments.ALARMS.Network Comm Failure,1,10004,
Petro-Instruments.ALARMS.Purge Fail MC,1,10005,
Petro-Instruments.ALARMS.Comm Failure Oven1,1,10006,
Petro-Instruments.ALARMS.Comm Failure Oven2,1,10007,
Petro-Instruments.ALARMS.Comm Failure Oven3,1,10008,
Petro-Instruments.ALARMS.Comm Failure Oven4,1,10009,
Petro-Instruments.ALARMS.Compile Error,1,10010,
Petro-Instruments.ALARMS.Missing Report,1,10011,
Petro-Instruments.ALARMS.Run Time Exceeded,1,10012,
Petro-Instruments.ALARMS.Runtime Error,1,10013,
Petro-Instruments.ALARMS.Script Not Found,1,10014,
Petro-Instruments.ALARMS.User Error #1,1,10015,
Petro-Instruments.ALARMS.User Error #2,1,10016,
Petro-Instruments.ALARMS.User Error #3,1,10017,
Petro-Instruments.ALARMS.User Error #4,1,10018,
Petro-Instruments.ALARMS.User Error #5,1,10019,
Petro-Instruments.ALARMS.User Error #6,1,10020,
Petro-Instruments.ALARMS.User Error #7,1,10021,
Petro-Instruments.ALARMS.User Error #8,1,10022,
Petro-Instruments.ALARMS.User Error #9,1,10023,
Petro-Instruments.ALARMS.User Error #10,1,10024,
// PGC5000Oven::Oven#1::/
Petro-Instruments.Oven#1.ALARMS.Software Error,1,10025,
Petro-Instruments.Oven#1.ALARMS.DTC Failure,1,10026,
Petro-Instruments.Oven#1.ALARMS.EPC Failure,1,10027,
Petro Instruments.Oven#1.ALARMS.DET Failure,1,10028,
Petro-Instruments.Oven#1.ALARMS.Purge Fail Oven,1,10029,
Petro-Instruments.Oven#1.ALARMS.CAN Comm Failure,1,10030,
Petro-Instruments.Oven#1.ALARMS.Extended I/O Fault,1,10031,
```

Fig. 7.18. CSV File Example

Transfer the file to the SBC. Reference the STAR Data Management System (DMS) Operating Instructions for additional information.

The SBC provides direct MODBUS TCP connection.

7.8.6 OPC communication

Analyzer Tag names used by the OPC Server represent data from the analyzer. For any given analyzer, there may be multiple analysis streams and/or components. The tag list defines the names used and the types of data available for the device.

7.9 Input/output options

The PGC5000 Generation 2 analyzer offers input/output (I/O) options internal and external to the Master Controller. The local input/output is available on the Single Board Computer PCB (see Figure 7.19). Additional input/output modules can be mounted internally on the DIN rail in the Master Controller. Ovens with Integrated Controllers do not accept input/output modules.

An external input/output option is available if a very large number of inputs and/or outputs is needed, or if input and/or output modules are needed with an Oven with Integrated Controller. This external enclosure also accommodates stream switching valves, if needed.

The input/output options are fully integrated with the analyzer’s local and remote user interfaces for direct operation and programming.

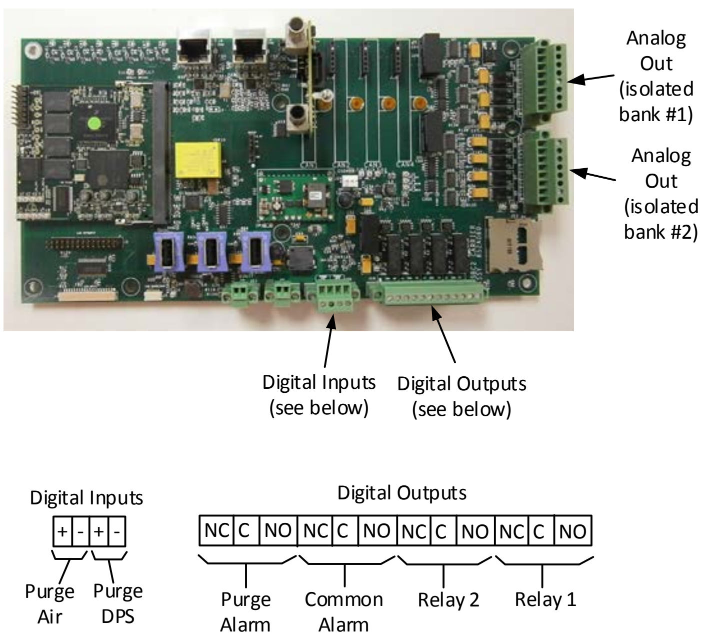


Fig 7.19. SBC PCB Showing Local Input/Output Connections

7.9.1 Local input/output option

The local input option connections are Purge Air and Purge DPS (see Figure 7.19). These alarms are not customer configurable.

The local output option connections are located on the Single Board Computer (SBC) PCB, as shown in Figure 7.19. These connections provide the primary analog and digital inputs and outputs.

Purge inputs and alarms on the SBC are not used in Oven with Integrated Controller installations.

7.9.2 Local output option setup

When the local output option is configured, the I/O Setup Tab displays the screen shown in Figure 7.20.

Fig. 7.20. Local I/O Setup Display

When the button for a specific output module is selected from the Function Select list, the appropriate Module Configuration display appears. Individual channels are listed on the button below the output module name. The button names can be edited for reference.

Figure 7.21 illustrates the local output display. The editable areas are:
NAME - reference name, used for the button name
RANGE LOW - analog output low limit
RANGE HIGH - analog output high limit
COMPONENT - configured component dropdown list
SET VALUE - user set value, used to test the module

Fig. 7.21. Local Output Display

7.9.3 Internal input/output option

The Master Controller allows the placement of optional Wago input/output modules internally, in front of the Single Board Computer (see Figure 7.22) and accessed through the front door.

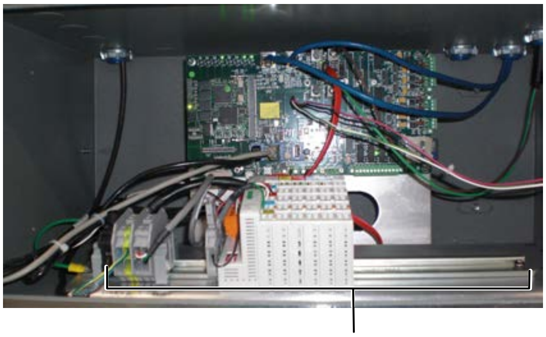


Fig. 7.22. Location of Internal Input/Output Option

The internal I/O option connects to the SBC CAN Interface Card via an electrical cable. Configuration of the option is completed and tested at the factory prior to shipment. The I/O option contains one Control Module, one End Module, and up to 18 input/output modules. The input/output modules are referred to in the manual and analyzer as Wago modules. The following input/output modules are available (color code at the top of each module indicate the type of module):

- 2 channel analog output, 4 to 20 mA (blue)
- 4 channel analog output, 4 to 20 mA (blue)
- 4 channel analog output, ±10 V, 0 to 10 V (blue)
- 2 channel analog input, AC/DC 0 to 10 (green)
- 2 channel analog input, 4 to 20 mA (green)
- 4 channel digital output, 24 V, with low-side switching (red)
- 4 channel digital output, 24 V, with high-side switching (red)
- 2 channel relay output, AC 230 V, DC 30 V (red)
- 4 channel digital input, DC 5 V, with high-side switching (yellow)
- 4 channel digital input, 24 V (yellow)

The Control Module (grey) is at the left end of the string of Wago modules and the End Module (grey) is at the right end. When the button for a specific I/O module is selected from the Function Select list, the appropriate Module Configuration display appears (Figure 7.23 shows the Digital I/O). Individual I/O channels are listed on the button below the I/O module name. The button names can be edited for reference.

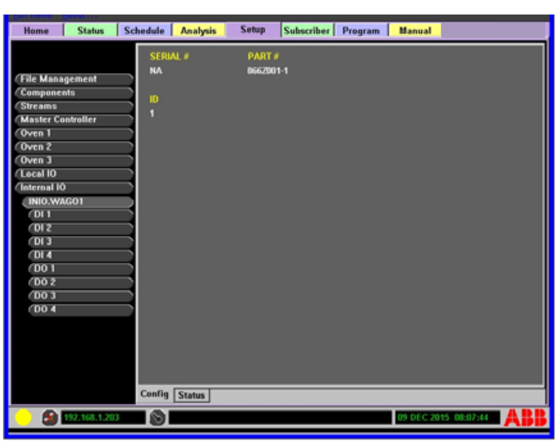


Fig. 7.23. Internal I/O Display

Input/output modules are shown in the following paragraphs, with the editable areas noted.

7.9.4 Digital output

Figure 7.24 illustrates the digital I/O display, with a digital output channel selected. The editable areas are:
NAME - reference name used for the button name
SET STATE - toggle switch used to set input On or Off
GROUP - indicator group assignment
NAME - assigned indicator name with the group

Fig. 7.24. Digital Output Display

7.9.5 Digital input

Figure 7.25 illustrates the Digital I/O display, with a digital input channel selected. The editable areas are:
NAME - reference name used for the button name
STATE - echoes the installed module's state (Red or Green indication is dependent on installation specifications)
FUNCTION - selected function (affected by state change)
ASSIGNMENT - assigned schedule for the selected function

Fig. 7.25. Digital Input Display

7.9.6 Analog input

Figure 7.26 illustrates the analog I/O display, with an analog input channel selected. The editable areas are:
NAME - reference name, used for the button name
RANGE LOW - analog input low limit
RANGE HIGH - analog input high limit

Fig. 7.26. Analog Input Display

7.10 External input/output option

The external I/O (EIO) option is housed in a separate enclosure and may include stream-switching valves. It communicates with the SBC through a fiber optic CANbus communication link.

8 Operator troubleshooting

This section contains operator troubleshooting for the PGC5000 Generation 2 analyzer Master Controller and attached ovens. For maintenance, service and in-depth troubleshooting refer to PGC5000 Generation 2 Service Instructions SI/PGC5000/GEN2.

8.1 Common issues

Most problems are the result of incorrect system and subsystem installations. To troubleshoot an installation problem, perform the following checks in the order given:

1. Check all cable and power connections in the Master controller, attached ovens, and optional equipment.
2. Verify all cables and boards are securely plugged in to the appropriate Master Controller.
3. Verify the Master Controller is configured properly and completes the Power On self-test.
4. Remove all options, including USB drives, one at a time, checking the effect on the Master Controller.
5. Disconnect the power, wait 60 seconds, reconnect the power and let the system restart.

If the Master Controller or oven does not power on, check for power related issues including loss of external power, fusing, and breaker boxes for possible resolutions. The Master Controller and oven may power on, but the schedule will not start until the oven has met the minimal temperature requirements established in the Setup Tab. Refer to the Power Failure setup in the Schedule Tab section for more information on restarts after power failure.

For installations with an Oven with Integrated Controller, follow the troubleshooting steps, replacing "Master Controller" with "Oven with Integrated Controller."

8.2 Oven LED indicators

The oven has three Light Emitting Diodes (LEDs) located on the left front of each unit. These LEDs indicate the current status of the oven.

- If the LEDs are not lighted, check power to the unit.
- If the top LED is GREEN and flashing the system is initializing.
- For all other instances use the table below.

LED	Red	Amber	Green
Top	Oven Idle	Future Use	Executing Analysis
Middle	DTC Malfunction	Low Oven Air and/or Carrier Gas Alarm	DTC Operation Normal
Bottom	FID/FPD Flame Out	Future Use	FID/FPD Flame lit

8.3 Indicator troubleshooting procedures

Most system errors are identified by the Condition Monitoring System, resulting in indicator activation. If an indicator is placed in one or more of the user defined Status Tab scopes, it reflects in the Master Rollup Indicator located at the bottom left corner of the LUI or RUI display (see Figure 8.1).

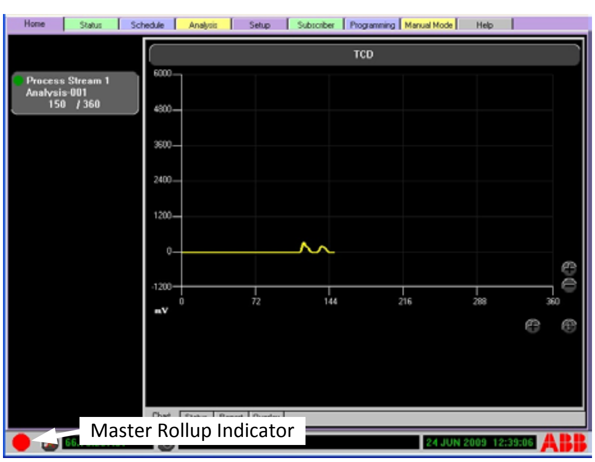


Fig. 8.1. Master Rollup Indicator

Use the following steps to identify and correct issues.

1. If the Master Rollup Indicator is RED, YELLOW or BLUE (triggered), select the Home Tab and note the running analysis button.
2. If an analysis button indicator light is not GREEN, select the Analysis button, then the Status subtab; locate the triggered indicator(s) and identify the source and correct the issue(s). Refer to the Status Indicator table in this section for issue resolution.
3. If all analysis button indicators are GREEN, go to the Status Tab. Check the scope subtabs (located at the top of the display) for triggered indicators.
4. Select the scope displaying the triggered indicator and locate the activated indicator(s). Refer to the Status Indicator table in the next paragraph for issue resolution.

Some Status Scopes have multiple sub-scopes to choose from or may require using the 'Page Down' icon to view all indicators. If not assigned to a scope, 'Triggered' indicators on the Status Tab, (displaying red, yellow or blue) are not reflected at the Master Rollup Status Indicator. It maintains a green (good) status.

Correct an issue by removing the condition which triggered the indicator. This includes removal and replacement of PCBs, adjusting parameter limits or simply acknowledging the indicator by using the reset button. If the triggering condition still exists, the indicator may not clear after pressing the Reset button.

8.4 Status indicators

The Status Indicator functions are an essential part of the User Interface of the analyzer (see Figure 8.2).

Fig. 8.2 Status Indicators

The Status Indicator table lists all available indicators under the Status Tab>All subtab. The table describes the triggering condition and resolution to clear the condition. Where more than one indicator may be present a range is given; e.g. (1-4). Refer to the glossary section for abbreviation explanations. The Reset column displays the means of reset; the AOC (Absence of Condition) is the most common. The Source column identifies the group and most likely origination of the triggering condition.

Indicator	Issue	Resolution	Reset	Source
Master Controller (MC) - Purge Fail	Purge fails for this zone	Correct purge issue.	Absence of Condition (AOC)	MC
MC - Power Fail	MC resets from power failure	Reset Indicator at Status Tab.	Manually	MC
Comm Failure Oven (1-4)	Oven Controller (OC) # Heartbeat fails	Check power to board. Check CAN connections. Check config files.	AOC	MC
Network Comm Failure	Communication to an Active Subscriber fails	Ensure Subscriber communication path is complete, IP address correct and the subscriber is powered on. Check routing tables if applicable.	AOC	MC

Indicator	Issue	Resolution	Reset	Source
POST Failure	Power On Self-Test fails	Cycle power. If POST error persists, note error and contact ABB Support.	AOC	MC
DTC Failure	DTC board indicates a fault; communication with the DTC board fails	Check power to board and CANBus connections. Follow DTC card check procedures in Service Instructions.	AOC	Oven
EPC Failure	EPC board indicates a fault or communication with EPC board fails	Check power to board and connections. Follow EPC card check procedure in Service Manual.	AOC	Oven
Extended I/O Fault	Error Condition detected on the External I/O controller	Refer to external I/O documentation.	AOC	Oven
Oven - HighTemp	Oven temperature out of range (high)	Check High limit from Setup tab. Adjust as necessary.	AOC	Oven
Oven - LowTemp	Oven temperature out of range (low)	Check Low limit setting from Setup tab. Adjust as necessary.	AOC	Oven
Oven - Purge Fail	Purge fails for this zone	Correct purge issue.	AOC	Oven
Software Error	Rollup of software faults at the OC	Check Oven Group indicators to refine search.	AOC	Oven
DTC Zone (1-3)	Zone 1 Controller card fails	Replace Card.	AOC	OVEN.DTC1
Hardware Error	Rollup of hardware diagnostics at the DTC	Check the DTC and DTC Zone Indicators.	AOC	OVEN.DTC1
Software Error	Rollup of software faults at the DTC	Check the DTC and DTC Zone Indicators.	AOC	OVEN.DTC1
T-Rating Conflict	DTC T-Rating does not match As-Built T-Rating	Possible Configuration Error, contact ABB for more information.	AOC	OVEN.DTC1
High Temperature	Temperature out of range (high)	Check setting at Setup Tab>Oven>DTC# Button. Adjust as needed.	AOC	DTC Zone
Low Temperature	Temperature out of range (low)	Check setting at Setup Tab>Oven>DTC# Button. Adjust as needed.	AOC	DTC Zone
Out of Control	Temperature deviates > ±10° from setpoint	Check analysis temperature control TCF settings. Check Zone indicators & Diagnostic Displays.	AOC	DTC Zone
Over temp	Temperature exceeds Max limit for T-Rating	Defective temperature sensor. Contact ABB for more information.	AOC	DTC Zone
Ramp Out of Control (Future Use)	Temperature deviates > ±10° from setpoint during Temperature Ramp	Check analysis temperature control TCF settings. Check Zone indicators & Diagnostic Displays.	AOC	DTC Zone
Temperature Sensor Fault	Temperature Measurement out of valid range	From the Setup Tab check the temperature settings. Replace temperature sensor if needed.	AOC	DTC Zone
DTC Digital Input 1	Low oven purge air pressure. Open on alarm.	Check purge pressure setting at ovens front panel gauge. Adjust as necessary. Check instrument air supply pressure. Check oven purge pressure switch.	AOC	Ovn#DTC#.1
DTC Digital Input 2-14	Optional Hardware inputs; Open on alarm	Verify option input device is function properly.	AOC	Ovn#DTC#.2 -14
Common Alarm Relay Override DigIn 16	Open input overrides the common alarm output	Verify proper operation of common alarm override switch.	AOC	Ovn#.DTC#. D1
Hardware Error	Rollup of hardware diagnostics at the EPC	Check the EPC and EPC Group Zone indicators.	AOC	Ovn#.EPC
Software Error	Rollup of software faults at the EPC	Check the EPC and EPC Group Zone indicators.	AOC	Ovn#.EPC

Indicator	Issue	Resolution	Reset	Source
EPC Zone One(1-10)	Rollup of Zone (1-10) Indicators	Check EPC Zone specific indicators and correct as necessary.	AOC	EPC Zones
Pressure Sensor Fault	Defective pressure sensor	Replace Pressure sensor if needed.	AOC	Ovn#.EPC.PZ.#
Low Alarm	Pressure out of range (low)	Adjust pressure zone's low limit under the Setup Tab. Verify supply pressure to the zone. Correct as necessary. Replace EPC sensor or solenoid valve as necessary.	AOC	Ovn#.EPC.PZ.#
High Alarm	Pressure out of range (high)	Adjust pressure zone's high limit under the Setup Tab. Replace EPC sensor or solenoid valve as necessary.	AOC	Ovn#.EPC.PZ.#
Ramp Out of Control	Pressure deviates > ±x psi from setpoint during Pressure Ramp	Check analysis pressure control TCF settings. Check Zone indicators & Diagnostic Displays.	AOC	Ovn#.EPC.PZ.#
Out of Control	Pressure deviates > ±x psi from setpoint	Check analysis pressure control TCF settings. Check Zone indicators & Diagnostic Displays.	AOC	Ovn#.EPC.PZ.#
Software Error	Rollup of software faults at the Det Amp	Check indicators and Diagnostic Displays at Detector Amplifier.	AOC	Ovn#.DTM#
Hardware Error	Rollup of hardware diagnostics at the Det Amp	Check indicators and Diagnostic Displays at Detector Amplifier.	AOC	Ovn#.DTM#
Detector Fault	Rollup of channel diagnostics	Check Diagnostics Display on Status Subtab.	AOC	Ovn#.DTM#.TCD.#
Flame Out	FID or FPD flame not detected.	Check utilities, igniter including fuel, burner, connection verify flows, burner air.	AOC	Ovn#.DTM#.FID/FPD#
Autoignite Limit	Retry of Automatic Ignites has been exceeded	Check utilities, igniter including fuel, burner, connection verify flows , burner air.	AOC	Ovn#.DTM#.TCD.#
Autozero Conflict	Autozero attempted during peak measurement	Move autozero TCF to a time into analysis when a component is not being measured.	When reported.	Ovn#.DTM#.TCD.#
Offline	Stream in offline state (Calibration, Validation, 'Stream Name")	Information Only.	AOC	Stream
Low Concentration	Concentration is below Low Setpoint but above Low-Low Setpoint	Information Only. Adjust Limits under the Setup tab as needed.	When reported	Component
Low–Low Concentration	Concentration is below Low-Low Setpoint	Information Only. Adjust Limits under the Setup tab as needed.	When reported	Component
High Concentration	Concentration exceeds the High Setpoint but below the High-High Setpoint	Information Only. Adjust Limits under the Setup tab as needed.	When reported	Component
High–High Concentration	Concentration exceeds the High-High Setpoint	Information Only. Adjust Limits under the Setup tab as needed.	When reported	Component
Response Factor (RF) Low Limit	Measurement out of range (low) (% of deviation from previous RF)	Information Only. Adjust Limits under the Setup tab as needed.	When re-calibrated	Component
RF High Limit	Measurement out of range (high) (% of deviation from previous RF)	Information Only. Adjust Limits under the Setup tab as needed.	When re-calibrated	Component
Retention Time High	Retention time exceeds the High Setpoint	Information Only. Adjust Limits under the Setup tab as needed.	When reported	Component

Indicator	Issue	Resolution	Reset	Source
Retention Time Low	Retention time is below Low Setpoint	Information Only. Adjust Limits under the Setup tab as needed.	When reported	Component
Validation	Measurement out of range (% of deviation from known standard)	Information Only. Adjust Limits under the Setup tab as needed.	When re-validated	Component
Missing Component	No peak found matching a component defined in the method	Information. Edit analysis as needed.	When reported	Analysis
Unknown Component	Peak detected in the analysis and not defined in the method	See Unknown Component TCF.	When reported	Analysis
Sample Flow Lost	Future functionality: Sample flow is lost	Restore Sample flow. Replace sample flow switch as necessary.	AOC	Script
Script Error	Script fails to operate within parameters	Use Program Tab to edit script to meet existing criteria of the system.	When cleared in script	Analysis
Analysis Aborted	1. Analysis does not complete analysis due to temperature, pressure and/or digital input programmed command. 2. User intervention using Stop Now command. 3. Related oven issues.	1. Check Pressure, Temperature and/or Digital Inputs. Correct problem accordingly. 2. User controlled. 3. Check oven related indicators for more information.	AOC.	Analysis
Invalid Analysis	Analysis failed validation	1. From Analysis Tab edit Analysis to meet requirements. 2. User controlled.	AOC	Analysis
DigIn Check TCF	Programmable Input checks.	See Digital input TCF.	AOC	Script
Prsr Check TCF	Pressure Check failed	See pressure check TCF.	AOC	Script
Offline	Schedule Offline: Oven is powered down	Information Only. Resets when oven power is restored.	AOC	Schedule
Idle	Schedule Stopped or paused	Information Only.	AOC	Schedule
Calibrating	Schedule running an analysis on Calibration Stream	Information Only.	AOC	Schedule
Validating	Schedule running an analysis on a Validation Stream	Information Only.	AOC	Schedule
Maintenance	Schedule set in Maintenance State	Information Only.	AOC	Schedule
Compile Error	Syntax errors in Script	From Program Tab check script syntax.	Next Run	Script
Runtime Error	Script encountered error during execution	From Program Tab check script objects.	Next Run	Script
Script Not Found	Script specified in TCF cannot be located	Ensure Script is in the Script library.	Next Run	Script
Missing Report	Script can't find the report to be modified	Edit the analysis under the Analysis Tab. Script TCF must have a time greater than the analysis cycle time.	Next Run	Script
Run Time Exceeded	Script exceeded allotted runtime	From Program Tab, Check script logic, increase Max Runtime variable.	Next Run	Script
User Error #1 - 10	Script Asserts Error #1 - 10	User programmable indicators. Information only.	Next Run	Script
Node Loss	Device no longer reachable on SHS CAN bus	Check cables & communication path on SHS CANBus	AOC	SHS

Indicator	Issue	Resolution	Reset	Source
New Node	Device added to SHS CAN bus	Information Only.	AOC	SHS
Address Conflict	Two devices with same address on SHS CANbus	Check SHS Node Id on device.	AOC	SHS
Invalid State	Combination of valve states not allowed	Correct Valve conflicts.	AOC	DVM
Vol Flow Low Low	Volumetric Flow lower than Low Low Limit	Information Only.	AOC	ARV
Vol Flow Low	Volumetric Flow lower than Low Limit	Information Only.	AOC	ARV
Vol Flow High	Volumetric Flow exceeds High Limit	Information Only.	AOC	ARV
Vol Flow High High	Volumetric Flow exceeds High High Limit	Information Only.	AOC	ARV
Pressure Low Low	Pressure lower than Low Low Limit	Information Only.	AOC	ARV
Pressure Low	Pressure lower than Low Limit	Information Only.	AOC	ARV
Pressure High	Pressure exceeds High Limit	Information Only.	AOC	ARV
Pressure High High	Pressure exceeds High High Limit	Information Only.	AOC	ARV
Temp Low Low	Temperature lower than Low Low Limit	Information Only.	AOC	ARV
Temp Low	Temperature lower than Low Limit	Information Only.	AOC	ARV
Temp High	Temperature exceeds High Limit	Information Only.	AOC	ARV
Temp High High	Temperature exceeds High High Limit	Information Only.	AOC	ARV
Vol Flow Low Low	Volumetric Flow lower than Low Low Limit	Information Only.	AOC	FastLoop
Vol Flow Low	Volumetric Flow lower than Low Limit	Information Only.	AOC	FastLoop
Vol Flow High	Volumetric Flow exceeds High Limit	Information Only.	AOC	FastLoop
Vol Flow High High	Volumetric Flow exceeds High High Limit	Information Only.	AOC	FastLoop
Pressure Low Low	Pressure lower than Low Low Limit	Information Only.	AOC	FastLoop
Pressure Low	Pressure lower than Low Limit	Information Only.	AOC	FastLoop
Pressure High	Pressure exceeds High Limit	Information Only.	AOC	FastLoop
Pressure High High	Pressure exceeds High High Limit	Information Only.	AOC	FastLoop
Temp Low Low	Temperature lower than Low Low Limit	Information Only.	AOC	FastLoop
Temp Low	Temperature lower than Low Limit	Information Only.	AOC	FastLoop
Temp High	Temperature exceeds High Limit	Information Only.	AOC	FastLoop
Temp High High	Temperature exceeds High High Limit	Information Only.	AOC	FastLoop
Loop DP Low Low	Loop Differential Pressure lower than Low Low Limit	Information Only.	AOC	FastLoop

Indicator	Issue	Resolution	Reset	Source
Loop DP Low	Loop Differential Pressure lower than Low Limit	Information Only.	AOC	FastLoop
Loop DP High	Loop Differential Pressure exceeds High Limit	Information Only.	AOC	FastLoop
Loop DP High High	Loop Differential Pressure exceeds High High Limit	Information Only.	AOC	FastLoop

The # is used in place of numbers to eliminate repeats in multiple card and oven systems. "Information Only" signifies the set indicator is activated in response to the setup criteria. It does not necessarily identify a fault.

8.5 Diagnostic displays

Diagnostic displays (indicator boxes) are displayed from the Setup Tab>Status subtab (see Figure 8.3). The associated boxes, when filled (black), indicate the named action is active. Not all indicators boxes denote issues with the system, but they represent processes in action.

Fig. 8.3. Diagnostic Display Example

The following table gives a resolution to the issue where applicable.

Source	Group	Issue	Resolution
Missing Device	Oven	Board did not report to Oven Controller (OC) at startup.	Check power to board. Check CAN connections. Contact ABB.
Mismatched Device	Oven	Board identity does not match config file.	Contact ABB. Check config file.
Inaccessible Device	Oven	Board communication not viable.	Check CAN connection to Wago module. Refer to Wago documentation.
Duplicate Device	Oven	Two devices have the same CAN node ID.	Correct by changing the node ID of one of the duplicate boards. Refer to Service Manual
Extra Device	Oven	A board that responded to the OC is not listed in the system configuration.	Contact ABB for more information. Remove board.
PIC Comm Error (Hardware Error)	DTC#	DSP and PIC supervisor have stopped communicating.	Replace DTC Digital card. Refer to the Service Manual.
Broken valve (Hardware Error)	DTC#	Valve failed start-up test.	Check solenoid block cable. Replace faulty solenoid if problem persists.

Source	Group	Issue	Resolution
AC fault (Hardware Error)	DTC#	DTC did not detect AC or power to heater failed.	Check AC connections to DTC assembly. T-Rating faults can also cause this symptom.
Current out-of-range (Hardware Error)	DTC#	Internal power test failed.	Check heater(s) to verify proper resistance. Check heater connections.
CAN Node Not Found	DTC#	Device did not communicate with OC or go online.	Check board LEDs for error. Refer to the Service Manual.
Lost CAN Heartbeat	DTC#	Device stopped communicating.	Check board LEDs for error. Check CAN bus. Refer to the Service Manual.
Code Download Error	DTC#	Failed to send executable code to device.	Check board LEDs for error. Refer to the Service Manual.
Unexpected Heater Voltage	DTC#.IsoThrml Oven	Internal power test failed.	Can occur as a result of PIC supervisor shutdown or T-Rating failure. Verify heaters and temperature feedback. Check for other faults.
T-Rating mismatch	DTC#.IsoThrml Oven	System information does not match DTC internal setting.	Contact ABB.
Low Prsr-Air/Carrier	DTC#.IsoThrml Oven	Air or carrier pressure switch is open.	Verify proper air/carrier pressure and increase if necessary. If pressure is correct, replace switch.
Temp Reading Invalid	DTC#.IsoThrml Oven	DTC unable to read temperatures.	Replace temperature probe. Possibly replace DTC Digital. Refer to the Service Manual.
CAN Node Not Found	EPC	Device did not communicate with OC or go online.	Check board LEDs for error. Refer to the Service Manual.
Lost CAN Heartbeat	EPC	Device stopped communicating.	Check board LEDs for error. Check CAN bus. Refer to the Service Manual.
Code Download Error	EPC	Failed to send executable code to device.	Check board LEDs for error. Refer to the Service Manual.
Barometric pressure low	EPC	Status Only.	Not Applicable.
Barometric pressure high	EPC	Status Only.	Not Applicable.
Ambient temperature low	EPC	Status Only.	Not Applicable.
Ambient temperature high	EPC	Status Only.	Not Applicable.
Zone plateau	EPC.Carrier#	Status Only.	Not Applicable.
Zone In Band	EPC.Carrier#	Status Only.	Not Applicable.
Zone Fail Zero	EPC.Carrier#	Status Only.	Not Applicable.
Zone Enabled	EPC.Carrier#	Status Only.	Not Applicable.
Can Node Not Found	Ovn.DetAmp#	Device did not communicate with OC or go online.	Check board LEDs for error.
Lost CAN Heartbeat	Ovn.DetAmp#	Device stopped communicating.	Check board LEDs for error. Check CAN bus. Refer to the Service Manual.
Code Download Error	Ovn.DetAmp#	Failed to send executable code to device.	Check board LEDs for error. Refer to the Service Manual.
RTC Failure	Ovn.DetAmp#	RTC signal missing or irregular.	Check CAN connections. Check power and ground connections. Check chassis ground connection to Oven Electronics Door.

9 Scripting

9.1 Introduction

The PGC5000 Generation 2 analyzer has programmatic control and calculation in addition to the built-in capabilities. The Program Tab provides the means to customize analyzer operation to support most requirements (see Figure 9.1).

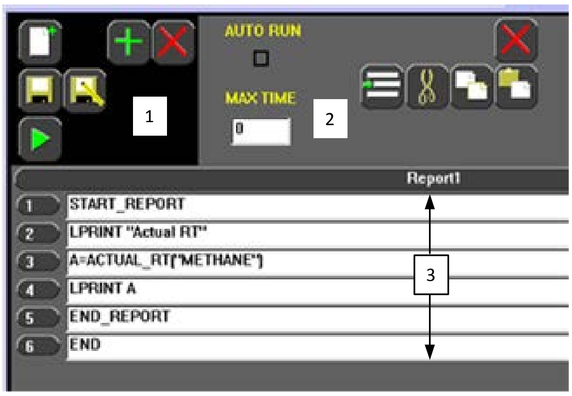


Fig. 9.1. Scripting Example

The scripting language has the capability to invoke a script upon the completion of an analysis providing any necessary calculations to support, for example, BTU calculations. The scripting language supports invoking a script during or upon the method or sequence completion. It also supports the means to invoke a script as a Time Coded Function (TCF) and as a schedule entry.

1. The Program Tab icons control the system scripting actions. To edit the scripts use the script editing icons.

Icon	Function	Icon	Function
	Create new script		Load existing script
	Clear script		Save and Save As
	Run Script		

2. The script editing icons are used to create and change script functions.

Field \ Icon	Function	Field \ Icon	Function
AUTO RUN	Blank = OFF / Marked = ON. Runs continuously from startup of the SBC	MAX TIME 5	Maximum time (in seconds) script has to complete execution before aborting
	Add / Insert Line		Cut line
	Copy line		Paste line
	Delete line		

3. Script editing area.

The script editing area has two major sections:

1. The Line # section is a non-editable region containing auto-generated line numbers:
   - When a statement is added, a line number is assigned and displayed.
   - When a statement is moved, the line numbers are re-assigned.
   - When a statement is deleted, the line numbers are re-assigned.

2. The statement section is the editing region contained the script:
   - One statement is allowed per line.
   - The script editor allows up to 999 statements.
   - The script editor allows lines up to 99 characters.

The statement section has horizontal grid lines to separate statements. This allows scrolling in horizontal and vertical directions. The control icons manipulate the script, the statements and the file.

9.2 Attachment to analysis elements

The scripting language supports the capability to have a script be invoked upon the completion of an analysis, a method, a sequence or attached as a TCF providing any necessary calculations to support, for example, BTU calculations.

The scripting language also supports invoking a script as a schedule entry and/or on the change of state. A script is either: An End-Of-Analysis (EOA) script or An Event-driven Script (a script that runs during the Analysis). The time offset (execution time) of the Script determines the Script type. If the Cycle Time of the longest Method in an Analysis (analyses can have more than one method), is exceeded by the time offset of the Script, then it will be a Script of End of Analysis type; otherwise it is a Script of Event-driven type.

The time offset of a script, which script is an End-Of-Analysis type, does nothing more than to cause that script to be identified as an End-Of-Analysis script by comparing its time offset with the Cycle Time.

The End-Of-Analysis scripts are simply executed in bulk, in no particular order. The following are End-of-Analysis scripting rules for Analysis, Method scoped and Sequence scoped Scripts.

- All 'Analysis Scoped' scripts are EOA scripts and must have an execution time greater than the maximum Cycle Time of all contained Methods within that Analysis.
- Any scripts at the Sequence and Method scope are EOA scripts if their execution time exceeds the Cycle Time of the longest (e.g.: maximum Cycle Time) Method. Scripts at Sequence or Method scope having an execution time less than the longest Method's Cycle Time and greater than the Cycle Time of the Method that contains it are considered being in error.
- A script at the Sequence or Method scope whose execution time is less than the Cycle Time of the Method that contains it are allowed.

This type of script cannot perform the functions of an End-Of-Analysis script, because it runs within the Cycle Time of the Method containing it. It will not be able to operate on or query the Analysis Report because that report does not exist until after the Analysis has been completed.

- When an Analysis completes all EOA scripts executed irrespective of the execution time defined.
  Example: An Analysis has two EOA scripts. Their execution times resolve to 181 and 182 seconds respectively. The analysis contains a Method with a maximum Cycle Time of 180 seconds. In this scenario, there is no guarantee as to which script gets executed first.

Line numbers are updated after a statement is added or deleted, if the statement is not the last statement in the script.

9.2.1 Creating a new script

1. Select the Program tab to open the script editor.
2. Select the **Create New Script** icon.
3. Enter the name in the area provided.
4. Press the **Accept** button and the script input page appears.
5. Enter lines of script (see Figure 9.1).

6. Enter MAX TIME and (if applicable) choose AUTO RUN.

AUTO RUN starts the script at initial SBC power up and runs the script continuously.

7. Save the script by clicking the **Save** icon.

9.2.2 Adding/running a script

1. Select the Analysis tab.
2. Open an existing analysis by selecting the **Add** icon.
3. Choose location and press the **Next** button.
4. Choose the analysis name and press the **Next** button.
5. Confirm selections by pressing the **Accept** button.
6. To select the script insertion point, select the button. (The script TCF appears below the selected button.)
7. Select the **Add New** icon.
8. Choose TCF – Sequence Scope and press the **Next** button.
9. Choose Script and press the **Next** button to continue.
10. Confirm selections by pressing the **Accept** button.
11. Select the newly added script button.
12. Select the Tabular Editor subtab.
13. Enter a DESCRIPTION and a TIME OFFSET.
14. Select SCRIPT NAME from the drop down list.
15. Select the **Save** icon or the **Save As** icon to save the modified analysis.

9.2.3 Adding a line to a script

The Insert Line icon adds a new statement to the script. When a line is added to the script, it is inserted above the current selected statement. If no statement is selected, the statement is added after the last statement in the script. When adding a statement to the script, the new statement becomes the currently selected statement. If a statement is inserted within the script, the line numbers are updated.

To add a line (see Figure 9.1):

1. Select a line by pressing the number button on the left. The new line will be inserted above this line.
2. Select the **Insert Line** icon.
3. Insert the desired script in the blank line.
4. Select the **Save** icon to save the modified script, or select the **Save As** icon to save it as a new script.

9.2.4 Deleting a line

To delete a line from a script:

1. Select the line by pressing the number button on the left.
2. Select the **Delete** Line icon.
3. Select the **Save** icon to save the modified script, or select the **Save As** icon to save it as a new script.

9.2.5 Copying a line

To copy a line in a script:

1. Select the line by pressing the number button on the left.
2. Select the **Copy Line** icon.
3. Identify the location where you want to copy the line.
4. Select the line below the desired location by pressing the number button on the left.
5. When the blank line appears, select the **Paste Line** icon.
6. Select the **Save** icon to save the modified script, or select the **Save As** icon to save it as a new script.

9.3 Operators

The following operands are available for use in the scripting language:

Precedence “(“		Floating “<>”	// Comparison
Precedence “)”		Floating “<”	// Comparison
Floating “=”	// Assignment	Floating “>”	// Comparison

Floating "+"		Floating "<="	// Comparison
Floating "-"		Floating ">="	// Comparison
Floating "*"		String "="	// Comparison
Floating "/"		String "<>"	// Comparison
Boolean "AND"		String "+"	//Concatenate
Boolean "OR"		String "="	//Assignment
Floating "="	// Comparison		

9.4 Alphabetic listing

9.4.1 ABSOLUTE VALUE function

Description: Returns the absolute value of a floating point expression.
Syntax: ABS (fp)
Comments: fp is a floating point expression.

Example: 0010 A = ABS(A)
Takes the absolute value of the expression stored in variable A and assigns it to variable A.

9.4.2 ACTIVATE STREAM command

Description: Sets the state of a Stream to ONLINE. Makes all uses of the Stream in the Schedule ACTIVE.
Syntax: ACTIVATE_STREAM(stream$)
Comments: stream$ is a string variable (or constant) containing the stream name of the stream to be activated.
Example: 0010 ACTIVATE_STREAM("CalStrm1")

9.4.3 ACTUAL RETENTION TIME function

Description: Returns the component's actual retention time.
Syntax: ACTUAL_RT(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example: 0010 A = ACTUAL_RT("Methane")
Gets the actual retention time of component named Methane and assigns to floating point variable A.

9.4.4 ANALYSIS NAME function

Description: Returns the method for the stream that has just been analyzed.
Syntax: ANALYSIS_NAME$
Example: 0010 A$ = ANALYSIS_NAME$

9.4.5 ASC function

Description: Returns the ASCII code value for a character.
Syntax: ASC(string$)
Example:

```
0020 CKS = 0
0030 REM CALCULATE CHECKSUM OF A$
0040 FOR J = 1 TO LEN( A$ )
0050 CKS = CKS + ASC( MID$( A$, J , 1 ) )
0060 NEXT J
```

9.4.6 BENCHMARK CONCENTRATION function

Description: Returns the component's benchmark concentration.
Syntax: BENCHMARK_CONCENTRATION(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example: 0010 A = BENCHMARK_CONCENTRATION("Methane")
Gets the benchmark concentration of component named Methane and assigns to floating point variable A.

9.4.7 BPRINT statement

Description: Functions identically to LPRINT except BPRINT converts numeric values into a string and places it in a string variable. See LPRINT statement for all options.
Syntax: BPRINT TO string var$ [USING format$;][expression list]

Comments: string_var$ is a string variable.
format$ is a string constant or string variable whose value specifies the format for conversions as defined for LPRINT.

Example 1: 0010 BPRINT TO A$ USING “%3D;” 0,-1, 10,100
Puts the following into A$: 000 0-1 010 100

Example 2: 0010 BPRINT TO A$ USING “%9.2R;”-0.12,100.23
Puts the following into A$: - 0.12 100.23

9.4.8 CALIBRATION CONCENTRATION function

Description: Returns the component’s calibration concentration.

Syntax: CALIBRATION_CONCENTRATION (component$)

Comments: component$ is a string variable (or constant) containing the component name.

Example: 0010 A = CALIBRATION_CONCENTRATION(“Methane”)
Gets the calibration concentration of component named Methane and assigns it to floating point variable A.

9.4.9 CANCEL REQUESTS command

Description: Removes all pending requests (uncommitted) from the designated Schedule Queue.

Syntax: CANCEL _REQUESTS(schedule$)

Comments: schedule$ is a string variable (or constant) containing the schedule name for which to clear the schedule queue.

Example: 0010 CANCEL_REQUESTS (“ScheduleA”)

9.4.10 COMPONENT CONCENTRATION function

Description: Returns the component concentration.

Syntax: COMPONENT_CONCENTRATION(component$)

Comments: component$ is a string variable (or constant) containing the component name.

Example: 0010 A = COMPONENT_CONCENTRATION (“Methane”)
Gets the concentration of component named Methane and assigns it to floating point variable A.

9.4.11 CHR$ function

Description: Converts a value to its corresponding ASCII character.

Syntax: CHR$(code)

Comments: “code” is a number between 0 and 255.

Example:

```
0010 A$ = "AREA MONITORING REPORT:"
0020 REM TACK ON SOME LINE FEEDS
0030 A$ = A$ + CHR$( 10 ) + CHR$( 10 )
```

9.4.12 CLEAR INDICATORS command

Description: Clears all the alarms.

Syntax: CLEAR_INDICATORS

Example: 0020 CLEAR_INDICATORS

9.4.13 COMMON floating point array

Description: This represents a global pre-declared array of floating point storage shared among all BASIC programs. A reference to a particular element of COMMON by any of the BASIC programs accesses the same locations in memory. Values can be stored in COMMON by a BASIC program and then be accessed by another BASIC program. This array shall provide for the storage of 4096 floating point values.

Syntax: COMMON(I)

Comments: “I” is an index into the array.

Example:

```
0010 FOR I = 1 TO 3048
0020 COMMON( I ) = I
0030 NEXT I
```

9.4.14 COMMON$ string array

Description: This represents a pre-declared array of string variables shared between all BASIC programs. A reference to a particular element of COMMON$ by any BASIC program accesses the same locations in memory. Values can be stored in COMMON$ by a BASIC program and then accessed by another BASIC program. The COMMON$ array passes strings between BASIC programs. This array shall provide for the storage of 128 character strings of length 128.

Syntax: COMMON$(I)

Comments: “I” is an index into the array.

Example:

```
0010 A$ = "ALARM HAS OCCURRED"
0020 B$ = "NO ALARMS"
0030 IF ALARM THEN
0040 COMMON$( I ) = A$
0050 ELSE
0060 COMMON$( I ) = B$
0070 ENDIF
```

9.4.15 COMPONENT NAME$ function

Description: Returns the name of the nth component in the analysis report.

Syntax: COMPONENT_NAME$(n)

Comments: n is the nth component in the analysis report

Example:

```
0010 LPRINT COMPONENT_NAME$( 1 )
```

9.4.16 COMPONENT TYPE function

Description: Returns a value representing the type of the component (Measured or Calculated).

Syntax: COMPONENT_TYPE(component$)

Comments: component$ is a string variable (or constant) containing the component name.
Return values:
0 = Measured
1 = Calculated

Example:

```
0010 IF COMPONENT_TYPE( "N2" ) <> 0 THEN
0020 LPRINT COMPONENT_CONCENTRATION( "N2" )
0030 ENDIF
```

If the Component Type of the component named “N2” is calculated, print the component’s value.

9.4.17 COMPONENT UNITS function

Description: Returns the Units Of Measure of the named component.

Syntax: COMPONENT_UNITS$(component$)

Comments: component$ is a string variable (or constant) containing the component name.

Example:

```
0010 LPRINT COMPONENT_UNITS$( “Methane” )
```

9.4.18 CURRENT STREAM function

Description: Returns the stream currently under analysis. (Evaluate adding function to return purging Stream)

Syntax: CURRENT_STREAM$(schedule$)

Comments: schedule$ is a string variable (or constant) containing the schedule name for which the current stream is desired.

Example:

```
0010 IF CURRENT_STREAM$( “Schedule 1” ) = “ST506” THEN
0020 GOSUB HydrogenStream:
0030 ENDIF
```

9.4.19 DEACTIVATE STREAM command

Description: Sets the state of a Stream to OFFLINE. Makes all uses of the Stream in the Schedule INACTIVE.

Syntax: DEACTIVATE_STREAM(stream$)

Comments: stream$ is a string variable (or constant) containing the stream name of the stream to be deactivated.

Example:

```
0010 DEACTIVATE_STREAM( “CalStrm1” )
```

9.4.20 DIM statement

Description: Allocates storage for an array of variables.
Syntax: DIM variable(extent)[,variable(extent)]....
Comments: variable is the variable name of the array.
extent is the number of elements in the array.
Notes: a) Only one dimension is allowed.
b) Array subscripts must be from 1 to the array dimension (extent).
c) To use a variable as an array, it must be declared before use in the DIM statement.
Example: 0020 DIM A(N_COMP(1)),B$(10),C%(50)
This statement declares an array A of floating point variables with as many elements as there are components in analysis 1, array B$ of 10 strings, and array C% of 50 integer variables.

9.4.21 END statement

Description: Indicates that program execution is complete.
Syntax: END
Comments: END is a statement that may appear anywhere in the program; if not, it is implied to follow the last statement of the program.
Example: 0010 IF ALARM(FLAME_OUT) THEN
0020 END
0030 ENDIF
For this example, when an alarm condition exists, program execution terminates.

9.4.22 END REPORT statement

Description: Terminates a report group for sending to Reporter. All LPRINT content is grouped together in one block starting with the START_REPORT statement.
Syntax: END_REPORT
Example: see START_REPORT

9.4.23 EXPECTED RETENTION TIME function

Description: Returns the component's expected retention time.
Syntax: EXPECTED_RT(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example: 0010 A = EXPECTED_RT("Methane")
Gets the expected retention time of component named Methane and assigns it to floating point variable A.

9.4.24 EXPONENT function

Description: Returns e (i.e., 2.71828) raised to the power of the floating point expression.
Syntax: EXP(fp)
Comments: fp is a floating point expression.
Example: 0010 A = EXP(T)
Raises e to the power of floating point variable T and assigns it to floating point variable A.

9.4.25 FOR...NEXT statements

Description: Does an iteration loop.
Syntax: FOR variable = initial x TO y [STEP z]
NEXT [variable, variable]
Comments: variable is an integer used as a counter.
x is the initial value of the counter.
y is the final value of the counter.
z is the increment for the counter.
Example: 0010 FOR I = 100 TO -100 STEP -2
.
.
0020 NEXT
Executes loop 101 times with loop counter values of 100, 98, …, -98, and -100.

9.4.26 GOSUB statement

Description: Branches to subroutine.
Syntax: GOSUB Line
RETURN
Comments: **line** is the statement number for the subroutine.
Example:

```
0010 GOSUB 100
0020 END
0030 100 RETURN
```

Branches to subroutine at statement 100. Subroutine returns execution at statement 20 which ends execution.

9.4.27 GOTO statement

Description: Branches to label.
Syntax: GOTO ProgramLabel:
Comments: Program Label: is the label where execution will continue.

9.4.28 IF statement

Description: Allows for alternative paths of execution based on the evaluation of an expression.
Syntax:

```
IF expression THEN
statements
ELSE
statements
ENDIF
```

Comments: expression is a logical expression whose result is TRUE or FALSE.
statements is a single or multiple statement.
Example:

```
0010 IF A = 1 AND B = 2 THEN
0020 LPRINT "ONE"
0030 ELSE
0040 LPRINT "TWO"
0050 ENDIF
```

If the expression is true, "ONE" is printed otherwise "TWO" is printed.

9.4.29 INDICATOR function

Description: Returns the Boolean state of a GC Indicator Group. Individual indicators can be selected by Bitwise mask. I.e. value returned is the IndicatorGroup & mask.
Syntax: INDICATOR(IndicatorGroup$, mask)
Comments: IndicatorGroup$ is a string variable (or constant) containing the name of the indicator group.
Example:

```
0010 FLAMEOUT = 16384
0020 IF INDICATOR( "Oven1.DTM1.FID.1", FLAMEOUT) THEN
0020 LPRINT( "Flame Out!" )
0030 ENDIF
```

9.4.30 INJECT TIME function

Description: Returns a string with the sample inject date and time using the same format as TIME$.
Syntax: INJECT_TIME$
Example:

```
0010 A$ = INJECT_TIME$
```

String variable A$ gets inject time and date for the current analysis report.

9.4.31 INTEGER TYPE conversion routine

Description: Returns the integer value of an expression.
Syntax: INT(fp)
Comments: fp is a floating point expression.
Example:

```
0010 I = INT( A )
```

Converts the value of floating point variable A to an integer and assigns it to integer variable I.

9.4.32 LENGTH function

Description: Returns the number of characters in a string.
Syntax: LENGTH(string$)

Comments: string$ is any string expression.
Example: 0010 A$ = “1234567890”
0020 N = LENGTH(A$)
Variable N gets the number of characters (10) in string variable A$.

9.4.33 LOGARITHM BASE TEN function
Description: Returns the Logarithm to base ten of an expression.
Syntax: LOG(fp)
Comments: fp is a floating point expression.
Example: 0010 A = LOG(10.123)
The logarithm to base ten of 10.123 is assigned to floating point variable A.

9.4.34 LPRINT statement
Description: Prints to the line printer.
Syntax: LPRINT [USING format$;][expression[,expression]...]
Comments: format$ is a string constant or variable that specifies the printout format
Note: Start/End Report is required to obtain output from LPRINT (see Start Report).

9.4.35 MID$ function
Description: Return a substring of a string
Syntax: MID$(“ABCDEFGHIL”, 2, 3)
Comments: first parameter is a string
second parameter is index to start substring
third parameter is length of substring
Example: 0010 A$ = MID$(“ABCDEFGHIL”, 2, 3)
Contents of A$ will be “BCD”

9.4.36 NATURAL LOGARITHM function
Description: Returns natural Logarithm (to the base e) of floating point expression.
Syntax: LN(fp)
Comments: fp is a floating point expression.
Example: 0010 A = LN(2.71828)
The natural logarithm (logarithm to the base e) of 2.71828 is assigned to floating point variable A.

9.4.37 NUMBER COMPONENTS function
Description: Returns the number of components in an analysis report.
Syntax: NUMBER_COMPONENTS
Comments: Analysis% is the Analysis ID
Example: 0010 FOR CompID = 1 TO NUMBER_COMPONENTS
0020 LPRINT COMPONENT_NAME$(CompID)
0030 NEXT CompID
For every component in analysis method one (statement 10), component name is printed (statement 20).

9.4.38 OUTSTANDING REQUESTS function
Description: Returns the number of uncommitted pending requests in Analysis Request (Schedule) Queue.
Syntax: OUTSTANDING_REQUESTS(schedule$)
Comments: schedule$ is a string variable (or constant) containing the schedule name.
Example: 0010 IF OUTSTANDING_REQUESTS(“ScheduleA”) > 0 THEN
0020 CANCEL_REQUESTS(“ScheduleA”)
0040 ENDIF
All uncommitted requests are deleted if there are any requests in the Analysis Request Queue.

9.4.39 PEAK AREA function
Description: Returns the peak’s corrected area
Syntax: PEAK_AREA(component$)
Comments: component$ is a string variable (or constant) containing the component name.

Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_AREA( COMPONENT_NAME $( I ) )
0030 NEXT I
```
The example prints the area under each peak.

9.4.40 PEAK CREST AMPLITUDE function

Description: Returns the peak's amplitude at crest.
Syntax: PEAK_CREST_AMP(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_CREST_AMP( COMPONENT_NAME$( I ) )
0030 NEXT I
```
Prints the amplitude of each peak's crest.

9.4.41 PEAK END AMPLITUDE function

Description: Returns the amplitude at the end of the peak.
Syntax: PEAK_END_AMP(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_END_AMP( COMPONENT_NAME$( I ) )
0030 NEXT I
```
Prints the amplitude of each peak's end.

9.4.42 PEAK END TIME function

Description: Returns the end time for the peak.
Syntax: PEAK_END_TIME(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_END_TIME( COMPONENT_NAME$( I ) )
0030 NEXT I
```
Prints the time of each peak's end.

9.4.43 PEAK NEGATIVE AREA function

Description: Returns the peak's negative area.
Syntax: PEAK_NEG_AREA(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_NEG_AREA( COMPONENT_NAME$( I ) )
0030 NEXT I
```
Prints the uncorrected area of each peak.

9.4.44 PEAK POSITIVE AREA function

Description: Returns the peak's positive area.
Syntax: PEAK_POS_AREA(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_POS_AREA( COMPONENT_NAME$( I ) )
0030 NEXT I
```
Prints the uncorrected area of each peak.

9.4.45 PEAK START AMPLITUDE function

Description: Returns the peak's starting amplitude.
Syntax: PEAK_START_AMP(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_START_AMP( COMPONENT_NAME$( I ) )
0030 NEXT I
```
Prints the amplitude at the start of each peak.

9.4.46 PEAK START TIME function

Description: Returns the start time for the peak.
Syntax: PEAK_START_TIME(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example:
```
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PEAK_START_TIME( COMPONENT_NAME$( I ) )
0030 NEXT I
```
Prints the time at the start of each peak.

9.4.47 PURGING STREAM function

Description: Identifies the stream currently purging for the given Schedule.
Syntax: PURGING_STREAM$(schedule$)
Comments: schedule$ is a string variable (or constant) containing the schedule name.
Example:
```
0010 ST$ = PURGING_STREAM$("Schedule1")
```
Requests the name of the stream currently purging stream for Schedule1.

9.4.48 PUT COMPONENT CONCENTRATION command

Description: Updates the component concentration.
Syntax: PUT_CONC(component$, concentration)
Comments: component$ is a string variable (or constant) containing the component name. Concentration is the new concentration for the specified component.
Example:
```
0010 PUT_CONC( "Methane", 10.1234 )
```
The concentration of 10.1234 is stored in the concentration for the component named “Methane” in the current report and analyzer Component Configuration.

9.4.49 PUT PRESSURE OF A ZONE command

Description: Updates the isobaric set point of the specified pressure zone.
Syntax: PUT_PRESSURE(ovenaddress$, setpoint)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the zone, e.g. “Oven1.Epc.PZ.1” setpoint is the desired pressure value.
Example:
```
0010 Z1 = ZONE_PRESSURE( "Oven1.Epc.PZ.1" )
0020 PUT_PRESSURE( "Oven1.Epc.PZ.2", Z1 )
```
Gets the actual pressure of oven 1, pressure zone 1 and sets it as the setpoint value for oven 1, pressure zone 2.

9.4.50 PUT RESPONSE FACTOR command

Description: Updates the response factor for a particular component.
Syntax: PUT_RF(component$, response_factor)
Comments: component$ is a string variable (or constant) containing the component name. response_factor is the new response factor for the specified component.
Example:
```
0010 PUT_RF( "Ethane", 0.98 )
```
The value of 0.98 is stored in the response factor for component named “Ethane”.

9.4.51 PUT TEMPERATURE OF A ZONE command

Description: Updates the isothermal set point of the specified temperature zone.
Syntax: PUT_TEMPERATURE(ovenaddress$, setpoint)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the zone, e.g. “Oven1.DTC1.TZ.1” setpoint is the desired temperature value.
Example:
```
0010 Z1 = ZONE_TEMPERATURE( "Oven1.DTC1.TZ.1" )
0020 PUT_ TEMPERATURE( "Oven1.DTC1.TZ.2", Z1 )
```
Gets the actual temperature of oven 1, temperature zone 1 and sets it as the setpoint value for oven 1, temperature zone 2.

9.4.52 READ ANALOG INPUT function

Description: Returns the value of an Analog Input.
Syntax: READ_ANALOG(ovenaddress$)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the input, e.g. “EXIO1.WAGO1.AI.1”

Example: 0010 AN1 = READ_ANALOG (“EXIO1.WAGO1.ANAIN.1”)

9.4.53 READ DIGITAL INPUT function

Description: Returns the state (0 or 1) of the digital input addressed.
Syntax: READ_DIGITAL(ovenaddress$)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the input, e.g. “EXIO1.WAGO1.DI.3”
Example: 0010 D1 = READ_DIGITAL(“EXIO1.WAGO1.DIGIN.3”)

9.4.54 REMARKS statement

Description: Used for placing remarks in the BASIC program.
Syntax: REM remark
Example: 0010 REM CLEAR OUT COMMON(1)
0020 COMMON(1) = 0.0

9.4.55 REQUEST_ANALYSIS command

Description: Requests an analysis of a stream.
Syntax: REQUEST_ANALYSIS(stream$, analysis$)
Comments: stream$ is a string variable (or constant) containing the name of a Stream
analysis$ is a string variable (or constant) containing the name of an Analysis
Example: 0010 REQUEST_ANALYSIS(“CalStream”, “AnalysisH7”)
Note: Stream/Analysis element must exist in the Demand table of an active schedule.

9.4.56 RESPONSE FACTOR function

Description: Returns the component’s response factor.
Syntax: RESPONSE_FACTOR(component$)
Comments: component$ is a string variable (or constant) containing the component name.
Example: 0010 A = RESPONSE_FACTOR(“Ethylene”)
Gets the response factor of component named Ethylene and assigns it to floating point variable A.

9.4.57 SCHEDULE ABORT function

Description: Issues a schedule STOP IMMEDIATE command to the designated schedule.
Syntax: SCHEDULE_ABORT(schedule$)
Comments: ‘schedule$’ is a string variable (or constant) containing the schedule name.
Example: 0010 SCHEDULE_ABORT(“Schedule1”)

9.4.58 SCHEDULE NAME function

Description: Returns the schedule name analyzed in last analysis cycle.
Syntax: SCHEDULE_NAME$
Example: 0010 IF SCHEDULE _NAME$ = “Schedule1” GOTO 100

9.4.59 SCHEDULE RUN function

Description: Issues a schedule RUN command to the designated schedule.
Syntax: SCHEDULE_RUN(schedule$)
Comments: schedule$ is a string variable (or constant) containing the schedule name.
Example: 0010 SCHEDULE_RUN(“Schedule1”)

9.4.60 SCHEDULE STOP function

Description: Issues a schedule STOP command to the designated schedule.
Syntax: SCHEDULE_STOP(schedule$)
Comments: schedule$ is a string variable (or constant) containing the schedule name.
Example: 0010 SCHEDULE_STOP(“Schedule1”)

9.4.61 SET BASIC ALARM function

Description: Sets the User Error indicator specified in the current script’s Indicator group
Syntax: SET_BASIC_ALARM(UserAlarm)
Comments: UserAlarm is an integer from 1-10.
Example: 0010 SET_BASIC_ALARM(3)

9.4.62 SLEEP function

Description: Pauses execution of the script for the designated number of seconds
Syntax: SLEEP(seconds)
Example: 0010 SLEEP(3)
Execution suspended for 3 seconds.

9.4.63 SQUARE ROOT function

Description: Returns the square root of a floating point expression.
Syntax: SQRT(fp)
Comments: fp is a floating point expression.
Example: 0010 A = SQRT(A * 100)
The square root of the quantity 100 times the value of floating point variable A is assigned to floating point variable A.

9.4.64 START REPORT statement

Description: Starts a report group for sending to Reporter. All LPRINT content is grouped together in one block until the END_REPORT statement is reached.
Syntax: START_REPORT
Example:
001 START_REPORT
002 LPRINT "First line of report"
003 LPRINT "Second line of report"
004 END_REPORT
Note: Start/End Report is required to obtain output from LPRINT.

9.4.65 STREAM NAME function

Description: Returns the stream number analyzed in last analysis cycle.
Syntax: STREAM_NAME$
Example: 0010 IF STREAM_NAME$ = "ST506" GOTO 100
When stream analyzed in previous cycle (analysis data currently being computed) is number three, branch to statement 100.

9.4.66 STREAM STATUS function

Description: Returns the active/inactive status of the stream.
Syntax: STREAM_STATUS(stream$)
Comments: stream$ is a string variable (or constant) containing the name of a Stream
0 = Offline (Inactive)
1 = Online (Active)
Example:
0010 IF STREAM_STATUS("CalStream") = 0 THEN
0020 LPRINT "CALIBRATION STREAM OFFLINE"

9.4.67 TIME$ function

Description: Returns a string containing the date and time in the following format: hh:mm:ss Day DD Mon YYYY (e.g., 17:46:31 Mon 6 Nov 1989)
Syntax: TIME$
Example: 0010 A$ = TIME$
The string variable A$ gets the time and date.

9.4.68 TOTAL PEAK AREA function

Description: Returns the total area value for all the peaks detected in an analysis.
Syntax: TOTAL_PEAK_AREA
Example:
0010 FOR I = 1 TO NUMBER_COMPONENTS
0020 LPRINT PK_AREA(COMPONENT_NAME(I))
0030 NEXT I
0040 LPRINT TOTAL_PEAK_AREA
For each component, print the area of the peak, then the total peak area of all components.

9.4.69 VALUE function

Description: Returns a floating point number that is the result of a conversion of the string passed.
Syntax: VALUE(string$)
Comments: string$ is any string expression. If a valid conversion can't be performed, VALUE returns zero. Leading non-numeric characters will cause an invalid conversion.
Examples: 0010 A = VAL("-10. 3")
The value of floating point variable A is set to -10.3.

9.4.70 VALVE command

Description: Turns valve On or Off.
Syntax: VALVE(ovenaddress$, state)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the v, e.g. "Oven1.DTC1.REG.2".
state: 0 = valve Off, 1 = valve On.
Example: 0010 VALVE("Oven1.DTC1.REG.2", 0)
Turns Analytical valve 2 in Oven 1 off.

9.4.71 WRITE ANALOG OUTPUT command

Description: Sets the specified analog output to the level desired in engineering units. The range is specified in Setup of the Analog Output.
Syntax: WRITE_ANALOG(ovenaddress$, value)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the output
(e.g. "InIo.Wago1.AnaOut.1")
value is the trend output value.
Example: 0020 WRITE_ANALOG("InIo.Wago1.AnaOut.1", 37.0)

9.4.72 WRITE DIGITAL OUTPUT command

Description: Specifies the state of Extended Digital Outputs.
Syntax: WRITE_DIGITAL(ovenaddress$, state)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the output
(e.g. "InIo.Wago1.DigOut.3"
state <> 0 asserts the output, state = 0 de-asserts the output.
Example: 0020 WRITE_DIGITAL("InIo.Wago1.DigOut.3", 0)

9.4.73 Y2X function

Description: Returns the value of Y raised to the X power.
Syntax: Y2X(fpbase, fpexp)
Comments: fpbase, fpexp are floating point expressions.
Example: 0010 LPRINT Y2X(2, 10)
Prints the value of 2 raised to the power of 10 (= 1024).

9.4.74 ZONE PRESSURE function

Description: Returns the actual pressure of the specified zone.
Syntax: ZONE_PRESSURE(ovenaddress$)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the zone, e.g. "Oven1.Epc1.PZ.1"
Example: 0010 Z1 = ZONE_PRESSURE("Oven1.Epc1.PZ.1")
Returns the actual pressure of zone 1 in EPC1 in Oven 1.

9.4.75 ZONE TEMPERATURE command

Description: Returns the actual temperature of the specified zone.
Syntax: ZONE_TEMPERATURE(ovenaddress$)
Comments: ovenaddress$ is a string variable (or constant) containing the address of the zone, e.g. "Oven1.Dtc1.TZ.1"
Example: 0010 Z1 = ZONE_TEMPERATURE("Oven1.Dtc1.TZ.1")

10 Version upgrade

10.1 Determine equipment to be upgraded

The first step in upgrading your system is to identify the equipment to be upgraded and determine if the PCs and Servers (i.e. Communication Gateways) are new enough to be upgraded. PCs running windows XP or older cannot be upgraded and Communication Gateways running Windows 2000 cannot be upgraded. In these cases the Hardware and Operating system must be replaced with a newer model. You may refer to each section below for more detail on upgrading.

A PGC5000 running software before Version 3.x.x.x, cannot be upgraded without first contacting ABB Lewisburg support (lwbsupport@us.abb.com).

Prior to performing the upgrade, you should create a recovery USB stick in the event that there is an issue with the upgrade.

1. To create a recovery USB stick, insert a clean, blank USB stick into the USB port at the left side of the Single Board Computer (SBC) PCB.
2. Navigate to the Setup>File Management screen.
3. Press the Recovery button.
4. Wait for the message that the process is complete.
5. Remove the recovery USB stick and store it in a safe location.

10.2 PC upgrading

If the PC has no VistaNET software installed, please refer to the STAR Data Management System (DMS) Operating Instructions. If there are existing PGC5000s Version 3.x.x.x in the system that will be running an older version of the RUI, then the files and GCHelpfiles folder (see Figure 10.1) will need to be copied to a temporary folder and then copied back after the VistaNET Core software is uninstalled.

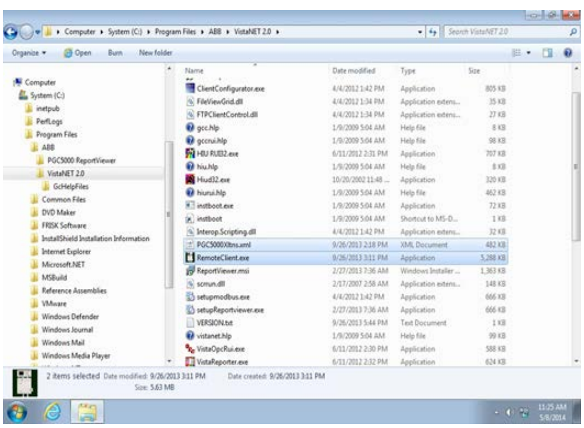


Fig. 10.1. GCHelpfiles Example

In order to determine if the PC has a previous VistaNET software install, navigate to the Control Panel/Programs/Uninstall a Program per Figure 10.2.

Fig. 10.2. Control Panel/Uninstall

If you have a previous install you will see Figure 10.3.

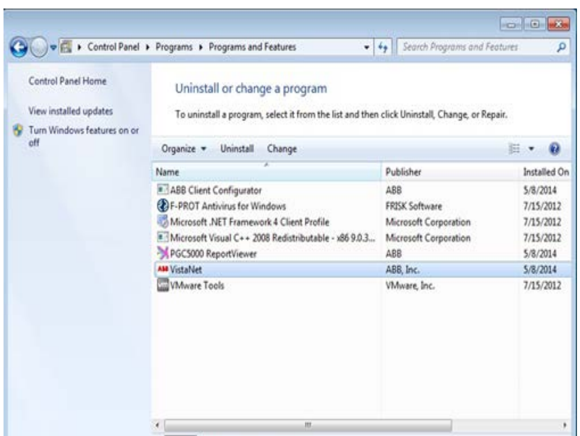


Fig. 10.3. Previous Install Screen

The old version of the VistaNET core software must be uninstalled before you can install the new version. Double left clicking on the VistaNET name will bring up Figure 10.4.

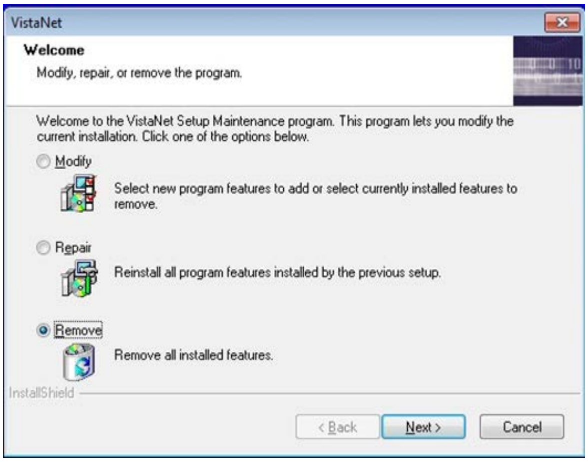


Fig. 10.4. Removing Old Software

Be sure to select **Remove** before selecting **Next**.

There will be a series of screens after this process. Select OK or Next at all of them, when prompted. After the process has completed, verify that the VistaNET software is no longer appearing in the Control Panel/Programs.

After the old version of the VistaNET software has been uninstalled, if you plan to use an older version of the RUI with an existing PGC5000 then you will need to copy the files and folder that were copied to the temporary folder above back to C:\\Program Files\ABB\VistaNET 2.0.

At this point installation of the STAR software can be performed on the PC per section 4 of the STAR Data Management System (DMS) Operating Instructions. After successful installation of the STAR core software, the Control Panel/Programs section should show Figure 10.5.

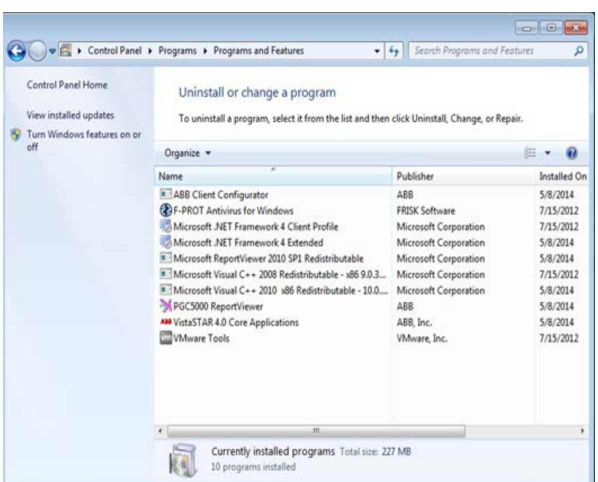


Fig. 10.5. Programs and Features Screen

10.3 Communication Gateway upgrading

During the upgrade process of the Communication Gateway communications to the DCS will be interrupted.

The first step is to determine if the Communication Gateway you have can be upgraded. The following models of Communication Gateway cannot be upgraded:

- Power Edge 350
- Power Edge 650
- Power Edge 750
- Power Edge 850.

These Communication Gateways must be replaced in order to work with version 4 of the PGC5000 or PGC5000 Generation 2. The Communication Gateway will only need upgrading if you intend to receive data from a PGC5000 running version 4 or a PGC5000 Generation 2 to it.

It is recommended to make an image of the Communication Gateway with the disk imaging software provided in case something goes wrong in the upgrade process.

On the Communication Gateway to be upgraded, locate and save the following files (note: some may not exist) to a secure location so that they can be copied back on to the Communication Gateway in a later step:

- Modbus_Client.csv
- VNSA.CFG (if VNSA is running on this Communication Gateway)
- VNOPCTags.txt
- Any PGC5000 tag files for PGC5000s that will be left in the system running version 3; these files will have the GC name and a .tag file extension.

If there are existing PGC5000s running Version 3.x.x.x in the system that will be running an older version of the RUI, then the files and GCHelpfiles folder shown in Figure 10.6 will need to be copied to a secure location and then copied back after the VistaNET Core software is uninstalled.

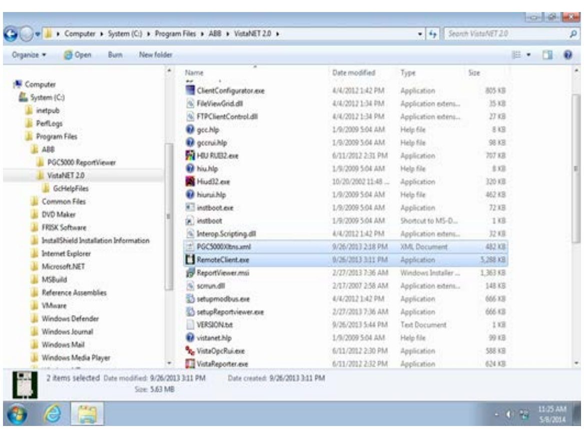


Fig. 10.6. GCHelpfiles Folder

The next step is to uninstall the following applications:

- VistaNET 2.0 OPC Applications
- VistaNET
- OPC Core Components Redistributable (x64)

These can be accessed thru the Control Panel/Programs/Uninstall a Program (see Figure 10.7).

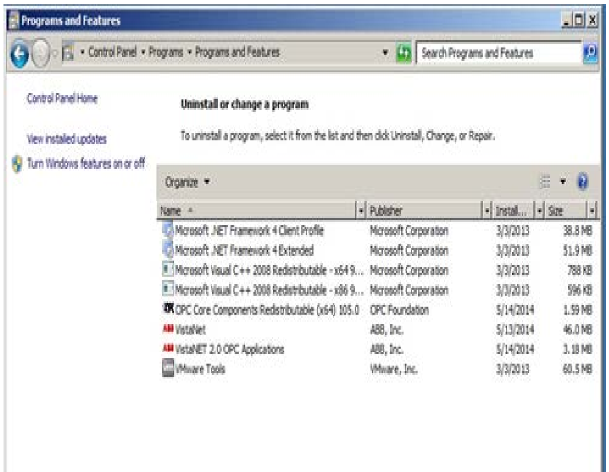


Fig. 10.7. Uninstall Screen1

Restart the server as prompted during the uninstall process.

At this point installation of the STAR software can be performed on the Communication Gateway per Section 4 of the STAR Data Management System (DMS) Operating Instructions. After a successful install of the STAR core software, the Control Panel/Programs section should be as shown in Figure 10.8.

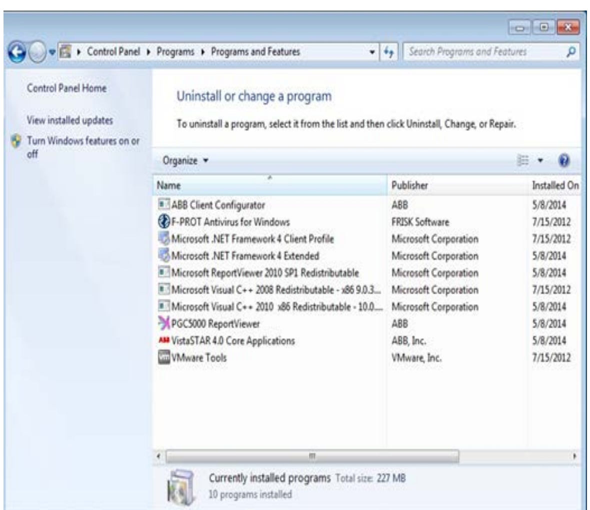


Fig. 10.8. Uninstall Screen2

Next perform an install of the OPC Server Version 4 software by running the Setup.exe file on the OPC Server installer CD and following the prompts. After the install of the OPC Server, the Control panel of installed programs will show Figure 10.9.

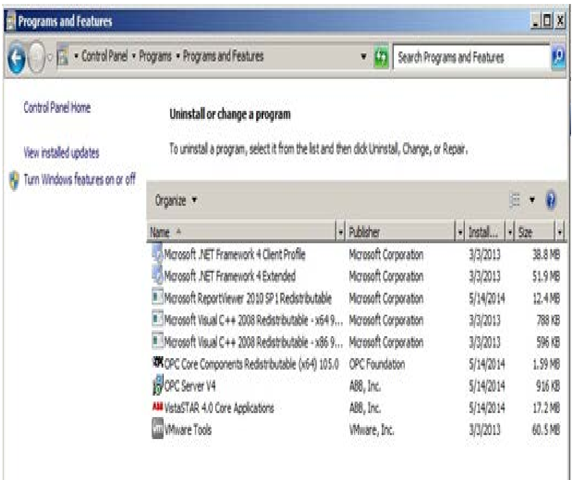


Fig. 10.9. Control Panel Screen

If you are installing the OPC Server on Windows Server 2003, the OPC DCOM settings need to be modified. From the command prompt, run “DCOMCNFG” and browse to the Component Services screen (see Figure 10.10) and view the “Properties” of the “ABB VistaNET Process Analyzer OPC Service” Component Service.

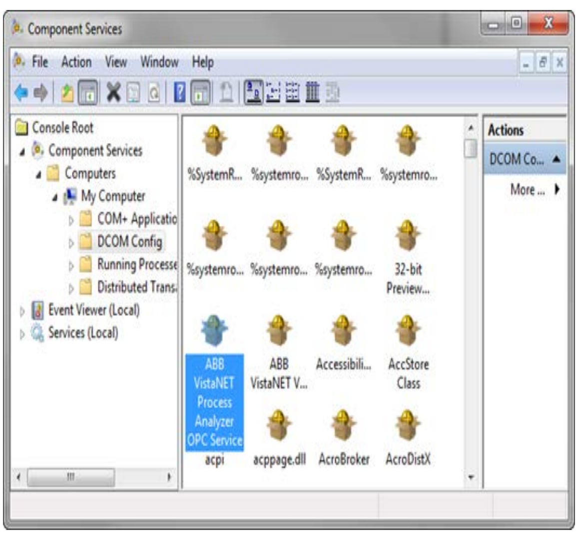


Fig. 10.10. Component Services Screen

The “Authentication Level” must be set to “None” on the “General” tab, as shown in Figure 10.11.

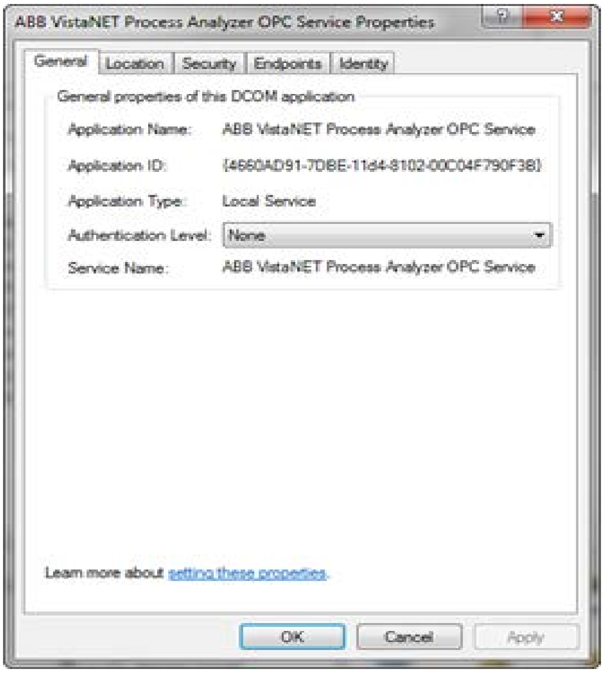


Fig. 10.11. General Tab/Authentication Level

Copy the files that were saved before the uninstall, to a secure location back on to the Communication Gateway. The Modbus_Client.csv will need to be copied back to the folder that it was copied from, usually Program Files (x86)\ABB\VistaNet 2.0.   VNSA.CFG (if VNSA is running on this Communication Gateway) will need to be copied to the ABB\Analytics folder, as this will be the new location of the version 4 compliant VNSA application.

VNOPCTags.txt and any PGC5000 tag files for PGC5000 and PGC5000 Generation 2 devices that will be left in the system will need to be copied to the ABB\Analytics folder, as this will be the new location of the OPC service. If a different install folder was specified during the installer process, then the files will need to be copied to the folder that was specified.

If there are existing PGC5000s in the system that will be running an older version of the RUI, then the files and GCHelpfiles folder copied from above will need to be copied back to the folder that it was copied from, usually Program Files\ABB\VistaNet 2.0.

10.4 Upgrading older PGC5000s

If the PGC5000s in the existing system are running a version of software that starts with 1 or 2, then please contact the factory as the Configuration files will need to modified by the factory in order for the upgrade to be performed.

To upgrade from Version 3.x.x.x of the PGC5000 to Version 4.x.x.x:

If the PGC5000 is in the “VistaNET Device Definition Table” of the VNSA, you must remove the entry from the VNSA or you will get a name conflict when the converted PGC5000 / PGC5000 Generation 2 analyzer restarts.

1. The upgrade kit should contain 2 USB drives:
   - A “Recovery” drive which is shipped blank – the user should insert the drive into the SBC of the analyzer to be upgraded and perform a Make Recovery USB.
   - An “Upgrade” drive which contains the proper V4 software and help files in a /format folder and the necessary UPGRADE.BIN on the root.
2. After the recovery drive has been created, mount both USB drives on a PC that has the XML_VersionConverter application installed.

3. Launch the converter and Figure 10.12 should appear.

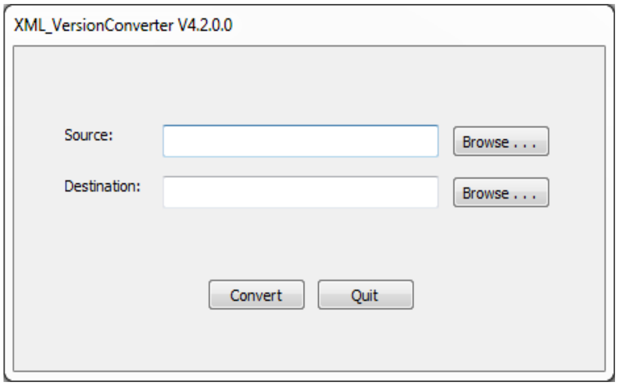


Fig. 10.12. XML Dialog Version Converter Box

4. For Source, browse to the “Recovery” USB drive and select the “\format\Configuration” folder.
5. For Destination, browse to the “Upgrade” USB drive and select the “\format” folder.
6. Press “Convert.”
7. If there are no problems, a “Completed Successfully!” dialog will appear.
8. The “Upgrade” drive will now be ready to apply to the analyzer.
9. Turn analyzer power OFF and insert the “Upgrade” drive in the SBC.
10. Turn analyzer power ON.
11. Wait for all files to install and the “Upgrade Complete” message to appear.
12. Turn analyzer power OFF.
13. Remove “Upgrade” drive.
14. Turn analyzer power ON.
15. Once the Analyzer has rebooted, ensure the LUI is operating properly by noting Date/Time seconds are incrementing as expected.
16. Go to “Setup>Master Controller” screen and note the analyzer NAME.
17. Go to “Setup>Master Controller>SBC>Network Adapters” and enter the analyzer NAME in the HOST NAME field exactly as it appeared on the Master Controller screen.
18. Press the Network Save button (Disk Icon above the HOST NAME caption). All configuration and network Information will be refreshed and the system will reboot.
19. At this point the upgrade should be complete.

To repeat the process, remove all the files from the recovery drive and remove the Configuration folder from the upgrade drive.

11 Temperature programmed oven

11.1 General description

The Temperature Programmed Gas Chromatograph (TPGC) analyzes samples with wide variations in component boiling points or molecular weights. It operates the same as the standard PGC5000 Generation 2 Process GC described in the previous sections of these Operating Instructions. It differs from the standard GC in having a temperature programmed oven (TPO) contained within the isothermal oven, and in how some operating features are utilized.

From the outside, the Oven Compartment looks the same as that of the standard PGC5000 Generation 2 C-Class oven. Internally, however, the TPO compartment is different (see Figure 11.1) in that the TPO contains:

- isothermal oven
- detector (FID or TCD)
- an insulated, temperature programmed oven containing the analytical column.

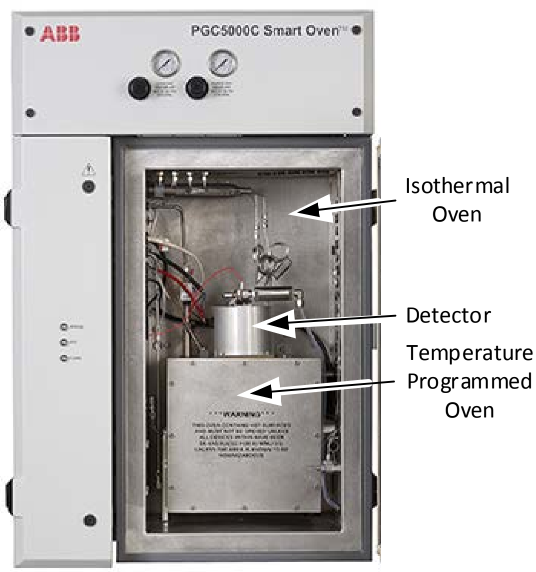


Fig. 11.1. Oven Compartment

11.1.1 Master Controller

Since the Master Controller for the Temperature Programmed GC is identical to the PGC5000 Generation 2 Master Controller, all information regarding the Master Controller is contained in the applicable sections of the PGC5000 Generation 2 Operating Instructions and Service Instructions.

11.1.2 Isothermal oven

The isothermal oven contains the liquid sample valve, detector, and digital temperature controller, which are the same as those in the standard GC. An optional Air Cleanup/ Methanizer Unit may be used. In addition, the isothermal oven contains the temperature programmed (TP) oven.

11.1.3 Temperature programmed oven

The oven in the Temperature Programmed GC contains components similar to those in the PGC5000 C-Class oven. The primary differences between the two versions are in the programmed oven section of the TPO and the heater blocks surrounding the detectors.

11.2 Technical description of isothermal oven

11.2.1 Liquid sample valve

The liquid sample valve is externally mounted on the right side of the oven compartment and extends into the oven. It is actuated by a pneumatic signal from a solenoid valve located in the Master Controller. The liquid sample valve captures a specific volume of liquid sample below its boiling point, then injects it into a temperature controlled (vaporizing) chamber of the sample valve. The sample valve then injects a vapor plug into the column.

11.2.2 Detector
Standard detectors are the flame ionization detector (FID) and the single port thermal conductivity detector (TCD). The detector is mounted on top of the temperature programmed oven and it is integrated with the TP oven in order to provide an optimal analytical flow path and eliminate potential cold spots. The detector has a heater block surrounding it; otherwise it is the same as that used in the standard PGC5000 Generation 2 analyzer.

11.2.3 Digital temperature controller
The Digital Temperature Controller (DTC) controls the temperature of the liquid sample valve, the temperature programmed oven, the detectors, and the isothermal oven, using the DTC's temperature control and configuration screens. All instructions for the DTC are described in the applicable Operating Instructions.

11.3 Technical description of temperature programmed oven
The temperature programmed (TP) oven is a low mass oven designed for rapid thermal response, capable of being programmed for temperatures ranging up to 280 degrees C. It contains a heater barrel, temperature probe, vortex cooling vent, air pressure sensor connection, and column. An air outlet allows a continuous cool air flow (purge) into the temperature programmed oven lining.

Sample separation takes place in the column, which is installed between the analytical valves and the detector. Everything to do with the column is application specific. Column composition (capillary or packed), size (length and diameter), and column packing material or film thickness depend on the composition of the representative sample and the analysis method.

11.4 Functional description
When the power is turned ON, the following components receive power:

- oven compartment, including both the isothermal and temperature programmed oven heaters
- detector power supply
- Master Controller (display illuminates)
- detector heater
- sample valve heater

Temperature programming is application dependent and is configured in the factory. Temperature settings for heated component zones can be found in the Data Package shipped with the analyzer. This information should be used as a reference during setup and start-up, and when troubleshooting and calibration are performed. If adjustments need to be made, they should be made according to the information in the Data Package.

Allow adequate time for the isothermal and temperature programmed ovens to heat to the proper temperature level.

When you perform the time cycle check, verify isothermal oven, temperature programmed oven, liquid sample valve, and detector temperatures with Data Package information. (These temperature settings are made in the factory and should not require adjustment.)

All other functions of the Temperature Programmed GC are the same as for the standard GC. Refer to the applicable sections of the Operating Instructions for this information.

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