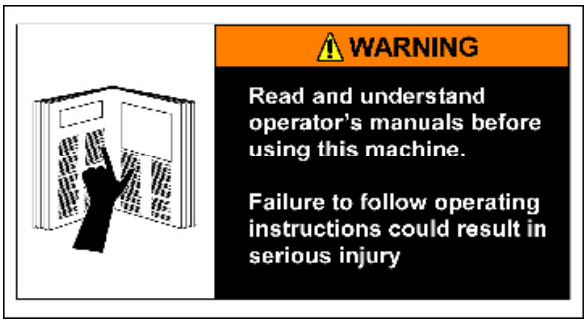
# MicroVission Controller

Operation and service manual • Version 1.0


VILTER™

EMERSON™

# Important Message




**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.

**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 16 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

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 i.

## 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.

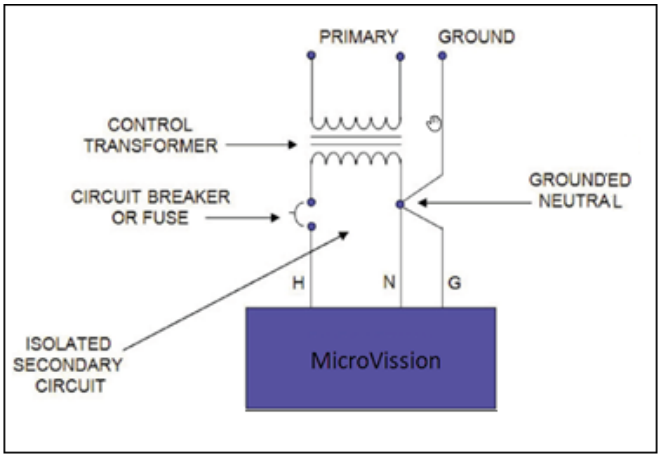



Figure 1-1. MicroVission with Individual Transformer

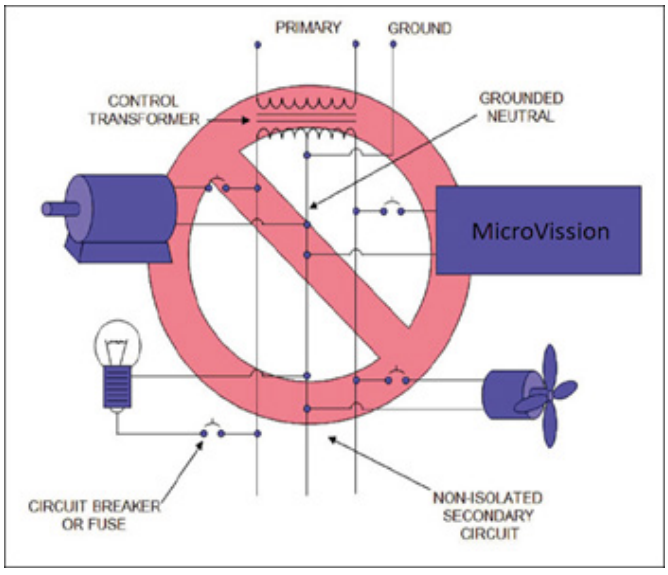



Figure 1-2. EMI and MicroVission

## 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.

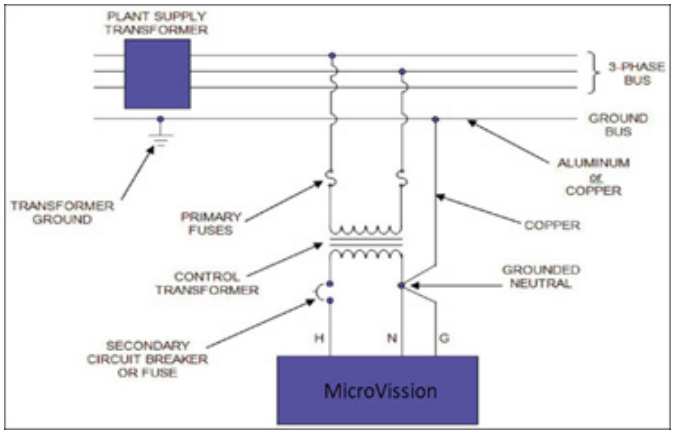



Figure 1-3. Ground Wiring

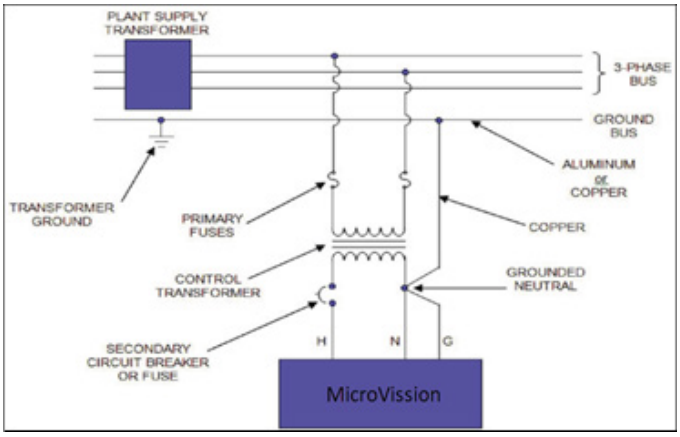



Figure 1-4. Mixed Voltage Wiring

## 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.

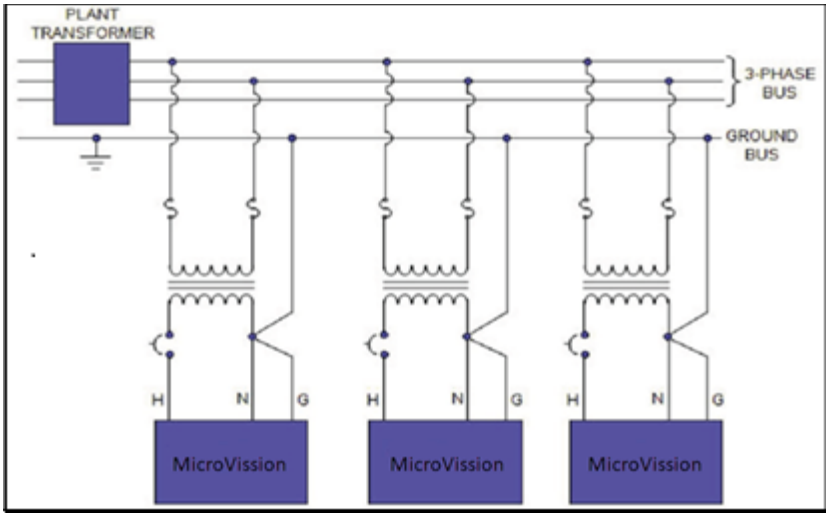



Figure 1-5. Correct Transformer Wiring Method

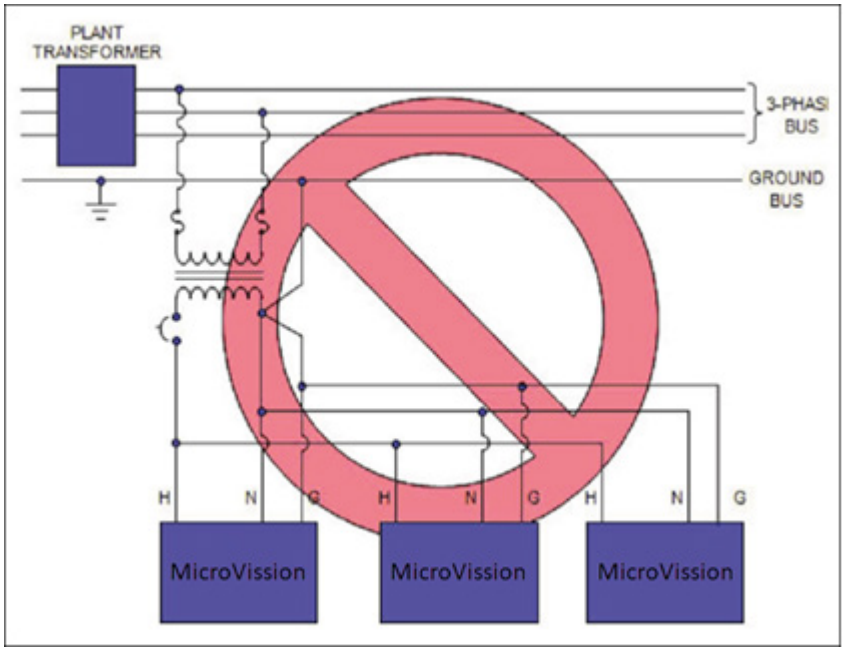



Figure 1-6. Incorrect Transformer Wiring Method

## 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

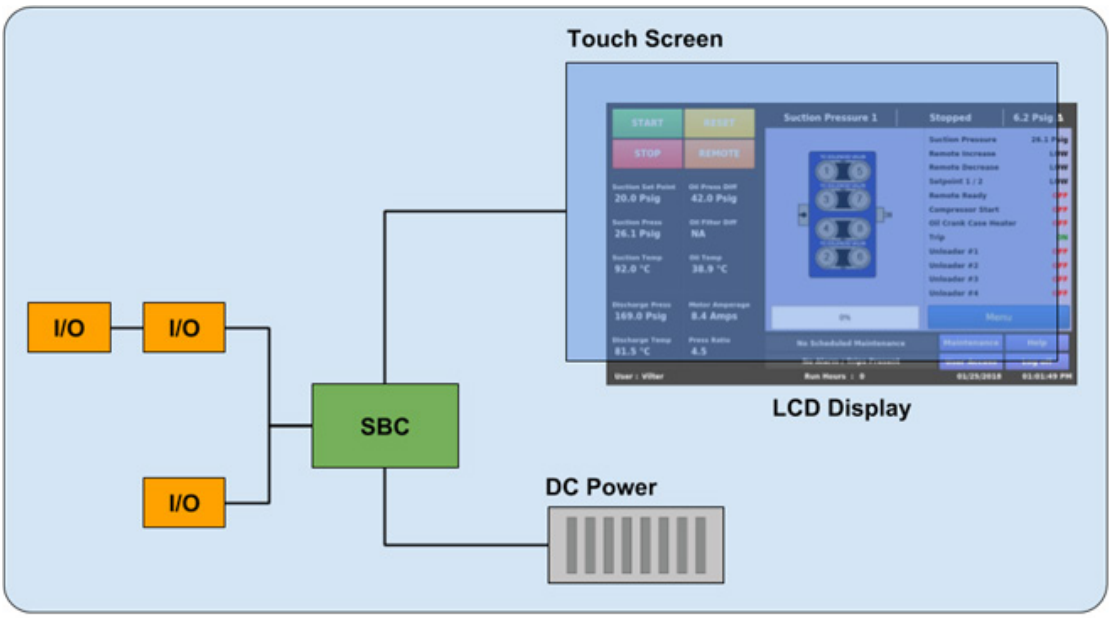



Figure 2-1. Hardware Architecture Overview

## 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.

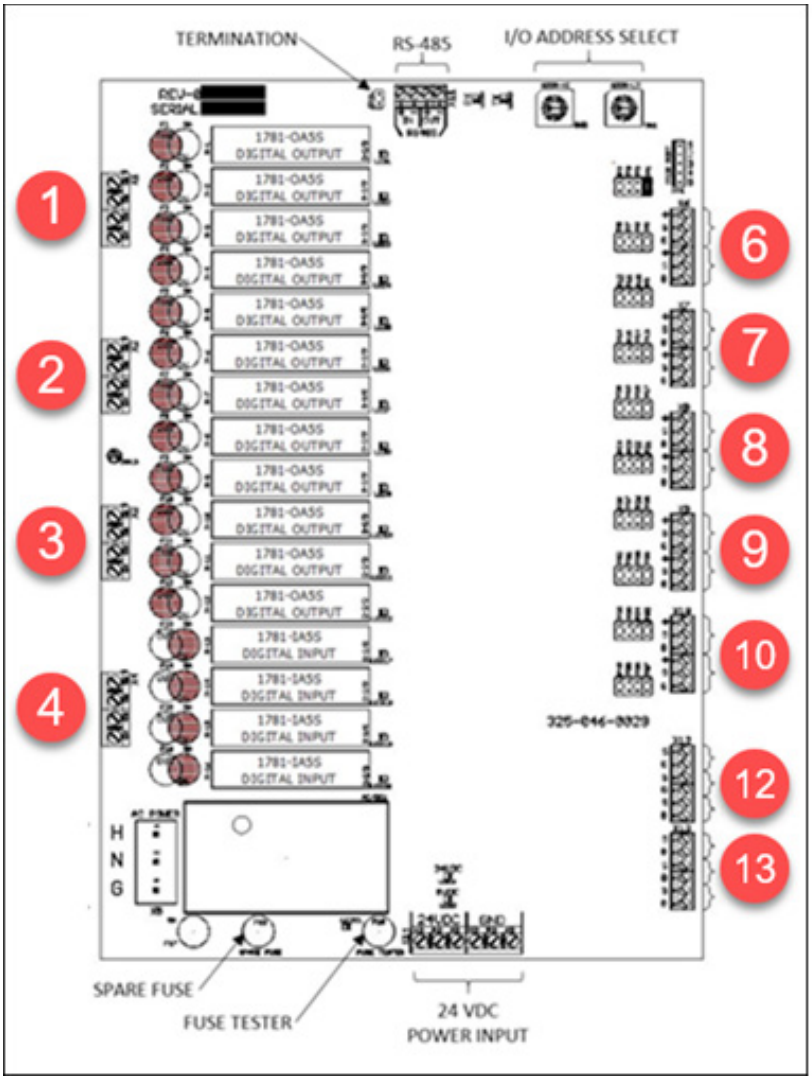



Figure 2-2. Multi I/O Board Layout

## 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 remote control. If the compressor parameter does not satisfy start conditions or is placed into the manual stop position, this output is de-energized.

**Setpoint 1/2 Input**

- This input will be monitored when the MicroVission panel is enabled for remote 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 remote 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 remote 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 remote 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.

**Compressor Motor Starter Auxiliary Input:**

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

## Table 2-1. Digital I/O

| 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 2-2. 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 | Not Defined | 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 |

## 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.

## 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 |

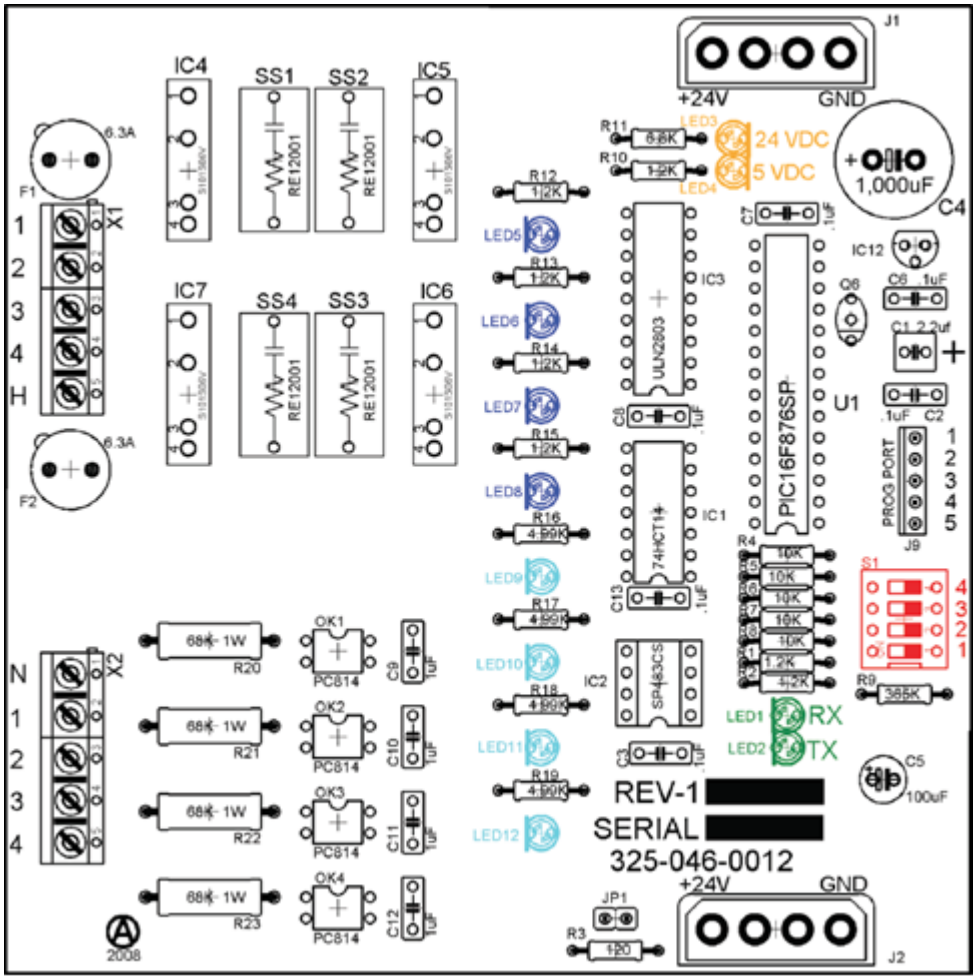
| Channel 7 | Signal | JP - 25 | JP - 26 | JP - 27 | JP - 28 |
|---|---|---|---|---|---|
| Analog Input 7 | 0-5 VDC | OUT | OUT | OUT | OUT |
| | 4-20 mA | IN | OUT | OUT | OUT |
| | ICTD | OUT | IN | OUT | OUT |
| | 0-10 VOLT | OUT | OUT | IN | OUT |
| | RTD | OUT | OUT | OUT | IN |

| 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.

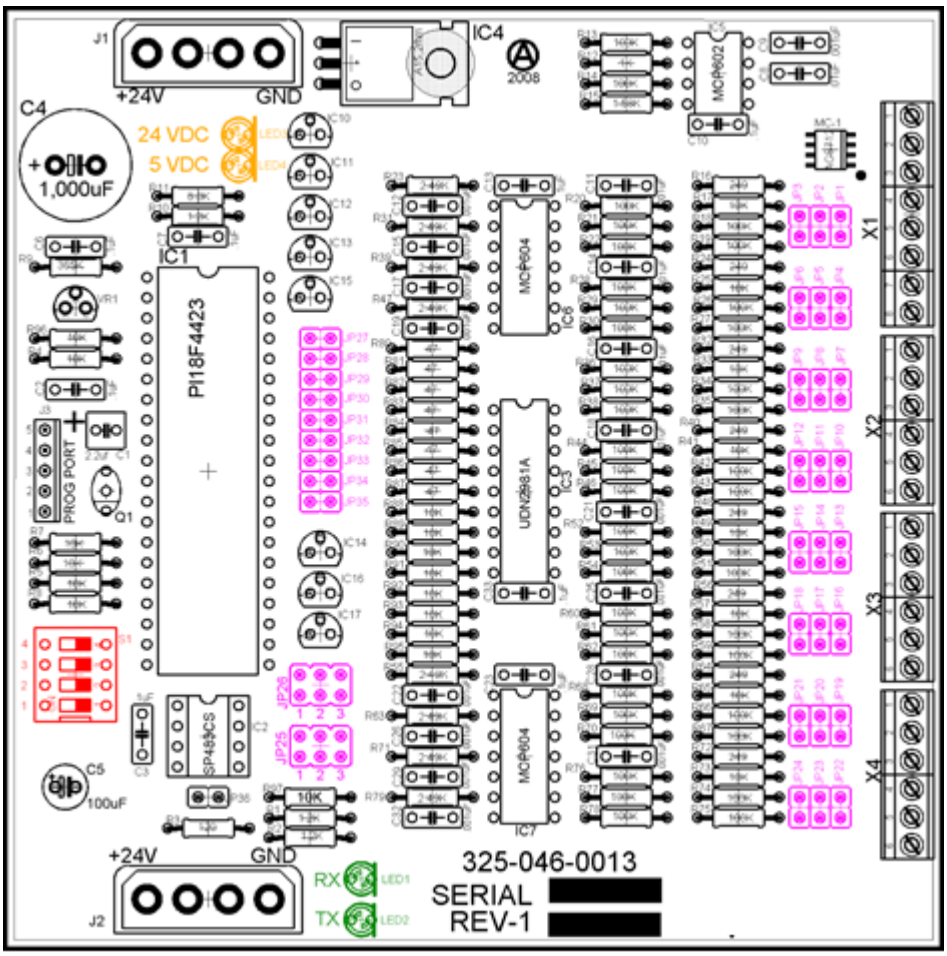
### Communication LEDs

- 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.

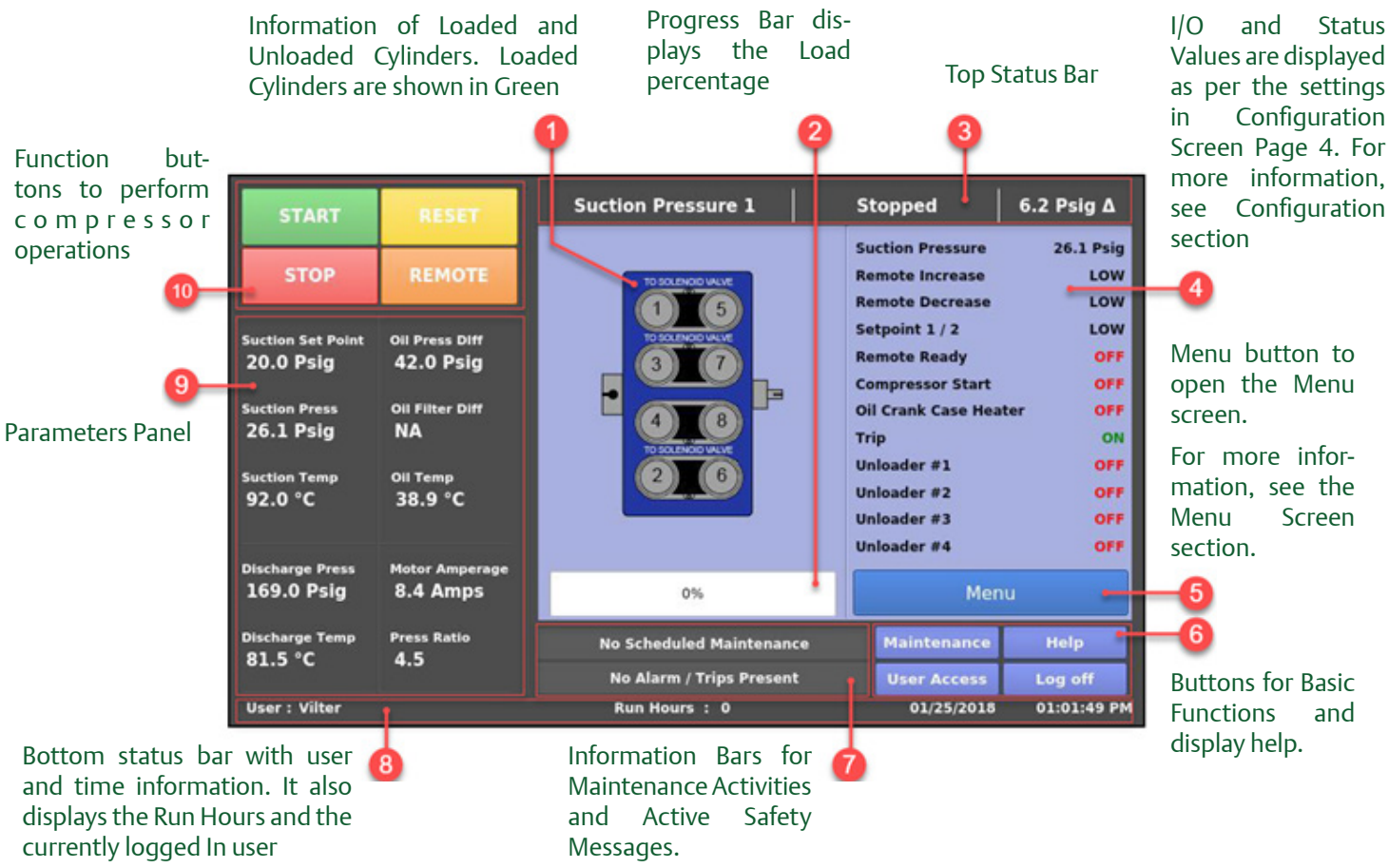



**Figure 3-1. Main Screen**

## 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. On the Top Status Bar, the information bar in green color appears with information flashed on it. The Top Status Bar and one or more information bars alternatively appears in a 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.

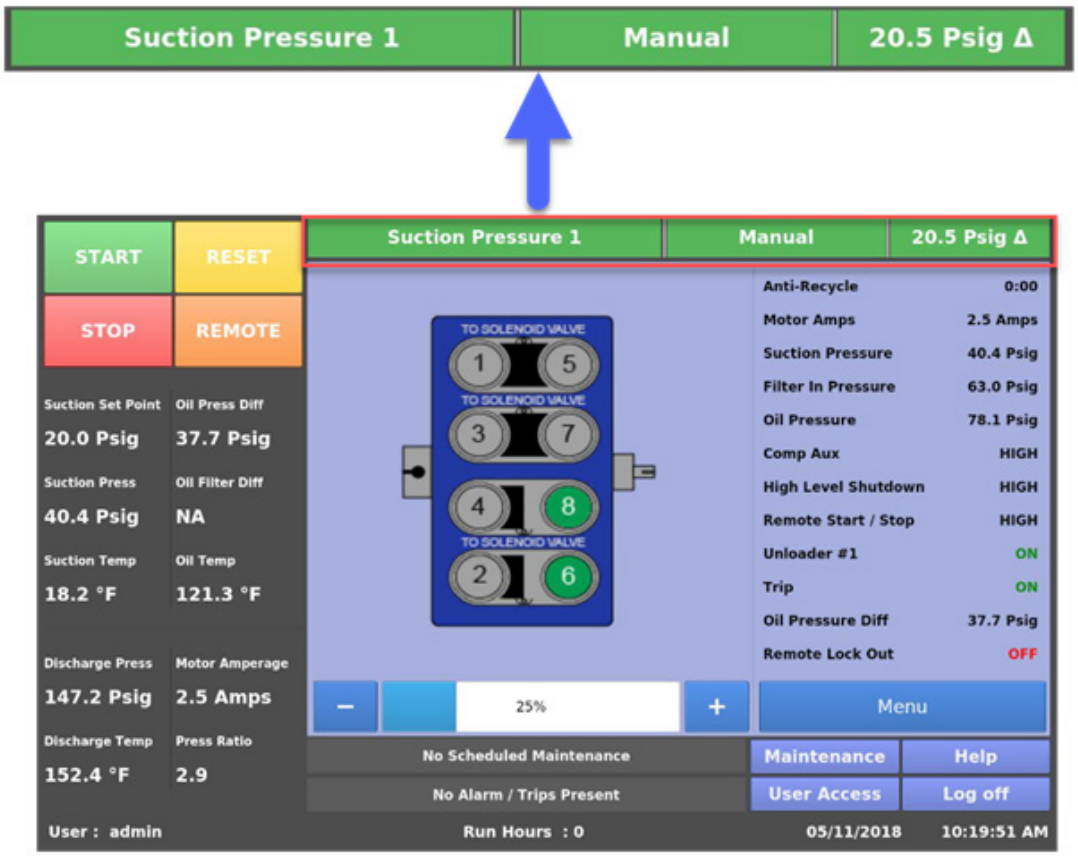



Figure 3-2. Top Status Bar

## 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 the remote lock out option. This is a safety feature that prevents any external devices from assuming control and starting the compressor. To release the remote lock out, the operator must press the “Start” button and then the “Remote” button when the start dialog box appears.

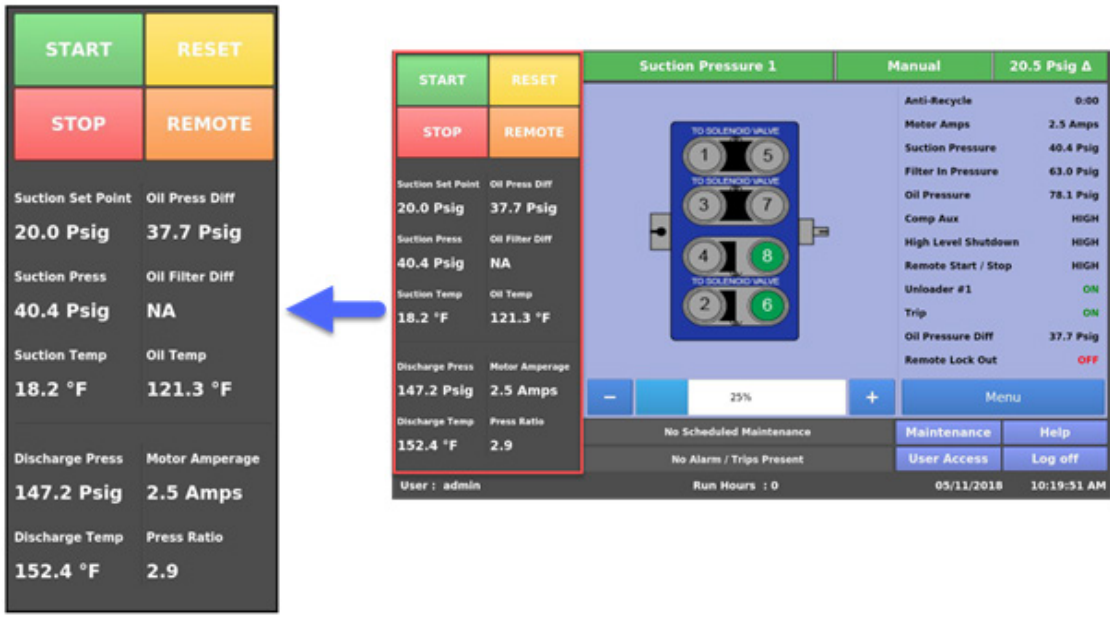



Figure 3-3. Parameters Bar

## 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.

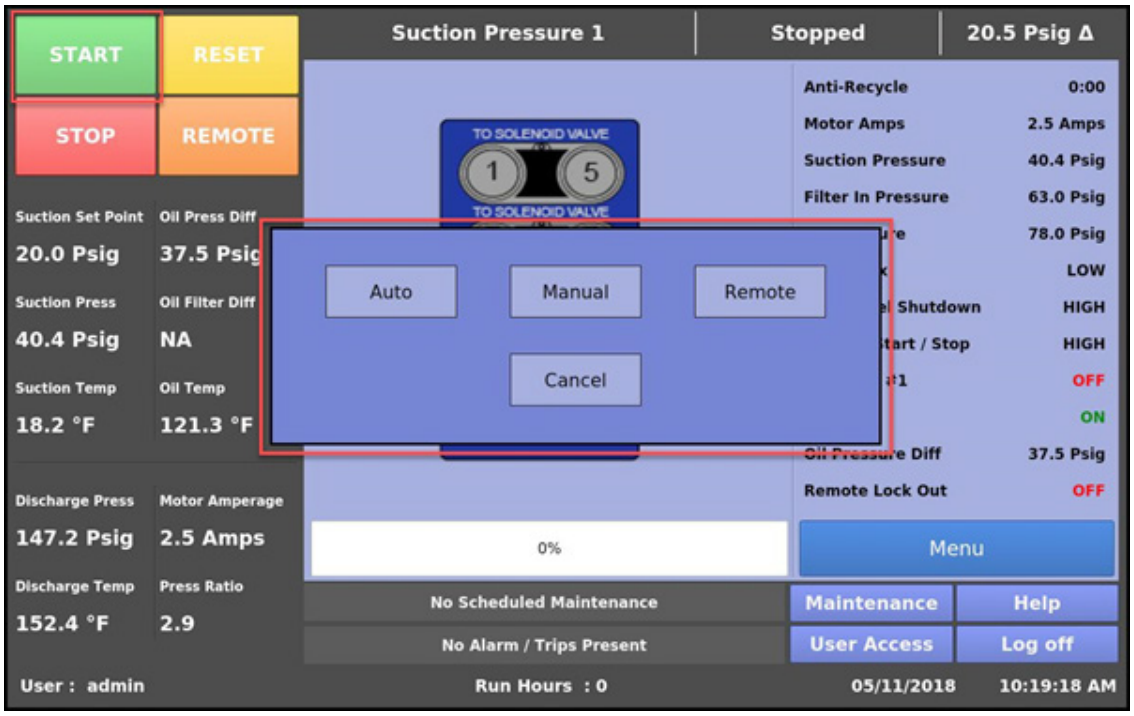



Figure 3-4. Start Dialog Box

## 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

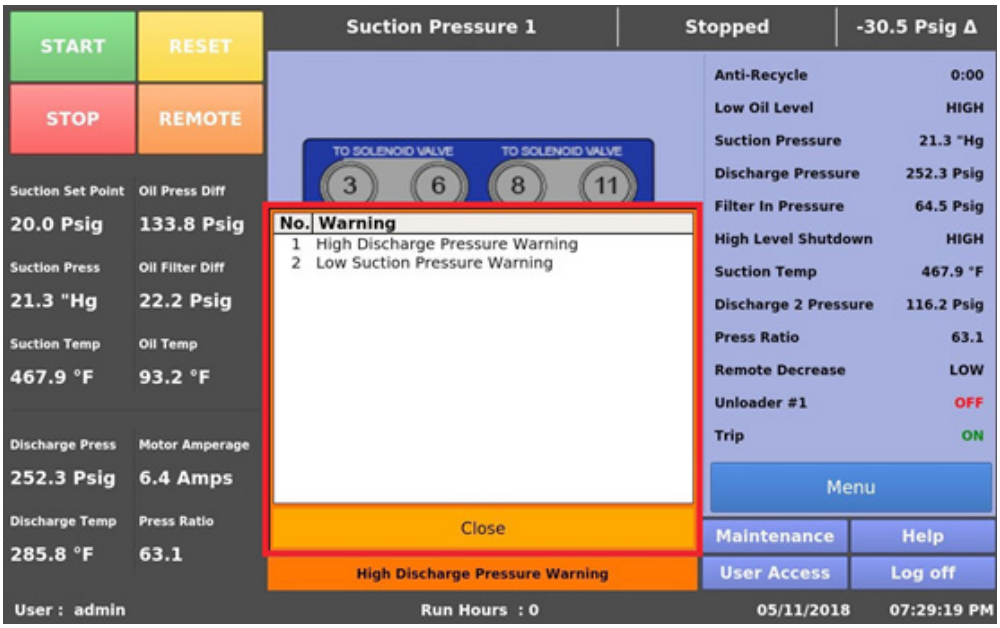



Figure 3-6. Warning Pop-up Window

## Splash Screen

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

The Splash screen area displays the status of loaded and unloaded cylinders through image, progress bar from 0% to 100% via blue gray bar to indicate ratio of loaded cylinders to total no. of cylinders on compressor, the configurable parameters as per settings on Page 4 of 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

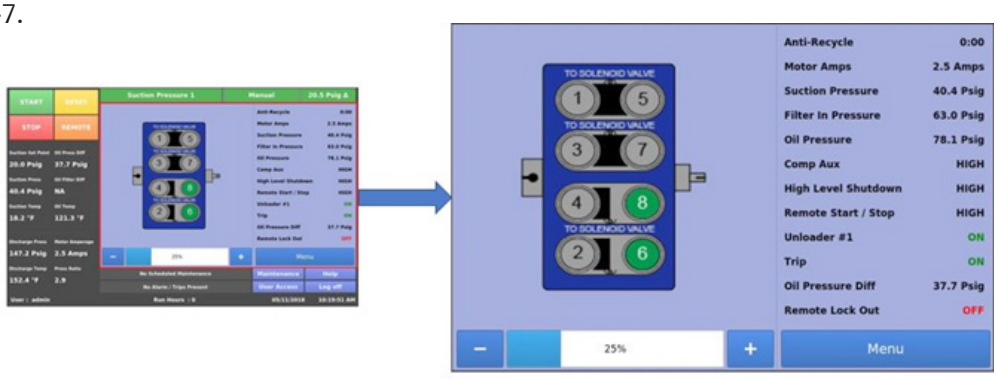
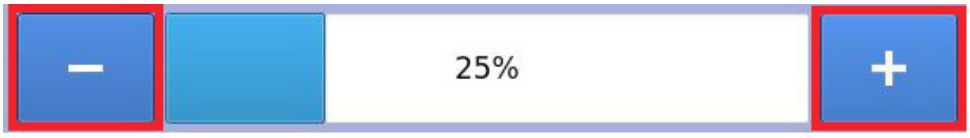



Figure 3-8. Manual Run Mode Buttons



## 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.

### Instrument Calibration

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

### 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.

### 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.

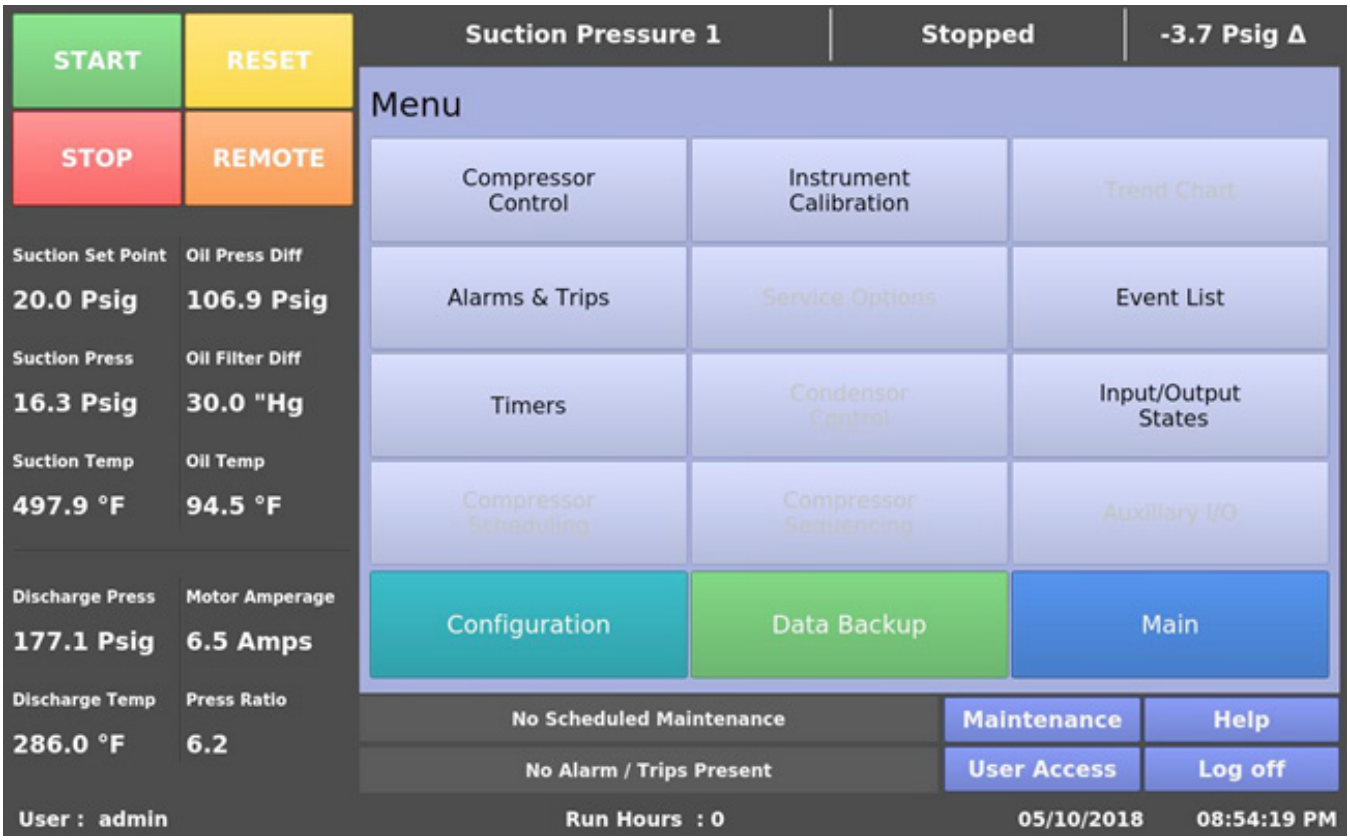



Figure 4-1. Menu Screen

## 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.

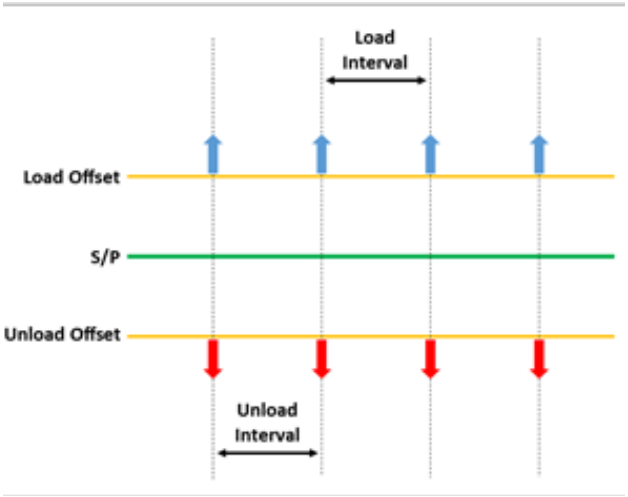
It is important to note that there isn't one correct way to set these parameters. Every application is different and requires the operator to tune these settings to achieve the best operation.

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.

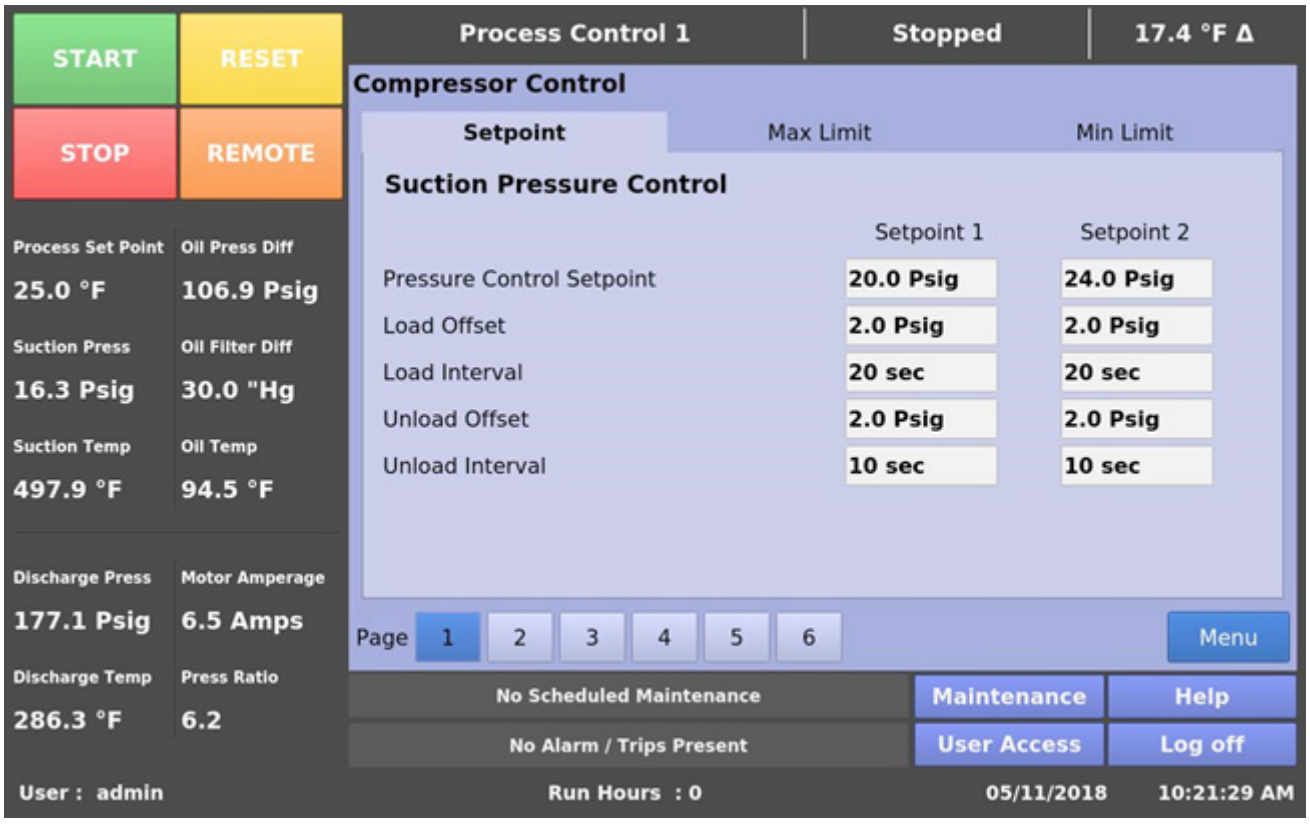



Figure 5-1. Compressor Control Screen - Suction Pressure Control

## 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.

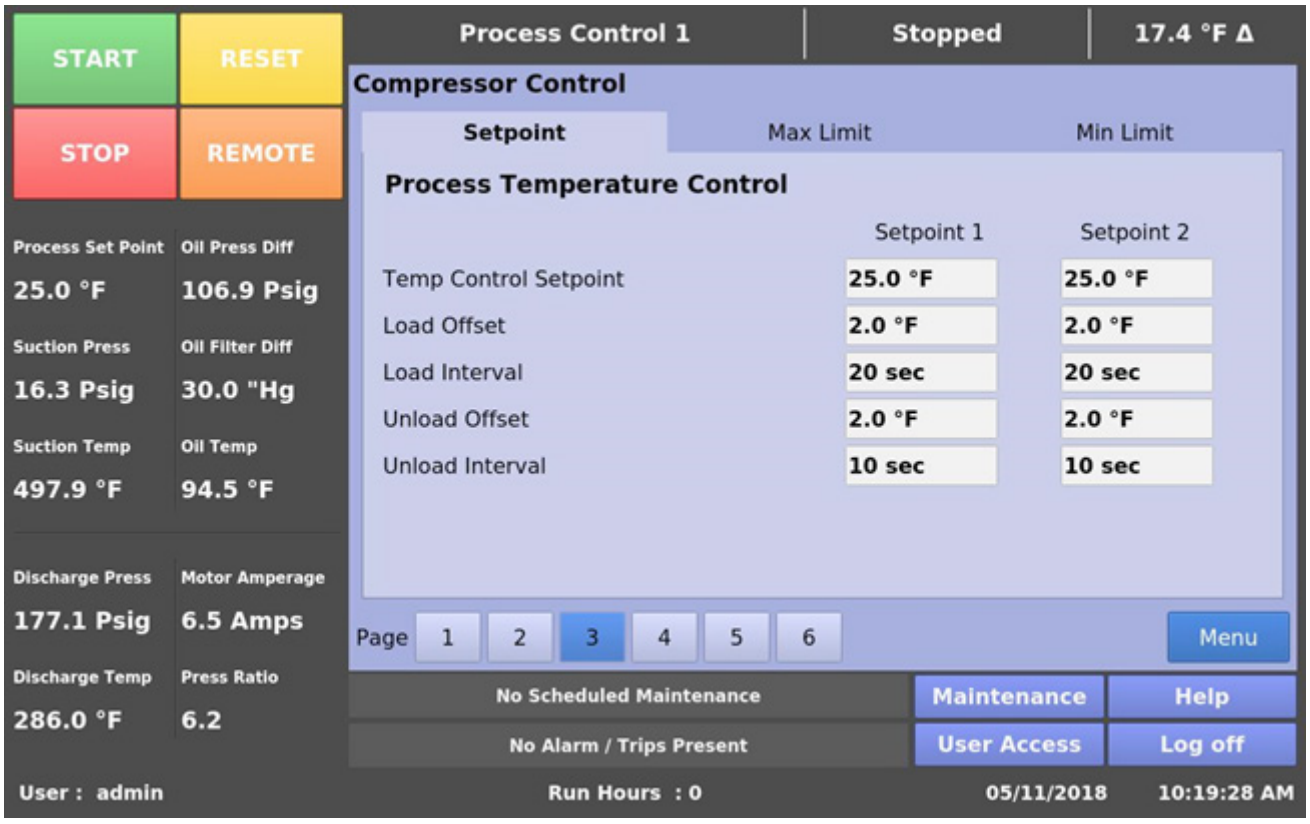



Figure 5-2. Compressor Control Screen - Process Temperature Control

## 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 “Remote Auto” mode. If the auto cycle feature is enabled while running in any other remote mode, the function will simply be ignored.

### 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".

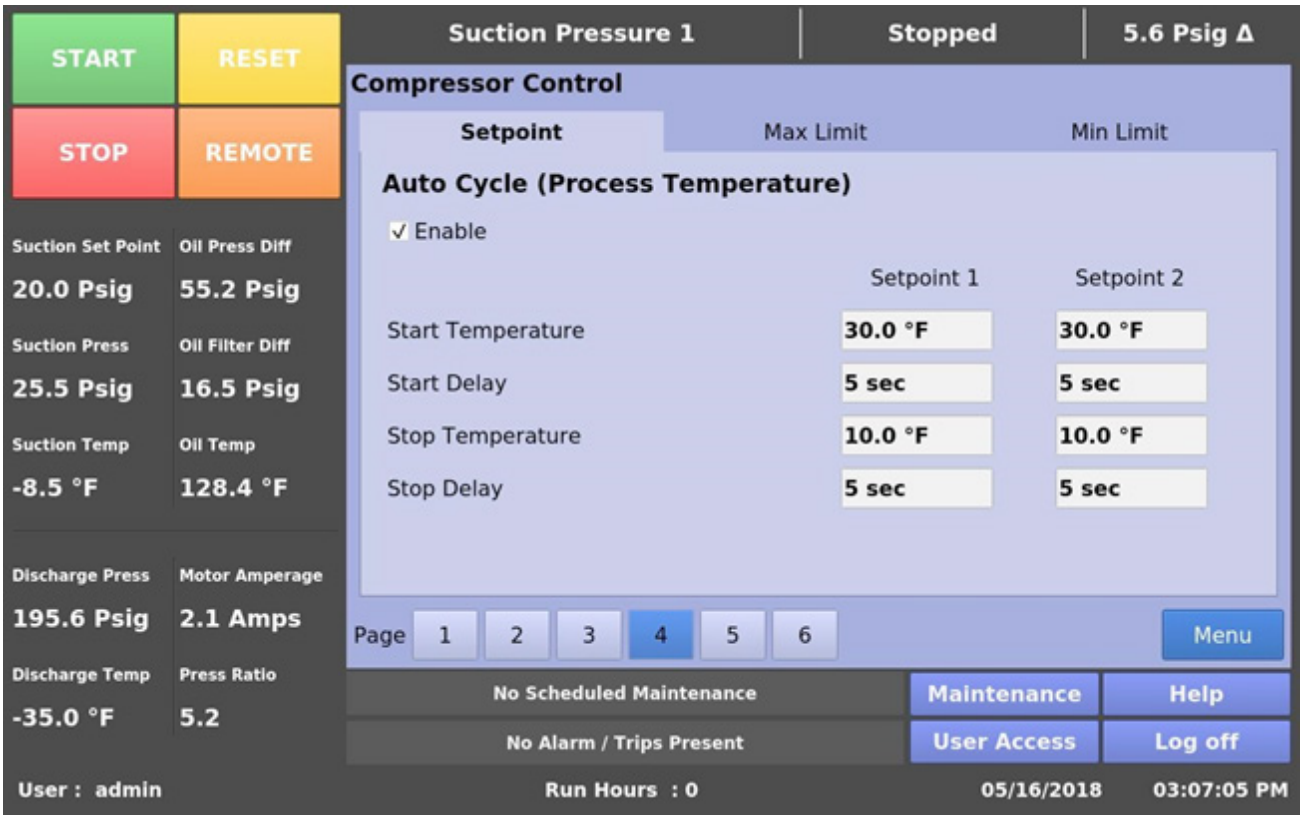



Figure 5-5. Compressor Control Screen – Auto Cycle (Process Temperature)

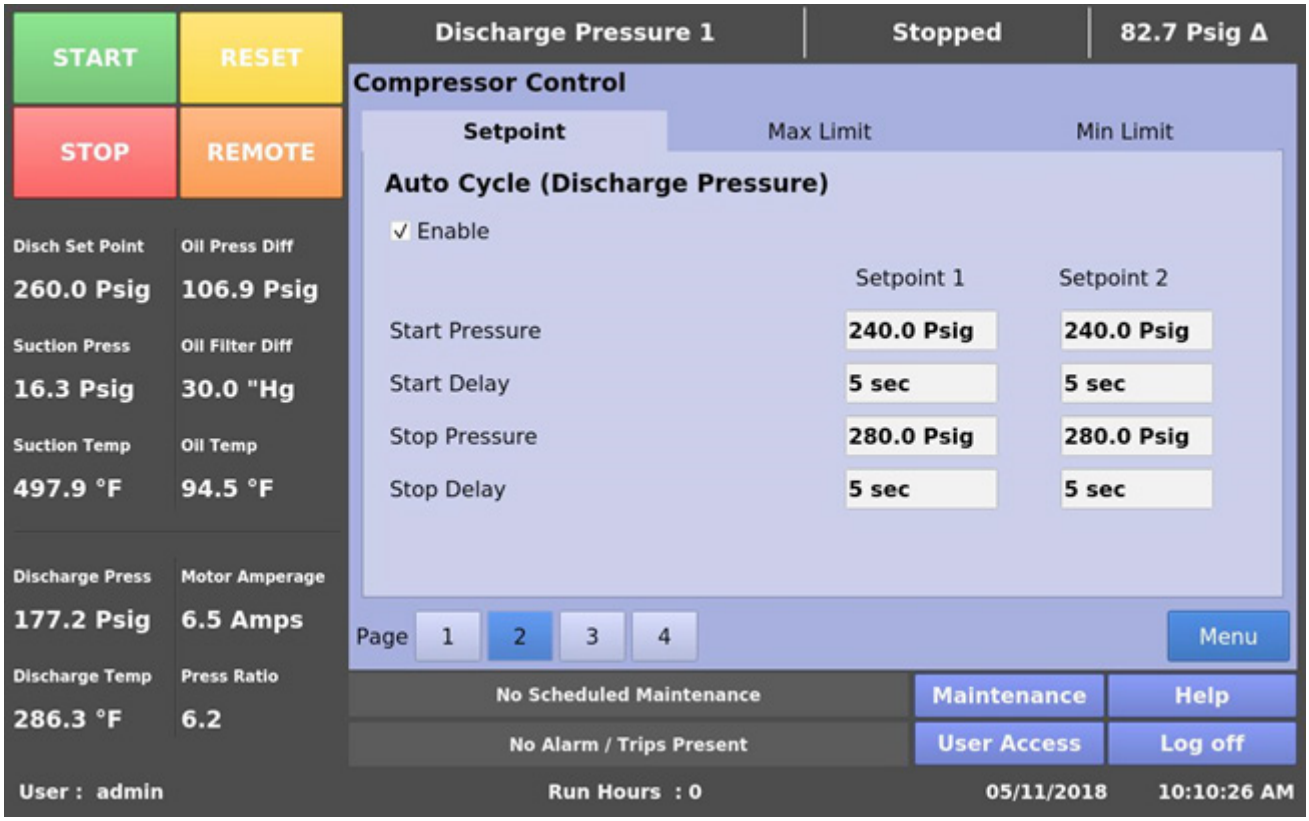



Figure 5-6. Compressor Control Screen - Auto Cycle (Discharge Pressure)

## Active Control Mode

This drop-down box gives the operator the ability to change the type of Active Control Mode such as Succion 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.

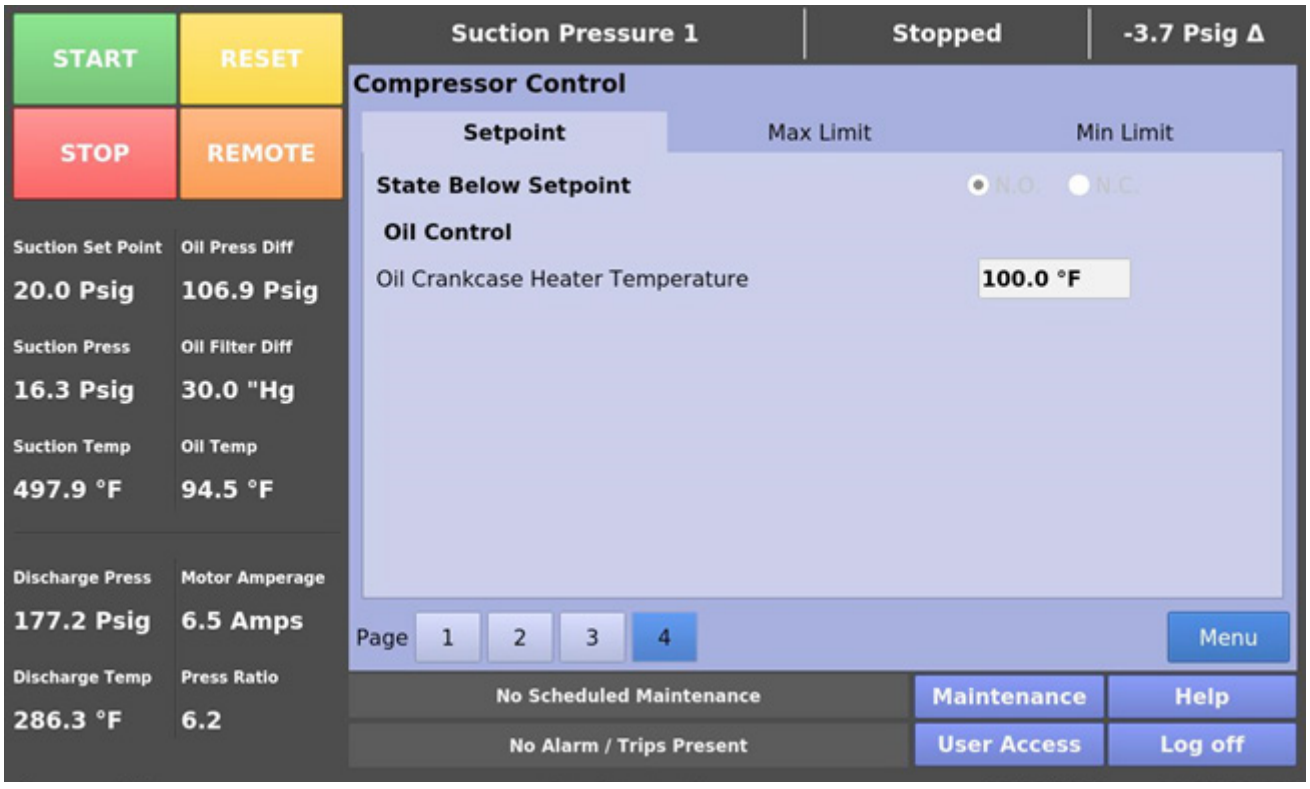



Figure 5-9. Compressor Control Screen - Oil Control

## 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.

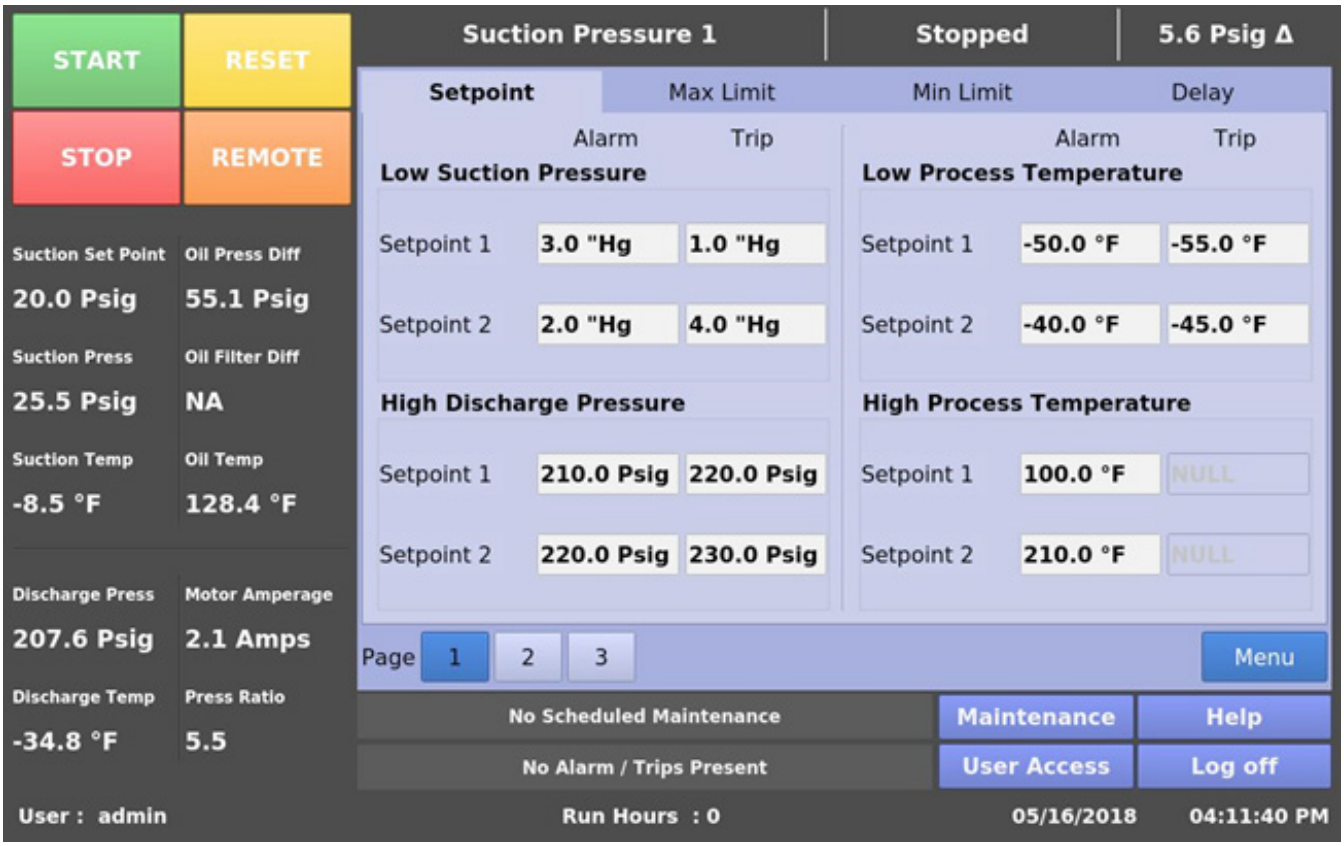



Figure 6-1. Alarms & Trips Setpoints (Page 1)

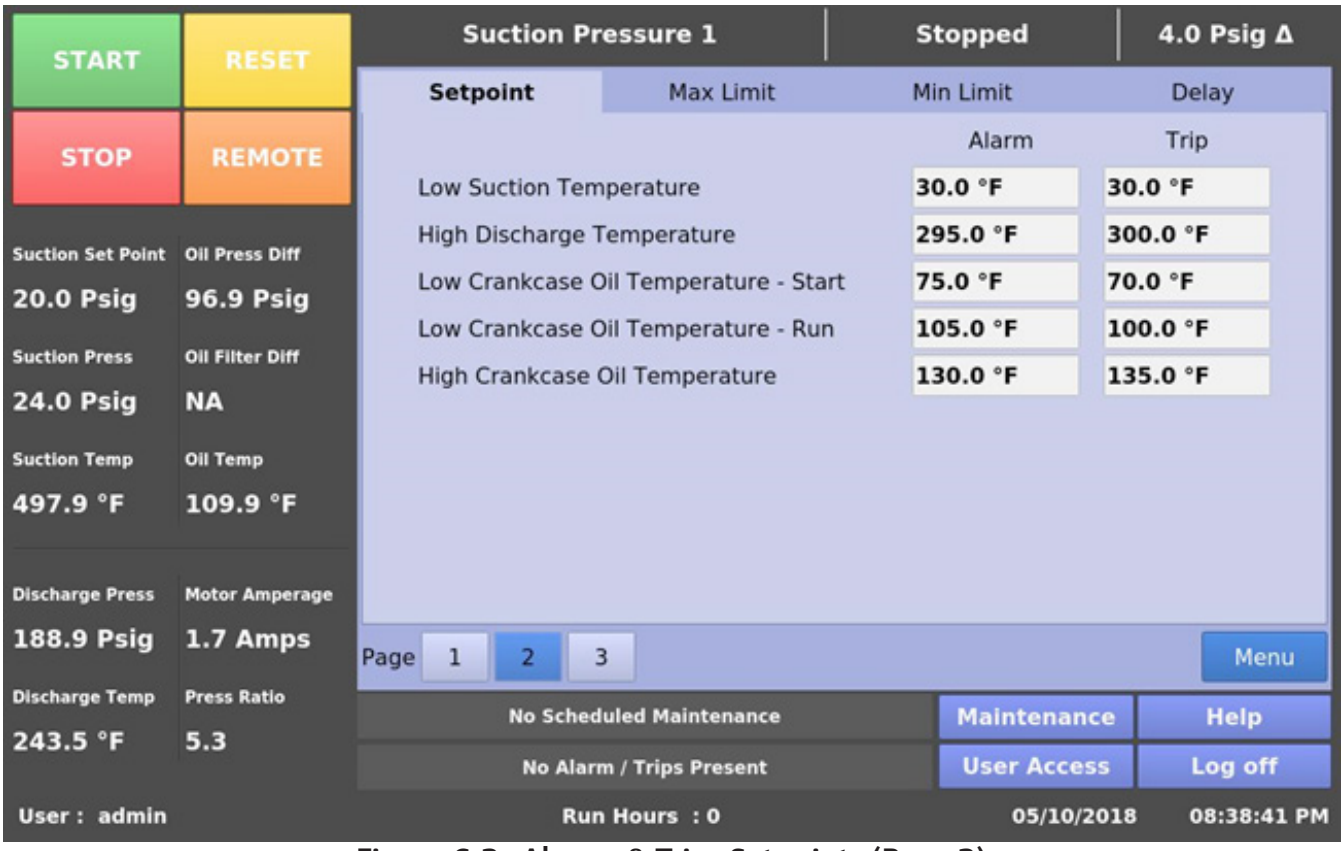



Figure 6-2. Alarms & Trips Setpoints (Page 2)


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:**<br>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.<br>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:**<br>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.<br>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:**<br>Below Messages will be displayed on Main Screen when Process Temperature value drops below configured setpoints. Refer Figure 6- 1 for Alarm & Trip setpoints.<br>There are two different set of Alarm & Trip setpoints which will be active depending on Active Control Mode selected from Compressor Control screen.<br>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:**<br>Below Messages will be displayed on Main Screen when Process Temperature value rises below configured setpoints. Refer Figure 6- 1 for Alarm setpoints.<br>There are two different set of Alarm setpoints which will be active depending on Active Control Mode selected from Compressor Control screen.<br>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:**<br>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:**<br>Below Messages will be displayed on Main Screen when Discharge Temperature value rises above configured setpoints. Refer Figure 6- 2 for Alarm & Trip setpoints.<br>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:**<br>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.<br>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:**<br>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.<br>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:**<br>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.:**<br>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.<br>These safeties will be only active once Oil Pressure Bypass Timer is lapsed.<br>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:**<br>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.<br>These safeties will be only active if below two conditions are met:<br>1) When Oil Monitoring option selected in Configuration Screen is “Oil Filter In & Oil Filter Out” or “Only Oil Filter In”.<br>2) When Filter Diff. Pressure Changeover Timer is running.<br>Filter Diff. Pressure Calculation for Oil Monitoring options, “Oil Filter In & Oil Filter Out” & “Only Oil Filter In” will be respectively as below:<br>a) Filter Diff. Pressure = Oil Filter Inlet Pressure – Oil Filter Outlet Pressure.<br>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:**<br>Below messages will be displayed when power is removed from the input module.<br>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.<br>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:**<br>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:**<br>Below message will be displayed on Main screen in following cases when Compressor is Idle.<br>1) Motor Auxiliary Contact is Closed.<br>2) Measured Motor Current Value is greater than Maximum Load Rating in Amperes. | | | |
| | | | False Start |
| | | | Motor Auxiliary Contact is Closed<br>OR<br>Motor Amperage > 20 % Maximum Amps |
| | | | |

| Warnings | Inhibits | Alarms | Trips |
|---|---|---|---|
| Not Running (Idle) | Pre-Start | Running | Running |
| **IO Comm.:**<br>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:**<br>Below messages will be displayed on Main Screen if Low Oil Level Digital Input is found Active Low.<br>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:**<br>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:**<br>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:**<br>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:**<br>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:**<br>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.<br>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:**<br>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.<br>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.

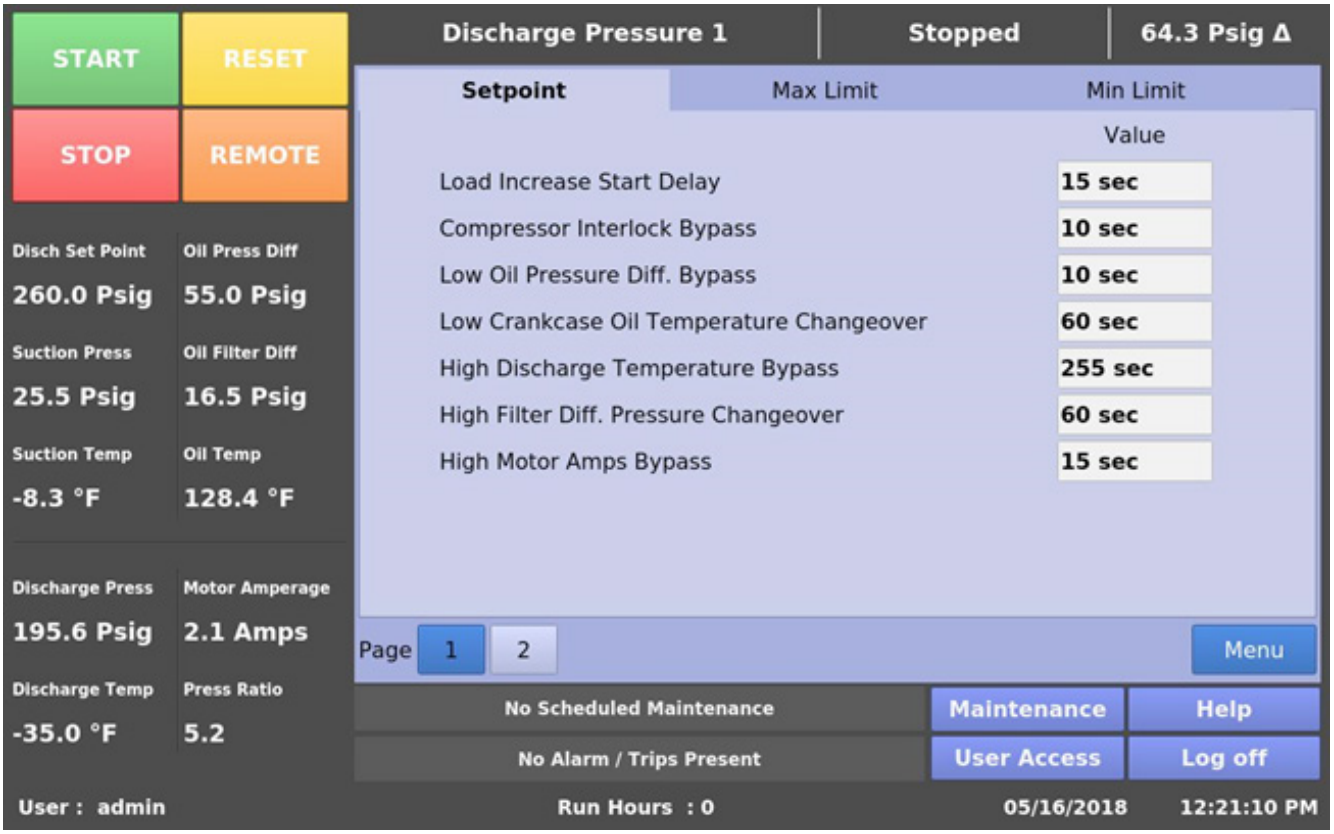



Figure 7-1. Timers Screen (Page 1)

### 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

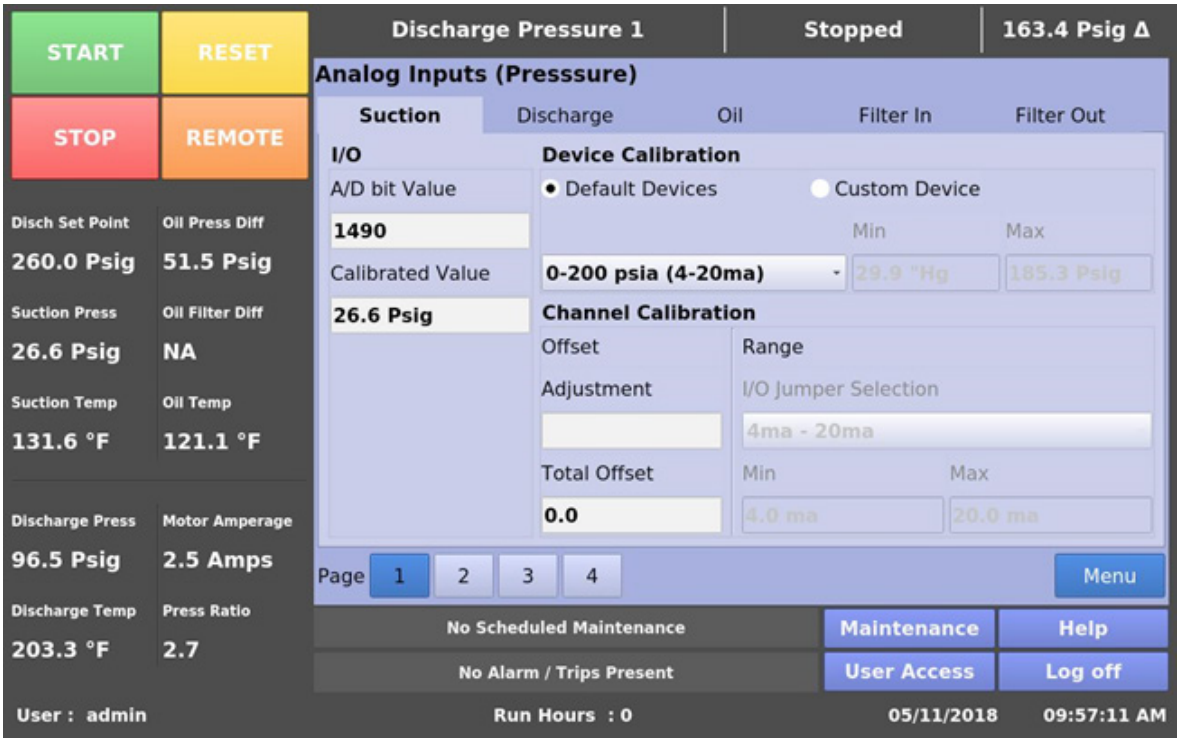



Figure 8-1. Instrument Calibration Screen Page 1 – Analog Inputs (Suction Pressure)

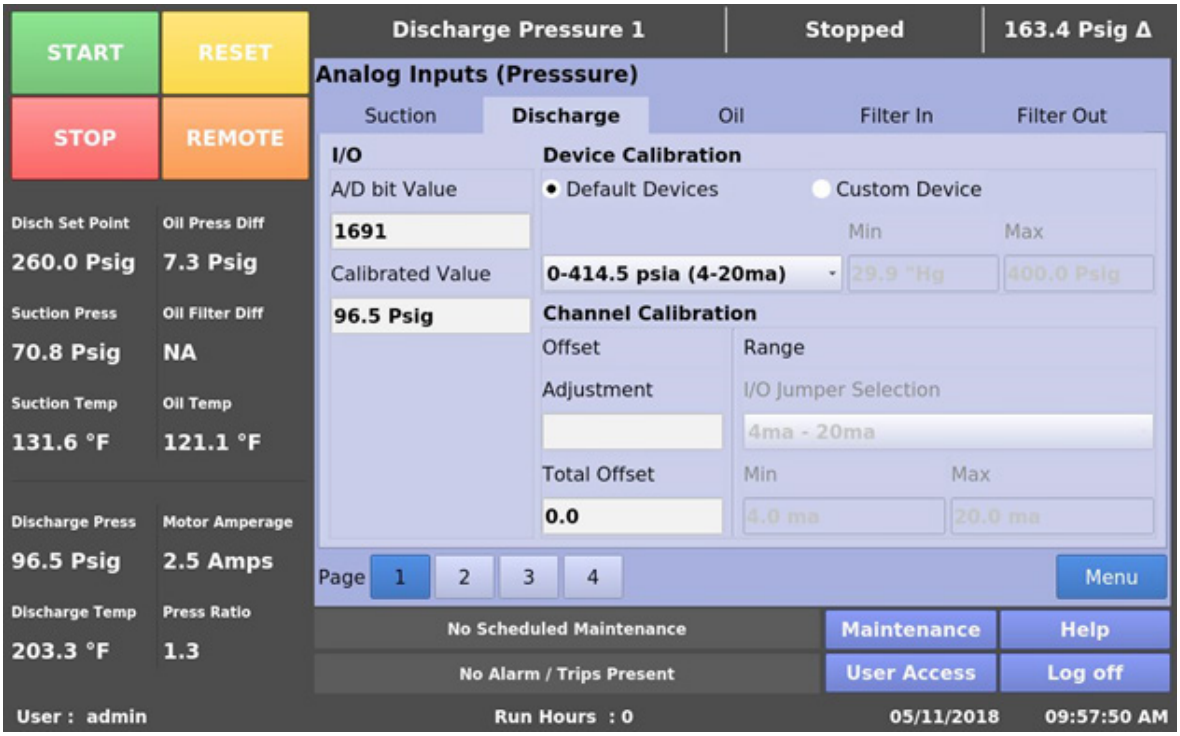



Figure 8-2. Instrument Calibration Screen Page 1 – Analog Inputs (Discharge Pressure)

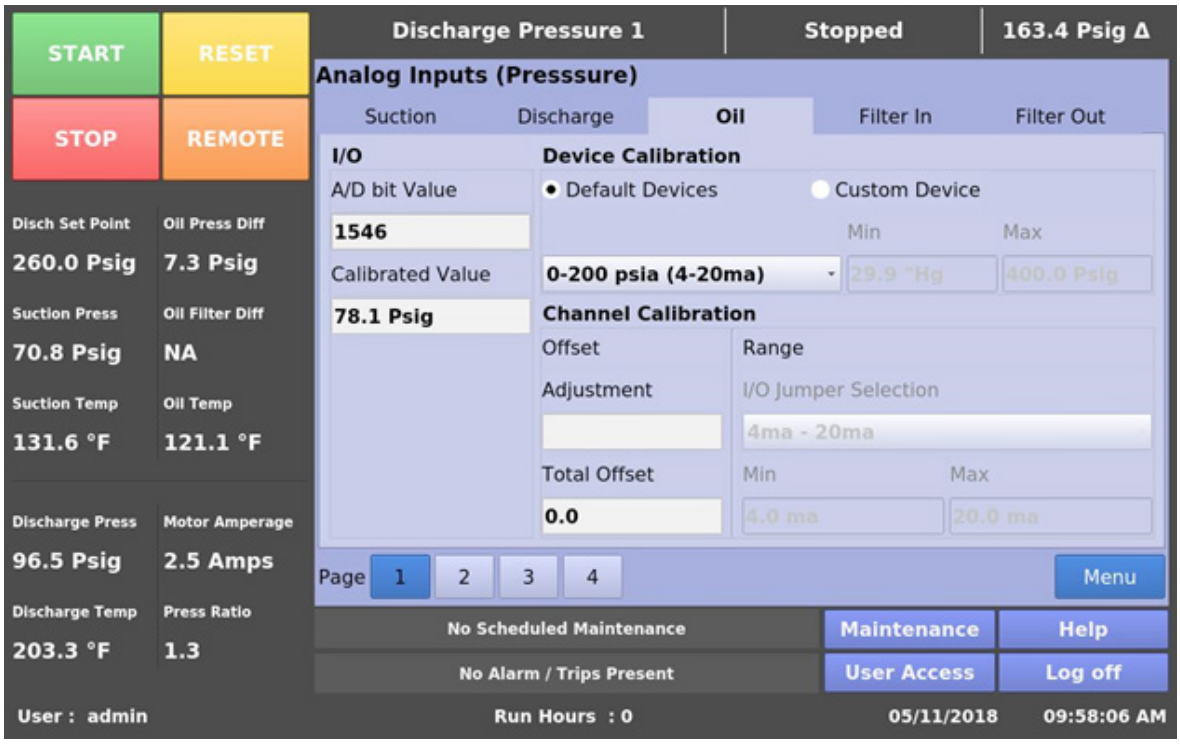



Figure 8-3. Instrument Calibration Screen Page 1 – Analog Inputs (Oil Pressure)

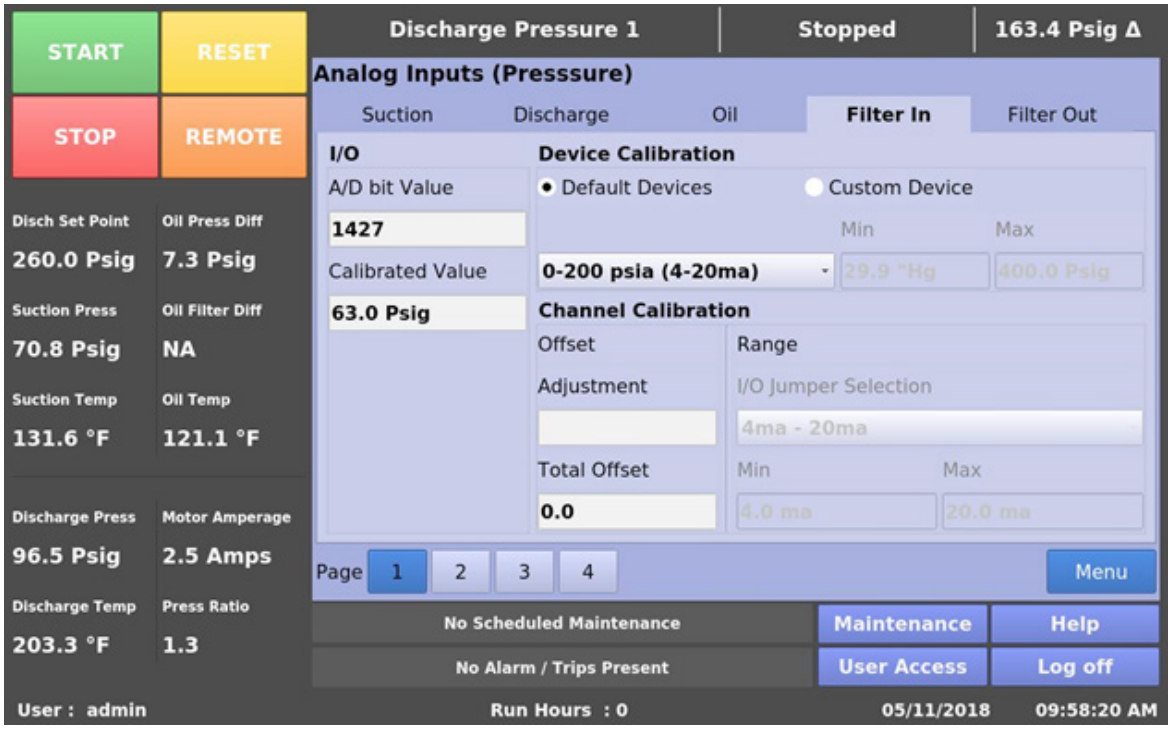



Figure 8-4. Instrument Calibration Screen Page 1 – Analog Inputs (Filter In Pressure)

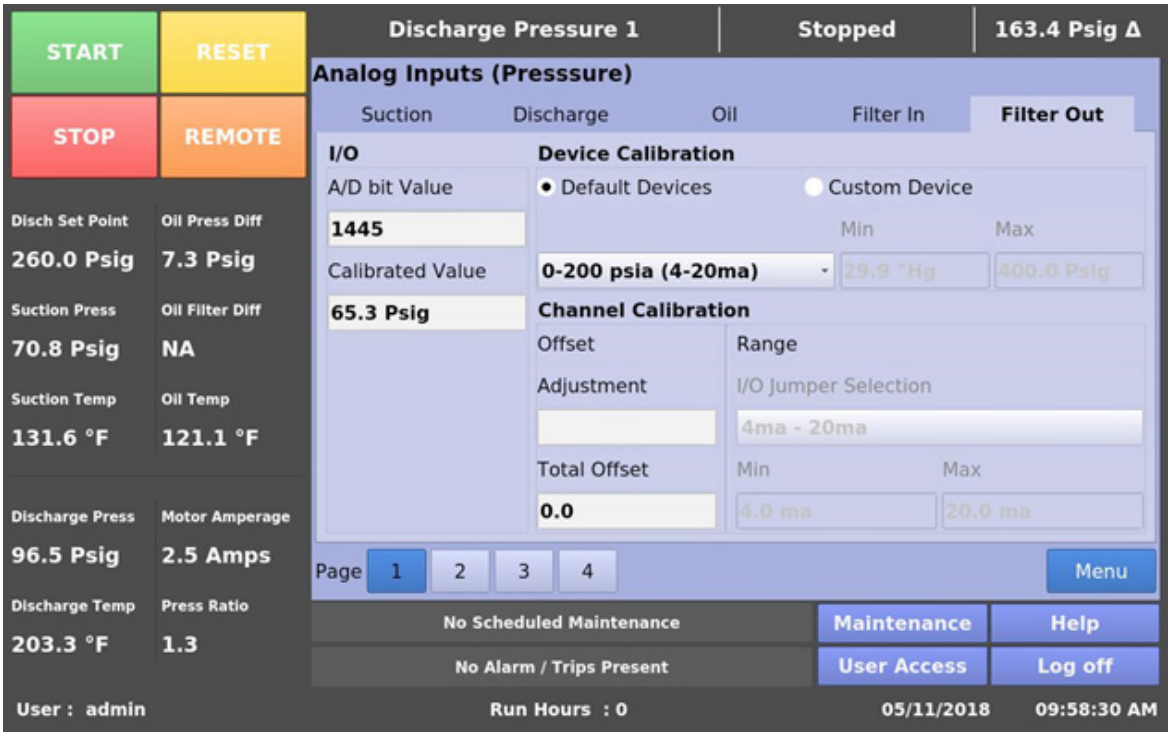



Figure 8-5. Instrument Calibration Screen Page 1 – Analog Inputs (Filter Out Pressure)

## Analog Inputs – Temperature

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

- Suction Temperature
- Discharge Temperature
- Oil Temperature

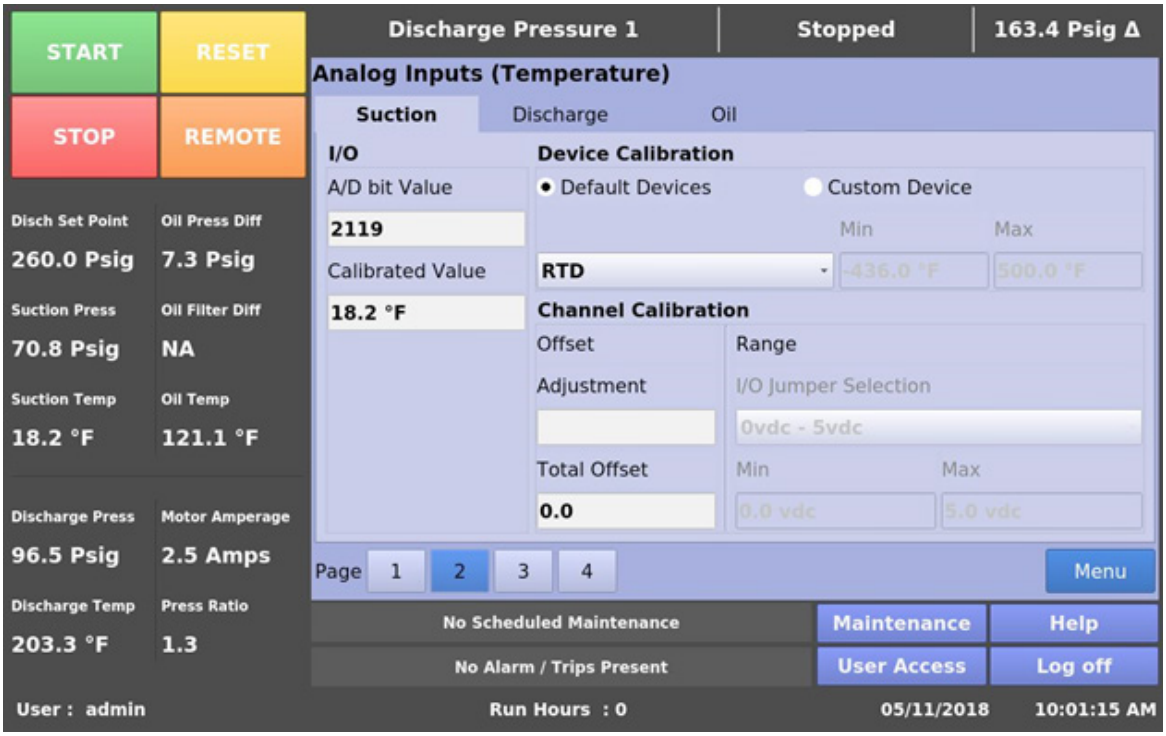



Figure 8-6. Instrument Calibration Screen Page 2 – Analog Inputs (Suction Temperature)


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

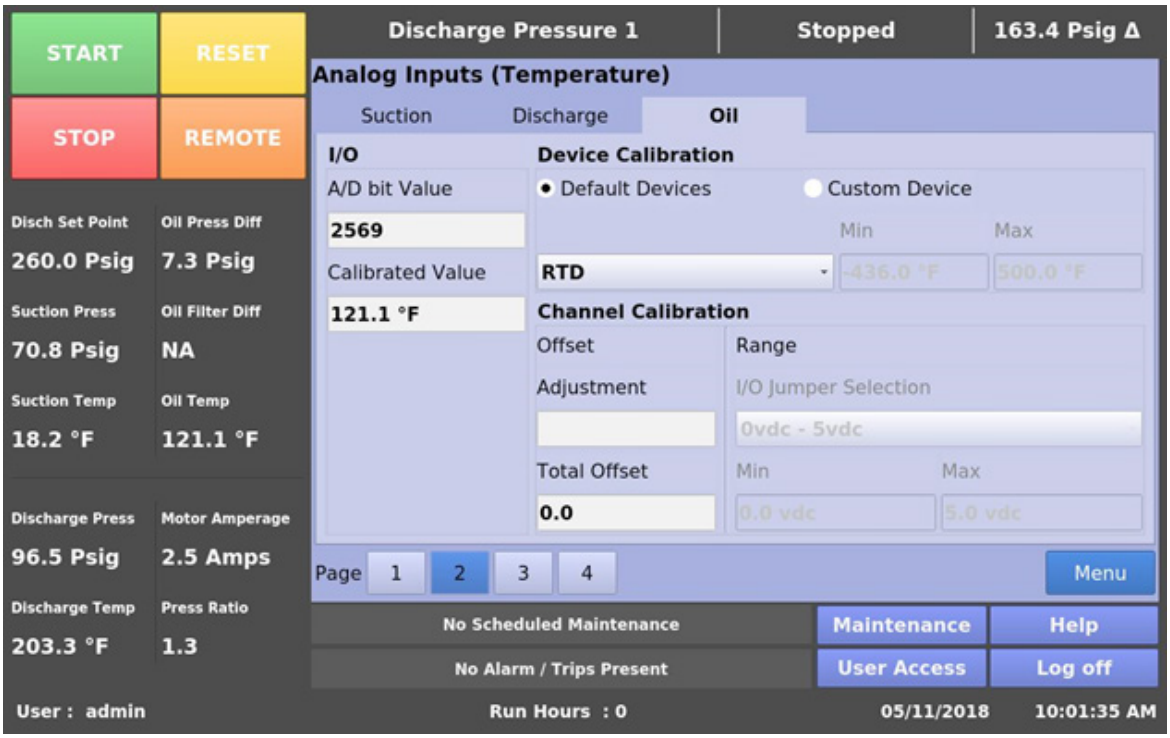



Figure 8-8. Instrument Calibration Screen Page 2 – Analog Inputs (Oil Temperature)

## 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.

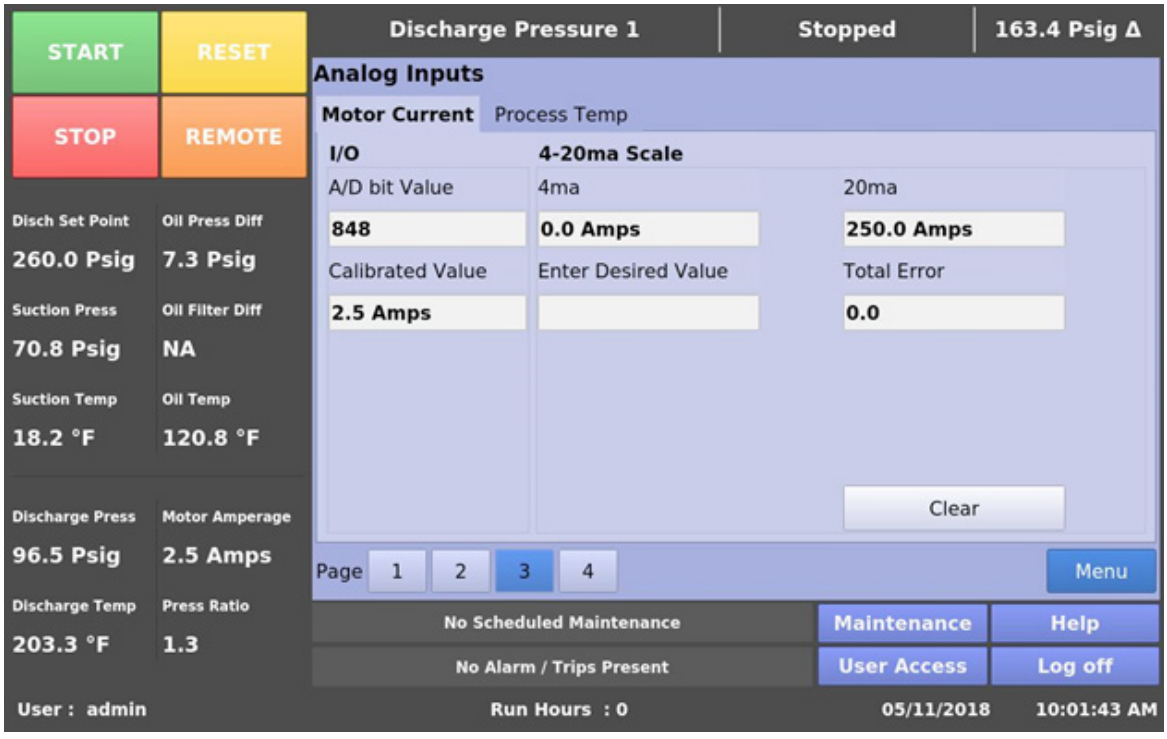



Figure 8-9. Instrument Calibration Screen Page 3 – Analog Inputs (Motor Current)

## 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.

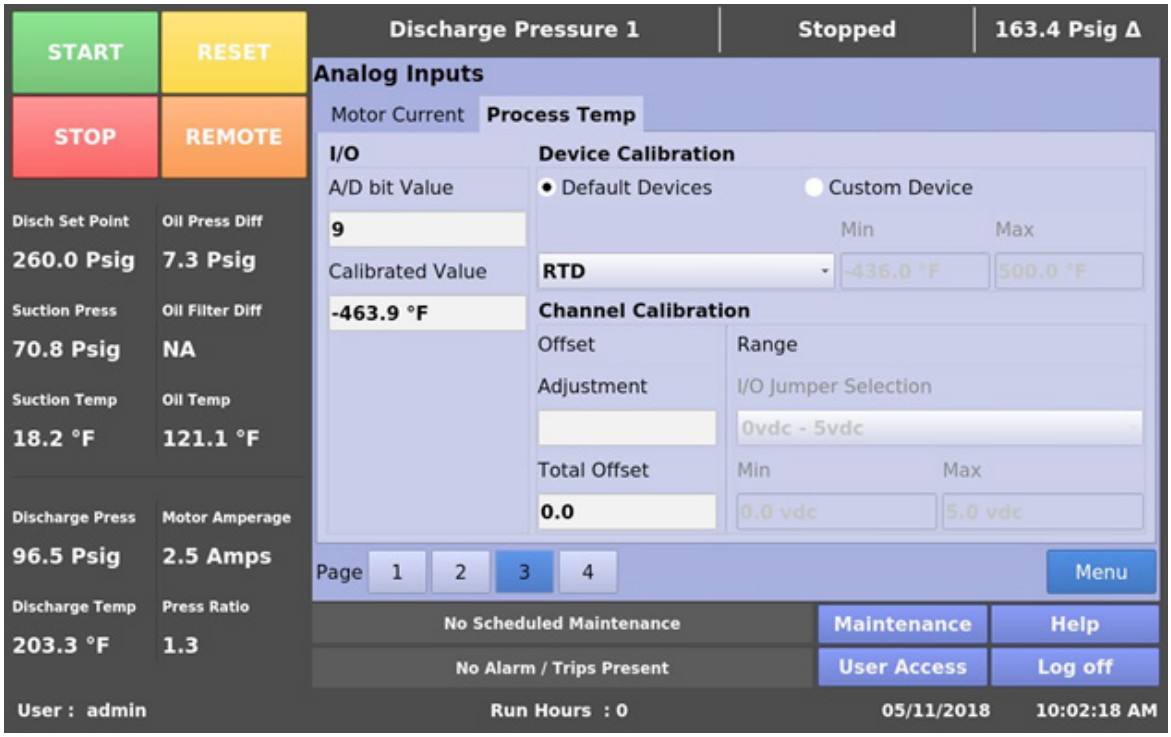



Figure 8-10. Instrument Calibration Screen Page 3 – Analog Inputs (Process Temperature)

## 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.

## 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.

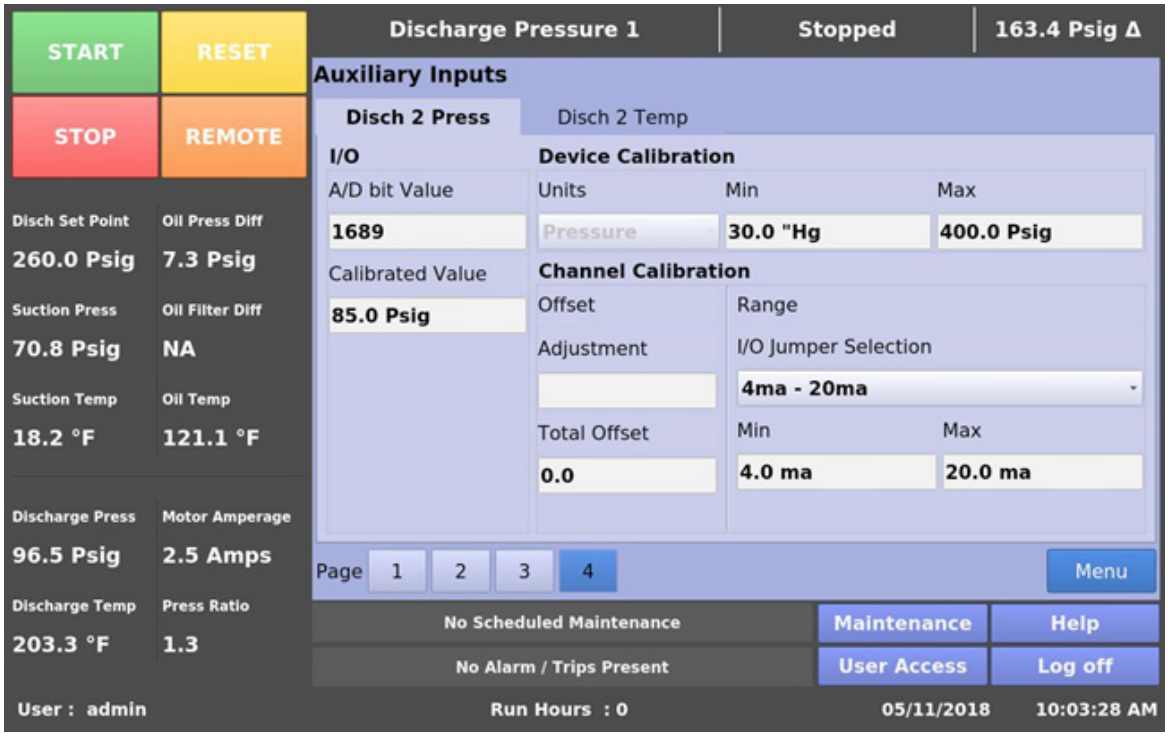



Figure 8-11. Instrument Calibration Screen Page 4 – Auxiliary Inputs (Discharge 2 Pressure)

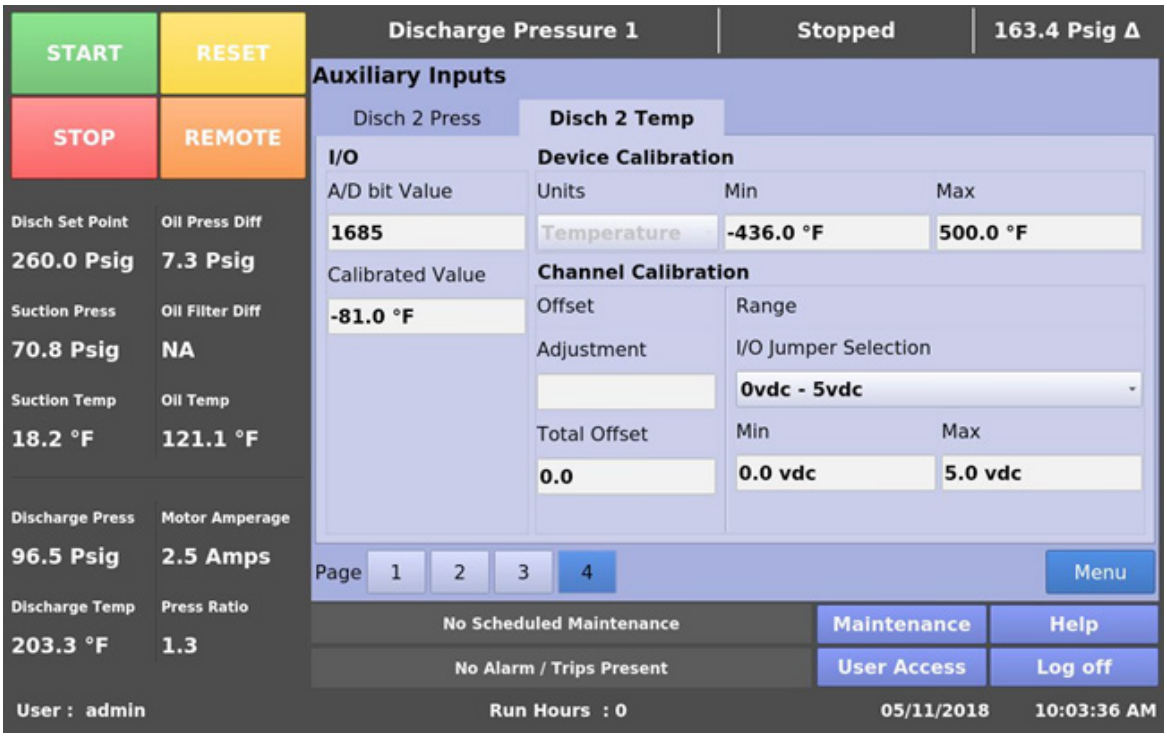



Figure 8-12. Instrument Calibration Screen Page 4 – Auxiliary Inputs (Discharge 2 Temperature)

## 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.

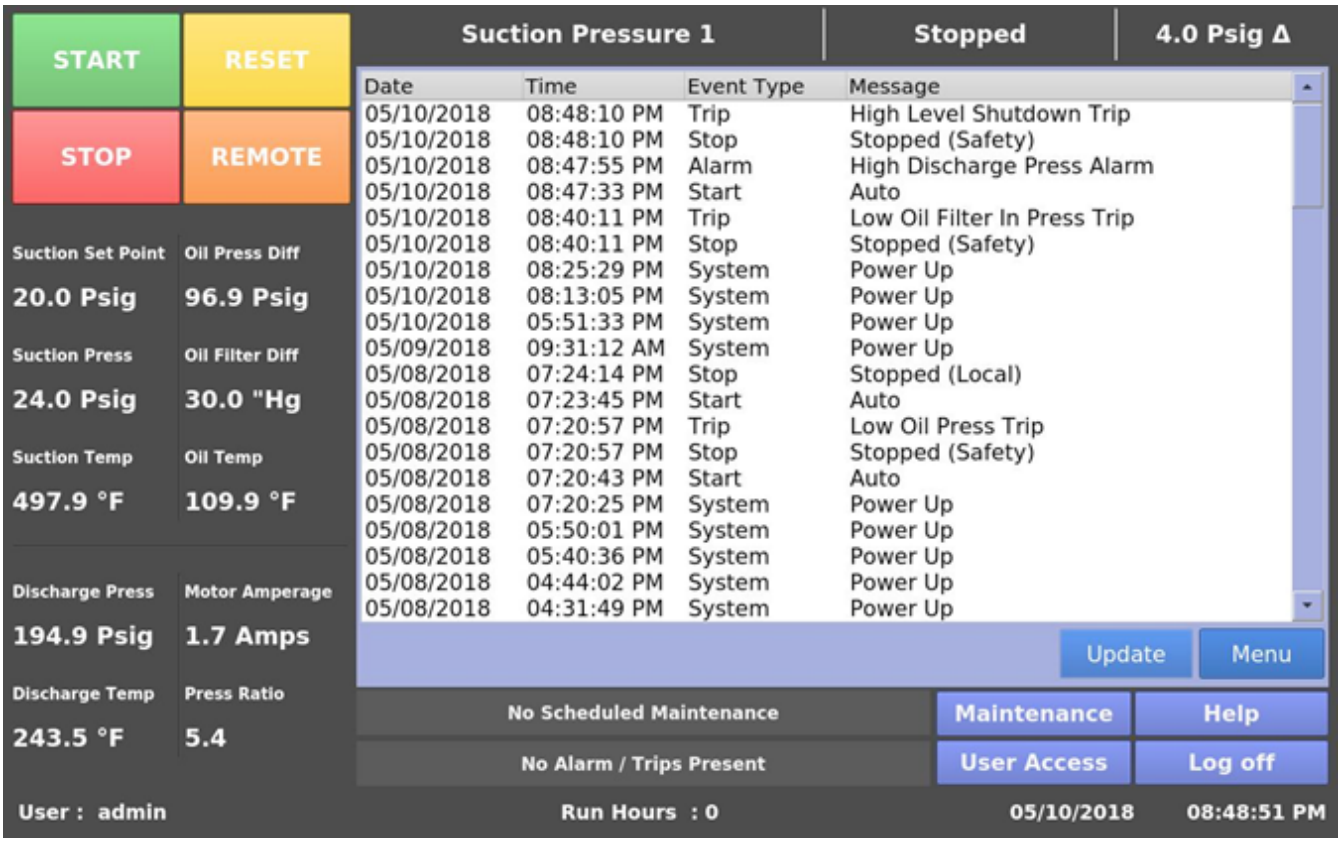



Figure 9-1. Event List Screen

## Overview

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

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 10-3 & 10-4. 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 10-5.

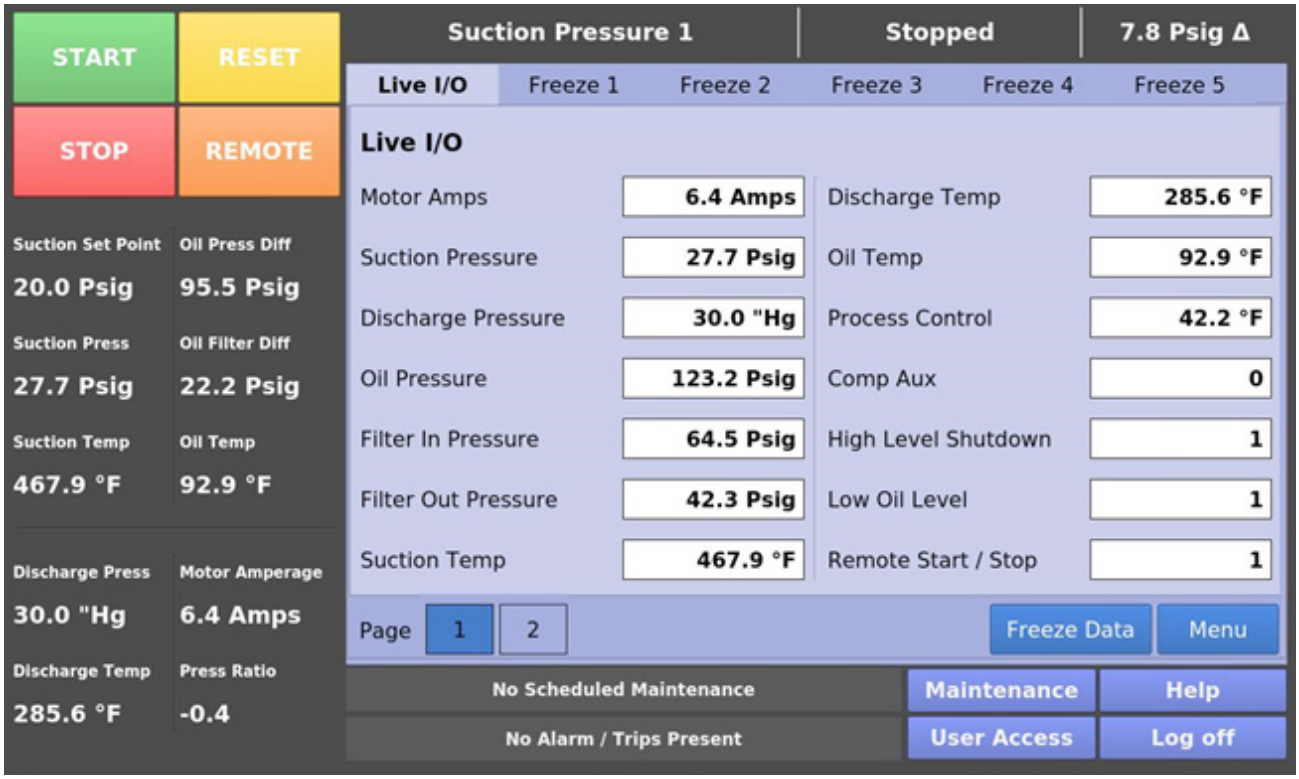



Figure 10-1. Input/Output States Screen Page 1 - Live I/O Data

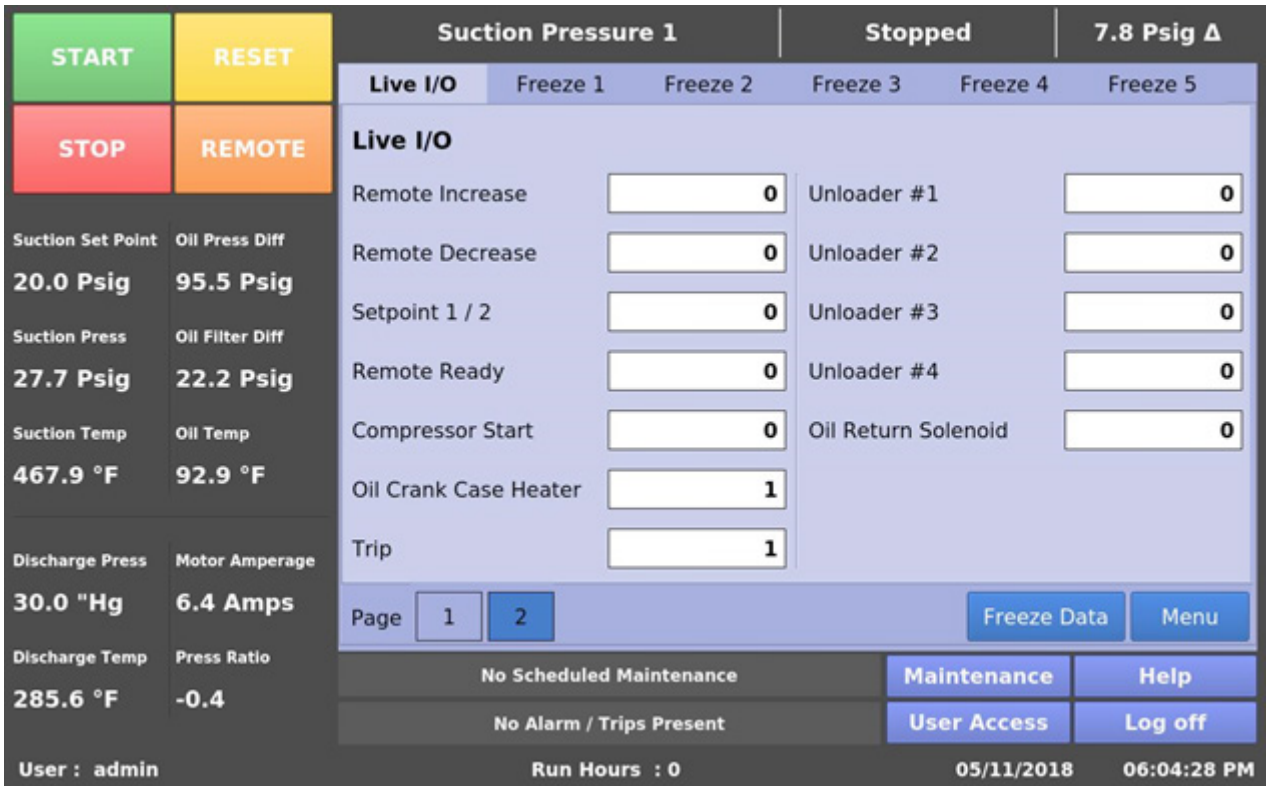



Figure 10-2. Input/Output States Screen Page 2 - Live I/O Data

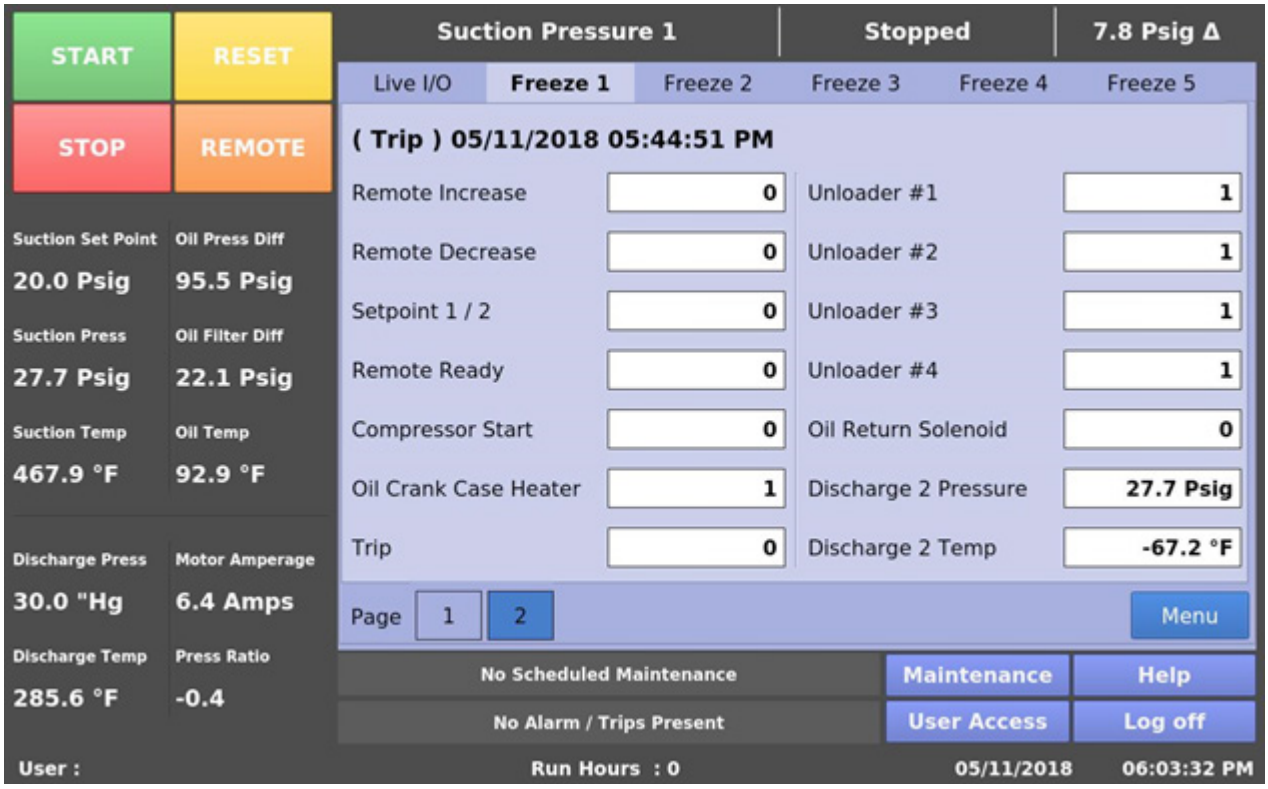



Figure 10-3. Input/Output States Screen - Freeze Data (Trip Condition)

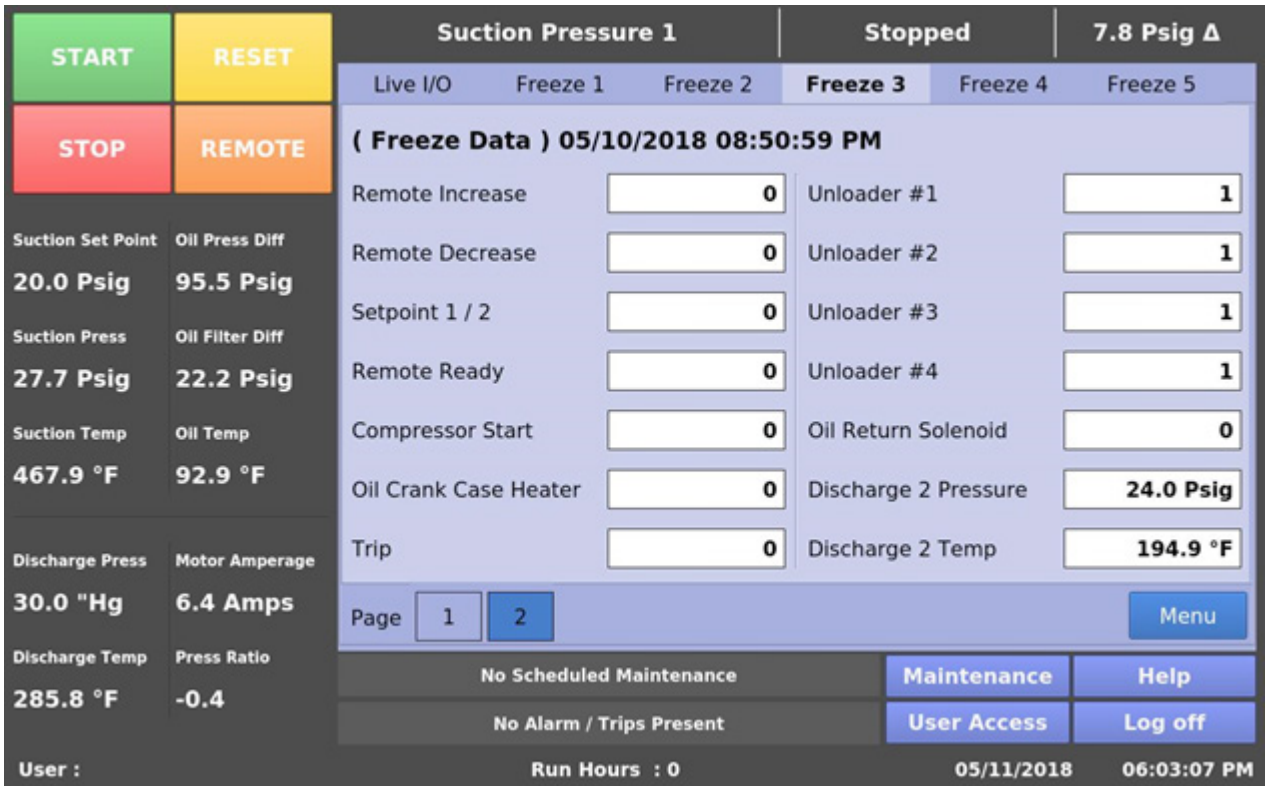



Figure 10-4. Input/Output States Screen - Freeze Data

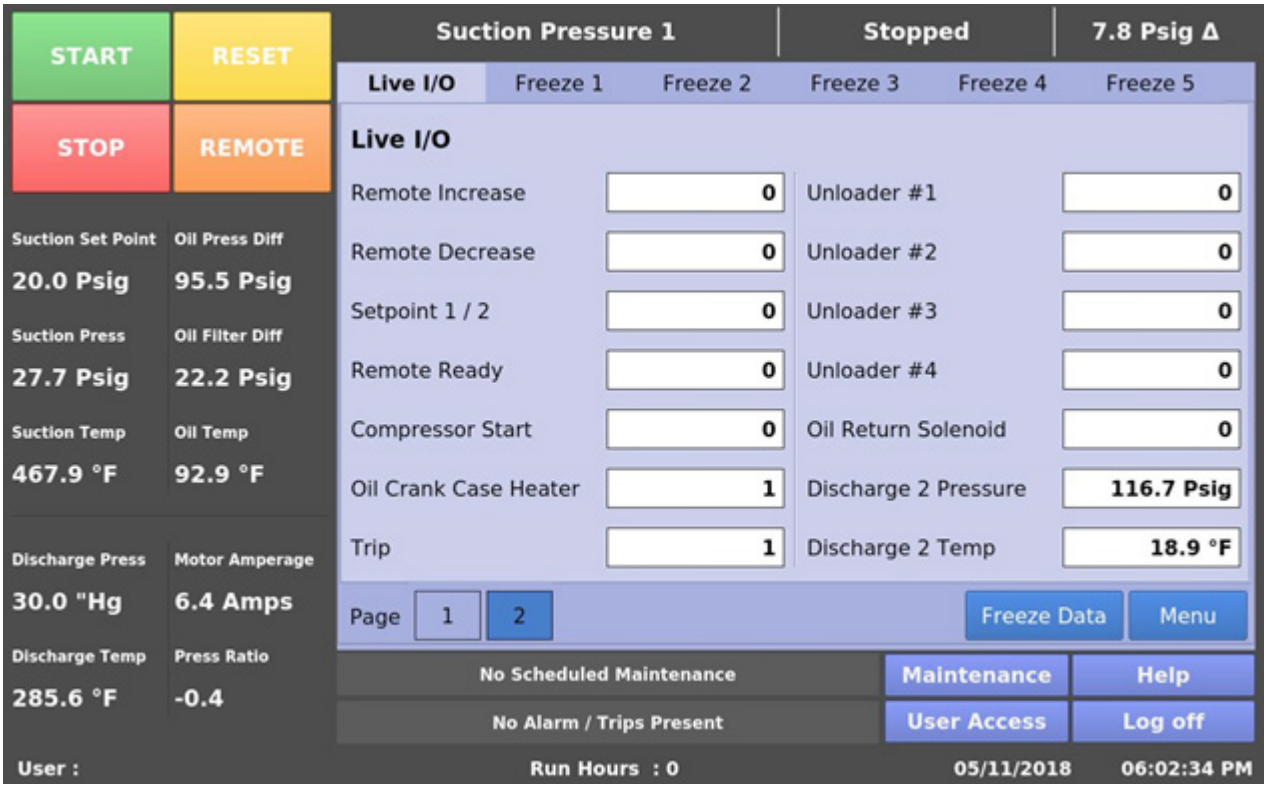



Figure 10-5. Input/Output States Screen – Auxiliary Analog Inputs

## 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.

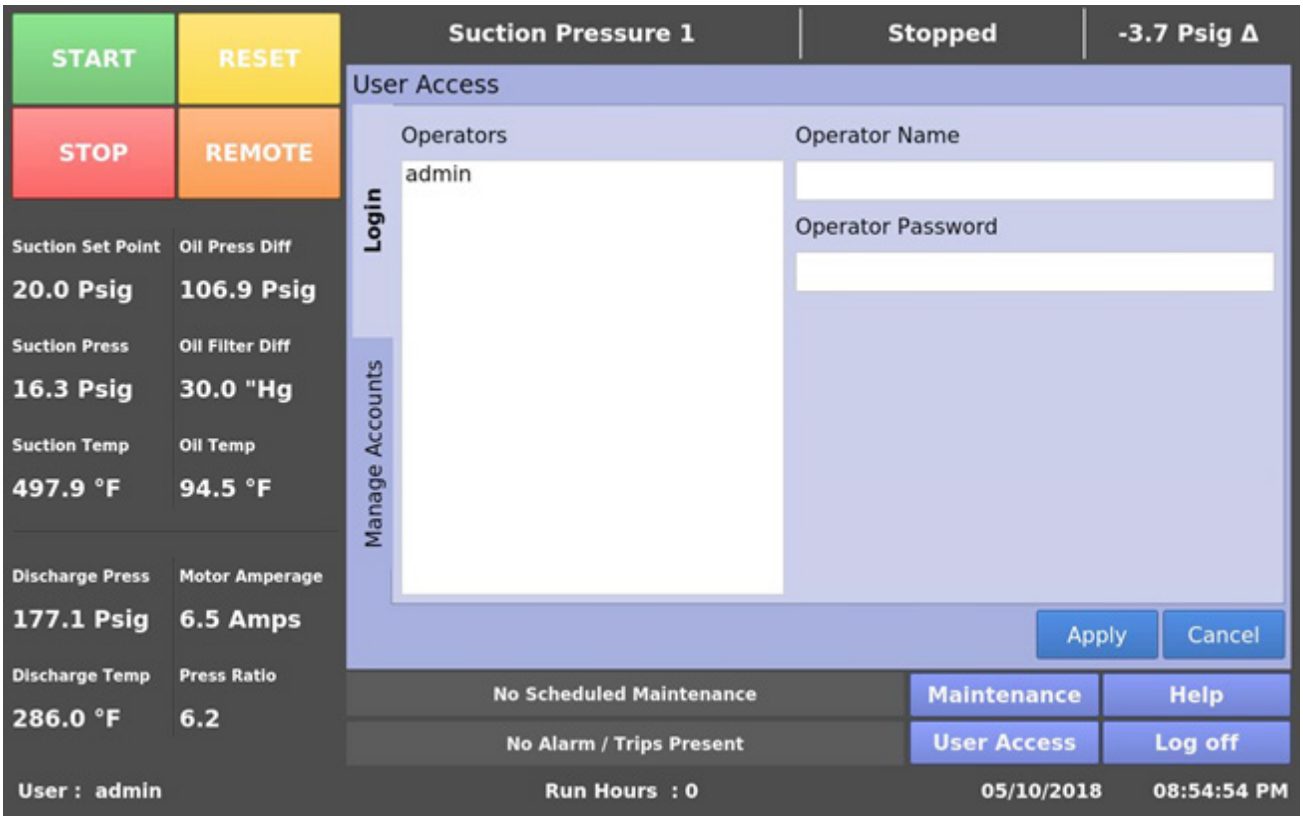



Figure 11-1. User Access Screen - Login

## 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.

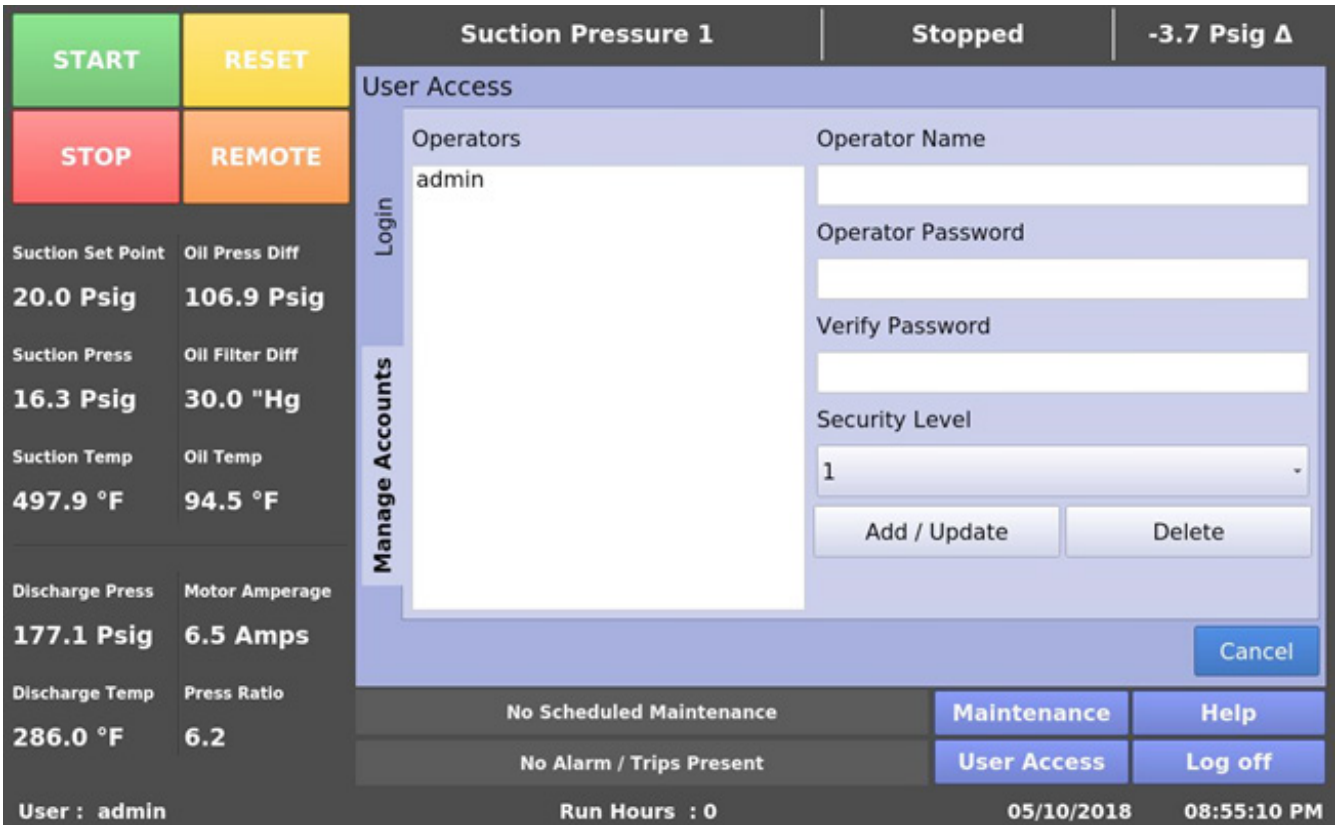



Figure 11-2. User Access Screen - Manage Accounts

### 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 | Security Level 0 | View |
| Input/ Output States | Security Level 0 | View/create freeze screen |
| Help | Security Level 0 | - |
| Alarms & Trips | Security Level 1* | Level 3 required for constraints |
| Compressor Control | Security Level 1* | Level 3 required for constraints |
| Instrument Calibration | Security Level 2 | - |
| Configuration | Security Level 2* | Level 3 required for page 5 |
| Timers | Security Level 2* | Level 3 required for constraints |
| VNC Account | Security 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.

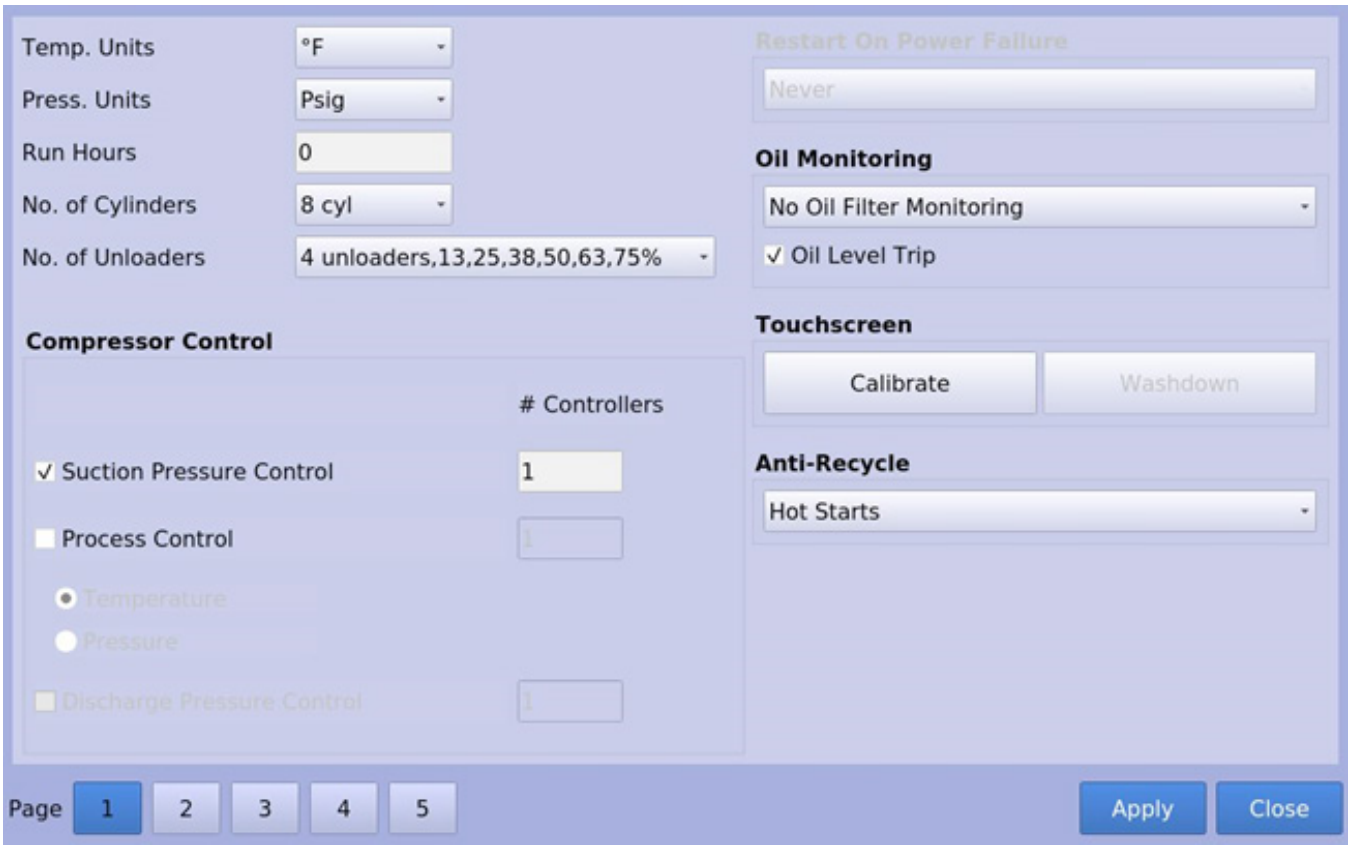



Figure 12-1. Configuration Screen - Initial Setup (Page 1)

## 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 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.
- **Format**: Selection to choose between 24 hours and 12 hours clock.

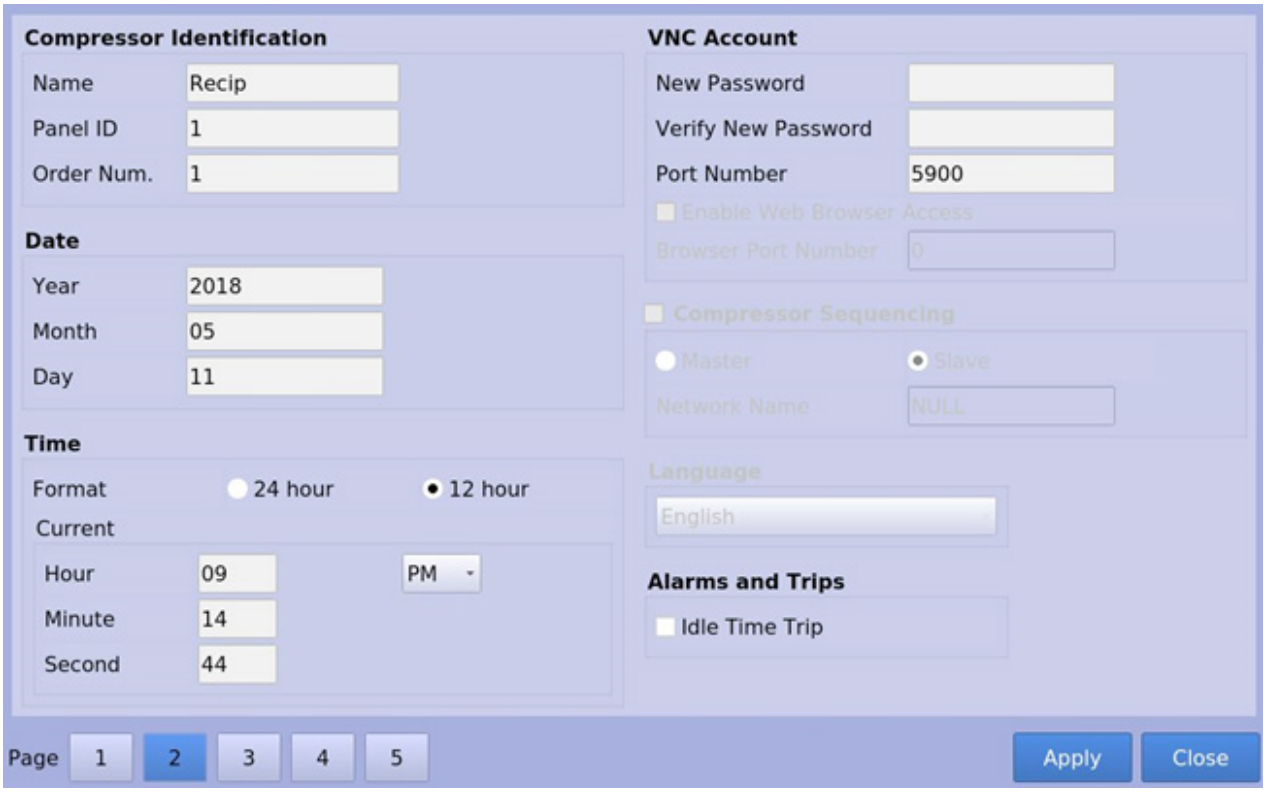



Figure 12-2. Configuration Screen (Page 2)

- **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.

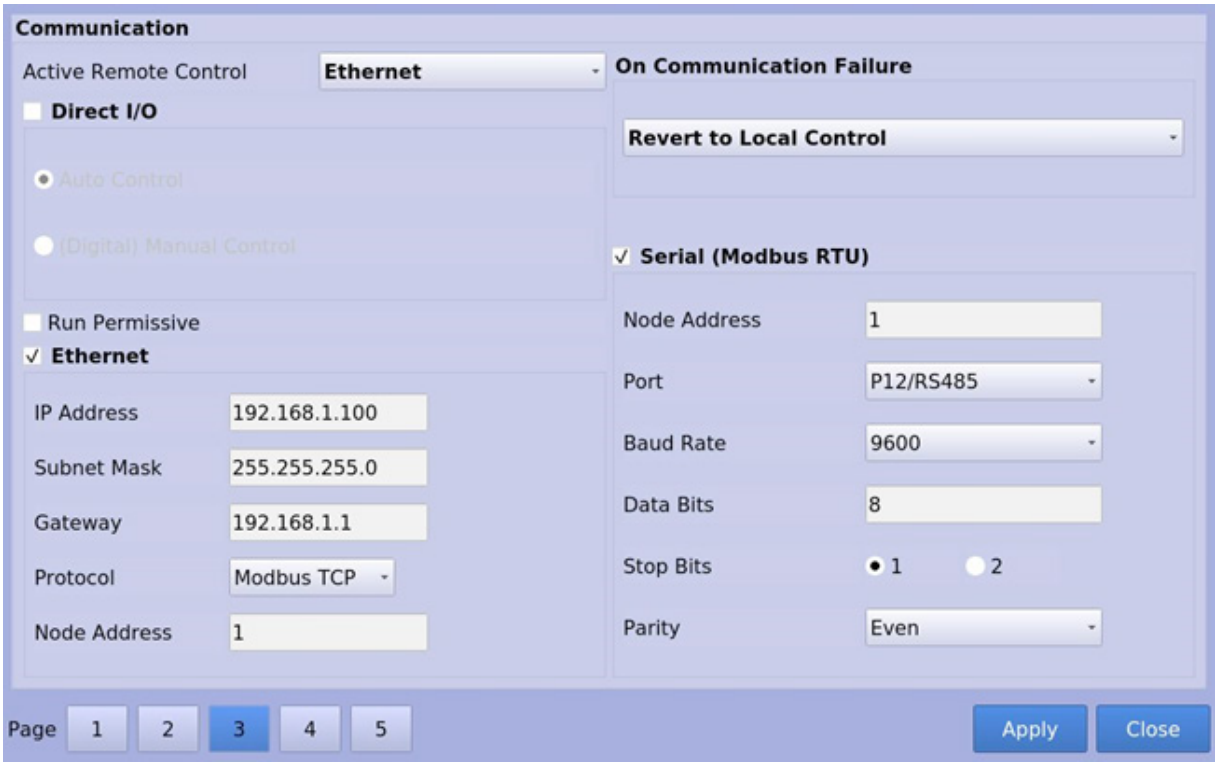



Figure 12-3. Configuration Screen - Communication

## 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

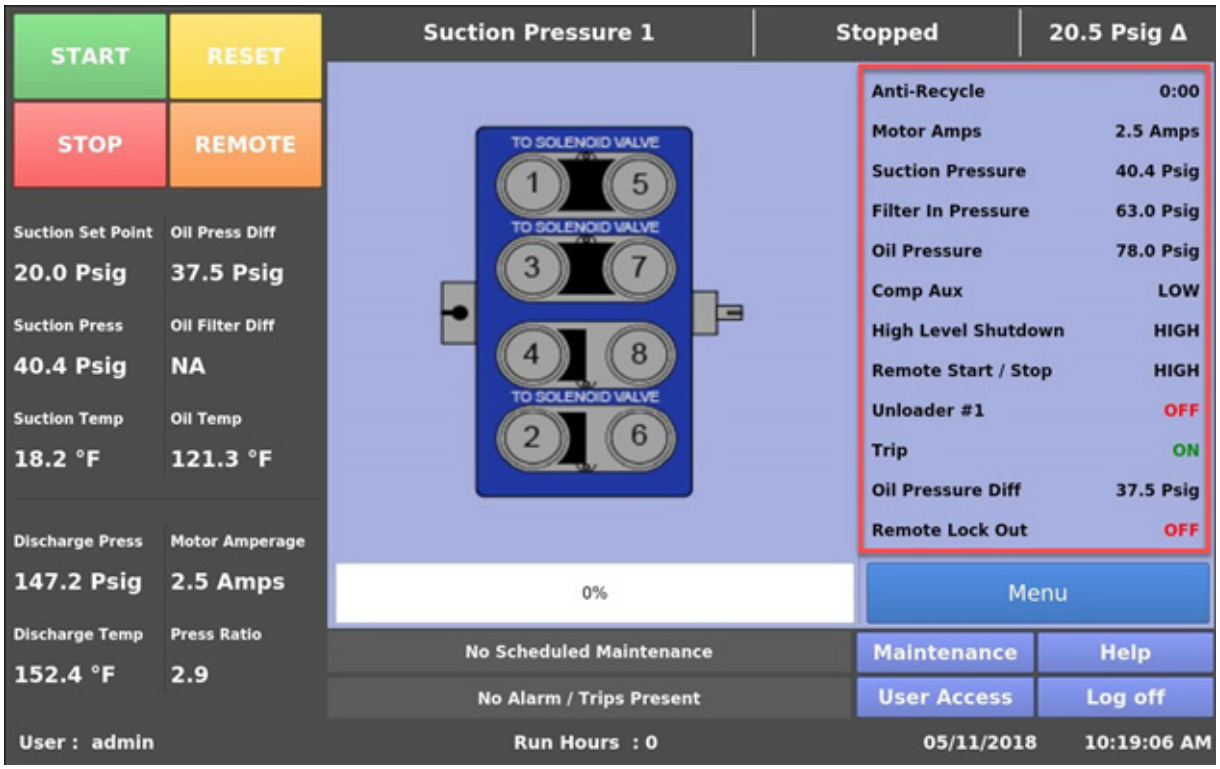



Figure 12-5. Configurable Parameters on Main Screen

## 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.

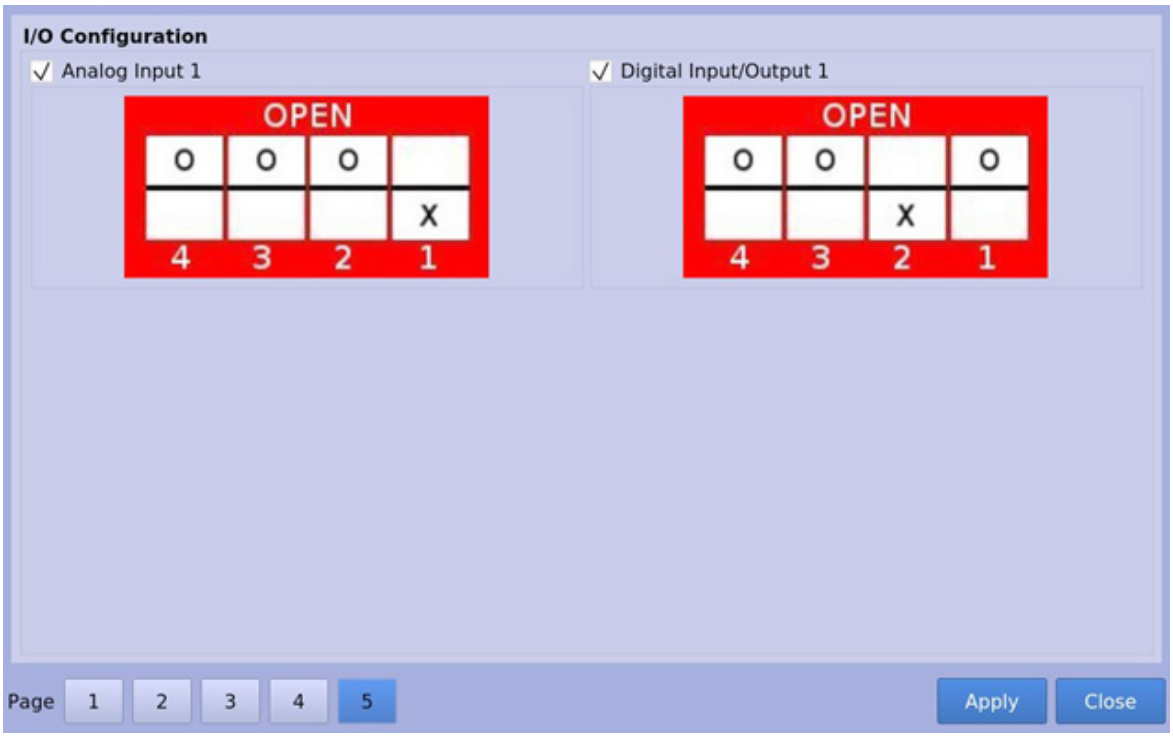



Figure 12-6. Configuration Screen - I/O Configuration

## Overview

The Database Backup screen provides the operator a way to extract information out of the MicroVission 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 MicroVission in the case of data corruption or to update the MicroVission 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 MicroVission setpoints and log information to a USB flash drive or load from a USB flash drive back to the MicroVission.

### Save

- Selecting Save allows the operator to save MicroVission 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 MicroVission 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.

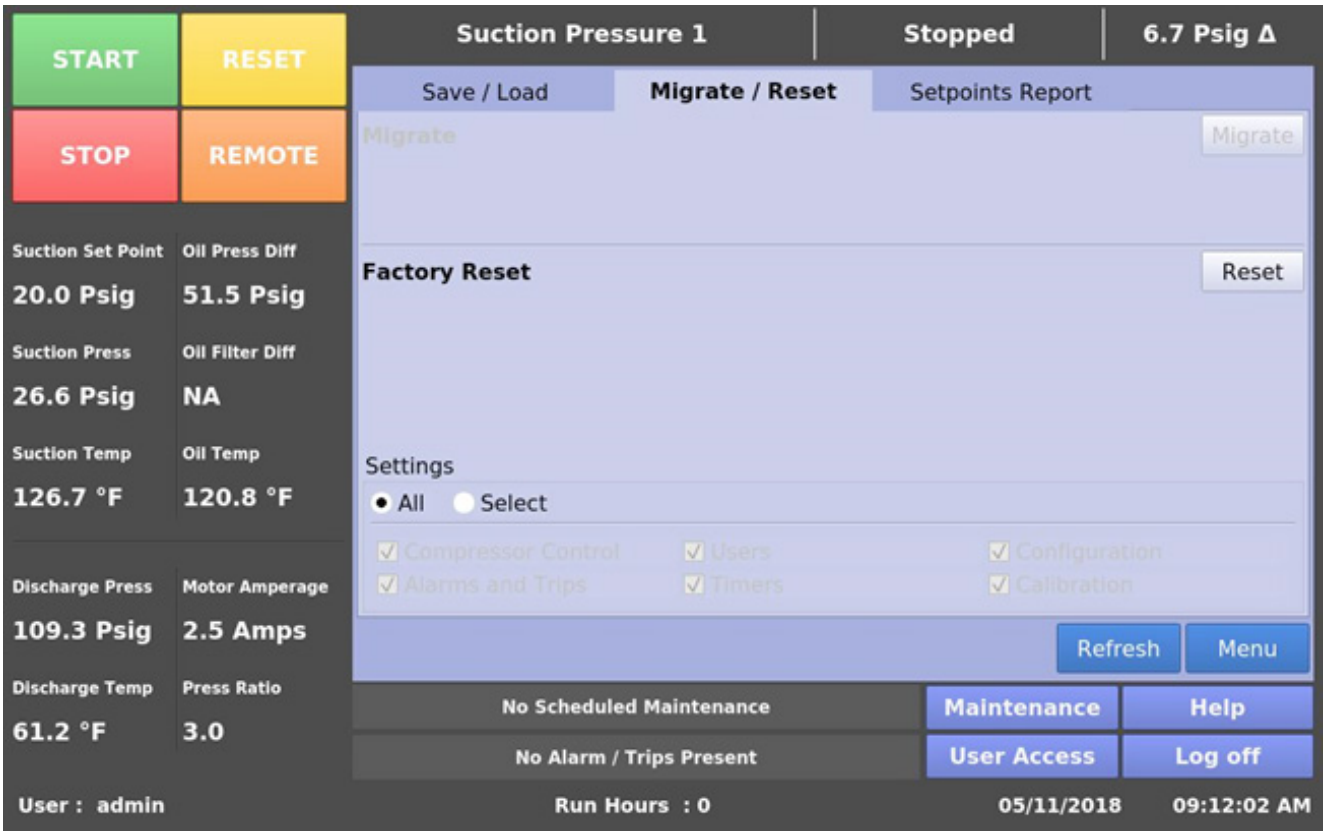



Figure 13-2. Data Backup Screen - Migrate and Factory Reset

## 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

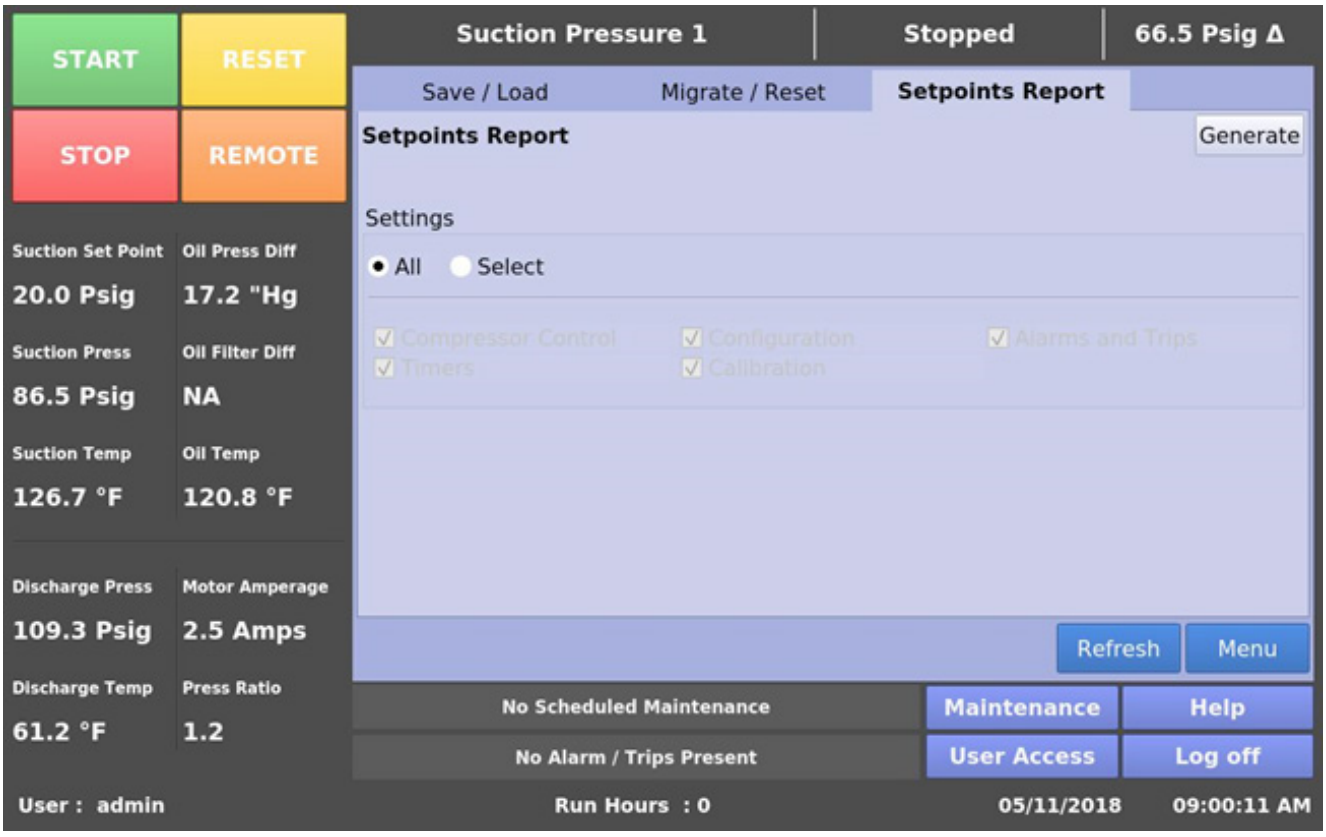



Figure 13-3. Data Backup Screen - Setpoints Report

## 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.

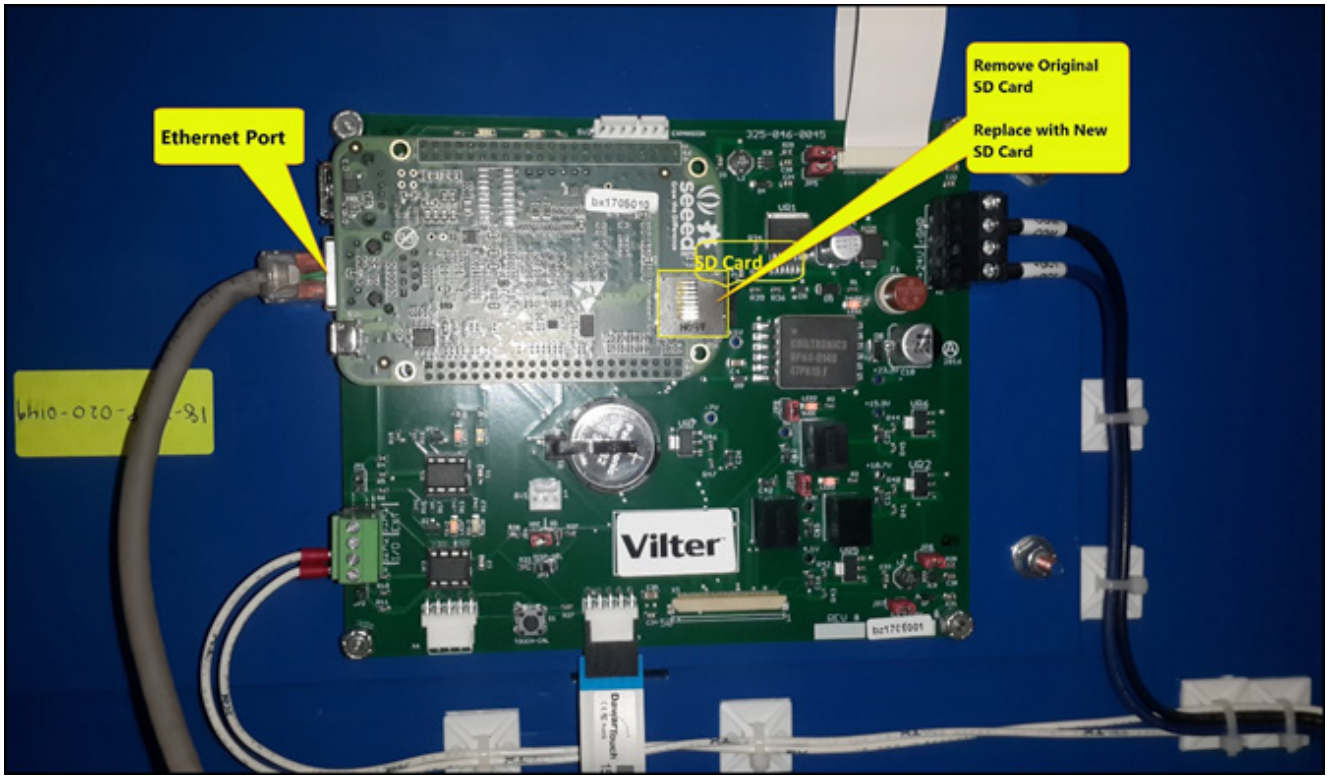



Figure 13-4. SD Card Replacement

# 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 1.0 .

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 | **Currently Unused** | Read | NA | NA |
| **N53:1** | 40101 | Not Assigned | F-INT | **Currently Unused** | Read | NA | NA |
| **N53:2** | 40102 | Not Assigned | F-INT | **Currently Unused** | Read | NA | NA |
| **N53:3** | 40103 | Not Assigned | F-INT | **Currently Unused** | Read | NA | NA |
| **N53:4** | 40104 | Not Assigned | F-INT | **Currently Unused** | Read | NA | NA |
| **N53:5** | 40105 | Not Assigned | 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 |

## 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<br>1 = Waiting<br>2 = Starting<br>3 = Manual<br>4 = Auto<br>5 = Remote Auto<br>6 = Remote Manual<br>7 = Remote Step Hold %<br>8 = Remote Ready (Idle)<br>9 = Direct I/O Auto<br>10 = Direct I/O Manual<br>11 = Direct I/O Step Hold %<br>12 = Auto Sequencing | Read | NA | NA |
| N55:11 | 40151 | Status Message | WORD | Bit 0 = High Suction Pressure<br>Bit 1 = High Discharge Pressure<br>Bit 2 = Low Suction Pressure<br>Bit 3 = High Motor Current<br>Bit 4 = Auto Cycle<br>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)<br>1 = Direct I/O<br>2 = Serial<br>3 = Ethernet | Read-Write | NA | NA |
| **N56:2** | 40172 | Remote Control Select | ENUM | 0 = Auto Control<br>1 = Step Load / Unload | Read-Write | NA | NA |
| **N56:3** | 40173 | Auto Control Type | ENUM | 0 = Suction Pressure (if enabled)<br>1 = Process Control (if enabled)<br>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<br>2 = Setpoint 2<br>(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<br>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. Alarms/Trips Block (Page 1)

| 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 |
| **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 |

Table B-15. Alarms/Trips Block (Page 1) (continued)

| Ethernet IP Address | Modbus Address | Alarms/Trips (Page 1) | Data Type | Value | Mode | Lower Range | Higher Range |
|---|---|---|---|---|---|---|---|
| **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 Set-point #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-16. 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-17. 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-18. 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-19. 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-20. 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-21. Configuration (Other) Block

| 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<br>1 = 3 cyl<br>2 = 4 cyl<br>3 = 5 cyl<br>4 = 6 cyl<br>5 = 7 cyl<br>6 = 8 cyl<br>7 = 12 cyl<br>8 = 16 cyl | Read | NA | NA |
| **N67:1** | 40611 | No. of Unloaders | ENUM | 0 = No Unloader<br>1 = 1 Unloader, 33%<br>2 = 1 Unloader, 50%<br>3 = 2 Unloaders, 25, 50%<br>4 = 2 Unloaders, 25, 50, 75%<br>5 = 2 Unloaders, 29, 57%<br>6 = 2 Unloaders, 33, 66%<br>7 = 2 Unloaders, 40, 60%<br>8 = 2 Unloaders, 50, 100%<br>9 = 3 Unloaders, 13, 38, 63%<br>10 = 3 Unloaders, 14, 29, 43, 57%<br>11 = 3 Unloaders, 17, 33, 50, 66%<br>12 = 3 Unloaders, 17, 33, 50, 66, 83%<br>13 = 3 Unloaders, 25, 50, 75%<br>14 = 3 Unloaders, 33, 50, 66%<br>15 = 3 Unloaders, 33, 66, 100%<br>16 = 4 Unloaders, 13, 25, 38, 50, 63, 75%<br>17 = 4 Unloaders, 25, 50, 75, 100% | Read | NA | NA |
| **N67:2** | 40612 | Suction Pressure Control Available | INT | 0 = No, 1 = Yes | Read | NA | NA |
| **N67:3** | 40613 | Suction Pressure Control # of Setpoints | INT | | Read | NA | NA |
| **N67:4** | 40614 | Process Control Available | INT | 0 = No, 1 = Yes | Read | NA | NA |
| **N67:5** | 40615 | Process Control # of Setpoints | INT | | Read | NA | NA |

Table B-21. Configuration (Other) Block (continued)

| Ethernet IP Address | Modbus Address | Configuration (Other) | Data Type | Value | Mode | Lower Range | Higher Range |
|---|---|---|---|---|---|---|---|
| **N67:6** | 40616 | Process Control Type | ENUM | 0 = Temperature<br>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<br>1 = Only Oil Filter In<br>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<br>1 = Accumulative Anti-Recycle<br>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<br>1 = Stop with Alarm | Read | NA | NA |
| **N67:16** | 40626 | Panel ID | INT | | Read | NA | NA |

## 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)

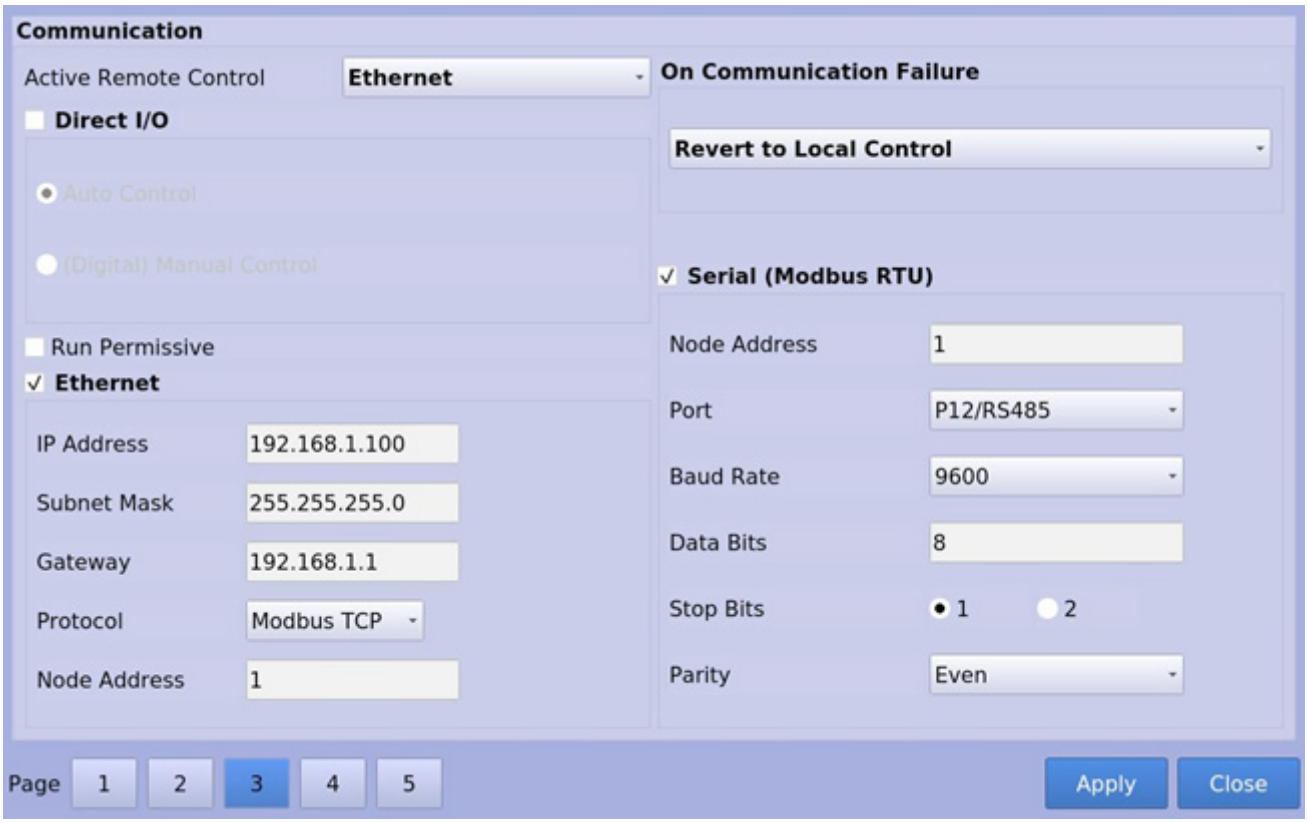



Figure C-1. Configuration Screen (Page 3)

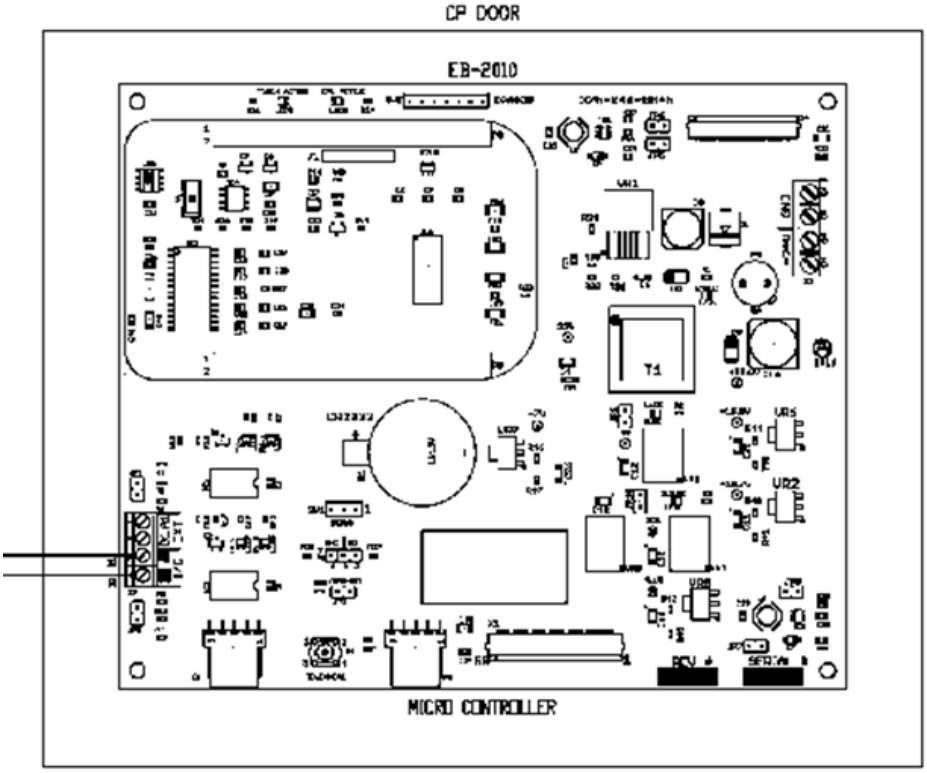



Figure C-2. Serial Communication Ports on Single Board Computer

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, Setting MicroVission in Remote Mode.

### 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).

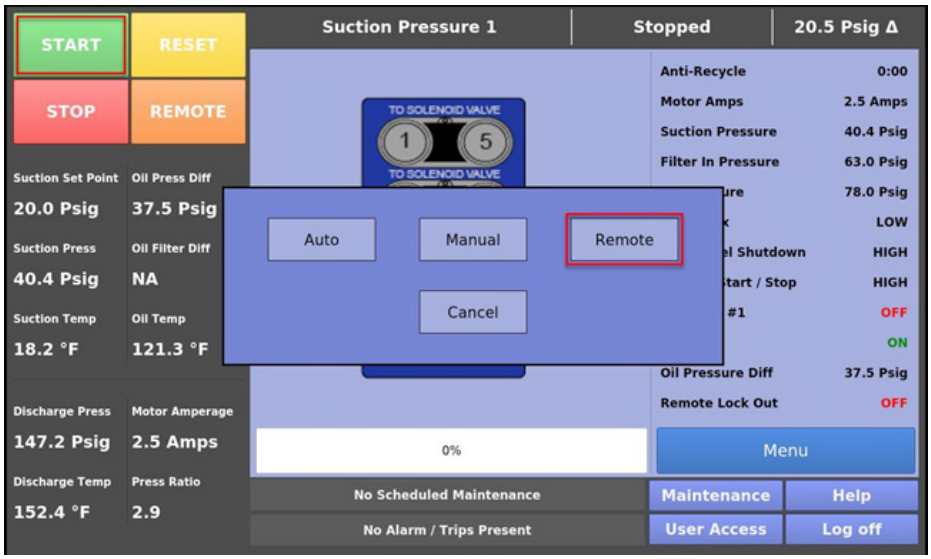



**Figure C-3. Setting MicroVission in Remote Mode**

- 3 = Ethernet (Modbus TCP or Ethernet IP communications.)

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.