

Sprint^{mD}



Uson

for good measure

Operator's Manual

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Preface

Please read this Operating Manual carefully before putting your Sprint mD into service, especially all safety related **WARNINGS and CAUTIONS** throughout the manual.

About this manual

The purpose of this manual is to inform the operator how to install, wire, operate, maintain, and troubleshoot the Sprint mD Tester.

Related Documentation

- Sprint mD Brochure

Intended Use

This tester is intended to be used in an indoor, industrial environment by suitably trained personnel.

Equipment Needed

- Master Part-Must be a known good part and be identical and of same material as production parts (for calibration).
- Leak Master (for calibration).

Document History

- **06-20-2018 - Rev 1.0:** Initial release. Based on Software Version 1.0.0.
- **09-04-2018 - Rev 2.0:** Added - Audit Trail Log, Importing Files/Adding & Modifying Users. Modified - Leak Calibration and Challenge. Revised - Export Test Data. Minor edits. Based on Software Version 1.3.0.
- **07-17-2019 - Rev 3.0:** Added - Electronic Regulator, Barcode Scanner, Wiring Diagrams/Information, Message Display/History. Based on Software Version 2.1.0.
- **12-13-2019 - Rev 4.0:** Added - Import/Export to USB or Network the entire Sprint mD database or programs for same serial number tester; import from USB/network drive a program # for foreign serial number tester if the smart key and features keys match; timezone setup screen; timer check screen, and automatic control of network time protocol (NTP) dependent on network connectivity. Removed all file browsers from the user interface. Changed hardware clock from local time to UTC. Added MS AD LDAP Server Setup information. Based on Software Version 2.4.0.
- **3-6-2020 - Rev 5.0:** Added High Pressure model information. Based on Software Version 2.5.0.
- **3-25-2021 - Rev 6.0:** Software improvements. Based on Software Version 2.6.0.
- **10-10-2023 - Rev 7.0:** Software improvements. Based on Software Version 2.13.0.

1.1 Introduction

This section explains the warnings and cautions that should be observed before using, wiring, installing, or operating the Sprint mD; however, additional safety information is also covered at relevant points throughout the manual. Please read this manual in its entirety before installing/wiring/operating the instrument. Should any point remain unclear, contact your supplier for assistance before proceeding.

1.1.1 Safety Alert Symbols



WARNING: Informs users of potentially hazardous situation, such as personal injury or death and/or severe equipment damage, if instructions are not followed.



CAUTION: Informs user of potential hazards to equipment if instructions are not followed and may invalidate the warranty.



NOTE: Helps user perform task.

1.2 Safety Precautions

Observe the following Warnings/Cautions before installing or using this product or associated equipment.



WARNINGS



- If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired, and may void warranty.
- This instrument is capable of supplying high-pressure air. Before testing, ensure that the system is guarded to local health and safety standards.
- 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.
- Always wear eye protection when working with pressurized air.
- Disconnect all pressure sources when working with internal components of Uson equipment.
- To avoid damage to the sensitive transducer in the instrument, the component to be tested, and the air supply line to the Sprint mD, must be free from water or liquid residue before testing.
- 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.
- 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.
- Sprint mD operates on 24VDC from a power supply which must be connected to an earthed (grounded) power supply of 100-240VAC 50/60Hz.
- The covers on the equipment should be removed only by trained personnel to avoid the risk of electric shock. The power supply to the equipment must be switched off and disconnected before removing/replacing any covers.
- 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 Sprint mD is switched on.



EU Declaration of Conformity



1. Product model: Sprint mD

2. Name and address of the manufacturer or his authorised representative:

Uson L.P.
8640 North Eldridge Parkway
Houston, Texas 77041, USA
281- 671-2000
ServiceUS@uson.com

3. This declaration of conformity is issued under the sole responsibility of the manufacturer.

4. Object of the declaration:

Equipment: Air Leak Tester
Brand name: Uson
Model/type Sprint mD

5. The object of the declaration described above is in conformity with the relevant Union harmonization Legislation:

Electromagnetic Compatibility Directive (EMC) 2014/30/EU (EN 61326-1:2013),
Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU
Low Voltage Directive (LVD) 2014/35/EU
Pressure Equipment Directive (PED) 2014/68/EU
Machinery Directive (MD) 2006/95/EC

6. References to the relevant harmonised standards used or references to the other technical specifications in relation to product which conformity is declared:

LVD: Exempt – +24VDC Product (Power supply shipped with unit is CE marked)
EMC: IEC 61000-4-2: (2009)
IEC 61000-4-3: (2006) + A1(2007) + A2(2010)
IEC 61000-4-4: (2012)
IEC 61000-4-5:(2014)
IEC 61000-4-6:(2014)
IEC 61000-4-8:(2009)
IEC 61000-4-11:(2010)
EN 55011 Emission Class A (2009)+A1(2010) (Radiated and Conducted Emissions)
RoHS: EN 50581:2012:2012
PED: Sound Engineering Practice
MD: Article 1 – 1. (g) Partly Completed Machinery

7. Signed for and behalf of:

Uson L.P. Houston, Texas:

Date of Issue: 19 February 2020



David Q. Oliveaux, President

Uson

产品模型 (Product): Sprint mD

关于符合中国《电子信息产品污染控制管理办法》的声明
Management Methods on Control of Pollution from
Electronic Information Products
(China RoHS declaration)

产品中有毒有害物质的名称及含量

部件名称 (Parts)	有毒有害物质或元素 (Hazardous Substance)					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
机箱子组件 Chassis subassembly	○	○	○	○	○	○
电源 Power Supply	○	○	○	○	○	○
印刷板组件 Printed Board Assemblies (PBA)	○	○	○	○	○	○
LCD 显示 LCD Display	○	○	○	○	○	○
金属部件 Metal Parts	○	○	○	○	○	○
○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T 11363-2006标准规定的 限量要求以下。 ○：Indicates that this hazardous substance contained in all homogeneous materials of this part is below the limit requirement in SJ/T 11363-2006. ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准 规定的限量要求。 ×：Indicates that this hazardous substance contained in at least one of the homogeneous materials of this part is above the limit requirement in SJ/T 11363-2006. 对销售之日的所售产品, 本表显示我公司供应链的电子信息产品可能包含这些物质。注 意：在所售产品中可能会也可能不会含有所有列出的部件 This table shows where these substances may be found in the supply chain of our electronic information products, as of the date of sale of the enclosed product. Note that some of the component types listed above may or may not be a part of the enclosed product.						



2.1 Sprint ^{mD} Overview

The **Sprint^{mD}** is a multi-function leak and flow tester that can be configured to support a variety of non-destructive test combinations for both part integrity and part performance, including: pressure, vacuum, flow testing, occlusion, burst, and crack.

By incorporating comprehensive communication enhancements (such as embedded Fieldbus and expanded digital I/O) and refined analytics (data trends, standard deviations, etc.), the Sprint ^{mD} is intelligently-equipped to highlight all the necessary process improvements, data analysis insights, and historical trends needed to continuously optimize your testing process.

The innovative tester is also designed to keep your operation regulatory compliant with its advanced security features such as user authentication through passwords and roles, customizable access authorization, and the ability to log and monitor changes to parameters.

With its large touchscreen and intuitive interface, the Sprint ^{mD} is simple-to-use, easy-to-navigate, and efficient-to-operate. Its modular design makes it easy-to-service and upgrade, with the versatility to accommodate a wide range of testing and analysis.

2.1.1 Contents

The Sprint^{mD} is supplied with the following components:

- User manual on USB drive
- Power supply
- Calibration certificate
- Purchased options/accessories

If any component is missing, please contact Uson: 1-855- GET-USON (438-8766) or service@uson.com. *Please have unit serial number available.*

2.1.2 Sprint mD Front Panel Overview

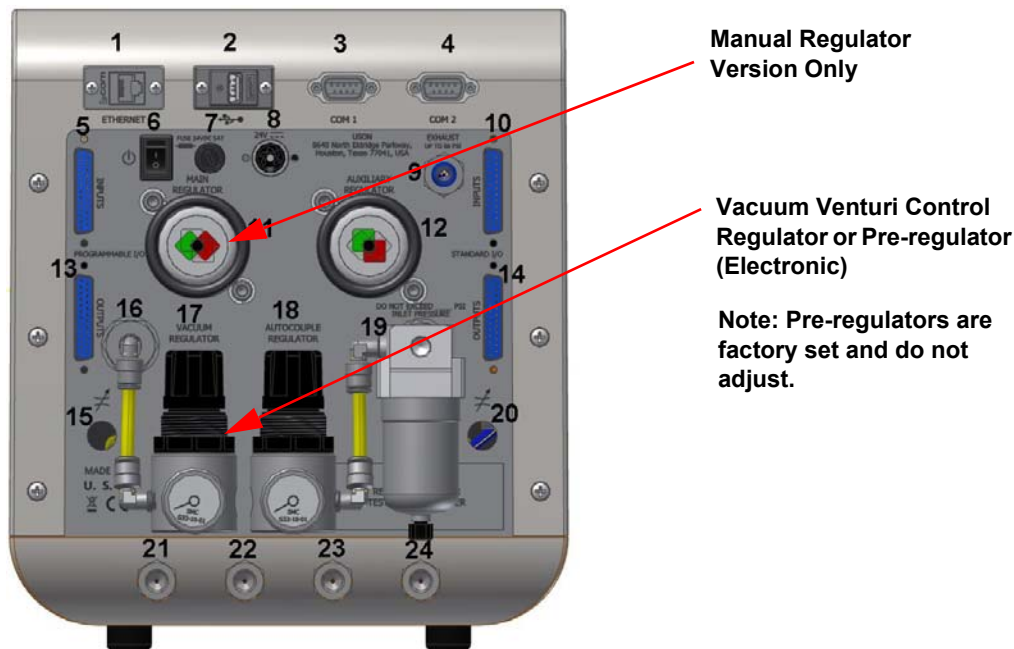
Figure 2–1: Sprint mD Front Panel View



Item#	Description
1	Stop Test Button
2	Start Test Button
3	LCD Display
4	Test Ports 1-4
5	USB

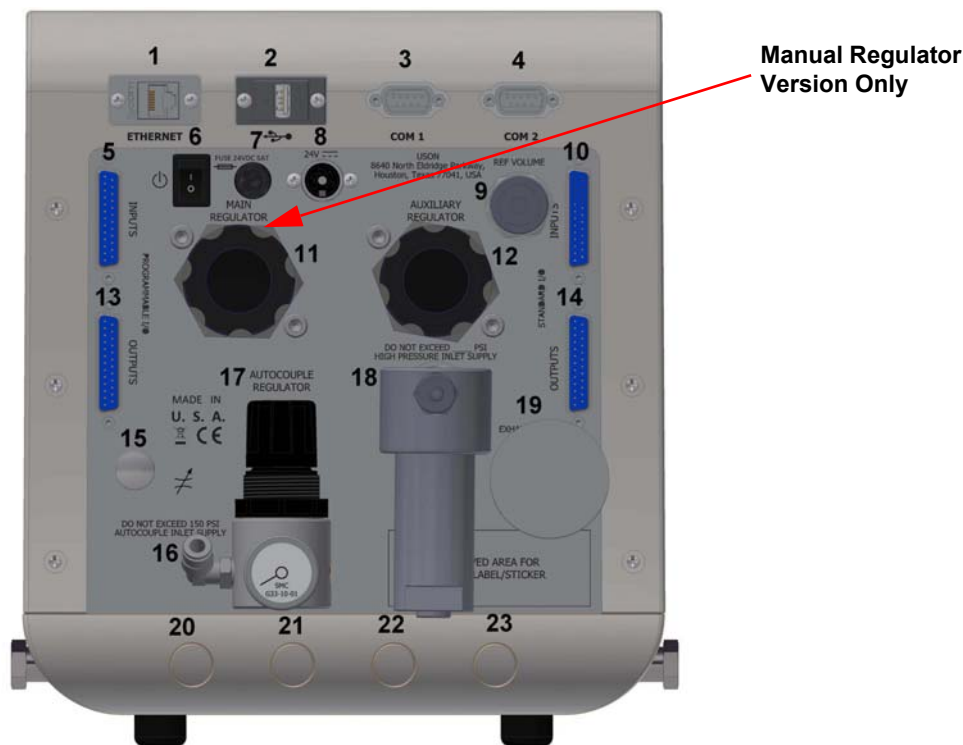
2.1.3 Sprint mD Back Panels

Figure 2–2: Sprint mD Back Panel



Item#	Description	item	Description
1	Ethernet Port	13	Expanded Digital Output (option)
2	USB Port: Note: Only USB thumb drives formatted with FAT 32 file system are supported.	14	Standard Digital Output
3	Serial Port - Logging data	15	Taper Valve (option)
4	Serial Port - Modbus	16	Vacuum Input Bulkhead (option)
5	Expanded Digital Input (option)	17	Vacuum Regulator (option)
6	Power Switch	18	Auto Couple Regulator (option)
7	Fuse 24 VDC	19	Compressed Air Inlet with Filter
8	Power Receptacle	20	Taper Valve (option)
9	Vacuum Exhaust (option)	21	Coupling Port 1 (option)
10	Standard Digital Input	22	Coupling Port 2 (option)
11	Regulator 1 - Main	23	Coupling Port 3 (option)
12	Regulator 2 - Auxiliary (option)	24	Coupling Port 4 (option)

Figure 2-3: Sprint mD Back Panel (High Pressure Model)



Item#	Description	item	Description
1	Ethernet Port	13	Expanded Digital Output (option)
2	USB Port: Note: Only USB thumb drives formatted with FAT 32 file system are supported.	14	Standard Digital Output
3	Serial Port - Logging data	15	Taper Valve (option)
4	Serial Port - Modbus	16	Auto Couple compressed air inlet 0-150 psi
5	Expanded Digital Input (option)	17	Auto Couple Regulator (option)
6	Power Switch	18	Main Compressed Air Inlet with Filter
7	Fuse 24 VDC	19	Exhaust
8	Power Receptacle	20	Coupling Port/Test Port 1 (option)
9	Volume	21	Coupling Port/Test Port 2 (option)
10	Standard Digital Input	22	Coupling Port/Test Port 3 (option)
11	Regulator 1 - Main	23	Coupling Port/Test Port 4(option)
12	Regulator 2 - Auxiliary (option)		

2.2 Specifications

MODEL(S)	Sprint ^{MD} : Sequential Low Pressure (Type-S); Concurrent Low Pressure (Type-C); Sequential High Pressure (Type-J); Concurrent High Pressure (Type-H)
DESCRIPTION	Multi-function, configurable leak and flow tester
ENCLOSURE DIMENSIONS	Low Pressure: 10.5" (H) x 10" (W) x 12" (D) High Pressure: 11.5" (H) x 10.4" (W) x 18.6" (D)
WEIGHT	Low Pressure: 15 to 22 lbs, configuration dependent High Pressure: 31 to 32 lbs, configuration dependent
PNEUMATICS	Integral and highly configurable
TEST PORTS	1/8" or 1/4" with NPT or BSPP threads (other interfaces available by request), front, left, right, or rear (dependent on model)
COUPLE PORTS	3-way & 4-way pneumatic couple ports available, output pressure 0-125 psi
LEAK MEASUREMENT	Calculated flow or delta pressure
PRESSURE RANGES	Vacuum to 150 psi (Type S and C); 200-750 psi (Type J & H)
PRESSURE ACCURACY	0.255%FS (pressure range dependent)
PRESSURE RESOLUTION	24-bit ADC for high-resolution pressure measurement
FLOW RANGES	Up to 20 liters per minute (Type S only)
FLOW ACCURACY	1.0%FS (flow range dependant)
WARMUP TIME	30-minutes minimum
WORKING TEMPERATURE	10-40C (50 - 104F)
STORAGE TEMPERATURE	0-40C (32 - 104F)
MAXIMUM INTERNAL VACUUM (OPTION)	Venturi Only: -13.5 PSI. (Note: Requires minimum 80psi inlet supply pressure.) Venturi & Vacuum Regulator: -12.5 PSI at standard atmospheric conditions
TEST TYPES (MODEL DEPENDENT)	Pressure Decay Testing; Sealed Component Testing; Volume Verification Testing; Inter-Lumen Decay Testing; Vacuum Decay Testing; Occlusion Testing; Back-Pressure Testing; Seal Creep Testing; Burst Testing; Crack Testing; Fast Flush Device Testing
CONFIGURATIONS AND PORTS	Concurrent: 2, 4 Channels Low Pressure Sequential: 1, 2, 3, 4 Channels High Pressure Sequential: 1 or 2 Channels
DISPLAY	Large 8.5" color touch screen LCD with a rich dashboard-style user interface
PLATFORM	High-speed, quad-core CPU with reliable solid-state memory
LANGUAGES	English, Spanish, Chinese, Korean
NO. OF PROGRAMS	128
UNITS	User-selectable flow and pressure units of measurement
DATA COLLECTION	USB or Ethernet or RS-232
PRINTER SUPPORT	USB/RS-232

SOFTWARE FEATURES	Local and network authentication, audit logs, test setup, statistics, real-time data, self-test diagnostics
DIGITAL I/O	Standard: 14 outputs/11 inputs Expanded: 16 outputs/8 inputs (option)
DISCRETE PLC INTERFACE	Inputs: Start, Stop, & Program selection. Outputs: Pass, Fail, Alarm, Ready, EOC & Timer
FIELDBUS (OPTION)	Standard: Modbus RTU Expanded: Ethernet/IP, Profinet, Profibus, other protocols supported by request
COMMUNICATION	USB, Ethernet, RS 232
POWER SUPPLY	24 VDC from 90 to 264 VAC 47 to 63 Hz supply (auto sensing, multi-voltage power supply)
CERTIFICATIONS	FCC, CE, RoHS II Compliant
CALIBRATION	NIST Traceable, ISO 17025 available
OPTIONS	Remote start/stop button (pendant), Leak Master.

Due to a program of continuous development, specifications may be changed without notice.

2.3 Installation

2.3.1 Environmental/Location Requirements

- The Tester 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.
- The Tester should be sited as near as possible to the test component in order to keep the test volume to a minimum.
- To avoid temperature variations, which can affect the repeatability of the readings, the complete system should be installed away from heaters and drafts.
- It's advisable to insulate the connecting test-pipe work.
- The tester must be placed on a horizontal support, free from vibration, where there is free access to the front panel controls and rear panel connectors (see *Figure 2–5* for dimensions).
- Do not remove the rubber feet.

Figure 2–4: Sprint mD Dimensions

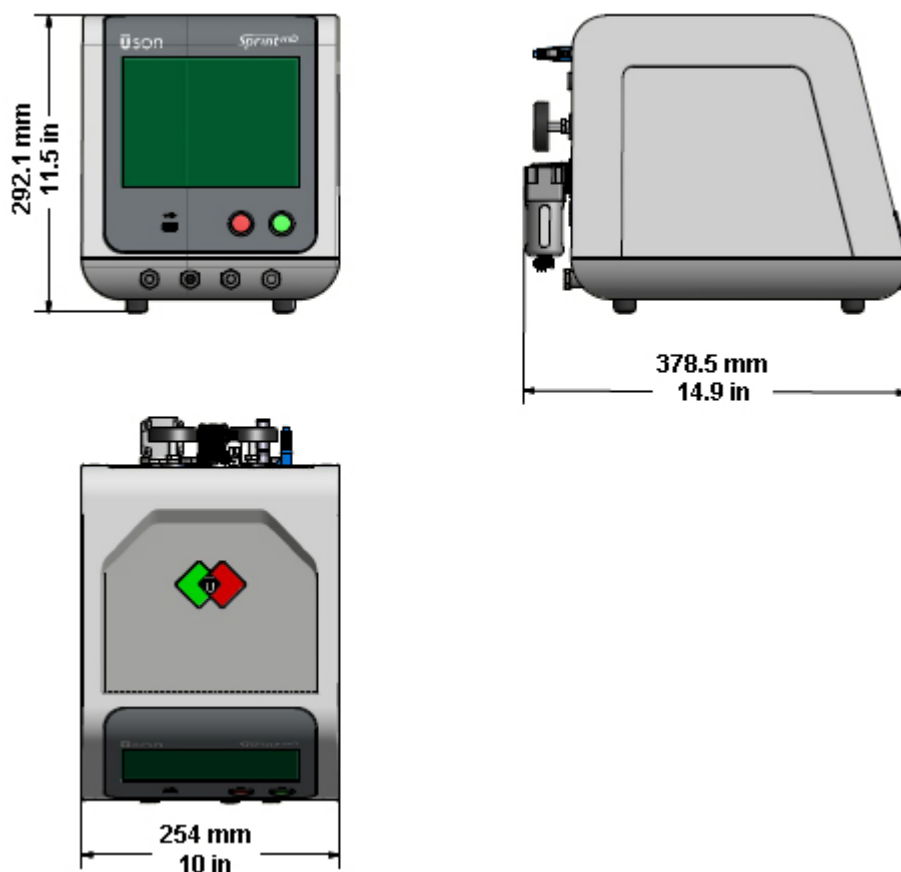
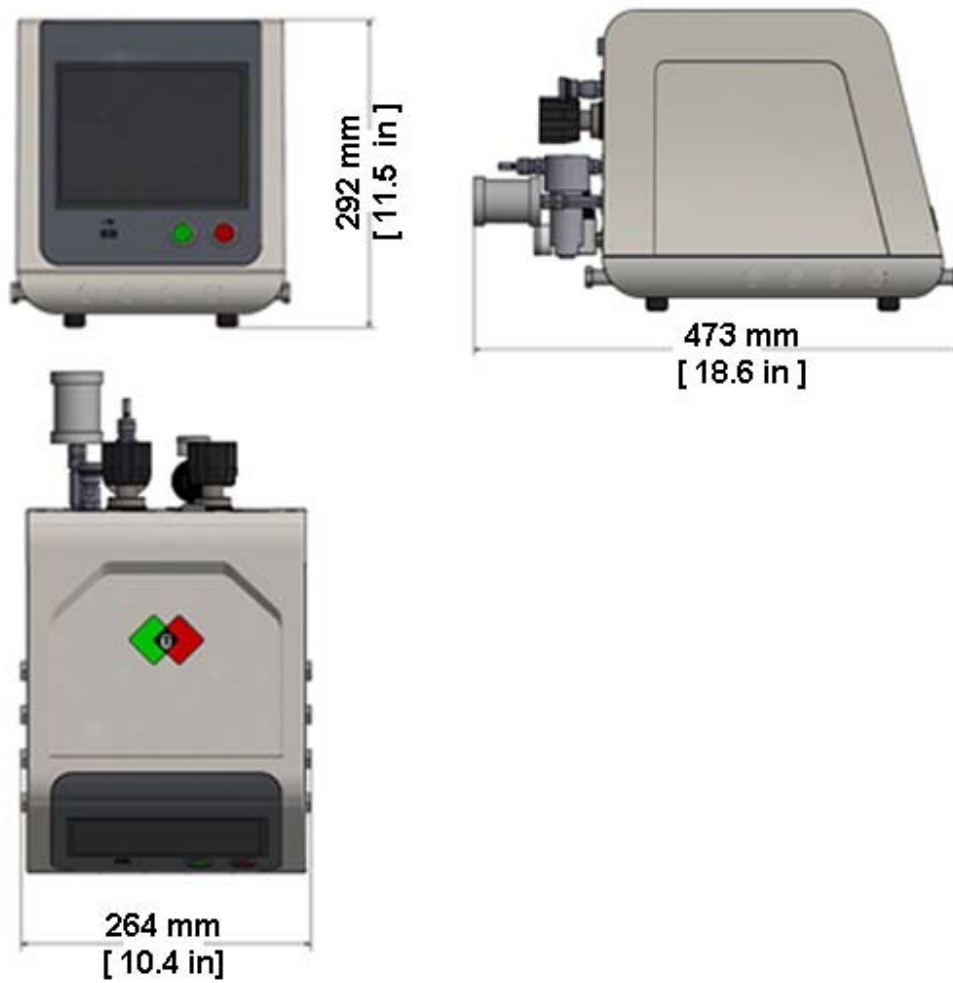


Figure 2-5: Sprint mD Dimensions (High Pressure Version)



2.3.2 Connecting Power Supply

Use the following procedures for connecting the tester to the power supply:



WARNING: Sprint mD operates on 24VDC from a power supply (supplied by Uson or customer), which must be connected to an earthed (grounded) power supply of 100-240VAC 50/60Hz. The power supply to the equipment must be switched off and disconnected before removing any covers.

1. Turn Sprint mD power switch **OFF**.
2. Connect **1** AC power cord to the **2** power supply.
3. Attach the **3** DC output power cord to the tester's power receptacle.
4. Connect the AC power cord to the facility power receptacle.



WARNING: Tester should always be switched OFF before connecting or disconnecting the power supply.



WARNING: The power lead plug is the disconnect device; it must be accessible in an emergency.

Figure 2–6: Power Supply



Power Supply Specifications

Input

- Voltage: 100 to 240V AC
- Current: 3.2A Max
- Frequency: 47 to 63 Hz.

Output

- Voltage: 24V DC.
- Current 5.4A max
- Power 70 W

General

- Weight: 0.4 Kg / 0.8 lb net
- Dimensions (D) x (W) x (H): 190 x 85 x 50 mm / 7.5 x 3.4 x 2.0 in

Connections

- The mains inlet socket is an IEC320-C14.
- The DC outlet is a 5 way circular connector for connecting directly to the tester.
- The pin connections are:

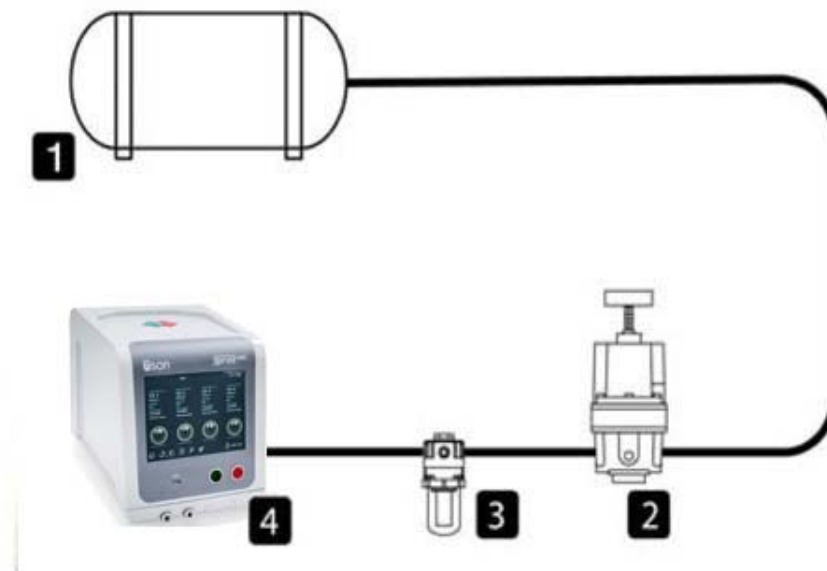
Pin	Connection
1,2,3	0V DC
4,5	+24V DC
Shield	Ground

2.3.3 Connecting the Air Supply



WARNING: AVOID INJURY/DEATH AND/OR EQUIPMENT DAMAGE. 1) Review all Safety Precautions in Section 1, Safety. 2) Do NOT omit the exhaust fitting connection. 3) Do NOT run exhaust to the interior of the enclosure as this could injure personnel and damage the tester.

- Before connecting air (or other gas) to the Sprint mD, make certain the supply air is clean and dry, and that the pressure doesn't exceed the maximum input listed on the rear panel for test pressure and couple port pressure. (See [Table 2-1](#) for Model Supply Pressure Requirements.)
- Supply air is connected to the filter (3), which is connected to the inlet of the tester.
- The owner is responsible for step-down pressure regulation if the available supply pressure exceeds the tester's input limit.
- Recommended practice is to install and maintain an external filter/regulator immediately upstream of the tester.



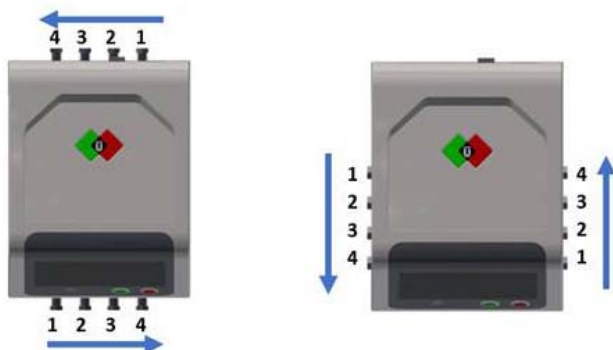
Item#	Description
1	Air Compressor
2	Step Down Regulator
3	Mist and Particulate Filter
4	Sprint mD Tester

Table 2–1: Supply Pressure Requirements

Model Type Supply Pressure Requirements							
Supply		LP Main	HP Main				HP Couple
Test Pressure Range		Vac – 150 psi	200-300 psi	400 psi	500 psi	750 psi	
Inlet Supply Pressure	Minimum	25 psi above max test pressure or couple pressure or venturi supply pressure whichever is greater	25 psi above max test pressure required				25 psi above max couple pressure required
	Maximum	165 psi	330 psi	500 psi	525 psi	800 psi	150

2.3.4 Couple Port/Test Port Numbering Conventions

Couple ports and test ports are numbered starting left to right, as shown below:



If the test ports and couple ports are placed on the same side of the tester, then the first two ports (left to right) will be designated as test ports, the next two for the couple ports, as shown below:

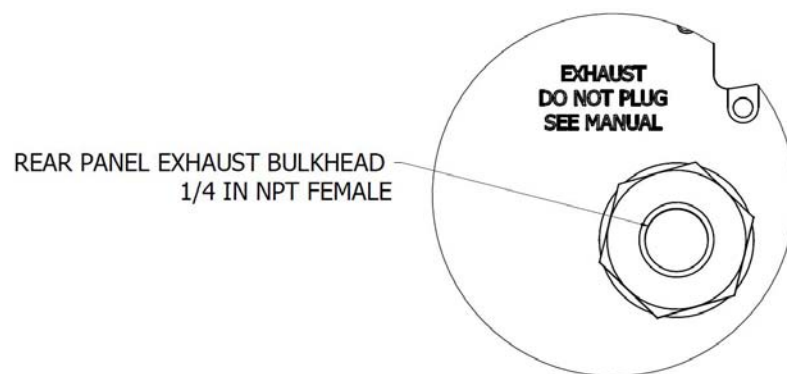


2.3.5 Vent Port



WARNING: Check the vent port is not restricted and the muffler is fitted to ensure correct operation and to minimise noise levels when pressurised air is vented.

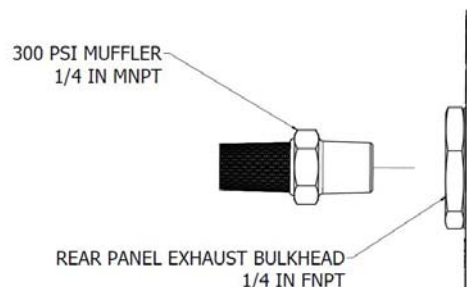
The exhaust/vent port is located on the unit's rear panel and is fitted with a 1/4 IN NPT female bulkhead. For the exhaust/vent location, see *Figure 2-3 on page 2-4*.



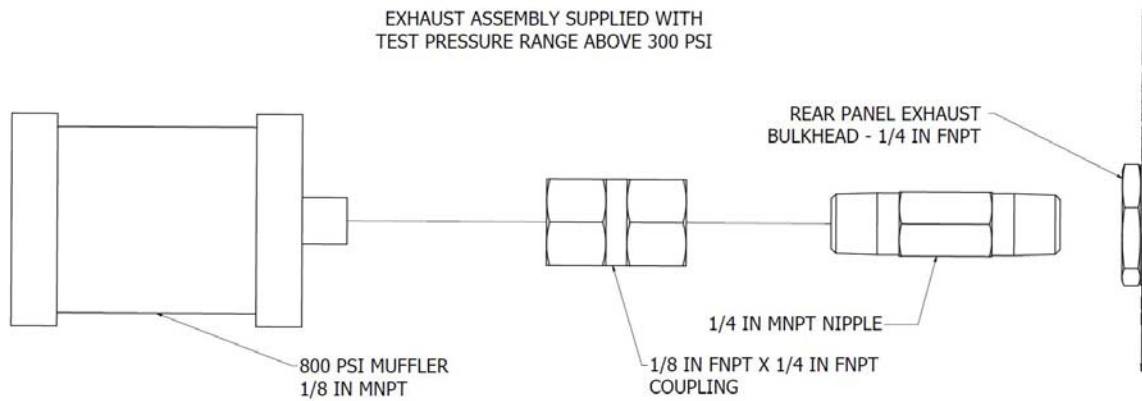
A vent port muffler is provided to filter and minimize noise levels when venting the test pressure to the local environment. The vent port is fitted with a 1/4" NPT female thread to allow the muffler to be replaced by an external connection for exhausting air to a remote location. The remote vent connection is the end user's responsibility to ensure the connecting parts have sufficient diameter to not restrict the flow and pressure rating.

For tester's configured for a pressure range above 150 psi but below 300 psi, your tester ships with an exhaust assembly already fitted to the rear panel (see the following figure).

EXHAUST ASSEMBLY FITTED WITH
TEST PRESSURE RANGE ABOVE 150 PSI, UP TO 300 PSI



For tester's configured for a pressure range above 300 psi, the exhaust assembly will be supplied by Uson with the tester, but will need installing (see the following figure).



2.4 Wiring Your Tester

Inputs and output connections are located on the Sprint mD tester's back panel, as shown in *Figure 2-3 on page 2-4*. The tester has 11 inputs and 14 outputs as standard, with an option for 16 expanded, programmable outputs and 8 inputs.

	WARNING: AVOID DEATH/INJURY/AND OR EQUIPMENT DAMAGE. 1) Review Safety Precautions in Section 1, Safety. 2) Always disconnect Sprint mD(s) from their electrical power supply before installing, wiring, servicing/adjusting, and opening/closing enclosures. 3) Do not plug the Sprint mD into an electrical power supply until all installation, wiring, servicing/adjusting, etc. procedures have been completed; and all enclosures are in place. 4) Servicing, wiring, and performing adjustments to the Sprint mD must be made by trained and qualified personnel only!
---	---

2.4.1 Connecting Sprint mD Digital I/O

The following information and diagrams describe/show the connections and pin assignments to the Sprint mD's standard and expanded digital I/O.

Input Connections Internal 24V

Sprint mD Input connections Internal 24V input signals are opto-isolated and require a +24VDC (+/- 3V) excitation for assertion. Sprint mD provides and isolated +24VDC, 250 mA output for input signal excitation, available on pins 1 & 14 of the input connector. See *Figure 2-7*.

Input Connections External 24V

Sprint mD Input connections Internal 24V input signals are opto-isolated and require a +24VDC (+/- 3V) excitation for assertion. Sprint mD allows for external +24VDC input signal excitation. The external input signal GND needs to be connected to the isolated input GND on pin 13 or 25 of the Sprint mD input connector. See *Figure 2-8*.

Output Connections

Sprint mD outputs, when asserted, provide +24VDC voltage levels with up to 0.7 Amps per output up to 4 Amps. The output signals are driven by an isolated 24V High-Side Driver. Sprint mD grounds (OP GND) are all connected internally. See *Figure 2-9*.

Standard I/O Pin Assignments

Inputs and output connections are located on the Sprint mD tester's back panel, as shown in *Figure 2-3 on page 2-4*. See *Figure 2-10* and *Figure 2-11* for the standard I/O pin assignments.

Figure 2-7: Input Connections Internal 24V

Sprint mD Input signals are Opto-Isolated and require a +24VDC (+/- 3V) excitation for assertion.

Sprint mD provides an Isolated +24VDC, 250mA Output for Input signal excitation, available on pins 1 and 14 of the Input connector.

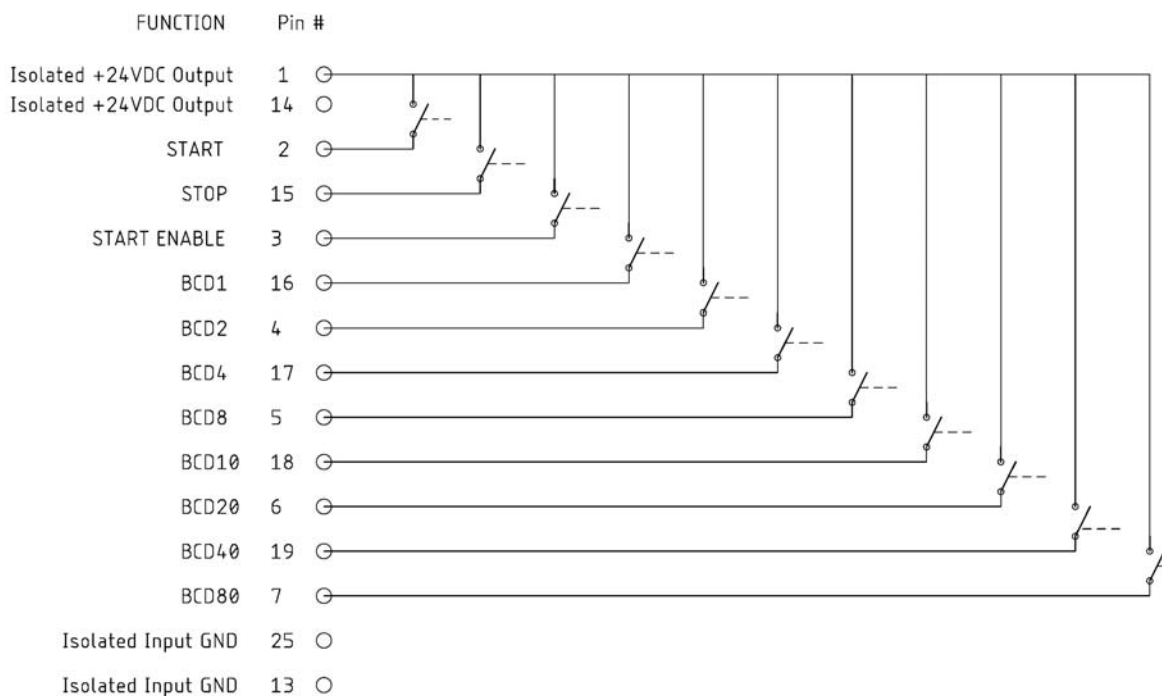


Figure 2-8: Input Connections External 24V

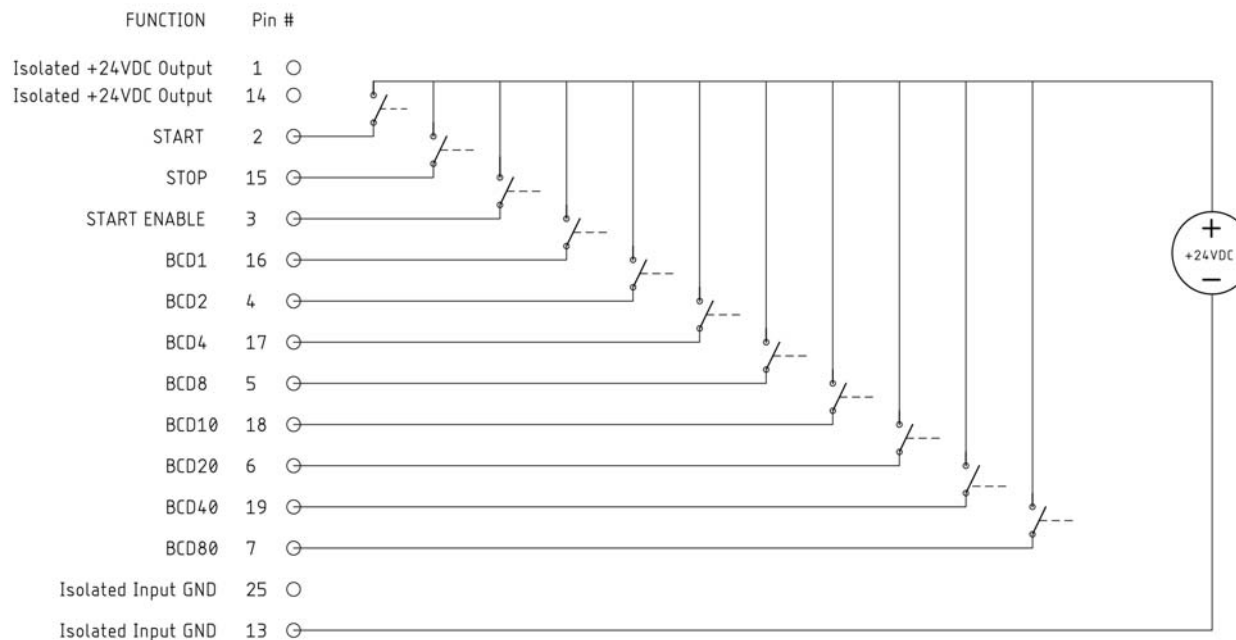


Figure 2–9: Output Connections

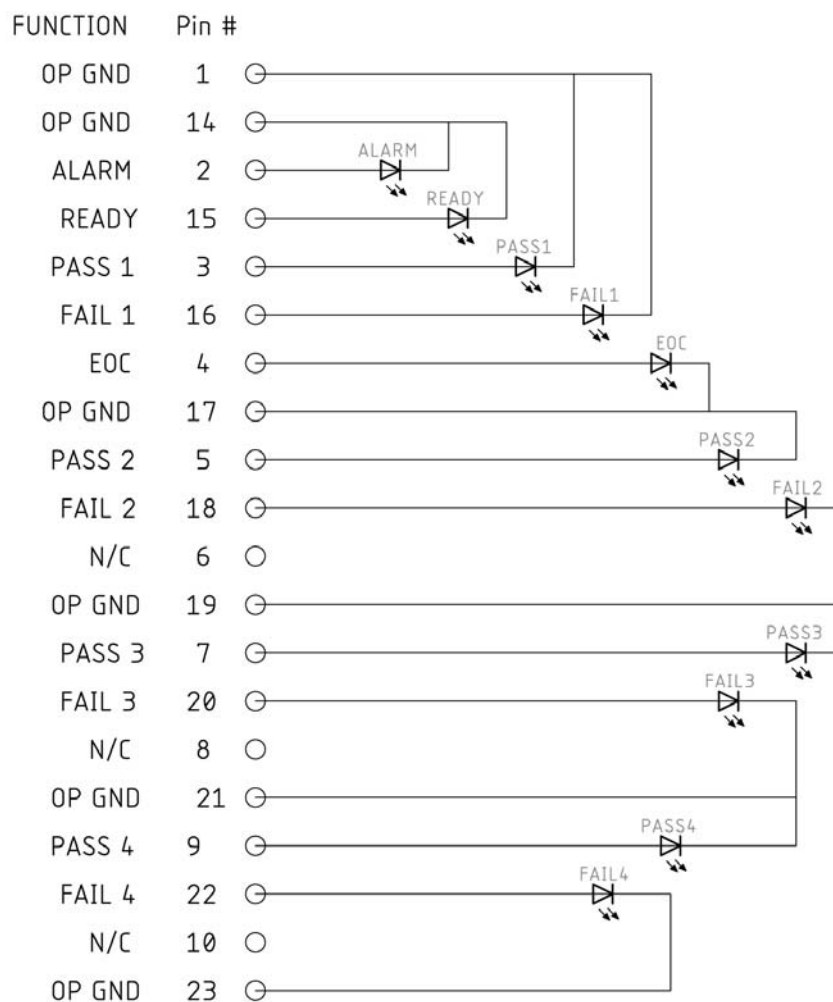


Figure 2-10: I/O Pin Assignments - Standard Inputs

Sprint mD
Standard Inputs Connector
Pin Assignments

Pin #	Pin #	INPUT FUNCTION	PIN #
		+24VDC	1
		+24VDC	14
		START	2
		STOP	15
		START ENB	3
		BCD1	16
		BCD2	4
		BCD4	17
		BCD8	5
		BCD10	18
		BCD20	6
		BCD40	19
		BCD80	7
		N/C	20
		N/C	8
		N/C	21
		N/C	9
		N/C	22
		N/C	10
		N/C	23
		N/C	11
		N/C	24
		N/C	12
		+24V RET	25
		+24V RET	13

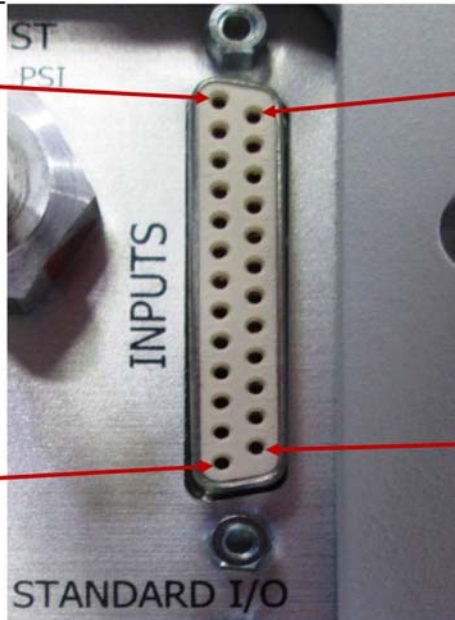


Figure 2-11: I/O Pin Assignments - Standard Outputs

Sprint mD Standard Outputs Connector Pin Assignments			
Pin #	Pin #	OUTPUT FUNCTION	PIN #
		OP GND	1
		OP GND	14
		ALARM	2
		READY	15
		PASS 1	3
		FAIL 1	16
		EOC	4
		OP GND	17
		PASS 2	5
		FAIL 2	18
		N/C	6
		OP GND	19
		PASS 3	7
		FAIL 3	20
		N/C	8
		OP GND	21
		PASS 4	9
		FAIL 4	22
		N/C	10
		OP GND	23
		N/C	11
		N/C	24
		N/C	12
		TIMER*	13
		TIMER RET	25

* Timer Output Voltage: + 3.3V

Figure 2-12: Expanded Input Connector Pin Assignments

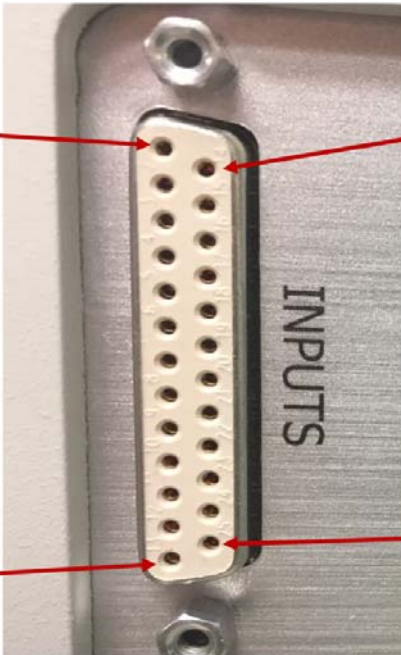
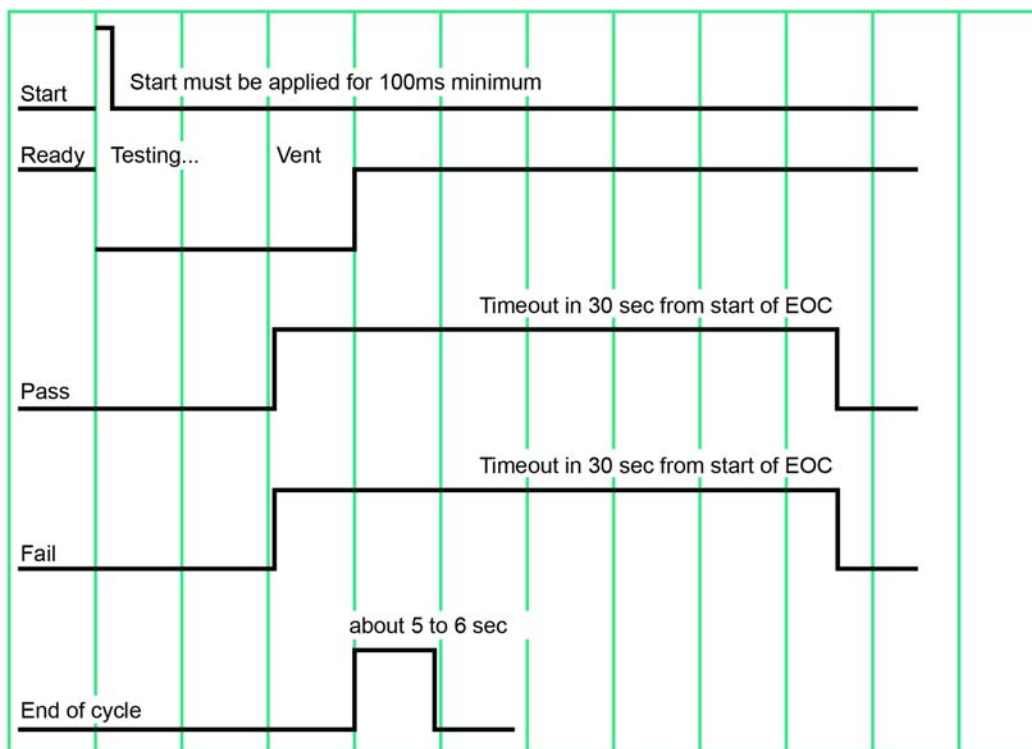
Sprint mD Expanded Input Connector Pin Assignments			
Pin #		INPUT FUNCTION	PIN #
		+24VDC	1
		+24VDC	14
		EXP I/P 1	2
		EXP I/P 2	15
		EXP I/P 3	3
		EXP I/P 4	16
		EXP I/P 5	4
		EXP I/P 6	17
		EXP I/P 7	5
		EXP I/P 8	18
		N/C	6
		N/C	19
		N/C	7
		N/C	20
		N/C	8
		N/C	21
		N/C	9
		N/C	22
		N/C	10
		N/C	23
		N/C	11
		N/C	24
		N/C	12
		+24V RET	25
		+24V RET	13

Figure 2-13: Expanded Output Connector Pin Assignments

**Sprint mD
Expanded Output Connector
Pin Assignments**

Pin #		Pin #	OUTPUT FUNCTION	PIN #
			OP GND	1
			OP GND	14
			EXP O/P 1	2
			EXP O/P 2	15
			EXP O/P 3	3
			EXP O/P 4	16
			EXP O/P 5	4
			OP GND	17
			EXP O/P 6	5
			EXP O/P 7	18
			EXP O/P 8	6
			OP GND	19
			EXP O/P 9	7
			EXP O/P 10	20
			EXP O/P 11	8
			OP GND	21
			EXP O/P 12	9
			EXP O/P 13	22
			EXP O/P 14	10
			OP GND	23
			EXP O/P 15	11
			EXP O/P 16	24
			N/C	12
			N/C	13
			N/C	25

Figure 2-14: Output Timing Diagram



2.5 Turning the Tester On/Off



CAUTION: Before switching the tester ON, make sure the power supply is located in a position where it will be open to air flow and stable.

After all I/O, power, and pneumatic connections are complete, the Sprint mD is ready to be powered on by turning the Tester's On/Off switch (located on the back of the tester) to the On position, see *Figure 2.5 on page 2-23*.

After power-up, the tester opens up to the Home Page, as shown in *Figure 2-15 on page 2-24*.

2.6 External USB Hubs



CAUTION: Do not use externally powered USB hubs as this may cause damage and/or prevent the tester from powering up.

2.7 WEEE Material 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.



2.8 Software Introduction

The Sprint mD is a highly configurable yet easy-to-use tester that provides quick and easy access to configurable operations and measurement data. The tester also provides access to detailed views of data for users with different levels of interest, and can be configured to permit access only to tester functions that are permitted on a per-user basis. This feature allows the software to closely follow the standard operating procedures for limiting access that may be unique to your environment.

2.8.1 Software Navigation

On-screen navigation is simplified with a responsive touchscreen. On power-up, the Home page gives an at-a-glance view of the tester.

The Home page has three main areas:

1: Program Bar (top)

2: Gauge Panel (center)

3: Function Bar/Status Message Bar (bottom)

The Program Bar (1) and Function Bar (3) are always visible (see [Table 2-2](#)); the Gauge Panel (center area) changes as the user selects various functions. Individual gauges display real time test progress and measurement results

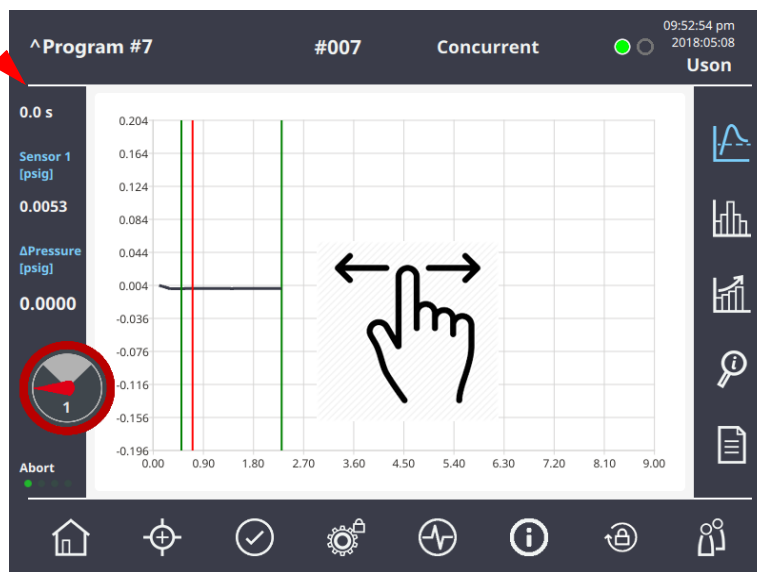
Figure 2-15: .Home Page



Selecting the on-screen icons reveals detailed views. For example, selecting the gauge for a specific port reveals a detailed view of the pressure profile during a pressure decay test, as shown below.

In detailed view, the Active Gauge Panel for the selected port is now visible on the left and new views and analytics are visible on the right for the selected port (“Detail View” Bar). To navigate to one port to another, simply swipe left or right on any of the detailed view pages (see [Table 2–2](#))..

Active
Gauge
Panel

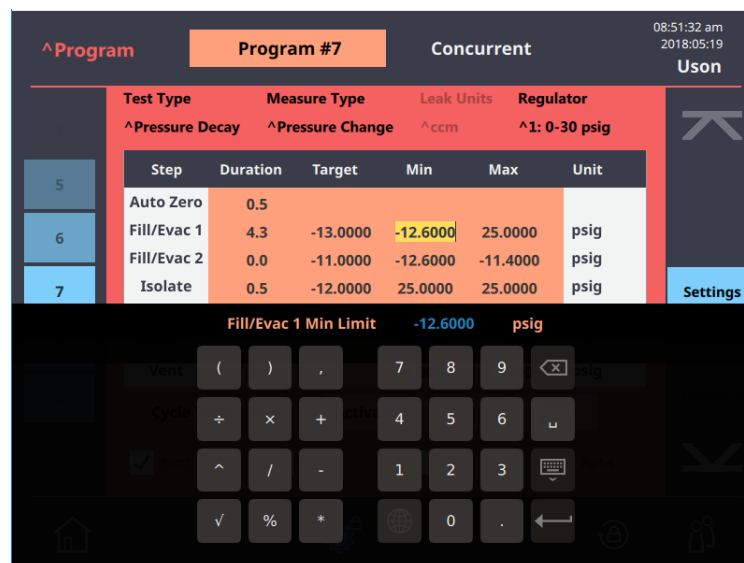


Detailed
View Bar

The selected view will show ellipses at of bottom the panel when additional views are available by swiping left or right.



An intelligent on-screen alpha-numeric or numeric-only keyboard will appear for fields that can be modified or adjusted. Data entry is checked to minimize entry of invalid data.



2.8.2 Icon Descriptions

Table 2–2: Icon Description Table

Function Bar Icons (Bottom)	
Icon	Description
	Home
	Leak Calibration
	Challenge
	Program Settings
	Tester Diagnostics
	Tester Information
	Password Reset
	Sign In

Detail View Bar (Right)	
Icon	Description
	Profile
	Statistics
	Trend
	Step Details
	Result History

2.8.3 Status Message Bar

Status messages appear on the bottom of the screen (in the Function bar area) and are hidden until there is a message to be displayed. The status bar message display time is configurable between 1-10 seconds. The default is 3 seconds.



The number of status messages that can be displayed is configurable between 1 -10. The default is 3 messages. Once the maximum number of status messages display, the operator will be notified that some status messages were skipped and not shown, however a list of unshown messages are viewable from the Status Bar History and Control Page (see [Status Message History & Control Page](#)).

Status Message History

Each status message is appended to a status message history list. The maximum number of status messages in the history list is 1000. The default is set to 200. The status message history list is scrollable and can be cleared by the operator.

As the status message history list approaches its user selected maximum (1-1000), the oldest item is removed, and the newest item is appended.



NOTE: The status message history list resets to empty on power-up.

Status Message History & Control Page

1. To view the Status Message History page, press the **Status icon**  (located on the bottom of the screen). The "Ready to Run" page displays.
2. Swipe **left**. The Status Bar History and Control page displays with the following status message history user settings:

Duration: The amount of time a status message displays (0-10).

Queue Size: The maximum number of status messages to display (1-10).

Max History: The maximum number of status message history messages available for viewing (1-1000).

Clear History Button: Used to clear the status message history.

Program #2
#002
Sequential

10:35:28 am

2019:04:19

Admin

Status Bar History and Control

Date Time	Status Messages
2019-04-19 10:22:43	barcode scan timer expired - begin again
2019-04-19 10:27:36	barcode scan timer expired - begin again
2019-04-19 10:30:17	barcode scan selected program #3
2019-04-19 10:30:31	barcode scan selected program #2
2019-04-19 10:30:47	barcode scan selected program #3
2019-04-19 10:32:51	barcode scan selected program #4
2019-04-19 10:32:55	barcode scan selected program #1
2019-04-19 10:32:57	barcode scan selected program #3

Duration
Queue Size
Max History

3

sec

3

200

Clear History

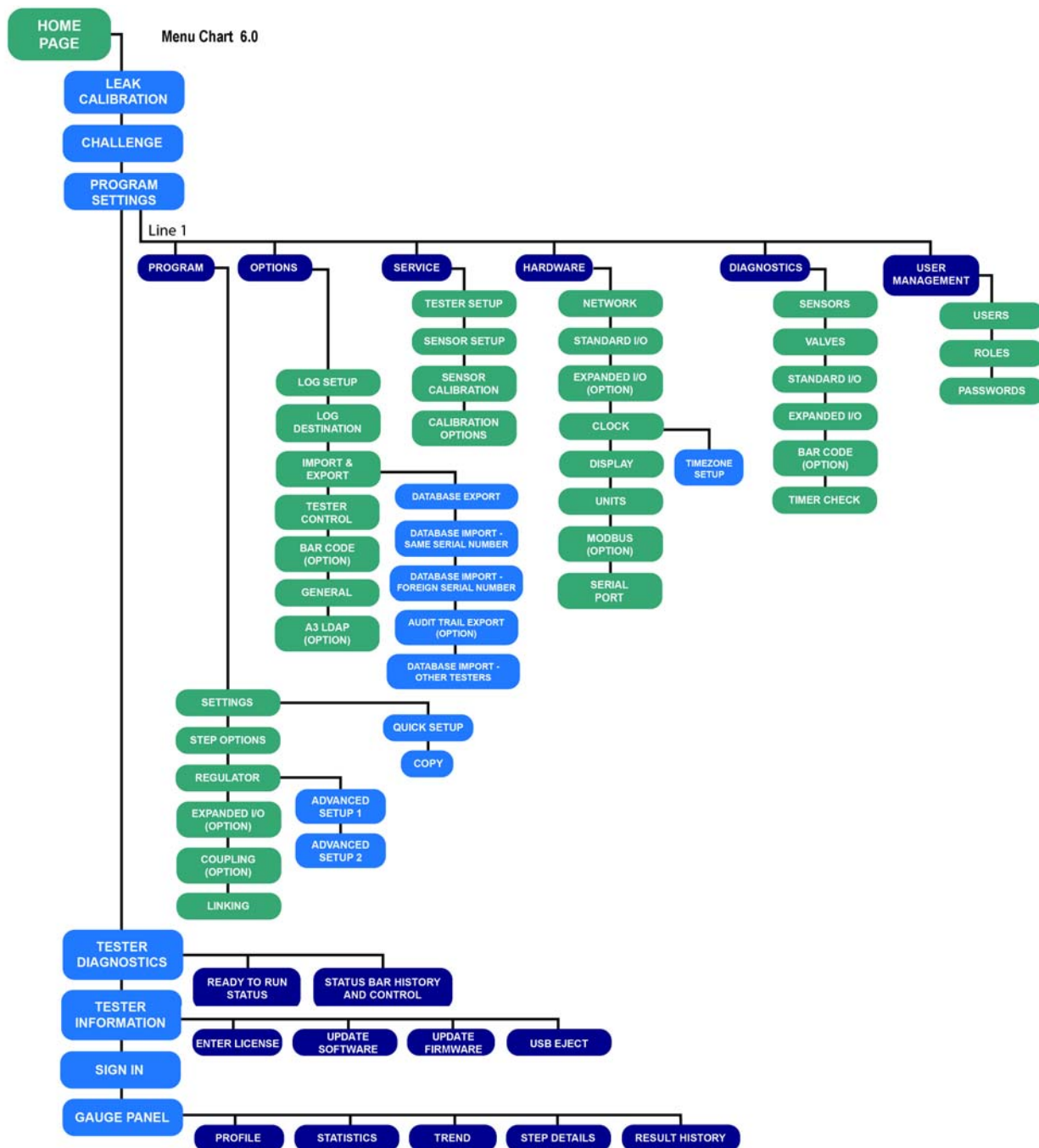









2.8.4 Menu Navigation Hierarchy



2.9 Identifying Your Tester Configuration

To view your tester's configuration, select the **About Icon**  from the Function Bar. The about or information page provides summary information regarding your tester, such as: Uson contact information, tester identifiers such as model type, serial number, mD ID, and smart part number and license key information and status.



NOTE: To safely remove a USB flash drive, select “Eject USB Disk” to ensure data is completely saved to the drive before removal.

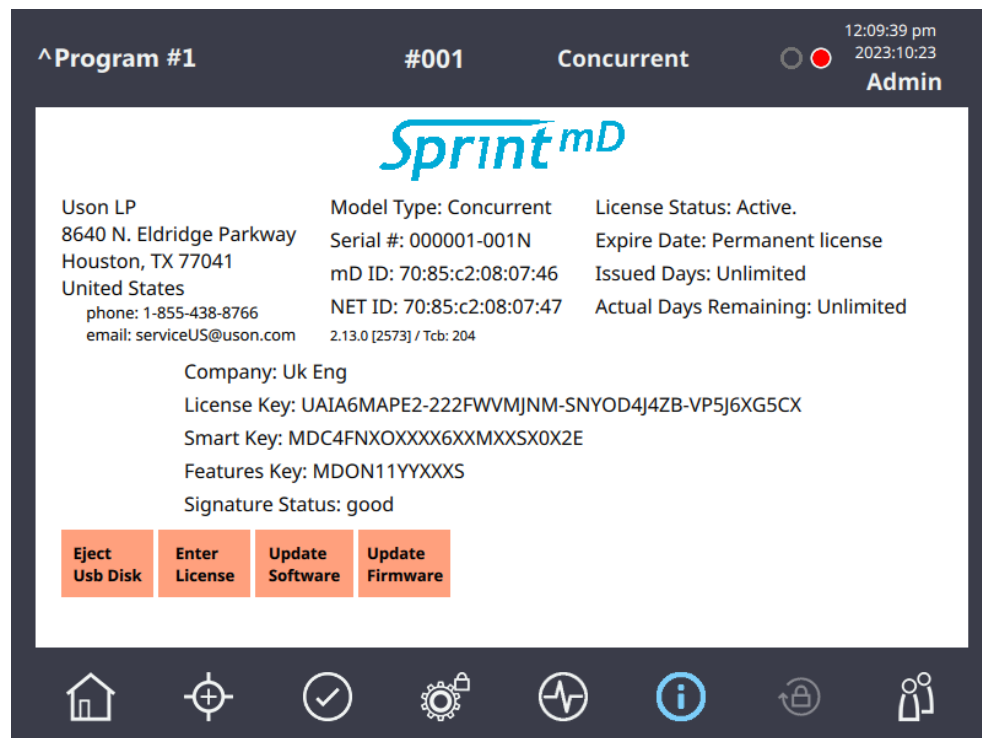


NOTE: The license, software, and firmware updates can only be performed by an Admin user.

To update a license, insert a USB key containing the license file and select **Enter License** (see [Chapter 9, License Update](#)).

Software updates are performed by inserting a USB key containing the software update and selecting **Update Software**. The current version, (e.g., w.x.y[zzzz]) of software is shown below the NET ID Value (see [Chapter 9, Software Update](#)).

To update Firmware, select **Update Firmware**, (see [Chapter 9, Firmware Update](#)). The current version (e.g., Tcb: xxx) is shown below the NET ID Value..



The screenshot shows the 'About' screen of the SprintmD device. At the top, it displays 'Program #1', '#001', 'Concurrent', and the user 'Admin' with a timestamp '12:09:39 pm 2023:10:23'. The main content area features the SprintmD logo and a table of configuration details:

Uson LP 8640 N. Eldridge Parkway Houston, TX 77041 United States phone: 1-855-438-8766 email: serviceUS@uson.com	Model Type: Concurrent Serial #: 000001-001N mD ID: 70:85:c2:08:07:46 NET ID: 70:85:c2:08:07:47 2.13.0 [2573] / Tcb: 204	License Status: Active. Expire Date: Permanent license Issued Days: Unlimited Actual Days Remaining: Unlimited
---	--	---

Below the table, the following information is displayed:

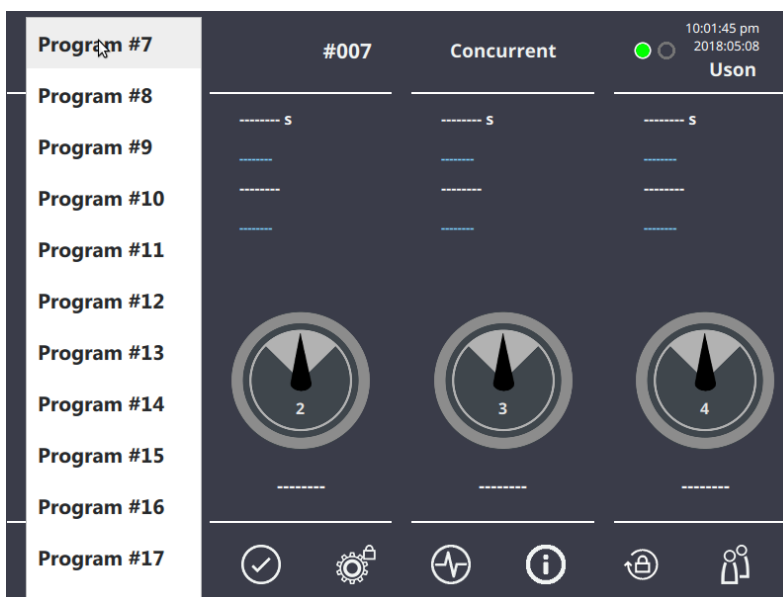
- Company: Uk Eng
- License Key: UAIA6MAPE2-222FWVMJNM-SNYOD4J4ZB-VP5J6XG5CX
- Smart Key: MDC4FNXOXXX6XXMXSX0X2E
- Features Key: MDON11YYXXS
- Signature Status: good

At the bottom of the screen, there are four orange buttons: 'Eject Usb Disk', 'Enter License', 'Update Software', and 'Update Firmware'. A navigation bar at the very bottom contains icons for Home, Settings, Status, About, and Users.

2.10 Quick Start Guideline

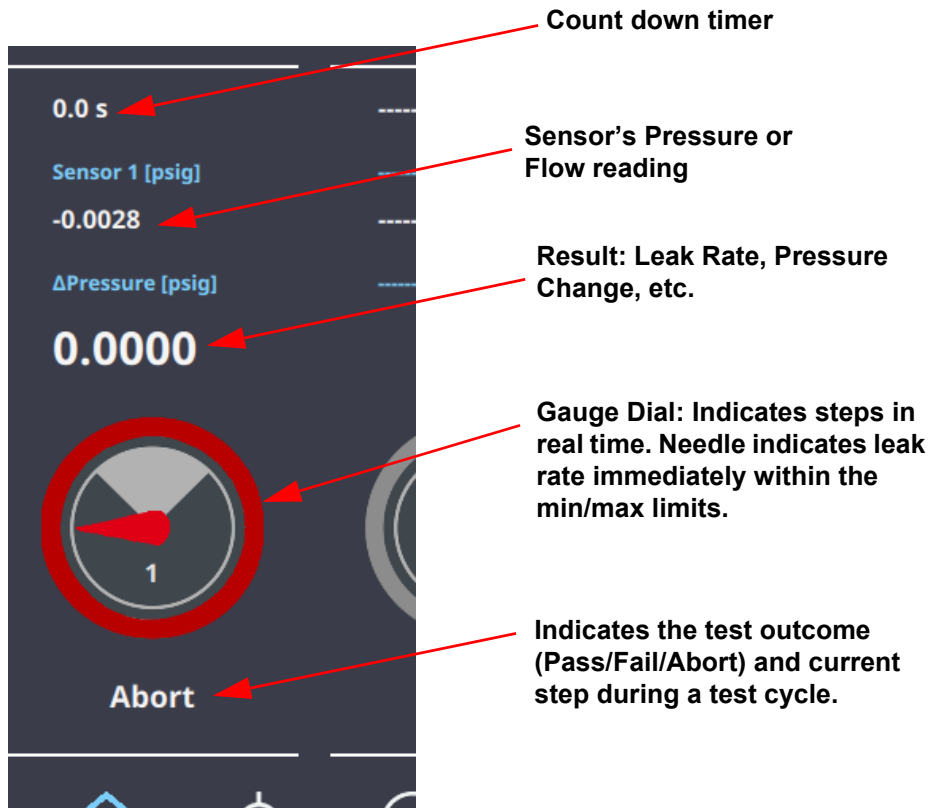
The following Quick Start Outline includes only the essential steps to get your Sprint mD setup and ready to use. (Refer to the appropriate sections in this manual for more details on setting up and running the tester for your particular application.)

1. Review **Section 1, Safety**.
2. Complete your **systems wiring** requirements.
3. Connect a clean, dry **air supply**.
4. Connect **peripheral devices**, if any (network cables, PLC's Modbus, etc.).
5. Connect **power cord**.
6. Turn Unit **On**.
7. Select **Program**, and setup the Sprint mD for your particular application.



8. Press **START button**  from the front panel to initiate a test(s).
9. View **Summary Results**. (See *Figure 2–16 on page 2-33.*)

Figure 2-16: Test Summary Results Description



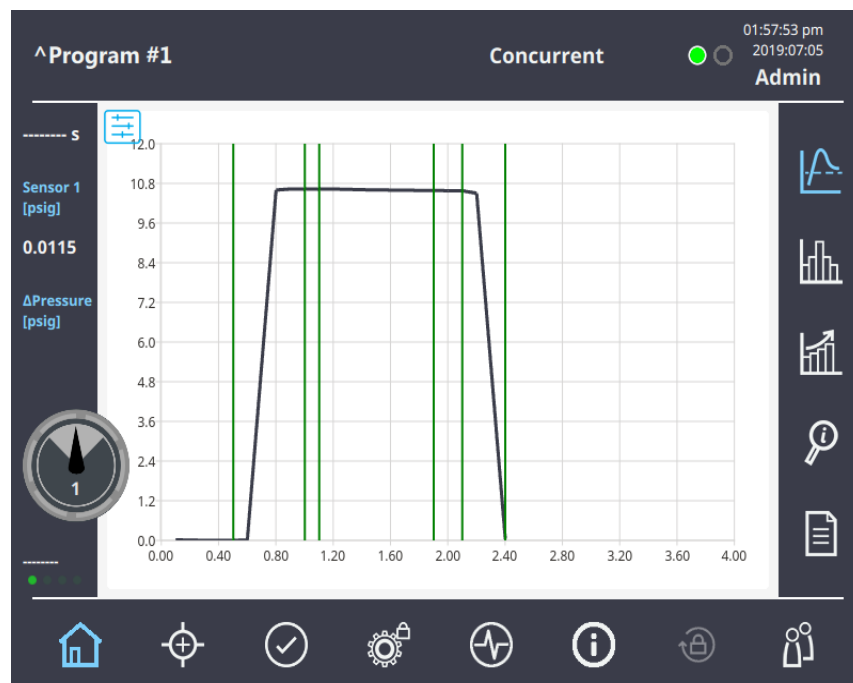
2.11 Test Results

2.11.1 Profile Screen

The profile screens consists of two screens: one to view the profile, and one to setup/select profile options. The first Profile screen displays the profile of Pressure vs. Time for one of four sensors. Swipe left or right to select which sensor to view. Black, Red, and Green Vertical lines on the Profile graph indicate the step result:

- **Black line** = No decision made/no limit
- **Red line** = Step failed
- **Green line** = Step passed

Select **Top Left Icon** to open the Profile options screen where you can set maximum and minimum sensor values and time. It is also used to apply default profile settings. After making Profile settings, Select **Done** to apply settings, or **Cancel** to dismiss them.

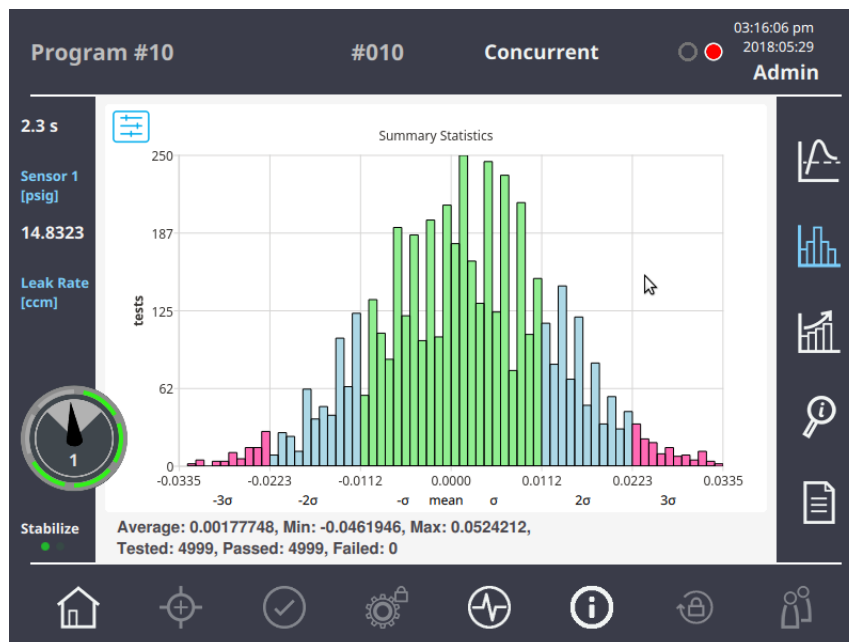


2.11.2 Distribution Screen

The distribution screen displays the most recent stored test results (up to 9999) from a big picture point of view. By viewing many test results on the same graph, you can perceive the statistical distribution curve of past test results.

Select **Top Left Icon** to open the Distribution setup screen. This screen allows for adjusting the range of the graph and the number of data entry slots (bins) available to receive a test result. By adjusting the Minimum, Maximum, and Number of Bins, you are able to render the Distribution graph in a view relevant and fitting to your set of test data.

After making Distribution settings, click **Done** to accept settings or **Cancel** to dismiss them.



2.11.3 Trend Screen

The Trend screens allows you to observe the overall trend of the most recent test results (up to 9999).

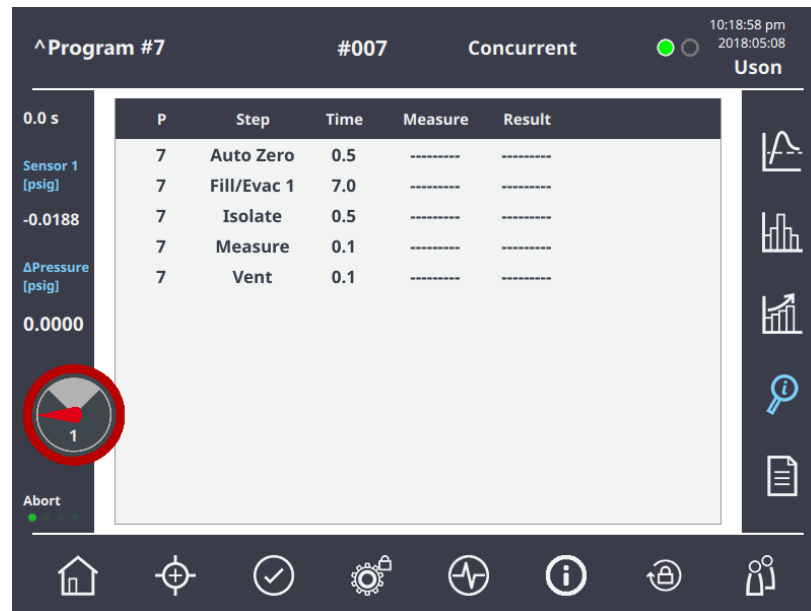
The X and Y axis can be adjusted per program. Select **Top Left Icon** to open the Trend setup screen

The Trend options screen is used to select the maximum and minimum result to display on the Trend graph; enter the Start Test Count and End Test Cycle; and/or Apply Defaults. After setting Trend settings, select **Done** to save settings or **Cancel** to dismiss them.



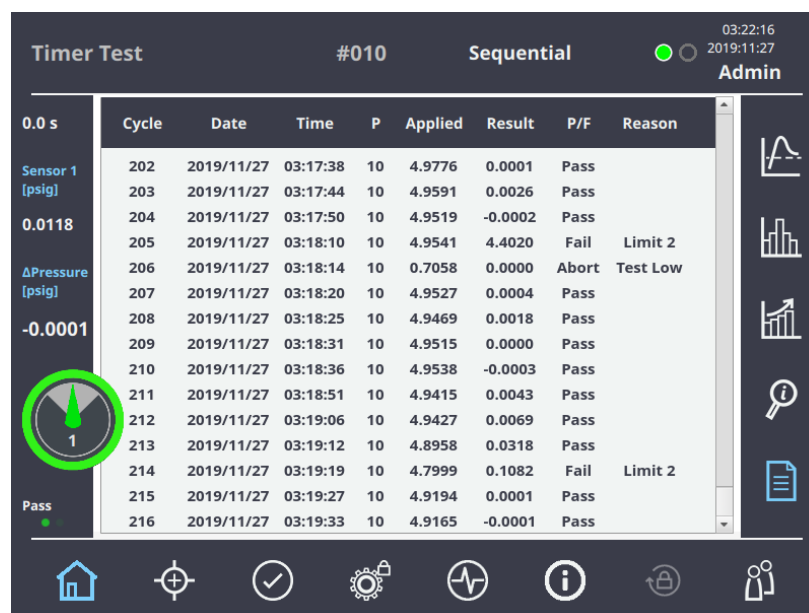
2.11.4 Step Details

The Step details screen displays the current data for the most current step.



2.11.5 Results History

The Results history screen displays data results of a list of up to the last 9999 tests that have been run. This list includes the date and time each test was run, the test result and cycle number along with the Pass or Fail result.



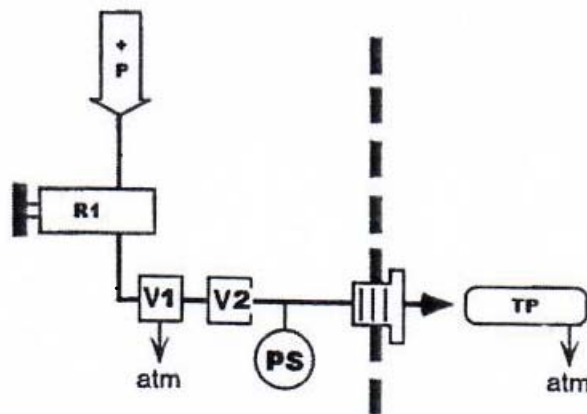
2.12 Log Files

Log files are used to record test data results and to create daily test logs for each channel. The results for each channel can be recorded/saved to various destinations such as serial port, network, or USB.

To enable log output and format, select **Program Settings** , **Options**, then **Log Setup and Log Destination**.

3.1 Decay Test

Decay testing is used to test products for leaks by trapping air inside a product (either pressure or vacuum) and then measuring pressure change over time. The tester intelligently interprets when pressure or vacuum is used and automatically adjusts readouts and graphs to give the correct presentation.



How Decay Testing Works:

1. The part to be tested [TP] is attached to the test port and the test is started.
2. The part is pressurized to desired test pressure set by the pressure regulator [R1] by opening valves [V1] and [V2] during the Fill step.
3. At the end of the Fill step, pressure is then trapped inside the part as [V2] closes. After a slight delay, [V1] closes allowing the line between [V1] and [V2] to be vented to atmosphere through [V1]. This way, any leakage through [V2] will typically cause the tester to see this leakage and fail all tests. The extra valve allows for a fail-safe configuration.
4. Trapped pressure inside the test circuit is held through the Stabilize step and then measured by the pressure sensor [PS] during the Measure step.
5. If the part exceeds the programmed leak tolerance (pressure drop over time or quantified leak rate), the display shows why the part failed and displays the pressure loss or leak rate in user defined units of measure.
6. At the end of Measure step, pressure trapped in the part is vented to atmosphere through [V1] by opening [V2] during the Vent step, and is ready to make the next test.

Parameters which must be set in a decay test:

- Test Pressure
- Pressure Tolerances
- Couple Time (Optional)
- Auto Zero (Optional)
- Fill Time (Evacuate Time)
- Isolate Time
- Stabilization Time
- Measure Time
- Vent (0 or time)
- Reject Criteria
- Product Volume (optional, to calculate cc/m)

Test Pressure

Test pressure is the required pressure to be applied during a test. Test pressure is a preset value both stored in the program and set with the pressure regulator. If the regulator is adjusted or fails to achieve the target pressure, the test terminates and displays an error message.

The preset test pressure should be very close to the actual pressure from which the product starts to drop. If not, the pressure regulator may have been moved or there is a problem with the supply air to the tester.

There are two types of test pressure values:

- **Preset Test Pressure** is the pressure you set using the pressure regulator on the rear panel. The pressure value is the “ideal” or target test pressure.
- **Actual Test Pressure** is the pressure the product is subjected to during a test. The actual pressure could be different from the preset test pressure due to variations in product and small changes in the test system. For this reason, you set the pressure tolerances to allow for a range of acceptable test pressures.

Pressure Tolerances

The minimum and maximum pressure limits define the expected variation of test pressure for the test. The test is aborted when the maximum limit is exceeded, and indicates an over pressure condition. The minimum limit is checked at the end of the fill and stab steps. Tests below the minimum pressure limit abort, and a gross leak condition displays.

Timers in Decay Tests

Couple Time

Couple time is generally the period when the pneumatic or mechanical fixtures are applied to seal the product from atmosphere before applying pressure. Often used in open-ended products such as tubing, catheters, and containers.

If coupling valves are used, the valves turn on at the start of the test and turn off when the test is finished.

If external fixtures are not used, set the couple time to zero time.

Auto Zero Time

Setting an auto zero time enables the auto zero function to minimize long-term sensor zero drift caused by environmental changes by venting the sensor to atmosphere for the set duration and applying the new zero values (reference points) for the current test. The zero setting is only updated for sensors used by the test type with the auto zero function enabled.

Fill Time

At the start of fill time, a valve opens to pressurize the product. Fill duration depends on the size and construction of the part to be tested. Optimum fill time pressurizes the part fast enough for a good throughput, yet not so fast that the product is still expanding during measure step. Large products require a longer fill time than smaller products. At the end of fill time, the valve is closed and pressure is trapped inside both the part and the test circuit.

Isolate Time

A short delay to minimize pressure loss when the valves change state to Isolate the selected pressure regulator from the test circuit. **Note:** a 0.1s minimum time is required.

Stab Time

Stab time allows the pressure to settle before going into the measure step. Best established through trial and error, stabilization time varies depending on product characteristics. Start with stabilize and measure times that are equal to each other. The stabilize time is used to get the maximum separation and repeatability in test results between a known good part and a borderline failure. If the same part is tested repeatedly and the leak result is inconsistent, you probably need to increase the stabilization time. The smaller the leak, the longer the time required.

- **Gross Leak:** A gross leak is detected when pressure drops below the lower pressure limit during stabilization time. When detected, the test aborts and the unit displays a gross condition. A gross leak is generally caused by a product having a severe defect or because external fixtures are not sealing the product. If you repeatedly get gross error messages and neither the product or the fixture seals appear to be the problem, consider increasing the fill time, the pressure

error tolerance, or both. Also at fault could be the test pressure setting. Make sure the pressure regulator has not been moved and the actual applied pressure closely matches the preset test pressure.

Measure Time

In a pressure decay test, measure time is the period over which the amount of pressure drop is measured. Once the test enters measure step, the first pressure reading is recorded and stored as **P1**. At the end of measure step, the final reading is recorded and holds this value as **P2**. The difference between **P1** and **P2** is the total test pressure loss over the measure time. Measure time must be long enough to distinguish between good and bad parts. The smaller the leak the longer the time.

The Delta Pressure is the amount of pressure change from the first pressure measurement in test phase (**P1**) to the last pressure measurement in test phase (**P2**). Decay rate is the pressure drop divided by time.

$$\frac{P1 - P2}{\text{Measure Time}} = \text{Decay Rate}$$

Sprint mD uses the pressure drop to compare to the maximum allowable loss (known as the reject maximum) to decide whether a product is accepted as good or rejected as bad. The reject limit you enter into the parameters menu is generally a low pressure value, such as 0.050 psig, because the reject pressure is the drop from the first pressure reading, not the full pressure on the scale.

Reject Maximum, Reject Minimum (Reject Limits)

Predefined pressure limits allowed during the measure step before a reject is triggered. These settings are made in the **Pass/Reject Limit Menu** under the **Test Parameters Menu**. The level is the difference between the actual test pressure (**P1**) and the test pressure unit values you enter. The menu allows easily selecting how the limits will be used as **Pass Criteria** to decide the outcome of the test. For example, if the “In Band” Pass Criteria is chosen, if the pressure is equal to or within the max and min setting at the end of test phase, the product passes; if not, it rejects. If vent is set on, the dump valve opens and vents the pressure to atmosphere.

Vent Time

Vents the test part to atmosphere for the duration time set and will automatically be extended until the pressure is vented to atmosphere with +/- 1 psi.

3.2 Back-Pressure Flow Test

A back-pressure test is typically used for parts with large passages and therefore high flow rates. (An occlusion tests is typically used on smaller parts.)

A back-pressure flow is performed using the same basic pneumatic circuit employed in pressure decay. Programming is the only difference since the part is not expected to maintain pressure. The part is continuously pressurized while air is escaping to atmosphere through the passages being checked. The residual pressure (back-pressure) seen at the parts inlet is measured and must remain within a specific range of pressure defined by reject maximum and reject minimum to pass the test. Thanks to the commonality of test circuits, it is possible (and quite common) to conduct pressure decay tests followed by back-pressure flow tests.

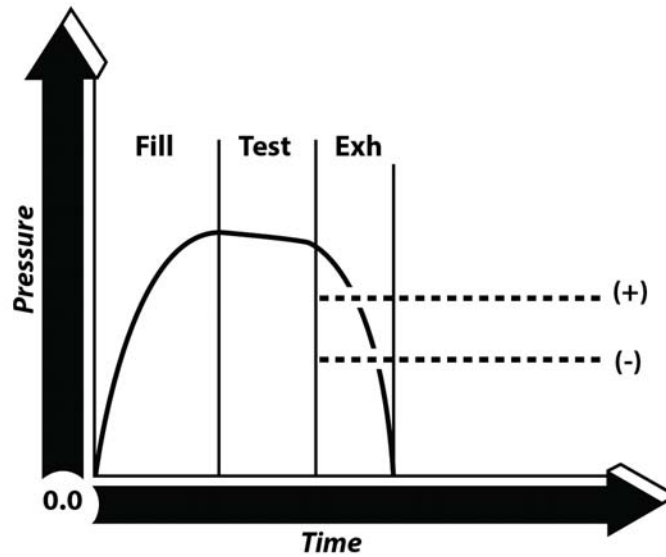
How Back-Pressure Flow Testing Works

1. The upstream end of the part to be tested [TP] is attached to the test port and the downstream end of the part is left unsealed and open to atmosphere.
2. Part is pressurized with positive pressure [+P] to the desired test pressure set by the pressure regulator [R1] by opening valves [V1] and [V2] throughout the test.
3. At the end of Measure step, the resulting back-pressure is recorded using its pressure sensor [PS].
4. If the measured back-pressure during the Measure step is outside accept/reject setpoints entered into the test program, the display shows why the part failed.
5. At the end of the test, any remaining pressure trapped in the part is vented to atmosphere through [V1] by opening [V2] only, and is ready to make the next test.

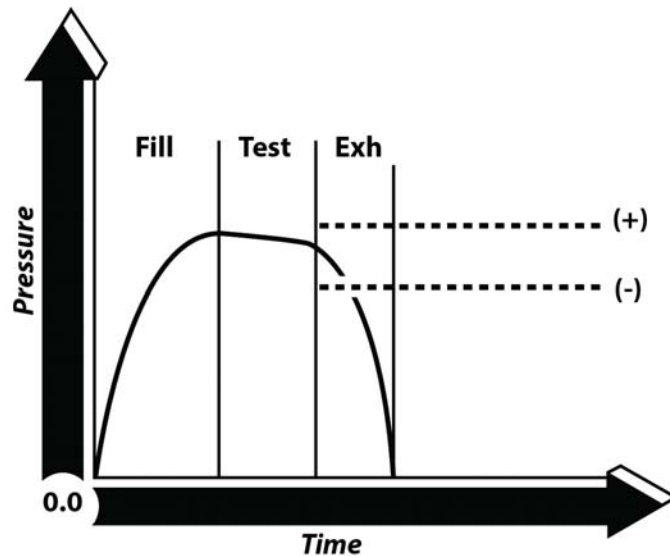
Rejected Vs. Accepted Tests

The following figure illustrates a typical back-pressure flow test sequence in which the part under test fails the evaluation. The part in this example fails because the residual back-pressure seen at the inlet of the part (while the outlet is vented to

atmosphere) was not within the established limits (reject minimum and maximum), indicating that the passage was the wrong size.



The following figure shows a typical back-pressure flow test in which the part passes the evaluation. In this example, the residual back-pressure seen at the part's inlet (while the outlet is vented to atmosphere) was within the established reject minimum and reject maximum limits, indicating that the passage was the correct size.



3.3 Occlusion (Blockage) Test

An occlusion test (also called a blockage test or a gross pressure loss test) is a method of testing in which pressure in an open product must drop below a set level for a pass condition. Occlusion tests are generally used to evaluate products that have openings to check for potential blockages or obstructions of the flow path. Generally, occlusion tests are used on parts which are not large enough to work well with a back-pressure test.

All occlusion test parameters are the same as in a pressure decay test. The reject maximum and reject minimum is the reverse of a pressure decay leak test. Rather than expecting the part to hold pressure we now expect the pressure to flow to atmosphere. In an occlusion test, a good part is expected to leak (or flow) so the reject value must be greater than a given value.

For simplicity, the definitions of all the parameters or how to program will not be explained here. For more information see the explanation of a pressure decay test.

Occlusion Test Examples

The same pneumatic circuit employed in pressure decay testing is used in occlusion testing; only the programming is different.

Thanks to the commonality of test circuits, it is possible to conduct pressure decay tests followed by occlusion tests. This is easy to accomplish with Sprint mD's program linking ability.

Typically, a pressure decay test is conducted first, then the product is opened to atmosphere and an occlusion test is performed.

Sealing the Product

Occlusion tests can be conducted by using a clamping device to seal the product during the fill time and releasing the seal to allow the product to flow to atmosphere during the measure step. Alternatively, the product can be opened to the atmosphere throughout the entire test.

An occlusion test can be run with or without a clamping device to seal off the product.

Example Setup

Step 1.

- Select the required program number and set the Test type to Occlusion which will clear the program parameters.
- Set values to the required test conditions, using Quick setup or by entering values manually.
- The picture below shows an example setup to perform a test at 20 psi on port 1.
Note: the final step times and measure step limits will need to be determined using known good and blocked parts.

Step	Duration	Target	Min	Max	Unit
Auto Zero	0.5				
Fill/Evac 1	3.0	20.000	18.000	22.000	psig
Fill/Evac 2	0.0				
Isolate	0.1	20.000	18.000	22.000	psig
Measure	1.0		18.500		psig
Vent	0.1		-1.000	1.000	psig

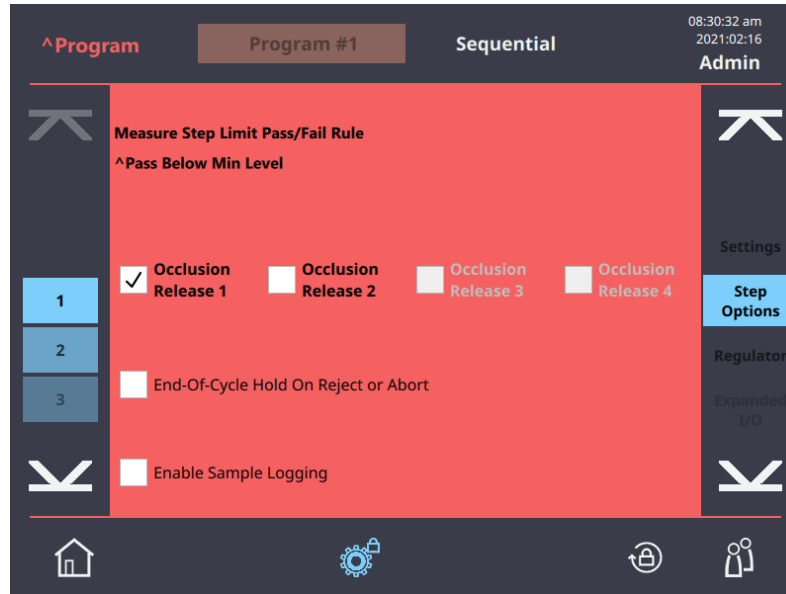
Cycle Time : 4.7 Event Limit : 0 psig Copy

☒ Port 1 ☐ Port 2 ☐ Port 3 ☐ Port 4

Step 2.

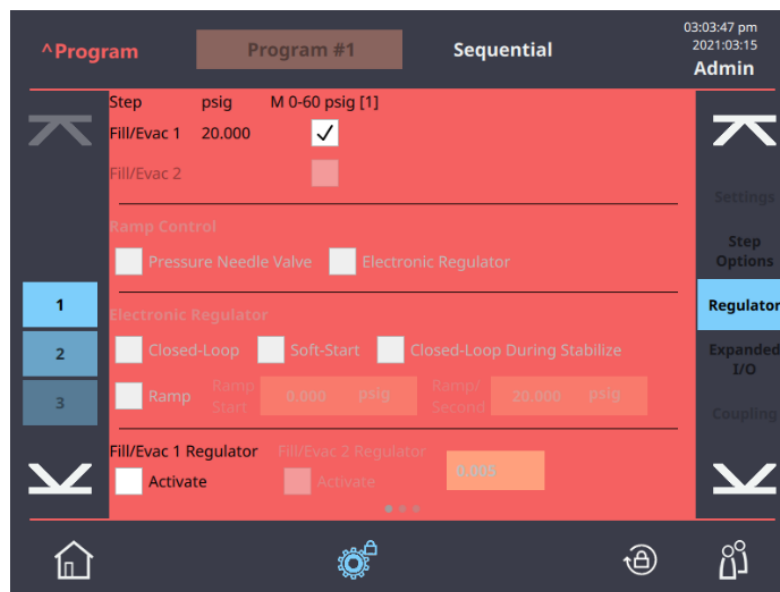
- Select the Step option page.
- Select the required Measure Step Pass/fail rule.
- Select the Occlusion Release output to automatically release during the measure step for the couple output used to seal the product during the fill step.
- (Note: The Occlusion Release output number corresponds to Couple output.)

- In this example, the Pass below min level is used (i.e., a single Min Limit) and Couple 1 is the release output.



Step 3.

- If a manual regulator is fitted, select the Regulator page.
- Ensure test port 1 is sealed (i.e., blanking cap is fitted).
- Activate Fill/Evac step regulator and adjust regulator to achieve required test pressure.
- De-activate regulator selection.



Step 4.

- Select the Coupling screen.
- Set the required couple output step time and output states as required.
- The picture below shows an example setup using couple 1 and additional outputs used for clamping the test part.

^Program		Program #1		Sequential				08:29:12 am 2021.02.16 Admin	
Step	Duration secs	Couple 1 3W NC OP	Couple 2 3W NC OP	Couple 3 Disabled	Couple 4 Disabled				
Couple1	1	on	off	off	off				
Couple2	0	off	off	off	off	Regulator			
Couple3	0	off	off	off	off	Expanded I/O			
Couple4	0	off	off	off	off	Coupling			
UnCouple4	0	off	off	off	off	Linking			
UnCouple3	0	off	off	off	off				
UnCouple2	0	off	off	off	off				
UnCouple1	1	off	off	off	off				
Cycle Time	Coupling 2	Test 4.7	Total 6.7						

This completes the initial setup of an Occlusion test program. **Note:** Tests must be performed using known good and blocked test parts to finalize test parameters and limits.

Occlusion Test

The occlusion test can be set up as follows:

1. The operator connects a product to the test port and the open end of the product is either placed in the sealing (clamping) fixture, or left isolated to atmosphere. The operator pushes the **START** switch. (Or the start could be activated by automated equipment.)
2. The couple timer provides delay time needed to activate the fixture before starting the test. A coupling valve can be used to supply air to the fixture and hold the seal until the test ends.
3. At the end of couple time, the pressure decay valve opens and fills the product with air. The stabilize step is only selected if the test pressure is within the pressure limits tolerance at the end of the fill step.
4. At the end of fill time, valves close trapping air inside the product including the internal test circuit. Stabilization time lets the pressurized product settle before

measuring pressure drop readings. For large flow rates stabilization time is not needed and can be set to zero.

5. At the end of stabilization time, the unit selects the measure step if the test pressure is within the pressure error tolerance.
6. During measure time, the seal clamps release (when enabled) and the test part is opened to atmosphere. The resulting pressure drop is compared with the set limits. If the pressure decay (or pressure loss) is greater than the reject minimum at the end of measure time, the pass indicator lights. If the pressure is less than or equal to the reject minimum, the fail indicator lights.
7. If the vent parameter is set a time other than zero, the vent valve vents the product to atmosphere. If another test is linked to the occlusion test, Sprint mD goes to the next linked test in the series as long as the product passed all tests.
8. At the end of all linked tests, the operator (or automated machinery) removes the product and is ready to begin the next test.

3.4 Flow Test

The sequential test model can include an optional flow test option when specified. A flow test continuously supplies air to a product under test and measures the amount of air flowing through the product to atmosphere using a mass flow sensor and a pressure transducer to monitor the air pressure.

The flow test can be configured to measure air flow through a product and to pass that product if air flow is between the minimum and maximum limits set in the program. Flow tests are often used to check for blocked passages in small tubing and other low-flow devices.

Flow Test Parameters

- Test Pressure
- Pressure Tolerances
- Stab Time
- Couple Time (if external fixtures are used)
- Fill Time (only required on large products)
- Stabilization Time
- Measure time
- Vent (0 or time)
- Max Flow (maximum flow)
- Min. Flow (minimum flow)



PROTECT THE FLOW SENSOR

Do NOT run a flow test unless product is attached to Sprint mD's test port. Without this restriction, the high flow rate could damage the flow sensor.

Pressure Tolerances in a Flow Test

Pressure tolerances are used to ensure pressure is in acceptable limits to perform a flow test. This is necessary because flow rate changes as pressure changes. Pressure limit checks in a flow test function similar to a pressure decay test.

Flow Test Stabilization

Make sure the stab time is long enough for the flow to reach a steady flow rate.

Flow Setpoints

To pass a flow test, the product must be within the pressure tolerance and within the minimum and maximum setpoints at the end of measure time.

If both the pressure tolerance and flow tolerance are exceeded during a test, the pressure error displays because pressure error has priority over flow tolerance.

If the air flow sensor is below the minimum setpoint at the end of test phase, the reject indicator light and shows LOW in the status box.

If vent is active, the vent valve opens and pressure is vented to atmosphere.

Fill time in a Flow Test

Use the fill time in a flow test to get the product pressurized and flowing properly before taking flow readings. This protects the flow sensor from overpressure and provides more consistent flow readings.

If vent is active, the vent valve opens and pressure is vented to atmosphere.

Leak Test Using Flow

You can use Sprint mD to check for leaks using flow. When setting up this kind of test, you set the minimum flow rate to zero. The maximum flow setting is then set to the maximum flow rate you wish to accept. The exact flow rate depends on your product characteristics and specifications.

When to use a flow leak test

A leak test using flow is often an excellent option when certain conditions apply. If your product is small and the acceptable leak rate is relatively high, a leak test using flow can be much faster than a pressure decay test. This is because a flow test conducted on a small product requires minimum fill or stabilization time. Typical leak tolerances used in flow leak testing are roughly 1.0 sccm for small rigid products, and 5.0 sccm or greater for larger and more flexible products.

If the acceptable leak rate is relatively small (less than the rates discussed above) a pressure decay test is probably your best choice for leak testing. Call Uson to discuss your special testing needs. We specialize in helping test engineers come up with the very best tests for a wide range of products.

When setting the maximum flow setpoint, you'll need to experiment to find the best setting. The maximum flow setting is typically quite high above zero to allow for high speed testing-the reason to use a flow leak test in the first place. If the maximum flow setting is set too close to zero and the time is kept short, a high number of rejects could occur simply due to inconsistencies among the products tested. Atmospheric and room pressure changes could also cause errors if the maximum setpoint is set too close to zero.



PROTECT THE FLOW SENSOR

Do NOT run a flow test unless product is attached to Sprint mD's test port. Without this restriction, the high flow rate could damage the flow sensor.

In a leak test using flow, you have the option of using fill time or going straight to test phase. Fill time is usually needed for large parts that need to fill with air before they start flowing. Small parts can often do without fill time because they fill up and start flowing immediately. The flow rate is displayed for both during the fill and test phases.

3.5 Burst Test

A sequential model type can include the burst test option if specified. A burst test increasing the pressure supplied and checks for devices to open resulting in a loss of pressure within a required pressure range.

Test engineers often use a burst test to check pressure relief mechanisms designed to open within a preset pressure range. Burst tests are also used to check the friction relief-point of hydraulic and pneumatic devices.

Pressure Ramp Rate

The pressure ramp rate is either determined by a taper valve located on the back panel or using the electronic regulator ramp feature. Adjust the flow control (using trial and error) to get the best rate of pressure increase.

Peak Pressure (P)

Peak Pressure is the maximum pressure achieved before a burst. Condition is detected and is used as the starting point to measure the event value. After the event, the final peak value is compared to the minimum and maximum burst setpoints to decide whether the product is accepted or rejected.

Event (E)

Event is the amount of pressure drop from the peak pressure when a burst occurs and the product opens occurs product opens to atmosphere resulting in a loss of pressure.

Burst Test Parameters

Test Pressure

Pressure Tolerances

Measure time

Vent (0 or time)

Event Value (minimum pressure value to trigger end of test)

Minimum and Maximum for Burst

Minimum and maximum setpoints establish a window in which a burst event must take place to be a pass. If the burst occurs below the minimum setpoint, the test stops and a Low Burst condition displays.

If pressure goes above the maximum setpoint without the product bursting, the test stops and a Hi Burst condition displays.

If product fails to reach a peak pressure above the maximum burst setpoints before the end of the measure step, the test stops and a No Burst condition displays.

3.6 Creep Test

The sequential model type can include a creep test option when specified. Creep tests are used to test products such as blister packages that need to hold a certain amount of air pressure without failing but are expected to increase in size or “creep up” during the test. A creep test is selected by selected the Pressure Creep test type in the Test Parameters Menu.

Use the Pass/Reject Limit Menu to select the Reject Maximum pressure. Products reaching this pressure setting are passed, while products not reaching this setting in the allowed measure time are rejected. Products opening to atmosphere (bursting) before reaching the setting setpoint are also rejected.

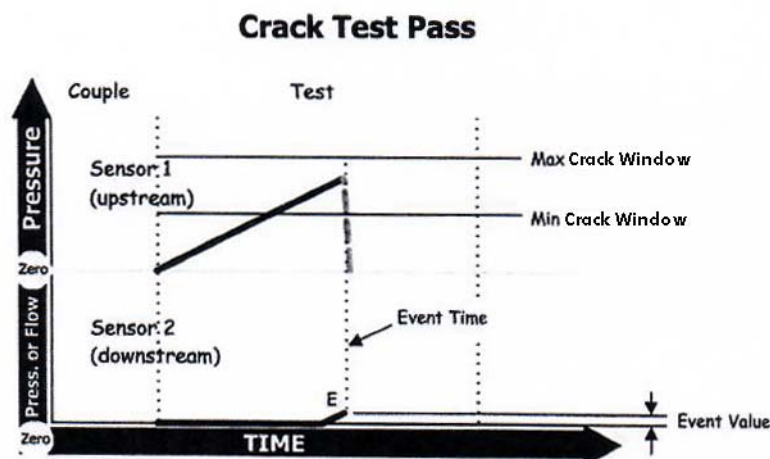
An Event Limit pressure must also be set in the Pass/Reject Limit Menu. This limit sets the limit of allowable pressure variation events permitted as the pressure ramps. For example, if set to 1 psi, a jump event of 1 psi during the test will cause the test to reject the product.

The Event Limit should not be set to zero, as it will cause all creep tests to fail.

3.7 Crack Test

The sequential model type can include a crack test when specified. Crack testing is used to detect a slight opening or change in pressure. Crack testing is used in devices such as valves intended to open a certain pressure range. Because a crack is desired, a pass indication is given if the crack happens within established tolerances.

Crack testing is related to burst testing, which is used to test products that open quickly to atmosphere and create a dip in pressure called an event. In some products, the event is too small or the pressure does not drop at all. A crack test uses a second sensor downstream from the part to catch a pressure rise or flow coming out of the part.



Downstream Sensing

In some test parts, the crack (pressure change) is so gradual or low in magnitude that the sensor can't detect the pressure change. This isn't a fault of the sensor, rather the placement of the sensor in the test circuit becomes an issue. Being upstream from the product, the normal sensor is subjected to constant makeup air.

To test products that open slowly or merely "weep," a separate sensor is used downstream from the cracking device to detect very slight pressure or flow changes. In this arrangement, the downstream sensor measures the small pressure or flow variations caused by changes in the product being tested. This arrangement requires the downstream to be routed back to the tester's Port A.

The Crack Event

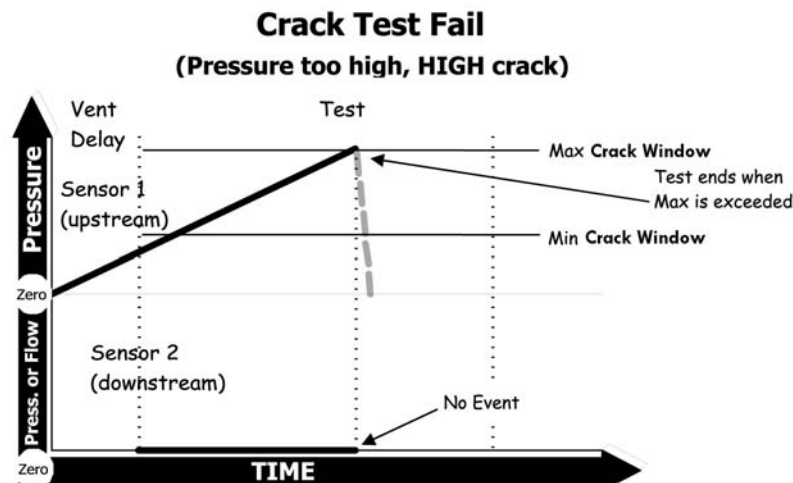
The gauge sensor measures the pressure rise being applied to the test part on the upstream side. The downstream sensor measures a change in pressure or flow on the downstream side of the test part. This downstream sensor can be either a pressure or flow sensor.

Two measured values are associated with an event value: the peak pressure attained (upstream side), and the amount of pressure or flow rise (downstream side)

Both sensors are monitored at the same time. To register as a pass, the upstream peak pressure must be within the min and max crack window AND the downstream pressure or flow must exceed the event setting. For example, if the event is set at 0.05 psig, the downstream pressure is monitored till it increases more than 0.05 psig. At that time: the peak upstream pressure must fall within the minimum and maximum crack settings for the test to pass.

Programming a Crack Test:

The parameters of a crack test are set in the same manner as a burst test. (See *"Burst Test" on page 3-14.*)



3.8 Sealed Component Testing

A sequential model type is capable of performing Sealed Component pressure and Vacuum tests when specified. This type of test can be employed when the test component is completely sealed, and has no ports or openings. The component is tested by placing it in a custom-built test chamber. The chamber should be constructed so that the internal volume is only slightly greater than the volume of the test component.

The test is performed by pressurizing a metered volume and then discharging the known pressured volume of air into a test chamber containing the sealed component. A larger pressure change occurs for leaking components. The resulting pressure drop depends on the metered volume, test component volume and the dead volume within the test chamber (i.e., test chamber volume minus test component volume) which are application dependent.

The sealed component test performs the following steps: Fill, Isolate, Test, and Vent. The Fill step operates a valve to pressurize only the metered volume connected to it. The Isolate step operates a valve to isolate the regulator from the metered volume. The Measure step energizes the selected channel valves to connect the test part to the pressurized volume and displays the pressure change as a delta value.

Example Setup

Step 1.

- Select the **required program number** and set the **Test type to Sealed Comp**, which clears the program parameters.
- Set **Measure Type to Pressure Change** (i.e., total pressure difference between Fill step to Measure step) or **Pressure** (actual resulting pressure at the end of the measure step) as required.
- Enter **required test conditions** using either the Quick setup or by entering the values manually.
- The following picture shows an example setup to perform a test at 20 psi on port 1. **Note:** the final step times and measure step limits will need to be determined using known good and reject (i.e., gross leak) part.

Program #3 Sequential

02:45:23 pm
2021:03:15
Admin

Step	Duration	Target	Min	Max	Unit
1 Auto Zero	0.5				
2 Isolate	0.1		-1.000	1.000	psig
3 Fill/Evac 1	1.0	20.000	18.000	22.000	psig
4 Fill/Evac 2	0.0				
5 Stabilize	0.1	20.000	18.000	22.000	psig
6 Measure	1.0		1.000		psig
7 Vent	0.5		-1.000	1.000	psig

Cycle Time : 3.2 Event Limit : 0 psig

☒ Port 1 ☐ Port 2 ☐ Port 3 ☐ Port 4

Step 2.

- If a manual regulator is fitted, select the **Regulator** page.
- Ensure **test port 1** is sealed (i.e., blanking cap is fitted).
- Activate **Fill/Evac step regulator** and adjust **regulator** to achieve required test pressure.
- De-activate the **regulator selection**.

Program #3 Sequential

03:01:40 pm
2021:03:15
Admin

Step psig M 0-60 psig [1]

Fill/Evac 1 20.000 ☒

Fill/Evac 2 ☐

Ramp Control

☐ Pressure Needle Valve ☐ Electronic Regulator

Electronic Regulator

☐ Closed-Loop ☐ Soft-Start ☐ Closed-Loop During Stabilize

☐ Ramp Ramp Start 0.000 psig Ramp/ Second 20.000 psig

Fill/Evac 1 Regulator Fill/Evac 2 Regulator

☐ Activate ☐ Activate -0.019

Step 3.

- Select the **Linking** page
- Set the **On Pass Jump To** parameters to **jump immediately to a decay test** (i.e., program 4) **without venting** to perform a normal leak test.

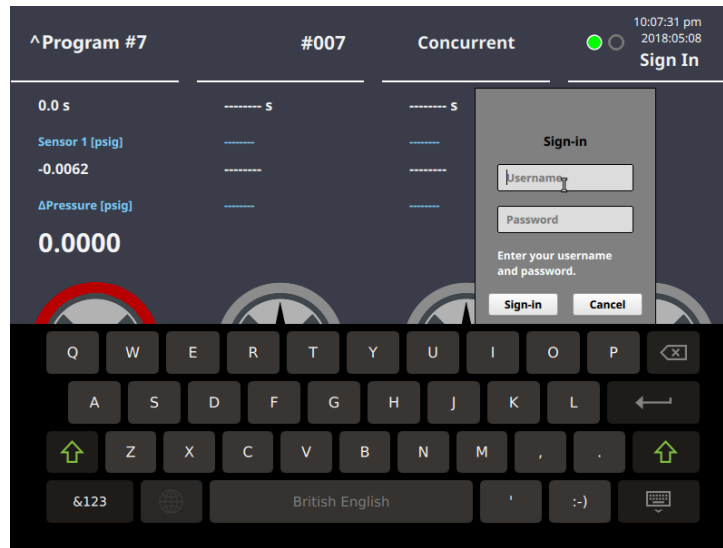
This completes the initial setup of an Sealed Comp test program. **Note:** Tests must be performed using known good and blocked test parts to finalize test parameters and limits.

Sealed Component Test

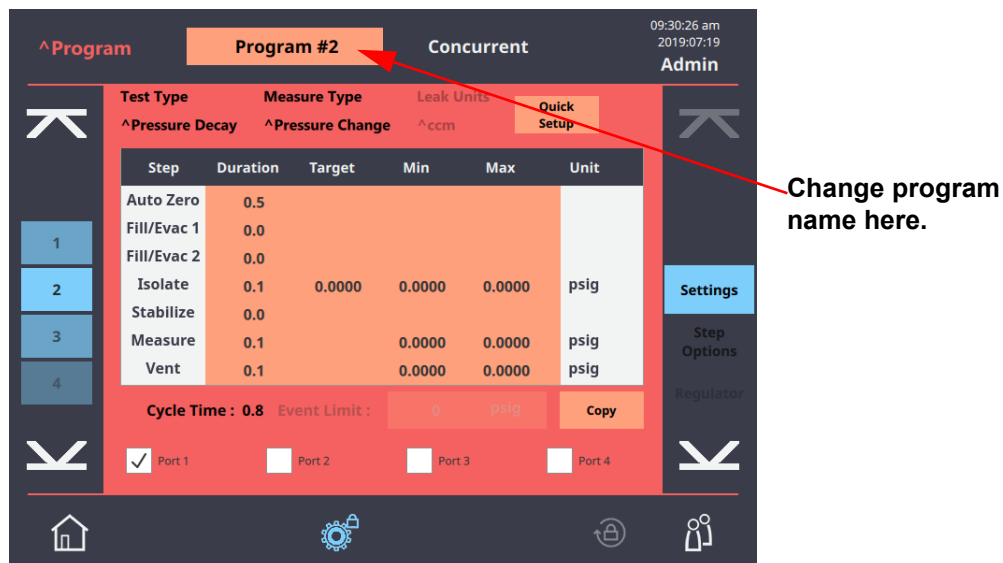
1. Connect the **reference volume to test port 4** (metered port).
2. Connect the **custom test chamber to test port 1**.
3. Insert the **test part into the chamber**.
4. Select the **sealed component test program** and **start the test**.
5. The test will perform the sealed component test and either jump to the decay test on pass condition or stops on a fail condition.

4.1 Creating a Basic Program

1. Select the Login  Icon to Login/Sign on to the Tester. Refer to *Section "7.3", Configuring User Role Permissions.*



2. Select **Program > Settings**



3. Select **Program number** using arrow keys (on left-side of screen).
4. Enter **Program name and number.**

5. Use the **Arrow keys** (on right-side of screen) to select the various program setup categories and inputs suited for your application.
6. Select required **Test Type** and **Measure Type** for your application. Perform either **Manual Setup** (Step 7) or **Quick Setup** (Step 8).
7. **Manual Setup:** Manually enter required data for **Duration, Target, and Min/Max Limits** for each of the displayed steps or chose **Quick Setup** (Step 8).
8. **Quick Setup:** a) Select **Quick Setup** to display the Quick Setup screen. b) Enter the test criteria into the corresponding fields, then select **Check** option to verify the data entered. c) Correct any reported invalid data entries, then select **Confirm**, which updates step details. d) **Note:** The step data is an initial guide that will need to be verified by performing tests.

Program #2 Concurrent 09:31:54 am 2019:07:19 Admin

Leak Threshold	Test Pressure	Test Tolerance
0 ccm	0 psig	10 %

Volume Units: ^ml Volume: 0 ml

Check Cancel Confirm

Step	Value	Unit
Stabilize	0.0	
Measure	0.1	0.0000 0.0000 psig
Vent	0.1	0.0000 0.0000 psig

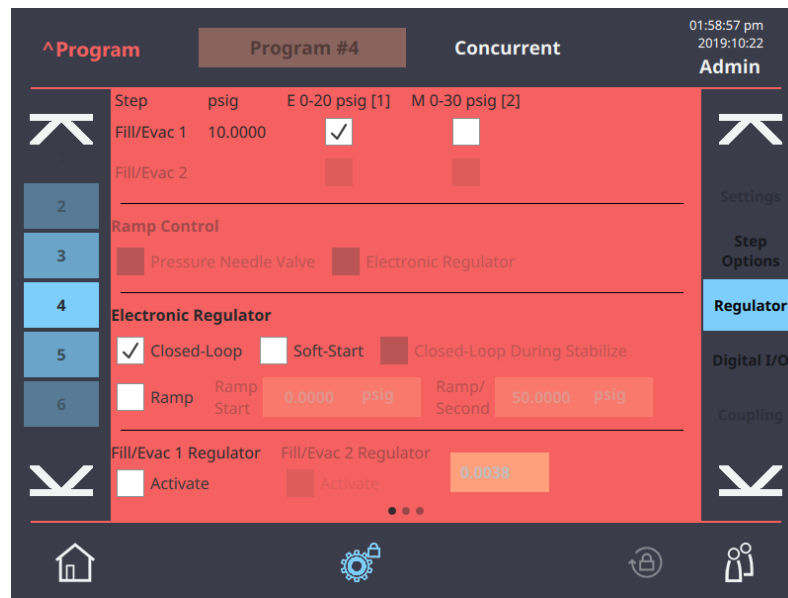
Cycle Time : 0.8 Event Limit : 0 psig Copy

☒ Port 1 ☐ Port 2 ☐ Port 3 ☐ Port 4

Settings Step Options Regulator

4.2 Regulator Setup

1. Select which regulator sets the test pressure during steps where the regulator is active.
2. Choose the ramp control mechanism (only applies to certain Test Types).
3. Enable electronic regulator options.
4. Activate the regulator temporarily for diagnostics or to adjust a manual regulator's output.



01:58:57 pm
2019:10:22
Admin

Program #4 **Concurrent**

Step	psig	E 0-20 psig [1]	M 0-30 psig [2]
Fill/Evac 1	10.0000	☒	☐
Fill/Evac 2		☐	☐

Ramp Control

☐ Pressure Needle Valve ☐ Electronic Regulator

Electronic Regulator

☒ Closed-Loop ☐ Soft-Start ☐ Closed-Loop During Stabilize

☐ Ramp Ramp Start 0.0000 psig Ramp/Second 50.0000 psig

Fill/Evac 1 Regulator Fill/Evac 2 Regulator

☐ Activate ☐ Activate 0.0038

Settings
Step Options
Regulator
Digital I/O
Coupling

Home Settings Lock User

4.3 Calibrating Your Tester for Leak Rate Measure Type

4.3.1 Compensation

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.

4.3.2 Calibration

Each program can be calibrated to detect a leak in flow units (e.g., cc/m) using a leak standard (such as a Uson Leak Master) from the pressure change, or by entering the known test volume. This process is called leak calibration. Leak calibration depends on the volume of the part and therefore a representative part should be used with a leak standard during the calibration process.

When to run:

- Upon initial installation
- When the test part changes
- When the test parameters change such as test times, test pressure, or leak rate.

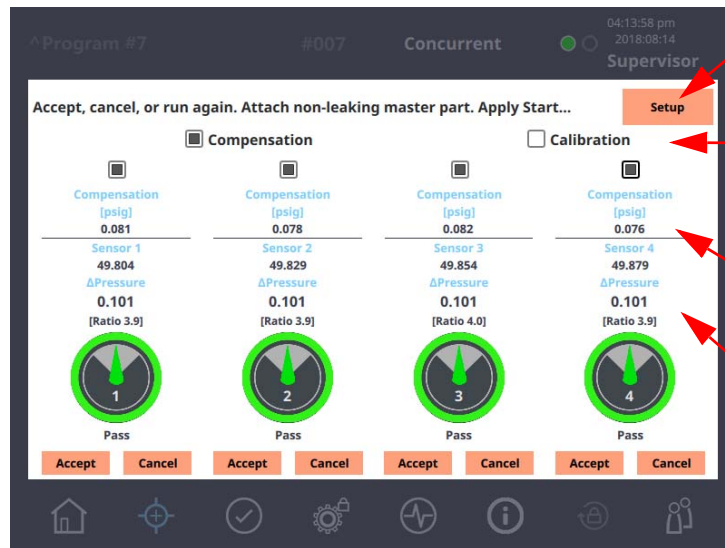
What is needed:

- Master Part-Must be a known good part and be identical and of same material as production parts.
- Leak Master.

The leak calibration test consists of two parts:

- **Compensation:** (Optional but recommended.) Perform before Calibration; Enable or Disable via the setup screens. During compensation, the Sprint mD records the pressure characteristics of a non-leaking part.
- **Calibration:** (Comp/Cal calculation method only). Applies only to programs with Measure Type of leak rate. During calibration, the Sprint mD records the pressure characteristics of a known leak value.

1. Select **Home** , then **Leak Calibration** .



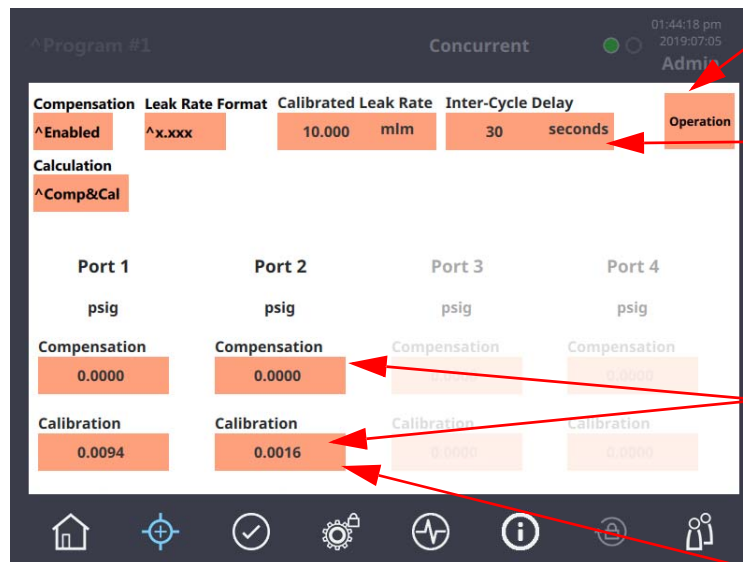
Press **Setup** to edit parameters as shown below.

Select **Compensation** or **Calibration**. Multiple ports can be enabled on a Concurrent.

The top section of each port's column shows the current values.

The bottom section shows the values just learned that can be accepted or cancelled.

2. Enter the parameters for Comp/Cal calculation method specific to your application.



Press **Operation** to return to the Operation

Top row parameters apply to all ports. The Inter-Cycle Delay setting applies to both Leak Calibration and Challenge.

Compensation and Calibration values for each port are normally learned, but can be entered manually.

For repeatability, Calibration Value should be $\geq 0.05\%$ of sensor full scale.

3. Enter the parameters for Volume calculation method specific to your application.

Press Operation to return to the Operation

Top row parameters apply to all ports. The Inter-Cycle Delay setting applies to both Leak Calibration and Challenge.

Compensation values for each port are normally learned, but can be entered manually.

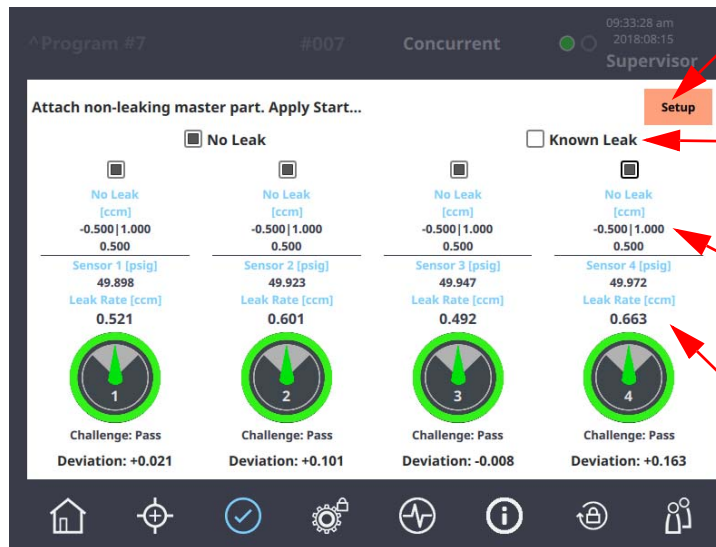
The test volume must be entered for each test port enabled in the volume unit specified. The selected volume units can be changed via the Program Quick setup menu.

Port 1	Port 2	Port 3	Port 4
psig	psig	psig	psig
Compensation	Compensation	Compensation	Compensation
0.0000	0.0000	0.0000	0.0000
ml	ml	ml	ml
Volume	Volume	Volume	Volume
10.00	10.00	10.00	10.00

4.4 Challenging Your Tester with a Uson Leak Master

The Challenge screen is used to validate your tester under non-leaking and leaking conditions. A non-leaking master part is used to verify No Leak operation. A Leak Master is attached to the master part to verify a Known Leak.

1. Select **Home** , then **Challenge**  to access the challenge screen.



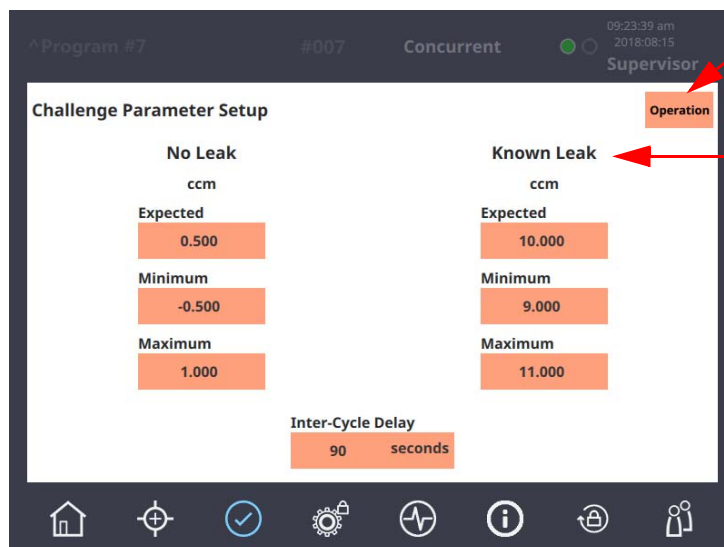
Press **Setup** to edit parameters as shown below.

Select **No Leak** or **Known Leak** operation. Multiple ports can be enabled on a Concurrent model.

The top section of each port's column shows the minimum, maximum, and expected.

The bottom section shows **Challenge** operation results and deviation from expected.

2. Enter the parameters specific to your application.



Press **Operation** to return to the Operation screen.

Enter parameters for **No Leak** and **Known Leak** verification. The **Inter-Cycle Delay** setting applies to both Leak Calibration and Challenge.

4.5 Creating an Advanced Program

A basic program can be configured on the **Program> Settings** page however, additional options can be configured for:

- Step
- Regulator
- Digital I/O

To Create an Advanced Program:

1. Select **Program**.
2. Select required **Test Type**.
3. Select required **Measure Type**.
4. Select **Quick Setup** to set default values or **enter the various parameters** specific to your application.

The screenshot shows the 'Program #1' configuration screen in the Uson Sprint mD software. The interface is dark-themed with orange and blue accents. At the top, it shows 'Program #1' and 'Sequential' mode. Below this, there's a table of test steps. The 'Quick Setup' button is visible on the right. At the bottom, there are checkboxes for 'Port 1' through 'Port 4'.

Step	Duration	Target	Min	Max	Unit
Auto Zero	0.5				
Fill/Evac 1	3.0	20.000	18.000	22.000	psig
Fill/Evac 2	0.0				
Isolate	0.1	20.000	18.000	22.000	psig
Measure	1.0	18.500	18.500		psig
Vent	0.1		-1.000	1.000	psig

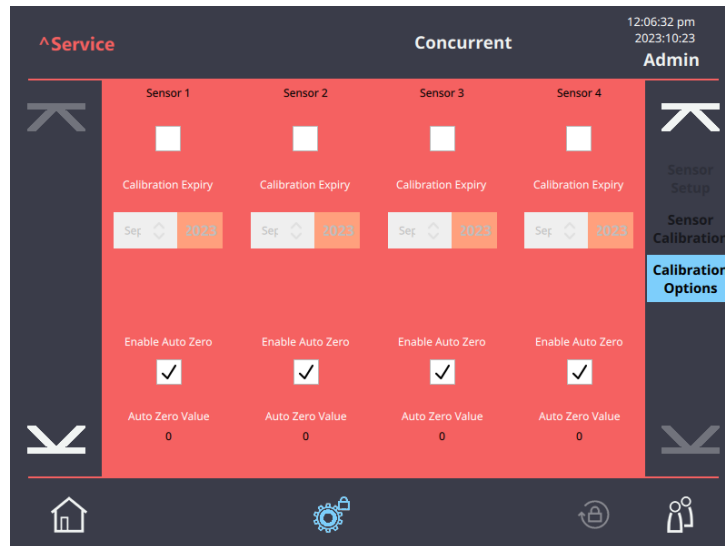
Below the table, the 'Cycle Time' is set to 4.7 and the 'Event Limit' is set to 0. The 'Quick Setup' button is highlighted in orange. At the bottom, there are checkboxes for 'Port 1' (checked), 'Port 2', 'Port 3', and 'Port 4'.

Additional Step Notes:

Auto Zero Step

The sensor's auto zero value is updated when the sensor's auto zero function is enabled. The auto zero step is only performed by the first program in a linked sequence of programs. The test cycle will be aborted when a sensor's zero reading is not within the sensor's zero limit. This may occur when performing repeat cycles on the same component due to residual pressure from the previous test cycle as the vent terminates when pressure is within +/- 1psi.

The Service > Calibration Options screen (below) allows each sensor auto zero function to be enabled/disabled by an Admin user and displays the current auto zero value in ADC counts. Turning the auto zero off will clear the value. The auto zero value is cleared on a power cycle.



Isolate Step

A 0.1s minimum step time is required to minimize pressure loss due to valves changing state when disconnecting the regulator from the test circuit.

Vent Step.

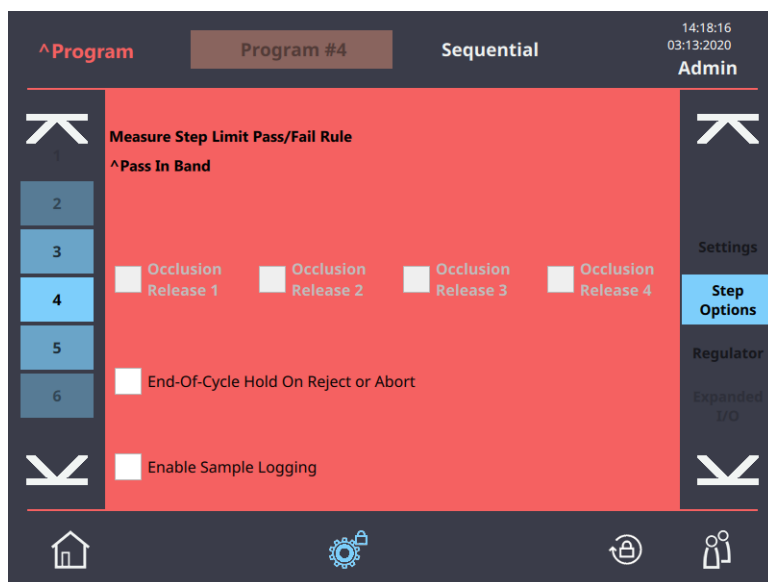
Vents the test part to atmosphere for the set duration time and is then automatically extended until the pressure is vented to within +/- 1 psi.

4.5.1 Step Options

- **The Measure Step Limit Pass/Fail Rule** sets the result criteria in conjunction with measure step reject limits.
- **The Occlusion 1 to 4** options allows the couple outputs to be turned off during the Occlusion test type's measure step to check there is a flow path through the test part.
- **The End of Cycle option Hold Reject On Reject or Abort** option allows individual programs to be held on an abort condition until acknowledged by stop/reset inputs.
- **The Enable Sample Logging** option allows logging program data as the program executes.



NOTE: The sample logging destination must be selected on the Options > Log Destination screen. See *"Log Destination"* on page 5-4.



4.5.2 Regulator

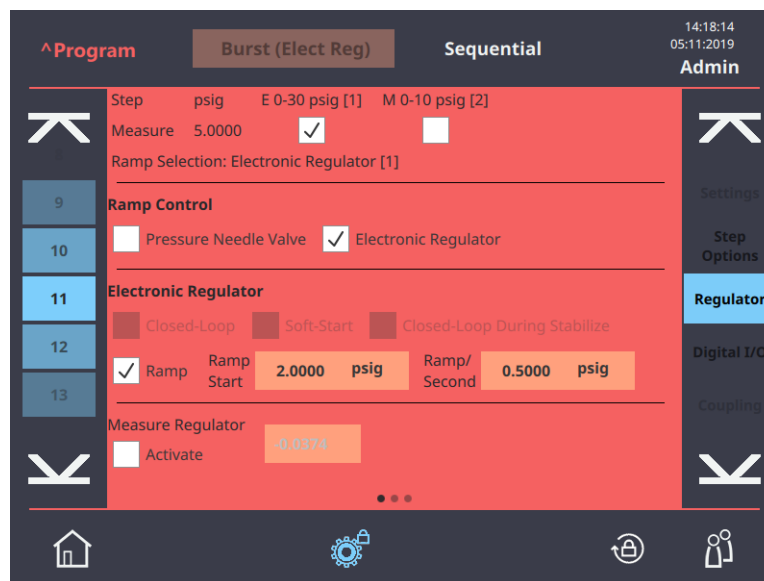
Advanced regulator settings for advanced programs include:

Ramp Control: Applies to Test Types of Burst, Crack, and Creep where pressure is ramped during the Measure step.

Needle Valve: Manually controls the ramp using a taper valve.

Electronic Regulator: Allows the ramp to be configured on a per program basis. Select from the following options:

- **Closed Loop:** Enables using the sensor as feedback to improve accuracy during the Fill/Evac step.
- **Soft-Start:** Limits the initial pressure rate of change.
- **Closed Loop During Stabilize:** Extends closed-loop control into the Stabilize step (Only applies to a Flow Test.)
- **Ramp:** Set “Ramp Start” to the beginning pressure for the ramp and Ramp/Second to control the rate of change.



Swipe left to access advanced regulator setup screens.



Enable Advanced Soft-Start: Allows over-ride of the default soft-start algorithm. The default ramps from the current pressure output to the target for 20% of the Fill/Evac step's duration, but not to exceed 1-sec. Advanced Soft-Start allows specifying the initial pressure and the ramp time.

Initial Target%: Sets initial pressure output at the beginning of the Fill/Evac step.

Ramp Time (Sec): Amount of time to ramp from the initial pressure to the target pressure.

% Step Duration: Percentage of the Fill/Evac step's duration to perform closed-loop control.

P Term, I Term, and D Term: Proportional-Integral-Derivative control terms.

I Guard %: Integral adjustment is skipped if absolute value of target-feedback exceeds this % of target.

I Limit %: Integral adjustment is capped if the accumulated error exceeds this % of target.

No Adjust Band %: No adjustment when absolute value of target-feedback is within this % of target.



Hold Off (Sec): Closed-loop control is delayed until this period expires. This parameter is not applicable if Advanced Soft-Start is enabled and its Ramp Time exceeds the value entered for Hold off.

Hold Off Extension %: The hold off period is extended another sample interval if the absolute value of the sample-to-sample delta pressure exceeds this % of target.

Pressure Cancels Hold Off: When enabled, the hold off period is immediately terminated if the pressure exceeds target.

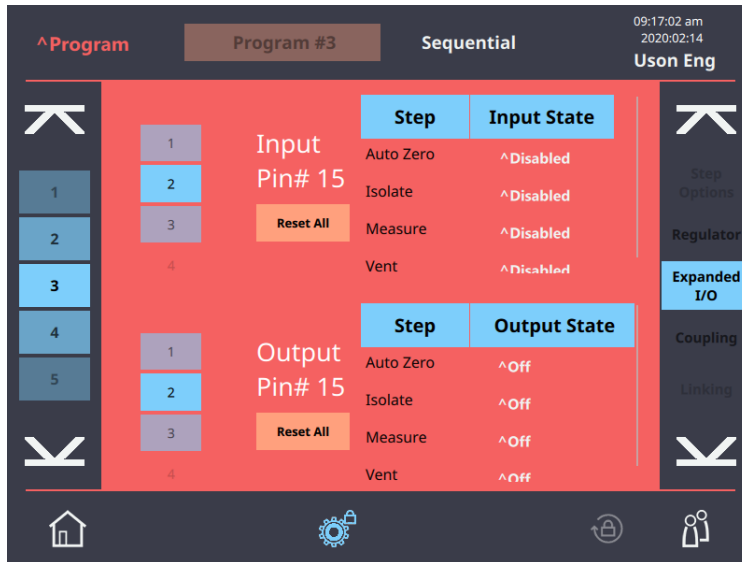
Calculate Defaults: This button sets all Electronic Regulator Advanced Parameters to defaults per the target pressure.

Reset Offsets: This button clears the internal control counts that have been learned over previous Test cycles that had Accept status. The Fill Step 1 and Fill Step 2 values are diagnostic read-only displays of the learned control counts.

4.5.3 Expanded I/O

The expanded inputs and outputs screen is a licensed option used to setup the tester for interfacing to external discreet switches, sensors, or for connection to a PLC.

The expanded I/O configuration is controlled by the Hardware Expanded I/O screen (refer to *"Expanded I/O" on page 6-5*).



Digital Inputs

Each Step can optionally be configured to check that one or more inputs are ON or OFF at End-of-Step. If comparison is false, the Step rejects. The digital input comparison is in addition to sensor limit checks that factor into a Step's accept/reject status.

To access the Digital Inputs screen, select **Program Mode > Program > Expanded I/O**.

Input: Used to select input ID number to setup.

Input Pin: Used to identify the Input Pin associated with the input ID and name.

Step/Input State: Used to enable/disable inputs for an associated input during a test; options include:

- **Disabled:** No check performed.
- **On/Off:** Check specified input level is valid.
- **Don't Care:** Check accepts on/off input level.

Digital Outputs

Used to configure output actions for a corresponding test. To access the Digital Outputs screen, select the Digital Outputs Tab under **Program Settings > Program > Expanded I/O**.

Output: Used to select Output ID number to setup.

Output Pin: Used to identify the Output Pin associated with the output ID and name.

Hardware Setup allows each Expanded Output to be configured as one of the following selections:

- **Off:** Output is Off for duration of the step.
- **On:** Output is On for the duration of the step.
- **Pulse at Start of Step:** Output is pulsed on at 500 ms at step-start.
- **Pulse at End of Step:** Output is pulsed on at 500 ms at step-end.

4.5.4 Couple Port Activation During a Program Cycle

Step	Duration secs	Couple 1 4W NC	Couple 2 4W NO	Couple 3 Output	Couple 4 Output
Couple1	1	off	off	on	off
Couple2	2	off	off	on	on
Couple3	3	on	on	on	on
Couple4	0	off	off	off	on
UnCouple4	0	off	off	off	off
UnCouple3	3	off	off	on	on
UnCouple2	2	off	off	on	off
UnCouple1	1	off	off	off	off

Cycle Time: Coupling 12 Test 15.1 Total 27.1

The Coupling screen located under **Program settings> Program> Coupling** displays the couple port configuration and settings for the selected program.

The couple port configuration specifies the valve type and function as follows:

- 4-Way Normally Open and Closed Valve (i.e., assigned two couple ports) providing 0 to 125psi output pressure for controlling air cylinders.
- 3-Way Normally Closed Valve to provide a 0 to 125psi Output pressure for controlling external pilot operated devices.
- 2-Way Normally Open Valve to provide an Input with pressure range 0 to 750psi for occlusion seal operation.

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.

To set Coupling 1-4 and Uncoupling 1-4, 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.

Use the buttons in the Couple 1-4 Output columns to turn the corresponding Coupling On or Off. If Off, the couple will not activate.

Coupling 1-4 always occur in order at the start of the test, and Uncoupling 4-1 occurs at the end of the test.

The step rows list the step name, individual couple/uncouple test cycle step duration, and corresponding valve states.

Step	Duration secs	Couple 1 2W NO IP	Couple 2 2W NO IP	Couple 3 3W NC OP	Couple 4 3W NC OP
Couple1	1	on	off	off	off
Couple2	1	on	off	on	off
Couple3	0	off	off	off	off
Couple4	0	off	off	off	off
UnCouple4	0	off	off	off	off
UnCouple3	0	off	off	off	off
UnCouple2	1	on	off	off	off
UnCouple1	1	off	off	off	off
Cycle Time	Coupling 4	Test 4.1	Total 8.1		

The couple columns shows the couple port valve type and valve states for each of the individual couple and uncouple steps.

The valve type abbreviation refers to:
 W = Way,
 NC = Normal Closed.
 NO = Normally Open.
 OP = Output port.
 IP = Input port.

Click to change the valve state On/Off. (Off means valve is de-energized.)

Blank fields indicate no couple output fitted.

4.5.5 Linking Programs

Linking is used to jump to another program based on the current test's outcome. Linking parameters are set on the **Program Settings > Program > Linking** screen.

On Pass Jump To	On Fail Jump To
Jump Method ^Jump Immediately	Jump Method ^Pause, then Jump
Pause time 0.0 Sec	Pause time 4.5 Sec
Jump To Program 8	Jump To Program 9
Program #8	Program #9
☒ Vent On	☒ Vent On
☐ Couple On	☐ Couple On

It's possible to set a unique link behavior for test results that are Pass, Fail, or Abort. The jumping behavior can be set to:

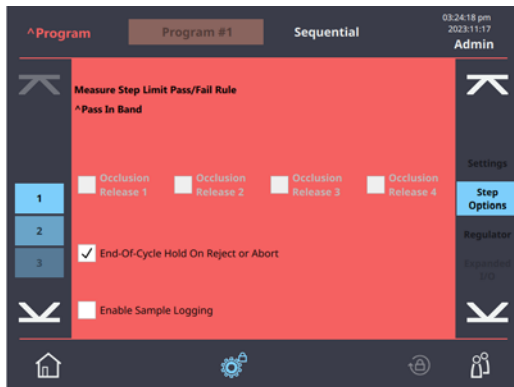
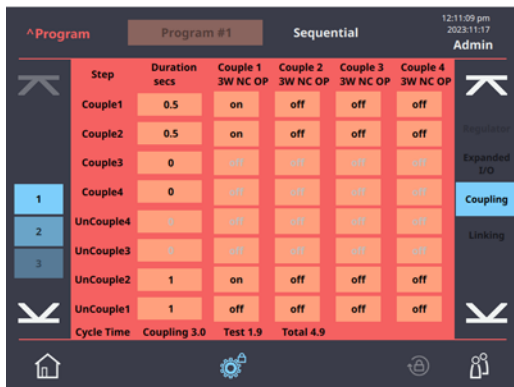
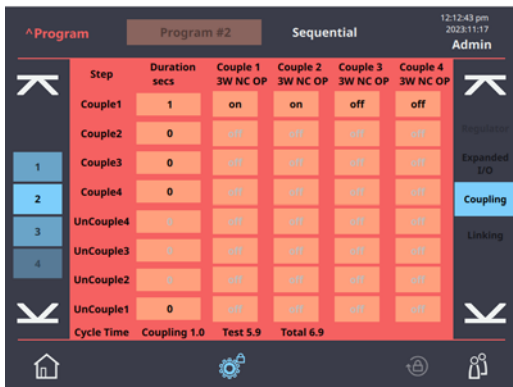
- **None**
- **Jump Immediately:** Jump when the test cycle ends.
- **Wait For Signal:** Jump when a start signal is received, either from the digital input on the rear panel or by pressing the front panel Start button.
- **Pause, then Jump:** Jump when the test cycle ends after a specified delay. If "Pause, then Jump" is selected, a data box appears for the purpose of entering the amount of time for the pause.
- **Vent On:** Enables or disables the Vent step between linked programs. (*Note the vent step always performs when a test cycle terminates.*)
- **Couple On:** The couple outputs are normally defined by the first program in the linked series. The coupling/uncoupling states can be updated by the program in a linked sequence by enabling this option.

Couple On option example setup:

The application requirements are:

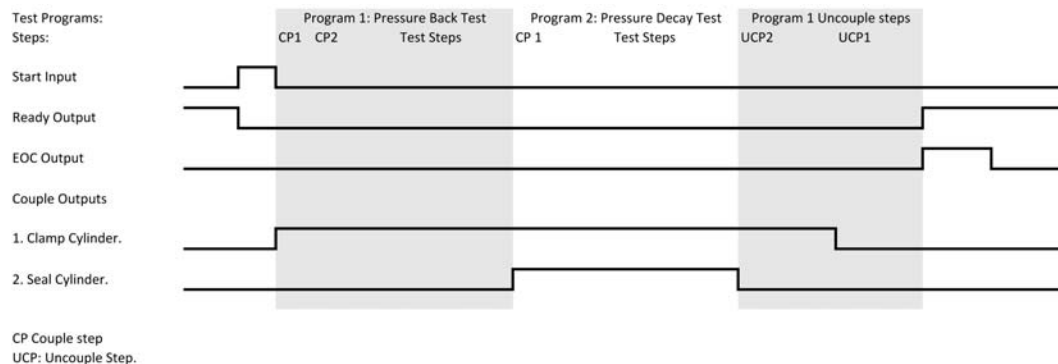
- To check the test part's flow path from inlet port to the outlet port and leak tightness.
- The tests are to be performed using a linked sequence configured to automatically perform the two tests using a Back pressure flow test to check for a blockage between the test part inlet and outlet and then a Pressure decay test to perform a leak test.
- The link operation is to only start the leak test immediately when the back pressure test passes with no vent.
- A couple output is required to operate a cylinder to clamp the test part and hold for the duration of the linked sequence.
- A second couple output is required to operate a cylinder to seal the test part's outlet port at the start of the pressure decay test.
- A 1 second delay is required after each couple operation to allow the cylinder to extend and retract.
- The couple outputs are to be held on a reject or abort condition until the user presses the reset button.

Programs 1 and 2 are configured for the Back pressure flow test and pressure decay respectively with following additional program settings to meet the coupling and linking requirements with Couple 1 and Couple 2 outputs assigned to control the clamp and seal cylinders. *See the following example settings.*

Program 1 Back Pressure Flow	Program 2 Pressure Decay
Step Options Settings	
The End of cycle Hold On Reject or Abort option is checked to enable the hold state until Reset input occurs prior to uncoupling steps when either program fails.	
	
Coupling Settings	
Program 1 controls the coupling and uncoupling outputs at the start and end of the linked sequence. Couple 1 and 2 steps durations are set to 0.5s to achieve a total 1s delay with only couple 1 enabled. This is required to enable uncouple 1 & 2 steps. The uncouple steps are set to turn the couple outputs off in the reverse sequence with the required delay.	Program 2 sets the couple 1 step to enable the Couple 1 & 2 outputs with a delay of 1s.
	

Program 1 Back Pressure Flow	Program 2 Pressure Decay
Linking Settings	
Program 1 link options are set to jump immediately to program 2 on a pass condition with vent and couple options disabled. A fail condition will terminate the link sequence venting the test part.	Program 2 link options: 1. The Jump methods are set to None to terminate the sequence on a pass or fail result and will start Program 1 uncouple steps. 2. The couple On is enabled and will perform the enabled couple step at the start of the program. 3. The Vent on is enabled by default but the last program in the sequence will always vent the test part.
	

The timing sequence for the above settings is shown below:



5

Options

5.1 Log Setup

To customize log, use the log setup screen to select and enter desired logging parameters.

The log file format defaults to a comma separated format and is created daily in the specified location with the name based on date (e.g. YYYYMMDD.log). Refer to [Table 5–1](#) for log field descriptions.



NOTE: Use CRLF to terminate logging output(s).

The screenshot shows the 'Log Setup' screen within the 'Options' menu. The screen has a dark blue header with 'Options' in red, 'Sequential' in white, and the time '15:44:25' and date '03:13:2020' in white. Below the header is a table with columns 'Field', 'Step', 'Text', and 'Delimiter'. The table has four rows: 'Cycle' (Step: None, Delimiter: Comma), 'SerialNum' (Step: None, Delimiter: Comma), 'Channel' (Step: None, Delimiter: Comma), and 'Pgm Name' (Step: None, Delimiter: Comma). Below the table are four buttons: 'Cycle', 'None', 'EMPTY', and 'Comma'. At the bottom are three buttons: 'Factory Reset', 'Add', and 'Delete'. On the right side, there is a vertical menu with 'Log Setup' (highlighted), 'Log Destination', 'Import & Export', and 'Admin'.

Field	Step	Text	Delimiter
Cycle	None		Comma
SerialNum	None		Comma
Channel	None		Comma
Pgm Name	None		Comma

Buttons: Cycle, None, EMPTY, Comma

Buttons: Factory Reset, Add, Delete

Right Menu: Log Setup, Log Destination, Import & Export, Admin

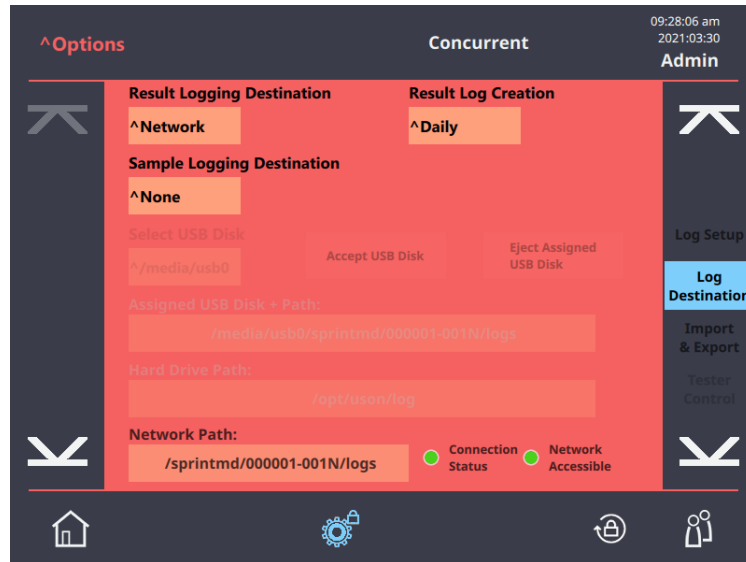
Table 5–1: Log Field Descriptions

Field	Description
None	No Data Selected
SerialNum	The Tester Serial Number (e.g. 012345.678N).
Channel	The test port selected for the test (1 to 4).
Cycle	The test cycle number.
Date	The date the test was performed.
Time	The time the test was performed.
Pgm Num	The Test Program Number selected for the test.
Pgm Name	The Program Name for the selected test program.
Test Type	The Test Type selected for the test (e.g. Pressure Decay, Burst, etc).
Result Type	The Measure step type selected for the test (e.g. Pressure Change, Leakrate, etc).
Test Val	The Test value recorded for the test. Note: The value is dependent upon the measure step value and measure type selection.
Test Unit	The Test value unit of measurement.
Test Time	The test duration excluding couple times.
Test Result	The Measure step result status (e.g. Pass, Fail or Abort).
Reason	The reason for the Abort (i.e. Operator) or Fail (Max limit) result.
Min Limit	The measure step minimum limit value.
Mid Limit	The measure step middle limit value.
Max Limit	The measure step maximum limit value.

Field	Description
Text	The text field is enabled to allow user defined data (i.e., Production line, Cell, etc).
Step Value	The sensor value recorded for the selected test step. Note: Use Test value and units for the final test result which includes comp/cal when enabled.
Step Unit	The sensor measurement unit for the selected test step.
Step Time	The step duration for the selected test step.
Step Result	The selected step result (e.g. Pass, Fail or Abort).
Bar code 1 to 3	The scanned bar codes prior to starting the Test.
PT 1 to 3	The Pass Through text received from Field bus interface prior to starting the Test.
Pass cpk	The cpk (Process Capability) value for the pass results for the selected test program.
All cpk	The cpk (Process Capability) value for the all results for the selected test program.
CRC32	A 32-bit CRC (cyclic redundancy checksum) for the result log string which can be used to validate the data integrity.
User Name	The logged in user's name who performed the test.
Full Name	The logged in user's full name for who performed the test.

5.2 Log Destination

The Log Destination setup screen is used to select/configure the destination of the results log and sensor sample log files.



The result log file is created either daily or per test based on the Results Log Creation parameters with the name based on date and time:

<YYYYMMDD>T<HHMMSS>.log (e.g., 20210325T090520.log). The content of the file is set by the Log Setup page.

The sample log file created for each test cycle is a comma separate file (CSV) with the name <Serial #> <Date> <Time> Sample Data.csv. The file content records the sensor readings for 0.1s intervals, as shown in *Figure 5–1*.

Figure 5–1: Sample Logging Example

The first line shows test details: <serial No>, <Program No>, <Test Type>, <Date>, <Time>

```
000001-001N, 1, Pressure Decay, 2020/02/04, 14:00:33
Auto Zero, 0, -0.0000399, 0, 0, 0
Auto Zero, 1, 0.0001197, 0, 0, 0
Auto Zero, 2, -0.0001064, 0, 0, 0
Auto Zero, 3, -0.0002395, 0, 0, 0
Auto Zero, 4, -0.0000399, 0, 0, 0
Auto Zero, 5, 0.0000931, 0, 0, 0
Fill/Evac 1, 6, 0.0000133, 0, 0, 0
Fill/Evac 1, 7, -0.0000798, 0, 0, 0
Fill/Evac 1, 8, -0.000133, 0, 0, 0
Fill/Evac 1, 9, -0.0001863, 0, 0, 0
Fill/Evac 1, 10, -0.0001064, 0, 0, 0
Fill/Evac 1, 11, 0.0000399, 0, 0, 0
```

The following lines show the sample values in the format: <Test Step>, <Sample Number>, <sensor 1 value>, <sensor 2 value>, <sensor 3 value>, <sensor 4 value>. Note: A zero value is recorded for sensors not required by the test type or are not installed.

The logging destination options are:

- **None:** No logging data will be saved (or data will no longer be saved).
- **Com 1:** The selected logging format will be transmitted serially to allow displaying on a remote terminal.
- **USB:** The log file will be saved to the selected USB device. (**Note:** only USB thumb drives formatted with FAT 32 file systems are supported.)
- **Hard Drive:** The log will be saved to the internal hard drive.
- **Network:** The log file will be saved through the Ethernet. There are two status indicators, one for network availability, and one for connection status to the Windows Share; both indicators must be green for logging to the Network and for starting a test if logging to the Network option is selected. The Network destination is only available for accessible networks and a good Windows Share connection, i.e., the Windows Share is CIFS mounted. The Network Path field is read only. Contact your IT administrator for assistance.



NOTE: The log files will be saved to the specified path location displayed for the selected destination and cannot be modified.

5.3 Import/Export Data

Select **Program Settings > Options > Import & Export** to access the four (4), swipeable (right/left) Import/Export screens, consisting of:

- **Database Export**
- **Database Import (SSN) Same Serial Number**
- **Database Import (FSN) Foreign Serial Number**
- **Audit Trail Export**
- **Database Import (OUT) Other Uson Testers**



NOTE: Screens' controls will be disabled until a thumb-drive is plugged in.



NOTE: Only USB thumb drives formatted with FAT 32 file systems are supported.

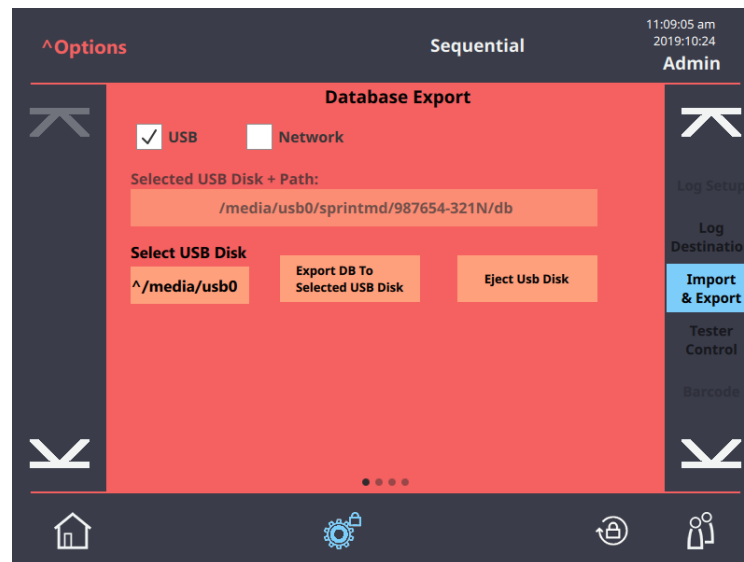
5.3.1 Database Export

The Database Export screen allows exporting the database to either to a USB thumb-drive or a Windows Share/Network.

To export database to a USB thumb-drive:

1. Plug a **thumb-drive (USB disk)** into the appropriate **USB port**.
2. Select **the USB Disk** to save the database to.
3. Select the **Export DB to Selected USB Disk button**.
4. Once the Export DB process is complete, select the **Eject USB Disk button**.

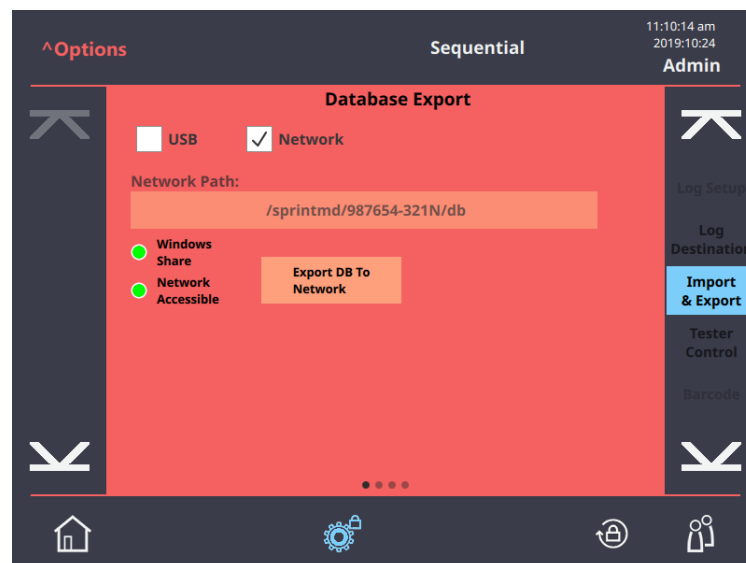
Note that the Selected USB Disk + Path field is read only.



To export database to a Windows Share/Network:

1. **Select Network.**
2. Select the **Export DB to Network button**. (The Export DB to Network button is enabled only when Windows Share and Network Accessible indicators are green.)

Note the Network Path is read only.



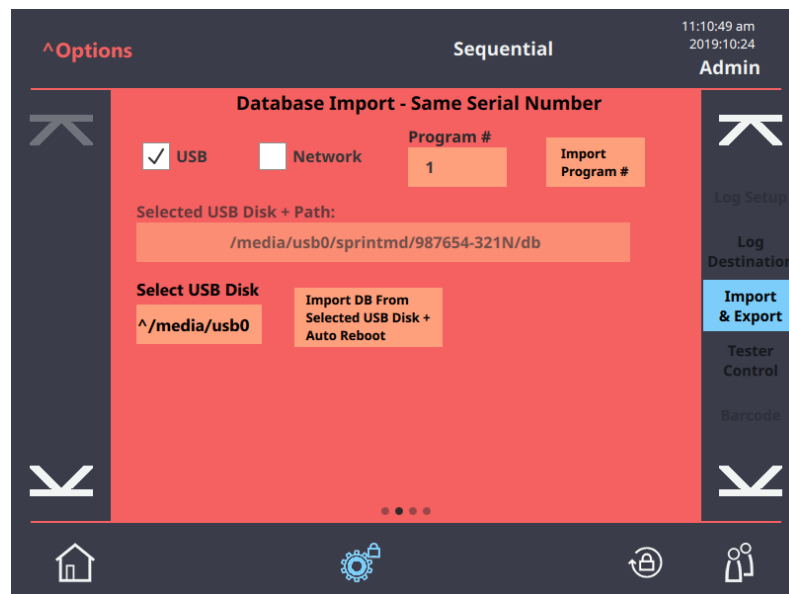
5.3.2 Database Import Same Serial Number (SSN)

The Database Import screen allows importing either individual programs (multiple times if needed) or an entire database, and to either to a USB disk or a Windows Share/Network.

To Import a Database (SSN) to USB disk:

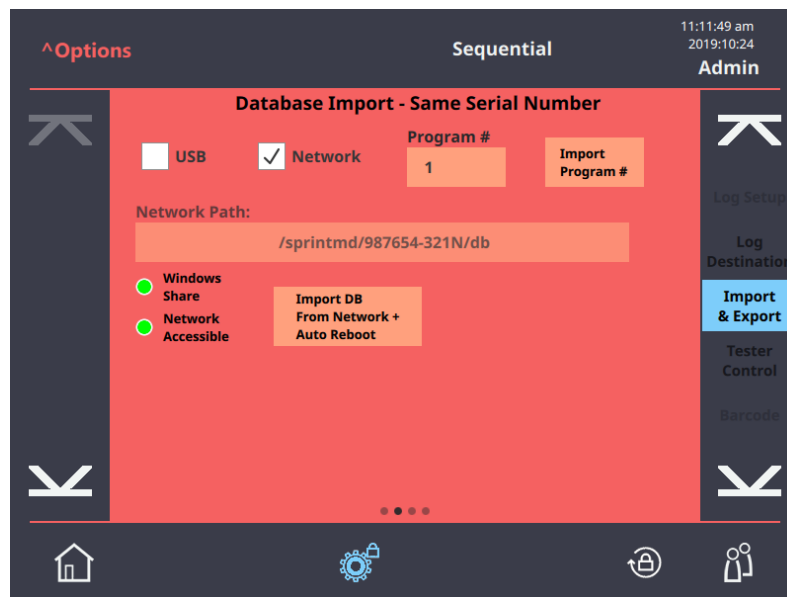
1. **Swipe right 1X from the Database Export Screen** to access the Data Import (SSN) screen.
2. To import a program or database, **plug a thumb-drive (USB disk) into the appropriate USB port.**
3. **Select the USB Disk** to import database from.
4. To import only a program, follow step 4, otherwise skip to step 5. **Enter the program #** you want to import in the “Program #” field, then select the **Import Program # button**. A status message displays (on the bottom of the screen) the process results. Repeat step 4 to import additional programs (1-127) if desired.
5. To import the entire database, select **Import DB from Selected USB Disk + Auto Reboot button**. A status messages displays (on the bottom of the screen) the process results.

Note that the Selected USB Disk + Path field is read only.



To Import a Database (SSN) to a Windows Share/Network:

1. **Swipe right 1X from the Database Export Screen** to access the Data Import (SSN) screen.
2. **Select Network.** (To continue, the Windows Share and a Network Accessible indicators must be green.)
3. To import only a program, follow step 3, otherwise skip to step 4. **Enter the program #** you want to import in the “Program #” field, then select the **Import Program # button**. A status message displays (on the bottom of the screen) the process results. Repeat step 3 to import additional programs (1-127) if desired.
4. To import the entire database, select **Import DB from Network + Auto Reboot button**. A status messages displays (on the bottom of the screen) the process results.



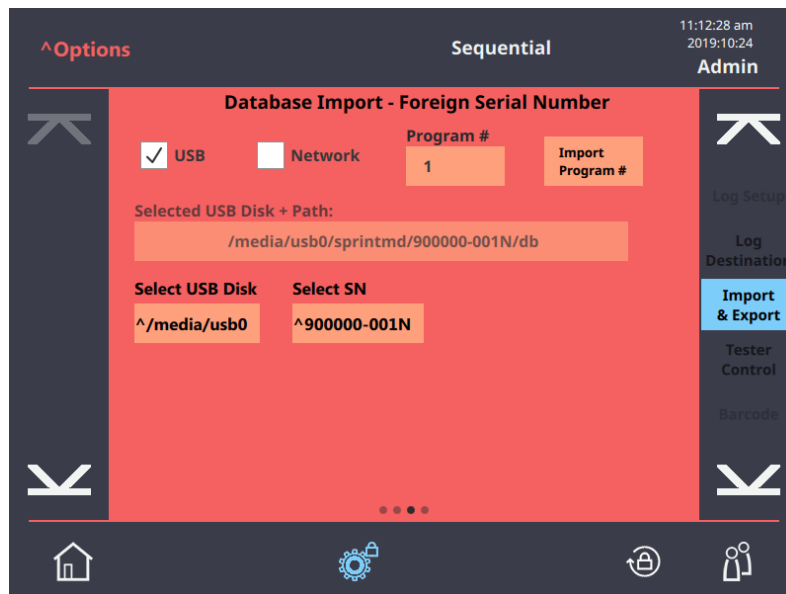
5.3.3 Database Import Foreign Serial Number (FSN)

The Database Import FSN screen only allows importing individual programs (multiple times if needed) from a foreign serial number if the Smart Key and Features Keys match. Programs can be imported from a USB disk or a Network.

To Import a Program from a USB Disk (FSN):

1. **Swipe right 2x from the Database Export Screen** to access the Data Import (FSN) screen.
2. To import a program, **plug a thumb-drive (USB disk) into the appropriate USB port.**
3. **Select the USB Disk** to import data from.
4. Select the desired foreign serial number database to import data from the **Select SN** drop down list.
5. **Enter the program #** you want to import in the “Program #” field, then select the **Import Program #** button. A status message displays (on the bottom of the screen) the process results. Repeat step 5 to import additional programs (1-127) if needed.

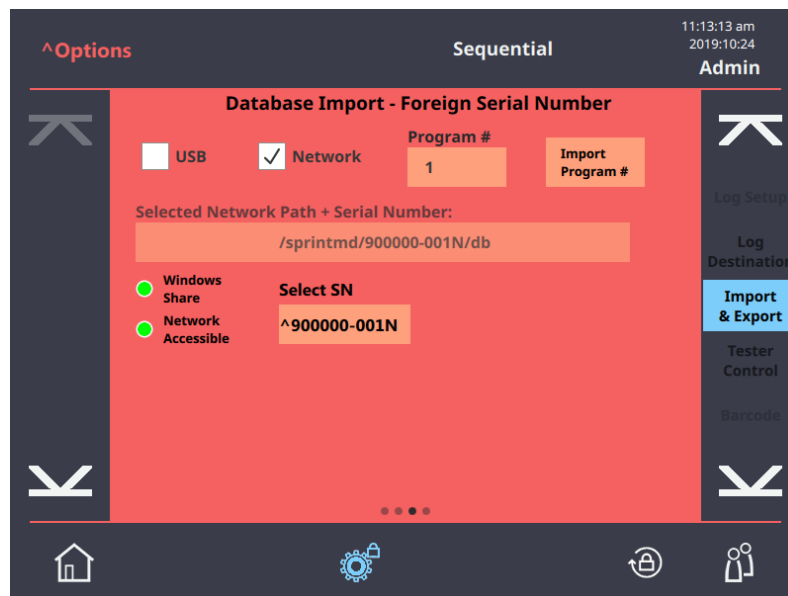
Note that the Selected USB Disk + Path field is read only.



To Import a Program from a Network (FSN):

1. **Swipe right 2x from the Database Export Screen** to access the Data Import (FSN) screen.
2. **Select Network.** (To continue, the Windows Share and a Network Accessible indicators must be green.)
3. Select the desired foreign serial number database to import data from the **Select SN** drop down list.
4. **Enter the program #** you want to import in the “Program #” field, then select the **Import Program #** button. A status message displays (on the bottom of the screen) the process results. Repeat step 4 to import additional programs (1-127) if needed.

Note that the Selected Network Path + Serial Number path field is read only.

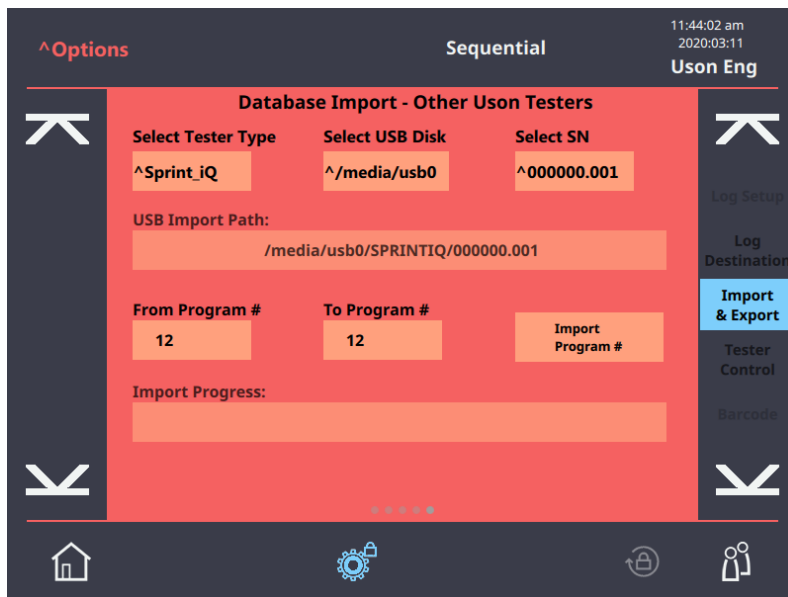


5.3.4 Database Import Other Uson Tester (OUT)

The Database Import OUT screen only allows Sprint mD programs with a similar configuration (i.e. Test type, pressure range, etc) to be imported from a USB disk.

To Import a Program from a USB Disk (OUT):

1. Perform a **Sprint iQ System Export** to the USB disk.
2. Select the **Sprint mD Options Import & Export** screen.
3. Swipe **right** from the Database Export Screen to access the Database Import (OUT) screen.
4. Insert the **thumb-drive** (USB disk) into the appropriate USB port.
5. Select the **USB Disk to import data** from the drop list.
6. Select the required **tester serial number** to import from the drop list.
7. The USB Import Path field is read only and displays the path for the selected data.
8. Enter the **range of programs required into fields From Program # and To Program #.**
9. Select the **Import Program** button. The Import Progress field and Status bar (on the bottom of the screen) displays the import results.



Database Import - Other Uson Testers

Select Tester Type: ^Sprint_iQ

Select USB Disk: ^/media/usb0

Select SN: ^000000.001

USB Import Path: /media/usb0/SPRINTIQ/000000.001

From Program #: 12

To Program #: 12

Import Progress: [Progress Bar]

Import Program #

Options: ^Options

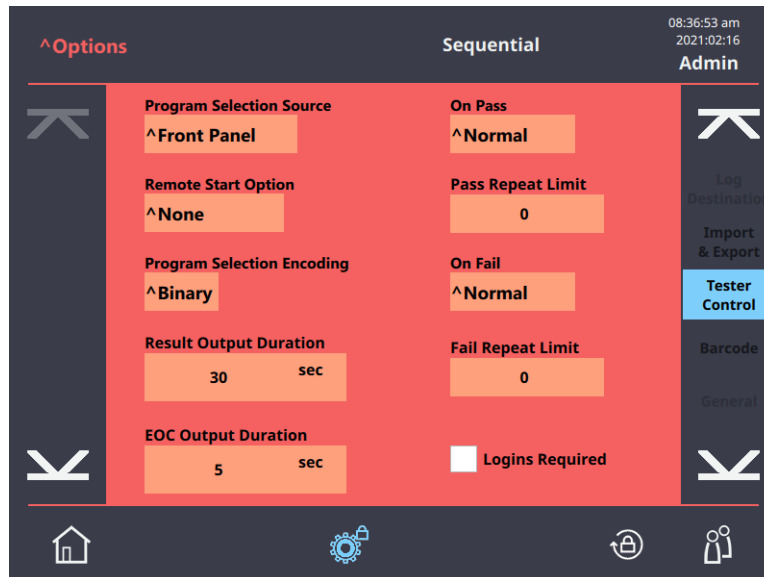
Sequential

11:44:02 am
2020:03:11
Uson Eng

Log Setup
Log Destination
Import & Export
Tester Control
Barcode

5.4 Tester Control

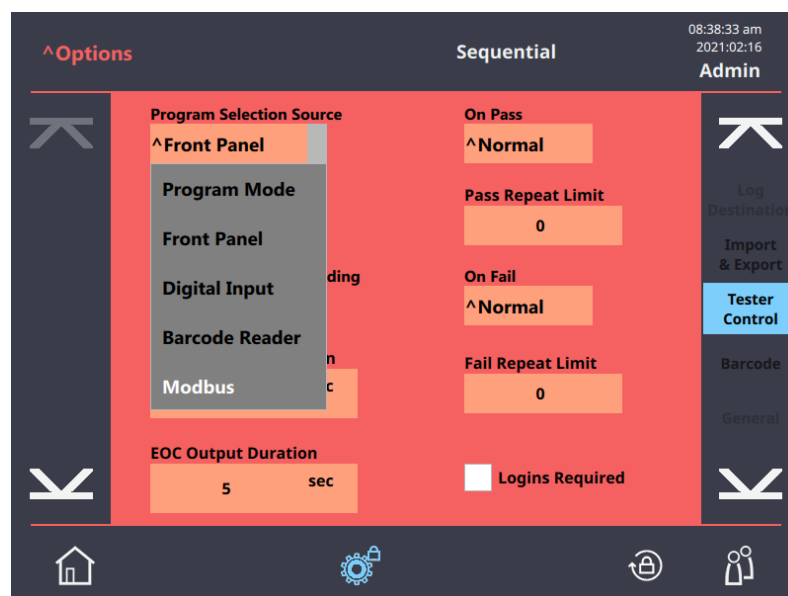
Select **Program Settings > Options > Tester Control** to access the tester control configuration screen.



The Tester Control screen is used to configure Program Select and Start options:

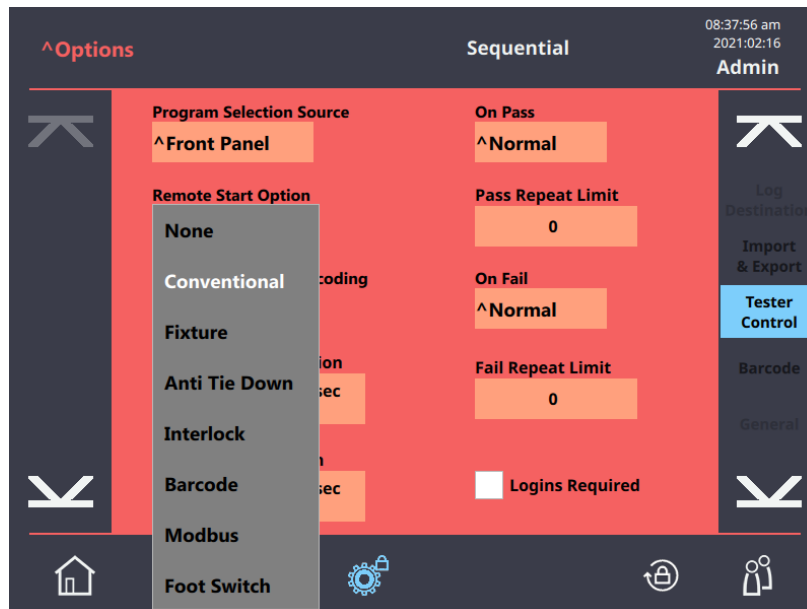
Program Selection Source: Use the Program Selection Source list menu to configure how the Sprint mD's program can be accessed.

These five selections are mutually exclusive and include: Program Mode, Front Panel, Digital Input, Barcode Reader, and Modbus:



- **Program Mode:** Allows program selection only from within Program Mode. Program selection will be locked in Run Mode.
- **Front Panel:** Allows changing program selections via the front panel interface in Run Mode.
- **Digital Input:** Program must be selected from input to I/O port.
- **Barcode Reader:** Programs selected by a barcode reader (optional). See *"Barcode Scanner Setup" on page 5-17*. The Front Panel Stop button or Remote Panel Stop Input can be used to abort the test.
- **Modbus:** Programs selected via Modbus (optional). The Front Panel Stop button or Remote Panel Stop Input can be used to abort the test.

Start Options: There are several, mutually exclusive program start options available. Use the **Remote Start Option** list menu to make selection.



- **Conventional:** The Remote Start Enable input state is ignored for this start policy and a test cycle is started when the Remote Start input is asserted. The Remote Stop input will abort the test when asserted.
- **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:** Allows the current selected test to start using *any* valid barcode. The Front Panel Stop button or Remote Panel Stop Input can be used to abort the test. See *"Barcode Scanner Setup" on page 5-17*.
- **Modbus:** Programs can be started via Modbus. The Front Panel Stop button or Remote Panel Stop Input can be used to abort the test.
- **Foot Switch:** To setup this remote start feature, first plug the remote start pedal connection into the Sprint mD's Digital Input Port, which is located on the unit's back panel (see *Figure 2-3*). Next, select **Front Panel** from the Program Selection Source menu, then **Foot Switch** from the Remote Start Option Menu. After setup is complete, pressing the foot pedal will start the selected test. The Front Panel Stop button or Remote Panel Stop Input can be used to abort the test.

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

- **None**
- **Binary:** The 8 inputs are decoded as binary input 2^0 to 2^7 .
- **BCD:** The lower 4 binary inputs (2^0 to 2^3) are decoded as decimal units 0 to 9 and the upper 4 binary inputs (2^4 to 2^7) are decoded as decimal tens 10 to 90.

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.

On Pass: Determines the action to take at the end of the test cycle.

- **Normal:** Terminates the test cycle on completion.
- **Auto Repeat:** Restarts the test on completion for the number specified by the Pass limit.

Pass Repeat Limit: Specifies the number of test cycles to be performed for a pass condition. A 0 value results in continuous testing.

On Fail: Determines the action to take at the end of the test cycle.

- **Normal:** Terminates the test cycle on completion.
- **Auto Repeat:** Restarts the test on completion for the number specified by the Repeat fail limit.

Fail Repeat Limit: Specifies the number of test cycles to be performed for a fail condition. A 0 value results in continuous testing.

Logins Required: A user must login to change front panel program selection or to start a test when enabled.

5.5 Barcode Scanner Setup

Barcode is a licensed feature of Sprint mD. The Barcode scan setup is performed under two Sprint mD screens:

- **Setup > Options > Tester Control**
- **Setup > Options > Barcode**

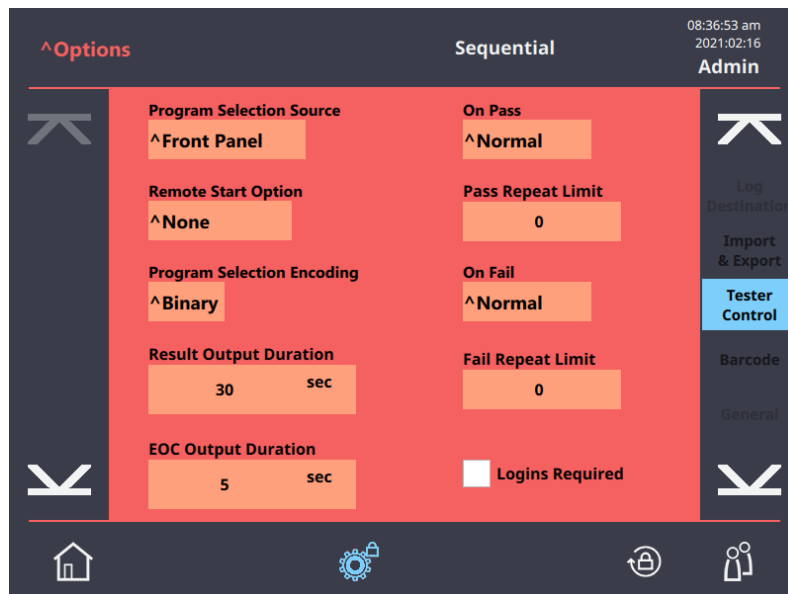
and can be configured to do the following:

- **Require a barcode scan(s) before test start**
- **The barcode scan specifies which program to run**
- **The barcode scan starts the test**

5.5.1 Setup barcode scan before test

Use this barcode setup to specify that barcode scans are required before starting a test (between 0-3). Note that the content of the barcode is logged with the test. If the required number of barcode scans is set to zero, then barcode scans are not required to start a test. Attempting to start a test without the required number of scans causes an error condition, see *Barcode Error Handling* later in this section.

Example Setup 1: 1 scan required, no timeout (2 screens)



NOTE: Program Selection Source is not Barcode Reader.

The screenshot shows the 'Options' screen in 'Sequential' mode. The top bar displays the time '08:51:50 am', date '2021:02:16', and user 'Admin'. The main area contains a table with columns 'ID #', 'Scan Key', and 'Program Num'. Below the table are buttons for 'Add Scan' and 'Remove Scan'. The 'Required Scans' field is set to '1' and the 'Scan Timeout(s)' field is set to '0'. There are also checkboxes for 'Remote Start On Last Scan' and 'Scan Case Sensitive', both of which are unchecked. At the bottom, there is a 'Scan # Selects Program' field set to '1' and a checkbox for 'Scan Selects Program' which is unchecked. The right sidebar contains links for 'Import & Export', 'Tester Control', 'Barcode' (highlighted), 'General', and 'A3 LDAP'. The bottom navigation bar includes icons for home, settings, lock, and user.

NOTE: Required Scans is set to 1 with no scan timeout specified.

Example 2 Setup: 2 Scans required, timeout = 5 seconds (1 screen)

The screenshot shows the 'Options' screen in 'Sequential' mode. The top bar displays the time '08:52:27 am', date '2021:02:16', and user 'Admin'. The main area contains a table with columns 'ID #', 'Scan Key', and 'Program Num'. Below the table are buttons for 'Add Scan' and 'Remove Scan'. The 'Required Scans' field is set to '2' and the 'Scan Timeout(s)' field is set to '5'. There are also checkboxes for 'Remote Start On Last Scan' and 'Scan Case Sensitive', both of which are unchecked. At the bottom, there is a 'Scan # Selects Program' field set to '1' and a checkbox for 'Scan Selects Program' which is unchecked. The right sidebar contains links for 'Import & Export', 'Tester Control', 'Barcode' (highlighted), 'General', and 'A3 LDAP'. The bottom navigation bar includes icons for home, settings, lock, and user.

NOTE: Required Scans is set to 2 with timeout set to 5.

5.5.2 Setup barcode scan to specify program to run

Use this barcode setup for specifying the number of barcode scans required before testing (between 1-3), and for correlating a scan number to a test program to run. The timeout parameter is optional.

If multiple barcode scans are required before starting a test, the number of the scan is set to determine which one specifies the program number to run. For example, 3 scans may be required, with the last scan determining which program to run. Or, the first scan or middle scan can be used to determine which program to run.

Timeout is optional.

To Setup barcode scan to specify a program to run:

1. Navigate to the Tester Control Screen (**Program Settings > Options > Tester Control**), then select **Barcode Reader** from the “Program Selection Source” field.

NOTE: ‘Program Selection Source’ is set to ‘Barcode Reader’

2. Navigate to the Barcode Screen (**Program Settings > Options > Barcode**) to configure your settings. See the following example:

Example: 3 barcode scan program numbers, 3 scan required, last scan specifies program to run, 5 barcode scan patterns identify which program to run when there is a match.

The screenshot shows the 'Barcode' configuration screen. At the top, it says 'Options' and 'Sequential'. The top right shows the time '08:43:06 am' and date '2021:02:16', along with the user 'Admin'. The main area contains a table with 3 columns: 'ID #', 'Scan Key', and 'Program Num'. The table has 5 rows of data. Below the table are buttons for 'Add Scan' and 'Remove Scan'. There are also input fields for 'Required Scans' (set to 2) and 'Scan Timeout(s)' (set to 5). There are checkboxes for 'Remote Start On Last Scan' (unchecked), 'Scan Case Sensitive' (unchecked), and 'Scan Selects Program' (checked). The bottom of the screen has a navigation bar with icons for home, settings, a lock, and a user profile.

ID #	Scan Key	Program Num
1	Part 1	1
2	Part 2	2
3	Part 3	5
4	Part 4	10
5	Part 5	22

Buttons: Add Scan, Remove Scan

Required Scans: 2, Scan Timeout(s): 5

Remote Start On Last Scan: ☐ Scan Case Sensitive: ☐

Scan # Selects Program: 1, Scan Selects Program: ☒

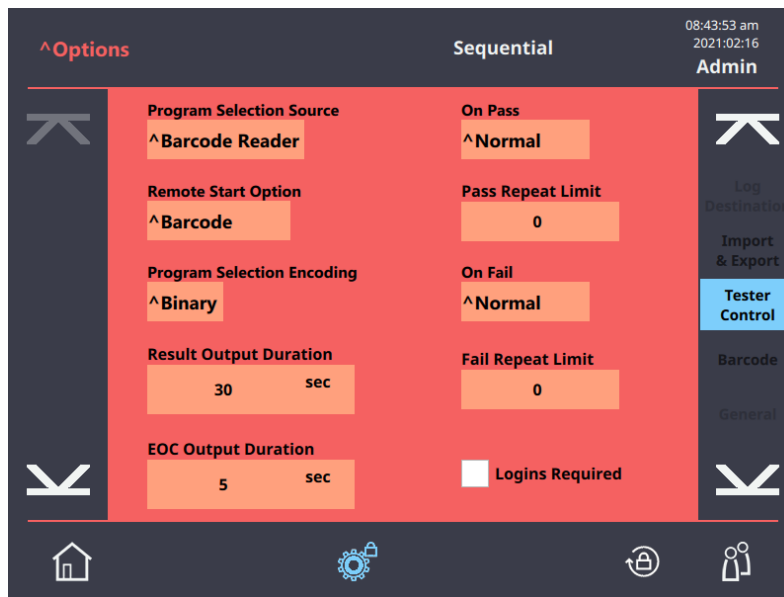
NOTE: Required Scans is set to 3, no timeout, last scan selects the program number to run, 5 barcode patterns are entered along with the program number to run when there is a match.

5.5.3 Setup barcode scan to start test

Use this barcode setup to allow Barcode Scan start the test. The last barcode scan specified starts the test. Optionally, the barcode scan can select the program to be run, as in Section 5.5.2, *Setup barcode scan to specify program to run*.

The Tester Control screen is used to specify “Remote Start Option” as “Barcode”

Example: Identify the program to run and starts the test on the last barcode scan required.



The screenshot shows the 'Tester Control' screen with the following settings:

Options	Sequential
Program Selection Source ^Barcode Reader	On Pass ^Normal
Remote Start Option ^Barcode	Pass Repeat Limit 0
Program Selection Encoding ^Binary	On Fail ^Normal
Result Output Duration 30 sec	Fail Repeat Limit 0
EOC Output Duration 5 sec	☐ Logins Required

On the right side, there is a vertical menu with the following options: Log Destination, Import & Export, **Tester Control** (highlighted), Barcode, and General. The top right corner shows the time 08:43:53 am and date 2021:02:16.

NOTE: ‘Remote Start Option’ is set to ‘Barcode’. Optionally, ‘Program Selection Source’ is set to ‘Barcode Reader’ in this example.

5.5.4 Barcode Error Handling

Barcode errors usually occur for two reasons:

1. Barcode scanner is required but not available.
2. Incorrect setup or run-time operational flow causes an error.

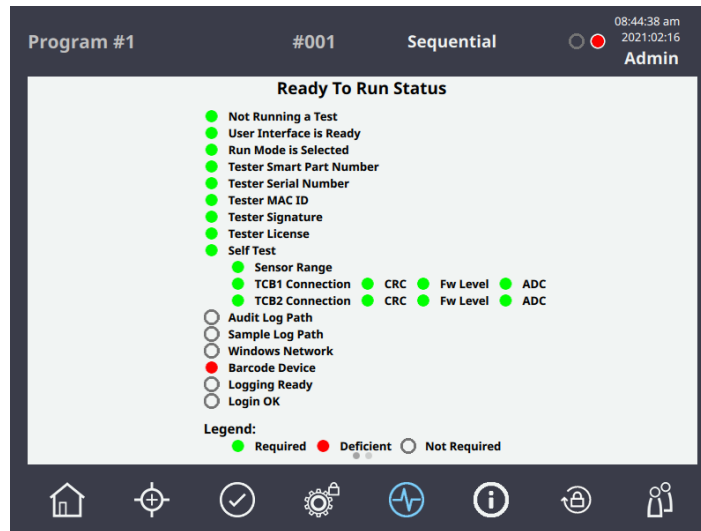
Barcode Scanner Not Available

The barcode scanner is not required to be plugged into the USB port if it is not used in the test.

However, if the barcode test setup requires a barcode scan, and the barcode scanner is not plugged into the USB port, then ready-to-run status will be RED, as shown in the next image:



Note that the ready-to-run status screen shows that barcode scanner prevents the test from being ready to start. To fix, **plug the barcode scanner into the USB port**. The ready-to-run condition turns GREEN.



NOTE: The sensor range error indicates the sensor signal is outside the expected range.

Incorrect Setup or Run-time Process Flow Issue

Various use cases may cause error messages because of either incorrect barcode setup or a run-time process flow issue. A number of reasons for these error messages are:

1. Test start attempted when insufficient number of barcode scans exists. For example, 3 scans are required and then the operator scans twice and attempts to start the test. To fix, **make sure to scan the required number of barcode scans before attempting to start a test.** The result is shown in the next image:



2. Test start attempt when barcode scan timeout expires. This may be caused by operator delay, or not scanning the appropriate number of scan(s). For example, 2 scans are required, but operator scanned 3 times. As such, the first 2 scan are ignored, but the concluding scan did not happen. The same result as above image happens for this condition. To fix, **provide the required number of barcode scans within the timeout period.**
3. Test start attempted when barcode scan does not provide a valid program number. This condition can be caused either by improper barcode setup or operational error in scanning the barcode. Either way, the result is shown in the next image:



If this is caused by a run-time operational error, **then fix by scanning the correct barcode that specifies which program to run.**

If this is caused by a barcode setup error, then the setup must be revised and corrected before proceeding.

5.6 General

The General screen is used to select the language, and for data and file management.

Clear Results: Used to clear results.

Clear Counters: Used to clear all counters.

Language Selection: Used to select tester language.

Set Program Defaults: Used to clear the selected programs to default values.

Delete Log Files: Used to delete all log files.

Delete Core Files: Used to delete core files. (System error files.)



5.7 A3 LDAP

The A3 LDAP screens are enabled/active for Sprint mD testers with an A3 network license. This option requires Microsoft Windows Server Active Directory with LDAP services enabled and setup per MS AD LDAP Service Setup outlined in Appendix B, (*Server Manager Setup*).

Ldap is setup across three screens:

- **Setup**
- **Options**
- **Authentications Trial.**

5.7.1 Setup Screen

Navigate to **Settings > Options > A3 Ldap** to access the Ldap setup screen inputs.

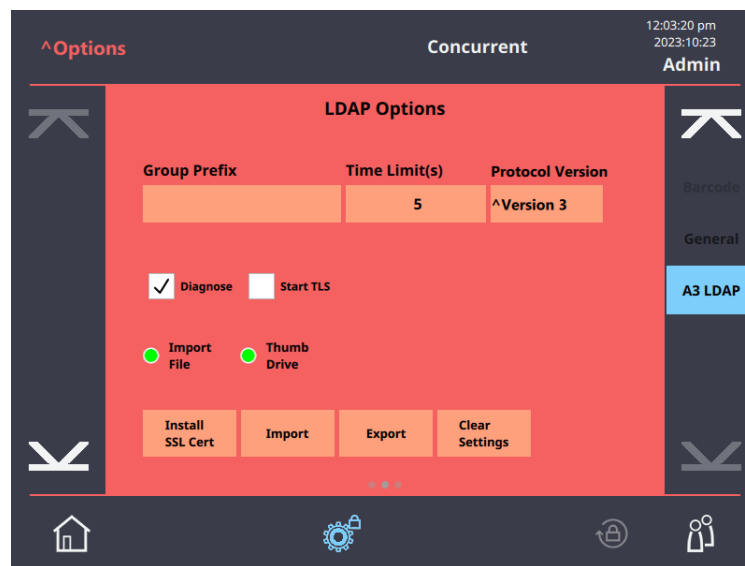
Notes: For all fields, the length of the text is limited to 50 characters. Parameters with * must be provided by the company's IT department.

- **Server Uniform Resource Identifier (URI)*** – specifies the domain controller (i.e. adc-dc1) within the domain (abc.com) which can be set to ldap://adc-dc1, ldap://adc-dc1.abc.com or an ip address ldap://xxx.xxxx.xxx.xxx if the name is not resolved by the network. Either ldaps or ldap protocol can be specified by entering ldaps://testserver.com or ldap://testserver.com as required. Note the ldaps protocol will require a self sign certificate (SSL) to be installed using the Options tab “Install SSL cert function”.
- **Base Distinguished Name (DN)*** – specifies the parent domain (i.e., abc.com) as individual domain components (dc).
- **Base OU path** – specifies the location for the Ldap Admin name, Sprint mD group/role definitions and optional users.

- **User Search DN*** – specifies the search path for user credentials as a series of space separated organizational units (ou)
- **Ldap Admin Name** – specifies the user name required to perform LDAP operations. This must be the user’s AD common name (cn).
- **LDAP Admin Password***– password to perform LDAP operation.

5.7.2 Options Screen

To access the Ldap Options screen, navigate to **Settings > Options > A3 Ldap**, then **swipe left**.



- **LDAP Group Prefix** – specifies the text to be prefixed to the default group/role names SprintmDAdmin, SprintmDSupervisor, and SprintmDOperator. This allows different role names to be assigned to various users to control access to specific testers in different locations (i.e., production cells/lines). For example, using the tester serial number different groups/roles i.e., 64500-001mDSprintmDOperator, 64500-002mD-SprintmDOperator, etc can be created and assigned to the required users. Note that the text length is limited to 50 characters.
- **Time Limit (seconds)** – specifies how long to wait for an LDAP network operation to complete. Typically, 5 seconds is a good value.
- **Protocol Version (selector defaults to 3)** – LDAP version 3 is the desired setting.
- **Diagnose (checkbox)** – used only for debugging purposes and should remain unchecked otherwise.
- **Start TLS (checkbox)** – enables encryption when using the ldap protocol; requires a SSL certificate to be installed.

- **Import File Indicator** – when green, an Ldap setup file is available for importing from a thumb drive.
- **Thumb drive Indicator** – when green, indicates a thumb drive is selected for importing/exporting data.
- **Install SSL Certification** – used to import an SSL (Secure Sockets Layer) certificate with pem or crt file extensions from a USB. The SSL certificate must be installed when ldaps or ldap with start TLS option is selected.
- **Import** – imports the Ldap setup settings from the thumb drive.
- **Export** – exports the Ldap settings to the thumb drive.
- **Clear Settings** – forces Login Status to be an Empty Circle, which means that a successful LDAP authentication has not been attempted. This provides a way to fall back to using local default users, if desired.

5.7.3 Authentications Trial Screen

The Authentications Trial screen is used to verify A3 LDAP authentication setup using the parameters on the A3 LDAP screen, a network user's credentials. Ethernet is needed to perform LDAP authentication (a green Ethernet Enabled indicator indicates it's enabled). Successful logins are dependent on authentication against the AD LDAP server.

To ensure the “Try Login” button is enabled, the following LDAP parameters must have inputs: **Server URI, Base DN, User Search DN, LDAP Admin Password**. Optional setup parameters include:

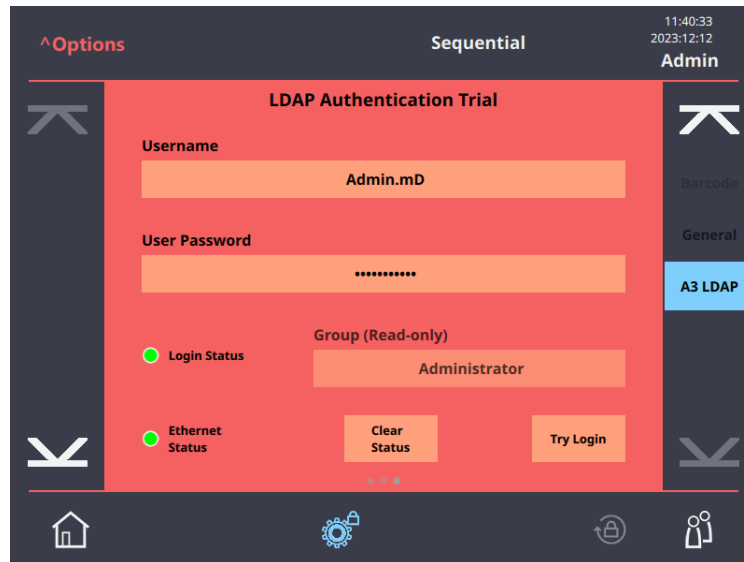
Time Limit (seconds) - specifies how long to wait for an LDAP network operation to complete. Typically, 5 seconds is a good value.

Protocol Version (selector defaults to 3) - LDAP version 3 is the desired setting.

Diagnose (checkbox) - used only for debugging purposes and should remain unchecked otherwise.

To Perform an Authentication Trial:

1. Access the Ldap options screen by navigating to **Settings > Options > A3 Ldap**, then **swipe left** to select the **LDAP Authentication Trial** screen.
 2. Enter the network user's **Username** and **Password**, then select **Try Login** to perform a trial authentication.
- A successful LDAP authentication is indicated by a Green Login Status indicator and the Group (Read-only) field displaying the user's assigned role: Administrator, Supervisor, or Operator. LDAP and the A3 Network are functional.
 - An unsuccessful LDAP authentication results in a Red Login Status indicator and displayed error information. The operation falls back to using the default users and authentication.
 - To clear the LDAP status indicator, select **Clear Status**.



5.7.4 Ldap Sign-in

Once a successful LDAP authentication has been completed and the current user logs out, then all further logins will be dependent on the Microsoft Server AD LDAP and Network operation. (**Note:** The local default users will be disabled.) The network users will only be able to login when the sign-in dialogue LDAP and Ethernet status indicators are green as shown below:



A red A3 LDAP status indicates a problem has occurred with the Microsoft Server AD LDAP and only the local default users are permitted to login. The local admin user will need to login to resolve the LDAP issue and to perform a successful login trial to re-establish the LDAP authentication.

6.1 Network

To use the Sprint mD network options the following settings must be configured and the network cable connected to the Ethernet port located on the rear panel.

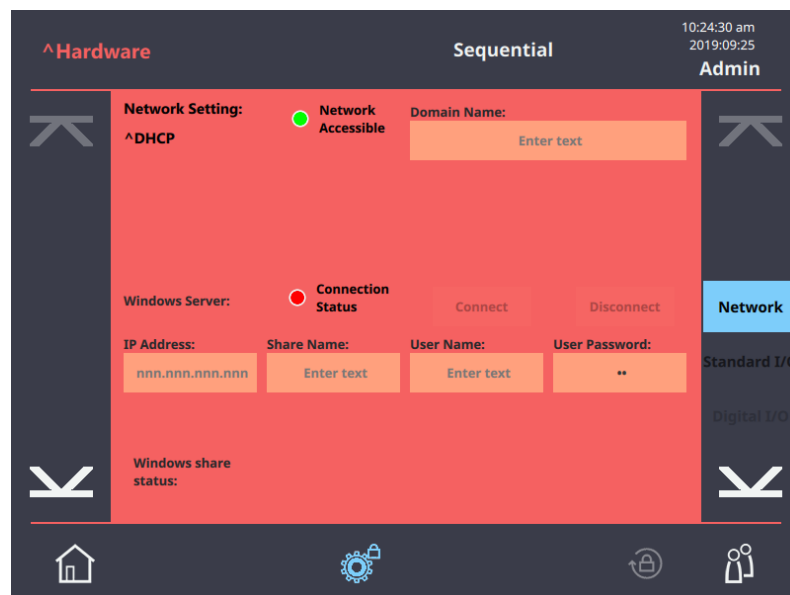
Your network administrator should be able to provide the details required and once configured the tester will automatically attempt to connect to the network during the power-up sequence.

6.1.1 Static IP Setup



1. Ensure network is accessible. If accessible, the green “Network Accessible” status indicator will be lit. If the network is disabled, contact your local IT administrator for assistance.
2. Select "**Static IP**" from the Network Setting option.
3. Set the **IP address, subnet mask, gateway address, and domain name** as necessary for your environment. *Contact your local IT administrator for assistance regarding these settings.*
4. Once configured, "**ping**" the tester from another computer on the same network to confirm connectivity.

6.1.2 DHCP IP Setup



1. Ensure network is accessible. If accessible, the green “Network Accessible” status indicator will be lit. If the network is disabled, contact your local IT administrator for assistance.
2. Select "**DHCP**" from the Network Setting option. Since the IP address is automatically assigned by a router or server, no further configuration is required.

6.1.3 Windows Share

- The network settings must be configured and a valid network connection should be indicated by the Network accessible indicator *prior* to configuring the windows share information.
- Enter the windows share's parameters and select the **Connect button** to verify the connection details; status of connection will display by the Windows share status field.
- The Windows Share connects when the tester is switched On.

Use the following table for troubleshooting Windows Share error messages:

Windows Share error message	Invalid setting
Connection to windows share failed unable to find suitable drive.	IP address
Error 2: No such file or directory.	Share name
Error 5: Input/output error.	User Name
Error 6: No such device or address.	IP address
Error 9: Operation not supported.	SMB version not supported
Error 13: Permission denied.	User password
Error 101: Network unreachable.	Network Cable not connected
Error 95: IP address.	IP address
Error 115: Firewall or Network Routing Issue.	Firewall or Network Routing

6.2 Standard I/O

The I/O configuration parameter controls the remote pass/fail outputs operation and the settings are:

Sprint mD (default value) – The individual channel Pass/Fail outputs are set corresponding to the selected channel test result.

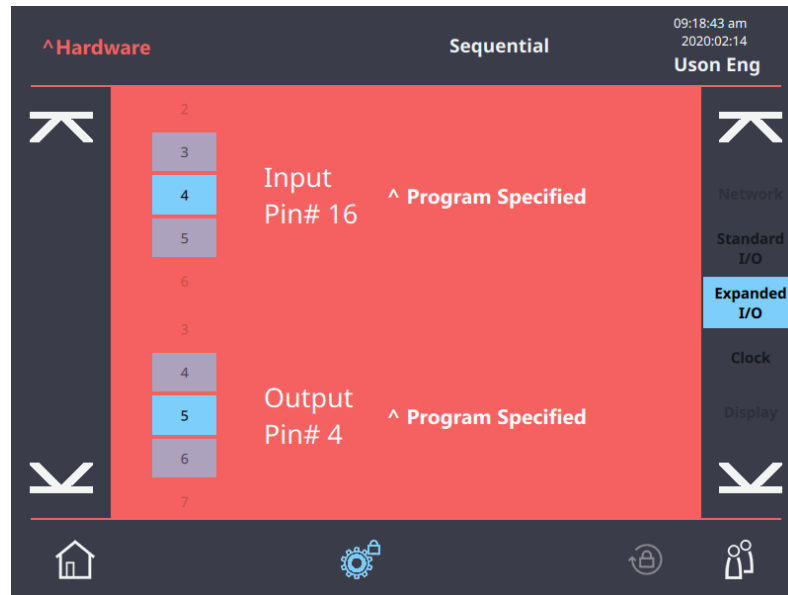
Sprint LC – A single pass (remote pass output 1) and fail (remote fail output 1) outputs. The pass output is set for a pass result on all selected channels or the fail output is set for a fail result on any of the channels selected. **Note:** The Sprint mD and LC IO interfaces are not compatible and an additional converter module is required, refer to Uson Technical support for further information.

To access the Standard I/O settings, select **Program Settings > Hardware > Standard I/O**.



6.3 Expanded I/O

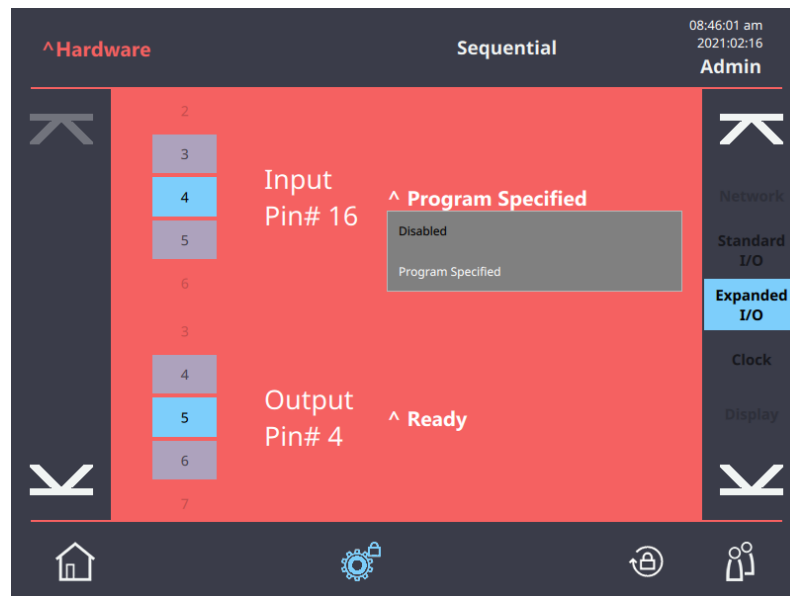
The expanded I/O screen is a licensed option and specifies the individual I/O functions. To access the I/O screen, select **Program Settings > Hardware > Expanded I/O**.



I/O: Used to select I/O ID number to setup.

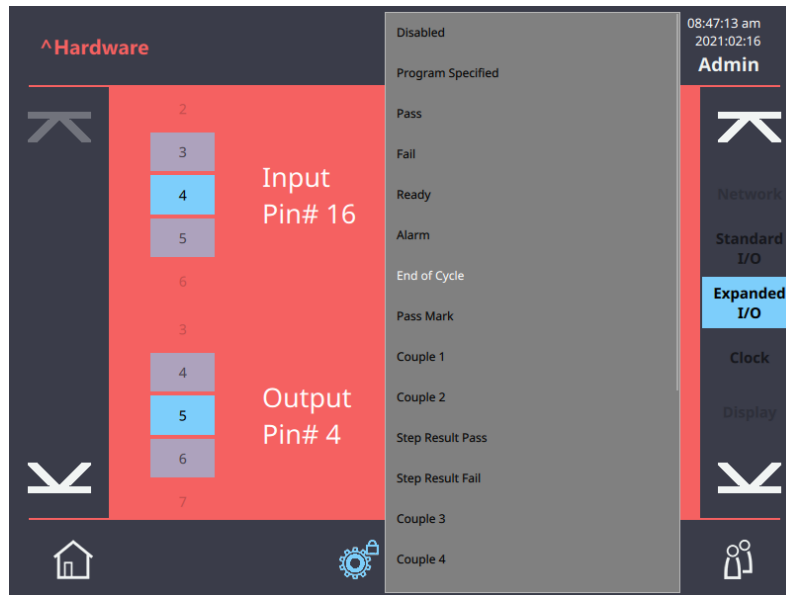
I/O Pin: Used to identify the I/O Pin associated with the I/O ID and name.

6.3.1 Expanded Inputs



- **Disabled:** I/O not used.
- **Program Specified:** Behavior specified by program settings (refer to "*Expanded I/O*" on page 4-14).

6.3.2 Expanded Outputs



Selections:

- **Disabled:** Output is not used.
- **Program Specified:** Function assigned by each program (refer to "*Expanded I/O*" on page 4-14).
- **Pass:** Indicates Test Result Output.
- **Fail:** Indicates Test Result Output.
- **Port 1-4 Pass:** Indicates the individual test ports that passed the test.
- **Port 1-4 Fail:** Indicates the individual test ports that failed the test.
- **Ready:** Indicates the tester is ready to start a test cycle.
- **Alarm:** Indicates an error has been detected or the Test Cycle was aborted.
- **EOC:** A pulse output to indicate the test has been completed.
- **Pass Mark:** A pulse output to indicate a test pass condition which can be used to control an external marker device. Pulse ON for 1 sec on Test Accept. Normally used to physically mark the part.
- **Couple 1 to 4:** Replicates the pneumatic couple output states and for indication or for controlling electrical devices.
- **Step Result Pass or Fail:** Not currently supported.

6.4 Adjusting Tester Clock & Timezone



Time and Calendar settings are disabled if the clock screen's NTP (Network Time Protocol) status indicator is on. You can, however, still access time formatting settings.

Select **Program Settings > Hardware > Clock** tab to access the tester's clock and time zone settings. The correct time setting is important for accurate time stamps and logs.



The clock automatically updates to daylight savings time based on time zone setting. Note this event is not included in the Audit trail log section.

Setting the Date and Time

1. Select the correct **Year**, **Month**, and **Date** on the calendar.



Changing the Date on the calendar resets the time to 12:00:00 am.

2. Using the Current Time field, enter the **correct time**.

- **Date Format:** The Date Format can select either dd/mm/yy or mm/dd/yy format.
- **Time Format:** The Time Format may be set to either 12- or 24-hour format.
- **Current Time:** Shows the current time in the format selected under Time Format.
- **Calendar:** Shows the current day.



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

- **NTP checkbox:** Used to turn NTP ON/OFF. Select **checkbox** to turn NTP ON, deselect the **checkbox** to turn NTP OFF. Users can turn NTP ON if the following conditions are met: The current NTP state is disabled; the network is enabled; and the ethernet port's cable is connected. If these conditions are not met, a status bar feedback message displays describing the reason(s).
- **NTP Status Indicator:** Displays the current NTP operational status as follows:

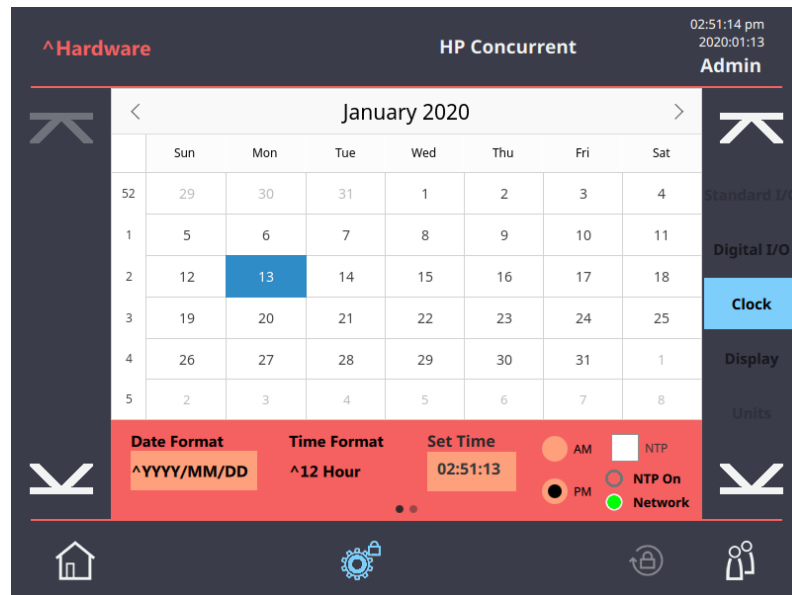
Empty Circle: NTP is OFF.

Green Circle: NTP is ON and fully operational.

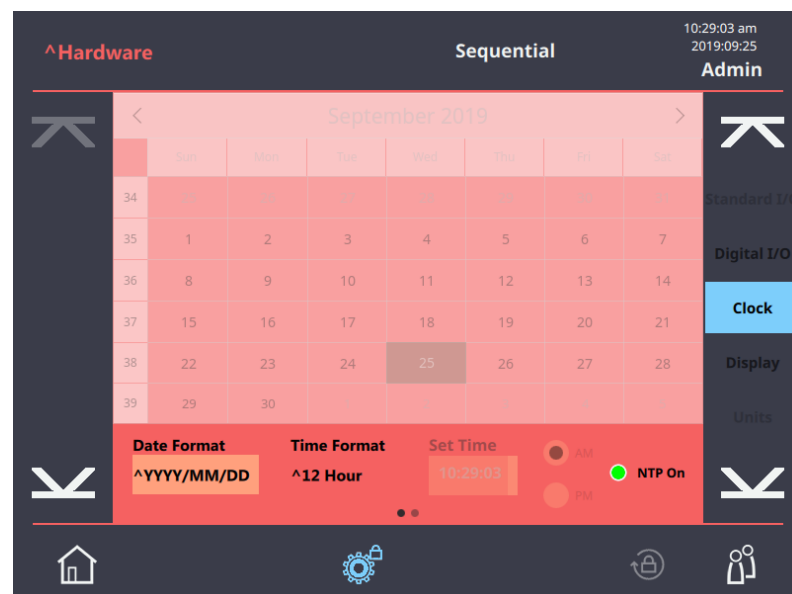
Green Blinking Circle: NTP is transitioning from OFF to ON.

Red Circle: The NTP transition to ON has failed.

Network Accessibility Status Indicator: If green, network is enabled and ethernet is plugged in with hardware connectivity.



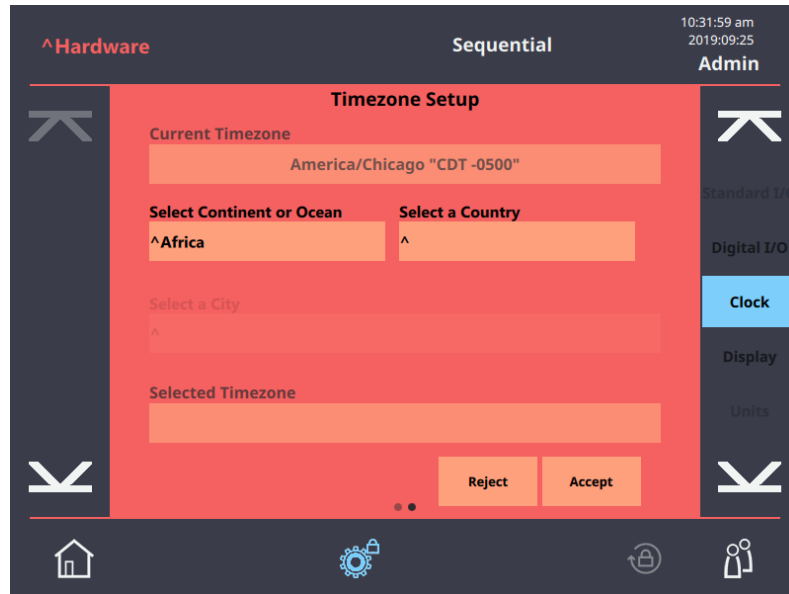
Clock options for NTP disabled.



Clock options for NTP enabled.

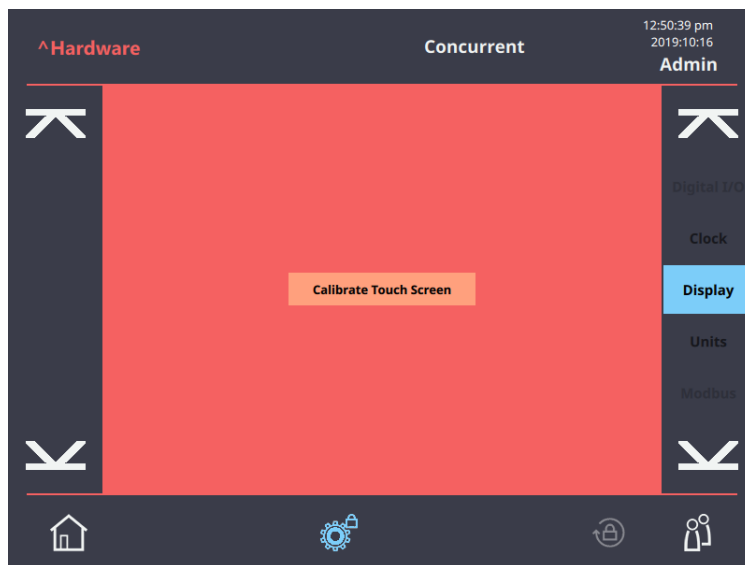
Setting the TimeZone

1. Select **Program Settings > Hardware > Clock.**
2. **Swipe screen to the right** to access the Timezone screen.
3. **Configure** the timezone using the available fields (Continent/Ocean, City, Country), then select **Accept** to save the timezone setting.



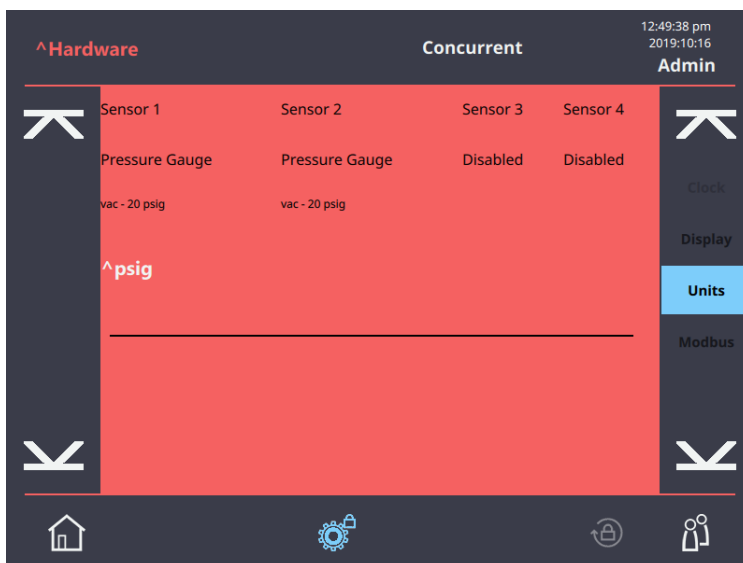
6.5 Display

To recalibrate the touchscreen, select **Calibrate Touchscreen**, then follow the on-screen instructions.



6.6 Units

To change the displayed sensor reading units, select the **displayed unit**, then select an alternate unit from the displayed list.



6.7 Modbus

The Sprint mD is optionally provisioned through licensing add-ons to support independent control and monitoring via Modbus.

The Tester communicates with host systems through its serial port, and follows the Modbus communications protocol to allow integration into distributed control systems or automated management systems.

The Sprint mD acts as a slave to a host system, and provides remote access to all data and settings, including the following:

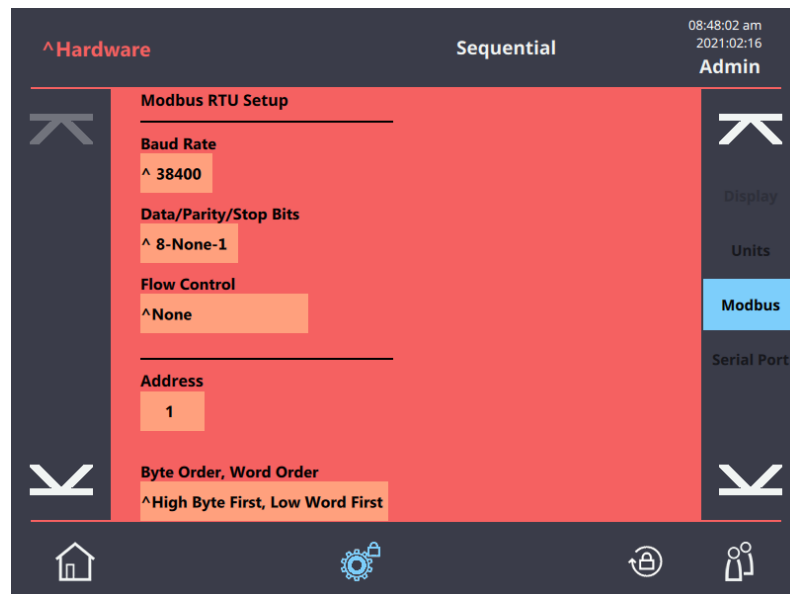
- Operational status
- Operational control
- Events/Alarms
- Test Parameters
- Test Results
- History



NOTE: Since the Sprint mD is a slave to its Modbus host, the host system must poll the tester regularly to identify alarms and other changes in status.

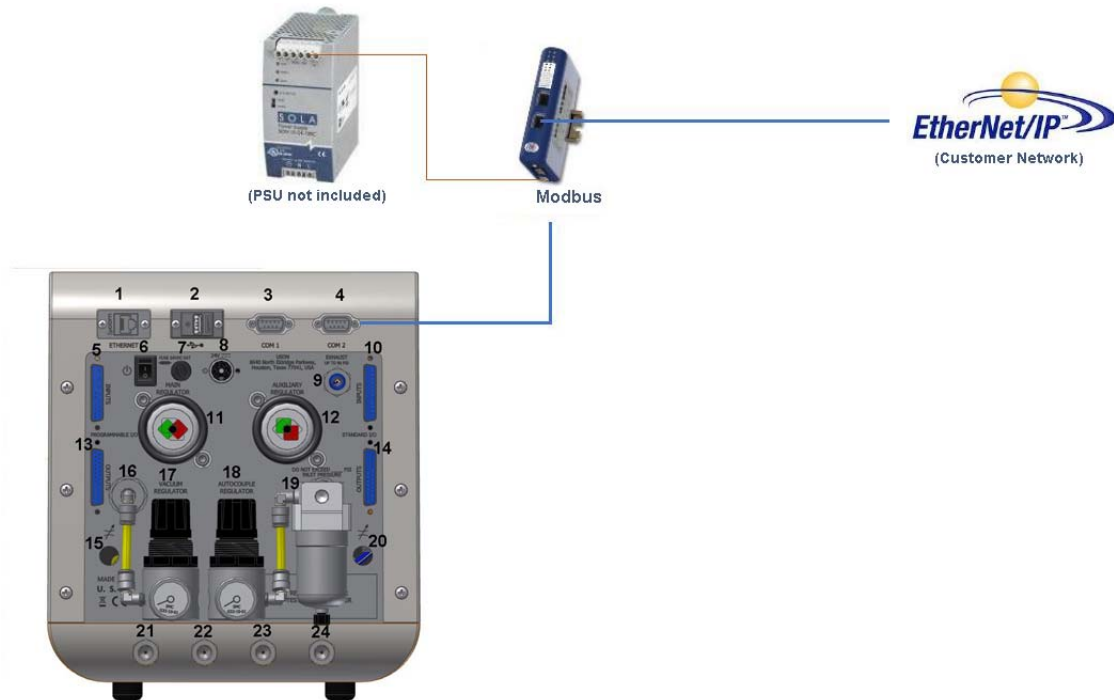
6.7.1 Modbus Configuration

- Modbus Mode is RTU.
- Modbus port is Com 2 on the rear panel. The com port is generally connected to external field bus gateway with the following setup:
Baud rate: 38400.
Data Bits: 8 bits.
Parity: None.
Stop bit: 1.
Flow control: None.
- The Modbus Address may be set within the range of 1 to 247.
- The Architecture can be selected for Byte Order First/Low Word First or Low Byte First/High Word First
- No. of Coils, No. of Inputs, No. of Input Registers, and No. of Holding Registers cannot be changed. (See "[Modbus Registers Configuration](#)" on [page 7-12](#).) Note: Modbus is available only on testers for which this option has been purchased.



6.7.2 Modbus to Fieldbus Option

- Other Fieldbus protocols are provided through a gateway that converts modbus protocol to Ethernet/IP, Profinet, or Profibus, dependent on the module. The following shows power and data connections to the modules. Power and data connections to the modules are shown below:



6.7.3 Modbus Communications

The table below summarizes the standard configuration and options:

Standard Configuration	Options
RS-232	None
Full-duplex, no hardware handshake, 19200 baud	1200 to 57600 baud with or without hardware handshaking
8 data bits, no parity, 1 stop bit	

6.7.4 Supported Modbus Functions

The Sprint mD 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, and obtaining results and status information, along with history.

Modbus functions					Type of data	
Read	Write (single)	Write block	Location reference	Modbus description	mD usage	Field size*
1	5	15	0xxxx	Coils	Global commands and settings	1
2		†	1xxxx	Digital inputs	Inputs, Events, & Status	1
4		†	3xxxx	Input registers	Test results and status	2
3	6	16	4xxxx	Holding registers	Test selection, control	2

The Sprint mD 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 [†]	Silence

6.7.5 Modbus Address Map

The Sprint mD Modbus address map and assigned parameters is fixed and is summarized below. Further information on the parameter format is defined in the following sections.

1. Coils

: 00001 Start Signal
: 00002 Abort Signal

2. Inputs

:10001 Ready-to-run
: 10002 Start-of-cycle
: 10003 End-of-cycle
: 10004 Busy
: 10005 Alarm
: 10006 Pressure Ok
: 10007 Isolate
: 10008 Test Pass- Ch1
: 10009 Test Fail- Ch1
: 10010 Unused
: 10011 Test Pass- Ch2
: 10012 Test Fail- Ch2
: 10013 Unused
: 10014 Test Pass- Ch3
: 10015 Test Fail- Ch3
: 10016 Unused
: 10017 Test Pass- Ch4
: 10018 Test Fail- Ch4
: 10019 Unused

3. Input Registers

: 30001 Heartbeat
: 30002 Serial Number

: 30008 Tester Model Type
 : 30009 RTR, SOC, EOC, Busy, etc.
 : 30010 Standard Digital Output Bitmap
 : 30011 Expanded Digital Output Bitmap
 : 30012 Standard Digital Input Bitmap
 : 30013 Expanded Digital Input Bitmap
 : 30014 Program Number
 : 30015 Program Name
 : 30033 Test Type
 : 30034 Total Count
 : 30036 Pass Count
 : 30038 Fail Count
 : 30040 Cycle Count
 : 30042 Time Stamp
 : 30058 Program Number
 : 30059 Test Type
 : 30060 Channel
 : 30061 Test Code
 : 30062 Step Type
 : 30063 Pass, Fail Status Bitmap
 : 30064 Applied Units- Ch1
 : 30065 Applied Value- Ch1
 : 30067 Result Units- Ch1
 : 30068 Result Value- Ch1
 : 30070 Fail Code- Ch1
 : 30071 Sensor Measure Value- Ch1
 : 30073 Sensor Measure Units- Ch1
 : 30074 Applied Units- Ch2
 : 30075 Applied Value- Ch2
 : 30077 Result Units-Ch2
 : 30078 Result Value- Ch2
 : 30080 Fail Code- Ch2

: 30081 Sensor Measure Value- Ch2
 : 30083 Sensor Measure Units- Ch2
 : 30084 Applied Units- Ch3
 : 30085 Applied Value- Ch3
 : 30087 Result Units- Ch3
 : 30088 Result Value- Ch3
 : 30090 Fail Code- Ch3
 : 30091 Sensor Measure Value- Ch3
 : 30093 Sensor Measure Units- Ch3
 : 30094 Applied Units- Ch4
 : 30095 Applied Value- Ch4
 : 30097 Result Units- Ch4
 : 30098 Result Value- Ch4
 : 30100 Fail Code- Ch4
 : 30101 Sensor Measure Value- Ch4
 : 30103 Sensor Measure Units- Ch4
 : 30104 Fill/Evac 1 Target
 : 30106 Fill/Evac 2 Target
 : 30108 Fill/Evac 1 Min Limit
 : 30110 Fill/Evac 1 Max Limit
 : 30112 Fill/Evac 2 Min Limit
 : 30114 Fill/Evac 2 Max Limit
 : 30116 Fill/Evac 1 Timer
 : 30118 Fill/Evac 2 Timer
 : 30120 Isolate Timer
 : 30122 Stabilize Timer
 : 30124 Measure Timer
 : 30126 Vent Timer
 : 30128 Measure Limits– Min
 : 30130 Measure Limits– Middle
 : 30132 Measure Limits– Max
 : 30134 Cal Leak Rate

: 30136 Comp Value- Ch1
 : 30138 Cal Value- Ch1
 : 30140 Comp Value- Ch2
 : 30142 Cal Value- Ch2
 : 30144 Comp Value- Ch3
 : 30146 Cal Value- Ch3
 : 30148 Comp Value- Ch4
 : 30150 Cal Value- Ch4
 : 30152 Program Number
 : 30153 Units
 : 30154 All: Min
 : 30156 All: Max
 : 30158 All: Avg
 : 30160 All: Std Dev
 : 30162 Pass: Min
 : 30164 Pass: Max
 : 30166 Pass: Avg
 : 30168 Pass: Std Dev
 : 30170 Fail- Ch1: Min
 : 30172 Fail: Max
 : 30174 Fail: Avg
 : 30176 Fail: Std Dev
 : 30178 X Isolate Target
 : 30180 X Isolate Min Limit
 : 30182 X Isolate Max Limit
 : 30184 X Stabilize Target
 : 30186 X Stabilize Min Limit
 : 30188 X Stabilize Max Limit
 : 30190 X Vent Min Limit
 : 30192 X Vent Max Limit

4. Holding Registers

: 40001 Start, Abort
 : 40002 Set Program by Number
 : 40003 X Fill/Evac 1 Target
 : 40005 X Fill/Evac 2 Target
 : 40007 X Fill/Evac 1 Min Limit
 : 40009 X Fill/Evac 1 Max Limit
 : 40011 X Fill/Evac 2 Min Limit
 : 40013 X Fill/Evac 2 Max Limit
 : 40015 X Fill/Evac 1 Timer
 : 40017 X Fill/Evac 2 Timer
 : 40019 X Isolate Timer
 : 40021 X Stabilize Timer
 : 40023 X Measure Timer
 : 40025 X Vent Timer
 : 40027 X Measure Limits– Min
 : 40029 X Measure Limits– Middle
 : 40031 X Measure Limits– Max
 : 40033 X Cal Leak Rate
 : 40035 X Comp Value- Ch1
 : 40037 X Cal Value- Ch1
 : 40039 X Comp Value- Ch2
 : 40041 X Cal Value- Ch2
 : 40043 X Comp Value- Ch3
 : 40045 X Cal Value- Ch3
 : 40047 X Comp Value- Ch4
 : 40049 X Cal Value- Ch4
 : 40051 Inquire Test Setup of Program #
 : 40052 Transfer Test Setup to Program #
 : 40053 Pass Thru Text 1
 : 40062 Pass Thru Text 2

: 40071 Pass Thru Text 3
: 40080 X Isolate Target
: 40082 X Isolate Min Limit
: 40084 X Isolate Max Limit
: 40086 X Stabilize Target
: 40088 X Stabilize Min Limit
: 40090 X Stabilize Max Limit
: 40092 X Vent Min Limit
: 40094 X Vent Max Limit

6.7.6 Modbus ‘Coils’ – Discrete Closures

System Control – Discrete Closure data structures of the mD are available to the Modbus Master via Modbus discrete signals (“Coils”). The following tables summarize these control signals. The Modbus Master has read/write access. All of these are Boolean types that have only a ‘1’ or ‘0’ value.

#Coils	Name/description
1	Start Signal – start the test cycle (1 = start, 0 = ignored)
1	Abort Signal – stop the test cycle (1 = abort 0 = ignored)

6.7.7 Modbus ‘Inputs’ – Discrete Closures

System Status and Test Status Closure data structures of the mD are available to the Modbus Master via Modbus discrete signals (“Inputs”). The following tables summarize these system and test status signals. The Modbus Master has read-only access. All of these are Boolean types that have only a ‘1’ or ‘0’ value.

System Status	
#Digital Inputs	Name/description
1	Ready-to-run (1 = ready, 0 = not ready)
1	Start-of-cycle (1 = SOC, 0 = not at SOC)
1	End-of-cycle (1 = EOC, 0 = not at EOC)
1	Busy (1 = busy, 0 not busy)
1	Alarm (1 = Alarm, 0 = no alarm)

Test Status	
#Digital Inputs	Name/description
1	Test Pass Ch1 (1 = Pass, 0 = no result)
1	Test Fail Ch1 (1 = Fail, 0 = no result)
1	Test Pass Ch2
1	Test Fail Ch2
1	Test Pass Ch3Test Pass Ch2
1	Test Fail Ch3
1	Test Pass Ch4Test Pass Ch2
1	Test Fail Ch4

6.7.8 Modbus Input Registers

Much of the Sprint mD's 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 mD data structures. Additional description is provided for the layout of various data structures as required. The Modbus Master has read-only access.

System Setup – Factory Configuration – Tester	
# Input Registers	Name/description
6	Serial Number – uses 6 registers (12 characters)
1	Spring mD Tester Model Type – an enum code (see Enum Table 6-1)

System Status – Closures	
# Input Registers	Name/description
1	System Status (Boolean packed binary) Bit0 – Ready-to-run Bit1 – Busy Bit2 – Start-of-cycle Bit3 – End-of-cycle Bit4 – 0 (Unused) Bit5 – 0 (Unused) Bit6 – 0 (Unused) Bit7 – 0 (Unused) Bit8 – Alarm Bit9 – Run Mode Bit10 – Run Sub-mode Map Bit 0 Note: See Bit11 – Run Sub-mode Map Bit 1 Table 6-8 Bit12 – Run Sub-mode Map Bit 2
1	Standard Digital Output Bitmap
1	Expanded Digital Output Bitmap
1	Standard Digital Input Bitmap
1	Expanded Digital Input Bitmap

System Status – Health	
# Input Registers	Name/description
1	Heartbeat – Value that increments from 1-65535 (with rollover) at 1 second intervals.

The following registers are updated in real-time when each program begins to run.

Test Setup – Specification	
# Input Registers	Name/description
1	Program Number – 1 to 127 (unsigned short)
1	Program Name – 18 registers (null-terminated 36 character string)
1	Test Type – enum code (see Table 6-2)

Test Status – Counters	
#Input Registers	Name/description
1	Test Counter – All, 2 registers (unsigned long)
1	Test Counter – Pass, 2 registers (unsigned long)
1	Test Counter – Fail, 2 registers (unsigned long)

Test Status – Results	
# Input Registers	Name/description
2	Context – Cycle Number, 2 registers (unsigned long)
16	Time Stamp, 16 registers (32 character null-terminated string)
1	Program Number, 1 to 127 (unsigned short)
1	Test Type, enum code (see Table 6-2)
1	Channel Number
1	Test Code, enum code (see Table 6-4)
1	Test Step Type, enum code (see Table 6-7)
1	Test Pass/Fail Status Bitmap (Boolean packed binary) Bit0 – Pass (Ch1) Bit1 – Fail (Ch1) Bit2 – 0 (Unused) Bit3 – 0 (Unused) Bit4 – Pass (Ch2) Bit5 – Fail (Ch2) Bit6 – 0 (Unused) Bit7 – 0 (Unused) Bit8 – Pass (Ch3) Bit9 – Fail (Ch3) Bit10 – 0 (Unused) Bit11 – 0 (Unused) Bit12 – Pass (Ch4) Bit13 – Fail (Ch4) Bit14 – 0 (Unused) Bit15 – 0 (Unused)
1	Applied Units Ch1, enum code (see Table 6-3)
2	Applied Value Ch1 (float)

1	Result Units Ch1, enum code (see Table 6-3)
2	Result Value Ch1 (float)
1	Fail/Abort Code Ch1, enum code (see Table 6-5 or Table 6-6)
2	Measure Value Ch1 [used for comp/cal] (float)
1	Measure Units Ch1 (see Table 6-3)
1	Applied Units Ch2, enum code (see Table 6-3)
2	Applied Value Ch2 (float)Applied Value Ch1 (float)
1	Result Units Ch2, enum code (see Table 6-3)
2	Result Value Ch2 (float)
1	Fail/Abort Code Ch2, enum code (see Table 6-5 or Table 6-6)
2	Measure Value Ch2 [used for comp/cal] (float)
1	Measure Units Ch2 (see Table 6-3)
1	Applied Units Ch3Applied Unites Ch2 enum code (see Table 6-3)
2	Applied Value Ch3 (float)
1	Result Units Ch3, enum code (see Table 6- 3)
2	Result Value Ch3 (float)
1	Fail/Abort Code Ch3, enum code (see Table 6-5 or Table 6-6)
2	Measure Value Ch3 [used for comp/cal] (float)
1	Measure Units Ch3 (see Table 6-3)
1	Applied Units Ch4, enum code (see Table 6-3)
2	Applied Value Ch4 (float)Applied Value Ch1 (float)
1	Result Units Ch4, enum code (see Table 6-3)
2	Result Value Ch4 (float)
1	Fail/Abort Code Ch4, enum code (see Table 6-5 or Table 6-6)
2	Measure Value Ch4 [used for comp/cal] (float)
1	Measure Units Ch4 (see Table 6-3)
1	Initial value at start of measure step.

Test Setup – Inquire Specification

The following registers are Program #n Specifications and are updated when Holding Register “Command - Inquire Program #n” is written.

# Input Registers	Name/description
2	Fill/Evac 1 Target (float)
2	Fill/Evac 2 Target (float)
2	Fill/Evac 1 Min Limit (float)
2	Fill/Evac 1 Max Limit (float)
2	Fill/Evac 2 Min Limit (float)
2	Fill/Evac 2 Max Limit (float)
2	Fill/Evac 1 Timer (float)
2	Fill/Evac 2 Timer (float)
2	Isolate Timer (float)
2	Stabilize Timer (float)
2	Measure Timer (float)
2	Vent Timer (float)
2	Measure Step Limits – Min 1 (float)
2	Measure Step Limits – Middle (float) ¹
2	Measure Step Limits – Max (float)
2	Calibration Leak Rate (float)
2	Compensation Value Ch1 (float)
2	Calibration value Ch1 (float)
2	Compensation Value Ch2 (float)
2	Calibration value Ch2 (float)
2	Compensation Value Ch3Compensation Value Ch2 (float) (float)
2	Calibration value Ch3 (float)
2	Compensation Value Ch4Compensation Value Ch2 (float)
2	Calibration Value Ch4 (float)
2	Isolate Target (float)
2	Isolate Min Limit (float)
2	Isolate Max Limit (float)
2	Stabilize Target (float)
2	Stabilize Min Limit (float)
2	Stabilize Max Limit (float)
2	Vent Min Limit (float)
2	Vent Max Limit (float)

1. The Middle limit is the same as the Max limit if using a simple min/max window limit.

Test Status – Statistics

# Input Registers	Name/description
1	Context – Program Number, 1 to 127 (unsigned short)
1	Context – Units enum code (see Table 6-3)
2	All – Min, 2 registers (float)
2	All – Max, 2 registers (float)
2	All – Average, 2 registers (float)
2	All – Std. Dev., 2 registers (float)
2	Pass – Min, 2 registers (float)
2	Pass – Max, 2 registers (float)
2	Pass – Average, 2 registers (float)
2	Pass – Std. Dev., 2 registers (float)
2	Fail – Min, 2 registers (float)
2	Fail – Max, 2 registers (float)
2	Fail – Average, 2 registers (float)
2	Fail – Std. Dev., 2 registers (float)

6.7.9 Modbus Holding Registers

Modbus Holding Registers are used for mD System Control and Test Specification. These registers are similar to Modbus ‘Input Registers’, except that the Modbus Master has read and write access.

System Control

# Holding Registers	Name/description
1	Start, Abort - tester control (Boolean packed binary) Bit0 – Start Bit1 – Abort

Test Control – Specification

# Holding Registers	Name/description
1	Set Program by Number (1 to 127 are valid) Program #n specifications set when “Command: Transfer to Program #n” written.
2	Fill/Evac 1 Target (float)
2	Fill/Evac 2 Target (float)
2	Fill/Evac 1 Min Limit (float)
2	Fill/Evac 1 Max Limit (float)
2	Fill/Evac 2 Min Limit (float)
2	Fill/Evac 2 Max Limit (float)
2	Fill/Evac 1 Timer (float)
2	Fill/Evac 2 Timer (float)
2	Isolate Timer (float)
2	Stabilize Timer (float)
2	Measure Timer (float)
2	Vent Timer (float)
2	Measure Step Limits – Min 1 (float)
2	Measure Step Limits – Middle (float) ¹
2	Measure Step Limits – Max (float)
2	Calibration Leak Rate (float)
2	Calibration value Ch1 [master with leak decay] (float)
2	Compensation value Ch1 [master with no leak decay] (float)
2	Calibration value Ch2 [master with leak decay] (float)
2	Compensation value Ch2 [master with no leak decay] (float)
2	Calibration value Ch3Calibration value Ch2 [master with leak decay] (float)

2	Compensation value Ch3 [master with no leak decay] (float)
2	Calibration value Ch4Calibration value Ch2 [master with leak decay] (float)
2	Compensation value Ch4 [master with no leak decay] (float)
Commands to inquire and set program parameters	
1	Command: Inquire of Program #n (1 to 127 are valid)
1	Command: Transfer to Program #n (1 to 127 are valid)
2	Isolate Target (float)
2	Isolate Min Limit (float)
2	Isolate Max Limit (float)
2	Stabilize Target (float)
2	Stabilize Min Limit (float)
2	Stabilize Max Limit (float)
2	Vent Min Limit (float)
2	Vent Max Limit (float)

1. The Middle limit is the same as the Max limit if using a simple min/max window limit.

Test Control - Information

# Holding Registers	Name/description
9	Pass Thru Text 1, (null-terminated 18 character string)
9	Pass Thru Text 2. (null-terminated 18 character string)
9	Pass Thru Text 3. (null-terminated 18 character string)

6.7.10 Enum Code Tables

Table 6–1: Tester Model Type Enum

Enum Code	Name/Description
0	Undefined
↓	Sequential
	Sequential Dual Path
	Sequential Continuous Fill
	Sequential Fast Flush
	Concurrent
	Concurrent Dual Path

Table 6–2: Test Type Enum

Enum Code	Name/Description
0	Undefined
1	Pressure Decay
2	Pressure Rise
3	Sealed Component
4	Back Pressure Flow
5	Flow
6	Force
7	Vacuum Decay
8	Occlusion
9	Burst
10	Crack
11	Creep
12	Electrical test
13	Fast Flush (Leak Flow)
14	Fast Flush (1 st Low Flow)
15	Fast Flush
16	Fast Flush (2 nd Low Flow)
17	Fast Flush (Deviation)
18	Fast Flush (Rollover)

Table 6–3: 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 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	smm3hr
34	mm3s
35	mm3m
36	mm3hr
Flow Units	
37	sls

38	slhr
39	ls
40	lhr
Mass Units	
41	lbs
42	kgrams
43	grams
Electrical Units	
44	milli-Volts
Misc. Units	
45	Percentage
Volume Units	
100	cubic centimeter
101	cubic meter
102	milliliter
103	centiliter
104	liter
105	cubic inch
106	cubic foot
107	fluid ounce (US)
108	fluid ounce (imperial)
109	liquid pint (US)
110	liquid pint (imperial)
111	liquid quart (US)
112	liquid quart (imperial)
113	liquid gallon (US)
114	gallon (imperial)

Table 6–4: Test Code Enum

Enum Code	Name/Description
0	Undefined
1	Pass
2	Fail – use Table 5 to decode fail reason
3	Unused
4	Abort – use Table 6 to decode abort reason
5	Fail Limit 1
6	Fail Limit 2

Table 6–5: Fail Code Enum

Enum Code	Name/Description
0	Undefined
1	Fail Limit 1
2	Fail Limit 2
3	Fail Limit 3
4	Gross
5	No Burst
6	Low Burst
7	High Burst
8	Creep Reject
9	No Crack
10	Low Crack
11	High Crack
12	Leak (Fast Flush)
13	Low Flush (Fast Flush)
14	Return Flush (Fast Flush)

Table 6–6: Abort Reasons 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 Error
12	Sensor 1 Error
13	Sensor 2 Error
14	Sensor 3 Error
15	Sensor 4 Error
16	Air Supply Error
17	Step Limit Error
18	Program Input Error
19	Connect Error
20	Sensor 1 Proof Pressure Error

21	Sensor 2 Proof Pressure Error
22	Sensor 3 Proof Pressure Error
23	Sensor 4 Proof Pressure Error
24	Sensor Over Range
25	No Result
26	Program Number Error
27	Invalid Leak Cal
28	Bar Code Scan Error
29	TCB Error

Table 6–7: Test Step Type Code Enum

Enum Code	Name/Description
0	Undefined
1	Coupling 1
2	Coupling 2
3	Coupling 3
4	Coupling 4
5	Auto zero
6	Atmos Fill
7	Atmos Iso
8	Atmos Stab
9	Atmos Equal
10	Atmos Measure
11	Connect
12	Pulsefill
13	Pulsecheck
14	Fill/Evac 1
15	Fill/Evac 2
16	Selftest
17	Flow
18	Flowbypass
19	Isolate
20	Stabilize
21	Equalize
22	Measure
23	Reserved, not used.
24	Vent
25	Uncouple 4
26	Uncouple 3
27	Uncouple 2
28	Uncouple 1

Table 6–8: 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

Byte & Word Order Examples

The following has examples for Input Registers. Holding Registers use the same format.

16 Bit Unsigned or Signed Value – Single Register

Example	Byte, Word Order Setting	
4660 Dec, 0x1234 Hex in Heartbeat register at Input Reg. 30001	High Byte First, Low Word First	Low Byte First, High Word First
30001	0x1234	0x3412

32 Bit Unsigned or Signed Value – Two Registers Per Value

Example	Byte, Word Order Setting	
305,419,896 Dec, 0x12345678 Hex in Cycle Count at Input Reg. 30040,30041	High Byte First, Low Word First	Low Byte First, High Word First
30040	0x5678	0x3412
30041	0x1234	0x7856

32 Bit IEEE 754 Float – Two Registers Per Value

Example	Byte, Word Order Setting	
1.2345 Dec, 0x3F9E0419 Hex in Result Value at Input Reg. 30068,30069	High Byte First, Low Word First	Low Byte First, High Word First
30068	0x0419	0x9E3F
30069	0x3F9E	0x1904

Text Strings – Two characters per register. Requires null (0x00) termination. Byte, Word order setting does not apply. First character always in the register’s high-byte.

Example: “Leak Test” String, 0x4C65616B2054657374 Hex in Program Name at Input Reg. 30015 - 30032	
30015	0x4C65
30016	0x616B

30017	0x2054
30018	0x6573
30019	0x7400
30020	0x0000
↓	0x0000
30032	0x0000

6.8 Logging Serial Port/COM 1

COM 1 is the dedicated serial port/RS232 for logging (see [Figure 2–3](#) for COM 1 location).

Select **Program Settings > Hardware > Serial Port** to access the Logging Serial Port Setup screen. The logging serial port is configurable for baud rate, data/parity/bits, and flow control.



User Management

7.1 Introduction

Sprint mD is available with enhanced security features, such as user authentication through passwords and roles, customizable access authorization, and the ability to log and monitor changes to test parameters. The Sprint mD also enables compliance with standards such as 21 CFR Part 11 (U.S.), MHRA/EU Annex 11, and others.

The level of configuration is dependent upon the optional “Advanced Authorization and Authentication” (A3) option and the features are summarized below:

A3 - Disabled

Limited to three users admin, supervisor and operator and only their names and passwords can be modified by the Admin user.

A3 - Local

Allows configuration of users, roles, permissions and password policies. The following options are available:

- Add, Delete and Modify users
- Import users
- Configure Roles
- Configure Password policy
- Audit Trail Log and export option.

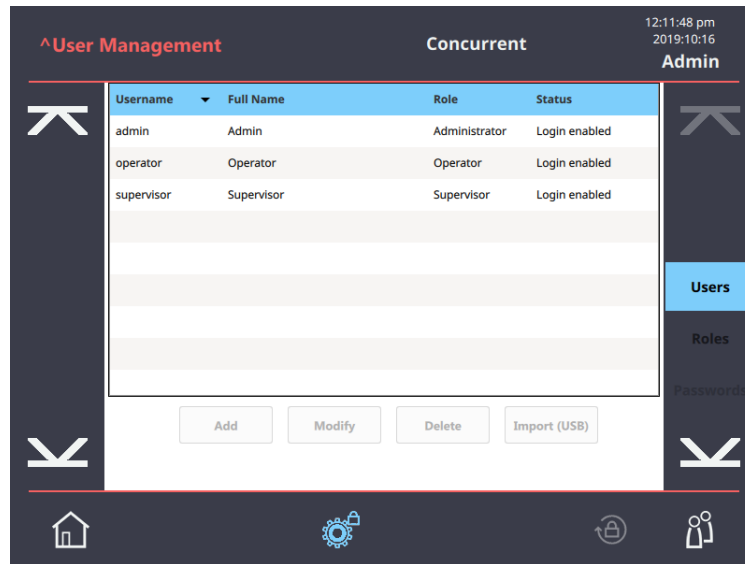
A3 - Network

Users are setup and configured by the local network active directory administration and requires LDAP services to be enabled. Refer to section Options Network and LDAP pages to configure settings. The following options are available:

- The three local users setting. Note these are enabled when network/LDAP is disconnected.
- Config Roles
- Audit Trail Log and export option.

7.2 Adding or Updating a User Account or Password

Select **Program Settings > User Management > Users** to access the Current Users screen where you can add, delete, or modify a user's account.



7.2.1 Changing a User's Password

1. Select **Program Settings > User Management > Users** to access the Current Users screen where you can add, delete, or modify a user's account.
2. Select the **corresponding username** you want to change the password for.
3. Select the **Modify** button. The following screen displays where you can modify the user's password. After making the change, select **Submit**.

The screenshot shows the 'Modify User' screen for the user 'operator'. The screen has a dark blue header with 'User Management' in red, 'Concurrent' in white, and the time '12:13:14 pm' and date '2019:10:16' in white. Below the header, there's a red bar with 'Modify User : operator'. The main area is red and contains four input fields: 'First and Last Name', 'User Password', 'Role' (with a dropdown showing '^Operator'), and 'Status' (with a dropdown showing '^Login disabled'). At the bottom right of the red area are 'Cancel' and 'Submit' buttons. On the right side, there's a vertical menu with 'Users' (highlighted in blue), 'Roles', and 'Passwords'. The bottom of the screen has a dark blue bar with icons for home, settings, lock, and user profile.

7.2.2 Password Reset

1. Select the **top of the run screen** to access the Password Reset pop-up screen.
2. Enter the **current user's password you are resetting**, then enter the new password twice.
3. Select **Submit**.

The screenshot shows the 'Reset Password' pop-up screen. The background is a dark blue screen with '001' in red, 'Sequential' in white, and a green status indicator. The background also shows sensor data: 'Sensor 1 [psig]' with a value of '-0.870' and 'Pressure [psig]'. There are three circular gauges labeled 1, 2, and 3. The pop-up screen is white and contains three input fields: 'Password', 'New password', and 'Confirm password'. Below these fields is a message 'Enter your current and new password.' and two buttons: 'Submit' and 'Cancel'. The bottom of the screen has a dark blue bar with icons for home, target, checkmark, settings, heart rate, information, lock, and user profile.

7.3 Configuring User Role Permissions

The Sprint mD uniquely identifies authorized individuals with IDs and passwords, and restricts access to certain operations per the individual's assigned role (operator, supervisor, administrator).

With the optional "Advanced Authorization and Authentication" module or A3 (local), you can configure the user, roles, permissions, and password policies.



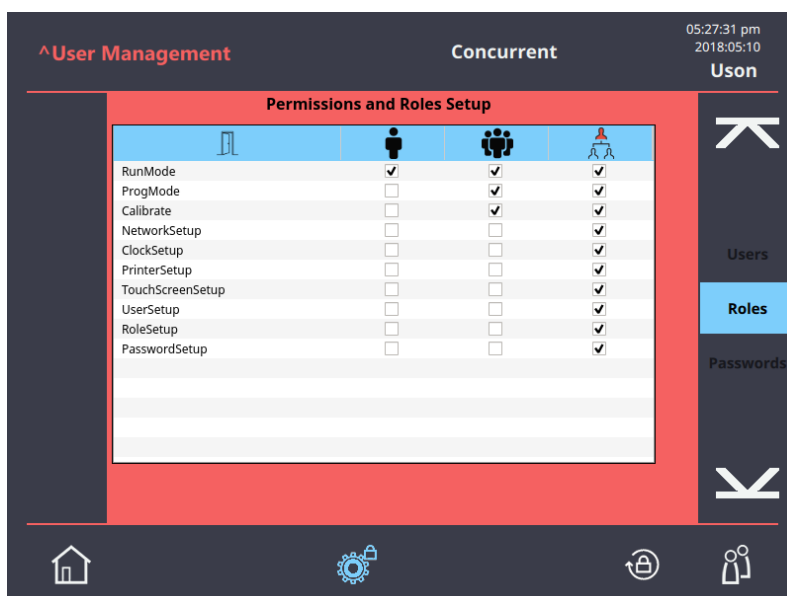
NOTE: If the A3 (local) is not purchased, the tester will have default accounts with fixed roles; however, usernames and passwords can be changed. See [Table 7-1](#) for default settings.

Table 7-1: Default Usernames/Roles

Username	Password	Role
operator	operator	operator
supervisor	supervisor	supervisor
admin	admin	admin

To Configure User Role Permissions:

1. Select **Program Settings > User Management > Roles** to access the roles permissions.
2. Set the **required permission** for each role.
3. User must **logout** to assign new permissions.



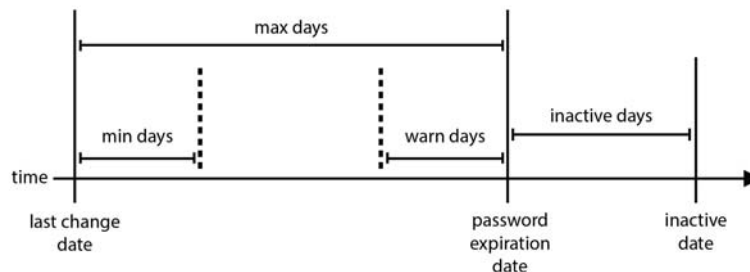
7.4 Configuring Password Policies

The Global Password Setup feature allows for setting up universal password specifications for all users, such as case sensitivity, login timeouts, password length, etc.

To Configure Password Policies:

1. Select **Program Settings > User Management > Passwords** to access the Global Password screen.
2. Select the **Global password features and parameters** desired for your application.

The timing sequence for password inactivity and expiration policy parameters are shown in the following diagram.



7.5 Forgotten Password

Contact Uson to obtain a temporary password if you forget the Administrator name or password and advise the tester serial number and mD ID, which is located under the Run Mode information view. *Note the temporary password is only valid for -2 to +10 days from creation, and the tester date must be correct.*

To Reset Admin Password:

1. Select **Sign In**.
2. Enter user name **loginmgr**.
3. Enter **temporary password**.
4. Select **Program Mode**.
5. Select **User Management**.
6. Select **Admin user**.
7. Select **Modify**.
8. **Set new password**.
9. Select **Submit**.
10. Select **Run Mode**.
11. **Log out**.
12. Check Admin user login with new password.

7.6 Import File – Add or Modify Users

This is a feature for the customer to use a CSV import file to add or update user names, roles, and passwords on the tester.

7.6.1 Description of Operation

1. One or more CSV files are prepared that have the content of the users to be added or modified.
2. These files are put on a thumb-drive in a case-sensitive path of:
"/sprintmd/importusers" (**Note:** Only USB thumb drives formatted with FAT 32 file systems is supported.)
3. The CSV files can be any valid name with a ".csv" extension.
4. The content of the CSV file contains a header that describes each 'field, followed by one or more records for users to be added or 'modified. This must be the first line in the CSV file. After the ' header is processed, empty lines are allowed but ignored in the CSV file.
5. The format of the header file is case-insensitive as follows:
"Username,Fullname>Password,Role"
6. The following example contains multiple users to be added or modified. It has a header record, followed by two records that modify current users, and the last record that adds a new user:
---- /md/importusers/file1.csv ----
Username,Fullname>Password,Role
ajohnson,"Al Johnson",o}dW6>tK,Administrator
djones,"Dale Jones",10vhDY}S,Supervisor
msmith,"Molly Smith",msmith,Operator

7. The thumb-drive is inserted into the USB port of the tester.
8. An authorized person can import the file(s) by navigating to **Setup> User Management >Users screen** and then pressing the '**Import (USB)**' button.
9. Feedback is provided to indicate the results.

7.6.2 Additional Notes

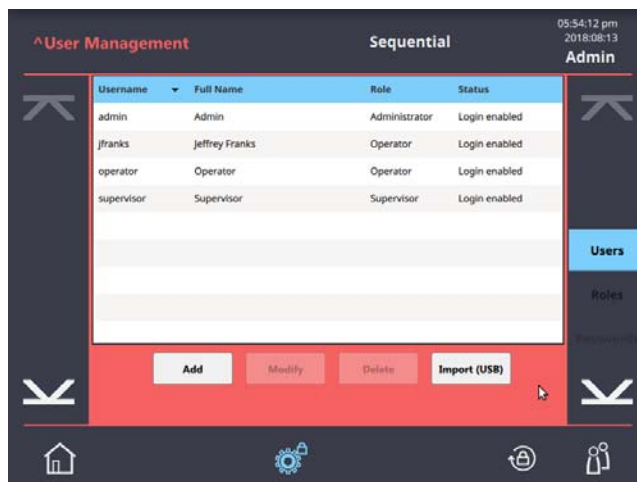
- Any legal filename that has extension .csv may be used. It must be put in the well-known path '/sprintmd/importusers'.
- The 1st line must be the header (case-insensitive).
- There is no particular ordering required among the user records.
- Multiple words within the 'Fullname' field should be quoted.
- The 'Role' field IS case-sensitive and must be one of the following 'Operator', 'Supervisor', or 'Administrator'.
- Determination of adding a record verses modifying a record is made when the file is imported. If the username does not already exist in the tester database,

then the name is added. Otherwise, the user is modified according to values in the CSV file.

- The initial password for new users may be a simple password since new users are required to immediately change it upon 1st login. For example, the new user 'msmith' shows this particular case. 'msmith' is a user being added to the tester for the first time; users 'ajohnson' and 'djones' have passwords that comply with the global password setup parameters for the tester.

```
---- /md/importusers/file1.csv ----
Username,Fullname>Password,Role
ajohnson,"Al Johnson",o}dW6>tK,Administrator
djones,"Dale Jones",10vhDY}S,Supervisor
msmith,"Molly Smith",msmith,Operator
-----
```

- All fields within a record must NOT be empty.
- All passwords MUST be unique between records. The same password shall not be the same between multiple records.
- All full names MUST be unique between records. The same full name shall not be the same between multiple records.
- Errors in adding a record most likely are caused by non-unique full name or passwords between records.



7.7 Log Setup (Audit-Trail Log)

Parameter changes can be recorded in an audit-trail log if the licensed feature “A3” is purchased. The purpose of the audit-trail log is to provide the customer with support for 21 CFR Part 11 requirements.

7.7.1 Audit-Trail Log Description

The Audit-trail log feature is engaged automatically when the “A3” licensed feature is enabled. Some of the Audit-trail log features include:

- The following fields logged to text file: Time Stamp, Tester serial number, and session ID or parameter ID + information of what has changed.
- A setup screen that allows for audit-trail log file rotation of interval and depth. The default is “monthly” with a depth of 36. This default supports 3 years of log files in monthly intervals.
- The log files are stored internally and automatically deleted after the set period of rotation * depth.
- A provision to manually export the audit-trail log file to a USB thumb-drive or the network for online use. This should be performed periodically to archive log files.

7.7.2 Audit-Trail Log Elements

The following is a list of audit-trail log elements:

- Session ID (user login, user full-name, and user’s role[operator | supervisor | administrator]).
- Any parameters that are changed during calibration, and program setup.

7.7.3 Audit-Trail Log File Snippet

Aug 9 15:15:25 987654-321N p545[3075]: audit-trail SESSION - USER: admin
ROLE: Administrator

Aug 9 15:18:02 987654-321N p545[3075]: audit-trail PARAMETER - DB:
Program1 NAME: test_volume VALUE+UNITS: 0 in3 --> 10 in3

Aug 9 15:18:02 987654-321N p545[3075]: audit-trail PARAMETER - DB:
Program1 NAME: test_pressure VALUE+UNITS: 0 psig --> 30 psig

Aug 9 15:18:02 987654-321N p545[3075]: audit-trail PARAMETER - DB:
Program1 NAME: leak_threshold VALUE+UNITS: 0 ccm --> 0.1 ccm

Aug 9 15:18:03 987654-321N p545[3075]: audit-trail PARAMETER - DB:
Program1 NAME: Quick Setup

Aug 9 15:18:03 987654-321N p545[3075]: audit-trail PARAMETER - DB:
Program1 NAME: pf_limit_data.limit1 VALUE+UNITS: 0 psig --> -0.03 psig.

7.7.4 Audit Trail Log Rotation & Export

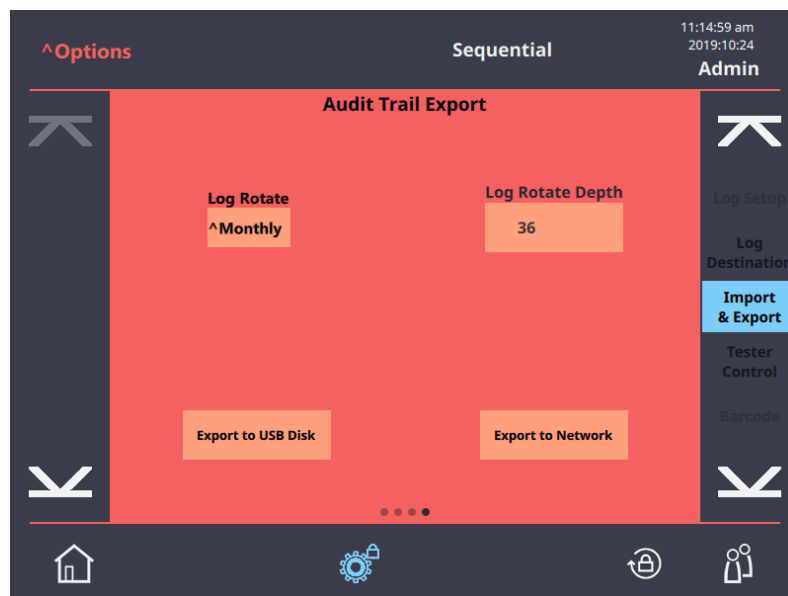
Navigate to **Program Mode > Options > Import/Export Menu**, then swipe to **Audit Trail Export View**. The Audit Trail screen is used to configure the log rotation period, log rotation depth, and allows exporting audit trail data to either the network or USB device.

Log Rotation and Depth

1. **Swipe right 3x from the Database Export Screen** to access the Audit Trail Export screen.
2. Select the desired Log Rotation period from the **Log Rotate** drop down menu.
3. Enter the desired Log Rotate Depth into the **Log Rotate Depth** field.

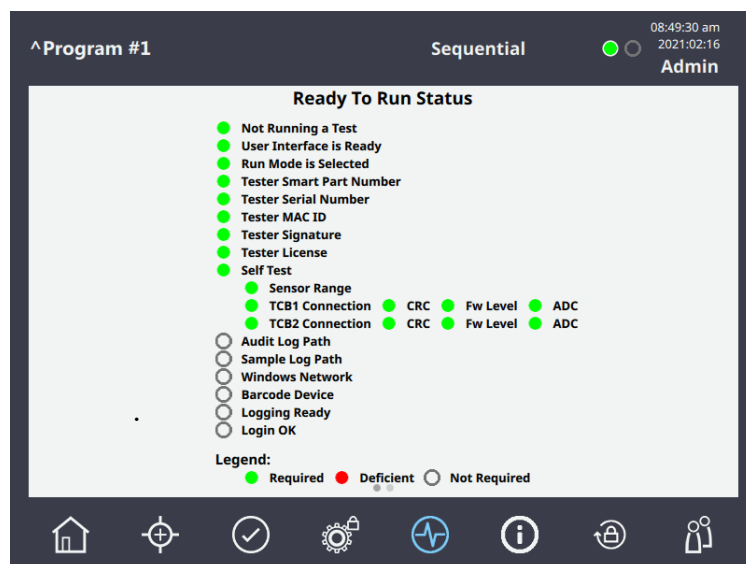
Audit Trail Export

1. **Swipe right 3x from the Database Export Screen** to access the Audit Trail Export screen.
2. To export Audit Trail data to a USB device, select the **Export to USB Disk** button.
3. To export Audit Trail data to the network, select **Export to Network** button.

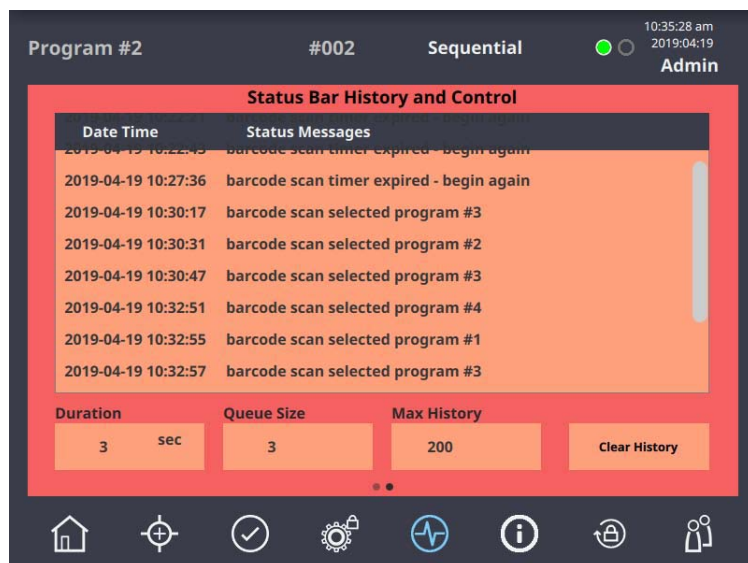


8.1 Health Status

Select the **Health Status Icon**  to access the tester's current health status screen (Ready to Run Status screen).



Swipe **left** to display the Status Bar History and Control screen, which shows recent messages and fields to configure message history preferences (Duration, Queue size, Maximum history).



8.2 Diagnostics

1. Select **Program Settings > Diagnostics** to access the available diagnostics screens such as sensors, valves, standard/programmed I/O, etc to enter and select desired **diagnostics settings**.

The screenshot shows the 'Diagnostics' screen with the 'Sensors' tab selected. The screen displays a table of sensor data for four sensors. The data is organized into rows for Raw Data, Processed Data, Minimum Data, Maximum Data, and Std Dev. At the bottom, there are buttons for 'Clear Tare', 'Set Tare', and 'Clear Statistics'.

Detail	Sensor #1	Sensor #2	Sensor #3	Sensor #4
Raw Data	-11184	-1386.	-1358.	-1338.
Processed Data	-0.0893	-0.0111	-0.0108	-0.0107
Minimum Data	-11201	-1390.	-1362.	-1341.
Maximum Data	0.0000	0.0000	0.0000	0.0000
Std Dev	10813.998	1341.8364	1315.1721	1295.8064

The screenshot shows the 'Diagnostics' screen with the 'Valves' tab selected. The screen displays a grid of 18 valve outputs, each with a checkbox. At the bottom, there are buttons for 'Commit Settings' and 'Uncheck & Deactivate All'.

Valve Outputs			
☐ Valve 1	☐ Valve 2	☐ Valve 3	☐ Valve 4
☐ Valve 5	☐ Valve 6	☐ Valve 7	☐ Valve 8
☐ Valve 9	☐ Valve 10	☐ Valve 11	☐ Valve 12
☐ Valve 13	☐ Valve 14	☐ Valve 15	☐ Valve 16
☐ Valve 17	☐ Valve 18		

^Diagnostics
Concurrent
05:40:49 pm
2018:05:10
Uson

Standard Inputs

☐ Start (1)
☐ Stop (2)
☐ ST ENA (3)
☐ BCD1 (4)

☐ BCD2 (5)
☐ BCD4 (6)
☐ BCD8 (7)
☐ BCD10 (8)

☐ BCD20 (9)
☐ BCD40 (10)
☐ BCD80 (11)

Standard Outputs

☐ Alarm (19)
☐ Ready (20)
☐ Pass 1 (21)
☐ Fail 1 (22)

☐ EOC (23)
☐ Pass 2 (24)
☐ Fail 2 (25)
☐ Pass 3 (27)

☐ Fail 3 (28)
☐ Pass 4 (30)
☐ Fail 4 (31)

Commit Settings
Uncheck & Deactivate All

Sensors
Valves
Standard I/O
Programmed I/O
Barcode

^Diagnostics
Sequential
09:17:56 am
2020:02:14
Uson Eng

Programmed Inputs

☐ Pip 1 (2)
☐ Pip 2 (15)
☐ Pip 3 (3)
☐ Pip 4 (16)

☐ Pip 5 (4)
☐ Pip 6 (17)
☐ Pip 7 (5)
☐ Pip 8 (18)

☐ Pip 9 (6)
☐ Pip 10 (19)
☐ Pip 11 (7)

Programmed Outputs

☐ Pop 1 (2)
☐ Pop 2 (15)
☐ Pop 3 (3)
☐ Pop 4 (16)

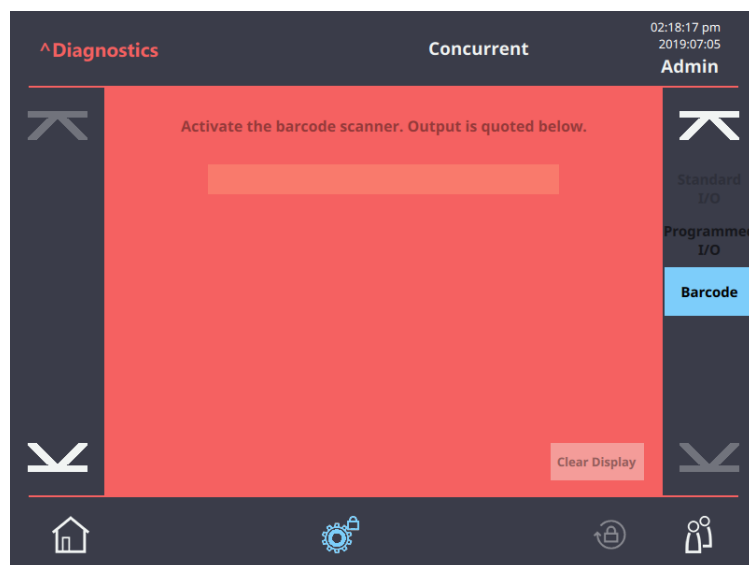
☐ Pop 5 (4)
☐ Pop 6 (5)
☐ Pop 7 (18)
☐ Pop 8 (6)

☐ Pop 9 (7)
☐ Pop 10 (20)
☐ Pop 11 (8)
☐ Pop 12 (9)

☐ Pop 13 (22)
☐ Pop 14 (10)
☐ Pop 15 (11)
☐ Pop 16 (24)

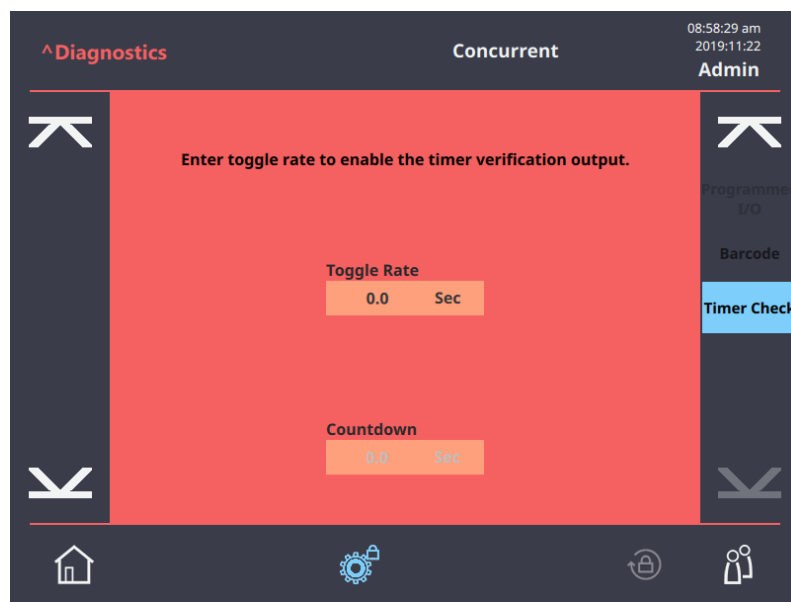
Commit Settings
Uncheck & Deactivate All

Valves
Standard I/O
Expanded I/O
Barcode
Timer Check



8.3 Timer Check Screen

Connect a frequency counter's positive input to the standard I/O output connector, Pin 13 (Timer), and the counter's ground input to Pin 25 (Timer Ret). The timer output is a 0 V to 3.3 V level signal that idles at 3.3 V. Enter a toggle rate between 0.1 to 3600 seconds to enable output.



9.1 Changing Fuse

The power fuse is fitted on the rear panel of the tester: **Type T5A/250V, 20mm, glass.**

To Replace the Fuse:

1. Ensure that the tester is switched **off** and **disconnected from the mains power supply**.
2. Unscrew the **cover** of the fuse holder on the rear panel.
3. Remove the **fuse** and discard.
4. Fit a **new fuse** of the same type and rating into the fuse holder.
5. Screw the **fuse holder** back into position.



NOTE: It's recommended to fix the source of the blown fuse before reapplying power.

9.2 Cleaning

Power off the instrument and disconnect from the power supply. The outer case may be cleaned periodically with a damp cloth or using a proprietary cleaner. Avoid paper based cleaning materials as these may cause scratches on the surface. When the case is clean, rub over the entire surface evenly with a dry clean cloth to remove any residual moisture.

The keypad and display window may be cleaned to remove finger marks with a small amount of Isopropanol based cleaning fluid, (isopropyl alcohol) on a clean soft cloth. Avoid paper based cleaning materials as these may scratch the gloss display window. Gently apply the cloth to the surface of the key pad and display window. Do not rub or apply any pressure. **Do not - under any circumstances - immerse or overwhelm with cleaning fluid.** Follow any precautions supplied with the cleaning fluid. Leave the instrument to dry before re-connecting to the power supply.

9.3 Preventive Maintenance

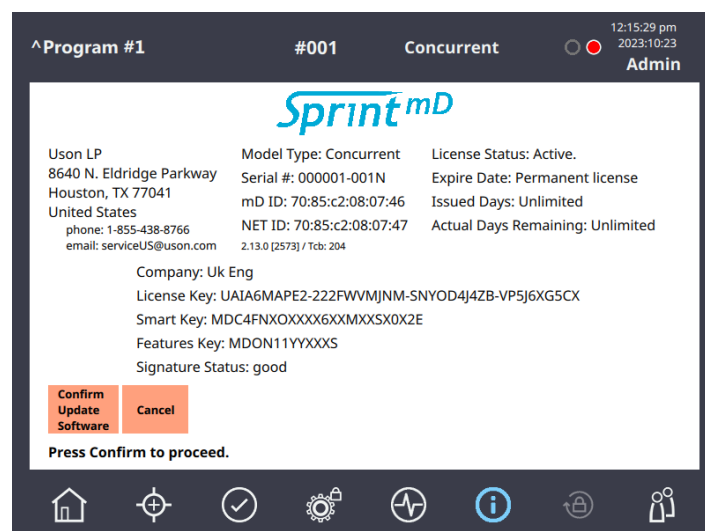
As an OEM, Uson recommends annual calibration of Uson test equipment. Actual calibration intervals are determined per customer based on a number of factors, such as duty cycle, risk-appetite, regulation, environment, out-of-tolerance conditions, etc.

9.4 Software Update

The current version of software is shown below the NET ID value on the Run Mode information screen.

To Update Software:

1. Copy the **software update file mD.zip** (do not unzip the file) to a **USB thumb drive root folder**.
2. Install the **USB thumb drive with the new software update into the Sprint mD's front panel USB port**. (Note: Only USB thumb drives formatted with FAT 32 file systems is supported.)
3. Wait for the **status message to display** that the thumb drive status changed before continuing.
4. Login as an **Admin user**.
5. Select the **Run Mode** information screen.
6. Press the **Update Software option** and follow any **on-screen prompts**.
7. When the update process is complete, **power cycle the Sprint mD**.



9.5 Firmware Update

Firmware updates are copied to the tester as part of the normal software update and this option is used to install the required version. Its advised to use the latest version available.

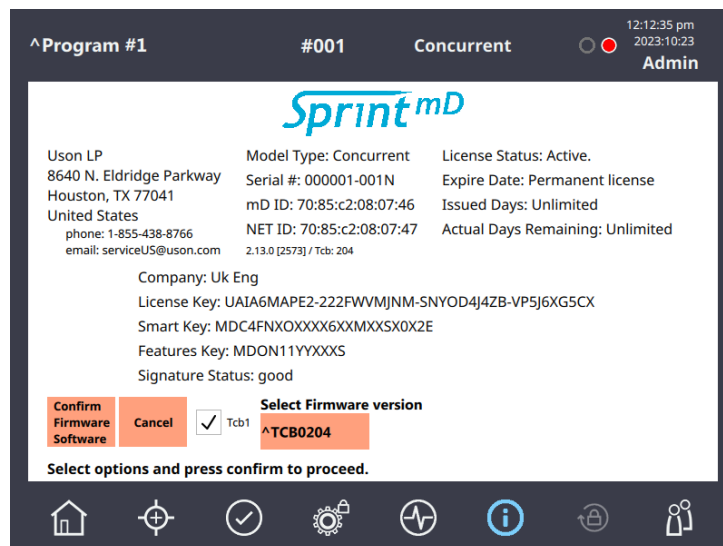
The current Tcb firmware version is shown below the NET ID on the Run Mode information screen.

Note: The Tcb firmware version format is dependent upon the Tcbs installed:

- i) tcb: 0 for no tcbs fitted or connected.
- ii) tcb: xxx: for a single tcb or for tcbs with the same version.
- iii) tcb 1: xxx tcb 2: yyyy for tcbs with different versions.

To update the firmware:

1. Log in as an **Admin user**.
2. Select the **Run Mode** information screen.
3. Press the **Update Firmware option**.
4. Select the required **Version** and **TCB** to be updated.
5. Select the **Confirm Firmware update** and follow any **on-screen prompts**.
6. When the update process is complete repeat for second tcb if required.
7. **Power cycle** the tester.

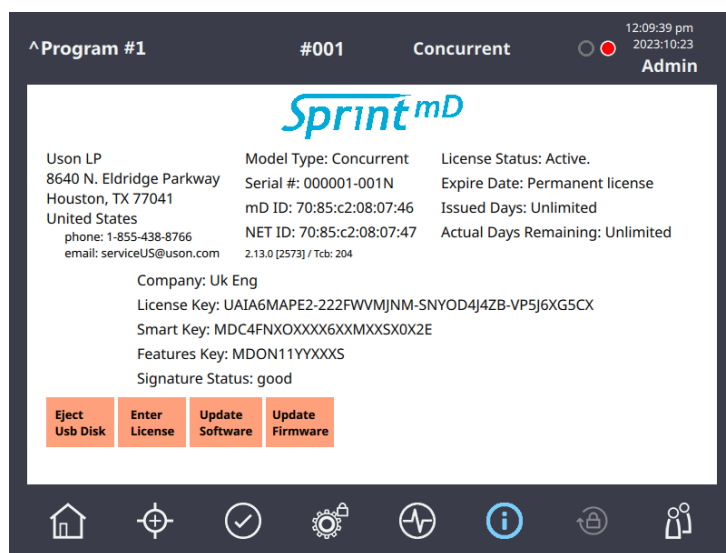


9.6 License Update

All Sprint mD testers are shipped from Uson with a temporary license. To check the number of days remaining on the license, select the **Info** screen and observe the days remaining in the expiration field.

Perform the following to Install a Permanent License or a License Upgrade:

1. Copy the **supplied license file** xxxxxx.xxxn.LIC (where x's are the tester's serial number) **to the root folder on a USB drive.**
2. Install a **USB drive into the Sprint mD's USB port.** (Note: Only USB thumb drives formatted with FAT 32 file systems is supported.)
3. Select the **Run Mode** information screen.
4. Select the **“Enter License”** option and follow the **on-screen instructions.**
5. **Power cycle** the tester after a successful license installation.



Appendix A - Barcode Scanner Configuration

10.1 Barcode Scanner Configuration for use with Sprint mD

The bar code reader's USB interface is a USB CDC (Communications Device Class), ACM (Abstract Control Model) serial communications that enumerates with ttyACM0 or ttyACM1 devices. The setup instructions below are provided for the Uson provided barcode scanner - part number 054501. If the barcode is purchased from Uson, the barcode typically arrives configured and the instructions below are not required.

10.1.1 Datalogic Barcode Configuration

To configure the barcode scanner for use with the Sprint mD:

1. Restore factory settings/custom defaults by scanning the following barcode:



Custom defaults are based on the interface type. Configure the imager for the correct interface before scanning this label.



Restore Custom Default Configuration

2. Scan the following interface bar code USB-COM to simulate standard RS-232 interface:



Select USB COM-STD^a

3. Enter Programming Mode by scanning the following barcode:



ENTER/EXIT PROGRAMMING MODE

4. Scan Country Mode barcode, US.



Country Mode = U.S.

5. Exit Programming Mode by scanning the following barcode:



ENTER/EXIT PROGRAMMING MODE

6. Enter Programming Mode by scanning the following barcode:



ENTER/EXIT PROGRAMMING MODE

7. Scan the Set Global Suffix barcode, below:



Set Global Suffix

8. Scan barcode 0, below:



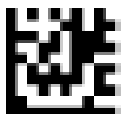
0

9. Scan barcode D, below



D

10. Scan barcode 0, below



0

11. Scan barcode A, below



A

12. Exit Programming Mode by scanning the following barcode:



ENTER/EXIT PROGRAMMING MODE

13. Enter Programming Mode by scanning the following barcode:



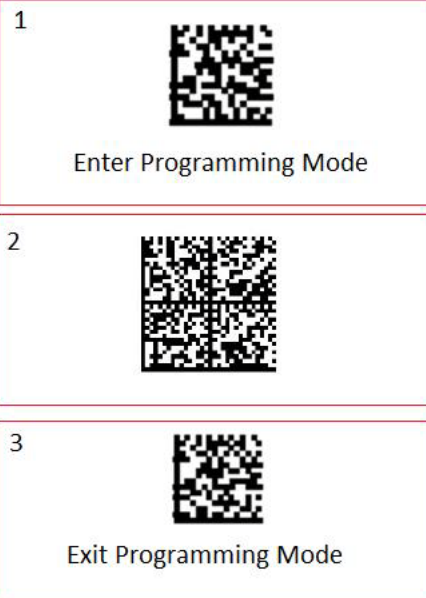
ENTER/EXIT PROGRAMMING MODE

14. Select Program Mode Diagnostics option and Barcode screen. Scan the following QR code **35900G9** to test your settings:



10.1.2 Zebra Barcode Configuration

The setup instructions below are provided for the Uson provided barcode scanner. If the barcode is purchased from Uson, the barcode typically arrives configured and the instructions below are not required.



Appendix B - MS AD LDAP Server Setup

11.1 Introduction

This document provides the MS Server setup configuration used to develop the Sprint mD LDAP authentication feature, otherwise known as A3N.

A3N is a Sprint mD licensed feature option for Microsoft Windows Server AD LDAP for Sprint mD user authentication capability. User credentials and password policies are centralized in Windows Active Directory, and made accessible via LDAP queries by the Sprint mD client. The Sprint mD client performs no operations that modify objects on the AD LDAP server.

11.2 Overview

The domain *controller name* **jlf-dc1** and *domain name* **jflflab.com** are used for the following setup examples. (Users' IT departments define the actual names.)

The domain **jflflab.com** was customized by adding an organizational unit with the name SprintmD. This is required in order to provide a well-known place for other objects related to Sprint mD LDAP authentication setup.

The pseudo-user **SprintLdapAdmin** under SprintmD is a member of *Domain Users*. This entity becomes a well-known user that is used to gain AD LDAP server access for authentication purposes and search for information regarding the actual user of interest. Once the distinguished name is identified for the user of interest, an attempt is made at LDAP authentication with the user's credentials. The MS Server does the rest of the work and provides the results for the LDAP authentication attempt. In all cases, simple authentication is used for all users.



Since SprintLdapAdmin is not a "real" user, password options are set to NOT expire. This pseudo-user is provided for machine-to-machine access to LDAP. If the recommended password policy is not used/allowed by IT, the password expires, and machine-to-machine LDAP operations fail. To remedy, the IT department will need to reset the password and provide the new password to the Sprint mD administrator. The administrator will then need to update all Sprint mD testers with the new password in order to restore LDAP authentication.

The organizational unit name *Groups* under SprintmD has three Security Group objects: **SprintmDAdmin**, **SprintmDOperator**, and **SprintmDSupervisor**.

A user that logs into a Sprint mD tester must be a member of only one of these groups. (There is nothing special about the Security Group objects except their unique names.) Once a user is authenticated using LDAP, their Sprint mD group is

determined and authorized in the Sprint mD tester as either Operator, Supervisor, or Administrator.

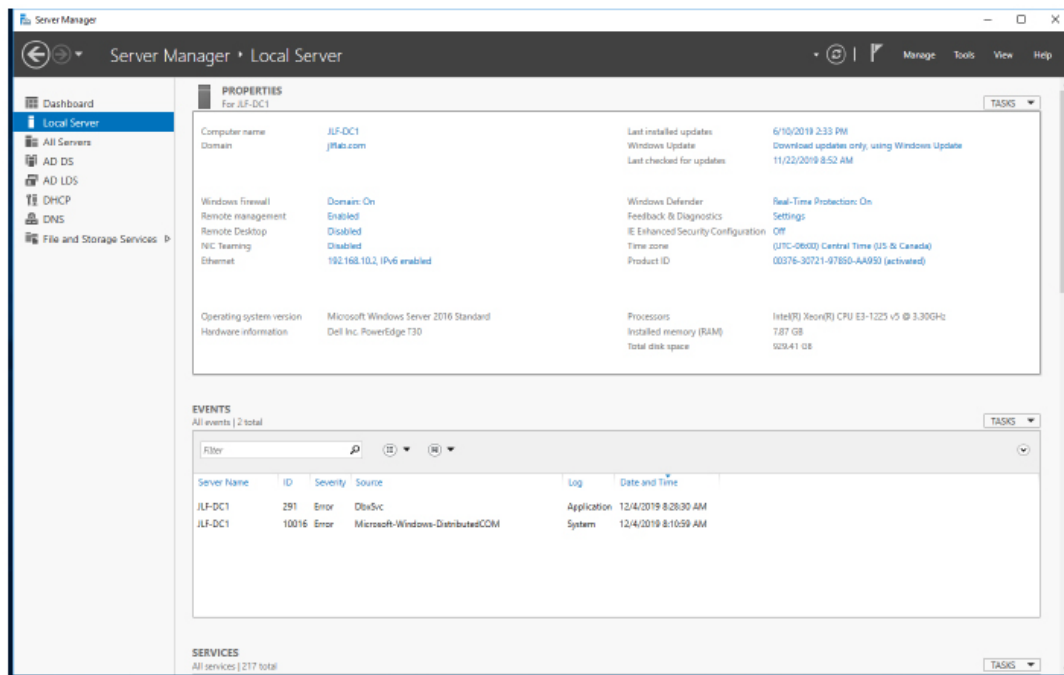
The organizational unit name *Users* under SprintmD has three pseudo-users that are reserved as generic login names for SprintmD tester: **Admin mD**, **Operator mD**, and **Supervisor mD**. *It's recommended the password options for these be set to not expire for the same reasons as SprintLdapAdmin explained previously.*

Typical users already part of the domain are included in this example. The organizational unit name *JLF-Offices* shows an example of two users in a company hierarchy. (The actual name used at the customer's site will be defined by their IT department.) This node is where all users are expected to be found that can authenticate with LDAP in order to login to the Sprint mD tester. Since these are "real" users, they maintain their own password updates, and come under the policies set by the user's IT department. However, in order to authenticate with the LDAP server, they need to be setup as a member of only one of the groups: **SprintmDAdmin**, or **SprintmDOperator**, or **SprintmDSupervisor**.

11.3 Server Manager Setup

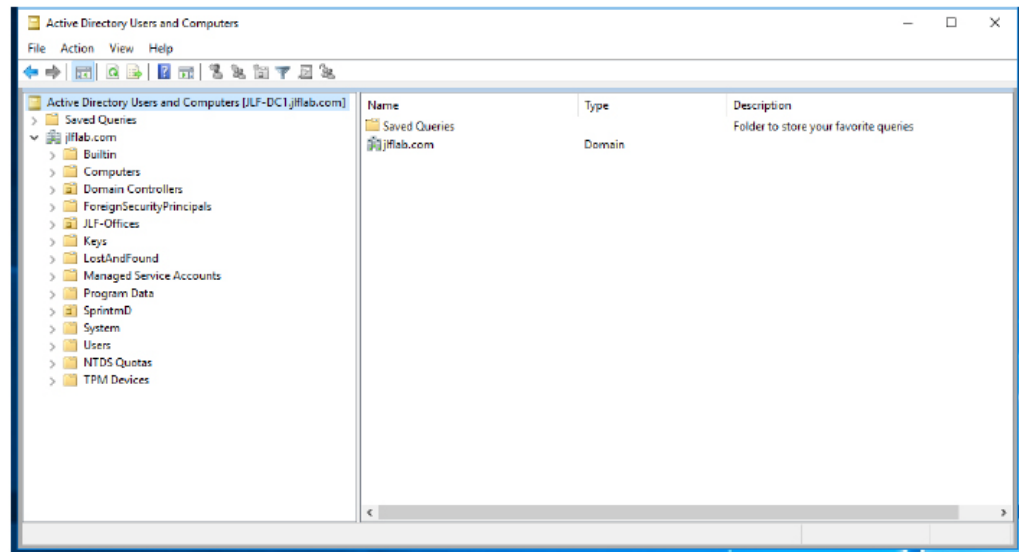
The basic setup:

- Computer name: **JLF-DC1**
- Domain name: **jlfmlab.com**



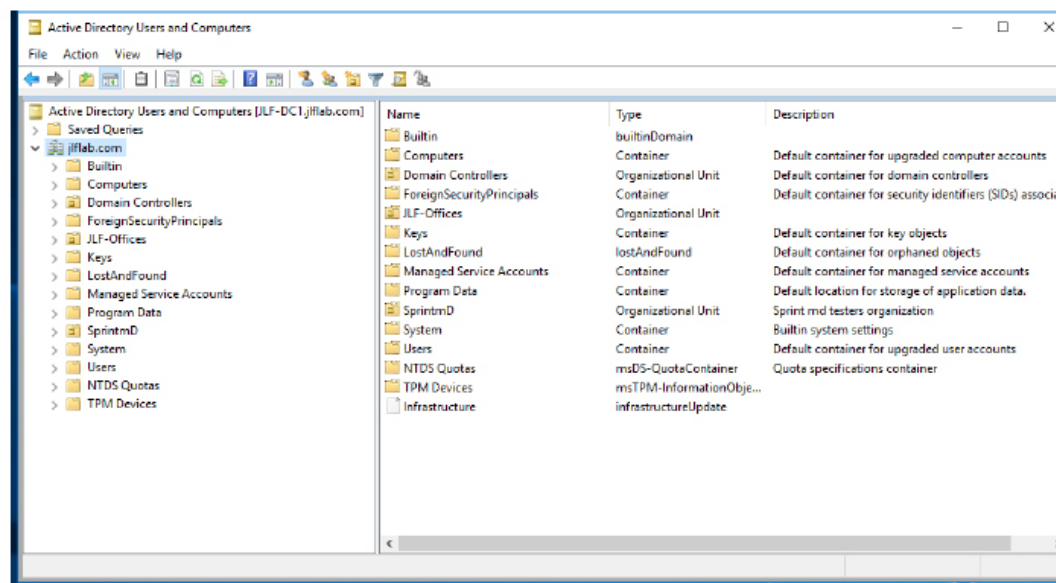
11.4 Active Directory Users and Computers

The basic organization contains the domain object **jflab.com**.



11.4.1 Domain

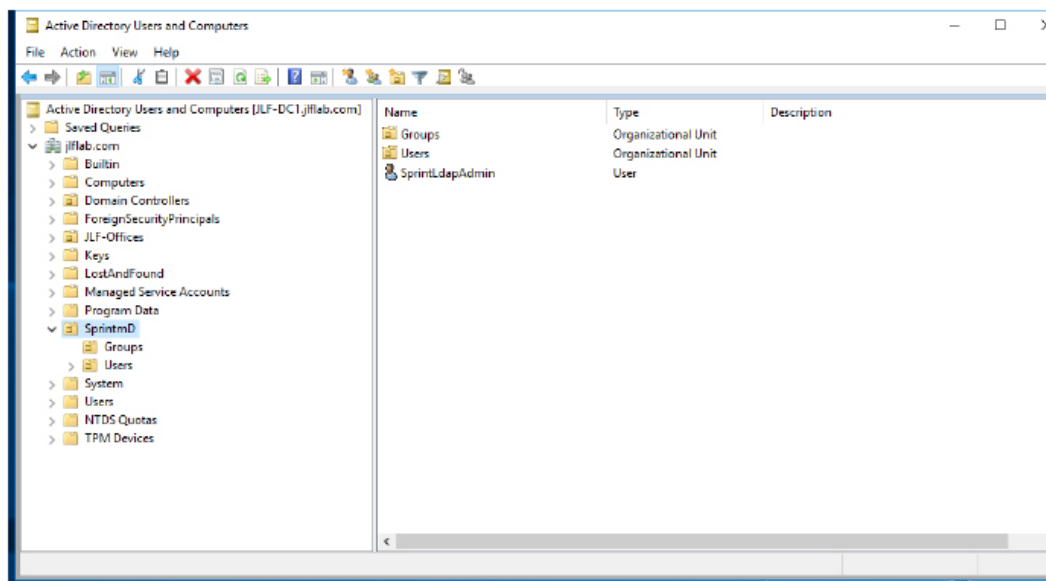
The domain object **jflab.com** contains a customization - SprintmD organizational unit.



Sprint mD Organizational Unit

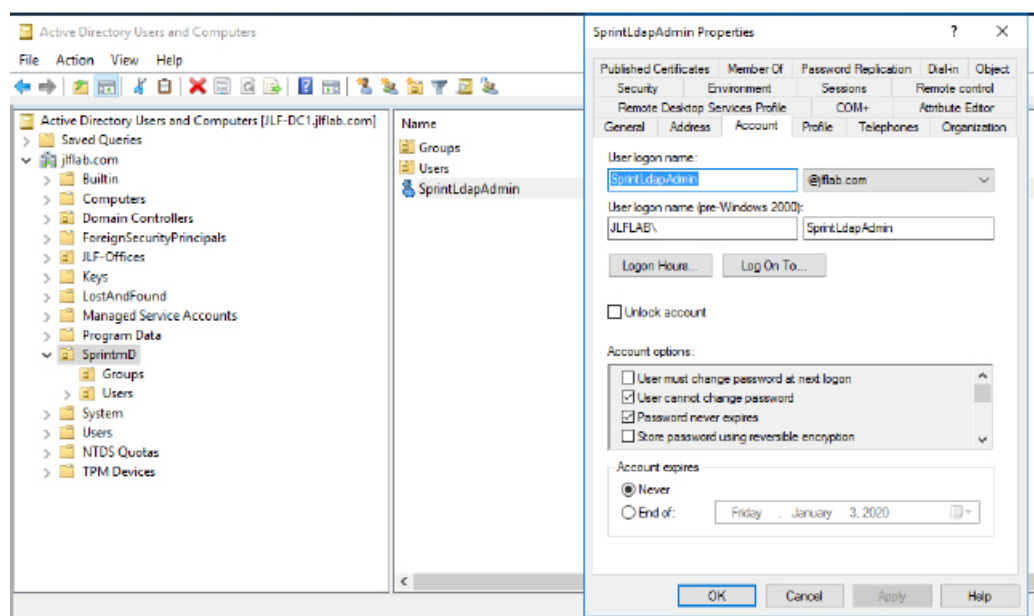
SprintmD has the following objects:

- User: **SprintLdapAdmin**
- Organizational Unit: **Groups**
- Organizational Unit: **Users**

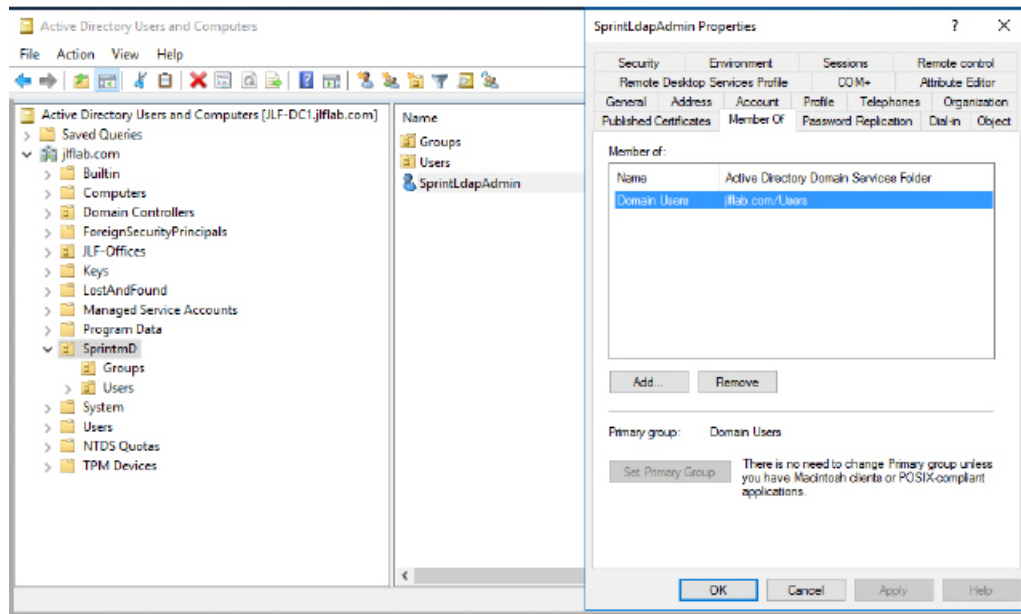


User- SprintLdapAdmin

The user SprintLdapAdmin account options are customized.



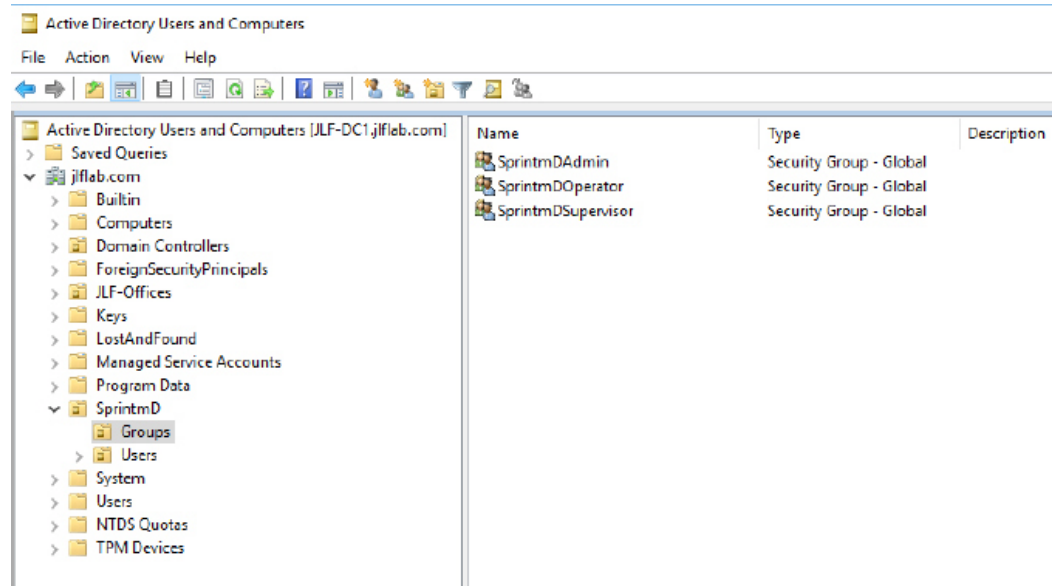
The user SprintLdapAdmin is only a member of Domain Users.



Organizational Unit - Groups

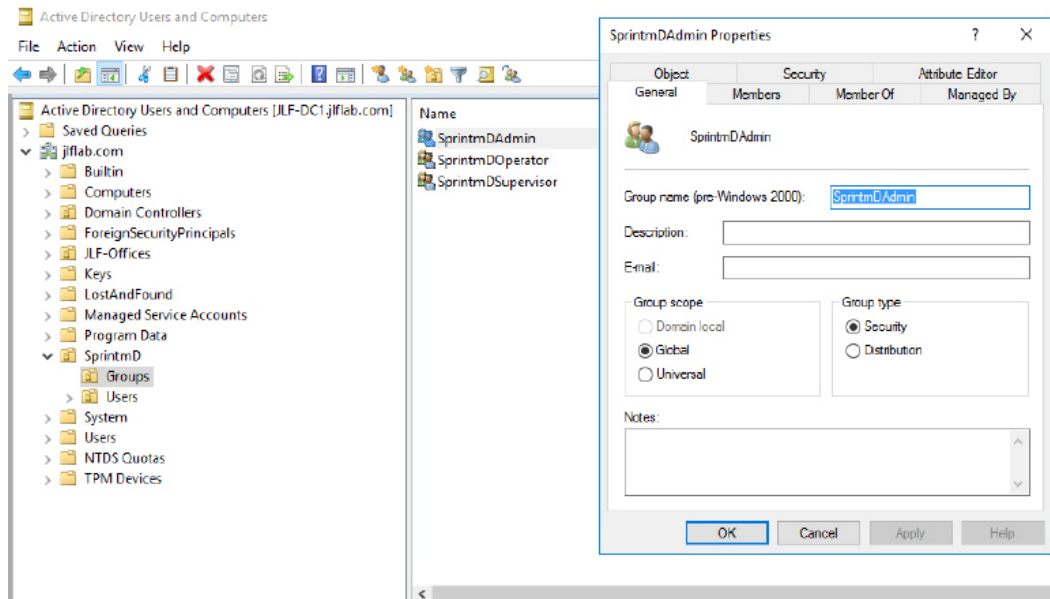
Groups has the following objects:

- Security Group - **Global: SprintmDAdmin**
- Security Group - **Global: SprintmDOperator**
- Security Group - **Global: SprintmDSupervisor**

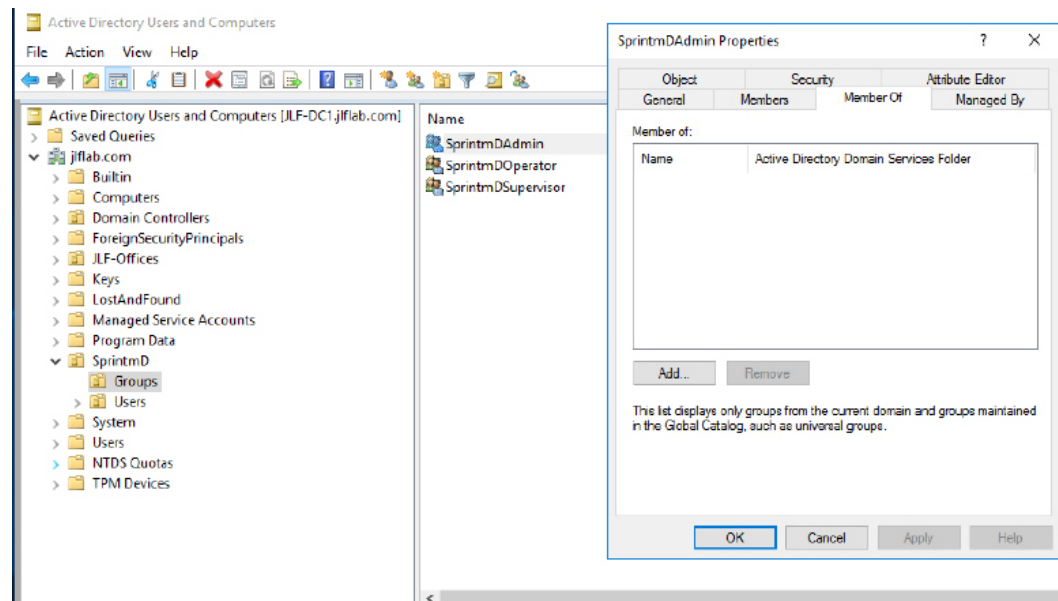


Security Group Settings

Except their name, security group settings for SprintmDAdmin, SprintmDOperator, SprintmDSupervisor are setup the same. The following security group setups are common to all three groups:

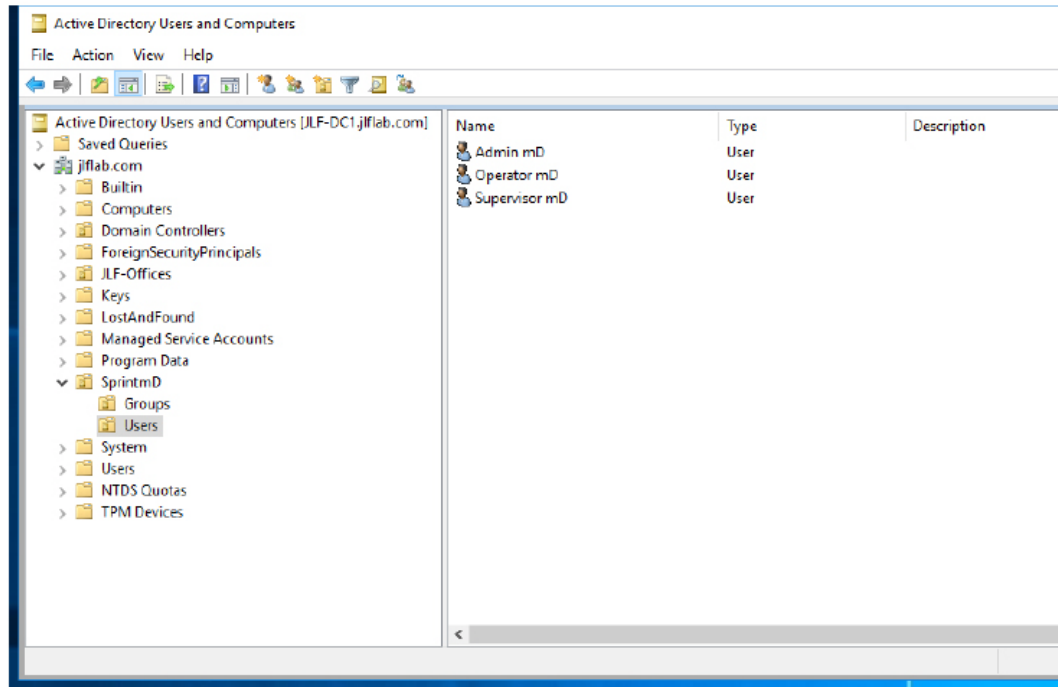


Security group settings for SprintmDAdmin, SprintmDOperator, SprintmDSupervisor have no assigned membership, as shown:

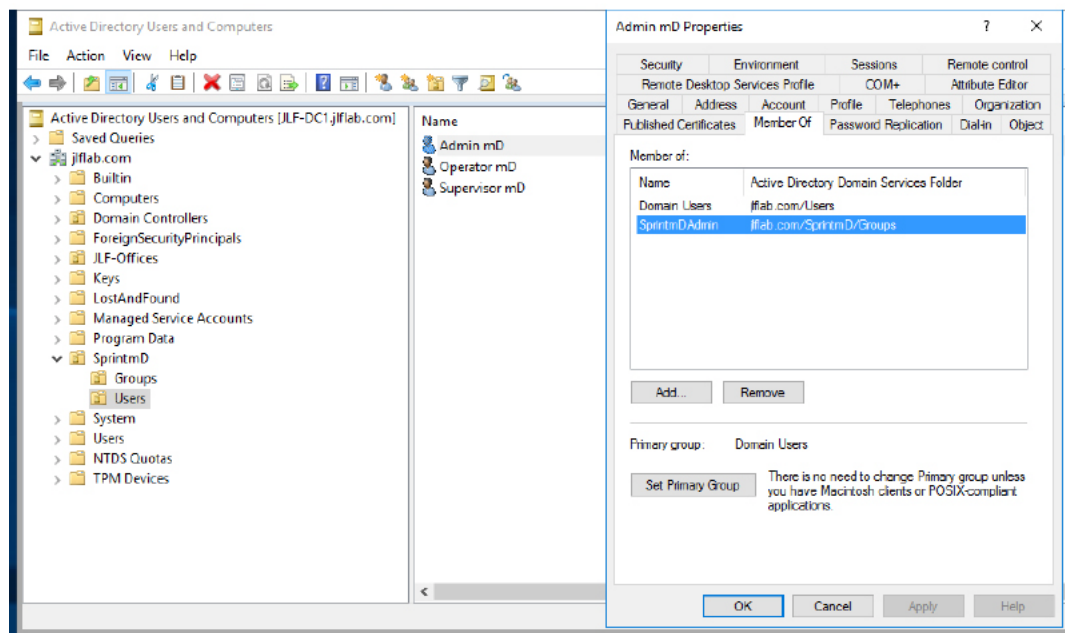


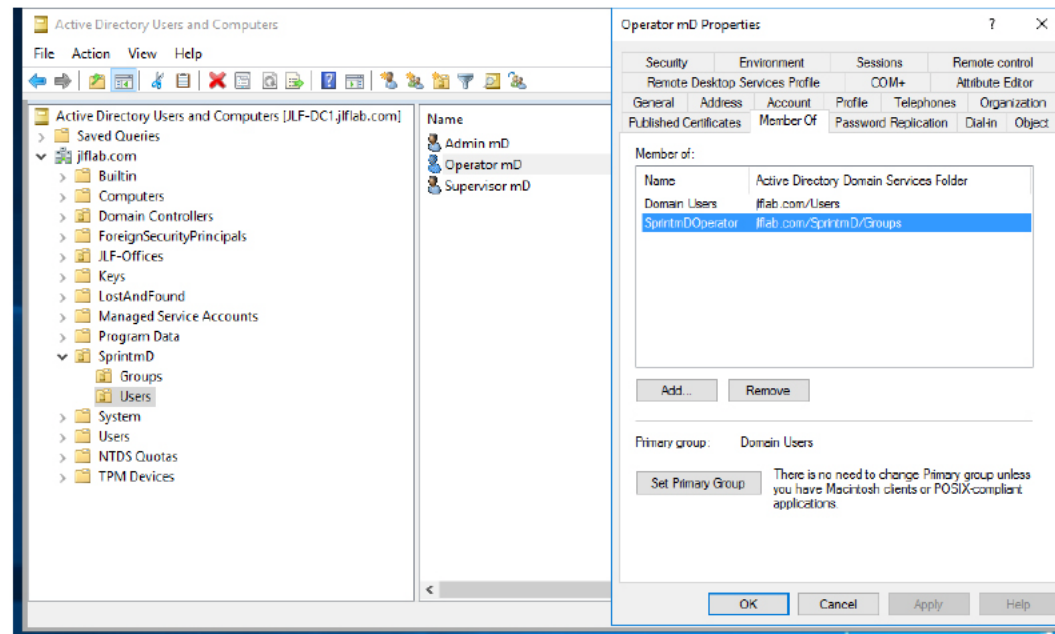
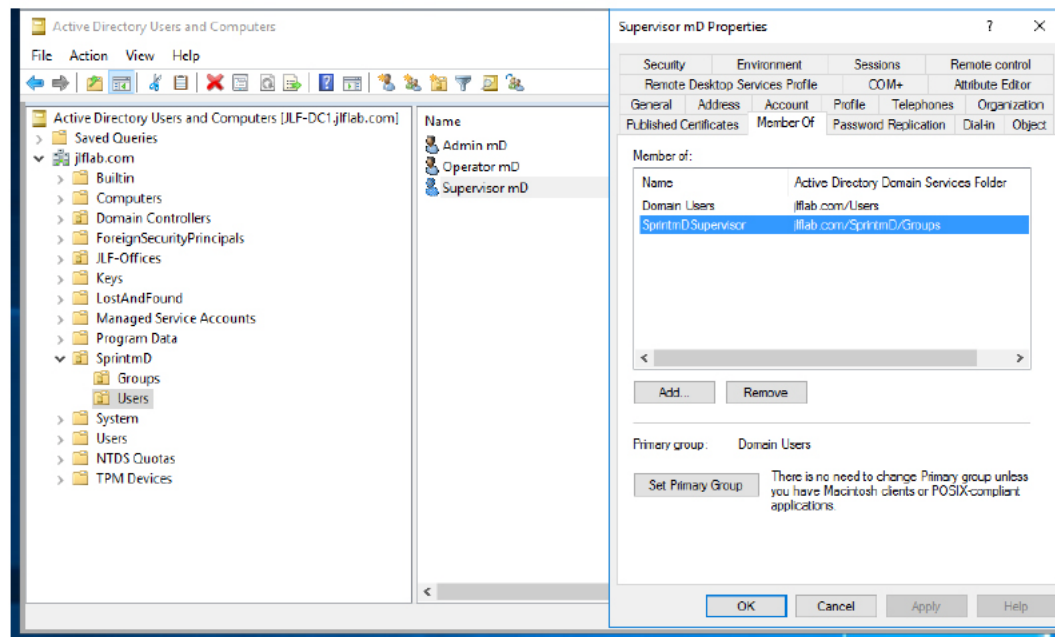
Organizational Unit: Users

The organizational unit Users under SprintmD is provided to define generic pseudo-users that are given login access to the Sprint mD tester. *This is not required, but can be used if desired.* The example setup provided here shows three pseudo-users located under Users under SprintmD as Admin mD, Operator mD, and Supervisor mD, as shown:



The setup member setup these pseudo-users are shown next:



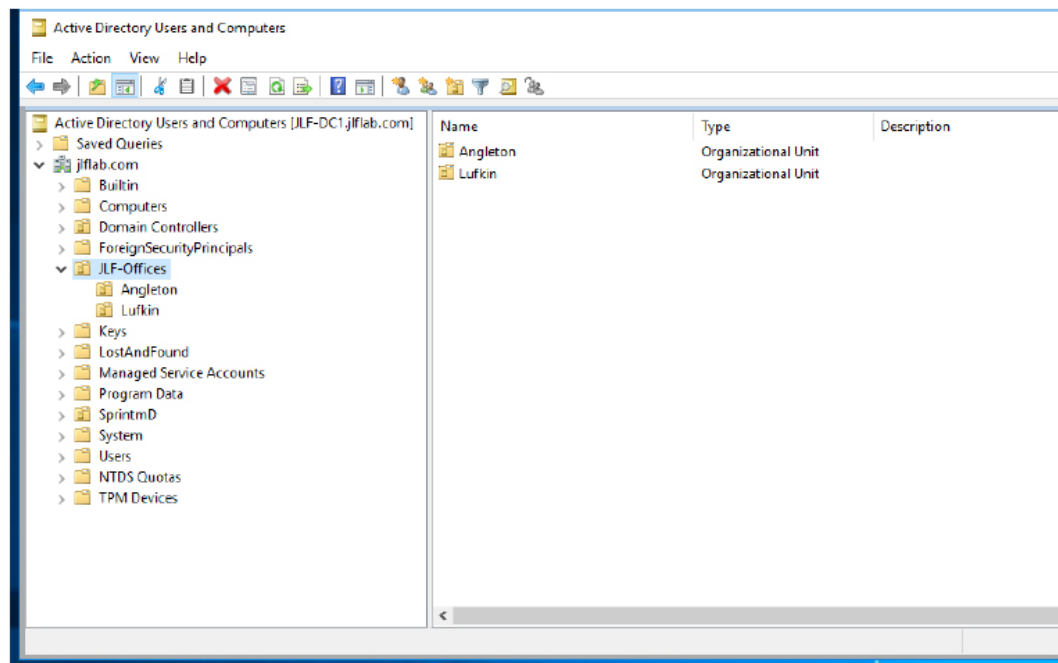


11.5 Integration of Domain Users into Sprint mD LDAP Authentication

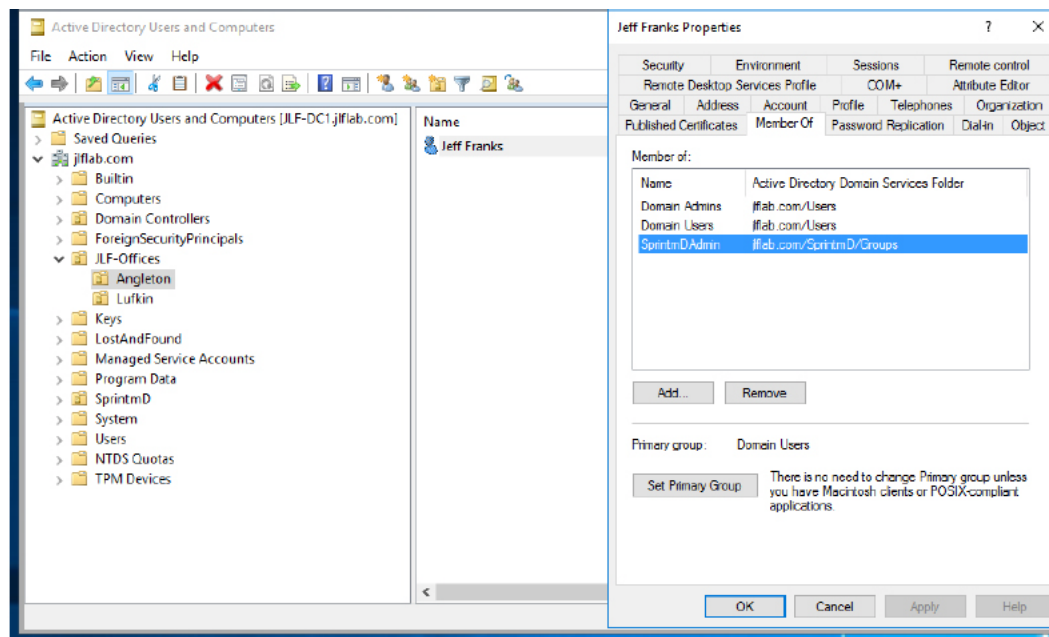
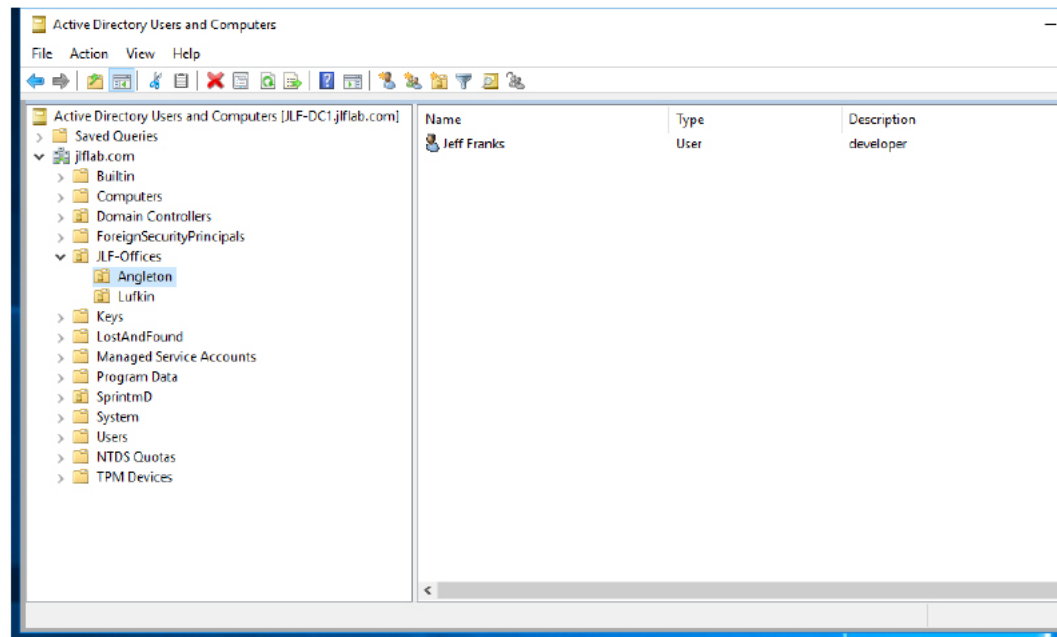
Typically, the customer already has a place where domain users are defined. This is expected to be one node under the domain object, which is used during LDAP authentication attempts on Sprint mD tester.

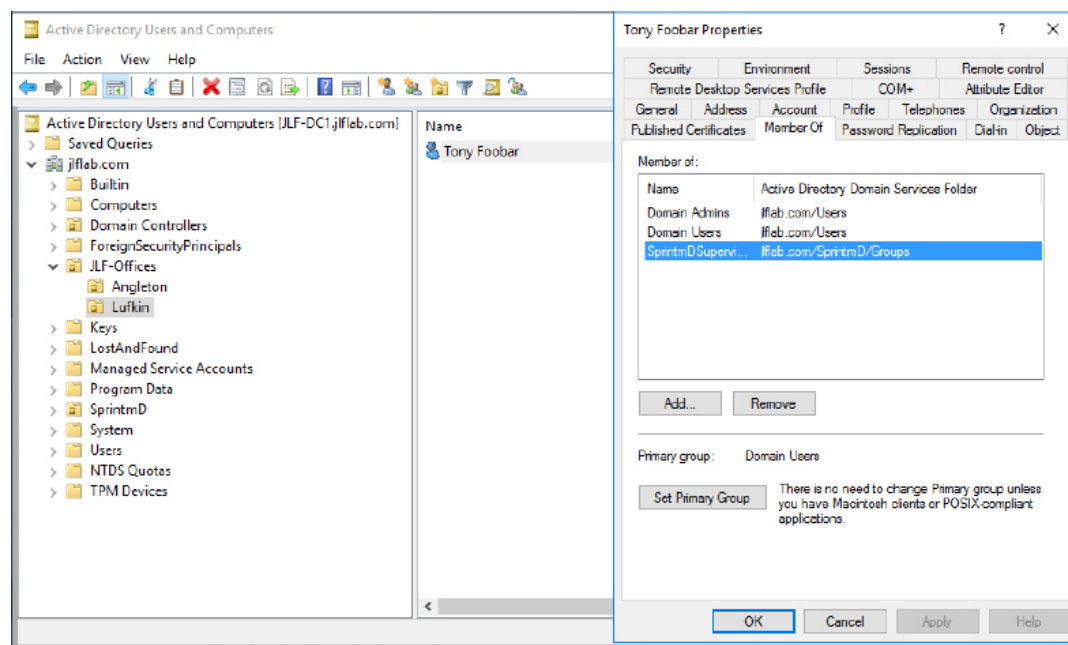
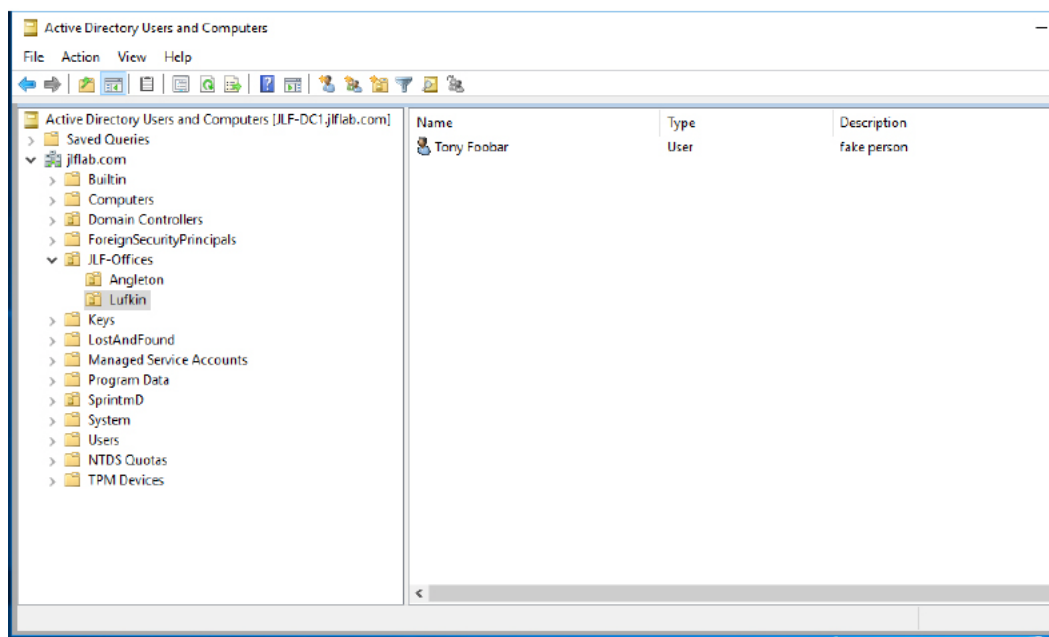
The only requirement for a user to be able to log-in via LDAP to a Sprint mD tester is that the user must be a member of only one of the groups defined under SprintmD organizational unit. And so they must be a member of: SprintmDAdmin, or SprintmDOperator, or SprintmDSupervisor.

An example is provided under the domain object to define users that have LDAP authentication capability for Sprint mD testers. The example is the node **JLF-Offices**. There are two locations defined under this hierarchy: **Angleton** and **Lufkin**.



There is one user defined for each of these locations: Jeff Franks and Tony FooBar respectively. These are made members of one of the SprintmD groups as shown with the next series of screen-shots.





11.6 Using LDAP Server Configuration to Setup Sprint mD

There are a number of LDAP entities that are used on the Sprint mD LDAP setup page. The following are the basic parameters that allow a trial run for testing LDAP authentication in the Sprint mD tester. For this particular example, the setup is as follows:

Server URI: LDAP://jlf-dc1

Base DN: dc=jlflab, dc=com

User Search DN: ou=JLF-Offices

LDAP Admin Password: <password for pseudo-user SprintLdapAdmin >

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