CONSPEC CONTROLS

CS0352-MP

User Manual

1/24/2017

Rev. 3

Index

Purpose

Conspec atmospheric sample draw systems are designed to continuously monitor gas levels in areas with extreme conditions. A gas monitor cannot be directly placed in areas of extreme heat, high moisture levels and areas with large amounts of airborne debris. The remote probe design allows for monitoring in such conditions without damaging the sensitive parts of the gas monitor. The PLC controlled system is fully automated and allows for easy set up after installation.

The CS0352-MP is an extractive carbon monoxide monitoring system designed specifically to work in conjunction with the MillPro mill protection system. It is designed to be able to handle the higher temperatures and moisture levels of PRB coal burning systems. It is a single mill dual probe system. One probe is located in the top of the mill near the exhaust ports and the second probe is inserted into the underbowl of the mill.

System Overview

During start up, shutdown and normal running operations the sample is pulled from the top of the mill. A sample is pulled from the underbowl only while the mill is offline to detect smoldering coal that may have fallen to the bottom of the mill. The pump is disabled and sampling ceases during a deluge or spray down of the mill to avoid the system from taking in too much water. The PLC determines the mill status by several inputs from the MillPro system and acts accordingly.

The CS0352-MP performs scheduled high pressure blow backs to clear the sintered metal probes of any blockage. The system is able to detect a low flow condition if the probe becomes clogged and will perform an unscheduled blowback. Scheduled blow back intervals are user definable through the touch screen interface.

Several sample conditioning elements are utilized to ensure accurate gas detection and sensor life. A Vortec panel cooler and thermostat have been incorporated into the panel to lower the temperature of the sample. Lowering the temperature to an acceptable level ensures sensor life and condenses any excess moisture out of the sample air to be removed by a water catch and peristaltic pump.

A flow matching calibration process is used for more accurate gas detection. Using a 3 LPM regulator on the calibration gas bottles and an adjustable flow regulator within the panel, the sampling flow rate and calibration flow rate can be matched resulting in a more accurate gas reading

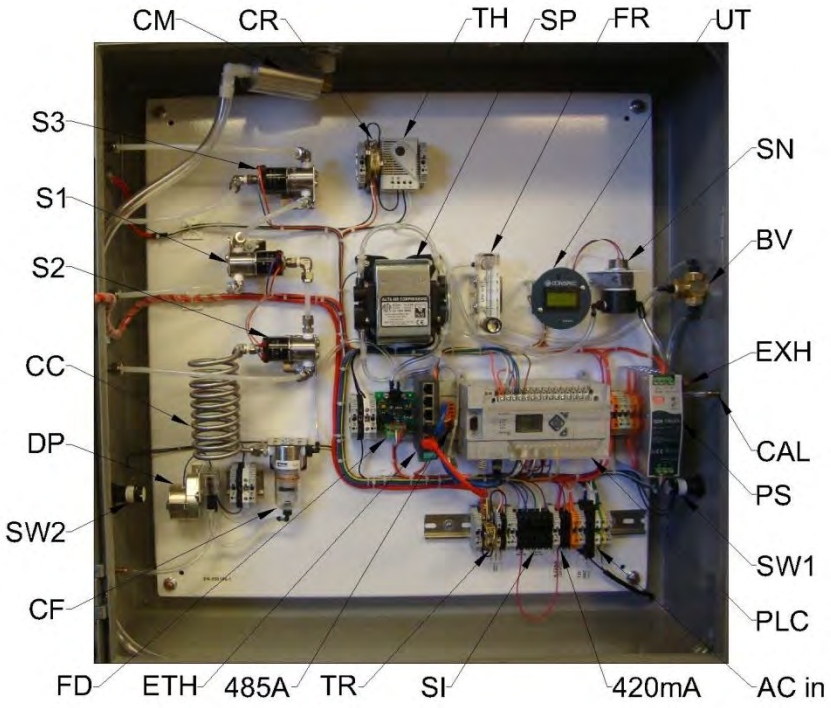


Figure 1: CS0352-MP Components

CS0352-MP Components – Labels, Descriptions, and Part Numbers

PLC	Allen Bradley 1400	1766-L32BWA
PS	Meanwell 24VDC 5A Supply	SDR-120-24
UT	500PPM CO Detector Card	900732-03
SN	1000PPM CO Sensor	P2261-3
FD	Flow Detector Card	900724
SP	120Vac 12 LPM Sample Pump	AL-6SB
SW1	Sample Pump Switch	P1907-SL
DP	115Vac Peristaltic Drain Pump	SP101R.104
SW2	Drain Pump Switch	P1907-SL
ETH	Moxa Ethernet Switch	EDS-205
485A	RS485 to Serial Adaptor	1763-NC01
S1	Probe Select Solenoid	3CBX4S-Y-24VDC
S2	Pressure Release Solenoid	3CBX4S-Y-24VDC
S3	H.P. Blow Back Solenoid	3CBX4S-Y-24VDC
TH	Thermostat	Vortex 747 System
TR	Trouble Relay	814-3028
CR	Cooler Solenoid Relay	814-3028
FR	.4-5.0LPM Flow Regulator	FL2013
CF	Coalescing Filter	2383T47
CC	Cooling Coil	Non Inventory Item
BV	3-way Ball Valve (Calibration)	46095K41
CAL	Calibration Port	DMA3
EXH	Exhaust Port	DMA3
ACin	120VAC Supply Input	N/A
SI	System Inputs	N/A
420mA	4-20mA CO Level Output	N/A

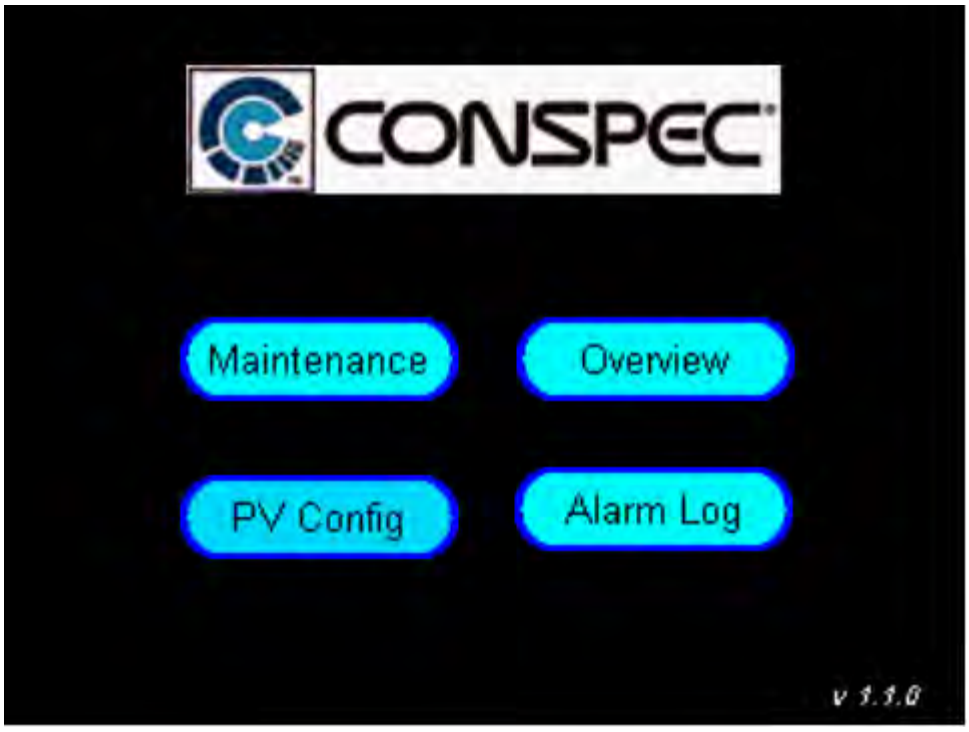
CM	Cooling Muffler	Vortex 747 System

Components not shown

PV	Panel view Component C600	2711C-T6T
S4	120Vac 2 way Cooler Solenoid	Vortex 747 System
VC	Vortec Cooler	Vortex 747 System

PanelView Screens

Main screen



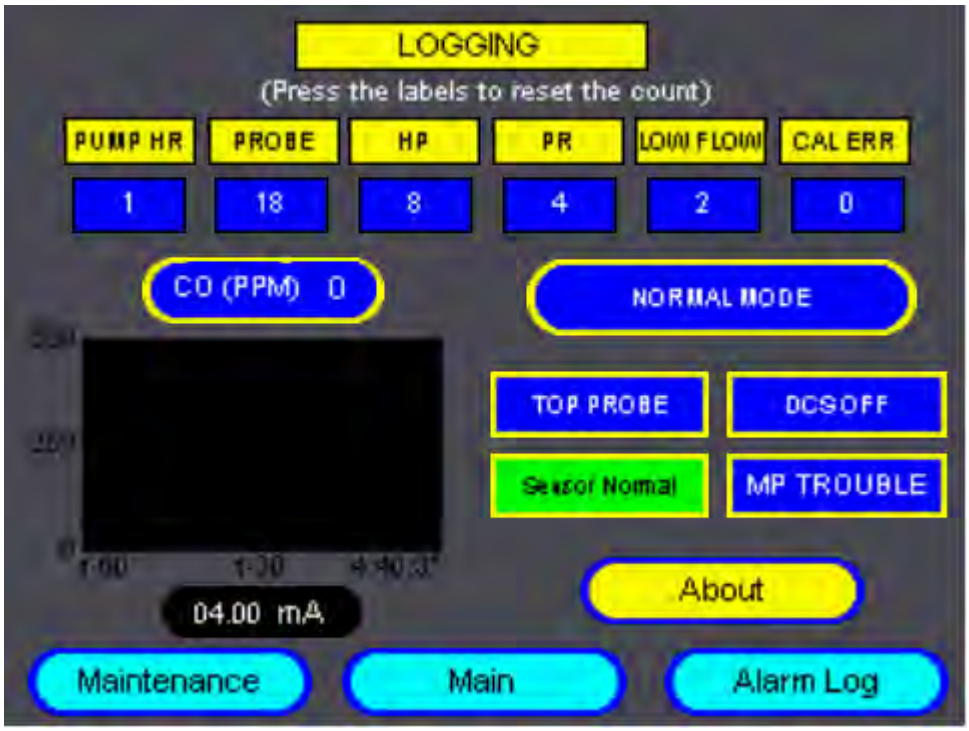
The main screen contains a link to all the other screens. All the screens are accessible from the main screen. The screens are:

Maintenance
Overview
PV Config
Alarm Log

PV Config

The Panel View Configuration screen is a user screen created by Allen Bradley Products to adjust screen settings such a contrast, brightness, screen time out time, etc. The date and time are also set from this screen as well as communication settings.

Overview



The Overview screen shows useful information all on one screen for easy viewing. The panel status, sensor status, an approximated 4-20mA value, CO value, hour long trend window, MillPro status, Mill Status, and logging information are all displayed. The logs keep track of operation times so the user can predict when components will need maintenance or replacement. The About screen can be accessed from the overview screen.

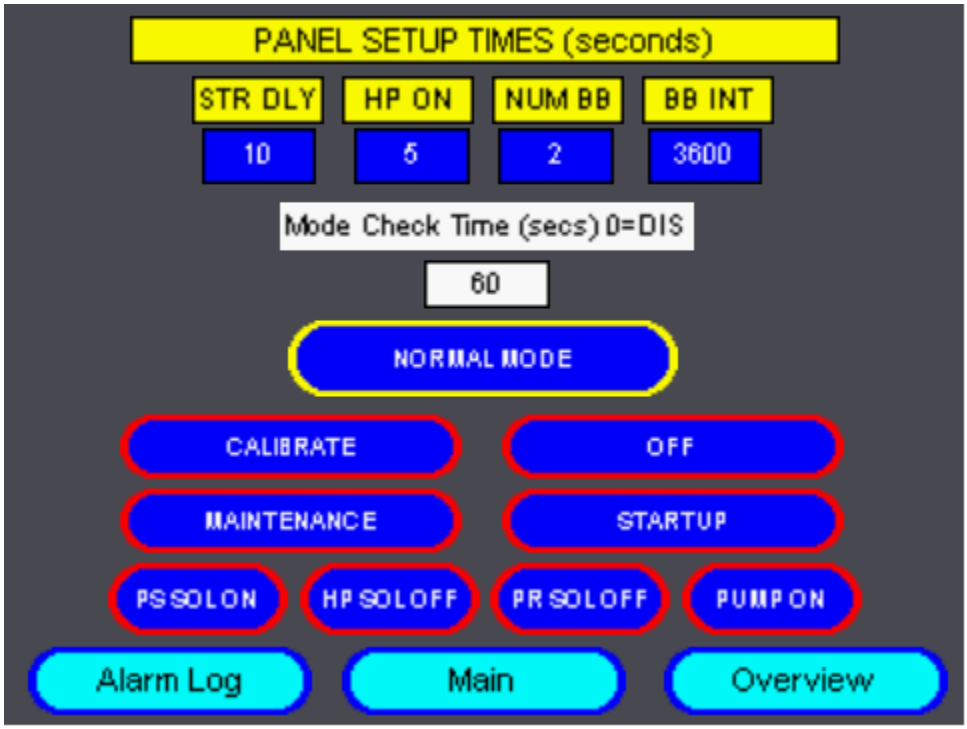
The about screen provides software version and contact information.

***When the log counts reach 10,000 they are reset to 0**

Alarm Log

The Alarm Log screen logs alarms and error conditions. When an error occurs (such as a blocked probe during start up mode) the PLC immediately goes into alarm and energizes the trouble relay. This error is displayed on the panel view screen and needs to be cleared or acknowledged. A record of alarms and errors is kept in this screen and can be cleared if desired.

Maintenance



The Maintenance screen gives the options to change the Panel Setup Times and modes. Under the Panel Setup Times the user can adjust the Startup delay, High Pressure on time, number of blow backs, and the time between blowbacks. The modes available are the calibration mode, off mode, maintenance mode, and the startup mode. In maintenance mode the user can choose to turn on or off the High pressure solenoid, pressure release solenoid, the pump, and choose the probe selection. The mode check alarm time is adjustable in the maintenance screen as well.

<u>Modes</u>

Start Up Mode

Start up mode is the first mode that the sample panel goes into upon being enabled. Start up mode allows pressure to be created within the lines and give the flow detector time to stabilize. The sample panel enters start up mode every time that the pump turns on. If there is a low flow condition or the line is clogged during start up mode the sample panel goes into an error condition and the PLC energizes the trouble relay and sends a signal to the DCS signaling that maintenance is required.

Normal Mode

Normal mode occurs immediately after start up mode and is maintained during normal sampling conditions. Normal mode is defined as: the pump operating correctly, the flow detector is within normal range and the panel is not in maintenance or blowback mode.

Normal Blow Back Mode

Normal Blow Back Mode can only be accessed during Normal Mode and is an automated process which occurs every 60 minutes. The time interval is user definable but is factory defaulted to occur every 60 minutes. Normal Blow Back Mode is used to blow high pressure air through the probe to clear it of any dust or particles that could clog the sintered end of the probe and cause a low flow condition.

Low Flow Blowback mode

Low Flow Blow Back Mode can occur at anytime during Normal Mode. Low Flow Blow Back Mode begins if the flow detector goes outside of its normal range and signals that there is a low flow condition. The Low Flow Blow Back works just like the Normal Blow Back mode except that it is not a timed event and relies on a low flow condition to start it.

Calibration Mode

Calibration Mode begins when the Universal Transmitter is put into Calibration by the user. All other modes are disabled during this mode. The pump and solenoids are off and the flow detector reading is ignored.

Maintenance Mode

Maintenance Mode should be entered by the user anytime that work is being performed on the system. This will ensure that the scheduled blow back to occur every 30 minutes will not happen and the pumps and solenoids will be turned off unless forced on by the user. Maintenance Mode is a useful tool for trouble shooting and checking for proper operation of individual components. From this mode the pump and solenoids can all be turned on individually. Other modes can also be selected from maintenance mode to ensure they are working correctly. If the Sample Panel is left in Maintenance mode for longer than 2 hours the (User selectable via HMI) PLC energizes the trouble relay and a signal is sent to the DCS requiring that the error be acknowledged. This will ensure that the sample panel is not accidentally left in maintenance mode.

Trouble Conditions

Low Flow alarm

The amount of gas flow to the sensor was too low and was not able to be restored to normal flow (2-3LPM) after low flow blow back sequences.

Sensor fail

The calculated gas value has drifted negative by more than 3% of the monitors full range. A gas calibration will typically correct this issue. If the sensor cannot pass calibration sensor replacement is required.

Communication Error/Demoted

The PLC has lost communications to the gas transmitter board. Typically caused by a loose connection or improperly configured communication settings in the Universal Transmitter.

Mode Check Error

The panel has been left in “Maintenance Mode” for longer than the user definable time frame. Error will clear once panel is put into startup mode.

Alarm 1

The gas value has exceeded the alarm 1 user definable set point.

Alarm 2

The gas value has exceeded the alarm 2 user definable set point.

Temperature error

The internal temperature of the panel is outside of the -4F-120F range of the gas sensor.

Flow Cal Error

The pump is off but the flow detector still signals that flow is sufficient. Recalibration of the flow detector will correct this issue.

CO Sensor Calibration

Required parts:

Zero gas (20.9% O2)
Span gas (250 PPM CO)
3/16" I.D. rubber hose
3LPM regulator
UP99 Universal IR programmer

These parts are included in the P1879-CO-250-NC-3 Calibration Kit.

To calibrate the sensor the panel door must be opened so the user can view the LCD display on the Universal Transmitter and the adjustable flow regulator.

The UP99 Universal Programmer is used to put the Universal Transmitter into Calibration mode. To do so point the programmer at the infrared sensor on the top of the Universal Transmitter, then the unlock code must be entered. To unlock the Universal Transmitter press 25 (the unlock code will not be displayed on the screen) then press enter (E) on the programmer. Next enter the password which is factory defaulted to 1 then press enter (E). When the monitor is unlocked enter 111 then press enter to access calibration mode. When in calibration the PLC will shut off the pump so it does not interfere with the calibration. The Universal Transmitter interface is also explained in the Universal Transmitter Manual.

Once in Calibration mode turn the handle of the ball valve on the right side of the enclosure to the upward position and connect the 3/16" I.D. hose from the 3LPM regulator on the "zero gas" cylinder to the calibration port on the right side of the enclosure. The status light on the bottom of the Universal Transmitter will turn green when in calibration mode indicating that the zero gas should be applied to the sensor. Open the valve on the regulator and apply the zero gas.

Make sure that the adjustable flow regulator inside the panel is fully open to allow maximum flow. Apply the zero gas for two minutes. After two minutes or a stabilized reading, point the IR programmer at the Universal Transmitter and press enter. The status light will now turn red indicating the monitor is ready to have the "span gas" applied. Remove the zero gas and apply the span gas for two minutes.

Notice the LPM level on the flow regulator; it should be approximately 3 LPM. The sample flow rate will have to be adjusted to match this flow for the most accurate sampling possible. After two minutes or a stabilized reading, point the IR programmer at the Universal Transmitter and press enter. The monitor will display if the calibration has passed or failed and go into standby mode for 60 seconds to allow the PPM level to drop to avoid false alarms.

Immediately after you have finished the span gas calibration, while the monitor displays either "Cal Pass" or "Cal Fail" quickly turn off and remove the span gas and turn the handle of the ball valve back to sample mode. The PLC will automatically enter startup mode and turn the pump back on while the monitor is in standby mode to lower the gas value.

At this point the adjustable flow regulator will need to be adjusted to match the 3LPM flow rate that the sensor was calibrated at.

When the sample panel is in calibration mode the pump is turned off and all activities such as high pressure blow back and low flow blow back are disabled. The Universal Transmitter calibration is also explained in the Universal Transmitter Manual.

Flow Detector Calibration

To calibrate the flow detector go into the maintenance screen and put the system into maintenance mode. Then turn the pump on and open panel door. Adjust the flow regulator so that the float is between 1.5-2LPM.

On the Flow detector card is a small yellow button. Press and hold that button for one second until the indicator light begins to blink green. This indicates that the card is ready to accept its low flow calibration set point. With the flow regulator adjusted to approximately 1.5-2 LPM press and hold the yellow button until the light stops blinking green then release it.

The indicator light will begin blinking red indicating that it is ready for the high flow set point. Adjust the flow regulator to allow for full flow which should be approximately 4 LPM. Wait a few seconds to allow the flow detector to stabilize then press and hold the yellow button again until the light stops blinking red and then release it.

The indicator light should be solid green which indicates that the flow is within the calibrated parameters. If the light is blinking green and red the calibration was not accepted. Repeat the process using a slightly higher or lower low flow set point.

Once a successful calibration has been accepted lower the flow slowly to make sure the indicator light turns red at approximately 1-1 .5 LPM and that you hear the relay energize and "click". If the calibration worked correctly raise the flow to approximately 3 LPM and close the door and put the panel back into run mode.

If the light does not turn red within .5 LPM of the low flow set point a calibration will have to be attempted again. On the second attempt during the full flow calibration slightly restrict the exhaust port with a finger to allow slightly more pressure to build in the system. Verify that the flow detector indicator light turns red at approximately 1-1.5 LPM

See Also

Universal Transmitter Manual
CS0352-MP Pneumatic Drawing (DWG2014-099 RevA)

Replacement Parts

Damaged or questionable parts should be replaced immediately upon detection. Damaged or inoperative parts could contribute to hazardous and/or unsafe conditions. Any consumable parts should be replaced if the reliability is questionable or within the part's specific expected life. Consumable parts include any filters, pumps, sensors, solenoids….etc.

Contact Information

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