MicroVission Controller

Operation and service manual • Version 1.1

VILTER™

EMERSON™

Standard VILTER™ Warranty Statement

What is covered & how long it is covered: Subject to the other terms of this Warranty Statement, Seller warrants to its direct purchasers (and to no others) that the Products it manufactures will be free from defects in material and workmanship under normal use, regular service and maintenance. This warranty only applies when such defect appears in the Products within 12 months ("m") from the date such Products are placed in service and when such Products are returned to and received by Seller within 18m from the date of manufacture by Seller ("12m/18m"), except that defects in the following Products different than 12m/18m are covered by the number of months indicated below if returned to Seller within the following number of months ("m Ship") from shipment by Seller—

Product	Compressor Type		
	Reciprocating Compressors	VSS / VSM Refrigeration Compressors	VSG / VSSG Gas Compressors
New Unit	24m Ship	24m Ship	12m/18m
Compressor (New Unit Only)	24m Ship	60m Ship	12m/18m
New Bareshaft Compressor	24m Ship	24m Ship	12m/18m
Remanufactured Compressor	12m/18m	12m/18m	12m/18m
Any Engineered to Order (ETO) packaged system (including Heat Pumps and Process Chillers) not described above carry the 12m/18m warranty.			
VSS / VSM single screw compressors installed and shipped on New Units carry an internal Product component warranty of 5 years from shipment date and a warranty of 15 years from shipment date for compressor bearings only. Does not include actuator motors and shaft seals.			
Vilter™ Genuine OEM Parts, retrofit Vission 20/20 panels, retrofit PLC panels and any other supplied equipment not described above carry a 12m warranty from shipment date.			
New Vapor Recovery Units ("VRU Units") and its Compressors carry the standard 12m/18m warranty—all other VRU parts carry a 6 m warranty from shipment date.			

What is not covered: This warranty does not extend to any losses or damages due to misuse; corrosion; accident; abuse; neglect; normal wear and tear; negligence (other than Seller's); unauthorized alteration; use beyond rated capacity; acts of God; war or terrorism; unsuitable power sources or environmental conditions; operation with refrigeration or lubricants which are not suitable for use with the Product; improper installation, repair, handling, maintenance or application; substitution of parts not approved by Seller; or any other cause not the fault of Seller. This warranty is only applicable to Products properly maintained and used according to Seller's instructions, the use of genuine Vilter™ replacement parts and recommended oil in all repairs, and when Buyer has demonstrated adherence to a scheduled maintenance program as detailed in the applicable operating manual. The Buyer must use Vilter approved oil only and provide oil analysis results to Vilter. To the extent the Buyer has supplied specifications, information, representation of operating conditions or other data to Seller in the selection or design of the Products and the preparation of Seller's quotation, and in the event that actual operating conditions or other conditions differ from those represented by Buyer, any warranties or other provisions contained herein which are affected by such conditions will be null and void. Seller does not warrant that the Products comply with any particular law or regulation not explicitly provided in the Product specifications, and Buyer is responsible for ensuring that the Products contain all features necessary to safely perform in Buyer's and its customers' plants and operations. If the Products are for a gas compression application, this warranty does not apply if the Products are operated in conjunction with a gas with an H_2S level above 100 PPM.

Third Party Motors & Starters: Motors and starters or Motor & Starter Parts purchased by Seller from a third party for resale to Buyer or for incorporation into Seller's Product will carry only the warranty extended by the original manufacturer ("OEM"). Motor manufacturer warranties cover only the repair or replacement of the motor, and do not cover removal and installation charges, incidental charges associated with the removal and installation process, loss of product, or shipping to and from the manufacturer or approved shop. The individual motor manufacturer warranty terms can be found on the manufacturer's associated websites.

Other limitations: Seller will not be liable under the above warranty if Buyer is in default of its payment obligations to Seller under any purchase order or credit agreement. Except with Seller's written permission given after receipt of Buyer's request within 60 days of an event, Seller will not be responsible for costs of dismantling, lost refrigerant, reassembling, repair labor and expenses, travel cost or transporting the Product. Products repaired or replaced under this warranty will be warranted for the unexpired portion of the warranty applying to the original Products. Buyer agrees that all instructions and warnings supplied by Seller will be passed on to those persons who use the Products. Products are to be used in their recommended applications and all warning labels adhered to the Products by Seller must be left intact. Any technical advice furnished by Seller before or after delivery in regard to the use, application or suitability of the Products may not be construed as an express warranty unless confirmed by Seller in writing, and Seller assumes no obligation or liability for the advice given or results obtained—all advice given and accepted at Buyer's sole risk.

Exclusive Remedy: Within (10) ten days after Buyer's discovery of any warranty defects within the warranty period, Buyer will notify Seller of such defect in writing. Seller will, at its option and as Buyer's exclusive remedy, repair, correct, or replace F.O.B. point of manufacture, or issue credit or refund the purchase price for, that portion of the Products found by Seller to be defective. Failure by Buyer to give such written notice within the applicable time period will be deemed an absolute and unconditional waiver of Buyer's claim for such defects. Buyer assumes all other responsibility for any loss, damage, or injury to persons or property arising out of, connected with, or resulting from the use of the Products, either alone or in combination with other products/components. If so required, Products or parts for which a warranty claim is made are to be returned transportation prepaid to Seller's factory. **THE FOREGOING CONSTITUTES THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY HEREUNDER.**

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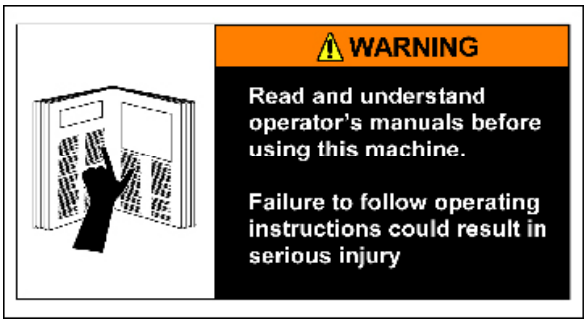

READ CAREFULLY BEFORE OPERATING YOUR COMPRESSOR.

The following instructions have been prepared to assist in operation of Vilter™ MicroVission Controllers.

The entire manual should be reviewed before attempting to operate.

Only qualified personnel shall operate, install and maintain the equipment.

Qualified personnel shall be accredited by a local regulatory agency, which requires that they are continually scrutinized by an organization whose sole mission is to establish, maintain and assure that the highest industry standards are set and met in a continuous and ongoing basis. The credentials shall address topics ranging from plant safety, operating concepts and principles and operations through the basics of refrigeration compliance and PSM (Process Safety Management) requirements.

Follow local workplace occupational safety and health regulations.

Vilter™ micro-controllers are thoroughly inspected at the factory. However, damage can occur in shipment. For this reason, the equipment should be thoroughly inspected upon arrival. Any damage noted should be reported immediately to the Transportation Company. This way, an authorized agent can examine the unit, determine the extent of damage and take necessary steps to rectify the claim with no serious or costly delays. At the same time, the local Vilter™ representative or the home office should be notified of any claim made.

All inquires should include the Vilter™ sales order number, compressor serial and model number. These can be found on the compressor nameplate on the compressor.

All requests for information, services or parts should be directed to:

Vilter™ Manufacturing LLC
Customer Service Department
5555 South Packard Ave
Cudahy, WI 53110 USA
Telephone: 1-414-744-0111
Fax:1-414-744-3483
E-mail: info.vilter@emerson.com

Equipment Identification Numbers:

Vilter Order Number: _____Software Version: _____
Vilter Order Number: _____Software Version: _____
Vilter Order Number: _____Software Version: _____
Vilter Order Number: _____Software Version: _____

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How to Use This Manual

NOTE

Manual revision should match software version.

This manual contains instructions for the MicroVission Operation & Service Manual. It has been divided into 20 sections.

Section 1: Installation Recommendations
Section 2: Main Screen
Section 3: Hardware Architecture
Section 4: Menu Screen
Section 5: Compressor Control Screen
Section 6: Alarms and Trips Screen
Section 7: Timers Screen
Section 8: Instrument Calibration Screen
Section 9: Event List Screen
Section 10: Input/Output Screen
Section 11: User Access
Section 12: Configuration Screen
Section 13: Data Back-Up
Section 14: Maintenance
Section 15: Compressor Scheduling
Section 16: Service Options
Section 17: Trend Chart

Appendix A: Unloaders
Appendix B: Communication Tables
Appendix C: Remote Control and Monitoring

It is highly recommended that the manual be reviewed prior to servicing the MicroVission system parts.

Figures and tables are included to illustrate key concepts.

Safety precautions are shown throughout the manual. They are defined as the following:

WARNING - Warning statements are shown when there are hazardous situations, if not avoided, will result in serious injury or death.

CAUTION - Caution statements are shown when there are potentially hazardous situations, if not avoided, will result in damage to equipment.

NOTE - Notes are shown when there are additional information pertaining to the instructions explained.

NOTICE - Notices are shown when there are important information that can help avoid system failure.

ADDITIONAL IMPORTANT NOTES

- Due to continuing changes and unit updates, always refer to the www.Emerson.com/Vilter to make sure you have the latest manual.
- Any suggestions for manual improvements can be made to Vilter™ Manufacturing at the contact information on page iii.

Proper Wiring Sizing

- Always size wire gauges as specified by the National Electrical Code (NEC) for electronic control devices.
- For improved noise immunity, install one size larger wire gauge than the NEC requirement to assure ample current-carrying capability.
- Never under size wire gauges.

Voltage Source

- Transformers block a large percentage of Electromagnetic Interference (EMI). It is recommended that the Vilter MicroVission should be isolated with its own control transformer for the most reliable operation. See Figure 1-1: MicroVission with Individual Transformer.
- Avoid connecting MicroVission to breaker panels and central control transformers if possible as the MicroVission is exposed to large amounts of EMI emitted from the other devices connected to the secondary terminals of the transformer. See Figure 1-2: EMI and MicroVission.

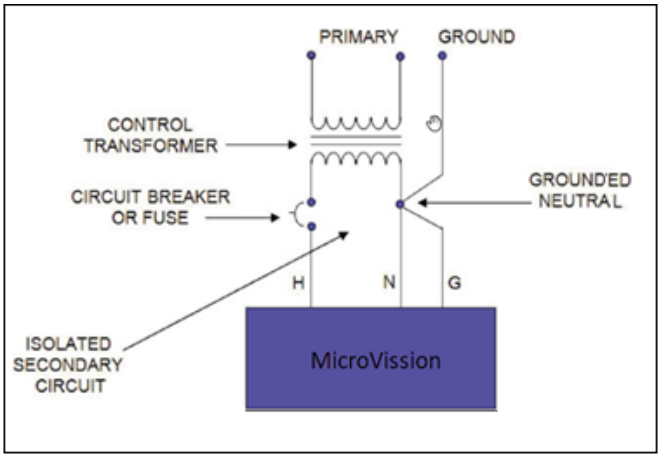


Figure 1-1. MicroVission with Individual Transformer

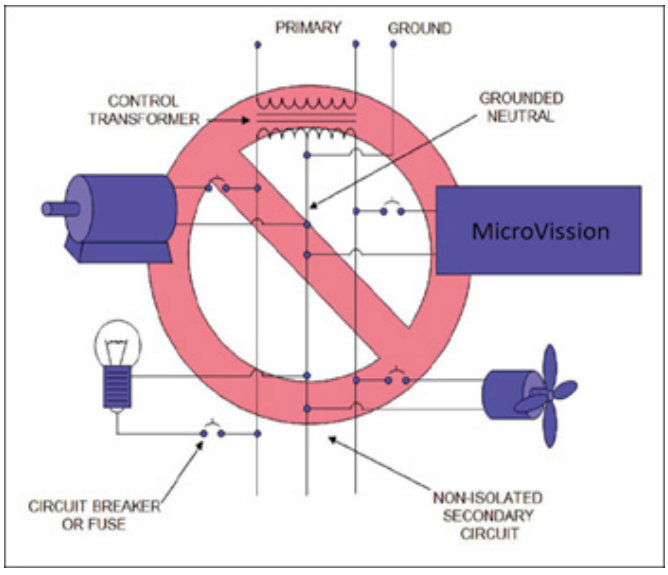


Figure 1-2. EMI and MicroVission

Grounding

- Ensure that you run continuous grounds from the utility ground to the MicroVission. See Figure 1-3: Ground Wiring.
- Grounds must be copper or aluminum wire.
- Never use conduit grounds.

Mixing Voltages

- Separate different voltages from each other and separate AC from DC, see Figure 1-4: Mixed Voltage Wiring.
- Each voltage level must be run in separate conduit:
    - o 460 VAC
    - o 230 VAC
    - o 120 VAC
    - o 24 VAC
    - o DC Signals
- If your installation site has wireways or conduit trays, you must install dividers between the different voltages.

DC signals

- If your installation site has wireways or conduit trays, you must install dividers between the different voltages.

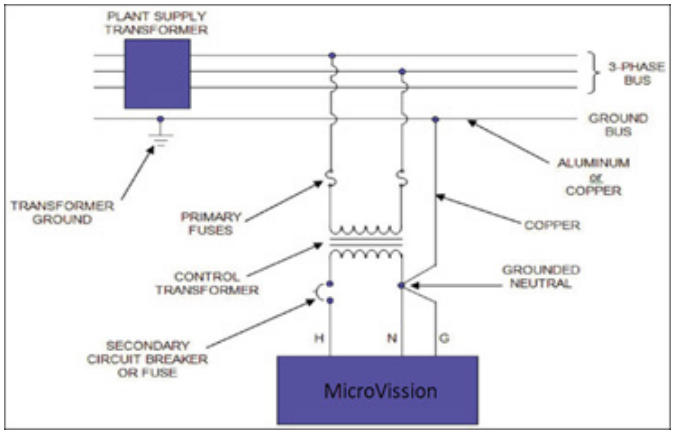


Figure 1-3. Ground Wiring

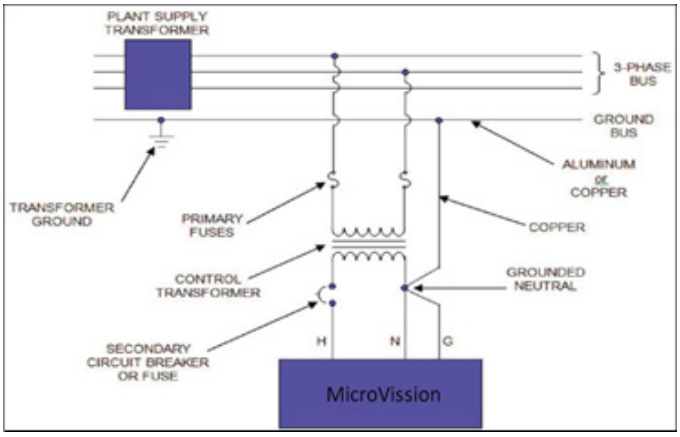


Figure 1-4. Mixed Voltage Wiring

Wiring Methods

Each MicroVission panel should have its own individual control transformer, see Figure 1-5: Correct Transformer Wiring method and Figure 1-6: Incorrect Transformer Wiring Method.

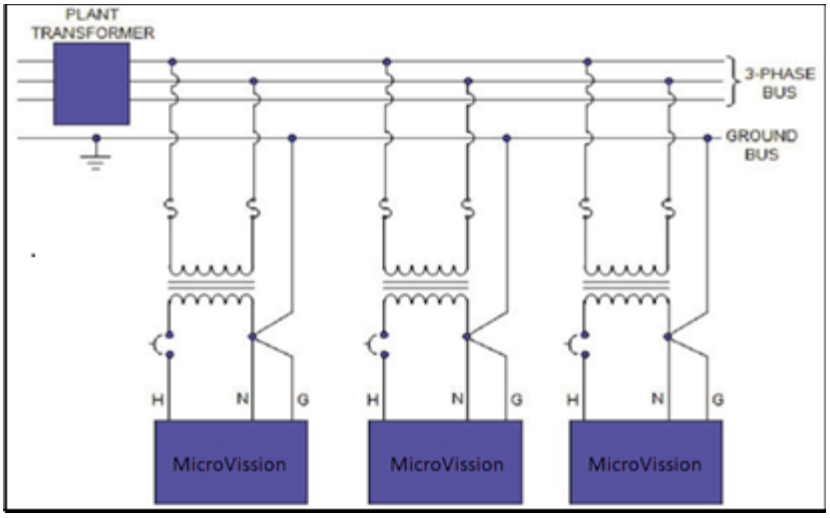


Figure 1-5. Correct Transformer Wiring Method

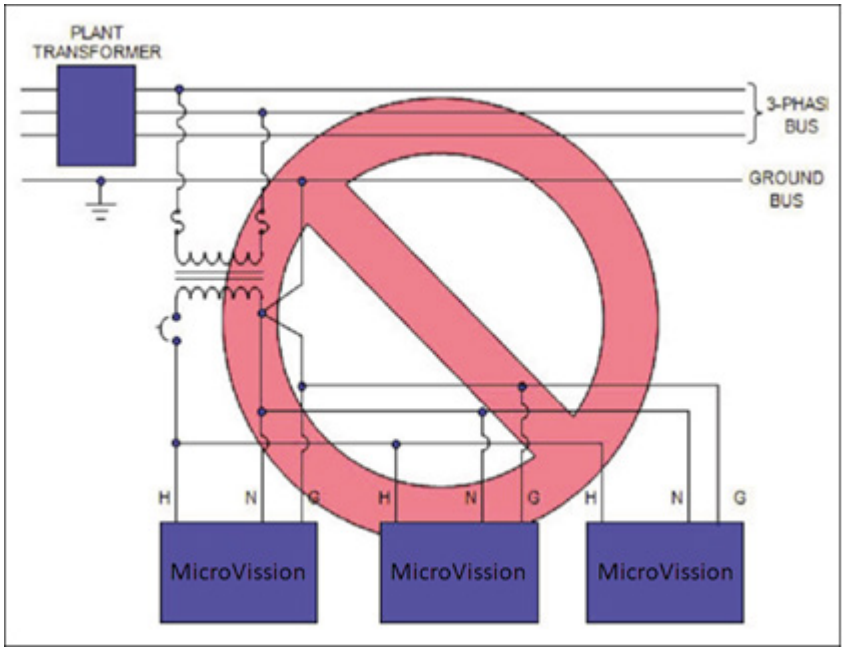


Figure 1-6. Incorrect Transformer Wiring Method

Best Practices

- Do:
    - Keep AC wires away from circuit boards.
    - Always run conduit into the bottom or sides of an enclosure.
    - Use a water-tight conduit fitting to keep water from entering the enclosure, if the conduit must be placed in the top of an enclosure.
    - The MicroVission is supplied with pre-punched conduit holes for your use.
- Don't:
    - Do not run wires through the MicroVission enclosure that are not related to the compressor control.
    - Do not add relays, timers, transformers, etc. In the MicroVission enclosure without first checking with Vilter™.
    - Do not run conduit into the top of an enclosure.
    - Do not run refrigerant tubing inside the enclosure.
    - Do not drill metal enclosures without taking proper precautions to protect circuit boards from damage.

Transformer, Fusing and UPS Sizing

The following information can be used to help determine the power requirements for a MicroVission panel. This information can be helpful for sizing transformers or UPS devices that will power the MicroVission panel.

- The MicroVission panel contains a single power supply

  (1) 24VDC @ 4.5 A (108 watts)

- The DC loads that are attached to the power supply are divided approximately as follows;
    1. Each press transducer +24VDC @ 30 mA each (x4) = 120 mA
    2. Each RTD (negligible), (the hardware applies a 25 mA pulsed signal, which is not constant).

       For estimating purposes, assume:

       A total sum constant draw for total RTDs used 50 mA
    3. Each 4-20mA transmitter for an RTD = 10 mA

- So, for 120V fusing – consider 110 watts for the power supply, PLUS add any additional 120V loads that are connected to the digital outputs + relays added to the panel.

    1. Each unloader solenoid = 0.125 amps AC load
    2. Each small solenoid = 50 watts (estimate – read the nameplate for exact load rating)
    3. Large solenoids (water, hot gas) = 100 watts (estimate– read nameplate for exact load rating)
    4. Each small pilot relay = 25 watts (estimate– read the nameplate for exact load rating)
    5. Add load values for panel heaters if used, and heat trace tape if used

Overview

The MicroVission control panel utilizes the ARM PC technology with a Linux operating system. For hardware architecture, see Figure 2-1.

The MicroVission has the following attributes

- Low power, Industrial rated ARM CPU
- 10" XGA, high resolution LCD display. (Outdoor viewable LCD optional)
- 8-wire touch screen operator interface
- Flexible and expandable I/O
- NEMA-4 enclosure (NEMA-4X optional)
- Industrial temperature range design

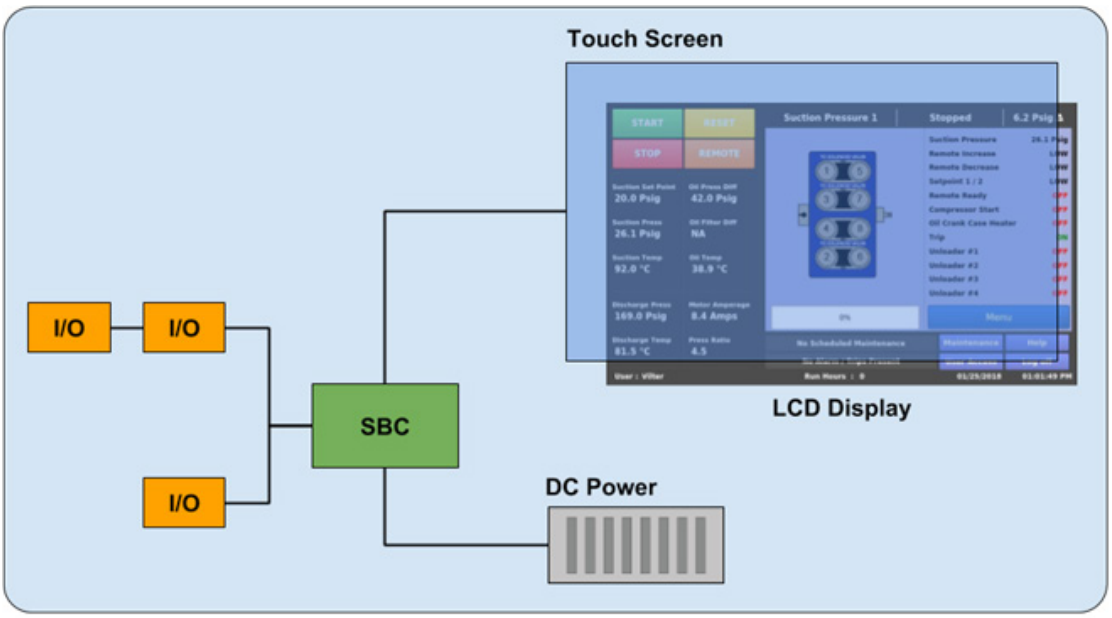


Figure 2-1. Hardware Architecture Overview

Multi-I/O (Input/Output) Board

This section explains about the Multi-IO board containing Digital Input/Output and Analog Input/Output signals.

The Multi-IO board converts signals generated by the MicroVission program into 120VAC signals as well as detect external 120VAC inputs to signal the MicroVission program. All the signals shown by connectors 1, 2, 3 and 4 are digital, in that there are only two states available either ON or OFF. See board layout, Figure 2-2.

The Multi-IO board converts the varying DC signals into a signal that the MicroVission program can interpret. The signals are considered analog because the input DC signal can vary from the minimum value to the maximum value. All the signals shown by connectors 6, 7, 8, 9 and 10 are analog inputs. This board can also convert signals from the MicroVission program into a current ranging from 4mA to 20mA. These are called analog outputs and shown by connectors 12 and 13. For more information about the board layout see Figure 2-2.

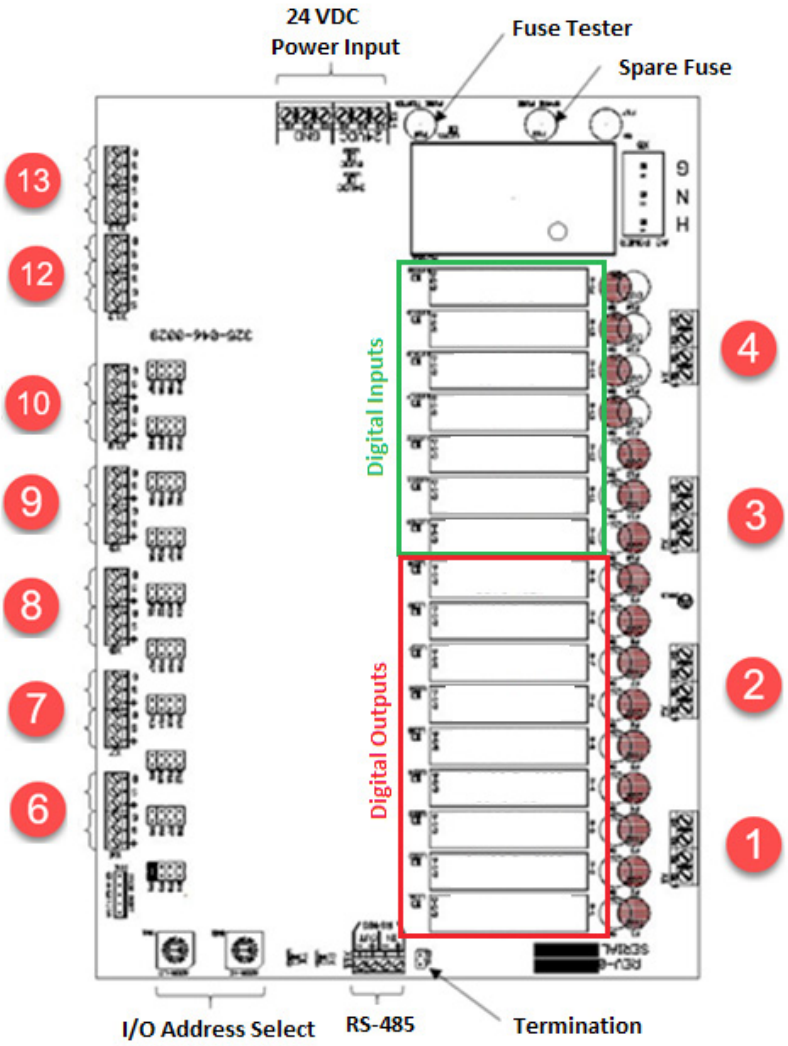


Figure 2-2. Multi I/O Board Layout

Multi-IO Board Digital I/O

For information about each Digital I/O signal, see Table 2 - 1: Digital I/O.

Oil Return Solenoid Output

- When state of Low Oil Level Digital Input is found Active Low, this output is energized. When state of Low Oil Level Digital Input is changed to Active High from Active Low state, this output will be de-energized only once Oil Recovery Solenoid Shutoff Delay Timer is Lapsed.

Unloader (#1 to #4) Output

- These outputs are active only when the compressor is running. When the MicroVission determines that the compressor should increase or decrease capacity, these outputs will get de-energized or energized respectively in specific sequence as per Compressor Type set in Configuration screen. See Appendix A, Unloaders section for more details.

Trip Output

- This output is energized when the system has no Trips. If a trip is issued, the output de-energizes and stays de-energized until the trip condition is cleared.

Oil Crank Case Heater Output

- This output is active and energized when the oil temperature is lower than the oil temperature set-point. It is de-energized when the oil temperature is higher than the oil temperature setpoint.

Compressor Start Output

- When the MicroVission signals the compressor to start, this output is energized. When the MicroVission signals the compressor to stop, this output is de-energized.

Remote Ready Output

- This output is energized when the MicroVission panel is enabled for Direct I/O control. This output will be de-energized in any of these cases:
  - ◊ If there is a warning/trip/inhibit condition present in the compressor
  - ◊ if there is still Anti-Recycle Time present
  - ◊ if the compressor is placed in the manual stop position

Setpoint 1/2 Input

- This input will be monitored when the MicroVission panel is enabled for Direct I/O control. When this input is de-energized, the MicroVission will use Setpoint 1 as Control Setpoint for modulating the compressor capacity. When this input is energized, the MicroVission will use Setpoint 2 as Control Setpoint for modulating the compressor capacity. For using Setpoint 2, the operator should make sure that No. of Controllers is set to 2 in Configuration screen.

Remote Decrease Input

- This input will be monitored when the MicroVission panel is enabled for Direct I/O control. When this input is energized, the MicroVission will unload compressor by one step.

Remote Increase Input

- This input will be monitored when the MicroVission panel is enabled for Direct I/O control. When this input is energized, the MicroVission will load compressor by one step.

Remote Start/Stop Input

- This input will be monitored when the MicroVission panel is enabled for Direct I/O control or if Run Permissive option is enabled. When this input is energized, the compressor will be allowed to start in selected run mode. If the compressor is running and this input is found de-energized, the compressor will be stopped and the compressor will have to wait for next start until this input gets energized.

Low Oil Level Input

- This input must be energized for the compressor to operate. If this input gets de-energized, the compressor will be stopped and issue a Low Oil Level trip provided Oil Level Trip option is enabled in Configuration screen.

High Level Shutdown Input:

- The MicroVission monitors this digital input to check whether the power is removed from the input module during compressor start. This input must be energized for the compressor to operate. If de-energized, the compressor will shut down and issue a High Level Shutdown trip.

Connector on Multi-IO Board	I/O #	Description	Channel Type
X1 – 1	1	Oil Return Solenoid	OUTPUT
X1 – 2	2	Unloader #4	OUTPUT
X1 – 3	3	Unloader #3	OUTPUT
X1 – 4	4	Unloader #2	OUTPUT
X2 – 1	5	Unloader #1	OUTPUT
X2 – 2	6	Trip	OUTPUT
X2 – 3	7	Oil Crank Case Heater	OUTPUT
X2 – 4	8	Compressor Start	OUTPUT
X3 – 1	9	Remote Ready	OUTPUT
X3 – 2	10	Setpoint 1/2	INPUT
X3 – 3	11	Remote Decrease	INPUT
X3 – 4	12	Remote Increase	INPUT
X4 – 1	13	Remote Start/ Stop	INPUT
X4 – 2	14	Low Oil Level	INPUT
X4 – 3	15	High Level Shutdown	INPUT
X4 – 4	16	Compressor Motor Auxiliary	INPUT

Table 2-1. Digital I/O

Table 2-2. Analog I/O

Connector on Multi-IO Board	I/O #	Description	Channel Type	Signals Type
X6 – 2	1	Process Temperature	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X6 – 5	2	Oil Temperature	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X7 – 2	3	Discharge Temperature	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X7 – 5	4	Suction Temperature	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X8 – 2	5	Filter Out Pressure	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X8 – 5	6	Filter In Pressure	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X9 – 2	7	Oil Manifold Pressure	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X9 – 5	8	Discharge Pressure	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X10 – 2	9	Suction Pressure	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X10 – 5	10	Motor Amps (4-20 mA)	INPUT	0-5 V, 0-10 V, 4-20 mA, RTD, ICTD
X12 – 1	11	Compressor VFD	OUTPUT	4-20 mA
X12 – 3	12	Not Defined	OUTPUT	4-20 mA
X12 – 5	13	Not Defined	OUTPUT	4-20 mA
X13 – 1	14	Not Defined	OUTPUT	4-20 mA
X13 – 3	15	Not Defined	OUTPUT	4-20 mA
X13 – 5	16	Not Defined	OUTPUT	4-20 mA

Compressor Motor Starter Auxiliary Input:

- This input looks for a feedback signal from the compressor starter, confirming that the compressor starter is energized.

Multi-IO Board Analog I/O

For information about each Analog I/O signal, see Table 2 - 2: Analog I/O.

Process Temperature

- Default signal is RTD. Process temperature calibration is set in the calibration screen.

Oil Temperature

- Default signal is RTD. Oil temperature calibration is set in the calibration screen.

Discharge Temperature

- Default signal is RTD. Discharge temperature calibration is set in the calibration screen.

Suction Temperature

- Default signal is RTD. Suction temperature calibration is set in the calibration screen.

Filter Out Pressure

- Default signal is 4-20mA. Filter Out pressure transducer range and calibration are set in the calibration screen.

Filter In Pressure

- Default signal is 4-20mA. Filter In pressure transducer range and calibration are set in the calibration screen.

Oil Manifold Pressure

- Default signal is 4-20mA. Oil manifold pressure transducer range and calibration are set in the calibration screen.

Discharge Pressure

- Default signal is 4-20 mA. Discharge pressure transducer range and calibration are set in the calibration screen.

Suction Pressure

- Default signal is 4-20 mA. Suction pressure transducer range and calibration is set in the calibration screen.

Motor Amps

- Default signal is a 4-20 mA. The Motor Amps calibration is set in the calibration screen.

Compressor VFD

- Default signal is a 4-20 mA output to control compressor motor speed with a Variable Frequency Drive (VFD).

Multi-IO Board Analog Input Jumper Tables

The following tables are used to configure each channel of the Multi-IO board analog inputs, signal type and range desired by the operator, see Table 2-3.

Table 2-3. Multi-IO Board Analog Input Jumper Tables

Channel 1	Signal	JP - 1	JP - 2	JP - 3	JP - 4
Analog Input 1	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 2	Signal	JP - 5	JP - 6	JP - 7	JP - 8
Analog Input 2	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 3	Signal	JP - 9	JP - 10	JP - 11	JP - 12
Analog Input 3	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 4	Signal	JP - 13	JP - 14	JP - 15	JP - 16
Analog Input 4	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 5	Signal	JP - 17	JP - 18	JP - 19	JP - 20
Analog Input 5	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 6	Signal	JP - 21	JP - 22	JP - 23	JP - 24
Analog Input 6	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

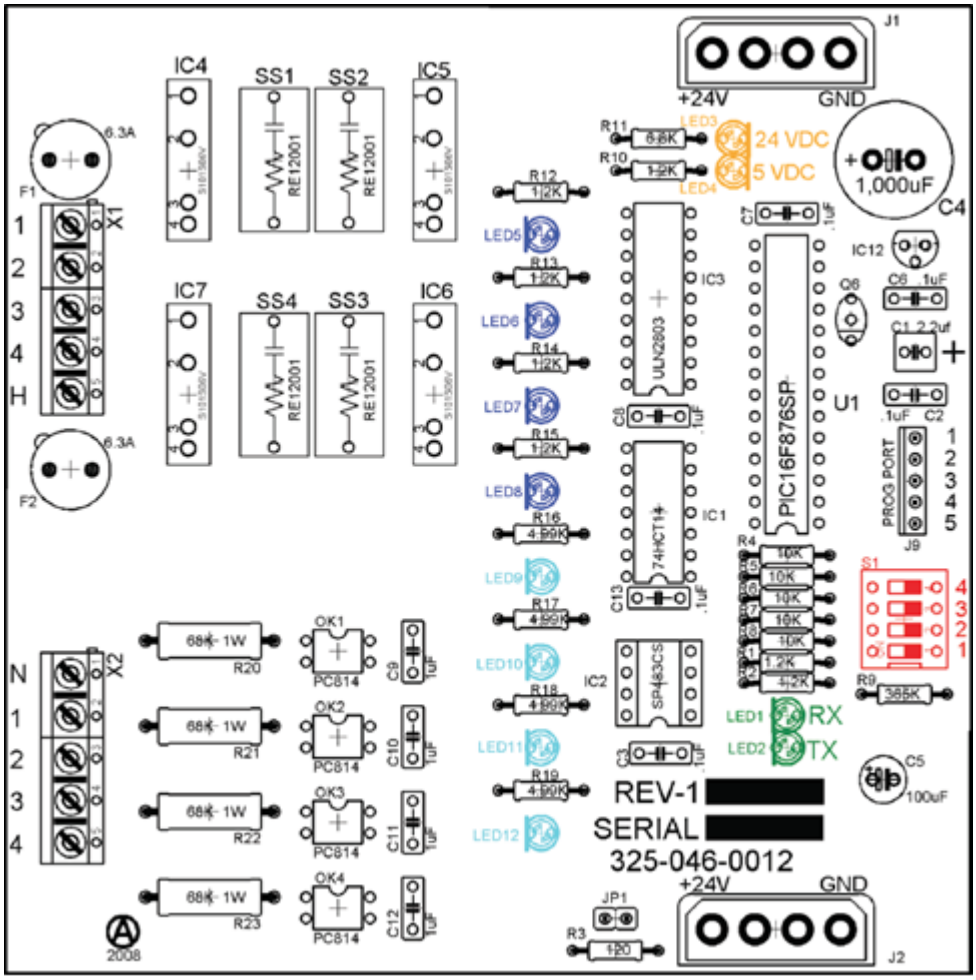
Channel 7	Signal	JP - 25	JP - 26	JP - 27	JP - 28
Analog Input 7	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 8	Signal	JP - 29	JP - 30	JP - 31	JP - 32
Analog Input 8	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 9	Signal	JP - 33	JP - 34	JP - 35	JP - 36
Analog Input 9	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Channel 10	Signal	JP - 37	JP - 38	JP - 39	JP - 40
Analog Input 10	0-5 VDC	OUT	OUT	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	RTD	OUT	OUT	OUT	IN

Figure 2-3. Digital Input-Output Board Layout



Digital In-Out Board

The digital input - output board converts signals generated by the MicroVision program into 120VAC signals as well as detect external 120VAC inputs to signal the MicroVision program. All the signals are digital and in that there are only two states available either ON or OFF. See board layout, Figure 2-3.

Signal LEDs

- In the following diagram, the Signal LEDs for output are marked in a Blue color and for input they are marked in a Light Blue color. These LEDs indicate when a 120VAC output is being produced or a 120VAC signal is detected.

Voltage LEDs

- In the following diagram, the Voltage LEDs are marked in an Orange color. These LEDs indicate the correct voltage of both the 5V DC and 24V DC power sources.

Communication LEDs

- In the following diagram, the Communication LEDs are marked in a Green color. These LEDs show the active communications between the digital output board and MicroVision CPU board.

Address Dipswitches

- In the following diagram, the Address Dipswitches are marked in a Red color. These dipswitches are used to assign each board its address position. The addresses are binary and therefore the address of a digital output board will either be address 1 (0001) or 2 (0010).

Analog Input Board

The analog input board converts the varying DC signals into a signal that the MicroVission program can interpret. The signals are considered analog because the input DC signal can vary from the minimum value to the maximum value. See Figure 2-4.

Configuration Jumpers

- In the following diagram, the configuration jumpers are marked in purple color. The jumpers allow the operator to configure the signal type and range for incoming analog signals. For the correct jumper setting for a given application, see Table 2-4. Analog Input Jumper Tables.

Voltage LEDs

- In the following diagram, the Voltage LEDs are marked in Orange color. These LEDs indicate the correct voltage of both the 5V DC and 24V DC power sources.

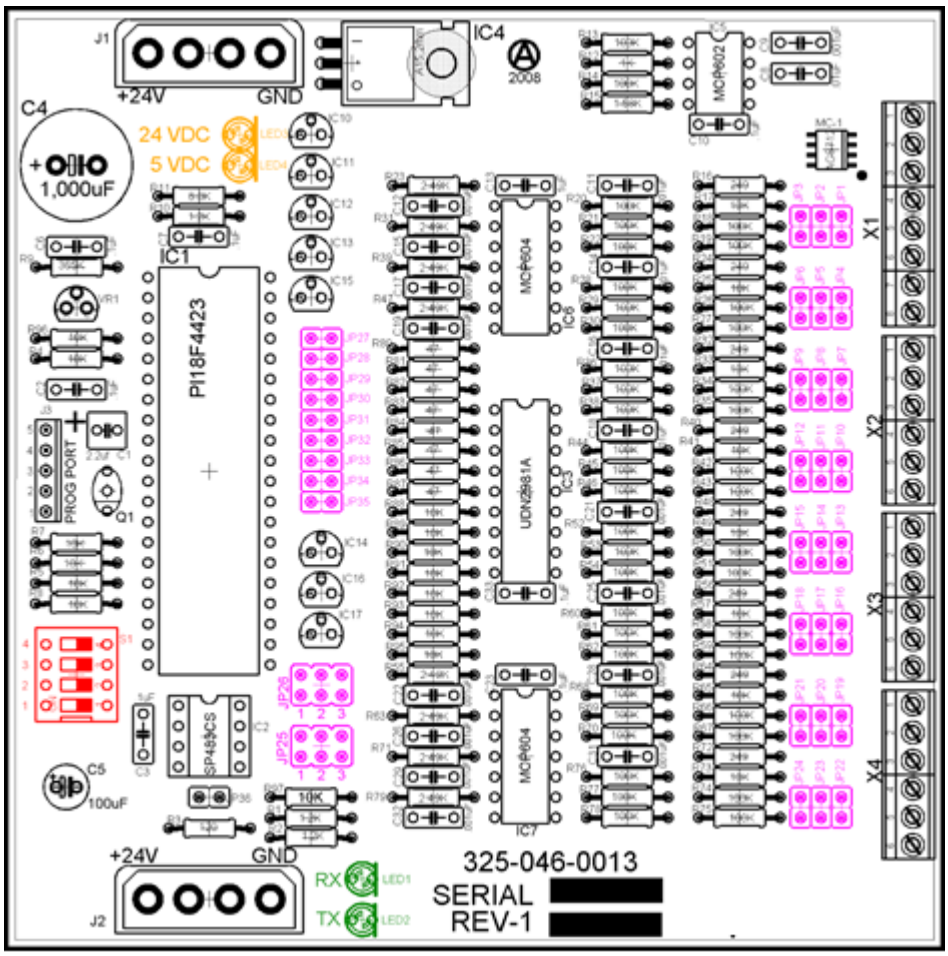
Communication LEDs

- In the following diagram, the Communication LEDs are marked in Green color. These LEDs show the active communications between the digital output board and the MicroVission CPU board.

Address Dipswitches

- In the following diagram, the Address Dipswitches are marked in Red color. These dipswitches are used to assign each board its address position. The addresses are binary and therefore the address of a analog input board will be address 1 (0001) or 2 (0010).

Figure 2-4. Analog Input Board Layout



Analog Input Board Jumper Tables

The following tables are used to configure each channel of the analog input board signal type and range desired by the operator, see Table 2-4.

Table 2-4. Analog Input Board Jumper Tables

Channel 1	Signal	JP - 1	JP - 2	JP - 3	JP - 27	JP - 35
Analog Input 1-A*	0-5 AMP	OUT	OUT	OUT	OUT	IN
Analog input 1-B**	0-5 VOLT	OUT	OUT	OUT	OUT	OUT
	1-5 VOLT	OUT	OUT	OUT	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT	OUT
	4-20 mA	IN	OUT	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT	OUT
	RTD	OUT	OUT	OUT	IN	OUT

* Use Analog Input 1-A when 0-5 AMP secondary current transformers are installed in the motor starter.

** Use Analog Input 1-B when current transformers are installed in the motor starter.

Channel 2	Signal	JP - 4	JP - 5	JP - 6	JP - 28
Analog Input 2	0-5 VOLT	OUT	OUT	OUT	OUT
	1-5 VOLT	OUT	OUT	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	RTD	OUT	OUT	OUT	IN

Channel 3	Signal	JP - 7	JP - 8	JP - 9	JP - 29
Analog Input 3	0-5 VOLT	OUT	OUT	OUT	OUT
	1-5 VOLT	OUT	OUT	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	RTD	OUT	OUT	OUT	IN

Channel 4	Signal	JP - 10	JP - 11	JP - 12	JP - 30
Analog Input 4	0-5 VOLT	OUT	OUT	OUT	OUT
	1-5 VOLT	OUT	OUT	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	RTD	OUT	OUT	OUT	IN

Channel 5	Signal	JP - 13	JP - 14	JP - 15	JP - 31
Analog Input 5	0-5 VOLT	OUT	OUT	OUT	OUT
	1-5 VOLT	OUT	OUT	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	RTD	OUT	OUT	OUT	IN

Table 2-4. Analog Input Board Jumper Tables (continued)

Channel 6	Signal	JP - 16	JP - 17	JP - 18	JP - 32
Analog Input 6	0-5 VOLT	OUT	OUT	OUT	OUT
	1-5 VOLT	OUT	OUT	OUT	OUT
	0-10 VOLT	OUT	OUT	IN	OUT
	4-20 mA	IN	OUT	OUT	OUT
	ICTD	OUT	IN	OUT	OUT
	RTD	OUT	OUT	OUT	IN

Channel 7	Signal	JP - 19	JP - 20	JP - 21	JP - 33	JP – 25*
Analog Input 7	0-5 VOLT	OUT	OUT	OUT	OUT	2
	1-5 VOLT	OUT	OUT	OUT	OUT	2
	0-10 VOLT	OUT	OUT	IN	OUT	2
	4-20 mA	IN	OUT	OUT	OUT	2
	ICTD	OUT	IN	OUT	OUT	2
	RTD	OUT	OUT	OUT	IN	2
	ACTUATOR	OUT	OUT	OUT	OUT	1
	POTENTIOMETER	OUT	OUT	OUT	OUT	3

*JP-25
- **Position 1** = sends +24VDC (unregulated) to "supply" terminal (2.2A limit)
- **Position 2** = sends +24VDC (regulated) to "supply" terminal (25mA limit)
- **Position 3** = sends +5VDC (regulated) to "supply" terminal

Channel 8	Signal	JP - 22	JP - 23	JP - 24	JP - 34	JP – 26*
Analog Input 8	0-5 VOLT	OUT	OUT	OUT	OUT	2
	1-5 VOLT	OUT	OUT	OUT	OUT	2
	0-10 VOLT	OUT	OUT	IN	OUT	2
	4-20 mA	IN	OUT	OUT	OUT	2
	ICTD	OUT	IN	OUT	OUT	2
	RTD	OUT	OUT	OUT	IN	2
	ACTUATOR	OUT	OUT	OUT	OUT	1
	POTENTIOMETER	OUT	OUT	OUT	OUT	3

*JP-26
- **Position 1** = sends +24VDC (unregulated) to "supply" terminal (2.2A limit)
- **Position 2** = sends +24VDC (regulated) to "supply" terminal (25mA limit)
- **Position 3** = sends +5VDC (regulated) to "supply" terminal

Overview

The Main screen is the first screen displayed after powering up the MicroVission Panel. The Main screen is designed as the starting point for all other screens in the system. The interface displays the values of all important setpoints that can help you to get the status of the compressor at a glance.

The Main screen is divided into different sections such as Top Status Bar, Bottom Status Bar, Parameters Bar and the Splash Screen. See Figure 3-1.

Whenever you navigate to any other screen, Top Status Bar, Bottom Status Bar and Parameters Bar will remain visible so that operator can always view the critical information. The Splash screen is the only dynamic section. All navigation to any other screens will be performed through the Main screen.

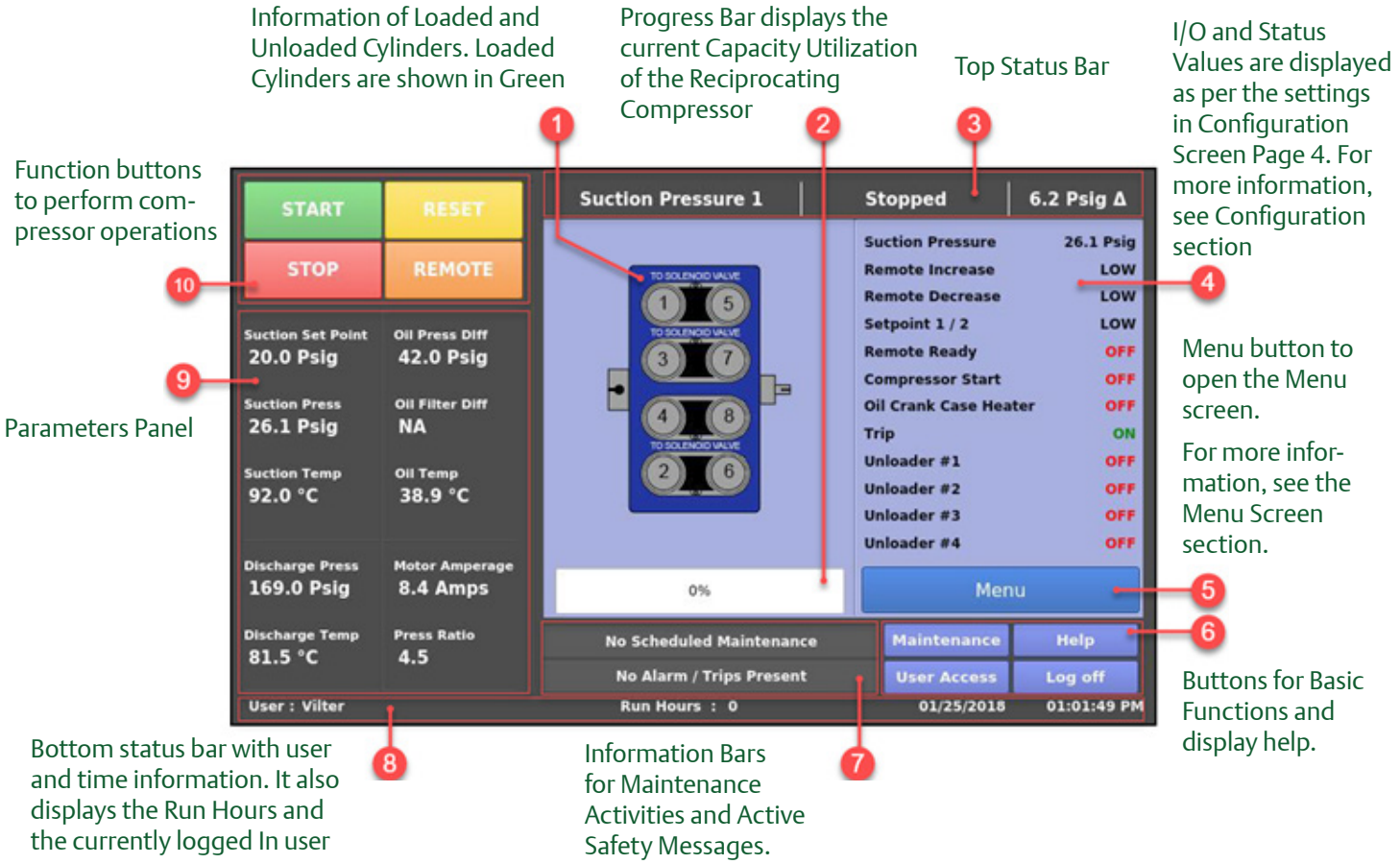


Figure 3-1. Main Screen

Top Status Bar

The standard view of the status bar displays the following information. From Left to Right, bar shows Control Method, Current Run Mode & the difference between the desired control setpoint and actual value of the process variable. See Figure 3-2.

The Top Status Bar also displays the information that requires user attention or intervention. This information is displayed by highlighting it in different color or by flashing the additional information bars over standard status bar view.

Standard Bar - Black

The Standard Bar with Black color indicates the condition where the compressor motor is not running.

Standard Bar - Green

The Standard Bar with Green color displays the information that the compressor motor is currently running.

Information Bars will flash their information over the top of the status bar. The user will see the status bar and then one or more information bars in a repetitive sequence.

Information Bar - Black

The Information Bar with Black color displays the operational modes, which are different than the normal running condition. For example, the load limit condition. The compressor is unable to completely load due to some setpoint conditions, like high motor current. This is notified on the information bar with black color..

Information Bar - Yellow

The Information Bar with Yellow color displays the alarm conditions. Alarm conditions do not stop the compressor, but these are alerts to the operator that if they do not take any corrective action, this can result in a compressor trip.

Information Bar - Red

The Information Bar with Red color displays the information that the compressor motor was stopped due to the condition listed on the Information Bar. Compressor trips are designed to protect the equipment and any personnel operating the equipment.

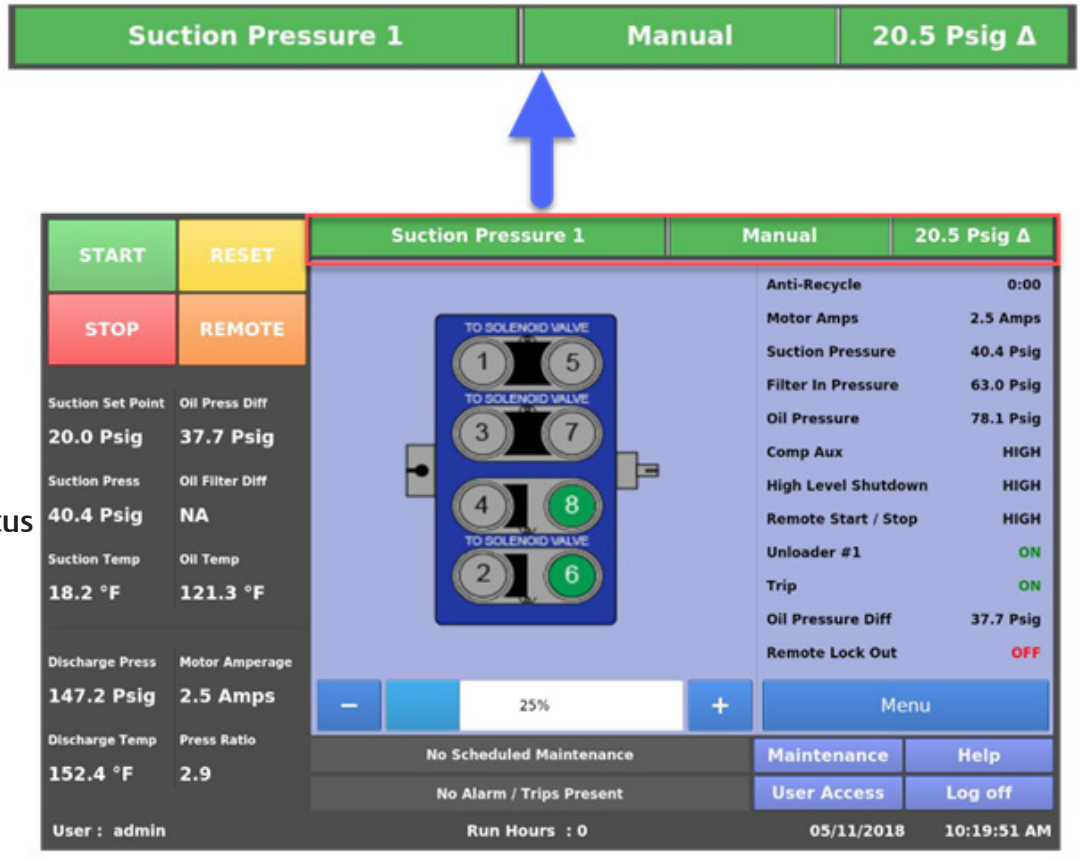


Figure 3-2. Top Status Bar

Parameters Bar

The parameters bar displays the common operational parameters that you want to view to understand the current compressor status at a glance. In addition to displaying the information, it also provides the operator access to critical buttons such as “Stop” & “Start buttons apart from “Reset” & “Remote” buttons. See Figure 3-3.

Start Button

When pressed, a start dialog box that gives the operator several run options will appear: Auto, Manual or Remote. See Figure 3-4.

Stop Button

When pressed, stops the compressor in all cases.

Reset Button

When pressed, clears any current alarms, trips and status messages that may be displayed on the information bar.

NOTE

If the condition that created the alarm, trip or status message still exits after pressing the “Reset” button, the message will reappear on the information bar.

Remote Button

When pressed, activates/de-activates the remote lock out option. This is a safety feature that prevents any external devices from assuming control and starting the compressor. The operator can also release the remote lock out by pressing the “Start” button and then the “Remote” button when the start dialog box appears.

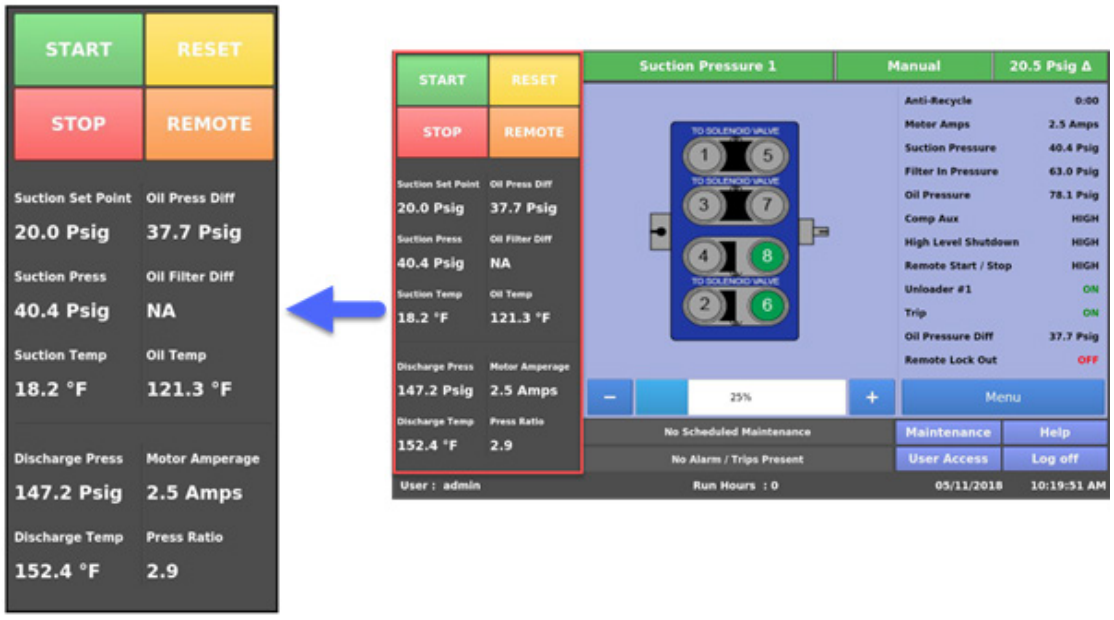


Figure 3-3. Parameters Bar

Control Parameter Box

The parameter boxes provide updated data on several key control parameters.

Control Setpoint

The top box displays the desired control setpoint that is set in the Compressor Control Screen.

Suction Press

Displays the current Suction Pressure value.

Suction Temp

Displays the current Suction Temperature value.

Discharge Press

Displays the current Discharge Pressure value.

Discharge Temp

Displays the current Discharge Temperature value.

Oil Press Diff

This is calculated as Oil Manifold Pressure minus Suction Pressure

Oil Filter Diff

This is calculated depending on the Oil Monitoring setting in the Configuration screen. When Oil Monitoring Setting is set as:

a. No Oil Filter Monitoring
Oil Filter Differential is not calculated and value displayed is NA.

b. Only Oil Filter In
Oil Filter Differential is calculated as Filter Inlet Pressure minus Oil Manifold Pressure.

c. Oil Filter In and Oil Filter Out
Oil Filter Differential is calculated as Filter Inlet Pressure minus Filter Outlet Pressure.

Oil Temp

Displays the current Oil Temperature value.

Motor Amperage

Displays the current motor current.

Press Ratio

Displays ratio of Absolute Discharge Pressure to Absolute Suction Pressure.

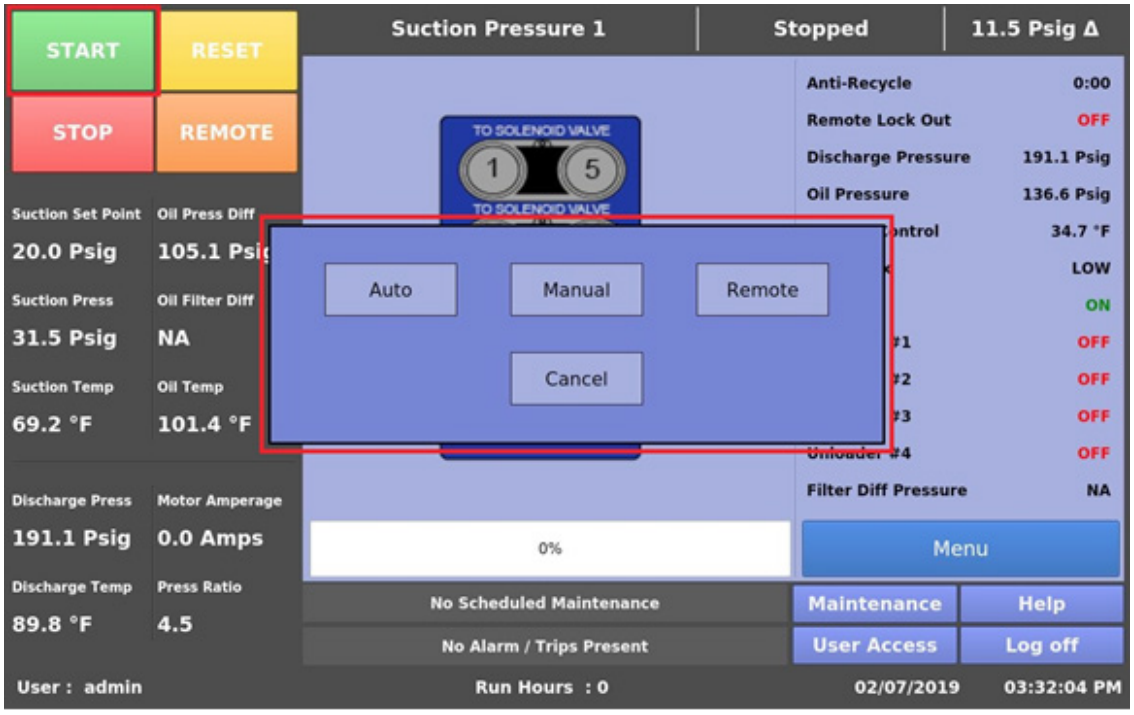


Figure 3-4. Start Dialog Box

Bottom Status Bar

The bottom status bar gives the operator easy access to some basic functions and information. See Figure 3-5.

Status Bars

There are two status bars. The first status bar displays the information about scheduled maintenance activities. The second status bar displays all types of currently active safety information like warnings, inhibits, alarms and trips in their respective colors. All warning messages can be collectively seen in a pop-up window. This pop-up is displayed when a warning condition is present and status bar for displaying warnings is pressed. See Figure 3-6.

At the bottom of the status bars, operator can view the following information from left to right:

- Current User (if any is logged in)
- Compressor Run Hours
- Current Date
- Current Time

At the right side of the status bars, operator can view the following function buttons:

Maintenance Button

Pressing the Maintenance button will give the operator access to the maintenance charts and sign off tables.

User Access Button

This button takes the operator to the login screen to create additional users or log in.

Log off Button

Pressing the log off button logs off the current user if any are logged in.

Help Button

Pressing the help button takes the operator to the help screen where the operation and service manual can be read and access to the program information is also provided.

Figure 3-5. Bottom Status Bar

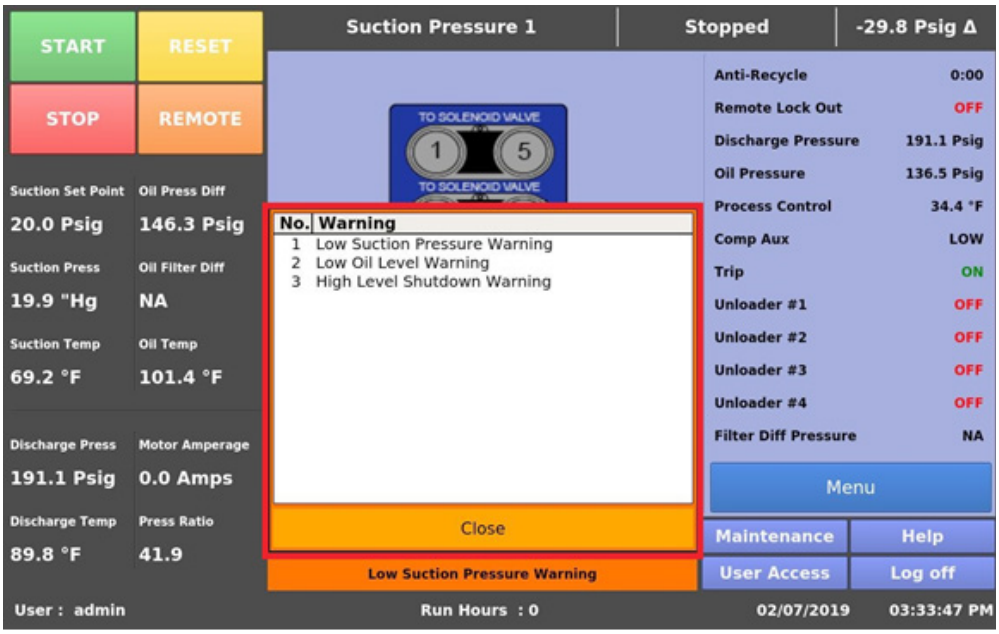


Figure 3-6. Warning Pop-up Window

Splash Screen

The Splash screen is the dynamic portion of the screen that will change as the operator navigates through the MicroVision panel screens.

The Splash screen area displays the status of loaded and unloaded cylinders through image, an horizontal blue progress bar from 0% to 100% to indicate the current capacity utilization of the compressor, the configurable parameters as per settings on Page 4 of the Configuration screen, and the Menu button. Operator can navigate to the Menu screen by pressing Menu button which in turn will allow navigation to other screens on MicroVission. See Figure 3-7.

Manual Run Mode Buttons

When operator runs compressor in Manual run mode, two buttons "+" (plus) and "-" (minus) will be available on display along both sides of progress bar, See Figure 3-8. The "+" button & "-" button will allow the operator to increase and decrease compressor capacity respectively in pre-defined steps as per No. of Cylinders and No. of Unloaders settings of Configuration screen.

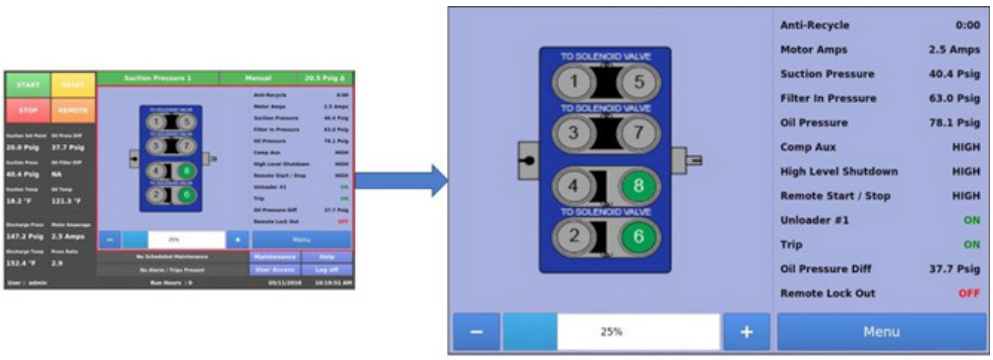


Figure 3-7. Splash Screen

Figure 3-8. Manual Run Mode Buttons And Progress Bar

Progress Bar Breakdown

The meaning of the value shown on the Progress Bar depends on the capacity control the compressor is utilizing.

Compressor With Disabled VFD

The percentage value corresponds to the ratio of the number of Loaded Cylinders to the total number of Compressor Cylinders.

Compressor With Enabled VFD

The percentage value corresponds to the average of two values:

- The ratio of the number of Loaded Cylinders to the total number of Compressor Cylinders.
- The compressor VFD Load Percentage.

Normally the compressor VFD Load Percentage is 0 when the VFD output is at 4 mA, and VFD Load Percentage is 100 when the VFD output is at 20 mA.

Overview

The Menu screen is the launching point to every other section of the MicroVision panel software. Every screen navigated to from this screen will return to the menu screen upon exiting, see Figure 3-1.

Navigation Buttons

Compressor Control

Navigates to the Compressor Control screen where the operator can set the various compressor control parameters.

Alarms and Trips

Navigates to the Alarms and Trips screen where the operator can set the various alarm and trip parameters.

Timers

Navigates to the Timers screen where the operator can set the various time related parameters.

Compressor Scheduling

Navigates to the Compressor Scheduling screen where the operator can set the scheduler to change the control method at settable dates and times.

Instrument Calibration

Navigates to the Instrument Calibration screen where the operator can calibrate all the system sensors.

Service Options

Navigates to the Service Options screen where the operator can manually turn on/off digital and analog outputs for maintenance and diagnostics purposes.

Trend Chart

Navigates to the Trend Chart screen where the operator can select up to four parameters for graphical historical data trending.

Event List

Navigates to the Event List screen where the operator can view the systems events such as trips or alarms in descending chronological order.

Input/ Output States

Allows viewing of the live data of all analog and digital input and outputs. Also allows viewing of a “snapshot” of all analog and digital input and outputs at the time of the last compressor fault event.

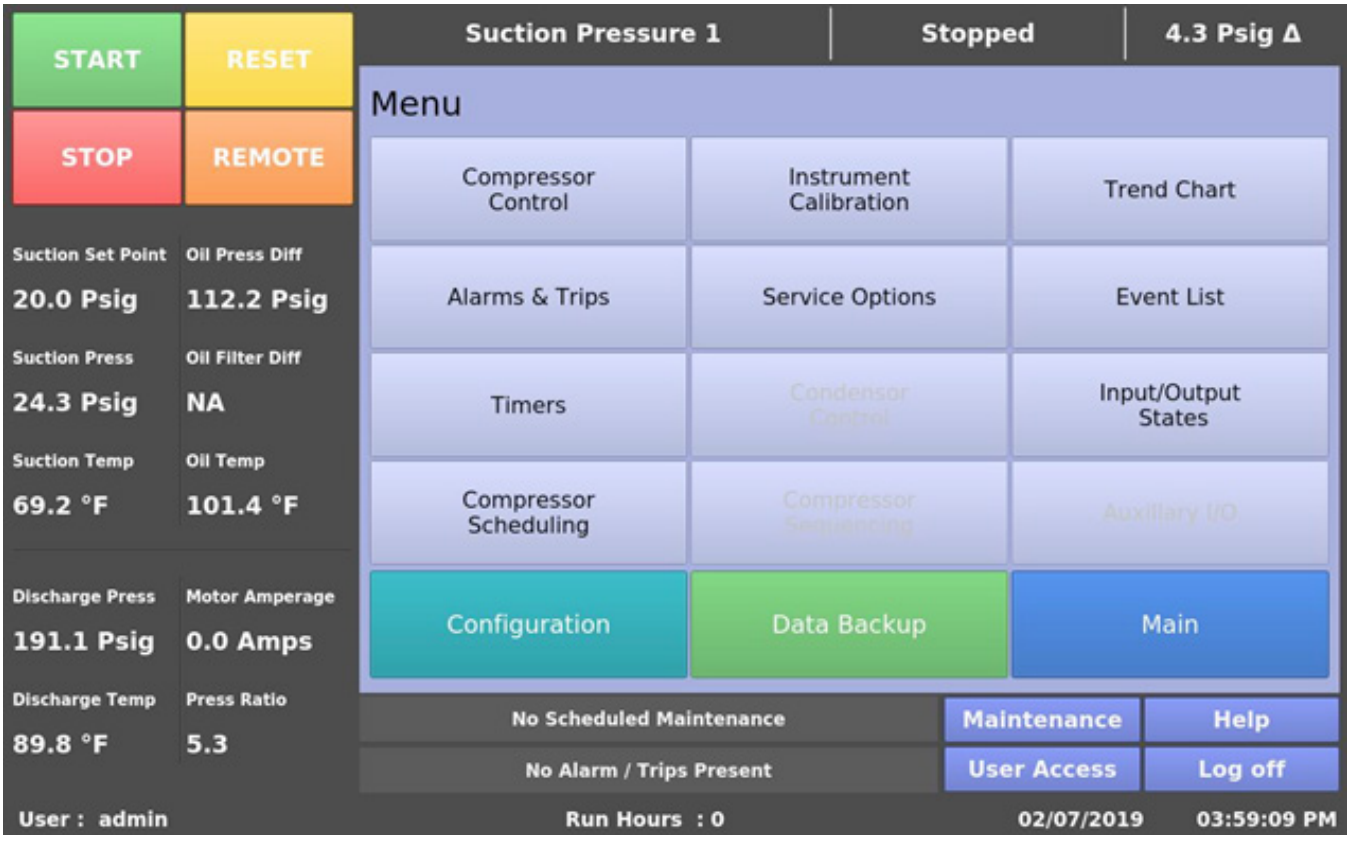


Figure 4-1. Menu Screen

Configuration

Navigates to Configuration screen where the operator can configure all the initial system parameters.

Data Backup

Navigates to the Data Backup screen where the operator can back up setpoints, configuration parameters and calibration settings to a USB memory device. In addition, this allows the restoration of previously saved database files.

Main

Navigates back to the Main screen.

Overview

The Compressor Control screens is where an operator can set majority of the compressor settings. These settings define how the compressor will operate and respond to changing loads. The compressor control screen consists of several pages, but in order not to overwhelm the operator with options, many of the pages may not be visible.

NOTE

How the compressor is setup in the configuration screen will determine what compressor control pages are displayed.

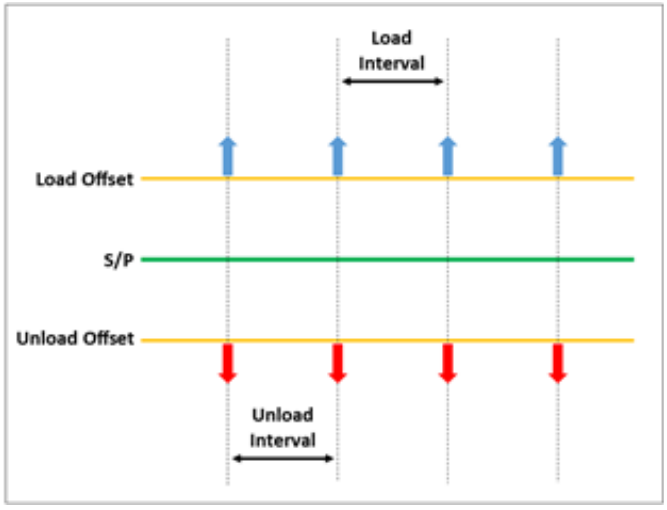
It is important to note that there isn't one correct way to set these parameters. Every application is different and requires the operator to tune these settings to achieve the best operation.

For Suction Pressure Control, Process Temperature Control & Discharge Pressure Control operator can use two different set of values for compressor control. These values are categorized as Setpoint 1 and Setpoint 2. Active Control Mode decides which set of values will be used to control the compressors.

How Compressor Control Setpoint works?

The MicroVission will load and unload reciprocating compressor cylinders to maintain the control setpoint. The control setpoint can be either of suction pressure control setpoint, process temperature control setpoint or discharge pressure control setpoint depending on what the operator has selected as the control mode.

The following figure shows how the MicroVission uses the setpoints and offset values to load / unload compressor in steps after specific time interval.



Suction Pressure Control

When the Active Control Mode is set to "Suction Pressure SP1" or "Suction Pressure SP2"', the control setpoint is Suction Pressure Control.

Pressure Control Setpoint

The suction pressure of the compressor to operate when the compressor is running in Auto, Remote Auto, or Direct I/O Auto run mode.

Load Offset

The offset value when added to the "Pressure Control" setpoint, determines the suction pressure for loading the compressor.

Load Interval

The time interval for which control algorithm will wait between the steps while loading the compressor.

When the suction pressure of the compressor is equal to or greater than the "Pressure Control" setpoint plus the "Load Offset" value, the control algorithm loads one step and then waits for the load interval time. Once the load interval time is lapsed, the control algorithm will again check if the suction pressure is equal to or greater than the "Pressure Control" setpoint plus the "Load Offset" value. If yes, MicroVission loads the next step.

Unload Offset

The offset value when removed from the "Pressure Control" setpoint, determines the suction pressure for unloading the compressor.

Unload Interval

The time interval for which control algorithm will wait between the steps while unloading the compressor.

When the suction pressure of the compressor is less than or equal to the "Pressure Control" setpoint minus the "Unload Offset" value, the control algorithm unloads one step and then waits for the unload interval time. Once the unload interval time is lapsed, the control algorithm will again check if the suction pressure is less than or equal to the "Pressure Control" setpoint minus the "Unload Offset" value. If yes, MicroVission unloads the next step.

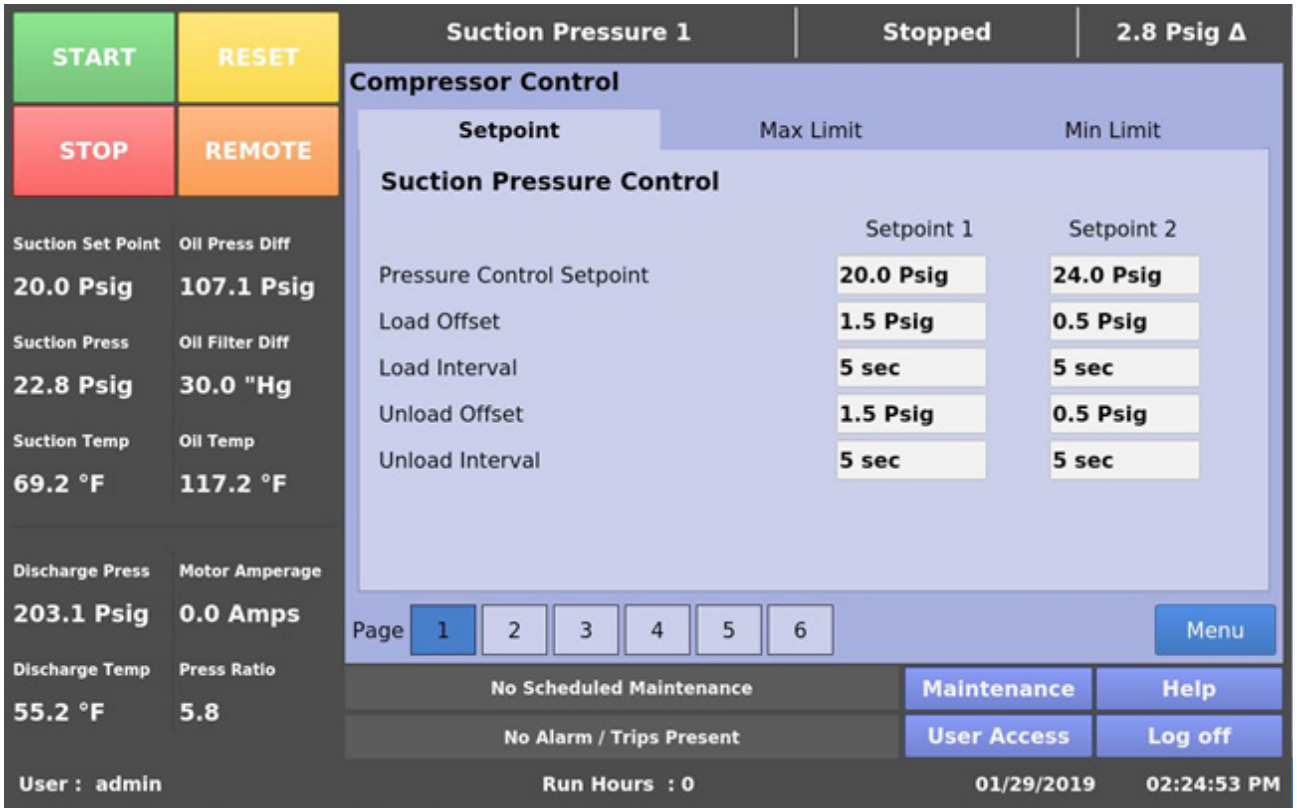


Figure 5-1. Compressor Control Screen - Suction Pressure Control

Process Temperature Control

When the Active Control Mode is set to "Process Temperature SP1" or "Process Temperature SP2"', the control setpoint is Process Temperature Control.

Temp Control Setpoint

The process temperature of the compressor to operate when the compressor is running in Auto, Remote Auto, or Direct I/O Auto run mode.

Load Offset

The offset value when added to the "Temp Control" setpoint, determines the process temperature for loading the compressor.

Load Interval

The time interval for which control algorithm will wait between the steps while loading the compressor.

When the process temperature of the compressor is equal to or greater than the "Temp Control" setpoint plus the "Load Offset" value, the control algorithm loads one step and then waits for the load interval time. Once the load interval time is lapsed, the control algorithm will again check if the process temperature is equal to or greater than the "Temp Control" setpoint plus the "Load Offset" value. If yes, MicroVission loads the next step.

Unload Offset

The offset value when removed from the "Temp Control" setpoint, determines the process temperature for unloading the compressor.

Unload Interval

The time interval for which control algorithm will wait between the steps while unloading the compressor.

When the process temperature of the compressor is less than or equal to the "Temp Control" setpoint minus the "Unload Offset" value, the control algorithm unloads one step and then waits for the unload interval time. Once the unload interval time is lapsed, the control algorithm will again check if the process temperature is less than or equal to the "Temp Control" setpoint minus the "Unload Offset" value. If yes, MicroVission unloads the next step.

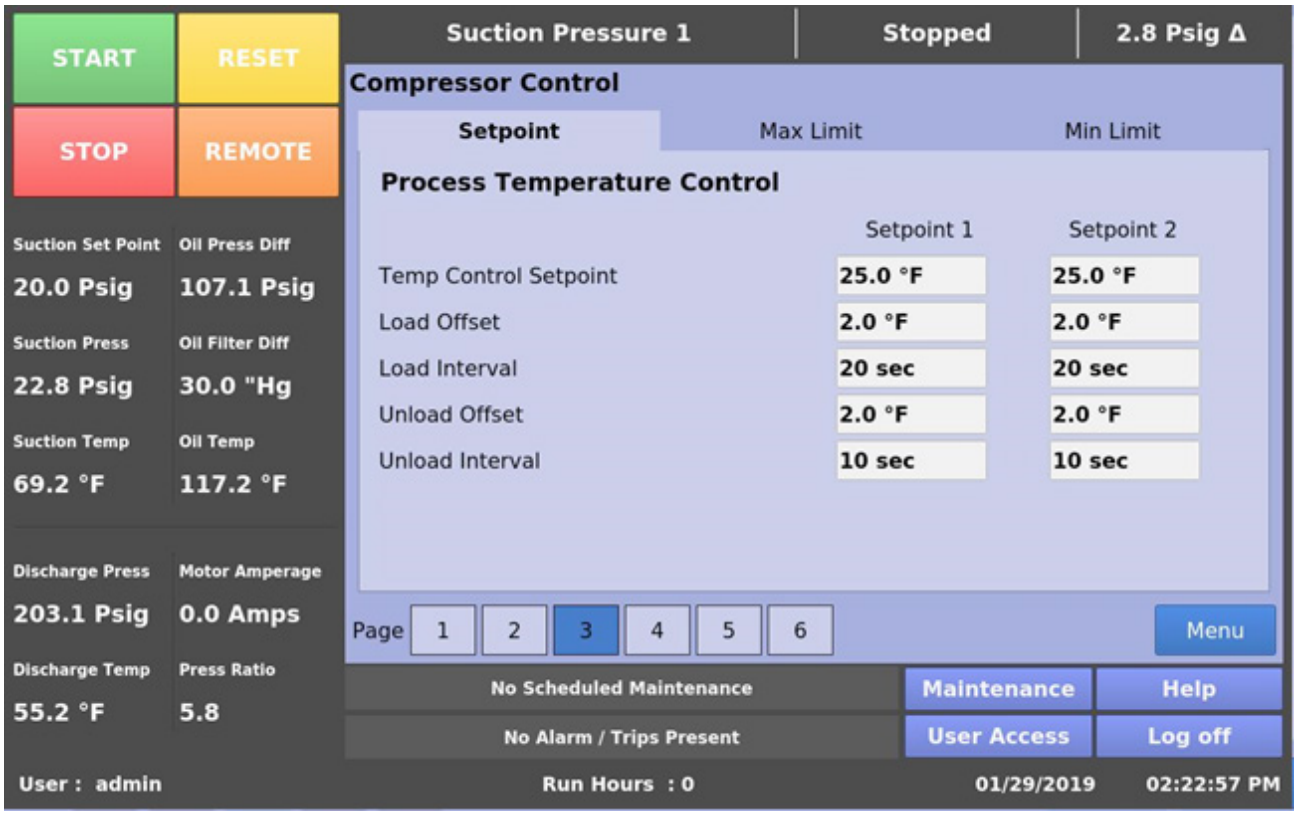


Figure 5-2. Compressor Control Screen - Process Temperature Control

Discharge Pressure Control

When the Active Control Mode is set to “Discharge Pressure SP1” or “Discharge Pressure SP2”’, the control setpoint is Discharge Pressure Control.

Pressure Control Setpoint

The discharge pressure of the compressor to operate when the compressor is running in Auto, Remote Auto, or Direct I/O Auto run mode.

Load Offset

The offset value when removed from the “Pressure Control” setpoint, determines the discharge pressure for loading the compressor.

Load Interval

The time interval for which control algorithm will wait between the steps while loading the compressor.

When the discharge pressure of the compressor is less than or equal to the “Pressure Control” setpoint minus the “Load Offset” value, the control algorithm loads one step and then waits for the load interval time. Once the load interval time is lapsed, the control algorithm will again check if the discharge pressure is less than or equal to the “Pressure Control” setpoint minus the “Load Offset” value. If yes, MicroVission loads the next step.

Unload Offset

The offset value when added to the “Pressure Control” setpoint, determines the discharge pressure for unloading the compressor.

Unload Interval

The time interval for which control algorithm will wait between the steps while unloading the compressor.

When the discharge pressure of the compressor is equal to or greater than the “Pressure Control” setpoint plus the “Unload Offset” value, the control algorithm unloads one step and then waits for the unload interval time. Once the unload interval time is lapsed, the control algorithm will again check if the discharge pressure is equal to or greater than the “Pressure Control” setpoint plus the “Unload Offset” value. If yes, MicroVission unloads the next step.

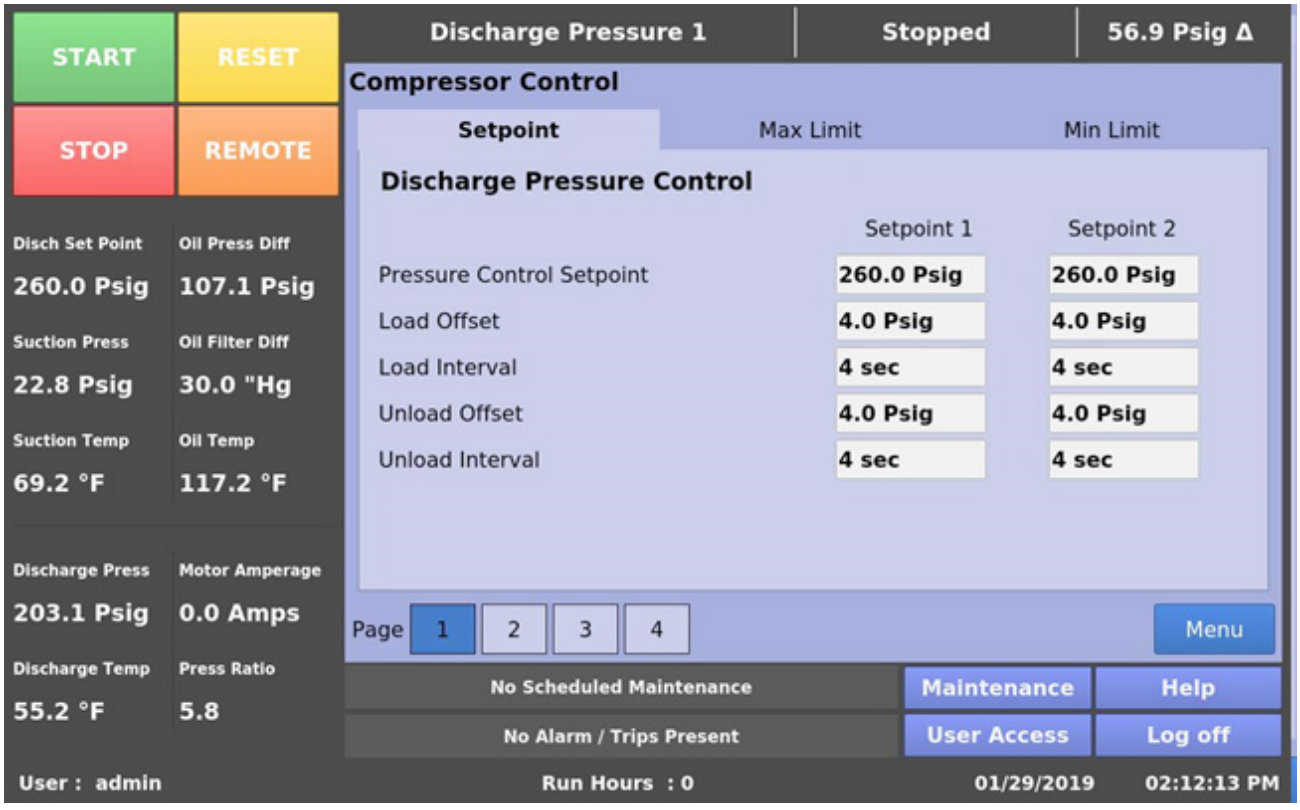


Figure 5-3. Compressor Control Screen - Discharge Pressure Control

Auto Cycle

The auto-cycle setpoints define the control points in which the compressor will automatically cycle on and off when placed into “Auto” run mode. These setpoints can be “enabled” or “disabled” using the check box. The auto-cycle function will operate only in local “Auto” mode and “Direct I/O (Auto)” mode. If the auto cycle feature is enabled while running in any other remote mode, the function will simply be ignored.

If the compressor changes from a Remote mode back to Local “Auto” mode, the auto-cycle feature will operate normally.

Auto Cycle Suction Pressure

- **Enable**: Enables the Auto cycle control. Uncheck the box to disable the Auto cycle setpoints.
- **Start Pressure**: When the suction pressure is equal to or greater than this setpoint, the compressor will start.
- **Start Delay**: Before the compressor start, there is a delay for the set time to ensure that suction pressure remains equal to or greater than the “Start Pressure”.
- **Stop Pressure**: When the suction pressure is less than or equal to this setpoint, the compressor will stop.
- **Stop Delay**: Before the compressor stop, there is a delay for the set time to ensure that the suction pressure remains less than or equal to the “Stop Pressure”.

Auto Cycle Process Temperature

- **Enable**: Enables the Auto cycle control. Uncheck the box to disable the Auto cycle setpoints.
- **Start Temperature**: When the process temperature is equal to or greater than this setpoint, the compressor will start.
- **Start Delay**: Before the compressor start, there is a delay for the set time to ensure that process temperature remains equal to or greater than the “Start Temperature”.
- **Stop Pressure**: When the process temperature is less than or equal to this setpoint, the compressor will stop.
- **Stop Delay**: Before the compressor stop, there is a delay for the set time to ensure that the process temperature remains less than or equal to the “Stop Temperature”.

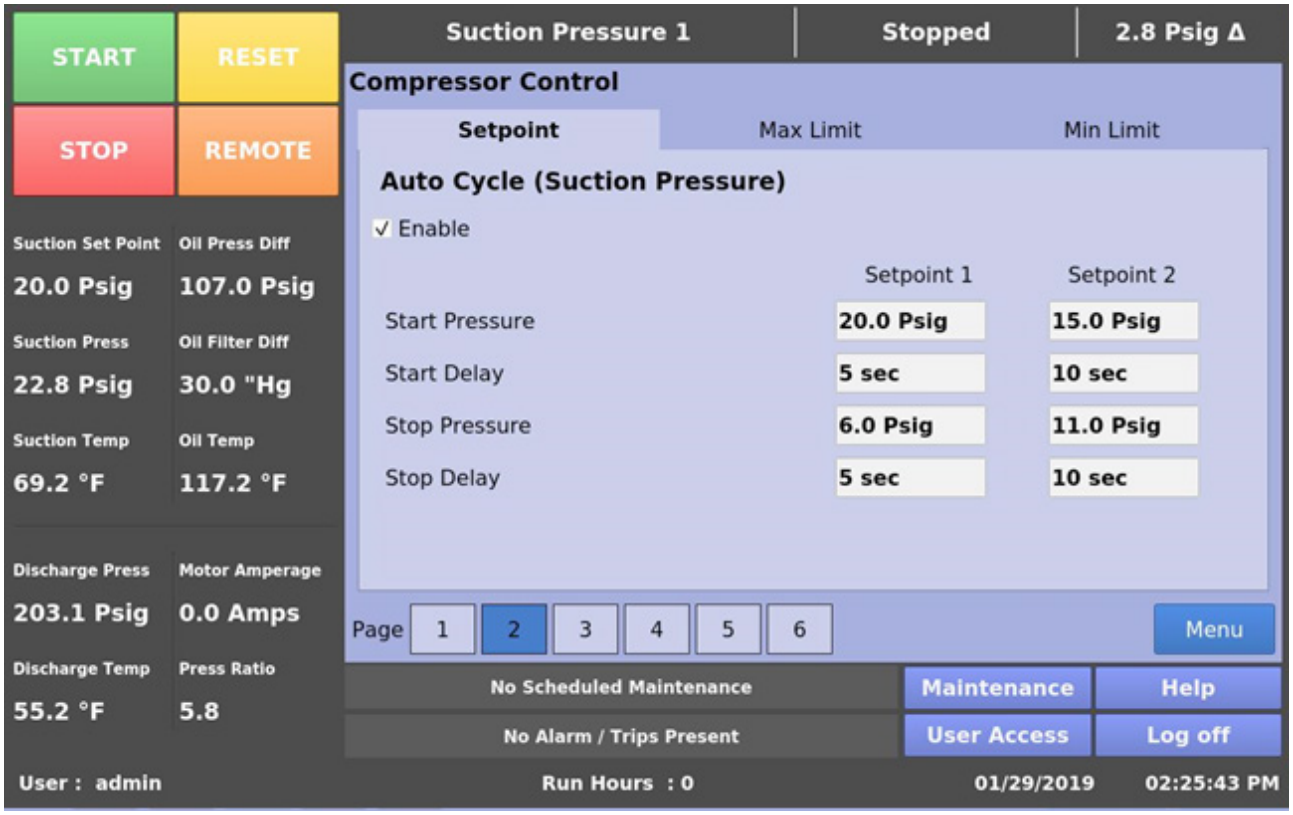


Figure 5-4. Compressor Control Screen - Auto Cycle (Suction Pressure)

Auto Cycle Discharge Pressure

- **Enable**: Enables the Auto cycle control. Uncheck the box to disable the Auto cycle setpoints.
- **Start Pressure**: When the discharge pressure is less than or equal to this setpoint, the compressor will start.
- **Start Delay**: Before the compressor start, there is a delay for the set time to ensure that discharge pressure remains less than or equal to the "Start Pressure".
- **Stop Pressure**: When the discharge pressure is equal to or greater than this setpoint, the compressor will stop.
- **Stop Delay**: Before the compressor stop, there is a delay for the set time to ensure that the discharge pressure remains equal to or greater than the "Stop Pressure".

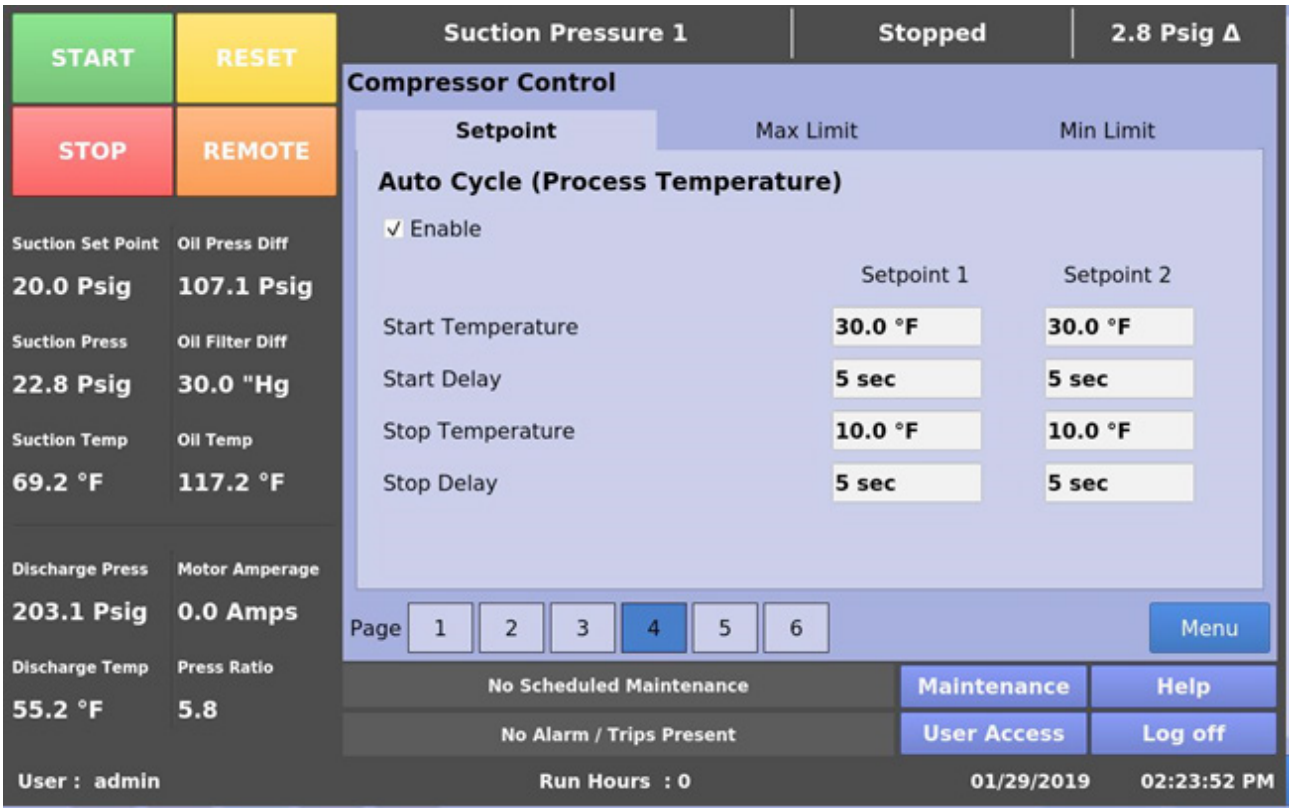


Figure 5-5. Compressor Control Screen – Auto Cycle (Process Temperature)

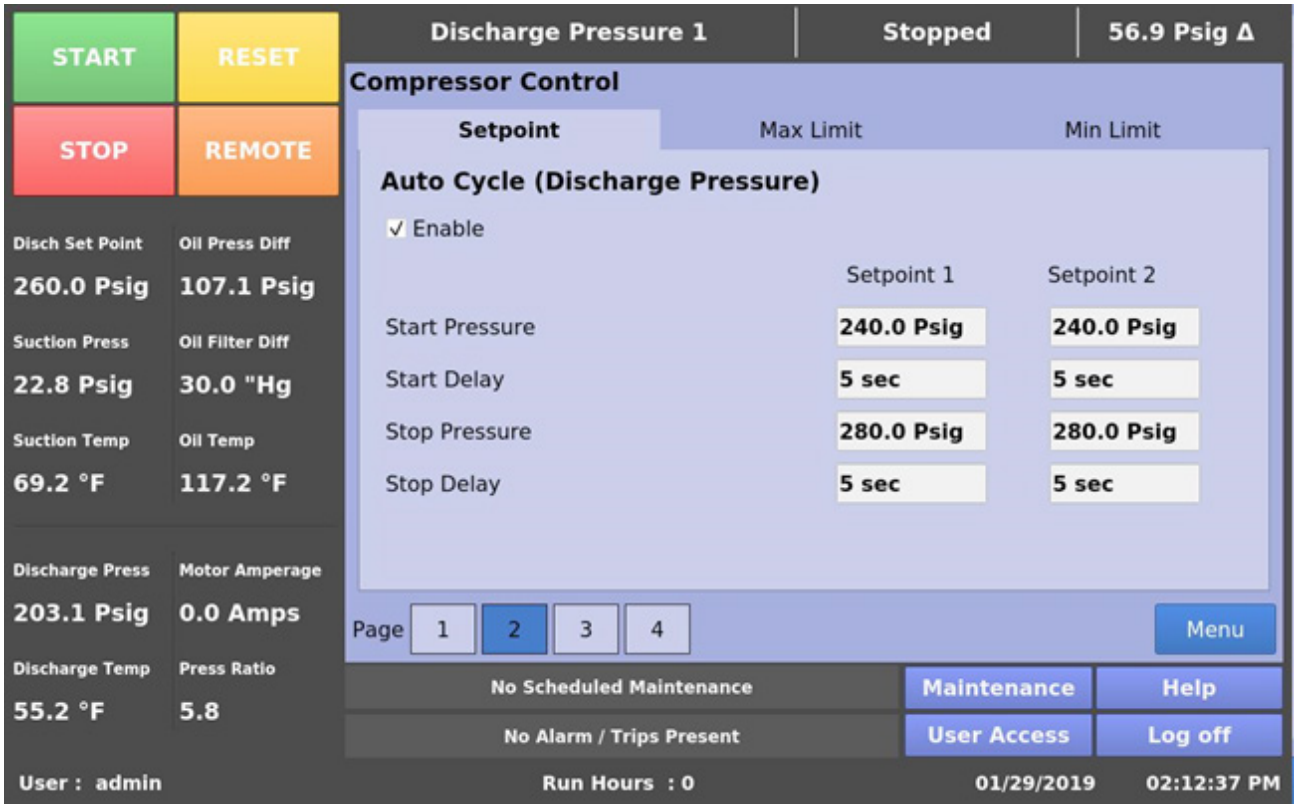


Figure 5-6. Compressor Control Screen - Auto Cycle (Discharge Pressure)

Active Control Mode

This drop-down box gives the operator the ability to change the type of Active Control Mode such as Suction Pressure, Process Temperature or Discharge Pressure. The operator can also switch from Setpoint 1 (SP1) and Setpoint 2 (SP2) for each control method. The options for drop-down box will depend on the number and type of control selected in the configuration screen.

I/O Based Setpoint Control

This checkbox when enabled, monitors the Remote Setpoint #1/#2 Digital Input (10th Digital Channel on Multi IO Board). When Compressor is running in Auto / Remote(Auto) run mode, the selection of Active Control Setpoint depends upon the state of Remote Setpoint #1/#2 Digital Input. When Remote Setpoint #1/#2 Digital Input is Energized, Active Control Mode will be Setpoint 2. When Remote Setpoint #1/#2 Digital Input is De-Energized, Active Control Mode will be Setpoint 1.

NOTE

This checkbox will be displayed only when "Direct I/O" is disabled in Configuration Screen.

Load Limiting

The stop load and force unload feature's primary purpose is an attempt to prevent the compressor from tripping off due to instrument reading. For example, if the suction pressure drops very low, the compressor will trip off for safety reasons. However, the stop load and force unload algorithm recognizes the potential trip and either stops the compressor from loading up or even unloads the compressor step-by-step to prevent the trip.

Stop Load Setpoints

High Suction Pressure

- When the suction pressure value is equal to or greater than this setpoint, algorithm will not allow loading of the compressor. However, if the suction pressure value drops below this setpoint, algorithm will allow loading of the compressor.

High Discharge Pressure

- When the discharge pressure value is equal to or greater than this setpoint, algorithm will not allow loading of the compressor. However, if the discharge pressure value drops below this setpoint, algorithm will allow loading of the compressor.

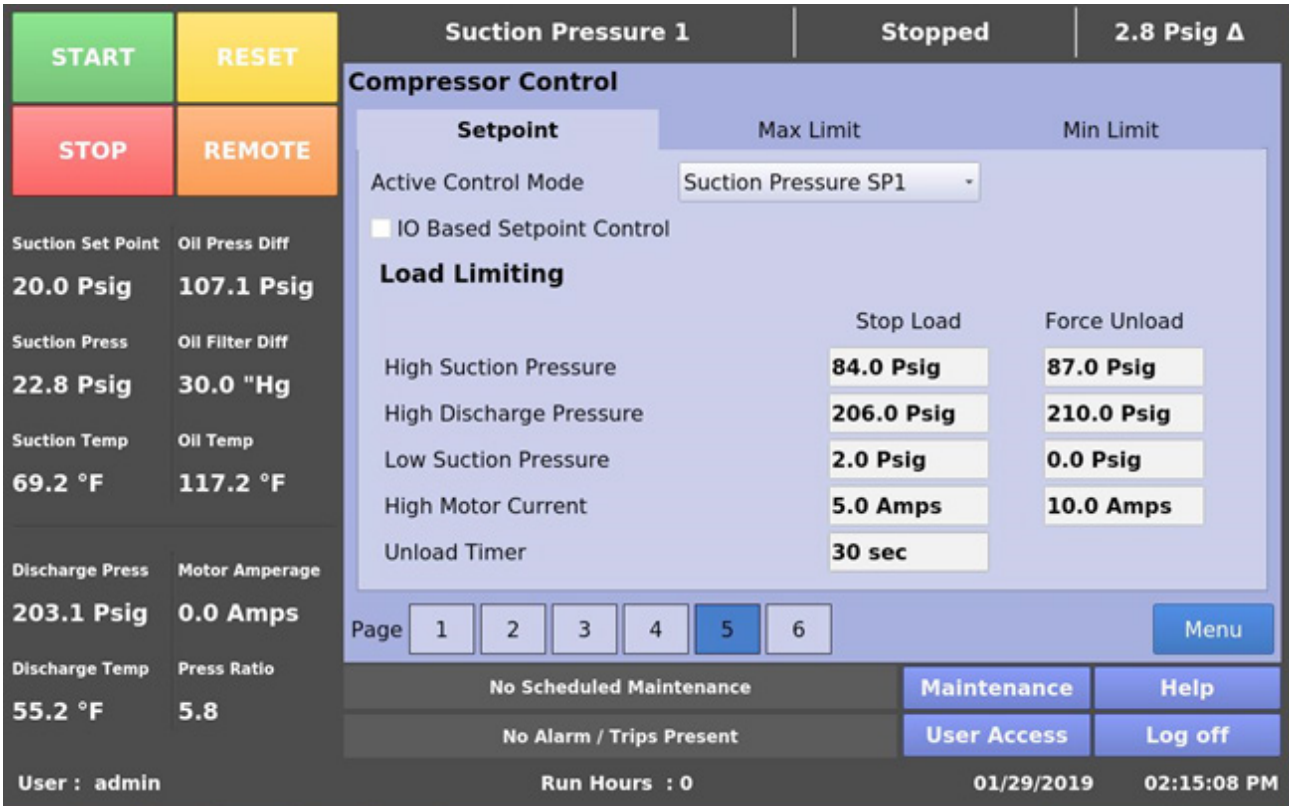


Figure 5-7. Compressor Control Screen – Active Control Mode - I/O Based Setpoint Control

Low Suction Pressure

- When the suction pressure value is equal to or less than this setpoint, algorithm will not allow loading of the compressor. However, if the suction pressure value exceeds this setpoint, algorithm will allow loading of the compressor.

High Motor Current

- When the motor current value is equal to or greater than this setpoint, algorithm will not allow loading of the compressor. However, if the motor current value drops below this setpoint, algorithm will allow loading of the compressor.

Force Unload Setpoints

High Suction Pressure

- When the suction pressure value is equal to or greater than this setpoint, algorithm will unload the compressor by one step. Algorithm will continue unloading the compressor step-by-step to minimum load until the suction pressure value drops below this setpoint.

High Discharge Pressure

- When the discharge pressure value is equal to or greater than this setpoint, algorithm will unload the compressor by one step. Algorithm will continue unloading the compressor step-by-step to minimum load until the discharge pressure value drops below this setpoint.

Low Suction Pressure

- When the suction pressure value is equal to or less than this setpoint, algorithm will unload the compressor by one step. Algorithm will continue unloading the compressor step-by-step to minimum load until the suction pressure value exceeds this setpoint.

High Motor Current

- When the motor current value is equal to or greater than this setpoint, algorithm will unload the compressor by one step. Algorithm will continue unloading the compressor step-by-step to minimum load until the motor current value drops below this setpoint.

Unload Timer

- This is the time duration that force unload algorithm will use while unloading each step during the force unload condition. For example, when the suction pressure value is equal to or greater than the “High Suction Pressure” Force Unload setpoint, the algorithm will unload one step and wait for the time as defined by this setpoint. Once the time set is lapsed, the algorithm will check again if the suction pressure value is equal to or greater than the “High Suction Pressure” Force Unload setpoint. If yes, the algorithm will unload one more step.

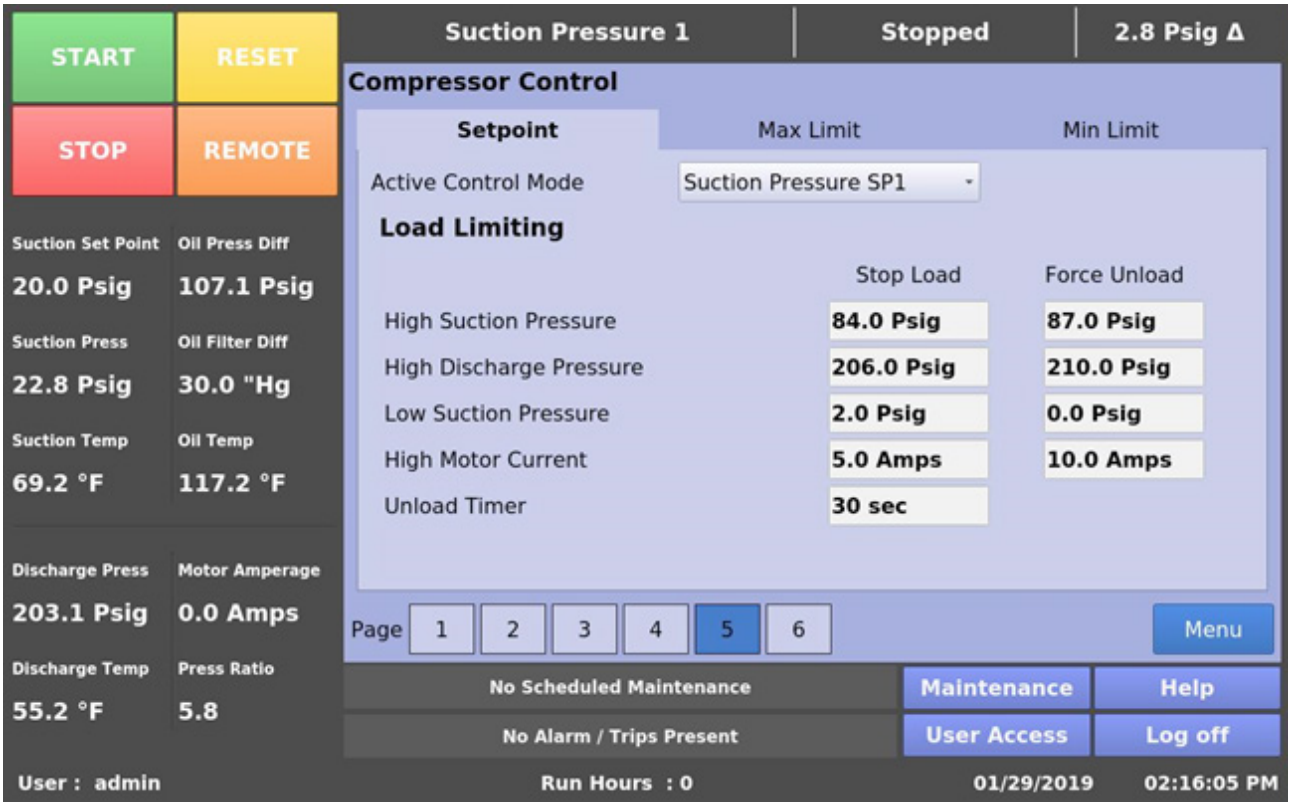


Figure 5-8. Compressor Control Screen - Load Limiting

Oil Control

This setpoint defines how the MicroVission will manage the crankcase's oil. When the compressor is used in cold climatic conditions, it might be possible that compressor does not start due to low crankcase oil temperature.

Oil Crankcase Heater Temperature

- When the oil temperature falls below this setpoint, the oil heater (7th Digital Channel on Multi IO Board) will turn ON. Note, there is a 2°F differential associated with this setpoint. For example, when set at 100 °F, the oil heater will turn ON at 98 °F and turn OFF at 102 °F.

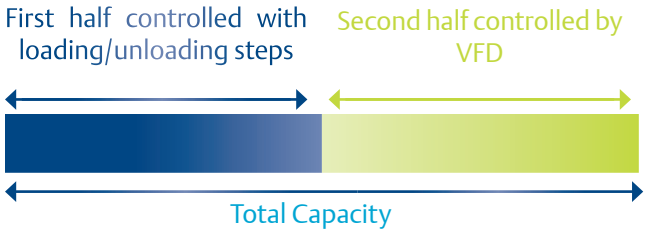
Compressor Variable Frequency Drive(VFD) Control

The VFD page is where the operator can tune the motor´s VFD for the desired operation, see Figure 5-10. Compressor Control Screen - VFD Settings Control.

A reciprocating compressor uses the variable speed of a VFD-controlled motor to vary the amount of work or capacity of the compressor.

When VFD Control is enabled, the first half of the total available capacity is controlled using load steps, and the motor speed is used to control the second half of the total available capacity.

If the compressor needs to load to 100% of its capacity, the control algorithm will first load all the cylinders, and then the motor speed will ramp up to its maximum speed. In the unloading direction, the motor speed will first ramp down to its minimum speed, and then the cylinders will be unloaded.



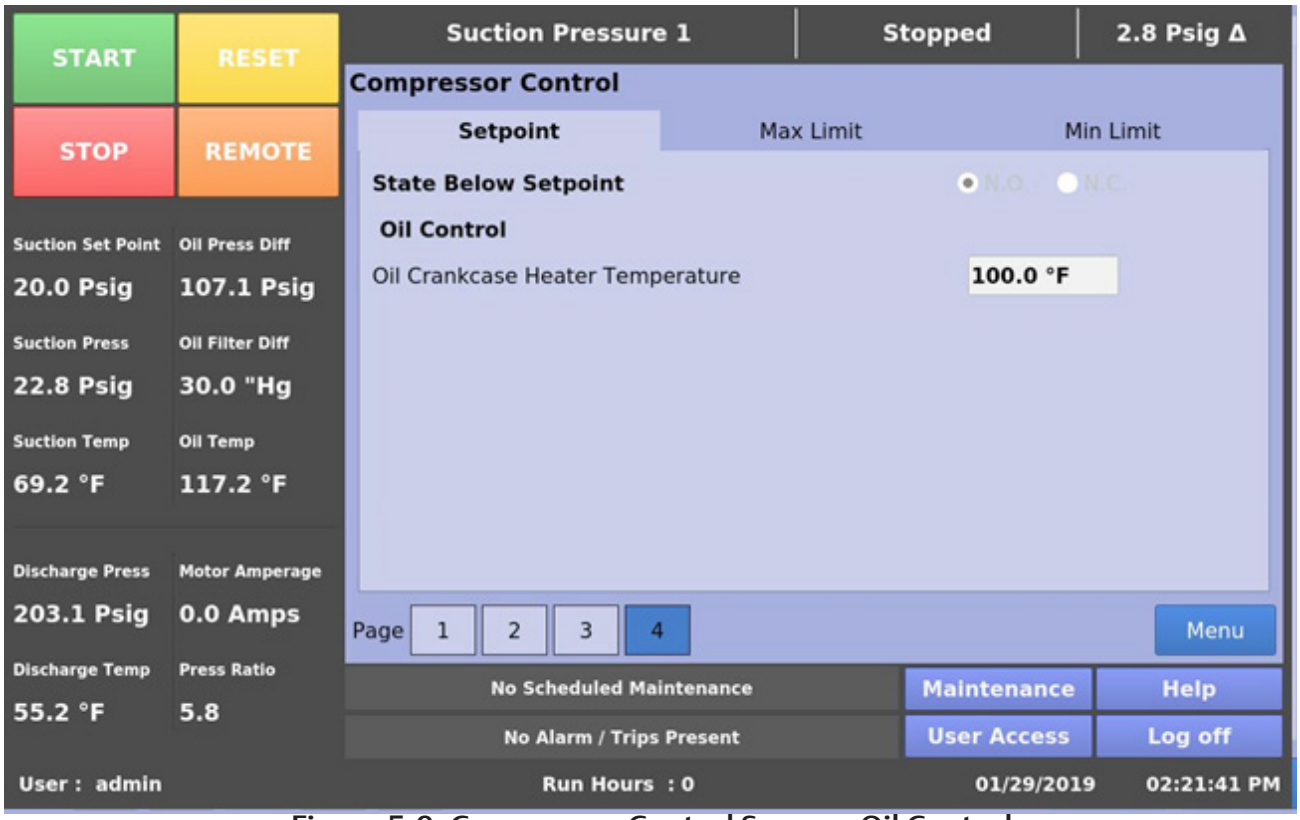


Figure 5-9. Compressor Control Screen - Oil Control

NOTE

VFD installation is not covered in this manual. A VFD that is not properly installed and configured has the potential of causing intermittent and dangerous problems. Please consult your VFD manual.

VFD Speed:

- Defines the minimum and maximum speed for the motor.

P = Proportional (gain) setpoint:

- Used to adjust the motor speed action in direct proportion to the difference between the control setpoint and the process variable (SP - PV error).
- This is a unit-less quantity and is used for coarse adjustment, and this setpoint should be set to the lowest value that gives adequate control system response.
- Increasing the Proportional setting increases the control system's sensitivity to small process fluctuations and the tendency to hunt.

I = Integral (reset) setpoint:

- Used to adjust the load control action, integrating the error over time, to account for a small error that has persisted for a long time.
- This quantity is used for fine adjustment, and this setpoint is used to smooth out process variations.
- This setpoint should be set high enough to prevent hunting but low enough to prevent control system overshoot.

D = Derivative (rate) setpoint:

- Used to adjust the load control action, accounting for how fast the error is changing, positively or negatively. It´s a standard PID loop variable, and it is not used for our applications.

Interval:

- This setpoint defines the time interval for calculation of Integral Error.

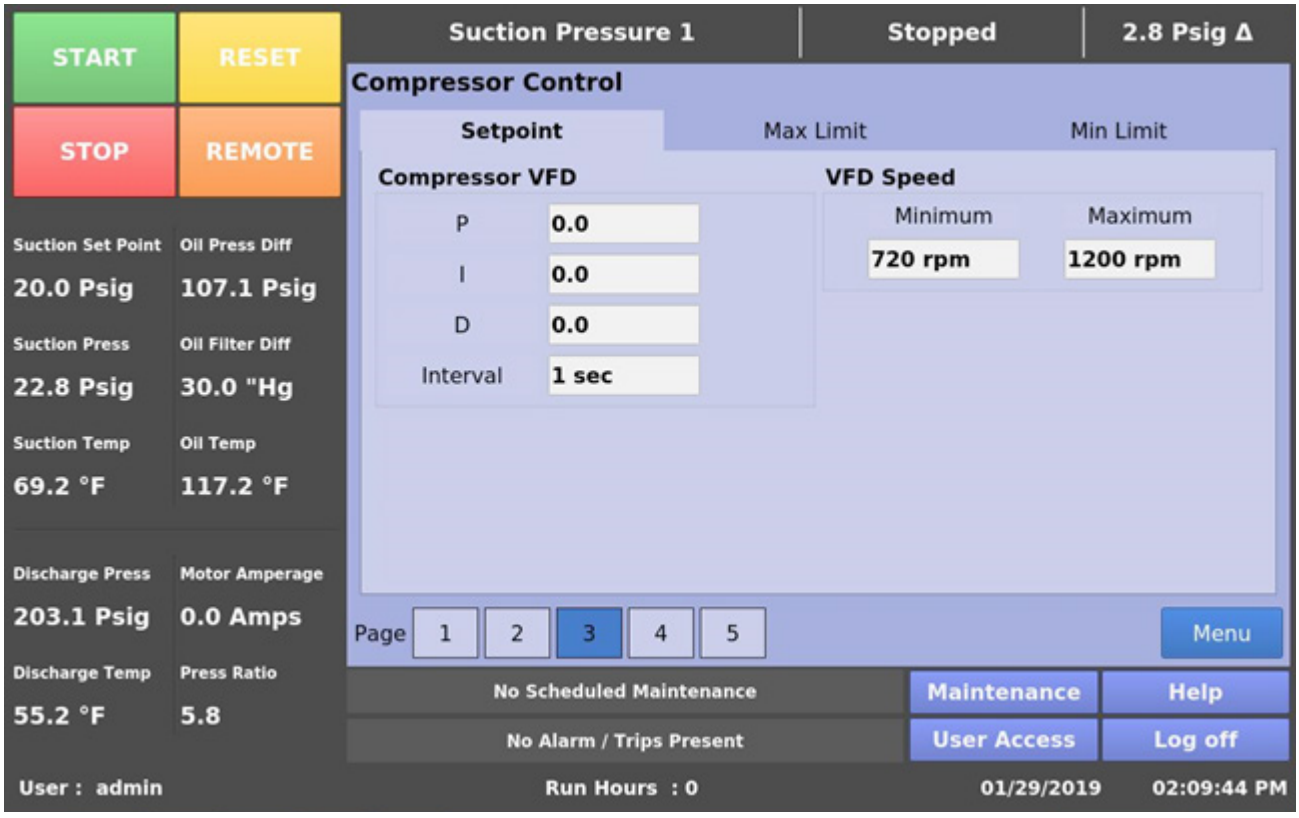


Figure 5-10. Compressor Control Screen - VFD Settings Control

Overview

The Alarms and Trips screen provides the options to view and adjust settings for compressor safety and alarm settings.

Warnings

The MicroVission uses Warnings to notify the operator of the parameters that might inhibit the compressor when started. Warnings are monitored only when compressor is not running. Unless other specified, Warnings use alarm setpoints for detection and message generation. The Warning condition occurs when the value of a parameter drops below or rises above the configured alarm setpoint when the compressor is not running.

All warning messages can be collectively seen in a pop-up window. This pop-up is displayed when a warning condition is present and the bottom status bar is pressed. When the warning condition earlier present is cleared or not anymore present, the corresponding warning message will be automatically removed from bottom status bar.

Warnings are shown in an Orange color banner on the bottom status bar

Inhibits

The MicroVission uses start Inhibits to prevent the compressor from starting to protect the compressor and the refrigeration system. Inhibits are only active during Pre-Start condition. While starting the compressor, inhibits are checked first before the motor is started. Failed start due to an inhibit do not count toward any of the anti-recycle timer including Hot Starts. Unless other specified, inhibits use alarm setpoints to abort compressor start and message generation. The Inhibit condition occurs if the value of a parameter drops below or rises above the configured alarm setpoint during the compressor start.

Inhibits are shown in a Red color banner on the top and bottom status bars

Alarms

The MicroVission uses Alarms to notify the operator of running parameters that if left unchecked could result in the compressor shutting down due to a trip. Alarms are only active when compressor is running. The Alarm condition occurs if the value of a parameter drops below or rises above the configured Alarm setpoint for a continuous delay time (default 5 seconds).

Alarms are shown in a Yellow color banner on the top and the bottom status bars

Trips

Trips are the conditions that exceed the safety limits of the compressor or refrigeration system and stops the compressor. Trips are only active when compressor is running. The Trip condition occurs if the value of a parameter drops below or rises above the configured Trip setpoint for continuous delay time (default 5 seconds). During Trip condition, compressor run mode will get changed to idle from running.

Trips are shown in a Red color banner on the top and bottom status bars

NOTE

When more than one safety condition is active/present, Safety message for each condition (Except Warning) will get displayed on Top Status Bar in rotating manner.

Freeze Screens

Trips also trigger the input/output screen to take snapshot of all input and output values as Freeze 1 screen. The Freeze screens are very useful as a troubleshooting tool for the operator. Refer to Input/Output States section for a typical Freeze Data (Trip) screen.

Logging – Event List

All Inhibits, Alarm and Trip conditions are logged in the Event List so the operator can get the complete operational history. The operator can access the Event List from the Menu screen.

Alarms & Trips setpoints

This screen provides three different pages to configure Alarm and Trip setpoints along with corresponding delay tabs for configuration of delay time.

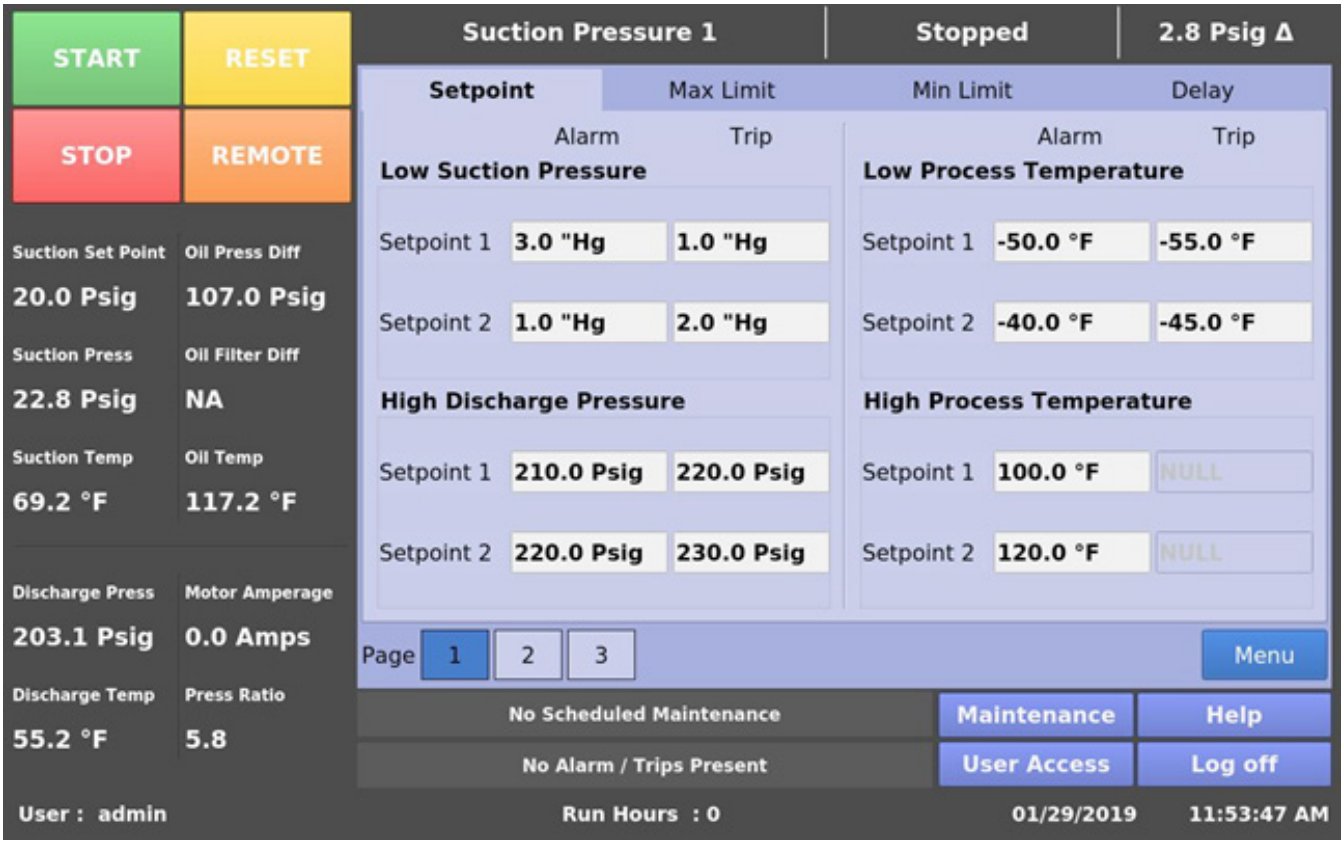


Figure 6-1. Alarms & Trips Setpoints (Page 1)

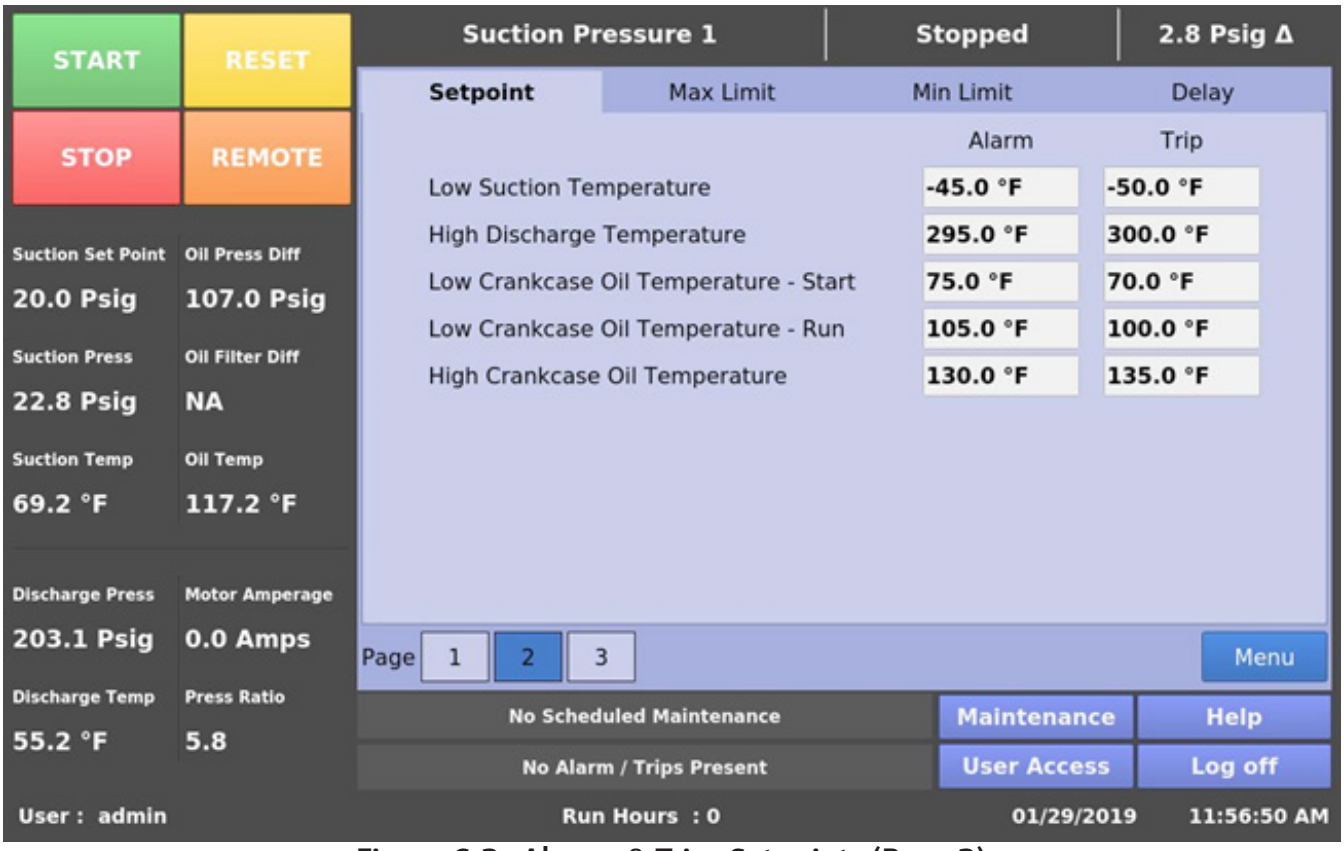


Figure 6-2. Alarms & Trips Setpoints (Page 2)

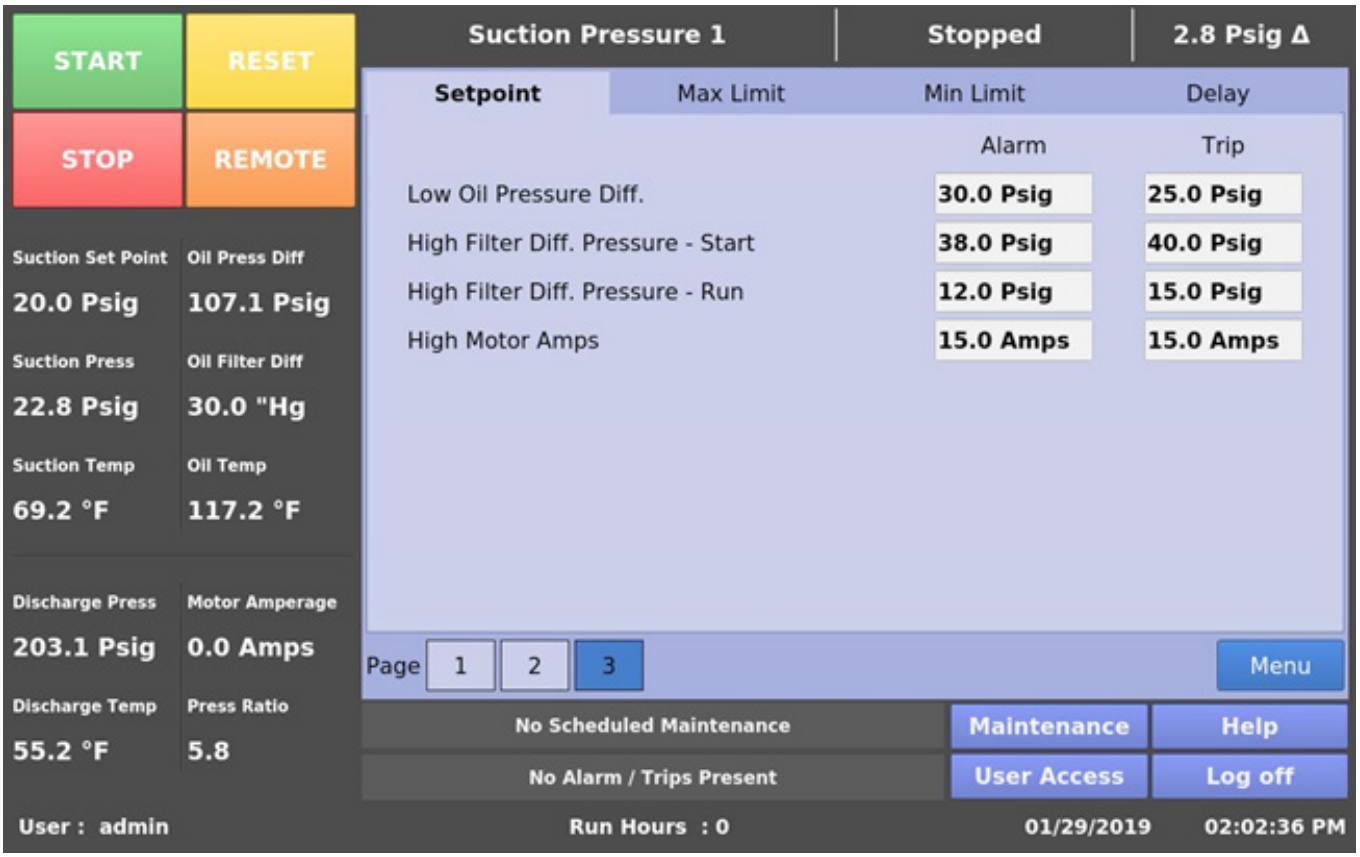


Figure 6-3. Alarms & Trips Setpoints (Page 3)

MicroVission Safety Messages

The following table lists all possible Warning, Inhibit, Alarm and Trip Messages generated by MicroVission while monitoring safety parameters.

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running
Low Suction Pressure: Below Messages will be displayed on Main screen when Suction Pressure value drops below configured set-points. Refer Figure 6- 1 for Alarm & Trip setpoints. There are two different set of Alarm & Trip setpoints which will be active depending on Active Control Mode selected from Compressor Control screen.			
Low Suction Pressure Warning	Low Suction Pressure Inhibit	Low Suction Pressure Alarm	Low Suction Pressure Trip
Suction Pressure <= Low Suction Pressure Alarm Setpoint 1 / Setpoint 2	Suction Pressure <= Low Suction Pressure Alarm Setpoint 1 / Set-point 2	Suction Pressure <= Low Suction Pressure Alarm Setpoint 1 / Setpoint 2	Suction Pressure <= Low Suction Pressure Alarm Setpoint 1 / Setpoint 2
High Discharge Pressure: Below Messages will be displayed on Main Screen when Discharge Pressure value rises above configured set-points. Refer Figure 6- 1 for Alarm & Trip setpoints. There are two different set of Alarm & Trip setpoints which will be active depending on Active Control Mode selected from Compressor Control screen.			
High Discharge Pressure Warning	High Discharge Pressure Inhibit	High Discharge Pres-sure Alarm	High Discharge Pressure Trip
Discharge Pressure >= High Discharge Pressure Alarm Setpoint 1 / Set-point 2	Discharge Pressure >= High Dis-charge Pressure Alarm Setpoint 1 / Setpoint 2	Discharge Pressure >= High Discharge Pres-sure Alarm Setpoint 1 / Setpoint 2	Discharge Pressure >= High Discharge Pressure Trip Setpoint 1 / Setpoint 2
Low Process Temperature: Below Messages will be displayed on Main Screen when Process Temperature value drops below configured setpoints. Refer Figure 6- 1 for Alarm & Trip setpoints. There are two different set of Alarm & Trip setpoints which will be active depending on Active Control Mode selected from Compressor Control screen. These safeties will be only active when Active Control Mode selected from Compressor Control screen is “Pro-cess Temperature SP1” or “Process Temperature SP2”.			
Low Process Temperature Warning	Low Process Temperature Inhibit	Low Process Tempera-ture Alarm	Low Process Temperature Trip
Process Temperature <= Low Process Tempera-ture Alarm Setpoint 1 / Setpoint 2	Process Temperature <= Low Pro-cess Temperature Alarm Setpoint 1 / Setpoint 2	Process Tempera-ture <= Low Process Temperature Alarm Setpoint 1 / Setpoint 2	Process Temperature <= Low Process Temperature Trip Setpoint 1 / Setpoint 2

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running
High Process Temperature: Below Messages will be displayed on Main Screen when Process Temperature value rises below configured setpoints. Refer Figure 6- 1 for Alarm setpoints. There are two different set of Alarm setpoints which will be active depending on Active Control Mode selected from Compressor Control screen. These safeties will be only active when Active Control Mode selected from Compressor Control is “Process Temperature SP1” or “Process Temperature SP2”.			
		High Process Temperature Alarm	
		Process Temperature >= High Process Temperature Alarm Setpoint 1 / Setpoint 2	
Low Suction Temperature: Below Messages will be displayed on Main Screen when Suction Temperature value drops below configured setpoints. Refer Figure 6- 2 for Alarm & Trip setpoints.			
Low Suction Temperature Warning	Low Suction Temperature Inhibit	Low Suction Temperature Alarm	Low Suction Temperature Trip
Suction Temperature <= Low Suction Temperature Alarm Setpoint	Suction Temperature <= Low Suction Temperature Alarm Setpoint	Suction Temperature <= Low Suction Temperature Alarm Setpoint	Suction Temperature <= Low Suction Temperature Trip Setpoint
High Discharge Temperature: Below Messages will be displayed on Main Screen when Discharge Temperature value rises above configured setpoints. Refer Figure 6- 2 for Alarm & Trip setpoints. High Discharge Temperature Alarm & High Discharge Temperature Trip safeties will be monitored only once High Discharge Temp Bypass Timer is lapsed.			
High Discharge Temperature Warning	High Discharge Temperature Inhibit	High Discharge Temperature Alarm	High Discharge Temperature Trip
Discharge Temperature >= High Discharge Temperature Alarm Setpoint	Discharge Temperature >= High Discharge Temperature Alarm Setpoint	Discharge Temperature >= High Discharge Temperature Alarm Setpoint	Discharge Temperature >= High Discharge Temperature Trip Setpoint

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running
Low Crankcase Oil Temperature - Start: Below Messages will be displayed on Main screen when Oil Temperature value drops below configured set-points. Refer Figure 6- 2 for Alarm & Trip setpoints. These safeties will be only active when Crankcase Oil Temp Changeover Timer is running.			
Low Crankcase Oil Temperature Start Warning	Low Crankcase Oil Temperature Start Inhibit	Low Crankcase Oil Temperature Alarm	Low Crankcase Oil Temperature Trip
Oil Temperature <= Low Crankcase Oil Temperature – Start Alarm Setpoint	Oil Temperature <= Low Crankcase Oil Temperature – Start Alarm Setpoint	Oil Temperature <= Low Crankcase Oil Temperature – Start Alarm Setpoint	Oil Temperature <= Low Crankcase Oil Temperature – Start Trip Setpoint
Low Crankcase Oil Temperature - Run: Below Messages will be displayed on Main screen when Oil Temperature value drops below configured set-points. Refer Figure 6- 2 for Alarm & Trip setpoints. These safeties will be only active once Crankcase Oil Temp Changeover Timer is lapsed.			
		Low Crankcase Oil Temperature Alarm	Low Crankcase Oil Temperature Trip
		Oil Temperature <= Low Crankcase Oil Temperature – Run Alarm Setpoint	Oil Temperature <= Low Crankcase Oil Temperature – Run Trip Setpoint
High Crankcase Oil Temperature: Below Messages will be displayed on Main screen when Oil Temperature value rises above configured setpoints. Refer Figure 6- 2 for Alarm & Trip setpoints.			
High Crankcase Oil Temperature Warning	High Crankcase Oil Temperature Inhibit	High Crankcase Oil Temperature Alarm	High Crankcase Oil Temperature Trip
Oil Temperature >= High Crankcase Oil Temperature Alarm Setpoint	Oil Temperature >= High Crankcase Oil Temperature Alarm Setpoint	Oil Temperature >= High Crankcase Oil Temperature Alarm Setpoint	Oil Temperature >= High Crankcase Oil Temperature Trip Setpoint

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running
Low Oil Pressure Diff.: Below Messages will be displayed on Main Screen when Oil Pressure Diff. value drops below configured set-points. Refer Figure 6-3 for Alarm & Trip setpoints. These safeties will be only active once Oil Pressure Bypass Timer is lapsed. Oil Pressure Calculation is as follows: Oil Pressure = Oil Manifold Pressure – Suction Pressure			
		Low Oil Pressure Diff Alarm	Low Oil Pressure Diff Trip
		Oil Pressure Diff. <= Low Oil Pressure Diff. Alarm Setpoint	Oil Pressure Diff. <= Low Oil Pressure Diff. Trip Setpoint
High Filter Diff. Pressure - Start: Below Messages will be displayed on Main screen when Filter Diff. Pressure value rises above configured set-points. Refer Figure 6- 3 for Alarm & Trip setpoints. These safeties will be only active if below two conditions are met: 1) When Oil Monitoring option selected in Configuration Screen is “Oil Filter In & Oil Filter Out” or “Only Oil Filter In”. 2) When Filter Diff. Pressure Changeover Timer is running. Filter Diff. Pressure Calculation for Oil Monitoring options, “Oil Filter In & Oil Filter Out” & “Only Oil Filter In” will be respectively as below: a) Filter Diff. Pressure = Oil Filter Inlet Pressure – Oil Filter Outlet Pressure. b) Filter Diff. Pressure = Oil Filter Inlet Pressure – Oil Manifold Pressure.			
High Filter Diff Pressure Start Warning	High Filter Diff Pressure Start Inhibit	High Filter Diff Pressure Alarm	High Filter Diff Pressure Trip
Filter Diff. Pressure >= High Filter Diff. Pressure – Start Alarm Setpoint	Filter Diff. Pressure >= High Filter Diff. Pressure – Start Alarm Setpoint	Filter Diff. Pressure >= High Filter Diff. Pressure – Start Alarm Setpoint	Filter Diff. Pressure >= High Filter Diff. Pressure – Start Trip Setpoint

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running

High Filter Diff. Pressure - Run:

Below Messages will be displayed on Main screen when Filter Diff. Pressure value rises above configured set-points. Refer Figure 6- 3 for Alarm & Trip setpoints.

These safeties will be only active if below two conditions are met:

1) When Oil Monitoring option selected in Configuration Screen is “Oil Filter In & Oil Filter Out” or “Only Oil Filter In”.

2) When Filter Diff. Pressure Changeover Timer is lapsed.

Filter Diff. Pressure Calculation for Oil Monitoring options, “Oil Filter In & Oil Filter Out” & “Only Oil Filter In” will be respectively as below:

a) Filter Diff. Pressure = Oil Filter Inlet Pressure – Oil Filter Outlet Pressure

b) Filter Diff. Pressure = Oil Filter Inlet Pressure – Oil Manifold Pressure

		High Filter Diff Pressure Alarm	High Filter Diff Pressure Trip
		Filter Diff. Pressure >= High Filter Diff. Pressure – Run Alarm Setpoint	Filter Diff. Pressure >= High Filter Diff. Pressure – Run Trip Setpoint

High Motor Amps:

Below Messages will be displayed on Main Screen when Motor Amps value rises above configured setpoints. Refer Figure 6- 3 for Alarm setpoints.

These safeties will be only active once High Motor Amps Bypass Timer is lapsed.

		High Motor Amps Alarm	High Motor Amps Trip
		Motor Amps >= High Motor Amps Alarm Setpoint	Motor Amps >= High Motor Amps Trip Setpoint

High Discharge #2 Pressure:

Below Messages will be displayed on Main Screen when Discharge #2 Pressure value rises above configured setpoints. Refer Figure 6- 1 for Alarm & Trip setpoints.

There are two different set of Alarm & Trip setpoints which will be active depending on Active Control Mode selected from Compressor Control screen.

These safeties will be only active when No. of Cylinders set in Configuration screen is “12 cyl” or “16 cyl”.

High Discharge 2 Pressure Warning	High Discharge 2 Pressure Inhibit	High Discharge 2 Pressure Alarm	High Discharge 2 Pressure Trip
Discharge #2 Pressure >= High Discharge Pressure Alarm Setpoint 1 / Setpoint 2	Discharge #2 Pressure >= High Discharge Pressure Alarm Setpoint 1 / Setpoint 2	Discharge #2 Pressure >= High Discharge Pressure Alarm Setpoint 1 / Setpoint 2	Discharge #2 Pressure >= High Discharge Pressure Trip Setpoint 1 / Setpoint 2

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running

High Discharge #2 Temperature:

Below Messages will be displayed on Main Screen when Discharge #2 Temperature value rises above configured setpoints. Refer Figure 6- 2 for Alarm & Trip setpoints.

These safeties will be only active if below two conditions are met:

1) When No. of Cylinders set in Configuration screen is “12 cyl” or “16 cyl”.

2) High Discharge Temp Bypass Timer is lapsed.

High Discharge 2 Temperature Warning	High Discharge 2 Temperature Inhibit	High Discharge 2 Temperature Alarm	High Discharge 2 Temperature Trip
Discharge #2 Temperature >= High Discharge Temperature Alarm Setpoint	Discharge #2 Temperature >= High Discharge Temperature Alarm Setpoint	Discharge #2 Temperature >= High Discharge Temperature Alarm Setpoint	Discharge #2 Temperature >= High Discharge Temperature Trip Setpoint

Remote Comm. Time-out:

Below Messages will be displayed on Main Screen when there is no remote communication to the MicroVission for time as set in Compressor Failure Detect Timer. Refer Timers screen for setpoint.

Remote Comm. Time-out Alarm will be only monitored if “Revert to Local Control” option is set for On Communication Failure setting in Configuration screen.

Remote Comm. Time-out Trip will be only monitored if “Stop Compressor with Trip” option is set for On Communication Failure setting in Configuration screen.

		Remote Comm Time out Alarm	Remote Comm Time out Trip
		Remote Comm. Inactive Time >= Compressor Failure Detect Timer	Remote Comm. Inactive Time >= Compressor Failure Detect Timer

Compressor Interlock:

Below message will be displayed on Main Screen in following cases:

1) When Motor Auxiliary Contact Fails to Close during Compressor Start.

2) When Motor Auxiliary Contact Opens when Compressor is Running.

	Compressor Interlock Inhibit		Compressor Interlock Trip
	Motor Auxiliary Contact Fails to Close when Compressor is Starting		Motor Auxiliary Contact Opens when Compressor is Running

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running
High Level Shutdown: Below messages will be displayed when power is removed from the input module. High Level Shutdown switch is wired to the digital input normally closed. Usually connected to a float switch on a vessel containing liquid refrigerant. In case of multiple switches, any open switch will generate a relevant message depending on compressor operating mode. When "Idle Time Trip" checkbox is enabled in Configuration screen, High Level Shutdown Trip will be monitored even when compressor is idle.			
High Level Shutdown Warning	High Level Shutdown Inhibit		High Level Shutdown Trip
High Level Shutdown Digital Input is Active Low	High Level Shutdown Digital Input is Active Low during Compressor Start		High Level Shutdown Digital Input is Active Low while Compressor is Running
Starter: Below message will be displayed on Main Screen when Motor Auxiliary Contact Fails to Open after Compressor shutdown.			
			Starter Shutdown Trip
			Motor Auxiliary Contact is Closed after Compressor is Stopped
False Start: Below message will be displayed on Main screen in following cases when Compressor is Idle. 1) Motor Auxiliary Contact is Closed. 2) Measured Motor Current Value is greater than Maximum Load Rating in Amperes.			
			False Start
			Motor Auxiliary Contact is Closed OR Motor Amperage > 20 % Maximum Amps

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running
IO Comm.: Below message will be displayed on Main Screen when there is problem in Serial Modbus Communication between IO Boards & MicroVission SBC Board.			
			I/O Comm Trip
			Problem found in Communication between SBC & IO Boards
Low Oil Level: Below messages will be displayed on Main Screen if Low Oil Level Digital Input is found Active Low. Low Oil Level Trip will be only active when “Oil Level Trip” checkbox is enabled in Configuration screen.			
Low Oil Level Warning	Low Oil Level Inhibit	Low Oil Level Alarm	Low Oil Level Trip
Low Oil Level Digital Input is Active Low	Low Oil Level Digital Input is Active Low	Low Oil Level Digital Input is Active Low >= Low Oil Level Alarm Delay Time	Low Oil Level Digital Input is Active Low >= Low Oil Level Trip Delay Time
Low Discharge Pressure: Below Messages will be displayed on Main Screen when there is a failure while reading Discharge Pressure value from Measuring Instrument. There is no user configured setpoint.			
Low Discharge Pressure Warning	Low Discharge Pressure Inhibit		Low Discharge Pressure Trip
Discharge Pressure <= -66.5 Psig	Discharge Pressure <= -66.5 Psig		Discharge Pressure <= -66.5 Psig
Low Discharge Temperature: Below Messages will be displayed on Main Screen when there is a failure while reading Discharge Temperature value from Measuring Instrument. There is no user configured setpoint.			
Low Discharge Temperature Warning	Low Discharge Temperature Inhibit		Low Discharge Temperature Trip
Discharge Temperature <= -100 °F	Discharge Temperature <= -100 °F		Discharge Temperature <= -100 °F

Warnings	Inhibits	Alarms	Trips
Not Running (Idle)	Pre-Start	Running	Running
Low Oil Filter In Pressure: Below Messages will be displayed on Main Screen when there is a failure while reading Filter Inlet Pressure value from Measuring Instrument. There is no user configured setpoint.			
Low Oil Filter In Pressure Warning	Low Oil Filter In Pressure Inhibit		Low Oil Filter In Pressure Trip
Filter Inlet Pressure <= -66.5 Psig	Filter Inlet Pressure <= -66.5 Psig		Filter Inlet Pressure <= -66.5 Psig
Low Oil Filter Out Pressure: Below Messages will be displayed on Main Screen when there is a failure while reading Filter Outlet Pressure value from Measuring Instrument. There is no user configured setpoint.			
Low Oil Filter Out Pressure Warning	Low Oil Filter Out Pressure Inhibit		Low Oil Filter Out Pressure Trip
Filter Outlet Pressure <= -66.5 Psig	Filter Outlet Pressure <= -66.5 Psig		Filter Outlet Pressure <= -66.5 Psig
Low Discharge #2 Pressure: Below Messages will be displayed on Main Screen when there is a failure while reading Discharge 2 Pressure value from Measuring Instrument. There is no user configured setpoint. These safeties will be only active when No. of Cylinders set in Configuration screen is “12 cyl” or “16 cyl”.			
Low Discharge 2 Pressure Warning	Low Discharge 2 Pressure Inhibit		Low Discharge 2 Pressure Trip
Discharge 2 Pressure <= -66.5 Psig	Discharge 2 Pressure <= -66.5 Psig		Discharge 2 Pressure <= -66.5 Psig
Low Discharge #2 Temperature: Below Messages will be displayed on Main Screen when there is a failure while reading Discharge 2 Temperature value from Measuring Instrument. There is no user configured setpoint. These safeties will be only active when No. of Cylinders set in Configuration screen is “12 cyl” or “16 cyl”.			
Low Discharge 2 Temperature Warning	Low Discharge 2 Temperature Inhibit		Low Discharge 2 Temperature Trip
Discharge 2 Temperature <= -100 °F	Discharge 2 Temperature <= -100 °F		Discharge 2 Temperature <= -100 °F

Overview

The Timers screen allows the operator to view and adjust timer settings associated with the compressor operation. There are different types of timers that the operator should be aware of listed below. For Timers Screen pages, see Figures 7-1 & 7-2.

Changeover

The changeover timers will change from one type control to another once the compressor has started and then the time has expired.

Bypass

The bypass timers prevent certain alarm and trip checks from occurring until the compressor has started and then the time has expired.

Delays

The delay timers require the condition to occur for the specified amount of time.

Timers

A general timer requiring the time to be expire before the listed event can occur.

Timer Setpoints

Following are the setpoints that the operator can configure on MicroVission.

Load Increase Start Delay

At compressor startup, the compressor capacity will be at minimum load for this time. This is to allow compressor and system conditions to stabilize. After this timer expires, the system modulates the compressor capacity according to the system demands.

Compressor Interlock Bypass

Once the MicroVission has sent a command to the compressor starter to start, it expects the return signal. This timer defines how much time to wait for that signal before setting a trip condition.

Low Oil Pressure Diff. Bypass

This is the time for which the “Low Oil Pressure” safety setpoints will remain inactive. After the timer has expired, the “Low Oil Pressure” safety setpoints will become active and safeties related to “Low Oil Pressure” will get monitored.

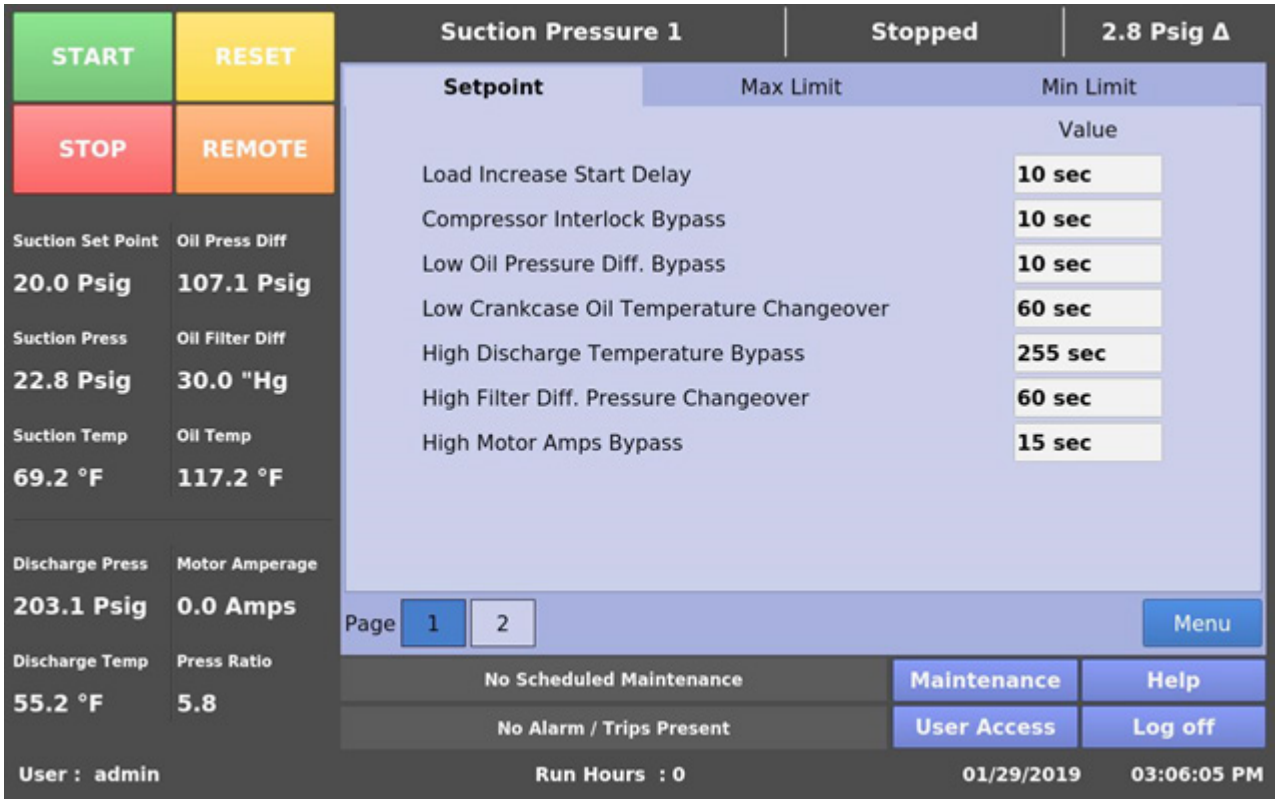


Figure 7-1. Timers Screen (Page 1)

Low Crankcase Oil Temperature Changeover

This is the time for which the "Low Crankcase Oil Temperature – Start" safety setpoints will remain active. After the timer has expired, the "Low Crankcase Oil Temperature – Start" safety setpoints will become inactive and the "Low Crankcase Oil Temperature – Run" safety setpoints will become active.

High Discharge Temperature Bypass

This is the time for which the "High Discharge Temperature" safety setpoints will remain inactive. After the timer has expired, the "High Discharge Temperature" safety setpoints will become active and safeties related to "High Discharge Temperature" will get monitored.

High Filter Diff. Pressure Changeover

This is the time for which the "High Filter Diff. Pressure – Start" safety setpoints will remain active. After the timer has expired, the "High Filter Diff. Pressure – Start" safety setpoints will become inactive and the "High Filter Diff. Pressure – Run" safety setpoints will become active.

High Motor Amps Bypass

Starting motors can typically pull much more than current than its rated full load amps for a short time. This timer ignores that sudden inrush of current for the specified time.

Communication Failure Detect Timer

This timer forces the compressor to wait for the set time before displaying "Remote Comm Timeout" Alarm or "Remote Comm Time-out" Trip when there is no remote communication to MicroVission for the configured time.

True Anti-Recycle Timer

Once the compressor turns off, this timer will keep the compressor OFF for the time set in this setpoint. This timer is used to prevent short cycling of the compressor.

NOTE

The operator will be able to modify True Anti-Recycle Timer setpoint only if "True" option is set for Anti-Recycle setting in the Configuration screen.

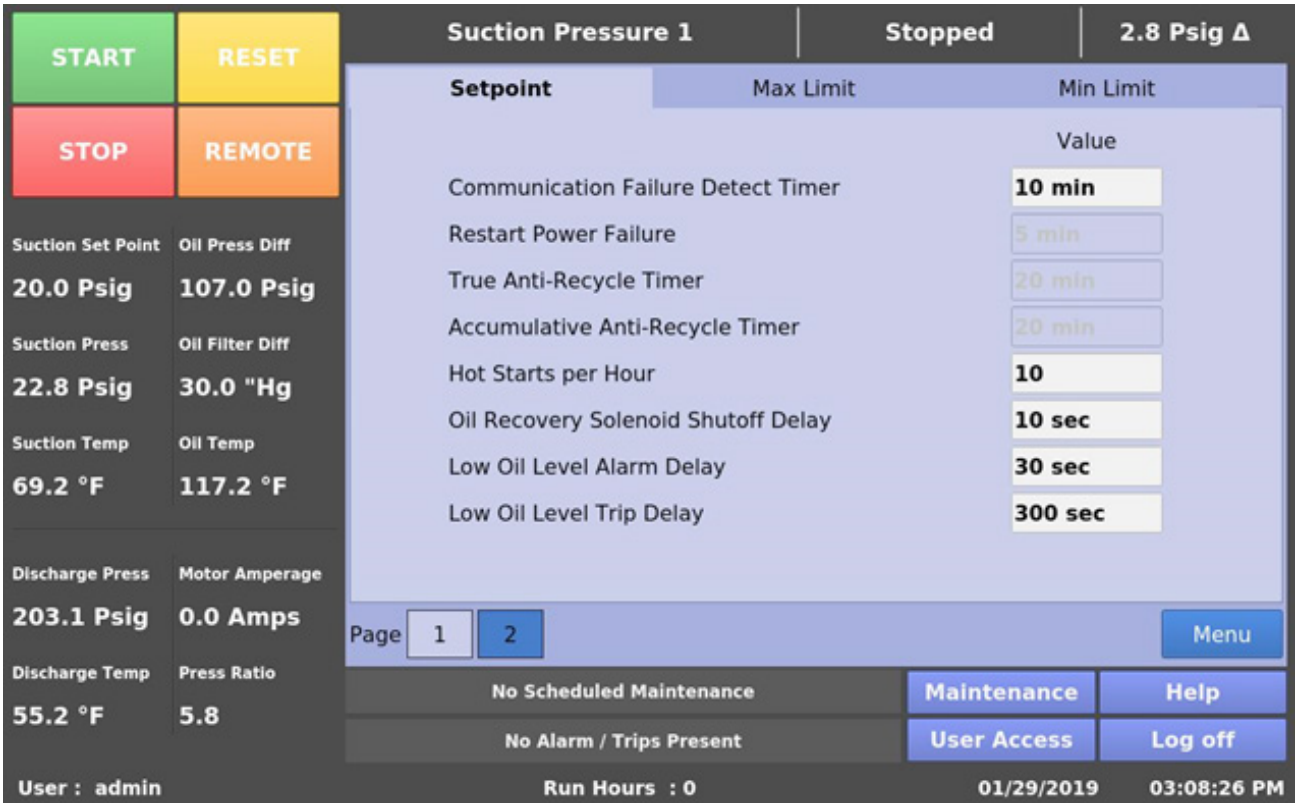


Figure 7-2. Timers Screen (Page 2)

Accumulative Anti-Recycle Timer

This timer forces a specified time between the consecutive compressor starts. When the compressor starts, this timer resets the time and starts accumulating the running time. Once the compressor shuts down, it will not be allowed to restart for the remainder of time left on the Accumulative Anti-Recycle Timer. Unlike the True Anti-Recycle Timer, if the compressor has run for the entire time of the Accumulative Anti- Recycle Timer and then if compressor shuts down, the compressor will be allowed to restart immediately.

NOTE

The operator will be able to modify Accumulative Anti-Recycle Timer setpoint only if "Accumulative" option is set for Anti-Recycle setting in the Configuration screen.

Hot Starts per Hour

This counter will count the number of compressor starts in an hour. This counter will reset only when the time between two compressor starts is at least an hour. If in an hour's time, counter reaches to its set value, then the compressor will not be allowed to start until an hour is complete from the time when the counter was last reset. This counter allows consecutive compressor starts, but once the counter reaches to the set value, it requires a one-hour window between compressor starts for the counter to reset.

NOTE

The operator will be able to modify Hot Starts per Hour setpoint only if "Hot Starts" option is set for Anti-Recycle setting in the Configuration screen.

Oil Recovery Solenoid Shutoff Delay

This is the time for which Oil Recovery Solenoid Digital Output will remain ON when the state of Low Oil Level Digital Input is changed from Active Low to Active High. When this timer expires, the state of Oil Recovery Solenoid Digital Output will change to OFF.

Low Oil Level Alarm Delay

This is time for which "Low Oil Level Alarm" will not be generated once "Low Oil Level" Digital Input is found Active Low. If state of "Low Oil Level" Digital Input remains Active Low continuously for this time, then alarm condition will be generated and "Low Oil Level Alarm" message will be displayed on the Main screen.

Low Oil Level Trip Delay

This is time for which "Low Oil Level Trip" will not be generated once "Low Oil Level" Digital Input is found Active Low. If state of "Low Oil Level" Digital Input remains Active Low continuously for this time, then trip condition will be generated and "Low Oil Level Trip" message will be displayed on the Main screen.

NOTE

The operator will be able to detect and see "Low Oil Level Trip" message on Main screen only if "Oil Level Trip" checkbox is Enabled in the Configuration screen

Overview

The Instrument Calibration screen allows the operator to define how the MicroVission will interpret the signal from any devices connected to panel's analog inputs. The Instrument Calibration screen is organized in four pages. Each page is then divided into individual tabs for every device.

I/O

Each tab has this section that provides basic information for that device.

A/D bit Value

This field displays the actual value read by MicroVission analog to digital convertors. This value is unaffected by any changes to the calibrations settings. If a device is connected to the associated input, there will be some value displayed in this field.

Calibrated Value

This field displays the calibrated value which is the result of the calibration process. Calibrated value for Pressure & Temperature values will be displayed in pressure / temperature unit as configured in Configuration Screen.

All instruments are calibrated using a two-point linear calibration process. Any device that has a non-linear response to environmental stimuli will not be able to be calibrated through the MicroVission.

Pressure & Temperature Inputs

The most commonly used Instruments are pressure and temperature sensors. The first two pages of the Instrument Calibration Screen are dedicated to these Instruments; see Figure 8-1 up to Figure 8-12.

Each tab on these two pages are divided into two sections, Device Calibration and Channel Calibration.

Devices Calibration

The Device Calibration section is where the operation parameters of the Instrument are defined.

Default Devices

By selecting this option, the operator will have access to several common devices via a drop-down list. The devices are predefined and if one is selected, then all the setpoints will be set for the operator.

Custom Device

This option allows the operator to choose the minimum and maximum value of the Instrument being used.

The Instrument Calibration screen provides a set of ranges for default devices. You must select an appropriate range to calibrate the sensor. If you do not find a correct range, you can specify the custom range.

Based on the calibration range that you select or specify, the MicroVission displays the calibrated value. This calibrated value of the respective analog input is also shown on the Main screen.

Channel Calibration

The Channel Calibration section defines the type of signal sent by the Instrument.

Offset

Once the two-point calibration is completed, it is common for a small error to exist. By entering the value of the error from the calibrated value and the actual value into the "Adjustment" entry box, that error will be added/subtracted from the "Total Offset". The offset is applied to the calibrated value which should correct the error.

Range

This option is available when the "Custom Device" option is selected. Here the operator defines the signal type and range transmitted by the Instrument. The operator can select from several predefined ranges in the drop-down list or enter a value.

Analog Inputs – Pressure

On the Instrument Calibration Screen Page 1, the operator can calibrate following pressure sensors:

- Suction Pressure
- Discharge Pressure
- Oil Pressure
- Filter In
- Filter Out

Figure 8-1. Instrument Calibration Screen Page 1 – Analog Inputs (Suction Pressure)

Figure 8-2. Instrument Calibration Screen Page 1 – Analog Inputs (Discharge Pressure)

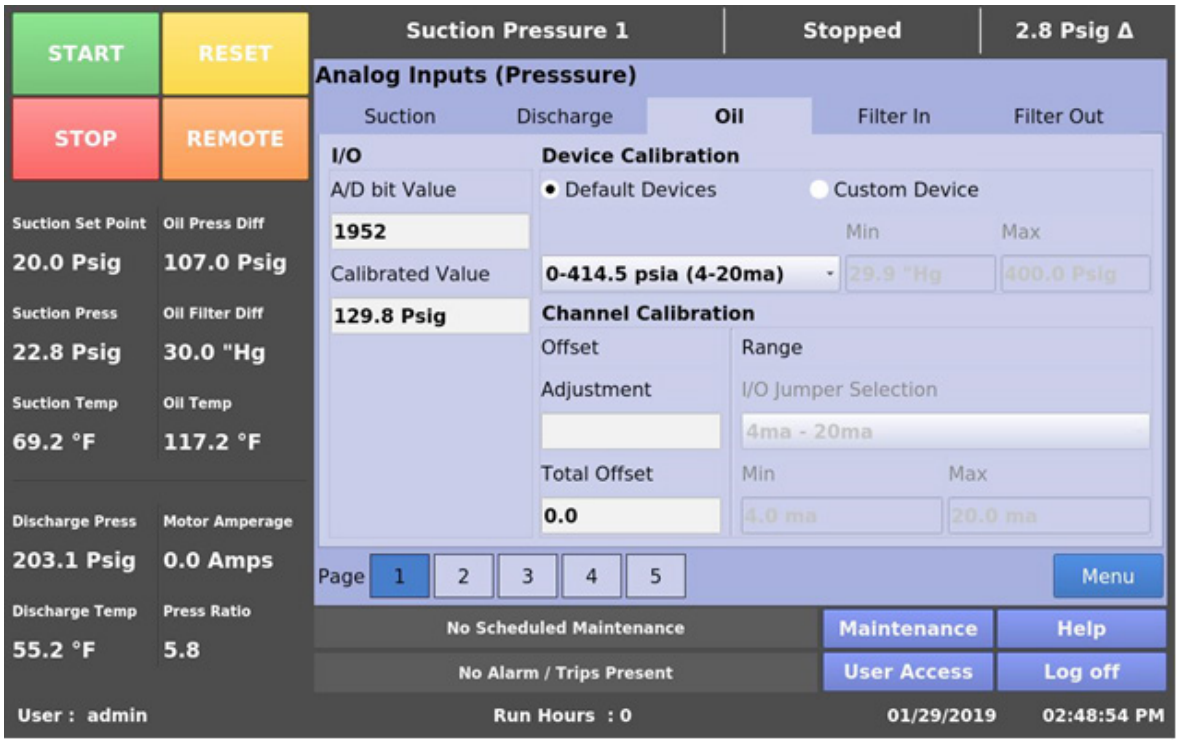


Figure 8-3. Instrument Calibration Screen Page 1 – Analog Inputs (Oil Pressure)

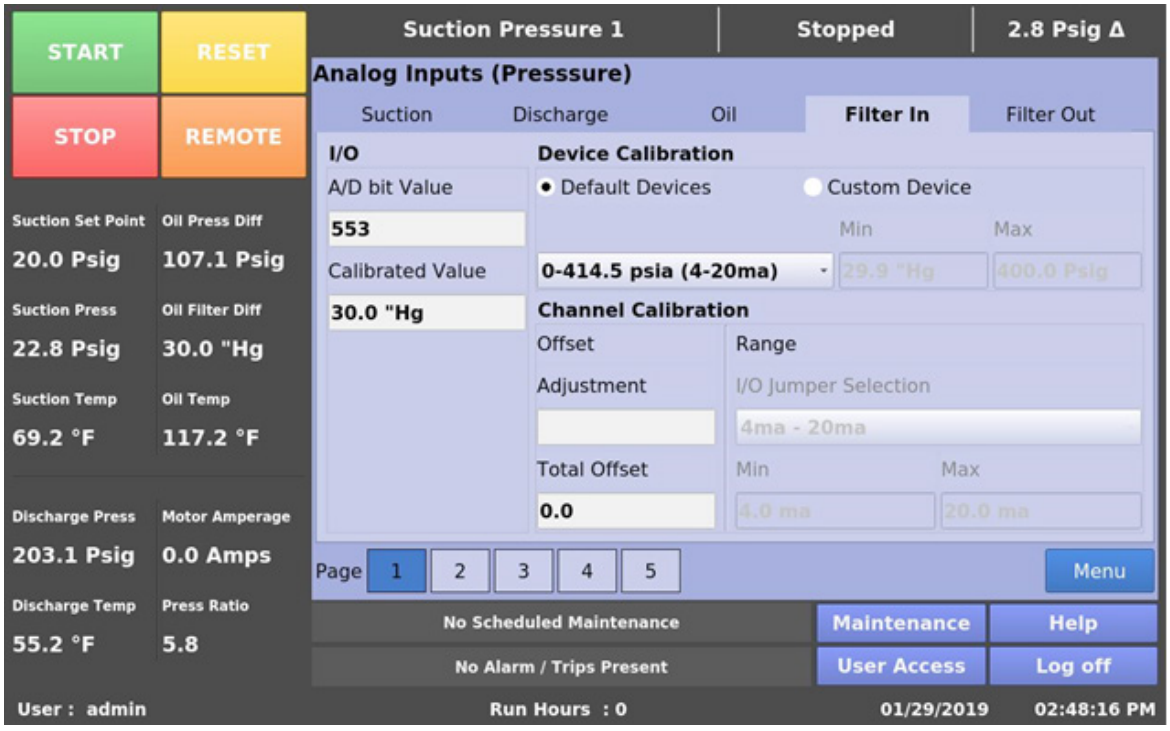


Figure 8-4. Instrument Calibration Screen Page 1 – Analog Inputs (Filter In Pressure)

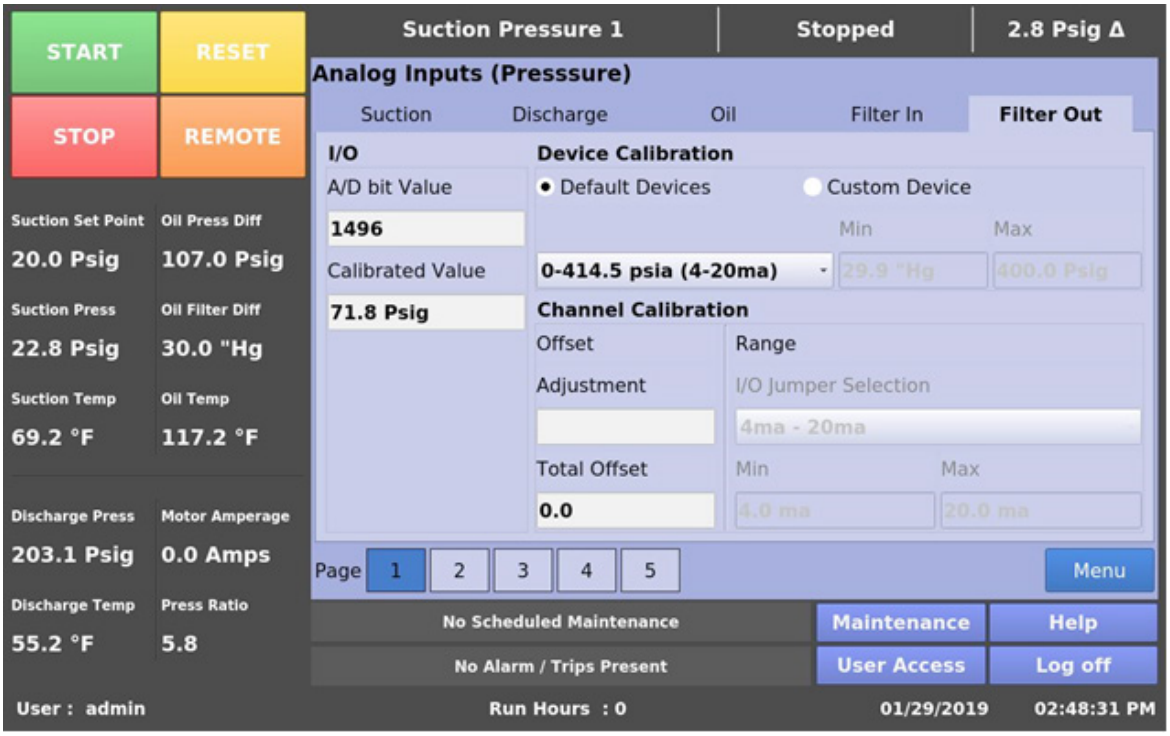


Figure 8-5. Instrument Calibration Screen Page 1 – Analog Inputs (Filter Out Pressure)

Analog Inputs – Temperature

On the Instrument Calibration Screen Page 2, the operator can calibrate following temperature sensors.

- Suction Temperature
- Discharge Temperature
- Oil Temperature

Figure 8-6. Instrument Calibration Screen Page 2 – Analog Inputs (Suction Temperature)

Figure 8-7. Instrument Calibration Screen Page 2 – Analog Inputs (Discharge Temperature)

Figure 8-8. Instrument Calibration Screen Page 2 – Analog Inputs (Oil Temperature)

Analog Inputs

Page 3 of Instrument Calibration Screen is dedicated to instruments used for Motor Current and Process Control.

Motor Current

The MicroVission measures the motor current value using the 4-20 mA signal transmitted from the external device.

The calibration process for Motor Current is slightly different from all other calibration procedures. The motor current must be calibrated while the compressor is running at close to full amps as much as possible. In addition, the operator will need a value into the “Enter Desired Value” entry box that is equal to the measured value in amps by a calibrating measurement device. After entering the measured value, the displayed motor current in “Calibrated Value” field may still be off slightly. In this case re-enter the desired value and the displayed value should get progressively closer.

4-20mA Scale

- 4mA: Not editable by the operator. Defines the minimum value in Amps represented by 4mA input..
- 20mA: Defines the maximum value in Amps that represented by 20mA input.
- Enter Desired Value: The operator enters the correct current value. Each entry will re-calculate the point slope calculations of the current calibration.
- Total Error: Not editable by the operator. Displays the total error offset of the value from the “Enter Desired Value” setpoint.

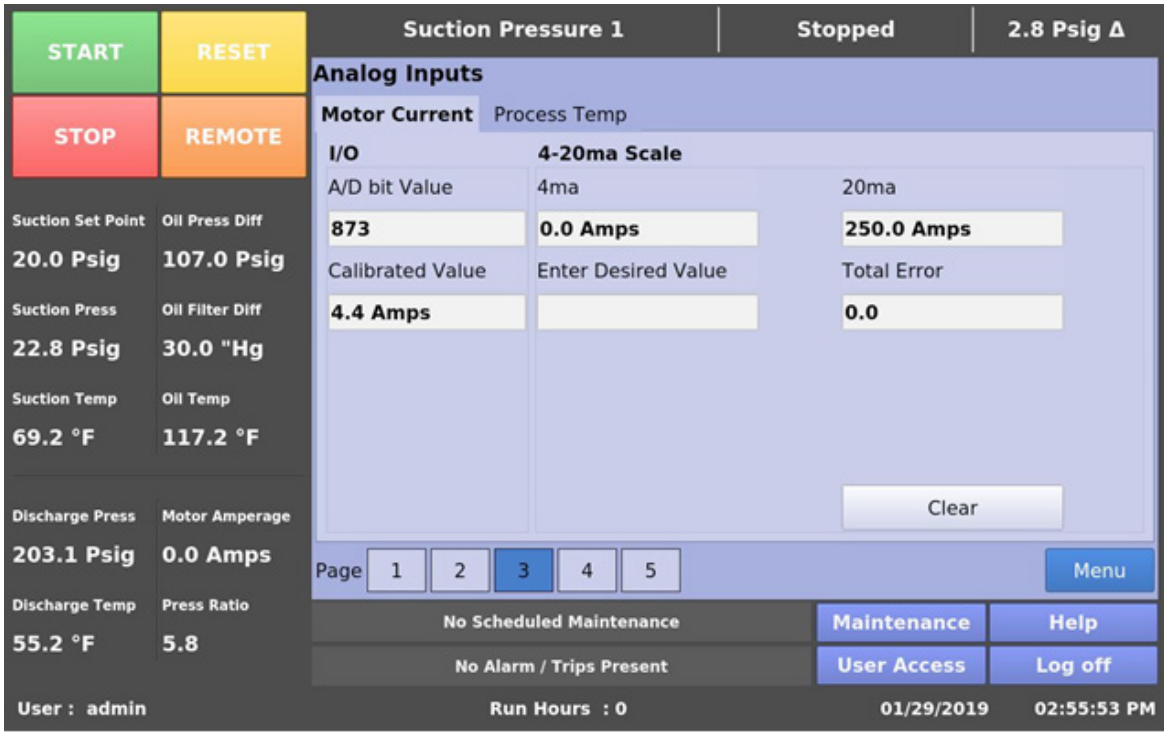


Figure 8-9. Instrument Calibration Screen Page 3 – Analog Inputs (Motor Current)

Process Temperature or Pressure

The Process Control tab on this page will display either Process Temperature or Process Pressure depending on the “Process Control” type selected by the operator in the Configuration screen. For more information, see Configuration section.

The tab is divided into two sections, Device Calibration and Channel Calibration with Default Devices and Custom Device as well as Offset and Range Calibration features as described for the standard Pressure and Temperature Inputs.

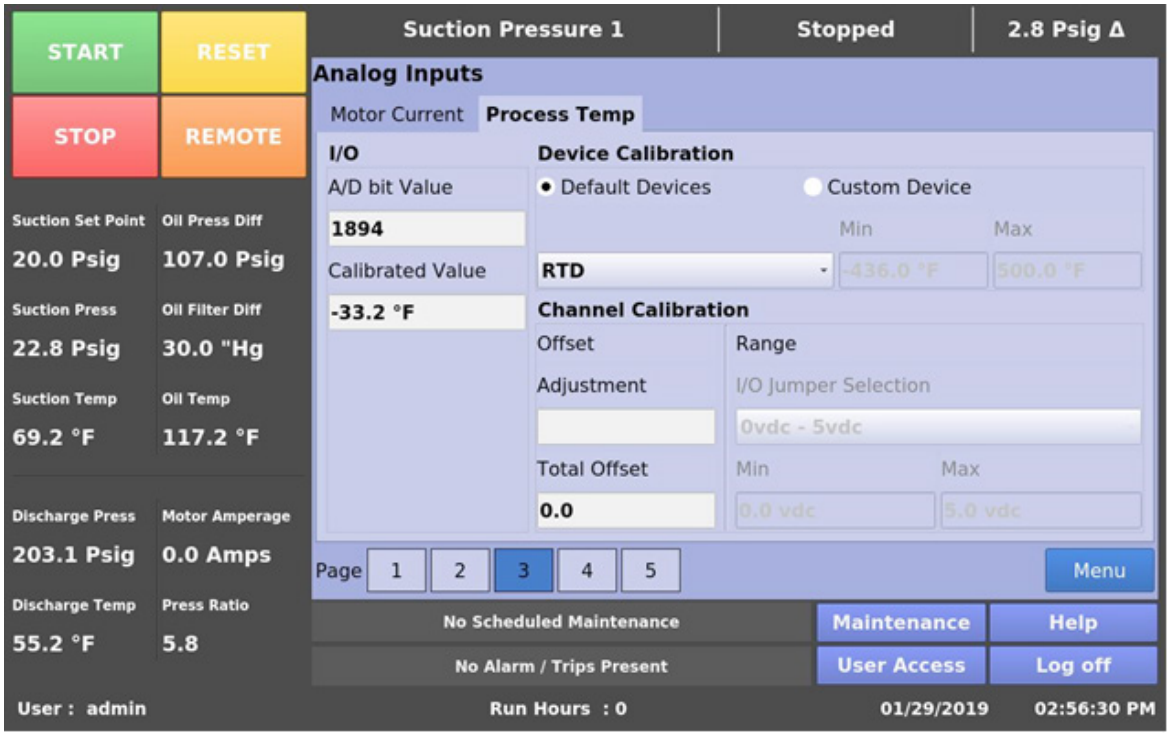


Figure 8-10. Instrument Calibration Screen Page 3 – Analog Inputs (Process Temperature)

Auxiliary Inputs

Page 4 of the Calibration screen allows the operator to define the parameters of an installed auxiliary analog instrument. These instruments are usually not part of a typical compressor set-up but MicroVission provides a way for the operator to add additional capabilities. The layout of this screen is typical to the pressure and temperature calibration screens.

NOTE

The Discharge 2 Pressure and Temperature tabs will be only visible here if "Analog Input 1" Board is enabled, and as long as the number of cylinders configured is 12 or 16 in the configuration screen.

Device Calibration

These setpoints allow the operator to define what the input from the auxiliary instrument means in terms of unit and range. If a temperature measuring instrument is connected, then the operator would select temperature from the "Units" dropdown box then set the minimum and maximum value for the scale.

Channel Calibration

The Channel Calibration section defines the type of signal sent by the Instrument.

- Offset: Once the two-point calibration is completed, it is common for a small error to exist. By entering the value of the error from the calibrated value and the actual value into the "Adjustment" entry box, that error will be added/subtracted from the "Total Offset". The offset is applied to the calibrated value which should correct the error.
- Range: Here the operator defines the signal type and range transmitted by the Instrument. The operator can select from several predefined ranges in the drop-down list or enter a value.

Figure 8-11. Instrument Calibration Screen Page 4 – Auxiliary Inputs (Discharge 2 Pressure)

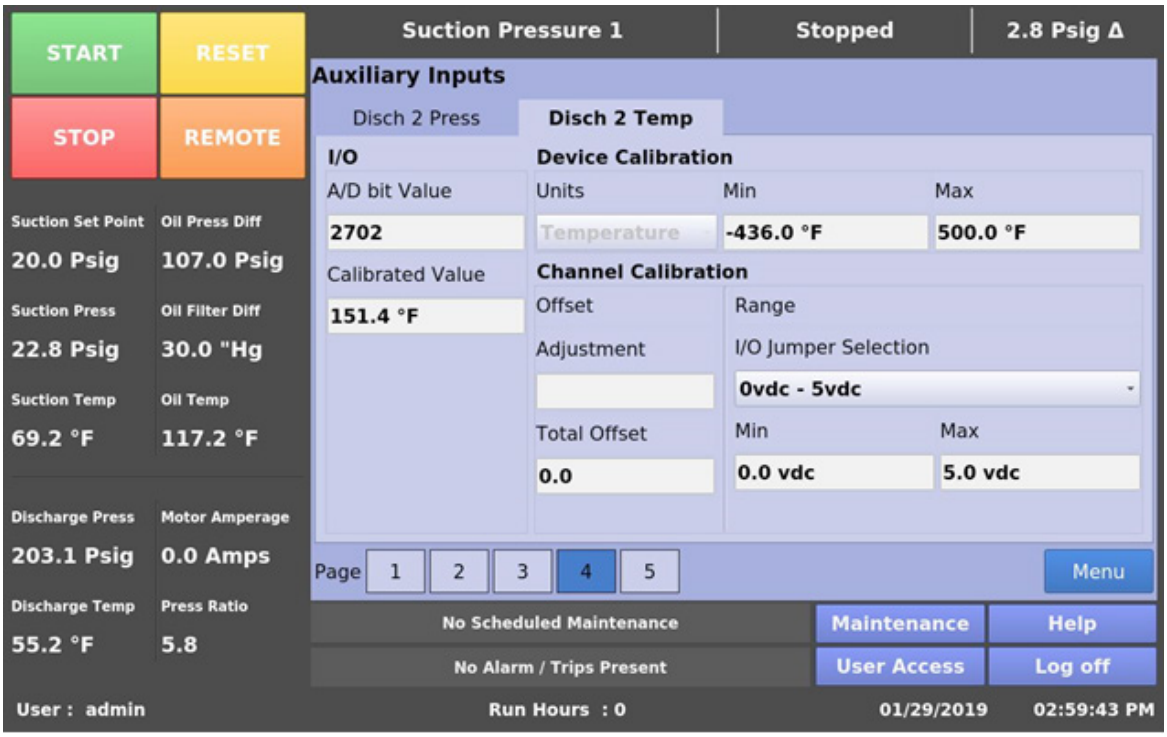


Figure 8-12. Instrument Calibration Screen Page 4 – Auxiliary Inputs (Discharge 2 Temperature)

Analog Outputs

The Analog Outputs are calibrated through Page 5. These MicroVission outputs generate a 4–20mA signal to be fed to any attached devices.

However, it is not uncommon for a small difference in the board components to translate into a small difference in the output. In such cases, this screen offers the operator the ability to fine tune the upper and lower output values, see Figure 8-13.

Test Limits:

- By pressing either the Min or Max buttons, the output will go to either 4mA or 20mA, allowing the operator then to use a multimeter to read the actual output for accuracy.

Min (mA):

- If the 4mA output has an unacceptable amount of error, the operator can add or subtract a value through the Offset (mA) box to adjust the output.

Max (mA):

- If the 20mA output has an unacceptable amount of error, the operator can add or subtract a value through Offset (mA) box to adjust the output.

Offset (mA):

- Entering the value of the error between the calibrated value and the actual value into the Offset entry box, will cause the error to be added to/subtracted from the mA value.
- The offset is applied to the mA value, which should correct the error. The resolution of error should not be under than 0.01.

Apply Changes:

- Min (mA) and Max (mA) values are stored in the database by pressing this button. The Offset (mA) value entered to correct the 4mA or 20mA output is hence not saved until this button is pressed.

Figure 8-13: Instrument Calibration Screen Page 5 – Auxiliary Outputs

Overview

The Event List screen is designed to display the list of all compressor events are arranged in chronological order with the latest event appearing at the top. The information available on the screen helps operator to understand the operation of the compressor and troubleshooting. This screen is divided into four columns and can list up to 128 separate events. The operator can also download the information on the event list through the Data Backup Screen.

Event List Columns

- **Date**: Displays the date of the event in MM/DD/YYYY format.
- **Time**: Displays the time of the event in HH:MM:SS format. The time data displays AM/PM information when 12-hour format is configured in the Configuration screen.
- **Event Type**: Displays the type of message for a listing. The common event types are “Start”, “Stop”, “Trip”, “Inhibit”, “Alarm”, “Info”, and “System”. These helps the operator to understand the meaning of the “Message” column.
- **Message**: The information that describes the event.

The operator can use “Update” button to refresh the event list data when this screen is open, instead of exiting the screen and re-entering to see the latest events data.

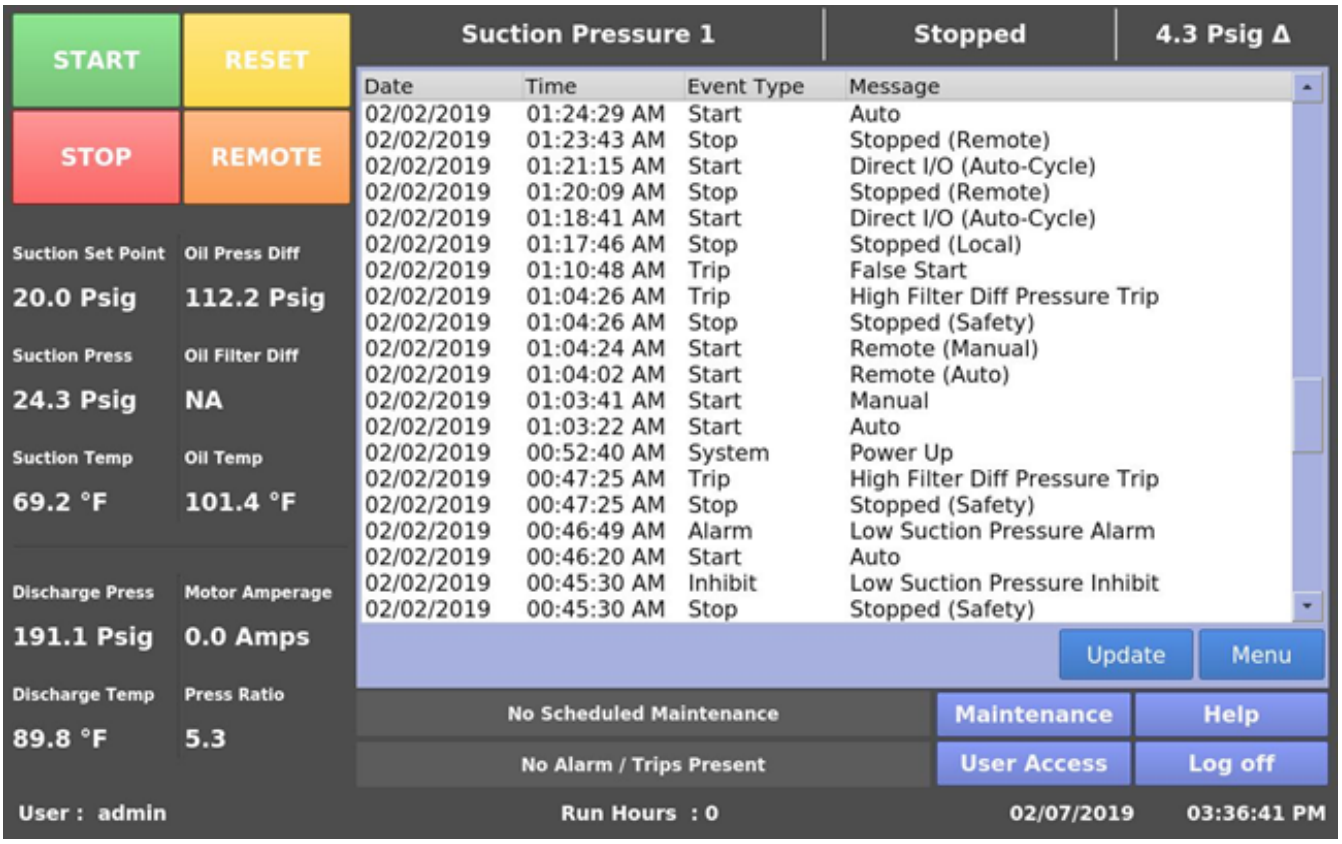


Figure 9-1. Event List Screen

Overview

This screen displays “Live Data” of all the Analog Inputs / Outputs and Digital Inputs / Outputs being monitored. There are three pages of Inputs / Outputs (I/O) available for viewing, see Figures 10-1, 10-2 & 10-3.

This screen also takes a snapshot of all the I/O points when the operator presses on “Freeze Data” button or if the compressor experiences a trip condition. The Freeze page displays the title that indicates whether the Freeze data is saved due to trip condition or “Freeze Data” button was pressed by the operator, see Figures 10-4 & 10-5. Latest Freeze data is shown in Freeze 1 tab. Up to five Freeze pages can be saved. The oldest Freeze page will be removed when more than five Freeze events occur. These freeze events can be downloaded to a USB drive through Data Backup screen.

NOTE

The format in which time is displayed on the Freeze page does not change depending on time format selected in the Configuration screen. Also values for Auxiliary Analog Inputs like Discharge 2 Pressure & Discharge 2 Temperature will be only shown when Analog Input 1 Board is enabled from the Configuration screen, see Figure 10-6.

Figure 10-1. Input/Output States Screen Page 1 - Live I/O Data

Figure 10-2. Input/Output States Screen Page 2 - Live I/O Data

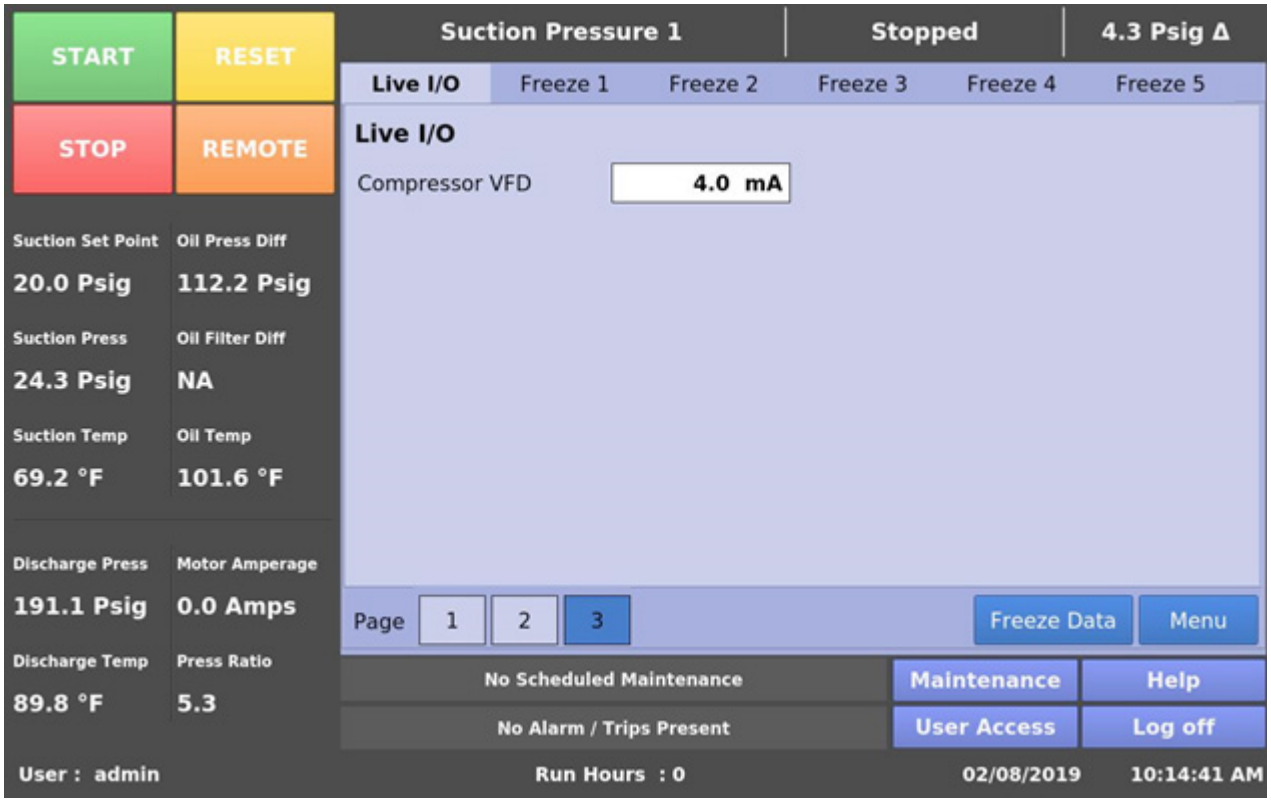


Figure 10-3. Input/Output States Screen Page 3 – Live I/O Data

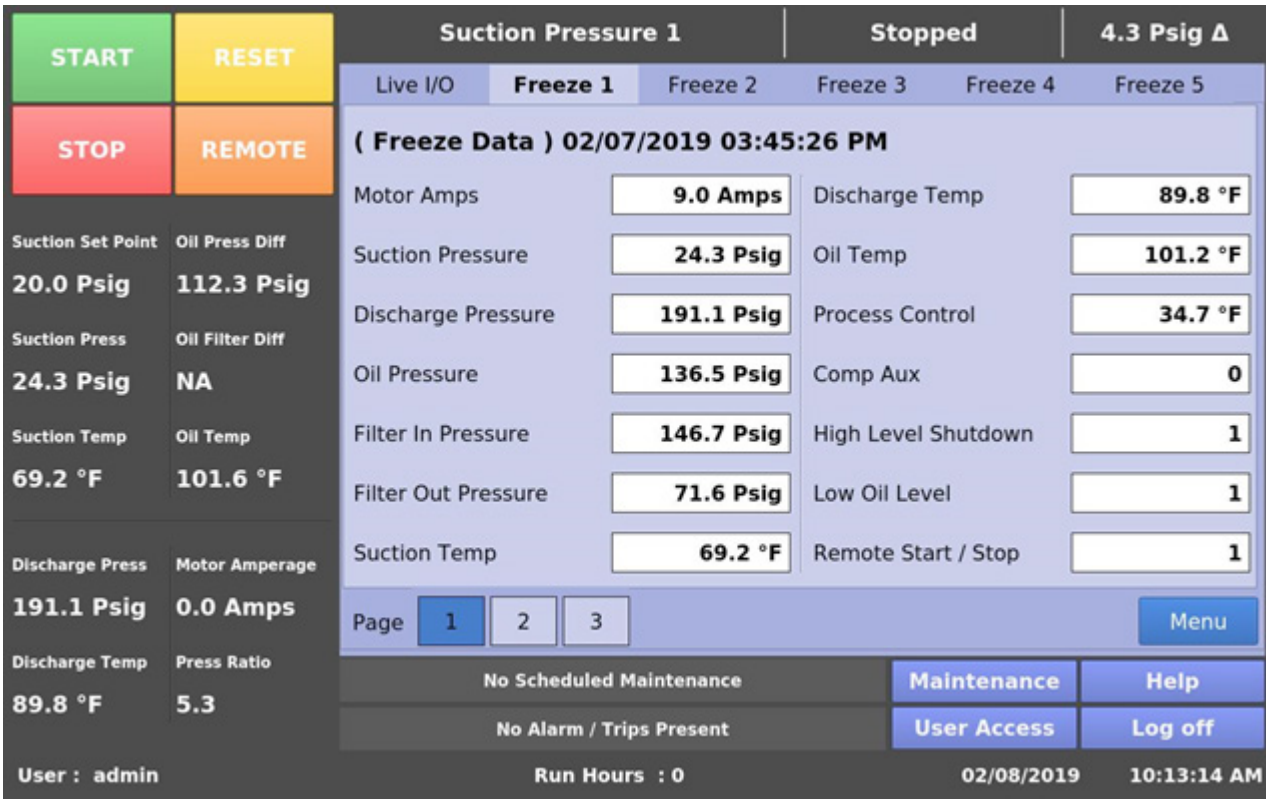


Figure 10-4. Input/Output States Screen - Freeze Data

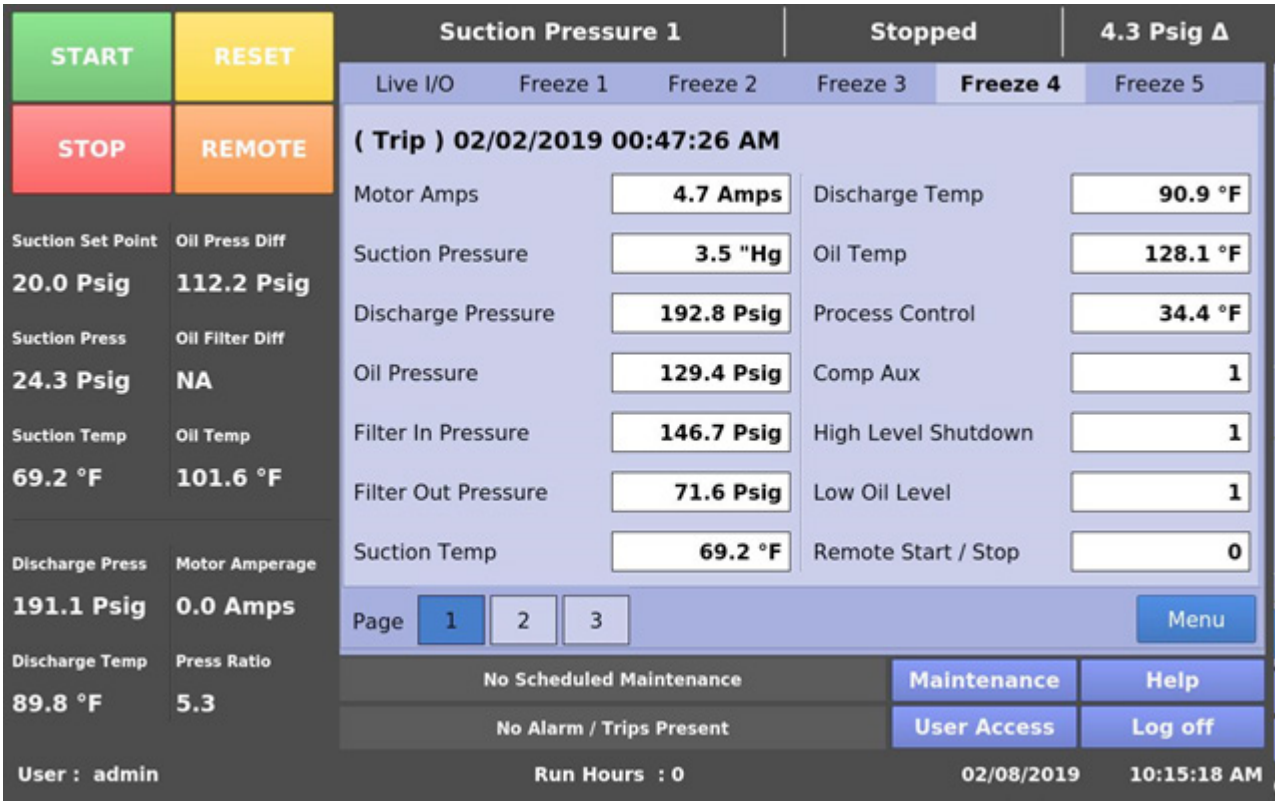


Figure 10-5. Input/Output States Screen - Freeze Data (Trip Condition)

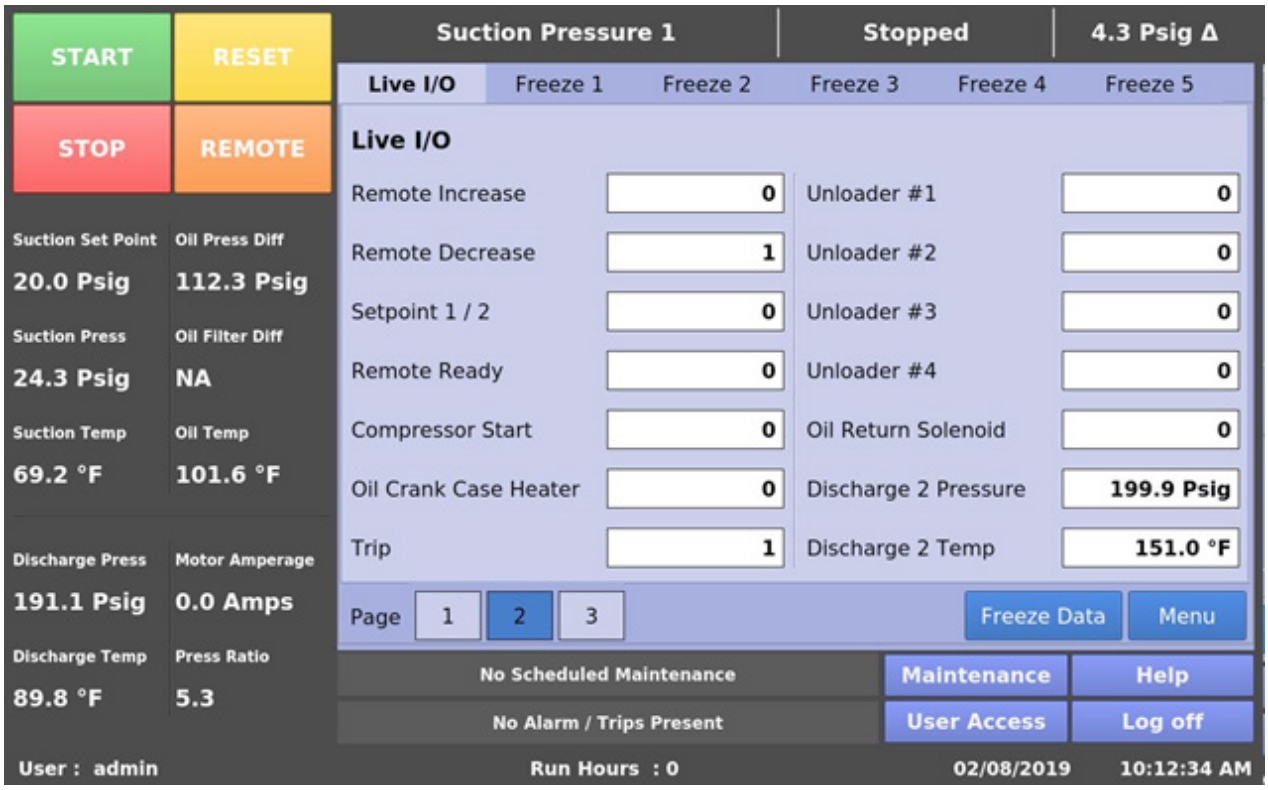


Figure 10-6. Input/Output States Screen – Auxiliary Analog Inputs

Overview

The User Access is the screen where all operators go to log in.

In the MicroVission, each screen has a security level that provides the necessary permissions to the operator, technicians and/or supervisors to modify different sets of setpoints. The MicroVission has four levels of security, see Figure 11-1.

- Level 0 – This is the default level where no operator is logged in. The functions available to the operator are very limited and basically only allows them to start and stop the compressor.
- Level 1 – This is a technician level of access. All the setpoints needed to operate and adjust the performance of the compressor will be available to an operator with this level of access.
- Level 2 – This is a supervisor level of access. Setpoints that require a higher level of knowledge such as calibrating instrument will be available to an operator with this level of access.
- Level 3 – This is considered a contractor level of access. The setpoints available at this level have the most potential of causing damage to the compressor. Therefore, this access is restricted to those only with the highest level of competence.

The User Access screen also provides options to add new operators and modify or delete existing operators. Any operator can add an additional operator but can only add operator of lesser or equal security level.

The MicroVission will be shipped with a Level 3 operator and password pre-assigned to the installing contractor. The contractor can then assign all users with security levels as needed.

The procedure to assign user access levels is to first press the User Access button. The User Access screen will appear with the preassigned level 3 operator name visible within the “Operators” section. Highlight the name, then enter the password associated with that name of the user, then press Enter key to close the keyboard. Then press the “Apply” button. Press the “Manage Accounts” tab to begin the process of entering another Operator name, and assigning password and user level of this additional user. Lastly – remember to press the “Add/Update” button to add this user to the list, then press the “Apply” button before exiting this screen to make this change permanent.

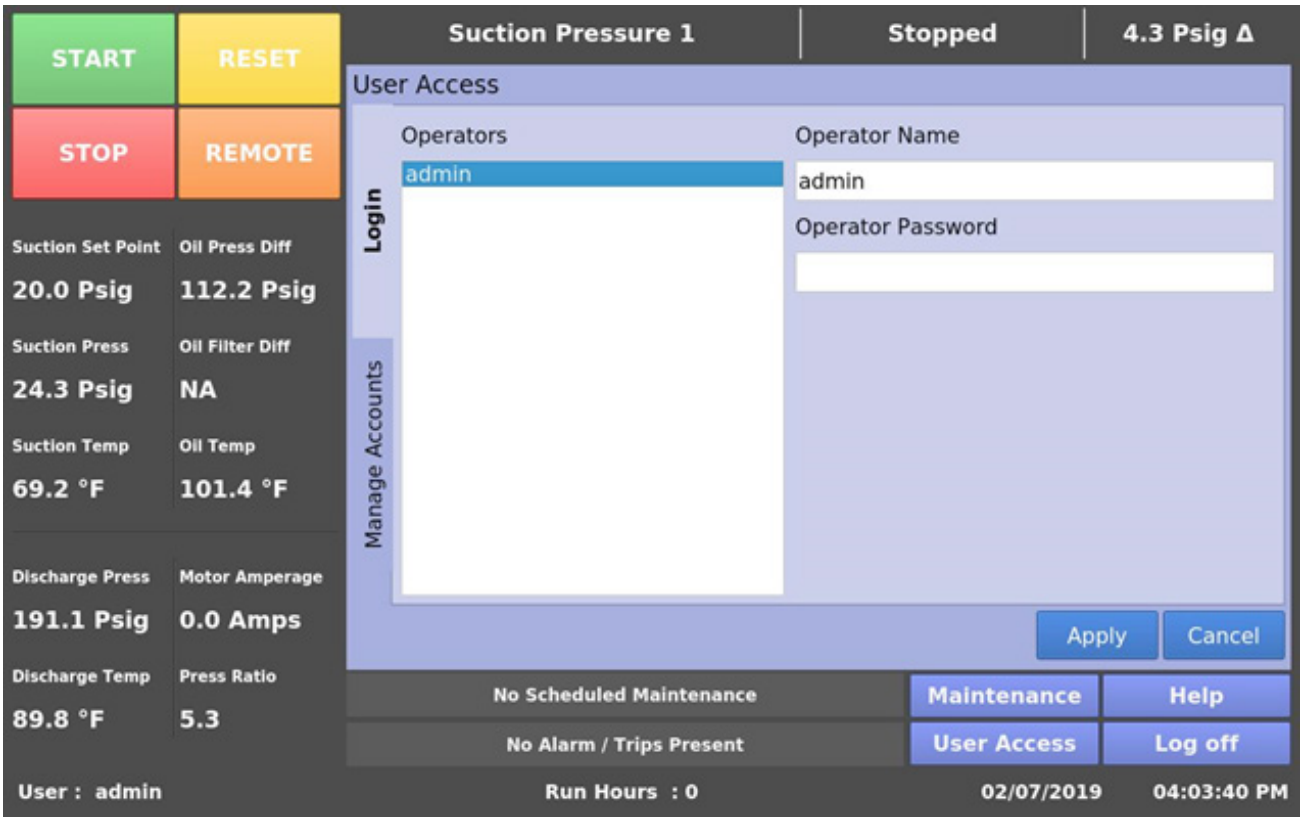


Figure 11-1. User Access Screen - Login

Login

The Login tab is where an operator will enter the username and password to gain access to MicroVisssion screens. If the username and password match with the existing user then the operators name will be applied to the lower status bar and the operator will be given access to screens of equal security level.

Operators

This window displays all operators that have been added to the MicroVisssion user tables. If a name of an operator is selected from this window, the name is added to the “Operator Name” entry box.

Operator Name

This entry box is for the operator’s username. The operator can either select the username from the “Operators” window or enter the username manually by touching the entry box and entering the name via the pop-up keyboard.

Operator Password

This entry box is for operator’s password. The password can be entered by touching the password entry box and entering the password via pop-up keyboard.

Manage Accounts

The Manage Accounts tab allows addition, removal and modification of authorized users. See Figure 11-2.

Operators

This window contains the list of authorized users already added to the MicroVisssion. Selecting a name from this list will add that name to the “Operator Name” entry box.

Operator Name

This entry box is for operator’s username who is to be added, removed or modified. The operator can either select the username from the “Operators” window or enter the username manually by touching the entry box and entering the name via the pop-up keyboard.

Operator Password

This entry box is for the operator’s password. The password can be entered by touching the “Operator Password” entry box and entering the password via the pop-up keyboard.

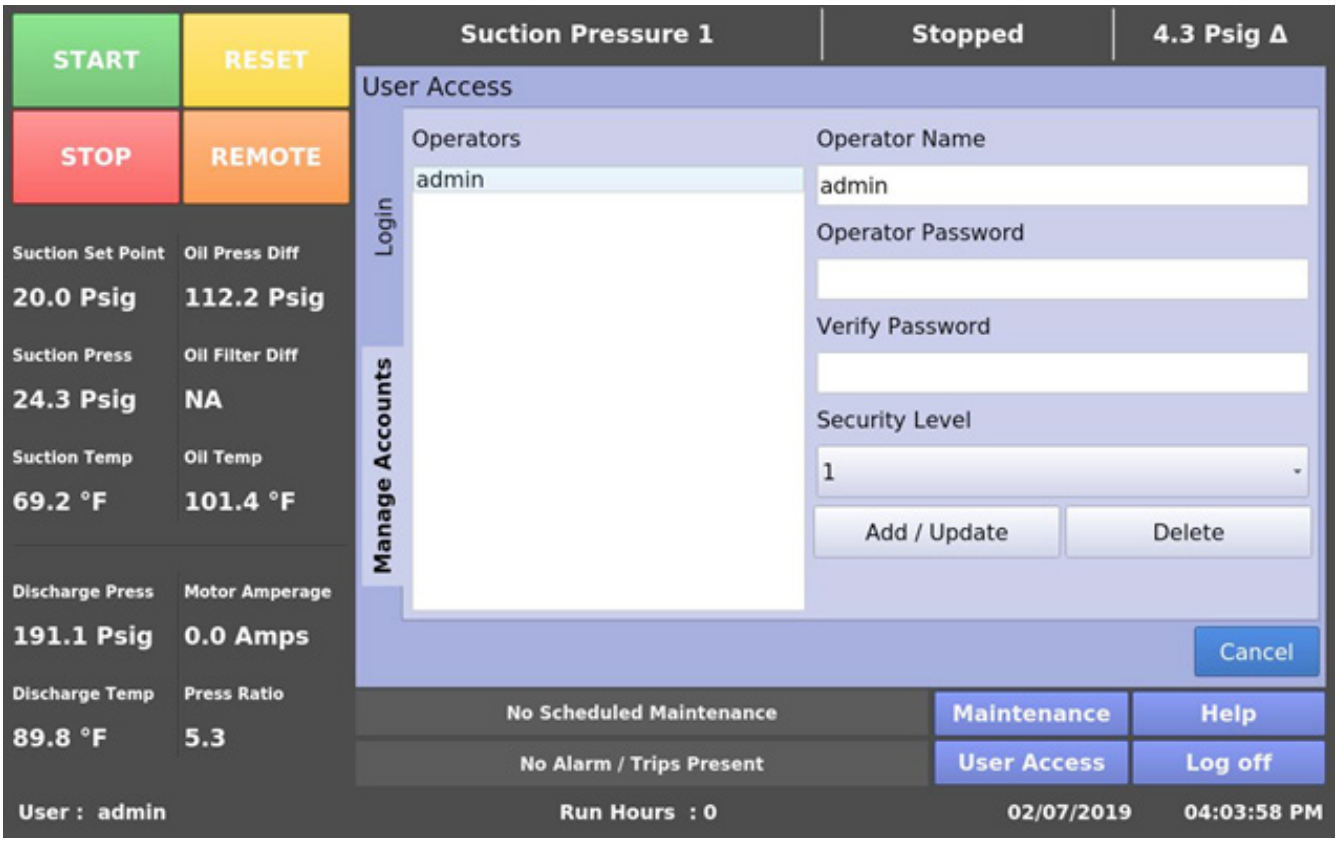


Figure 11-2. User Access Screen - Manage Accounts

Verify Password

This entry box is to verify the operator's password. The password can be entered by touching the "Verify Password" entry box and entering the password via the pop-up keyboard.

Security Level

This drop-down list allows selection of security level for the account being added or modified. Only levels that are equal to or less than the operator's own security level will be shown.

Add / Update

Pressing this button will initiate the creation or modification of the specified account.

Delete

Pressing this button will delete the specified account.

Screen Security Levels

The following table lists all screen and their base security levels, see Table 11-1. Most screens have more than one security level. The base security level gives the user access to the setpoints that can change the performance of the compressor. The secondary security level is typically level 3 and is reserved for those setpoints that require a high level of care and knowledge of the system to make changes safely without damaging the system.

Table 11-1. Security Access Levels

Security Access Levels		
Page	User Level	Note
Event List	Level 0	View
Input/ Output States	Level 0	View/create freeze screen
Trend Chart	Level 0	View/Operate
Help	Level 0	-
Alarms & Trips	Level 1	Level 3 required for constraints
Compressor Scheduling	Level 1	-
Compressor Control	Level 1	Level 3 required for constraints
Maintenance	Level 1	-
Data Back-up	Level 1	Level 3 required to upload data
Instrument Calibration	Level 2	-
Service Options	Level 2	-
Configuration	Level 2	Level 3 required for page 5
Timers	Level 2	Level 3 required for constraints
VNC Account	Level 3	-

Overview

The configuration screen is where most of the MicroVission features are enabled and configured. The initial setup of the MicroVission will generally start here, see Figure 12-1. Based on what is selected, different portions of the MicroVission will be available to the operator.

Units

This section sets how values will be represented throughout the MicroVission program.

Temp. Units

- Drop-down box to select the temperature units from “Fahrenheit” and “Celsius”. Once selected, all screen temperatures will be displayed in the selected units

Press. Units

- Drop-down box to select the pressure units from “Psig”, “Bar” and “Kpa”. Once selected, all screen pressures will be displayed in the selected units.

Run Hours

- Offers the ability to change the compressor run hours. This is typically used when replacing an older micro controller on an existing compressor with a new MicroVission.

No. of Cylinders

- The operator should set appropriate setting as per the compressor connected. This setting informs the control program to properly process the number of analog channels for your compressor. For instance, if 12 or 16 cylinders is selected, then the control program processes a second discharge pressure safety and second discharge temperature safety.

No. of Unloaders

- The operator should set appropriate setting as per the compressor connected. This setting informs the control program to control unloader digital outputs which in turn modulates the capacity of compressor in steps. Each setting option displays the number of unloaders and the unload percentage steps for the compressor. This setting is based on “No. of Cylinders”. For more information about Unloaders, see Appendix: Unloaders.

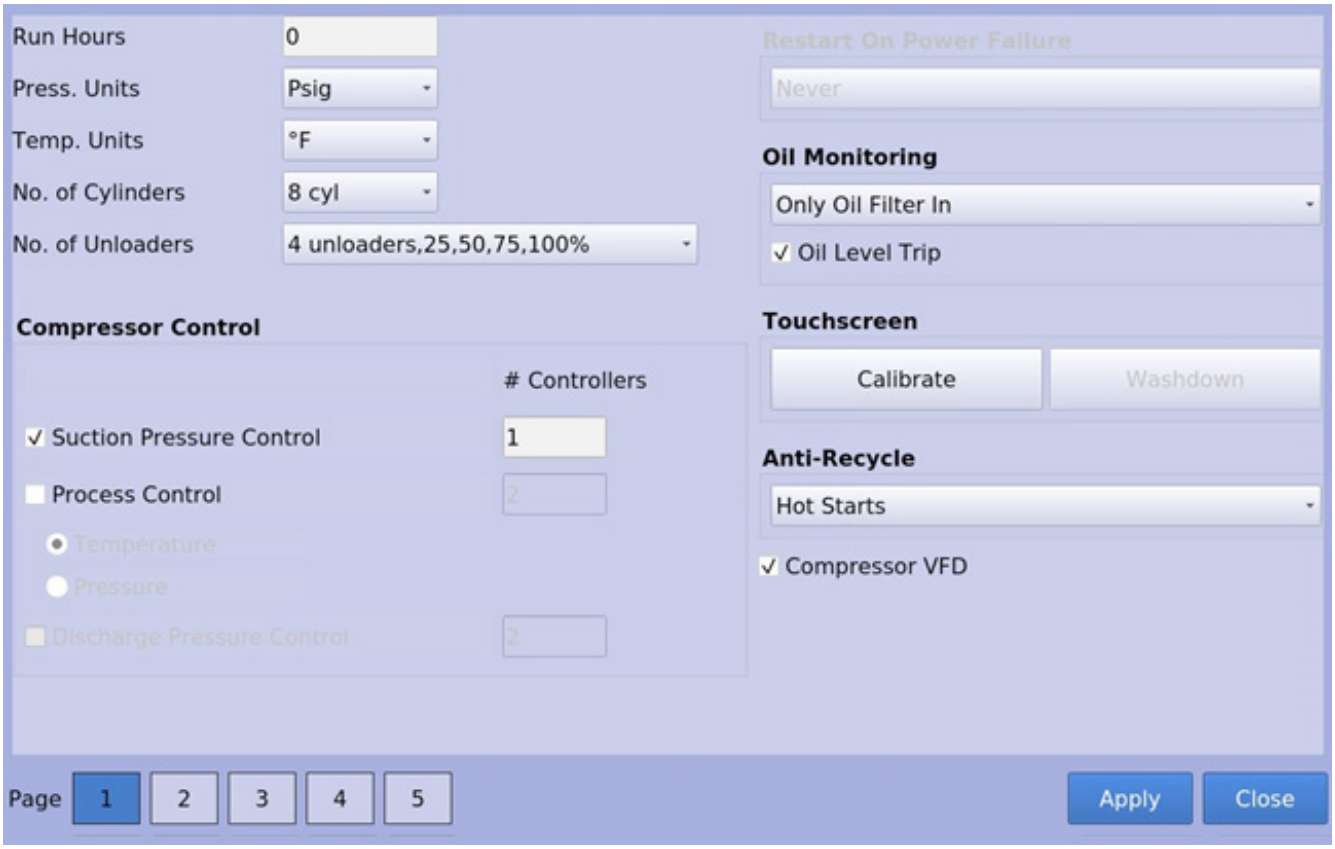


Figure 12-1. Configuration Screen - Initial Setup (Page 1)

Compressor Control Section

Vilter compressors typically run in one of the three control modes: Suction Pressure Control, Process Control or Discharge Pressure Control. Discharge Pressure Control is mutually exclusive with Suction Pressure Control & Process Control. When Discharge Pressure Control is selected, Suction Pressure Control & Process Control are grayed out and cannot be selected. Similarly, if Suction Pressure Control and/or Process Control is selected, Discharge Pressure Control is grayed out and cannot be selected.

- **Suction Pressure Control**: This defines the Suction Pressure input as the process variable and all controls will be based on Suction Pressure. The operator has the option to select up to two controllers where each can have its own set of setpoints.
- **Process Control**: This defines the Process Control input as the process variable and all controls will be based on either Process Temperature or Process Pressure. The operator has the option to select up to two controllers where each can have its own set of setpoints. The operator has to select one of the process control modes, either temperature or pressure as a process variable. Temperature and Pressure options are mutually exclusive.
- **Discharge Pressure Control**: This defines the Discharge Pressure input as the process variable and all controls will be based on Discharge Pressure. The operator has the option to select up to two controllers where each can have its own set of setpoints.

Oil Monitoring

This section provides the options to monitor the Oil Filter related Analog Inputs. The operator will be able to set any of one option related to Oil Filter from below three options:

- **No Oil Filter Monitoring**: When this option is selected, Filter Inlet Pressure & Filter Outlet Pressure inputs will not get monitored. Oil Filter Differential Pressure will not get calculated. Safeties related to "High Filter Differential Pressure" will not be active.
- **Only Oil Filter In**: When this option is selected, Only Filter Inlet Pressure input will get monitored while Filter Outlet Pressure input will not get monitored. Oil Filter Differential Pressure will get calculated as Filter Inlet Pressure minus Oil Manifold Pressure. Safeties related to "High Filter Differential Pressure" will be active and monitored.
- **Oil Filter In and Oil Filter Out**: When this option is selected, both Filter Inlet Pressure input & Filter Outlet Pressure will get monitored. Oil Filter Differential Pressure will get calculated as Filter Inlet Pressure minus Filter Outlet Pressure. Safeties related to "High Filter Differential Pressure" will be active and monitoredBased on the option you select for oil monitoring, the MicroVission Controller displays the warning and trip message for the low oil filter pressure.

You can also select an option to trip the compressor if the oil level drops below the required level.

Oil Level Trip

This checkbox when enabled, allows the operator to monitor "Low Oil Level Trip". When this option is enabled, MicroVission program will monitor state of "Low Oil Level" Digital Input. The digital input will be low when compressor oil level drops below the minimum required level. For more information on monitoring related to safeties, see Timers section.

Touch Screen

The "Calibrate" button puts the screen into calibration mode. Calibration of the touchscreen is only required if the operator finds that the pointer's arrow is not following the finger while trying to operate on the MicroVission screens.

In calibration mode, the operator needs to touch the pointers as shown on the screen starting with the top-left corner. After touching the pointer, next pointer will be shown. The operator need to touch on all four pointers shown on corners of the screen in the given sequence to complete the calibration.

Anti-Recycle

Anti-Recycle defines the method of motor protection due to repeated motor starts. The operator has three options for protection:

- **Hot Starts**: This option will allow only a certain number of compressor starts in an hour before setting the time to the anti-recycle timer. The number of starts to be allowed is set through the "Hot Starts per Hour" setpoint of the Timers screen.
- **True**: This option adds the time to anti-recycle timer once the compressor is shutdown, hence forcing a specific wait time once compressor is stopped and next compressor start. The wait time required is set through the "True Anti-Recycle Timer" setpoint of the Timers screen. The compressor motor cannot be started if there is anti-recycle time left.
- **Accumulative**: This option immediately adds the time to anti-recycle timer once the compressor is started. The time to be added is set through the "Accumulative Anti-Recycle Timer" setpoint of the Timers screen. Unlike the True Anti-Recycle Timer, if the compressor has run for the entire time of the Accumulative Anti-Recycle Timer and then the compressor stops, the compressor will be allowed to restart immediately.

The operator can view anti-recycle time on the Main screen if "Anti-Recycle" option is selected in Configurable Main Screen Settings on Page 4.

Compressor VFD

Enables the compressor motor's VFD option.

Compressor Identification

This section sets the identification for a MicroVission unit.

- **Name**: Unique identifier that is used for all MicroVission units.
- **Panel ID**: Panel Identifier used by controller when communicating with multiple panels.
- **Order Num**: Identifies the Order Number of the purchase of the compressor. This number will be needed if the operator requires help/support from the Vilter.

Date and Time

These section sets the date and time of the MicroVission. Accurate date and time are essential for accurate logging and troubleshooting. Setting these parameters will set the hardware clock embedded in the MicroVission CPU. If the time is not retained after powering down the panel, the operator should check and/or replace the coin style battery on the panel SBC behind the touchscreen.

- **Year**: Entry box to set the current year.
- **Month**: Entry box to set the current month.
- **Day**: Entry box to set the current date.

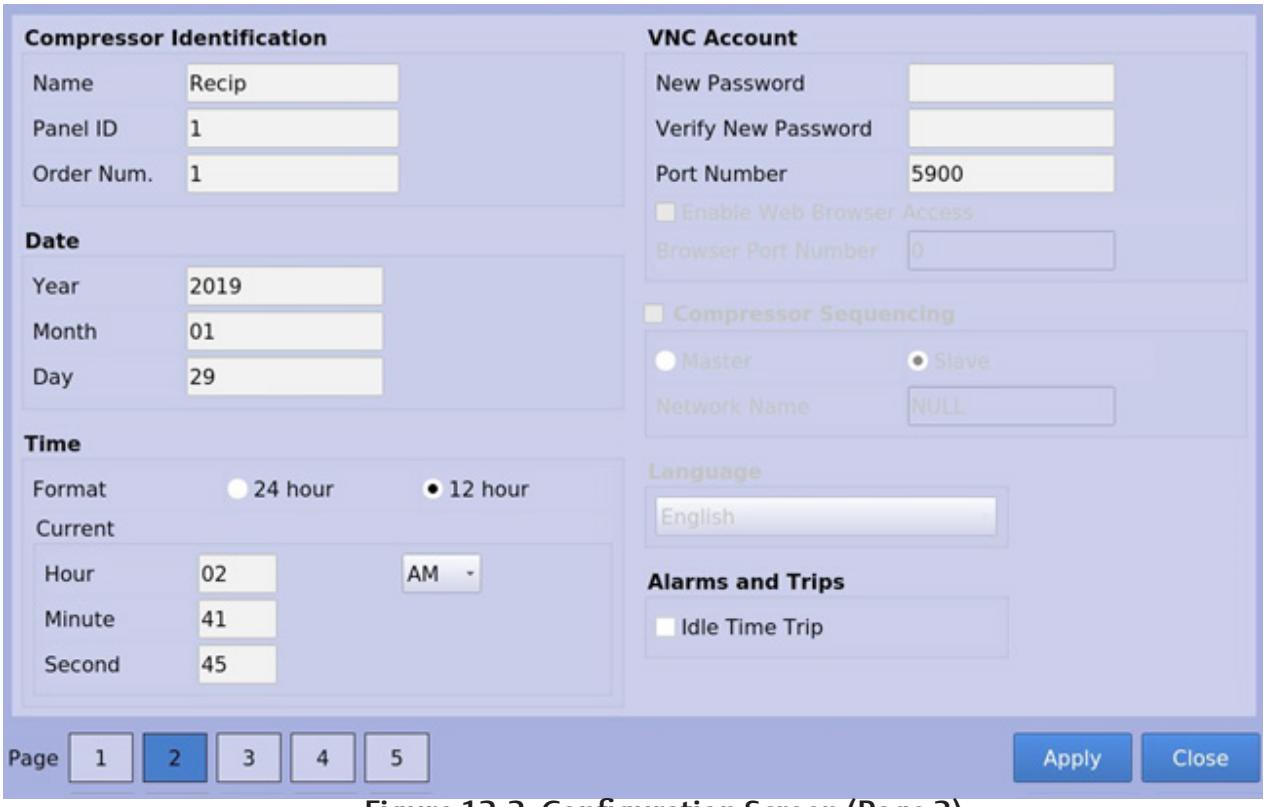


Figure 12-2. Configuration Screen (Page 2)

- **Format**: Selection to choose between 24 hours and 12 hours clock.
- **Hour**: Entry box to set the clock hours. AM or PM drop-down box will be available if the 12 hours format is selected.
- **Minute**: Entry box to set the clock minutes.
- **Second**: Entry box to set the clock seconds.

VNC Account

MicroVission panels can be accessed remotely by using a VNC client over TCP/ IP network. This section allows the operator to change default VNC password and VNC port number. For more information, see Figure 12-2.

- **New Password**: The operator will add the password by touching the entry box and typing the password via the pop-up.
- **Verify New Password**: The operator will re-enter the password by touching the entry box and typing the password via the pop-up keyboard.
- **Port Number**: The operator will change the port number for the VNC server by touching the entry box and typing the port number via pop-up keypad. Default port number is 5900. The operator can assign the port number in the range from 5900 to 6000.

Alarms and Trips

The "Idle Time Trip" checkbox works in conjunction with the "High Level Shutdown" digital input. If checkbox is enabled, when the compressor is in idle state and this digital input is off, the compressor should give a trip message.

Communication

The communication section is the control center for all communications to the MicroVission panel. It is possible to have multiple modes of communications enabled and used. However, only one mode can be used to control the MicroVission, which would be the one selected in the "Active Remote Control" drop-down box.

For a complete list of communication registers, see Appendix B, Communication Table.

Active Remote Control

Select the mode of remote control. The operator any one option from Direct I/O, Ethernet, Serial and None.

Direct I/O

Enables the Direct I/O Inputs. When checkbox is enabled, the operator can select any one Direct I/O option from "Auto Control" and "(Digital) Manual Control".

- **Auto Control**: This option will allow the operator to run compressor in Direct I/O Auto Run Mode. The algorithm will use setpoints of Compressor Control screen for loading & unloading of compressor cylinders.
- **(Digital) Manual Control**: This option will allow the operator to run compressor in Direct I/O Manual Run Mode. The algorithm will monitor the state of "Remote Increase" & "Remote Decrease" Digital Inputs for loading & unloading compressor cylinders respectively. If "Remote Increase" Digital Input is ON & "Remote Decrease" Digital Input is OFF then the compressor will load one step. Similarly, if "Remote Increase" Digital Input is OFF & "Remote Decrease" Digital Input is ON then the compressor will unload one step.

The operator should ensure following conditions are met to run the compressor in Direct I/O Run Mode:

1. "Direct I/O" checkbox is enabled
2. "Active Remote Control" setting is set to "Direct I/O"
3. "Remote Start/Stop" Digital Input is ON

Once above conditions are met, the operator can start compressor in Direct I/O Run mode by pressing on "START" button in Main screen and then selecting "Remote" option in pop-up window.

Run Permissive

When this checkbox is enabled, MicroVission monitors the "Remote Start/Stop" Digital Input. If "Remote Start/Stop" Digital Input is energized (turned ON), the compressor can start in the selected run mode (Auto / Manual / Remote). If the "Remote Start/Stop" Digital Input is de-energized (turned OFF), the compressor will wait until the Digital Input is energized.

When this check box is disabled, MicroVission will not monitor the state of "Remote Start/Stop" Digital Input during the compressor start.

On Communication Failure

This feature of the MicroVission offers the ability to define how the MicroVission will handle communication failure.

The operator can select any one options from below two options:

- **Revert to Local Control**: Once the compressor has started running in the Remote Run Mode, the "Communication Failure Detect Timer" as configured in Timers screen will start. If no further communication with MicroVission takes place for the configured time, the MicroVission will be placed in Local Auto Mode. MicroVission will also display "Remote Comm Timeout" Alarm Message and add time-stamped alarm event to Event List screen.
- **Stop Compressor with Trip**: Once the compressor has started running in the Remote Run Mode, the "Communication Failure Detect Timer" as configured in Timers screen will start. If no further communication with MicroVission takes place for the configured time, the compressor will be stopped due to "Remote Comm Timeout" Trip. MicroVission will also display "Remote Comm Timeout" Trip Message and add time-stamped trip event to Event List screen.

Ethernet

This checkbox when selected, enables the network settings for the Ethernet port. Other settings will be allowed for selection when this option is enabled.

- **IP Address**: Entry box to set the IP Address.
- **Subnet Mask**: Entry box to set the Subnet Mask.
- **Gateway**: Entry box to set the Gateway Address.
- **Protocol**: Drop-down box to select the type of protocol used to remotely control the MicroVission. Available options are "Modbus TCP" and "Ethernet IP".
- **Node Address**: Address used by the MicroVission when communicating with multiple panels.

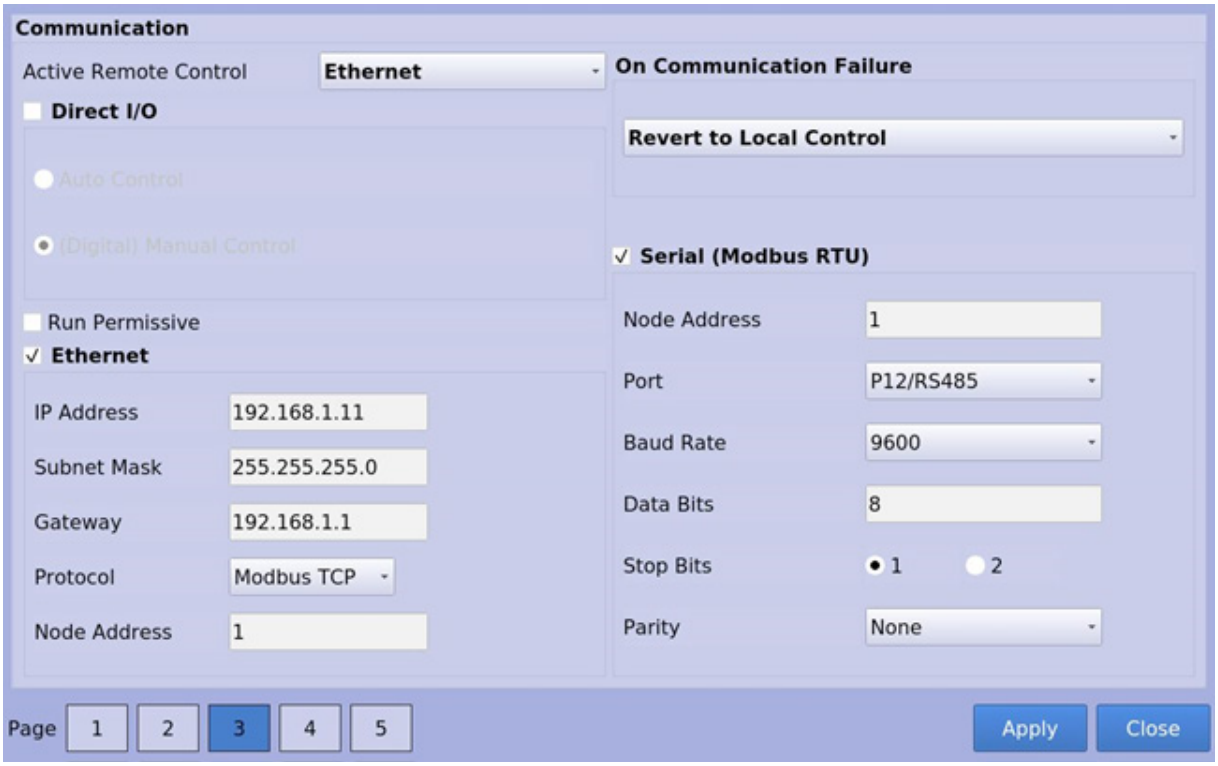


Figure 12-3. Configuration Screen - Communication

Serial (Modbus RTU)

This checkbox when selected, enables the Serial Modbus RTU port. Other settings will be allowed for selection when this option is enabled.

- **Node Address**: Address used by the MicroVission when communicating with multiple panels.
- **Port**: The MicroVission has two ways to communicate on serial bus, either via the in-built serial port P12/RS485 or through the USB port. This dropdown box allows the operator to choose which one will be used.
- **Baud Rate**: Sets the baud rate for the serial communication.
- **Data Bits**: Fixed at 8 Data bits.
- **Stop Bits**: Identifies the end of character for re-synchronizing.
- **Parity**: Identifies the type of error detection.

Configurable Main Screen Settings

In this section provides options for selection of twelve custom fields for display of their values on the Main screen.

Each row will have two dropdown boxes. The first dropdown box will have options like “Standard Analog I/O”, “Standard Digital I/O” and “Status Value” to select the type of value to be displayed on the Main Screen. Based on the first dropdown box selection, the second dropdown box will show list of values for selection. The value set from the second dropdown box will get displayed on Main Screen. See Figure 12-4 & 12-5 for details.

For Analog Inputs, the calibrated values will be shown on Main Screen. For Digital Inputs, values will be displayed as “HIGH” & “LOW” depending on the current state of digital input if Energized or De-Energized respectively. For Digital Outputs, values will be displayed as “ON” & “OFF” depending on whether MicroVission is trying to drive output High or Low respectively. For Status Values, calculated values or Anti-Recycle Time value will be displayed. If value set in second dropdown box is “None”, that row will be displayed blank on Main screen.

Figure 12-4. Configuration Screen – Configurable Main Screen Settings

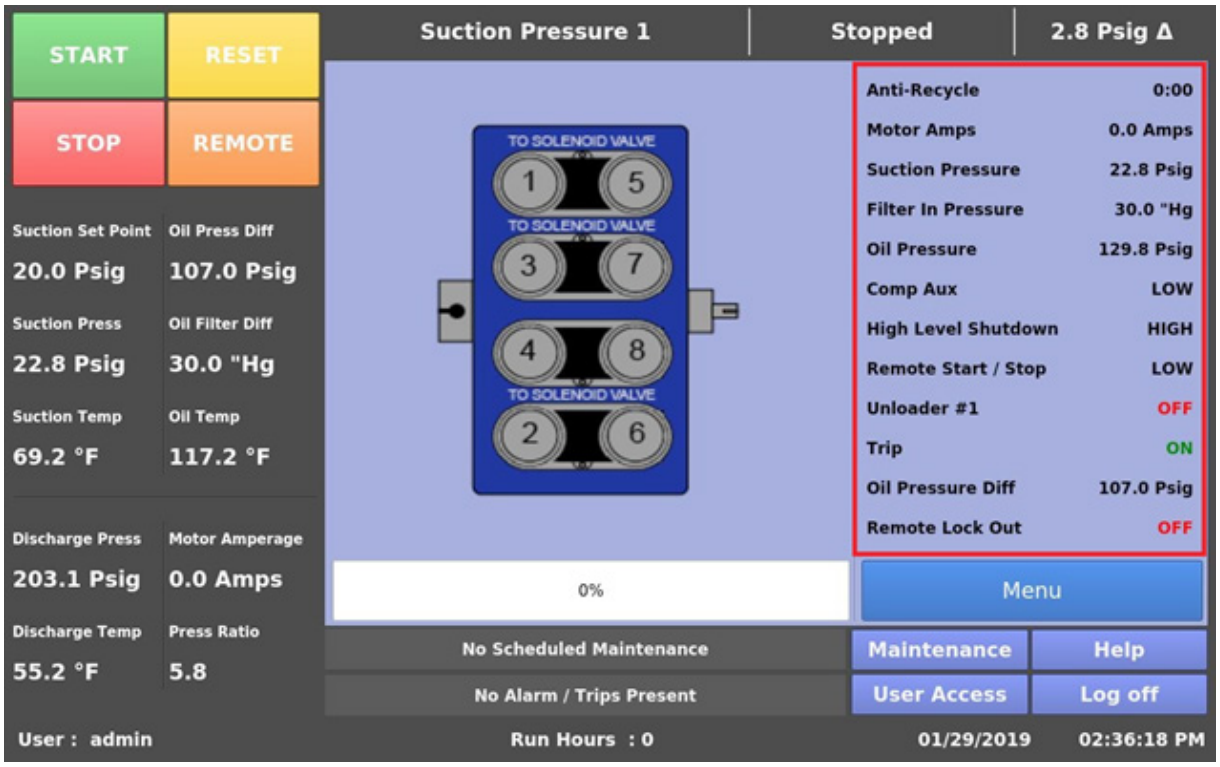


Figure 12-5. Configurable Parameters on Main Screen

I/O Configuration

If any additional I/O cards are added to the MicroVission, this is where these cards are enabled for use by its algorithms. Some features of the MicroVission will not be available unless specific expansion cards are selected, see Figure 12-6.

- **Analog Input 1**: Enables the optional Analog Input card 1.
- **Digital Input/Output 1**: Enables the optional Digital Input/Output card 1.

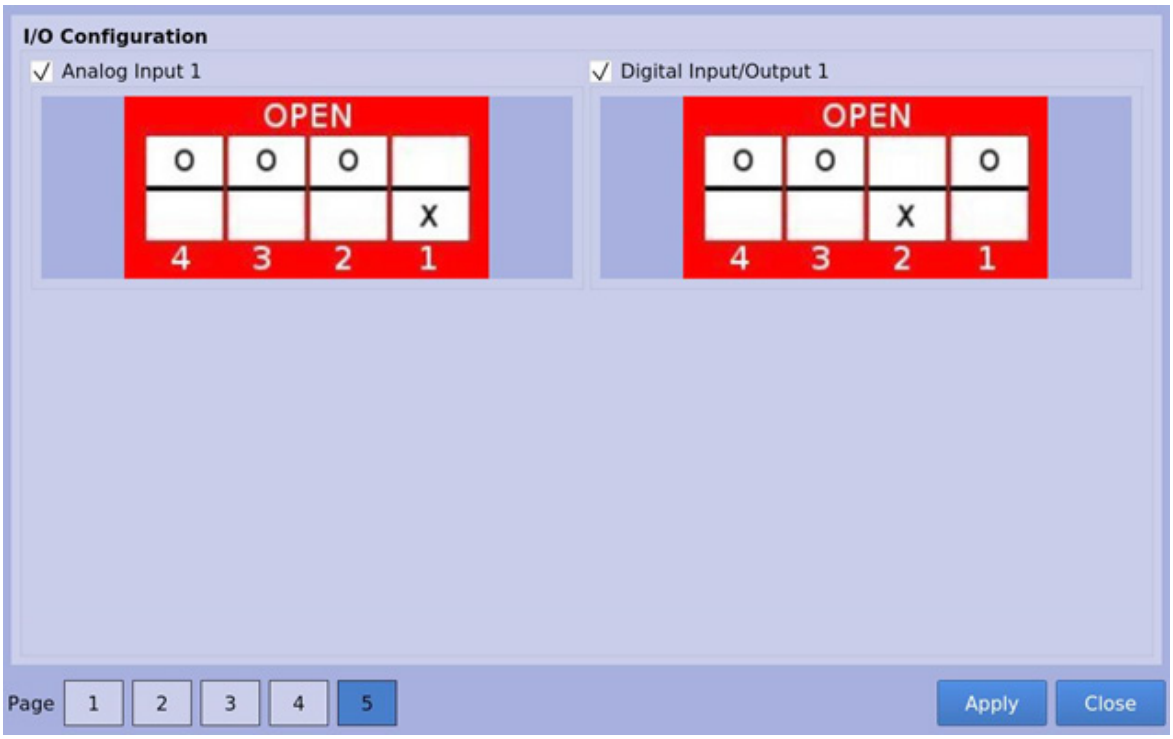


Figure 12-6. Configuration Screen - I/O Configuration

Overview

The Database Backup screen provides the operator a way to extract information out of the MicroVision for backup purposes or diagnostics. See Figure 13-1: Data Backup Screen - Save/Load.

From this screen, the operator can download all the Setpoint Databases, Maintenance Logs, Event Lists, Freeze Data, Trend Data and Compressor Run Hours to a portable USB flash drive. That information can then be uploaded back to the MicroVision in the case of data corruption or to update the MicroVision program.

Additionally, this screen also allows the operator to reset all values to the factory defaults.

All the information saved to the USB flash drive is open information, meaning none of the data is encrypted and operator is free to examine it. The log files are all saved as simple ASCII text and the databases can be examined with SQLite.

Refresh

- The Refresh button is used to initiate a scan of the USB ports and list any devices found in the "Available Devices" window.

Save / Load

In this section, operator can either save the MicroVision setpoints and log information to a USB flash drive or load from a USB flash drive back to the MicroVision.

Save

- Selecting Save allows the operator to save MicroVision data to a USB flash drive using the information provided on the screen. The button on the top right side will be labeled "Save" when this is selected.

Load:

- Selecting Load allows the operator to load data from a USB flash drive to the MicroVision using the information provided on the screen. The button on the top right side will be labeled "Load" when this is selected.

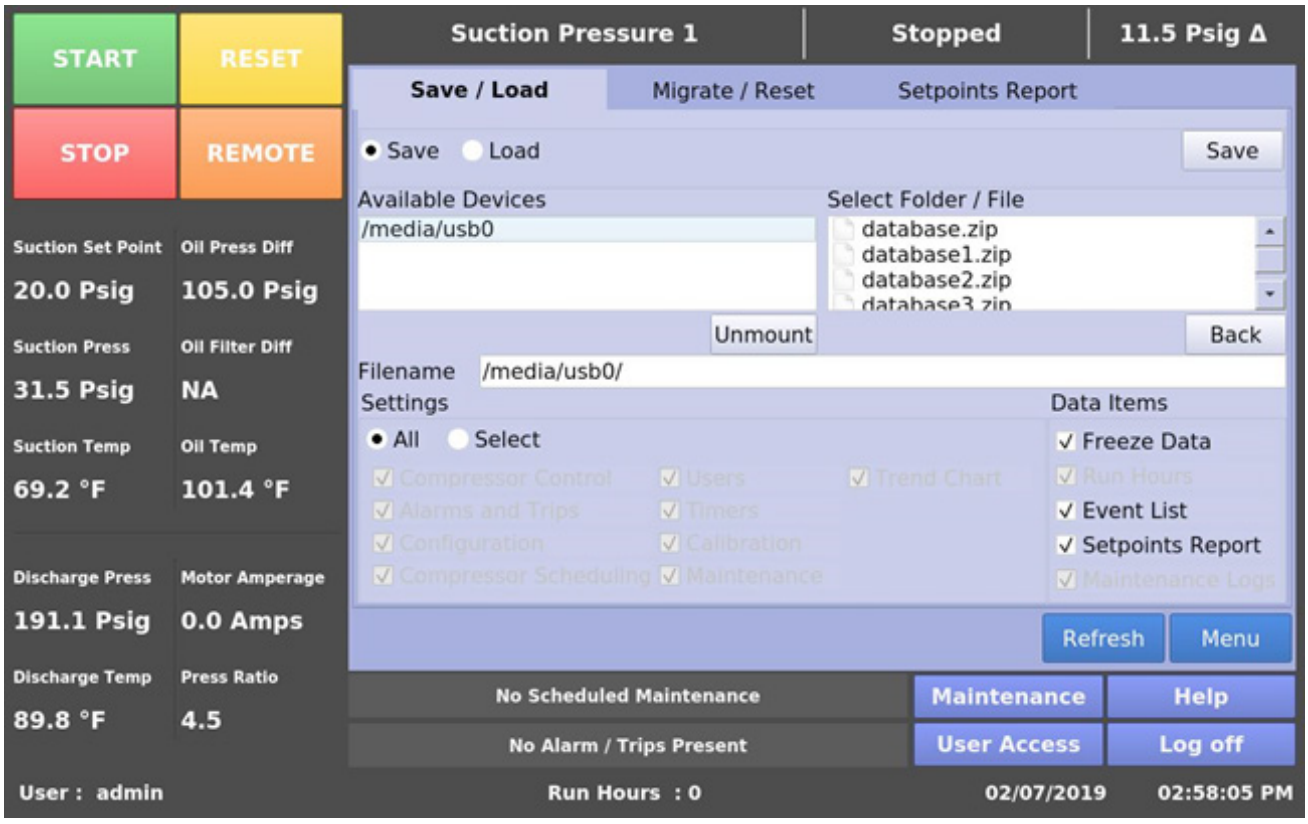


Figure 13-1. Data Backup Screen - Save/Load

Available Devices

This window displays any USB flash drive plugged into one of the MicroVission USB ports. Once one of the available devices is selected, the contents of the selected device will be displayed in the “Select Folder / File” window. If the plugged in USB flash drive is not showing up, operator can try pressing the “Refresh” button at the bottom of the screen.

NOTE

Unfortunately, not all USB flash drives are compatible with the MicroVission and might not be shown in the available devices list

Select Folder/File

- This window displays the folders and files contained in the USB flash drive selected in the “Available Devices” window. The information from the MicroVission will be stored into a .zip file. So, a zip file will have to be selected to load the data or overwritten when saved. Once a zip file is selected, the name will be shown in the “Filename” window.

Unmount

- By Pressing the Unmount button, any USB drive selected in the “Available Devices” window will be disconnected from the operating system and can be safely removed from the USB port.

Back

- The Back button returns the operator to the preceding window display of files and folders.

Filename

- This window is where you can give a name to a saved backup file. This field will automatically be populated if file is selected in the “Select Folder/File” window.

Settings

- Using this table, the operator can choose to save or load all or part of information contained in the MicroVission.

Data Items

- Using these checkboxes, the operator can choose to save or load all or part of information contained in the MicroVission according to the selection of options.

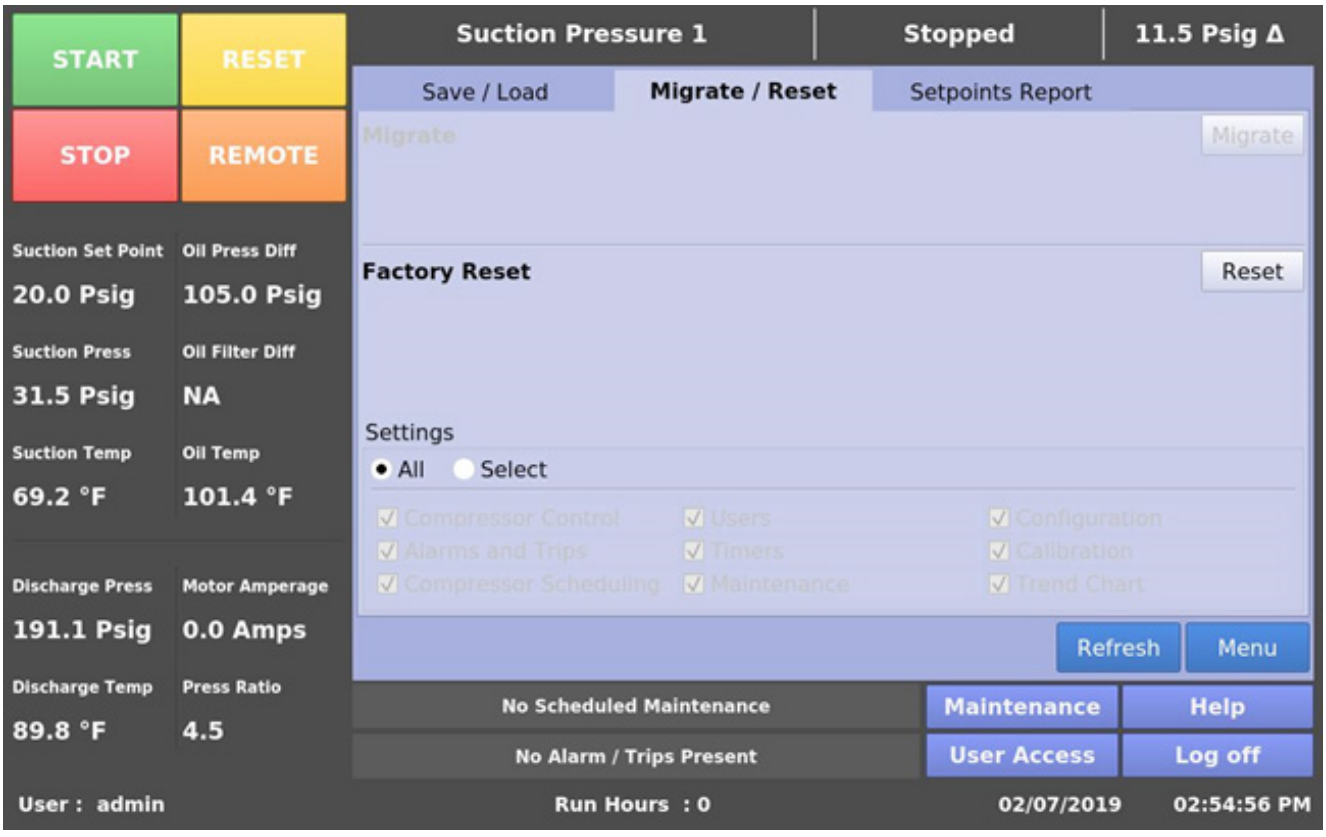


Figure 13-2. Data Backup Screen - Migrate and Factory Reset

Factory Reset:

The Factory reset button offers the operator the ability to reset all the MicroVission setpoints back to the factory default settings or a specific database. If the operator finds that a screen will not load when selected, it is likely that the database associated with that screen has been corrupted. Unfortunately, data corruption is always a possibility in any system. So, this function was designed to help the operator to regain control, see Figure 13-2.

Reset

- This button initiates the process to revert the MicroVission back to the factory default settings.

Setpoints Report

The setpoints report screen offers the operator ability to generate a setpoints report for all screens. The reports are stored as .csv files and can be saved to a USB drive from Save/Load screen by selecting the "Setpoints Report" option in Data Items section during backup of database. The .csv file can be imported in any spread sheet application. During operation, the operator can generate reports at any time. See Figure 13-3: Data Backup Screen - Setpoints Report.

All/ Select:

- Selecting "All" will include all screens in the report that is generated. When "Select" option is selected, the operator can choose which screens will be included in the report.

Generate:

- This button initiates the process to generate setpoints report files

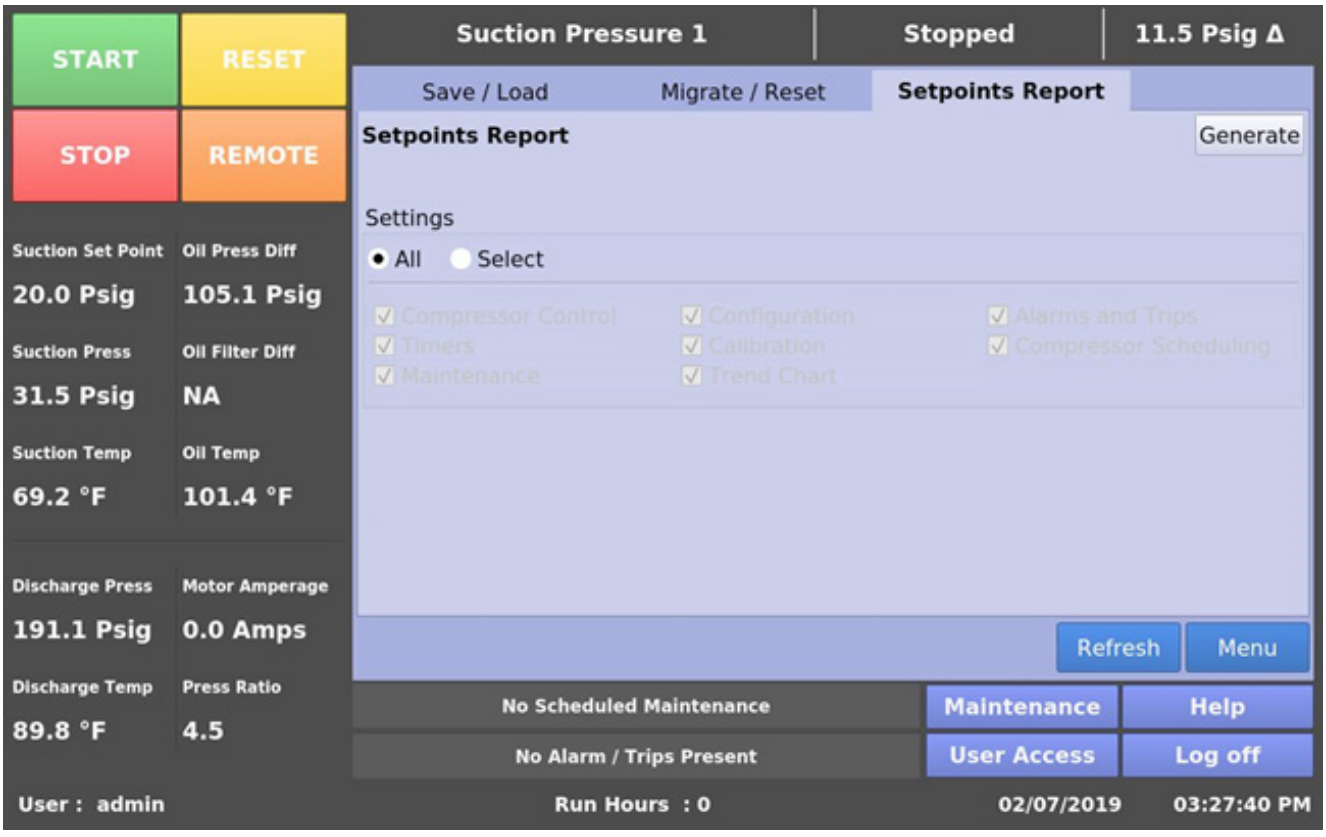


Figure 13-3. Data Backup Screen - Setpoints Report

Database Backup Procedure

Upgrading the program in the MicroVission panel normally involves replacing the SD card. Note that all compressor operation setpoints, calibration values and maintenance information is stored on the SD card. So, when upgrading to a new program (new SD card), the task is simplified by using the "Database Backup" and "Database Restore" functions provided in the MicroVission to migrate the database of the original SD card to the new SD card.

There are three main steps to this process:

1. Backup the database of original SD card (currently in the MicroVission panel) – onto a thumb drive or flash drive.
2. Replace the original SD card with new SD card.
3. Restore the original database to new SD card.

Backup Database of Original SD Card

NOTE

It is REQUIRED to manually reenter the Alarms and Trip settings when upgrading from some older version of programs. Therefore, it is highly recommended to create a hardcopy of all compressor operating setpoints, or to create and have handy a printout of the Setpoints Report .csv file.

It is also recommended to make a hardcopy of the configuration information and maintenance information prior to changing SD cards. For the list of all the information that you should record, see the "Record operating setpoints and configuration information" section below.

The data migration procedure (moving the original SD card database to new SD card) uses a "thumb drive" or "flash drive" to transfer data from the original SD card to the new SD card. Note there have been a few records of some thumb drives not being recognized by the MicroVission. If you have difficulty in getting the MicroVission to recognize the thumb drive – then try a different one. Vilter has successfully tested many different manufacturers and sizes; a partial list is given below:

- o SanDisk micro cruzer 2.0 GB
- o Imation 2.0GB
- o Kingston DataTraveler 512 MB
- o SanDisk mini cruzer 128 MB

1. With the original SD card installed into the MicroVission SBC, insert the flash drive into the USB port. This port is located along the left side of the single board computer above the ethernet connector. See Figure 13-4: SD Replacement.
2. Log into the MicroVission using your username and password (you will need to be Level 3 to upload data).
3. Navigate to the Data Backup screen.
4. In the "Available Devices" window, you should see something like "/media/usb0". If you do not see anything in this window, press the "Refresh" button, and wait about 5 seconds. After that press the button again. If you still do not see the device, then the MicroVission does not recognize the flash drive - try a different one. If you do see it, highlight it.
5. Now highlight the "Filename" field (which will also contain "/media/usb0"). A keyboard will appear. Now type in the name of the file that you want for your database for this compressor. For instance, "cylinders_month_day_year" or something similar for identifying the file to the compressor. Then press "Enter" key on keyboard.
6. Now press the "Save" button. A "watch" icon will appear. Shortly thereafter, a popup box should appear with a message that the save was successful and asking if you want to "unmount" the flash drive device. Press on "Yes" Button. If the "watch" icon remains after a minute or so, then the MicroVission is unable to close the backup file it has written to the thumb drive. Power down the MicroVission and try the procedure with a different thumb drive.

Replace Original SD card with New SD card

Now that the database file has been saved to the thumb drive, you can replace the "original" SD card with a new SD card.

1. Power down the MicroVission.
2. Remove the thumb drive and take out the "original" SD card and install the new one.
3. Label both the old and new card to identify the compressor it is for.

Restore Original Database to New SD card

Now that the new card is inserted, power up the MicroVission panel. The MicroVission boots up in a minute or so.

- Once the MicroVission is booted up, press on the "User Access" button.
- Insert the thumb drive in to the USB port.
- Navigate to the Data Backup screen. You should again see the USB thumb drive listed in the "Available Devices" window.
- Select the Load function (above the "Available Devices" field), and then highlight the device that is listed in the "Available Devices" window.
- In the "Select Folder/File" window, find the backup file for this compressor, and highlight it.
- Now press the "Load" button.

  a) A pop-up window will appear with a message Loading new databases will require a program restart. Continue?". Press "Yes".

  b) Another pop-up window might appear with a message "One or more settings selected for loading were missing from the archive. And it will list what is missing. Continue loading anyway?". Press "Yes".

  c) Another pop-up box might appear with a message asking if you want to use the IP address it found. Press "OK".
- A pop-up box appears with a message "Settings were successfully loaded. Program will restart". Press "OK".

When the OK button is pressed, the panel will reboot. Now using the "hand documented" settings that you recorded, compare the setpoints on that list against those in the MicroVission. They should all be OK. Here are the KNOWN issues that we have found with this procedure.

- If you have communication connection issues after restoring the database, you may have to "re-enter" the IP address that is shown on page 3 of the configuration screen. If you experience problems after the "Restore" function – then re-enter your communication settings.

Record Operating Setpoints And Configuration Information

Before powering down the MicroVission to replace the SD card, copy the following operating setpoints and configuration information.

1. Configuration Screen - Page 1
   a. No. of Cylinders and No. of Unloaders
   b. Compressor Control Type & Number of Controllers
   c. Oil Monitoring Settings
   d. Anti-Recycle Settings
2. Configuration Screen - Page 2
   a. Order Number
3. Configuration Screen - Page 3
   a. Active Remote Control Setting
   b. If Active Remote Control = Direct I/O, document "type" of Direct I/O selection.
   c. Ethernet Settings
4. Configuration Screen, Page 5
   a. Optional I/O boards
5. Compressor Control Setpoints – all
6. Alarms and Trips Setpoints – all
7. Timer Setpoints – all
8. Instrument Calibration, Pressure page
   a. Record Transducer Range selection for Suction Pressure, Discharge Pressure, Oil Pressure, Filter Inlet Pressure & Filter Outlet Pressure.
   b.Record 'Total Offset" value for Suction Pressure, Discharge Pressure, Oil Pressure, Filter Inlet Pressure & Filter Outlet Pressure.
9. Instrument Calibration - Temperature page
   a. Record Transducer Range selection for Suction Temperature, Discharge Temperature, Oil Temperature & Process Temperature
   b. Record "Total Offset" value for Suction Temperature, Discharge Temperature, Oil Temperature & Process Temperature
10. Instrument Calibration – Motor Current Settings
11. Compressor Runtime.

Replace SD card

1. Power down the MicroVission panel.
2. Remove old SD card and install new SD card.
3. Power up the MicroVission panel.

Re-Enter Operating Setpoints And Configuration Information

1. Logon as “admin” user (default password = admin).
2. Re-enter all values in Configuration screen. The most vital thing is to re-enter the correct No. of Cylinders and No. of Unloaders. Re-enter the Compressor Runtime on page 2 of the configuration screen. Ensure you re-select any optional boards that are installed, and apply those additions.
3. Re-enter all Control Limits.
4. Re-enter all Alarm and Trip setpoints. The most vital thing is - under the “Delay” tab, enter 5 seconds for all alarm and trip delays.
5. Re-enter all Timer Setpoints.
6. Re-enter all Instrument Calibration offsets for pressure transducers. Insure that the Suction Pressure transducer range is properly selected (typically 0-200psia 4-20mA) – but double check proper setting.

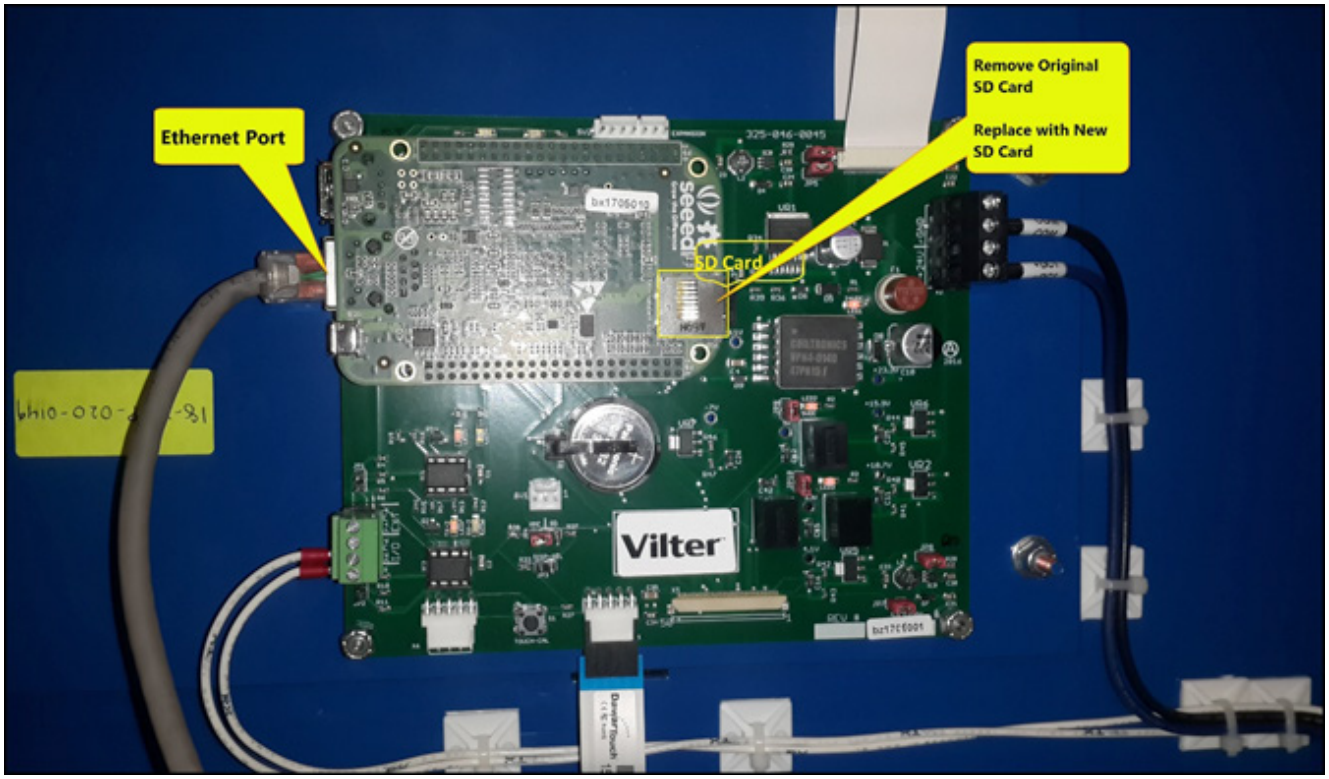


Figure 13-4. SD Card Replacement

Overview

The maintenance screen is a convenient place to keep track of the maintenance performed and of any up-coming maintenance recommended by Vilter™. Based on the information contained in this screen, banners will be displayed on the lower status bar.

Yellow banners are to warn the operator of any up-coming maintenance and red banners indicate maintenance that is overdue.

Chart Tab

The chart on Figure 14-1 is the original maintenance chart that is provided with the compressor. This maintenance chart contains the list of maintenance items and their respective service intervals.

The operator will also perform his/her maintenance sign-offs through the maintenance chart. Once the operator has chosen the item to sign off, pressing the service interval item will perform the sign-off operation, and the maintenance performed will be recorded on the maintenance log.

Inspection/Maintenance

This column lists down all the maintenance Items.

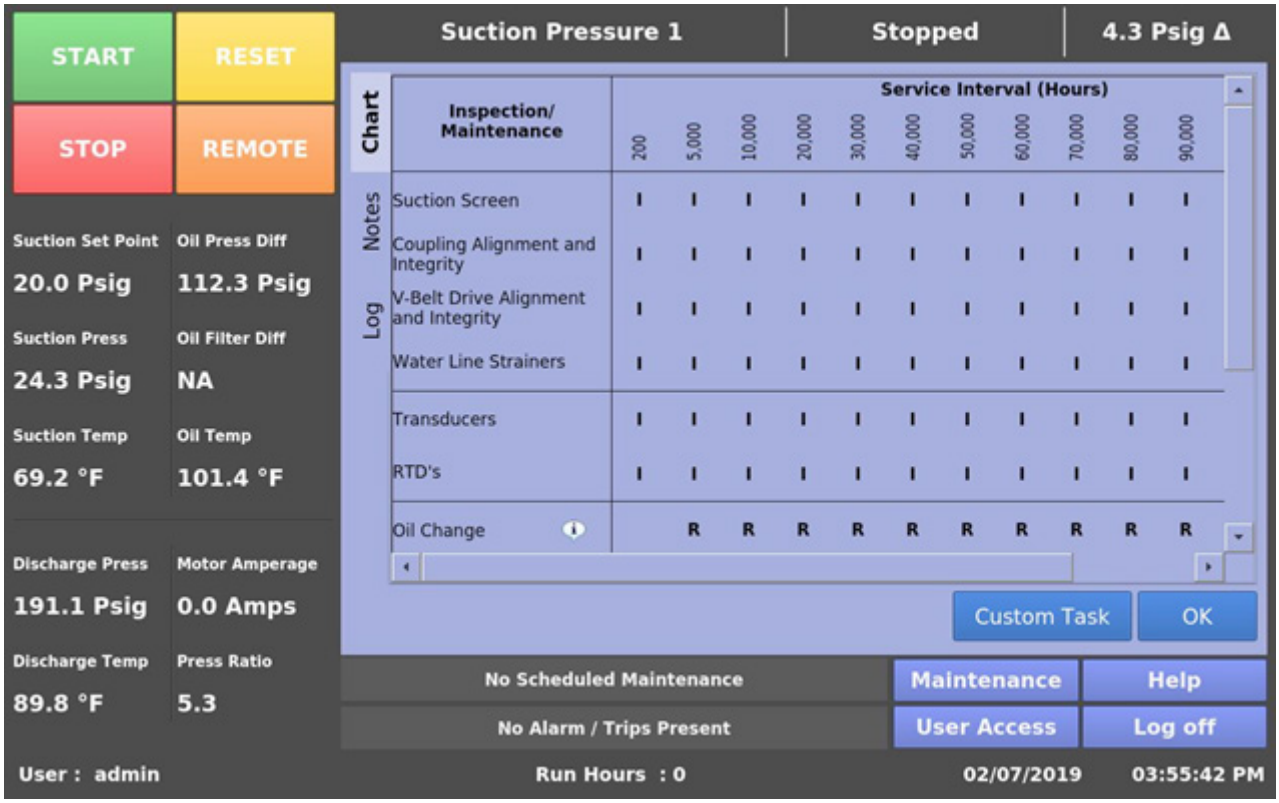


Figure 14-1. Maintenance Screen - Chart

Maintenance Information Icon

Clicking on the information icon will bring up a box with information about the item, see Figure 14-2.

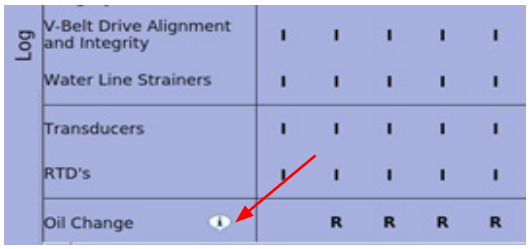


Figure 14-2. Maintenance Screen – Information Icon

Service Interval (Hours)

The numbers indicate the intervals at which the maintenance should be performed.

- When maintenance is up-coming, the service interval field is highlighted with a yellow background, see Figure 14- 3.
- When maintenance is overdue, the service interval field is highlighted with a red background, see Figure 14-4.

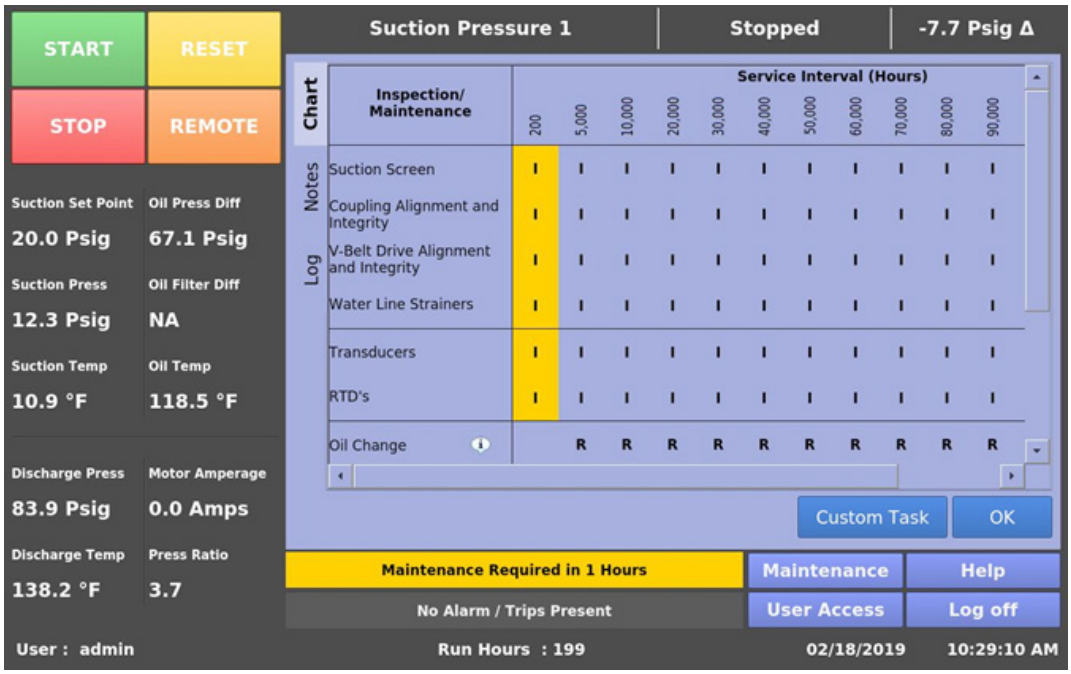


Figure 14-3. Maintenance Screen – Maintenance Due Soon

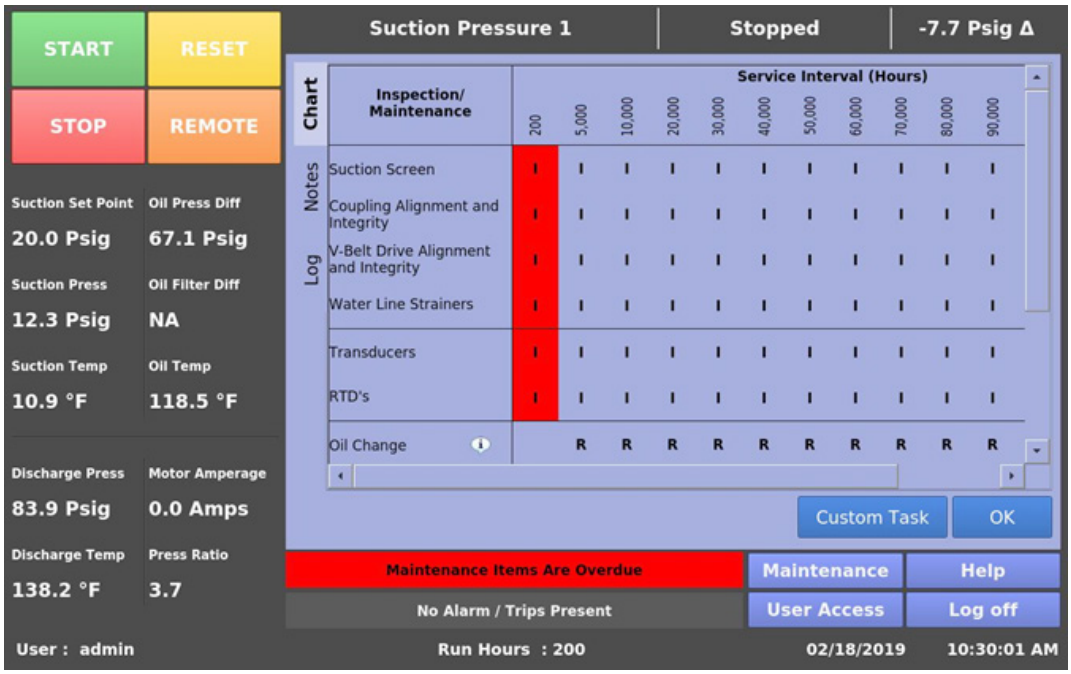


Figure 14-4. Maintenance Screen – Maintenance Overdue

When the maintenance is up-coming or already over-due, the operator can sign-off on a maintenance item by pressing on the service interval field, and a confirmation pop-up will get displayed. Refer to Figure 14-5.

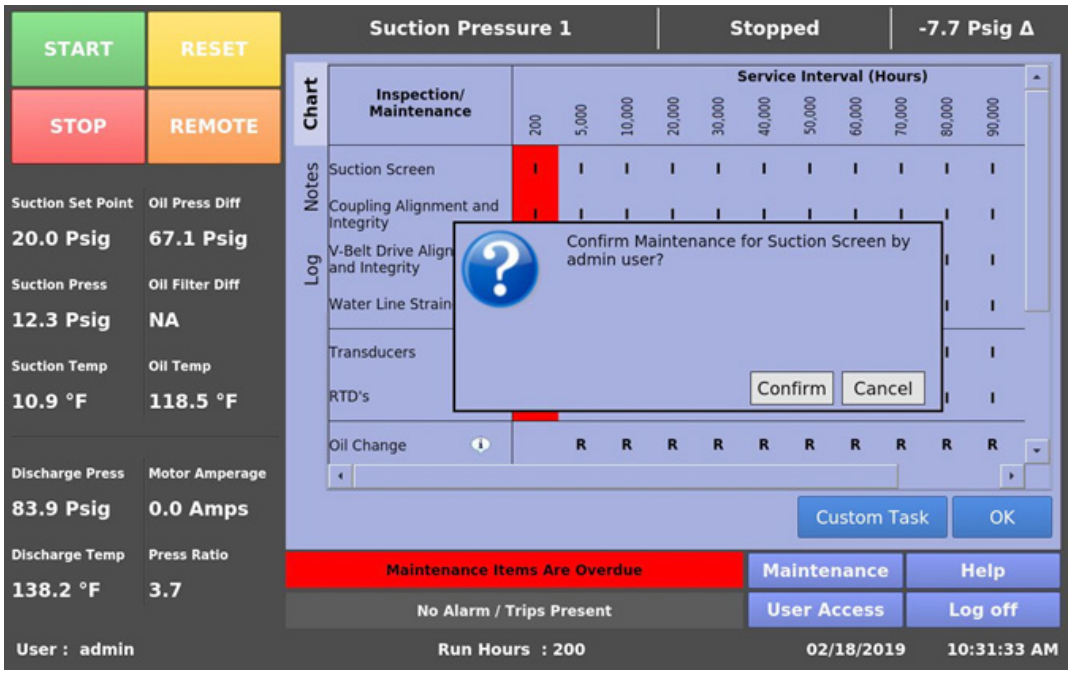


Figure 14-5. Maintenance Screen – Confirmation for Maintenance Sign-Off

Performing the sign-off operation will cause the service interval field to be highlighted with a green background and the maintenance log will be updated with the item performed. Refer to Figures 14-6 & 14-9.

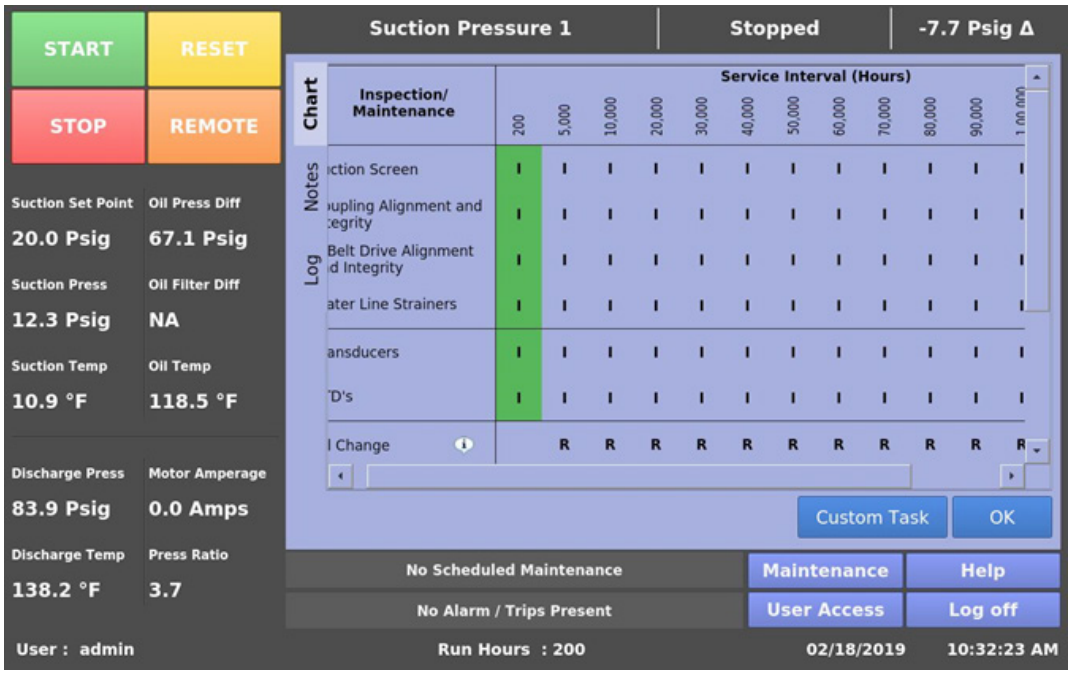


Figure 14-6. Maintenance Screen – Maintenance Sign-Off Has Been Performed

Custom Task

The operator can record custom maintenance tasks not listed on the Inspection/Maintenance column in the "Chart" tab. Refer to Figure 14-7.

The Custom Maintenance Task pop-up appears when the Custom Task button is clicked. The Operator can then enter a description for the task performed on the entry box, and click "OK" to save it and add it to the Maintenance Log.

The "Cancel" button will close the Custom Maintenance Task pop-up.

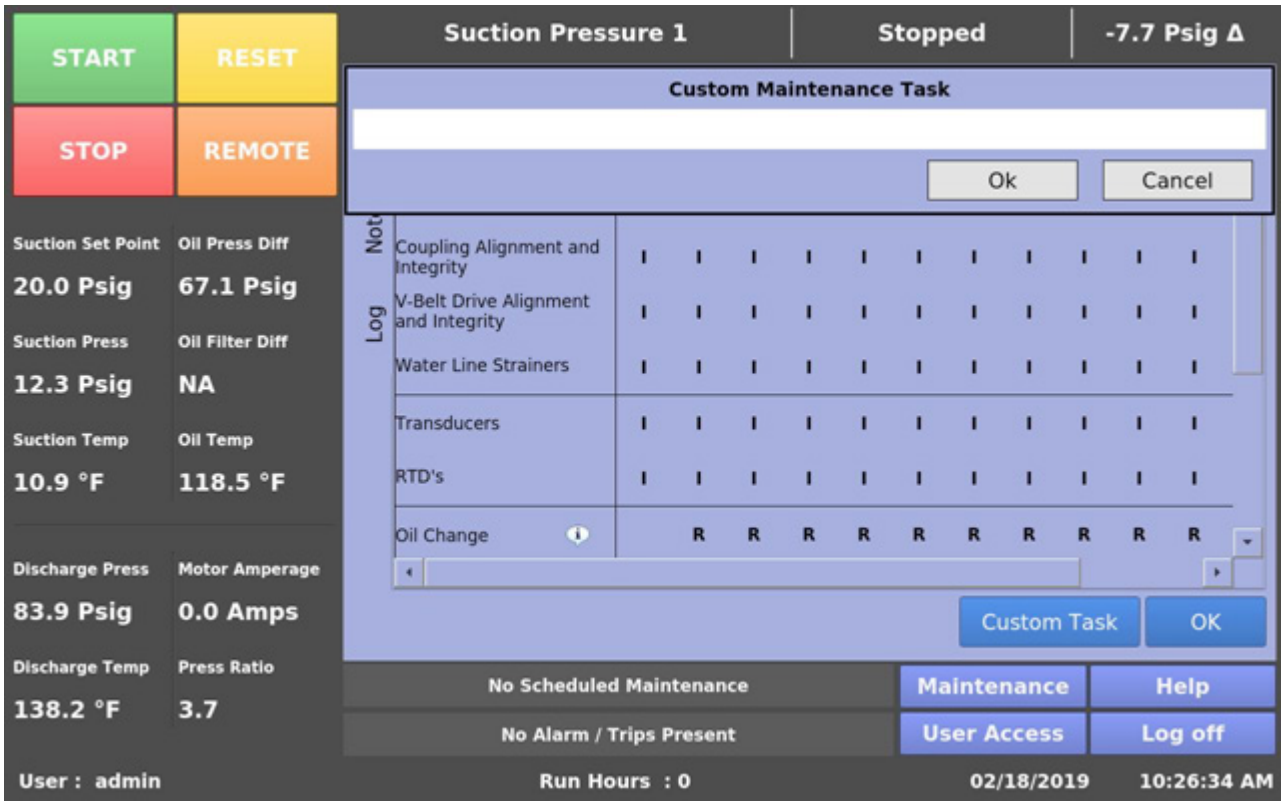


Figure 14-7. Maintenance Screen – Custom Maintenance Task Pop-up

Notes Tab

The Notes tab allows the operator to make notes for any personnel who might have access to the MicroVission. Refer to Figure 14-8.

After clicking on the top entry box, the Operator can write the note and then press on the “Add Line” button to have this new line added to the maintenance notes.

The bottom entry box is provided to edit/delete existing lines from the maintenance notes. The operator needs to choose the line to be edited/deleted, and by clicking on it, make it populate the bottom entry box.

Once the line has been edited (or deleted by leaving it blank) clicking on the “Edit Line” button will record the modification in the maintenance notes.

Clear

The Clear button in the Notes tab allows the operator to clear all existing maintenance notes.

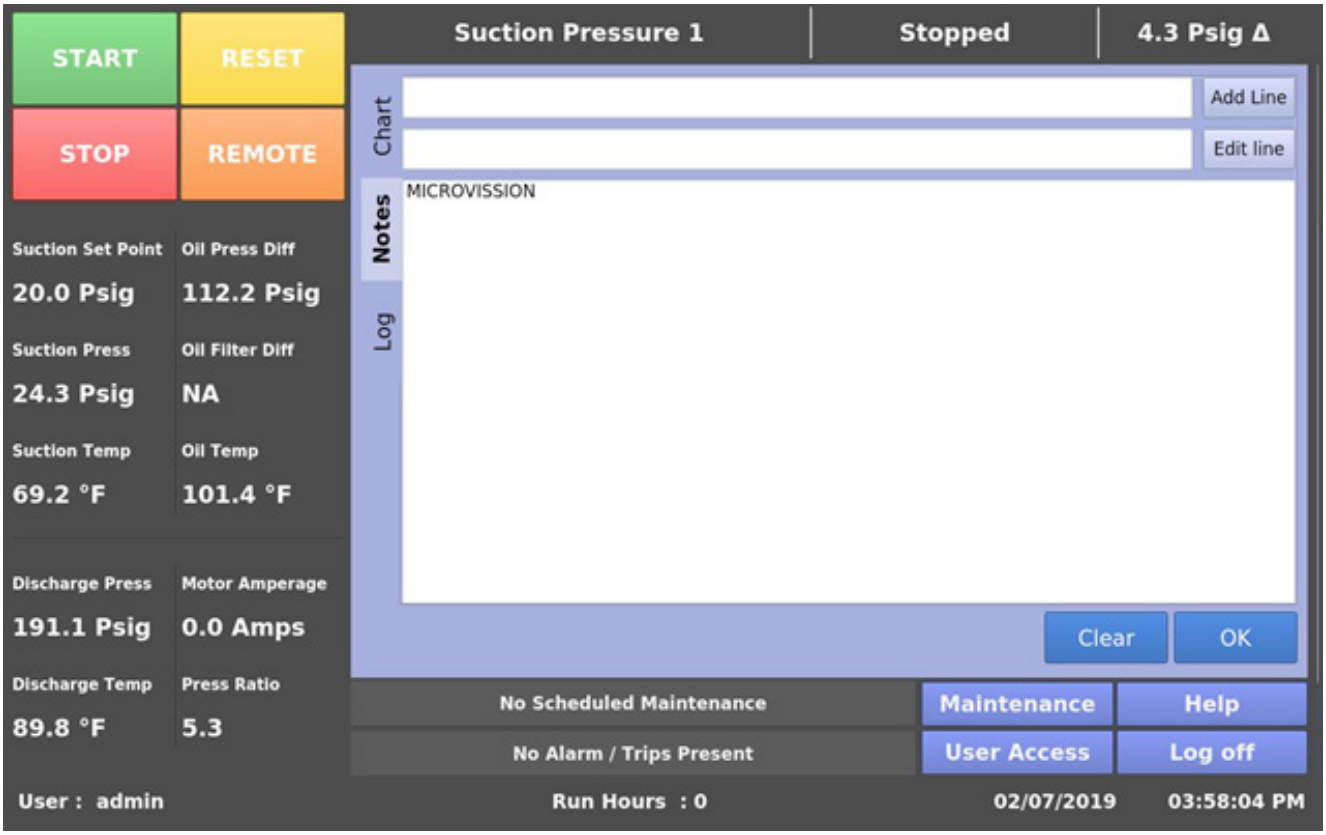


Figure 14-8. Maintenance Screen – Notes

Log Tab

The maintenance log tab lists all the maintenance tasks performed in descending order, see Figure 14-9.

Date

Lists the date the maintenance task was performed.

Time

Lists the time the maintenance task was performed.

User

Lists the name of the operator who performed the maintenance task.

Maintenance Performed

Lists the maintenance tasks that were performed.

Run Hours

Lists the run hours at which the maintenance task was performed.

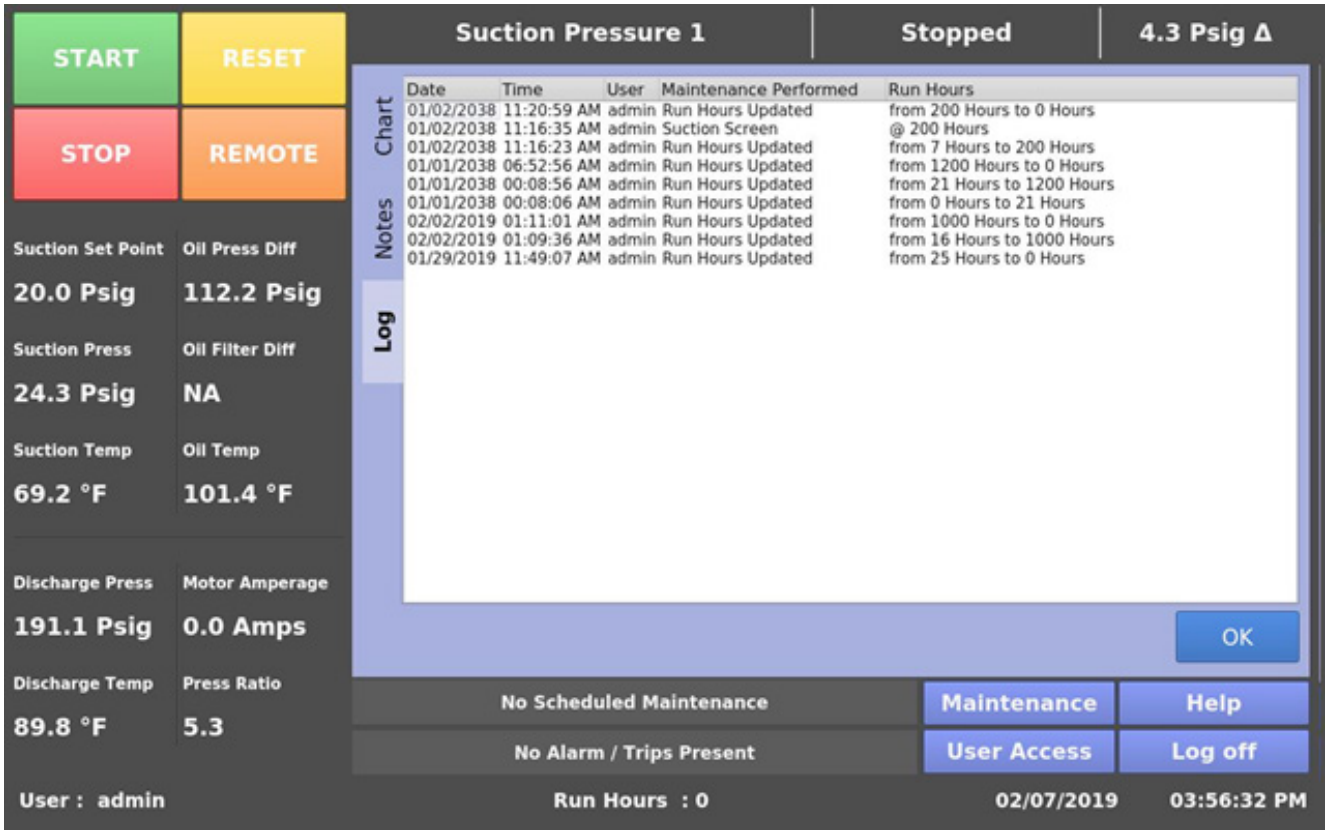


Figure 14-9. Maintenance Screen – Log

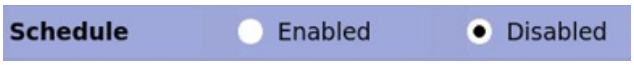
Overview

This menu allows the operator to schedule control setpoint switching during the day and week, according to application´s needs.

This feature can be enabled and disabled from the Compressor Scheduling screen. Up to four setpoint "switch" events can be scheduled per day, see Figure 15-1.

Schedule

The options available are "Enable" & "Disable".
For an Operator to be able to configure setpoints related to scheduled events, the schedule must have been disabled first.



The operator can enable the Compressor Scheduling Feature only if the established time intervals for all days are set in an increasing order. That is, Event #1 is always scheduled to happen before Event #2, Event #2 is always scheduled to happen before Event 3, etc.
If the Events are not in the correct time order, the invalid events will be marked with the caution symbol, to inform the operator of a conflict which has to be resolved before the feature can be enabled.

Control Mode

These drop-down boxes allow the selection of operating modes which will get switched once the schedule event time is achieved.
The list of available operating modes depends on the number of controllers selected in the configuration screen.
For example, if the number of Suction Pressure Control Setpoints selected is "2", and the number of Process Control Setpoints selected is "1", then the Control Mode drop-down box will show the following as selectable options:

"Unscheduled"
"Suction Pressure SP1"
"Suction Pressure SP2"
"Process Control SP1"

If the selected Control Mode is "Unscheduled", a switch will not take place when the set time for that Event is achieved.
Hence the Control Mode can be left as "Unscheduled" if the operator does not want to use all 4 events per day.

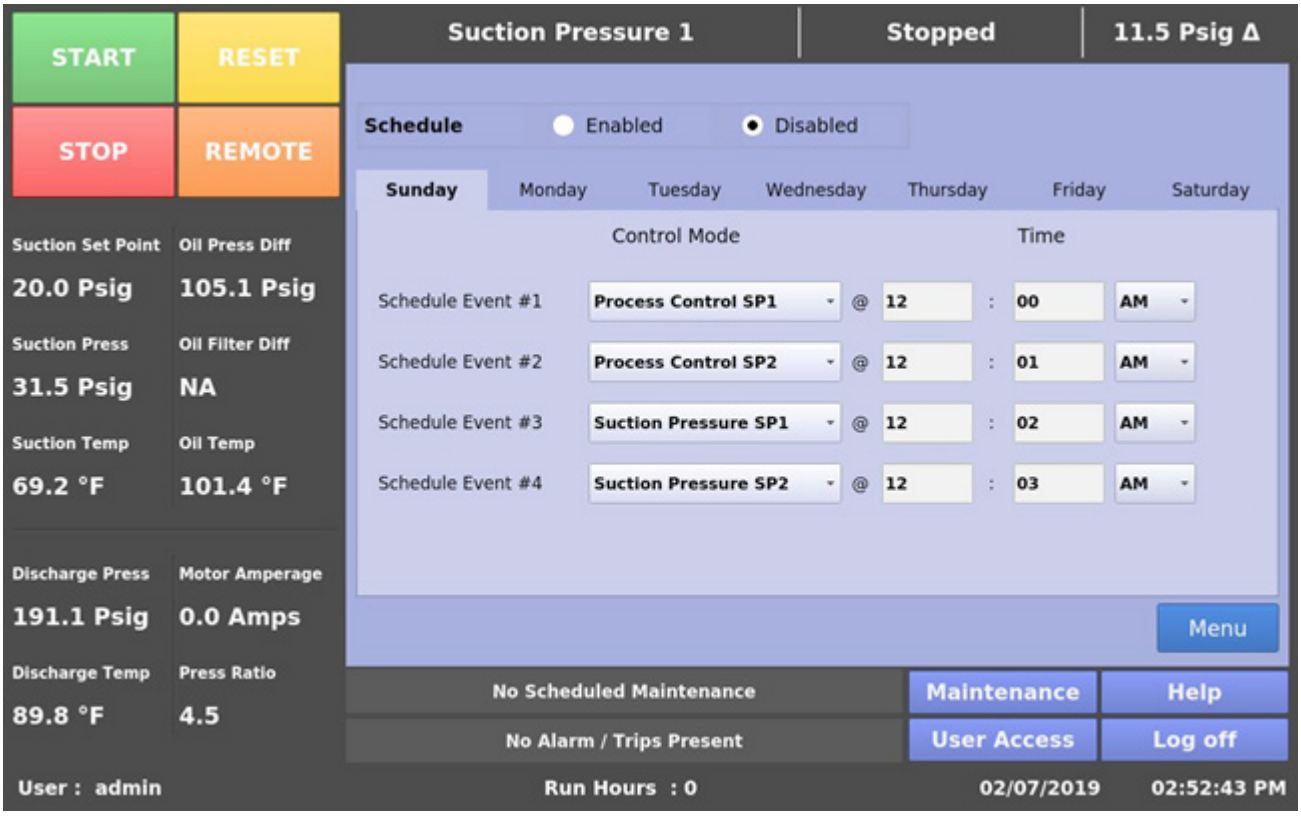


Figure 15-1. Compressor Scheduling Screen

Time

This setpoint allows the selection of Hours, Minutes and AM/PM values for an event.

When the time set for an event is achieved, the control mode will get changed as selected for that event.

The range of values admisible for the Hours setting is 1–12 with the 12 hour format, and 0 – 23 with the 24 hour format.

The range of values admisible for the Minutes setting is 0 – 59.

The selection of AM/PM is active only when the Time Format selected in the configuration screen is 12 hour.

If the No. of controllers for Suction Pressure Control & Process Control are changed in the configuration screen while the scheduling feature is enabled, this would make the control modes selected in the compressor scheduling screen invalid.

In this case, the feature will get disabled automatically and an indication will be sent to operator to correct the setting.

Overview

The Service Option screen gives the operator the ability to force individual digital or analog outputs ON.

This feature can be used for diagnostic purposes during the initial setup, or when the operator suspects there´s an issue with the outputs.

The buttons on this screen are not available while the compressor is running.

Digital Outputs

The Digital Output buttons are momentary-toggle buttons. An output will be active while the operator has his finger on the button, and will deactivate when the operator´s finger is removed.

The operator can measure the output at the terminal block using a multimeter, or visually check the output by watching the LEDs located on the Multi-IO Board.

See Figure 16-1 for Digital Output screen.

Oil Return Solenoid

Activates the output assigned to the Oil Return Solenoid. The output is connected to terminal X1-1 and is the 1st LED on the Multi-IO Board.

Unloader #4

Activates the output assigned to the Unloader #4. The output is connected to terminal X1-2 and is the 2nd LED on the Multi-IO Board.

Unloader #3

Activates the output assigned to the Unloader #3. The output is connected to terminal X1-3 and is the 3rd LED on the Multi-IO Board.

Unloader #2

Activates the output assigned to the Unloader #2. The output is connected to terminal X1-4 and is the 4th LED on the Multi-IO Board.

Unloader #1

Activates the output assigned to the Unloader #1. The output is connected to terminal X2-1 and is the 5th LED on the Multi-IO Board.

Trip

Deactivates the output during a trip or inhibit condition. This is an inverse acting output, connected to terminal X2-2 and is the 6th LED on the Multi-IO Board.

Oil Crank Case Heater

Activates the output assigned to the Oil Crank Case Heater. The output is connected to terminal X2-3 and is the 7th LED on the Multi-IO Board.

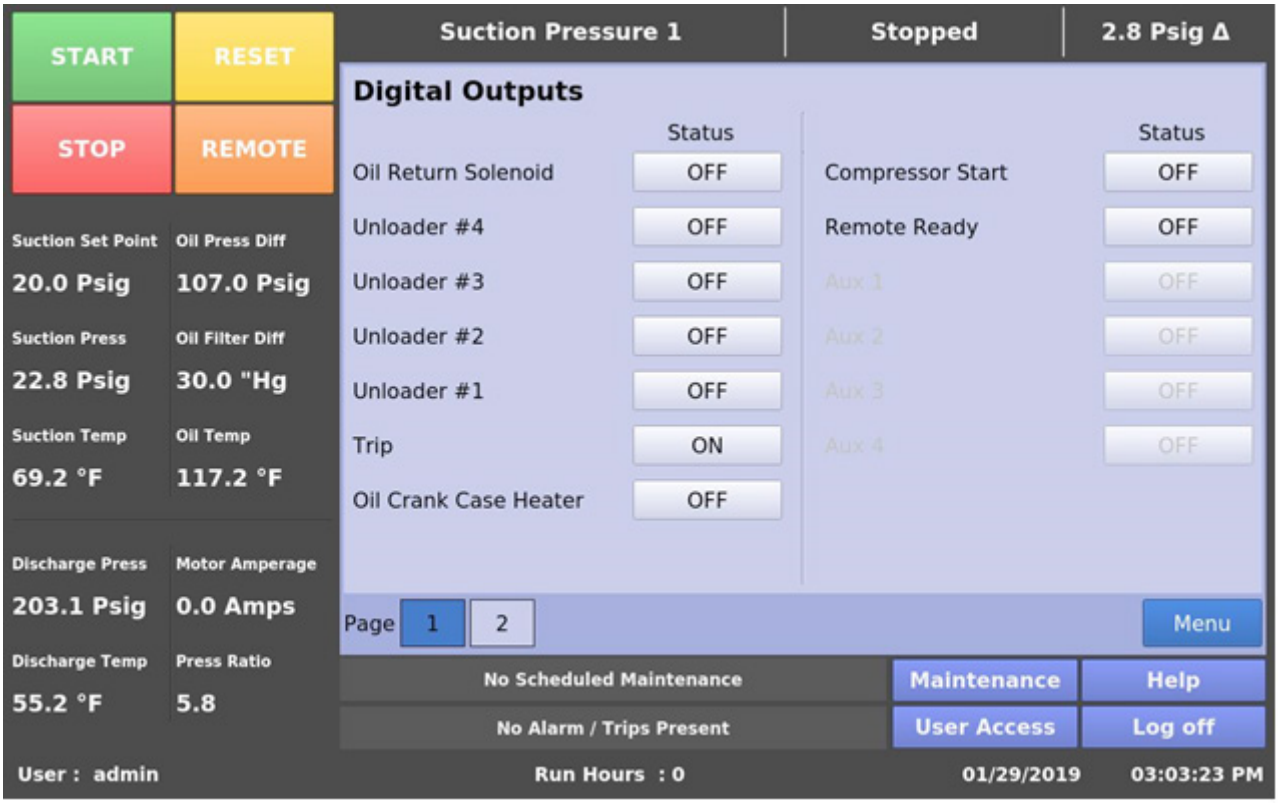


Figure 16-1. Service Options Screen Page 1 – Digital Outputs

Compressor Start

Activates the output assigned to the compressor motor starter. The output is connected to terminal X2-4 and is the 8th LED on the Multi-IO Board.

Remote Ready

Activates the output assigned to the remote ready. The output is connected to terminal X3-1 and is the 9th LED on the Multi-IO Board.

Figure 16-2. Service Options Screen Page 2 – Analog Outputs

Analog Outputs

The Analog Output (AO) selections allow the operator to enter a desired value for the output before turning it ON to test, see Figure 16-2.

The operator will have to measure the output using a meter capable of measuring a 4-20mA signal.

Compressor VFD

Sets the analog output assigned to the Compressor VFD. The output is connected to X12-1 on the Multi-IO Board.

Overview

This screen allows the Operator to view and adjust settings for the Trend Chart, see Figure 17-1.

The trending feature can be started & stopped from this screen, and the Operator can select up to four variables for on-screen plotting.

Each variable is assigned a specific color, and both the plotted trace and the vertical axis labels for the variable will be of the same color.

Other than the variables, the operator can select the time intervals for plotting as often as necessary. The vertical axis scale and offset for each variable plotted is based on the range of values of the entire data plotted on screen.

The available data for display is 120 hours maximum.

Chart Operation

Pen Selection

Pen selection allows the operator to select up to four different variables to plot on the screen (In red, blue, green and yellow).
The operator can select “None” as an option to disable the plotting of data for a pen.
The options in the pen selection drop-down boxes will depend on the channels selected in the Trend Setup screen.

Start/Stop

This button allows the operator to Start/Stop the trend feature. When the trend feature is not running, the button will display “Start” and will be green in color.
While the trend feature runs, the button will display “Stop” and will be red in color.
By pressing the “Stop” button the trend data is saved to a file.

Zoom In/Out

These buttons allow the Operator to adjust the number of data points plotted on the screen.
At the maximum zoom level, 3 minutes of trend data occupy the whole screen, and the Zoom In button will be inactive. At the minimum zoom level, the full 120 hours of trend data will be available on the screen and the Zoom Out button will be inactive.

Figure 17-1. Trend Chart Screen

Back/Forward

These buttons allow the Operator to move the plot and view trend data at different time intervals.
The forward button will be inactive when the Operator is viewing the first data point plotted on the screen (i.e. when the displayed time interval is 0:00). The back button will be inactive when the operator is viewing the last data point on the screen (i.e. when the displayed time interval is 120:00).
At minimum zoom level, both the Back & Forward buttons will be inactive.

Trace

This button allows the Operator to move a white cursor line across all four trend lines and receive a read out of all four variables at that point in time. When the Trace button is pressed, the cursor position is displayed along with the values of all four variables on the screen.

Hold

This button allows the Operator to stop the data from advancing on the screen, without stopping the trend feature itself.
When the Hold button is pressed, the Hold Time is displayed on the screen.

Trace Back (<) / Forward (>)

These buttons allow the operator to move a white cursor line across the trend lines, and to view the trend data values at that point.
These buttons will only be active when the trace button has been pressed.
Using these buttons will move the cursor, and the trace position will be updated on the screen.

Setup

This button allows the operator to open the Trend Setup screen. This button is inactive when the trend feature is running.

Trend Data Storage

The Trend Analysis Screen shows recorded data for problem analysis or tuning improvements. A logging buffer holds 5 minutes of data sampled at 10 second intervals.

When the logging buffer fills up with 5 minutes of data, it is automatically transferred to a temporary .csv file. A temp trend file will hold up to 1MB of accumulated data. When the temp file reaches this 1MB limit, the data is written to new trend file, and the temp file is overwritten with new data from the logging buffer until reaching again 1MB of data.

When a total of 15MB of trend data has been accumulated, and the logging buffer has filled with another 5 minutes of data to write, the file with the oldest trend data is deleted.

NOTE

Trend data will be stored with either temperature or pressure units depending on the selected Process Control Mode

Trend Setup

The operator can modify trending options through the Trend Setup screen, see Figure 17-2.

The Trend Setup screen can be accessed by pressing the Setup button when the trending feature is not running. This screen allows the operator to select a maximum of 10 analog I/O channels to populate the drop-down boxes for trending.

The operator can also set a path for the trend data files to be stored from the drop-down box in the setup screen. The default option is saving on the Hard-Disk, but a USB drive will appear as an option as long as it has already been mounted on the panel.

If there is no space available on the USB, the trend data files will be written to hard disk.

If the operator switches between Press/Temp units or changes the Process Control Mode from the configuration screen while the trending feature is running, then the trending running in the background will stop.

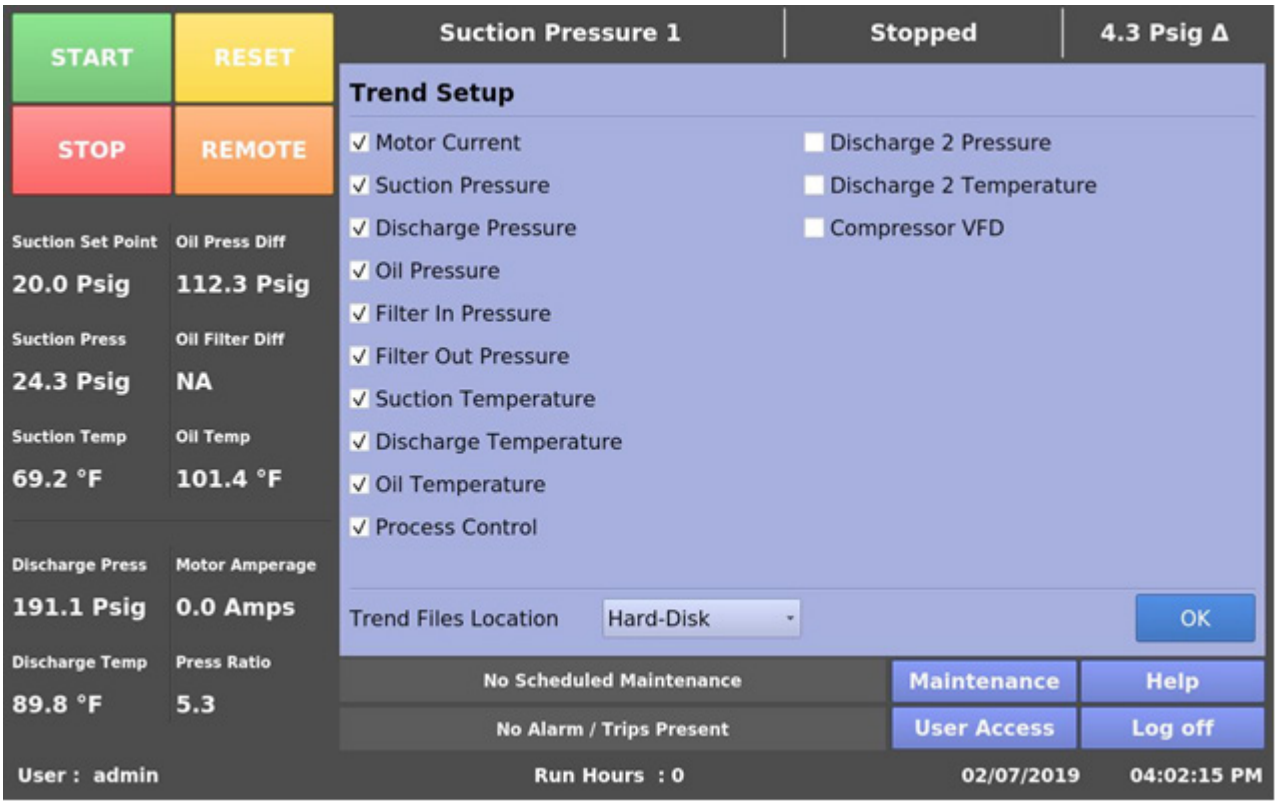


Figure 17-2. Trend Setup Screen

Appendix A • Unloaders

Unloader Tables

The following Table lists the different types of Unloading Schemes provided for balancing Vilter Reciprocating Compressor's capacity to varying load requirements.

Table A-0. Unloading Schemes

Type	Unloaders
TYPE1	2, 4 or 6 cylinders with 50% unloading
TYPE2	4 cylinders with 25%, 50%, 75% unloading. Single cylinder on Unloader Output #1
TYPE3	6 or 12 cylinders with 33%, 66% unloading
TYPE4	8 or 16 cylinders with 25%, 50% unloading
TYPE5	8 or 16 cylinders with 25%, 50%, 75% unloading
TYPE6	4 or 8 cylinders with 50%, 100% unloading
TYPE7	6 or 12 cylinders with 33%, 66%, 100% unloading
TYPE8	6 or 12 cylinders with 17%, 33%, 50%, 66% unloading. Single cylinder on Unloader Output #1
TYPE9	6 or 12 cylinders with 17%, 33%, 50%, 66%, 83% unloading. Single cylinder on Unloader Output #1
TYPE10	7 cylinders with 29%, 57% unloading
TYPE11	Compressor with NO unloading
TYPE12	3 cylinders with 33% unloading
TYPE13	8 or 16 cylinders with 25%, 50%, 75%, 100% unloading
TYPE14	6 cylinders with 33%, 50%, 66% unloading. Single cylinder on Unloader Output #1
TYPE15	8 cylinders with 13%, 25%, 38%, 50%, 63%, 75% unloading. Single cylinder on Unloader Output #1 and Output #2
TYPE16	8 cylinders with 13%, 38%, 63% unloading. Single cylinder on Unloader Output #1
TYPE17	6 cylinders with 33%, 50%, 66% unloading. Single cylinder on Unloader Output #1
TYPE18	5 cylinders with 40%, 60% unloading. Single cylinder on Unloader Output #1
TYPE19	3 cylinders with 33%, 66% unloading. Single cylinder on Unloader Output #1 and Output #2
TYPE20	7 cylinders with 14%, 29%, 43%, 57% unloading. Single cylinder on Unloader Output #1

Unloader Tables

The following tables provide the status of Unloader Outputs for each type of unloading scheme at every step.

Table A-1. Type 1 Unloader - Cylinders: 2, 4, or 6
Unloading Percentage: 50% *

% Load	Compressor Start Output	Unloader Output #1	% Unload
0 (OFF)	0	0	100
50	1	1	50
100	1	0	0

Table A-2. Type 2 Unloader - Cylinders: 4
Unloading Percentage: 25%, 50%, 75% | Single cylinder on Unloader Output #1 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	% Unload
0 (OFF)	0	0	0	100
25	1	1	1	75
50	1	0	1	50
75	1	1	0	25
100	1	0	0	0

Table A-3. Type 3 Unloader - Cylinders: 6 or 12
Unloading Percentage: 33%, 66% *

% Load	Compressor Start Output	Unloader Output #1	Unloader Output #2	% Unload
0 (OFF)	0	0	0	100
33	1	1	1	66
66	1	0	1	33
100	1	0	0	0

Table A-4. Type 4 Unloader - Cylinders: 8 or 16
Unloading Percentage: 25%, 50% *

% Load	Compressor Start Output	Unloader Output #1	Unloader Output #2	% Unload
0 (OFF)	0	0	0	100
50	1	1	1	50
75	1	0	1	25
100	1	0	0	0

* 0 = output OFF
  1 = output ON

Table A-5. Type 5 Unloader - Cylinders: 8, 16
Unloading Percentage: 25%, 50%, 75% *

% Load	Compressor Start Output	Unloader Output #1	Unloader Output #2	Unloader Output #3	% Unload
0 (OFF)	0	0	0	0	100
25	1	1	1	1	75
50	1	0	1	1	50
75	1	0	0	1	25
100	1	0	0	0	0

Table A-6. Type 6 Unloader - Cylinders: 4 or 8
Unloading Percentage: 50%, 100% *

% Load	Compressor Start Output	Unloader Output #1	Unloader Output #2	% Unload
0 (OFF)	0	0	0	100
0 (ON)	1	1	1	100
50	1	0	1	50
100	1	0	0	0

Table A-7. Type 7 Unloader - Cylinders: 6 or 12
Unloading Percentage: 33%, 66%, 100% *

% Load	Compressor Start Output	Unloader Output #1	Unloader Output #2	Unloader Output #3	% Unload
0 (OFF)	0	0	0	0	100
0 (ON)	1	1	1	1	100
33	1	0	1	1	66
66	1	0	0	1	33
100	1	0	0	0	0

Table A-8. Type 8 Unloader - Cylinders: 6 or 12
Unloading Percentage: 17%, 33%, 50%, 66% | Single cylinder on Unloader Output #1 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	Unloader Output #3 (double cylinder)	% Unload
0 (OFF)	0	0	0	0	100
33	1	0	1	1	66
50	1	1	0	1	50
66	1	0	0	1	33
83	1	1	0	0	17
100	1	0	0	0	0

* 0 = output OFF
1 = output ON

Table A-9. Type 9 Unloader - Cylinders: 6 or 12
Unloading Percentage: 17%, 33%, 50%, 66%, 83%
Single cylinder on Unloader Output #1 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	Unloader Output #3 (double cylinder)	% Unload
0 (OFF)	0	0	0	0	100
17	1	1	1	1	83
33	1	0	1	1	66
50	1	1	0	1	50
66	1	0	0	1	33
83	1	1	0	0	17
100	1	0	0	0	0

Table A-10. Type 10 Unloader - Cylinders: 7
Unloading Percentage: 29%, 57% *

% Load	Compressor Start Output	Unloader Output #1	Unloader Output #2	% Unload
0 (OFF)	0	0	0	100
43	1	1	1	57
71	1	0	1	29
100	1	0	0	0

Table A-11. Type 11 - Compressor with no Unloading *

% Load	Compressor Start Output
0 (OFF)	0
100	1

Table A-12. Type 12 Unloader - Cylinders: 3
Unloading Percentage: 33% *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	% Unload
0 (OFF)	0	0	100
66	1	1	33
100	1	0	0

* 0 = output OFF
1 = output ON

Table A-13. Type 13 Unloader - Cylinders: 8, 16
Unloading Percentage: 25%, 50%, 75%, 100% *

% Load	Compressor Start Output	Unloader Output #1	Unloader Output #2	Unloader Output #3	Unloader Output #4	% Unload
0 (OFF)	0	0	0	0	0	100
0 (ON)	1	1	1	1	1	100
25	1	0	1	1	1	75
50	1	0	0	1	1	50
75	1	0	0	0	1	25
100	1	0	0	0	0	0

Table A-14. Type 14 Unloader - Cylinders: 6
Unloading Percentage: 33%, 50%, 66%
Unloading - Single cylinder on Unloader Output #1 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	Unloader Output #3 (double cylinder)	% Unload
0 (OFF)	0	0	0	0	100
33	1	0	1	1	66
50	1	1	0	1	50
66	1	0	0	1	33
100	1	0	0	0	0

Table A-15. Type 15 Unloader - Cylinders: 8
Unloading Percentage: 13%, 25%, 38%, 50%, 63%, 75%
Unloading - Single cylinder on Unloader Output #1 and Output #2 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (single cylinder)	Unloader Output #3 (double cylinder)	Unloader Output #4 (double cylinder)	% Unload
0 (OFF)	0	0	0	0	0	100
25	1	1	1	1	1	75
37	1	0	1	1	1	63
50	1	0	0	1	1	50
62	1	0	1	0	1	38
75	1	0	0	0	1	25
87	1	0	1	0	0	13
100	1	0	0	0	0	0

* 0 = output OFF
1 = output ON

Table A-16. Type 16 Unloader - Cylinders: 8
Unloading Percentage: 13%, 38%, 63%
Unloading - Single cylinder on Unloader Output #1 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	Unloader Output #3 (double cylinder)	% Unload
0 (OFF)	0	0	0	0	100
37	1	1	1	1	63
62	1	1	0	1	38
87	1	1	0	0	13
100	1	0	0	0	0

Table A-17. Type 17 Unloader - Cylinders: 6
Unloading Percentage: 33%, 50%, 66%
Unloading - Single cylinder on Unloader Output #1 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	Unloader Output #3 (double cylinder)	% Unload
0 (OFF)	0	0	0	0	100
33	1	0	1	1	66
50	1	1	0	1	50
66	1	0	0	1	33
100	1	0	0	0	0

Table A-18. Type 18 Unloader - Cylinders: 5
Unloading Percentage: 40%, 60% | Single cylinder on Unloader Output #1 *

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	% Unload
0 (OFF)	0	0	0	100
40	1	1	1	60
60	1	0	1	40
100	1	0	0	0

* 0 = output OFF
1 = output ON

Table A-19. Type 19 Unloader - Cylinders: 3
Unloading Percentage: 33%, 66%
Single cylinder on Unloader Output #1 and Output #2*

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (single cylinder)	% Unload
0 (OFF)	0	0	0	100
33	1	1	1	66
66	1	0	1	33
100	1	0	0	0

Table A-20. Type 20 Unloader - Cylinders: 7
Unloading Percentage: 14%, 29%, 43%, 57%
Single cylinder on Unloader Output #1

% Load	Compressor Start Output	Unloader Output #1 (single cylinder)	Unloader Output #2 (double cylinder)	Unloader Output #3 (double cylinder)	% Unload
0 (OFF)	0	0	0	0	100
43	1	0	1	1	57
57	1	1	1	0	43
71	1	0	0	1	29
86	1	1	0	0	14
100	1	0	0	0	0

* 0 = output OFF
  1 = output ON

MicroVission Communication Table

Scope: MicroVission Programs – version 1.1 .

NOTES:
- All ENUM variables are of INT (Integer) type
- All F-INT data types represent floating point values as INT types multiplied by 10
- All Pressures are in Psig
- All Temperatures are in Fahrenheit
- Modbus TCP addressing is PLC-style (Base 1) addressing
- On Error, Modbus TCP server only returns an error code of "Illegal Data Address"
- All registers returned (INT and F-INT) are 2 bytes long
- For Ethernet/IP, use INT data type and PLC-5 Word Range Read/Write MSG instructions
- Remote commands cannot be issued if the panel is in the "Remote Lock" mode
- Polling rates should not be less than 5 secs
- Writes to the MicroVission should only occur when a value needs to be changed
- Lower Range and Higher Range values mentioned are default values of MicroVission setpoints
- Users can modify Lower Range & Higher Range values from MicroVission Panel and accordingly maintain their own table

Table B-1. Digital Inputs Block

Ethernet IP Address	Modbus Address	Digital Inputs	Data Type	Value	Mode	Lower Range	Higher Range
N50:0	40001	Setpoint 1/2	INT	0 = OFF, 1 = ON	Read	NA	NA
N50:1	40002	Remote Decrease	INT	0 = OFF, 1 = ON	Read	NA	NA
N50:2	40003	Remote Increase	INT	0 = OFF, 1 = ON	Read	NA	NA
N50:3	40004	Remote Start/Stop	INT	0 = OFF, 1 = ON	Read	NA	NA
N50:4	40005	Low Oil Level	INT	0 = OFF, 1 = ON	Read	NA	NA
N50:5	40006	High Level Shutdown	INT	0 = OFF, 1 = ON	Read	NA	NA
N50:6	40007	Compressor Auxiliary	INT	0 = OFF, 1 = ON	Read	NA	NA

Table B-2. Digital Outputs Block

Ethernet IP Address	Modbus Address	Digital Outputs	Data Type	Value	Mode	Lower Range	Higher Range
N51:0	40030	Oil Return Solenoid	INT	0 = OFF, 1 = ON	Read	NA	NA
N51:1	40031	Unloader #4	INT	0 = OFF, 1 = ON	Read	NA	NA
N51:2	40032	Unloader #3	INT	0 = OFF, 1 = ON	Read	NA	NA
N51:3	40033	Unloader #2	INT	0 = OFF, 1 = ON	Read	NA	NA
N51:4	40034	Unloader #1	INT	0 = OFF, 1 = ON	Read	NA	NA
N51:5	40035	Trip	INT	0 = OFF, 1 = ON (ON when no Trip)	Read	NA	NA
N51:6	40036	Oil Crank Case Heater	INT	0 = OFF, 1 = ON	Read	NA	NA
N51:7	40037	Compressor Start	INT	0 = OFF, 1 = ON	Read	NA	NA
N51:8	40038	Remote Ready	INT	0 = OFF, 1 = ON	Read	NA	NA

Table B-3. Analog Inputs Block

Ethernet IP Address	Modbus Address	Analog Inputs	Data Type	Value	Mode	Lower Range	Higher Range
N52:0	40060	Process Control	F-INT		Read	NA	NA
N52:1	40061	Oil Temperature	F-INT		Read	NA	NA
N52:2	40062	Discharge Temperature	F-INT		Read	NA	NA
N52:3	40063	Suction Temperature	F-INT		Read	NA	NA
N52:4	40064	Filter Outlet Pressure	F-INT		Read	NA	NA
N52:5	40065	Filter Inlet Pressure	F-INT		Read	NA	NA
N52:6	40066	Oil Manifold Pressure	F-INT		Read	NA	NA
N52:7	40067	Discharge Pressure	F-INT		Read	NA	NA
N52:8	40068	Suction Pressure	F-INT		Read	NA	NA
N52:9	40069	Motor Amps	F-INT		Read	NA	NA

Table B-4. Analog Outputs Block

Ethernet IP Address	Modbus Address	Analog Outputs	Data Type	Value	Mode	Lower Range	Higher Range
N53:0	40100	Compressor VFD Speed	F-INT		Read	NA	NA
N53:1	40101	Standard Analog Output #1	F-INT	Currently Unused	Read	NA	NA
N53:2	40102	Standard Analog Output #2	F-INT	Currently Unused	Read	NA	NA
N53:3	40103	Standard Analog Output #3	F-INT	Currently Unused	Read	NA	NA
N53:4	40104	Standard Analog Output #4	F-INT	Currently Unused	Read	NA	NA
N53:5	40105	Standard Analog Output #5	F-INT	Currently Unused	Read	NA	NA

Table B-5. Calculated Values Block

Ethernet IP Address	Modbus Address	Calculated Values	Data Type	Value	Mode	Lower Range	Higher Range
N54:0	40120	Filter Differential Pressure	F-INT		Read	NA	NA
N54:1	40121	Pressure Ratio	F-INT		Read	NA	NA
N54:2	40122	Oil Pressure Differential	F-INT		Read	NA	NA
N54:3	40123	Compressor VFD RPM	INT		Read	NA	NA

Table B-6. Statuses Block

Ethernet IP Address	Modbus Address	Statuses	Data Type	Value	Mode	Lower Range	Higher Range
N55:0	40140	Anti-Recycle Time (Minutes)	INT		Read	NA	NA
N55:1	40141	Compressor Status	ENUM		Read	NA	NA
N55:2	40142	Alarm Status Word #1	WORD		Read	NA	NA
N55:3	40143	Alarm Status Word #2	WORD		Read	NA	NA
N55:4	40144	Warning Status Word #1	WORD		Read	NA	NA
N55:5	40145	Warning Status Word #2	WORD		Read	NA	NA
N55:6	40146	Trip Status Word #1	WORD		Read	NA	NA
N55:7	40147	Trip Status Word #2	WORD		Read	NA	NA
N55:8	40148	Trip Status Word #3	WORD		Read	NA	NA
N55:9	40149	Trip Status Word #4	WORD		Read	NA	NA
N55:10	40150	Current Run Mode	ENUM	0 = Idle 1 = Waiting 2 = Starting 3 = Manual 4 = Auto 5 = Remote Auto 6 = Remote Manual 7 = Remote Step Hold % 8 = Remote Ready (Idle) 9 = Direct I/O Auto 10 = Direct I/O Manual 11 = Direct I/O Step Hold % 12 = Auto Sequencing	Read	NA	NA
N55:11	40151	Status Message	WORD	Bit 0 = High Suction Pressure Bit 1 = High Discharge Pressure Bit 2 = Low Suction Pressure Bit 3 = High Motor Current Bit 4 = Auto Cycle Bit 5 = Run Permissive	Read	NA	NA
N55:12	40152	Remote Lock Mode	INT	0 = OFF, 1 = ON	Read	NA	NA
N55:13	40153	Runtime Hours (x1000)	INT		Read	NA	NA
N55:14	40154	Runtime Hours (1-999)	INT		Read	NA	NA

Alarm Status Words

Statuses: Alarm Status Word(s) – currently 17 alarms, so both Alarm Status Word 1 and 2 are used, with each position indicating an alarm:

MSB	LSB
[Bit 15, Bit 14, Bit 13 ... Bit 3, Bit 2, Bit 1, Bit 0]	

Table B-7. Alarm Status Words

Word 1	Word 2
Bit 0 = Low Suction Pressure Alarm	Bit 0 = Remote Comm Time out
Bit 1 = Low Process Temperature Alarm	Bit 1 = Unused
Bit 2 = Low Process Pressure Alarm	Bit 2 = Unused
Bit 3 = Low Suction Temperature Alarm	Bit 3 = Unused
Bit 4 = Low Crankcase Oil Temperature Alarm	Bit 4 = Unused
Bit 5 = Low Oil Pressure Diff. Alarm	Bit 5 = Unused
Bit 6 = Low Oil Level Alarm	Bit 6 = Unused
Bit 7 = High Discharge Pressure Alarm	Bit 7 = Unused
Bit 8 = High Discharge 2 Pressure Alarm	Bit 8 = Unused
Bit 9 = High Process Temperature Alarm	Bit 9 = Unused
Bit 10 = High Process Pressure Alarm	Bit 10 = Unused
Bit 11 = High Discharge Temperature Alarm	Bit 11 = Unused
Bit 12 = High Discharge 2 Temperature Alarm	Bit 12 = Unused
Bit 13 = High Crankcase Oil Temperature Alarm	Bit 13 = Unused
Bit 14 = High Filter Differential Pressure Alarm	Bit 14 = Unused
Bit 15 = High Motor Current Alarm	Bit 15 = Unused

Warning Status Words

Statuses: Warning Status Word(s) – currently 20 warnings, so both Warning Status Word 1 and 2 are used, with each position indicating an alarm:

MSB	LSB
[Bit 15, Bit 14, Bit 13 ... Bit 3, Bit 2, Bit 1, Bit 0]	

Table B-8. Warning Status Words

Word 1	Word 2
Bit 0 = Low Suction Pressure Warning	Bit 0 = Low Discharge 2 Pressure Warning
Bit 1 = Low Process Temperature Warning	Bit 1 = Low Discharge 2 Temperature Warning
Bit 2 = Low Process Pressure Warning	Bit 2 = Low Oil Filter In Pressure Warning
Bit 3 = Low Suction Temperature Warning	Bit 3 = Low Oil Filter Out Pressure Warning
Bit 4 = Low Crankcase Oil Temperature Start Warning	Bit 4 = Unused
Bit 5 = Low Oil Level Warning	Bit 5 = Unused
Bit 6 = High Discharge Pressure Warning	Bit 6 = Unused
Bit 7 = High Discharge 2 Pressure Warning	Bit 7 = Unused
Bit 8 = High Process Pressure Warning	Bit 8 = Unused
Bit 9 = High Discharge Temperature Warning	Bit 9 = Unused
Bit 10 = High Discharge 2 Temperature Warning	Bit 10 = Unused
Bit 11 = High Crankcase Oil Temperature Warning	Bit 11 = Unused
Bit 12 = High Filter Diff. Pressure Start Warning	Bit 12 = Unused
Bit 13 = High Level Shutdown Warning	Bit 13 = Unused
Bit 14 = Low Discharge Pressure Warning	Bit 14 = Unused
Bit 15 = Low Discharge Temperature Warning	Bit 15 = Unused

Trip Status Words

Statuses: Trip Status Word(s) – currently 48 trips, so all Trip Status Words 1, 2, 3 and 4 are used, with each position indicating an alarm:

MSB	LSB
[Bit 15, Bit 14, Bit 13 ... Bit 3, Bit 2, Bit 1, Bit 0]	

Table B-9. Trip Status Words (Words 1 & 2)

Word 1	Word 2
Bit 0 = Low Suction Pressure Inhibit	Bit 0 = Low Discharge Temperature Inhibit
Bit 1 = Low Process Temperature Inhibit	Bit 1 = Low Discharge 2 Pressure Inhibit
Bit 2 = Low Process Pressure Inhibit	Bit 2 = Low Discharge 2 Temperature Inhibit
Bit 3 = Low Crankcase Oil Temperature Start Inhibit	Bit 3 = Low Oil Filter In Pressure Inhibit
Bit 4 = Low Oil Level Inhibit	Bit 4 = Low Oil Filter Out Pressure Inhibit
Bit 5 = Low Suction Temperature Inhibit	Bit 5 = Unused
Bit 6 = High Discharge Pressure Inhibit	Bit 6 = Unused
Bit 7 = High Discharge 2 Pressure Inhibit	Bit 7 = Unused
Bit 8 = High Process Pressure Inhibit	Bit 8 = Unused
Bit 9 = High Discharge Temperature Inhibit	Bit 9 = Unused
Bit 10 = High Discharge 2 Temperature Inhibit	Bit 10 = Unused
Bit 11 = High Crankcase Oil Temperature Inhibit	Bit 11 = Unused
Bit 12 = High Filter Differential Pressure Start Inhibit	Bit 12 = Unused
Bit 13 = Compressor Interlock Inhibit	Bit 13 = Unused
Bit 14 = High Level Shutdown Inhibit	Bit 14 = Unused
Bit 15 = Low Discharge Pressure Inhibit	Bit 15 = Unused

Table B-9. Trip Status Words (Words 3 & 4)

Word 3	Word 4
Bit 0 = Low Suction Pressure Trip	Bit 0 = Compressor Interlock Trip
Bit 1 = Low Process Temperature Trip	Bit 1 = False Start
Bit 2 = Low Process Pressure Trip	Bit 2 = Starter Shutdown Trip
Bit 3 = Low Suction Temperature Trip	Bit 3 = Remote Comm Time out
Bit 4 = Low Crankcase Oil Temperature Trip	Bit 4 = IO Comm Trip
Bit 5 = Low Oil Pressure Diff. Trip	Bit 5 = Low Discharge Pressure Trip
Bit 6 = Low Oil Level Trip	Bit 6 = Low Discharge Temperature Trip
Bit 7 = High Discharge Pressure Trip	Bit 7 = Low Discharge 2 Pressure Trip
Bit 8 = High Discharge 2 Pressure Trip	Bit 8 = Low Discharge 2 Temperature Trip
Bit 9 = High Process Pressure Trip	Bit 9 = Low Oil Filter In Pressure Trip
Bit 10 = High Discharge Temperature Trip	Bit 10 = Low Oil Filter Out Pressure Trip
Bit 11 = High Discharge 2 Temperature Trip	Bit 11 = Unused
Bit 12 = High Crankcase Oil Temperature Trip	Bit 12 = Unused
Bit 13 = High Filter Differential Pressure Trip	Bit 13 = Unused
Bit 14 = High Level Shutdown Trip	Bit 14 = Unused
Bit 15 = High Motor Amps Trip	Bit 15 = Unused

Table B-10. Commands Block

Ethernet IP Address	Modbus Address	Commands	Data Type	Value	Mode	Lower Range	Higher Range
N56:0	40170	Alarm Reset	INT	1 = Perform Reset	Read-Write	NA	NA
N56:1	40171	Active Remote Control	ENUM	0 = None (Local) 1 = Direct I/O 2 = Serial 3 = Ethernet	Read-Write	NA	NA
N56:2	40172	Remote Control Select	ENUM	0 = Auto Control 1 = Step Load / Unload	Read-Write	NA	NA
N56:3	40173	Auto Control Type	ENUM	0 = Suction Pressure (if enabled) 1 = Process Control (if enabled) 2 = Discharge Pressure (if enabled)	Read-Write	NA	NA
N56:4	40174	Remote Step Load	INT	1 - Load	Read-Write	NA	NA
N56:5	40175	Remote Step Unload	INT	1 - Unload	Read-Write	NA	NA
N56:6	40176	Step Hold %	INT	Currently Unused	Read-Write	NA	NA
N56:7	40177	Active Setpoint	ENUM	1 = Setpoint 1 2 = Setpoint 2 (if enabled)	Read-Write	NA	NA
N56:8	40178	Start Command	INT	1 = Remote Auto	Read-Write	NA	NA
N56:9	40179	Stop Command	INT	1 = Stop	Read-Write	NA	NA
N56:10	40180	Auto-Cycle Enable/ Disable	INT	0 = Disable 1 = Enable	Read-Write	NA	NA

NOTE
Commands: Start Command – starts the compressor in the currently active control mode. If anti-recycle time exists, this command will fail

Table B-11. Compressor Control Setpoints Block

Ethernet IP Address	Modbus Address	Compressor Control Setpoints	Data Type	Value	Mode	Lower Range	Higher Range
N57:0	40200	Control Setpoint #1 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(-15.0, -100.0, -15.0)	(150.0, 300.0, 400.0)
N57:1	40201	Load Offset Setpoint #1 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(0.1, 0.1, 0.5)	(150.0, 300.0, 20.0)
N57:2	40202	Load Interval Setpoint #1 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 600, 5)
N57:3	40203	Unload Offset Setpoint #1 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(0.1, 0.1, 0.5)	(150.0, 300.0, 20.0)
N57:4	40204	Unload Interval Setpoint #1 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 600, 5)
N57:5	40205	Control Setpoint #2 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(-15.0, -100.0, -15.0)	(150.0, 300.0, 400.0)
N57:6	40206	Load Offset Setpoint #2 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(0.1, 0.1, 0.5)	(150.0, 300.0, 20.0)
N57:7	40207	Load Interval Setpoint #2 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 600, 5)
N57:8	40208	Unload Offset Setpoint #2 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(0.1, 0.1, 0.5)	(150.0, 300.0, 20.0)
N57:9	40209	Unload Interval Setpoint #2 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 600, 5)

Table B-12. Auto Cycle Block

Ethernet IP Address	Modbus Address	Auto Cycle	Data Type	Value	Mode	Lower Range	Higher Range
N58:0	40220	Start Setpoint #1 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(-15.0, -100.0, -15.0)	(150.0, 150.0, 400.0)
N58:1	40221	Start Delay Time Setpoint #1 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 300, 300)
N58:2	40222	Stop Setpoint #1 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(-15.0, -100.0, -15.0)	(150.0, 150.0, 400.0)
N58:3	40223	Stop Delay Time Setpoint #1 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 300, 300)
N58:4	40224	Start Setpoint #2 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(-15.0, -100.0, -15.0)	(150.0, 150.0, 400.0)
N58:5	40225	Start Delay Time Setpoint #2 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 300, 300)
N58:6	40226	Stop Setpoint #2 (Suction Press, Process Control, Discharge Press)	F-INT		Read-Write	(-15.0, -100.0, -15.0)	(150.0, 150.0, 400.0)
N58:7	40227	Stop Delay Time Setpoint #2 (Suction Press, Process Control, Discharge Press)	INT		Read-Write	(1, 1, 1)	(600, 300, 300)

Table B-13. Stop Load & Force Unload Block

Ethernet IP Address	Modbus Address	Stop Load & Force Unload	Data Type	Value	Mode	Lower Range	Higher Range
N59:0	40240	High Suction Pressure Stop Load Setpoint	F-INT		Read	NA	NA
N59:1	40241	High Discharge Pressure Stop Load Setpoint	F-INT		Read	NA	NA
N59:2	40242	Low Suction Pressure Stop Load Setpoint	F-INT		Read	NA	NA
N59:3	40243	High Motor Current Stop Load Setpoint	F-INT		Read	NA	NA
N59:4	40244	High Suction Pressure Force Unload Setpoint	F-INT		Read	NA	NA
N59:5	40245	High Discharge Pressure Force Unload Setpoint	F-INT		Read	NA	NA
N59:6	40246	Low Suction Pressure Force Unload Setpoint	F-INT		Read	NA	NA
N59:7	40247	High Motor Current Force Unload Setpoint	F-INT		Read	NA	NA
N59:8	40248	Unload Timer	INT		Read	NA	NA

Table B-14. Oil Control Block

Ethernet IP Address	Modbus Address	Oil Control	Data Type	Value	Mode	Lower Range	Higher Range
N60:0	40260	Oil Crankcase Heater Temperature	F-INT		Read	NA	NA

Table B-15. Compressor VFD Block

Ethernet IP Address	Modbus Address	Compressor VFD	Data Type	Value	Mode	Lower Range	Higher Range
N68:0	40280	VFD Gain (P)	F-INT		Read	NA	NA
N68:1	40281	VFD Reset (I)	F-INT		Read	NA	NA
N68:2	40282	VFD Rate (D)	F-INT		Read	NA	NA
N68:3	40283	VFD Interval	INT		Read	NA	NA
N68:4	40284	Minimum Speed (rpm)	INT		Read	NA	NA
N68:5	40285	Maximum Speed (rpm)	INT		Read	NA	NA

Table B-16. Alarms/Trips Block (Page 1) (1 of 2)

Ethernet IP Address	Modbus Address	Alarms/Trips (Page 1)	Data Type	Value	Mode	Lower Range	Higher Range
N61:0	40400	Low Suction Pressure Alarm Setpoint #1	F-INT		Read-Write	-15	300
N61:1	40401	Low Suction Pressure Trip Setpoint #1	F-INT		Read-Write	-15	300
N61:2	40402	High Discharge Pressure Alarm Setpoint #1	F-INT		Read		
N61:3	40403	High Discharge Pressure Trip Setpoint #1	F-INT		Read		
N61:4	40404	Low Process Temperature Alarm Setpoint #1	F-INT		Read-Write	-100	210
N61:5	40405	Low Process Temperature Trip Setpoint #1	F-INT		Read-Write	-100	210
N61:6	40406	High Process Temperature Alarm Setpoint #1	F-INT		Read-Write	-100	210
N61:7	40407	Low Suction Pressure Alarm Setpoint #2	F-INT		Read-Write	-15	300
N61:8	40408	Low Suction Pressure Trip Setpoint #2	F-INT		Read-Write	-15	300
N61:9	40409	High Discharge Pressure Alarm Setpoint #2	F-INT		Read		
N61:10	40410	High Discharge Pressure Trip Setpoint #2	F-INT		Read		
N61:11	40411	Low Process Temperature Alarm Setpoint #2	F-INT		Read-Write	-100	210

Table B-16. Alarms/Trips Block (Page 1) (2 of 2)

Ethernet IP Address	Modbus Address	Alarms/Trips (Page 1)	Data Type	Value	Mode	Lower Range	Higher Range
N61:12	40412	Low Process Temperature Trip Setpoint #2	F-INT		Read-Write	-100	210
N61:13	40413	High Process Temperature Alarm Setpoint #2	F-INT		Read-Write	-100	210
N61:14	40414	Low Process Pressure Alarm Setpoint #1	F-INT	(Currently Unused)	Read-Write	-15	300
N61:15	40415	Low Process Pressure Trip Setpoint #1	F-INT	(Currently Unused)	Read-Write	-15	300
N61:16	40416	High Process Pressure Alarm Setpoint #1	F-INT	(Currently Unused)	Read-Write	-15	350
N61:17	40417	High Process Pressure Trip Setpoint #1	F-INT	(Currently Unused)	Read-Write	-15	350
N61:18	40418	Low Process Pressure Alarm Setpoint #2	F-INT	(Currently Unused)	Read-Write	-15	300
N61:19	40419	Low Process Pressure Trip Setpoint #2	F-INT	(Currently Unused)	Read-Write	-15	300
N61:20	40420	High Process Pressure Alarm Setpoint #2	F-INT	(Currently Unused)	Read-Write	-15	300
N61:21	40421	High Process Pressure Trip Setpoint #2	F-INT	(Currently Unused)	Read-Write	-15	300

Table B-17. Alarms/Trips Block (Page 2)

Ethernet IP Address	Modbus Address	Alarms/Trips (Page 2)	Data Type	Value	Mode	Lower Range	Higher Range
N62:0	40430	Low Suction Temperature Alarm	F-INT		Read-Write	-100	210
N62:1	40431	Low Suction Temperature Trip	F-INT		Read-Write	-100	210
N62:2	40432	High Discharge Temperature Alarm	F-INT		Read	NA	NA
N62:3	40433	High Discharge Temperature Trip	F-INT		Read	NA	NA
N62:4	40434	Low Crankcase Oil Temperature - Start Alarm	F-INT		Read	NA	NA
N62:5	40435	Low Crankcase Oil Temperature - Start Trip	F-INT		Read	NA	NA
N62:6	40436	Low Crankcase Oil Temperature - Run Alarm	F-INT		Read	NA	NA
N62:7	40437	Low Crankcase Oil Temperature - Run Trip	F-INT		Read	NA	NA
N62:8	40438	High Crankcase Oil Temperature Alarm	F-INT		Read	NA	NA
N62:9	40439	High Crankcase Oil Temperature Trip	F-INT		Read	NA	NA

Table B-18. Alarms/Trips Block (Page 3)

Ethernet IP Address	Modbus Address	Alarms/Trips (Page 3)	Data Type	Value	Mode	Lower Range	Higher Range
N63:0	40460	Low Oil Pressure Alarm	F-INT		Read	NA	NA
N63:1	40461	Low Oil Pressure Trip	F-INT		Read	NA	NA
N63:2	40462	High Filter Diff. Pressure - Start Alarm	F-INT		Read	NA	NA
N63:3	40463	High Filter Diff. Pressure - Start Trip	F-INT		Read	NA	NA
N63:4	40464	High Filter Diff. Pressure - Run Alarm	F-INT		Read	NA	NA
N63:5	40465	High Filter Diff. Pressure - Run Trip	F-INT		Read	NA	NA
N63:6	40466	High Motor Amps Alarm	F-INT		Read	NA	NA
N63:7	40467	High Motor Amps Trip	F-INT		Read	NA	NA

Table B-19. Timers Block (Page 1)

Ethernet IP Address	Modbus Address	Timers (Page 1)	Data Type	Value	Mode	Lower Range	Higher Range
N64:0	40500	Load Increase Start Delay (seconds)	INT		Read	NA	NA
N64:1	40501	Compressor Interlock Bypass (seconds)	INT		Read	NA	NA
N64:2	40502	Low Oil Pressure Diff. Bypass (seconds)	INT		Read	NA	NA
N64:3	40503	Low Crankcase Oil Temperature Changeover (seconds)	INT		Read	NA	NA
N64:4	40504	High Discharge Temperature Bypass (seconds)	INT		Read	NA	NA
N64:5	40505	High Filter Diff. Pressure Changeover (seconds)	INT		Read	NA	NA
N64:6	40506	High Motor Amps Bypass (seconds)	INT		Read	NA	NA

Table B-20. Timers Block (Page 2)

Ethernet IP Address	Modbus Address	Timers (Page 2)	Data Type	Value	Mode	Lower Range	Higher Range
N65:0	40520	Communication Failure Detect Timer (minutes)	INT		Read	NA	NA
N65:1	40521	Restart Power Failure Timer (minutes)	INT	(Currently Unused)	Read	NA	NA
N65:2	40522	True Anti-Recycle Timer (minutes)	INT		Read-Write	6	60
N65:3	40523	Accumulative Anti-Recycle Timer (minutes)	INT		Read-Write	6	60
N65:4	40524	Hot Starts per Hour	INT		Read-Write	1	10
N65:5	40525	Oil Recovery Solenoid Shutoff Delay (seconds)	INT		Read	NA	NA
N65:6	40526	Low Oil Level Alarm Delay (seconds)	INT		Read	NA	NA
N65:7	40527	Low Oil Level Trip Delay (seconds)	INT		Read	NA	NA

Table B-21. Configuration (Time) Block

Ethernet IP Address	Modbus Address	Configuration (Time)	Data Type	Value	Mode	Lower Range	Higher Range
N66:0	40600	Time – Hours	INT	(HH)	Read-Write	0	23
N66:1	40601	Time – Min	INT	(MM)	Read-Write	0	59
N66:2	40602	Time – Secs	INT	(SS)	Read-Write	0	59
N66:3	40603	Date – Year	INT	(YYYY)	Read-Write	1970	2037
N66:4	40604	Date – Month	INT	(1-12)	Read-Write	1	12
N66:5	40605	Date – Day	INT	(1-31)	Read-Write	1	31

Table B-22. Configuration (Other) Block (1 of 2)

Ethernet IP Address	Modbus Address	Configuration (Other)	Data Type	Value	Mode	Lower Range	Higher Range
N67:0	40610	No. of Cylinders	ENUM	0 = 2 cyl 1 = 3 cyl 2 = 4 cyl 3 = 5 cyl 4 = 6 cyl 5 = 7 cyl 6 = 8 cyl 7 = 12 cyl 8 = 16 cyl	Read	NA	NA
Ethernet IP Address	Modbus Address	Configuration (Other)	Data Type	Value	Mode	Lower Range	Higher Range
N67:1	40611	No. of Unloaders	ENUM	0 = No Unloader 1 = 1 Unloader, 33% 2 = 1 Unloader, 50% 3 = 2 Unloaders, 25, 50% 4 = 2 Unloaders, 25, 50, 75% 5 = 2 Unloaders, 29, 57% 6 = 2 Unloaders, 33, 66% 7 = 2 Unloaders, 40, 60% 8 = 2 Unloaders, 50, 100% 9 = 3 Unloaders, 13, 38, 63% 10 = 3 Unloaders, 14, 29, 43, 57% 11 = 3 Unloaders, 17, 33, 50, 66% 12 = 3 Unloaders, 17, 33, 50, 66, 83% 13 = 3 Unloaders, 25, 50, 75% 14 = 3 Unloaders, 33, 50, 66% 15 = 3 Unloaders, 33, 66, 100% 16 = 4 Unloaders, 13, 25, 38, 50, 63, 75% 17 = 4 Unloaders, 25, 50, 75, 100%	Read	NA	NA
N67:2	40612	Suction Pressure Control Avail-able	INT	0 = No, 1 = Yes	Read	NA	NA
N67:3	40613	Suction Pres-sure Control # of Setpoints	INT		Read	NA	NA
N67:4	40614	Process Control Available	INT	0 = No, 1 = Yes	Read	NA	NA

Table B-22. Configuration (Other) Block (continued) (2 of 2)

Ethernet IP Address	Modbus Address	Configuration (Other)	Data Type	Value	Mode	Lower Range	Higher Range
N67:5	40615	Process Control # of Setpoints	INT		Read	NA	NA
N67:6	40616	Process Control Type	ENUM	0 = Temperature 1 = Pressure	Read	NA	NA
N67:7	40617	Discharge Pressure Control Available	INT	0 = No, 1 = Yes	Read	NA	NA
N67:8	40618	Discharge Pressure Control # of Setpoints	INT	0 = No, 1 = Yes	Read	NA	NA
N67:9	40619	Restart on Power Fail	ENUM	(Currently Unused)	Read-Write	NA	NA
N67:10	40620	Oil Monitoring	ENUM	0 = No Oil Filter Monitoring 1 = Only Oil Filter In 2 = Oil Filter In and Oil Filter Out	Read	NA	NA
N67:11	40621	Oil Level Trip Available	INT	0 = No, 1 = Yes	Read	NA	NA
N67:12	40622	Anti-Recycle	ENUM	0 = True Anti-Recycle 1 = Accumulative Anti-Recycle 2 = Hot Starts	Read	NA	NA
N67:13	40623	Compressor Sequencing	INT	(Currently Unused)	Read	NA	NA
N67:14	40624	Idle Time Trip	INT	0 = No, 1 = Yes	Read	NA	NA
N67:15	40625	On Communication Failure	ENUM	0 = Revert to Local Control 1 = Stop with Alarm	Read	NA	NA
N67:16	40626	Panel ID	INT		Read	NA	NA
N67:17	40627	Compressor VFD	INT	0 = Disable 1 = Enable	Read	NA	NA

Table B-23. Trend Chart (1 of 2)

Ethernet IP Address	Modbus Address	Trend Chart	Data Type	Value	Mode	Lower Range	Higher Range
N70:0	40650	Motor Current Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:1	40651	Suction Pressure Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:2	40652	Discharge Pressure Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:3	40653	Oil Pressure Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:4	40654	Filter In Pressure Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA

Table B-23. Trend Chart (2 of 2)

Ethernet IP Address	Modbus Address	Trend Chart	Data Type	Value	Mode	Lower Range	Higher Range
N70:5	40655	Filter Out Pressure Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:6	40656	Suction Temperature Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:7	40657	Discharge Temperature Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:8	40658	Oil Temperature Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:9	40659	Process Control Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:10	40660	Discharge 2 Pressure Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:11	40661	Discharge 2 Temperature Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:12	40662	Auxiliary Input #1 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:13	40663	Auxiliary Input #2 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:14	40664	Auxiliary Input #3 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:15	40665	Auxiliary Input #4 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:16	40666	Auxiliary Input #5 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:17	40667	Auxiliary Input #6 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:18	40668	Auxiliary Input #7 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:19	40669	Auxiliary Input #8 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:20	40670	Compressor VFD Enabled	INT	0 = Disabled 1 = Enabled	Read	NA	NA
N70:21	40671	Standard Analog Output #1 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:22	40672	Standard Analog Output #2 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:23	40673	Standard Analog Output #3 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:24	40674	Standard Analog Output #4 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:25	40675	Standard Analog Output #5 Enabled	INT	(Currently Unused)	Read	NA	NA
N70:26	40676	Trend Files Location	ENUM	0 = Hard Disk 1 = USB Drive	Read	NA	NA

Table B-24. Compressor Scheduling Block (1 of 3)

Ethernet IP Address	Modbus Address	Compressor Scheduling	Data Type	Value	Mode	Lower Range	Higher Range
N69:0	40800	Sunday Event #1 Control Mode	ENUM		Read-Write	0	6
N69:1	40801	Sunday Event #1 Hour	INT		Read-Write	0	23
N69:2	40802	Sunday Event #1 Minute	INT		Read-Write	0	59
N69:3	40803	Sunday Event #2 Control Mode	ENUM		Read-Write	0	6
N69:4	40804	Sunday Event #2 Hour	INT		Read-Write	0	23
N69:5	40805	Sunday Event #2 Minute	INT		Read-Write	0	59
N69:6	40806	Sunday Event #3 Control Mode	ENUM		Read-Write	0	6
N69:7	40807	Sunday Event #3 Hour	INT		Read-Write	0	23
N69:8	40808	Sunday Event #3 Minute	INT		Read-Write	0	59
N69:9	40809	Sunday Event #4 Control Mode	ENUM		Read-Write	0	6
N69:10	40810	Sunday Event #4 Hour	INT		Read-Write	0	23
N69:11	40811	Sunday Event #4 Minute	INT		Read-Write	0	59
N69:12	40812	Monday Event #1 Control Mode	ENUM		Read-Write	0	6
N69:13	40813	Monday Event #1 Hour	INT		Read-Write	0	23
N69:14	40814	Monday Event #1 Minutes	INT		Read-Write	0	23
N69:15	40815	Monday Event #2 Control Mode	ENUM		Read-Write	0	6
N69:16	40816	Monday Event #2 Hour	INT		Read-Write	0	23
N69:17	40817	Monday Event #2 Minute	INT		Read-Write	0	59
N69:18	40818	Monday Event #3 Control Mode	ENUM		Read-Write	0	6
N69:19	40819	Monday Event #3 Hour	INT		Read-Write	0	23
N69:20	40820	Monday Event #3 Minute	INT		Read-Write	0	59
N69:21	40821	Monday Event #4 Control Mode	ENUM		Read-Write	0	6
N69:22	40822	Monday Event #4 Hour	INT		Read-Write	0	23
N69:23	40823	Monday Event #4 Minute	INT		Read-Write	0	59
N69:24	40824	Tuesday Event #1 Control Mode	ENUM		Read-Write	0	6
N69:25	40825	Tuesday Event #1 Hour	INT		Read-Write	0	23
N69:26	40826	Tuesday Event #1 Minutes	INT		Read-Write	0	23
N69:27	40827	Tuesday Event #2 Control Mode	ENUM		Read-Write	0	6
N69:28	40828	Tuesday Event #2 Hour	INT		Read-Write	0	23
N69:29	40829	Tuesday Event #2 Minute	INT		Read-Write	0	59
N69:30	40830	Tuesday Event #3 Control Mode	ENUM		Read-Write	0	6
N69:31	40831	Tuesday Event #3 Hour	INT		Read-Write	0	23
N69:32	40832	Tuesday Event #3 Minute	INT		Read-Write	0	59
N69:33	40833	Tuesday Event #4 Control Mode	ENUM		Read-Write	0	6
N69:34	40834	Tuesday Event #4 Hour	INT		Read-Write	0	23
N69:35	40835	Tuesday Event #4 Minute	INT		Read-Write	0	59
N69:36	40836	Wednesday Event #1 Control Mode	ENUM		Read-Write	0	6
N69:37	40837	Wednesday Event #1 Hour	INT		Read-Write	0	23
N69:38	40838	Wednesday Event #1 Minutes	INT		Read-Write	0	23

Table B-24. Compressor Scheduling Block (2 of 3)

Ethernet IP Address	Modbus Address	Compressor Scheduling	Data Type	Value	Mode	Lower Range	Higher Range
N69:39	40839	Wednesday Event #2 Control Mode	ENUM		Read-Write	0	6
N69:40	40840	Wednesday Event #2 Hour	INT		Read-Write	0	23
N69:41	40841	Wednesday Event #2 Minute	INT		Read-Write	0	59
N69:42	40842	Wednesday Event #3 Control Mode	ENUM		Read-Write	0	6
N69:43	40843	Wednesday Event #3 Hour	INT		Read-Write	0	23
N69:44	40844	Wednesday Event #3 Minute	INT		Read-Write	0	59
N69:45	40845	Wednesday Event #4 Control Mode	ENUM		Read-Write	0	6
N69:46	40846	Wednesday Event #4 Hour	INT		Read-Write	0	23
N69:47	40847	Wednesday Event #4 Minute	INT		Read-Write	0	59
N69:48	40848	Thursday Event #1 Control Mode	ENUM		Read-Write	0	6
N69:49	40849	Thursday Event #1 Hour	INT		Read-Write	0	23
N69:50	40850	Thursday Event #1 Minutes	INT		Read-Write	0	23
N69:51	40851	Thursday Event #2 Control Mode	ENUM		Read-Write	0	6
N69:52	40852	Thursday Event #2 Hour	INT		Read-Write	0	23
N69:53	40853	Thursday Event #2 Minute	INT		Read-Write	0	59
N69:54	40854	Thursday Event #3 Control Mode	ENUM		Read-Write	0	6
N69:55	40855	Thursday Event #3 Hour	INT		Read-Write	0	23
N69:56	40856	Thursday Event #3 Minute	INT		Read-Write	0	59
N69:57	40857	Thursday Event #4 Control Mode	ENUM		Read-Write	0	6
N69:58	40858	Thursday Event #4 Hour	INT		Read-Write	0	23
N69:59	40859	Thursday Event #4 Minute	INT		Read-Write	0	59
N69:60	40860	Friday Event #1 Control Mode	ENUM		Read-Write	0	6
N69:61	40861	Friday Event #1 Hour	INT		Read-Write	0	23
N69:62	40862	Friday Event #1 Minutes	INT		Read-Write	0	23
N69:63	40863	Friday Event #2 Control Mode	ENUM		Read-Write	0	6
N69:64	40864	Friday Event #2 Hour	INT		Read-Write	0	23
N69:65	40865	Friday Event #2 Minute	INT		Read-Write	0	59
N69:66	40866	Friday Event #3 Control Mode	ENUM		Read-Write	0	6
N69:67	40867	Friday Event #3 Hour	INT		Read-Write	0	23
N69:68	40868	Friday Event #3 Minute	INT		Read-Write	0	59
N69:69	40869	Friday Event #4 Control Mode	ENUM		Read-Write	0	6
N69:70	40870	Friday Event #4 Hour	INT		Read-Write	0	23
N69:71	40871	Friday Event #4 Minute	INT		Read-Write	0	59
N69:72	40872	Saturday Event #1 Control Mode	ENUM		Read-Write	0	6
N69:73	40873	Saturday Event #1 Hour	INT		Read-Write	0	23
N69:74	40874	Saturday Event #1 Minutes	INT		Read-Write	0	23
N69:75	40875	Saturday Event #2 Control Mode	ENUM		Read-Write	0	6
N69:76	40876	Saturday Event #2 Hour	INT		Read-Write	0	23
N69:77	40877	Saturday Event #2 Minute	INT		Read-Write	0	59

Table B-24. Compressor Scheduling Block (3 of 3)

Ethernet IP Address	Modbus Address	Compressor Scheduling	Data Type	Value	Mode	Lower Range	Higher Range
N69:78	40878	Saturday Event #3 Control Mode	ENUM		Read-Write	0	6
N69:79	40879	Saturday Event #3 Hour	INT		Read-Write	0	23
N69:80	40880	Saturday Event #3 Minute	INT		Read-Write	0	59
N69:81	40881	Saturday Event #4 Control Mode	ENUM		Read-Write	0	6
N69:82	40882	Saturday Event #4 Hour	INT		Read-Write	0	23
N69:83	40883	Saturday Event #4 Minute	INT		Read-Write	0	59
N69:84	40884	Comp Schedule Enable/Disable	INT	0 = Disable 1 = Enable	Read-Write		

NOTE

- **Compressor Scheduling Enable/Disable**: if a valid schedule has not been defined (on screen or through communications), this command will fail.

- **Compressor Scheduling Control Mode ENUM values**:
  0 = Unscheduled
  1 = Suction Pressure SP1
  2 = Suction Pressure SP2
  3 = Process Control SP1
  4 = Process Control SP2
  5 = Discharge Pressure SP1
  6 = Discharge Pressure SP2

If the control mode being set isn't active in the configuration, the command will result in error. This value can be changed only when the schedule is disabled

Compressor Scheduling Hour INT – This value can be changed only when the schedule is disabled
Compressor Scheduling Minute INT – This value can be changed only when the schedule is disabled

Introduction

This document provides the guidelines to successfully communicate and integrate with the MicroVission control panel.

Networking

The MicroVission supports two different hardware networks:

- Ethernet: Supporting Modbus TCP and Ethernet IP protocols
- RS485: Supporting serial Modbus RTU protocol

Communication Wire

For any communication network to work properly, it is important to use the proper wire.

Ethernet Cable Specifications

For Ethernet communication, the Category 6 cable is recommended. Many installations now use gigahertz switches, and category 6 provides greater immunity to signal crosstalk.

RS-422/485 Cable Specifications

The following cables are recommended for RS-422/485 serial communications.

Although you may elect to use other cables, a low capacitance (less than 15 pF/ft.) is important for high-speed digital communication links. The cables listed below are all 24-gauge, 7x32 stranded, with 100-ohm nominal impedance and a capacitance of 12.5 pF/ft.

Select from the following four-pair, three-pair, and two-pair cables, depending on your application needs. All will yield satisfactory results. It is recommended that you choose a cable with one more pair than your application requires.

Use one of the extra wires, rather than a shield, for the common.

Four-Pair

- Belden P/N 8104 (with overall shield)
- Belden P/N 9728 (individually shielded)
- Belden P/N 8164 (individually shielded with overall shield)
- Manhattan P/N M3477 (individually shielded with overall shield)
- Manhattan P/N M39251 (individually shielded with overall shield)

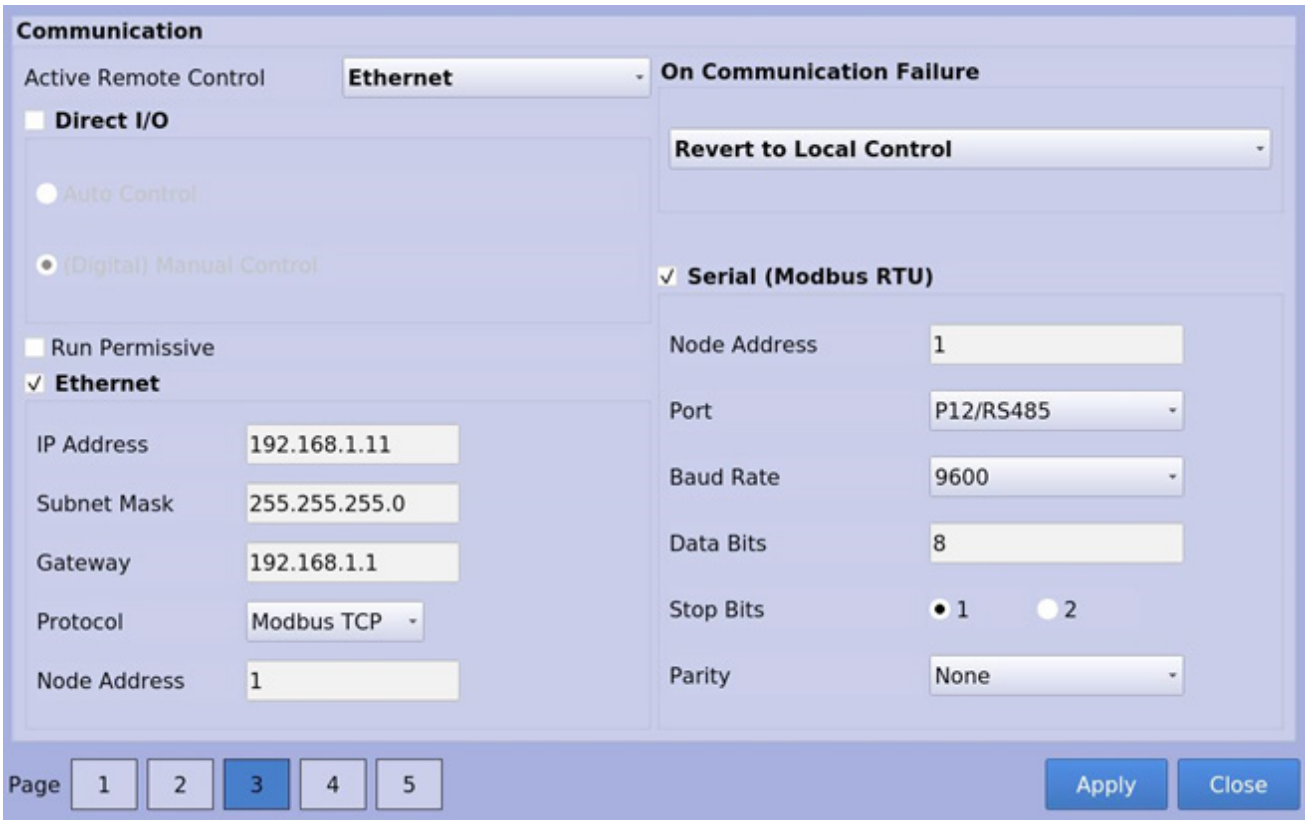


Figure C-1. Configuration Screen (Page 3)

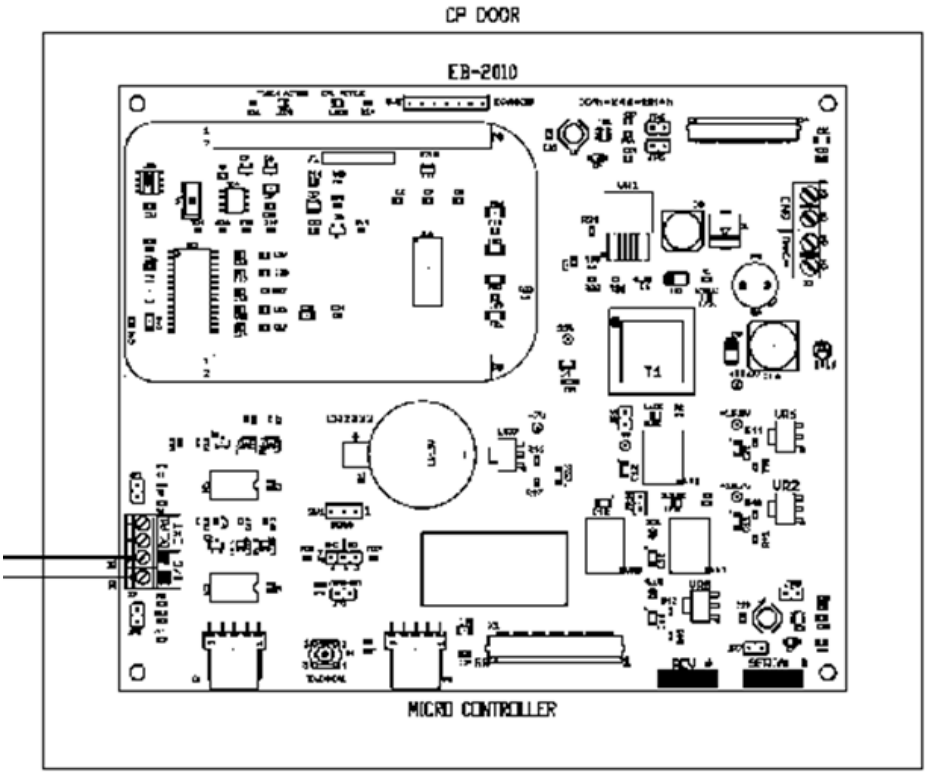


Figure C-2. Serial Communication Ports on Single Board Computer

Three-Pair

- Belden P/N 8103 (with overall shield)
- Belden P/N 9730 (individually shielded)
- Belden P/N 8163 (individually shielded with overall shield)
- Manhattan P/N M3476 (individually shielded with overall shield)
- Manhattan P/N M39250 (individually shielded with overall shield)

Two-Pair

- Belden P/N 8102 (with overall shield)
- Belden P/N 9729 (individually shielded)
- Belden P/N 8162 (individually shielded with overall shield)
- Manhattan P/N M3475 (individually shielded with overall shield)
- Manhattan P/N M39249 (individually shielded with overall shield)

Common Register Setup to Control the MicroVission (Compressor Control) Via Communications

Register Setup and Control Scenario

The MicroVission panel first needs to be placed in **REMOTE** mode before the sending the Compressor Control commands (Registers 40170 through 40180).

To do this, press the **START** button on the main page and then the **REMOTE** button, see Figure C-3.

Modbus Register 40171 - Active Remote Control

Reading this register can be used to verify the Active Remote Control mode, which was previously setup from the Configuration screen. Writing to this register can change the Active Remote Control mode, however this is not common.

- 0 = None (internal local setpoints will be used to control the compressor).
- 1 = Direct I/O (hardwired control - via digital inputs. Refer to wiring diagram.)
- 2 = Serial (serial communications via RS485 Modbus RTU).
- 3 = Ethernet (Modbus TCP or Ethernet IP communications.)

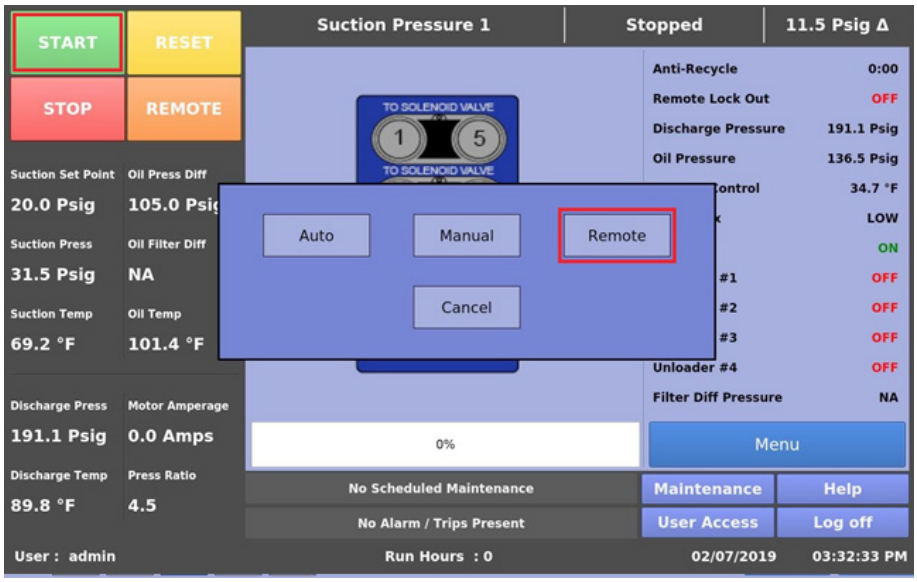


Figure C-3. Setting MicroVission in Remote Mode

Typically, the following registers are setup (written to) before a "Start" command is issued to the compressor.

Modbus Register 40172 - Remote Control Select

- 0 = Auto Control. This selection defines that the MicroVission will control compressor capacity from its internal Control Setpoints.
- 1 = Pulse Load / Unload. This selection defines that the MicroVission will control compressor load from contents of Remote Step Load register 40174 and Remote Step Unload register 40175.

Modbus Register 40177 - Active Setpoint

This register is used in conjunction with Register 40172 = 0, Auto Control mode.

- 1 = Setpoint #1 Active
- 2 = Setpoint #2 Active (note: you must enable two setpoints from configuration screen first).

Sometimes compressors are switched from Suction Pressure control mode to Process Temp control mode or vice versa. This can be done via communications using the following register.

Modbus Register 40173 - Auto Capacity Control Type

- 0 = Suction Pressure (if enabled from Configuration screen)
- 1 = Process Temp (if enabled from Configuration screen)
- 2 = Discharge Pressure (if enabled from Configuration screen)

Compressor Start and Stop Commands

Modbus Register 40178 – Start Command

- 1 = Start Compressor in Remote Auto Mode

Two (2) minute Remote mode time-out timer

Once the compressor has been started in Remote Auto Mode using the Start Compressor Command, a 2-minute timer will start. If no further communication takes place to the MicroVission within 2 minutes, the MicroVission will be placed in Local Auto mode, a yellow banner will be displayed on the MicroVission signifying that a "Remote Comm Time-out" occurred, and the Event List will get populated with a time-stamped "Remote Comm Time-out" event.

Modbus Register 40509 - Stop Command

- 1 = Stop Compressor Command

MicroVission panel will remain in Remote (Idle) mode after a Stop Compressor command has been issued.

Remote Control via Direct I/O (Hard-wired)

Remote Control of the compressor can also be accomplished using hard-wired inputs. These include Remote Start-Stop digital input, Remote Increase digital input and Remote Decrease digital input. For communication register information, refer to Appendix B: Communication Table.

Configuration Screen Setup

Refer to Figure C-1. Configuration Screen (Page 3).

For Direct I/O control:

- Configure the "Active Remote Control" drop-down box to "Direct I/O". This selection activates the Remote Start-Stop digital input. This is the ONLY selection that activates the Remote Start-Stop digital input.
- Below the "Active Remote Control" selection box, check the "Direct I/O" box.

Now radio-buttons for selecting the desired control method are available:

- Auto Control
- (Digital) Manual Control – Comp. Capacity controlled via digital increase and decrease inputs.

Auto Control

The compressor is started and stopped from the Remote Start/Stop input, but the compressor capacity is controlled from the internal compressor control setpoints entered in the MicroVission. The Auto-cycle setpoints can be enabled or disabled as desired.

(Digital) Manual Control

The compressor started and stopped from the Remote Start/Stop input, but the compressor capacity is controlled from the Remote Increase and Remote Decrease digital inputs.

Control Scenario

Once the Configuration Screen has been configured for the desired type of Digital I/O control, the MicroVission needs to be placed in REMOTE mode. To do this, press the green color START button on the main page, and then the REMOTE button.

The Remote Start-Stop input is now active. The state of the Remote Enable Output should be determined by the controlling device. When it is determined to be ON, then the controlling device can energize the Remote Start-Stop input. After the compressor has started, then the compressor capacity is controlled by the selected option. Thought should also be given as to how the compressor will be restarted after a power failure occurs.

Remote Monitoring

It should be noted that while the compressor is being controlled (starting, stopping and load control) via hard-wired inputs, the monitoring of compressor operating parameters can still occur by using the communication ports available in the MicroVission. Remote monitoring can be accomplished by utilizing either the Ethernet communication port (via Ethernet IP or Modbus TCP/ IP) or the serial port (via RS485 Modbus RTU). For communication register information, refer to Appendix B: Communication Table.

Communication Port Setup

See Figure C-1. Configuration Screen (Page 3).

For Serial Port Modbus RTU Monitoring

- Check the "Serial" box inside the "Communications" section.
- Configure serial port settings (baud rate, # data bits, # stop bits, parity) and panel ID number (which is "node" number for Modbus RTU.)

For Ethernet Monitoring

- Check the "Ethernet" box inside the "Communications" section.
- Configure IP address and Subnet Mask.
- Select Protocol (Ethernet IP or Modbus TCP/ IP)

Once the port is setup properly, communication can be established. You will be able to read from and write to registers. In Direct I/O mode, you cannot write to registers in the Control Block region of Modbus registers 40170 through 40180.