Qualitek^mR Owner's Guide

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Uson

for good measure

EXECUTIVE SUMMARY

The purpose of this series of tests was to demonstrate the Electromagnetic Compatibility (EMC) characteristics of the QUALITEK MR the following tests were performed:

REQUIREMENTS	STATUS		COMPLIANT Yes/No/NA
IEC 61000-6-2	**ITE Immunity**		**Yes**
IEC 61000-4-2 ESD	CRITERIA (B)	@ 2,4,8 kV Air @ 2,4kV Contact	**Yes**
IEC 61000-4-3 Radiated Immunity	CRITERIA (A)	@ 10 V/m, 80-1000 MHz, 1 kHz 80% AM modulation	**Yes**
IEC 61000-4-4 EFT	CRITERIA (B)	@ 2 kV Mains / I/O DC @ 1 kV Signal,	**Yes**
IEC 61000-4-5 SURGE	CRITERIA (B)	@ Mains 1 kV L-L, 2 kV L-G @ Signal Ports 1kV L-G @ DC I/O Ports .5kV L-L .5kV L-G	**Yes**
IEC 61000-4-6 Conducted Immunity	CRITERIA (A)	@ 10 Vrms, 0.15-80 MHz, 1 kHz 80% AM modulation	**Yes**
IEC 61000-4-8 Magnetic Filed Immunity	CRITERIA (A)	@ 30 A/m 50/60Hz	**Yes**
IEC 61000-4-11 Voltage Dips & Variations	CRITERIA (B) CRITERIA (C) CRITERIA (C) CRITERIA (C)	@ 30% for 5p @ 60% for 5p @ 60% for 50p @ <95% for 5p	**Yes**
CISPR 11	**Emissions**		**Yes**
CISPR 11 Radiated Emissions	Class A		**Yes**
CISPR 11 Conducted Emissions	Class A		**Yes**
IEC 61000-3-2 Current Harmonic Emissions	complaint		**Yes**
IEC 61000-3-3 Voltage Fluctuation & Flicker	complaint		**Yes**

Signed By:

CL Payne III: _____

Sr. Engineering Manager
DNB Engineering Inc.
NVLAP Approved Signatory

1.1 FCC Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Qualitek mR

Tested To Comply
With FCC Standards

FOR HOME OR OFFICE USE

Contents

FCC Notice ..... i-ii

Chapter 1: Safety **1-1**

Introduction 1-1
Materials Disposal 1-1
English 1-2
Nederlands 1-4
Français 1-5
Deutsch 1-6
Italiano 1-7
Portuguesa 1-8
Español 1-9
Svensk 1-10

Chapter 2: Introduction **2-1**

Introduction 2-1
Available Models 2-1
Features 2-1
Specifications 2-2
Applications 2-3

Chapter 3: Installation **3-1**

Installation 3-1
- Unpacking 3-1
- Location 3-1
- Power Supply 3-2
  - Connecting Power 3-2
- Operating Conditions 3-3
- Pneumatic Connections 3-3

Chapter 4: Quick Start **4-1**

Power On 4-1
Front Panel 4-2
- Touch Panel Screen 4-2
- Navigation Pad 4-3
- Security Key 4-4

Start and Abort Buttons 4-4
Back Panel 4-5
Differential Tester Module 4-6
Test Parameters 4-7
Fast-Track Setup 4-8
Put Qualitek mR to Work 4-8
In Case of Difficulty 4-9

CHAPTER 5: RUN MODE 5-1

Home Screen Features 5-1
USB Keyboard 5-3
Run Mode Home Screen 5-4
Quick Printing 5-6
Double Diamond and Header Display 5-9
Run Mode Icons 5-10
Calibrate Button Availability 5-11
Symbols 5-12
Dashboard 5-13
Dashboard Screen Elements 5-14
Dashboard Options 5-15
Details 5-16
Input - Output Status Bar 5-17
Digital I/O Status 5-18
Statistics 5-19
Profile 5-21
Using the Scroll Pad 5-22
Profile Options Screen 5-23
Distribution 5-24
Distribution Options Screen 5-25
Trend 5-26
Using the Scroll Pad 5-28
Reset Button 5-30
Trend Options Screen 5-31
Calibrate 5-32
Calibrate Button Availability 5-33
Challenge 5-34
Audit Log 5-36

CHAPTER 6: PROGRAM MODE 6-1

Program Mode 6-1
The Keyswitch Saves Changes In Program Mode 6-1
Screens in Program Mode 6-2

Data Boxes 6-2
Test Setup 6-3
Specifications 6-4
Coupling 6-7
Steps 6-10
Regulators 6-15
Linking 6-16
Calibration 6-17
Digital I/O 6-22
Service 6-24
Data Management 6-25
Login Test 6-26
Export 6-27
Import 6-28
Maintenance 6-29
License 6-31
Diagnostics 6-32
Options 6-38
Results Logging 6-39
Alerts 6-44
Tester Control 6-45
E-mail Setup 6-48
Passwords 6-50
General 6-54
Bar Code Option 6-54
Hardware Setup 6-57
Sensors 6-58
Serial Port 6-58
Printer 6-60
Network 6-61
Digital I/O 6-67
Audio 6-70
Clock 6-71
Display 6-72
Modbus 6-74
General 6-75
Factory Setup 6-76
Tester 6-77
Pneumatics 6-78
Sensors 6-79
Regulators 6-80
Add-Ons 6-81

Chapter 7: Basic Testing 7-1

Basic Testing....7-1
- Test Cycle....7-1
- Phases of the Pressure Decay Test Cycle....7-1
- Test Results: Pass, Fail, and Salvage....7-2
- Program Optimization....7-2
- Sealed Component Test Steps....7-3
- Fine Tuning....7-3

Chapter 8: Reference 8-1

Preventive Maintenance and Calibration....8-1
Touch-Panel Care....8-1
- Recovering From Lockup....8-1

RS-232 Connection....8-2
Standard Output Timing....8-3
Valve States....8-4
- Diff. Pressure Decay Valve Sequence....8-5
- Diff. Pressure Rise Leak Test Valve Sequence....8-7
- Gauge Press. Decay Leak Test Valve Sequence....8-8
- Mass Flow Test Valve Sequence....8-9
- Diff Mass Flow Leak Test Valve Sequence....8-10
- Back Pressure Flow Test Valve Sequence....8-11

Standard I/O Operation....8-12
I/O Port Pinout....8-13
Expanded I/O Port Pinout....8-14
Digital I/O Power Rating....8-15
Temperature Compensation (Temp Comp)....8-16
- Introduction....8-16
- Equipment....8-17
- QmR Configuration....8-17
  - License....8-17
  - Test Setup....8-18
  - Temperature Compensation Initial Setup.....8-18
  - Temperature Compensation Test Steps.....8-19
  - Results Logging.....8-20
- Data Analysis....8-23
  - Uson Temp Comp Excel Template.....8-23
  - Establishing Calibration Compensation....8-24
  - Establishing Temperature factor....8-25
- QmR Setup....8-27

Comp Offset 8-27
Temp Comp Parameters 8-27
Verification 8-28
Stallion Force Decay Tester Model 8-29
Specifications 8-30
Force Mode Steps 8-31
Force Mode Details (Run Mode) 8-32
Vacuum Mode Steps 8-33
Vacuum Mode Details (Run Mode) 8-34
Bar Code Scanner Initial Setup 8-35
Internal Clock Battery Replacement 8-38
Replacing the Battery in Battery-Holder Models 8-38
Replacing Soldered-In Batteries 8-39
Pneumatics Operation 8-41
Key Components 8-41
Pressure Change Calc. (Leak Rate) 8-45
Pneumatic Signal/Noise Ratio 8-46
Concepts Applicable to Testing 8-47
Terminology Reference 8-52

Chapter 9: QmR Modbus **9-1**

Introduction 9-1
Overview 9-1
Modbus Communications 9-2
Supported Modbus Functions 9-2
QmR Data Structure for Modbus Access 9-3
Modbus ‘Coils’: Discrete Closures 9-3
Modbus Inputs: Discrete Closures 9-3
System Status 9-4
Test Status 9-4
Modbus ‘Input Registers’ 9-5
System Setup: Factory Configuration: Tester 9-5
System & Test Status: Closures 9-5
System Status: Health 9-6
Test Setup: Specification 9-6
Test Status: Counters 9-6
Test Status: Statistics 9-7
Test Status: Results 9-8
Test Setup: Inquire Specification 9-8
Modbus Holding Registers 9-10
System Control 9-10

Test Setup: Specification 9-10
Test Control Information 9-11
Enum Code Tables 9-12
Default Modbus Setup 9-18
Default Modbus Registers 9-21
Bridge Module 9-22
Sample SYCON.NET Screen Captures 9-23

CHAPTER 10: LICENSE UPDATES 10-1

License Update Overview 10-1
About the License Key 10-1
License Update With a Memory Stick 10-2
License Update by Keyboard 10-5
Temporary License 10-8
Your License Number 10-9

CHAPTER 11: GPL LICENSE 11-1

GNU LIBRARY GENERAL PUBLIC LICENSE 11-1

1

Safety

1.1 Introduction

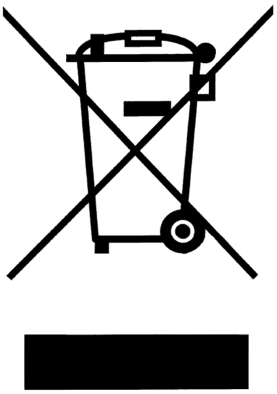
This section explains the warnings and cautions that should be observed when installing or operating the Qualitek mR.

Safety information is covered at relevant points throughout the manual. Please read this manual in its entirety before installing or operating the instrument. Should any point remain unclear, contact your supplier for assistance before proceeding.

The tester is designed for installation and use in an industrial environment by suitably trained personnel.

1.2 Materials Disposal

Uson is committed to meeting the requirements of the European Union (EU) Waste Electrical and Electronic Equipment (WEEE) Directive. Uson products that are within the scope of the Directive are labelled with a crossed-out "wheelie-bin" symbol, as required by the Directive. It indicates that the product was placed on the market after August 13, 2005 and that end users should segregate the product from other waste at end-of- life.



The detailed requirements vary considerably throughout the EU, and the Uson WEEE compliance approach varies among countries.

1.3 English

CAUTION/WARNING: Areas of the equipment that display this symbol in yellow or red are potentially hazardous. Consult the appropriate section of the user manual in respect of the specific hazard.

CAUTION: If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

WARNING: Avoid Personal injury and/or Equipment Damage. Tested parts must be secured in place mechanically or be enclosed/covered to avoid personal injury or equipment damage. Securing tested parts with air couple devices only, is NOT sufficient. Loss of power or air pressure, or multiple reset/abort inputs while the vent step is running will immediately de-energize any couple/clamp valves.

WARNING: Always wear eye protection when working with pressurized air. Disconnect all pressure sources when working with internal components of Uson equipment.

- The Qualitek mR must be connected to an earthed (grounded) power supply of 100-240VAC 50/60Hz.
- The covers on the equipment should be removed only by personnel trained to avoid the risk of electric shock. The power supply to the equipment must be switched off and disconnected before removing any covers.
- Do not substitute the fuse rating. Always use the correctly rated fuse, failure to do so may be hazardous and can cause damage to the equipment.
- Do not make or break external connectors or connections while the Qualitek mR is switched on.
- When using a pneumatic Autocoupling with the Qualitek mR, take care to ensure that both the Autocoupling and the component are adequately restrained.
- The component to be tested, and the air supply line to the Qualitek mR, must be free from water or liquid residue before testing; otherwise damage may be inflicted on the sensitive transducer within the instrument.
- The electrical IEC connector is a disconnect device and must therefore be totally accessible in an emergency.
- Operation of this product outside of the manufacturer's instructions may impair the protection provided by the equipment.

- This instrument is capable of supplying high-pressure air. Before commencing any component tests, ensure that the system is guarded to local health and safety standards.

Fixture safety considerations vary depending on the fixture being leak tested.[1] However, the following hazards of working with pressurized systems should be given serious consideration before operating the tester:

- High-pressure pneumatic air systems are exponentially more hazardous as the pressure increases, or as the volume of a system increases. Testing equipment subjected to consistently high-pressure ranges has an increased probability of becoming unable to permanently resist the effects of such pressure.
- Observe caution when working with nonreactive gases or liquids above their boiling points (even at lower pressures), especially when larger volumes of gases are involved. It is essential that relief valves, rupture disks, and pressure regulators are employed to ensure safety.
- Even at moderate pressures, pressurized systems can present a hazard in the form of pressurized air escaping from a leak or a failure. The hazard of flying particles is added when a sight glass or glass flow meter is introduced to the system. The sudden burst of a part could generate sufficient sound concussion to cause hearing damage.

1. Jackson, Charles N., Jr., Sherlock, Charles N., technical editors, and Moore, Patrick O., editor. "Safety Aspects of Leak Testing." Nondestructive Testing Handbook, third edition: Vol. 1, Leak Testing. Columbus, OH: American Society for Nondestructive Testing (1998): p 136.

1.4 Nederlands

De onderdelen van de detector die dit symbool vertonen, kunnen gevaren met zich meebrengen. Raadpleeg steeds het hoofdstuk in het handboek dat naar dat respectievelijke gevaar verwijst.

De Qualitek mR moet verbonden zijn aan een geaarde energiebron van 100-240VAC 50/60Hz.

Vervang de zekering niet door een zekering met een ander vermogen. Gebruik steeds een zekering met het juist vermogen. De Qualitek mR kan schade oplopen als dat niet wordt nageleefd.

Maak of verbreek geen externe connectoren of verbindingen terwijl de Qualitek mR aangeschakeld is.

Indien u de Qualitek mR met een pneumatische autokoppeling gebruikt, dient u erop te letten dat de autokoppeling en het onderdeel beiden voldoende onder controle gehouden worden.

De behuizingen mogen alleen verwijderd worden door personeel dat geleerd heeft hoe elektrische shocks te vermijden. De voornaamste energietoevoer moet onderbroken worden alvorens de behuizingen te verwijderen.

Het onderdeel dat getest wordt en de luchttoevoer naar de Qualitek mR, moeten vrij zijn van water of van enige andere vloeistof alvorens de test uit te voeren. De gevoelige transductor kan schade oplopen indien dat niet het geval is.

De elektrische IEC connector is een verbreekinrichting en moet daarom volledig toegankelijk zijn bij een noodsituatie.

Bediening van dit produkt buiten de instructies van de fabrikant om, kan de bescherming en veiligheid van het apparaat negatief beinvloeden.

Het instrument is in staat om een zeer hoge luchtdruk aftegeven. Voorafgaand aan het aansluiten en testen van een component dient u zich er van te verzekeren dat hetsysteem geschikt is voor deze druk. Alle locale veiligheidsregels van de lokale voorschriften voor gezondheid en veiligheid dienen in acht genomen te worden.

1.5 Français

Ce symbole présent sur certaines parties de l'équipement indique un risque de danger. Reportez-vous à la section du guide de l'utilisateur relative au risque encouru.

L'appareil Qualitek mR doit être relié à une alimentation électrique avec mise à la terre de 100-240VAC 50/60Hz.

Respectez l'ampérage des fusibles. Utilisez toujours un fusible approprié, faute de quoi l'appareil risquerait d'être endommagé.

Ne branchez/débranchez pas de prises ou connexions externes lorsque l'appareil Qualitek mR est sous tension.

Si vous utilisez un système de couplage pneumatique automatique sur l'appareil, assurez-vous que le système de couplage et les composants sont correctement fixés.

Les protections de l'équipement doivent être déposées uniquement par un personnel qualifié afin d'éviter tout risque de choc électrique. Débranchez l'appareil de l'alimentation électrique avant d'ôter les protections.

Le composant à tester ainsi que la conduite d'alimentation pneumatique raccord ée à l'appareil Qualitek mR doivent être exempts d'eau ou de liquide résiduel avant de procéder aux essais. Dans le cas contraire, le transducteur très sensible situé à l'intérieur de l'appareil risque d'être endommagé.

Le connecteur IEC pouvant être debranché doit toujours être accessible en cas d'urgence.

La protection de l'appareil peut être affectée si les instructions du fabriqant ne sont pas respectees.

Etant donné que l'appareil peut fournir de l'air à haute pression, avant qu'aucun produit ne soit testé il faut s'assurer que l'appareil est conforme aux normes standard de sécurité.

1.6 Deutsch

Alle Bereiche des Gerätes, die mit diesem Symbol gekennzeichnet sind, sind potentiell gefährlich. Bitte die maßgeblichen Abschnitte des Benutzerhandbuches hinsichtlich der besonderen Gefahren beachten.

Das Qualitek mR muß immer an eine korrekt geerdete Spannungsversorgung von 100-240VAC 50/60Hz angeschlossen sein.

Die Sicherungsleistung nicht verändern. Immer Sicherungen der richtigen Leistungsstärke einsetzen. Nichtbeachtung dieses Punktes kann zu Beschädigung des Qualitek mR führen.

Niemals externe Verbindungen herstellen oder unterbrechen, wenn Qualitek mR eingeschaltet ist.

Wenn pneumatische automatische Kupplungen mit Qualitek mR verwendet werden, unbedingt sicherstellen, daß die Teile und auch die automatische Kupplung in angemessener Weise festgemacht sind.

Die Gerätedeckel dürfen nur von geschultem Personal entfernt werden, um das Risiko von elektrischen Schocks zu vermeiden. Die Stromversorgung (Elektrizität) zum Gerät muß unterbrochen worden sein, bevor die Abdeckungen entfernt werden.

Die zu prüfenden Teile und die Luftzufuhr zum Qualitek mR dürfen vor dem Testen keinerlei Wasser - oder Flüssigkeitsreste enthalten. Nichtbeachtung diese Punktes kann zur Beschädigung des empfindlichen Umformers im Gerät führen.

Der elektrische IEC Verbinder ist ein Tremstecker und muß dafür für Notfälle freì zugänglich seìn.

Bei Nichtbeachtung der Hersteller - Instruktionen werden die Schutz-maßnahman des Neßinstrumantes unwirksam.

Das Meßgerät ist für Prüfungen unit hohen Drücken gelignet. Vor Beginn der Meßungen muß sichergestellt sein, daß das System den einschlagigen Sicherheitsrichtlinian enspricht.

1.7 Italiano

Le aree dell'apparecchio dove figura questo simbolo sono potenzialmente pericolose. Per informazioni sulla specifica natura del pericolo, consultate la pertinente area del manuale per l'utente.

Il Qualitek mR deve essere collegato ad una rete di alimentazione di 100-240VAC 50/60Hz dotata di connessione di messa a terra.

Non sostituite il fusibile con uno di valore diverso. Usate sempre un fusibile di valore adatto; mancando di fare ciò si possono causare danni al Qualitek mR.

Non effettuate connessioni o disconnessioni esterne, e non inserite o disinserite i connettori esterni, mentre il Qualitek mR è acceso.

Nell'effettuare un accoppiamento pneumatico automatico con il Qualitek mR, bisogna assicurarsi che il dispositivo di accoppiamento automatico e il componente siano adeguatamente trattenuti.

Per evitare il rischio di scosse elettriche, i pannelli di copertura dell'apparecchio devono essere rimossi soltanto da personale competente. Prima di rimuovere i pannelli di copertura, staccate lo strumento dalla rete elettrica di alimentazione.

Prima di effettuare le prove, il componente da verificare e la tubatura dell'aria compressa del Qualitek mR devono essere liberi da acqua o da residui liquidi, altrimenti si può danneggiare il sensibile trasduttore montato dentro lo strumento.

Il connettore ellettrico IEC é un dispositivo oli scollegamento e deve pertanto essere, completamente, accessibile in caso di emergenza.

Le operazioni effettuate all'infuori delle, istruzioui del fabbricante possono alterare le protezioni dello strumento stesso.

Lo strumento é in grado di folnile una pressione d'aria elevata - Prima di uniziare qualsiasi prova di, controllo assicurarsi che il sistema risponde aqti standard di sicurézzà t di safute.

1.8 Portuguesa

As areas do equipamento em que aparecer este sRmbolo podem ser potencialmente perigosos. É necessário consultar a secção apropriada do manual do usador à respeito da partte perigosa especRfica.

É necessário ligar o Qualitek mR à um suprimento de força ligado à terra de 100-240VAC 50/60Hz.

Não altera a capacidade do fusível. Sempre use a capacidade correta do fusível, senao poderá danificar o Qualitek mR.

Não faça ou quebra contatores ou connexões externas enquanto o Qualitek mR estiver ligado.

Qualitek uando usar um auto-binário pneumático com o Qualitek mR, verifique que ambos o auto-binário e o componente estejam adequadamente fixos.

As corberturas do equipamento sómente deverão ser removidos por pessoal treinados à evitar o risco de choques eléctricos. O suprimento de eléctricidade (força) geral do instrumento deverá ser desligado antes de remover as corberturas.

O componente à ser testado e a linha do suprimento de ar ao Qualitek mR precisam estar livres de água ou resíduo líquido antes de testar senão poderá causar danos ao transdutor sensível dentro do instrumento.

A Junçã eléctrica LEC é desconectável, dai que se tém de estar sempre totalmente accesível, para o caso de emergência.

Qualitek ualquer operação deste producto for a do âmbito das instruções do fabricante, poderá por em risco a protecção fornecida prlo equipamento.

O equipamento é capaz de fornecer ar a alta pressão. Antes de qualquer teste, certifique-se, (tenha a certeza) que o sistema está de acordo com as Normas de Saúde e Segurança em Vigor.

1.9 Español

Las zonas del equipo que muestran este sRmbolo son potencialmente peligrosas. Consulte la sección del manual del usuario correspondiente a ese peligro en particular.

El Qualitek mR debe estar conectado (conectado a tierra) a un suministro eléctrico de 100-240VAC 50/60Hz.

No cambie el voltaje del fusible. Utilice siempre el voltaje correcto del fusible, si no lo hiciera podrRa daZar el Qualitek mR.

No realice o rompa conexiones o conectores externos mientras esté encendido el Qualitek mR.

Cuando utilice un acoplamiento neumático con el Qualitek mR tenga cuidado de asegurarse de que tanto el acoplamiento como el componente estén correctamente empotrados.

Para evitar el riesgo de descarga eléctrica las tapas del equipo las debe quitar sólo personal especializado. Debe desconectar la alimentación (suministro eléctrico) del instrumento antes de quitar las tapas.

Debe comprobar el componente y la línea de suministro de aire al Qualitek mR debe estar libre de agua o cualquier residuo líquido antes de la comprobación; si no fuera así podría daZar el transconductor, altamente sensible, que se encuentra en el interior del instrumento.

El conector eléctrico IEC es un dispositivo de desconexión y por ello debe estar totalmente accesible para cualquier emergencia.

El falta de cumplimiento de las instrucciones de uso indicadas por el fabricante para este producto, puede perjudicar la protección provista en el equipo.

El instrumento es capaz de suministrar aire a alta presión. Antes de empezar prueba alguna de cualquier componente asegurarse de que el sistema cumple las normas establecidas por las autoridades locales en materia de Seguridad e Higiene.

1.10 Svensk

Områden i utrustningen försedda med denna symbol kan vara riskfyllda. Se lämpligt avsnitt i Användarhandboken avseende en viss fara.

Qualitek mR ska anslutas till ett jordat uttag om 100-240VAC 50/60Hz.

Använd alltid säkringar med rätt märkström. Qualitek mR kan annars skadas.

Koppla inte in/ut kontakter och anslutningar medan Qualitek mR är påslagen.

Vid användning av en automatisk tryckluftskoppling till Qualitek mR, kontrollera att bjde kopplingen och komponenten är tillräckligt fastspända.

Utrustningens kåpor får tas av endast av personal med kännedom om hur man undviker stötar. Nätströmmen till instrumentet måste vara bortkopplad innan kåporna tas av.

Komponenten under test och lufttillförsellinjen till Qualitek mR måste vara fria från vatten-och vätskeåterstoder före testen. Den känsliga omvandlaren i instrumentet kan annars skadas.

Den elektriska IEC brytaren är en frånskiljar - enhet och måste därför vara helt tillgänglig vid en nödsituation.

Användning av denna produkt utanför tillver - karens instruktioner kan nedsätta den skyddsgrad som produkten ger.

Detta instrument har en möjlighet att leverera luft som har ett högt tryck. Före start av en komponent test skall ett säkerställande ske att systemet är skyddat enligt lokala hälso samt skydds standarder.

2
Introduction

2.1 Introduction

The Qualitek mR tester is an advanced testing platform that can be configured to test a wide range of components. Programmable and flexible, this economical tester is designed and built to internationally recognized ISO9001:2008 and CE standards. The Qualitek mR incorporates the latest technology and Uson's decades of experience as a leading manufacturer of precision testers.

Due to a program of continuing product improvement, it is expected that some features described in this manual will differ in function or availability from your Qualitek mR.

2.2 Available Models

Qualitek mR-DPD: Differential Pressure Decay Tester

Qualitek mR-PD: Pressure Decay Tester

Qualitek mR-MF: Mass Flow Tester

Qualitek mR-DMF: Differential Mass Flow Tester

Qualitek mR-PR: Pressure Rise Tester

Qualitek mR-BPF: Back Pressure Flow

Qualitek mR-BPF: Force Decay Tester

2.3 Features

Standard Features:

- Simple menu driven operation
- 127 programs
- Statistics
- Salvage level
- Date and time facility
- Program copy
- Automatic zero facility

Optional Features:

- Fast fill (electronic regulator and dual regulator)
- Expanded I/O for control of interface to automation systems
- Bar code reader
- Temperature Compensation
- Remote communication can be achieved by using field bus operations

2.4 Specifications

Model: Qualitek mR

Description: Multi-Function Leak & Flow Tester

Display: 8.5” Diagonal 640 x 480 Color Graphic Backlit Touch-Screen LCD

Digital I/O: 16 inputs, 8 outputs – standard/ 8 inputs, 16 outputs – option

Communication: RS 232, USB, Ethernet, Modbus, Profibus, Device Net

Languages: English, Spanish, German, Hungarian (user selectable) Note: Custom languages also available

Test Programs: 127 available.

Test Channels Available: 1

Enclosure Dimensions: 11.5"(H) x 14”(W) x 17" (290mm x 355mm x 435mm)

Power Supply: 100-240VAC 50/60Hz (Auto Sensing & Switching)

Pressure Range: Up to 225 psig/15 bar differential
Up to 500 psig/35 bar gauge

Flow Range: Up to 100 liters per minute

Units: User selectable units of measure for flow and pressure.

Calibration: NIST Traceable

Leak Measurement: Calculated flow or delta pressure

2.5 Applications

A properly-equipped Qualitek mR can be used in almost any leak or flow testing application, some typical examples are:

Automotive

- Exhaust Systems
- Gear Boxes
- Water Pumps
- Heat Exchangers
- Fuel Pumps
- Steering Racks
- Engine Assemblies
- Hydraulic Components
- Check Valves

Medical

- Medical Tube Sets
- Bottle Tests
- Ostomy Pouches
- Blood Bags
- Packaging
- Appliances
- Castings.
- Combustion Chambers
- Pressure Switches
- Ball, Butterfly and Check Valves
- Domestic Appliances

General Engineering

- Castings
- Combustion Chambers
- Pressure Switches
- Ball, Butterfly, and Check Valves
- Domestic Appliances

For further information or assistance on applications please contact Uson or your supplier.

3
Installation

3.1 Installation

Be sure to heed all safety warnings previously given.

3.1.1 Unpacking

The Tester is supplied with a packing list showing the included components. The components will vary depending on the tester type. If any component is missing please contact your supplier.

The following items may be found in the shipping box.

- The user manual (on a USB drive).
- Power cord.
- Nylon tubing.
- Spare fuses.
- Pressure regulator knob (manual regulator versions only).
- Security keys (2).

3.1.2 Location

The Tester should be sited as near as possible to the test component in order to reduce the length of test tube, and therefore the test time, and to keep the internal volume to a minimum. In order to avoid temperature variations, which can affect the repeatability of the readings, the complete system should be installed in a position away from heaters and drafts. It is advisable to insulate the connecting test-pipework. The tester must be placed on a horizontal support, free from vibration, where there is free access to the front panel controls and connectors on the rear panel.

3.1.3 Power Supply

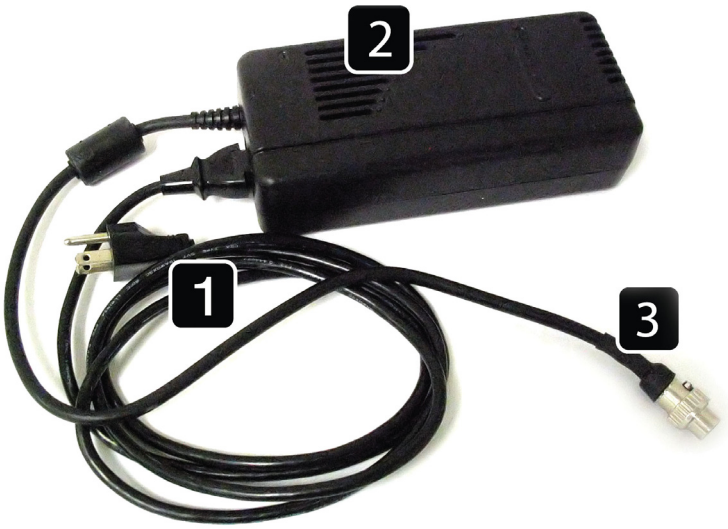
The appropriate power supply and connecting cord appropriate for the country of use is provided.

3.1.3.1 Connecting Power

1. Check that the power switch on the back panel of the tester is OFF.
2. Check that the power supply is not currently under power.
3. Referring to the figure below, connect the 1 AC power cord to the 2 power supply. (The type of power cord supplied with Qualitek mR will vary, depending on the country.)
4. Attach the 3 DC output power cord to the receptacle on the rear panel of the tester.) Lock the power cord in position by turning the connector collar so that it firmly grips the receptacle.
5. Finally, connect the AC power cord to the facility power receptacle. The green light on the power supply should now be illuminated indicating that the power supply is receiving AC power.

The tester must always be switched OFF whenever connecting or disconnecting the power cord.

Before switching the tester ON, be sure that the power supply is located in a stabilized position where it will be open to air flow.



3.1.4 Operating Conditions

The Qualitek mR will operate in a temperature range of 5°C to 40°C (41°F to 104°F), with a humidity range of 0 to 90% non-condensing.

3.1.5 Pneumatic Connections

The test component and air supply, or vacuum connection, should be connected to the appropriate ports. The air supply to the tester must be clean, dry, and free from contamination. It is recommended that an external filter/regulator should be fitted to improve the quality of the air supply to the tester.

Be certain the supply pressure doesn't exceed the maximum input listed on the rear panel.

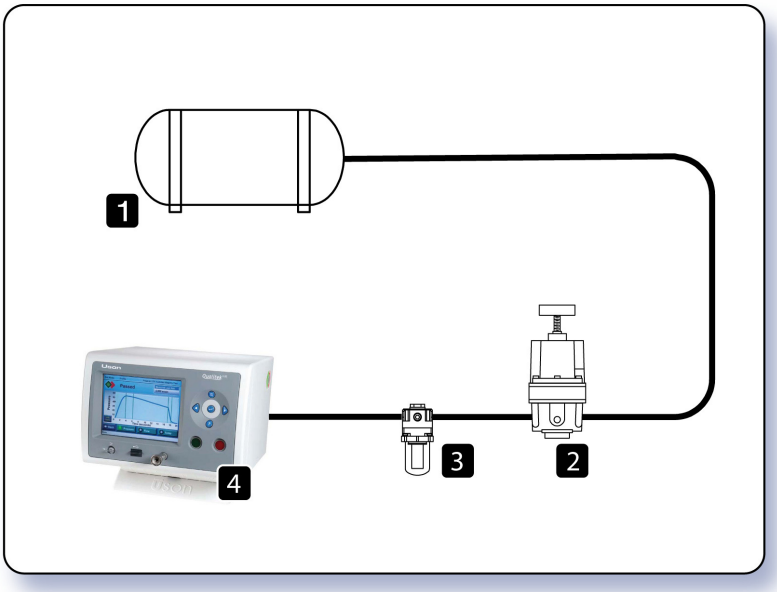
The input pressure must be at least **4 bar** (60 psi) to operate the differential transducer or differential pressure decay and pressure rise models. For other tester models, the minimum pressure requirements are dependent on sensor and model types.

Water vapor, particulates, and excessive pressure can damage Qualitek mR's internal components and affect product testing

If a manual regulator is fitted to the tester, the pressure regulation knob and spindle will have to be installed to the regulator body.

Supply air is connected to the fitting on the back of Qualitek mR.

1. Compressor
2. Step-down regulator
3. Mist and Particulate Filter
4. Qualitek mR



4
Quick Start

4.1 Power On

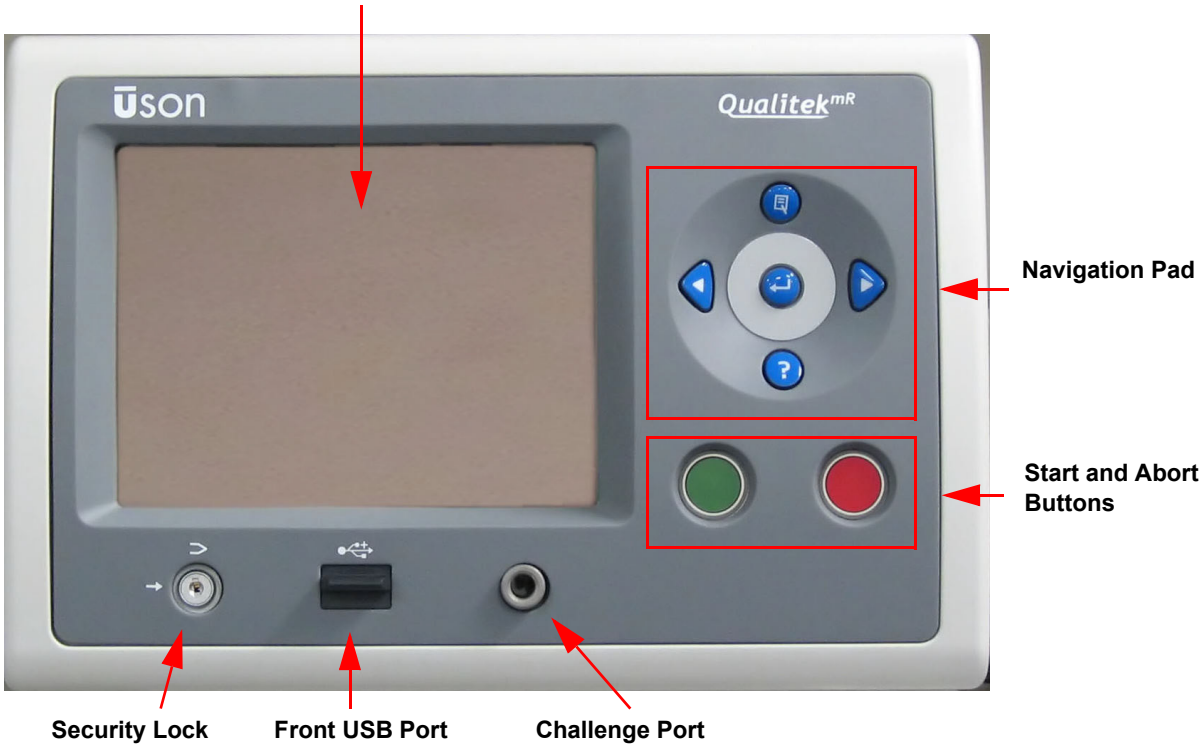
Apply power to the Qualitek mR by using the power switch located on the rear panel of the instrument.

When the power is applied, self-tests are performed to ensure that the instrument is functioning correctly. The screen will display scrolling messages. It is not necessary to read these messages and it is normal for them to pause and restart. Disregard the content of the messages. The entire start-up process requires approximately **two minutes.**

When the Home screen appears, it indicates the power-on process completed 100% successfully and the tester is ready for use.

4.2 Front Panel

The front panel of the Qualitek mR is shown below. The panel has a navigation pad, stop and start buttons, a security lock switch, and a USB port.



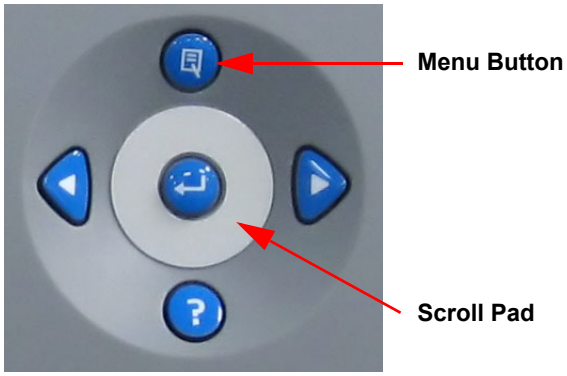
4.2.1 Touch Panel Screen

The prominent feature of the Qualitek mR is the touch panel screen. Tapping the graphical objects on the various screens with gentle finger pressure activates special screens for setting up, testing, and reviewing tester operations. On some screens, it is possible to touch and drag objects, such as graphs, to reposition them for viewing.

Touch panel care is described in the Reference chapter. See *"Touch-Panel Care" on page 8-1.*

4.2.2 Navigation Pad

The Navigation Pad has 5 buttons and a touch-sensitive ring (called the scroll pad) around the central button. Graphics on each button show what function it performs.



Enter Button

The center button is **Enter**. It can be used with the scroll pad to accept a selection that has been highlighted.

? Button

Press this button to see the firmware revision number on Status Line. (The firmware is the built-in program that controls the tester.)

Next and Previous Arrow Buttons (Left and Right).

These buttons are used to move the data entry cursor when using entering alphanumeric data from the keyboard. They also will navigate from one top level tab to the next one on Program Mode screen.

Menu Button

The Menu Button, located at the top position of the pad, is used to quickly return to the Home screen of the current mode from almost any screen. Some sub-screens, such as a keyboard display, require that their pending operation be completed or canceled before the Menu Button is permitted to operate. Repeated presses toggle between Run Mode and Program mode (when Program mode is permitted to the operator.)

Scroll Pad

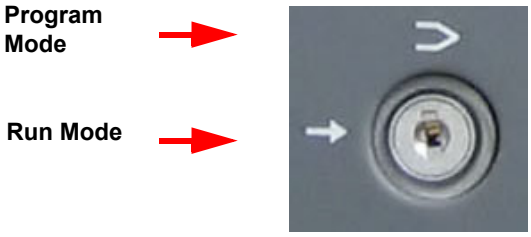
The Scroll Pad is is the touch-sensitive ring around the Enter button. The Scroll Pad provides helpful navigation shortcuts on many screens. For example, use the scroll pad to move the highlight cursor in list boxes or to change the scale of the Profile and Trend graphs. In lists, it can scroll the list up and down. Experimenting with the scroll pad on various screens will reveal other useful shortcuts to you.

4.2.3 Security Key

Qualitek mR is in Run mode when the key is horizontal. Turn the key to the vertical position for Program mode.

Changes made in Program mode are saved **only** when the key is used to return to Run mode.

The symbols for these modes are shown in the following illustration.

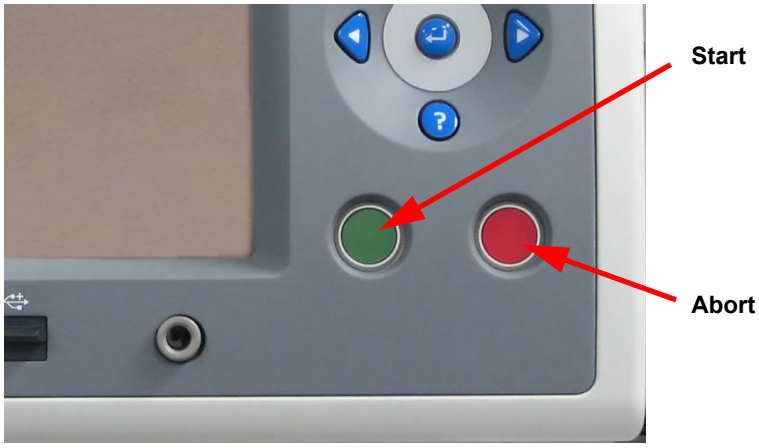


The tester must be in Run mode to use the Start button.

4.2.4 Start and Abort Buttons

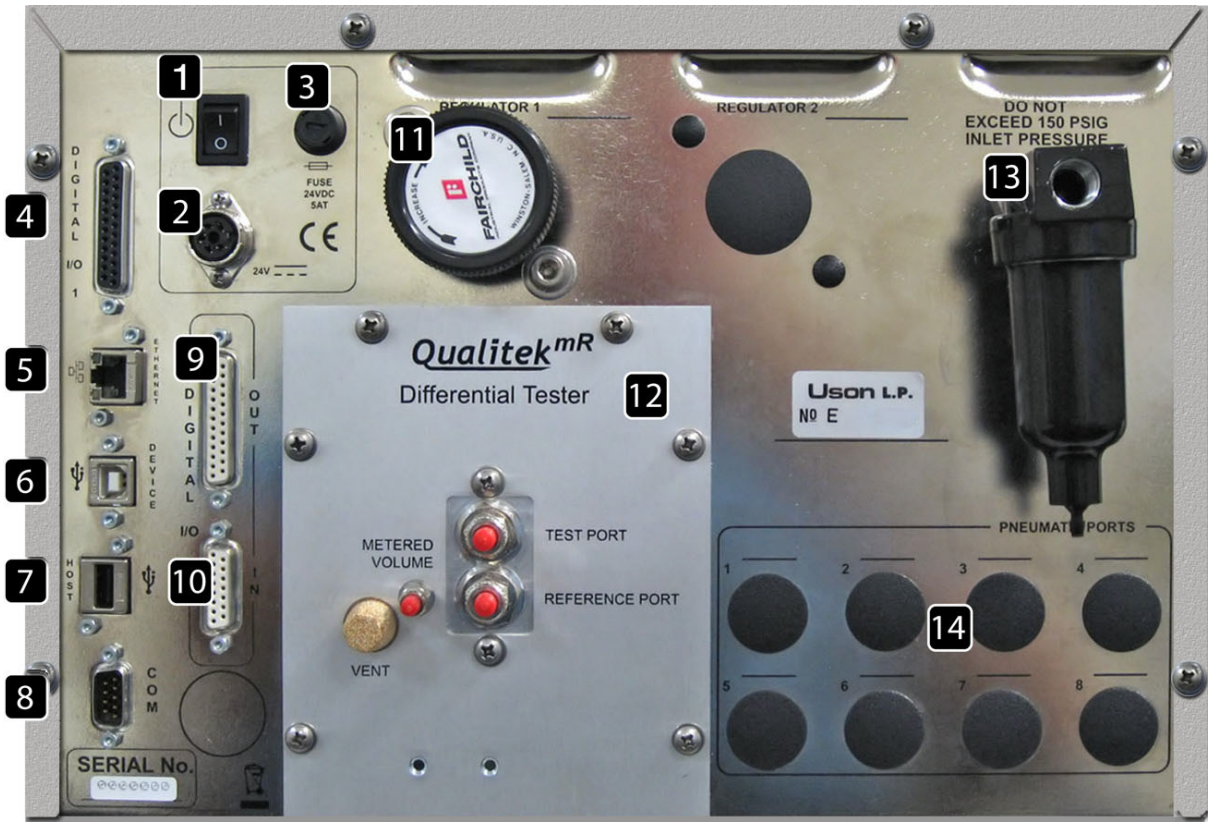
Press the green Start button to start a test. The red Abort button will immediately stop a test.

If the Remote Start Option is selected, program start is not available from the front pane, and the Start and Abort switches disable. See *"Tester Control" on page 6-45.*



4.2.5 Back Panel

The back panel below is from a Qualitek mR outfitted as a **Differential Pressure Decay** tester. The appearance will vary depending on the options and tester type chosen.



1. Power Switch
2. Power Receptacle
3. Fuse (24 VDC)
4. Digital I/O 1
5. Ethernet
6. USB
7. USB: Accommodates options such as a bar code scanner or keyboard (not provided)
8. Serial Port
9. Digital I/O 2 Out (Optional)
10. Digital I/O 2 In (Optional)
11. Manual Regulator
12. Test Module. See *"Differential Tester Module" on page 4-6.*
13. Inlet (shown with filter attached). The compressed air supply entering the instrument must be clean and dry.
14. Optional ports for coupling, if purchased, are installed here.

4.2.6 Differential Tester Module

The table below describes the function of the ports on the Differential Tester module shown.

Name	Purpose
TEST PORT	Connect the test port to the component to be tested.
VENT	This is the external vent port for test air.
REFERENCE PORT	This port is used when pairs testing or additional reference volume is required when testing components that have larger volumes than the internal volume of the instrument and very high test pressures.
METERED VOLUME	The port is also known as a s Sealed Component Reference Port. This port is provided to connect reference volumes in sealed component and blockage testing applications.

4.2.7 Test Parameters

Test parameters are setpoints and tolerances that tell Qualitek mR how to conduct a test and decide whether a product is accepted or rejected. Test parameters are set in Qualitek mR's Test Parameters menu.

When Test Parameters are Available

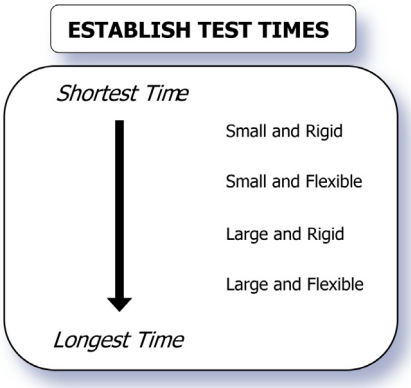
If existing test values are at hand, begin by simply entering those values into the Qualitek mR. Once all values are set correctly, the Qualitek mR is ready for fine tuning.

When Test Parameters are not Available

If there are no established test values, some experimenting is needed to arrive at values for pressures, flow rates, and times best suited to the product. Little effort is required to program Qualitek mR after test parameters are established. Yet, coming up with test values takes consideration when starting from scratch.

Setting Test Time

As test times are developed, keep in mind the size and material of parts to be tested. Parts that are both small and rigid typically require short test times. Parts that are both large and flexible generally require longer test times.



Avoid the Tendency to "Over-Test"

Optimum setup values are typically established after trial and error when working with known good and bad product samples. One point to keep in mind is not to over-test product. Avoid setting leak tolerances too tight with the idea that absolutely no leak is acceptable. Through experimentation you'll probably find that a small pressure drop occurs simply due to how your product behaves during pressurization. Many products create conditions that merely appear to be small leaks when pressurized.

4.3 Fast-Track Setup

Connect clean, dry supply air.

Connect peripheral devices, if any.

Connect the power cord and turn on Qualitek mR.

Turn the security lock switch to the *Program* position.

Set the units of measure to use for pressure, flow volume, and flow time.

Ensure the clock is set correctly for date and time (Hardware Setup: Clock)

Enter test parameters for the first program to run.

Enter test parameters for additional programs if you are using more than one program.

Set communication values for the connected peripherals, if used.

Turn the security lock switch to *Run* position. Qualitek mR is now ready to use.

4.3.1 Put Qualitek mR to Work

When everything is programmed and checked out, you're ready to put Qualitek mR to work and start testing products. A few tips:

- Explain controls and run display messages to operators.
- Keep external connections to the product under test as straight, rigid, and direct as possible. Flexible connections can cause inconsistent readings.
- Put the Qualitek mR in a place where the pressure regulator and other controls on the back won't get moved around or damaged.

4.3.2 In Case of Difficulty

Many difficulties encountered when setting up a new tester are caused by simple things. Address the items in the checklist below to ensure the tester is being operated correctly.

Setup Checklist

- The key must be used to save changes made in Program mode. Be sure that it is being used.
- Is the power supply connected to the back panel and is it receiving power (the power supply's green light is lit)?
- Is supply air connected to Qualitek mR?
- Is the supply air clean and dry? Air that contains moisture, oil, or hard particulate ***will*** damage Qualitek mR.
- Is the supply air within the correct pressure range?
- Has the pressure regulator changed from when the test pressure was set? A change will cause pressure errors.
- Has the security lock switch been set in the appropriate position for the desired task (Run vs. Program mode)?
- Has the sensor calibration been changed?
- Are units set to the correct units of measure?

If the problem persists, call Uson for help.

Uson's Customer Support Hotline is available at:

855-GET-USON (855-438-8766)

Changes made in Program Mode are NOT saved until the tester is returned to Run Mode by using the KEY.

5
Run Mode

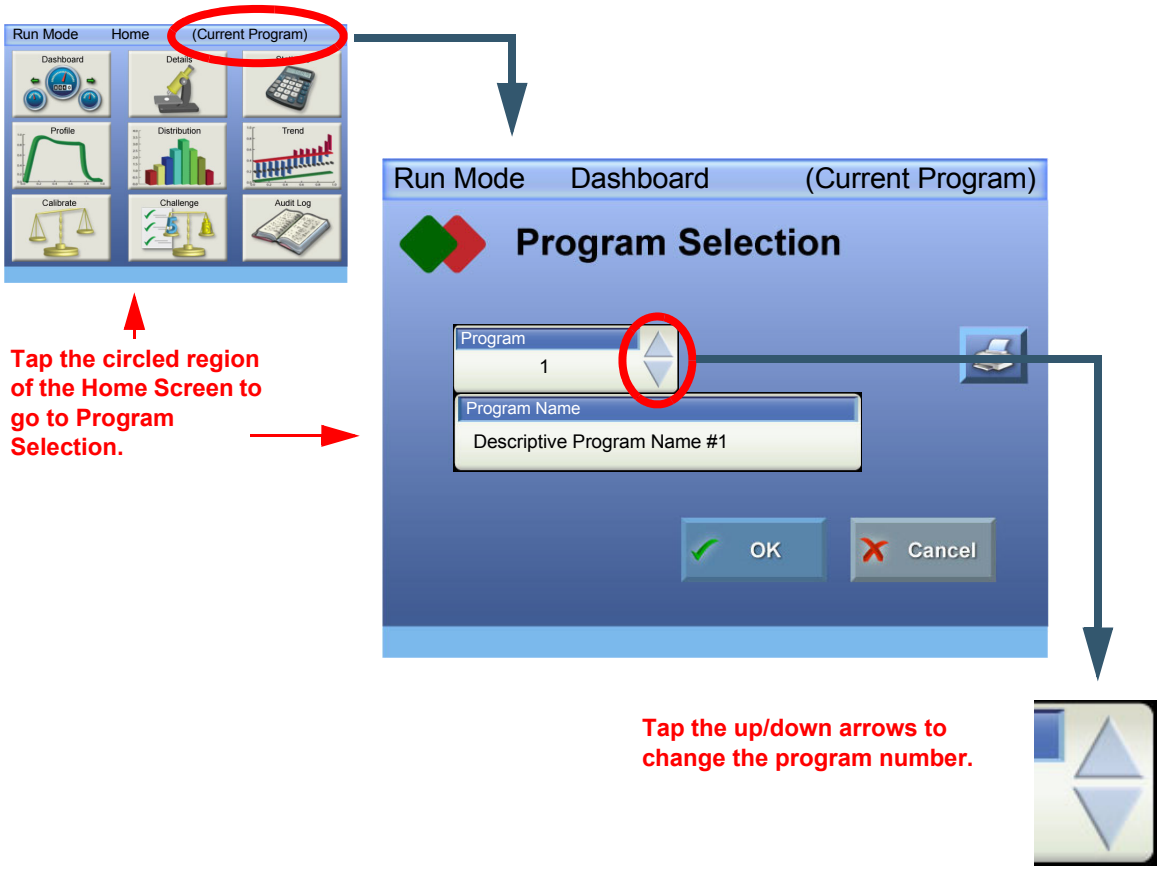
5.1 Home Screen Features

Tapping the program name at the right side of the Title Bar from any screen where it is visible will call up the Program Selection screen. Select a program by entering it's number in the **Program** data box. The program number can be selected in two ways. One method is to tap the up/down arrows to scroll through the available program numbers. This method is the easiest to use if the new program is reasonably close to the current number. The other method is to use the numeric keypad, described on the next page.

Program selection is not available in Run Mode when prohibited by settings made in Tester Control. The Program Information in the Title Bar is dimmed whenever Program Selection is not allowed. See *"Tester Control" on page 6-45.*

Once the program number appears in the Program Data Box, its corresponding name appears in the **Program Name** box. Use the **OK** button to accept the change or the **Cancel** button to quit without making changes.

Selecting a Program: Method 1



The title bar on the Program Selection screen shows the name of the screen that was previously being viewed. This screen will be recalled for display when the **Cancel** or **OK** button is touched.

The most direct way to make large changes from the current program number is to use the numeric keypad. Tap the **Program** data box to see the keypad and then enter the destination program number.

The **Clear**, **Backspace**, and **Cancel** buttons are used to correct entry mistakes or to quit the process without making any change.

Clear

Deletes all entries in the input field allowing data entry to start from the beginning.

Backspace

Move the data entry cursor back by one space each time it is pressed to allow correction of a mis-typed entry.

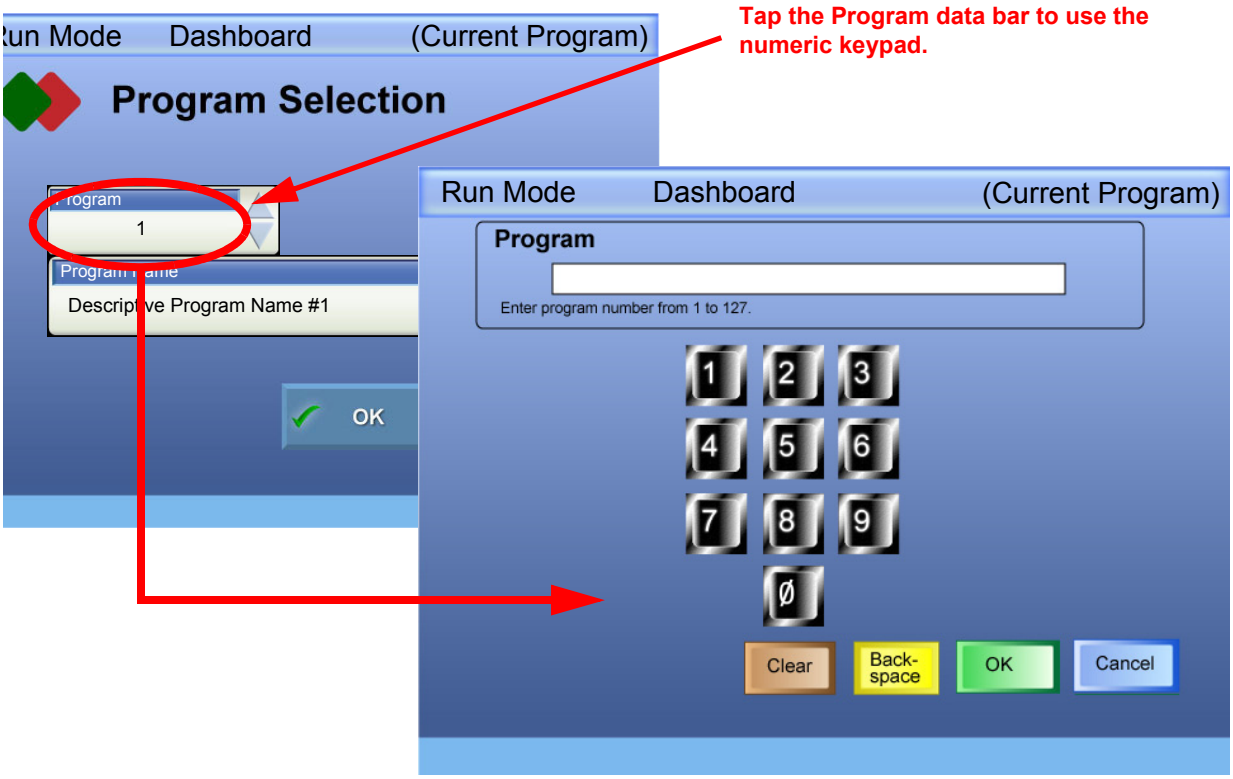
Cancel

Quits the process and returns to the previous screen. Any change in the entry will be discarded.

OK

Accepts the entry and returns to the previous screen.

Selecting a Program: Method 2



Keypads appear when it is necessary to enter characters or numbers in a data bar. A USB keyboard can be used, if desired.

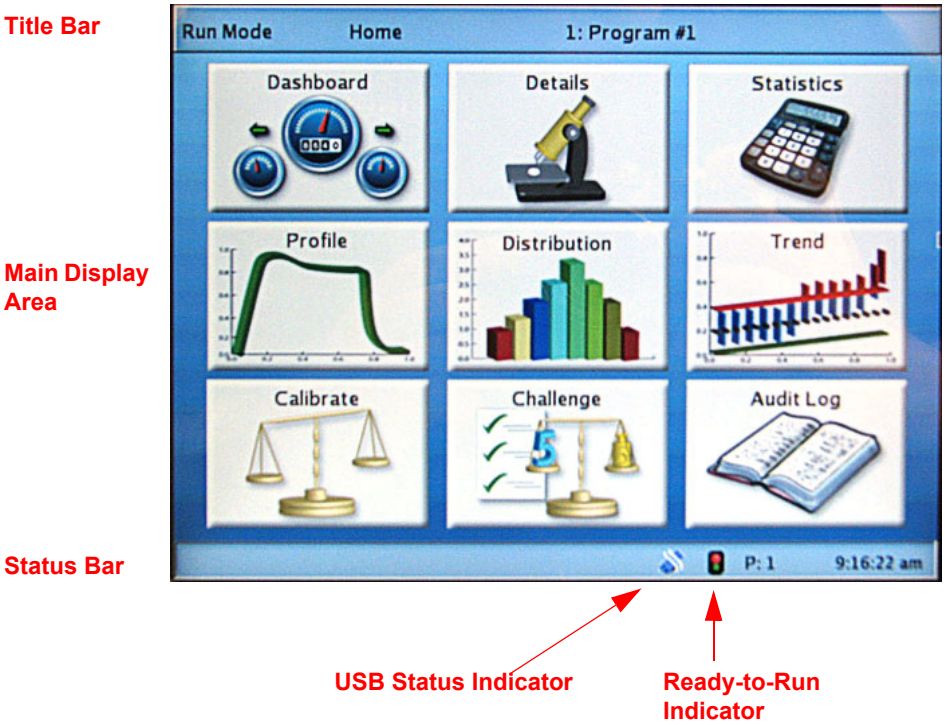
5.1.1 USB Keyboard

A generic USB keyboard can be connected to either the front or rear USB connector. Input from the keyboard is accepted whenever a keypad is on the screen.

Example USB Keyboard

5.2 Run Mode Home Screen

The screen below is the Run screen. After the tester finishes startup and while the keyswitch is in the Run position, this screen will appear. Program changes are not allowed in Run mode. The screen has a Title Bar, Status Bar, and Main Display area as shown in the illustration below.



The Title Bar in the example shows “Run Mode” which confirms that the tester is in Run Mode. “Home” indicates that this is the Home screen for this mode. The Title Bar is an aid to navigation as it always shows the feature currently in use. The number and name of the current program is shown as well.

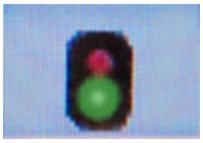
The Status Bar shows information about the status of the tester. If a program is running it will show **P:X** where X is the current program running. (This is useful for monitoring linked programs in progress.) The time is also shown.

The USB Ready indicator shows if an inserted memory stick is ready for use. The USB memory stick is ready to use when the figure is unbroken according to the example below.

USB memory not ready

USB ready

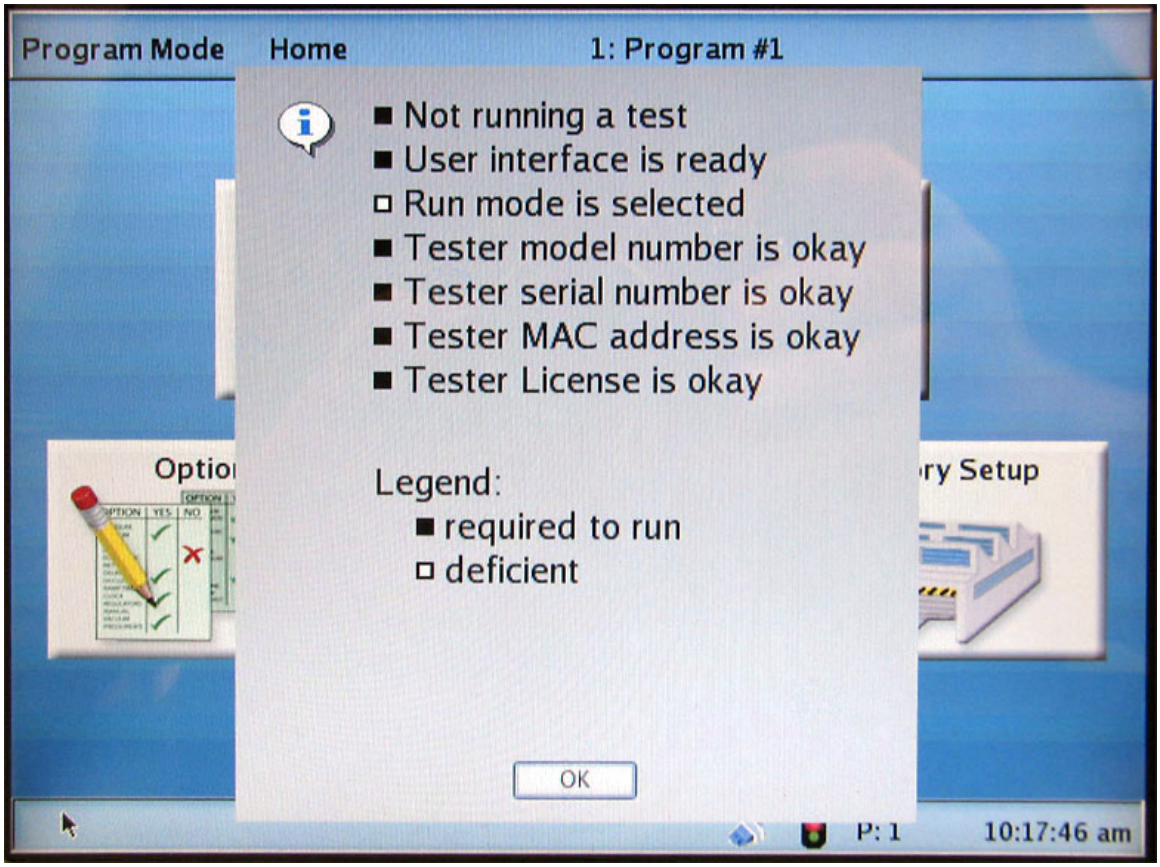
That Status Bar has a “ready-to-test” indicator. When the indicator is green the tester is ready to begin testing. If the indictor is red, a prerequisite is not being met.



Ready to Test

Not Ready

Touching the indictor will display a list showing which prerequisites are being met and which are deficient.



In this example, the tester is not ready because it is in Program Mode.

5.2.1 Quick Printing

The Qualitek mR tester provides a convenient method to print the configuration settings. This feature is available from almost every screen in the tester in both Run mode and Program mode. Use this feature to aid in such tasks as maintaining a record of the tester's configuration, and also to confirm that the desired configuration settings have been entered.

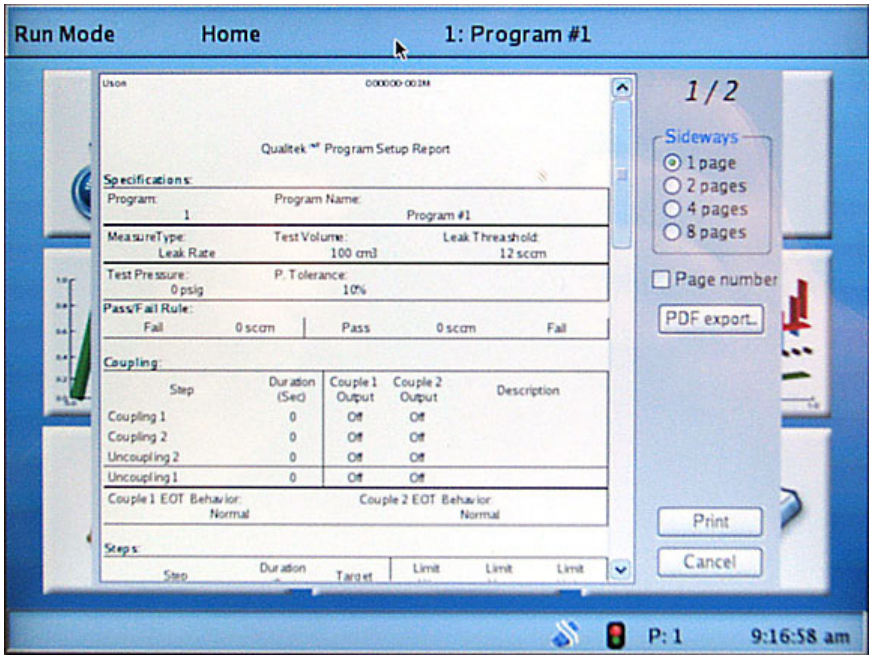
The following may be printed:

- Program Test Setup
- Options
- Hardware Setup
- Factory Setup

To activate the quick printing feature, tap the "Home" legend on the Title Bar as shown in the following illustration.

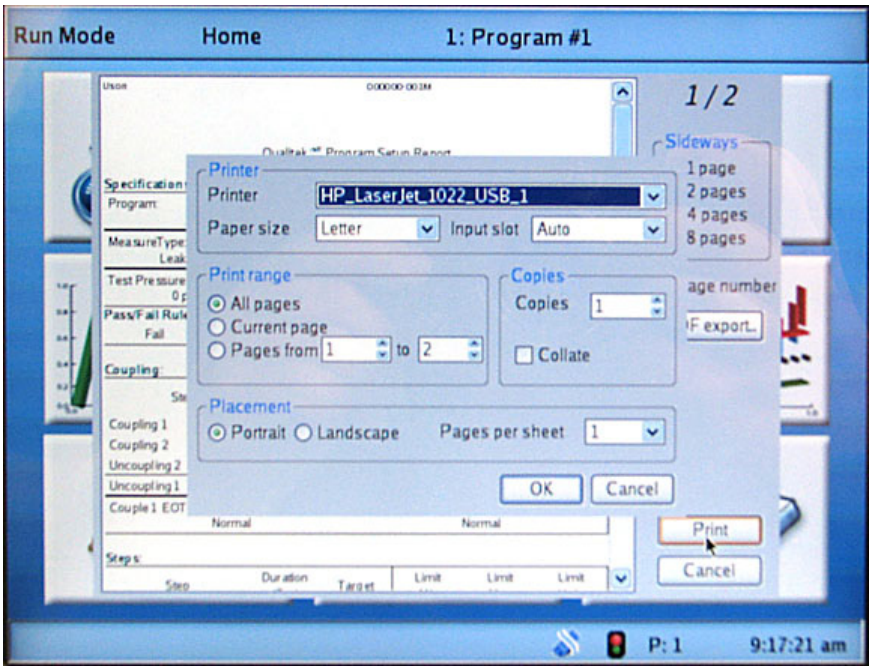
Tap the Title Bar here to open the Quick Print menu. (This feature is available in both Run mode and Program mode.)

The illustration below shows the first page of a Program Test Setup report. The report can be scrolled to view it completely.



If desired, use the **PDF export** button to save the report as a PDF file to a USB memory stick. Insert the memory stick and wait for the *USB Ready* indicator to show the stick is recognized. Press **PDF export** and wait for the activity light on the stick to stop blinking. When the light stops blinking, an appropriately-named PDF file will have been saved to the root level of the memory stick.

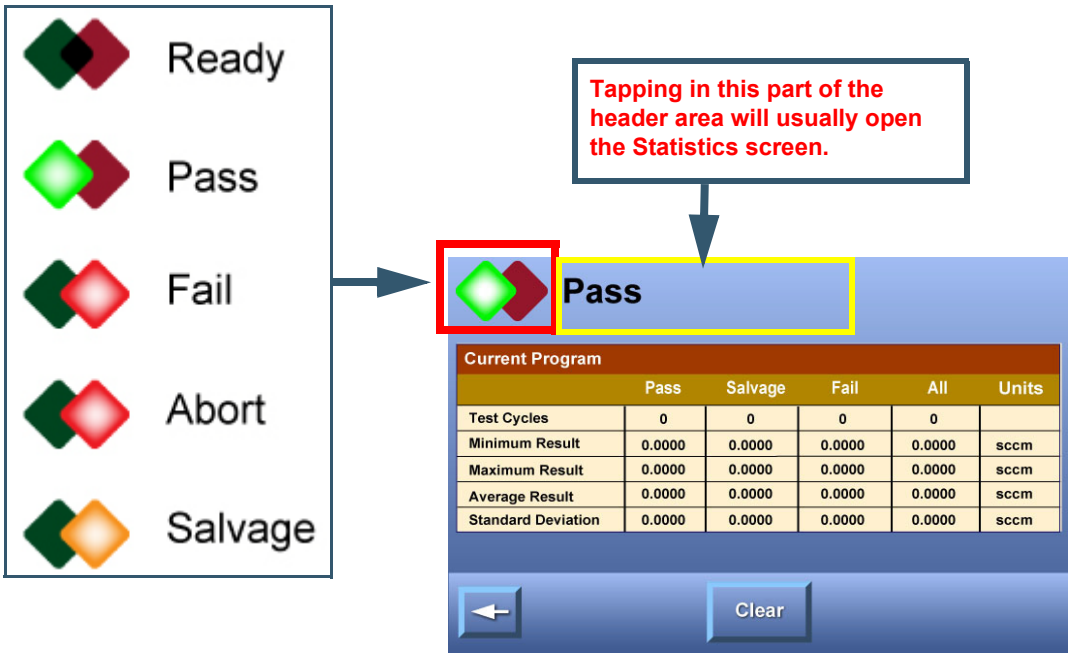
It is possible to print to a connected printer by pressing the **Print** button. A printer dialog box will open as shown below. Make the desired entries and press **OK** to print to the printer.



Press **Cancel** to close all dialog boxes and return to the Home screen when finished using the Print feature.

5.2.2 Double Diamond and Header Display

A prominent feature on many Run mode screens is the double diamond indicator that shows the status of the tester or the result of the last test. Colors and highlighting emphasize the status so that the display can be interpreted at a glance. Descriptive text, e.g. Pass, Fail, etc., is used also to declare the test status.



Fast Navigation Tips: Tapping the header will usually open the Statistics screen.Tapping the double diamonds wherever they appear will open the Dashboard display. See *page 5-13.*

5.2.3 Run Mode Icons

Nine large icons occupy the center of the display and are the gateways to the areas of the tester that an operator is likely to need.

These icons represent:

- Dashboard: See *"Dashboard" on page 5-13.*
- Details: See *"Details" on page 5-16.*
- Statistics: See *"Statistics" on page 5-19.*
- Profile: See *"Profile" on page 5-21.*
- Distribution: See *"Distribution" on page 5-24.*
- Trend: See *"Trend" on page 5-26.*
- Calibrate: See *"Calibrate" on page 5-32.*
- Challenge: See *"Challenge" on page 5-34.*
- Audit Log: See *"Audit Log" on page 5-36.*

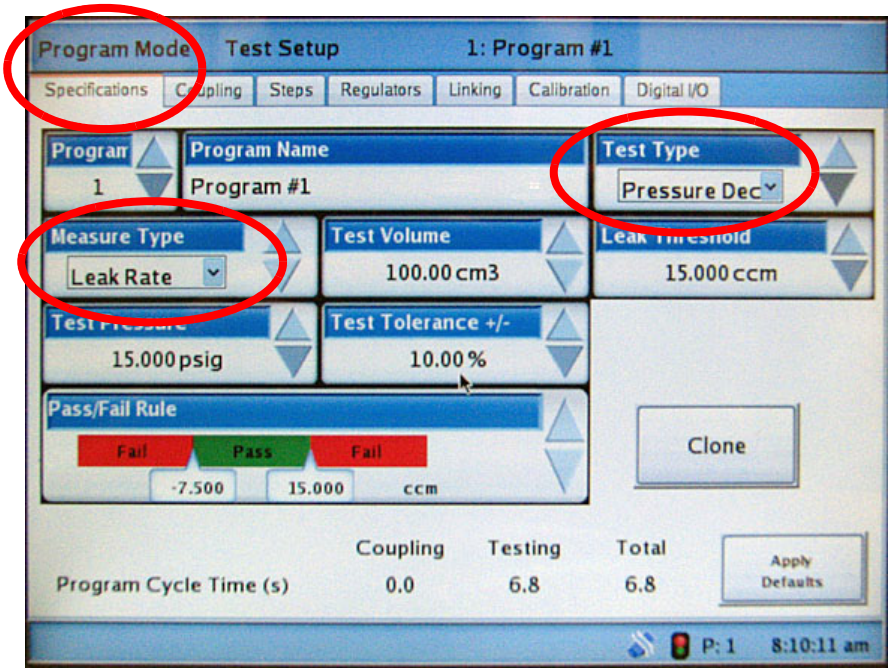
Note that the ***Calibrate** button* is “grayed out” (dimmed) if a Leak Rate test is not selected. (See *page 5-11.*)

5.2.3.1 Calibrate Button Availability

The Calibrate button is available only when the Measure Type of the current program is set to Leak Rate and Pressure Decay as shown. (The test type is set in Program Mode. See *"Specifications" on page 6-4.*) Otherwise, the button is dimmed and not available for use.

The Calibrate button is dimmed if the test type of the current program is ***not*** a Leak Rate and Pressure Decay type test.

In Program Mode, the Measure Type must be Leak Rate and Test Type Pressure Decay for the Calibrate Button to become available.



5.2.4 Symbols

The symbols shown below are used on some screens and they are defined as follows:

The **check mark** indicates a step or operation has completed successfully. Basically it indicates **OK**.

The yellow **question mark** is used to indicate a questionable step result or a salvage result.

The red **octagon** means the step stopped or was aborted before finishing.

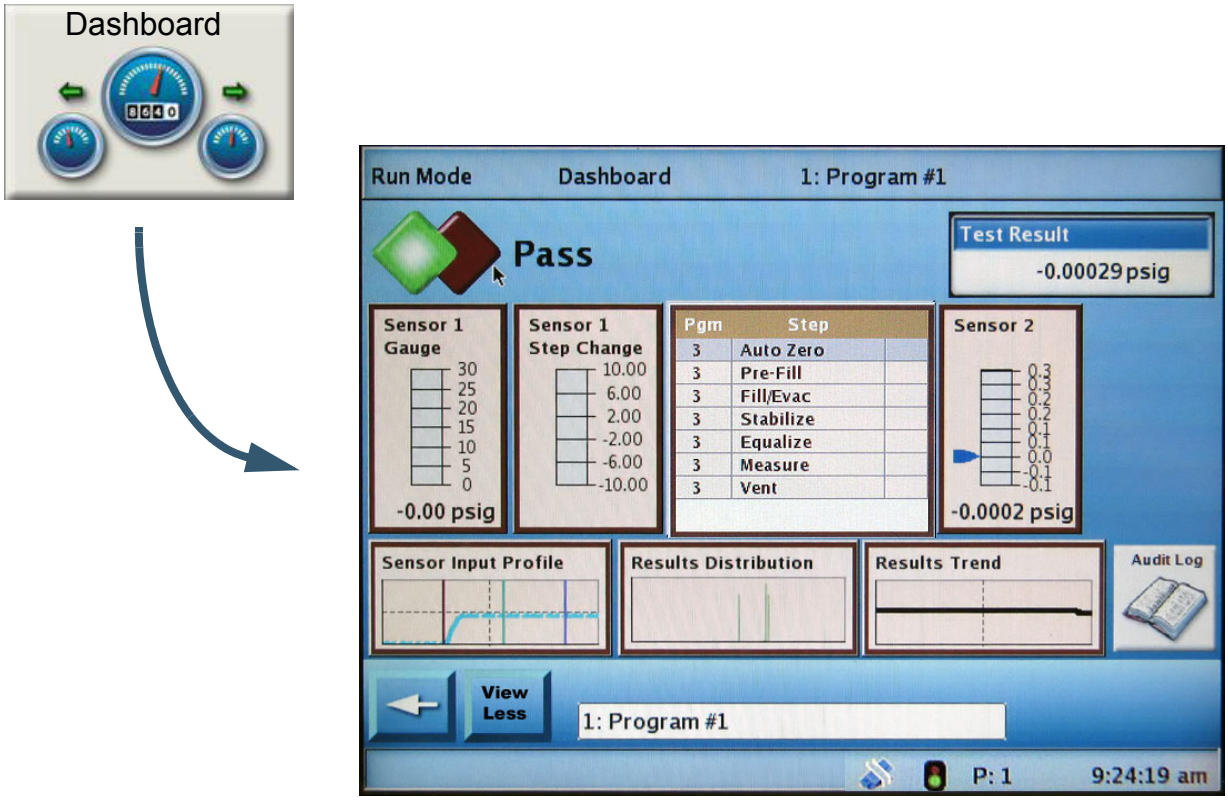
The red **x** shows that the step failed or that the step result is failed. Basically, it indicates **NOT OK**.

The symbols listed above have the same meaning on every screen where they may appear.

5.2.5 Dashboard

The Dashboard display is useful for monitoring tests in progress on a step-by-step basis. In many cases this will be the primary display preferred for watching tests as they proceed.

Tapping the area to the right of the “double diamonds” will show the Statistics screen (See *"Statistics" on page 5-19.*) Tap the back arrow on the Statistics screen to return promptly to the Dashboard.

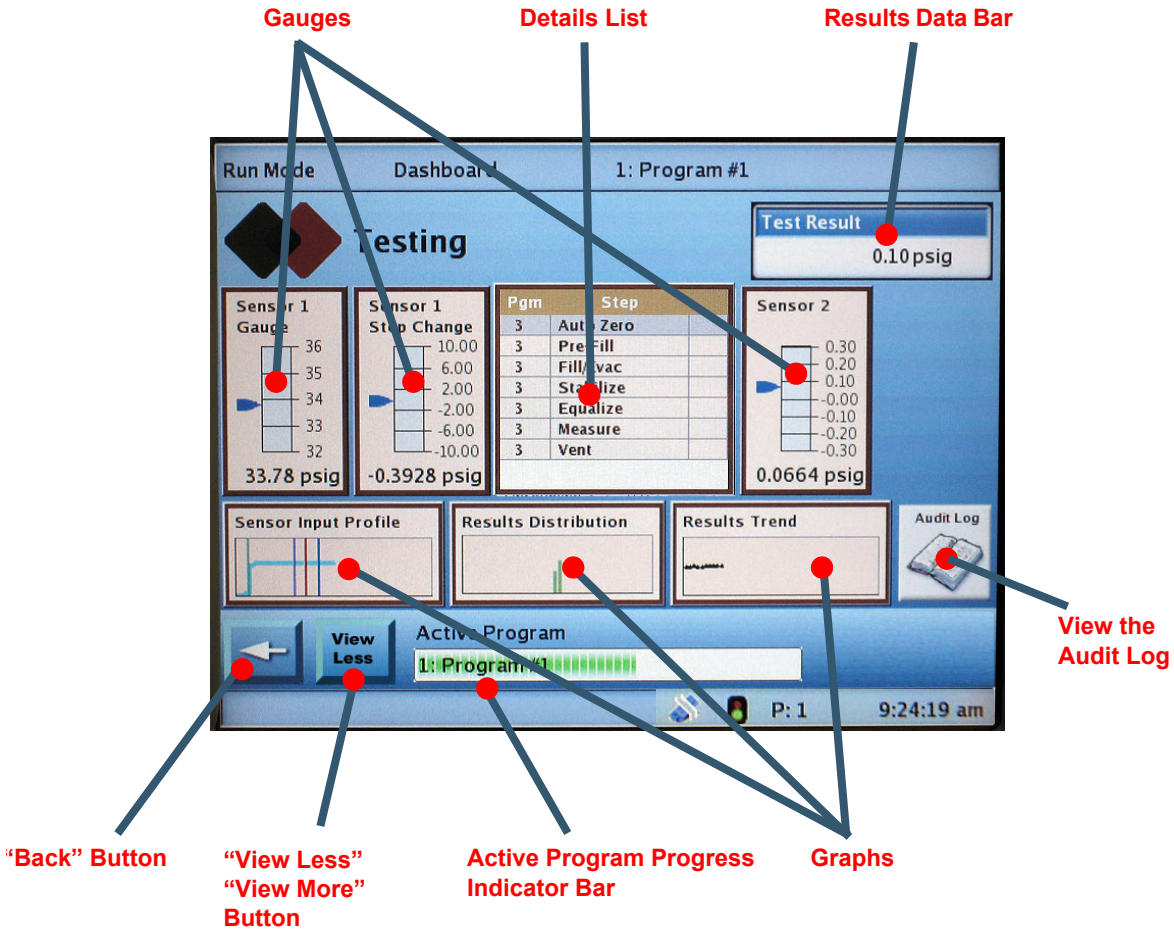


The illustration above shows how a large amount of information is displayed on this screen, making it perfect for monitoring tests in progress.

The **View Less** button is a toggle that reduces the number of elements displayed to a bare minimum. This reduces clutter for those operators who do not need detailed information about a process. The button description changes to **View More** when the minimal display is being used. Pressing it at such time brings all the screen elements back into view.

5.2.5.1 Dashboard Screen Elements

An illustration of the Dashboard screen in use while running a program is shown below. Note that the gauges, graphs, and program bar are operating. in real-time.



Gauges

Vertical gauges show the real-time status of sensors in use. The gauge markings may be customized.

Graphs

Profile graphs of sensor input, results distribution, and results trend are shown. Tapping a graph will show the operator the full-sized profile, distribution, or trend screen.

Details List

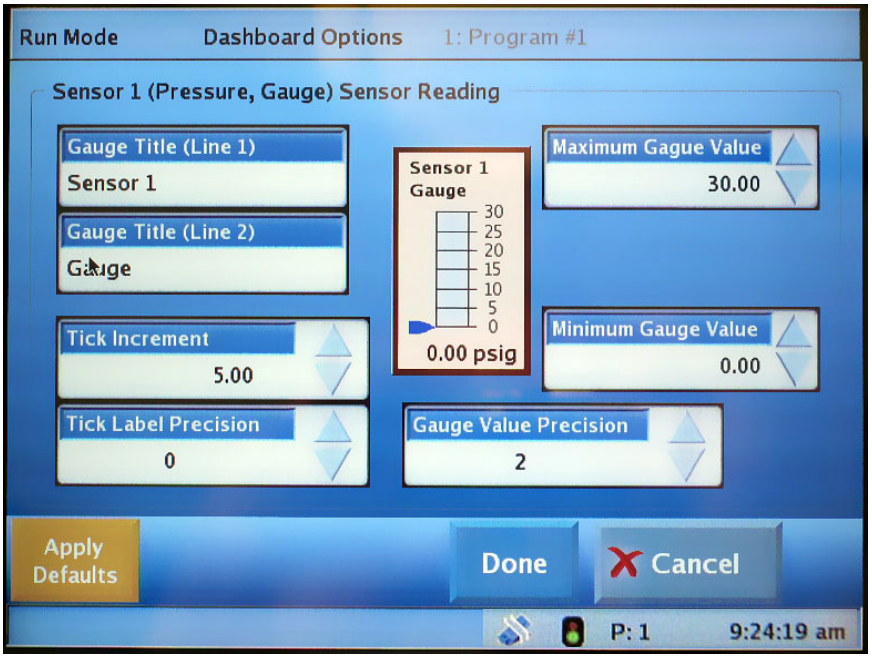
A condensed version of the Details display is shown in the middle of the screen.

Active Program Progress Indicator

The test progress is graphically shown as the rectangular bar at the bottom of the dashboard screen expands from left to right.

5.2.5.2 Dashboard Options

The dashboard gauges simplify the analysis of how the product and tester are performing during a test. The Dashboard gauges can be customized to further enhance the ease of monitoring the operation of the tester. Tapping any of the gauges will open the Dashboard Options screen shown below. This screen is where gauge customization takes place:



Gauge Title (Line 1) and **Gauge Title (Line 2)**

Tap these data bars to open the keyboard and enter a descriptive name for the graph that best suits your needs.

Tick Increment

Set the number of units to be included between each tick mark on the graph.

Tick Label Precision

Set the number of decimal places to appear on the label for each tick increment.

Maximum and Minimum Gauge Values

These values control the values at the extreme ends of the graph.

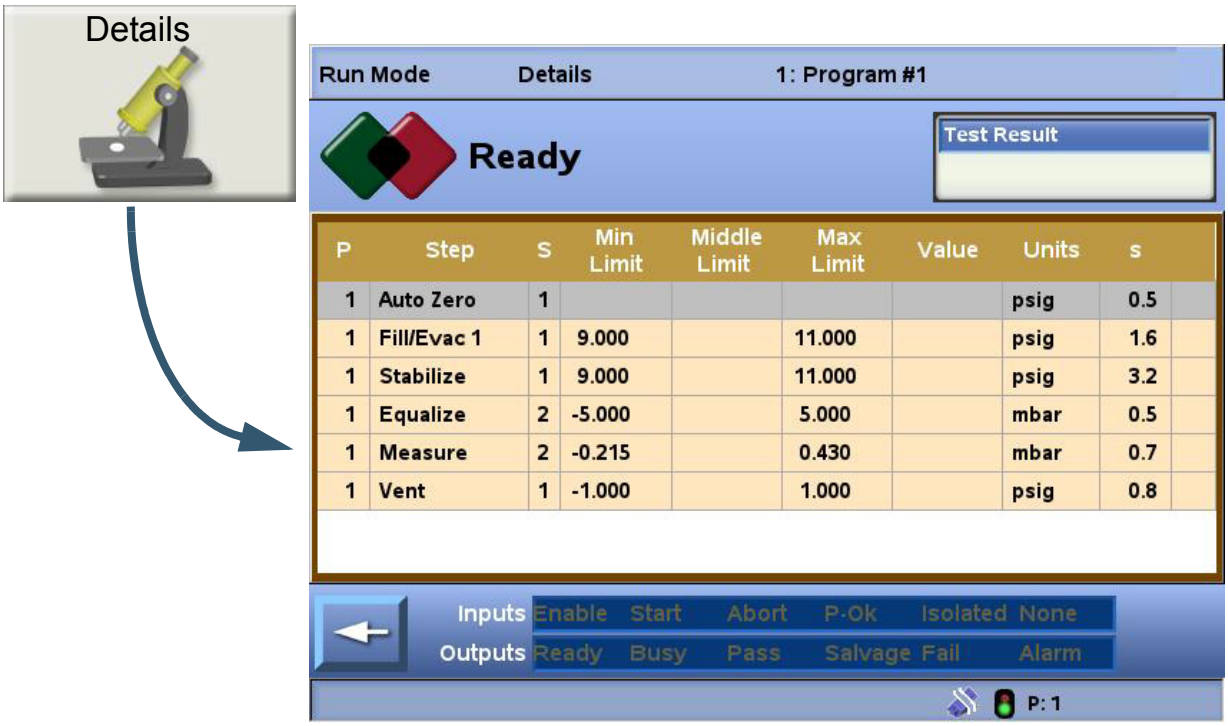
Gauge Value Precision

At the bottom each gauge is a numeric readout of the value. Set this value to the desired number of decimal places.

5.2.6 Details

The Details screen provides a complete view of the progress of the steps in the current program and any programs to which it may link.

The bottom of the display shows the status of relevant digital inputs and outputs.



Each row is a step in a program. The column headings are:

P: This is the program number of the step. When linking is used, the program number shown for a step will change whenever steps are being performed in a linked (different) program.

Step: The name of the current step. If coupling is being used, the coupling steps will be seen here as well.

S: The sensor number that is reporting for the step.

Limit: The limits that have been set for the step.

Value: The value being reported by the current sensor.

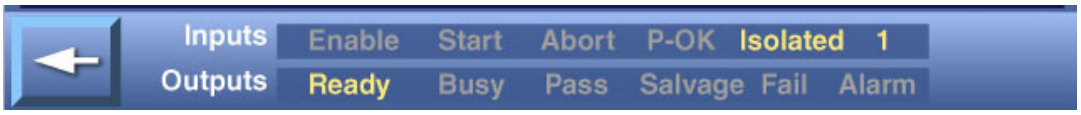
Units: The chosen units.

s: The number of seconds remaining for the step.

Symbols (far right column):
Graphical indicators appear in the right column to show if the step completed successfully or if there was a problem. For definitions of the symbols used: See *"Symbols" on page 5-12.*

5.2.6.1 Input - Output Status Bar

The informative bar at the bottom of the Details screen shows the status of Inputs and Outputs.



Outputs	When Illuminated
Ready	Ready to test
Busy	Tester is busy
Pass	Test has Pass result
Salvage	Test has Salvage result
Fail	Test has Fail result
Alarm	Alarm output activated

Inputs	When Illuminated
Enable	Enable is sensed
Start	Start signal received
Abort	Abort signal received
P-Ok	P-Ok illuminates when pressure circuit is functioning properly. This is an internal signal only.
Isolated	Test and Reference components are isolated from each other. This is an internal signal only.
Number X (seen at right of Inputs line)	Shows the decimal equivalent of the BCD number sensed at the input. This would indicate the program number to run from an external start command. If no digital connection exists, the “none” is always displayed.

5.2.6.2 Digital I/O Status

Tapping the center of the Details display will toggle the display to the Digital I/O Status Details display.

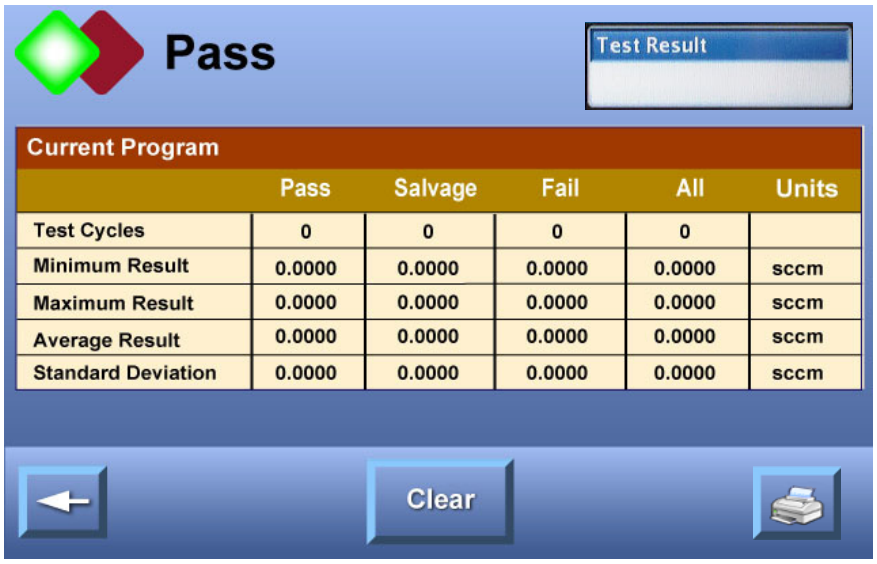
This display has the most complete information if the expanded I/O option is installed. The status of the inputs and outputs is shown according to this code:

- * (asterisk) = Disabled
- ON = 1
- OFF = 0 (zero)
- X = Don't care

5.2.7 Statistics

Constantly-updated accumulated statistics are shown on this screen. The displayed statistics are for the *current program only.* The Statistics option provides:

- Minimum, Maximum results
- Average results
- Standard Deviation results
- CPK results



	Pass	Salvage	Fail	All	Units
Test Cycles	0	0	0	0	
Minimum Result	0.0000	0.0000	0.0000	0.0000	sccm
Maximum Result	0.0000	0.0000	0.0000	0.0000	sccm
Average Result	0.0000	0.0000	0.0000	0.0000	sccm
Standard Deviation	0.0000	0.0000	0.0000	0.0000	sccm

Counts are shown for: passed tests, salvaged tests, failed tests, total tests, and aborted tests.

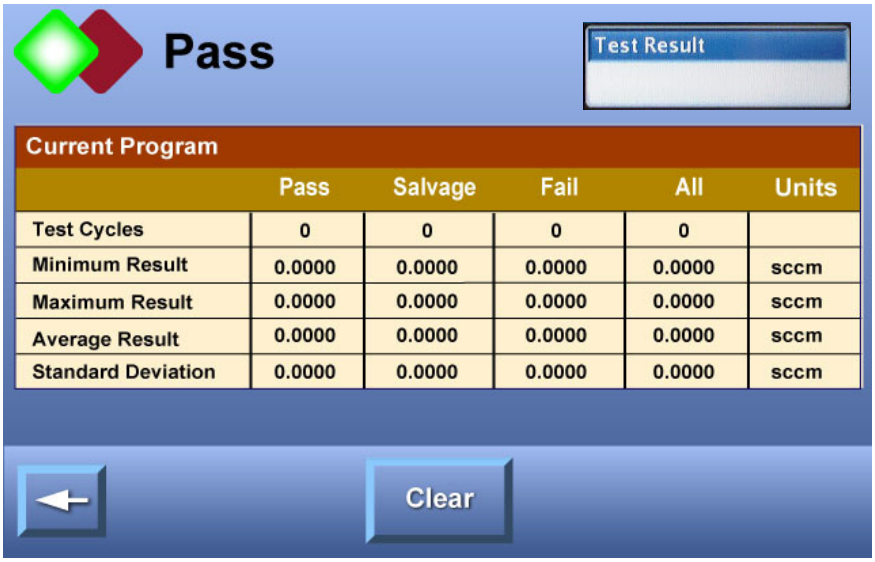
The **Clear** button allows the option to clear all programs or just the current program. The **Clear All** button clears all statistics.

The Clear All button removes ALL statistics.

The **Print** button will print the information to a printer. Note that the Print button will be seen only if a printer is selected on the Hardware Setup tab in Program Mode.

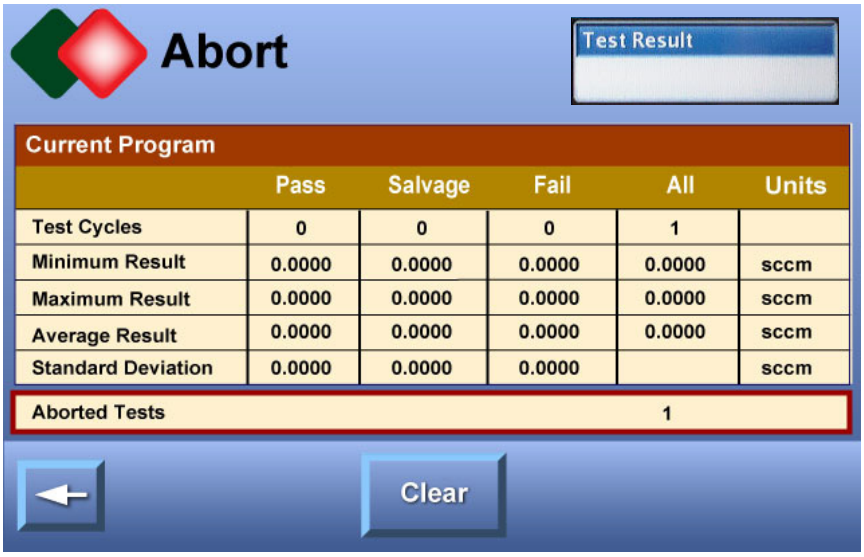
Use the **Back** button to return to the previous screen.

If any test is aborted, a row is added to the chart to show the aborted test information. The following illustration shows how this appears in action.



	Pass	Salvage	Fail	All	Units
Test Cycles	0	0	0	0	
Minimum Result	0.0000	0.0000	0.0000	0.0000	sccm
Maximum Result	0.0000	0.0000	0.0000	0.0000	sccm
Average Result	0.0000	0.0000	0.0000	0.0000	sccm
Standard Deviation	0.0000	0.0000	0.0000	0.0000	sccm

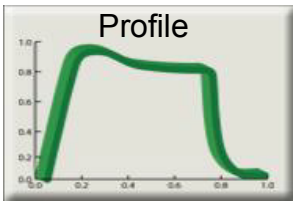
"Aborted Tests" is shown only if at least one test has aborted

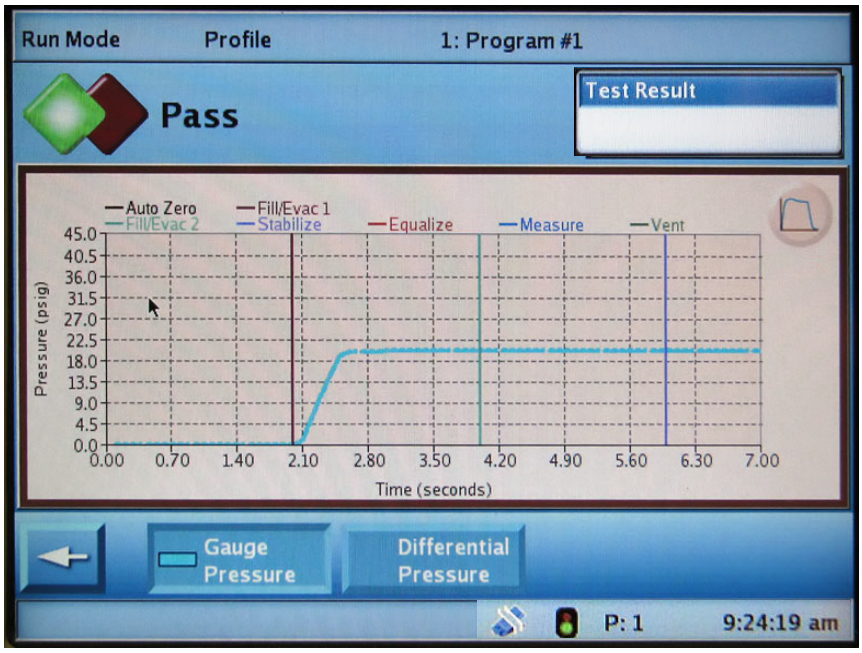


	Pass	Salvage	Fail	All	Units
Test Cycles	0	0	0	1	
Minimum Result	0.0000	0.0000	0.0000	0.0000	sccm
Maximum Result	0.0000	0.0000	0.0000	0.0000	sccm
Average Result	0.0000	0.0000	0.0000	0.0000	sccm
Standard Deviation	0.0000	0.0000	0.0000		sccm
Aborted Tests				1	

5.2.8 Profile

The Profile screen shows a plot of the current test referenced either to Gauge or Differential pressure.



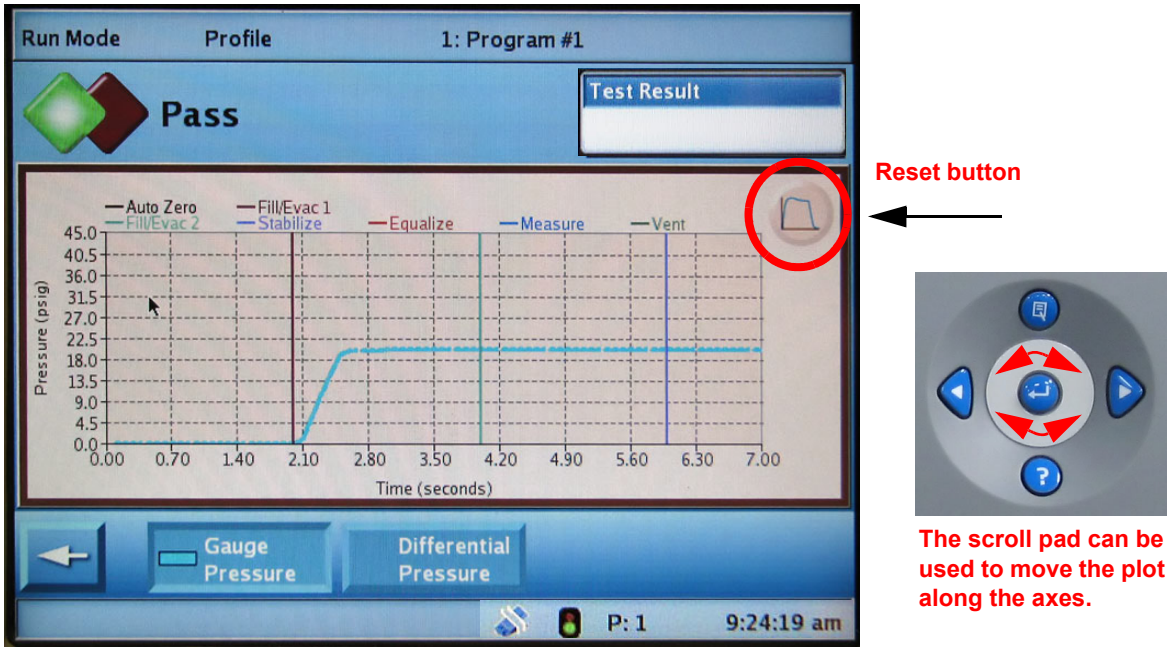


The Profile graph shown above and in the following illustration typical for Gauge Pressure. Selecting the Differential Pressure button will make the y-axis move up to the middle of the graph so that plus- and minus deviations from zero can be graphed. The default values on the x- and y-axes are originally obtained from the test setup but may be modified on the Profile Options screen. See *"Profile Options Screen" on page 5-23.*

The graph can be touched and dragged to reposition it. Use the reset button in the upper right corner to reset the axes to normal when desired.

5.2.8.1 Using the Scroll Pad

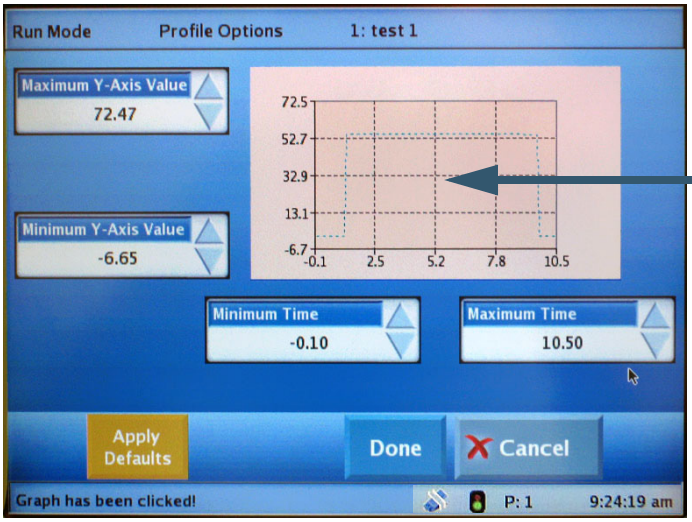
The scroll pad can be used to move the graphic plot as shown in the illustration below. The reset button is used to return the scale to default values whenever desired.



The scroll pad can be used to move the plot along the axes.

5.2.8.2 Profile Options Screen

Tapping the graph *along an axis* opens the Profile Options screen which allows changing the axis values. A smaller version of the graph is shown along with controls that can change the axis values. When the axis values are changed, the graph scaling is changed to alter the plot size or offset it from the original position. This allows viewing a portion of the graph in detail.



Touch and drag in this area to position the plot as desired when wishing to see details.

The plot can be magnified by changing the values in the data boxes.

The Minimum and Maximum values for Y-Axis and the Time values can be set to provide the desired amount of magnification or the location of a graph feature. Changes made here will carry over to the previous screen.

Use the **Apply Defaults** button to discard any changes made and return to the default values for the graph axes. Use the **Done** button to exit the Profile Options screen with the currently chosen values or tap the **Cancel** button to quit without making any changes.

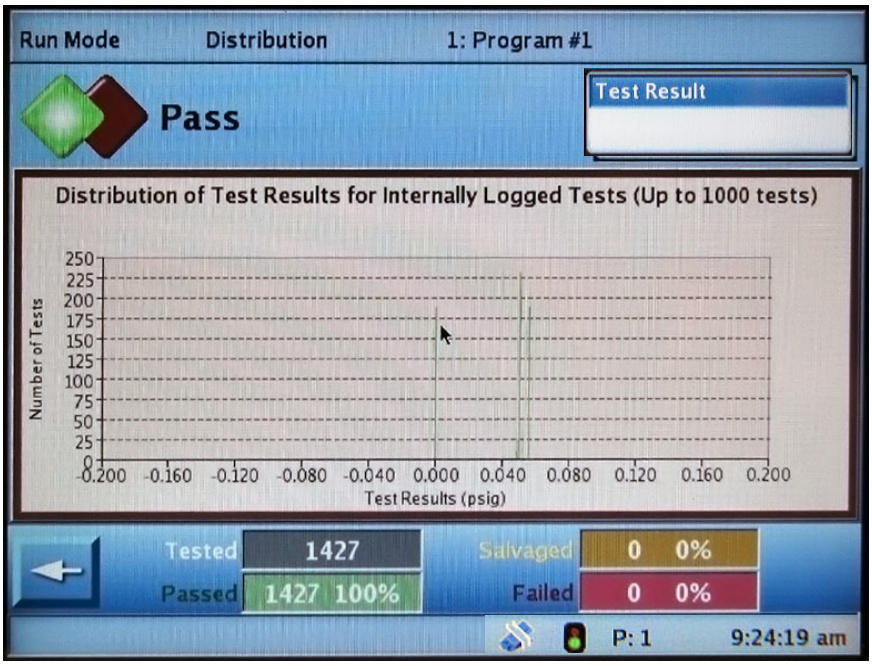
The Trend screen, as described later in this chapter, is positioned and scaled in a similar manner to the Profile screen.
See *"Trend" on page 5-26.*

5.2.9 Distribution

A histogram of the testing activity is shown on the Distribution screen.

Test results are grouped into vertical bar plot objects called *bins*. The bins show the groupings of the test results. The number of bins and the span of the results to display can be adjusted, as desired. A running total of counts may be viewed in the area below the graph. The following counts are displayed:

- Test Cycles
- Passed
- Salvaged
- Failed

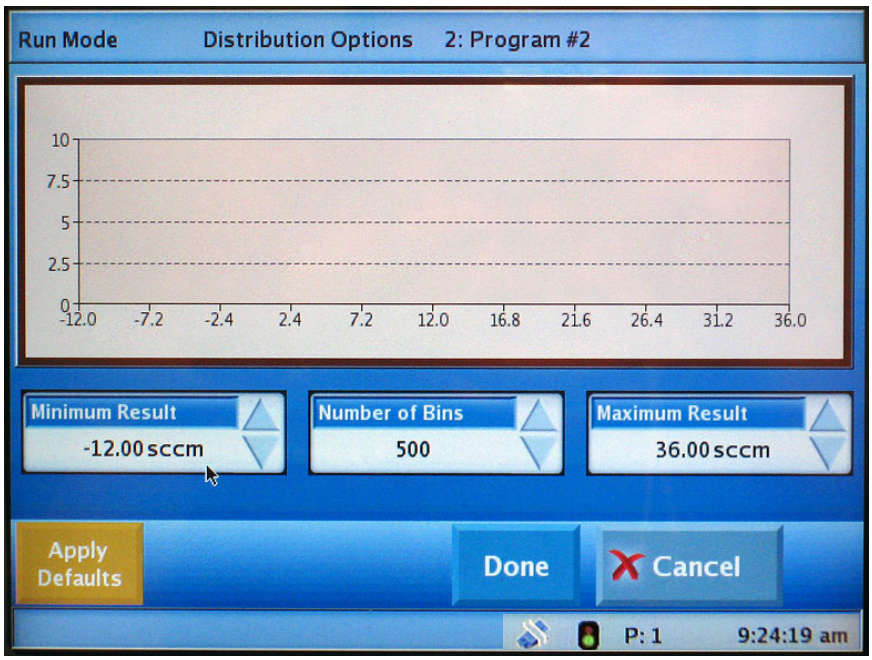


5.2.9.1 Distribution Options Screen

Tapping the plot area along either axis opens the Distribution Options screen shown in the following illustration.

Use the Distribution Options screen to set the following parameters:

- Minimum Result
- Number of Bins
- Maximum Result



The Options can be saved and transferred to the main Distribution screen by selecting **Done** or discarded by pressing **Cancel**.

Default values can be reset conveniently whenever desired by pressing the **Apply Defaults** button.

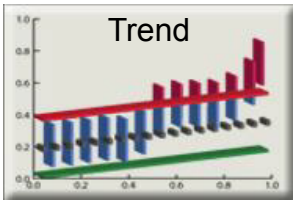
Number of Bins

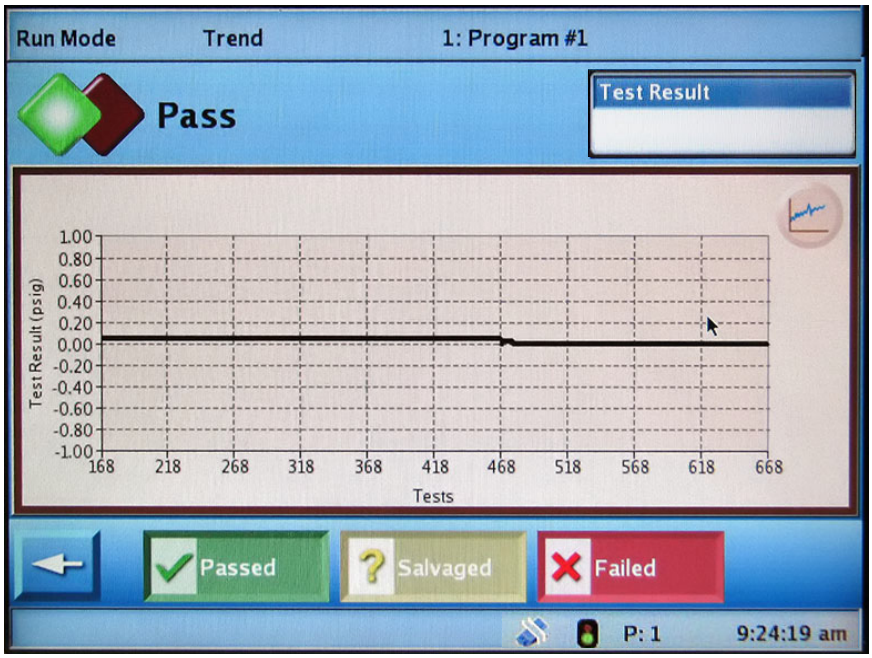
When the number of bins is set to a larger value, the width of the bars will become narrower. At times, with a sufficiently large number, the bars may appear only as vertical lines. If the results display is not to your liking, all that is needed is to select new values and tailor the chart to your needs.

5.2.10 Trend

A trend plot of the test results is shown on the Trend screen.

Trend results are very important as they may indicate problems with the testing strategy or product manufacturing process that might otherwise go unnoticed. Trend results are most useful when many results have been collected from tests. The more points collected, the better will be the representation of trends which may develop over the course of a testing run.



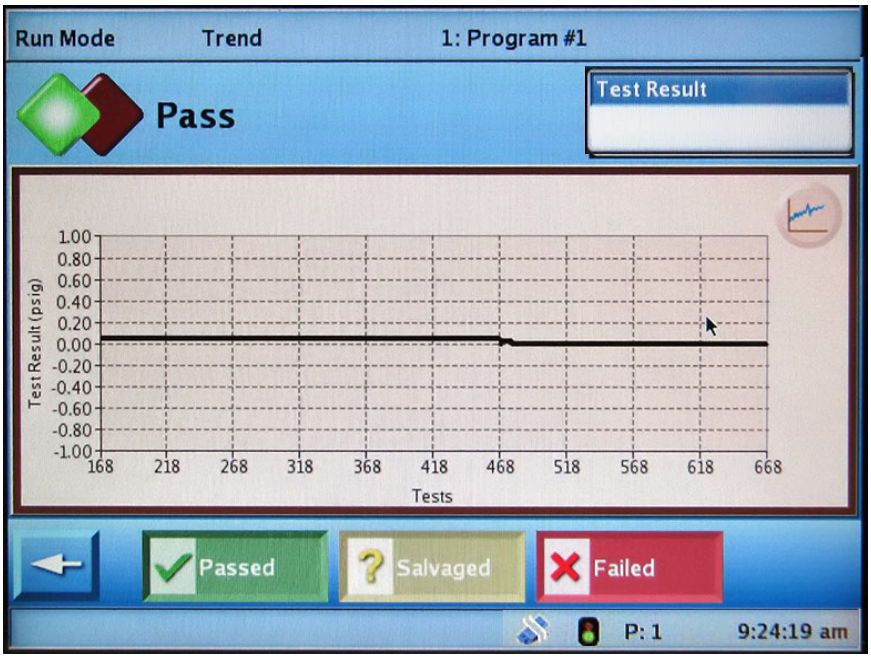


The trend plot is a graph that shows the test results in the chosen units of measure (y-axis) plotted against the number of tests (x-axis). The default values are obtained from the test setup. There is one plot point for every test that has been run.

The plot can be easily repositioned in the display area by touching the plot and dragging it to a new position.

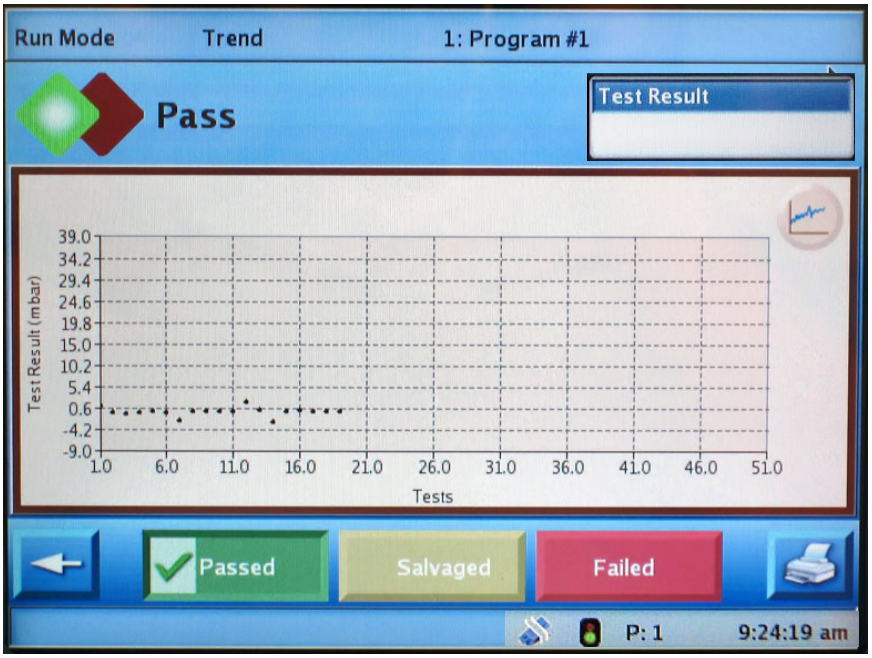
The trend plot can be filtered with the Passed, Salvaged, and Failed buttons to include any or all of those test results on the plot.

The trend results of all test outcomes are displayed because all filter buttons are pressed as shown.



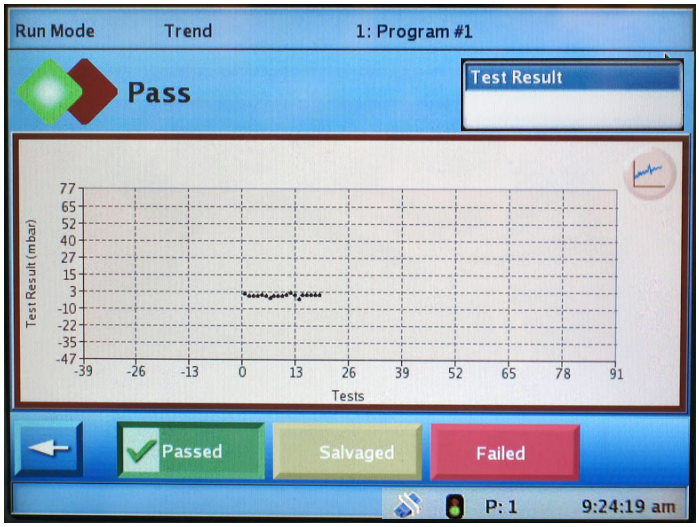
Shown are the results of 19 passed tests.

Failed and Salvaged results are not included because those filter buttons are not pressed.



5.2.10.1 Using the Scroll Pad

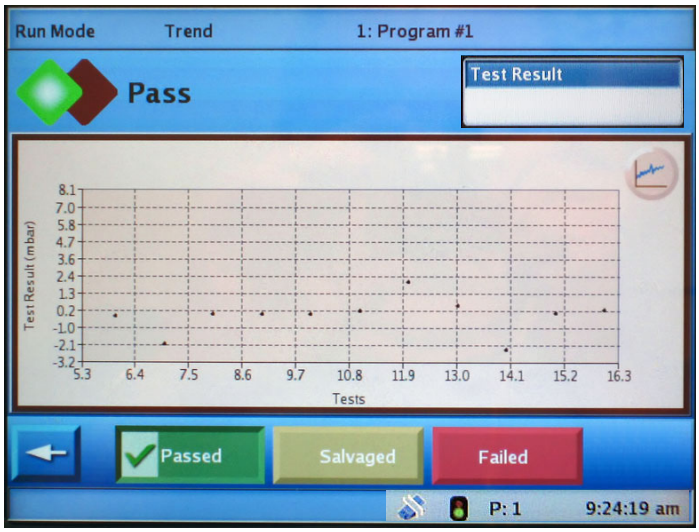
The Scroll Pad provides a convenient way to change the plot scale as shown below.



The scroll pad was turned counter-clockwise.

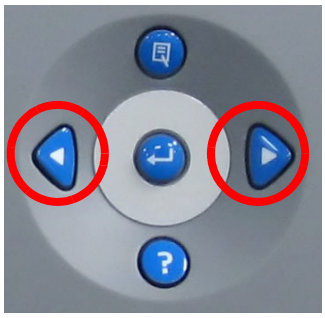
Use the scroll pad to expand or contract the scale of the axes. The effect of this is shown in the illustrations to the right.

Touch the plot and drag it to further adjustment its position, if desired.

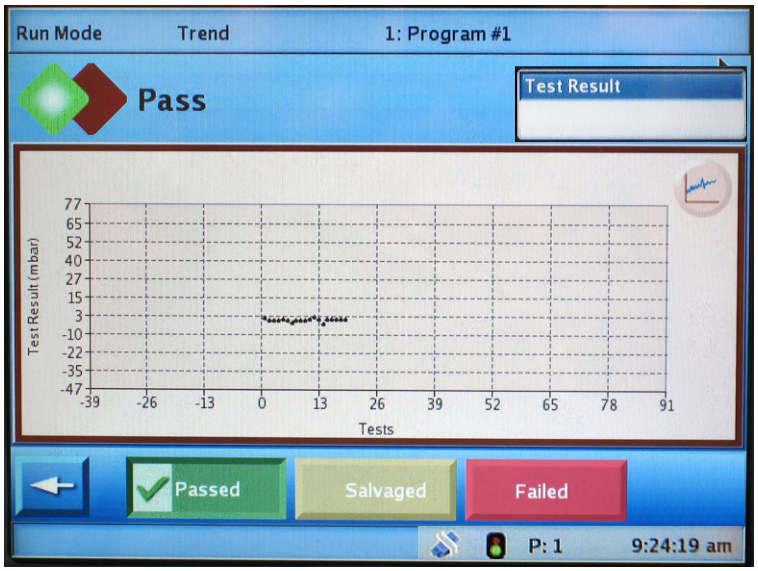


The scroll pad was turned clockwise.

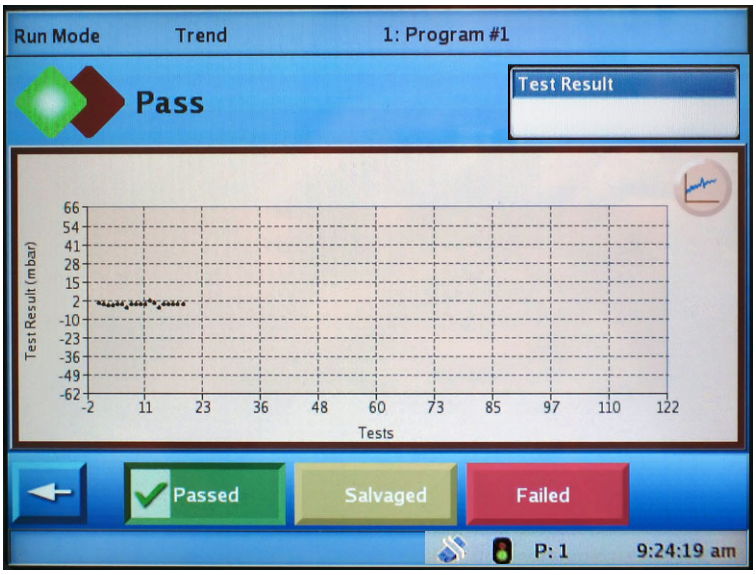
Accompanying the ability reposition the plot by touching and dragging it, the Arrow Keys are also useful for adjusting the plot position as shown in the following illustration.



The Left/Right arrow keys are used to move the x-axis to the left or right which shifts the plot accordingly.



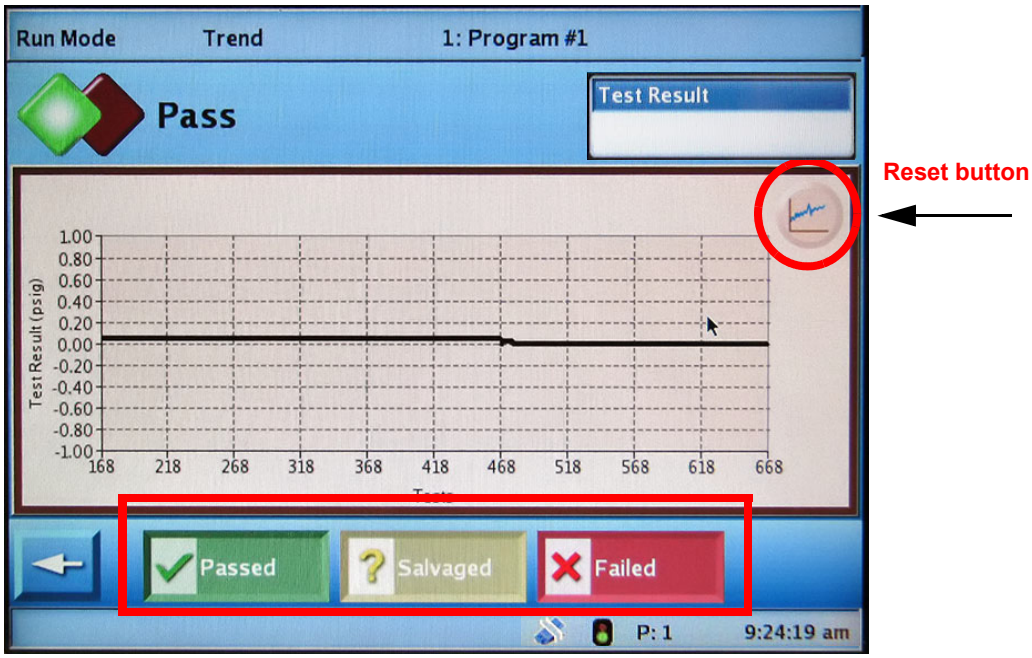
The original trend plot is shown above.



The plot is now repositioned as shown after repeatedly pressing the Right Arrow key.

5.2.10.2 Reset Button

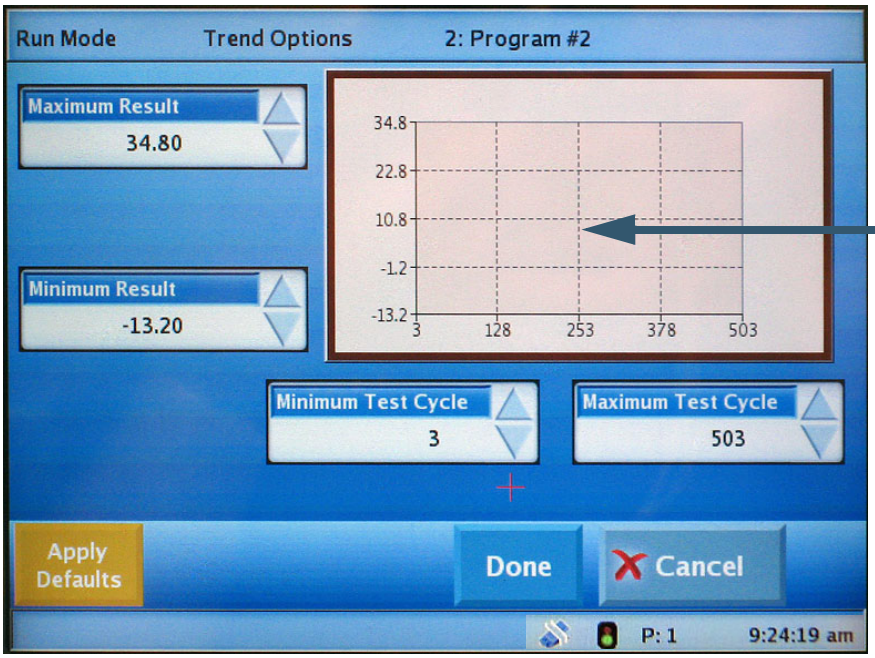
The reset button is available for use to return the scale to the original values whenever desired.



These 3 buttons are used to select the results to be included.
In this illustration, all of the buttons are pressed.

5.2.10.3 Trend Options Screen

Tapping the axes of plot area on either of the graph axes will open the Trend Options screen. This screen allows fine tuning the range of the axes so that the desired areas can be seen in detail. Changes made here will carry over to the main (previous) screen when **Done** is selected.



Touch and drag in this area to position the plot as desired when wishing to see details.

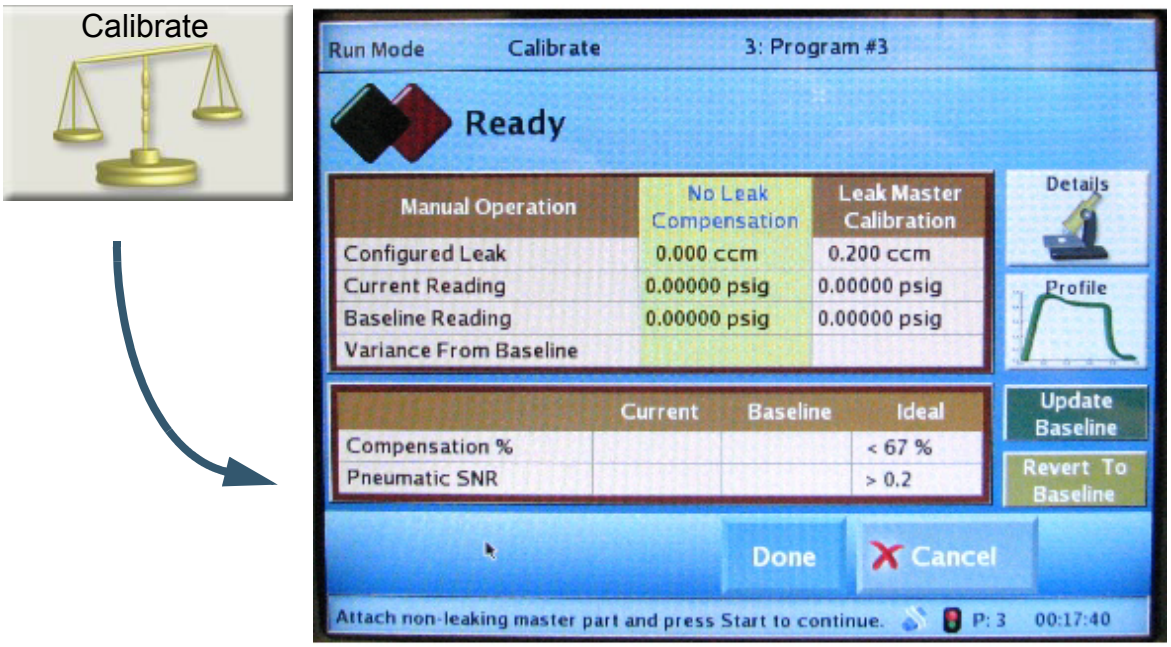
The plot can be magnified by changing the values in the data boxes.

Selecting **Cancel** will quit this screen without making any changes.

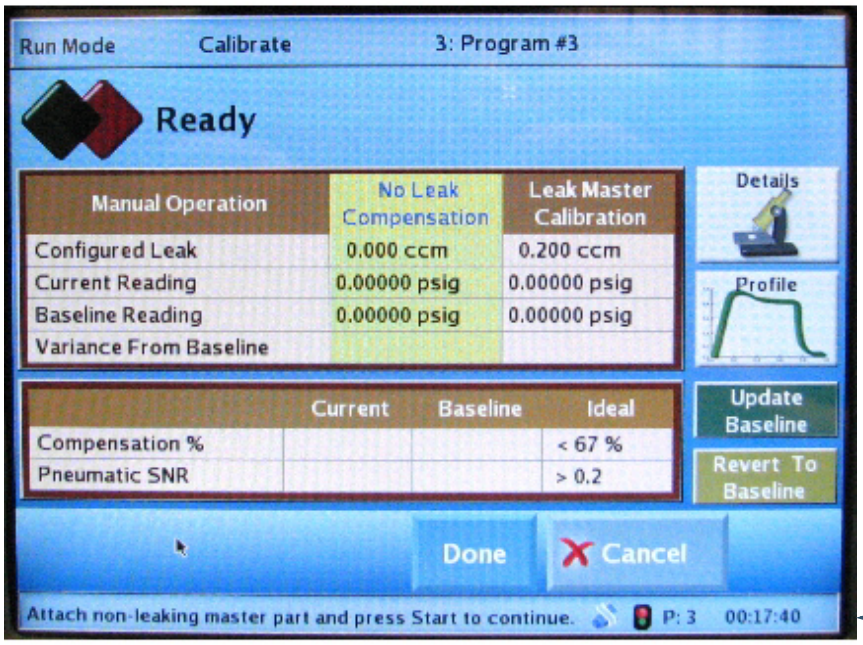
The **Apply Defaults** button will return all settings to default values.

5.2.11 Calibrate

Leak Calibration is sometimes known as *comp and cal* or *test calibration*. **Calibrate** is available only if the current test has the Leak Rate Measure Type (See *"Specifications" on page 6-4.*). The **Calibrate** button will be dimmed and it will not be selectable if the current test is a Pressure Change Measure Type,.



Leak rate calibration can be performed by following the prompts shown at the bottom of the Calibration screen.



Note: the SNR number of 0.2 displayed in these figures is for a differential tester. For a gauge tester, the SNR number will be 0.5.

Step-by-step Instructions are given on the status bar.

Leak calibration is a two-step process. First, the test is run with a non-leaking master part to establish the characteristic pressure change of the part and the pneumatic system. This result is referred to as the Comp value. The second test is run with a traceable Leak Master (e.g., traceable to the NIST in the USA) to introduce a known leak to the master part. This process establishes pressure loss caused by a leak, and the resulting value is referred to as Cal

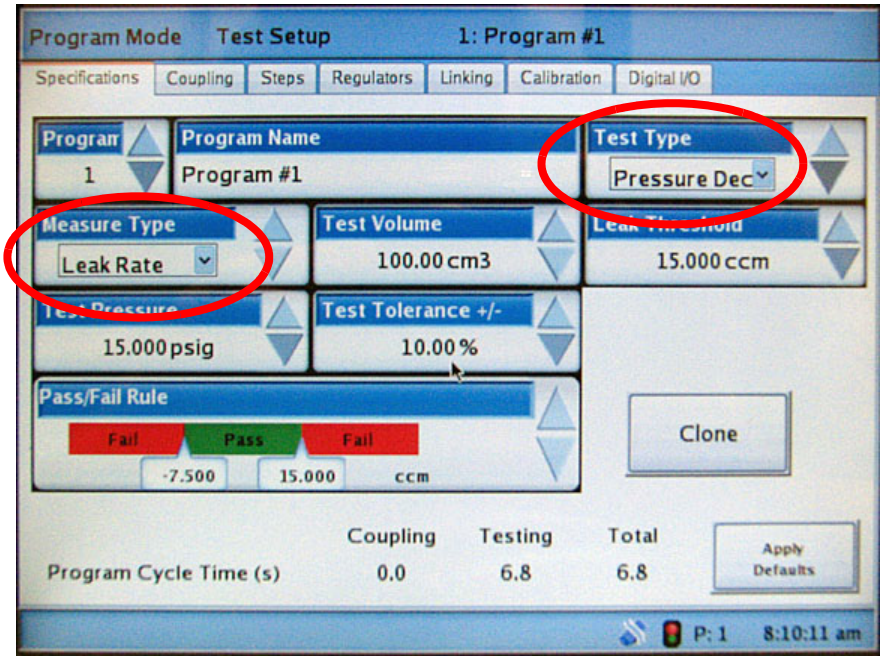
The **Update Baseline** button allows updating the current baseline with the new calibration data. Changes to the baseline in the current session may be discarded by pressing the **Revert to Baseline** button.

The Dashboard and Profile buttons can be used to temporarily visit those screens. However, the tester will remain in Calibrate mode (the title bar will reflect this) until Calibrate is ended from the Calibrate screen with either **Done** or **Cancel**.

5.2.11.1 Calibrate Button Availability

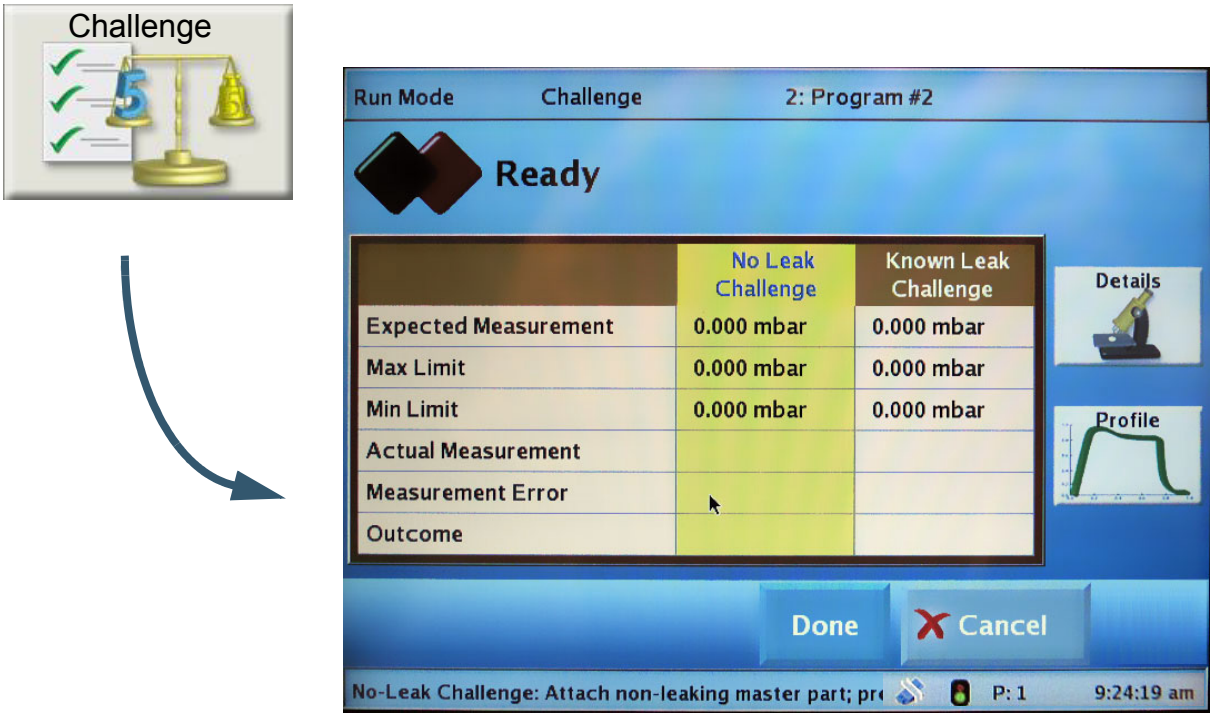
The Calibrate button can be selected only when the Measure Type of the current program is set to Leak Rate as shown and the Test Type is Pressure Decay. (The test type and measure type are set in Program Mode on the Specifications tab as shown.

If a Leak Rate measure type and Pressure Decay test type are not selected, as shown, the Calibrate button is dimmed and unavailable.



5.2.12 Challenge

Use the Challenge screen to compare how a non-leaking part compares to a calibrated leak master.

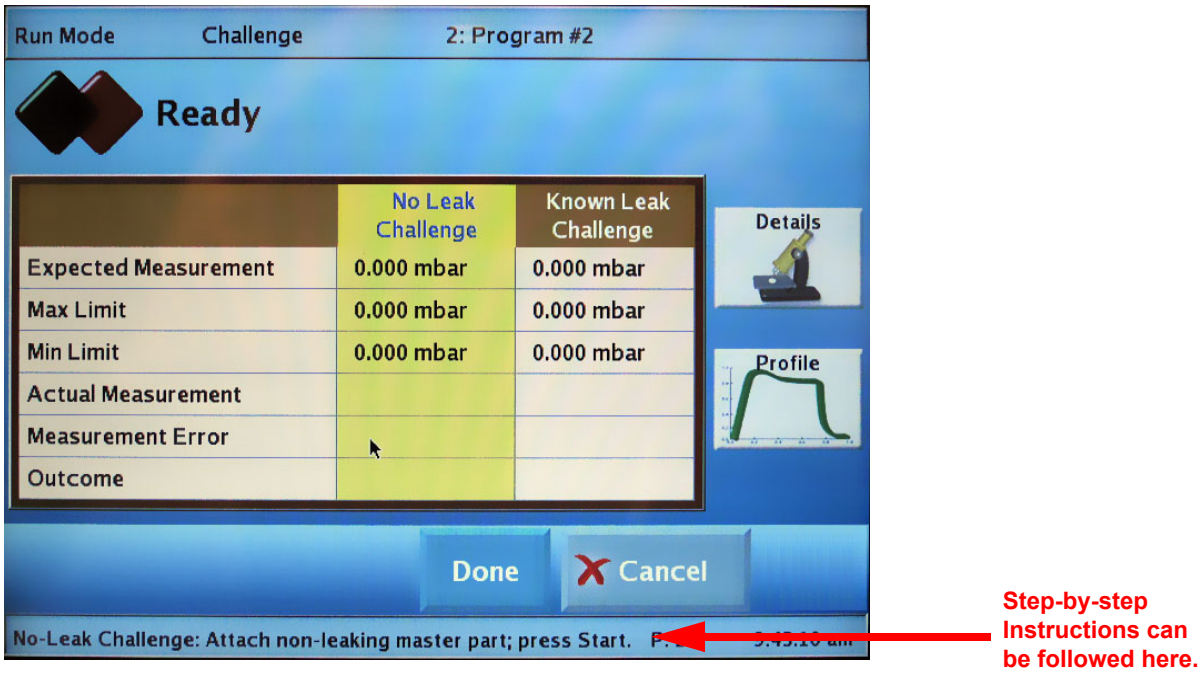


Prompts at the bottom of the screen will lead the way through the process. From this screen it is also possible to directly visit the following screens by touching the appropriate button:

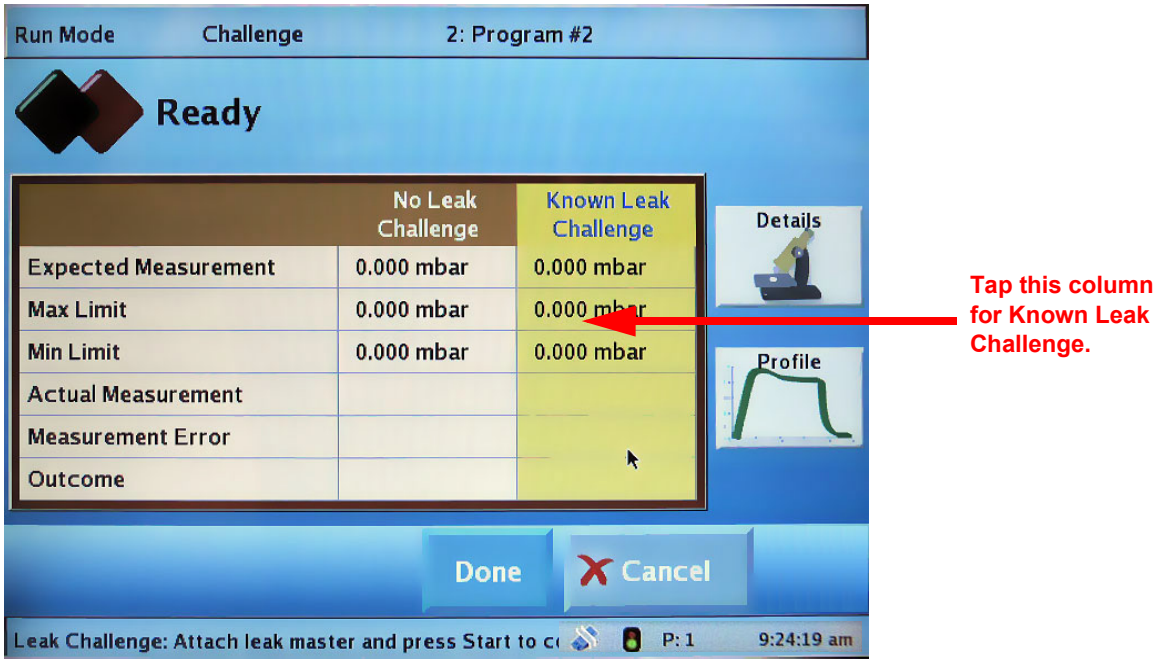
- Details
- Profile

Tapping within the area of a column will make that column active. In the screen shown below, the *No Leak Challenge* column has been made active (is shown in yellow color.)

As previously mentioned, it is possible to switch back and forth between the No Leak Challenge and Known Leak Challenge columns my tapping within the column. This concept is shown in the following illustrations. Below, the No Leak Challenge column is highlighted, so the operator is prompted to attach a non-leaking part for the test. When the start button is pressed, the selected program will run and values for the column will be computed.



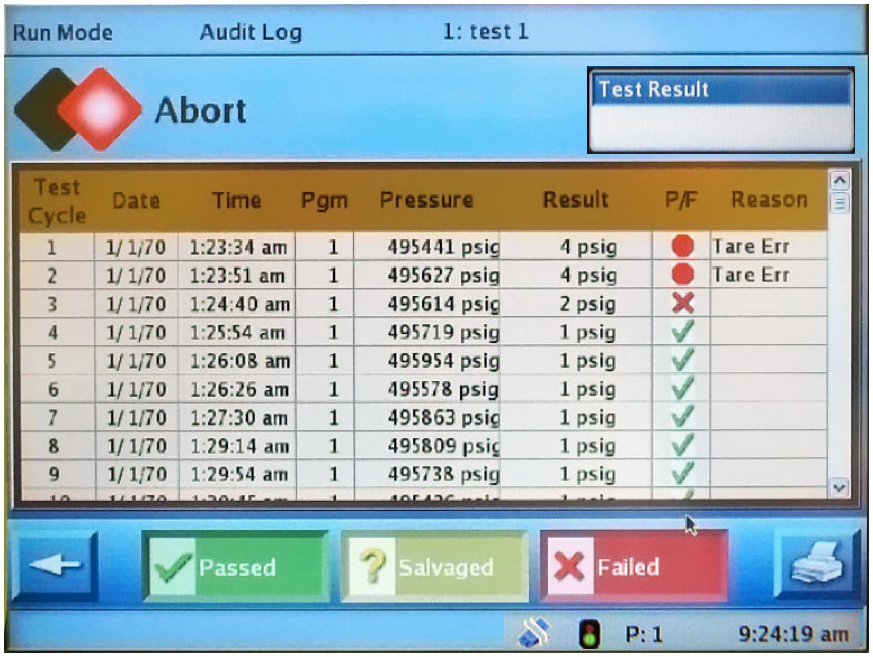
If the Known Leak Challenge column is selected (yellow), the Status bar will prompt to attach a calibrated leak master before pressing the Start button.



5.2.13 Audit Log

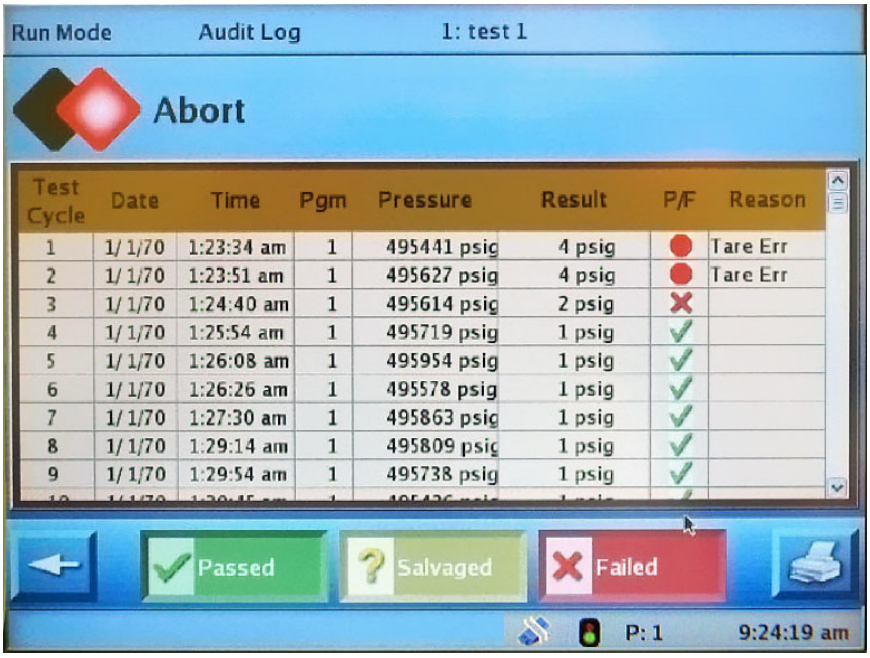
This screen shows a log of all test activity. The results can be filtered to show some or all categories based on “passed”, “salvaged”, and “failed.”

Use the **Printer** button to print the log. Note that the Print button will be seen only if a printer is selected on the Hardware Setup tab in Program Mode.



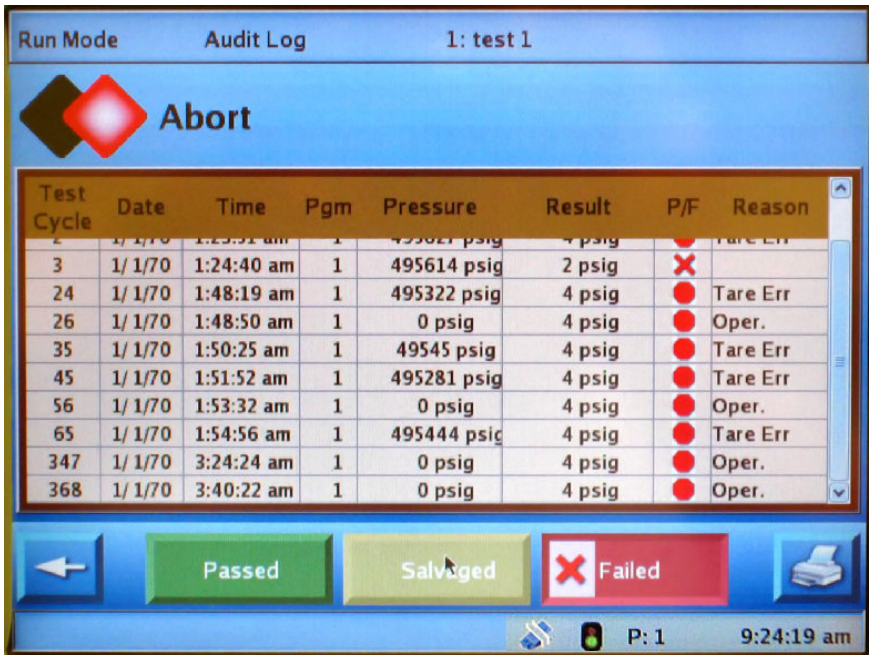
Touch and drag the Scroll Bar at the right side of the log to move up or down in the list. The scroll pad can also be used to the same effect.

All results are shown in the log because all filter buttons are pressed.



Test Cycle	Date	Time	Pgm	Pressure	Result	P/F	Reason
1	1/1/70	1:23:34 am	1	495441 psig	4 psig	●	Tare Err
2	1/1/70	1:23:51 am	1	495627 psig	4 psig	●	Tare Err
3	1/1/70	1:24:40 am	1	495614 psig	2 psig	✗	
4	1/1/70	1:25:54 am	1	495719 psig	1 psig	✓	
5	1/1/70	1:26:08 am	1	495954 psig	1 psig	✓	
6	1/1/70	1:26:26 am	1	495578 psig	1 psig	✓	
7	1/1/70	1:27:30 am	1	495863 psig	1 psig	✓	
8	1/1/70	1:29:14 am	1	495809 psig	1 psig	✓	
9	1/1/70	1:29:54 am	1	495738 psig	1 psig	✓	

Only "Fail" results are shown.



Test Cycle	Date	Time	Pgm	Pressure	Result	P/F	Reason
3	1/1/70	1:24:40 am	1	495614 psig	2 psig	✗	
24	1/1/70	1:48:19 am	1	495322 psig	4 psig	●	Tare Err
26	1/1/70	1:48:50 am	1	0 psig	4 psig	●	Oper.
35	1/1/70	1:50:25 am	1	49545 psig	4 psig	●	Tare Err
45	1/1/70	1:51:52 am	1	495281 psig	4 psig	●	Tare Err
56	1/1/70	1:53:32 am	1	0 psig	4 psig	●	Oper.
65	1/1/70	1:54:56 am	1	495444 psig	4 psig	●	Tare Err
347	1/1/70	3:24:24 am	1	0 psig	4 psig	●	Oper.
368	1/1/70	3:40:22 am	1	0 psig	4 psig	●	Oper.

For an explanation of the symbols used in the P/F column, See *"Symbols" on page 5-12.*

6
Program Mode

6.1 Program Mode

Program Mode is where all the operating options and parameters of the Qualitek mR are established. Unlike Run Mode, settings can be made in Program Mode that greatly affect the operation of the tester, so only authorized persons should use this mode. To enter Program Mode, switch the security lock to the horizontal position. The display screen will appear as shown, with five large icons.

Note that the title bar will show Program Mode and Home (since this is the Home screen.)

- Test Setup. See *"Test Setup" on page 6-3*
- Service. See *"Service" on page 6-24*
- Options. See *"Options" on page 6-38*
- Hardware Setup. See *"Hardware Setup" on page 6-57*
- Factory Setup. *See* *"Factory Setup" on page 6-76*

6.1.1 The Keyswitch Saves Changes In Program Mode

Changes made in Program Mode are NOT saved until the tester is returned to Run Mode by using the KEY.

6.2 Screens in Program Mode

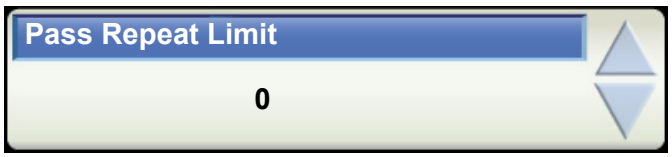
Navigation is simplified by the touch-sensitive display panel.

6.2.1 Data Boxes

The Data Box has several variations.

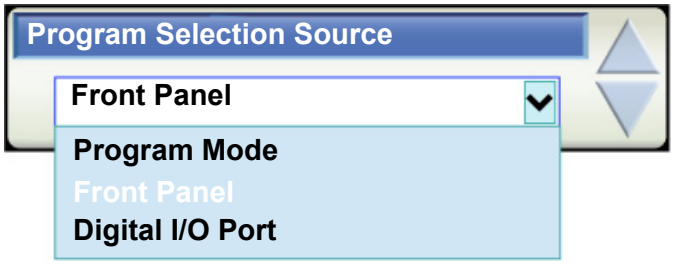
Informative Data Box

In some cases, tapping the box will call up a keyboard for changing the information.



Data Box with Up/Down Arrows

Tapping the arrow will scroll the entry through the allowable values. Tapping the box will call up a keyboard.



Data Box with List Box and Up/Down Arrows

Tapping the arrow will scroll through the allowable settings. through the allowable values. Tapping the box will activate the drop-down list box so that all allowed entries may be seen in their entirety and selected directly by touching one of them.

Alternatively, the Scroll Pad can move the highlight in the box and the Enter Button can be used to make the selection.

Data Box with Check Box

Tap the central box to toggle the checkmark. The checkmark shows the function is enabled, in this case, the Backlight.

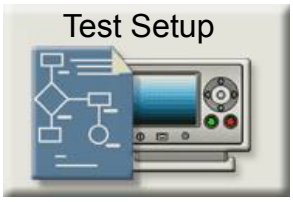
6.2.2 Test Setup

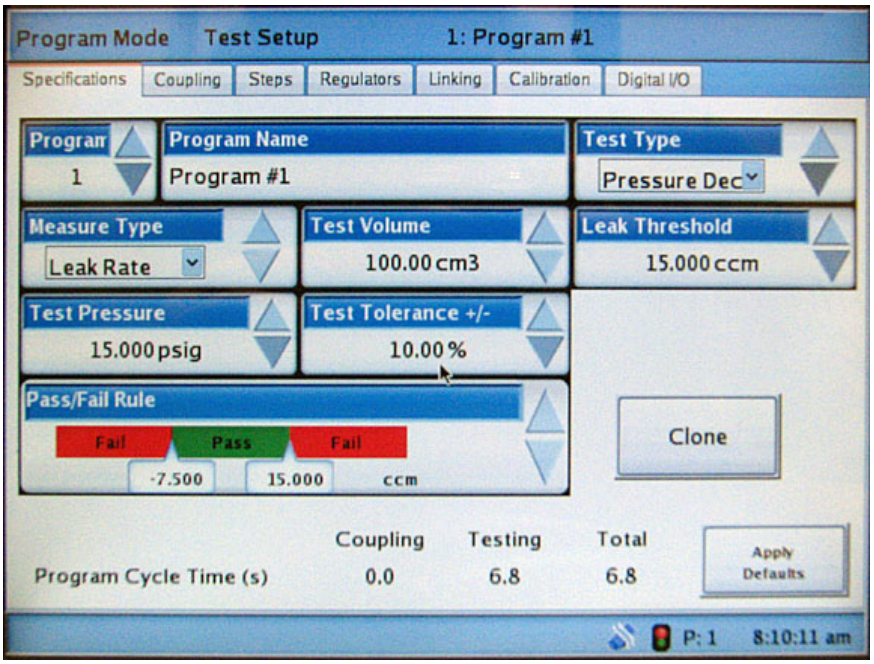
This screen gives an overview of the main settings for the selected program.

The tabs, in this case 6 of them, are used to move to different screens in Test Setup.

The screens are:

- Specifications. See *"Specifications" on page 6-4*
- Coupling. See *"Coupling" on page 6-7*
- Steps. See *"Steps" on page 6-10*
- Regulators. See *"Regulators" on page 6-15*
- Linking. See *"Linking" on page 6-16*
- Calibration. See *"Calibration" on page 6-17*
- Digital I/O (Optional). See *"Digital I/O" on page 6-22*

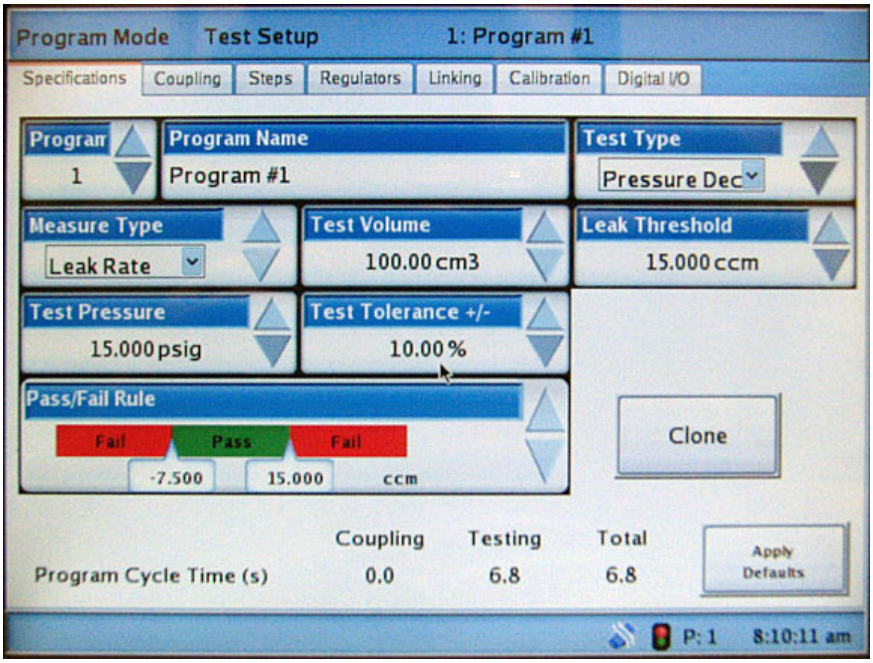




Changes made in Program Mode are NOT saved until the tester is returned to Run Mode by using the KEY.

6.2.2.1 Specifications

The Specifications screen is the primary screen for setting up a test. It is used to view and change, if desired, many of the important parameters of the currently selected program. Other tabs on the screen open additional screens for setting up the additional parameters for the test.



Program and Program Name

The program can be selected by number. The name of the program can be changed, if desired, by tapping the **Program Name** data box and typing a new name.

Test Type

Test type selections are dependent on tester model set in the factory configuration. Select from:

- Pressure Decay test
- Pressure Rise test
- Flow test
- Sealed Component test
- Backpressure Flow test
- Differential Mass Flow test
- Force Mode Test
- Vacuum Mode Test

Measure Type

Measure type selections are dependent on test type selections. Select either:

- **Leak Rate:** Measures the rate of change of pressure or flow

- **Pressure Change:** Measures the cumulative loss of pressure.
- **Flow:** Measures flow.
- **Pressure Measure:** Measurement of pressure.
- **Force Change:** Movement from a state of rest. The force sensor detects the change from the first measurement to the last measurement made during the test phase (delta force).

Test Volume

Enter the volume of the component to be tested.

Leak Threshold

This item sets the reject condition for leakage within a test component due to pressure loss. Leak rate values above the limit are rejected and values below the limit are passed. The value entered is either in pressure drop values, dependent upon the pressure unit settings and range, or flow rate units set by the user.

Test Pressure

Enter the required test pressure.

Pressure Tolerance

This item sets the tolerance that the pressure must be within during the test cycle. If the pressure at the test component exceeds the upper limit (i.e. test pressure plus tolerance), an overpressure error is detected and displayed. If the pressure at the test component drops below the lower limit (i.e. test pressure minus tolerance), a gross leak is detected and the test cycle is terminated.

This value will be applied to the Test Pressure to update relevant portions of the Steps Tab.

Pass/Fail Rule

Tap the **Pass/Fail Rule** data box to view all available Pass/Fail rule combinations on the Pass/Fail Rule Screen. Alternatively, tap the up/down arrows to scroll through the available combinations.

Limits set between the Pass, Fail, and Salvage areas on the rules set the boundaries between each area. Using the limits allows precise control over the test output.

The limits can be set directly from the Pass/Fail rule data box by tapping the numeric field and entering the limits with the pop-up numeric keypad.

Apply Defaults

This **Apply Defaults** features helps to automate the entire test setup process based on the values entered on this tab. Press the **Apply Defaults** button to compute and apply default step times and other test parameters. Program parameters, step durations, and limits will be computed and applied to the test program being currently defined. After pressing this button, confirmation will be requested before

the request is carried out. (Individual steps may be further refined on the succeeding tabs, if desired.)

Internal Leak Master Test

The Internal Leak Master Test check box option is only displayed when the Internal Leak Master is fitted. When the checkbox is selected it enables the internal leak master to allow the standard program operation to be verified.

Clone

Copies the current program to another program slot of your choice.

Pass/Fail Rule Screen

In this example, selecting this rule allows Limit 1 to set the boundary between Pass and Salvage while Limit 2 will set the boundary between Salvage and Fail.

The limit values are not set on this display, but on the Specifications page which preceded it.

Salvage

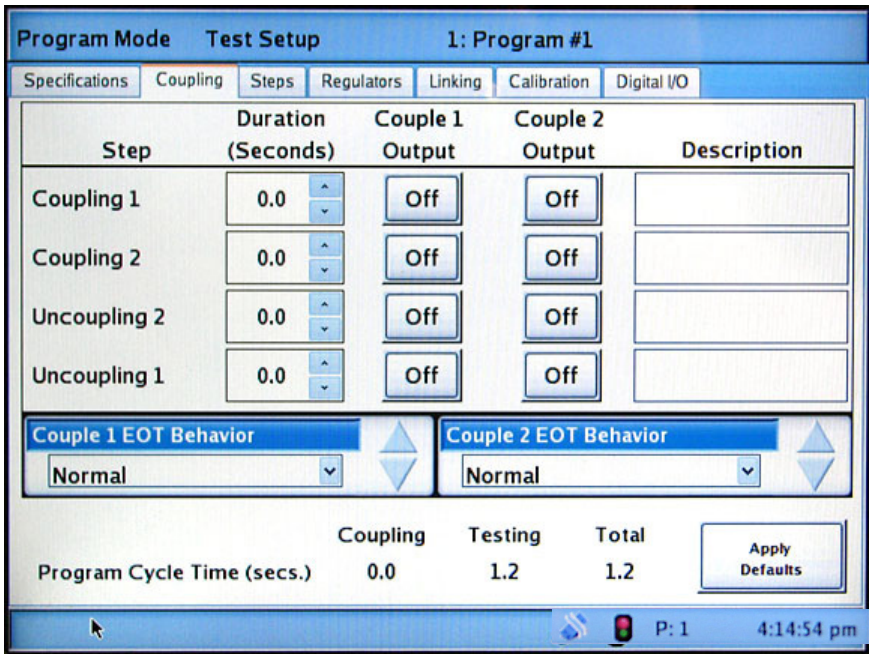
This concept called “Salvage” in a Pass/Fail rule allows the user to refine the test results by introducing a new category other than only pass or fail. A component with a salvage test result may in some cases be reworked to become leak-tight instead of being scrapped. Of course, this outcome requires choosing realistic limits wherein the salvage item could be reclaimed.

Using the Salvage feature can be very useful in casting applications or where the Qualitek mR is being used in an automatic production line where the component can be automatically directed to a rework station for repair.

6.2.2.2 Coupling

This screen is used to set the coupling parameters for coupling fixtures. Coupling may be turned off, if it is not required, by setting the couple duration to zero.

When coupling times are set, the coupling steps are automatically included as implied steps in the current program. In the illustration below, no couple times are set so no coupling is being used in this program.



How to Set the Coupling Timers

To set **Coupling 1**, **Coupling 2**, **Uncoupling 2**, and **Uncoupling 1** it is necessary to set a duration for the coupling to activate. As the times are adjusted, the affect on the program time is shown at the bottom of the screen.

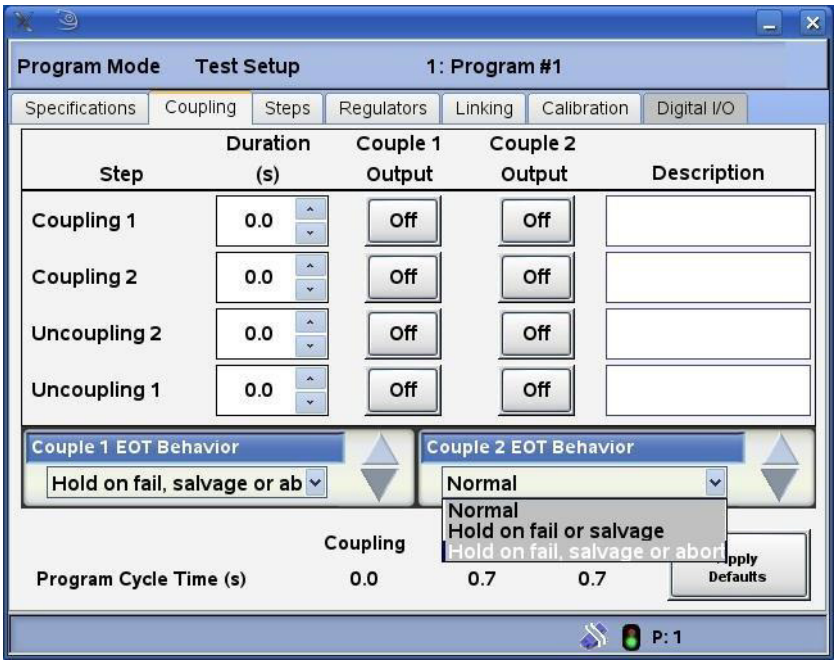
Tapping the **Description** field will open the keyboard, permitting a descriptive labeling for the coupling to be entered.

Couple 1 and 2 EOT behaviors

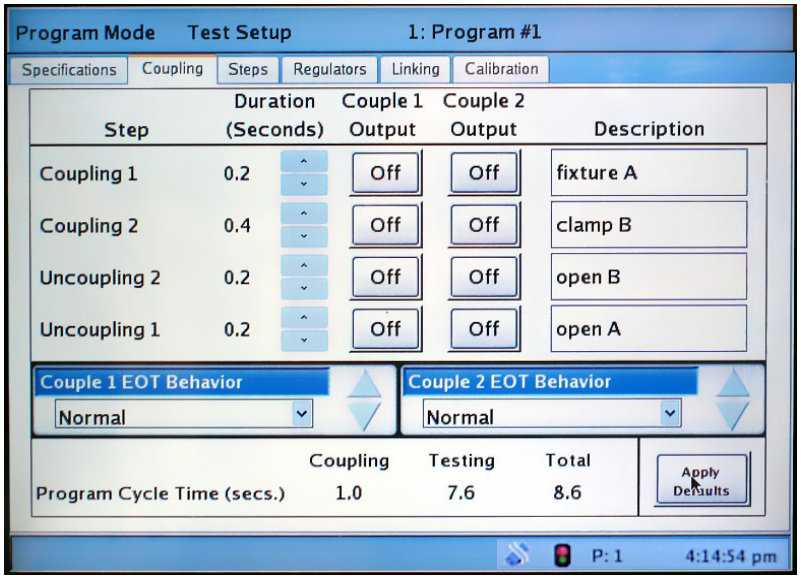
Normal, couple valves close at the end of the timer.

Hold on fail, salvage, couple valves stay on when the Measure steps fails or is salvageable, requires an abort signal to release.

Hold on fail, salvage or abort, the couple valve stays on when any step fails or is salvageable, requires an abort signal to release.



Coupling Setup Example



The illustration above shows that 4 coupling times are set which will add 1 second of coupling time to current program.

Use the buttons in the Couple 1 and Couple 2 Output columns as needed to use the desired couple for the step. If Off, the couple will not activate.

The Coupling 1 and Coupling 2 always occur in order at the start of the test and Uncoupling 2 and Uncoupling 1 will occur at the end of the test.

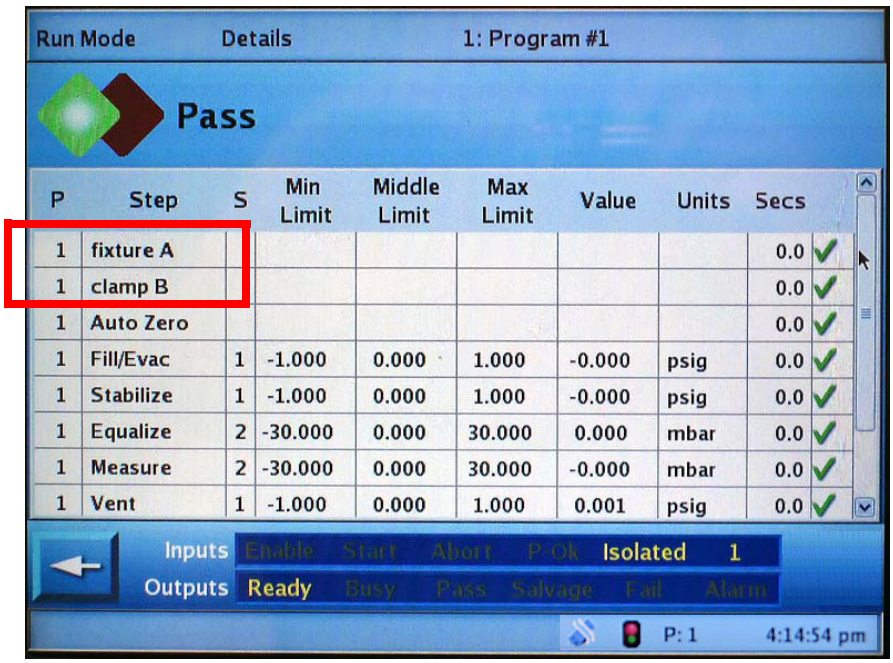
If text is entered in Description, then that descriptive name will be used whenever appropriate. For example, the Details screen shown below shows the descriptive coupling names that were set in the example

Apply Defaults

Apply Defaults button resets the parameters on this screen to the internally computed defaults. If values had manually been entered, confirmation will be required.

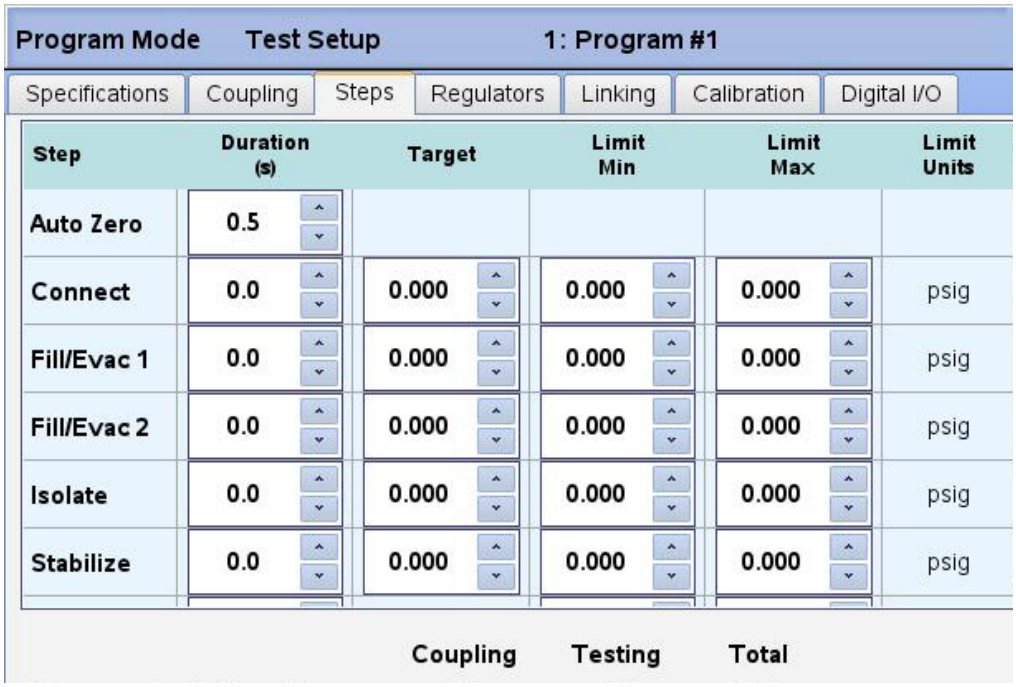
.

Couple steps and descriptive names, if used, appear in such places as the Details screen shown here.



6.2.2.3 Steps

The Steps screen shows the entire setup of the steps for a test. Steps that are not needed may be set to zero.



Auto Zero

The Qualitek mR's Auto Zero feature helps to maintain accuracy by eliminating any long-term zero drift (caused by environmental changes) by venting the sensors to atmosphere during the Auto Zero step. The subsequent reading is then used as the new zero value (reference point) for the current test.

To activate Auto Zero, simply enter a desired Auto Zero step duration time (using the arrows keys, or the pop-up virtual keyboard) into the Auto Zero step Duration Time field under the Program Mode, Test Setup, Steps tab.

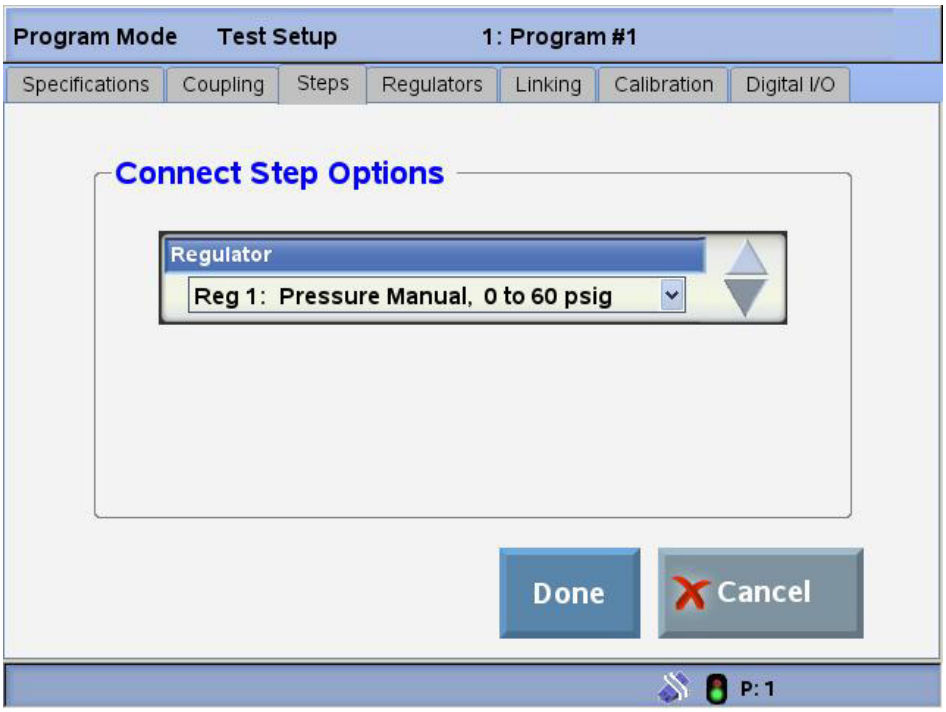
In addition, you will need to choose which sensors you want to apply the Auto Zone feature to: Sensor 1, Sensor 2, Sensor 3 (depending on your tester model configuration), or all three. To do this, navigate to the Program Mode, Hardware Setup, Sensor tab, then check the appropriate checkbox(s). (See *page 6-58* and *page 6-58*.)

To disable Auto Zero, enter **0** in the Auto Zero Duration Time field.

Connect

The DMF (Differential Mass Flow) test type includes a Connect step used to pressurize the test port. Once the pressure is within the preset limits (indicating a component has been connected), pressurizing stops before proceeding with the test cycle.

The default regulator for the connect step is Regulator 1. This can be changed if an additional regulator is fitted by clicking on Connect step, under the Program Mode, Test Setup, Steps tab. Note if the step time elapses, the cycle aborts, indicating no component has been connected and no further testing is required.



Fill/Evac 1/2

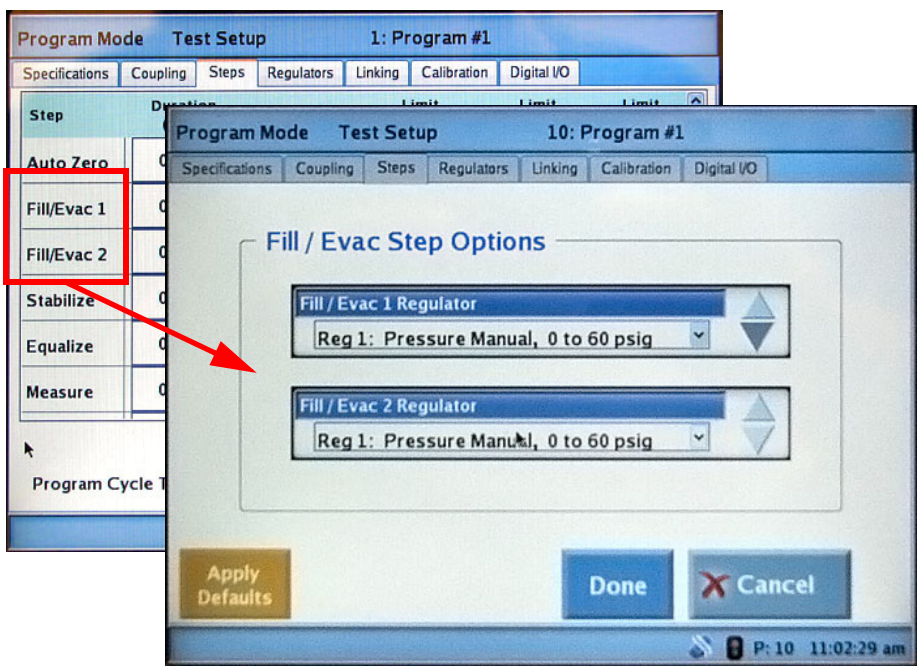
Specifies the time to expose the component to the test air. Ideally the Fill Time should be set so that, for a good component, no pressure variation occurs during the stabilization phase, generally a small variation is acceptable.

The Fill Time should be set to a period that is only long enough to ensure that the test component is filled to the correct pressure. If either of the Fill/Evac steps is not required, simply set its duration to zero to disable it.

If the Fill Time is too short, the test pressure displayed during the stabilization phase will either be lower than the set pressure, or will reduce during the stabilization phase as the pressure equalizes within the component.

The Fill/Evac steps can both be used in a single program, if desired. For example, this can be used as a “pre-fill” to expedite the fill time of a large volume in a pressure test. One Fill/Evac time could be set to allow a large flow terminated after a specific duration. This would be the Fill/Evac1 step. The Fill/Evac 2 step could then be used to bring the filled pressure to the desired value.

Each Fill/Evac step can have the same or a different regulator assigned (or none). To assign the regulator(s) to use in each fill/evac step, tap the label for **Fill/Evac 1** or **Fill/Evac 2** to view the **Fill/Evac Step Options** screen. The selections available are limited by the installed regulators, of course. An example of this screen is shown below:



Stabilize

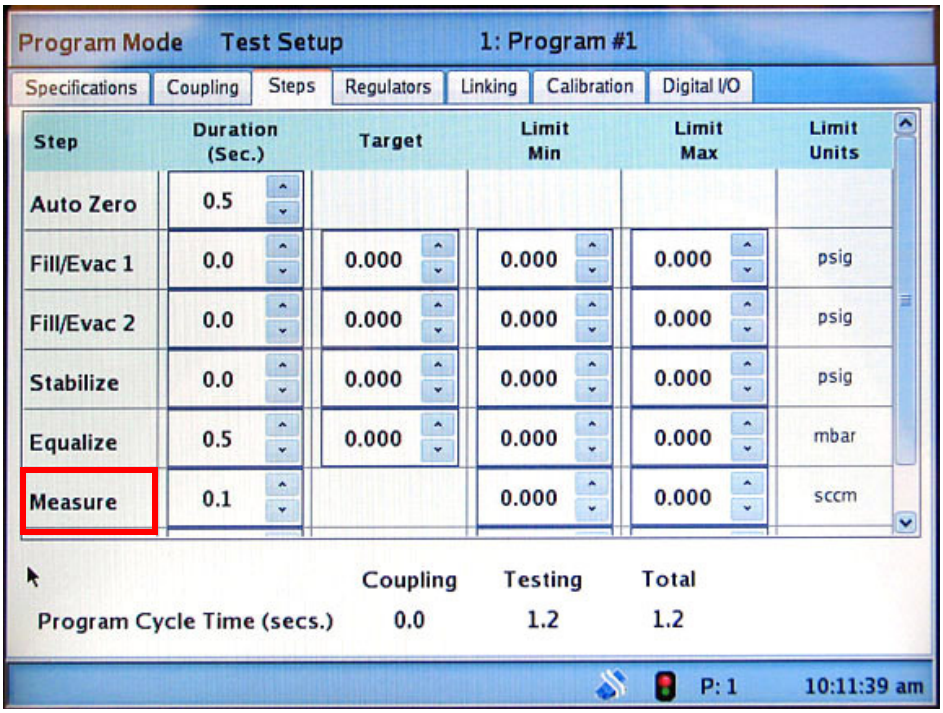
This option sets the time period during which the pressure and temperature is allowed to stabilize before a leak rate measurement is performed.

Equalize

This parameter allots a duration allowing the differential test chambers to adjust to tare and become ready before starting the measurement step. The tester will automatically pick the best default time for this step but it may be changed manually, if so desired.

Measure

Set the length of time for the measurement phase of the test. The measure time should be set to give good discrimination between leak tight parts and parts that only just fail the test criteria.



Pass Exit Criteria & Pass Hold Duration

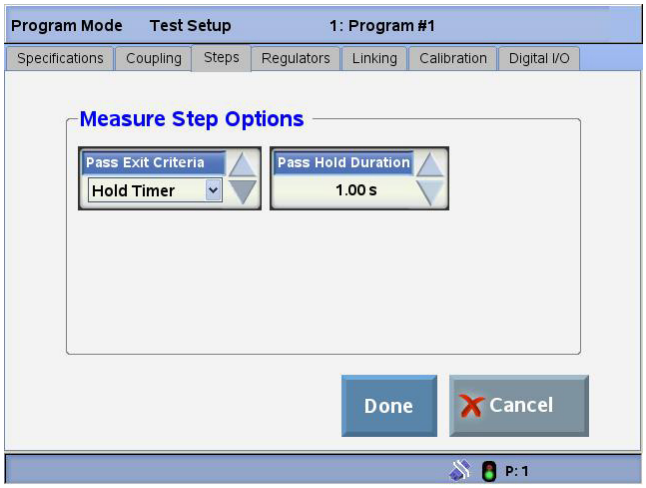
The DMF (Differential Mass Flow) model type Measure step provides options to set Pass Exit Criteria and Pass Hold Duration parameters. These parameters are displayed after clicking the Measure step label on the Program Mode, Test Setup Steps, screen.

The Pass Exit Criteria settings are:

None: The default setting which determines the result on completion of the Measure step time.

Hold Timer: A pass result requires a pass condition to be detected during the Measure step time and held continuously for the set Hold time. A flashing pass condition is indicated when Hold state is selected and normal result outputs are set on completion of the step.

Pass Hold Duration: Used to enter the amount of time to hold timer for a pass condition during the measure step. Use the arrow keys or virtual keyboard to enter value.



Vent

Vent Step Control Option: The vent output may be disabled by tapping the vent step label. Uncheck exhaust test part box and select **Done**. Next, set Vent Time to zero.

If the vent output is disabled, the test part may remain pressurized; use care when disconnecting the test part.

Set the Vent time: Used to open the part under test to atmospheric pressure.

6.2.2.4 Regulators

This screen shows the regulator(s) configured for the tester.

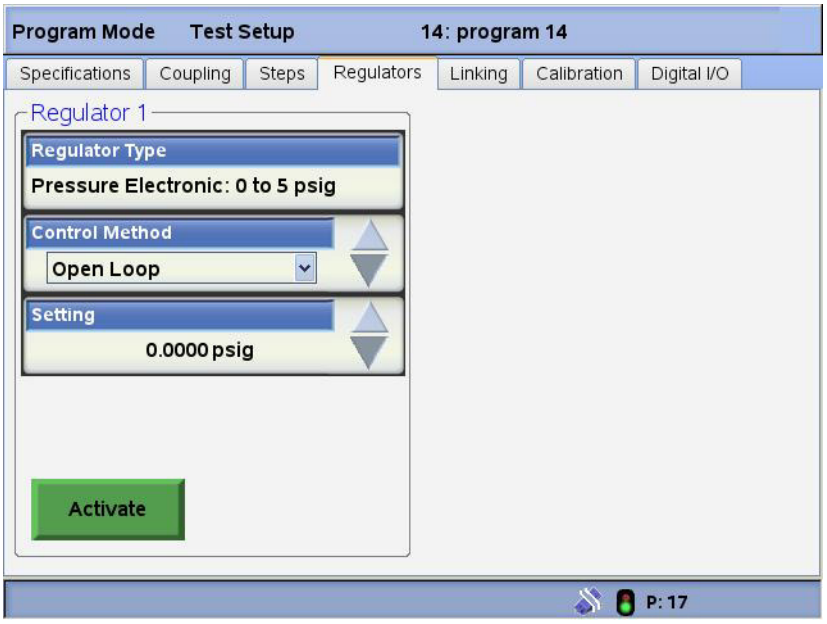
Regulators can be either manual or electronic.

If the tester is equipped with the electronic regulator option, the control method will be enabled. The control method has three controls:

- **None**: Deactivates the electronic regulator.
- **Open Loop:** The set point is commanded without using a feedback sensor.
- **Closed Loop:** The set point is reached using algorithms that incorporate measurements from the sensor.

A button is available to activate or deactivate its associated regulator for testing.

When Activate is pressed, an additional Sensor Reading data box opens to show the current sensor reading, updated in real time.



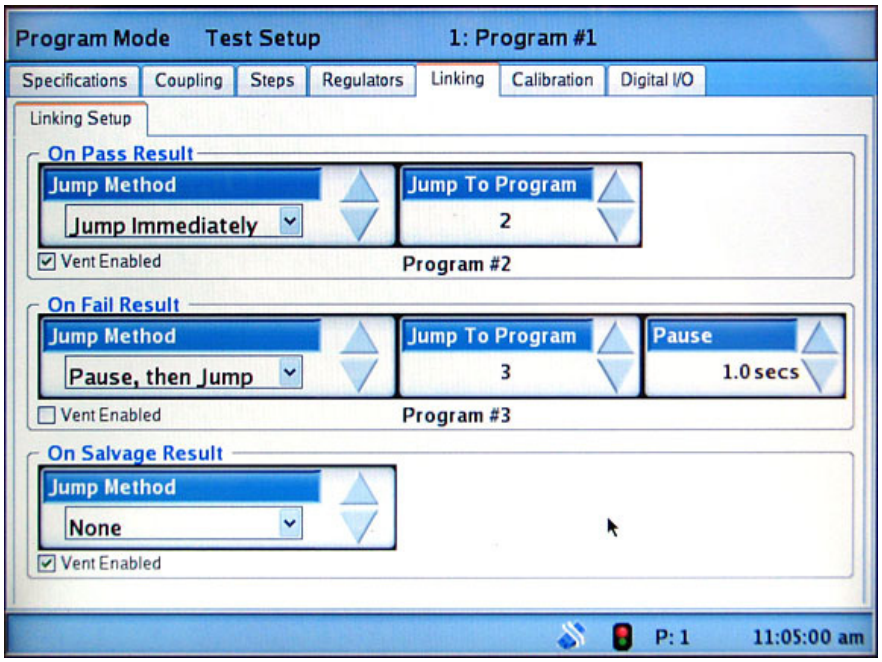
When the "Activate" button is pressed the "Sensor Reading" data box shows the current pressure.

6.2.2.5 Linking

Linking is used to jump to another program based on the current test's outcome. It is possible to set a unique link behavior for test results that are Pass, Fail, or are Salvage.

The jumping behavior can be set to:

- None
- Jump Immediately: Jump when the test cycle ends.
- Wait For Signal: Jump when a start signal is received, either from the digital input on the rear panel or by pressing the front panel Start button.
- Pause, then Jump: Jump when the test cycle ends after a specified delay.



If "Pause, then Jump" is selected, a data box appears for the purpose of entering the amount of time for the pause.

When Linking is used in a test, the Status Bar will show P:X where X is the current linked program. This allows confirmation of the progress of linked programs.

It is possible to choose a specific venting behavior for each result by using the Vent Enabled box in the Linking Setup. Choose to enable or disable the vent with the checkbox.

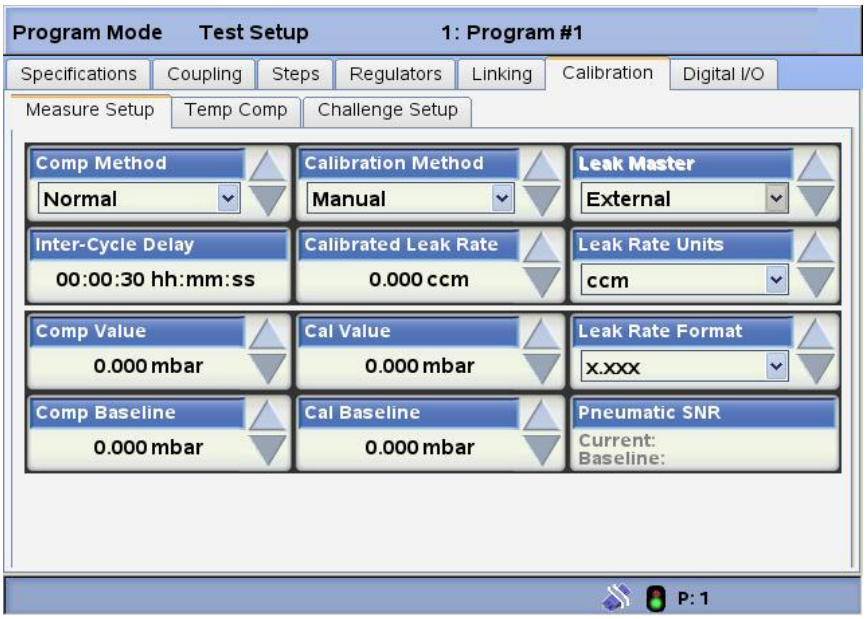
6.2.2.6 Calibration

Calibration values for the currently selected test can be set by navigating to the Program Mode, Test Setup, Calibration tab.

Each program needs to be calibrated individually and if any of the test parameters are changed, including the volume of the test component, a re-calibration should be performed.

Under certain conditions, when being tested under pressure, some components exhibit a zero offset, which may drift over a period of time. This is usually due to adiabatic changes or to changes in temperature due to the manufacturing process, e.g., component cooling following a welding process. This offset will appear as an apparent leak even when the component is leak-tight.

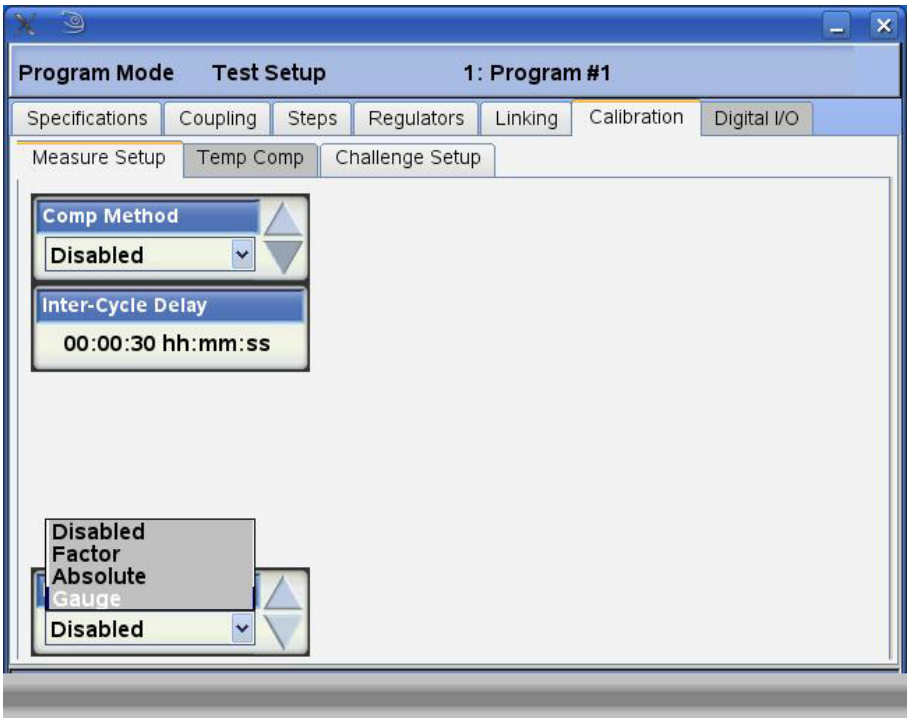
If any of a programs parameters are changed, including the type of test component, a compensation cycle needs to be performed again.



Measure Setup Tab

- Comp Method: Normal
- Inter-Cycle Delay: Enter the delay between test cycles when performing calibration.
- Comp Value: A Comp value can be entered manually, if desired.
- Cal Value: A Cal value can be entered manually here, if desired.
- Calibration Method: Automatic or Manual. Automatic mode assumes that the calibration option is fitted and switches the standard leak into the tester pneumatic circuit when required during calibration. Manual mode relies on the user exposing the standard leak during the calibration.
- Calibrated Leak Rate: View or enter the calibrated leak rate.

- Comp Baseline: View or enter the Comp baseline.
- Cal Baseline: View or enter the Cal baseline.
- Leak Master: Internal (if installed) or External.
- Leak Rate Units: Select the preferred units for leak rate.
- Leak Rate Format: Select the level of precision for the displayed rate.
- Pneumatic SNR: Displays the Pneumatic SNR.
- Pressure Correction: The pressure correction feature is used to correct flow reading due to pressure variations. Select the desired pressure correction method: Disabled, Factor, Absolute, or Gauge. (See “Pressure Correction Setup” later in this document.)

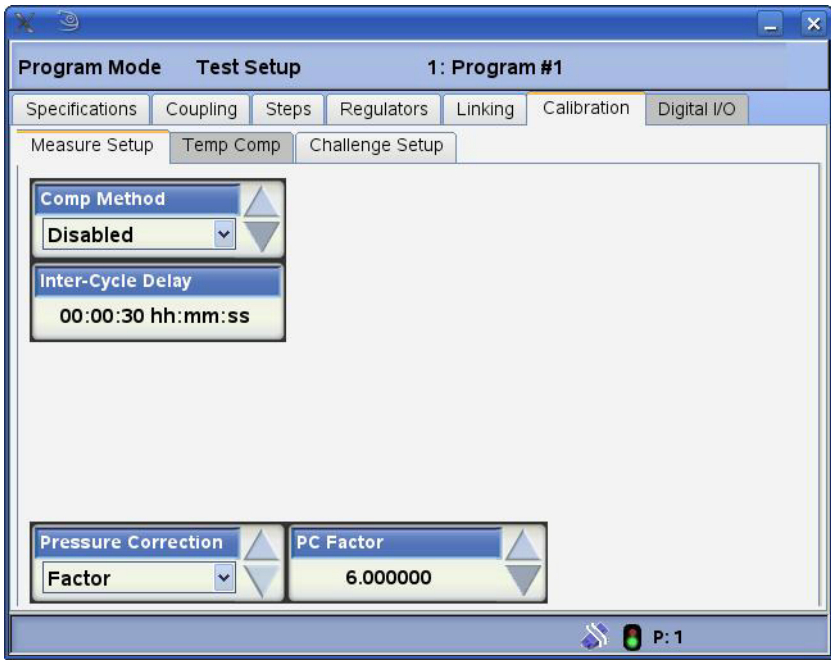


Disabled:

No correction pressure applied.

Factor:

The correction method applied is:
Corrected flow = measured flow + ((test pressure - measured pressure) * factor).



Absolute:

The correction method is based on ratio of absolute pressures:

Corrected flow = measured flow * (test pressure + atmosphere) / (measured pressure + atmosphere)

Gauge:

The correction method is based on the ratio gauge pressures:
Corrected flow = measured flow * (test pressure / measured pressure)

1.) Measured flow is the reading at the end of the measure step. 2.) Measured pressure is the reading at the end of the measure step. 3.) Test pressure is the target pressure entered on the specification tab. 4.) Atmosphere = 14.7psi.

Pressure Correction Setup

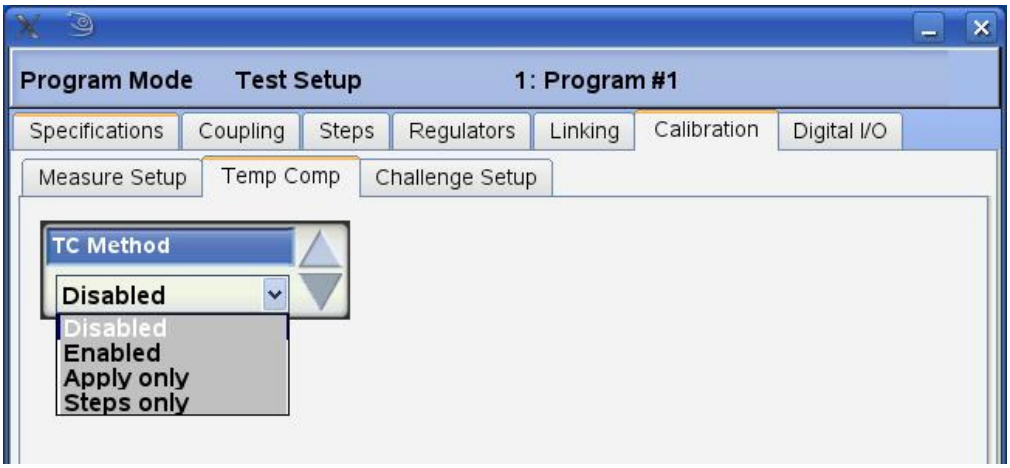
The Qualitek mR's Mass Flow and Differential Mass Flow models include a pressure correction option. In some applications, when you apply pressure to a part, flow variations may occur that affect the accuracy of the test reading. The pressure correction option is used to minimize this affect by adjusting the reading for flow variations caused from the applied pressure while under test. In other words, the pressure correction option is used to predict what the flow would have been if the pressure was held constant at the test pressure (no pressure variations). The adjustment is achieved by applying a correction factor based on the flow rate change for the required pressure variation (e.g., 0.5 sccm/psi).

Perform the following steps to setup the Pressure Correction option:

- Enter tests pressure at the Program Mode, Test Setup, Specifications tab and set defaults as required. (*Note this value is used in the pressure calculation.*)
- Perform tests to determine pressure and flow loss at required test specification.
- Navigate to the Test Setup, Calibration tab and enable the pressure correction option.
- Calculate the Correction Factor:
  Flow = Flow measured + (Pressure variation * correction factor), where the correction factor is calculated as the flow variation / pressure variation.
- Verify correction is sufficient.

Temp Comp (Compensation)Tab

- Temp Comp: The Temperature compensation option is enabled by selecting the Program Mode, Test Setup, Calibration, Temp Comp tab shown below and setting the required TC Method.



The TC Method selections are:

Disabled: Temperature compensation is disabled for the selected program and associated parameters are hidden.

Enabled: The temperature compensation test steps are performed and the compensation is applied.

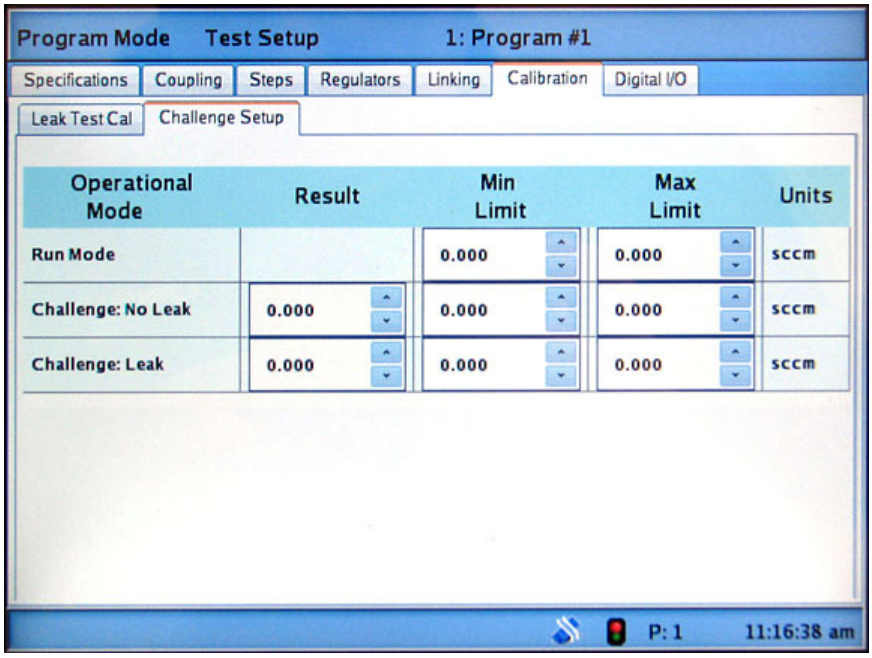
Apply Only: The temperature compensation information from a previous test is applied. This is generally used when programs are performed in a sequence of tests and the first atmospheric reading is used by subsequent tests in the sequence.

Steps Only: Performs the temperature compensation test steps but compensation is not applied. This option is generally used during the initial setup of temperature compensation to record values.

If tests are performed by individual programs then set the TC method to Steps Only for all programs requiring Temperature compensation. If tests are performed by a sequence of programs then set the TC Method to Steps Only on the first program within the sequence.

(See *page 8-16* for additional temperature compensation information.)

Challenge Setup Tab



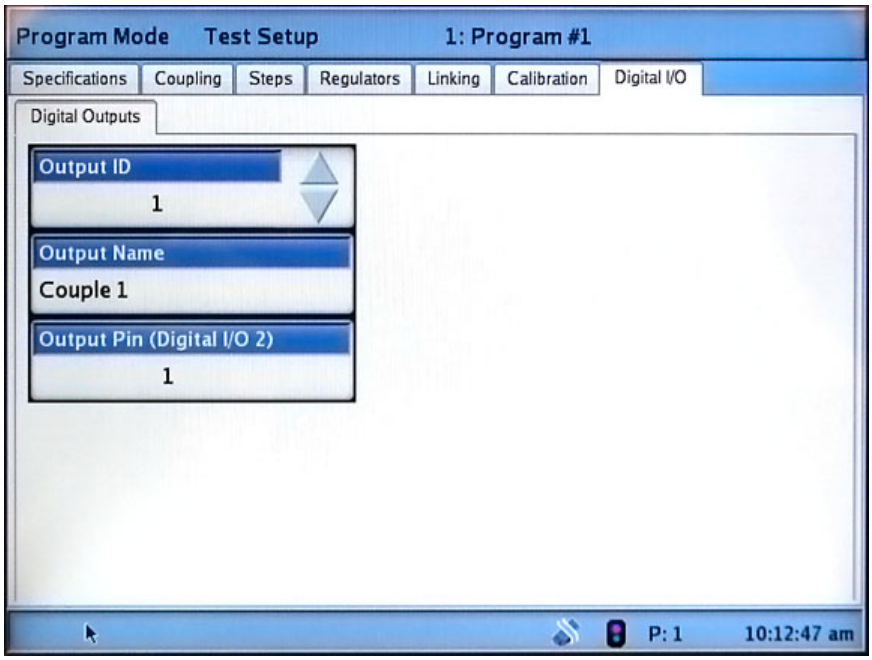
- Use the Challenge Setup screen to set the parameters to use for the challenge under leaking and non-leaking conditions.

6.2.2.7 Digital I/O

(Available on testers equipped with expanded Digital I/O only.)

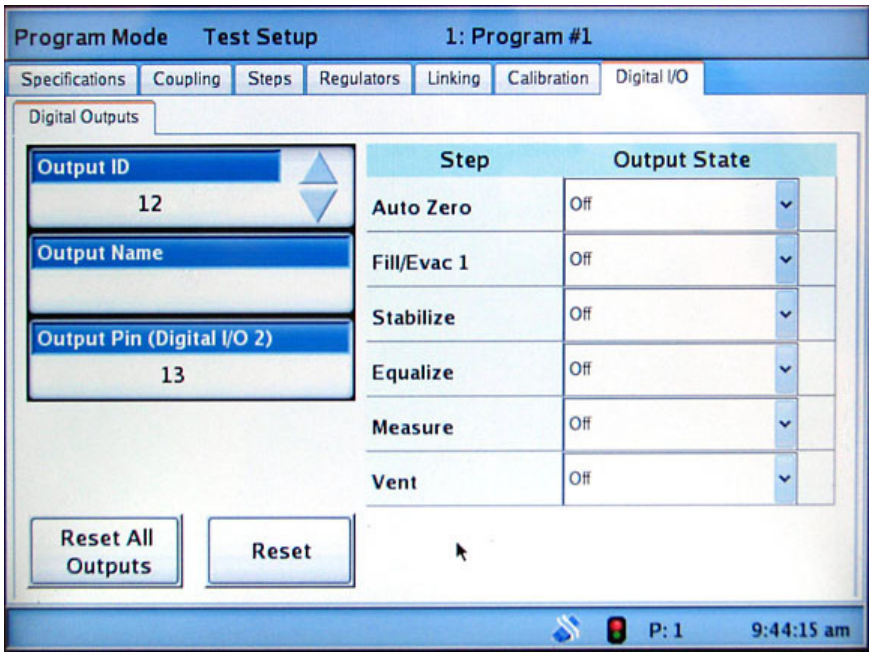
The Digital I/O tabs are used to customize the assignments made to the Digital I/O in the Program Mode so they function as desired in the currently selected test. See *"Digital I/O" on page 6-67*.

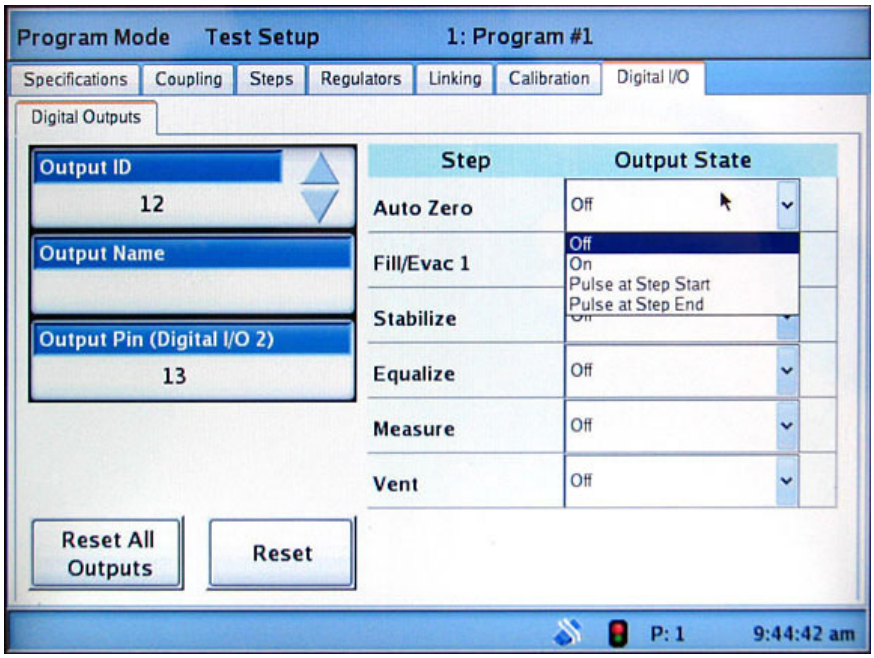
This display shows that Output ID 1, named Couple 1, is using Output Pin 1.
No further customization of this output is available on this screen. (It may be changed in Hardware Setup, however. See ***"Digital I/O" on page 6-67*****.**



Output ID 12 is seen here as available for Program Specified customization. Select the Output State for any or all steps as desired. Tap the Output Name button to set a unique name, if desired. (See ***"Digital I/O" on page 6-67*****.)**

Note that if a step has a zero time duration or is otherwise not being used in a test, it is not available on this screen for customization.

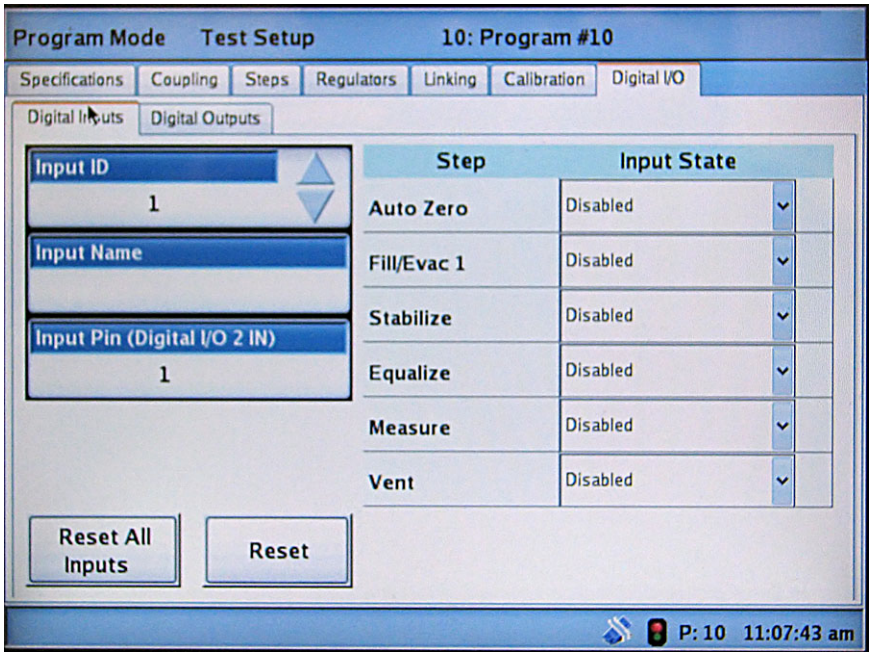




The output states for a step may be set to:

Off
On
Pulse at Step Start
Pulse at Step End

The Digital Inputs tabs works is similar manner to Digital Outputs, however the selections for Input State are not the same choices that were available for Digital Outputs:



For Inputs that may be configured, the settings are:

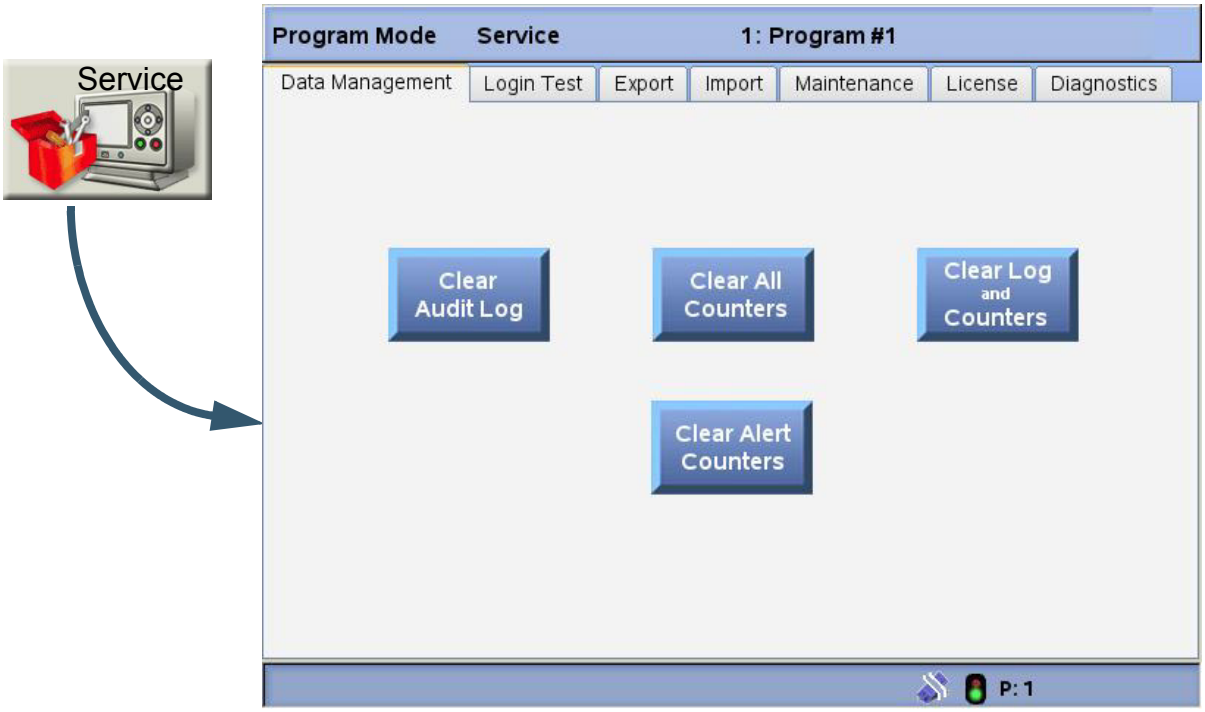
Disabled
Off
On
Don't Care

Details about status of the digital I/O inputs and outputs may be viewed in Run Mode. See *"Digital I/O Status" on page 5-18*.

6.2.3 Service

The Service screen has 7 tabs. They are:

- Data Management. See *"Data Management" on page 6-25*
- Login Test. See *"Login Test" on page 6-26*
- Export. See *"Export" on page 6-27*
- Import. See *"Import" on page 6-28*
- Maintenance. See *"Maintenance" on page 6-29*
- License. See *"License" on page 6-31*
- Diagnostics. See *"Diagnostics" on page 6-32*

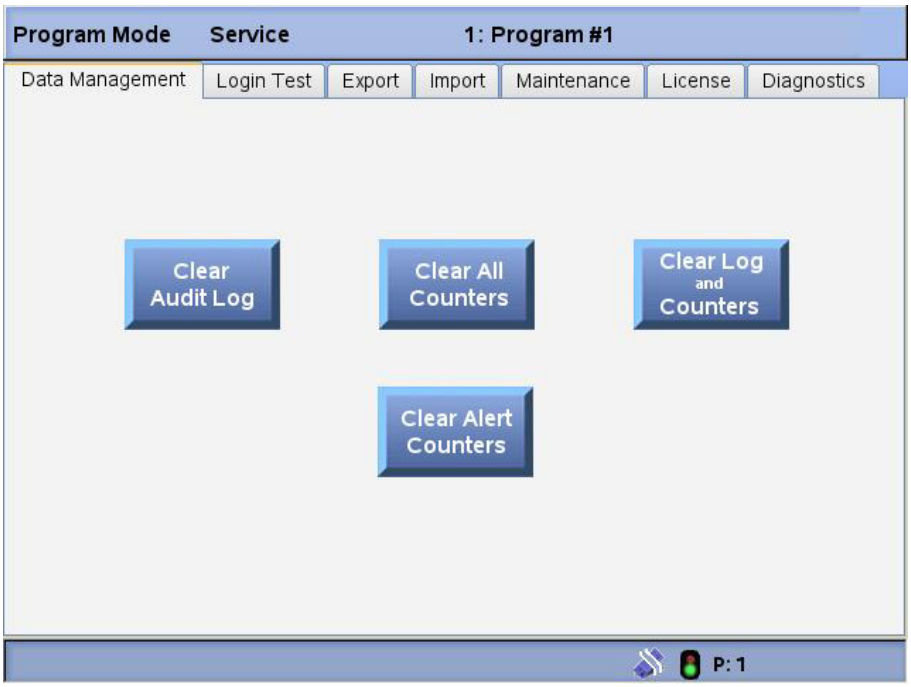


6.2.3.1 Data Management

The Data Management screen has four buttons which are used to clear the following logs and counters:

- Clear Audit Log
- Clear All Counters
- Clear Log and Counters
- Clear Alert Counters

Pressing the button performs the action immediately. Be sure to have printed or otherwise saved any data that may be needed for future use.

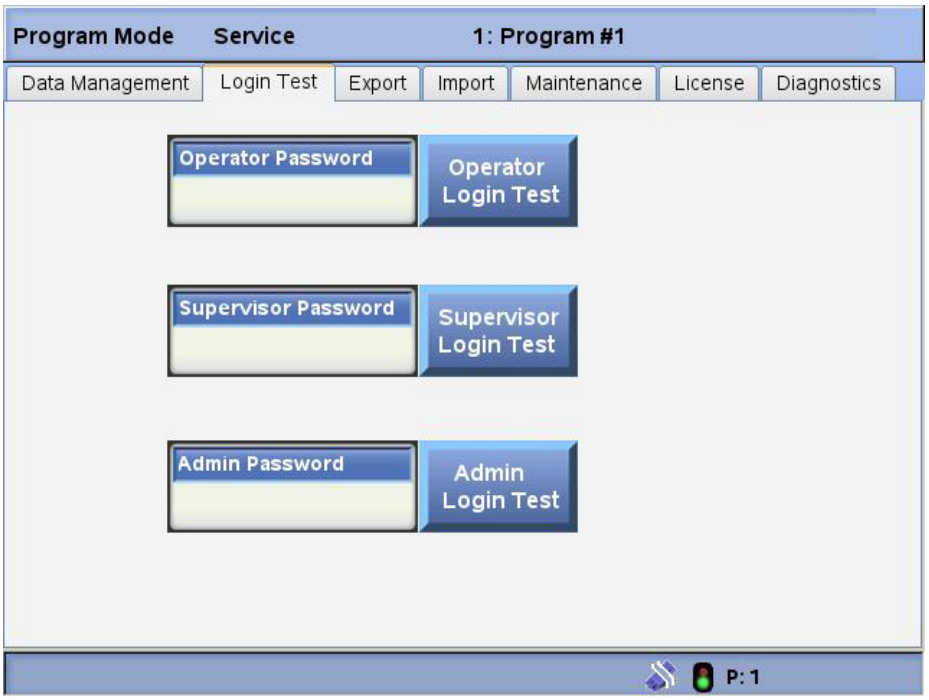


6.2.3.2 Login Test

Under the login test tab, you can test passwords for:

- Operator
- Supervisor
- Administrators

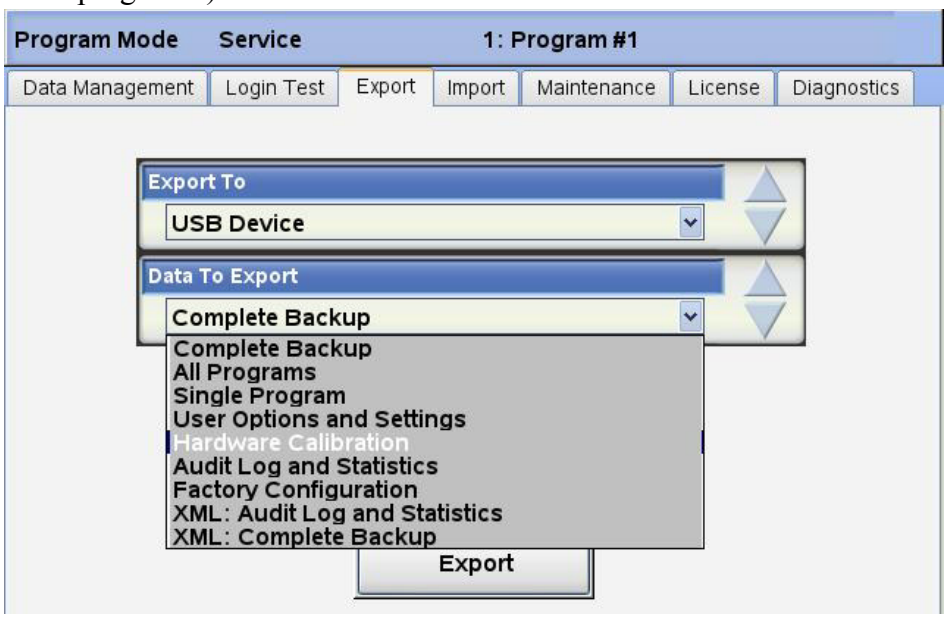
To test a password, enter the password you want to check into the appropriate field, then click the corresponding button.



6.2.3.3 Export

Data that can be exported from the tester:

- Complete Backup (All of the above)
- All Programs
- Single Programs
- User Options and Settings
- Hardware Calibration
- Audit Log and Statistics
- Factory Configuration
- XML: Audit Log and Statistics
- XML: Complete Backup
  (the XML files are readable by typical applications such as spreadsheet programs.)



The export destination is the USB memory stick inserted in the front panel.

To export, make the selection in Data to Export and put the memory stick in the front panel slot. Wait until the memory stick is recognized by the tester. The USB Ready indicator on the status bar shows when the USB device is ready.

The USB graphic on the status bar changes to look like this example when the USB device is ready for use.

Press the **Export** button and wait for the data transfer to finish. The Status Bar will show “Export Successful” when it is safe to remove the memory stick from the front panel.

If the exported file already exists on the memory stick, the tester will pop up a warning and request confirmation before proceeding with the export.

When exporting a file that contains the date and time, the date and time will be in "Unix" time. The number represents a value in seconds since 1/1/1970. To convert this value use the formula (((Unix time/60)/60/24 + DATE (1970,1,1).
Example:
Value from tester XML File: 1342442296
Formula for conversion: (((A2/60)/60)/24)+DATE(1970,1,1)
Converted Value: 41106.52657
Converted value formatted as 'Date': 7/16/2012
Converted value formatted as 'Time: 12:38:16 PM

6.2.3.4 Import

Data that was previously exported can be imported at this screen. Imported data may be:

- All Programs
- Single Programs
- User Options
- Factory Configuration
- Audit Log and Statistics
- Complete Backup (All of the above)

The source for the data import is the front USB port.

To perform the import, select **Data to Import** and place the memory stick in the front panel slot. Wait for the memory stick to be recognized by the tester. The USB Ready indicator on the status bar will show when the USB device is ready.

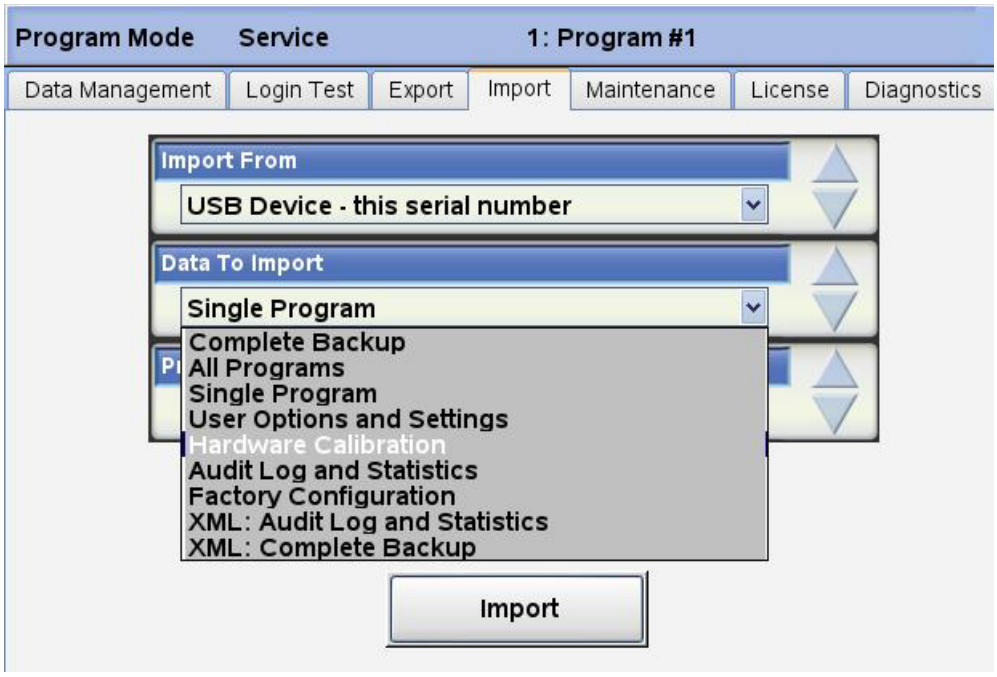
USB ready

Press the **Import** button and wait for the data transfer to finish. The Status Bar will show "Import Successful" when it is safe to remove the memory stick from the front panel. If the imported file already exists in the tester, the tester will pop up a warning and request confirmation before proceeding with the import and updating that data in the tester.

Import data from a tester with a different serial number

Data may be imported from a tester with a different serial number as long as the machines have identical factory configurations. To ensure identical configurations, you must **export a complete backup** from the originating tester before importing data to the second tester (see *page 6-27*). **To Import data:**

Select **Foreign Serial Number** for "Import from", then select the **Data to Import,** and input serial number of the QmR importing from. Next, place the memory stick in the front panel slot, wait for the memory stick to be recognized by the tester. The USB ready indicator on the status bar will show when the USB device is ready. Press the **import** button. Once the data transfer is complete, restart the tester.

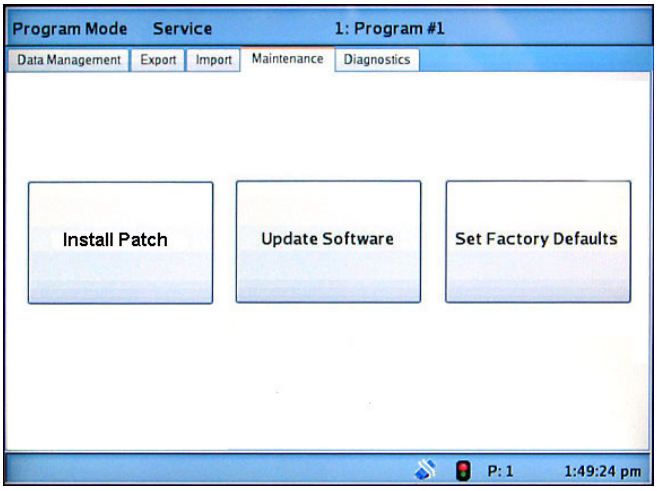


6.2.3.5 Maintenance

This screen allows updating the tester software by using the **Update Software** button. The update file must be on a USB memory stick inserted in the front panel USB slot.

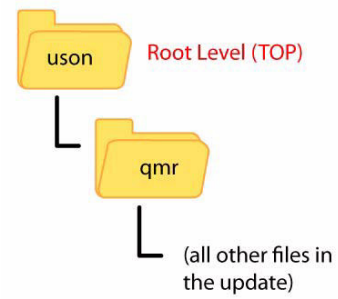
Set Factory Defaults

The **Set Factory Defaults** button is pressed to reset all tester settings to factory default values. When pressed, a warning box will ask for confirmation of the request and it may be cancelled at that point, if desired.



Update Software

Contact Uson Support to receive new software updates. *Once you receive your software update, copy the files to a USB memory stick following the same directory structure as shown below:*



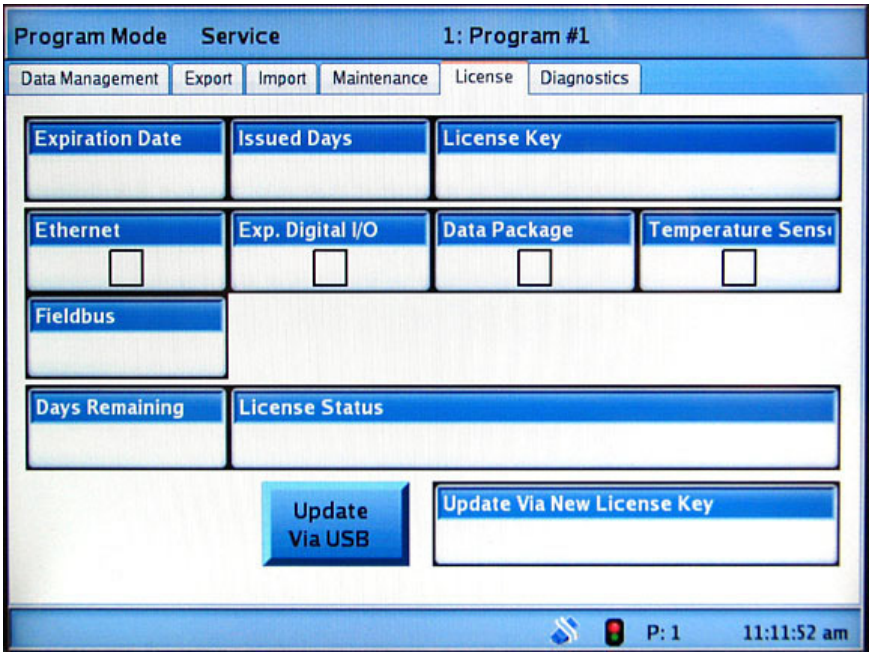
Next, install the memory stick with the new software into the front panel USB slot and *wait for the activity light on the stick to stop flashing*. Then press the **Update Software** button. The tester will locate the update files on the memory stick and update the software. Follow any on-screen prompts that may appear and follow the instructions they give. When the update process is complete, restart the tester.

Install Patch

This button will be used should Uson issue a patch to the software. Instructions for installing the patch will be provided at that time.

6.2.3.6 License

The License tab shows important information about the terms and features of the installed license.



See *"License Updates" on page 10-1* for detailed information about installing or updating a license.

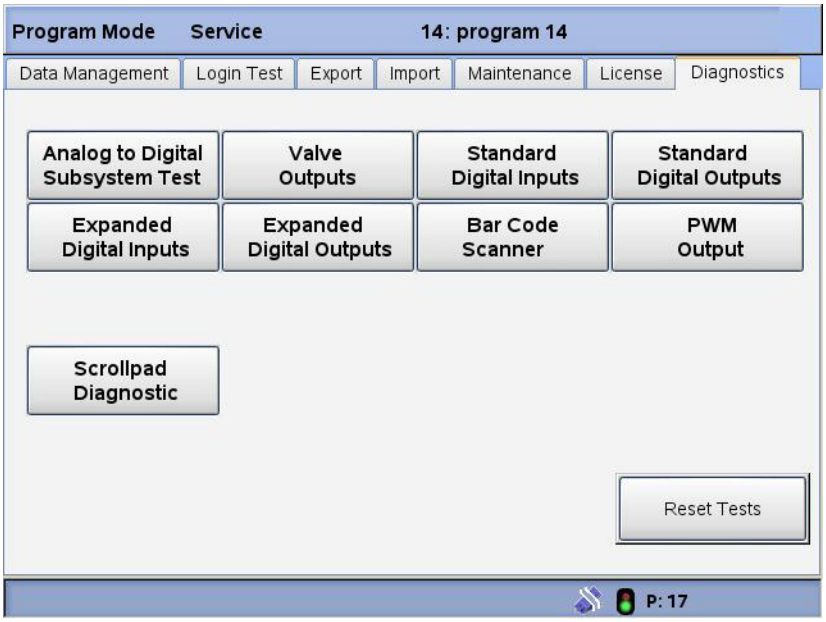
6.2.3.7 Diagnostics

The Diagnostics main screen (shown below) provides several system diagnostic subscreens/selections, including:

- Analog to Digital Subsystem Test
- Valve Outputs:
- Standard Digital Inputs
- Standard Digital Outputs
- Expanded Digital Inputs
- Expanded Digital Output
- Bar Code Scanner Diagnostic
- PWM Output
- Scrollpad Diagnostic

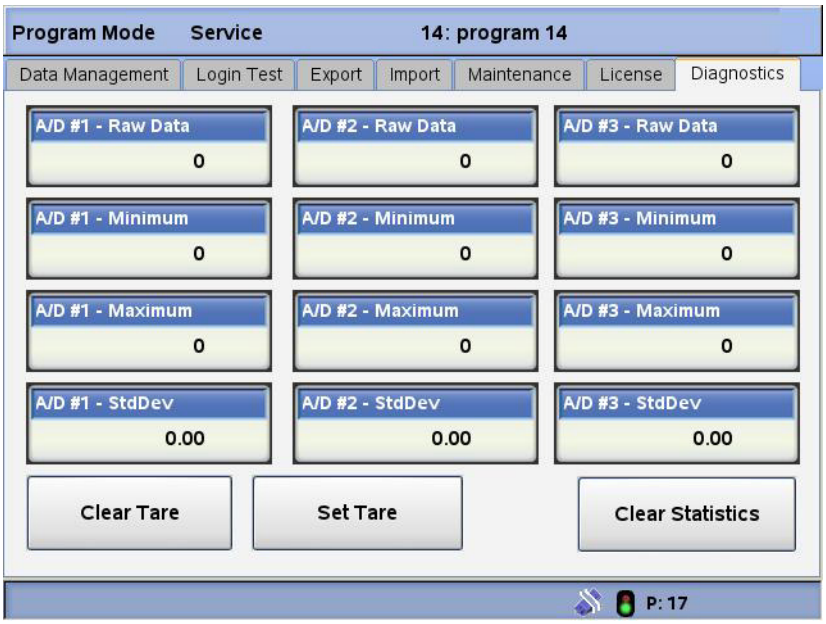
To Exit any diagnostic menu, select the Diagnostic Tab, then select the Reset Tests button.

Tester diagnostic selections may vary depending on tester specifications.



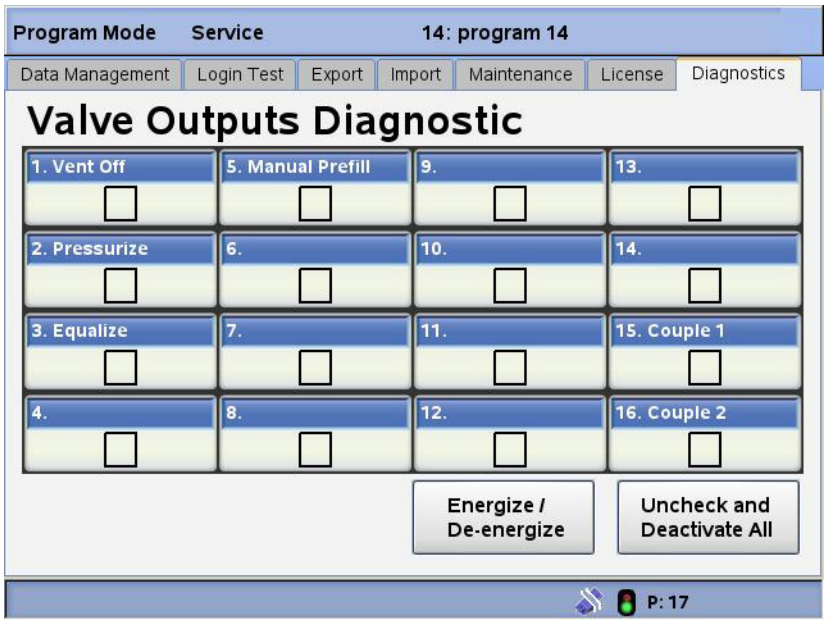
Analog-to-Digital Subsystem Test

The Analog to Digital subsystem screen allow viewing the sensor(s) raw data.



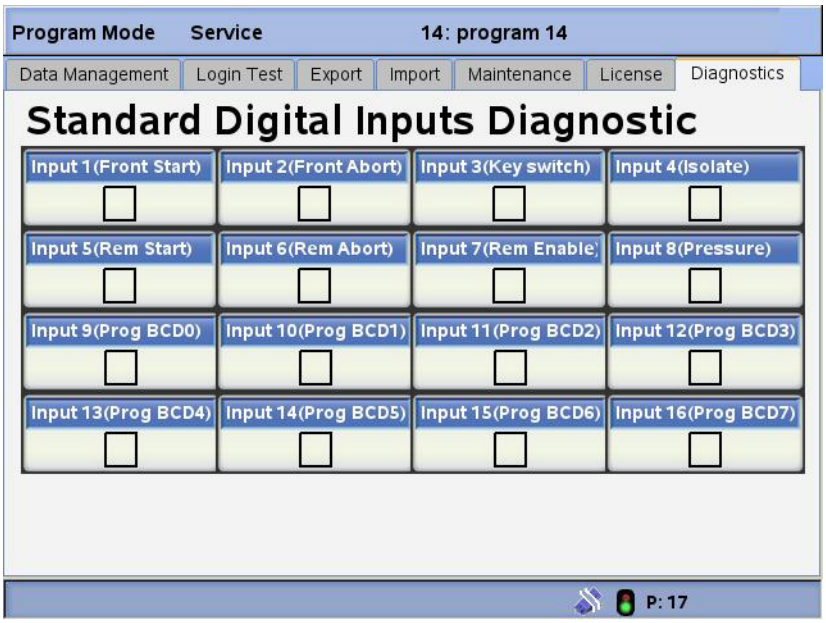
Valve Outputs Diagnostic

The Valve Outputs screen is used for testing internal valve(s) 1 to 16.



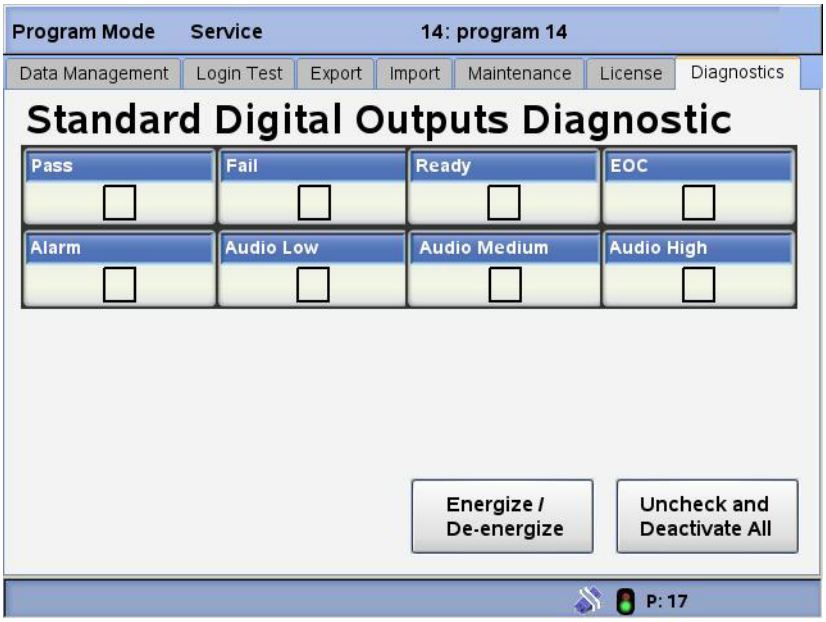
Standard Digital Inputs Diagnostics

The Standard Digital Inputs screen is used to test standard digital inputs 1 to 16.



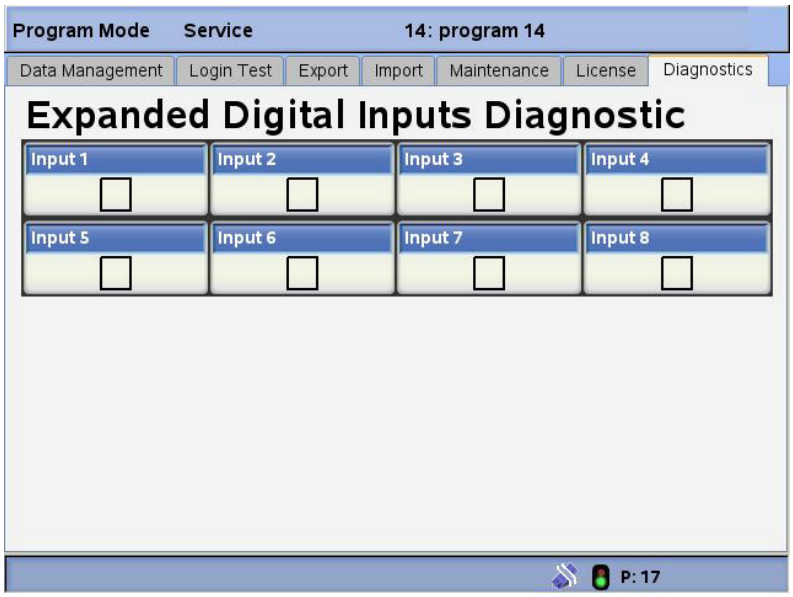
Standard Digital Outputs

The Standard Digital Outputs screen is used to test these digital outputs: pass, fail, ready, EOC, alarm, and audio.



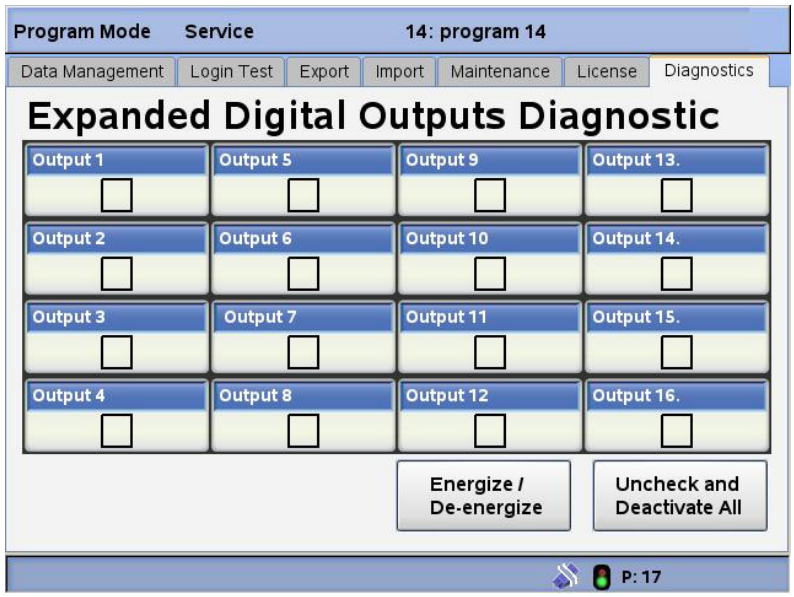
Expanded Digital Inputs

The Expanded Digital Inputs screen is used to test the expanded digital inputs 1 to 8.



Expanded Digital Outputs

The Expanded Digital Outputs screen is used to test expanded digital outputs 1 to 16.

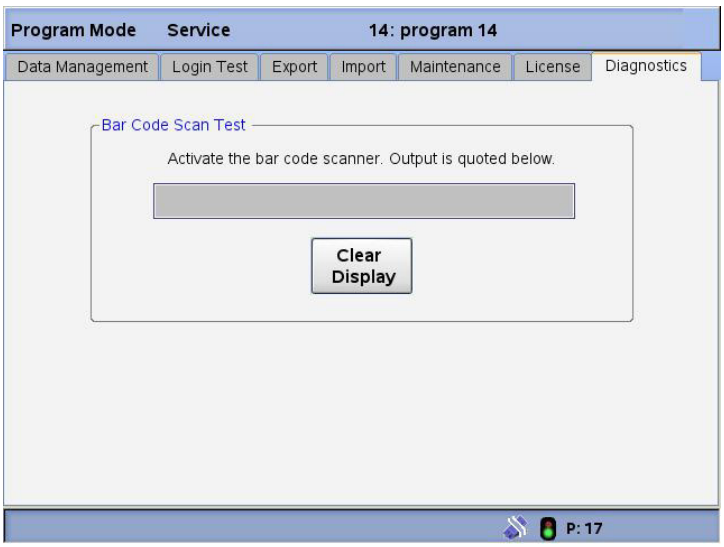


Bar Code Scanner Diagnostic

This screen will show the scan results to verify operation. Press **Clear Display** to clear the output and make another scan, if desired.

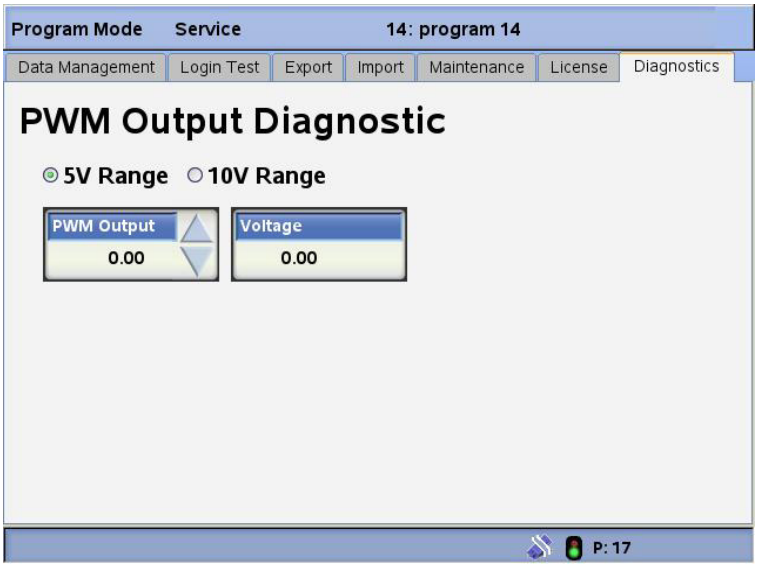
The scanner may be connected to the front or rear USB port. When connecting the scanner, the tester should be powered off.

If the bar code scanner is connected but does not scan, recycle tester power while it is connected so that the tester can recognize the scanner.



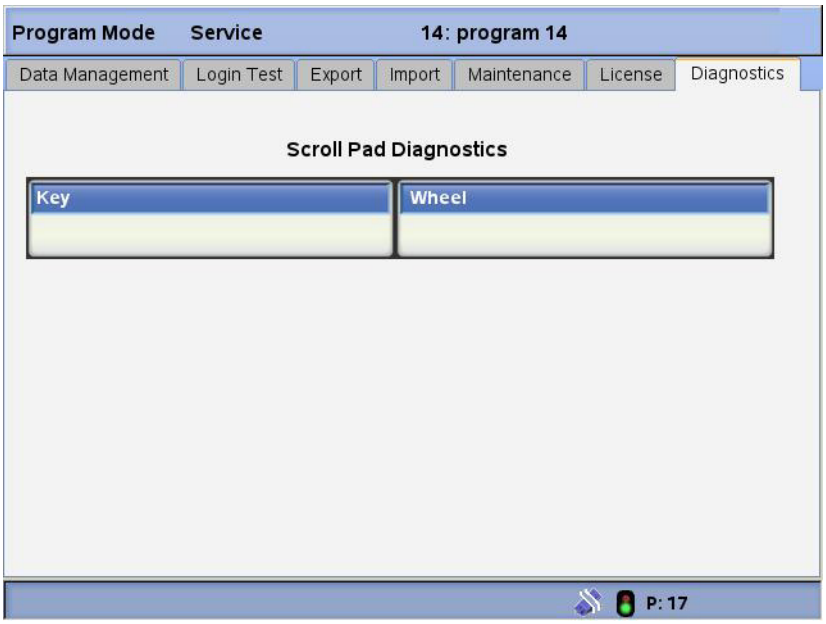
PWM Output

The PWM Output menu allows checking the voltage to the electronic regulator.



Scrollpad Diagnostic

This screen allows testing the scroll pad board.



To perform the Scroll Pad Diagnostics (Key/Wheel):

1. Press the '**Top key'** of the overlay keypad; you should see the value in the 'Key'box change to **0x01**. Release the Top key; the value should return to **0x00**.

2. Press the '**Right key'** of the overlay keypad; you should see the value in the 'Key' box change to **0x02**. Release the Top key; the value should return to **0x00**.

3. Press the '**Center key'** of the overlay keypad; you should see the value in the 'Key' box change to **0x04**. Release the Top key; the value should return to **0x00**.

4. Press the '**Left key'** of the overlay keypad; you should see the value in the 'Key' box change to **0x08**. Release the Top key; the value should return to **0x00**.

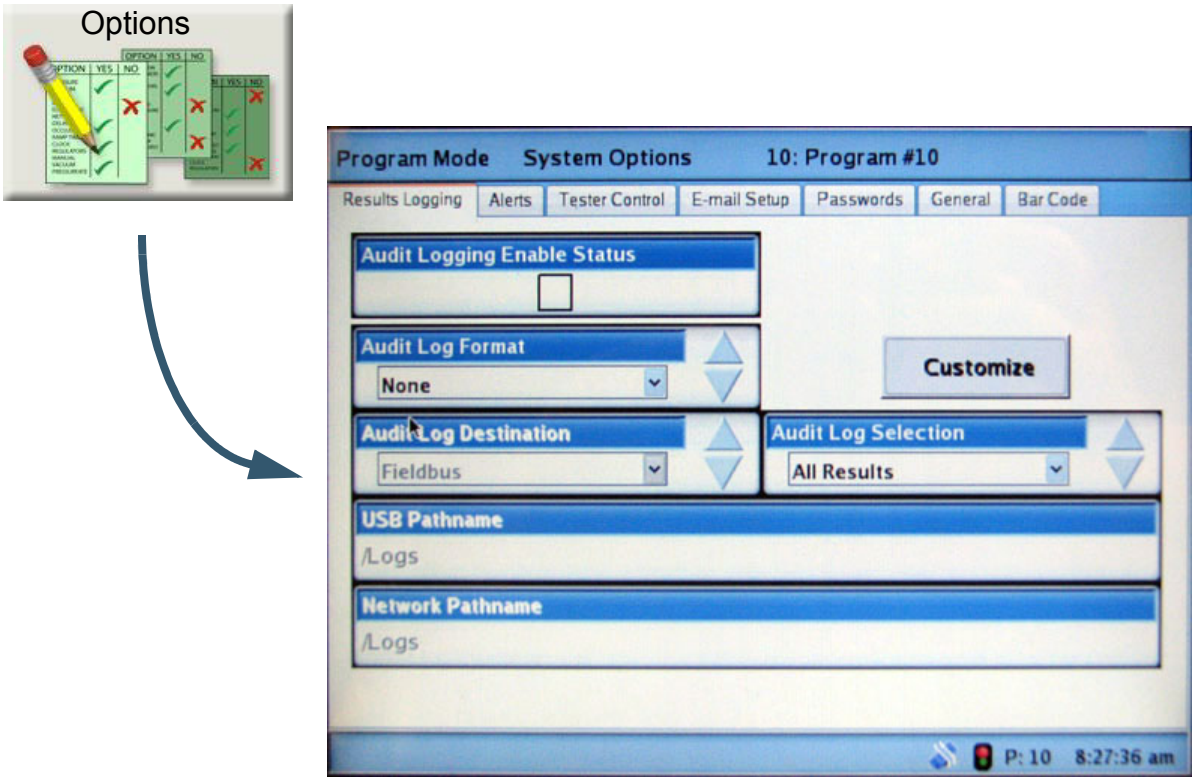
5. Press the '**Bottom key'** of the overlay keypad; you should see the value in the 'Key' box change to **0x10**. Release the Top key; the value should return to **0x00**.

6. The scroll wheel counts from 0x00 to 0x7F as you rotate your finger 'clockwise' starting from the top of the wheel. Ensure that the 'Wheel' box value counts from 0x00 to 0x7F. **Note:** Due to resolution of the wheel, it is very difficult to see every value from 0x00 to 0x7F. Verify at least the second digit counts from 0 x0? to 0x7?.

6.2.4 Options

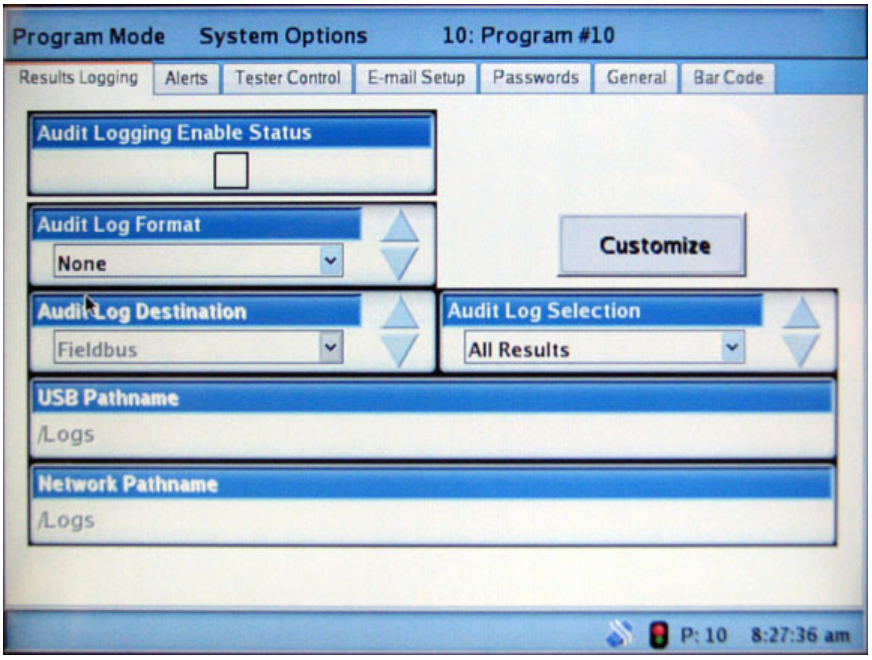
The Options button opens a screen with 6 tabs. The following options areas can be set:

- Results Logging. See *"Results Logging" on page 6-39*
- Alerts. See *"Alerts" on page 6-44*
- Tester Control. See *"Tester Control" on page 6-45*
- E-mail Setup. See *"E-mail Setup" on page 6-48*
- Passwords. See *"Passwords" on page 6-50*
- General. See *"General" on page 6-54*
- Bar Code. See *"Bar Code Option" on page 6-54*



6.2.4.1 Results Logging

Results logging is customized from the screen.



Audit Logging Enable Status

- This box is automatically checked when the settings on this screen have been set to allow an audit log to be created.

Audit Log Format

- None
- Standard
- Custom

Audit Log Destination

- None
- USB Memory Device
- Fieldbus or Com Port (whichever is optioned in the tester)
- Windows Network

USB Pathname

This option is only available when USB is set as the destination for the log.

- Enter the path name for the log

See *"Data Logging to USB Memory Stick" on page 6-43* for guidance about logging to a USB memory stick.

Network Pathname

This option is available when Windows Network is set as the log destination.

- Enter the path name for the log

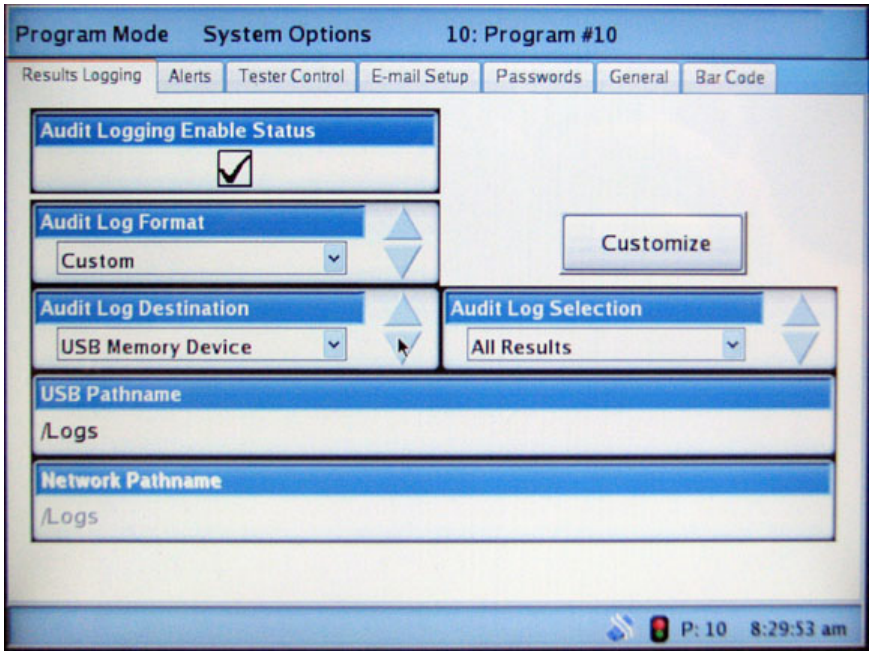
Standard Results Log

When Audit Log Format is set to Standard the following items are logged:

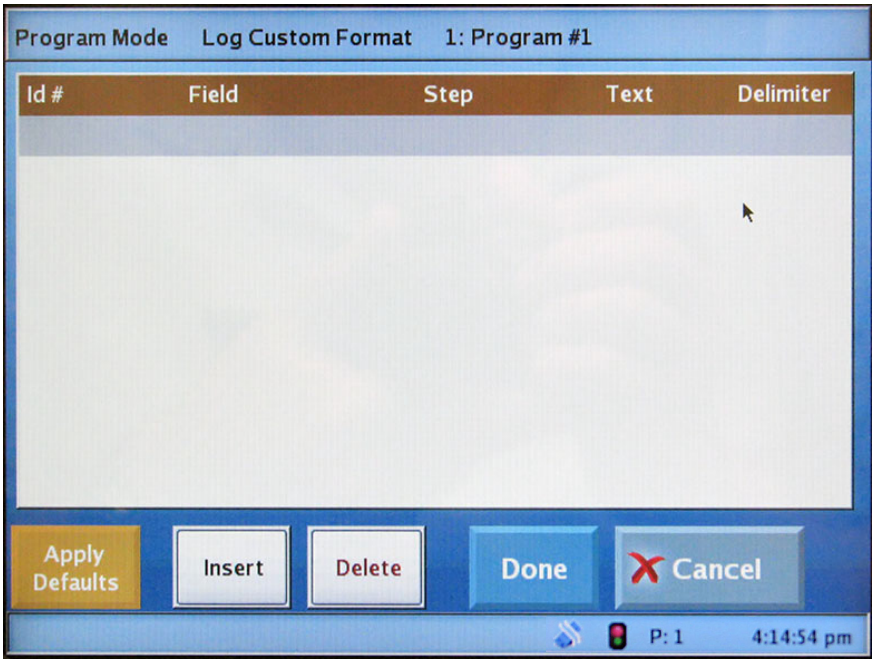
- Cycle Number
- Program Number
- Date
- Time
- Test Measurement
- Test Measurement Units
- Test Result

Customizing the Results Log

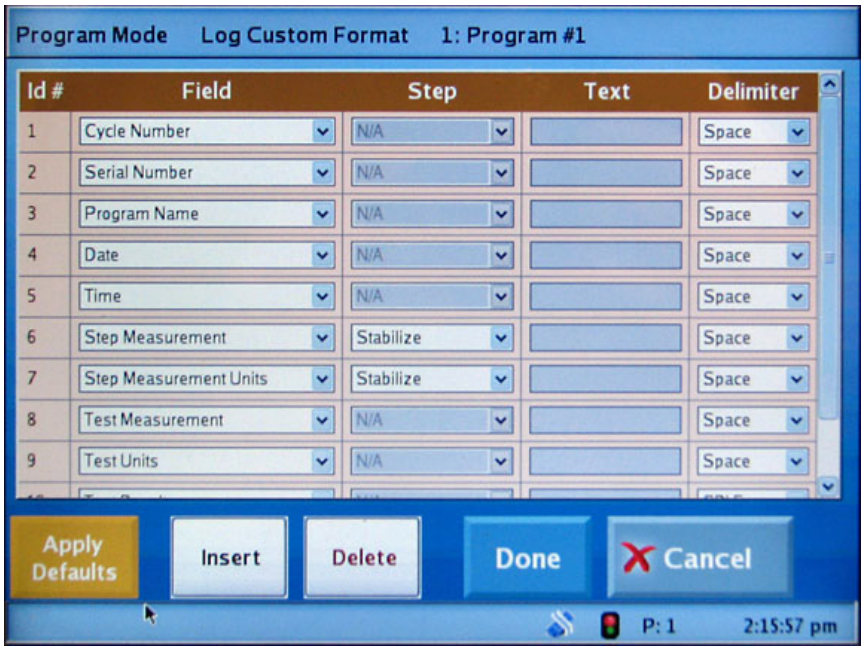
To begin customizing the log, change the **Audit Log Format** to **Custom** as shown below. Note that the **Customize** button is no longer darkened and so is now available for use.



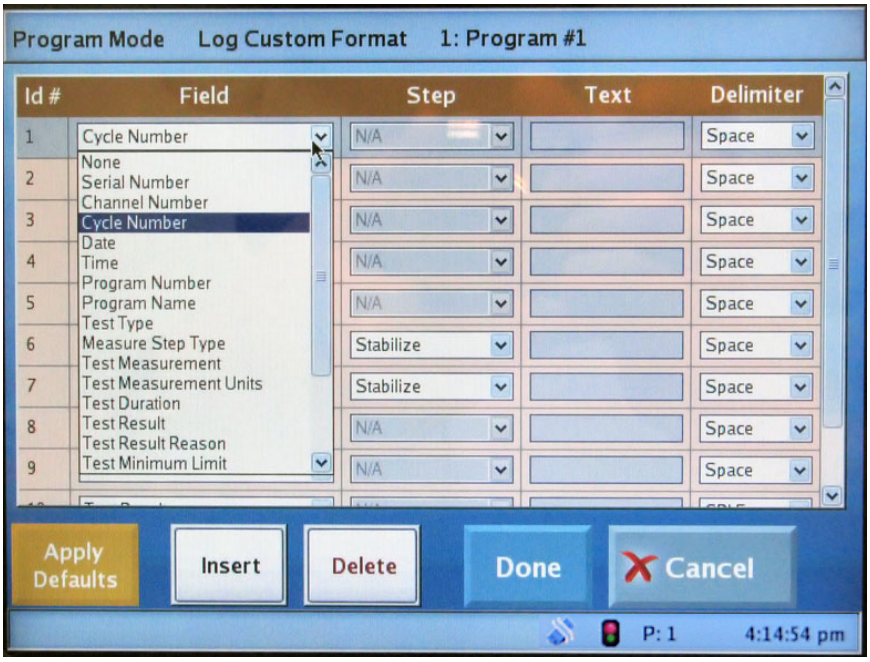
Pressing **Customize** will open the Log Custom Format display as shown below. If no custom log has ever been created, or if the entire previous log setup has been deleted, then the window will have no entries as shown



An easy way to populate the screen with the default custom settings is to press the Apply Defaults button. The screen will now appear as shown below.



Tapping an item in any of the columns will begin the process of customizing that item, if available. The illustration below shows a typical drop down menu that is shown when an item in the Field column is tapped.



Note that the delimiter used between fields may be selected from the Delimiter column as shown below. This is helpful for formatting the output so that it is more easily readable or for preparing it for importing into an application as a tab-delimited file for a spreadsheet, for example.

A new line (Id#) may be inserted by pressing the **Insert** button as shown below. A maximum of 30 Id#s may be used.

To delete a line, highlight it and press the **Delete** button.

After the desired changes are made, press the **Done** key to accept them.

Data Logging to USB Memory Stick

Before inserting a USB memory stick it is important to use the *key* to switch to Program Mode. Using the soft key to switch between run and program modes will not provide the needed results.

Before logging data to a memory stick, it is essential to do the following:

1. Ensure that the Audit Log Destination has been set to USB Memory Device in the Program Mode > Results Logging tab.
2. Use the **key** to switch the tester to Program Mode.
3. Insert the USB memory device into the front or rear port of the tester (while still switched to Program Mode).

After inserting the USB memory stick into either the front or rear of the tester, it is important to *wait at least 30 seconds* for the operating system to acknowledge that the USB device is available. After that wait, the key may be switched to the Run Mode. At this time, test results will be logged to the USB device as set up in the Options menu.

To stop logging data to the memory stick, do the following:

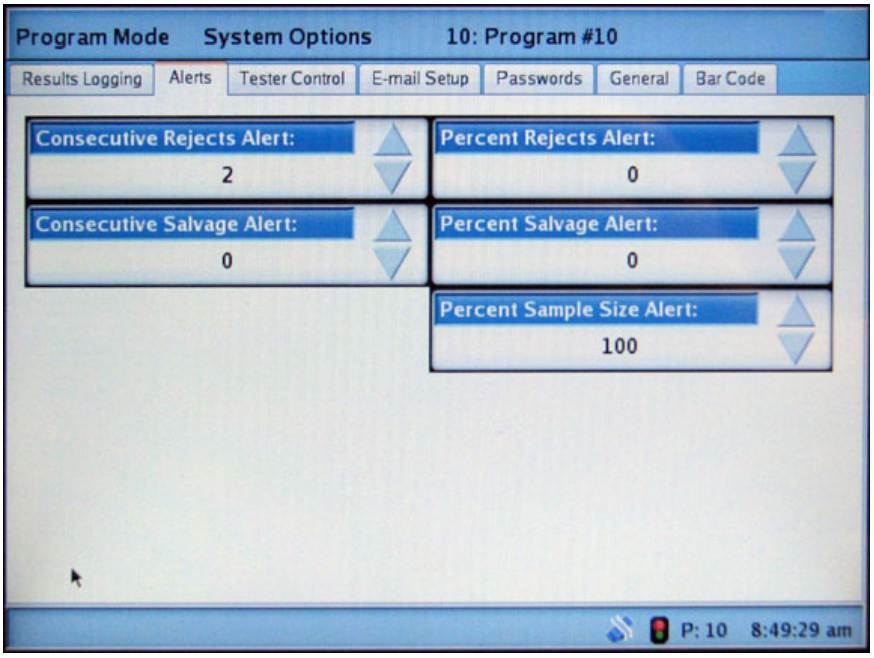
1. Stop testing.

2. Switch the Program/Run **key** to Program Mode, and then remove the USB memory stick.

Removing the stick before switching to the program mode leaves the file open and unreadable.

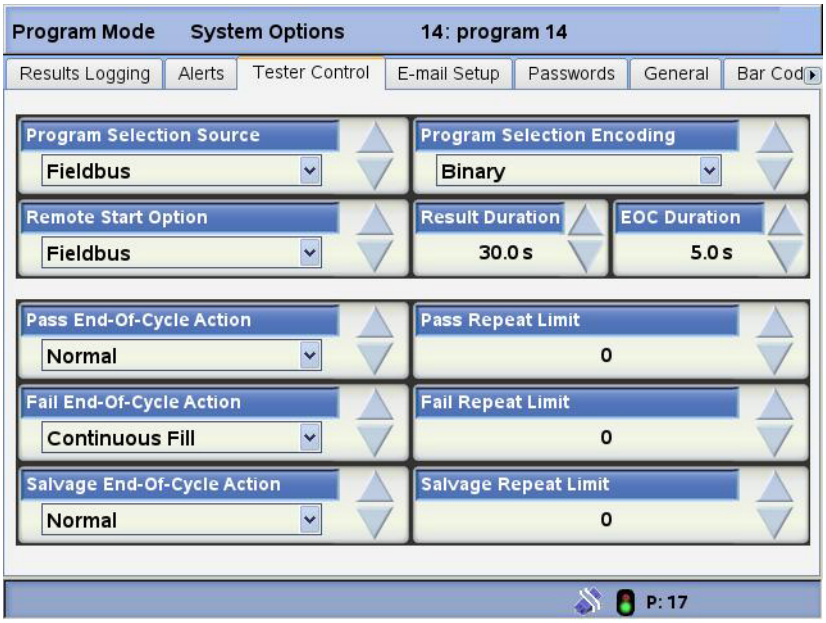
6.2.4.2 Alerts

Alerts will be issued when tests meet the conditions established on the **Alerts tab**.



6.2.4.3 Tester Control

Use the Tester Control screen to set how the tester is to be controlled.



Program Selection Source

May be set to:

- Program Mode: allows program selection only from within Program Mode. Program selection will be locked in Run Mode. This will prevent changing program selections by an operator without the Security Key.
- Front Panel: program selection may be freely made in either Mode.
- Digital I/O Port: program must be selected from input to the I/O port.
- Barcode Reader: programs selected by the barcode reader (optional).

Remote Start Option

Choose from:

- None
- Conventional
- Fixture: The Remote Start input starts the test cycle. Remote Start must be asserted throughout the test cycle, otherwise, its release aborts the test. Also, Remote Stop can optionally be used to abort the test cycle at any time. The Remote Start Enable input is not used for this start policy and is ignored.
- Anti-Tie Down: This start policy requires an external device that implements anti-tie-down operation. The output of this external device is connected to the remote start input. The test cycle is started when the anti-

tie-down device asserts the input for the duration of the coupling time (or times if there are multiple couplings). The intent is to keep the operator's hands safely on the anti-tie-down device and away from pinch points while the fixture is moving to close and seal on the test part. The test cycle is aborted if the anti-tie-down device releases the Remote Start input before the coupling time(s) have completed. Also, Remote Stop can optionally be used to abort the test cycle at any time. The Remote Start Enable input is not used for this start policy and is ignored.

- Interlock: The Remote Start input starts the test cycle, if Remote Start Enable is already asserted. Typically, Remote Start Enable is connected to a test fixture interlock switch that indicates when it is safe to test. After this condition is attained, some user action is required that asserts the Remote Start input thus starting the test cycle. If Remote Start Enable is released before the test cycle has finished, the test cycle is aborted. Also, Remote Stop can optionally be used to abort the test cycle at any time.
- Barcode: The tester will start when a barcode is scanned.

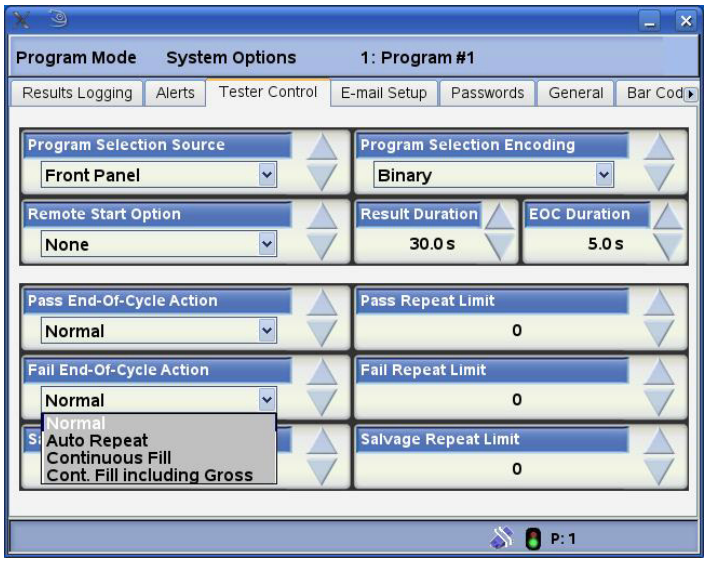
Pass End-of-Cycle Action

Choose from:

- Normal
- Auto Repeat
- Continuous Fill

The Continuous Fill option found in the end-of-cycle actions is used to maintain air pressure at the part as an aid in locating a leak.

Fail End-of-Cycle Action



Choose from:

- Normal
- Auto Repeat
- Continuous Fill
- Continuous Fill Including Gross

The Continuous Fill Including Gross option found in the fail end-of-cycle actions is only active after any step fails its limits, and used to continuously maintain air pressure at the part as an aid in locating a leak. It is terminated by the Abort signal.

Salvage End-of-Cycle Action

Choose from:

- Normal
- Auto Repeat
- Continuous Fill

If a user input is desired for an End-of-Cycle action, a Couple input can be used. See ***"Coupling" on page 6-7***

Program Selection Encoding

This option selects the type of binary input to use for program selection. Choose from:

- None
- Binary
- BCD

Results Duration

Used to set the amount of time the result output signal stays on.

EOC Duration

Used to set the amount of time the EOC (End of Cycle) output signal stays on.

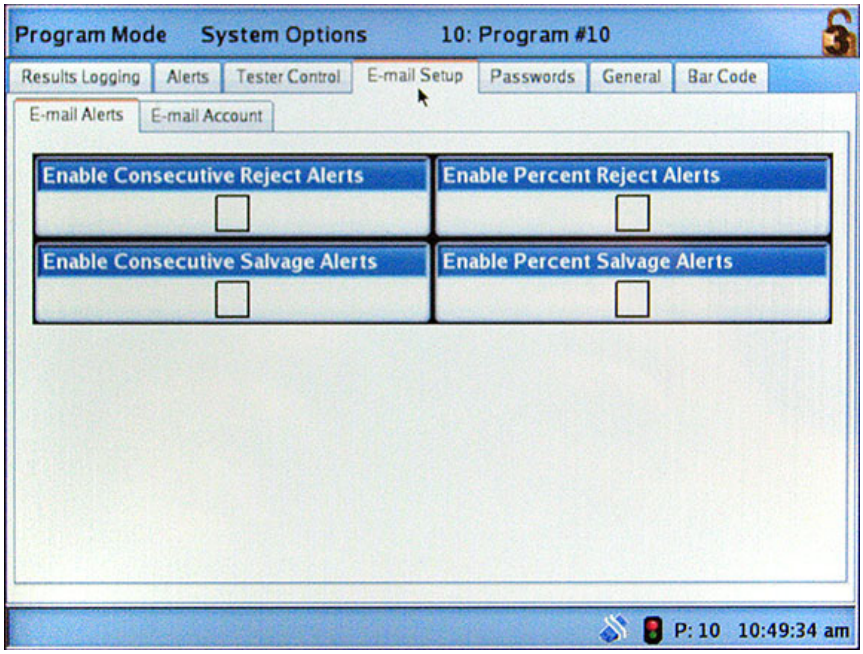
Pass / Fail / Salvage Repeat Limit

Enter the amount of end-of-cycle repeats to be allowed. Enter a zero to turn off the limit and allow unlimited repeats.

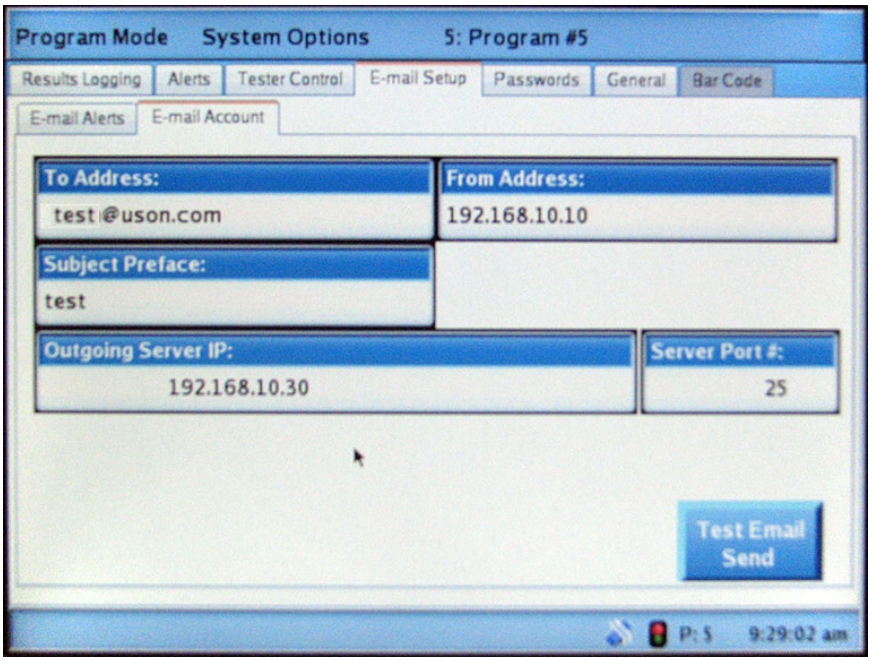
6.2.4.4 E-mail Setup

Use the E-mail Setup tab to select e-mail alerts and account settings.

Alerts established on the **Alerts tab** (See *"Alerts" on page 6-44*) can be selectively sent via e-mail. Check the box for each alert type to use.



Use the **E-mail Account tab** to establish the parameters for your site's setup. You may need the help of your site IT professional to assist with providing the correct values to enter.



The email option is only available when the Ethernet option is purchased.

6.2.4.5 Passwords

Lock Icon

A lock icon shows that passwords have been established to limit access to some areas of the tester. There are three password levels.

Operator:
Has access to some features available on the Run Mode screen and can run tests. Operators are not allowed to change tests or calibration.

Supervisor:
Has full control of the tester but is not able to change the network functions of the tester such as IP addresses.

Administrator:
Shares the functions of the Supervisor level and also has access to the IT functions of the tester so network settings may be made.

The Lock Symbol

The lock appears in top right corner of the display when a password exists. If the symbol is shown as locked, a logon is required to access Program Mode features. The symbol displays unlocked status whenever a numeral (1, 2, or 3) is superimposed on it.

A password has been setup and no user is logged on. No tests can be run and only Run Mode features can be accessed.

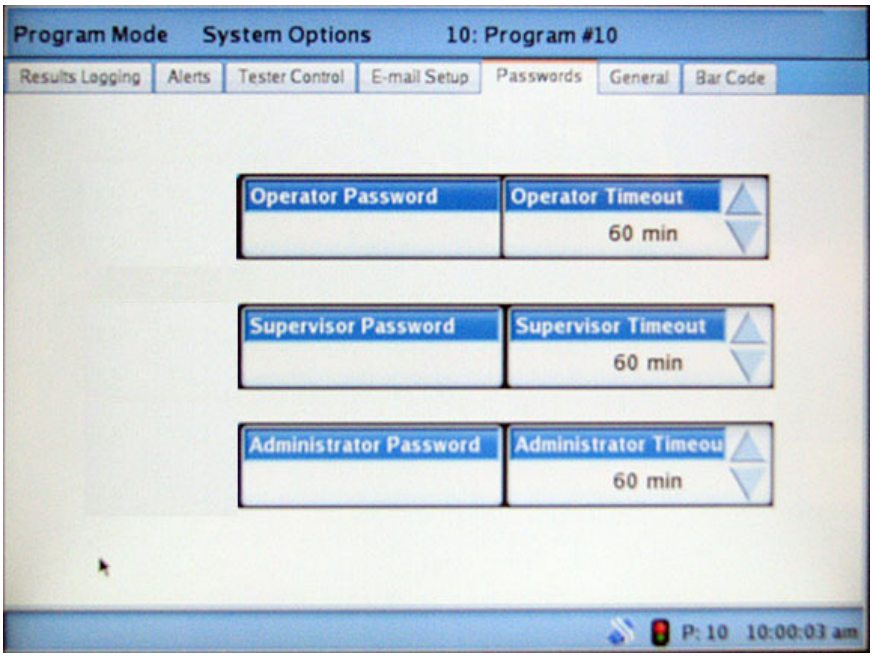
The Operator is logged on. Tests may be run. No Program Mode features are available. Test programs can't be changed.

The Supervisor is logged on and has full tester access except for network settings.

The Administrator is logged on and all tester features are available.

Setting a Password

The Passwords tab is the control center for passwords. Once a password has been set, only supervisors and administrators can reach this tab.



To Set a Password

Press **Operator Password**, **Supervisor Password**, or **Administrator Password** to make the keypad visible.

Enter the password using the keypad and select **OK** and automatically return to the previous screen.

The password is set and the Set Password button will change to the Clear Password button.

Operator Timeout

This feature controls how long the tester may sit idle before the user is automatically logged off. Operators may be granted up to 60 minutes. Supervisors and Administrators may be granted up to 480 minutes.

To Clear a Password

Press the **Clear Password** button to clear the password. (The Clear Password button is not visible until a password has been set.)

How to Logon

Touch the status bar and the pop-up menu will appear as shown below. Select **Login/Logout**.

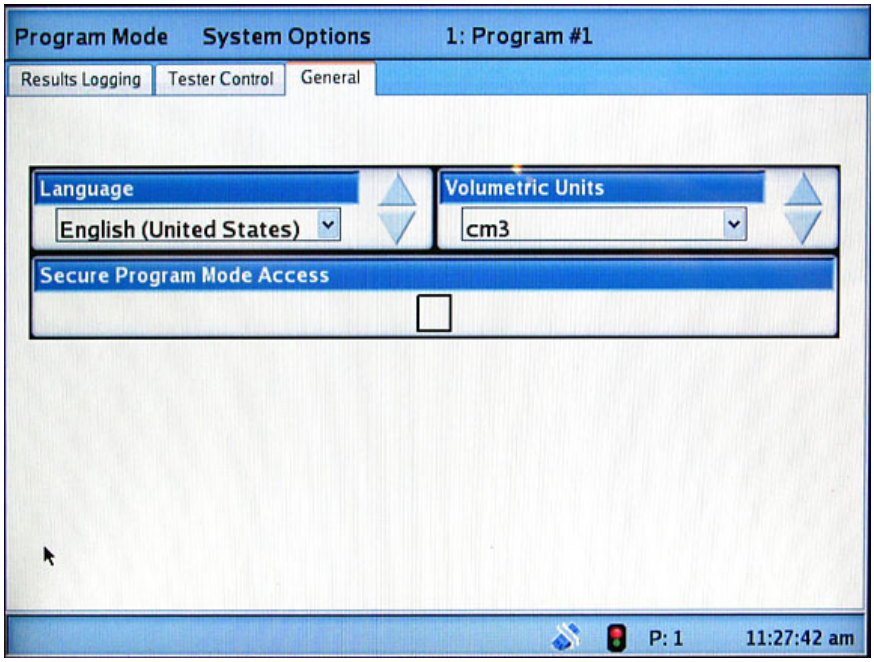
Forgotten Password

Call Uson to obtain a reset code. Select Forgot Password from the pop-up menu and enter the code and select OK. This action clears all passwords.

Select the appropriate user to login from the drop down menu in the **User** bar. Then touch the **Password** bar below it to open the keyboard and enter the password. Press OK to close the keyboard and return. Then, press the **Login** button to complete the login.

6.2.4.6 General

Use this screen to set the general parameters for the tester.



Language

Select the desired language. After changing the language selection, turn the key to Run mode and cycle power on the tester. When the tester completes power up, the new language will be in effect.

Secure Program Mode Access

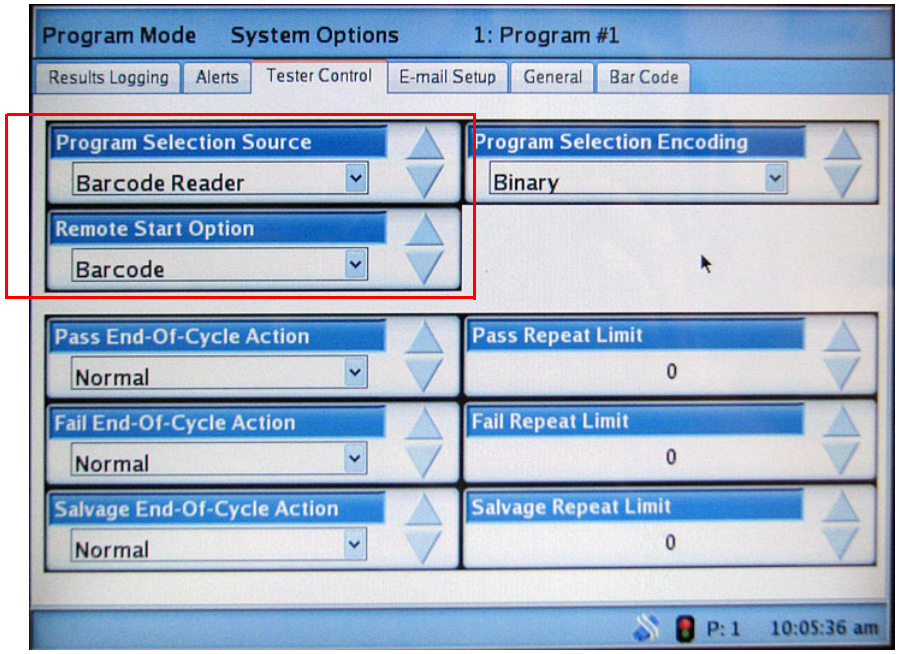
Select the check box to require the use of the keyswitch to select between Run and Program Modes.

Bear in mind that the key is always required to save settings regardless of how this option is set.

6.2.4.7 Bar Code Option

The Bar Code option allows a particular test program to be selected when the corresponding barcode is scanned. Also, the tester may be setup to begin testing when a barcode is scanned.

To use any of the Bar Code features (program selection and remote start), the Tester Control tab must be set to use one or both of the features. The sample display below shows that both features have been selected. When either or both of these features are selected, further settings are made available on the Bar Code tab.

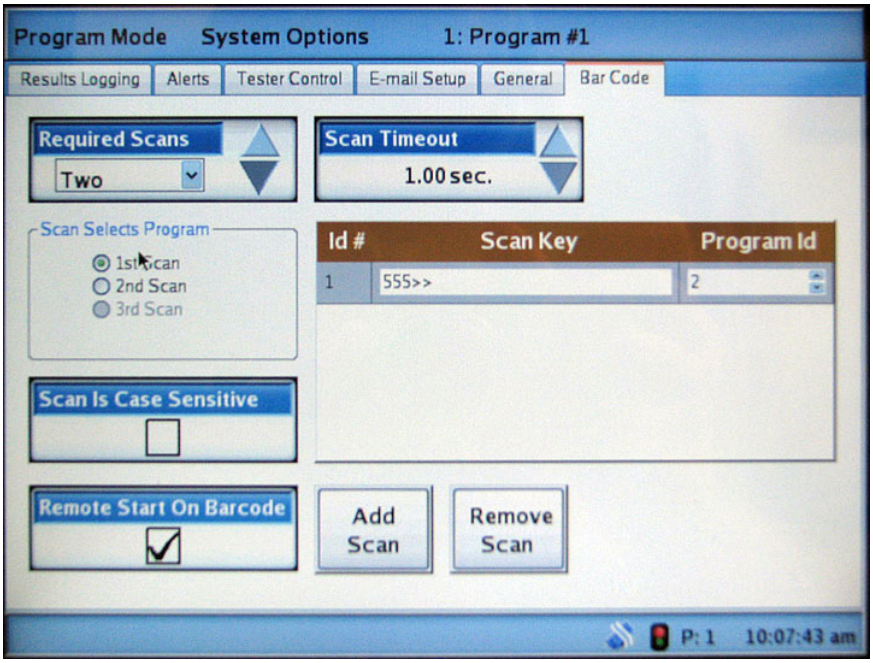


The scanner may be connected to either the front or rear USB port. The tester should be off while the scanner is connected. If the scanner is connected while the tester is powered on, the scanner will not work until the tester power is recycled.

Be sure to configure the scanner to output CRLF at the end of the scan string.

The bar code scanner may be tested with the diagnostics system. See *"Bar Code Scanner Diagnostic" on page 6-36*.

The Bar Code tab is shown below.

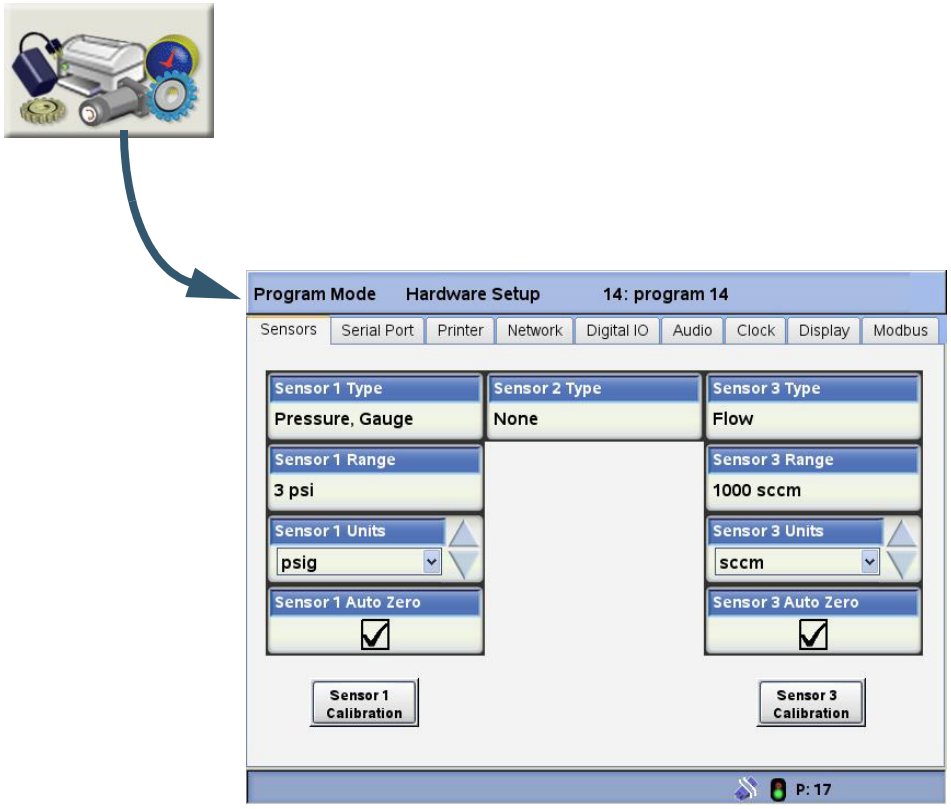


- **Required Scans**: Set to None, One, Two, or Three.
  Note: Always set this to None when finished using the barcode scanner or the operator may experience difficulty starting a test.
- **Scan Selects Program**: Select which scan will actually select the program. Note that the settings available here depend on the setting of the Required Scans box.
- **Scan is Case Sensitive:** Selecting this checkbox forces the tester to consider the case of the scanned input.
- **Remote Start on Barcode**: The box repeats the selection for Remote Start that was made at the Tester Control tab. This selection cannot be made here. If Remote Start on Barcode is desired, but is not shown as checked here, go to the Tester Control tab and select it.
- **Scan Timeout**: Select the time for the scan to be retained.
- **Scan Key box**: If Program Selection by barcode is enabled in Tester Control, this box shows the string to match in the barcode scan and the program Id it will start. The asterisk * character is a wildcard (matches any character). The maximum length for a barcode scan is 32 characters.
- **Add Scan**: Press this button to activate the keyboard to enter the desired Scan Key.
- **Remove Scan**: Tap the Id# of the Scan Key to highlight it and then press Remove Scan to delete that scan from the list.

6.2.5 Hardware Setup

Hardware Setup has 7 tabs:

- Sensors: See *"Sensors" on page 6-58*
- Serial Port: See *"Serial Port" on page 6-58*
- Printer: See *"Printer" on page 6-60*
- Network: See *"Network" on page 6-61*
- Digital I/O: See *"Digital I/O" on page 6-67*
- Audio: See *"Audio" on page 6-70*
- Clock: See *"Clock" on page 6-71*
- Display: See *"Display" on page 6-72*
- Modbus: See *"Modbus" on page 6-74*
- General: See *"General" on page 6-75*

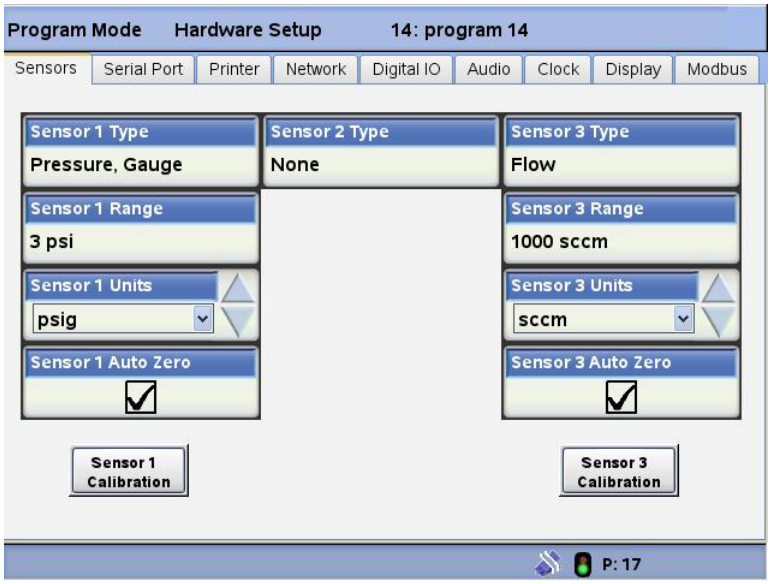


6.2.5.1 Sensors

This screen shows the installed sensors and is used to set the sensor(s) parameters for:

- Pressure Type
- Sensor Range
- Sensor Units

In addition, the sensor screen is used to enable/disable the Auto Zero feature and initiate the sensors' calibration processes.



CAUTION: Changing sensor units DELETES ALL Audit Log entries and Test Counters.

Auto Zero

The Auto Zero function is used to eliminate the long-term zero drift of the internal sensors by venting the sensors to atmosphere during the Auto Zero step. The subsequent reading is then used as the new zero value (reference point) for the current test. To add this feature to an internal sensor, select the corresponding checkbox. See *page 6-58*. In addition, in order to activate this feature, you will need to enter an Auto Zero duration time in the Program Mode, Test Setup, Steps screen. See *page 6-10*.

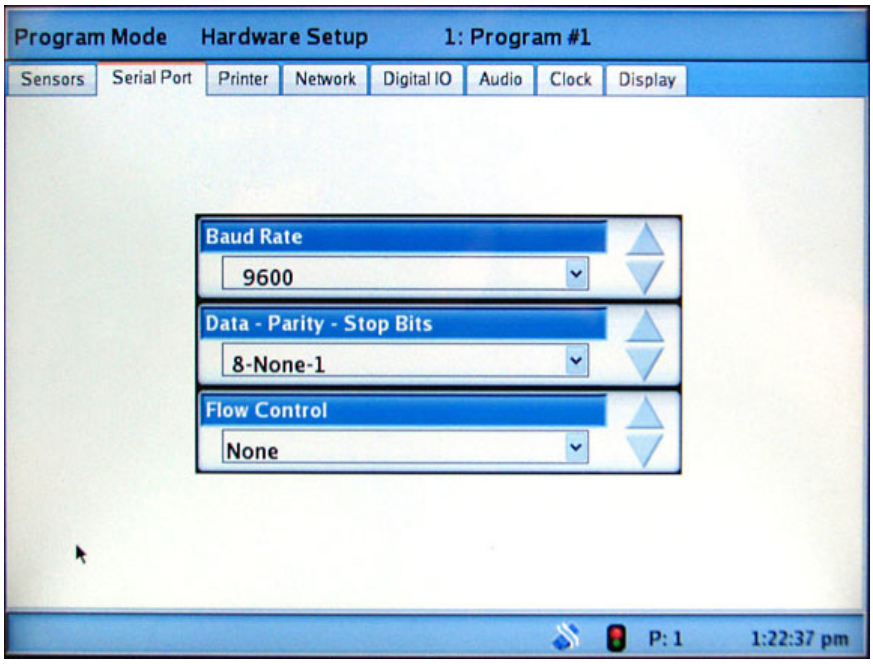
Sensor Calibration

Contact a qualified Uson representative for sensor calibration.

6.2.5.2 Serial Port

The serial port settings are made at this screen. To learn the correct settings to use you must consult the documentation that was provided with your device.

The settings made at this screen must match the requirements of the connected output device or communication may be garbled or impossible.



Baud Rate:

1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200

Data – Parity – Stop Bits:

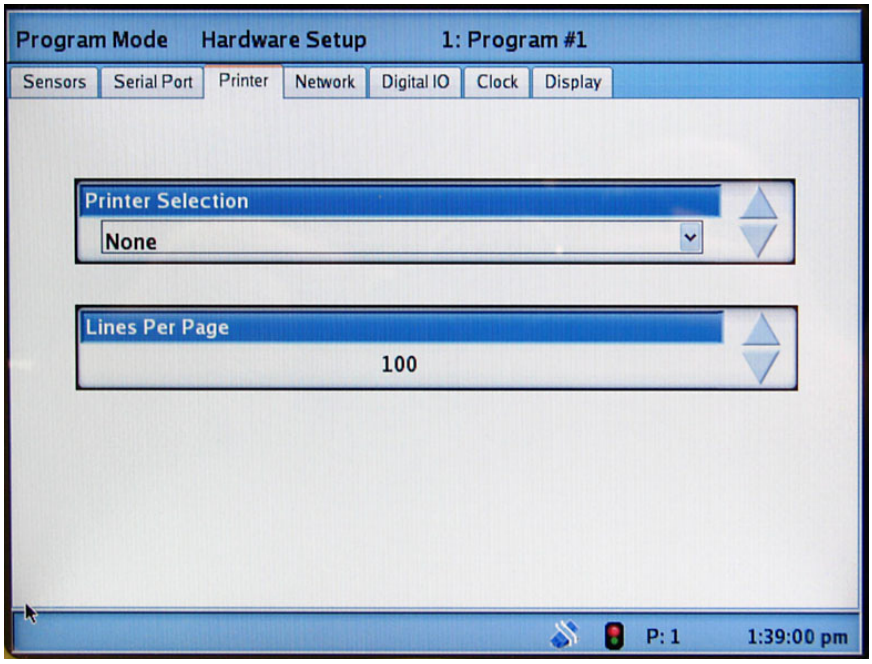
8 – none – 1
8 – even – 1
8 – odd – 1
7 – none – 1
7 – even – 1
7 – odd – 1
7 – space – 1

Flow Control:

Hardware or Xon/Xoff

6.2.5.3 Printer

Use the Printer tab to select a printer, if any, and the number of lines to print before advancing to the next page.



Examples of things that may be printed:

- Program Test setup
- Options
- Hardware setup
- Factory setup
- Audit log
- Details screen
- Values for the following screens:
  - Profile
  - Trend
  - Statistics

6.2.5.4 Network

Qualitek mR has the capability to log to a file on the network.

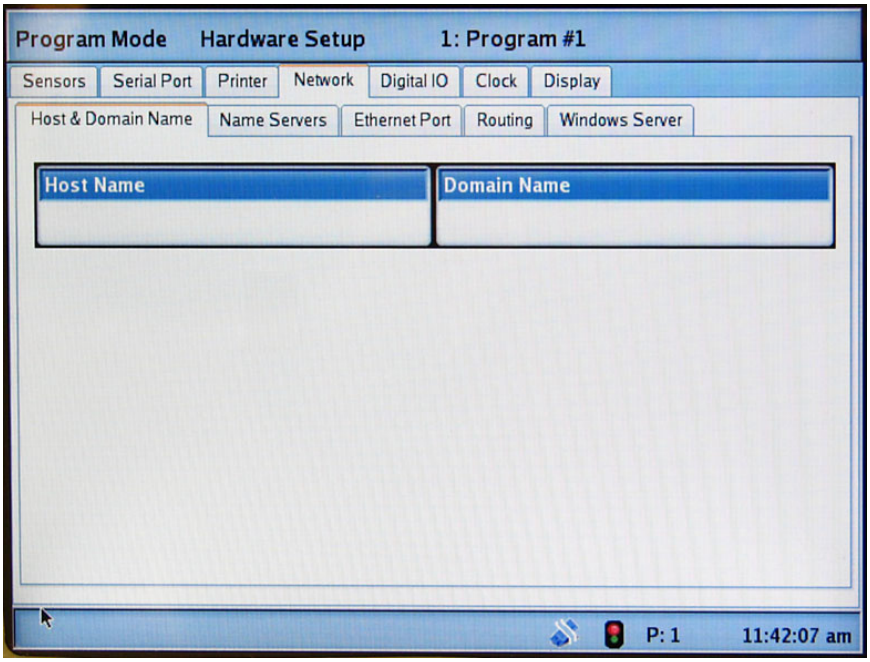
The Qualitek mR opens a log file when going from Program Mode to Run Mode. During this time, the file is actively used (open) by the tester. Attempts to delete, change, or move the file by other means are blocked by the network. The file can be viewed but it cannot be changed by outside means while the tester has it open.

The file is closed by either of two methods. The first method is when the tester transitions from Run Mode to Program Mode. The second method is when the date changes at midnight; the file is closed and a new one opened with the new date as the filename.

Network Configuration

Network configuration parameters are entered from the Program Mode "Hardware Setup" Network tab page. These items are described in the following sub-sections.

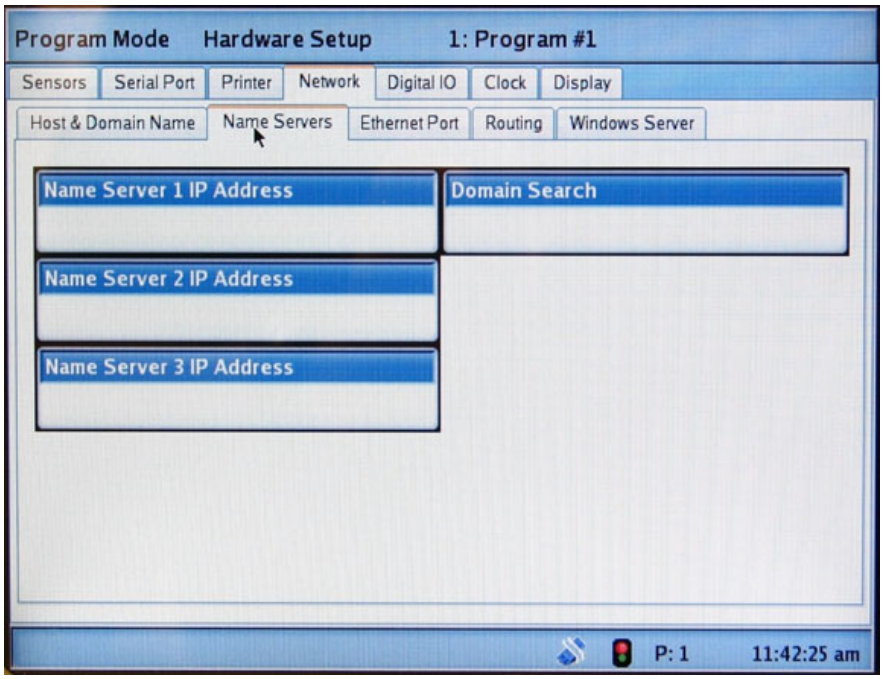
NOTE: The parameters on the first four tabs (i.e. **Host & Domain Name**, **Name Servers**, **Ethernet Port**, and **Routing**) should be entered first, *before* the Ethernet cable is connected. After these are entered and saved (by cycling the keyswitch from Program Mode to Run Mode), the tester should be powered off, the Ethernet cable should be connected, and the tester should be turned on again. Only after these preceding steps are completed should the **Windows Server** parameters on the last tab be entered.



Host & Domain Name

The host name is a unique name for this Qualitek mR tester. An example of a typical host name might be: “qmr-001”.

The domain name is relative to the network to which the tester is connected. The network administrator can provide the domain name.



Name Servers

Name servers provide translations of human-friendly names to network IP addresses. These services are defined relative to the network being connected to. The network administrator can provide the name server IP addresses, and the domain search identification.

An example of settings used at one site is given as follows:

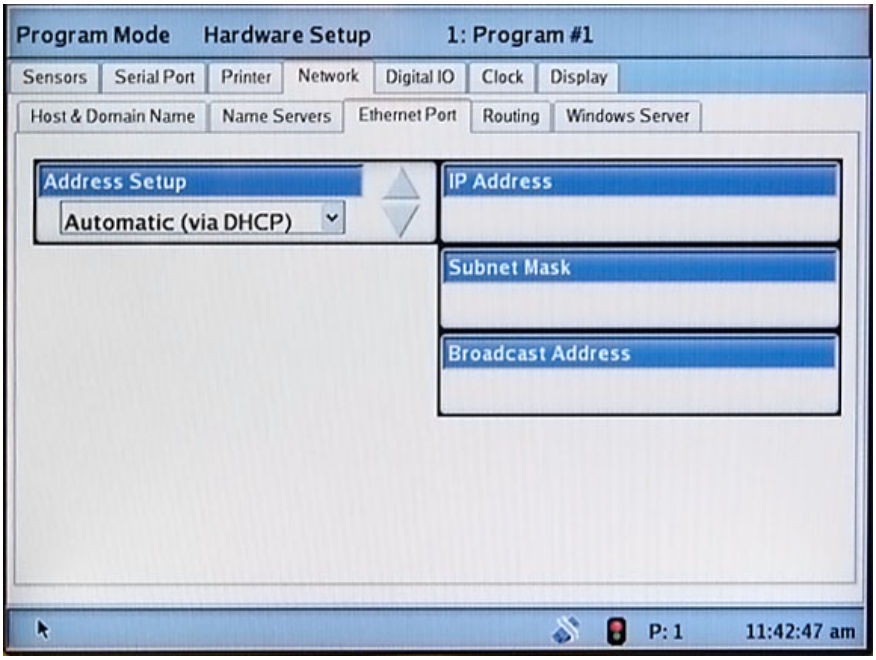
Name Server1: 192.168.10.10

Name Server2: 192.168.10.30

Name Server3: <unused>

Domain Search: factory.com

Settings will be different for each installation and are determined by the local network characteristics.



Ethernet Port

The physical Ethernet port on the Qualitek mR tester must have an IP address assigned to it relative to the network it is associated with.

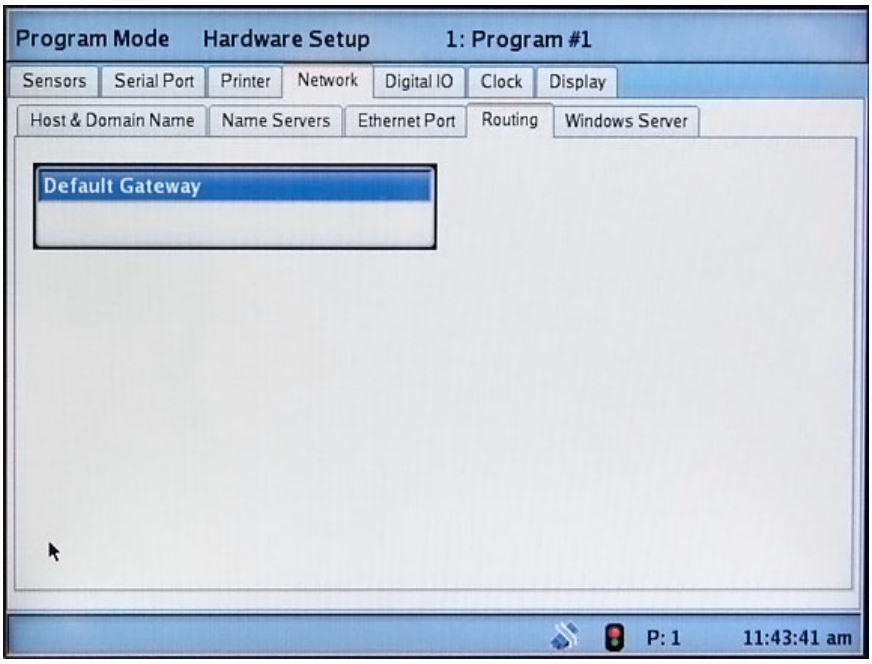
There are two ways to setup the IP address:

- Automatically (via DHCP)
- Static Address
- Disable

If Static Address is enabled, the following information needs to be setup:

- IP address
- Subnet mask
- Broadcast address

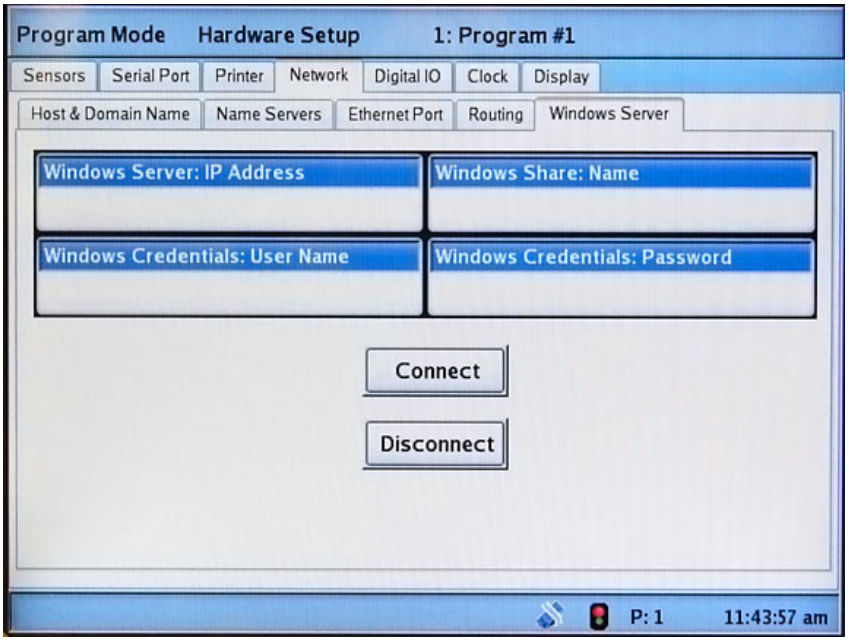
Your network administrator can provide details on how to set these parameters.



Routing

Routing allows access to the default gateway relative to the network being connected to. This parameter is defined by the network administrator.

After the preceding parameters have been entered, save them to the database by turning the key to Run mode, power the tester off and on again, and proceed to **Windows Server** tab.



Windows Server

Qualitek mR audit logging can be set to the "Windows Network." Before this can happen, the Windows Server parameters must be entered and a network connection made. Also, before we can connect to a Windows Network, all preceding steps regarding network setup must be done, saved, and the tester powered off and back on.

There are four parameters that must be entered relative to the Windows Network we want to connect to. These are:

1. Windows Server: IP Address
2. Windows Share: Name
3. Windows Credentials: User Name
4. Windows Credentials: Password

The network administrator can provide the information for each of these parameters.

All four parameters must be entered. If a password is not required, the field cannot be left blank, i.e., enter something. This is used to inform the tester that the operator has entered all parameters.

After the above parameters are entered, they are validated by pushing the **Connect** button located on the page. Successful connection is announced in a dialog box.

Once the tester has successfully connected to the Windows Server, the tester will silently attempt to connect each time at power-up.

Now that the parameters are correctly established, be sure to cycle the key to Run Mode to save the Windows Server settings to memory.

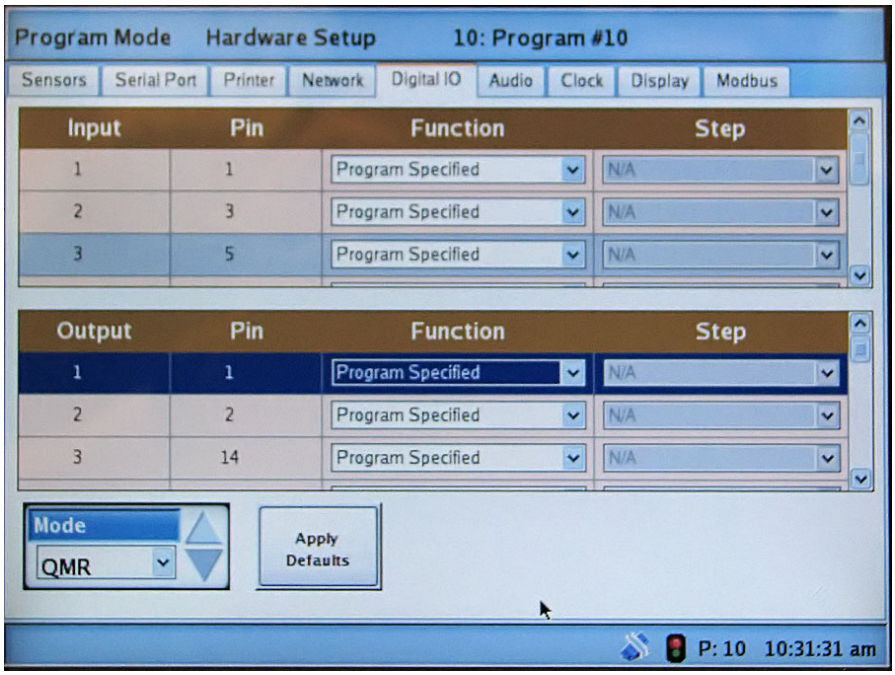
Network Logging Pathname

The network pathname is the directory path under the Windows Server share name. The simple case is where there is only one Qualitek mR (QMR) tester. An example pathname is “/qmr”. However, this will not work when more than one QMR tester is logging. Folders for each tester should be setup in advance. Thus, an example for this case is “/qmr-001” for the first QMR tester, and “/qmr-002” for the second. When there are many QMR testers, it might be good to choose a naming convention whereby the model number of the tester is used. An example might be: “/qmr/000001-001M” for tester one, “/qmr/000002-001M” for tester two, and “/qmr/0000010-001M” for tester ten.

6.2.5.5 Digital I/O

(Available on testers equipped with expanded Digital I/O only.)

The digital I/O can be customized to a high degree. Settings made here will apply to the tester in a global fashion. Changes can also be made locally to a test by further customizing the settings using the Digital I/O tab in the Test Setup screen. (See *"Digital I/O" on page 6-22*).



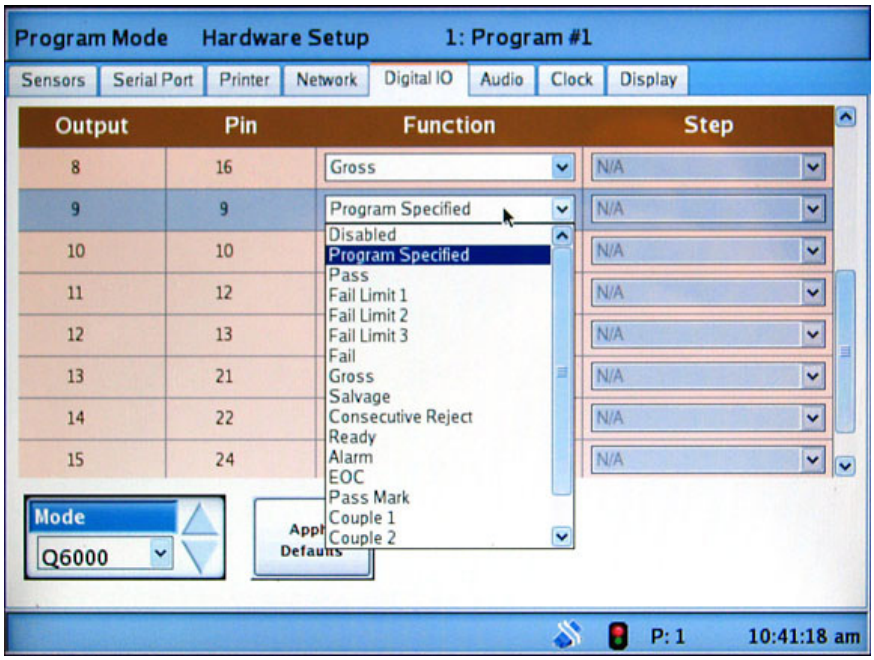
Set the mode to QMR, Q6000, or Testra and press Apply Defaults to change the mode to emulate that tester's default I/O settings.

Use the Mode Button and Apply Defaults to quickly set the I/O to the default settings for the selected tester.

The mode may be set to:

- Q6000
- QMR
- Testra

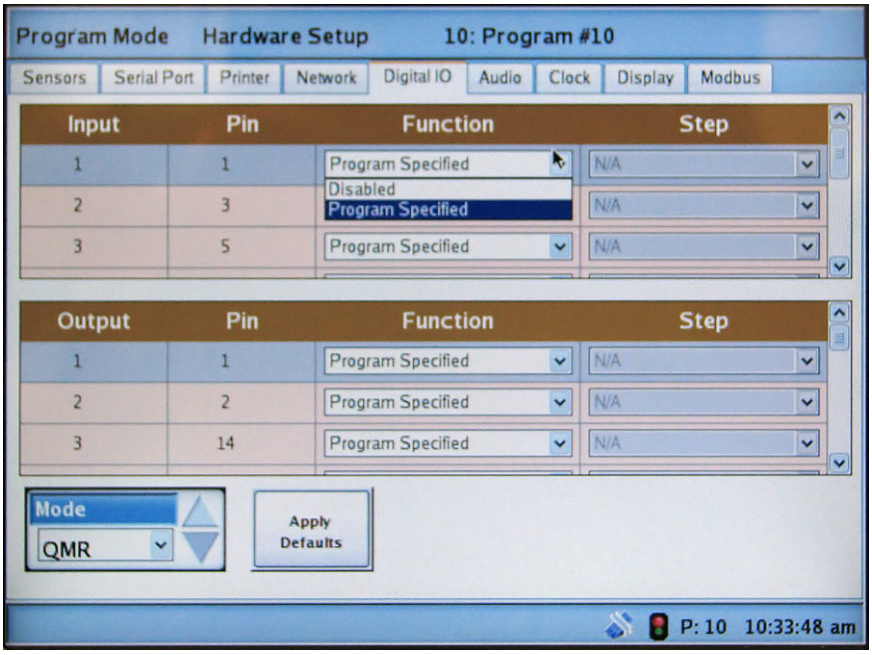
The settings my be further customized by tapping the assignment in the Function column and selecting the desired assignment.



Available assignments the digital outputs are:

- Disabled
- Program Specified
  (Allows setting the output in a program. See *"Digital I/O" on page 6-22*.)
- Pass
- Fail Limit 1, 2, 3
- Fail
- Gross
- Salvage
- Consecutive Reject
- Ready
- Alarm
- EOC
- Pass Mark
- Couple 1, 2
- *Step Pass Result (Selection activates the Step column)
- *Step Fail Result (Selection activates the Step column)

*The **Step** column, when activated by selecting Step Pass Result or Step Fail Result, allows specifying the step for the output function fail/abort/pass condition. The step result output will be set at the end of the specified step based on the step result and will be held on for the duration of the test. The step result output is cleared under normal operation with the standard result outputs.

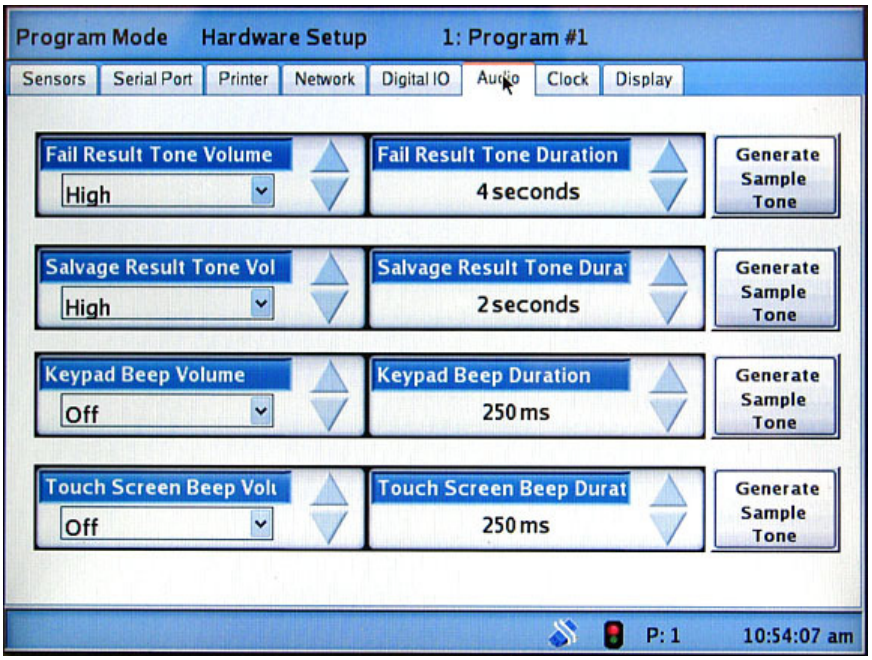


Available assignments for the digital inputs are:

- Disable
- Program Specified
  (Allows setting the output in a program. See *"Digital I/O" on page 6-22*.)

6.2.5.6 Audio

The parameters for volume and duration of audio tones are set at the Audio tab.



Volume settings are:

- Off
- Low
- Medium
- High

Use **Generate Sample Tone** to preview the tone at the selected volume and duration.

The result audio duration maximum limit is 60 seconds.

The beep audio duration maximum limit is 5000ms (5 seconds).

6.2.5.7 Clock

This screen is where the time, time format, and date are set. The correct time setting is important for accurate time stamps and logs.

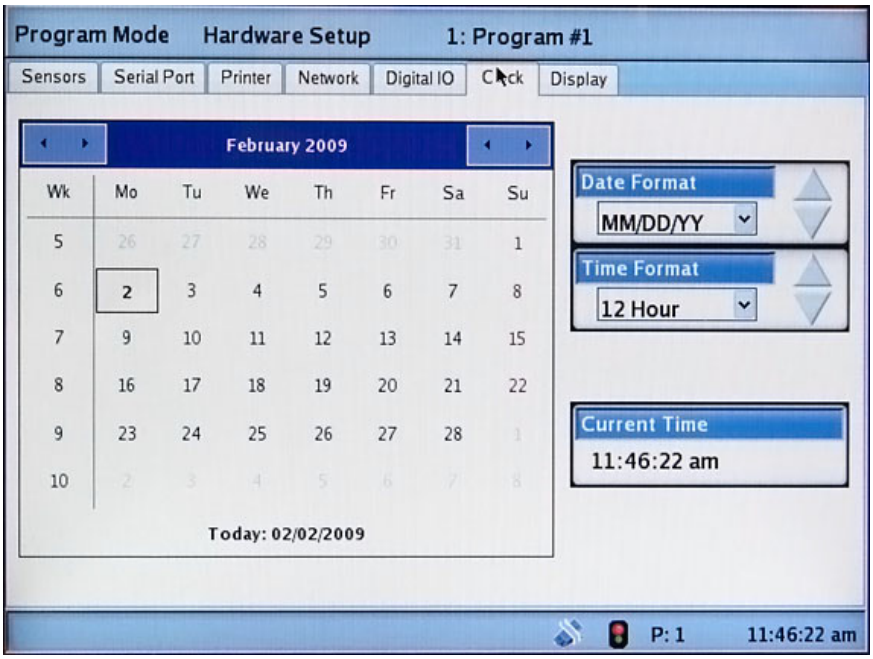
The large calendar displayed here shows the current date and time setting. If a discrepancy is noted in the date or time it can be set correctly at this screen by using the touch screen functions to change the values.

The **Time Format** may be set to either 12- or 24-hour format.

The **Date Format** can select either dd/mm/yy, mm/dd/yy, or yyyy/mm/dd format.

The pair of arrows at the upper-right of the calendar are used to set the year.

The pair of arrows at the upper-left of the calendar are used to set the month.



Once the correct month and year are displayed, the date can be selected by tapping it on the Calendar.

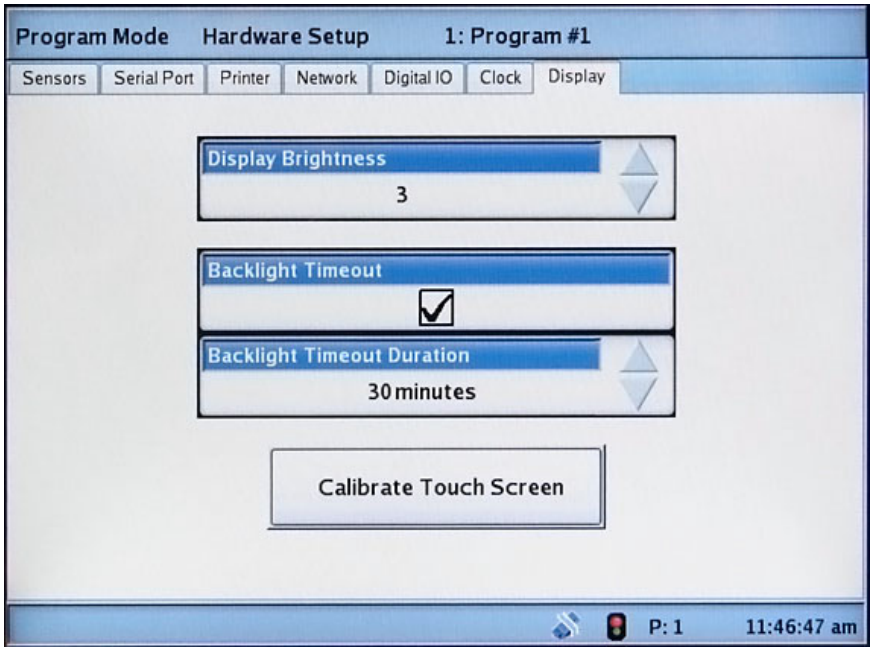
Time and date settings are retained and updated even while the tester is off.

6.2.5.8 Display

The brightness can be set to any of 6 levels, from 0 (most dim) to 5 (brightest) using the **Display Brightness** data box.

The display can be set to darken (timeout) after a chosen number of minutes when the tester is not being used. This feature is enabled by placing a checkmark in the **Backlight Timeout** data box. The desired duration before the backlight dims is set in the **Backlight Timeout Duration** data box.

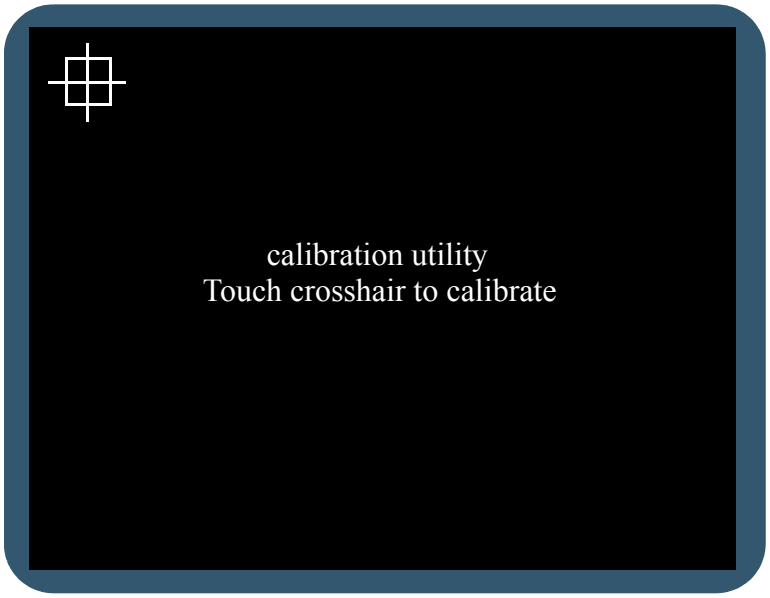
After the screen dims, touching the screen anywhere, or pressing a keypad button or the scroll pad will return the screen to normal brightness.



You can prolong the backlight lifetime by setting the brightness level no brighter than necessary for adequate visibility and using the backlight timeout to turn off the display during periods of inactivity.

Calibrate Touch Screen

If the touch screen fails to accurately respond to input, use the **Calibrate Touch Screen** button on the Display tab. When selected, the tester will display the calibration screen the next time it is powered up..



While powering up, just before the Home screen would normally appear, the calibration screen will appear as shown above. At first, the crosshair target will be seen in the upper left corner of the screen as shown. Touch that crosshair target point as precisely as possible in its center. If you have difficulty touching precisely, use a rounded-point stylus or the eraser end of a pencil to touch the crosshair.

Once the crosshair is properly touched, another point will appear (there will be 5 points to touch, in all). When the final point is touched the calibration is over and the power up process automatically continues to the Home screen as usual.

If the screen response to input is not improved, it may be necessary to perform the touch screen calibration again.

You can also activate the touch screen calibration procedure by connecting a USB keyboard and simultaneously pressing CTRL + C. After simultaneously pressing Ctrl and c, the following message displays: “Clear touch screen calibration and perform a new calibration when switching the instrument on”. Chose either OK or Cancel. The “Enter” key on the USB keyboard activates the OK on the QmR screen. Next, proceed with a power cycle.

6.2.5.9 Modbus

The tester can operate as a Modbus Remote Terminal Unit (RTU) by making the appropriate selections on the Modbus tabs. Modbus is available only on testers for which this option has been purchased.

General Tab Settings

At present, the only Modbus Mode is RTU.

The Modbus Address may be set within the range of 1 to 247.

The Architecture Select can be either Little Endian or Big Endian to best suit your requirements.

Four boxes are for information only and therefore cannot be changed. These are:

- No. of Coils
- No. of Inputs
- No. of Input Registers
- No. of Holding Registers

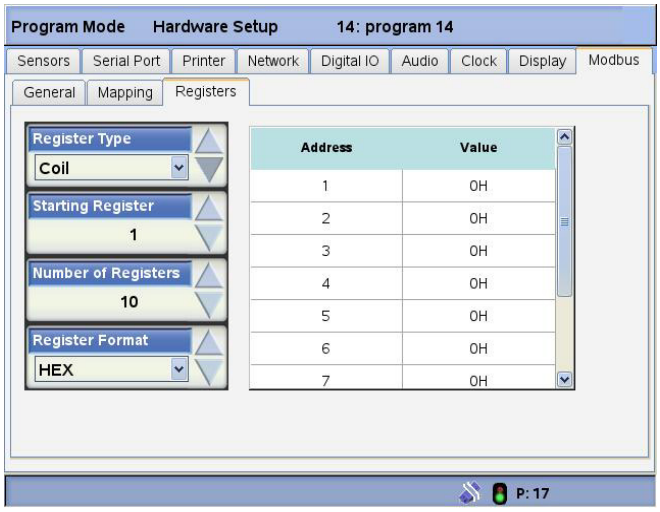
Modbus Mapping Tab Settings

This tab is where selections are made to implement the various Modbus building blocks to use in your system. An example of this screen is shown below. Normally, these settings will be provided by, or are made by, your site Programmer or System Integrator.

Press the Set Default button to set the Modbus Editor to default settings. See *"QmR Modbus" on page 9-1* for a detailed discussion of the nomenclature and registers used in the Mapping Tab.

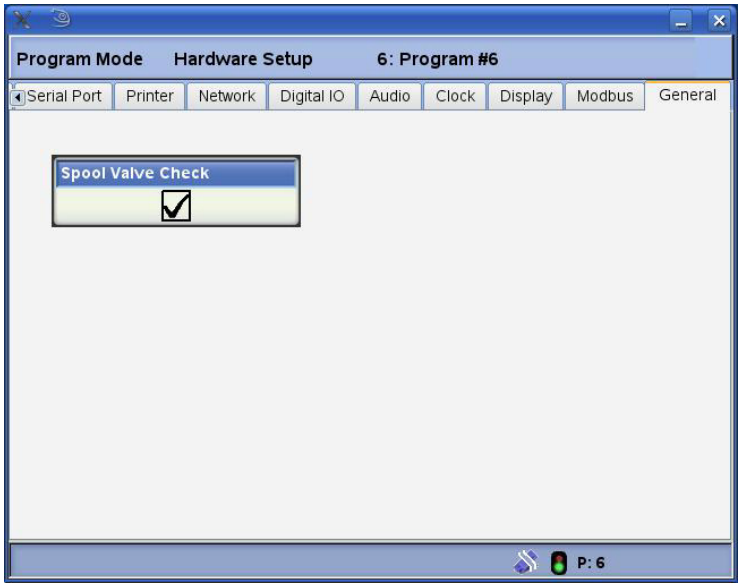
Modbus Registers Tab Settings

This tab is where you configure your system's Modbus registers. An example of this screen is shown below. Normally, these settings will be provided by, or are made by, your site Programmer or System Integrator.



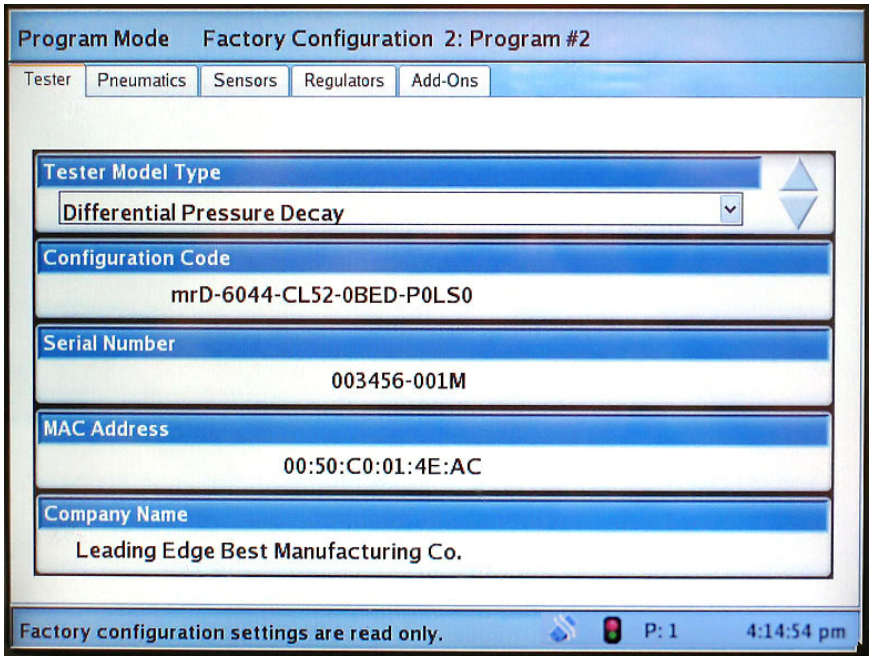
6.2.5.10 General

Spool Valve Check: The General tab includes a Spool Valve Check feature that monitors the status of the equalization valve during a differential pressure decay test, and aborts the test and reports an error if it detects the valve is in the wrong position. This option allows you to enable or disable the check to investigate cause of the error. Tests should not be performed with this option disabled unless the operation is periodically checked.



6.2.6 Factory Setup

The screens in Factory Setup are read-only, meaning the data cannot be changed except by authorized Uson personnel. The screens, however, contain useful information that can be readily viewed.

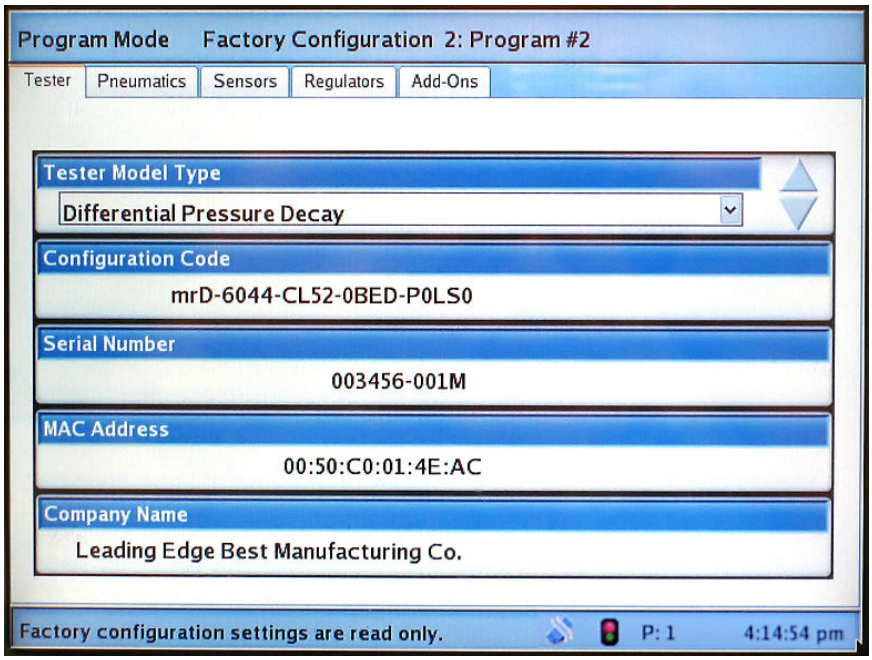


Factory Setup has five tabs. They are:

- Tester. See *"Tester" on page 6-77*
- Pneumatics. See *"Pneumatics" on page 6-78*
- Sensors. See *"Sensors" on page 6-79*
- Regulators. See *"Regulators" on page 6-80*
- Add-Ons. See *"Add-Ons" on page 6-81*

6.2.6.1 Tester

The Tester tab shows important information about the tester. This information may be requested by Uson support if help is necessary.

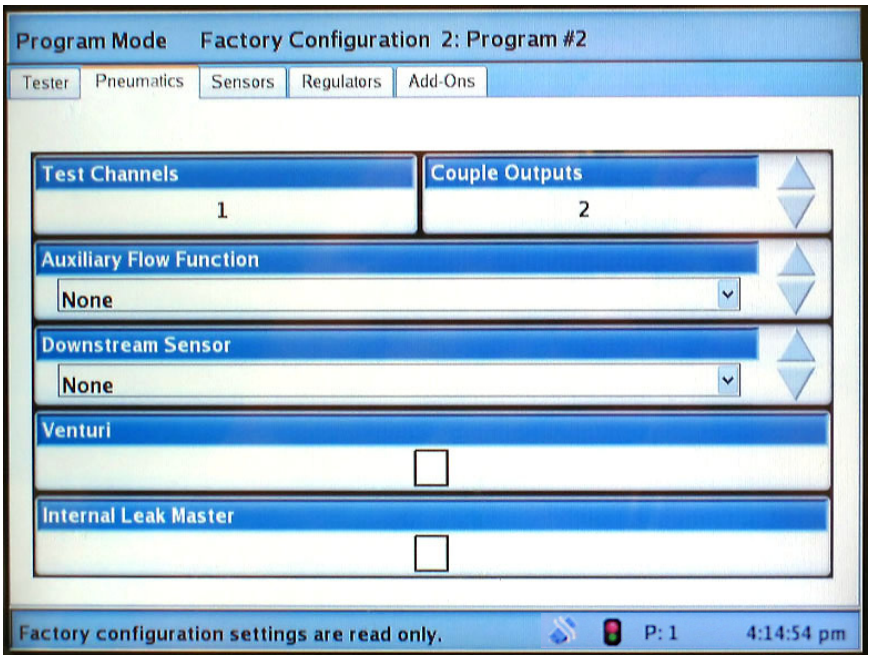


At this screen, the following may be seen:

- Tester Model Type
- Configuration Code
- Serial Number
- MAC Address
- Company Name

6.2.6.2 Pneumatics

The pneumatic configuration may be seen at this screen.

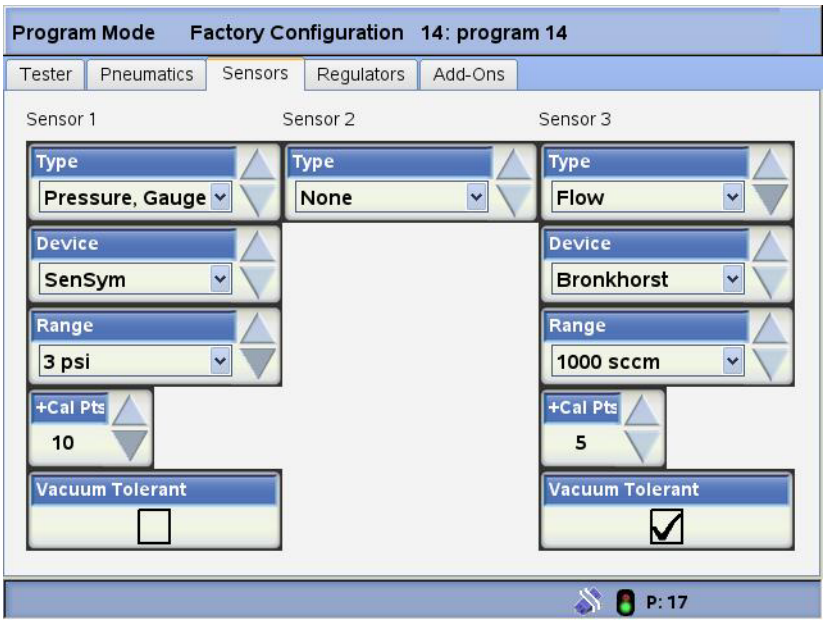


The items shown on this screen are:

- Test Channels (always 1)
- Couple Outputs: The number of installed couple outputs, 4 Max.
- Auxiliary Flow Function: Configuration or not installed.
- Downstream Sensor: Configuration or not installed.
- Venturi: Checked if installed.
- Internal Leak Master: Checked if installed

6.2.6.3 Sensors

This screen shows important information about the installed sensors.

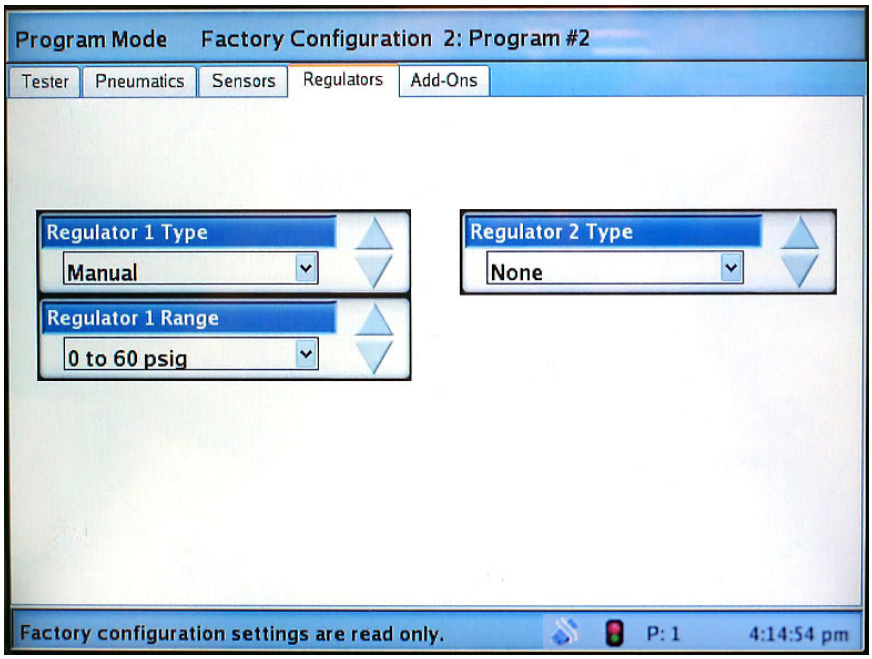


Sensor information which may be seen here includes:

- Sensor Type
- Sensor Range
- Number of Positive Calibration Points
- Number of Negative Calibration Points
- Sensor Vacuum: Yes or No

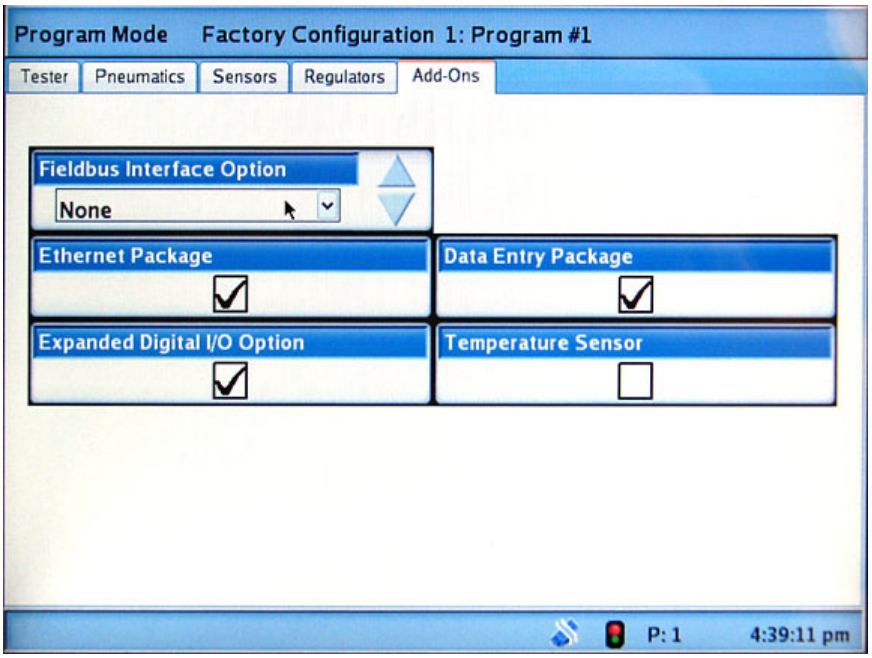
6.2.6.4 Regulators

This screen is a convenient place to see they type and range of the installed regulator(s).



6.2.6.5 Add-Ons

The status of various optional add-ons can be seen at this screen.



The following items can be viewed:

- Fieldbus Interface Option
- Ethernet Package: Installed or Not Installed
- Expanded Digital I/O Option: Installed or Not Installed
- Data Entry Package: Installed or Not Installed
- Temperature Sensor: Installed or Not Installed

7
Basic Testing

7.1 Basic Testing

7.1.1 Test Cycle

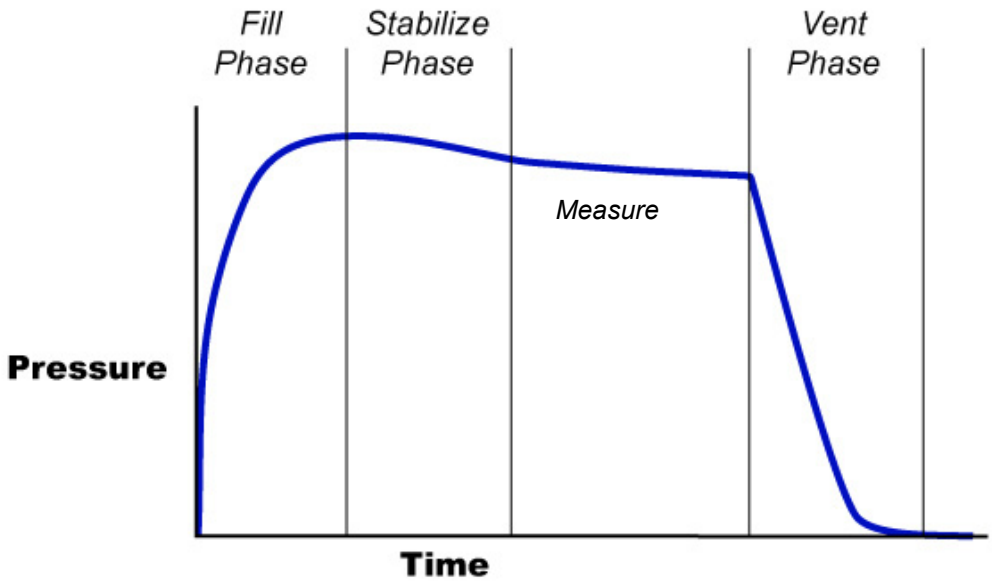
For normal operation, the component is connected to the test port of the unit and the Start button is pressed.

In a differential tester, the tester pressurizes the test component and a reference volume. A differential pressure transducer is then used to monitor any variation in pressure between the two.

A pass or reject result is indicated by front panel display and leak measurement is shown on the front panel display.

The display can be shown as a pressure change or expressed as a leak rate, if desired.

7.1.2 Phases of the Pressure Decay Test Cycle



A simple leak test cycle consists of the following phases:

Fill Phase:
The Fill Phase is when the test component is filled to the required test pressure.

Stabilize Phase:
During the Stabilize Phase the pressure and temperature in the test component achieve equilibrium.

Test Phase:
The Test Phase is when the instrument discriminates between a good and a leaking component. The detected leak must remain within preset limits or the test will end with either a rejected or salvageable component.

Vent Phase:
During the Vent Phase, the test component is vented to atmosphere.

7.1.3 Test Results: Pass, Fail, and Salvage

The Qualitek mR makes it very easy to determine the test results. The display will clearly indicate Pass, Fail, or Salvage at the end of the test. Also, the simulated indicator lights of the Uson double-diamond logo will brighten in color to indicate the status. Green indicates a Pass result, Red indicates fail (reject), and Amber indicates a Salvage condition.

A pressure error condition exists if the pressure tolerance is not met during the fill phase. If the pressure tolerance is exceeded during the stabilize time, then a gross pressure error is reported.

7.1.4 Program Optimization

Once an initial test has been carried out, the following parameters may need to be adjusted to achieve optimum performance.

Fill Time

Ideally the fill time should be set so that, for a good component, no pressure variation occurs during the stabilization phase, generally a small variation is acceptable. The fill time should be set to a period that is only long enough to ensure that the test component is filled and holds the correct pressure. If the fill time is too short, the test pressure displayed during the stabilization phase will either be lower than the set pressure, or will reduce during the stabilization phase as the pressure equalizes within the component.

Stabilize Time

The Stabilize time is the time that the instrument allows in order to achieve pressure and temperature equilibrium in the test component before a reliable leak test can be performed. Generally, increase the Stabilize time to reduce the leakrate measurement or improve the repeatability of measurement. If the Stabilize time is

too short, temperature effects or component expansion may cause erroneous results during the test phase.

Limits

In order to set a realistic test limits, the maximum admissible leak rate of the test component must be determined. This can be obtained from component specifications, trials, comparisons with previous test components or any other reliable source of information.

7.1.5 Sealed Component Test Steps

The gauge decay model sealed component test type steps are:

Isolate

To isolate the test port from the metered volume whilst the volume is being pressurized.

Fill 1

Pressurizes the metered volume using the selected regulator.

Fill 2

Pressurizes the metered volume using the selected regulator.

Measure

Connects the pressurized metered volume to the test port and reports the pressure change.

Vent

Vents the component and metered volume.

7.1.6 Fine Tuning

After you've entered the basic parameters into a program, you're ready to fine-tune your setup. A few tips:

- If not using external fixtures, set coupling time to zero.
- If product blows out of external fixtures, make sure you have a long enough coupling time.
- If you get gross failures when testing a flexible product, try increasing fill time or evacuate (for vacuum tests) time.
- Add fill and stabilize time to slow the decay rate and make it more consistent.
- If your test doesn't need a vent valve to vent product pressure after testing, set the vent parameter to off.
- In a flow test, set test time long enough for the product under test to fill and produce a stable flow rate.
- If repeated parts failures of good parts occur, try widening the pressure error tolerance or adding more fill or evacuate (for vacuum tests) time.

8
Reference

8.1 Preventive Maintenance and Calibration

To ensure continuing reliable operation, the Qualitek mR should be serviced and calibrated regularly by a competent service engineer. The servicing intervals and calibration requirements often vary between users based on any combination of local policy, environmental conditions, industry standards, or the type of testing being done. In the absence of any established servicing requirements at your installation, Uson recommends that servicing be performed *at least* once a year.

Many owners of Qualitek mR testers have their own servicing departments and/or calibration labs either on- or off-site. If such services are not convenient to you, Uson stands ready to meet all of your servicing and calibration requirements.

Your Uson Representative is the best source of information about these services and will help you make arrangements to send your tester to Uson for service.

Please contact the Uson Customer Support Hotline at (+1) 281-671-2000 or your Uson Representative for further information on calibration and maintenance services from Uson.

8.2 Touch-Panel Care

Unplug the tester. Lightly dampen a soft cloth with water or a mild detergent and gently wipe the panel. Take care not to force liquid into the corners and edges.

Never use an organic solvent, window cleaner, acid or alkali solution to clean the touch panel. Don't subject the panel to stress or impact and avoid exposing it to sharp objects.

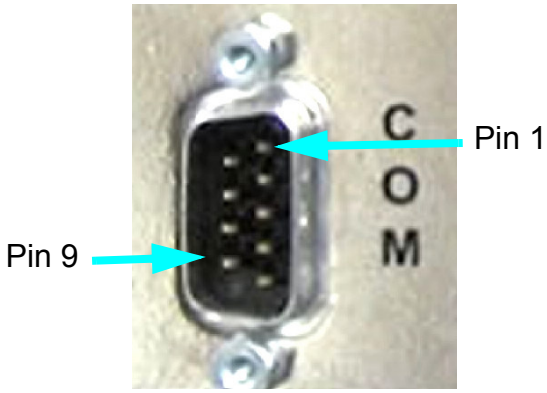
The touch-panel can be broken if it subjected to an impact or excessive pressure.

The touch-panel is illuminated by a backlight. Prolong the backlight's life by using the Backlight Timeout feature to dim the display when it is not being used. This feature is found in the Display tab of Hardware Setup in Program mode.

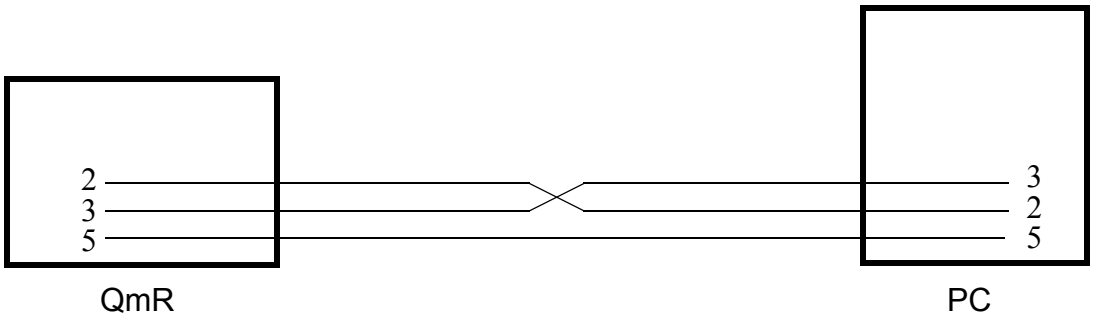
8.2.1 Recovering From Lockup

Like any computer-controlled device, there may be very rare instances when the touch-panel fails to respond to input after the Home screen first appears. Fix this situation by turning off the tester for at least 5 minutes. The touch panel will work normally when power is restored.

8.3 RS-232 Connection

QmR Pins		Name
	2	RD
	3	TD
	5	GND
	7	RTS
	8	CTS

Connect the QmR to a PC with a Null Modem Cable



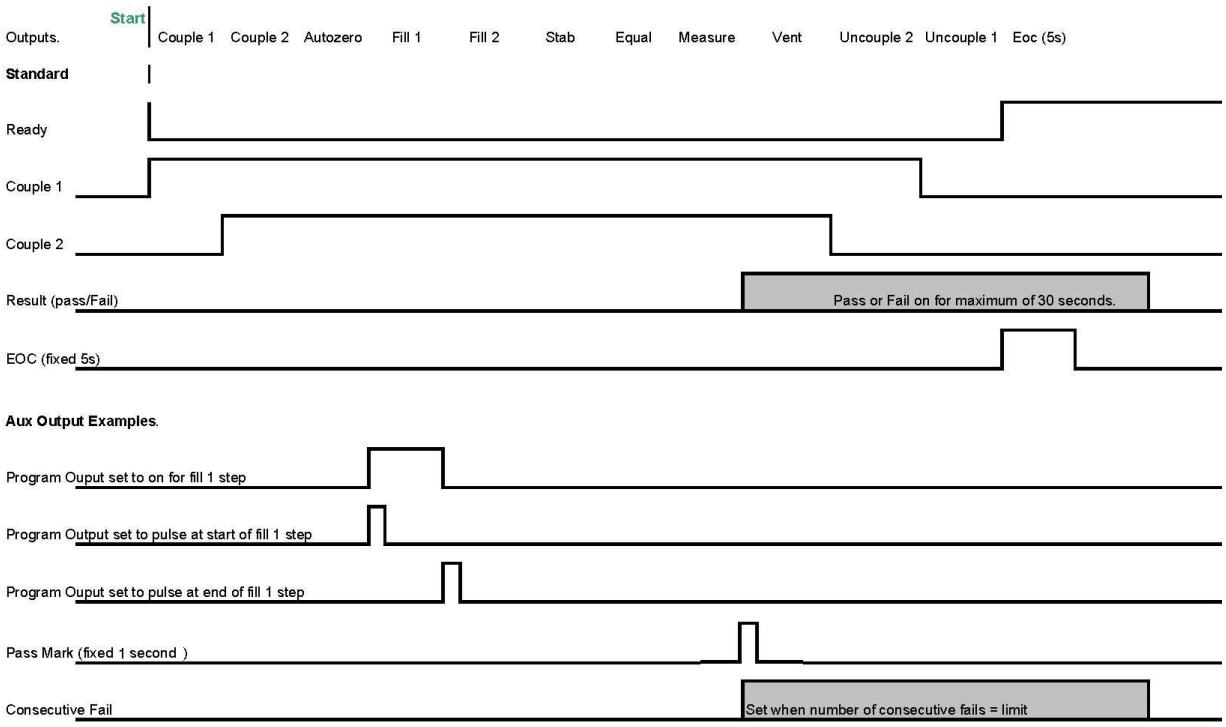
The most simple way to connect the QmR to a PC serial port is to use a null modem cable. This type of cable crosses transmit and receive and the ground wire carries straight through as shown above.

The QmR serial port is a DTE device, the same as a PC. This is why the transmit and receive wires must be crossed in the cable. If the QmR is being connected to a printer (a DCE device), then the cable carries transmit and receive straight through.

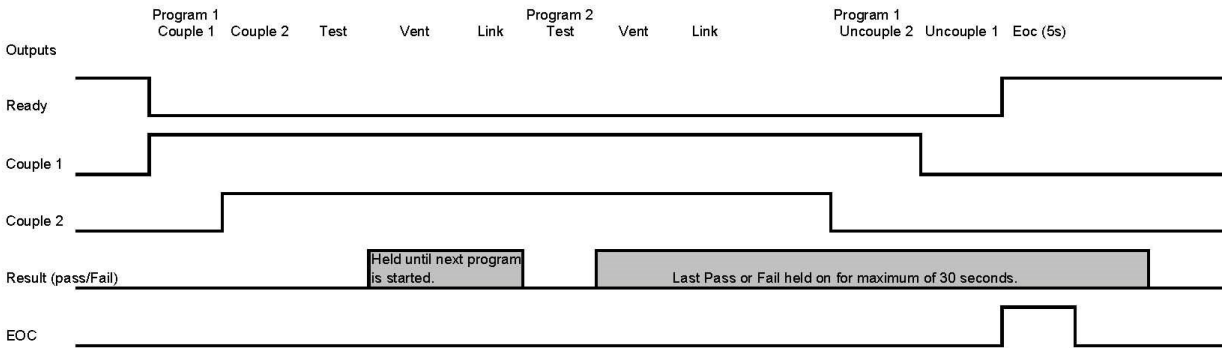
Use RTS and CTS if hardware handshaking is required. Usually this is only required when one device has to wait for the other device to be ready, e.g., when sending data to a slow printer with a small buffer. Refer to the device manual for the cable recommended by the manufacturer for connecting to a DTE device (the QmR).

As always with serial communication, both devices must be set to identical baud rates or the data will be scrambled or lost.

8.4 Standard Output Timing



Outputs for Multiple programs in a test sequence.



8.5 Valve States

Following are charts detailing the valve implementation for the different models of Qualitek mR.

Uson Qmr Model Type.	Sol. Valve - 1 - Vent Off/Upstream/SC Metered Volume	Sol. Valve - 2 - Pressurize	Sol. Valve - 3 - Equalize/Isolate/Bypass	Sol. Valve - 4 - Auto Cal. Leak	Sol. Valve - 5 - Regulator Selection	Output - 6 Venturi Control	Output - 7 Pulse/Downstream/SC Isolate	Output - 8 Not Used Or User Defined	Output - 9 Not Used Or User Defined	Output - 10 Not Used Or User Defined	Output - 11 Not Used Or User Defined	Output - 12 Not Used Or User Defined	Output - 13 Not Used Or User Defined	Output - 14 Not Used Or User Defined	Sol. Valve - 15 - Couple 1	Sol. Valve - 16 - Couple 2	2/4/09
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Differential Decay (650040)	x	x	x	x	x	x									x	x	
Gauge Decay (650041)	x	x	x	x	x	x	x								x	x	
Mass Flow (650042)	x	x	x	x	x	x	x								x	x	
Differential Mass Flow (650043)	x	x	x	x	x	x	x								x	x	
Differential Rise (650044)	x	x	x	x	x	x	x								x	x	
Flow Controller/Back Pressure (650045)		x	x	x	x	x									x	x	
Laminar Flow (650046)	x	x	x	x	x	x	x								x	x	

8.5.1 Diff. Pressure Decay Valve Sequence

Uson Qmr
Differential Pressure Decay
Leak Test Valve Sequence

2/4/0

X = Output On X/R = Output Latched on Reject

			S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
			Sensor (0 = none, 1 = Gauge, 2 = Diff.)	Sol. Valve - 1 - Vent Off	Sol. Valve - 2 - Pressurize	Sol. Valve - 3 - Equalize	Sol. Valve - 4 - Auto Cal. Leak	Sol. Valve - 5 - Regulator Selection	Output - 6 Venturi Control	Output - 7 Pulse	Output - 8 Not Used Or User Defined	Output - 9 Not Used Or User Defined	Output - 10 Not Used Or User Defined	Output - 11 Not Used Or User Defined	Output - 12 Not Used Or User Defined	Output - 13 Not Used Or User Defined	Output - 14 Not Used Or User Defined	Sol. Valve - 15 - Couple 1	Sol. Valve - 16 - Couple 2	
Test Sequence - Normal Production Test Cycle																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Fill/Evac 1	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	Stabilize	1	X														X	X	Stabilize (Gross Leak Gauge)
	7	Equalize	2	X		X												X	X	Equalize (Gross Leak Differential)
	8	Measure	2	X		X												X	X	Fine Leak Test (differential)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
	11	Uncouple 1	0															X/R		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Normal Leak Test Compensation Test Cycle (with or without Auto Cal Select)																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Fill/Evac 1	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X													X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	Stabilize	1	X														X	X	Stabilize (Gross Leak Gauge)
	7	Equalize	2	X		X												X	X	Equalize (Gross Leak Differential)
	8	Measure	2	X		X												X	X	Fine Leak Test (differential)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X	Disengage Coupling Port 2
	11	Uncouple 1	0															X		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle without Auto Cal Select																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Fill/Evac 1	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X													X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	Stabilize	1	X														X	X	Stabilize (Gross Leak Gauge)
	7	Equalize	2	X		X												X	X	Equalize (Gross Leak Differential)
	8	Measure	2	X		X												X	X	Fine Leak Test (differential)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X	Disengage Coupling Port 2
	11	Uncouple 1	0															X		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle with Auto Cal Select																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	6	Stabilize	1	X			X											X	X	Stabilize (Gross Leak Gauge)
	7	Equalize	2	X		X	X											X	X	Equalize (Gross Leak Differential)
	8	Measure	2	X		X	X											X	X	Fine Leak Test (differential)
	9	Vent	1				X											X	X	Exhaust
	10	Uncouple 2	0															X	X	Disengage Coupling Port 2
	11	Uncouple 1	0															X		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Sealed Component																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	x															X	X	Auto Zero Transducers

	4	Isolate	1			x														Isolates the test port .
	5	Fill/Evac 1	1	X	X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	Fill/Evac 2	1	X	X	x		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	8	Measure	1	X														X	X	Measure the resulting gauge pressure.
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
	11	Uncouple 1	0															X/R		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC

Test Sequence - Back Pressure Flow

	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	x															X	X	Auto Zero Transducers
	5	Fill/Evac 1	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	Fill/Evac 2	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	8	Measure	1	X														X	X	Measure resulting gauge pressure.
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
	11	Uncouple 1	0															X/R		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC

Test Sequence - Gauge Sensor Calibration - Zero

	1	Vent Sensor	1																	Vent
	2	Measure Sensor Output	1																	Measure Zero Output

Test Sequence - Gauge Sensor Calibration - Span

	1	Engage Equalize	0			X														Engage Equalize Valve
	2	Fill - Manual or Electronic	1	X	X	X														Pressurize (Manual or Electronic)
	3	Measure Sensor Output	1	X	X	X														Measure Full-scale Output
	4	Vent Sensor	1																	Exhaust
	EOC	Return to Ready.																		EOC

Test Sequence - Differential Sensor Calibration - Zero

	1	Vent Sensor	2																	Vent
	2	Measure Sensor Output	2																	Measure Zero Output

Test Sequence - Differential Sensor Calibration - Span

	1	Pressurize Test Port 20 mbar	2			X														Pressurize (Externally to 20.0 mbar)
	2	Measure Sensor Output	2			X														Measure Full-scale Output
	3	Vent Sensor	0																	Exhaust
	EOC	Return to Ready.																		EOC

Test Sequence - Seal Leak Test Cycle

	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Fill/Evac 1	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X													X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	Stabilize	1	X														X	X	Stabilize (Gross Leak Gauge)
	7	Equalize	2	X		X												X	X	Equalize (Gross Leak Differential)
	8	Measure	2	X		X												X	X	Fine Leak Test (pressure change/ tared value only)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
	11	Uncouple 1	0															X/R		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC

8.5.2 Diff. Pressure Rise Leak Test Valve Sequence

Uson Qmr
Differential Pressure Rise Leak
Test Valve Sequence

2/4/09

X = Output On X/R = Output Latched on Reject

Test Sequence - Normal Production Test Cycle			S (Sensor (0 = none, 1 = Gauge, 2 = Diff.))	1 (Sol. Valve - 1 - Vent Off)	2 (Sol. Valve - 2 - Pressurize)	3 (Sol. Valve - 3 - Equalize)	4 (Sol. Valve - 4 - Auto Cal. Leak)	5 (Sol. Valve - 5 - Regulator Selection)	6 (Output - 6 Venturi Control)	7 (Output - 7 Pulse)	8 (Output - 8 Not Used Or User Defined)	9 (Output - 9 Not Used Or User Defined)	10 (Output - 10 Not Used Or User Defined)	11 (Output - 11 Not Used Or User Defined)	12 (Output - 12 Not Used Or User Defined)	13 (Output - 13 Not Used Or User Defined)	14 (Output - 14 Not Used Or User Defined)	15 (Sol. Valve - 15 - Couple 1)	16 (Sol. Valve - 16 - Couple 2)	
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Pulse Fill	2	X		X				X								X	X	Pressurize chamber from internal volume pressurised by internal regulator.
	5	Pulse Check	2	X		X												X	X	Measure resulting pressure loss.
	6	Fill/Evac 1	1	X	X	X		X										X	X	Pressurize metered volume port using Reg 1 or 2 (Check Gauge Pressure)
	7	Fill/Evac 2	1	X	X	X		X										X	X	Pressurize metered volume port using Reg 1 or 2 (Check Gauge Pressure)
	8	Measure	2	X	X	X												X	X	Fine Leak Test (differential)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
	11	Uncouple 1	0															X/R		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Normal Leak Test Compensation Test Cycle (with or without Auto Cal Select)																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Pulse Fill	2	X		X				X								X	X	Pressurize chamber from internal volume pressurised by internal regulator.
	5	Pulse Check	2	X		X												X	X	Measure resulting pressure loss.
	4	Fill/Evac 1	1	X	X			X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X													X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	8	Measure	2	X	X	X												X	X	Fine Leak Test (differential)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X	Disengage Coupling Port 2
	11	Uncouple 1	0															X		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle without Auto Cal Select																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Pulse Fill	2	X		X												X	X	Pressurize chamber from internal volume pressurised by internal regulator.
	5	Pulse Check	2	X		X												X	X	Measure resulting pressure loss.
	4	Fill/Evac 1	1	X	X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	8	Measure	2	X	X	X												X	X	Fine Leak Test (differential)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X	Disengage Coupling Port 2
	11	Uncouple 1	0															X		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle with Auto Cal Select																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Pulse Fill	2	X		X												X	X	Pressurize chamber from internal volume pressurised by internal regulator.
	5	Pulse Check	2	X		X												X	X	Measure resulting pressure loss.
	4	Fill/Evac 1	1	X	X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	8	Measure	2	X		X	X											X	X	Fine Leak Test (differential)
	9	Vent	1				X											X	X	Exhaust
	10	Uncouple 2	0															X	X	Disengage Coupling Port 2
	11	Uncouple 1	0															X		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC
Test Sequence - Gauge Sensor Calibration - Zero																				
	1	Vent Sensor	1																	Vent
	2	Measure Sensor Output	1																	Measure Zero Output
Test Sequence - Gauge Sensor Calibration - Span																				
	1	Engage Equalize	0			X														Engage Equalize Valve
	2	Fill - Manual or Electronic	1	X	X	X														Pressurize (Manual or Electronic)
	3	Measure Sensor Output	1	X	X	X														Measure Full-scale Output
	4	Vent Sensor	1																	Exhaust
	EOC	Return to Ready.																		EOC
Test Sequence - Differential Sensor Calibration - Zero																				
	1	Vent Sensor	2																	Vent
	2	Measure Sensor Output	2																	Measure Zero Output
Test Sequence - Differential Sensor Calibration - Span																				
	1	Pressurize Test Port 20 mbar	2			X														Pressurize (Externally to 20.0 mbar)
	2	Measure Sensor Output	2			X														Measure Full-scale Output
	3	Vent Sensor	0																	Exhaust
	EOC	Return to Ready.																		EOC
Test Sequence - Seal Leak Test Cycle																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	2															X	X	Auto Zero Transducer
	4	Pulse Fill	2	X		X				X								X	X	Pressurize chamber from internal volume pressurised by internal regulator.
	5	Pulse Check	2	X		X												X	X	Measure resulting pressure loss.
	4	Fill/Evac 1	1	X	X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	Fill/Evac 2	1	X	X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	8	Measure	2	X	X	X												X	X	Fine Leak Test (pressure change/ tared value only)
	9	Vent	1															X	X	Exhaust
	10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
	11	Uncouple 1	0															X/R		Disengage Coupling Port 1
	EOC	Return to Ready.																		EOC

8.5.3 Gauge Press. Decay Leak Test Valve Sequence

Uson Qmr Gauge
Pressure Decay Leak Test Valve Sequence

2/4/09

X = Output On X/R = Output Latched on Reject

		Sensor (0 = none, 1 = Gauge, 2 = Diff.)	Sol. Valve - 1 - SC - Metered Volume.	Sol. Valve - 2 - Pressurize	Sol. Valve - 3 - Isolate	Sol. Valve - 4 - Auto Cal. Leak	Sol. Valve - 5 - Regulator Selection	Output - 6 Venturi Control	Output - 7 Pulse/SC Isolate	Output - 8 Not Used Or User Defined	Output - 9 Not Used Or User Defined	Output - 10 Not Used Or User Defined	Output - 11 Not Used Or User Defined	Output - 12 Not Used Or User Defined	Output - 13 Not Used Or User Defined	Output - 14 Not Used Or User Defined	Sol. Valve - 15 - Couple 1	Sol. Valve - 16 - Couple 2	
Test Sequence - Normal Production Test Cycle		**S**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
	1	**Couple 1**	0															X		Engage Coupling Port 1
	2	**Couple 2**	0															X	X	Engage Coupling Port 2
	3	**Auto zero**	1			X												X	X	Auto Zero Transducer
	4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	**Isolate**	1		X													X	X	Isolate regulator supply.
	7	**Stabilize**	1															X	X	Stabilize (Gross Leak Gauge)
	8	**Measure**	1															X	X	Fine Leak Test (differential)
	9	**Vent**	1			X												X	X	Exhaust
	10	**Uncouple 2**	0															X	X/R	Disengage Coupling Port 2
	11	**Uncouple 1**	0															X/R		Disengage Coupling Port 1
	EOC	**Return to Ready.**																		EOC
Test Sequence - Normal Leak Test Compensation Test Cycle (with or without Auto Cal Select)																			
	1	**Couple 1**	0															X		Engage Coupling Port 1
	2	**Couple 2**	0															X	X	Engage Coupling Port 2
	3	**Auto zero**	1			X												X	X	Auto Zero Transducer
	4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	**Isolate**	1		X													X	X	Isolate regulator supply.
	7	**Stabilize**	1															X	X	Stabilize (Gross Leak Gauge)
	8	**Measure**	1															X	X	Fine Leak Test (differential)
	9	**Vent**	1			X												X	X	Exhaust
	10	**Uncouple 2**	0															X	X	Disengage Coupling Port 2
	11	**Uncouple 1**	0															X		Disengage Coupling Port 1
	EOC	**Return to Ready.**																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle without Auto Cal Select																			
	1	**Couple 1**	0															X		Engage Coupling Port 1
	2	**Couple 2**	0															X	X	Engage Coupling Port 2
	3	**Auto zero**	1			X												X	X	Auto Zero Transducer
	4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	**Isolate**	1		X													X	X	Isolate regulator supply.
	7	**Stabilize**	1															X	X	Stabilize (Gross Leak Gauge)
	8	**Measure**	1															X	X	Fine Leak Test (differential)
	9	**Vent**	1			X												X	X	Exhaust
	10	**Uncouple 2**	0															X	X	Disengage Coupling Port 2
	11	**Uncouple 1**	0															X		Disengage Coupling Port 1
	EOC	**Return to Ready.**																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle with Auto Cal Select																			
	1	**Couple 1**	0															X		Engage Coupling Port 1
	2	**Couple 2**	0															X	X	Engage Coupling Port 2
	3	**Auto zero**	1			X	X	X										X	X	Auto Zero Transducer
	4	**Fill/Evac 1**	1		X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	**Fill/Evac 2**	1		X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	**Isolate**	1		X		X	X										X	X	Isolate regulator supply.
	7	**Stabilize**	1				X	X										X	X	Stabilize (Gross Leak Gauge)
	8	**Measure**	1				X	X										X	X	Fine Leak Test (differential)
	9	**Vent**	1			X	X	X										X	X	Exhaust
	10	**Uncouple 2**	0															X	X	Disengage Coupling Port 2
	11	**Uncouple 1**	0															X		Disengage Coupling Port 1
	EOC	**Return to Ready.**																		EOC
Test Sequence - Sealed Component																			
	1	**Couple 1**	0															X		Engage Coupling Port 1
	2	**Couple 2**	0															X	X	Engage Coupling Port 2
	3	**Auto zero**	1			X												X	X	Auto Zero Transducers
	4	**Isolate**	1	X		X			X											Isolate the test port whilst pressurising the metered volume.
	5	**Fill/Evac 1**	1	X	X	X		X	X									X	X	Pressurize the metered volume using Reg 1 or 2 (Check Gauge Pressure)
	6	**Fill/Evac 2**	1	X	X	X		X	X									X	X	Pressurize the metered volume using Reg 1 or 2 (Check Gauge Pressure)
	7	**Stabilize**	1	X	X													X	X	Allow pressure to stabilize in metered volume.
	8	**Measure**	1	X														X	X	Pressurise the test port with air from the metered volume and measure the resulting gauge pressure.
	9	**Vent**	1															X	X	Exhaust
	10	**Uncouple 2**	0															X	X/R	Disengage Coupling Port 2
	11	**Uncouple 1**	0															X/R		Disengage Coupling Port 1
	EOC	**Return to Ready.**																		EOC
Test Sequence - Back Pressure Flow																			
	1	**Couple 1**	0															X		Engage Coupling Port 1
	2	**Couple 2**	0															X	X	Engage Coupling Port 2
	3	**Auto zero**	x			X												X	X	Auto Zero Transducers
	5	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	8	**Measure**	1		X	X												X	X	Measure resulting gauge pressure.
	9	**Vent**	1			X												X	X	Exhaust
	10	**Uncouple 2**	0															X	X/R	Disengage Coupling Port 2
	11	**Uncouple 1**	0															X/R		Disengage Coupling Port 1
	EOC	**Return to Ready.**																		EOC
Test Sequence - Gauge Sensor Calibration - Zero																			
	1	**Vent Sensor**	1			X														Vent
	2	**Measure Sensor Output**	1			X														Measure Zero Output
Test Sequence - Gauge Sensor Calibration - Span																			
	1	**Engage Equalize**	0			X														Engage Equalize Valve
	2	**Fill - Manual or Electronic**	1		X	X														Pressurize (Manual or Electronic)
	3	**Measure Sensor Output**	1		X	X														Measure Full-scale Output
	4	**Vent Sensor**	1																	Exhaust
	EOC	**Return to Ready.**																		EOC
Test Sequence - Seal Leak Test Cycle																			
	1	**Couple 1**	0															X		Engage Coupling Port 1
	2	**Couple 2**	0															X	X	Engage Coupling Port 2
	3	**Auto zero**	1			X												X	X	Auto Zero Transducer
	4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
	6	**Isolate**	1		X													X	X	Isolate regulator supply.
	7	**Stabilize**	1															X	X	Stabilize (Gross Leak Gauge)
	8	**Measure**	1															X	X	Fine Leak Test (pressure change/ tared value only)
	9	**Vent**	1			X												X	X	Exhaust
	10	**Uncouple 2**	0															X	X/R	Disengage Coupling Port 2
	11	**Uncouple 1**	0															X/R		Disengage Coupling Port 1
	EOC	**Return to Ready.**																		EOC

8.5.4 Mass Flow Test Valve Sequence

Uson Qmr
Mass Flow Test Valve Sequence

7/27/12

X = Output On X/R = Output Latched on Reject

		Sensor (0 = none, 1 = Gauge, 2 = Diff, 3 = Flow/Temp.)	Sol. Valve - 1 UpSteam Flow.	Sol. Valve - 2 Pressurize/Vent	Sol. Valve - 3 By Pass	Sol. Valve - 4 Auto Cal. Leak	Sol. Valve - 5 Regulator Selection	Sol. Valve - 6 Venturi Control	Output - 7 - Down Steam Flow	Output - 8 Not Used Or User Defined	Output - 9 Not Used Or User Defined	Output - 10 Not Used Or User Defined	Output - 11 Not Used Or User Defined	Output - 12 Not Used Or User Defined	Output - 13 Not Used Or User Defined	Output - 14 Not Used Or User Defined	Sol. Valve - 15 Couple 1	Sol. Valve - 16 Couple 2	
Test Sequence - Normal Production Test Cycle		**S**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
1	**Couple 1**	0															X		Engage Coupling Port 1
2	**Couple 2**	0															X	X	Engage Coupling Port 2
3	**Auto zero**	1,3															X	X	Auto Zero Transducer
4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	**Isolate**	1	x	X					x								X	X	Isolate regulator supply.
7	**Stabilize**	1	x	x					x								X	X	Stabilize (Low Pressure)
8	**Measure**	3	x	x					x								X	X	Flow measurement
9	**Vent**	1															X	X	Exhaust
10	**Uncouple 2**	0															X	X/R	Disengage Coupling Port 2
11	**Uncouple 1**	0															X/R		Disengage Coupling Port 1
12	**Return to Ready.**																		EOC
Test Sequence - Normal Leak Test Compensation Test Cycle.																			
1	**Couple 1**	0															X		Engage Coupling Port 1
2	**Couple 2**	0															X	X	Engage Coupling Port 2
3	**Auto zero**	1,3															X	X	Auto Zero Transducer
4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	**Isolate**	1	x	X			x		x								X	X	Isolate regulator supply.
7	**Stabilize**	1	x	x			x		x								X	X	Stabilize (Low Pressure)
8	**Measure**	3	x	x			x		x								X	X	Flow measurement
9	**Vent**	1															X	X	Exhaust
10	**Uncouple 2**	0															X	X	Disengage Coupling Port 2
11	**Uncouple 1**	0															X		Disengage Coupling Port 1
12	**Return to Ready.**																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle without Auto Cal Select																			
1	**Couple 1**	0															X		Engage Coupling Port 1
2	**Couple 2**	0															X	X	Engage Coupling Port 2
3	**Auto zero**	1,3															X	X	Auto Zero Transducer
4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	**Isolate**	1	x	X			x		x								X	X	Isolate regulator supply.
7	**Stabilize**	1	x	x			x		x								X	X	Stabilize (Low Pressure)
8	**Measure**	3	x	x			x		x								X	X	Flow measurement
9	**Vent**	1															X	X	Exhaust
10	**Uncouple 2**	0															X	X	Disengage Coupling Port 2
11	**Uncouple 1**	0															X		Disengage Coupling Port 1
12	**Return to Ready.**																		EOC
Test Sequence - Normal Leak Test Calibration Test Cycle with Auto Cal Select																			
1	**Couple 1**	0															X		Engage Coupling Port 1
2	**Couple 2**	0															X	X	Engage Coupling Port 2
3	**Auto zero**	1,3															X	X	Auto Zero Transducer
4	**Fill/Evac 1**	1		X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	**Fill/Evac 2**	1		X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	**Isolate**	1	x	X		X	X		x								X	X	Isolate regulator supply.
7	**Stabilize**	1	x	x		X	X		x								X	X	Stabilize (Low Pressure)
8	**Measure**	3	x	x		X	X		x								X	X	Flow measurement
9	**Vent**	1															X	X	Exhaust
10	**Uncouple 2**	0															X	X	Disengage Coupling Port 2
11	**Uncouple 1**	0															X		Disengage Coupling Port 1
12	**Return to Ready.**																		EOC
Test Sequence - Back Pressure Flow																			
1	**Couple 1**	0															X		Engage Coupling Port 1
2	**Couple 2**	0															X	X	Engage Coupling Port 2
3	**Auto zero**	1,3															X	X	Auto Zero Transducers
4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	**Measure**	1		X	X												X	X	Measure resulting gauge pressure.
7	**Vent**	1			X												X	X	Exhaust
8	**Uncouple 2**	0															X	X/R	Disengage Coupling Port 2
9	**Uncouple 1**	0															X/R		Disengage Coupling Port 1
10	**Return to Ready.**																		EOC
Test Sequence - Gauge Sensor Calibration - Zero																			
1	**Measure Sensor Output**	1			X														Measure Zero Output
2	**Return to Ready.**																		
Test Sequence - Gauge Sensor Calibration - Span																			
1	**Measure Sensor Output**	1		X	X		x												Measure Output
2	**Return to Ready.**																		EOC
Test Sequence - Flow Sensor Calibration - Zero																			
1	**Measure Sensor Output**	3	x	x					x										Measure Zero Output
2	**Return to Ready.**																		
Test Sequence - Flow Sensor Calibration - Span																			
1	**Measure Sensor Output**	3		X			x		x										Measure Output
2	**Return to Ready.**																		
Test Sequence - Seal Leak Test Cycle																			
1	**Couple 1**	0															X		Engage Coupling Port 1
2	**Couple 2**	0															X	X	Engage Coupling Port 2
3	**Auto zero**	1,3															X	X	Auto Zero Transducer
4	**Fill/Evac 1**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	**Fill/Evac 2**	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	**Isolate**	1	x	X					x								X	X	Isolate regulator supply.
7	**Stabilize**	1	x						x								X	X	Stabilize (Low Pressure)
8	**Measure**	3	x						x								X	X	Flow measurement
9	**Vent**	1															X	X	Exhaust
10	**Uncouple 2**	0															X	X/R	Disengage Coupling Port 2
11	**Uncouple 1**	0															X/R		Disengage Coupling Port 1
12	**Return to Ready.**																		EOC

8.5.5 Diff Mass Flow Leak Test Valve Sequence

Uson Qmr
Diff Mass Flow Leak Test Valve Sequence

7/28/12

X = Output On X/R = Output Latched on Reject

Test Sequence - Normal Production Test Cycle		S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
			Sensor (0 = none, 1 = Gauge, 2 = Diff, 3 = FlowTemp.)	Sol. Valve - 1 Down Stream (Volume).	Sol. Valve - 2 Pressurize/Vent	Sol. Valve - 3 Bypass	Sol. Valve - 4 Auto Cal. Leak	Sol. Valve - 5 Regulator Selection	Output - 6 Venturi Control	Output - 7 Downstream Flow	Output - 8 Not Used Or User Defined	Output - 9 Not Used Or User Defined	Output - 10 Not Used Or User Defined	Output - 11 Not Used Or User Defined	Output - 12 Not Used Or User Defined	Output - 13 Not Used Or User Defined	Output - 14 Not Used Or User Defined	Sol. Valve - 15 Couple 1	Sol. Valve - 16 Couple 2	
1	Couple 1	0															X		Engage Coupling Port 1
2	Couple 2	0															X	X	Engage Coupling Port 2
3	Auto zero	1,3															X	X	Auto Zero Transducer
4	Fill/Evac 1	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	Fill/Evac 2	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	Isolate	1	x	X													X	X	Isolate regulator supply.
7	Stabilize	1	x						x								X	X	Stabilize (Low Pressure)
8	Measure	3	x						x								X	X	Flow measurement
9	Vent	1															X	X	Exhaust
10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
11	Uncouple 1	0															X/R		Disengage Coupling Port 1
12	Return to Ready.	0																	EOC

Test Sequence - Normal Leak Test Compensation Test Cycle.																			
1	Couple 1	0															X		Engage Coupling Port 1
2	Couple 2	0															X	X	Engage Coupling Port 2
3	Auto zero	1,3															X	X	Auto Zero Transducer
4	Fill/Evac 1	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	Fill/Evac 2	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	Isolate	1	x	X													X	X	Isolate regulator supply.
7	Stabilize	1	x						x								X	X	Stabilize (Low Pressure)
8	Measure	3	x						x								X	X	Flow measurement
9	Vent	1															X	X	Exhaust
10	Uncouple 2	0															X	X	Disengage Coupling Port 2
11	Uncouple 1	0															X		Disengage Coupling Port 1
12	Return to Ready.																		EOC

Test Sequence - Normal Leak Test Calibration Test Cycle without Auto Cal Select																			
1	Couple 1	0															X		Engage Coupling Port 1
2	Couple 2	0															X	X	Engage Coupling Port 2
3	Auto zero	1,3															X	X	Auto Zero Transducer
4	Fill/Evac 1	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	Fill/Evac 2	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	Isolate	1	x	X													X	X	Isolate regulator supply.
7	Stabilize	1	x						x								X	X	Stabilize (Low Pressure)
8	Measure	3	x						x								X	X	Flow measurement
9	Vent	1															X	X	Exhaust
10	Uncouple 2	0															X	X	Disengage Coupling Port 2
11	Uncouple 1	0															X		Disengage Coupling Port 1
12	Return to Ready.																		EOC

Test Sequence - Normal Leak Test Calibration Test Cycle with Auto Cal Select																			
1	Couple 1	0															X		Engage Coupling Port 1
2	Couple 2	0															X	X	Engage Coupling Port 2
3	Auto zero	1,3				x											X	X	Auto Zero Transducer
4	Fill/Evac 1	1		X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	Fill/Evac 2	1		X	X	X	X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	Isolate	1	x	X		X											X	X	Isolate regulator supply.
7	Stabilize	1	x			X			x								X	X	Stabilize (Low Pressure)
8	Measure	3	x			X			x								X	X	Flow measurement
9	Vent	1				X											X	X	Exhaust
10	Uncouple 2	0															X	X	Disengage Coupling Port 2
11	Uncouple 1	0															X		Disengage Coupling Port 1
12	Return to Ready.																		EOC

Test Sequence - Back Pressure Flow																			
1	Couple 1	0															X		Engage Coupling Port 1
2	Couple 2	0															X	X	Engage Coupling Port 2
3	Auto zero	1,3															X	X	Auto Zero Transducers
4	Fill/Evac 1	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	Fill/Evac 2	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	Measure	1		X	X												X	X	Measure resulting gauge pressure.
7	Vent	1			X												X	X	Exhaust
8	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
9	Uncouple 1	0															X/R		Disengage Coupling Port 1
10	Return to Ready.																		EOC

Test Sequence - Gauge Sensor Calibration - Zero																			
1	Measure Sensor Output	1																	Measure Zero Output
2	Return to Ready.																		

Test Sequence - Gauge Sensor Calibration - Span																			
1	Measure Sensor Output	1		X	X		x												Measure Output
2	Return to Ready.																		

Test Sequence - Flow Sensor Calibration - Zero																			
1	Measure Sensor Output	3	x	x					x										Measure Zero Output
2	Return to Ready.																		

Test Sequence - Flow Sensor Calibration - Span																			
1	Measure Sensor Output	3		X			x		x										Measure Output
2	Return to Ready.																		

Test Sequence - Seal Leak Test Cycle																			
1	Couple 1	0															X		Engage Coupling Port 1
2	Couple 2	0															X	X	Engage Coupling Port 2
3	Auto zero	1,3															X	X	Auto Zero Transducer
4	Fill/Evac 1	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
5	Fill/Evac 2	1		X	X		X										X	X	Pressurize using Reg 1 or 2 (Check Gauge Pressure)
6	Isolate	1	X	X													X	X	Isolate regulator supply.
7	Stabilize	1	X						x								X	X	Stabilize (Low Pressure)
8	Measure	1	X						x								X	X	Flow measurement
9	Vent	1															X	X	Exhaust
10	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
11	Uncouple 1	0															X/R		Disengage Coupling Port 1
12	Return to Ready.																		

8.5.6 Back Pressure Flow Test Valve Sequence

Uson Qmr Back Pressure Flow Test Valve Sequence

7/28/12

X = Output On X/R = Output Latched on Reject

			S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
			Sensor (0 = none, 1 = Gauge, 2 = Diff. 3 = Flow/Temp.)	Sol. Valve - 1 Not used	Sol. Valve - 2 Pressurize	Sol. Valve - 3 Isolate	Sol. Valve - 4 Auto Cal. Leak	Sol. Valve - 5 Regulator Selection	Output - 6 Venturi Control	Output - 7 Not Used.	Output - 8 Not Used Or User Defined	Output - 9 Not Used Or User Defined	Output - 10 Not Used Or User Defined	Output - 11 Not Used Or User Defined	Output - 12 Not Used Or User Defined	Output - 13 Not Used Or User Defined	Output - 14 Not Used Or User Defined	Sol. Valve - 15 Couple 1	Sol. Valve - 16 Couple 2	
Test Sequence - Normal Production Test Cycle																				
	1	Couple 1	0															X		Engage Coupling Port 1
	2	Couple 2	0															X	X	Engage Coupling Port 2
	3	Auto zero	1,3															X	X	Auto Zero Transducer
	4	Fill/Evac 1	3		X			X										X	X	Pressurize using Reg 1 or 2
	5	Fill/Evac 2	3		X			X										X	X	Pressurize using Reg 1 or 2
	6	Measure	1		X	X		X										X	X	Back pressure measurement
	7	Vent	3															X	X	Exhaust
	8	Uncouple 2	0															X	X/R	Disengage Coupling Port 2
	9	Uncouple 1	0															X/R		Disengage Coupling Port 1
	10	Return to Ready.	0																	EOC
Test Sequence - Gauge Sensor Calibration - Zero																				
	1	Measure Sensor Output	1																	Measure Zero Output
	2	Return to Ready.	0																	
Test Sequence - Gauge Sensor Calibration - Span																				
	2	Measure Sensor Output	1			X														Measure Output
	3	Return to Ready.	0																	
Test Sequence - Flow Sensor Calibration - Zero																				
	1	Measure Sensor Output	3		x			x												Measure Zero Output
	2	Return to Ready.	0																	
Test Sequence - Flow Sensor Calibration - Span																				
	1	Measure Sensor Output	3		X			x												Measure Full-scale Output
	2	Return to Ready.	0																	

8.6 Standard I/O Operation

Operation of the standard I/O is as follows:

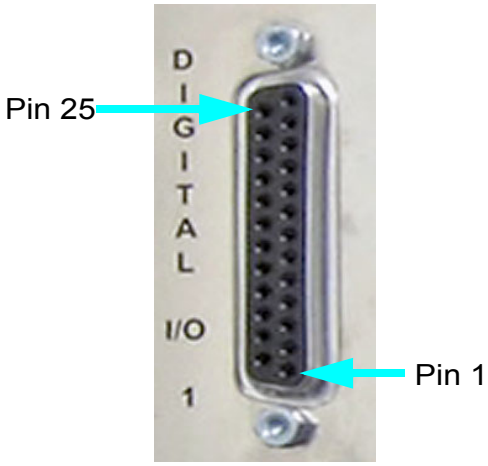
The inputs are opto-isolators requiring 24VDC power with respect to pin 19 (INRTN). The outputs are dry contact relays. If desired, it is possible to supply 24VDC to the (-) side of each of the outputs, and then when the output is asserted, there would be a 24VDC signal present on the (+) side.

See *"I/O Port Pinout" on page 8-13.*

8.7 I/O Port Pinout

Digital I/O 1 DB-25 connector on the rear panel:

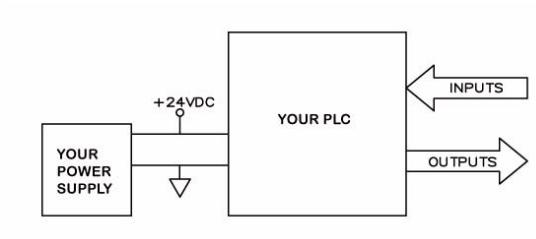
Operation of the standard I/O is as follows:
The inputs are opto-isolators requiring 24VDC power with respect to pin 19 (INRTN). The outputs are dry contact relays. If desired, it is possible to supply 24VDC to the (-) side of each of the outputs, and then when the output is asserted, there would be a 24VDC signal present on the (+) side.

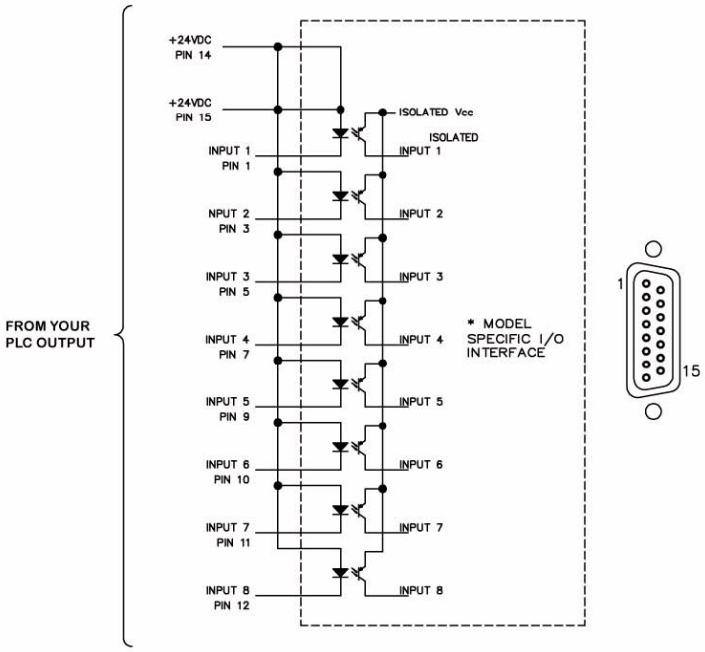


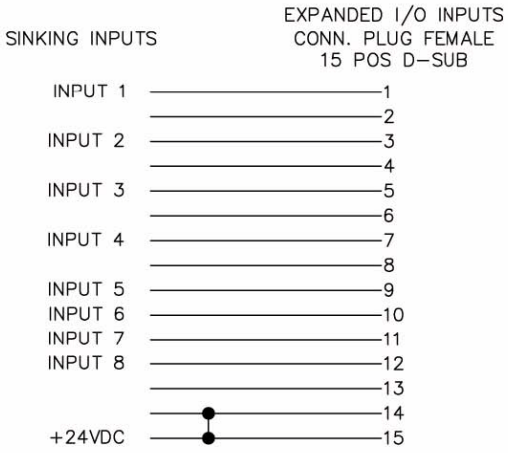
Pin	Function
1	STARTIN
2	ABORTIN
3	BCD1IN
4	BCD3IN
5	BCD5IN
6	BCD7IN
7	PASS1+
8	FAIL1+
9	READY+
10	EOC+
11	ALARM+
12	NOT USED
13	NOT USED
14	ENTSTIN (START ENABLE)
15	BCD0IN
16	BCD2IN
17	BCD4IN
18	BCD6IN
19	INRTN
20	PASS1-
21	FAIL1-
22	READY-
23	EOC-
24	ALARM-
25	NOT USED

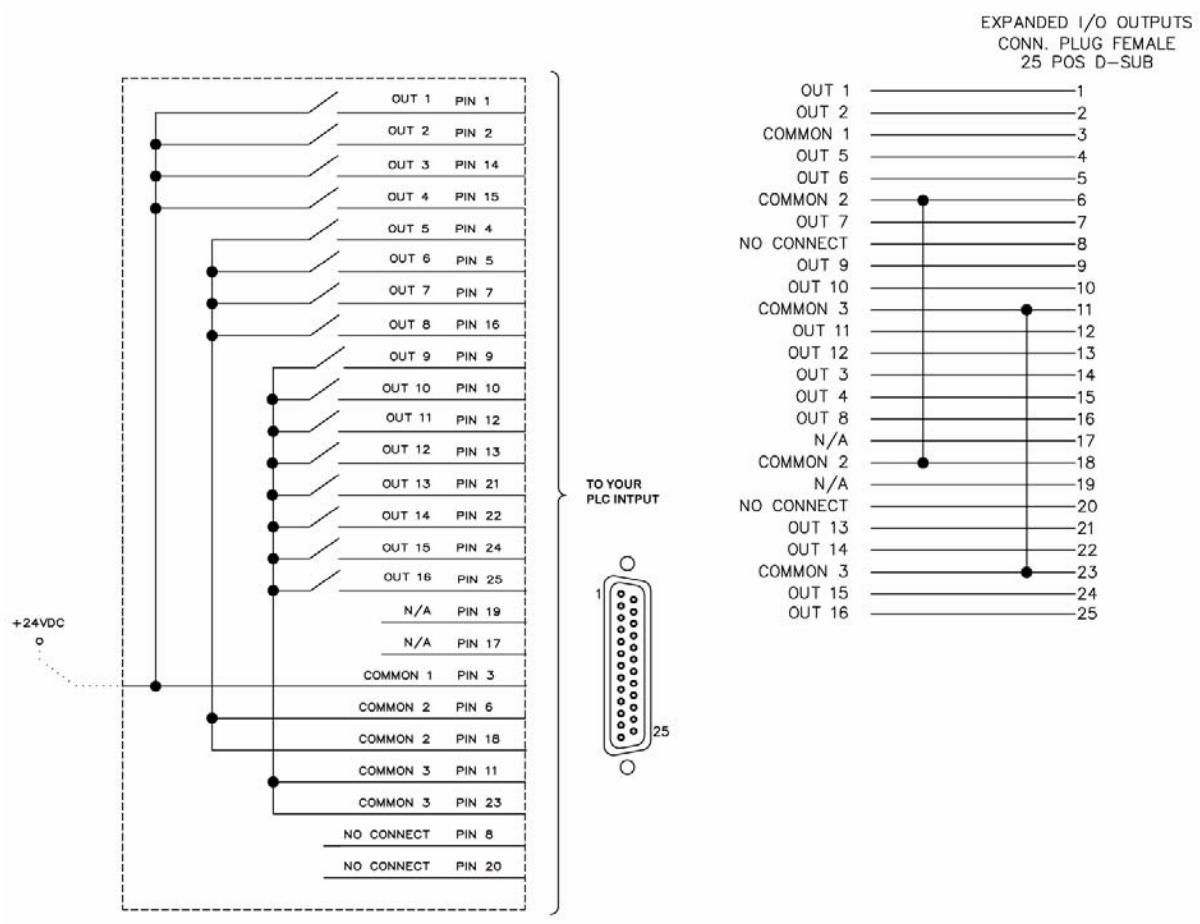
8.8 Expanded I/O Port Pinout

The expanded I/O assignments are configured by the user. The following illustrations below and on the next page show the hardwiring.









8.9 Digital I/O Power Rating

The I/O connector is used to connect the Qualitek mR to a Programmable Logic Controller (PLC) or other automation equipment. Be aware that it is possible to damage the interface when connecting to non-PLC loads such as incandescent lamps, valves, or other high-inrush devices.

Be certain that any customized circuitry adheres to the output specifications given below or risk damage to the Qualitek mR.

Maximum Switching Load:	10VA
Maximum Switching Current:	0.5A
Maximum Switching Voltage:	100VDC
Maximum Continuous Current:	1.5A

Uson has made a robust interface well suited for its intended purpose of driving a PLC. However, the user assumes all risks associated with making connections other than to a PLC with this interface if such connections are outside the limits of the specifications.

8.10 Temperature Compensation (Temp Comp)

8.10.1 Introduction

The QMR pressure decay tester determines the leak rate of the component by pressurizing the component to a set pressure and then measures the resultant pressure change over time. The pressure decay technique assumes the component's volume and temperature have remained constant and any pressure loss is due to leakage.

However, the pressure decay measurement is dependent upon temperature and volume changes defined by the ideal gas law:

$$PV = nRT$$

Where:

P = Pressure of the gas (abs)

V = Volume

n = Number of molecules

R = Ideal gas constant

T = Temperature of the gas (abs)

Based on the above law the pressure within a sealed volume will decrease if the volume increases or the temperature decreases over time. Temperature changes can affect the physical dimensions of the component and/or the air temperature within the component. Both of these changes can affect the measured pressure and compromise the measured pressure decay measurement. In many applications small changes in volume or temperature can be accommodated but in some applications these changes will cause testers to falsely indicate leak tight or leaking components.

The component's temperature may change due to the air supply temperature, ambient temperature changes due to sunlight, proximity to heaters or air conditioners, a manufacturing processes prior to testing where the component is heated due to a drying or welding process, the component is stored at a different ambient temperature prior to testing.

This document describes the setup and operation of the QMR Temperature Compensation option to minimize the effects of temperature changes on the pressure decay measurement.

8.10.2 Equipment

The following items are required:

- QMR Tester with software version 1.16.0 or later installed.
- PC with Microsoft Excel application.
- The Uson Temperature Compensation Excel spreadsheet Template.

The following items may be required to transfer QMR results to the PC:

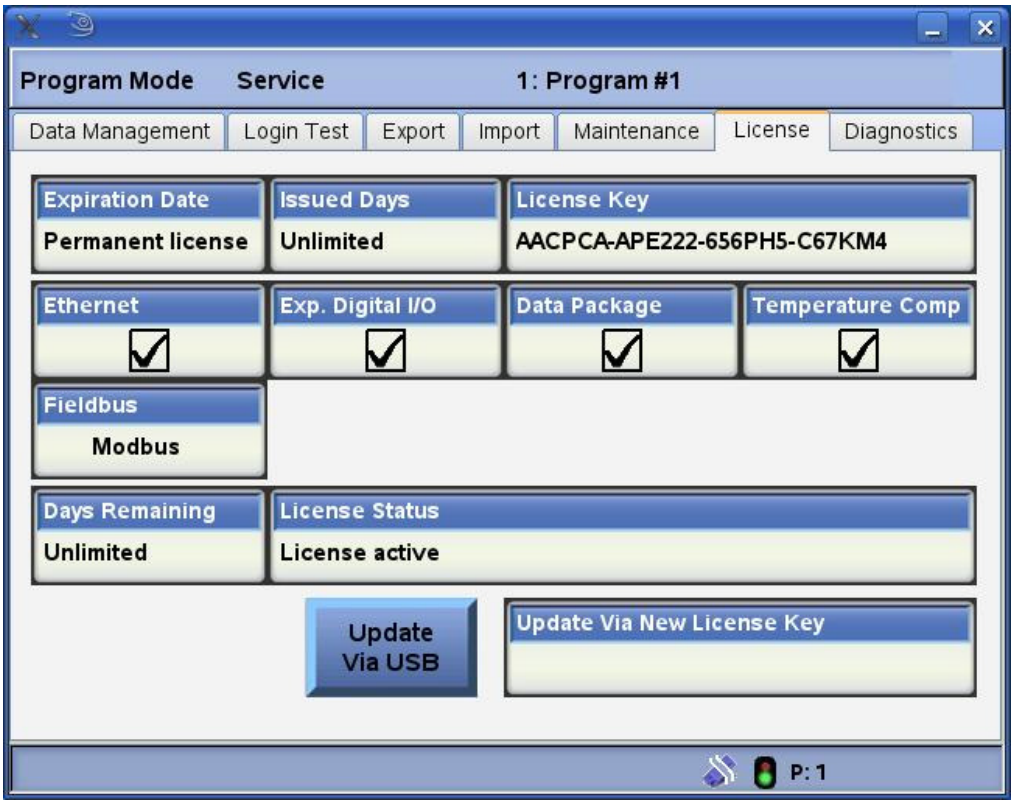
- RS-232 9-way D-type Cable.
- USB Memory Device.
- Serial Port Data logging application (e.g. Hyper Terminal Excel Wedge, etc.).

8.10.3 QMR Configuration

The following QMR tester options must be configured.

8.10.3.1 License

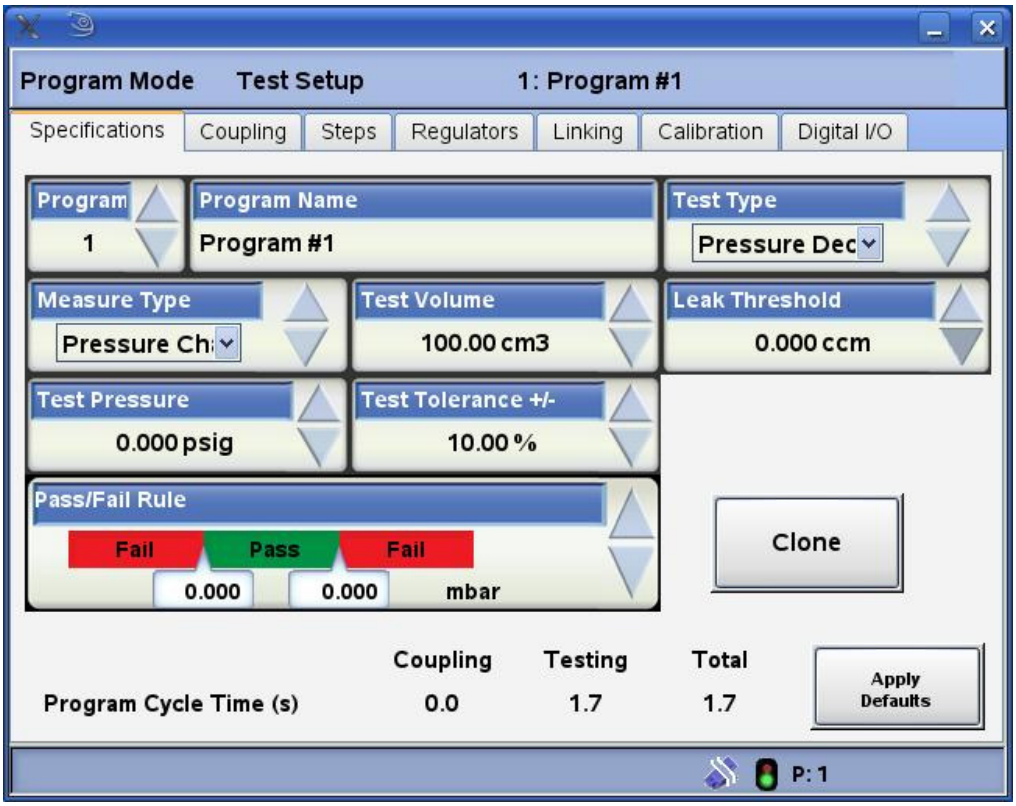
The Temperature compensation is a licensed option, which must be enabled via the Licence facility before proceeding. The licence status can be viewed by selecting the Program Mode Service Licence tab as shown below.



If the Temperature Comp option is not selected a licence update must be obtained from Uson.

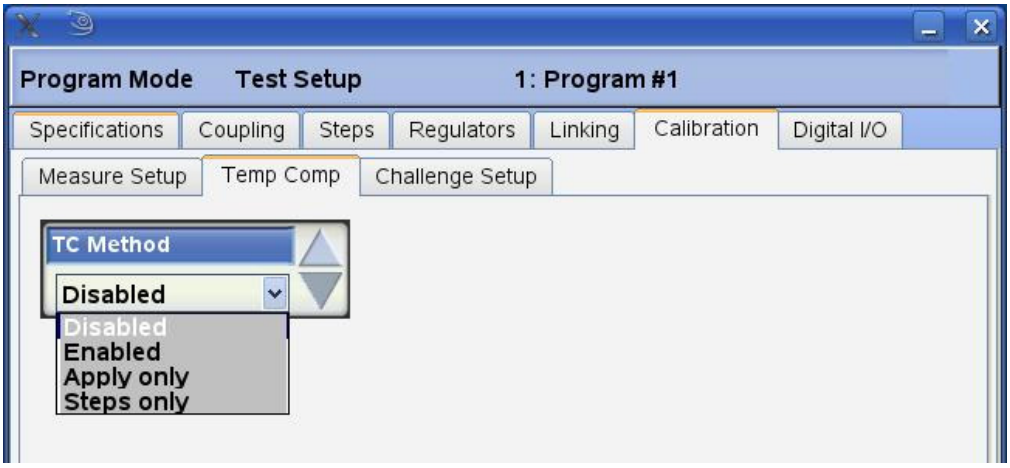
8.10.3.2 Test Setup

The test program or programs must be set and optimized for the test production parts at ambient temperature conditions using the Program Mode Test Setup tabs.



8.10.3.3 Temperature Compensation Initial Setup.

The Temperature compensation option is enabled by selecting the Program Mode Test Setup Calibration Temp Comp tab shown below and setting the required TC Method.



The TC Method selections are:

Disabled, temperature compensation is disabled for the selected program and associated parameters are hidden.

Enabled, the temperature compensation test steps are performed and the compensation is applied.

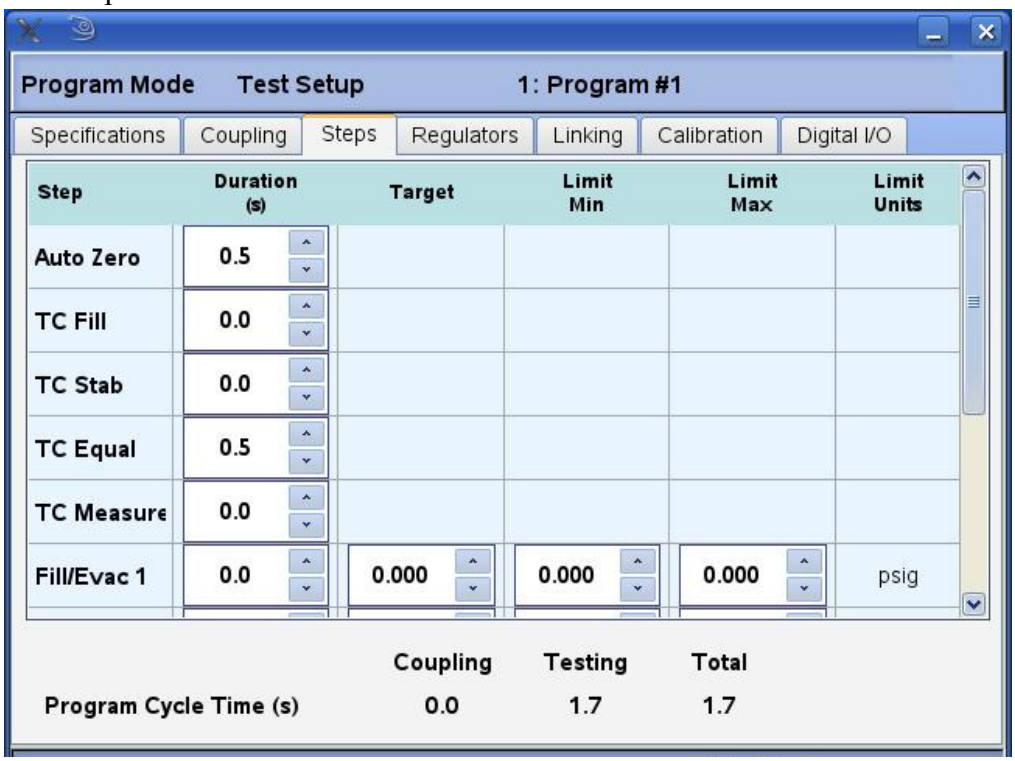
Apply Only, the temperature compensation information from a previous test is applied. This is generally used when programs are performed in a sequence of tests and the first atmospheric reading is used by subsequent tests in the sequence.

Steps Only, performs the temperature compensation test steps but compensation is not applied. This option is generally used during the initial setup of temperature compensation to record values.

If tests are performed by individual programs then set the TC method to Steps Only for all programs requiring Temperature compensation. If tests are performed by a sequence of programs then set the TC Method to Steps Only on the first program within the sequence.

8.10.3.4 Temperature Compensation Test Steps.

The Temperature compensation option allows the variation in component temperature to be taken into account by measuring the pressure change in the test component while at atmospheric pressure. To achieve this, additional steps are added to the start of the normal test cycle and must be set by selecting the Program Mode Test Setup Steps tab and setting the TC step times based on the step descriptions below.



The TC Fill step vents the test component to atmosphere and is only required when residual pressure remains within the component after the load and coupling steps. The duration of this step is typically a few seconds when required.

The TC Stab step allows the component and sealing heads to settle into their final positions prior to performing the pressure measurement. The duration of this step is typically a few seconds when required.

The TC Equal step pneumatically isolates the Test and Reference ports and checks the tester is ready to perform the Measure step. The tester will automatically set the required time for this step but it may be changed manually.

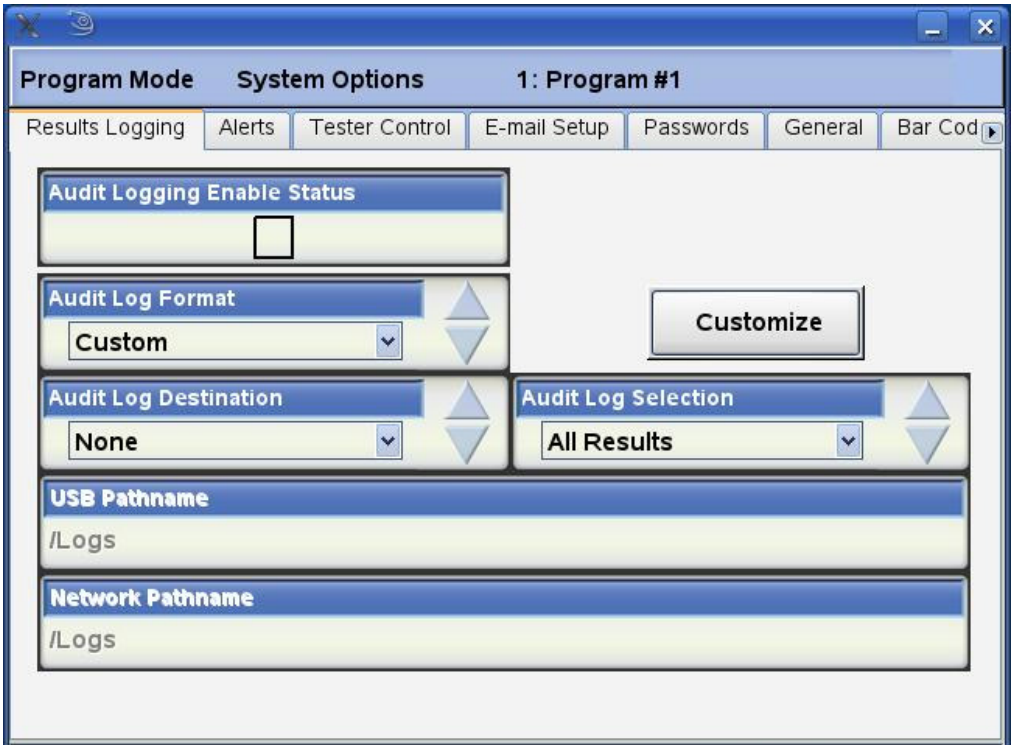
The TC Measure step measures the resulting pressure change at atmospheric conditions and is stored for use by the compensation algorithm. The step duration is normally set to the pressurized Measure time and then optimized depending upon the sensitivity of the reading to temperature changes.

8.10.3.5 Results Logging.

The test result information may be logged by various methods including the Audit output option, printer, or by simply noting the values on the display.

This section describes how to setup the Audit log option to generate the result information in a comma separated value (CSV) format to simply the transferring of data to an Excel spreadsheet.

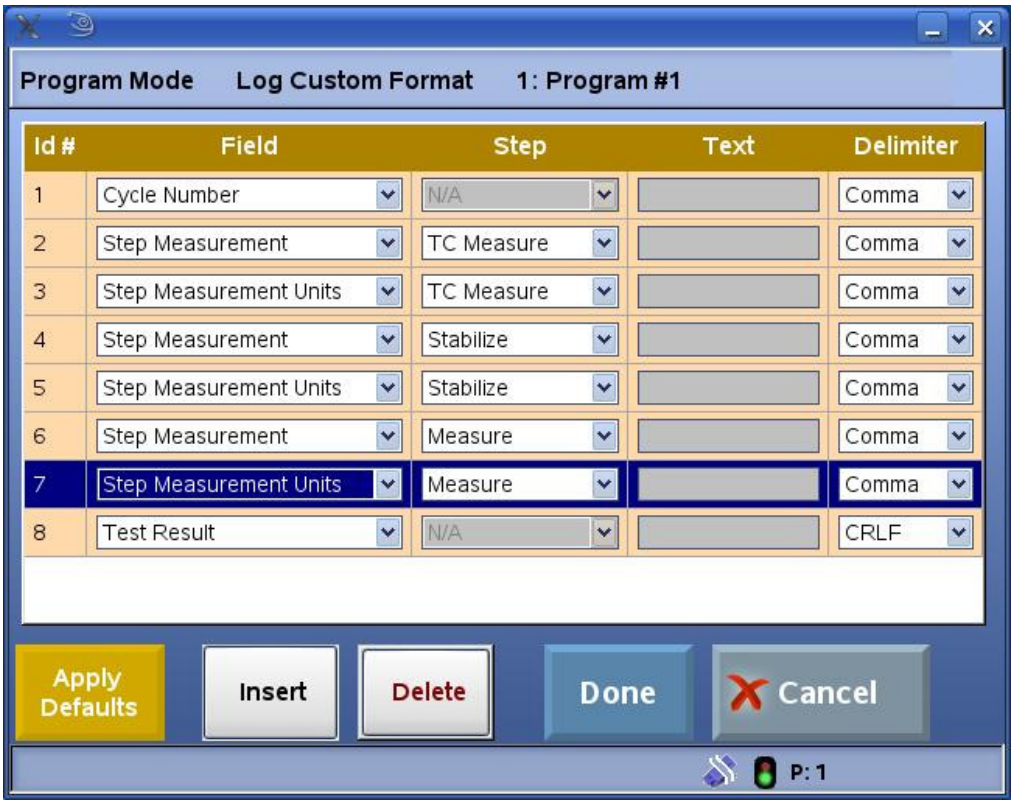
Select the Program Mode System Options Result Logging tab below and set the Audit Log Format parameter to Custom.



Custom Log Format

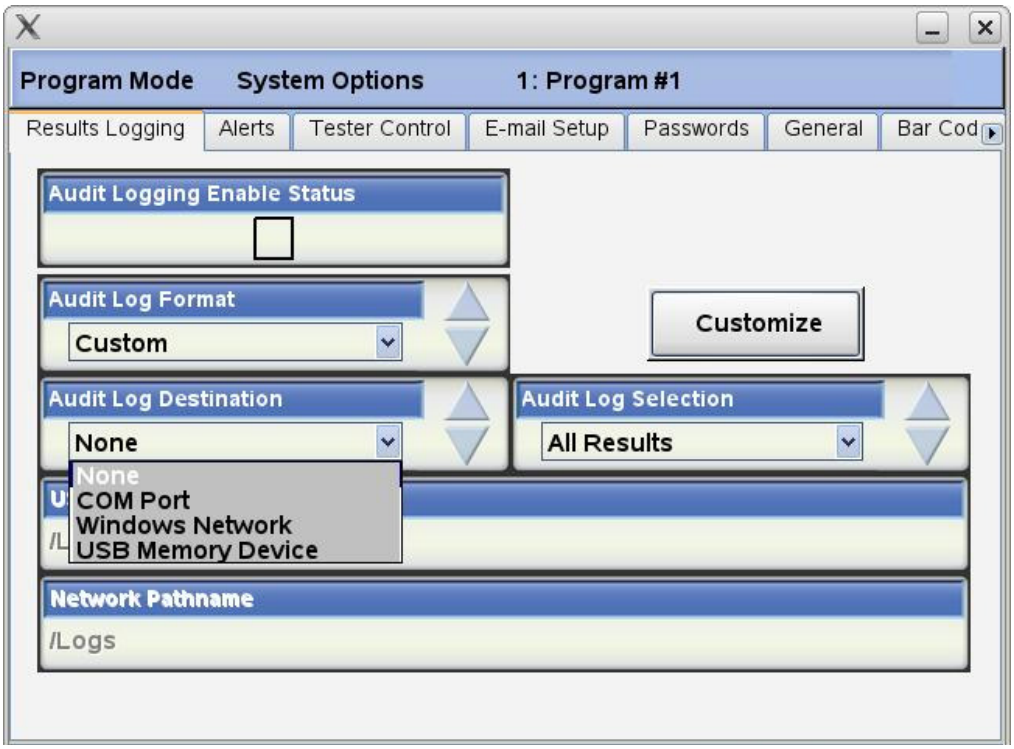
Select the Customize option and set the log format to produce a Comma Separated Value (CSV) output as shown below.

This will allow files created by the logging process to be imported into Microsoft Excel and allow data to be easily transferred between spreadsheets.



Log Destination

Set the Audit log Destination parameter to where the results will be saved as shown below.



The Com Port option will output the result information at the end of each test via the serial port located on the QMR rear panel. This option will require a Serial cable, a PC with a serial port connection and a serial data logging application (e.g. Windows HyperTerminal) to save data from the serial port to a local file.

The QMR serial port default settings are listed below and can be modified using the Program Mode Hardware Serial tab:

Baud rate:	9600
Data Bits:	8
Stop bits:	1
Parity:	None
Flow Control:	None.

The Windows Network option will log the result information at the end of each test to remote server specified by the Program Mode Hardware Network tab and the Result Logging Network Pathname parameter.

The USB Memory Device will log the result information at the end of each test to a folder on the USB memory device specified by the Result Logging USB pathname parameter.

8.10.4 Data Analysis

The first part of the setup procedure is to establish the calibration compensation values required to compensate for the volume changes at atmospheric and test pressures, which maybe due to the flexibility of the product and/or fixture. This can only be carried out with a number of test parts, which are known to be leak-tight, and are at the ambient temperature conditions.

The second part of the procedure will be to establish the correction factor using production parts as they transfer down the production line from the previous process and therefore will be at the typical temperature conditions to be corrected.

8.10.4.1 Uson Temp Comp Excel Template.

Uson provides a Temp Comp spreadsheet on the CD shipped with the tester; or you may request one from your Uson representative. Copy the **Uson Temp Excel** spreadsheet to a suitable working folder on the PC and open the spreadsheet as shown below.

Test Parameters

Product Reference	Heat Exchanger		(enter)
TC Measure Time	45	seconds	(enter)
Measure Time	120	seconds	(enter)
Pressure Units	psi		(enter)
Atmosphere	14.7 psi		
Test Pressure (Absolute)	34.7	psi	(enter)
Calibration Comp	0.0005		Calculated from testing ambient products
TC Comp Value	0.0024		Calculated from Testing ambient products
Temperature Factor	-0.52		Calculated from testing Production parts (note: ensure this value is **only** calculated from the average of the number of tested parts. Data from outside this range will create invalide results)

The spreadsheet has the following four tabs:

1. QMR Parameters
2. Compensation Template
3. Compensation Chart
4. Chart data.

Select the **File Menu > Save As** option and assign a name associated with the product being tested.

Open the first tab and enter the Test part reference, Step times and Test pressure in the respective fields. **Note:** the test pressure must be entered as an absolute pressure (i.e., when working in bar, add 1bar to the set pressure). The remaining fields are protected and will automatically display the calculated values required to compensate for temperature effects at the end of the set up procedure.

Select the **Compensation Template** tab and ensure that the display area is at the top of the page displaying “Ambient Products” will be displayed in Column “A”.

8.10.4.2 Establishing Calibration Compensation

The spreadsheet expects 10 results, but if there are fewer parts available, they can be tested more than once, providing there is a suitable delay between repeat tests. Alternatively, if the first two or three results are very similar, a judgement could be made to simply copy these results over the first 10 rows when transferred to the Excel spreadsheet.

Record the results for ambient parts and transfer the atmospheric and pressure measure step readings to the AT measure and Measure cells in the top 10 rows

labelled Ambient products on the Excel Temp Comp spreadsheet's Compensation Template page shown below.

	Temperature Compensation Template						
	Test No.	TC Measure step result	Measure step result	Modified TC Measure.	Modified Measure	Predicted Factor	Compensated Measure
Ambient Products		0.02000	-0.01000	-0.01100	-0.01100	0.742	0.00234
		0.03000	0.00000	-0.00100	-0.00100	0.742	0.00021
		0.03000	0.00000	-0.00100	-0.00100	0.742	0.00021
		0.02000	-0.01000	-0.01100	-0.01100	0.742	0.00234
		0.03000	0.01000	-0.00100	0.00900	-6.679	0.01021
		0.03000	0.00000	-0.00100	-0.00100	0.742	0.00021
		0.03000	0.01000	-0.00100	0.00900	-6.679	0.01021
		0.04000	0.01000	0.00900	0.00900	0.742	-0.00191
		0.06000	0.00000	0.02900	-0.00100	-0.026	-0.03617
		0.02000	0.00000	-0.01100	-0.00100	0.067	0.01234
Production Condition Products		0.79000	0.92000	0.75900	0.91900	0.899	-0.00147
		0.62000	0.66000	0.58900	0.65900	0.830	-0.05530
		0.43000	0.45000	0.39900	0.44900	0.835	-0.03488
		0.29000	0.33000	0.25900	0.32900	0.943	0.01490
		0.23000	0.23000	0.19900	0.22900	0.854	-0.01233
		0.15000	0.17000	0.11900	0.16900	1.054	0.02468
		0.13000	0.11000	0.09900	0.10900	0.817	-0.01106
		0.10000	0.08000	0.06900	0.07900	0.850	-0.00468
		0.12000	0.07000	0.08900	0.06900	0.575	-0.03893
		0.08000	0.07000	0.04900	0.06900	1.045	0.00958
		-0.21000	-0.32000	-0.24100	-0.32100	0.988	-0.02873
		-0.16000	-0.23000	-0.19100	-0.23100	0.898	0.00063
		-0.11000	-0.17000	-0.14100	-0.17100	0.900	0.00000
		-0.07000	-0.11000	-0.10100	-0.11100	0.816	0.01149
		-0.05000	-0.09000	-0.08100	-0.09100	0.834	0.00723
		-0.01000	-0.06000	-0.04100	-0.06100	1.104	-0.01128
		-0.01000	-0.06000	-0.04100	-0.06100	1.104	-0.01128
		0.01000	-0.04000	-0.02100	-0.04100	1.449	-0.01553
		0.02000	-0.03000	-0.01100	-0.03100	2.091	-0.01766
		0.02000	-0.02000	-0.01100	-0.02100	1.417	-0.00766
		0.02000	-0.02000	-0.01100	-0.02100	1.417	-0.00766
		0.04000	-0.03000	0.00900	-0.03100	-2.556	-0.04191
		0.02000	0.00000	-0.01100	-0.00100	0.067	0.01234
		-0.35000	-0.44000	-0.38100	-0.44100	0.859	0.02105
		-0.24000	-0.32000	-0.27100	-0.32100	0.879	0.00765
		-0.14000	-0.24000	-0.17100	-0.24100	1.046	-0.03362
		-0.11000	-0.19000	-0.14100	-0.19100	1.005	-0.02000
		-0.06000	-0.12000	-0.09100	-0.12100	0.987	-0.01064
		-0.05000	-0.09000	-0.08100	-0.09100	0.834	0.00723
		-0.01000	-0.06000	-0.04100	-0.06100	1.104	-0.01128
		0.00000	-0.05000	-0.03100	-0.05100	1.221	-0.01341
		0.01000	-0.04000	-0.02100	-0.04100	1.449	-0.01553

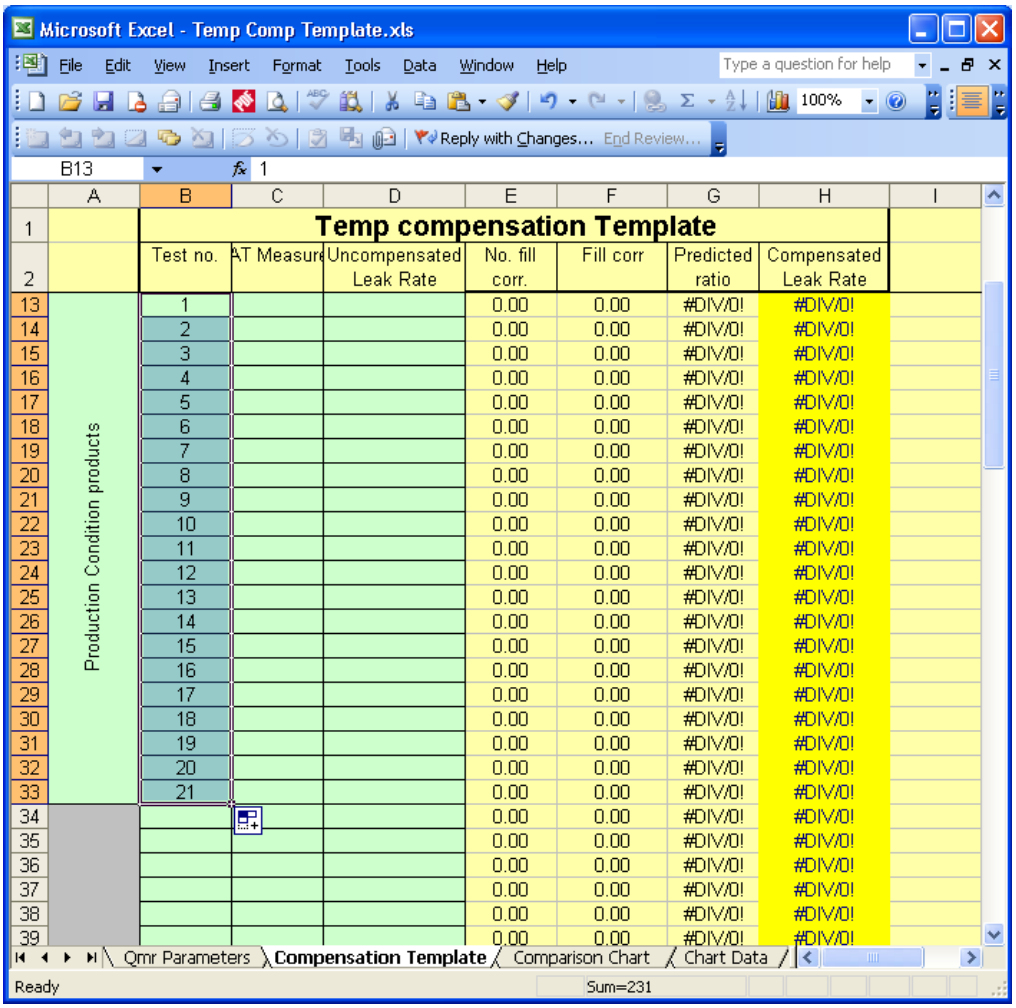
Only use the top 10 rows and do not extend into the next set of data rows. The QMR Parameter tab Calibration Offset and Temp Offset fields will now show the resultant corrected values.

8.10.4.3 Establishing Temperature factor

Testing should now be switched to normal products coming from the production line at normal temperature other than ambient. If these are not available then it is possible to take one of the leak tight components and replicate the temperature conditions (i.e. cool or heat the component as required).

The selected part should be tested a number of times as the part reaches a stable ambient condition providing there is a suitable relaxation period between tests. The results of tests should show both the ambient and pressure results progressively converging towards a stable result.

When a sufficient number of tests have been completed the results must be copied to the AT Measure and Measure columns in the Production Condition Parts section shown below.



Microsoft Excel - Temp Comp Template.xls

File Edit View Insert Format Tools Data Window Help

Temp compensation Template

	Test no.	AT Measure	Uncompensated Leak Rate	No. fill corr.	Fill corr	Predicted ratio	Compensated Leak Rate
Production Condition products	1			0.00	0.00	#DIV/0!	#DIV/0!
	2			0.00	0.00	#DIV/0!	#DIV/0!
	3			0.00	0.00	#DIV/0!	#DIV/0!
	4			0.00	0.00	#DIV/0!	#DIV/0!
	5			0.00	0.00	#DIV/0!	#DIV/0!
	6			0.00	0.00	#DIV/0!	#DIV/0!
	7			0.00	0.00	#DIV/0!	#DIV/0!
	8			0.00	0.00	#DIV/0!	#DIV/0!
	9			0.00	0.00	#DIV/0!	#DIV/0!
	10			0.00	0.00	#DIV/0!	#DIV/0!
	11			0.00	0.00	#DIV/0!	#DIV/0!
	12			0.00	0.00	#DIV/0!	#DIV/0!
	13			0.00	0.00	#DIV/0!	#DIV/0!
	14			0.00	0.00	#DIV/0!	#DIV/0!
	15			0.00	0.00	#DIV/0!	#DIV/0!
	16			0.00	0.00	#DIV/0!	#DIV/0!
	17			0.00	0.00	#DIV/0!	#DIV/0!
	18			0.00	0.00	#DIV/0!	#DIV/0!
	19			0.00	0.00	#DIV/0!	#DIV/0!
	20			0.00	0.00	#DIV/0!	#DIV/0!
	21			0.00	0.00	#DIV/0!	#DIV/0!
				0.00	0.00	#DIV/0!	#DIV/0!
				0.00	0.00	#DIV/0!	#DIV/0!
				0.00	0.00	#DIV/0!	#DIV/0!
				0.00	0.00	#DIV/0!	#DIV/0!
				0.00	0.00	#DIV/0!	#DIV/0!
				0.00	0.00	#DIV/0!	#DIV/0!

Qmr Parameters | Compensation Template | Comparison Chart | Chart Data

Ready Sum=231

The Temperature factor is automatically calculated based on the average of the predicted ratios in the lines between rows 13 and 20 of the Compensation Template tab.

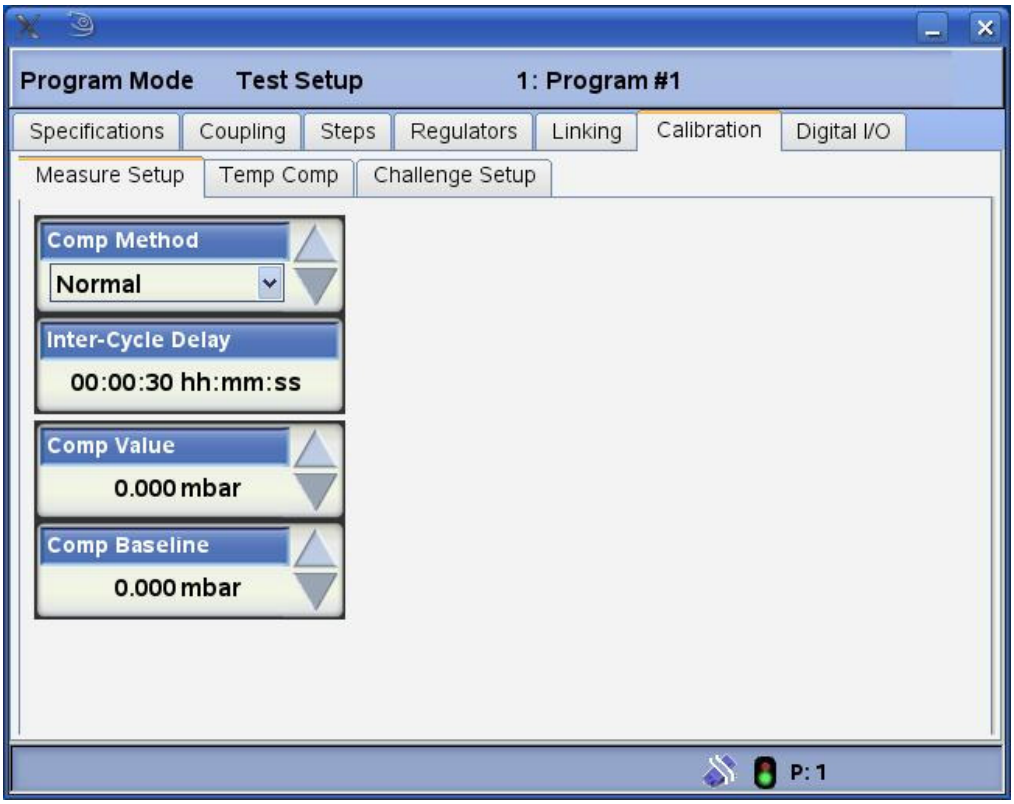
The QMR parameter page will now show the calculated Offsets and Temp Factor values in the respective windows.

8.10.5 QMR Setup

The calculated offset and factors are now transferred to the QMR Calibration and Temp Comp menus.

8.10.5.1 Comp Offset

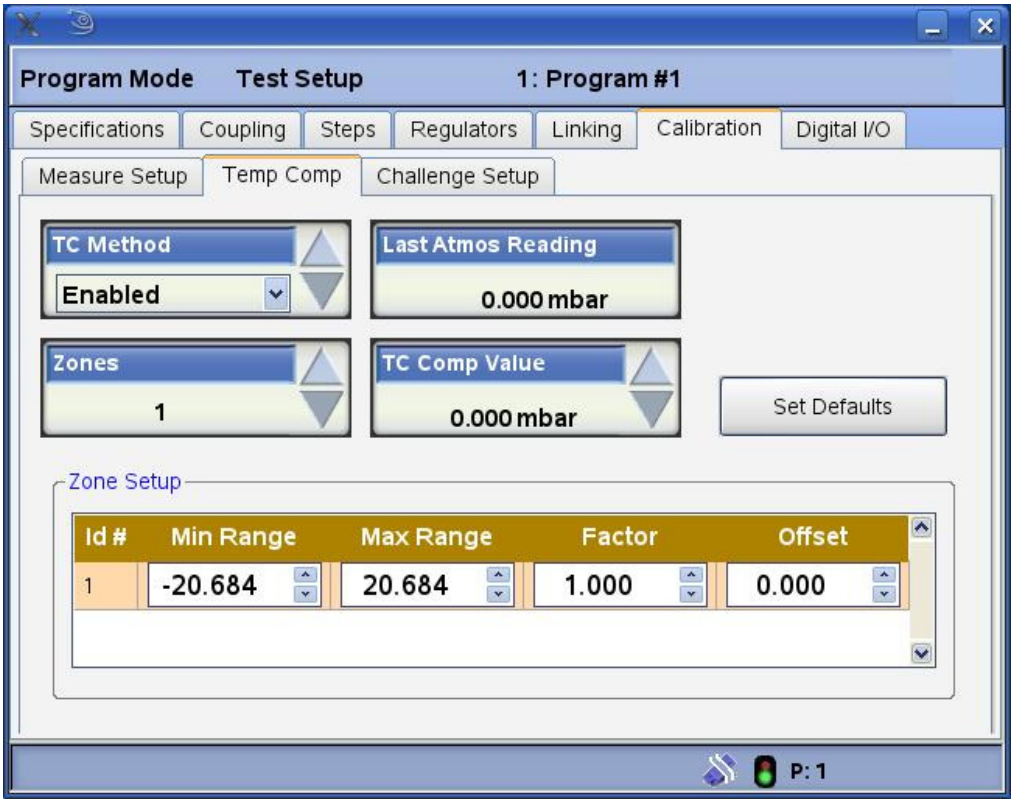
If a calibration offset is required, select the Program Mode Test Setup Calibration shown below. Set the Measure Setup sub tab Comp Method to Normal and enter the Calibration Offset value into the Measure Setup sub tab Comp value parameter.



8.10.5.2 Temp Comp Parameters.

Select the Calibration Temp Comp sub tab and set the TC Method to Enabled for individual tested programs or the first program within a sequence as shown below.

and to Apply for subsequent programs in a sequence requiring Temperature compensation.



The displayed parameters are:

The Last Atmos Reading parameter displays the last reading recorded by the program's AT Measure step.

The TC Comp value compensates for the pressure changes due to fixture and seal deformation during the TC Measure step. The default value is zero.

The Zones parameter specifies the number of individual zones which can be configured across the AT Measure range. This allows different correction factors to be applied based on the AT Measure value. The default setting is 1 and is sufficient for most applications.

The Zone Setup table lists the selected number of zones and each entry defines the selected AT Measure range and its associated compensation parameters.

Set the following parameters: Zones to 1, TC Comp Value to the calculated Temp Offset and Zone setup factor to the calculated Temperature Factor.

8.10.5.3 Verification

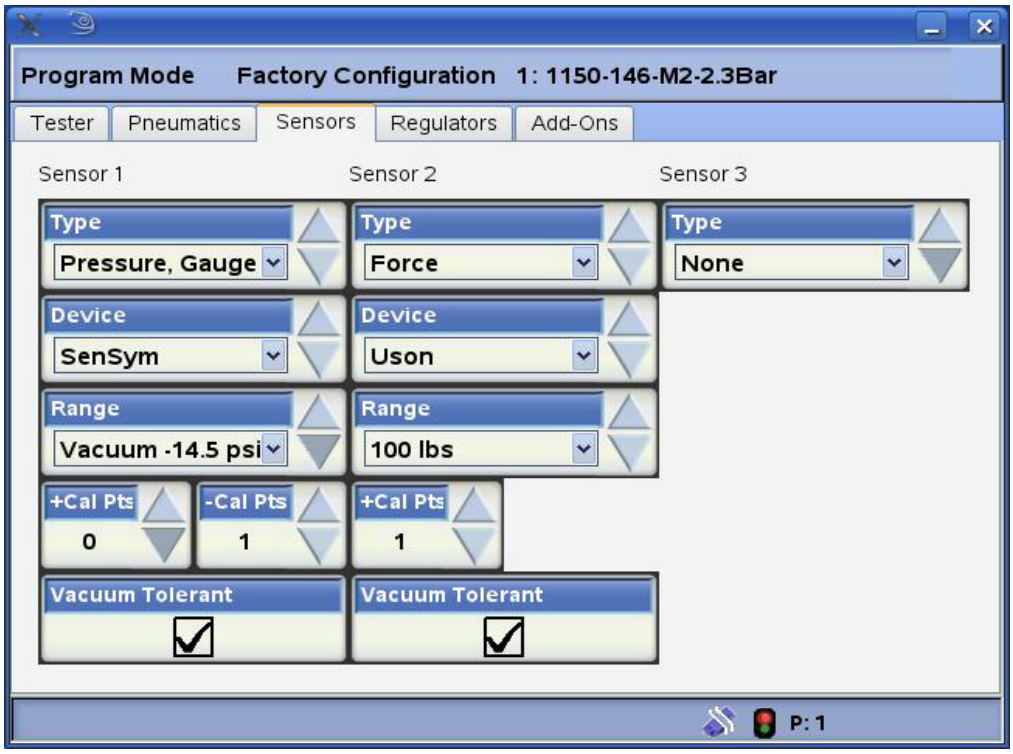
The QMR will now correct the test results according to the values entered and can now be verified by performing tests on known leak tight parts under normal operating temperature conditions with and without leak master.

8.11 Stallion Force Decay Tester Model

The Stallion Force Decay Sensor screen shows important information about the installed sensors for the Stallion Force Decay.

The sensor information includes the following options:

- Sensor Type
- Sensor Range
- Number of Positive Calibration Points
- Number of Negative Calibration Points
- Sensor Vacuum: Yes or No



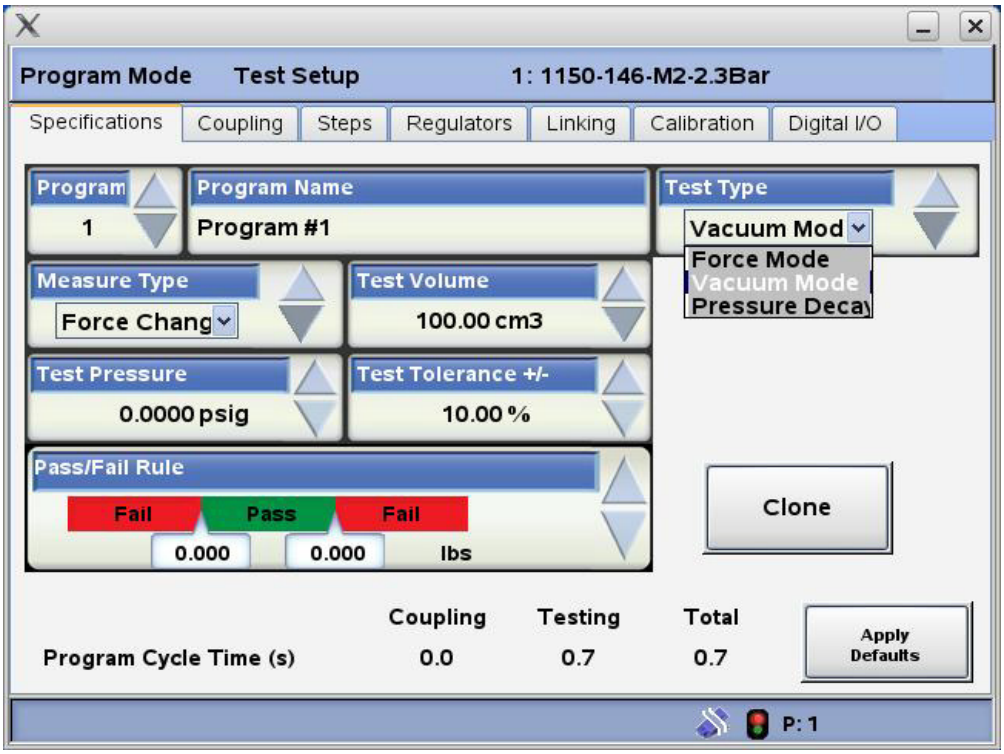
8.11.1 Specifications

The Specifications tab is primarily used to:

- Set up a force decay test
- View and change important parameters of the selected program
- Set up the additional testing parameters

The Force Decay model uses three test types:

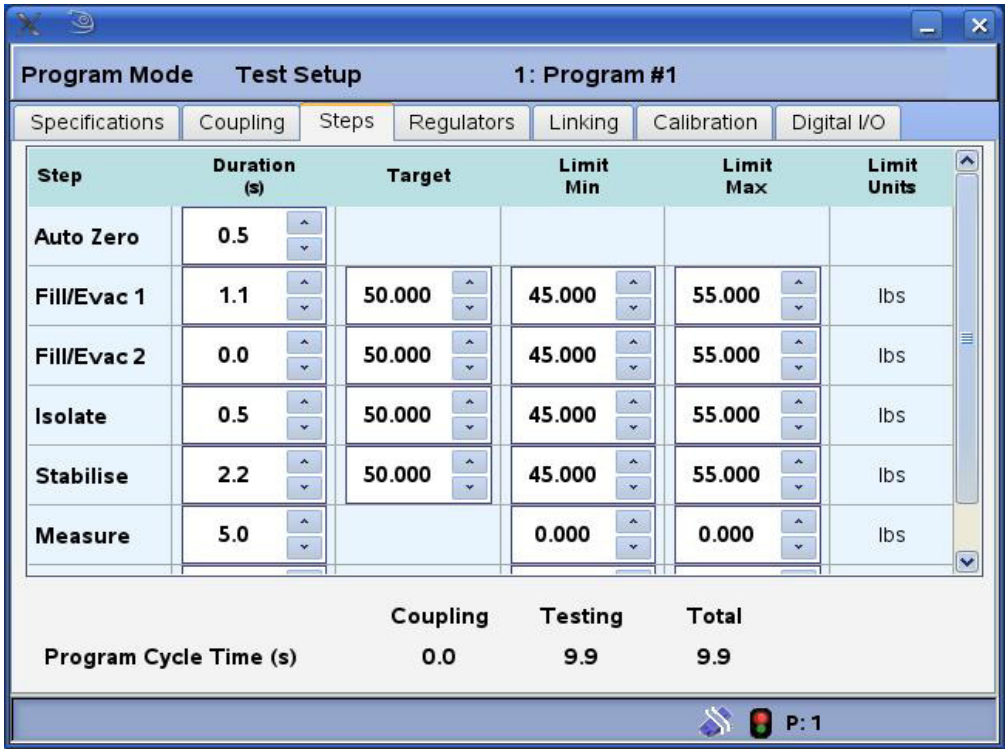
- Force mode
- Vacuum mode
- Pressure Decay



8.11.2 Force Mode Steps

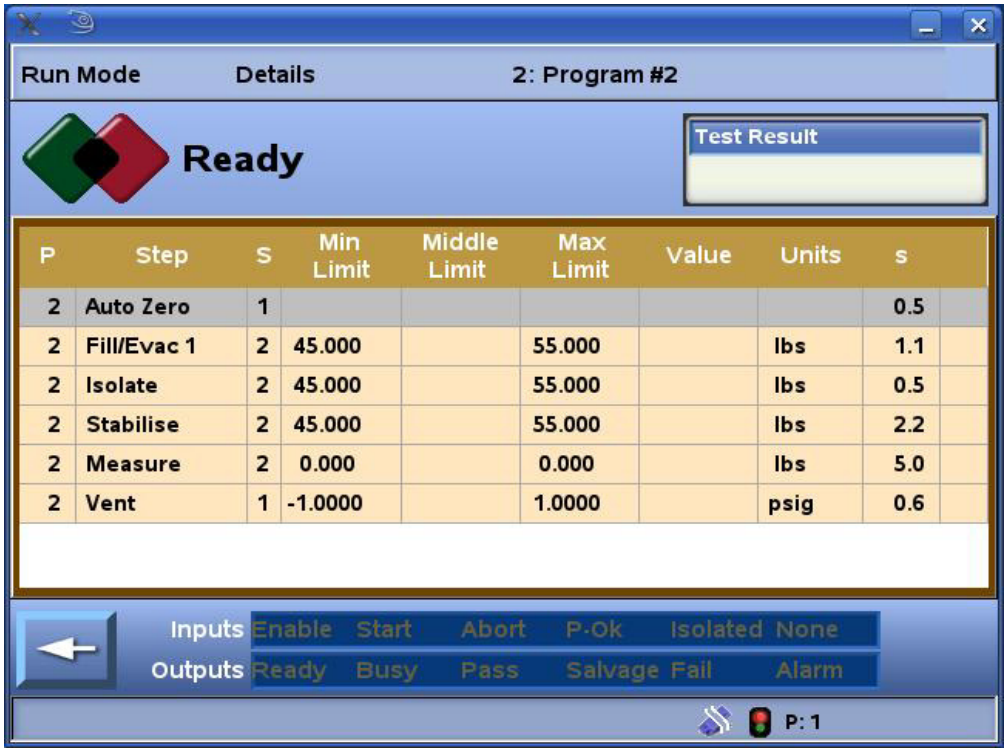
The Steps screen shows all of the steps for a force test type. Unnecessary steps can be set to zero. Force mode uses the force sensor for all steps, except the Vent Step.

The Fill step advances the program to the next step when the target pressure is achieved.



8.11.3 Force Mode Details (Run Mode)

The Details screen (Run Mode) shows the progress of the steps in the current program and any programs to which it is linked. The bottom of the display shows the status of relevant digital input and output. Each row is a step in a program that was set up in the Program Mode. The Fill step advances the program to the next step when target force is achieved.

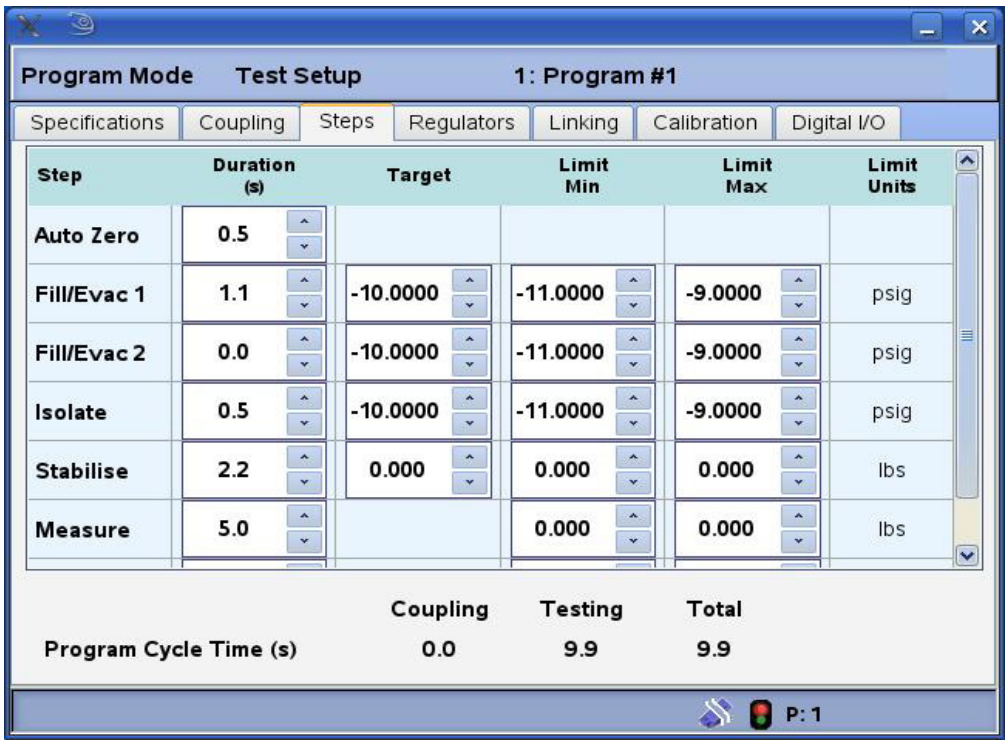


P	Step	S	Min Limit	Middle Limit	Max Limit	Value	Units	s
2	Auto Zero	1						0.5
2	Fill/Evac 1	2	45.000		55.000		lbs	1.1
2	Isolate	2	45.000		55.000		lbs	0.5
2	Stabilise	2	45.000		55.000		lbs	2.2
2	Measure	2	0.000		0.000		lbs	5.0
2	Vent	1	-1.0000		1.0000		psig	0.6

8.11.4 Vacuum Mode Steps

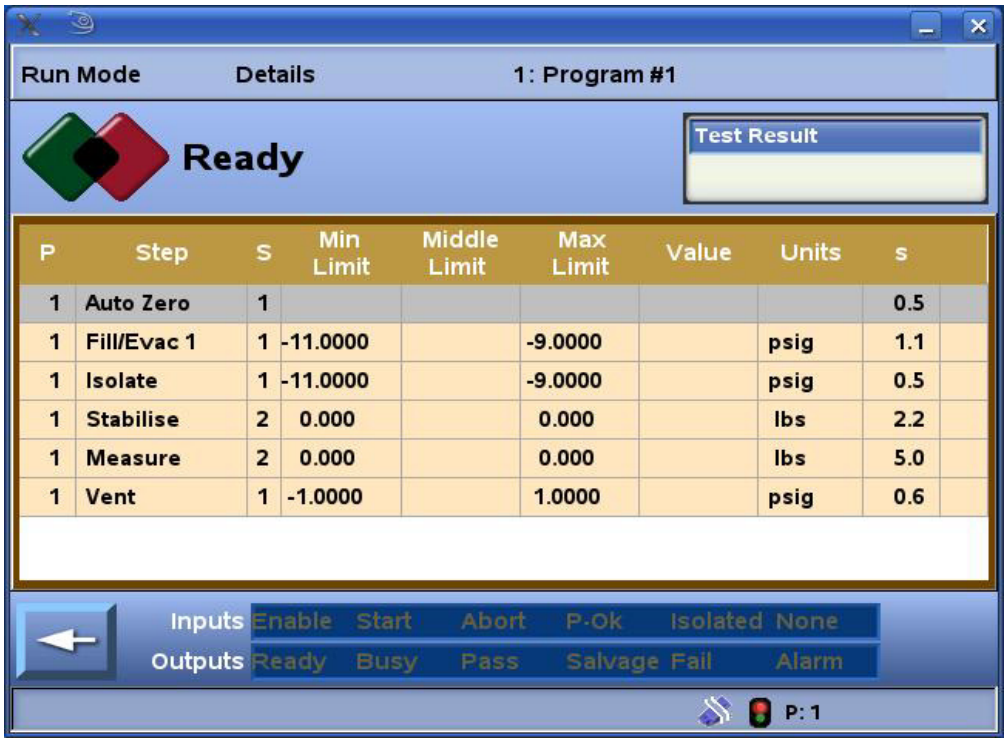
The Steps screen shows all of the steps for a Vacuum Test type. Unnecessary steps can be set to zero. Vacuum Mode uses the vacuum sensor for the Fill, Isolate, and Vent steps and the force sensor for the Stabilize and Measure steps.

The Fill step advances the program to the next step when the target pressure is achieved.



8.11.5 Vacuum Mode Details (Run Mode)

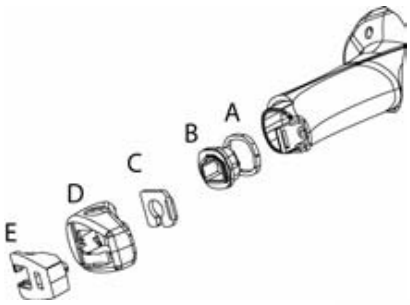
The Vacuum Mode Details screen (Run Mode) shows the progress of the steps in the current program and any programs to which it is linked. The bottom of the display shows the status of relevant digital input and output.



8.12 Bar Code Scanner Initial Setup

If you have purchased the optional bar code scanner, assemble it according to the instructions below.

CONNECTING THE CABLE



A. Rubber gasket
B. Plastic boot
C. Cable spacer
D. Cover
E. Strain relief

① Slip the cover over the cable.

② Push the plastic boot into the rubber gasket. Take care that the tab on the plastic boot is aligned with the notch in the rubber gasket.

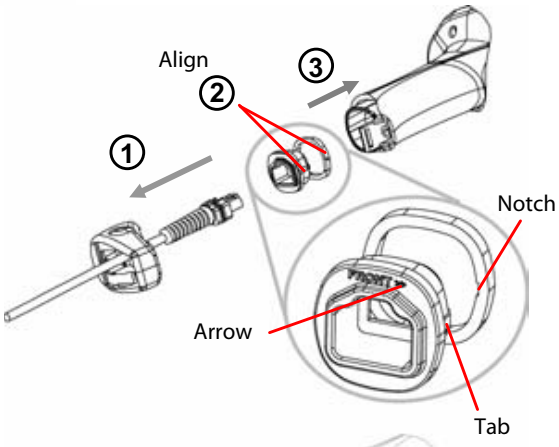
③ Push the plastic boot and gasket into the handle. Ensure that the "Front" marking on the plastic boot is facing out, with the arrow .pointing towards the front of the scanner.

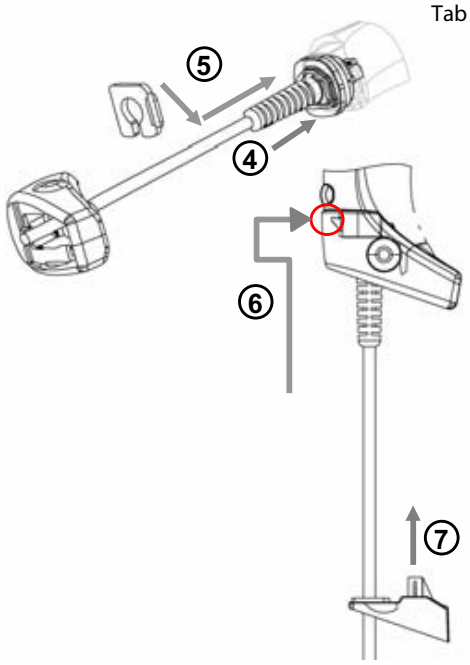
④ Insert the cable into the socket of the plastic boot.

⑤ Insert the cable spacer into the cable wire and slide it towards the handle.

⑥ Push the cover along the cable towards the reader, and hook it over the yellow "tooth".

⑦ Insert the strain relief into the cover and tighten the screw to fix the whole assembly to the reader handle.





Attach the scanner to the tester's USB port (front or rear) and cycle the tester power so that it can recognize that the scanner is attached. Us the scanner to scan the codes below to configure the scanner.

Scan the following bar codes, in order:

- Restore Default
- Interface Selection
- Data Format Terminator
- Language.

(The Language must correspond to the language that is selected in the Program Mode > System Options > General Tab > Language.)

Please refer to the *Quick Reference Guide* that is packed with the scanner for additional information about operating the scanner.

RESTORE DEFAULT

RESTORE DEFAULT

INTERFACE SELECTION

USB-COM

DATA FORMAT TERMINATOR

CR-LF

LANGUAGE

Select the language that is
set in the QmR's **Program Mode > System Options > General > Language screen**

Deutsch

English

Czech Republic

Français

Russian (Latin)

Hungarian

Italiano

USA (Default)

Español

Svenskt

Japanese

Slovenian, Croatian, Serbian (Latin)

Romanian

8.13 Internal Clock Battery Replacement

All but the earliest Qualitek mR testers have a user-replaceable Lithium button battery; Panasonic BR2330 or equivalent. The battery is used to retain the clock time across power cycles. When the battery weakens, the time will have to be set when powering up.

The battery only affects time-keeping and not the tester programming. The tester may still perform tests, although the current time will have to set by the user each time the tester is restarted.

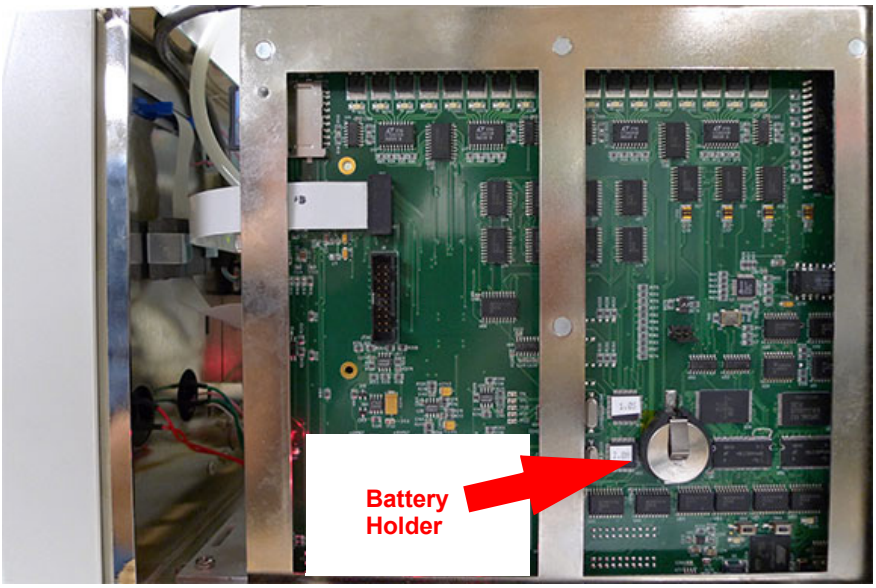
The earliest versions of Qualitek mR have a soldered-in battery. The tester can be returned to Uson for battery replacement or, if requested, Uson will ship a new battery and battery holder to the user for installation on-site.

Instructions for battery replacement for battery-holder models and soldered-in models are given below.

8.13.1 Replacing the Battery in Battery-Holder Models

To replace the battery:

1. Remove power from the tester.
2. Remove the cover.
3. Slide the battery out of the holder.
4. Replace the battery (positive side of battery faces away from the holder.)
5. Replace the cover and restore power.
6. When the unit has completed its boot-up, go to the Hardware Setup > Clock screen and reset the time.

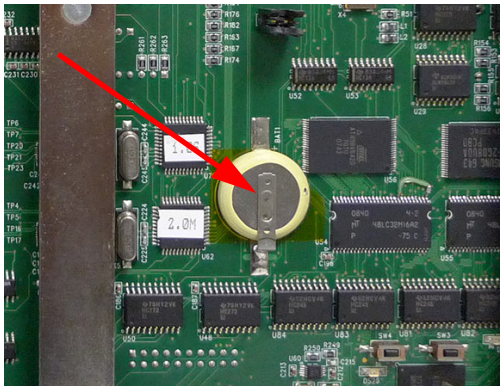


8.13.2 Replacing Soldered-In Batteries

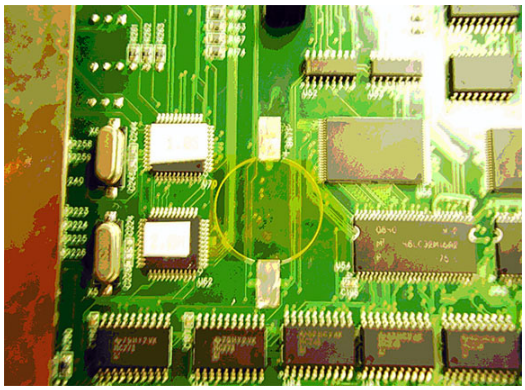
The following instructions are for those who wish to install a battery holder themselves and replace the battery.

1. Ensure the tester is powered off.

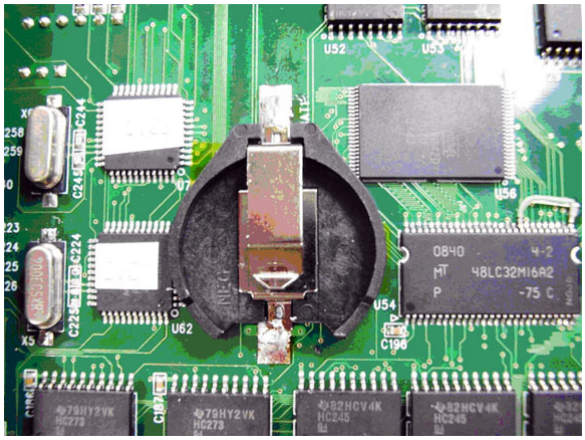
2. Remove the outer cover from the QMR tester and locate the battery on the printed circuit board (PCB).



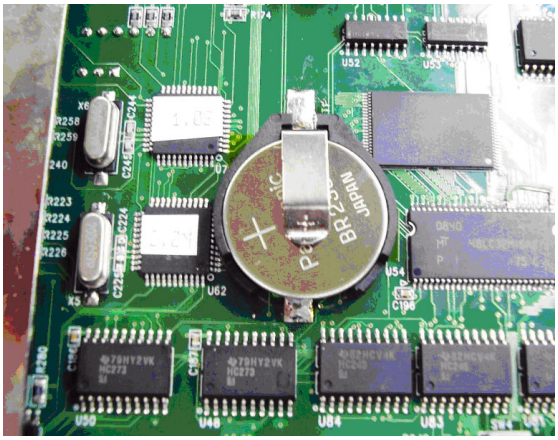
3. Use a soldering iron and remove the battery from the PCB and clean the solder pads.



4. Solder the provided battery holder onto the PCB, making sure the '+' on the holder goes to the '+' pad on the PCB.



5. Insert the provided battery into the battery holder making sure the '+' on the battery is facing up.



6. Replace the outer cover on the tester and power on the unit. When the unit has completed its boot-up, go to the Hardware Setup > Clock screen and reset the time.

8.14 Pneumatics Operation

The tester employs electrically controlled pneumatic valves to supply compressed air (or other gas) for leak testing a component.

The valves operate in a programmed sequence to pressurize a test component and a reference component or chamber. The test and reference components are then isolated from each other and a differential transducer is used to monitor the pressure difference between the two ports. A leak in the test component results in a pressure change, which is used to decide whether a leak in the test component is within a specified tolerance.

8.14.1 Key Components

The illustrations on the following pages show the pneumatic operation in the steps of a typical pressure decay test using a differential pressure decay tester. The key components shown in the diagrams are:

Combination Valve (also called a Combi-Valve)
The Combination Valve comprises the Fill/Vent and Equalization valves.

Fill/Vent Valve:

The Fill/Vent valve has 3 states.

A: Fill, selects the pressure regulator to pressurize the test component.

B: Isolate, locks or holds the pressure within the test component.

C: Vent, vents the pressure within the test component to the atmosphere.

Equalization Valve:

The Equalization valve has 2 states.

A: Open, provides a flow path from the Fill/Vent valve to the test component via the test and reference ports.

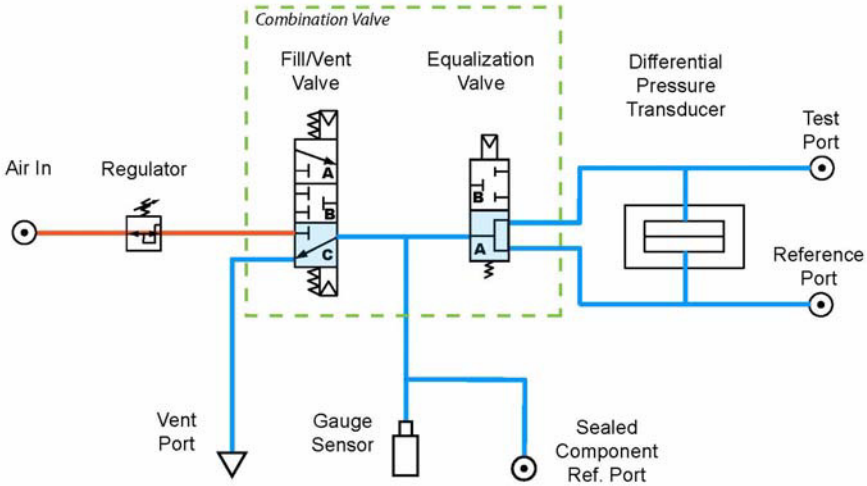
B: Closed, isolates the individual test port, reference port, and Fill/Vent valve from each other.

Differential Pressure Transducer
Monitors the pressure difference between the test and reference ports during the measure step and is used to determine the magnitude of leakage of a component connected to the test port.

Gauge Sensor
The gauge sensor transducer measure the test pressure applied to the test component and is used to check the pressure is within the preset tolerance.

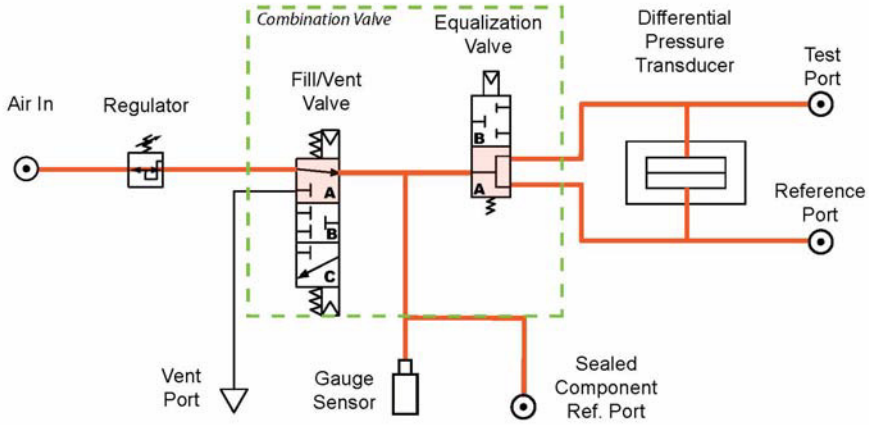
Regulator
An electronic or manual regulator supplies the required test pressure.

Step: Autozero



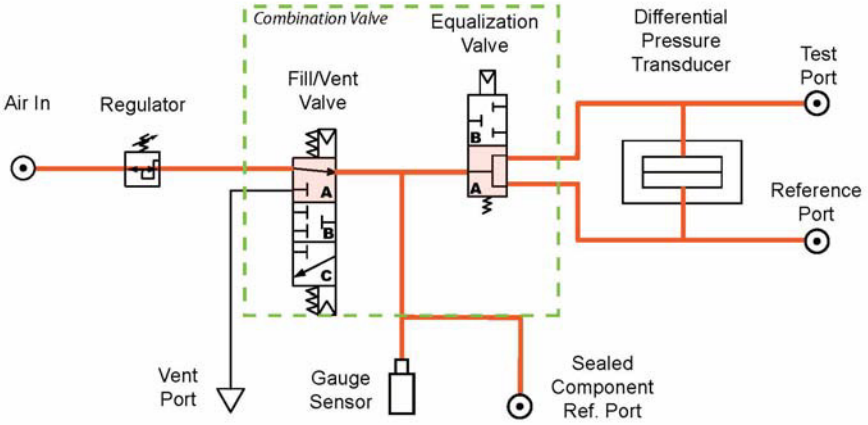
VALVE \ STEP	Autozero	Fill/Evac 1	Fill/Evac 2	Stabilize	Equalize	Measure	Vent
Fill/Vent Valve	C	A	A	B	B	A	C
Equalization Valve	A	A	A	A	B	B	A

Step: Fill/Evac 1



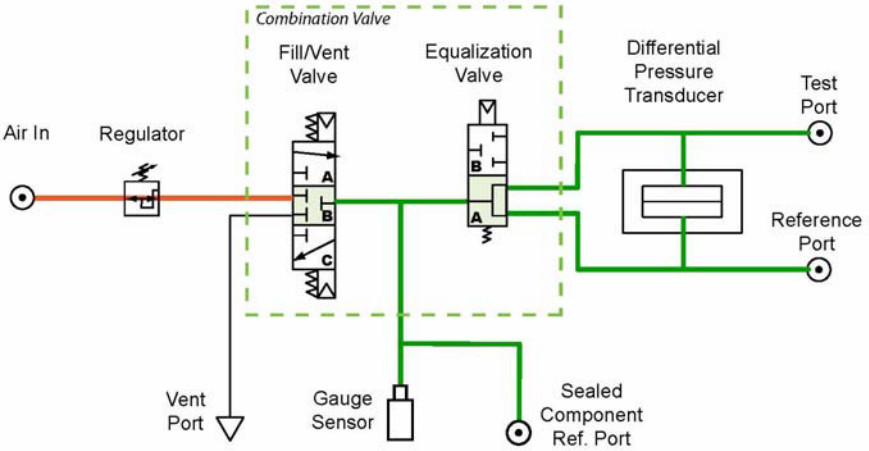
VALVE \ STEP	Autozero	Fill/Evac 1	Fill/Evac 2	Stabilize	Equalize	Measure	Vent
Fill/Vent Valve	C	A	A	B	B	A	C
Equalization Valve	A	A	A	A	B	B	A

Step: Fill/Evac 2



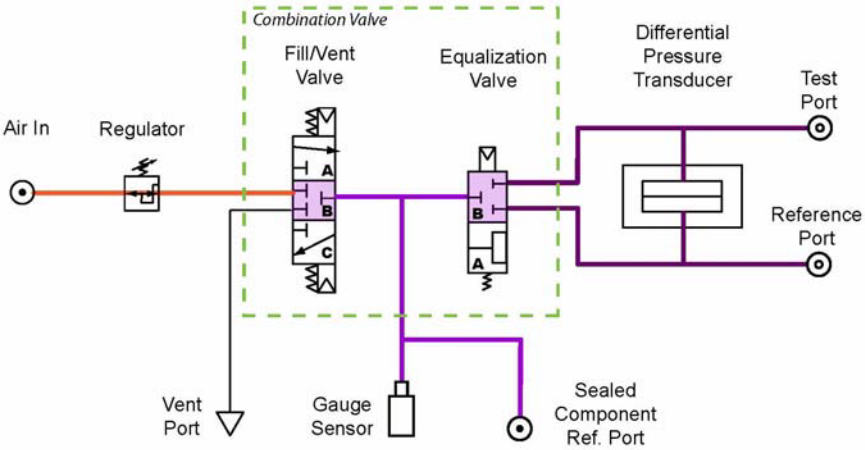
VALVE \ STEP	Autozero	Fill/Evac 1	Fill/Evac 2	Stabilize	Equalize	Measure	Vent
Fill/Vent Valve	C	A	A	B	B	A	C
Equalization Valve	A	A	A	A	B	B	A

Step: Stabilize



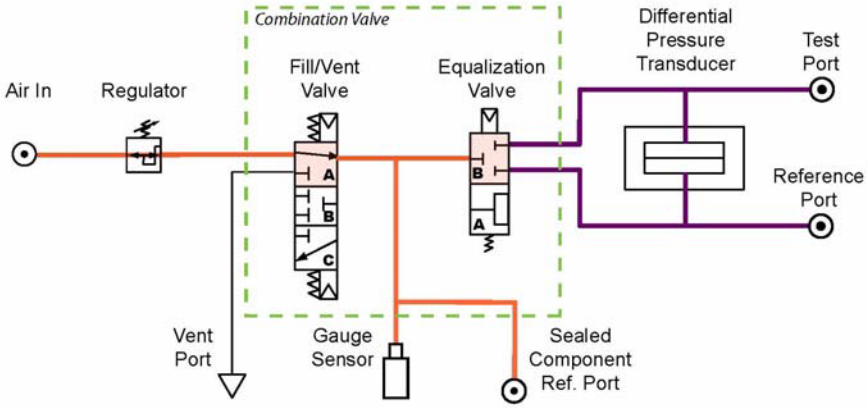
VALVE \ STEP	Autozero	Fill/Evac 1	Fill/Evac 2	Stabilize	Equalize	Measure	Vent
Fill/Vent Valve	C	A	A	B	B	A	C
Equalization Valve	A	A	A	A	B	B	A

Step: Equalize



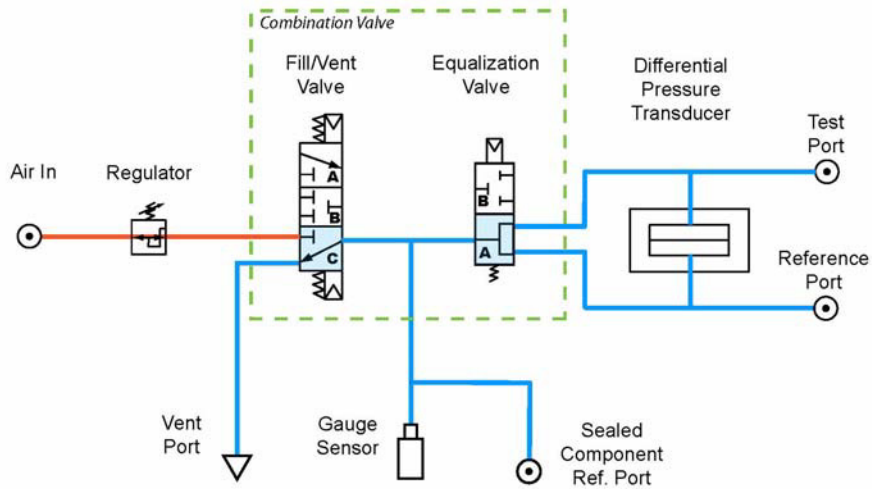
VALVE \ STEP	Autozero	Fill/Evac 1	Fill/Evac 2	Stabilize	Equalize	Measure	Vent
Fill/Vent Valve	C	A	A	B	B	A	C
Equalization Valve	A	A	A	A	B	B	A

Step: Measure



VALVE \ STEP	Autozero	Fill/Evac 1	Fill/Evac 2	Stabilize	Equalize	Measure	Vent
Fill/Vent Valve	C	A	A	B	B	A	C
Equalization Valve	A	A	A	A	B	B	A

Step: Vent



VALVE	STEP: Autozero	Fill/Evac 1	Fill/Evac 2	Stabilize	Equalize	Measure	Vent
Fill/Vent Valve	C	A	A	B	B	A	C
Equalization Valve	A	A	A	A	B	B	A

8.14.2 Pressure Change Calc. (Leak Rate)

For test types such as Leak Rate, Qualitek mR calculates the leak rate from the pressure change over time using values derived from the following formulae.

Variable Definitions for the Calculations:

CalRate = Leak Master Leak Value (user-entered value)
Tare = Measure at the Start of a Step
EndMeasure = Measure at the End of a Step

Compensation:

$$\textbf{Comp Value} = \textbf{EndMeasure}_{\textbf{comp}} - \textbf{Tare}_{\textbf{comp}} \textbf{ (using non-leaking master part)}$$

Calibration:

$$\textbf{Cal Value} = \textbf{EndMeasure}_{\textbf{cal}} - \textbf{Tare}_{\textbf{cal}} - \textbf{Comp (using Leak Master)}$$

Test:

$$\mathbf{Leak} = \frac{(\mathbf{EndMeasure}_{\mathbf{test}} - \mathbf{Tare}_{\mathbf{test}} - \mathbf{Comp})}{\mathbf{Cal}} \times \mathbf{CalRate}$$

The **Comp Value** and **Cal Value** can be seen (and edited) on the Leak Calibration Menu.

The concept previously known to many as the "comp/cal ratio" is employed in the Qualitek mR as the **Pneumatic Signal/Noise Ratio (**PSN ratio). Like the Comp Value and Cal Value, the PSN ratio appears on the Calibration screen.

8.14.2.1 Pneumatic Signal/Noise Ratio

The larger the PSN Ratio, which is the calibration value divided by the **c**ompensation value, the more repeatable the test will be. The PSN Ratio can be as small as 0.5 if ±10% test repeatability is sufficient. The screen suggests ideal values.

So for pressure decay tests, the following rules are strongly recommended:

Comp Value less than or equal to 3 times the Cal value

PSN Ratio (Cal / Comp) ≥ 0.2

Cal Value ≥ 0.05% of full scale of the sensor

For PSN Ratio, the larger the better. Longer test times typically yield a larger PSN Ratio.

If the Comp Value is set to zero, the PSN Ratio will cannot be computed.

8.15 Concepts Applicable to Testing

Pressure

In physics, pressure is a force measured in terms of its distribution over an area of an opposing force. This is expressed as force (F) divided by unit area (A) of the surface area to which the force is applied. Air pressure most commonly refers to a force exerted uniformly in all directions. Force X Area = pressure.

Absolute pressure is pressure measured with respect to zero pressure (a very high vacuum)

Gauge pressure is pressure measured with respect to surrounding air pressure (the pressure exerted by the weight of the atmosphere).

Barometric pressure is the surrounding pressure caused by the atmosphere. At average sea level, barometric pressure is about 14.7 pounds per square inch, or 29.9 inches of mercury. This is equivalent to 101.3 Kilopascals.

Negative Pressure (Vacuum)

A vacuum can be defined as a volume of space that contains no matter. For practical purposes, this means a volume where as much matter as possible has been removed. A perfect vacuum does not exist even in the depths of space. Any given volume will probably contain one or more particles of matter or one or more units of energy, which is the equivalent of matter (relativity). Even a vacuum with no measurable energy level is only a “virtual” vacuum.

Air Composition

The atmosphere is composed almost entirely of oxygen and nitrogen in their diatomic forms (two atoms bound together by chemical forces). Diatomic nitrogen makes up about 78% of the total molecules in the atmosphere. Diatomic oxygen represents nearly 21%. The inert noble gas, argon, accounts for about 0.9%, and the remaining 0.1% is composed of many trace gases, the most significant being carbon dioxide and water vapor. Carbon dioxide makes up only 325 parts per million of the atmosphere by volume. Water vapor is present in highly variable quantities ranging from 0 to 4% by volume.

Air Density

If the atmosphere were like water and incompressible, pressure would decrease uniformly as you went up. In reality, the atmosphere is compressible and density (mass per unit volume) is proportional to pressure. This relationship, called Boyle’s Law, implies that density decreases with height in the atmosphere: As height increases, less mass remains above a given point; therefore less pressure is exerted. At sea level, the density of air is about 1 kg per cubic meter (8 oz. per cubic foot). Both pressure and density decrease by about a factor of 10 for every 16 km (10 miles) increase in altitude.

Density does not depend solely on pressure. For a given pressure, density is inversely proportional to temperature. This relationship, known as Charles’ Law,

implies that the depth of an air column bounded by two constant-pressure surfaces will increase as the temperatures in the column decreases.

Density varies mostly with pressure over large vertical distances; at constant height, pressure variation with temperature becomes important. In the low atmosphere, air is heavy, with a stable mass of roughly one kilogram per cubic meter (1 oz/cubic foot). A room of 500 cubic meters (650 cubic yards) thus contains 0.05 metric ton of air. At an altitude of 3 km (2 miles), however, density is 30% less than at sea level.

This difference in air density can cause variations in flow readings from one location to another when elevations are quite different and no corrections are made.

Qualitek mR measures true air flow in units standardized to 29.92 inHg (14.68 psi) at 20 degrees C. Although the Qualitek mR's measurements are accurate and traceable to NIST standards, flow readings could be different if the tester is used at drastically different altitudes. This is not a tester fault; rather, conditions have changed and Qualitek mR measures this difference. At a high altitude, air is less dense than air at a lower elevation. When compressed to the same relative pressure, the air will exhibit a density shift when compared with air compressed to the same relative pressure at a lower level.

Difference in air density is the primary reason users can observe slightly different results when temperature and gauge pressures are identical. For this reason, it is important to establish all test parameters at the same altitude and under the same conditions in which the tester will be used.

Compensation may be necessary to reconcile air density variations between the two locations if measurements are made at different altitudes.

Compensation %

A high compensation % may indicate a high comp value and may not be a valid test. The Compensation % = (comp / (comp + cal)) * 100.

Fluids vs. Solids

The distinguishing feature of a fluid (gas or liquid), in contrast to a solid, is how easily the fluid can be deformed. If a shearing force, even a very small force, is applied to a fluid, the fluid will move and continue to move as long as the shear acts on it. For example, the force of gravity causes water poured from a cup to flow. Water continues to flow as long as the cup is tilted. If the cup is turned back up, the flow stops because the gravitational force is then exactly balanced by force of the cup wall.

Gas vs. Liquid

Unlike liquids, gases cannot be poured from one open container into another, but they deform under shear stress just the same. Because shear stresses result from

relative motion, stresses are equivalent whether the fluid flows past a stationary object or the object moves through the fluid.

Although a fluid can deform easily under an applied force, the fluid's viscosity creates resistance to this force. The viscosity of gases, which is much less than that of liquids, increases slightly as the temperature increases, whereas that of liquids decreases when the temperature increases. Fluid mechanics is mostly concerned with Newtonian fluids, or those in which stress, viscosity, and rate of strain are linearly related.

Pressure and Density

Pressure and density are considered mechanical properties of the fluid, although they are also thermodynamic properties related to the temperature and entropy of the fluid. For a small change in pressure, the density of a gas is essentially unaffected. For this reason, gas and all liquids can be considered incompressible. If density changes are significant in flow problems, however, then the flow must be considered compressible. Compressibility affects results when the speed of the flow approaches the speed of sound.

Fluid Flow-Real Fluids

Equations concerning the flow of real fluids are complex. In turbulent flow, the equations are not completely known. Laminar flow is described by the Navier-Stokes equations, for which answers can be derived only in simple cases. Only by using large computers can answers be derived in more complex flow situations. Experimentation is still important for fully correlating theory with actual flow.

Laminar vs. Turbulent Flow

When flow velocity increases, the flow becomes unstable, and changes from laminar to turbulent flow. In turbulent flow, gas particles start moving in highly irregular and difficult-to-predict paths. Eddies form and transfer momentum over distances varying from a few millimeters, as in controlled laboratory experiments, to several meters, as in a large room or other structure. Equations for turbulent flow are more complex than the formulas for laminar flow. For most answers, they require empirical relations derived from controlled experiments.

Whether a flow is laminar or turbulent generally can be determined by calculating the Reynolds number (Re) of the flow. The Reynolds number is the product of the density (designated by the Greek lower-case letter rho {D}), a characteristic length L, and a characteristic velocity v, all divided by the coefficient of viscosity (designated by the Greek lower-case letter mu {:}): **Re = (D)LV/:**

Reynolds Number (Re)

The Reynolds number is dimensionless, a pure number. As long as Re is small, the flow remains laminar. When the Reynolds number becomes greater than a critical value, the flow becomes turbulent. With rho, L, and mu constant, Re varies simply as velocity changes. For flow in smooth round pipes, critical value is about 2,000, with L equal to the diameter of the pipe.

Pascal's Law

In 1653, Blaise Pascal came up with the idea that in a fluid at rest, the pressure on any surface exerts a force perpendicular to the surface and independent of the direction or orientation of the surface. Any added pressure applied to the fluid is transmitted equally to every point in the fluid. Pascal used his idea to invent the hydraulic press. Pascal's principle is often used in devices that multiply an applied force and transmit it to a point of application. Examples include the hydraulic jack, and the pneumatic cylinder.

Gas Laws

The actions of gases under varying conditions of temperature, pressure, and volume can be described and predicted by a set of equations, or gas Laws. These Laws were determined by measurements of actual gases and are valid for all substances in a gaseous state.

Measurements on gases were first published by Robert Boyle in 1660. He figured out that if an enclosed amount of gas is compressed until it is half its original volume while the temperature is kept constant, the pressure will be doubled. Quantitatively, Boyle's Law is: PV = Constant, where the value of the constant depends on the temperature and the amount of gas present.

Relationships between the temperature of the gas and its volume while keeping the pressure unchanged were studied by Jacques Charles. He saw a steady increase in the volume as the temperature went up, finding that for every degree Celsius rise in temperature, the gas volume increase by 1/273 of its volume at zero degrees C.

Charles's Law and Kelvin Temperature

Charles's observations led to the absolute (Kelvin) temperature scale, since the gas, according to the equation, would have zero volume at -273 degrees C. The absolute temperature scale was defined by Kelvin so that absolute temperature equals negative 273 degrees C and each absolute degree is the same size as a Celsius degree. The modern value for absolute zero is -273.15 degrees C. This temperature scale allows Charles's Law to be written V/T = Constant, where V is the volume of the gas, T is the temperature on the absolute scale, and the constant depends on the pressure and the amount of gas present.

In 1802, Joseph Gay-Lussac played around with the relationship between pressure and temperature and came up with an equation a lot like Charles's Law: P/T = Constant.

Generalized Gas Law

We can combine Boyle's, Charles's, and Gay-Lussac's Laws to express this generalized gas Law: **PV/T = Constant**, where the value of the constant depends on the amount of gas present and t is the absolute (or Kelvin) temperature.

Ideal Gas Law

The Ideal Gas Law can be written in a slightly different manner from the Generalized Gas Law: **PV/T = nR**, or
PV = nRT. When written this way, it is called the Ideal-Gas Law. R is the gas constant, and n is the number of moles of gas. The gas constant can be examined experimentally as R = 0.082 liter atm/Kelvin moles. Knowing R, the fourth variable can be evaluated if any three are known.

The gas Laws are valid for most gases at moderate temperatures and pressures. At low temperatures and high pressures, gases deviate from the above Laws because the molecules are moving slowly at low temperatures and they are closer together on the average at higher pressures.

Ideal vs. Real Gas

Gases are typified as ideal or real. The ideal gas follows certain gas Laws exactly, whereas a real gas closely follows these Laws only at low density. Ideal behavior can be ascribed to a real gas if its molecules are separated by very large distances, so that intermolecular attraction is negligible.

Adiabatic Process

(ad-ee-uh-bat-ik)

Adiabatic compression and expansion are thermodynamic processes in which the pressure of a gas is increased or decreased without any exchange of heat energy with the surroundings. Any process that occurs without heat transfer is called an adiabatic process.

The adiabatic compression or expansion of a gas can occur if the gas is insulated from its surroundings or if the process takes place quickly enough to prevent any significant heat transfer. This is essentially the case in a number of important devices, including air compressors.

An adiabatic expansion is usually accompanied by a decrease in the gas temperature. This can be observed in a common aerosol can, which becomes cold after some compressed gas is released. The reason for the temperature drop is that the gas is released too quickly to absorb any significant heat energy from its surroundings. Work performed in expanding the released gas drains some internal energy of the gas still in the can, making it colder. After the can metal becomes cold, however, the process is no longer adiabatic.

In a similar fashion, adiabatic compression usually increases the temperature of a gas, since work is done on the system by the surroundings. For example, when air is pumped into an automobile tire, the air temperature rises as a result of adiabatic compression.

8.16 Terminology Reference

Abort a test, how to: Press the red STOP button during the test. An aborted test will register on the Tested and Rejects counters.

ASCII: The binary code used for representing characters.

Atmosphere (1): In this guide, atmosphere means room air pressure. Atmospheric pressure is nearly synonymous with barometric pressure-an external force pushing on all sides of every object on earth's surface. During a flow test, product being tested must flow into atmosphere, which causes a resistance to flow called back pressure. Room atmosphere can change due to fluctuations in air conditioning or changing weather conditions.

Atmosphere (2): The word atmosphere can refer to a unit of measure equal to pressure at average sea level. By convention, one atmosphere equals 14.7 psi. To say a test was taken at one atmosphere means the test was made at (or converted to) average sea level.

Bar: A unit of pressure approximately equal to sea level air pressure. In some parts of the world, atmospheric pressure is often expressed in millibars (mbar).

Barometric Pressure: Also called atmospheric pressure. The force of air pressing down on the earth. Barometric pressure changes with elevation and weather conditions. Qualitek mR's regulator compensates for changes in barometric pressure to provide a constant relative output.

Bulkhead Fitting: A connection passing through a panel or enclosure. The standard bulkhead on the front has a #10 by 32 pitch machine thread.

Cal Value: Cal Value = Pressure change during the leak test step with a calibrated leak master – the Comp Value.

Comp and Cal: Leak rate calibration

Compensation %: = (comp / (comp + cal)) * 100

Comp Value: Pressure change during the leak test step with a non-leaking master

Concurrent: Testing multiple ports or multiple parts at the same time is known as concurrent testing. If the tester has multiple test ports and tests them all at the same time, it is called a concurrent tester. See Sequential.

Contrast: The contrast of the LCD can be adjusted for the best viewing using the Display Contrast setting in the Setup Menu.

Counters: Qualitek mR uses counters to maintain totals of the number of tests performed and their results. Counters may be cleared from the Program Mode Data Management tab or in Run Mode Statistics.

Coupling Port: The coupling port supplies air pressure to product sealing fixtures or other external pneumatic components.

Coupling Pressure: The air pressure supplied to external fixtures. Coupling pressure must be greater than the test pressure and the same as the incoming line pressure unless additional pneumatic components are added.

Coupling Time: A delay timer used to apply a clamp or seal to product under test before the product is filled with air. Coupling time gives fixtures enough time to seal product before Qualitek mR applies test pressure.

Coupling Valves: The coupling valves can be programmed to allow automated testing of parts that have special sealing and/or connection requirements. An example would be a test part that has multiple ports to be sealed in a particular order or in different combinations for different tests in a sequence. This is common for check valves or parts that incorporate a check valve. A given port may need to be sealed in one test and then open in another test to verify that the check valve will open in one direction and close in the other. This may require that more than one coupling valves activate at the same time and is then one is released in a subsequent test.

Crack Test: A crack test is setup to measure the pressure at which a product, like a check valve, opens and allow air to flow through. It is used with parts that do not open quickly enough to cause a drop in the upstream pressure. An optional downstream sensor is required to measure a device that opens very slowly. Crack testing differs from burst testing because the product does not suddenly drop to zero pressure as in a burst test.

Decay Test: A test type which may be either a pressure decay or vacuum decay test.

Decay: The amount of pressure change a product can sustain during a test period before going out of an established tolerance. This applies to both pressure and vacuum decay testing.

Equalize Step: The Equalize step operates the equalize valve which, for a time determined by the step time, operates the equalization valve which allows the chambers of the differential transducer to adjust to tare.

Electronic Regulator: An optional device that automatically adjusts the test pressure to a preset value. Multiple test programs with multiple test pressures may be linked together if this option is installed. It also provides a way to avoid having the operator manually adjust the pressure for different test pressures.

Evacuate Time: The time duration to apply a vacuum to the test product in tests such as a decay test (vacuum).

Event: The instant pressure drops below the event value during a burst or creep test. Qualitek mR monitors pressure during a burst test or creep test and holds the maximum pressure value measured before the event (pressure drop) occurred.

Factory-Configured Programs: Uson ships Qualitek mR with a few programs already set up out of the 100 positions available to hold test programs. These programs can be retained, modified, or replaced as desired.

Fill Time: The time duration to apply test pressure to the product in tests such as a decay test (pressure).

Firmware: The set of instructions stored in programmable read-only memory (PROM) that tells Qualitek mR how to operate. Firmware cannot be altered by the customer.

Firmware Version (finding): The version of firmware running Qualitek mR is briefly displayed in the startup screen when the tester is first turned on and is also visible on the Program Mode screen.

Fixturing: A fixture is a device connected externally to Qualitek mR. Fixtures can be mechanical, electrical, pneumatic, or combinations of all. Typical fixtures are pneumatic clamps that seal products during a pressure decay or flow test. Qualitek mR can supply air from the coupling ports to operate pneumatic fixtures. Customers must specify at order whether they want coupling pressure to be line or test pressure. Many fixturing options are possible.

Flow Master: A measuring instrument or certified restrictor that can be connected to Qualitek mR as part of the sensor calibration for flow. The flow standard must have adequate accuracy, stability, and repeatability needed to calibrate Qualitek mR. The flow standard must have current calibration documentation if the customer requires accuracy traceability.

Flow: The amount of air passing through an object measured in cubic centimeters or liters per time period (minute, second, or hour).

Flow Transducer: A device that converts gas flow into electrical signals. The type of transducer used in Qualitek mR is a mass flow transducer, which is both accurate and compensated for room temperature influences.

Flow Test: A set pressure is used to push air through a product and measure the resultant flow sensor. Flow testing can be used in three ways:

1) Flow Leak Detection: Product is filled with air at a set pressure and then sealed from atmosphere in a pressure decay test. Any flow above zero indicates a leak.

(2) Flow Measurement: Air is pushed through a product at a set pressure and allowed to flow to atmosphere. The amount of air movement through product is measured by the flow sensor. Qualitek mR's digital readout shows flow rate in units that can be selected by the customer.

(3) Back-Pressure Flow Test: Many devices are constructed with large passages that not only must remain open, but must also be open a minimum amount to function normally when in use. In some cases, the large passages

have a sufficient tolerance making more precise testing unnecessary, such as mass flow. The part is continuously pressurized while air escapes to atmosphere through the tested passages. The residual pressure (back-pressure) at the inlet of the part is measured and must remain within a specific range of pressure defined by maximum and minimum limits to pass the test.

Force Decay Test: During the fill (evacuate) step, the air evacuates in the chamber around a package, causing the internal pressure of the package to expand. This expansion is measured by the force sensor; any decay in the measurement will indicate that the package is leaking.

Gauge Pressure: A force referenced to barometric pressure. Qualitek mR uses a gauge regulator to keep the pressure constant as barometric pressure changes.

Gross Leak: A leak that causes a drop below the negative pressure error during the stabilization phase. Typically, when a product under test has a gross leak, pressure cannot build high enough to reach test pressure. If Qualitek mR indicates a gross leak in good products, a larger pressure error value may be needed. This is often the case when testing large product or products constructed of flexible materials. See Pressure Error.

Hardware Calibration: A sometimes-used term for sensor calibration.

Help: Get technical help from Uson by calling **+1 281-671-2222**. Help is available during normal business hours in the Central Time Zone of the USA.

Interface Communication: between Qualitek mR and a peripheral device such as a PLC, computer or printer. Qualitek mR has many interface options such as an I/O port for discrete communication, an ethernet port, and serial port for test result output. The serial port uses a serial protocol known as RS-232 to communicate. The interface is setup in the Serial Port Menu reached through the Hardware Menu.

I/O (Input/Output): Devices or connections used by computers and Qualitek mR to communicate with other devices such as Programmable Logic Controllers (PLCs). See PLC

Jump: In the Test Parameter Menu use the Jump Menu to link programs in a variety of ways.

Keypad: The 5 blue buttons on Qualitek mR's front panel used to enter program values and other setup information.

LCD: Abbreviation for liquid crystal display. Qualitek mR's display is an LCD touch-screen device that provides setup prompts, menu options, test results, and other system information.

Leak Calibration: (Sometimes called Comp and Cal or Test Calibration) Leak Calibration is only required if a leak rate is to be computed and not just a pressure change. Leak Calibration requires a master, non-leaking part and a certified leak master with a known leak rate at a specified pressure.

Leak Rate: A pressure drop over time can be stated as a leak rate. For example -0.02 psi per second is a leak rate. A leak rate can also be stated in flow units, such as 4 cc/minute.

Leak Test: See Pressure Decay Test, Flow Test.

Line Conditioner: An optional device external to Qualitek mR that filters out noise from the AC power line input. Line conditioners are especially useful when Qualitek mR is connected to automated machines that produce electrical noise.

Linked Programs: Two or more programs can be linked (consecutively connected) to perform multiple actions during a single test cycle. For example, a flow program can be set to follow a decay program so that when the operator presses the START switch, Qualitek mR runs through a flow test then goes to a decay test. If the product goes out of parameter at any point in either test, the fail light turns on and the test ends.

Measurement Units: See Units of Measure.

NIST: National Institute of Standards and Technology (USA)

Occlusion Test: Occlusion testing is used to test products open passages by trapping pressure inside a product and then measuring an expected pressure loss.

Operator: The person who attaches products to Qualitek mR, presses the START button, and monitors the test. For the purposes of this guide, the operator is separate from the user. Users typically handle Qualitek mR's setup and programming.

Pascal: The Standard International unit for pressure. A Pascal (Pa) is equal to one Newton per square meter.

PLC: Abbreviation for Programmable Logic Controller. Industrial-strength computers designed to accept analog inputs and to provide output for process control. PLC's are used in a variety of automated control situations. Qualitek mR can send discrete test results to and accept signals to tell Qualitek mR when to begin a test from a PLC through the tester's I/O port. Qualitek mR can also send quantified test results over its RS-232 output.

Pressure Decay: Also called pressure drop or delta pressure. The pressure change from the first measurement to the last measurement made during the test phase of a test. See Reject Level.

Pressure Decay Test: Pressure decay testing is used to test products for leaks by trapping pressure inside a product and then measuring pressure loss. The abbreviation P Decay is often used in this guide to refer to pressure decay.

Pressure Error: Pressure setpoints above and below test pressure.

Pressure Standard: A precision measuring instrument that can be connected to Qualitek mR as part of sensor calibration for pressure or flow. The pressure standard must have the required accuracy, stability, and repeatability to measure Qualitek mR's output. The pressure standard must have current

calibration documentation if the customer needs to prove accuracy traceability.

Pressure: The relative force of a compressed air or gas. Qualitek mR is generally configured to use PSIG, which is the force of compressed gas relative to barometric pressure.

Pressure Transducer: An electro-mechanical device (also called a sensor) that converts pneumatic pressure into electrical signals. Qualitek mR's pressure transducers are rugged, accurate, repeatable, and have a very low internal volume.

Programming: Entering values to setup the tester. Also called setup or data entry.

Program: Data (such as test pressure, test time, and reject levels) entered by the user and stored in nonvolatile RAM. A program is setup in Qualitek mR's parameters screen. When multiple programs are linked, the programs become a test cycle. See also Stored Programs.

PSIG: Pounds per Square Inch Gauge. A unit of measurement for air pressure measured with respect to local atmospheric pressure.

Pneumatic SNR: Pneumatic Signal/Noise Ratio. The larger the PSN Ratio, which is the Cal Value divided by the Comp Value, the more repeatable the test will be. The PSN Ratio can be in the range of 0.2 to 0.25 if ±10% test repeatability is sufficient.

Ramp Up: To slowly increase pressure by routing test pressure through the flow control valve located on the back of Qualitek mR. Various ramp rates can be established by adjusting Qualitek mR's built-in flow control.

Rise Test: A test type which can be either a pressure rise or vacuum rise test. The results are expressed as a positive value if the pressure change is in the expected direction or negative if otherwise. E.g., a typical pressure decay test will have a positive value consistent with a positive pressure delta where the pressure is actually decreasing.

RS-232: A serial communications protocol used by most computers and computer peripherals. Qualitek mR uses an RS-232 protocol to send test result data to printers and computers.

Run: When the security lock is in the horizontal position, Qualitek mR is in Run Mode. Qualitek mR is set to run when used in production testing. The only other keyswitch condition is Program Mode (security lock in vertical position).

Run Display: The Run Display is the screen visible when the lockout key is in run (horizontal) position. This display is visible to the operator during testing.

Sealed Component Test: If a test component is completely sealed, and has no ports or openings, it can be tested using the sealed component method. The component is tested by placing it in a custom-built test chamber. The

chamber should be constructed so that the internal volume of the chamber is only slightly greater than the volume of the test component. This test is available on the Gauge Pressure Decay model Qualitek mR.

SCCM: Abbreviation for Standard Cubic Centimeters per Minute. This is a flow measurement standardized to 68 degrees Fahrenheit and 14.7 psi (average sea level)

Security lock: This key-operated switch locks out operators from Qualitek mR's Program Mode functions. The only way to access programming screens is to use the key and turn the switch to program (vertical) position.

Sensor: Qualitek mR uses sensors to detect the quantities to be measured.

Sensor Calibration: Comparison of a device (such as Qualitek mR) to a standard that is in turn calibrated to an even more accurate standard. Performed by Uson.

Sensor Calibration Menu: Sensor calibration is performed by Uson.

Setpoint: A programmable threshold value (usually a minimum and maximum value) used to establish a testing tolerance.

Start Switch: The green pushbutton.

Stop Switch: The red pushbutton. Pressing this switch will always abort a test in progress.

Stored Programs: A set of instructions (parameters) that can be set by the customer to run a variety of tests. There are a total of 100 programs available. Users can alter stored programs to meet specific product testing needs. Programs are configured in Qualitek mR's Test Parameters Menu and are kept in non-volatile RAM.

Supply Air: Qualitek mR's standard fitting is a 1/8 inch female NPT bulkhead. Air must be clean, dry, and free of oil. Unless the tester is a custom, the maximum supply pressure must not exceed the limit shown on the back panel label.

Test Parameter Menu: This menu is the first menu highlighted when the Keyswitch is turned to Program mode. This is the primary menu for entering the values that define the test and how it is to be conducted.

Test Circuit: The pneumatic tubing, fittings, valves, and sensors that make up the internal air passages.

Test Cycle: A test cycle is all Qualitek mR-controlled testing activities that occur from test start to finish. One test cycle can have multiple tests by linking programs in Qualitek mR's linking screen. Multiple tests in one cycle is sometimes called a test series.

Test Phases: Each testing mode has individual phases or intervals of testing.

Test Port: The product to be tested is connected to the test port.

Test Pressure: A positive value indicating the level of air pressure used to inflate the product under test. Test pressure is set by adjusting the air regulator on the back of Qualitek mR. Test pressure can only be set if Qualitek mR has supply air connected and the output port is blocked with a leak-tight cap. This limitation can be overcome with an electronic regulator. See Electronic Regulator

Test Vacuum: A negative value indicating the level of vacuum applied to the product under test.

Timers: Qualitek mR uses microprocessor timers to establish time intervals for a variety of test functions. Time values are set in the parameters screen to control coupling time, fill time, stabilization time, and test time. Timers are calibrated in seconds. See Parameters Screen

Units of Measure: Qualitek mR can display pressure, flow, and time in several user-selectable measurement units. Changing units of measure if made through the Setup Menu which is accessed from the initial Program Mode menu.

USB Security key: A USB device that unlocks capabilities which may be available for the tester. Normally this is used by Uson personnel.

User: For purposes of this guide, the user is the person who sets up and enters test parameters into the Qualitek mR. It is the operator who handles the day-to-day product testing with the Qualitek mR.

Vacuum Error: A negative quantity indicating the magnitude of the vacuum.

Valves: Qualitek mR contains modular solenoid valves that direct the flow of air through the measurement circuits. The number, type, and arrangement of valves in a Qualitek mR tester is dependant on the model and configuration.

Vent: After Qualitek mR completes a decay test, a valve can be activated to open the product and Qualitek mR's internal test circuit to atmosphere. The action of releasing pressure to atmosphere is called vent. If vent is not required (for instance, if you want to unplug product to vent pressure), set Vent time to zero.

Zero and Span: A sometimes-used term for sensor calibration.

9
QmR Modbus

9.1 Introduction

The QmR is optionally provisioned through licensing add-ons to support independent control and monitoring via Modbus. In order for this to function correctly, the system must be properly engineered and installed.

The QmR can communicate with host systems through its serial port, and follows the Modbus communications protocol to allow easy integration into distributed control systems. This document describes the QmR Modbus implementation in three sections, with progressively greater detail in each section:

- Overview
- Data structure
- Modbus Technical reference

9.1.1 Overview

The QmR can communicate with host system through it serial port. The QmR follows the Modbus communication protocol to allow easy integration into distributed control or automated management systems. The QmR acts as a slave to a host system, providing remote access to all data and settings, including the following:

- Operational status
- Operational control
- Events/Alarms
- Test Parameters
- Test Results
- History

***Note*:** Since the QmR is a slave to its Modbus host, the host system must poll the QmR regularly to identify alarms and other changes in status.

QmR provides a mapping feature that allows the user to select the features for accessing data and control. Note that in the “QmR Data Structure” Section, the example is presented as if all data and control features were mapped, which is an unlikely scenario. The “Default Modbus Setup” section provides the default Modbus setup that users can use or modify as required.

9.1.2 Modbus Communications

The QmR external communications serial port can be configured for use as an RS-232 transceiver. The table below summarizes the standard configuration and options.

Standard Configuration	Options
RS-232	None
Full-duplex, no hardware handshaking, 9600 baud	1200 to 57600 baud w/ or w/o hardware handshaking
8 data bits, no parity, 1 stop bit	

9.1.3 Supported Modbus Functions

The QmR provides the Modbus master (host system) with access to many functions that would be available to an operator for selecting, starting, and controlling a test, as well as obtaining results and status information, along with history.

Modbus functions					Type of data	
Read	Write (single)	Write block	Location reference	Modbus description	QmR usage	Field size[1]
1	5	15	0xxxx	Coils	Global commands and settings	1
2		2	1xxxx	Digital inputs	Inputs, Events, & Status	1
3			3xxxx	Input registers	Test results and status	2
4	6	16	4xxxx	Holding registers	Test selection, control	2

1.Number of bytes in RTU (binary) mode.
2.Digital inputs and input registers are read-only; there are no Modbus write functions for those registers.

The QmR supports the RTU (Remote Terminal Unit) Modbus transmission mode with the characteristics outlined in the following table.

Transmission Mode	Beginning of message frame	Data format	Error check	End of frame
RTU	Silence	8 bit binary	CRC[1]	Silence

1. CRC = Cyclical Redundancy Check

9.2 QmR Data Structure for Modbus Access

This section provides a detailed technical reference that maps all QmR data structures to Modbus registers *as an example only.* Any subset of this mapping can be used. The top level categories of QmR data structures are as follows:

- System Control
- System Status
- System Setup
- Test Control
- Test Status
- Test Setup

A default Modbus setup that can be used as-is or a starting point for further modifications using the built-in QmR mapping tool is provided at ***"Default Modbus Setup" on page 9-18.***

9.2.1 Modbus 'Coils': Discrete Closures

System Control – Discrete Closure data structures of the QmR are available to the Modbus Master via Modbus discrete signals ("Coils"). The following tables summarize these control signals with an example mapping. The Modbus Master has read/write access. All of these are Boolean types that have only a 1 or 0 value.

"Coils"	Address (decimal)	Name/description of 8-bit values
00001	1	Start Signal – start the test cycle (1 = start, 0 = ignored)
00002	2	Abort Signal – stop the test cycle (1 = abort 0 = ignored)

9.2.2 Modbus Inputs: Discrete Closures

System Status and Test Status Closure data structures of the QmR are available to the Modbus Master via Modbus discrete signals (Inputs). The following tables summarize these system and test status signals with an example mapping. The Modbus Master has read-only access. All of these are Boolean types that have only a 1 or 0 value.

9.2.3 System Status

Digital Input	Address (decimal)	Name/description of 8-bit values
10001	1	Ready-to-run (1 = ready, 0 = not ready)
10002	2	Start-of-cycle (1 = SOC, 0 = not at SOC)
10003	3	End-of-cycle (1 = EOC, 0 = not at EOC)
10004	4	Busy (1 = busy, 0 not busy)
10005	5	Alarm (1 = Alarm, 0 = no alarm)
10006	6	Pressure OK (1 = ok, 0 = not ok)
10007	7	Isolate (1 = active, 0 = not active)

9.2.4 Test Status

Digital Input	Address (decimal)	Name/description of 8-bit values
10008	8	Test Pass (1 = Pass, 0 = no result)
10009	9	Test Fail (1 = Fail, 0 = no result)

9.3 Modbus 'Input Registers'

Much of QmR data structure is available for mapping to Modbus Input Registers. The default size of a Modbus Input Register is 16-bits, known as an unsigned short. However, multiples of input registers are allocated to represent null-terminated character strings, floats, unsigned long counters, or packed Boolean state variables. This section is broken into categories of QmR data structures with examples of consecutive mappings. Additional descriptions are provided for the layout of various data structures as required. The Modbus Master has read-only access.

9.3.1 System Setup: Factory Configuration: Tester

Input Registers	Address (decimal)	Name/description of 16-bit values
30001	1	Serial Number – uses 6 registers slots (12 characters)
30007	7	QmR Tester Model Type – an enum code (See *"Enum Code Tables" on page 9-12.*)

9.3.2 System & Test Status: Closures

Input Registers	Address (decimal)	Name/description of 16-bit values
30008	8	System Status (Boolean packed binary) Bit0 – Ready-to-run Bit1 – Busy Bit2 – Start-of-cycle Bit3 – End-of-cycle Bit4 – Test Fail **Note:** Salvage is indicated when Bit5 – Test Pass Both Test Pass & Test Fail are set true. Bit6 – Pressure OK Bit7 – Isolate Bit8 – Alarm Bit9 – Run Mode *Bit10 – Run Sub-mode Map Bit 0 *Bit11 – Run Sub-mode Map Bit 1 *Bit12 – Run Sub-mode Map Bit 2 *See *"Table 8 – Run Sub-Mode Map Enum" on page 9-17.*

9.3.3 System Status: Health

Input Registers	Address (decimal)	Name/description of 16-bit values
30009	9	Heartbeat - sequences from 1 to n incrementing at 1 second intervals (unsigned short).

9.3.4 Test Setup: Specification

The following resisters are updated in real-time when each program begins to run.

Input Registers	Address (decimal)	Name/description of 16-bit values
30010	10	Program Number – 1 to 127 (unsigned short)
30011	11	Program Name – 18 registers (null-terminated 36 character string)
30029	29	Test Type – enum code (see Table 2)

9.3.5 Test Status: Counters

Input Registers	Address (decimal)	Name/description of 16-bit values
30030	30	Test Counter – All, 2 registers (unsigned long)
30032	32	Test Counter – Pass, 2 registers (unsigned long)
30034	34	Test Counter – Fail, 2 registers (unsigned long)
30036	36	Test Counter – Salvage, 2 registers (unsigned long)

9.3.6 Test Status: Statistics

Input Registers	Address (decimal)	Name/description of 16-bit values
30038	38	Context – Program Number, 1 to 127 (unsigned short)
30039	39	Context – Units enum code (see Table 3)
30040	40	All – Min, 2 registers (float)
30042	42	All – Max, 2 registers (float)
30044	44	All – Average, 2 registers (float)
30046	46	All – Std. Dev., 2 registers (float)
30048	48	Pass – Min, 2 registers (float)
30050	50	Pass – Max, 2 registers (float)
30052	52	Pass – Average, 2 registers (float)
30054	54	Pass – Std. Dev., 2 registers (float)
30056	56	Fail – Min, 2 registers (float)
30058	58	Fail – Max, 2 registers (float)
30060	60	Fail – Average, 2 registers (float)
30062	62	Fail – Std. Dev., 2 registers (float)
30064	64	Salvage – Min, 2 registers (float)
30066	66	Salvage – Max, 2 registers (float)
30068	68	Salvage – Average, 2 registers (float)
30070	70	Salvage – Std. Dev., 2 registers (float)

9.3.7 Test Status: Results

Input Registers	Address (decimal)	Name/description of 16-bit values
30072	72	Audit Log, 128 registers (up to 256 character null-terminated string)
30200	200	Context – Cycle Number, 2 registers (unsigned long)
30202	202	Time Stamp, 16 registers (32 character null-terminated string)
30218	218	Program Number, 1 to 127 (unsigned short)
30219	219	Test Type, enum code (see Table 2)
30220	220	Channel Number
30221	221	Applied Units, enum code (see Table 3)
30222	222	Applied Value (float)*
30224	224	Result Units, enum code (see Table 3)
30225	225	Result Value (float)
30227	227	Test Code, enum code (see Table 4)
30228	228	Fail/Abort Code, enum code (see Table 5 or Table 6)
30229	229	Test Step Type, enum code (see Table 7)
30230	230	Measure Value [used for comp/cal] (float)
30232	232	Measure Units (see Table 3)

* Initial value at start of measurement step.

9.3.8 Test Setup: Inquire Specification

The following registers are Program #n Specifications and are updated in response when 40039 register (inquire program #n) is written.

Input Registers	Address (decimal)	Name/description of 16-bit values
30233	233	Fill/Evac 1 Target (float)
30235	235	Fill/Evac 2 Target (float)
30237	237	Fill/Evac 1 Min Reject (float)

Input Registers	Address (decimal)	Name/description of 16-bit values
30239	239	Fill/Evac 1 Max Reject (float)
30241	241	Fill/Evac 2 Min Reject (float)
30243	243	Fill/Evac 2 Max Reject (float)
30245	245	Fill/Evac 1 timer (float)
30247	247	Fill/Evac 2 timer (float)
30249	249	Isolate timer (float)
30251	251	Stabilize timer (float)
30253	253	Measure timer (float)
30255	255	Vent timer (float)
30257	257	Limits - Min 1 (float)
30259	259	Limits - Middle (float)
30261	261	Limits - Max (float)
30263	263	Compensation value [master with no leak decay] (float)
30265	265	Calibration Leak Rate (float)
30267	267	Calibration value [master with leak decay] (float)

9.4 Modbus Holding Registers

Modbus Holding Registers are used for QmR System Control and Test Specification. These registers are similar to Modbus Input Registers, except that the Modbus Master has read and write access.

9.4.1 System Control

Holding Registers	Address (decimal)	Name/description of 16-bit values
40001	1	Start, Abort - tester control (Boolean packed binary) Bit0 – Start Bit1 – Abort

9.4.2 Test Setup: Specification

Holding Registers	Address (decimal)	Name/description of 16-bit values
40002	2	Set Program by Number (1 to 127 are valid)
Program #n Specifications to be set when 40039 command is written		
40003	3	Fill/Evac 1 Target (float)
40005	5	Fill/Evac 2 Target (float)
40007	7	Fill/Evac 1 Min Reject (float)
40009	9	Fill/Evac 1 Max Reject (float)
40011	11	Fill/Evac 2 Min Reject (float)
40013	13	Fill/Evac 2 Max Reject (float)
40015	15	Fill/Evac 1 timer (float)
40017	17	Fill/Evac 2 timer (float)
40019	19	Isolate timer (float)
40021	21	Stabilize timer (float)
40023	23	Measure timer (float)
40025	25	Vent timer (float)
40027	27	Limits - Min 1 (float)
40029	29	Limits - Middle (float)

40031	31	Limits - Max (float)
40033	33	Compensation value [master with no leak decay] (float)
40035	35	Calibration Leak Rate (float)
40037	37	Calibration value [master with leak decay] (float)
Commands to inquire and set program parameters		
40039	39	Command: Inquire of Program #n (1 to 127 are valid)
40040	40	Command: Transfer to Program #n (1 to 127 are valid)

9.4.3 Test Control Information

Holding Registers	Address (decimal)	Name/description of 16-bit values
40041	41	Pass Thru Text 1, (null-terminated 18 character string)
40050	50	Pass Thru Text 2, (null-terminated 18 character string)
40059	59	Pass Thru Text 3, (null-terminated 18 character string)

9.5 Enum Code Tables

Table 1 – Tester Model Type Enum

Enum Code	Name/Description
0	Undefined
1	Differential Pressure Decay
2	Pressure Decay
3	Mass Flow
4	Differential Mass Flow
5	Pressure Rise
6	Back Gauge Pressure Flow
7	Back Differential Pressure Flow
8	Force Decay
9	Laminar Flow

Table 2 – Test Type Enum

Enum Code	Name/Description
0	Undefined
1	Pressure Decay
2	Pressure Rise
3	Sealed Component
4	Back-pressure Flow
5	Flow

Table 3 – Common Units Enum

Enum Code	Name/Description
0	Undefined
Pressure Units	
1	Psi
2	Mbar
3	Bar
4	Pa
5	Kpa
6	Mpa
7	Kgcm2
8	Mmh2o
9	Cmh2o
10	Inh2o
11	Mmhg
12	Cmhg
13	Inhg
Mass Flow / Standard Flow Leak Rate Units	
14	Smls
15	Smlm
16	Smlhr
17	Sccs
18	Sccm
19	Scchr
20	Slm
Decay Flow Calibration Units	
21	mls
22	mlm
23	mlhr
24	ccs
25	ccm

26	cchr
27	lm
Temperature Units	
28	Deg c
29	Deg f
30	Deg k
Mm3 Flow Units	
31	smm3s
32	smm3m
33	smm3h
34	mm3s
35	mm3m
36	mm3hr
37	sls
38	slhr
39	ls
40	lhr

Table 4 – Test Code Enum

Enum Code	Name/Description
0	Undefined
1	Pass
2	Fail - use Table 5 to decode fail reason
3	Salvage
4	Abort - use Table 6 to decode abort reason

Table 5 – Fail Code Enum

Enum Code	Name/Description
0	Undefined
1	Fail Limit 1
2	Fail Limit 2
3	Fail Limit 3
4	Gross

Table 6 – Abort Reason Code Enum

Enum Code	Name/Description
0	Undefined
1	Operator
2	PF Over-pressure
3	PF Under-pressure
4	Test Over-pressure
5	Test Under-pressure
6	Valve Driver Output
7	Software Error
8	Tare Error
9	Equalize Valve Error
10	Equalize Zero Error
11	Sensor 1 Error
12	Sensor 2 Error
13	Sensor 3 Error
14	Air Supply Error
15	Step Limit Error
16	Program Input Error
17	Connect Error
18	Sensor 1 Proof Pressure Error

19	Sensor 2 Proof Pressure Error
20	Sensor 3 Proof Pressure Error
21	Sensor Over Range
22	No Result
23	Program Number Error

Table 7 – Test Step Type Code Enum

Enum Code	Name/Description
0	Undefined
1	Coupling 1
2	Coupling 2
3	Autozero
4	Atmos Fill
5	Atmos Iso
6	Atmos Stab
7	Atmos Equal
8	Atmos Measure
9	Connect
10	Pulsefill
11	Pulsecheck
12	Fill/Evac 1
13	Fill/Evac 2
14	Selftest
15	Flow
16	Flowbypass
17	Isolate
18	Stabilize
19	Equalize

20	Measure
21	Reserved (not used).
22	Vent
23	Uncouple 2
24	Uncouple 1

Table 8 – Run Sub-Mode Map Enum

Enum Code	Name/Description
0	Undefined
1	Standard Test
2	Challenge, Idle Mode
3	Challenge, Active Mode
4	Calibrate, Idle Mode
5	Calibrate, Active Mode

9.6 Default Modbus Setup

The default Modbus setup used in QmR uses only Modbus "Input Registers" and Modbus "Holding Register". The following two tables provide the default setup. This can be over-ridden by using the QmR Modbus editor to change the default settings to whatever is desired.

Table 6 – Default Input Register Setup

Input Registers	Address (decimal)	Name/description of 16-bit values
30001	1	QmR Tester Model Type – an enum code (see Enum Table 1)
30002	2	System Status (Boolean packed binary) Bit0 - Ready-to-run Bit1 - Busy Bit2 - Start-of-cycle Bit3 - End-of-cycle Bit4 - Test Fail Bit5 - Test Pass Bit6 - Pressure Ok Bit7 - Isolate Bit8 - Alarm Bit9 - Run Mode Bit10- Run Sub-Mode Map Bit 0 (see Table 8) Bit11 - Run Sub-Mode Map Bit 1 (see Table 8) Bit12 - Run Sub-Mode Map Bit 2 (see Table 8) **Note:** Salvage is indicated when both Test Pass and Test Fail are set True.
30003	3	Heartbeat - sequences from 1 to n incrementing at 1 second intervals (unsigned short)
30004	4	Program Number – 1 to 127 (unsigned short)
30005	5	Program Name – 18 registers (null-terminated 36 character string)
30023	23	Program Type – enum code (see Table 2)
30024	24	Test Counter – All, 2 registers (unsigned long)
30026	26	Test Counter – Pass, 2 registers (unsigned long)
30028	28	Test Counter – Fail, 2 registers (unsigned long)
30030	30	Test Counter – Salvage, 2 registers (unsigned long)
30032	32	Result Units, enum code (see Table 3)

30033	33	Results, 2 registers (float)
30035	35	Test Code, enum code (see Table 4)
30036	36	Fail/Abort Code, enum code (see Table 5 or Table 6)
30037	37	Context – Cycle Number (unsigned long)
30039	39	Time Stamp, 16 registers (32 character null-terminated string)
30055	55	Program Number, 1 to 127 (unsigned short)
30056	56	Test Type, enum code (see Table 2)
30057	57	Channel Number
30058	58	Applied Units, enum code (see Table 3)
30059	59	Applied Value (float)
30061	61	Test Step Type, enum code (see Table 7)
30062	62	Measure Value [used for comp/cal] (float)
30064	64	Measure Units (see Table 3)
The following registers are Program #n Specifications and are updated in response when 40039 register is written.		
30065	65	Fill/Evac 1 Target (float)
30067	67	Fill/Evac 2 Target (float)
30069	69	Fill/Evac 1 Min Reject (float)
30071	71	Fill/Evac 1 Max Reject (float)
30073	73	Fill/Evac 2 Min Reject (float)
30075	75	Fill/Evac 2 Max Reject (float)
30077	77	Fill/Evac 1 timer (float)
30079	79	Fill/Evac 2 timer (float)
30081	81	Isolate timer (float)
30083	83	Stabilize timer (float)
30085	85	Measure timer (float)
30087	87	Vent timer (float)
30089	89	Limits - Min (float)
30091	91	Limits - Middle (float)

30093	93	Limits - Max (float)
30095	95	Compensation value [master with no leak decay] (float)
30097	97	Calibration Leak Rate (float)
30099	99	Calibration value [master with leak decay] (float)

Table 7 – Default Holding Register Setup

Holding Registers	Address (decimal)	Name/description of 16-bit values
40001	1	Start, Abort - tester control (Boolean packed binary) Bit0 – Start Bit1 – Abort
40002	2	Set Program by Number (1 to 127 are valid)
Program #n Specifications to be set when 40040 command is written		
40003	3	Fill/Evac 1 Target (float)
40005	5	Fill/Evac 2 Target (float)
40007	7	Fill/Evac 1 Min Reject (float)
40009	9	Fill/Evac 1 Max Reject (float)
40011	11	Fill/Evac 2 Min Reject (float)
40013	13	Fill/Evac 2 Max Reject (float)
40015	15	Fill/Evac 1 timer (float)
40017	17	Fill/Evac 2 timer (float)
40019	19	Isolate timer (float)
40021	21	Stabilize timer (float)
40023	23	Measure timer (float)
40025	25	Vent timer (float)
40027	27	Limits - Min 1 (float)
40029	29	Limits - Middle (float)
40031	31	Limits - Max (float)
40033	33	Compensation value [master with no leak decay] (float)

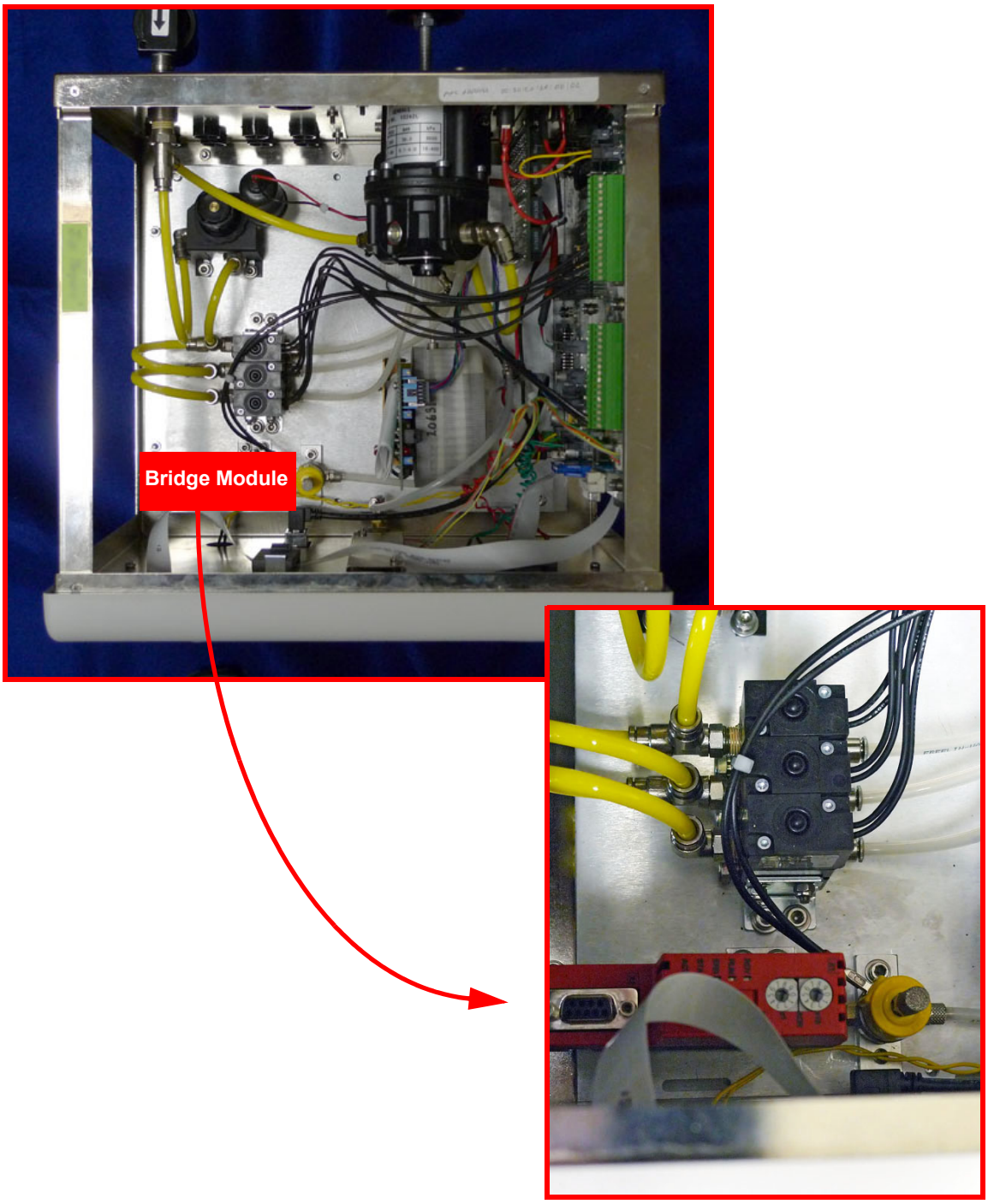
40035	35	Calibration Leak Rate (float)
40037	37	Calibration value [master with leak decay] (float)
Commands to inquire and set program parameters		
40039	39	Command: Inquire of Program #n (1 to 127 are valid)
40040	40	Command: Transfer to Program #n (1 to 127 are valid)
40041	41	Pass Thru Text 1. (Null-terminated 18 character string)
40050	50	Pass Thru Text 2. (Null-terminated 18 character string)
40059	59	Pass Thru Text 3. (Null-terminated 18 character string)

9.7 Default Modbus Registers

The Default MODBUS registers are used to assist in setting up communication requirements. Once the option to connect to a manufacturing Fieldbus has been purchased, the QmR connects using a specific gateway determined by network type. The Fieldbus option allows connection to Profibus, Profinet, Ethernet IP and DeviceNet through a gateway, or directly to the COM port if choosing MODBUS only.

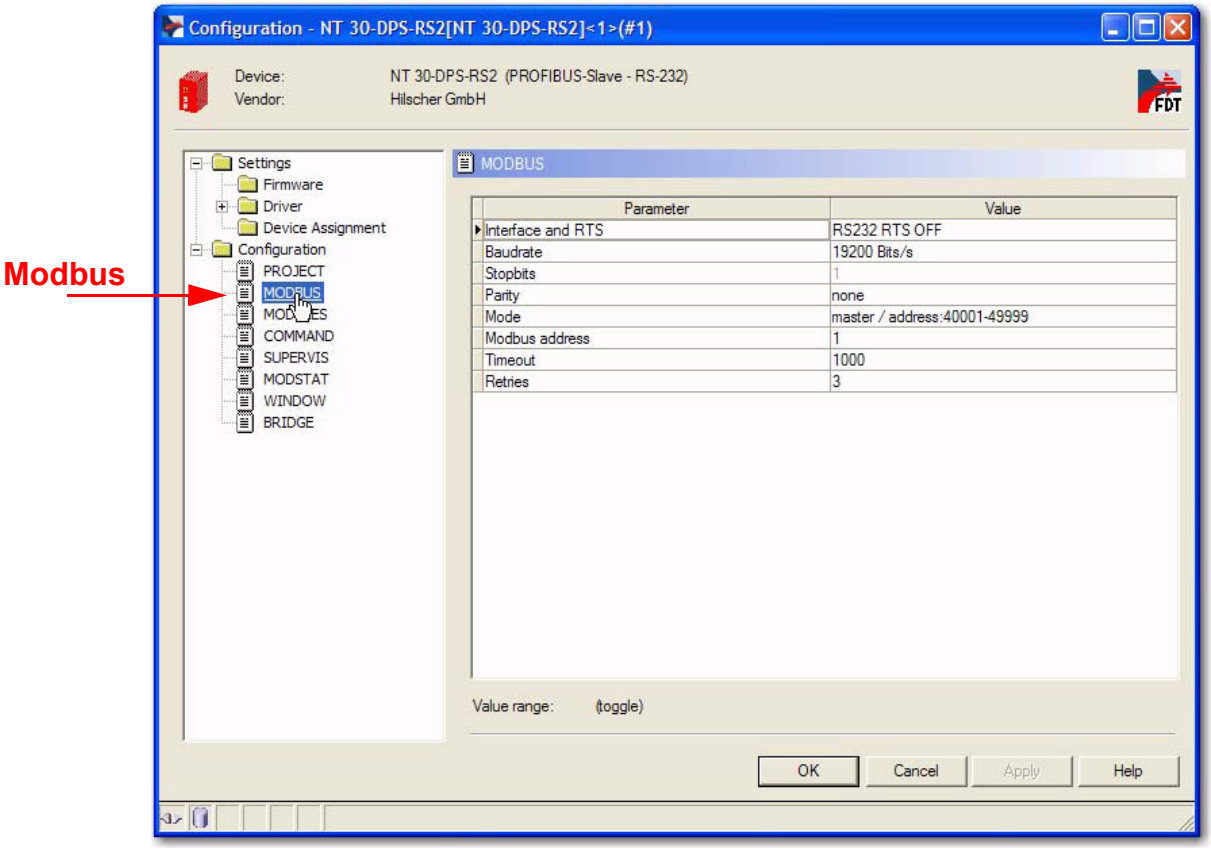
9.8 Bridge Module

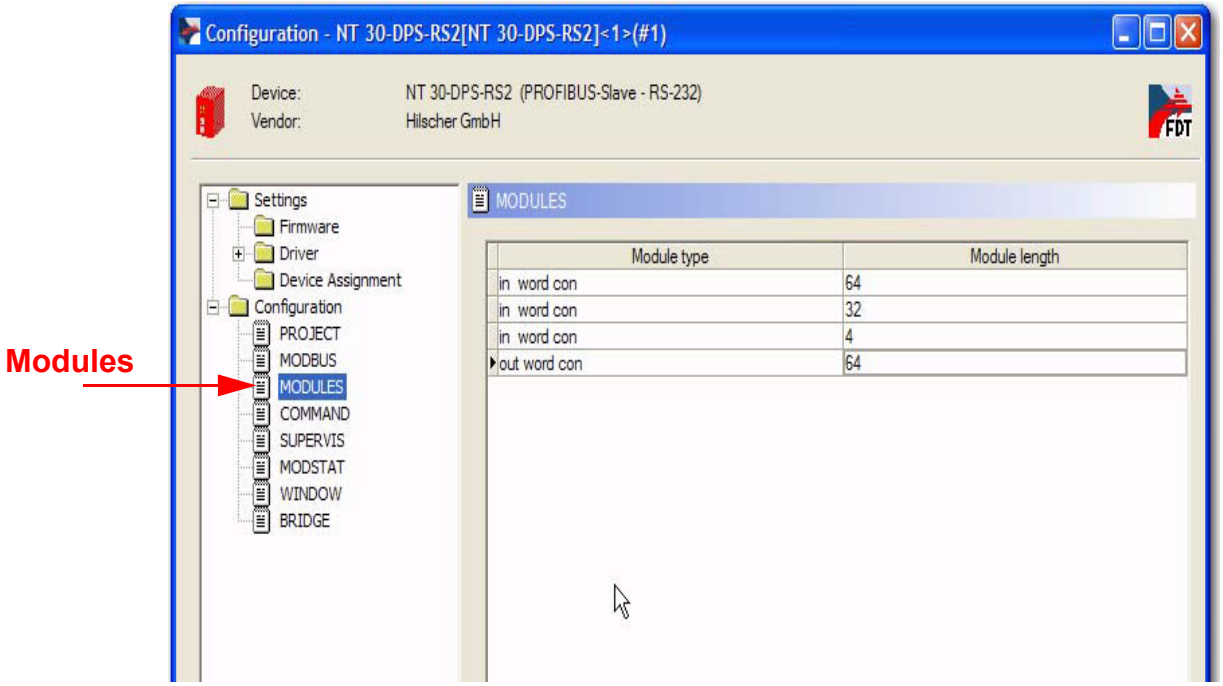
The bridge module is installed inside the QmR at the intersection of the front panel plate and the bottom plate. It is the component shown in the photo below.

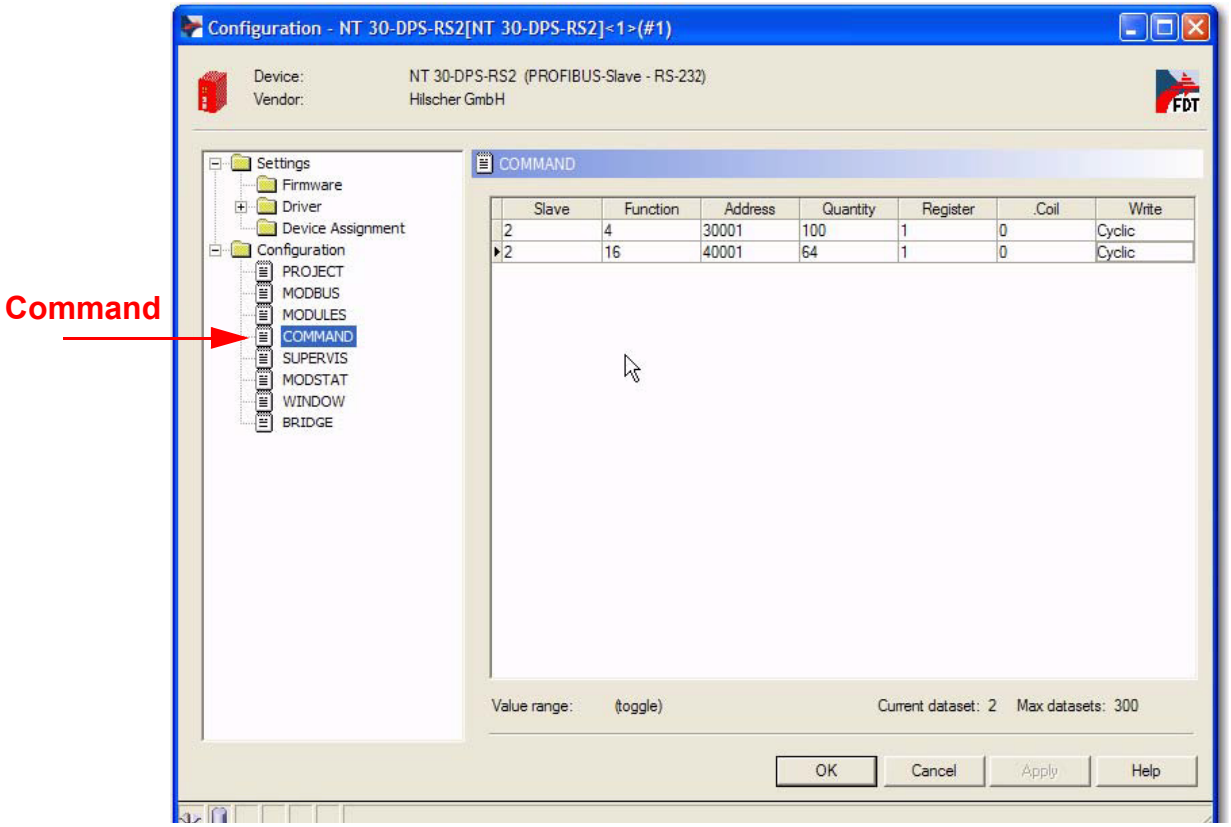


9.8.1 Sample SYCON.NET Screen Captures

On the following pages are screen captures from SYCON.net that show how the bridge was configured at USON.




Configuration - NT 30-DPS-RS2[NT 30-DPS-RS2]<1>(#1)
Device: NT 30-DPS-RS2 (PROFIBUS-Slave - RS-232)
Vendor: Hilscher GmbH
FDT
Settings
Firmware
Driver
Device Assignment
Configuration
PROJECT
MODBUS
MODULES
COMMAND
SUPERVIS
MODSTAT
WINDOW
BRIDGE
MODULES
Module type
Module length
in word con 64
in word con 32
in word con 4
out word con 64
Modules


Configuration - NT 30-DPS-RS2[NT 30-DPS-RS2]<1>(#1)
Device: NT 30-DPS-RS2 (PROFIBUS-Slave - RS-232)
Vendor: Hilscher GmbH
FDT
Settings
Firmware
Driver
Device Assignment
Configuration
PROJECT
MODBUS
MODULES
COMMAND
SUPERVIS
MODSTAT
WINDOW
BRIDGE
COMMAND
Slave Function Address Quantity Register Coil Write
2 4 30001 100 1 0 Cyclic
2 16 40001 64 1 0 Cyclic
Value range: (toggle)
Current dataset: 2 Max datasets: 300
OK
Cancel
Apply
Help
Command

10
License Updates

10.1 License Update Overview

All Qualitek mR testers ship from Uson with a temporary license. As this initial license period nears its end, periodic warnings are displayed on the screen. If unheeded, the license will expire and the tester will not be able to test. Installing the license update issued by Uson will keep the tester in service. A new license can be issued in several ways. It can be on a USB memory stick, or it can be issued by means of written correspondence or in a telephone conversation.

10.2 About the License Key

The license key consists of 27 characters in four sets of 6 character groups separated by a hyphen. This means that every license key has 3 hyphens.

A license key only works on the specific tester (by serial number) for which it was made.

A representative example of a QmR license key is:

RUDHCA-APE222-6TIVCJ-NTZZNL

The character set that is used for the license key is designed to be easy to enter. The character set is not case sensitive, so the following license text is equivalent to the one above and would work just as well:

rudhca-ape222-6tivcj-ntzznl

The numbers “0” and “1” are not used so as not to be confused with the letters “O” and “l”.

The character set is as follows:

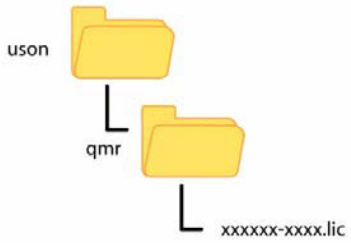
ABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

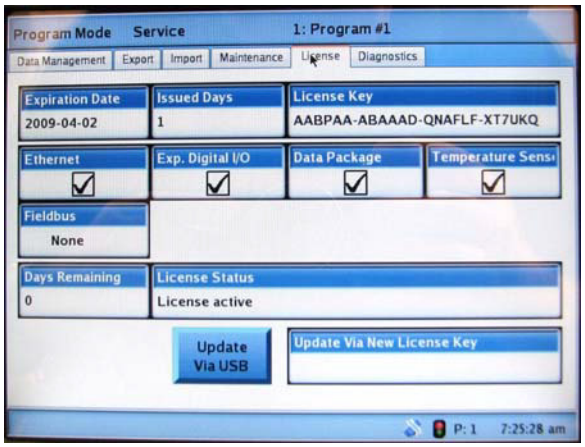
234567

10.3 License Update With a Memory Stick

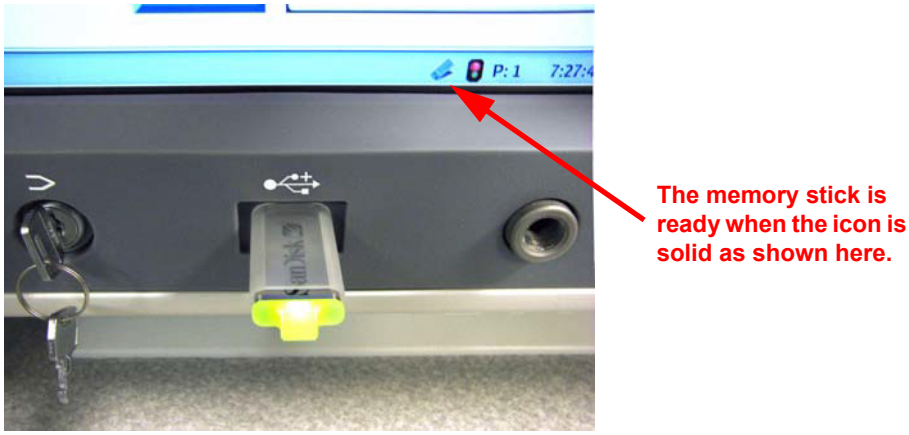
Note: When the license file is provided on a memory stick, the file must be in a specific place so that the QmR can find it and read it. The license file must be located in a folder named **qmr**. The **qmr** folder itself must be in the folder named **uson** in the top level (root) of the memory stick. The license file is named as **xxxxxx-xxxx.lic** where the x's will actually be the characters that identify your tester by serial number.



1. With the QmR running, turn the key to Program Mode.
2. Go to the Service screen and select the License tab. A screen similar to the one below will be seen.



3. Insert the license key memory stick (USB flash drive) into the USB port as shown below and wait for the memory stick to be recognized by the QmR. (The "USB connected" icon will become solid.).

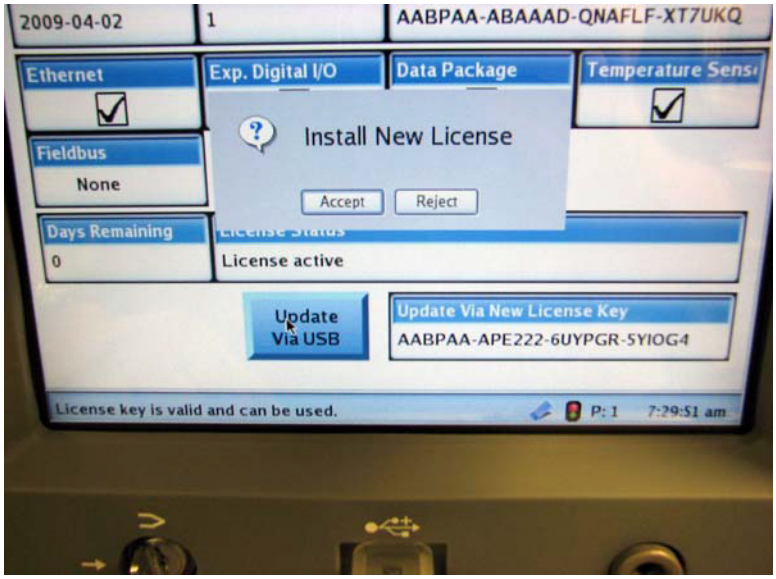


4. Press **Update Via USB** as shown.

5. The license number will appear in the Update Via New License Key box as shown.

The license number is automatically copied to License Key box.

6. Press **Accept** to install the new license.



7. The new license is now installed. Remove the memory stick. This completes the license installation process with the USB memory stick.

10.4 License Update by Keyboard

The license number may have been provided to you in written form or telephone call. If this is the case, the license has be entered using the QmR keyboard functions. Follow the steps given below to manually update the license.

For the purposes of explaining how the keyboard is used to enter the license, we will use the following example of a license number:

AABPAA-APE222-6UYPGR-5YIOG4

QmR licenses are not case-sensitive, so the license above is identical to its lowercase equivalent below:

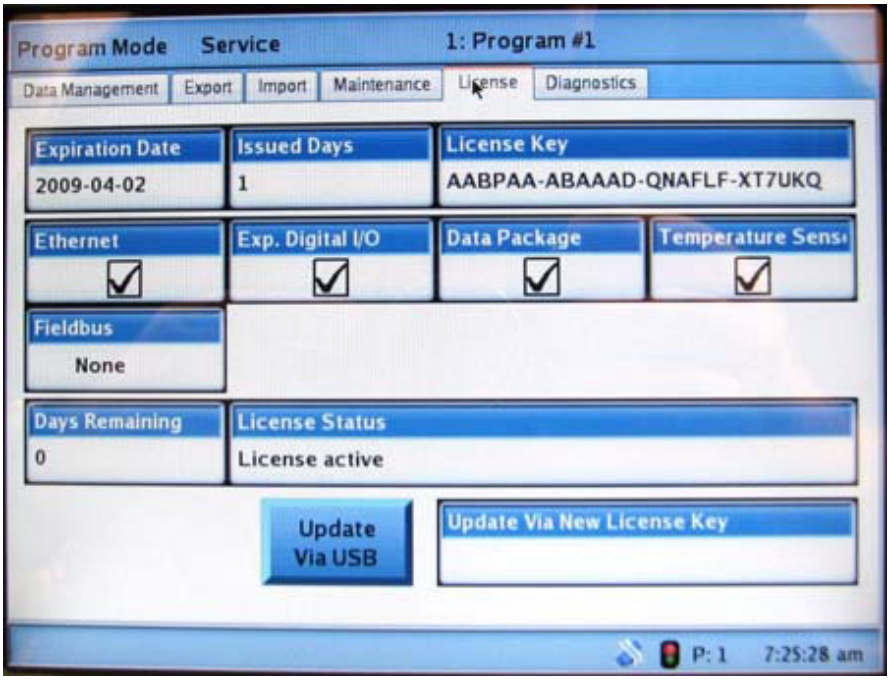
aabpaa-ape222-6uypgr-5yiog4

Lowercase entry is helpful because it simplifies the keyboard process. (We won't have to press the **Case** key to make uppercase letters.)

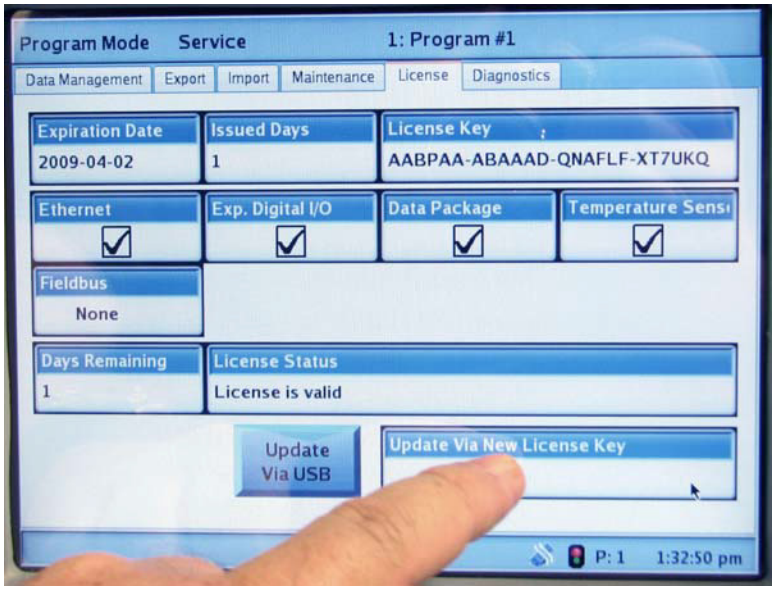
It is helpful to remember that the license number is 27 characters long and ALWAYS comprises 4 groups of 6 characters with a hyphen between each group.

Note: Your QmR will not accept the generic license shown above. You should use the license number provided to you by Uson as it is made for your tester.

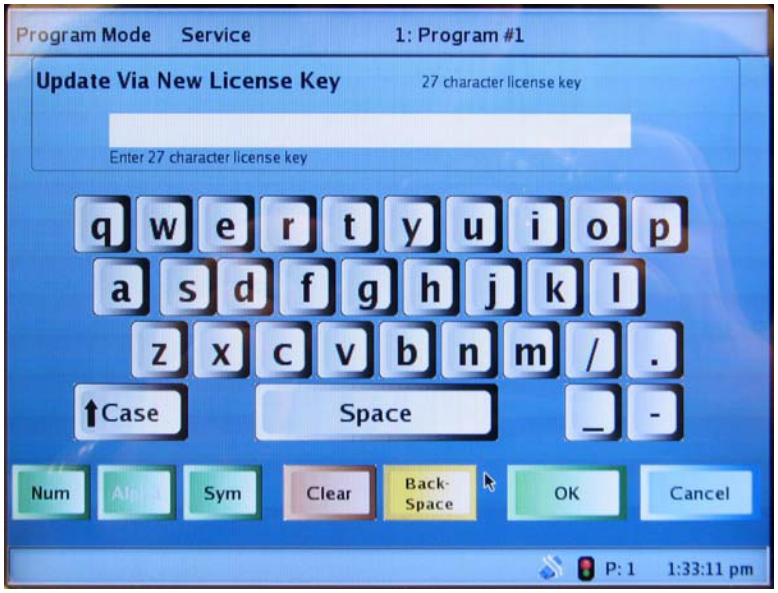
1. With the QmR running, turn the key to Program Mode.
2. Go to the Service screen and select the License tab. A screen similar to the one below will be seen.



3. Press Update Via New License Key.



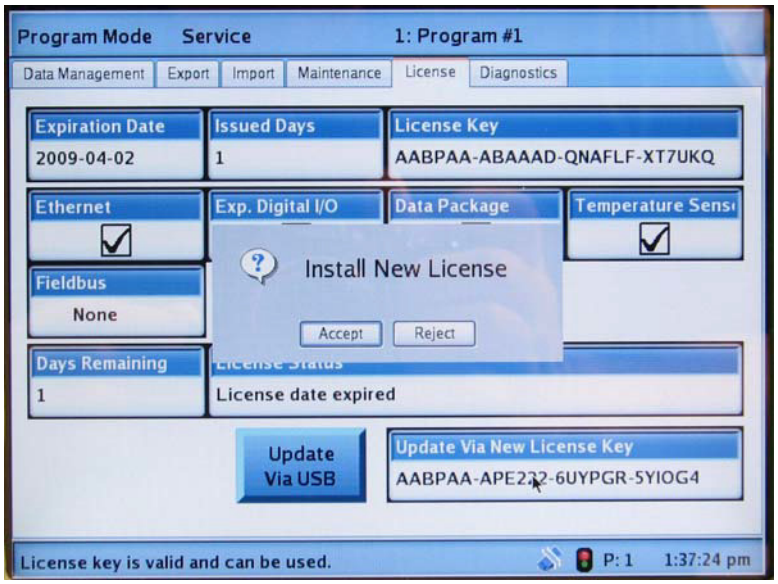
4. The keyboard screen will open as shown.



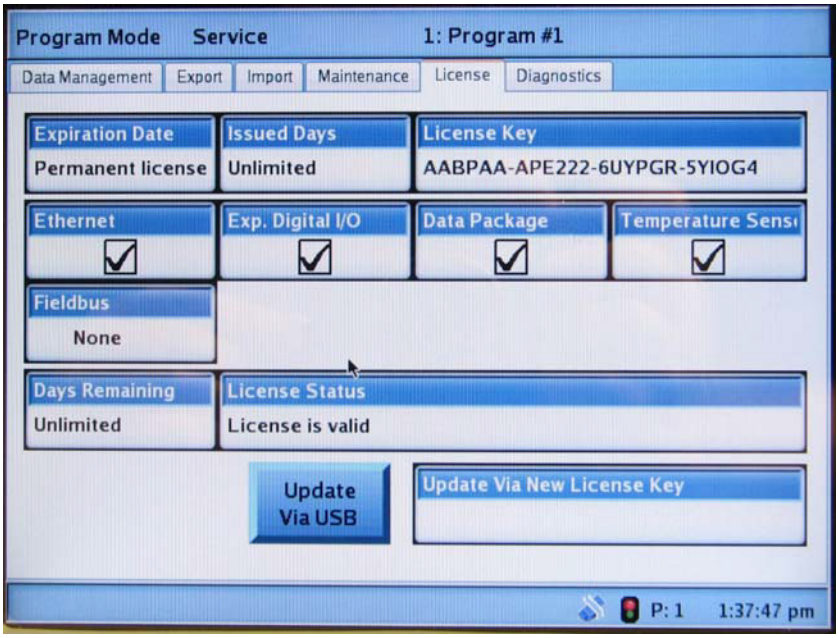
5. Enter the License Key. Use the **Num** key to open the number keypad for entering numbers when needed. Return to the alphabetic keyboard by using the **Alpha** key when needed. Since hyphens are used, it is important to note the

location of the **hyphen** key As explained previously, the numbers **one** and **zero** are *never* used..

6. When the 27-character key has been entered, press the green **OK** button on the keyboard screen.
7. If the license key has been entered correctly, the screen will now look like the one below. Press **Accept** to put the new license number into the QmR.



8. The QmR will now show that a valid license is installed. This concludes the license update process.



The license is successfully entered

10.5 Temporary License

A new tester is sold with a temporary license.

When initially setting up a new tester the date may be off by one day depending on your location in the world. You may change the date to match your locality one time. Do not change the date again after making this initial setting.

Testers usually ship with the temporary license already installed. It is possible, on rare occasions, that the a temporary license must be installed on location.

To install a temporary license, follow the license installation instructions given in this chapter. The date must be set correctly before installing the license.

It is not possible to extend the temporary license period in any way by manipulating the date or time.

10.6 Your License Number

For your convenience, use the form on the following page to record the license number of your tester and other pertinent information for safekeeping and future reference.

If you have multiple testers, you may make as many copies of the form as you wish.

QmR License Number

Tester Serial Number: _____

Tester is Located At: _____

Today's Date: _____

License Number:

□□□□□□-□□□□□□-□□□□□□-□□□□□□

Note: The numbers **0** and **1** (zero and one) are never used. The license number is 27-characters long. The three hyphens are part of the license number.

Notes:

11
GPL License

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Index

A

abort 8-52
abort button 4-4
absolute pressure 8-47
active program progress indicator 5-14
add scan 6-56
adiabatic process 8-51
air composition 8-47
air density 8-47
air supply 3-3
alerts 6-44
anti-tie-down 6-45
arrow buttons 4-3
ascii 8-52
atmosphere 8-52
audio 6-70
audit log 5-36
auto zero 6-10, 6-58
autocoupling 1-2
auxiliary flow function 6-78

B

back button 5-19
back panel 4-5
backlight timeout 6-72, 8-1
back-pressure flow test 8-54
bar 8-52
bar code 6-54
    enabling 6-55
    on Tester Control tab 6-54
    scanner assembly 8-35
    scanner configuration 8-36
    scanner connection 6-55
    scanner diagnostic 6-36, 6-37
barometric pressure 8-47, 8-52
battery replacement 8-38
big endian 6-74
bins 5-25
bridge module 9-22
    location 9-22
bulkhead fitting 8-52

C

cal 5-33
calibrate button 5-11, 5-33
calibrate touch screen 6-73
calibration 5-33
    at Uson 8-1
    scheduled 8-1
charles's law 8-50
check mark 5-12
cleaning 8-1
clear button 5-19
clearing counters 8-52
clock 4-8
    battery replacement 8-38
clone 6-6
combi-valve 8-41
comp 5-33, 8-45
comp and cal 5-32
comp value 8-52
compensation 8-45, 8-48
compensation % 8-48, 8-52
concurrent 8-52
configuration code 6-77
connect button 6-65
connect step 6-11
continuous fill 6-46
continuous fill including gross 6-47
contrast 8-52
counters 8-52
counters, clearing 8-52
couple outputs 6-78
coupling port 8-52

coupling pressure 8-53
coupling time 7-3, 8-53
coupling valves 8-53
covers 1-2
crack test 8-53
crosshair 6-73
customer support hotline 4-9

D

dashboard 5-13
dashboard options 5-15
date format 6-71
decay 8-53
decay test 8-53
density 8-49
detergent 8-1
diagnostics 6-32
    analog to digital subsystem 6-33
    standard digital inputs 6-34
    standard digital outputs 6-34
    valve outputs 6-33
differential pressure 5-21
differential pressure transducer 8-41
digital I/O 1 4-5
digital I/O 2 4-5
digital I/O power rating 8-15
digital I/O status details 5-18
digital input 5-16
digital output 5-16
display brightness 6-72
display contrast 8-52
distribution options 5-25
distribution screen 5-24
double diamonds 5-9, 5-13
    tapping 5-9
downstream sensor 6-78

E

electronic regulator 8-53
enter button 4-3
enum code tables 9-12
equalization valve 6-75, 8-41
equalize 6-13, 8-53
equalize step 8-53
ethernet 4-5
ethernet port 6-63
evacuate Time 8-53
event 8-53

F

factory-installed programs 8-54
fill time 8-54
fill/evac 6-12
Fill/Evac step options 6-12
fill/evac1 6-12
fill/evac2 6-12
filter 3-3
firmware 4-3, 8-54
fixture 6-45
fixturing 8-54
flow 8-54
flow master 8-54
flow test 8-54
flow transducer 8-54
fluid flow 8-49
fluids vs. solids 8-48
Force 6-5
force change 6-5
force decay 8-29, 8-55
force mode 6-4, 8-31
front panel 4-2
fuse 4-5

G

gas vs. liquid 8-48
gauge pressure 5-21, 8-47, 8-55
gauge regulator 8-55
gauge sensor 8-41
gauge value precision 5-15
generalized gas law 8-50

generate sample tone 6-70
graph 5-21
gross leak 8-55
gross pressure error 7-2

H

hardware calibration 8-55
hardware menu 8-55
help 8-55
home screen 4-3, 5-4
hotline 4-9
humidity 3-3

I

I/O 8-55
icons 5-10
ideal gas law 8-51
ideal vs. real gas 8-51
inlet 4-5
input pressure 3-3
install patch 6-30
installation 3-1
interface communication 8-55
interlock 6-46
internal leak master 6-78
internal leak master test 6-6

J

jump 6-16, 8-55

K

keypads 8-55

L

laminar flow 8-49
LCD 8-55
leak cal 8-45
leak cal value 8-52
leak calibration 8-45, 8-55
leak rate 8-55
leak rate calibration 8-52
leak threshold 6-5
license
    tab 6-31
    temporary 10-8
    update 10-1
line conditioner 8-56
linked programs 8-56
little endian 6-74
location 3-1
lockup 8-1
logging to USB memory 6-43
login test 6-26

M

MAC address 6-77
maintenance 8-1
manual regulator 3-3, 4-5
measure setup tab 6-17, 6-21
measure type 6-4
measurement units 8-56
menu
    leak calibration 8-46
menu button 4-3
metered volume 4-6
Modbus 9-1
    address 6-74
    default setup 9-18
    RTU 6-74

N

name servers 6-62
navigation pad 4-3
negative pressure 8-47
network logging pathname 6-66
NIST 5-33, 8-56

O

occlusion test 8-56
operating conditions 3-3
opto-isolator 8-12, 8-13

P

p 6-14
Pascal 8-56
pascal's law 8-50
pass exit criteria 6-13
pass hold 6-13
pass/rail rule 6-5
password 6-50
    access levels 6-50
    forgotten password 6-52
    lock symbol 6-51
    login - logout 6-52
    reset 6-52
    setting 6-51
    timout control 6-52
pause 6-16
PDF export 5-7
plc 8-56
pneumatic connections 3-3
pneumatic s/n ratio 8-46, 8-57
pneumatic SNR 6-18
power receptacle 4-5
power supply 1-2, 3-2
power switch 4-1, 4-5
pressure 8-47, 8-49, 8-57
pressure correction 6-18
    absolute 6-19
    disabled 6-19
    factor 6-19
    gauge 6-19
pressure correction setup 6-20
pressure decay 8-56
pressure error 7-2, 8-56
pressure standard 8-56
pressure tolerance 6-5
pressure transducer 8-57
print 5-6
print button 5-19
profile options 5-23
program 8-57
program data box 5-1
program mode 4-4
program mode saving changes 6-1
program selection 5-1
programming 8-57
psig 8-57
PSN ratio 8-46

Q

question mark 5-12
quick printing 5-6

R

ramp up 8-57
ready-to-test indicator 5-5
rear panel 3-1
red octagon 5-12
red x 5-12
reference port 4-6
regulator 8-41
    using two in one program 6-12
remote start 6-45
remote start on barcode 6-56
remove scan 6-56
repeat limit 6-48
required scans 6-56
reset button 5-22, 5-30, 5-31
revert to baseline 5-33
revision number 4-3
reynolds number 8-49
rise test 8-57
routing 6-64
RS-232 8-57
run 8-57
run mode 4-4

S

safety 1-1, 11-1
salvage 6-6
saving changes 4-9, 6-1, 6-3
scan key 6-56
scan selects program 6-56
scan timeout 6-56
sccm 8-58
scroll pad 4-3, 6-2
sealed component test 7-3, 8-57
secure program mode access 6-54
security key 4-4, 6-45
security lock 4-9, 8-58
security lock switch 4-2
selecting a program 5-1
self-test 4-1
sensor 8-58
sensor auto zero 6-58
sensor calibration 8-58
sensor calibration menu 8-58
serial number 6-77
serial port 4-5
serial port menu 8-55
servicing 8-1
set factory defaults 6-29
setpoint 8-58
software update 6-30
solvent 8-1
specifications 2-2
spool valve check 6-75
stabilize 6-13
stallion force decay model 8-29
standard digital inputs 6-34
standard digital outputs 6-34
standard I/O 8-12, 8-13
start button 4-4
start switch 8-58
status 5-9
step column 6-68
step fail result 6-68
step pass result 6-68
stop switch 8-58
stored programs 8-58
supply air 8-58
sycon.net 9-23
symbols 5-12

T

tare 8-45
TC logging 8-21
TC steps 8-20
temp comp 8-16
temperature 3-3
temperature compensation 6-20, 8-16
temporary license 10-8
test calibration 5-32, 6-17
test circuit 8-58
test cycle 8-58
test module 4-5
test parameter menu 8-58
test parameters 4-7
test phases 8-58
test port 4-6, 8-58
test pressure 8-59
test time 4-7
test vacuum 8-59
tick increment 5-15
time 5-4
time format 6-71
timeout 6-72
timers 8-59
timing diagram 8-3
title bar 5-4
touch panel 4-2
    care 8-1
    no response 8-1
transducer 8-41
trend 5-26
trend options 5-31
turbulent flow 8-49

U

units of measure 8-59
update baseline 5-33
update software 6-30
USB 4-5, 6-43
USB keyboard 5-3
USB port 4-2
USB ready 5-4, 5-7, 6-27, 6-28
USB security key 8-59
user 8-59

V

vacuum 3-3, 8-47
vacuum error 8-59
vacuum mode 8-33
vacuum mode test 6-4
valve operation in test 8-41
valve outputs 6-33
valve states 8-4
valves 8-41, 8-59
valves, coupling 8-53
vent 4-6, 7-3, 8-59
vent enabled 6-16
venturi 6-78
view less 5-13
view more 5-13

W

windows server 6-65