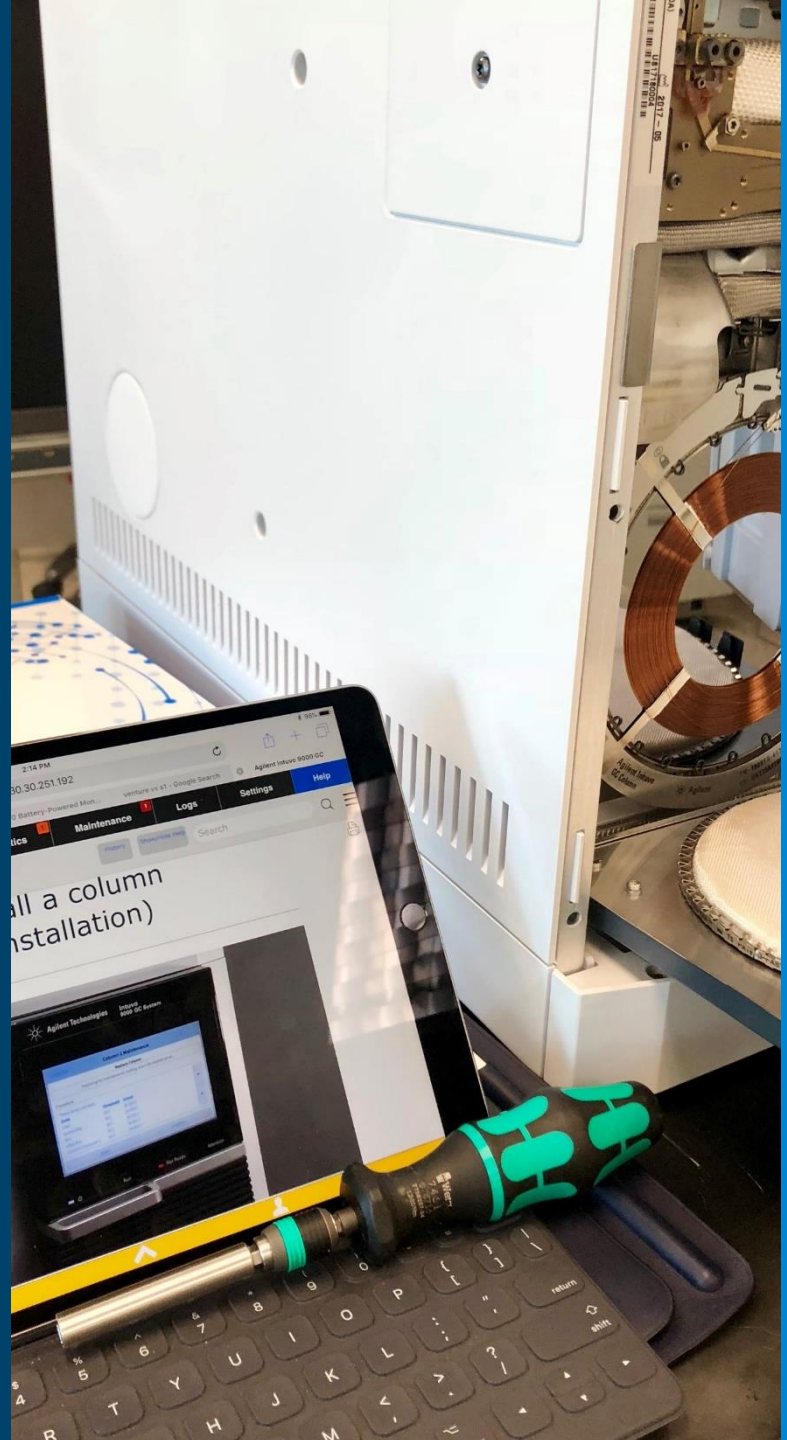
Put Your Smart GC to Work

Enable remote connectivity and take the guesswork out of GC Maintenance

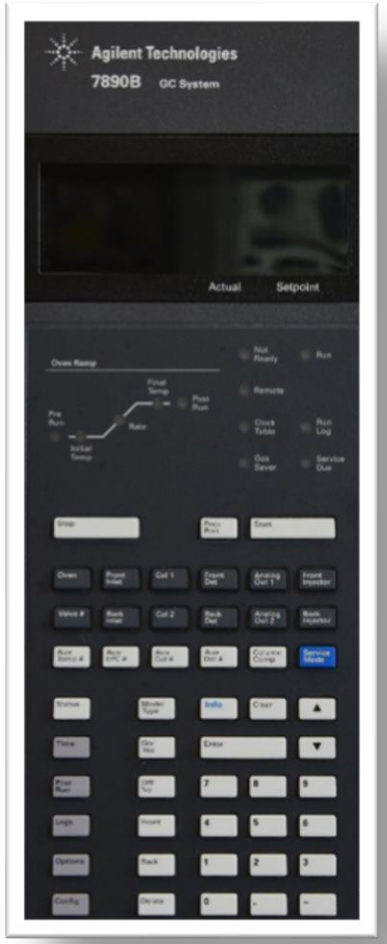
George Reiner & Nicole Hart
Agilent Technologies, Inc.
Webinar
October 23, 2018



Agilent
Trusted Answers

A User Interface Paradigm Shift is Taking Place

‘Touchtone phone to smartphone’



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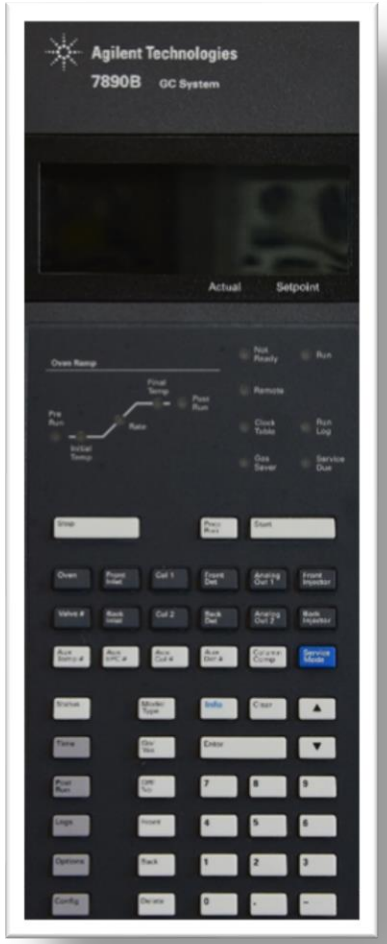

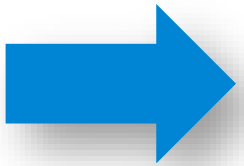

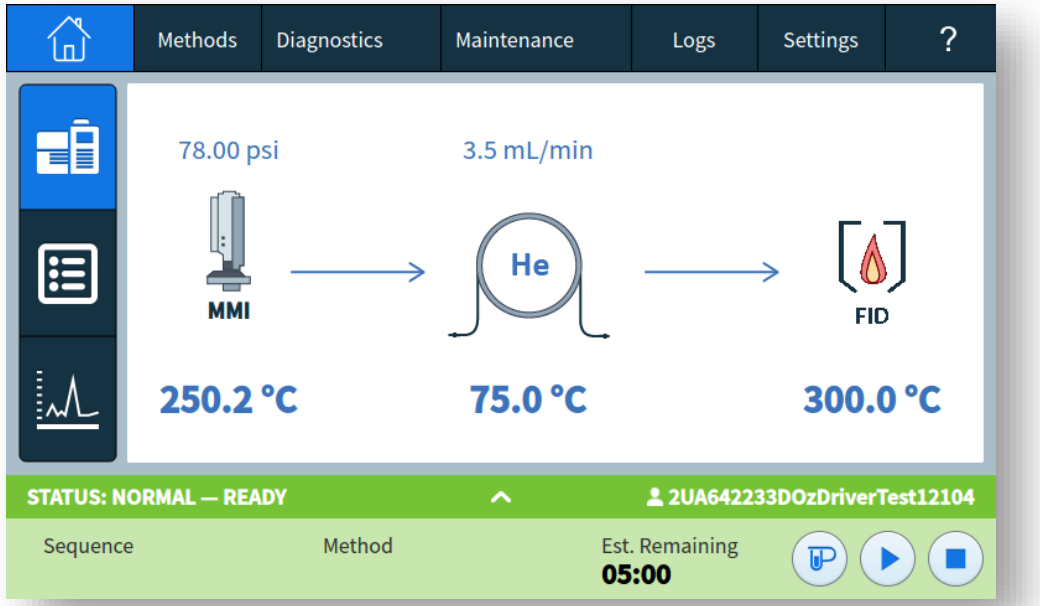

Challenges Facing the GC Lab: The Squeeze

Time for a Change

Shifting Demographics

- Seasoned operators retiring; highly skilled replacements harder to find
- GC troubleshooting skills not necessarily located at point of use
- Operators assuming multiple responsibilities

Challenging Economics

- Budgets squeezed, expectations increased
- Capital purchase decisions made on business NOT technical basis
- Competition on the rise

Understanding Key Success Factors
Listening to Users

Beyond the Box: *Be Smart and Connected*

What did we hear?

Customer Situation

Local lab expertise on hard to replace. Staff turnover increasing

Lab managers turning over, often with business specialists with less analytical expertise

Purchasing decisions becoming more business rather than technically driven

Transform the User Experience

- *Easier to install and setup*
- *Easier to use, troubleshoot and maintain*
- *Assist users to make less mistakes and be more productive*

A Better Business Outcome

- *Easier troubleshooting & maintenance*
- *Less/faster training; optimized HR & asset deployment*
- *Reduced unplanned downtime*

Mobile, Accessible Technology

Transforming the User Experience

New mobilized generation

- Expectations of remote mobile connection
- Technology accessed through interactive graphic SW and apps

Make technology accessible

- Interface meeting today's expectations
- Online suite of customer support and information

Every Interaction Matters

At instrument or remotely

GC Drivers

- **Interface to ALL CDS Systems**
- Consistent user experience

Browser Interface

- **Most Flexible Interface**
- PC, Tablet, Mobile
- Status, Diagnostics, Maintenance, Logs, & Help

Touchscreen

- **Primary Interface for “At Instrument” tasks**
- Status & Maintenance
- Provides some instrument control

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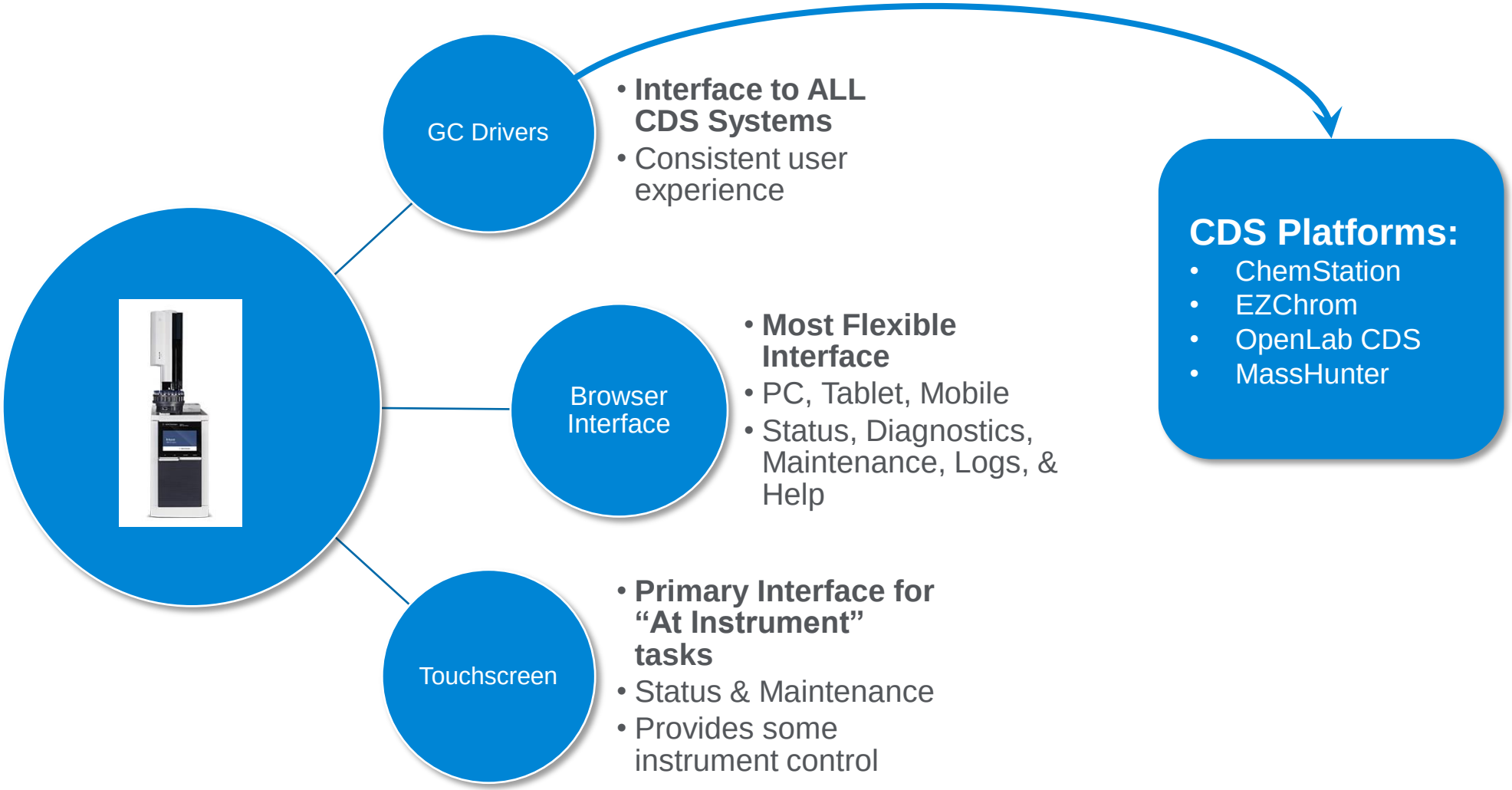

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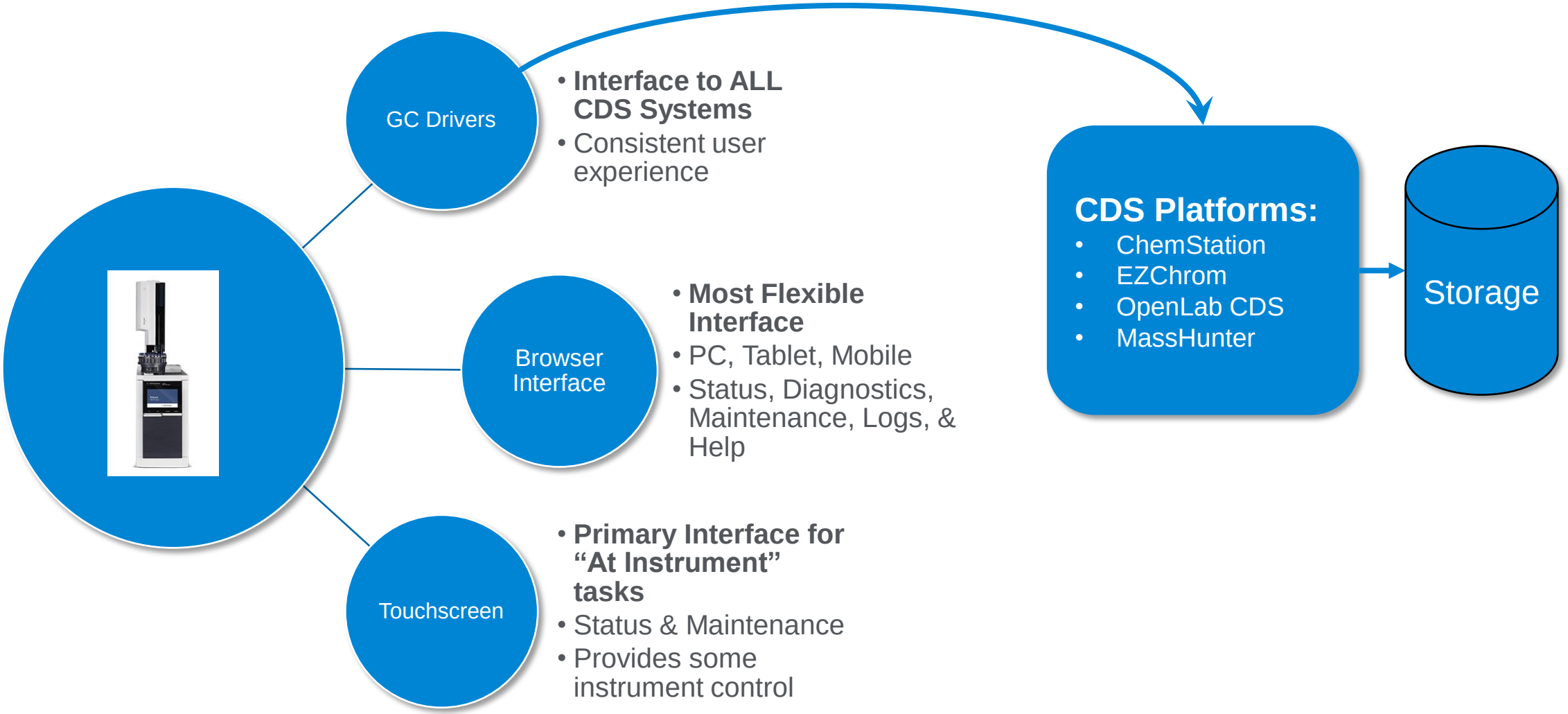

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CDS Platforms:

- ChemStation
- EZChrom
- OpenLab CDS
- MassHunter

Storage

User Experience Key for Agilent

All Interfaces Must Present Consistent User Experience

Key GC Intelligence and Software-Based Features

Built into the instrument firmware

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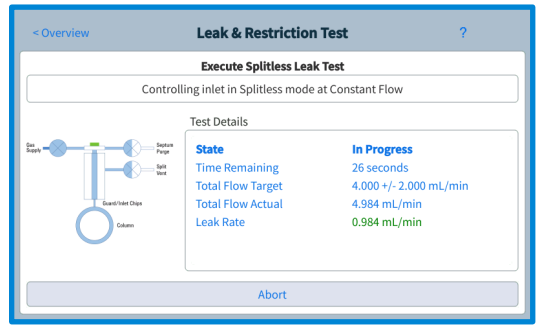
Built into the instrument firmware

- Self-Aware Features
  - User Initiated Diagnostic Tests
  - Autonomous Diagnostic Tests
  - Autonomous Continuous Monitoring
  - Self Guided Diagnostic Troubleshooting
  - Traditional Early Maintenance Feedback (EMF) counters
  - Self Guided Maintenance Procedures



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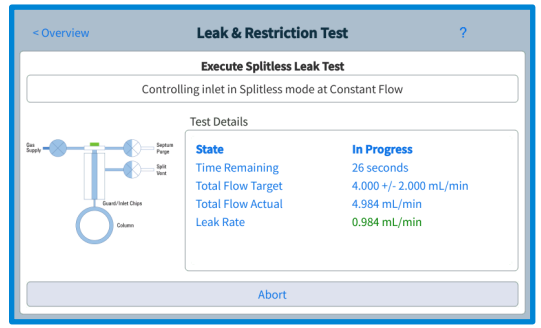
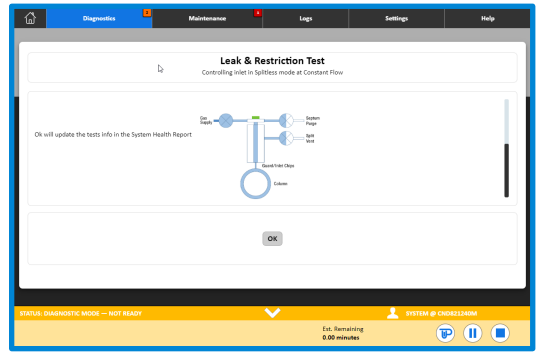
- Browser Interface
  - Allows access to key features of your Smart GC from virtually anywhere





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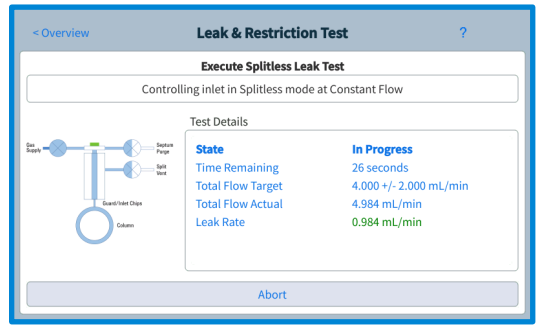
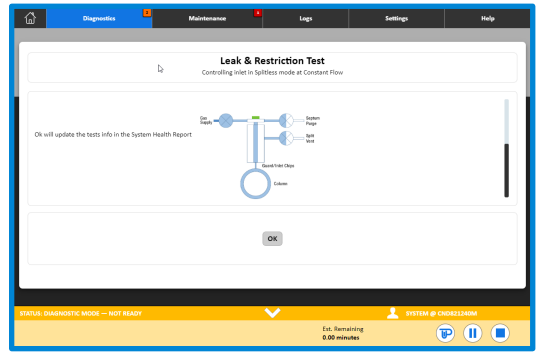
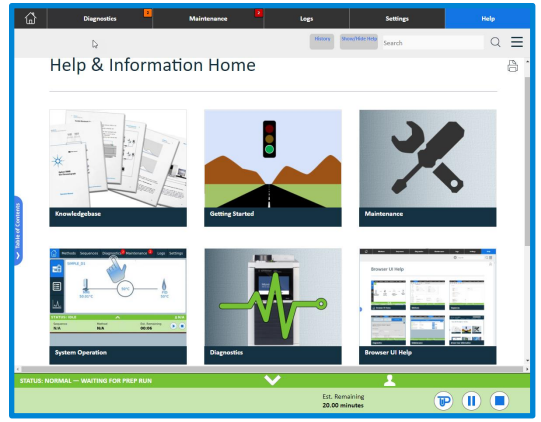
- On-Board Help & Information
  - Everything you need to be successful with your GC is right on the instrument







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Manually started via touchscreen or browser interface

Inlets

Leak and Restriction Test
Pressure Decay Test
Tank Pressure Check
Split Vent Restriction Test
Septum Purge Flow Test

Detector – FID

FID Jet Restriction Test
FID Leakage Current Test

Self Aware GC Features

- User Initiated D
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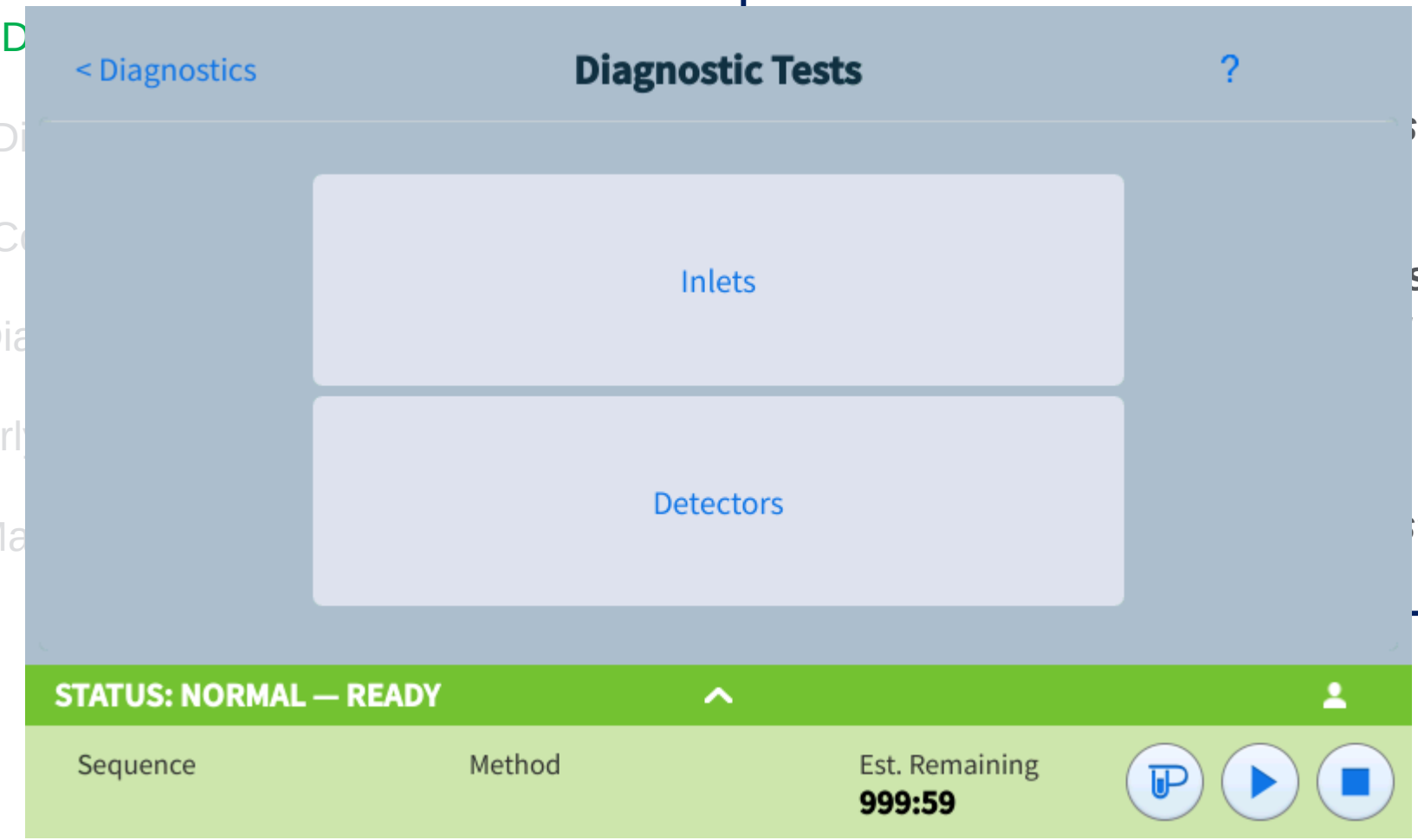

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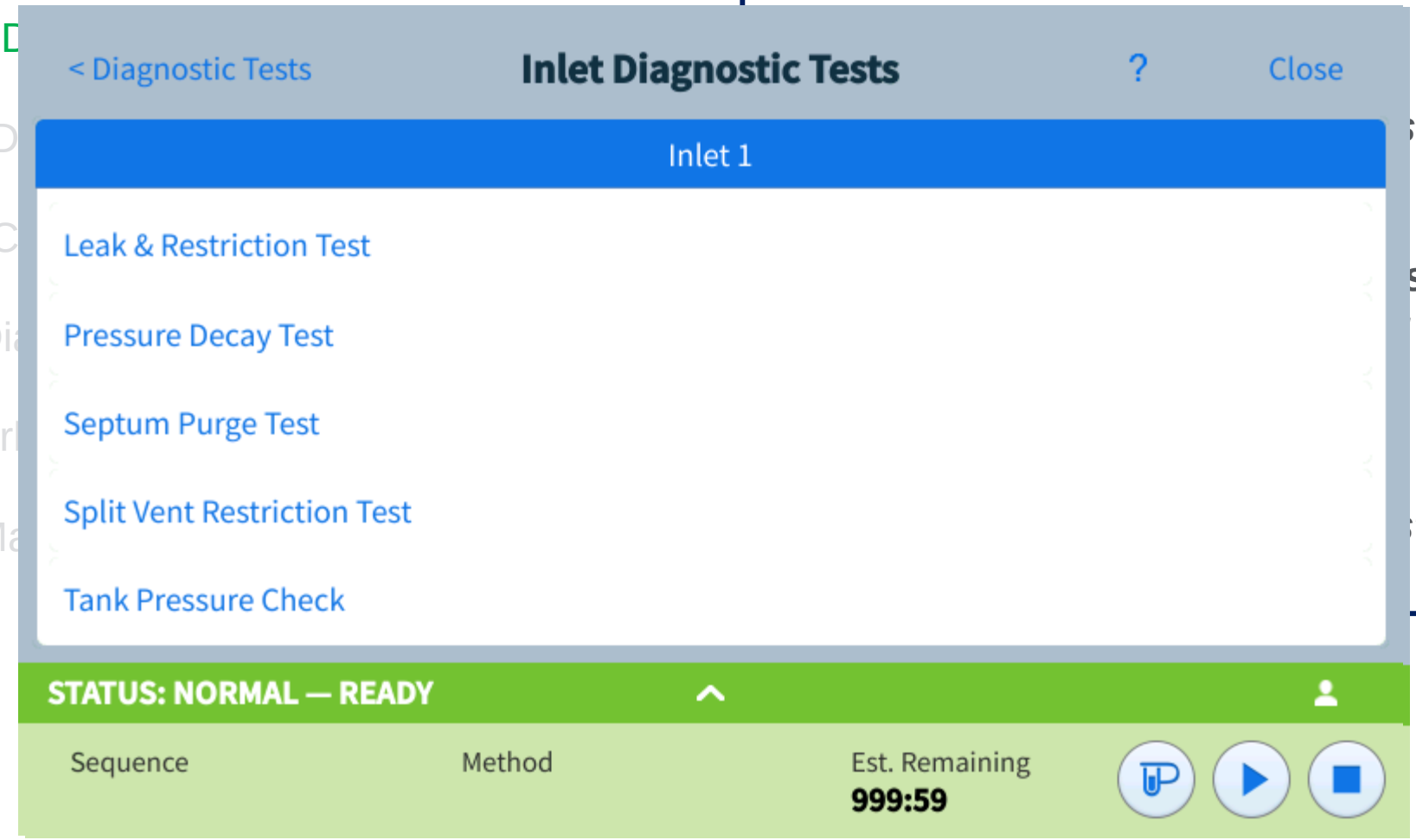

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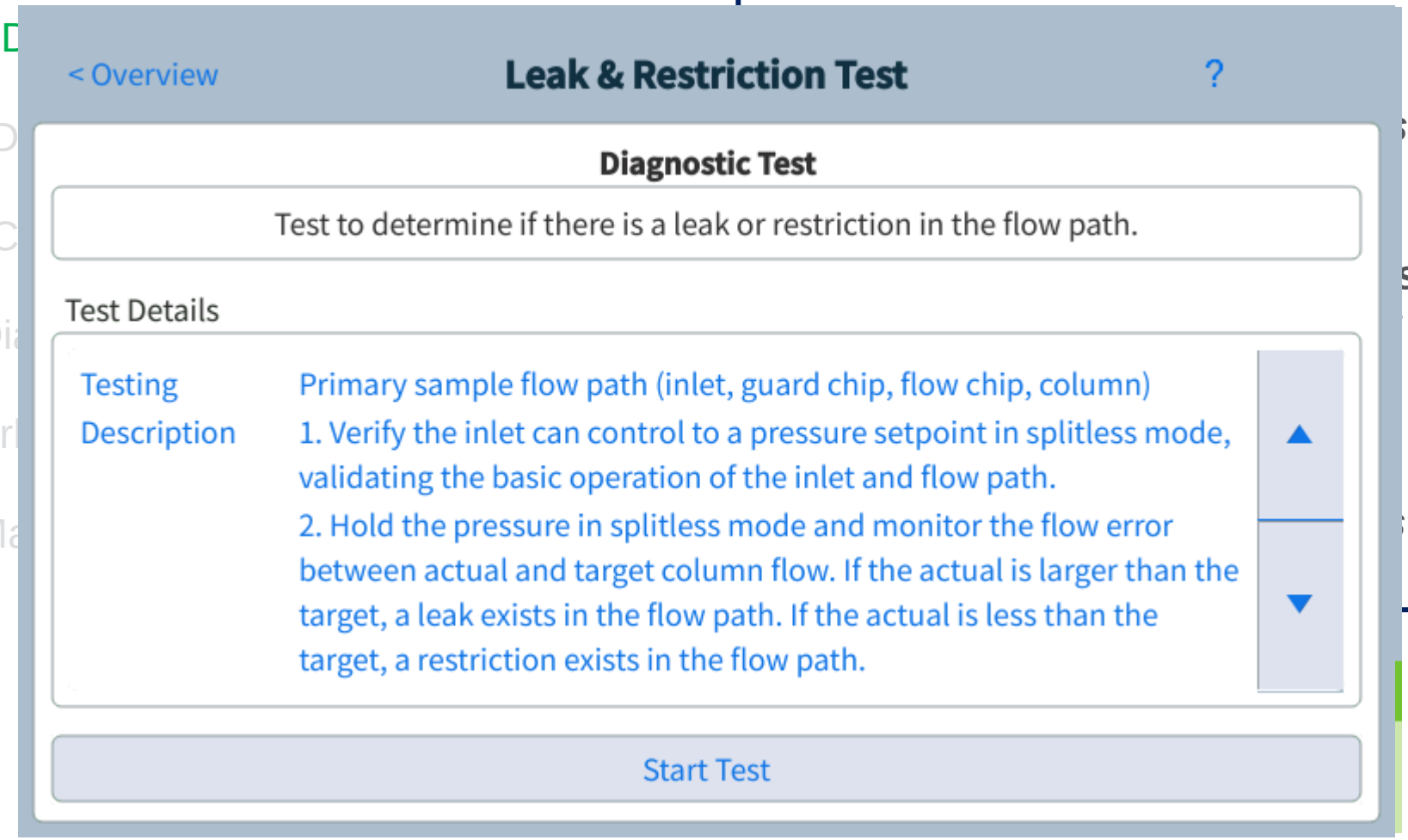

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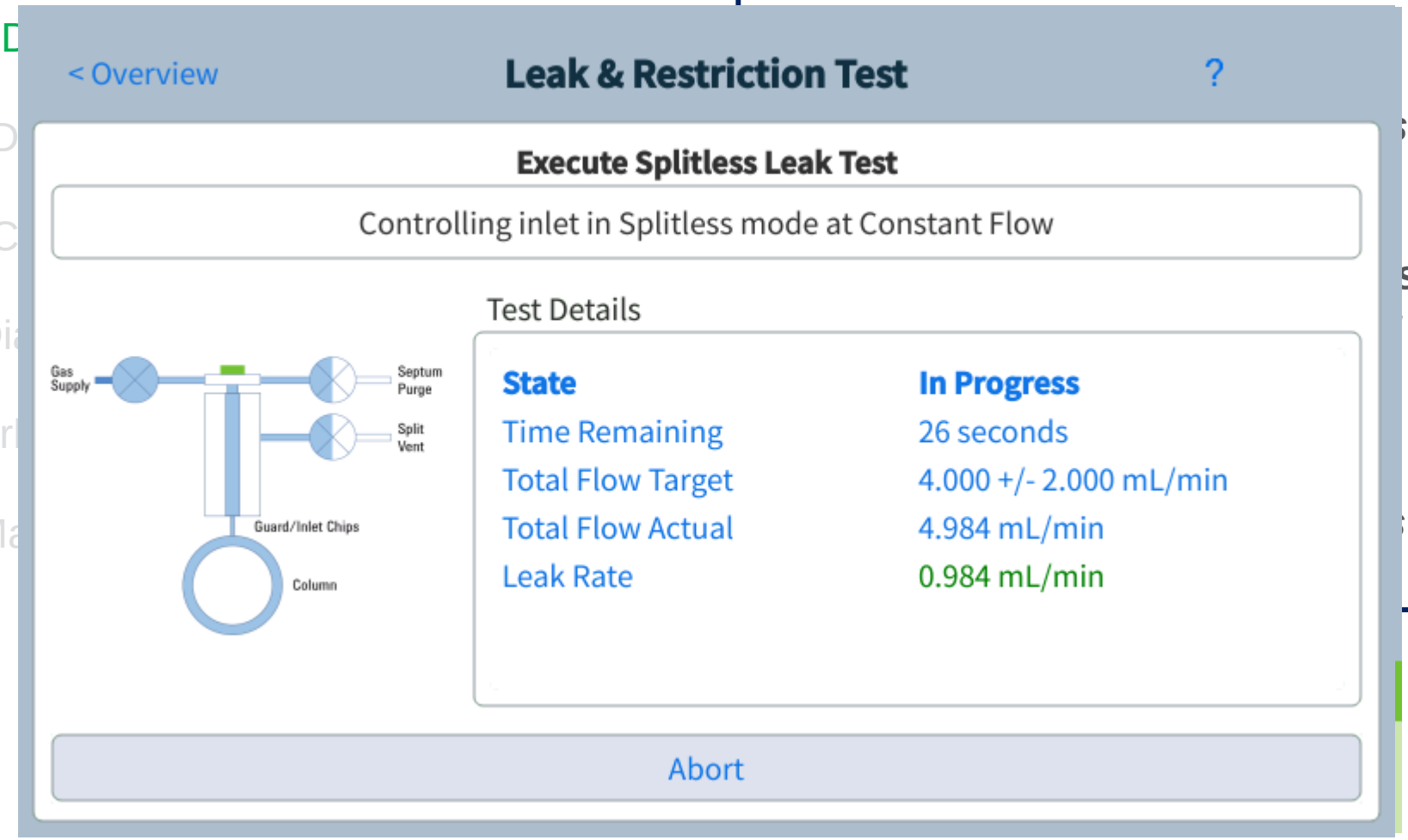

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User configurable tests in method/sequence or instrument settings

Inlets

Pre Run Flow Test

While the ALS is preparing the sample, flip the inlet control into forward pressure mode (ie. Splitless) and verify the total flow against the calculated column flow.

Periodic Split Vent Restriction Test

While the instrument is idle (30 minutes of sequence inactivity), execute a split vent restriction test after every 100 runs.

Pre Sequence Tank Pressure Check

Parse the methods in the sequence and determine the maximum inlet pressure required to execute the sequence. Verify the inlet can achieve this pressure before beginning the sequence.

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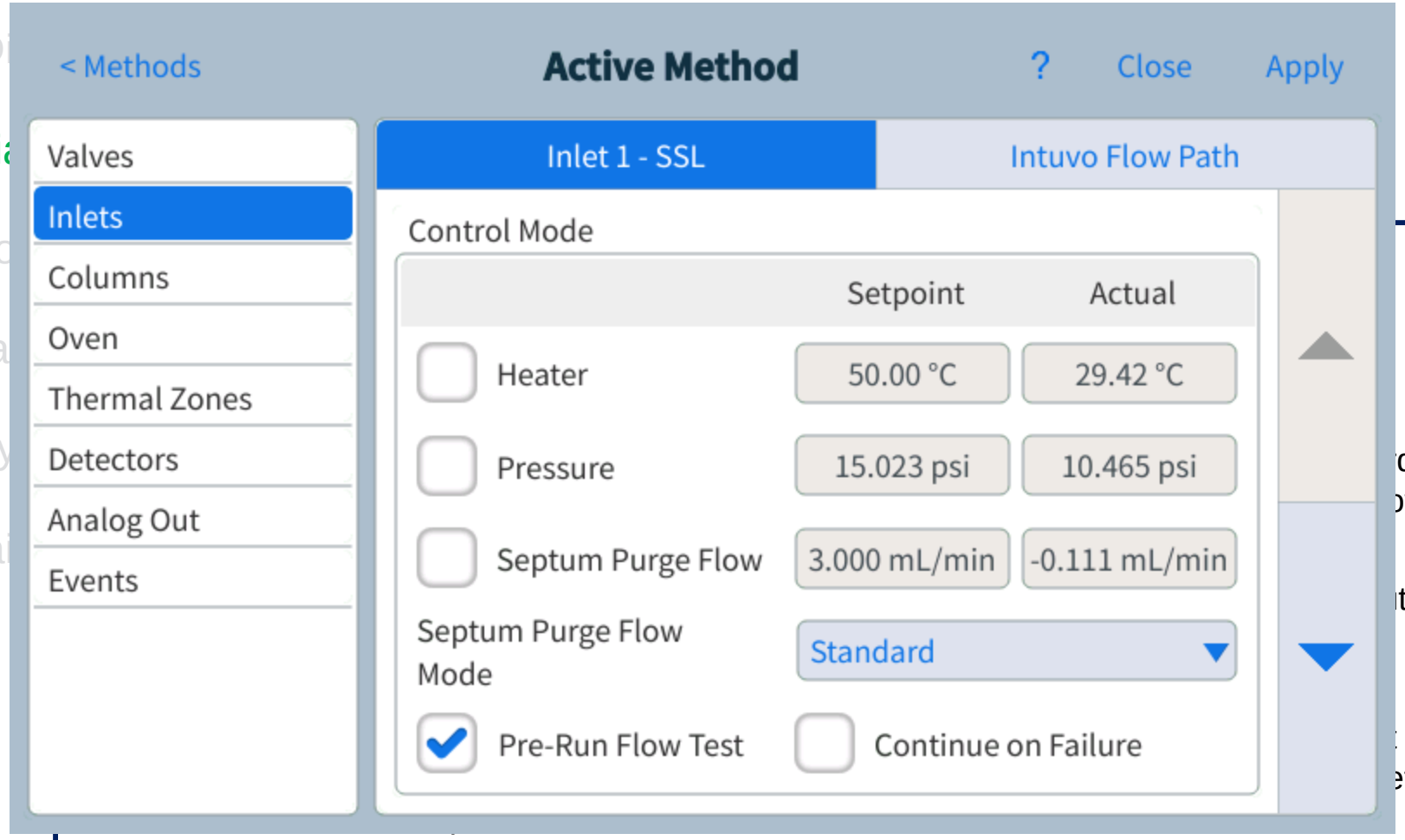

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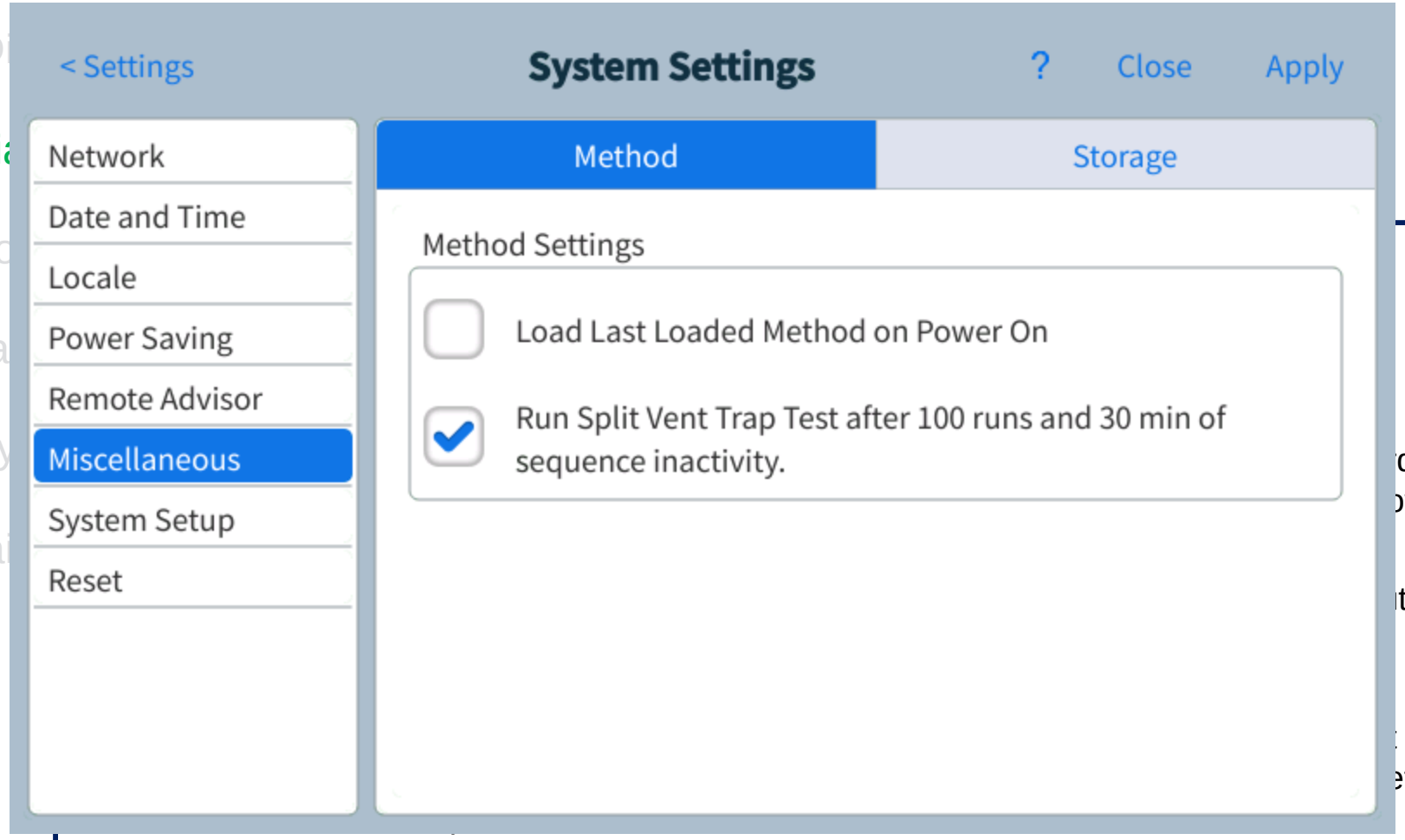

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Firmware continuously monitors and reports

- Detector
  - Supply Voltage
  - ADC References
  - FID Flameout
  - NPD Bead Open/Short
  - Igniter Open/Short
  - Collector Shorted
- Electronic Pneumatic Control (EPC)
- Thermal
  - Sensor Short
  - Open Sensor
  - Missing Heater
  - Wrong Heater
- Heater Current
  - Quiescent
  - Leakage
- Configuration mismatch
- Line Voltage Monitor
- Actuator Movements

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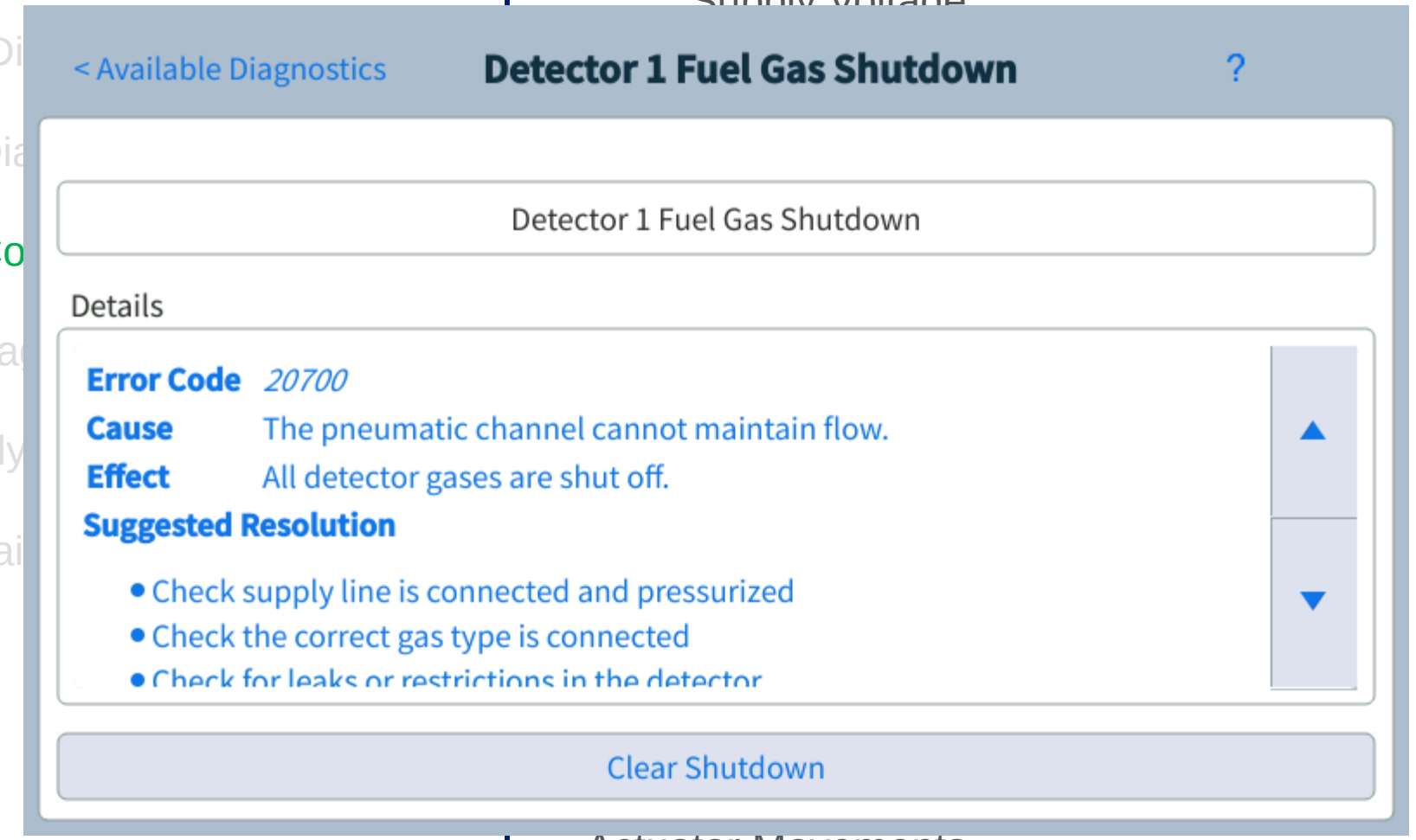

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A subset of conditions have troubleshooting trees defined onboard to aide the user to a resolution

Inlet Pressure Shutdown
System Unstable
Installation Inconsistencies
Tray Firmware Installation
Missing Flow Chip Information
Thermal Faults
Configuration Faults

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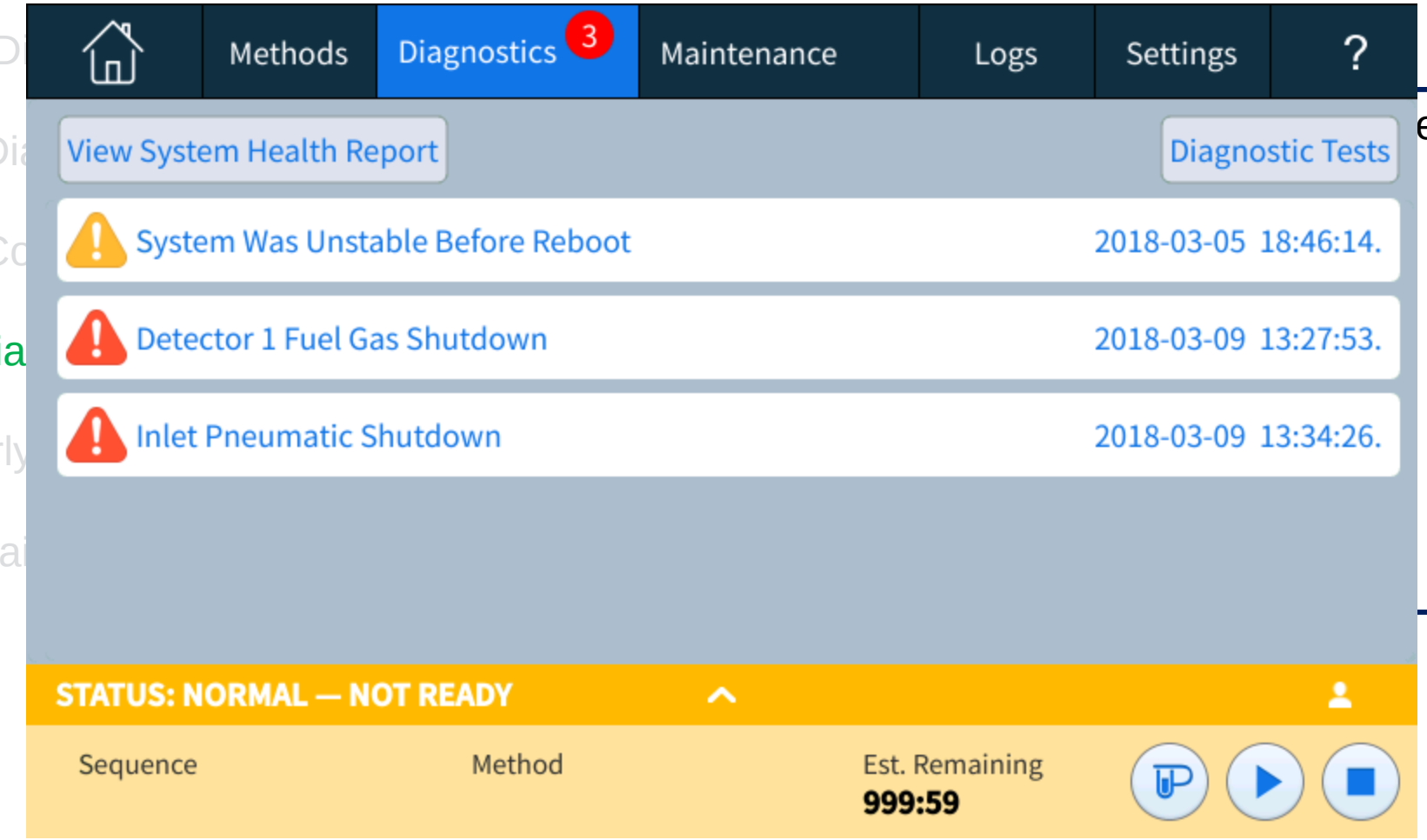

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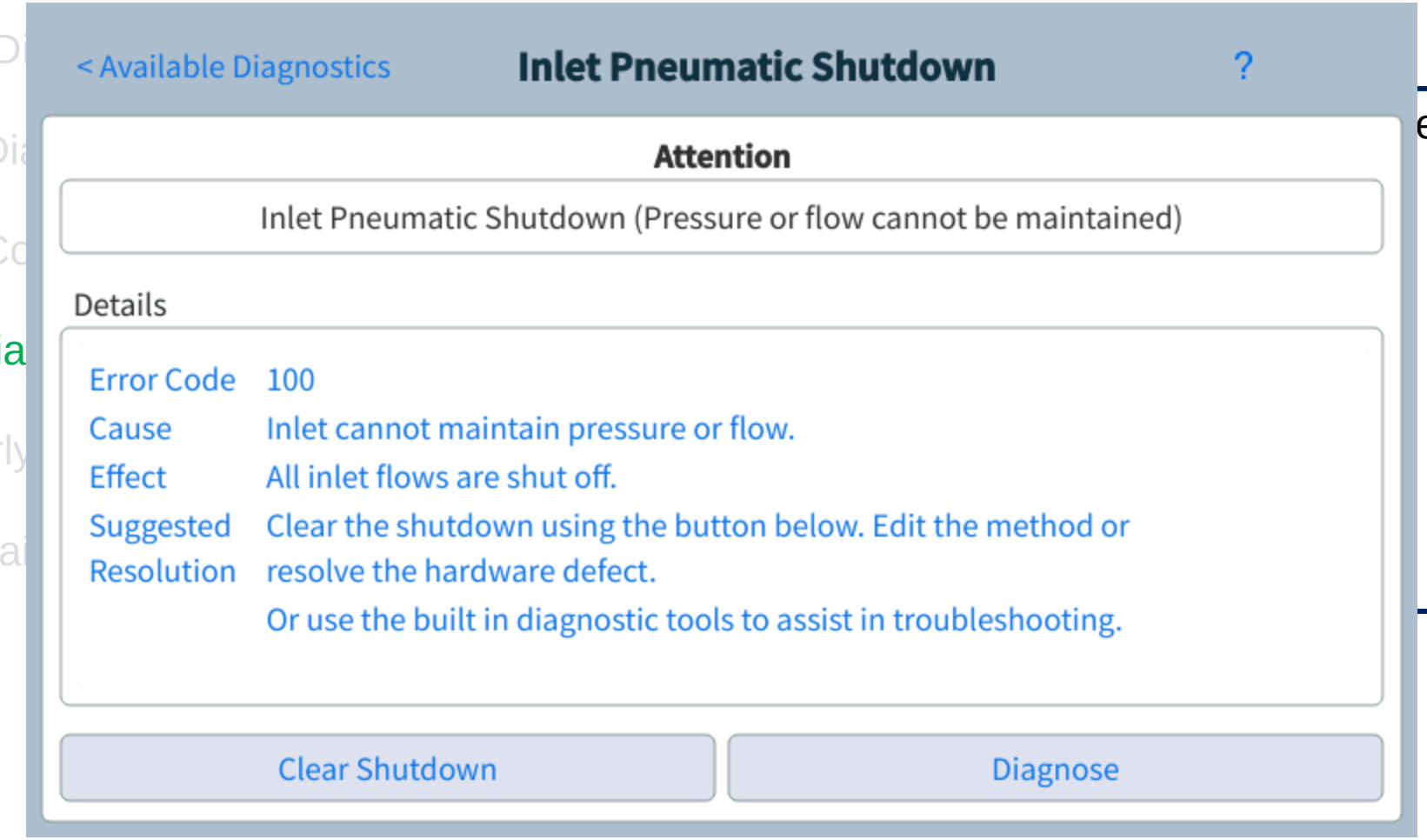

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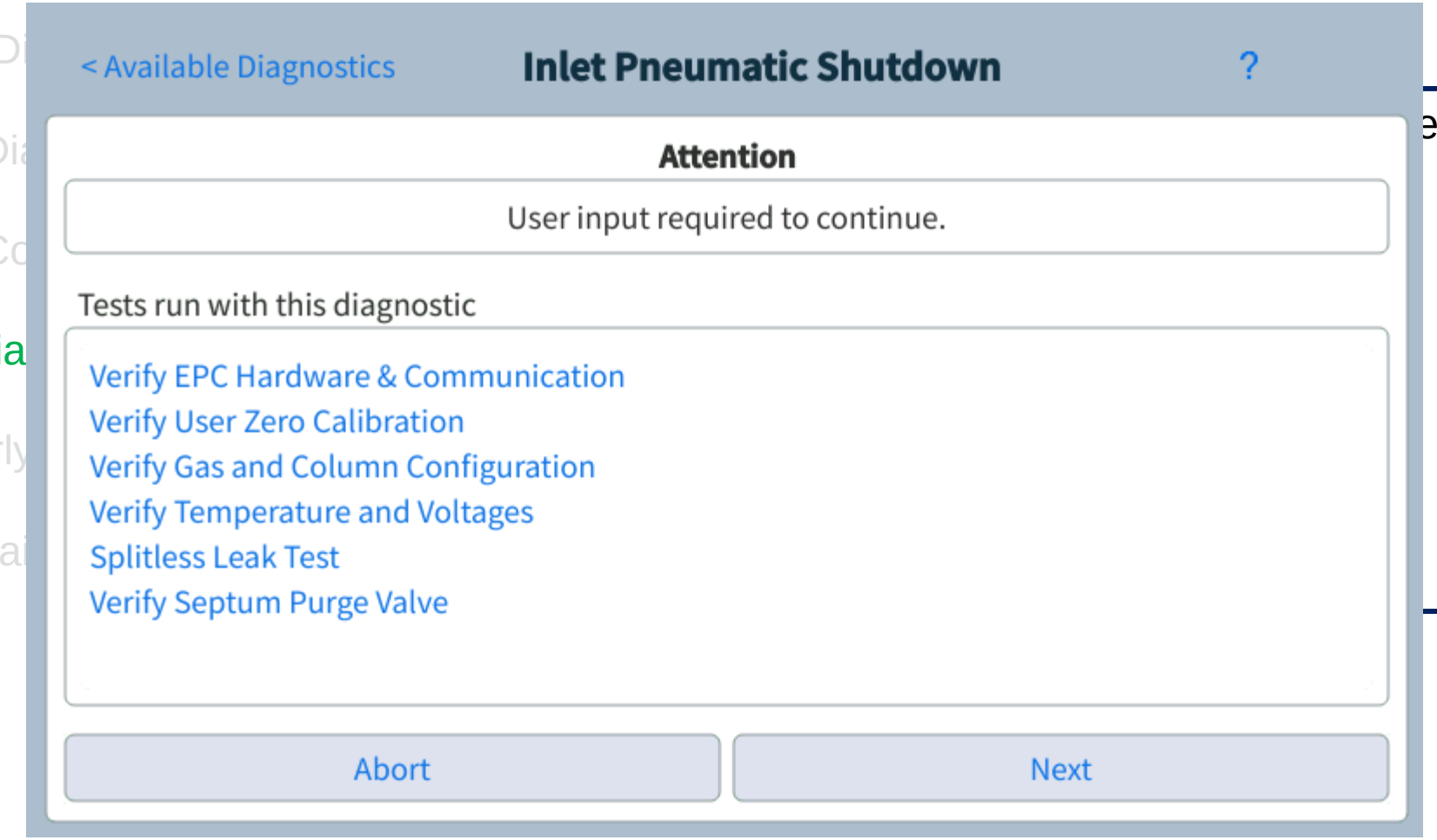

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A continuation of the 7890 implementation of EMF counters, several new counters were also introduced

52 counters supported

New Counters

Guard chip injections
Guard chip age
Detector tail injections
Detector tail age
NPD Applied bead current
Actuations
Disk usage
Instrument run time
Bus Injections
Bus Run count
Bus Time over max temperature
Bus Max applied temperature
Bus On time

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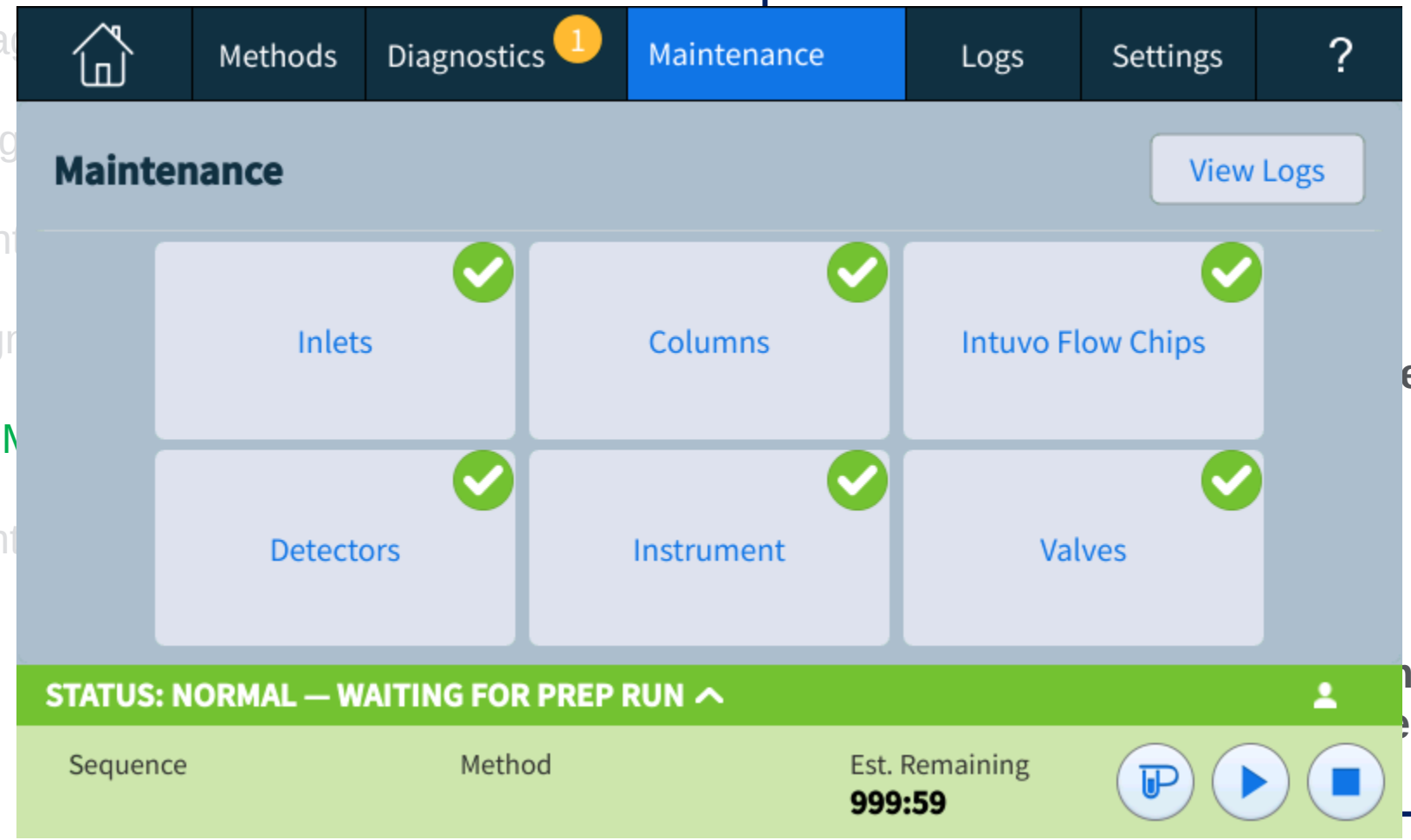

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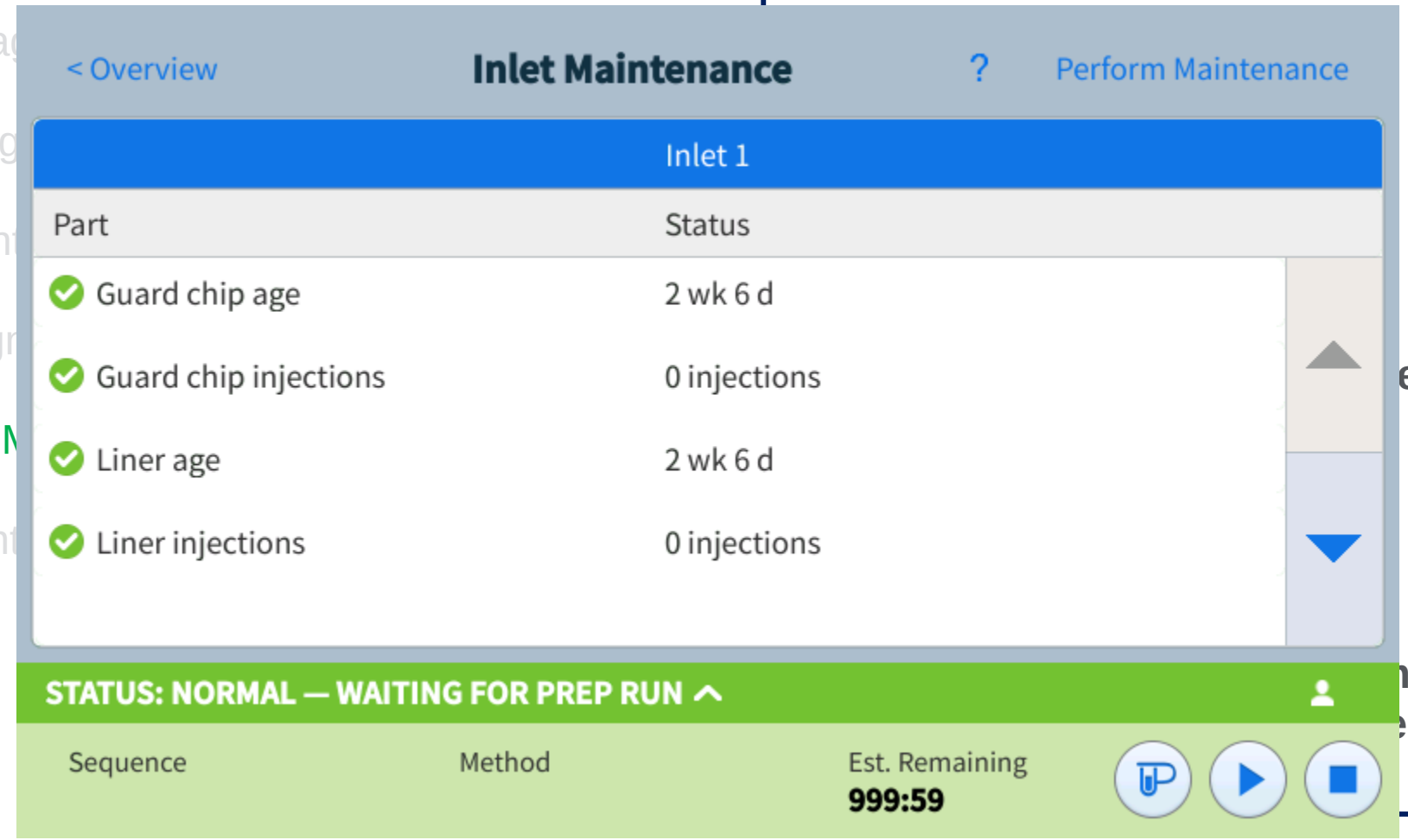

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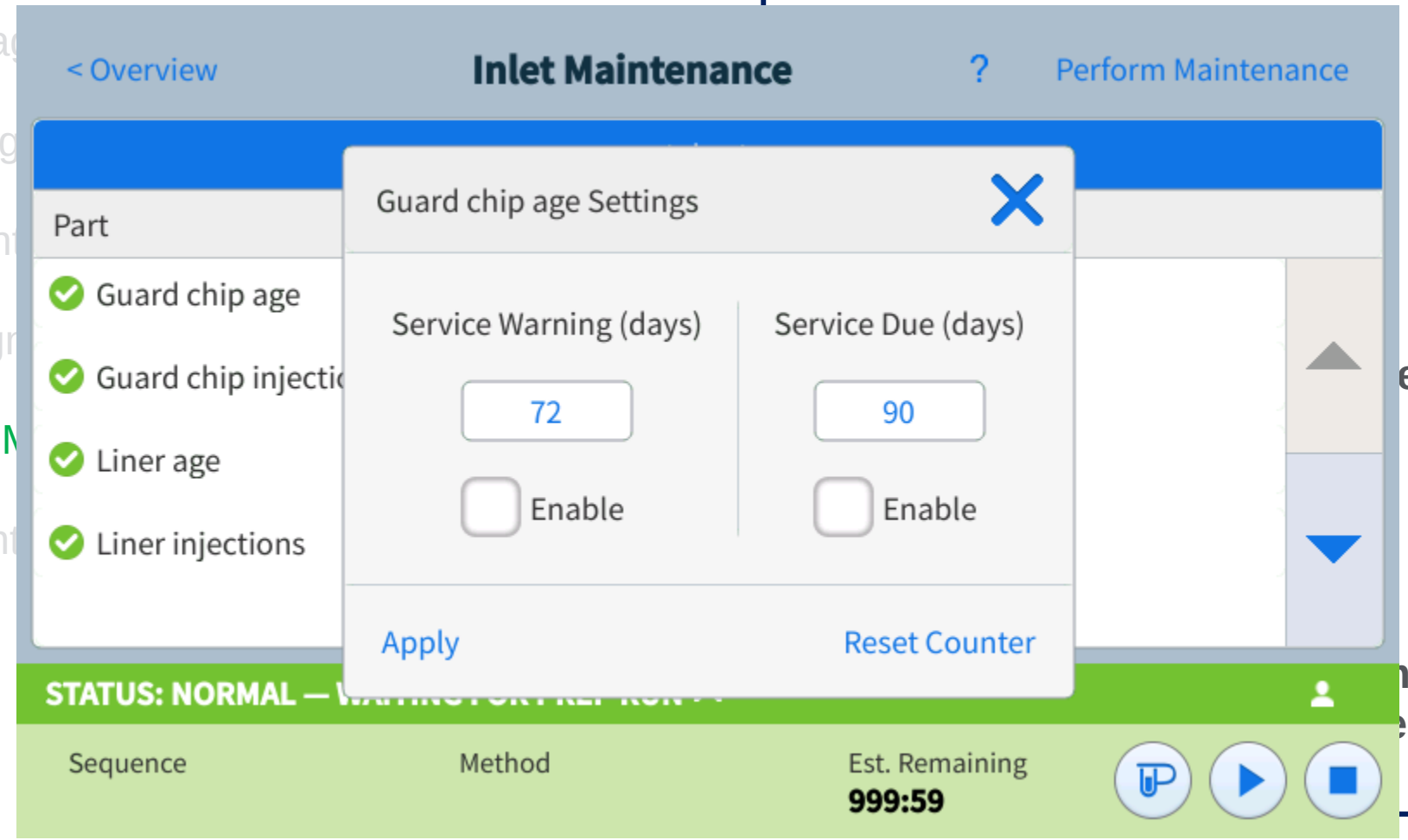

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Onboard procedures that provide the user with step-by-step instructions for performing maintenance. The service prepares the instrument by cooling zones, validates the work using diagnostic tests, and resets relevant EMF counters.

Inlet Replace Septa
Inlet Replace Liner
Inlet Replace Guard Chip
Inlet Replace Split Vent Trap
Inlet MMI Bleed Cryo Lines
Column Change Column
Detector Replace Detector Tail
Detector Replace FID Jet
Instrument Maintenance Mode

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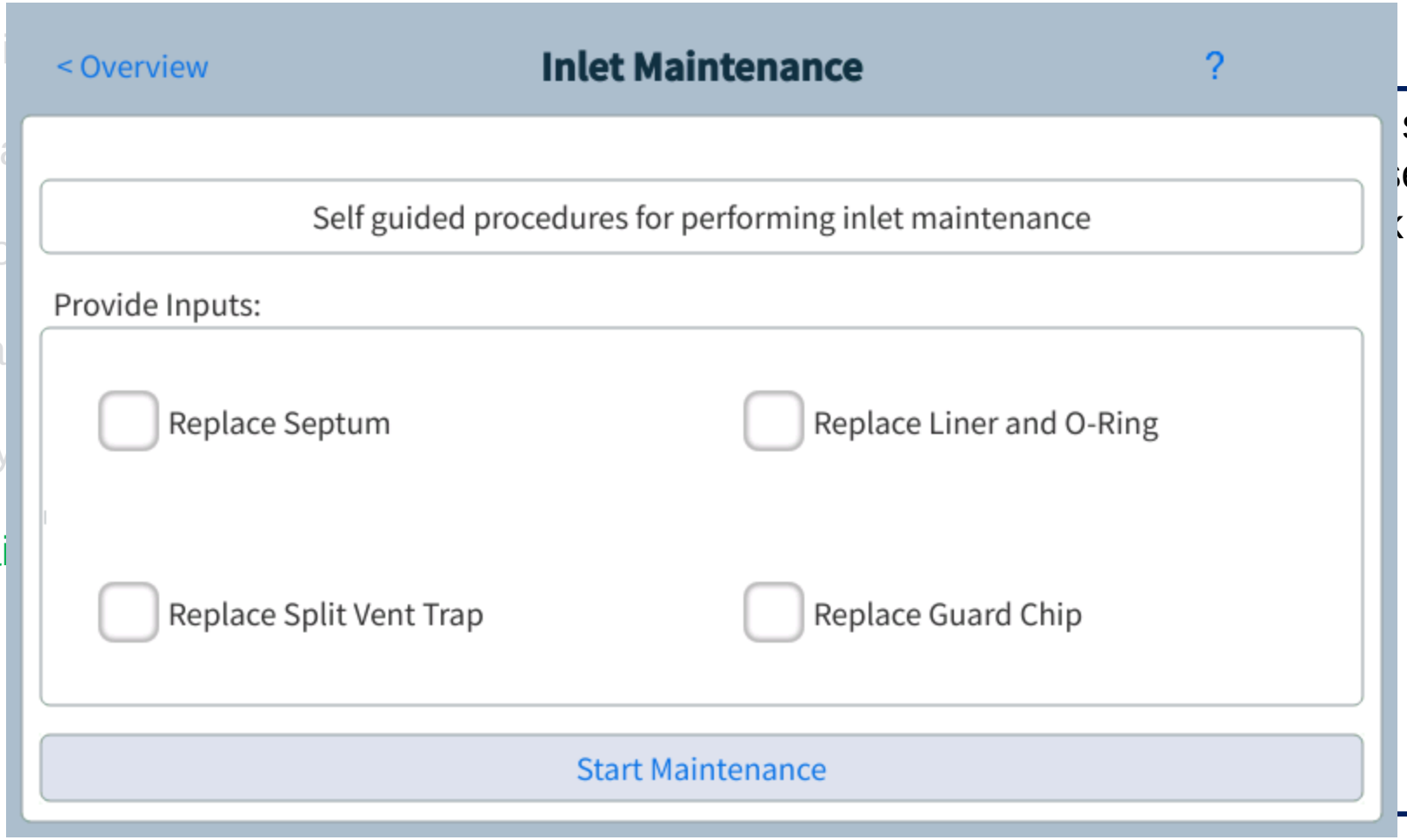

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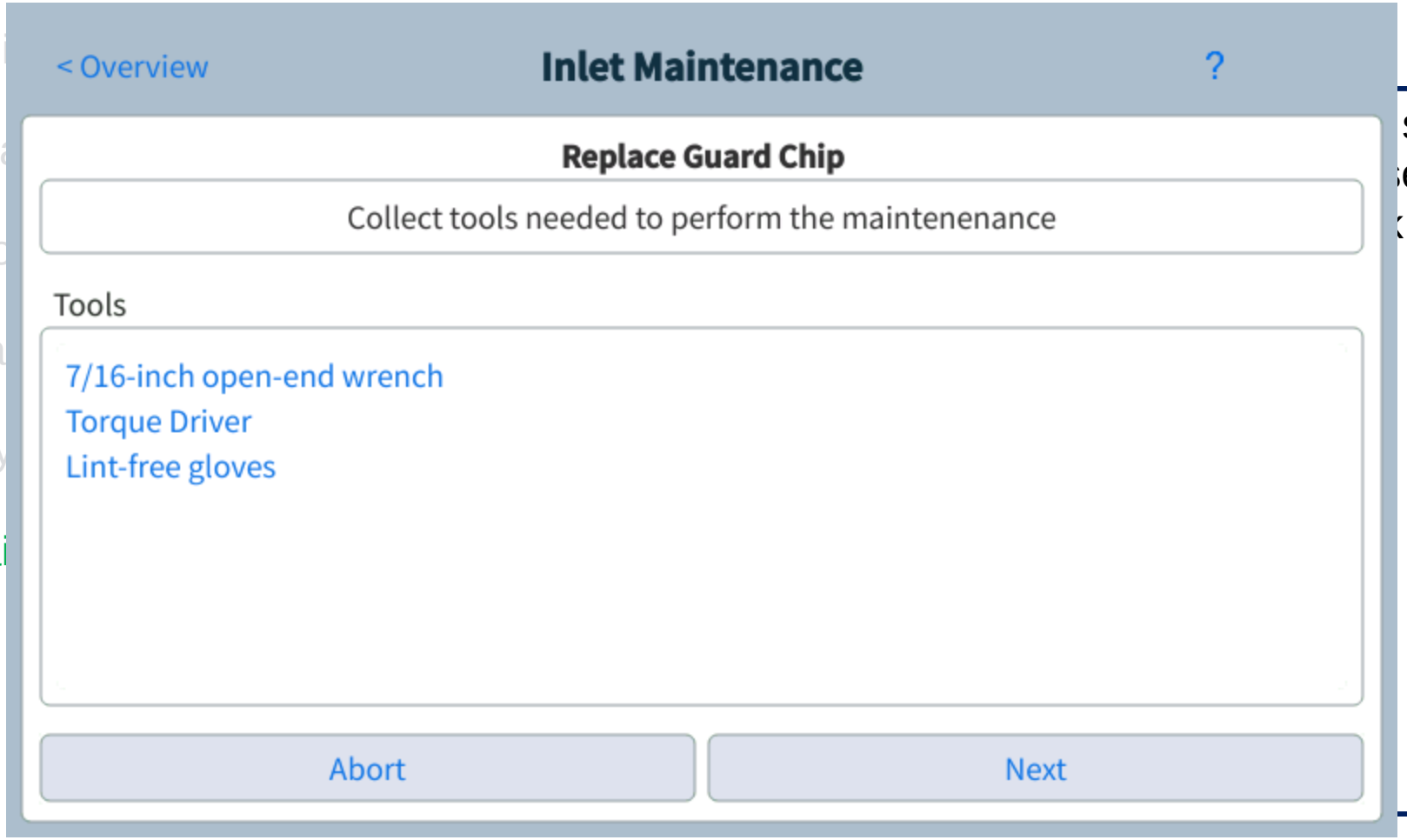

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< Overview

Inlet Maintenance

?

Replace Guard Chip

Preparing for maintenance, cooling down the heated zones...

Procedure

Waiting for these zones to become ready. Estimated time remaining : 8.7 minutes

Zone	Threshold	Actual
Inlet	50 C	92.030 C
Guard Chip	50 C	28.750 C
Bus	50 C	30.730 C
Little Bus	50 C	30.790 C
Column Connector 1	50 C	29.310 C

Abort

Ignore Ready

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Inlet Maintenance

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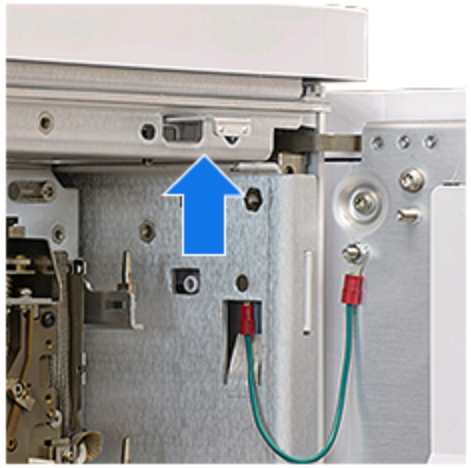
Open the guard chip cover



Procedure

1. Open the front door.
2. Remove the bus door.
3. Slide out the oven cover.

Abort | Back | Next

step-by-step
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The Browser Interface Allows Access to Everything the Touchscreen Does

While you are comfortably seated at your desk

- Accessible from Desktop, Laptop, or Tablet
- Outside Internet **NOT** required
  - Access via Corp. LAN
  - Can use wireless access pt.

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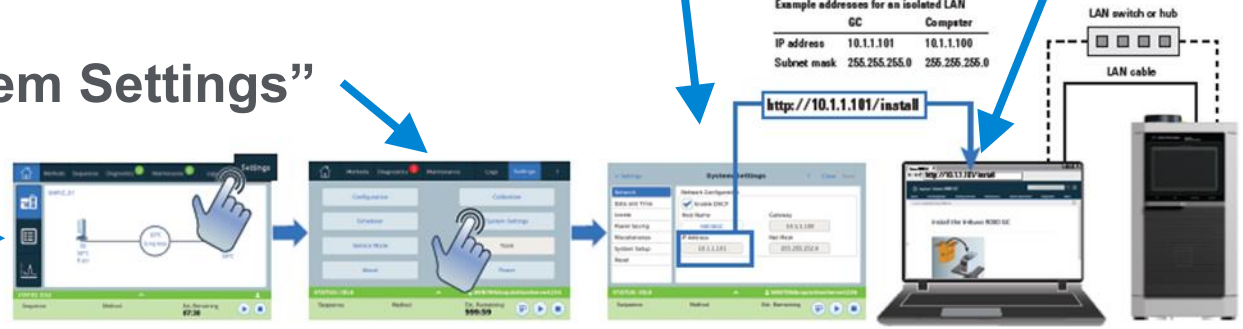
4. Enter into your browser address bar

3. Record IP Address Info.

2. Select “System Settings”

1. Access “Settings” tab



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Security
provided by your
Corporate IT Infrastructure.
(LAN, Corporate Intranet, VPN, etc.)

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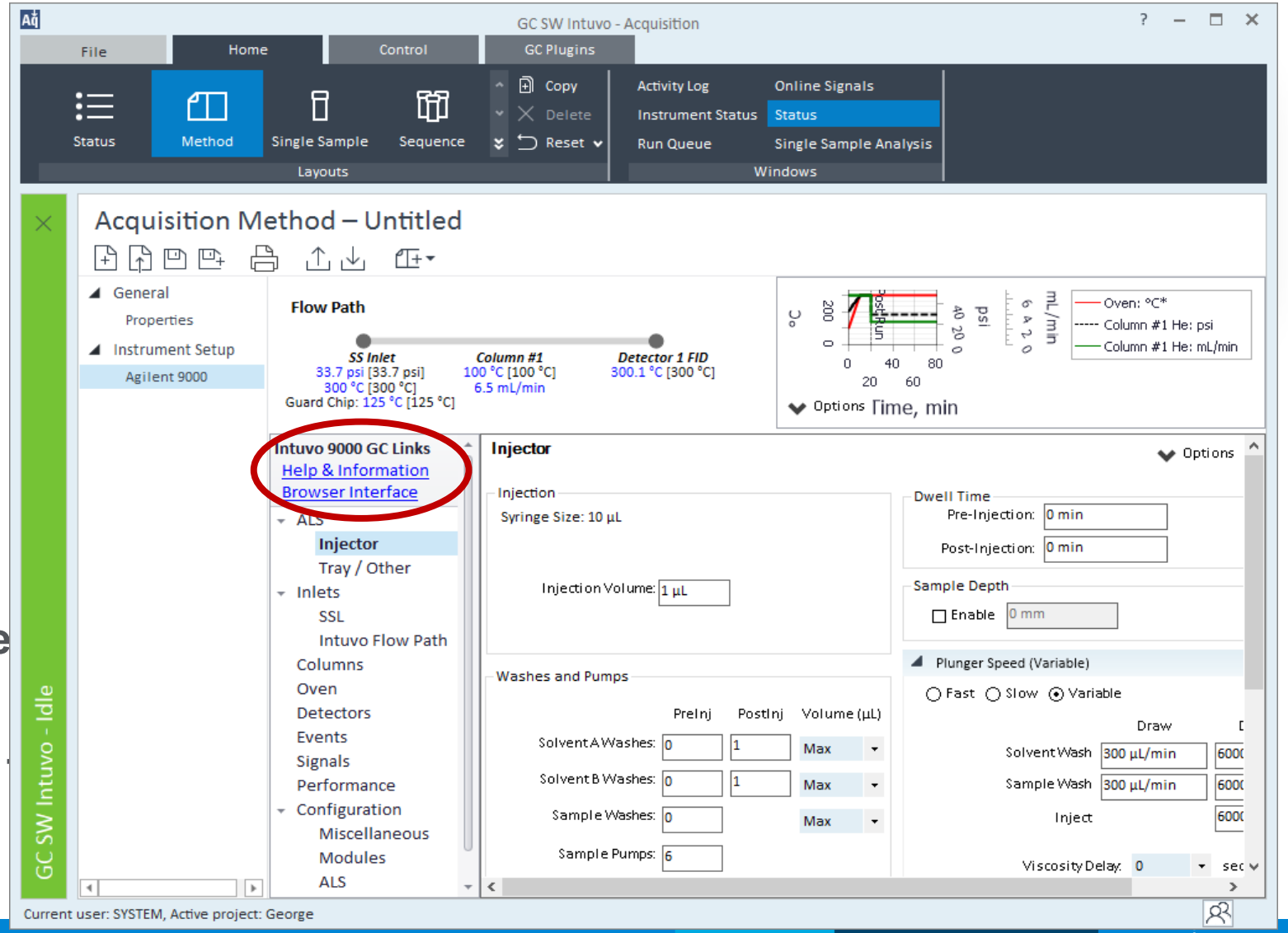

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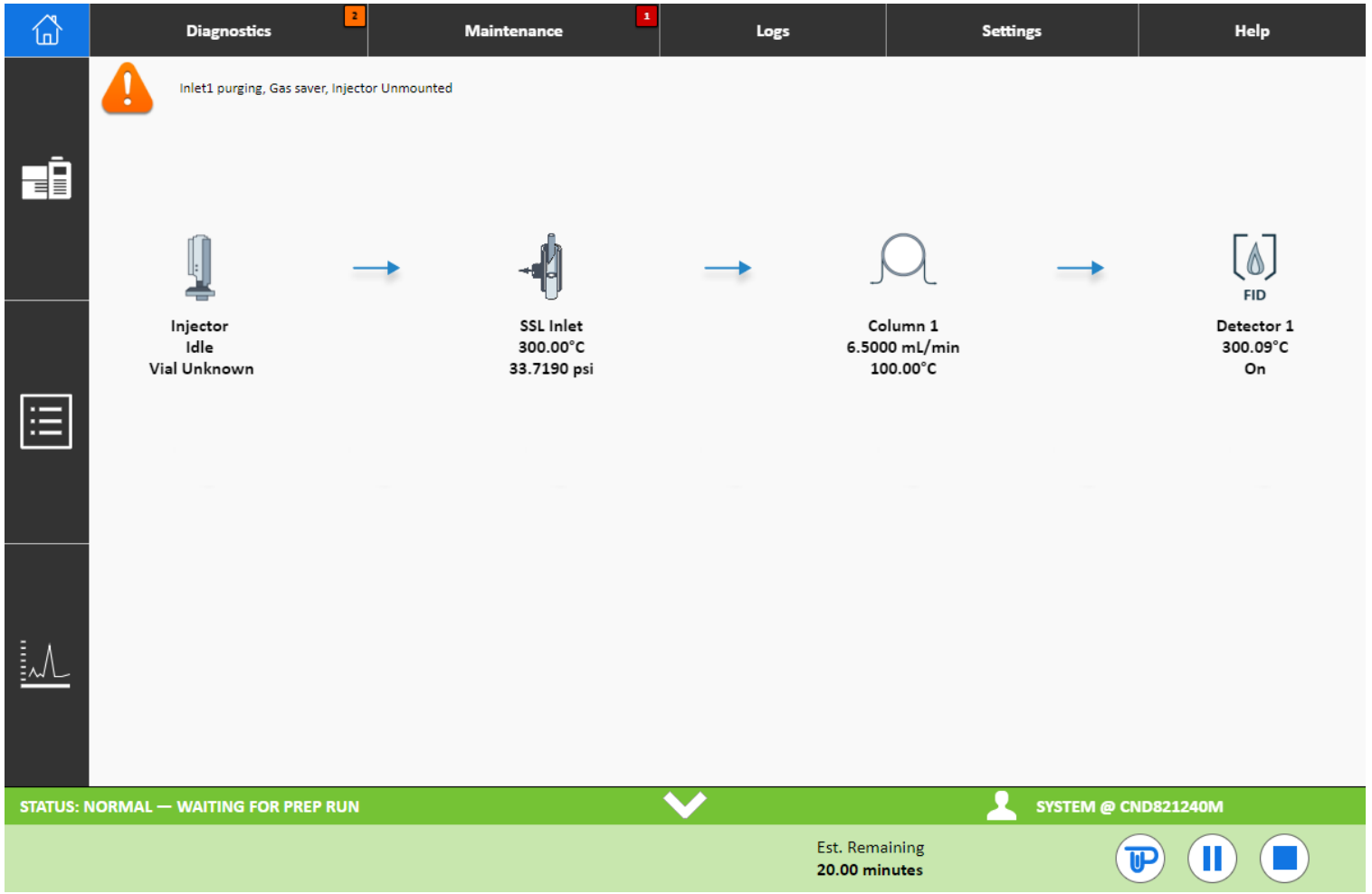
  - Maintenance (EMFs)
  - Logs
  - Help & Information



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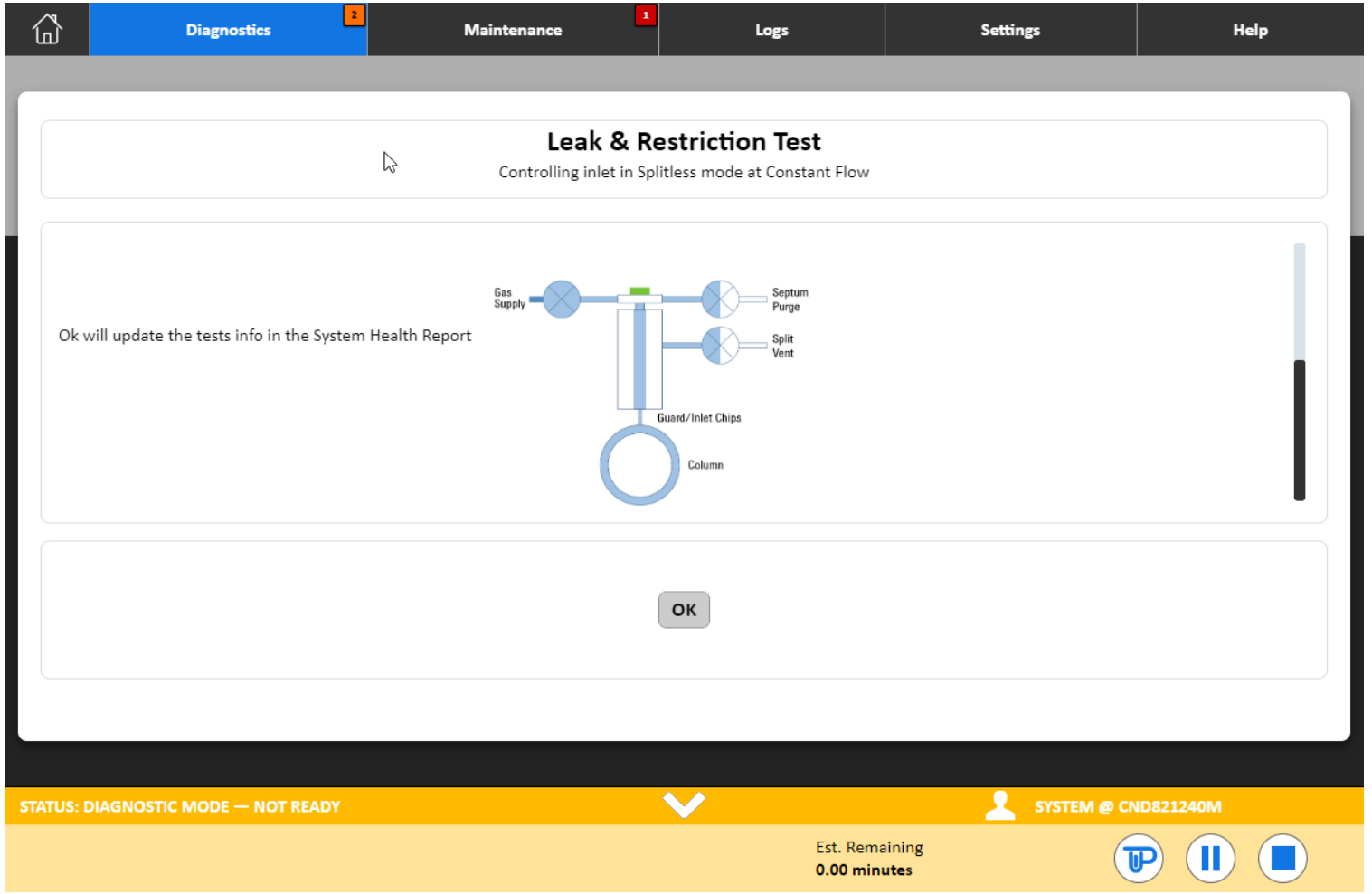

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  - Access via Corp. LAN
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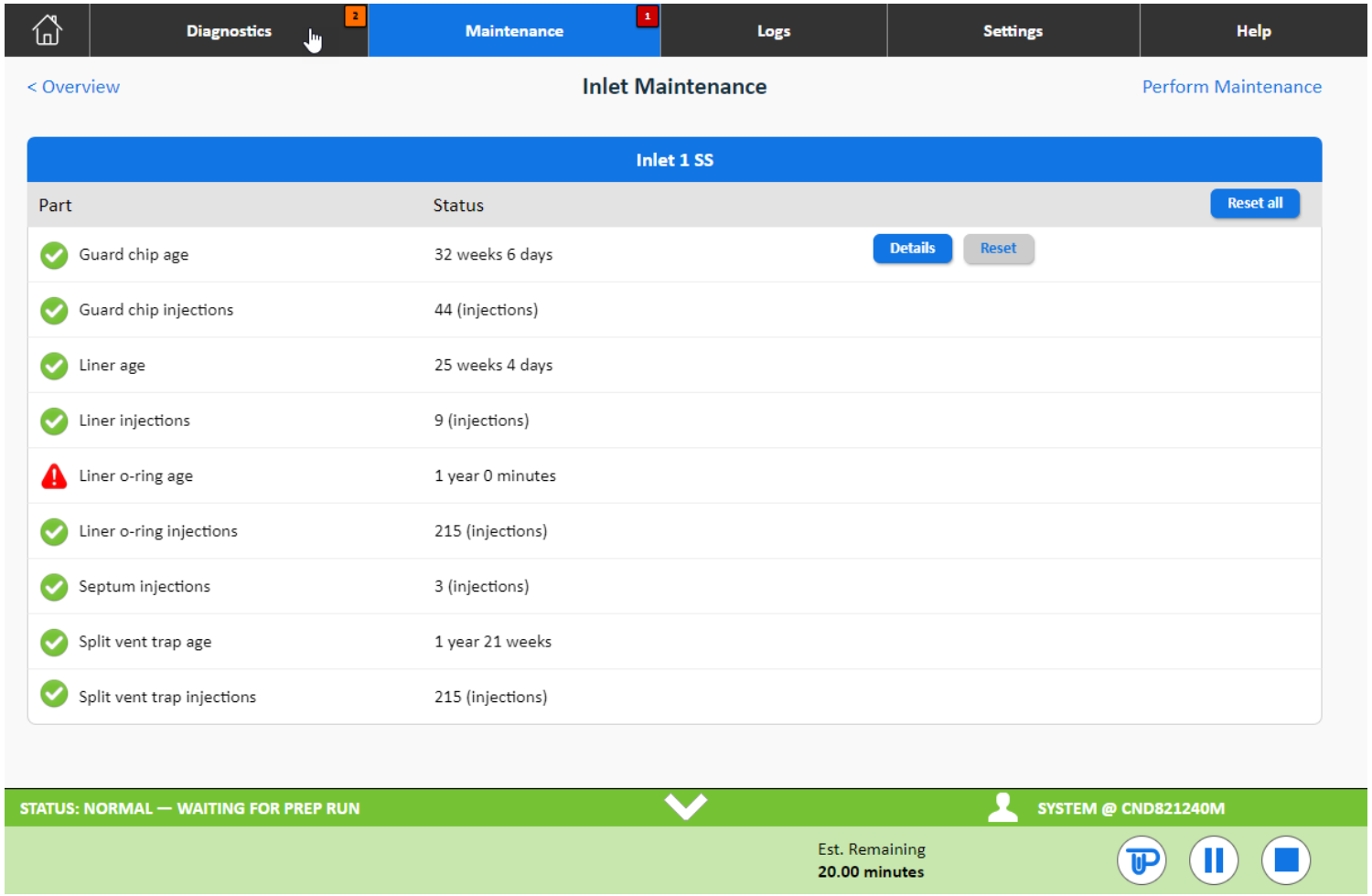

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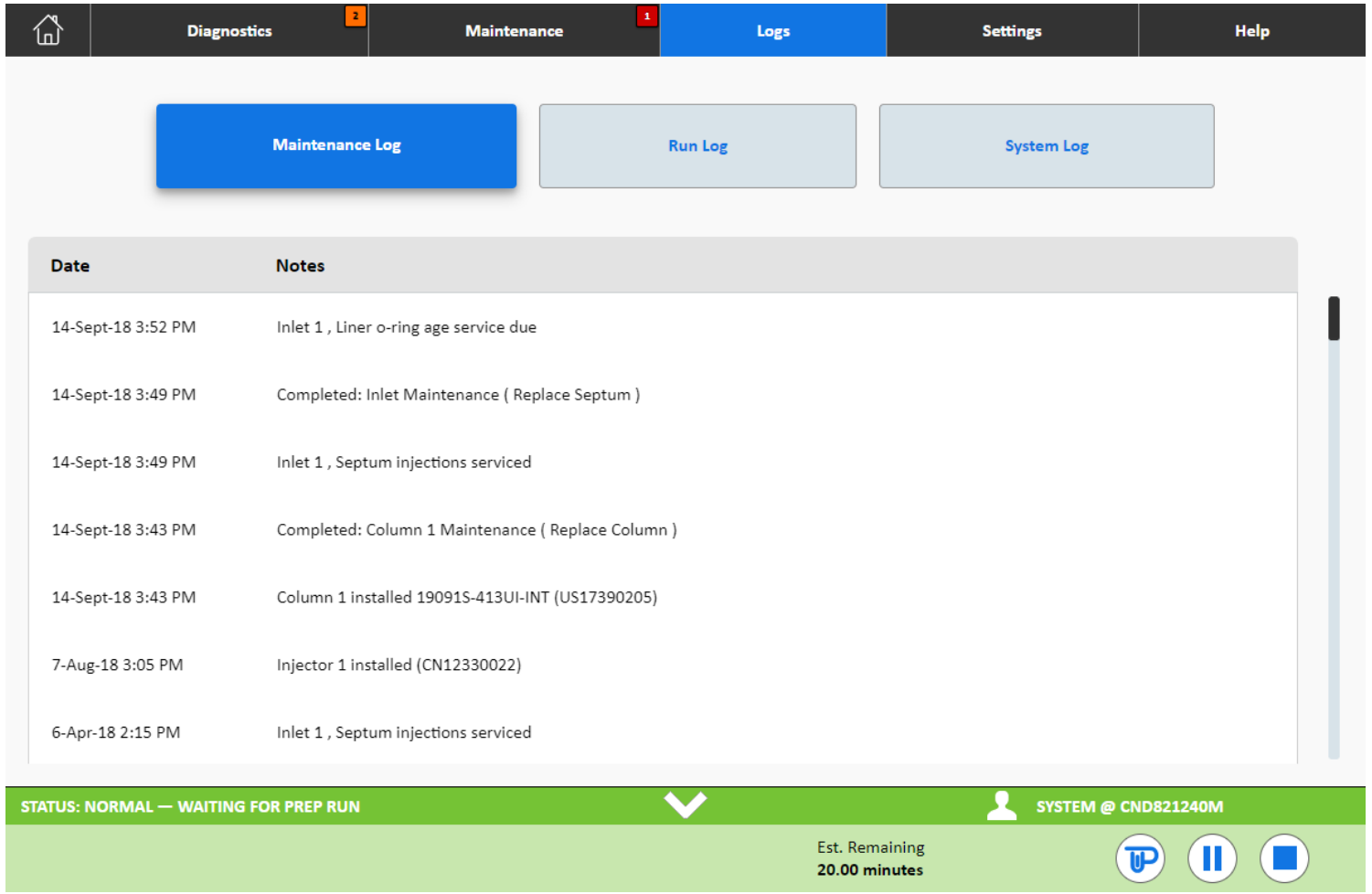

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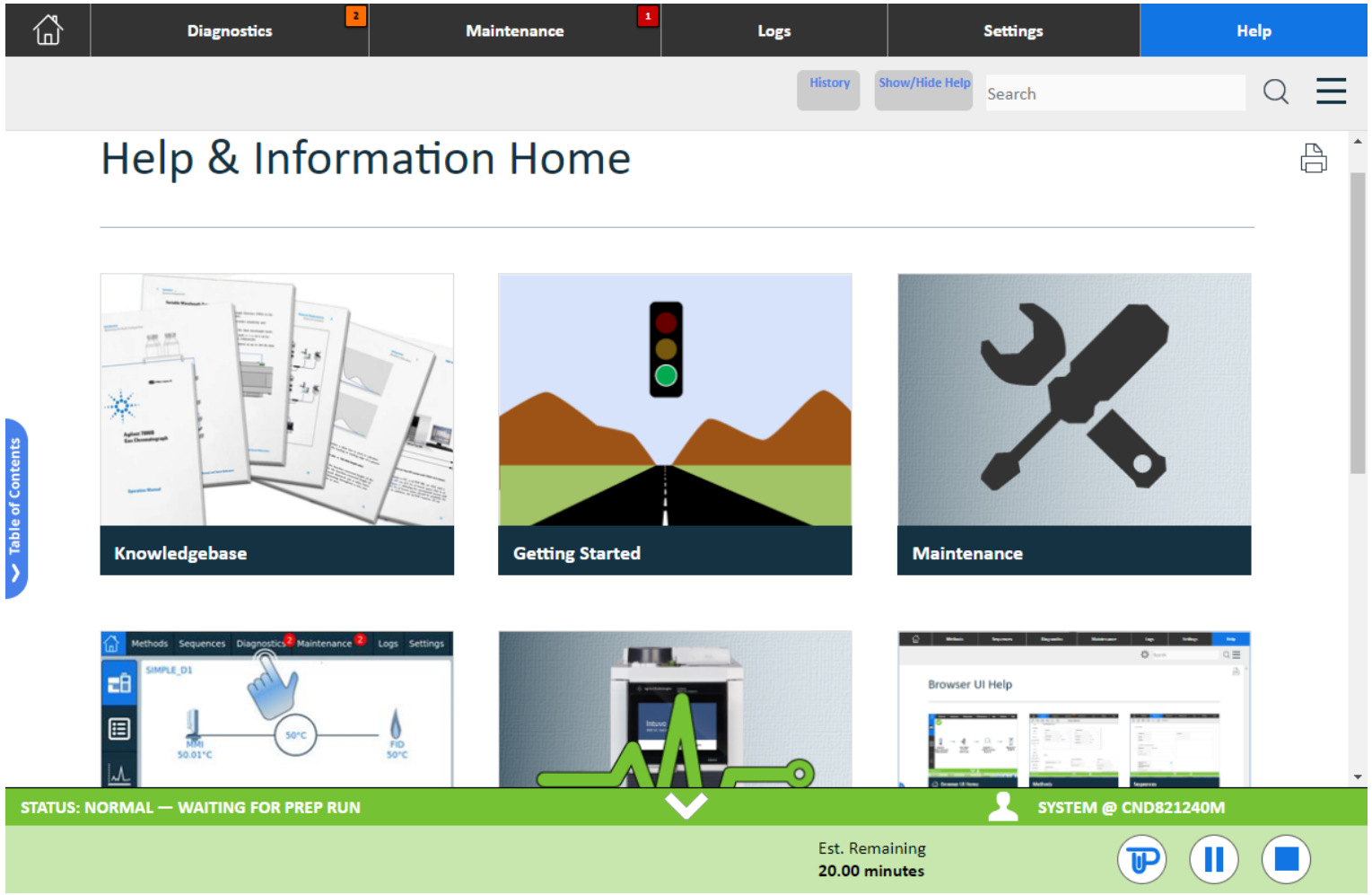
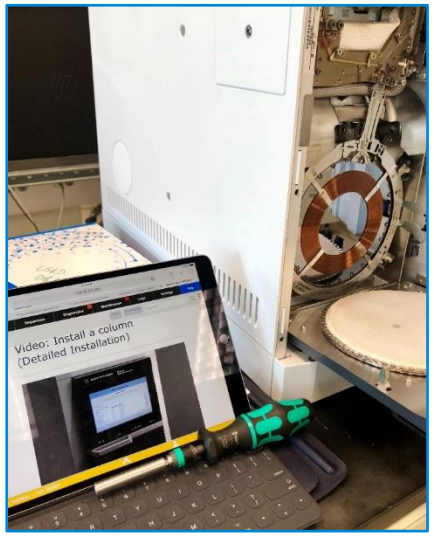


The Agilent GC Browser Interface

A convenient way to access your smart GC



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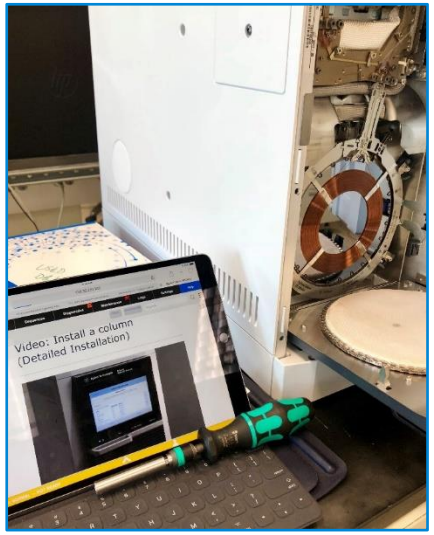

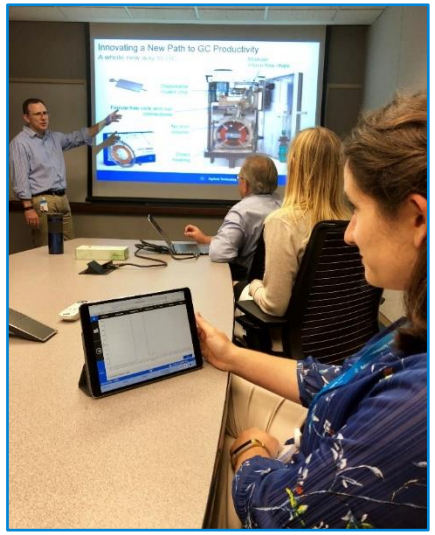

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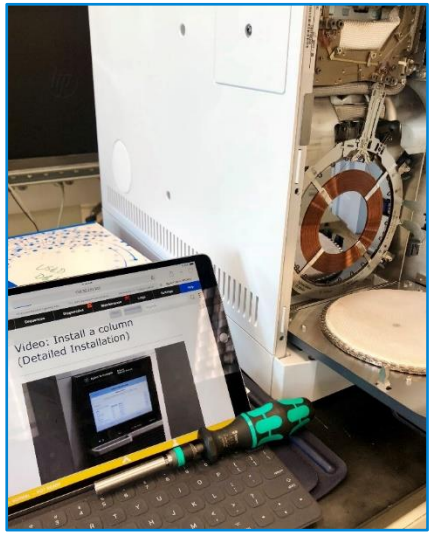

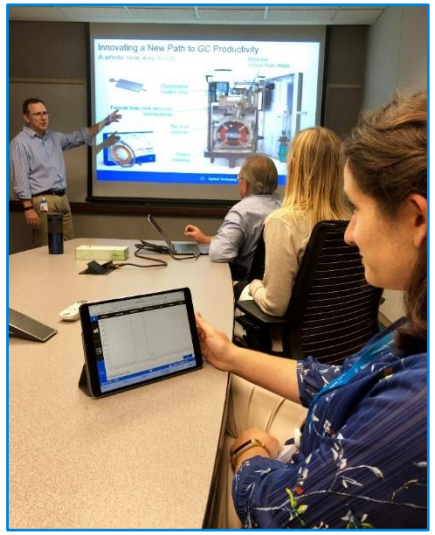

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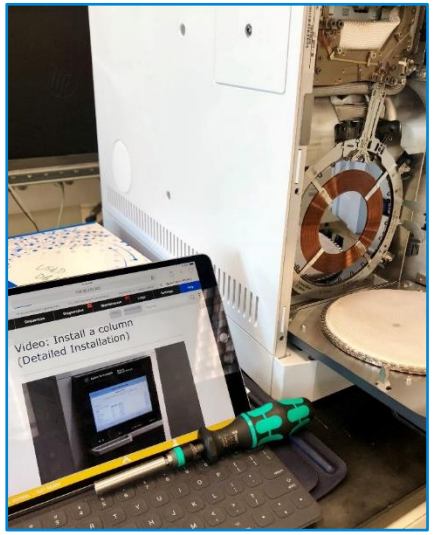

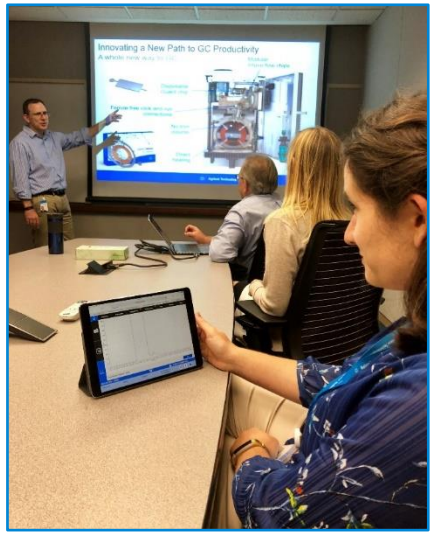

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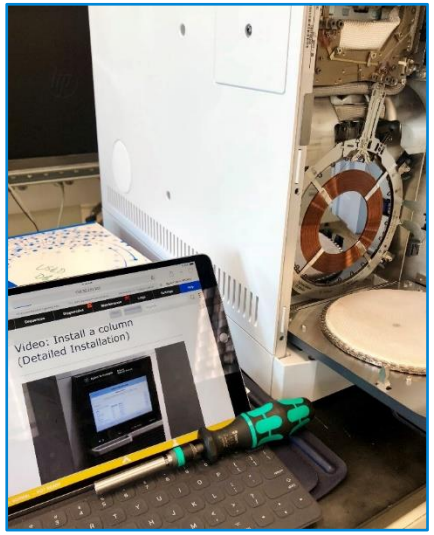

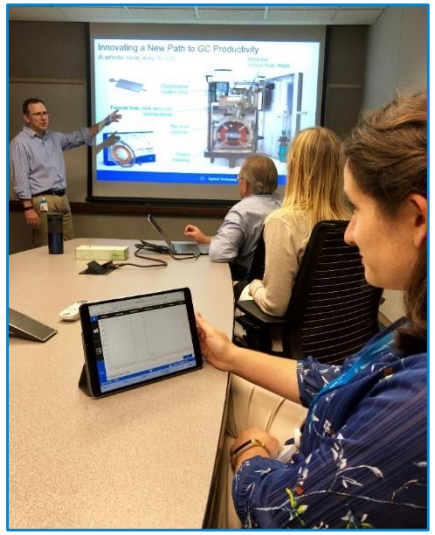

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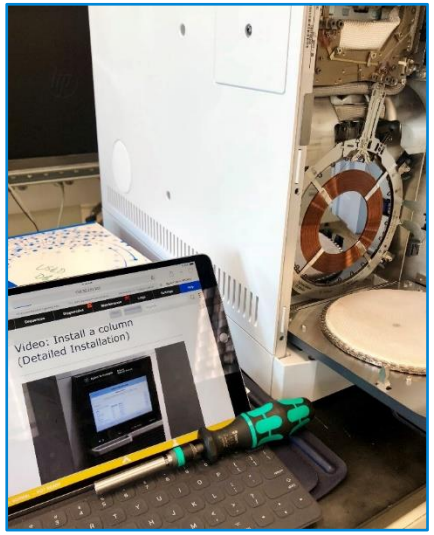

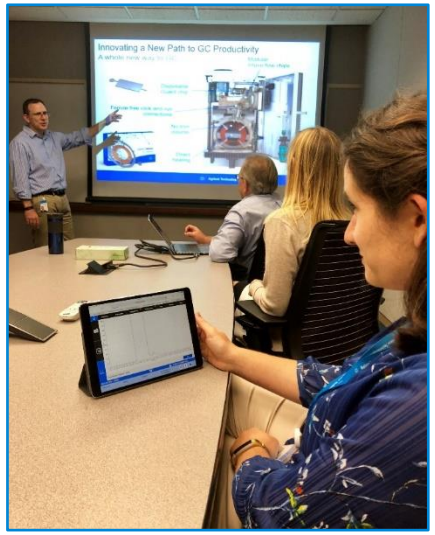



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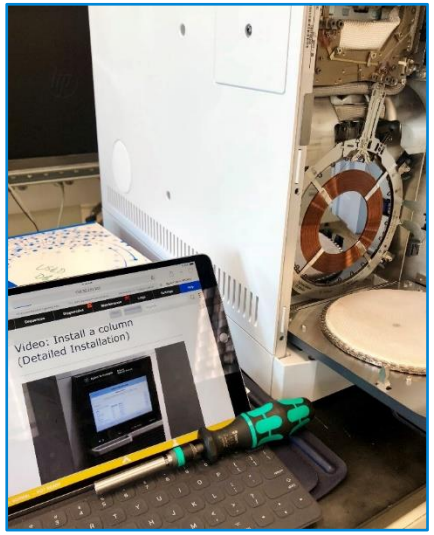

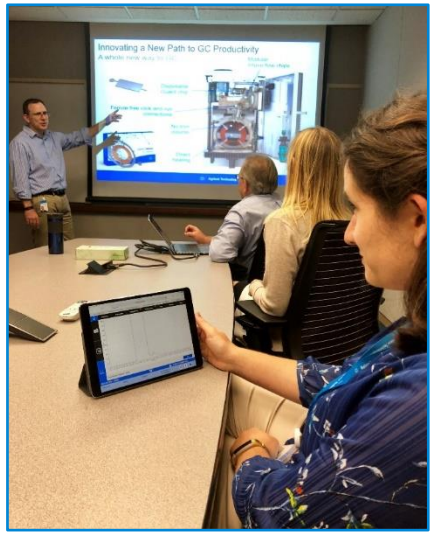



- You might not access your Smart GC from a boat or from Hong Kong
- But you can access it from wherever your network allows
  - Distant worksites sharing information
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On-Board Expanded Help & Information

Making help more helpful

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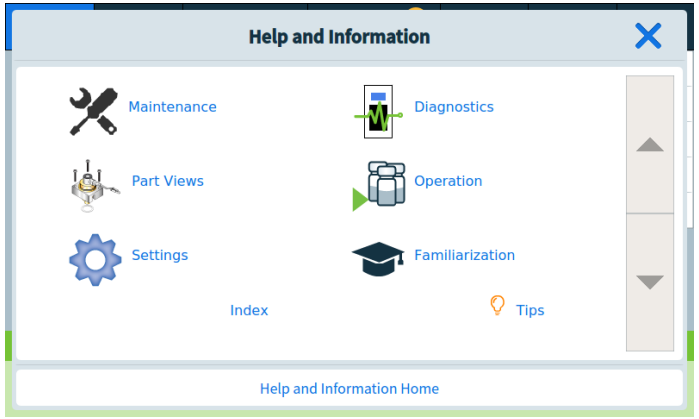

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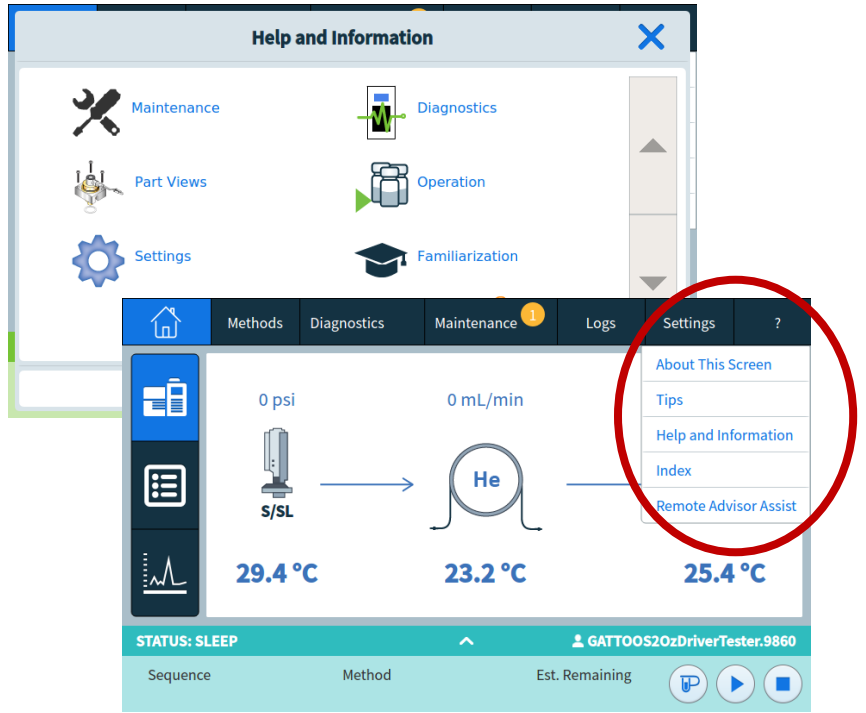

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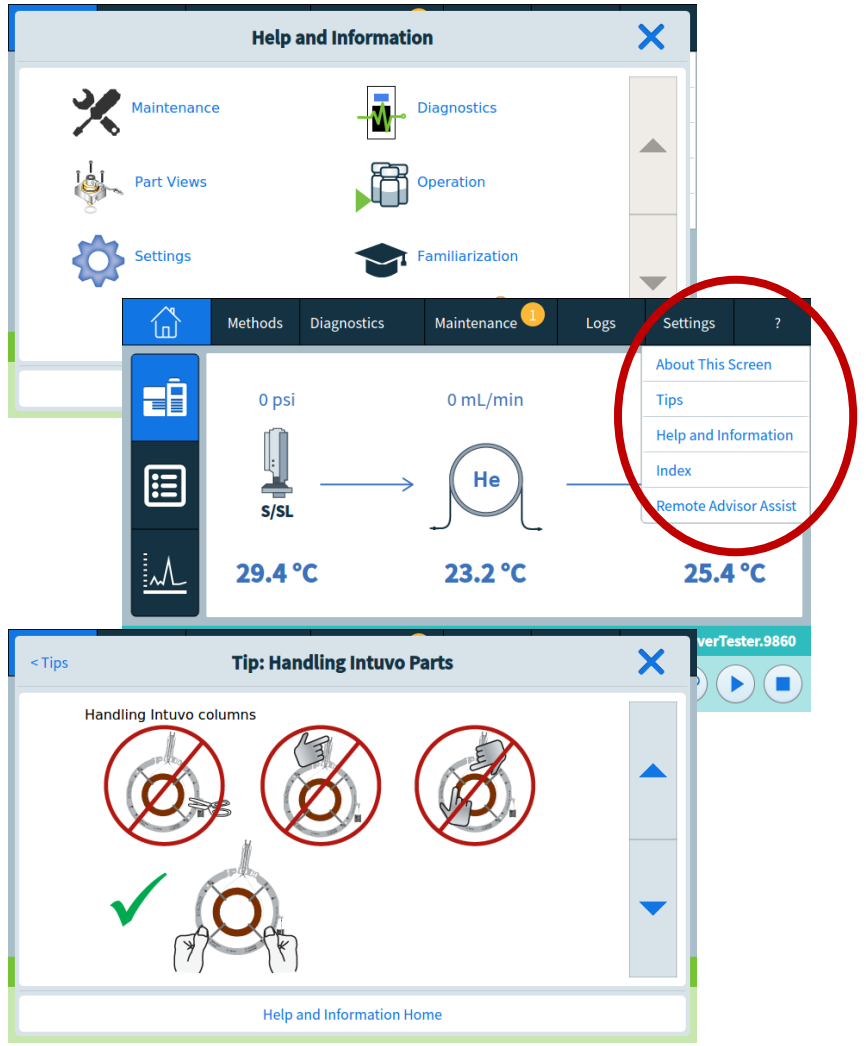

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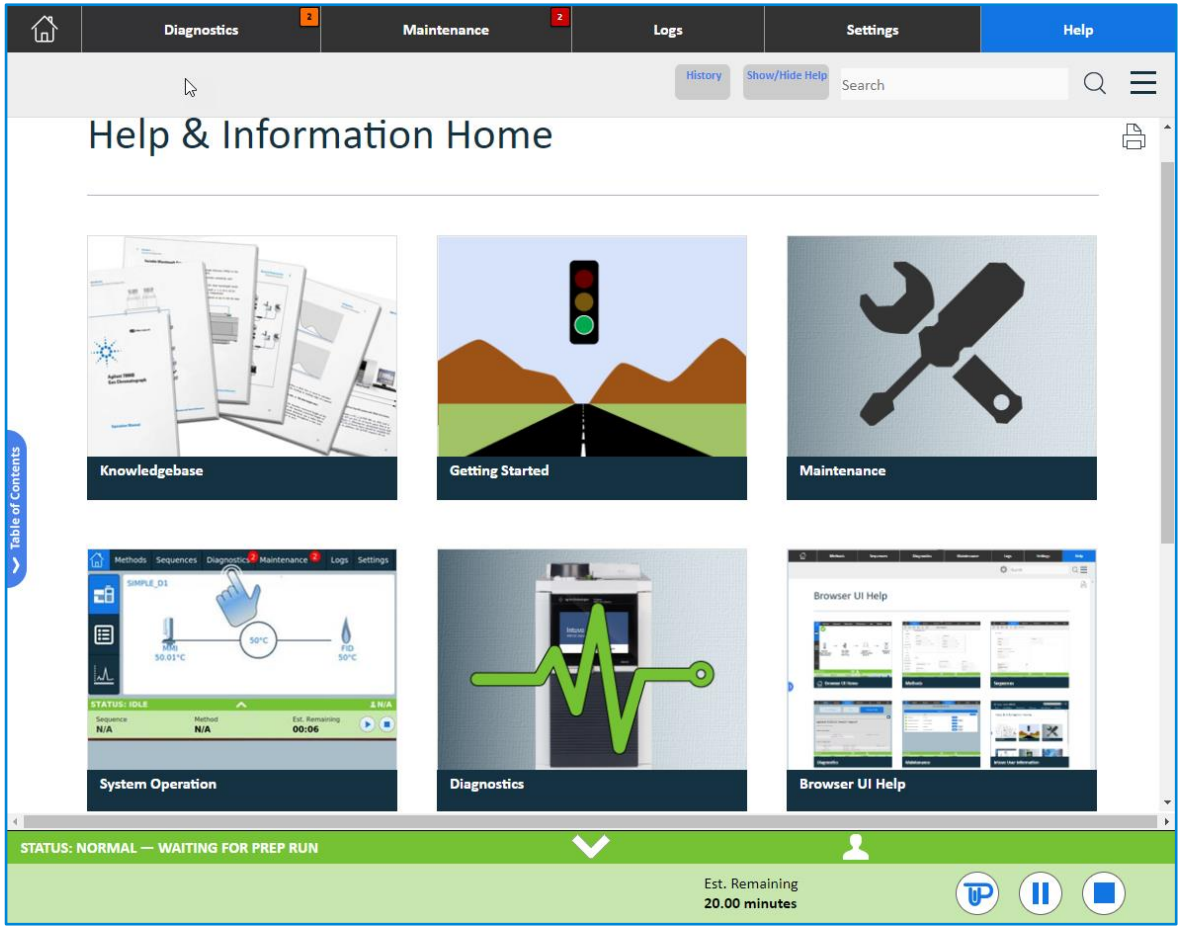

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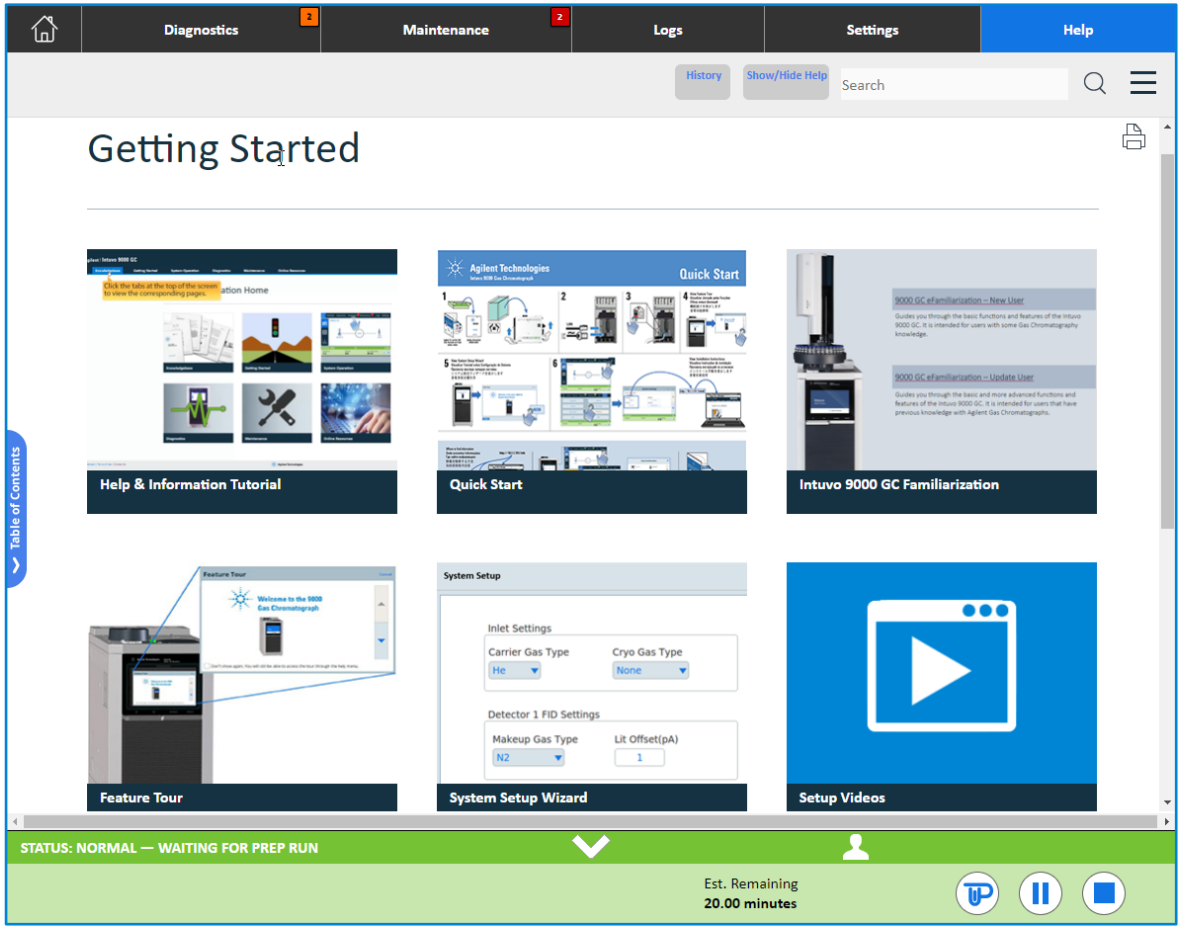

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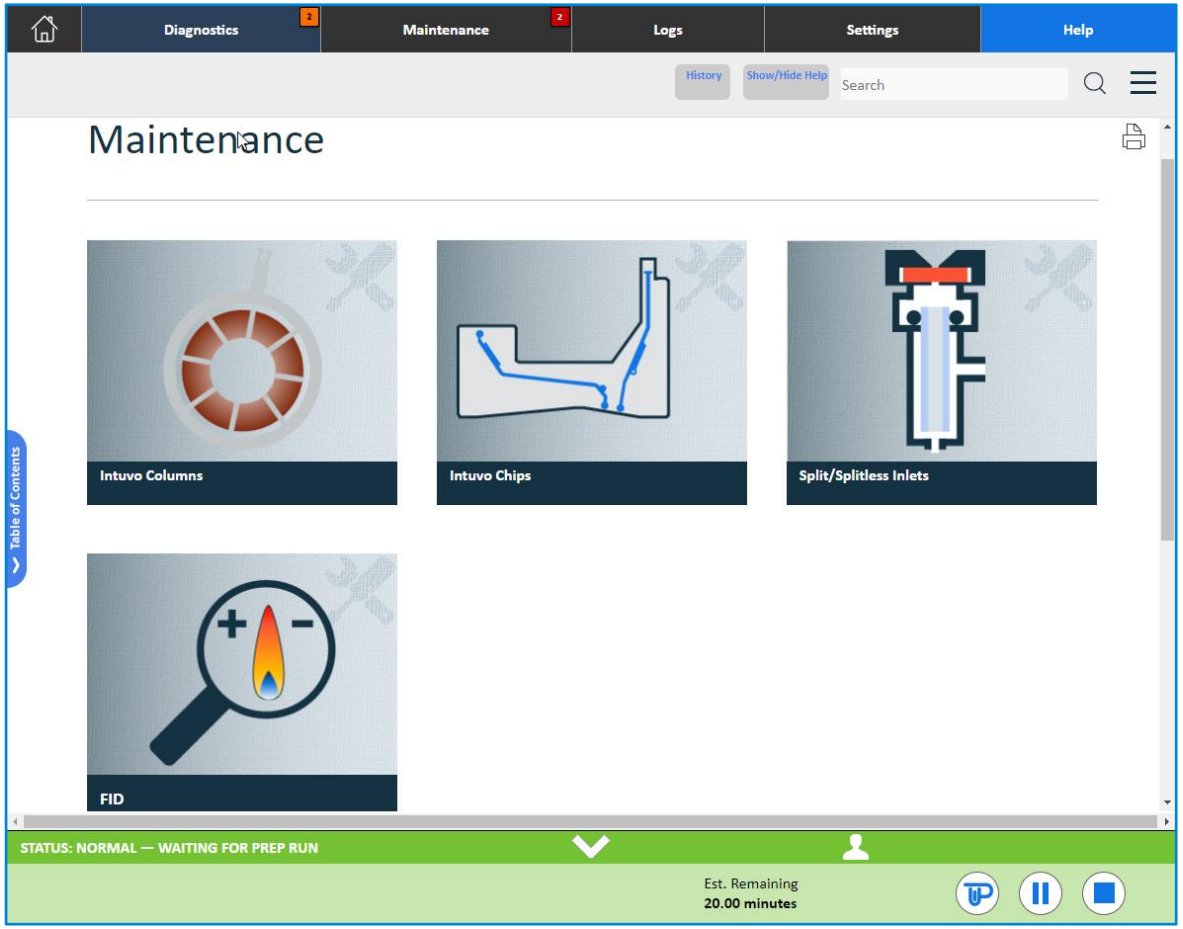

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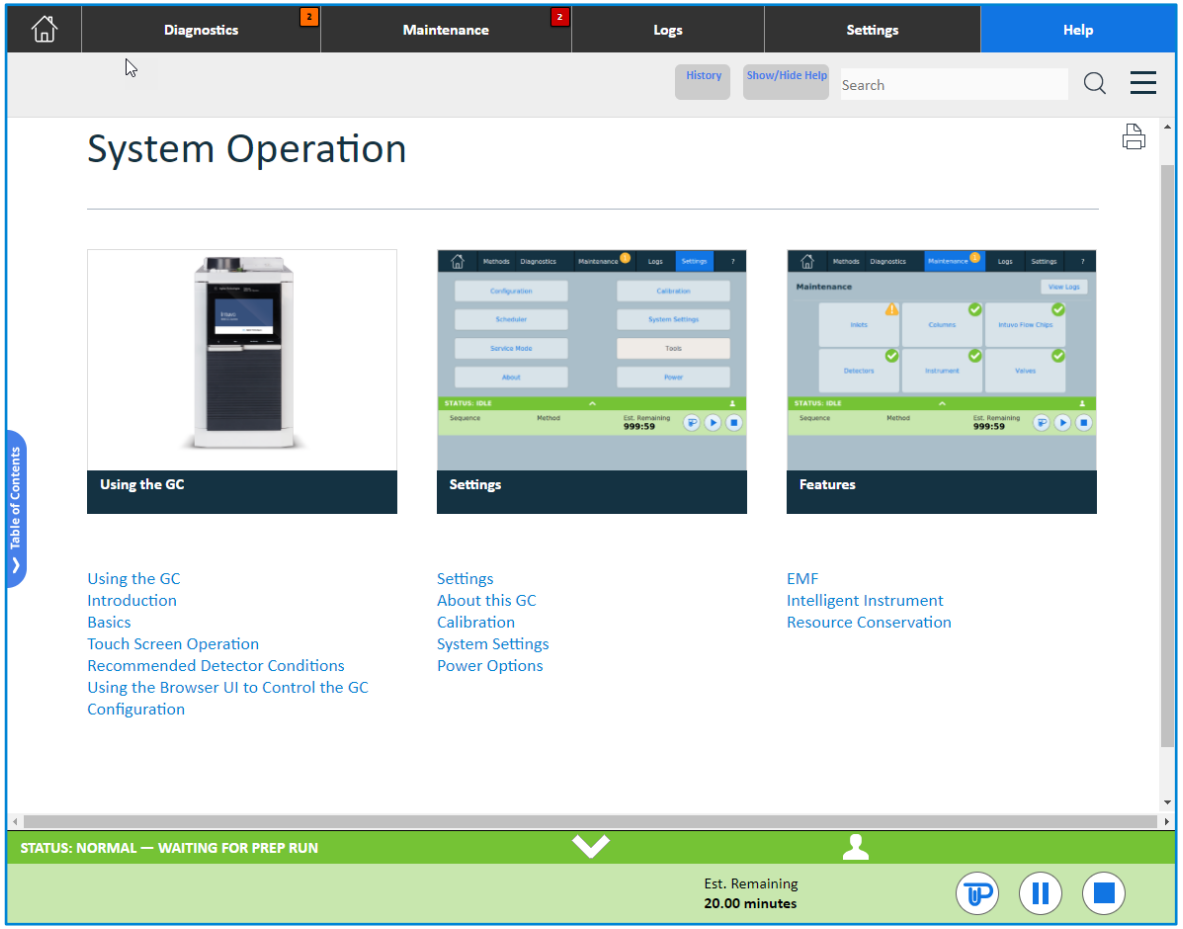

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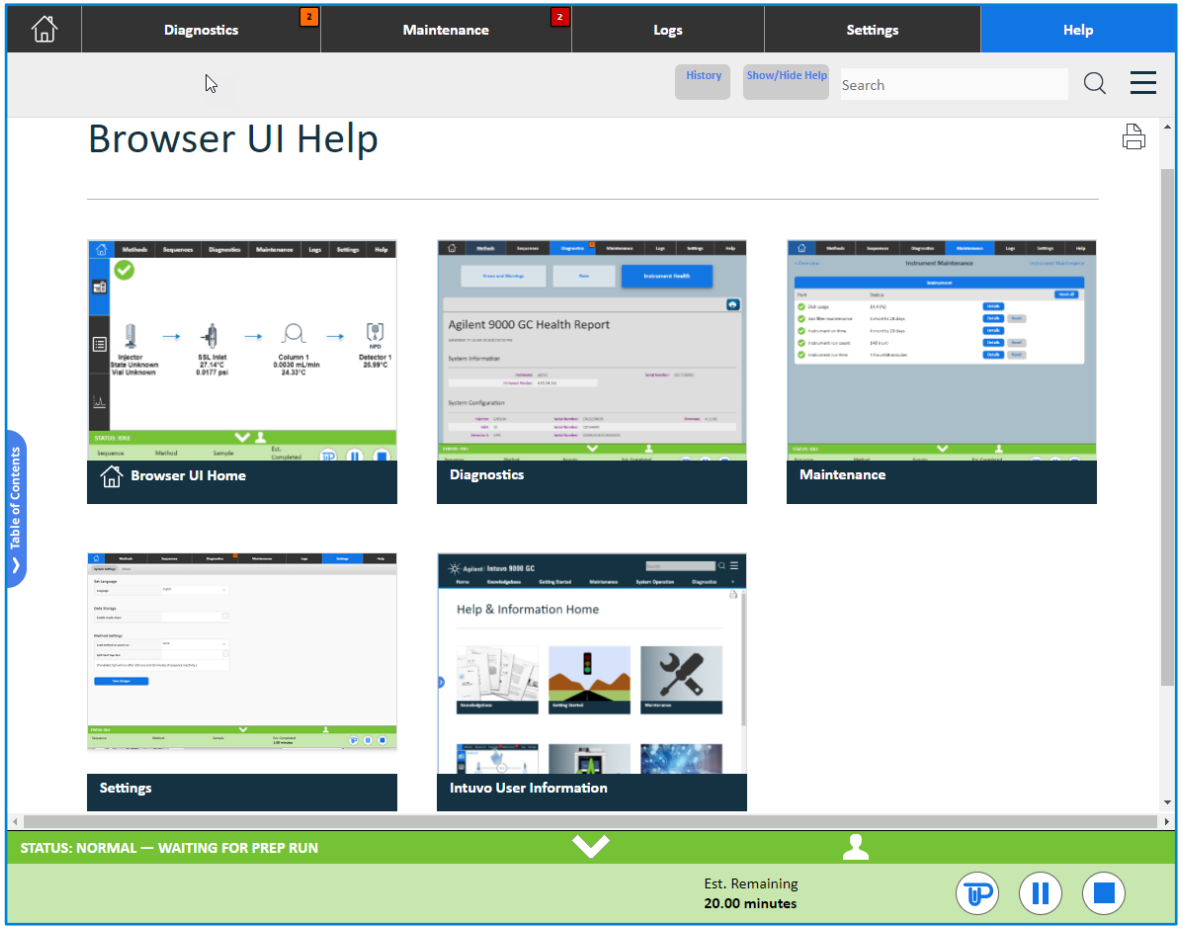

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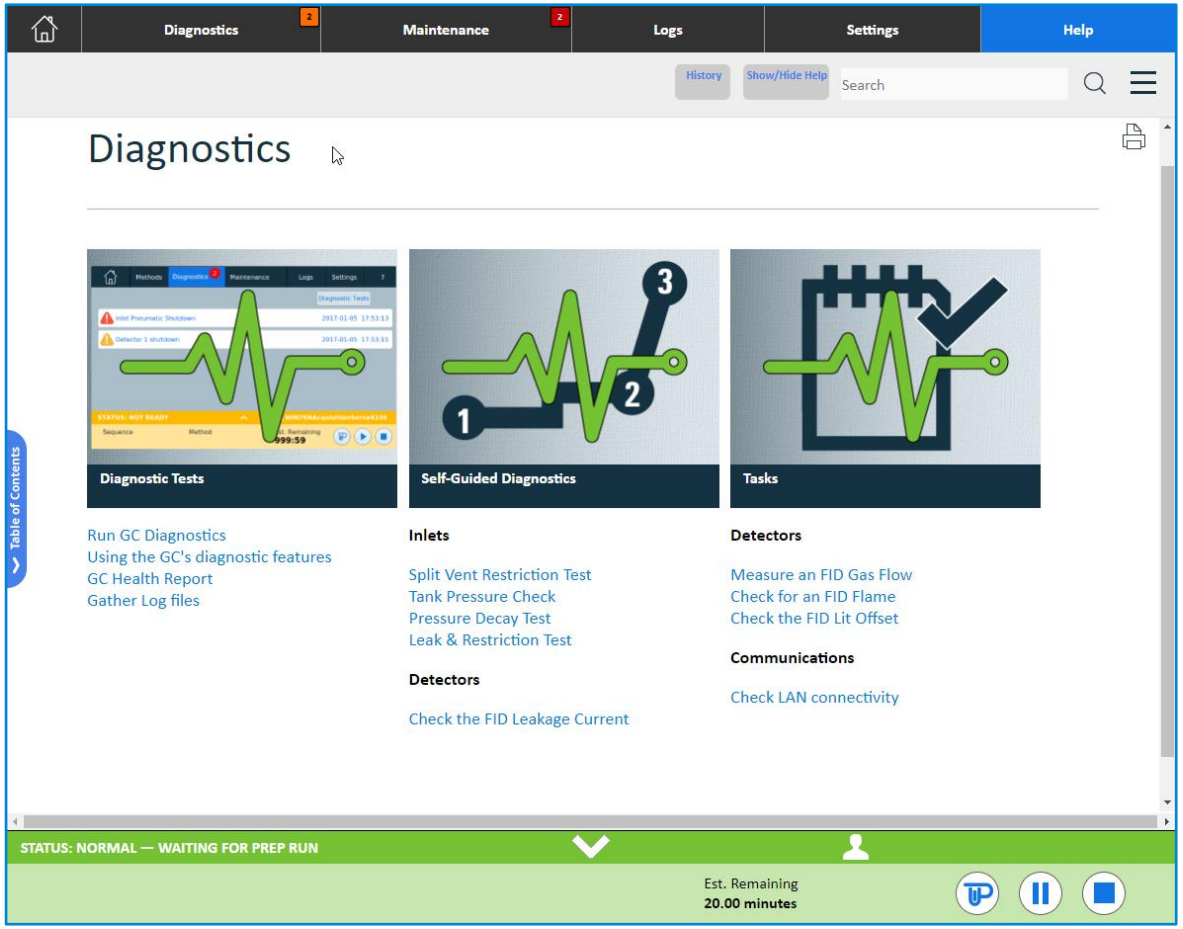

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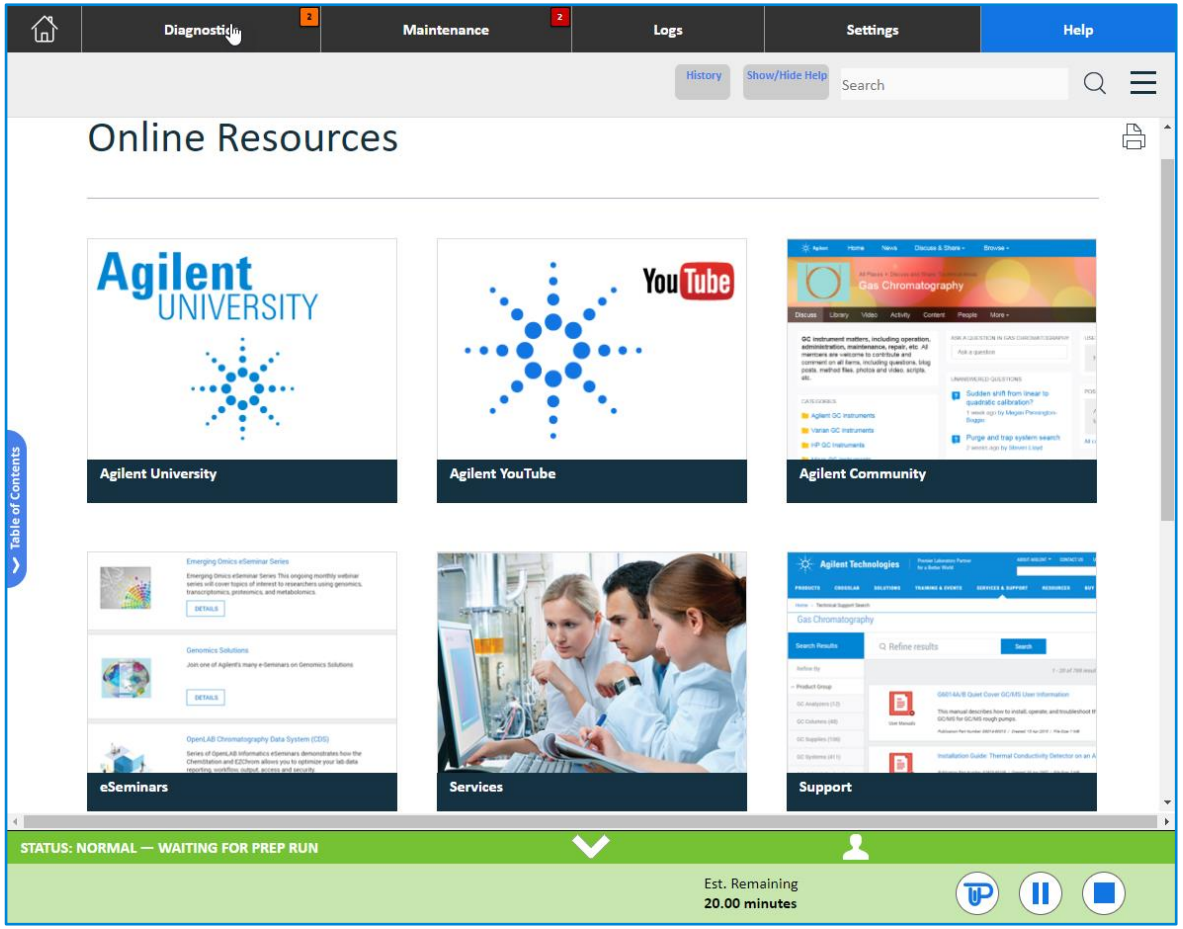

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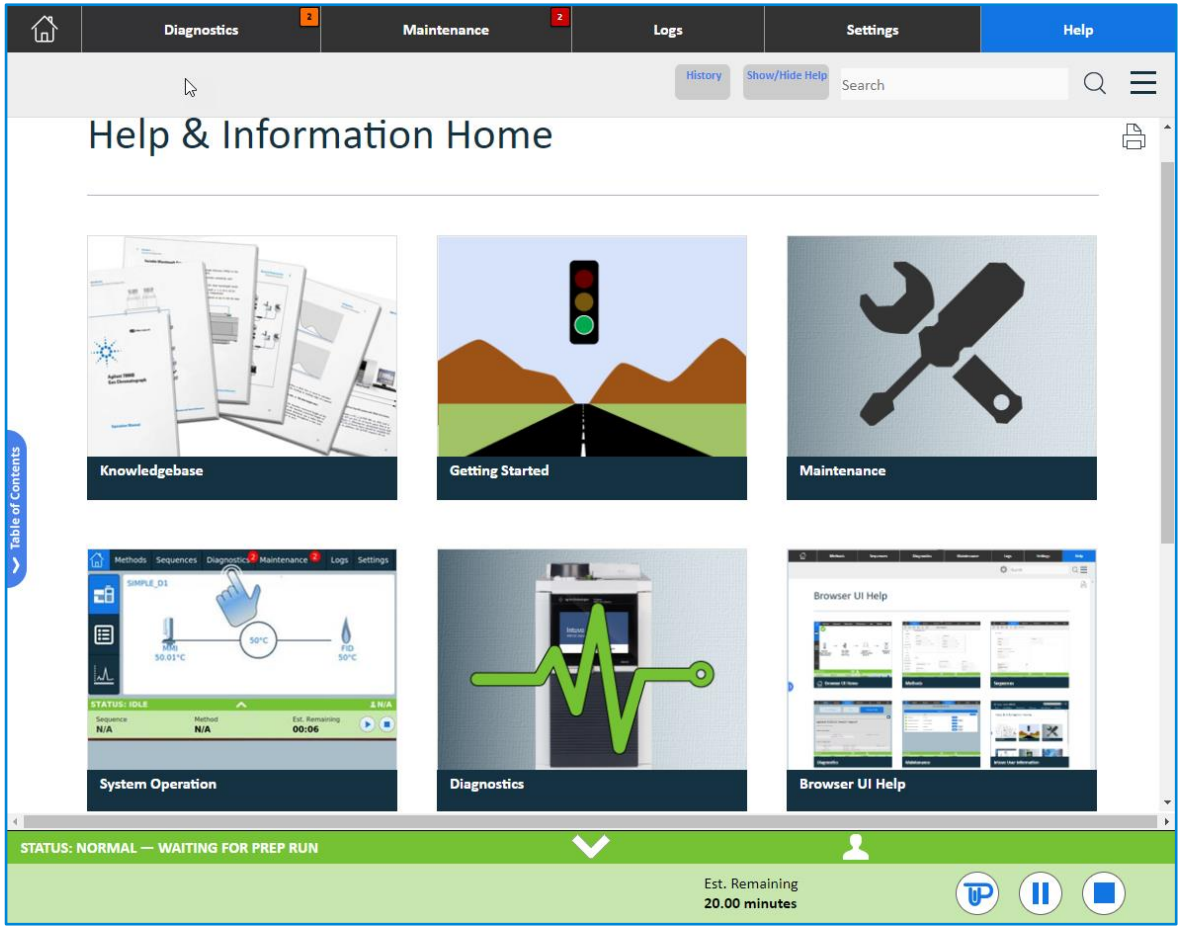

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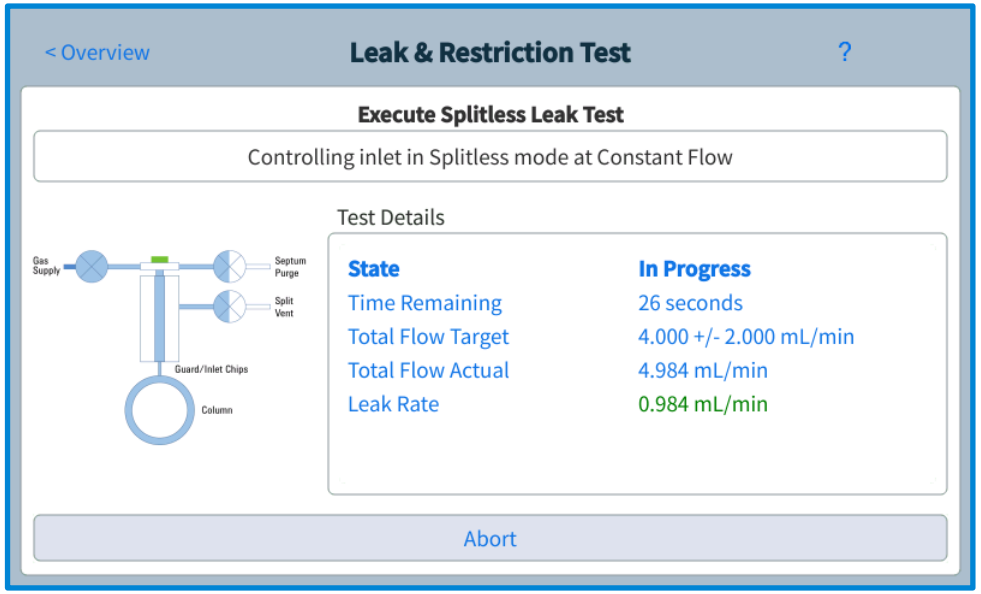

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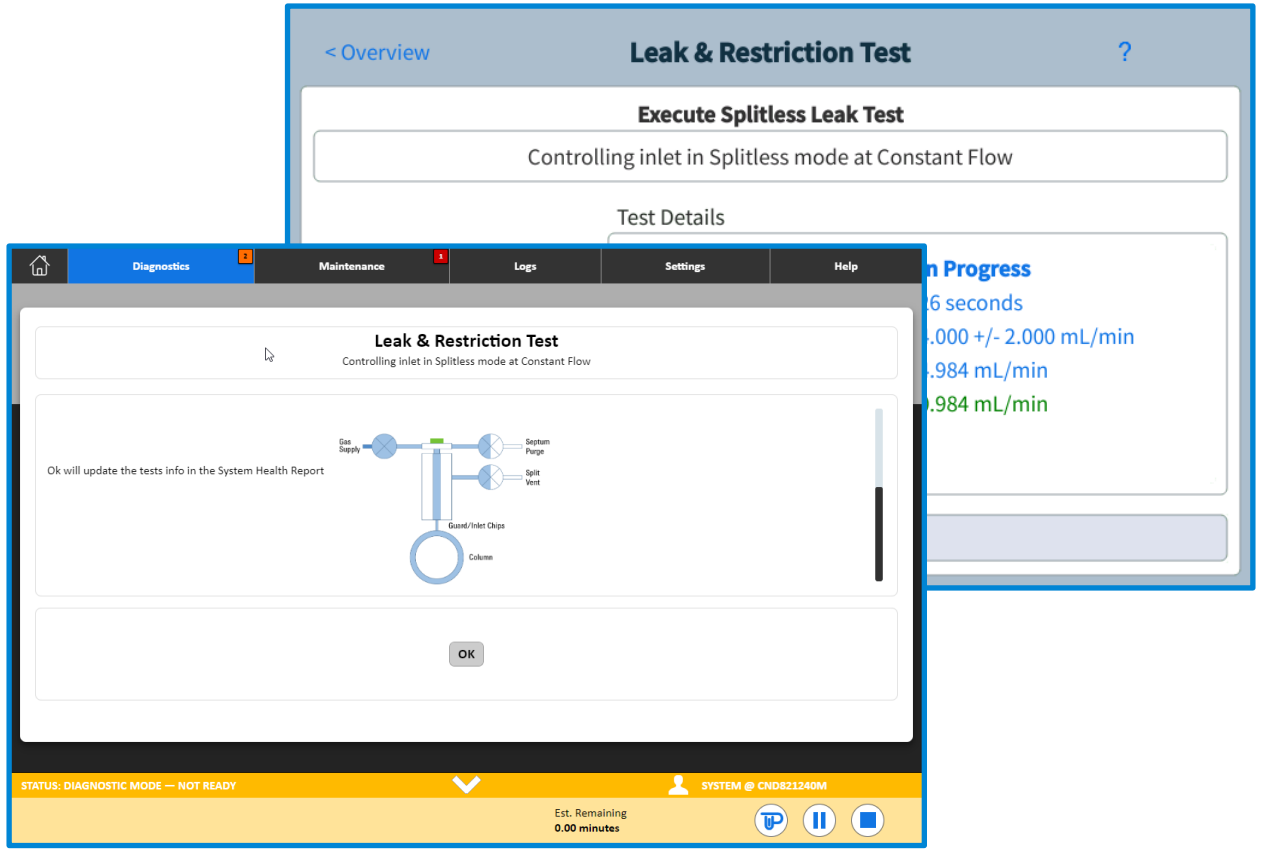

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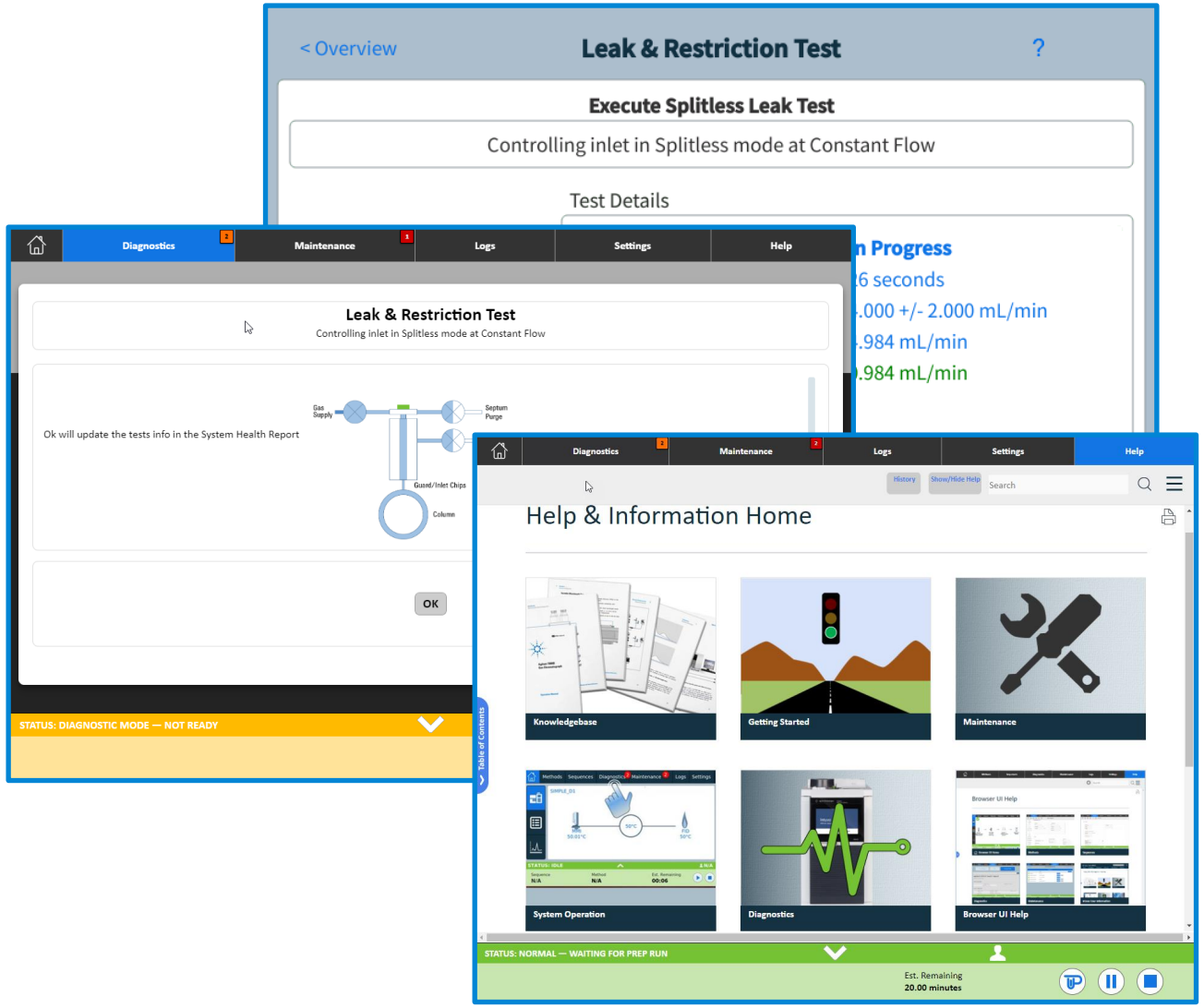

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GC Software Product Manager

Nicole Hart
Outbound Product Marketing Manager