



Mensor Model 9414



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Prior to starting any work, read the operating instructions!

Keep for later use!

General information

The Mensor Model 9414 Multi-Channel Pressure Controller is typically part of the Mensor 9415 Multi-Channel Test System. This test system is a mobile pressure rack configured with either one four channel Model 9414 Quad Pressure Controller with four Mensor digital pressure transducers and two 9412 dual tank modules or one two channel Model 9414 Dual Pressure Controller with two Mensor digital pressure transducers and one 9412 dual tank module. Auxiliary equipment provided in the system usually includes a pressure booster, venturi vacuum generator, related automated electrical and pneumatic switching devices and an external remote transducer selection and readout module. As such, the standalone 9414 has many features that are designed to work with the complete test system.

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The 9414 standalone unit is a two or four channel pressure controller that is optimized for controlling large volumes and constantly replenishing small amounts of air a rapid rate. The unit requires universal AC power (90 to 260 VAC, 50 or 60 Hz.) brought in through the rear panel IEC-320 power input module, two pressure supply ports for supply pressure and two vacuum input ports to supply vacuum if sub-atmospheric pressure output is required. The unit has separate control output ports and measure input ports for each channel.

Any external or remote transducers communicate with the 9414 over an RS-485 communications port found on the rear panel. Control of up to 8 solenoids valves (12vdc at a maximum of 1 amp) can be done with the 9414 controller and is provided to the user through the same 25 pin D-sub connector containing the RS-485 signals. The RS-485 port operates at 19200 Baud with 8 data bits, 1 stop bit, and no parity. External transducers must be addressed as 1, 2, 3, 4 or 5.

Communications between the Model 9414 Quad Pressure Controller and the user's computer are on an RS-232 9 pin D-Sub connector at 57,600 Baud, 8 data bits, 1 stop bit and no parity. The command set is provided in this manual.



Model 9414

Precautions

1. The system has a maximum working pressure of up to 300 psi (~2068 kPa).
2. The system can drive large pressure storage tanks that can hold large amounts of kinetic energy. User should bleed all pressure stored in the tanks before servicing, removing pressure hoses, or removing instruments. Normal shutdown and emergency shutdown should start the process, but due to the size of the tanks and desire to maintain a safe discharge rate, this operation may take an extended period of time to achieve. Utilize the pressure gauges on the front of the 9412 if so equipped to insure pressure has been released from each tank.
3. The system uses normal power line AC voltages. User should remove the AC power cord from mains when servicing inside enclosures.
4. Due to the internal pressures and voltages used within the 9415 system, only qualified and properly trained personnel should service this system.
5. The emergency shutdown electrical system is limited in capacity to approximately 6 amps of power. It is intended to shut down the pressure portion of the system (Model 9414).

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Setup

The initial installation should include removing any packing material used in shipment and inspect that fittings and screws are snug, and that hoses and electrical cords are not chafed or cut. The system should be installed on a level surface with adequate airflow to keep the system within its 15 to 45 C optimum operating temperature range. The system operates on line voltages between 90 and 260 VAC, 47 to 63 Hz. A dry compressed air supply is required for operation. This supply should be approximately 110 % of the 9414 maximum range. The air supply should be a quality class of 5 or better. This limits dirt particles to less than 40 microns, a water pressure dew point of 45 F or lower at 100 psig, and oil vapor of less than 25 ppm. Two supply pressure ports are provided on the rear of the unit. One is for channels P1 and P2, and the other is for channels P3 and P4. If sub-atmospheric pressures are required, the two exhaust ports on the rear will accept exhaust pressures from a suitable vacuum pump. Of these two fittings on the rear, one is for exhaust of channels P1 and P2 and the other is for channels P3 and P4.

The quad pressure control output ports are located on the rear of the 9414 and are labeled P1, P2, P3 and P4 Control. Pressure input ports are also in the upper left quarter of the rear panel and are labeled P1, P2, P3 and P4 Measure.

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If a dual channel system is ordered, only P1 and P2 will be available. These manifold ports are 7/16-20 straight thread and accept adapters for most common fittings, 1/4" tube, 6mm tube, 1/8 Female NPT, etc.

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1. Overview

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Generally, the system once configured requires power, clean dry air or nitrogen, and possibly a vacuum source. Start up operation commences when power is applied.

The 9414 was designed for predominately remote operation, but can be operated in most instances from the front panel through the LCD touch screen interface. On power up, the unit will initialize with all channels in the measure mode. All solenoid valves will be in their de-energized state.

The front panel display is divided into four main areas. Across the top of the LCD the model number and instrument description is displayed. On the left side of the display below the model number is the main controller area. Space is provided in this area to display the channel setpoint, the actual pressure reading and the mode of operation for each of the four channels. If the 9414 is populated with only two channels, the bottom two areas will be blank. In the lower right corner is a status window. This window displays the units of measure, a button to display and change the status of the VACuum enable solenoid valve (if equipped), a button to display and change the status of the AIR supply enable solenoid valves (if equipped), a window to display the number of remote transducers (Addresses 1, 2, 3, 4 or 5) found during the power up query and a window indicating the control status of P1, P2, P3 and P4. A P-OK status of green indicates the controller is within the allowed tolerance window of the control setpoint. A red square indicates that the controller is out of the tolerance window. The window should be green in all other operating modes, (MEAS, VENT, and STBY). The forth window is dynamic and changes based on the process state. Typically it displays the reading of any remote transducers found during initial power up. If one of the four setpoints is being edited, the remote transducer window will become a keypad for entering new values or control points into the selected channel. Once the setpoint is entered (by pressing the '=' button) the window will revert back to displaying the remote transducer readings. If the mode of operation is being edited, this window will allow the mode selection of measure, control, vent or standby. Once the mode has been selected, the window will revert back to displaying the remote transducer readings.

To change a setpoint, touch over the current setpoint value for the desired channel (P1, P2, P3, or P4) and the keypad menu will appear on the right. Press the keys for the new value and then end by pressing the equal key ('=') to enter the value. The new value should appear in the setpoint window. Values that are outside of the control range will not be accepted and the user must again touch over the current setpoint value and re-enter a valid pressure. Note: it is possible to enter a value up to a maximum of 300 psi (2088 kPa). It is the user's responsibility to insure attached devices can handle the full pressure.

To change the mode of operation for a channel, touch the current displayed mode for the particular channel (P1, P2, P3 or P4). Four buttons will be displayed to the right allowing the modes of measure (MEAS), control (CTRL), vent (VENT) or standby (STBY) to be selected. Once the mode has been pressed, the mode will be changed on the control screen and the remote transducer readings will be re-displayed.

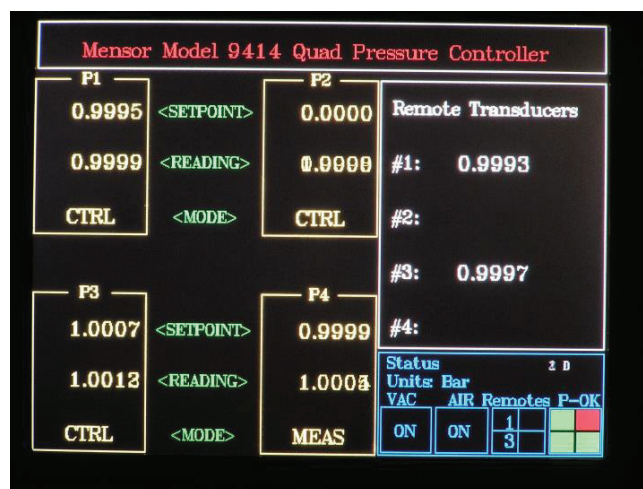


Figure 1.1 Model 9414 LCD touch screen interface

A typical start process should include the following steps:

1. Turn Power ON using the rear panel power switch. If the EMERGENCY SHUTOFF button has been pressed, this should be rotated clockwise to disengage. The normally open vent valves will automatically close. The system will interrogate the 9414 for installed control channels. This will typically be either two or four. The system will then check for remote transducers. The system can have one to four attached transducers. Internal transducers found will be displayed in the main control screen with its setpoint, reading and mode. If no internal transducer is found for a particular channel, the setpoint, reading and mode will be blank. Remote transducers will be displayed in the lower right status window under REMOTE as 1, 2, 3, 4 and B. The reading will also be displayed in the remote transducer reading window on the right side of the screen. Remote transducers are addressed as 1, 2, 3, and 4. If a barometric transducer is included in the system, this will be addressed as 5, but will be displayed on the status window as 'B' for barometer.
2. Provide the vacuum source to the system if required.
3. Provided appropriate source pressure to the system.
4. Before placing a channel in the control mode, verify that the system has no open hoses and that connections are verified to be leak free.
5. The channels that are going to be used in the control mode should have their setpoints entered.
6. Once the setpoints are entered, the channel mode should be set to control. The channel will drive to the setpoint. Once within the setpoint window, the P-OK status window will change from red to green. The orientation of the four status squares matches the main window. P1 is in the upper left, P2 in the upper right, P3 in the lower left, and P4 in the lower right. Failure to achieve a green status can be caused by a pressure leak, or because of insufficient source pressure. The time it takes to reach an initial setpoint is mainly determined by the size of the internal storage tanks, but can also depend on the source pressure capacity and the delta pressure change.

2. Communication Protocol

Communications between the user's external computer and the 9414 System Control Module is standard RS-232 serial communications with a protocol of 57600 baud, 8 data bits, 1 stop bit and no parity. The 9414 will accept both upper and lower case ASCII commands. A complete command set can be found below.

Communications between the 9414 controller and any external transducers is full duplex RS-485 serial communications with a protocol of 19200 baud, 8 data bits, 1 stop bit and no parity. These RS485 communications along with the 8 solenoid drive signals can be found on the 25 pin D-Sub located on the rear of the 9414. The 9414 handles all communication with the transducer(s) inside the module as well as provide the 12 volt DC power to the external transducer(s) and solenoid valves when present. To calibrate the Mensor 6100 transducer(s) inside the Remote Transducer Module use the 6180 command set described in the Series 6180 User's Manual. A copy of the manual can be found in the appendix of this document. It is usually best to remove the transducers from the 9414 enclosure and calibrate them as standard

3. Command Set

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All commands should terminate with a linefeed. Carriage Returns are ignored on incoming commands and should be avoided to reduce communication traffic. Responses are terminated with a carriage return followed by a linefeed. Commands are accepted in either uppercase or lowercase characters. Protocol is set at 57,600 baud, 8 data bits, 1 stop bit, no parity. Communication is RS-232 on a 9 pin D-sub.

The Model 9414 Quad Controller has a color LCD touch screen display that allow setting of control pressures, monitoring of controller readings and remote transducer readings. Front panel touch screen operation can be locked out Mensor Model 9414 Multi-Channel Pressure Controller 0017964001A 9/13/12 6 using commands over the communications port. (See PanelLock and PanelUnlock commands below.)

The following command set is an extension of the older Model 9411 System Controller. Where applicable, this command set is maintained in the 9414 System Controller/ Quad Pressure Controller. Model 9411 commands that have limited use in the 9414 based system are highlighted in gray. The user should determine if the commands highlighted in gray are necessary based on initial configuration and the overall system configuration.

Command	Description	Example
vacpump?	Returns status of vacuum pump valve as either enabled or disabled.	Returns 'Pump Off' or 'Pump Enabled' Or 'Function not available '
Vacpumpenable	Energizes vacuum pump valve to enable sub atmospheric pressures to upper APC600 controller. Responds with 'Pump Enabled'	Returns 'Pump Enabled' Or 'Function not available '
vacpump?	De-energizes vacuum pump valve to shutoff vacuum and vent exhaust port of upper APC600 controller. Responds with ' Pump Off'	Returns 'Pump Off' Or 'Function not available '
Status?	Returns the status of the sixteen solenoid valves drive signals. A '1' indicates enabled, and a '0' indicates disabled. The solenoids are labeled from left to right as S1 to S16. On Model 9414 units only the 8 external solenoid valves are shown. The solenoids are labeled from left to right as S1 to S8.	Returns: 1001000000000000 Indicates that valves one and 4 are energized and all others are de-energized. Returns: 11001010 Indicating valves 1, 2, 5 and 7 are enabled.
Supply?	Returns status of supply valve as either enabled or disabled	Returns 'Supply Enabled' or 'Supply Off' Or 'Function not available '
Supplyactive Energizes pressure supply	Energizes pressure supply valve to enable shop air supply to the pressure booster and ultimately to the pressure controllers	Returns 'Supply Enabled' Or 'Function not available '
Supplysafe	De-energizes pressure supply valve to shutoff supply to pressure controllers and pressure booster. Vents the supply lines.	Returns 'Supply Off' Or 'Function not available '
x1?	Returns pressure reading from transducer 1, the highest range Mensor 6100 remote transducer.	Returns 8 character value string in the current pressure units, or 0 if not transducer attached.
x2?	Returns pressure reading from transducer 2, a higher range Mensor 6100 remote transducer.	Returns 8 character value string in the current pressure units or 0 if not transducer attached.

Command	Description	Example
x3?	Returns pressure reading from transducer 3, a lower range Mensor 6100 remote transducer.	Returns 8 character value string in the current pressure units or 0 if not transducer attached.
x4?	Returns pressure reading from transducer 4, a lower range Mensor 6100 remote transducer.	Returns 8 character value string in the current pressure units or 0 if not transducer attached.
xhi?	Returns pressure reading from both high pressure transducers (x1 and x2)	Returns two sets of 8 character values with 3 fractional digits separated with a comma and space. Reading 1 is first and reading 2 is second. or 0 if not transducer attached.
xlo?	Returns pressure reading from both low pressure transducers (x3 and x4)	Returns two sets of 8 character values with 3 fractional digits separated with a comma and space. Reading 3 is first and reading 4 is second. or 0 if not transducer attached.
X5?	Returns the pressure reading of the barometric reference transducer if installed in system.	Reading or 0 if not transducer attached.
xall?	Returns pressure reading from all four pressure transducers (1, 2, 3 and 4) and the barometric reference transducer if installed.	Returns 4 sets of 8 character values with 3 fractional digits separated by a comma and space. Reading 1 is first followed by readings 2, 3 and 4 and then the barometric reference if installed.
serialno?	Returns the serial number of the control module	Returns the system control module serial number of
s4on	Energizes solenoid 4 (V4)	
s4off	De-energizes solenoid 4	
s5on	Energizes solenoid 5 (V5)	
s5off	De-energizes solenoid 5	
s6on	Energizes solenoid 6 (V6)	
s6off	De-energizes solenoid 6	
s7on	Energizes solenoid 7 (V7)	
s7off	De-energizes solenoid 7	
s10on	Energizes solenoid 10	
s10off	De-energizes solenoid 10	
s12on	Energizes solenoid 12	
s12off	De-energizes solenoid 12	
s14on	Energizes solenoid 14	
s14off	De-energizes solenoid 14	
s16on	Energizes solenoid 16	
s16off	De-energizes solenoid 16	
ventall	Turns off regulators and places channels in vent mode	
id?	Returns the system identification string	Returns: 'Mensor 9414 Quad Controller, SN: 990194'
Shutdown	De-energizes all solenoid valves allowing any air trapped in the tanks to be slowly released. Incoming pressure and vacuum is shut off and any trapped source pressure is released. Places controller in measure mode.	

Commands set of the pressure controller portion of the 9414		
SetP1=	Enters the control pressure setpoint for P1 in the current units of measurement. Must be between the minimum and maximum pressure range of the system. Typically 0 to 300 psia or approximately 0 to 2068 kPa.	Example: SetP1= 450 To set the setpoint to 450.
SetP2=	Enters the control pressure setpoint for P2 in the current units of measurement. Must be between the minimum and maximum pressure range of the system. Typically 0 to 300 psia or approximately 0 to 2068 kPa.	Example: SetP2= 600 To set the setpoint to 600.
SetP3=	Enters the control pressure setpoint for P3 in the current units of measurement. Must be between the minimum and maximum pressure range of the system. Typically 0 to 300 psia or approximately 0 to 2068 kPa. Command is ignored if optional P3 channel is not installed.	Example: SetP3= 750 To set the setpoint to 750a.
SetP4=	Enters the control pressure setpoint for P4 in the current units of measurement. Must be between the minimum and maximum pressure range of the system. Typically 0 to 300 psia or approximately 0 to 2068 kPa. Command is ignored if optional P4 channel is not installed.	Example: SetP4= 1450 To set the setpoint to 1450.
SetP1?	Returns the pressure setpoint for P1 in the current units of measurement.	Example: SetP1? 450
SetP2?	Returns the pressure setpoint for P2 in the current units of measurement.	Example: SetP2? 600
SetP3?	Returns the pressure setpoint for P3 in the current units of measurement.	Example: SetP3? 750
SetP4?	Returns the pressure setpoint for P4 in the current units of measurement.	Example: SetP4? 1450
SetAll?	Returns setpoint pressures for all controller channels, P1 through P4, comma separated.	SetAll? 450, 600, 750, 1450
ReadyP1?	Returns the status of P1 pressure channel. Returns YES if P1 pressure is within pressure window setting or NO if not within window. See SETWINDOW command.	ReadyP1? Yes
ReadyP2?	Returns the status of P2 pressure channel. Returns YES if P2 pressure is within pressure window	ReadyP2
ReadyP3?	Returns the status of P3 pressure channel. Returns YES if P3 pressure is within pressure window setting or NO if not within window. See SETWINDOW command.	ReadyP3? Yes
ReadyP4?	Returns the status of P4 pressure channel. Returns YES if P4 pressure is within pressure window setting or NO if not within window. See SETWINDOW command.	ReadyP4 Yes
RdgP1?	Returns reading of P1 Controller transducer in the current units of measurement	349.23
RdgP2?	Returns reading of P2 Controller transducer in the current units of measurement	450.10
RdgP3?	Returns reading of P3 Controller transducer in the current units of measurement	751.00
RdgP4?	Returns reading of P4 Controller transducer in the current units of measurement	1449.99
Rdgall?	Returns reading of P1, P2, P3 and P4 pressure controller transducers in the current units of measurement	349.23, 450.10, 751.00, 1449.99
ModeP1=	Sets P1 channel to Measure (MEAS), Control (CTRL), Vent (VENT), or Standby (STBY).	ModeP1= Ctrl
ModeP2=	Sets P2 channel to Measure (MEAS), Control (CTRL), Vent (VENT), or Standby (STBY).	ModeP2= Vent
ModeP3=	Sets P3 channel to Measure (MEAS), Control (CTRL), Vent (VENT), or Standby (STBY).	ModeP3=STBY
ModeP4=	Sets P4 channel to Measure (MEAS), Control (CTRL), Vent (VENT), or Standby (STBY).	ModeP4=stby
ModeP1?	Returns mode setting of P1 channel, Measure (MEAS), Control (CTRL), Vent (VENT), or Standby.	Ctrl
ModeP2?	Returns mode setting of P2 channel, Measure (MEAS), Control (CTRL), Vent (VENT), or Standby.	Vent

Commands set of the pressure controller portion of the 9414		
ModeP3?	Returns mode setting of P3 channel, Measure (MEAS), Control (CTRL), Vent (VENT), or Standby (STBY).	Stby
ModeP4?	Returns mode setting of P4 channel, Measure (MEAS), Control (CTRL), Vent (VENT), or Standby (STBY).	Stby
SetWindow=	Sets the pressure window value in current units of measurement. Value is used to determine if the pressure reading is within tolerance for a stable P-OK indication.	SetWindow= 0.002
SetWindow?	Returns the tolerance for determining the ready state of each controller	SetWindow?
SeqP1	Starts pressure 1 sequence of events. The sequence controls the order that operations are executed. See SEQTYPE command below	SeqP1
SeqP2	Starts pressure 2 sequence of events. The sequence controls the order that operations are executed. See SEQTYPE command below	SeqP2
SeqP3	Starts pressure 3 sequence of events. The sequence controls the order that operations are executed. See SEQTYPE command below	SeqP3
SeqP4	Starts pressure 4 sequence of events. The sequence controls the order that operations are executed. See SEQTYPE command below	SeqP4
SeqType=	Type 1: Stops controller operation, energizes DUT solenoid valve, Reads remote transducer for 1 second, Closes DUT solenoid valve, Recharges storage tank. Type 2 : Stops controller operation, energizes DUT solenoid valve, waits one second, closes DUT valve, reads remote transducer for 1 second while recharging tanks. Type 3: Does not stop controller operation, energizes DUT solenoid valve, reads remote transducer for 1 second, closes DUT valve, recharges storage tank.	
SeqType?	Returns sequence type of 1, 2, or 3	
Data?	Returns one hundred readings of remote transducer data taken during last sequence. Data consists of comma separated ASCII data (reading number, remote transducer 1, remote transducer 2, remote transducer 3, and remote transducer 4.setting or NO if not within window. See SETWINDOW command.	1, 100.100, 100.102, 100.103, 100.104 2, 100.100, 100.102, 100.104, 100.104 3.....
Ver?	Returns the version of the internal software	Returns:
Sn?	Returns the unit serial number	Returns:
Lockpanel	Disables the front panel touchscreen on the 9414. Must be re-enabled over the serial port using the 'Unlockpanel' command or power must be cycled	Lockpanel
Unlockpanel	Enables the front panel touchscreen on the 9414. This is the default power up mode.	Unlockpanel
Supplyenable	Enables the pressure supply to the pressure controllers	Supplyenable
RXswitchpt?	Returns the pressure switch point on the remote transducers. This is used when the 'LowPAuto' function is enabled to automatically switch to the low pressure transducer in a two pressure range system.	RXswitchpt? 133.45
RXswitchpt=	Sets the pressure switch point on the remote transducers. This is used when the 'LowPAuto' function is enabled to automatically switch to the low pressure transducer in a two pressure range system. The switch point is retained in the system on software versions 1.37 and higher. Software prior to 1.37 defaults to a known value on power up.	RXswitchpt= 133.45
RouteP1	Connects pressure P1 to Device Under Test (DUT) if Pressure Select Manifold is present in remote transducer module. Closes vent valve along with P2, P3 and P4 valves.	RouteP1
RouteP2	Connects pressure P2 to Device Under Test (DUT) if Pressure Select Manifold is present in remote transducer module. Closes vent valve along with P1, P3 and P4 valves.	RouteP2

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Commands set of the pressure controller portion of the 9414		
RouteP3	Connects pressure P3 to Device Under Test (DUT) if Pressure Select Manifold is present in remote transducer module. Closes vent valve along with P1, P2 and P4 valves.	RouteP3
RouteP4	Connects pressure P4 to Device Under Test (DUT) if Pressure Select Manifold is present in remote transducer module. Closes vent valve along with P1, P2 and P3 valves.	RouteP4
RouteVent	If the pressure select manifold is present in the remote transducer module, closes P1, P2, P3 and P4 pressure selection valves and opens vent valve to allow pressure in the Device Under Test (DUT) to escape.	Routevent
RouteNone	If the pressure select manifold is present in the remote transducer module, all valves will be closed sealing pressure in the Device Under Test (DUT).	Routenone
EchoON	Turns command echo on	Echoon
EchoOFF	Turns command echo off	Echooff
Echo?	Returns the state of echo command.	Returns: Echo ON or Echo OFF
Gains?	Returns the stored control gain settings for the pressure regulators.	Returns: Offset: 0.7000, 1.3000, 2.0000,-0.7000,-1.1000, -2.0000 mult: 1.000
Mult=	Increases or decreases the overall gain of the pressure regulators. Default value is 1.0. Values less than 1 decrease the sensitivity of the system and values greater than 1 increase the sensitivity.	MULT=1.25
Vp1=	Increase or decrease the overall sensitivity of the fine positive control valve. See 'gains?' Command for an initial starting value. Vp1 must be positive value, but less than vp2 and vp3	Vp1=0.009
Vp2=	Increase or decrease the overall sensitivity of the medium positive control valve. See 'gains?' Command for an initial starting value. Vp2 must be positive value, > vp1 and < vp3	Vp2= 1.01
Vp3=	Increase or decrease the overall sensitivity of the course positive control valve. See 'gains?' Command for an initial starting value. Vp3 must be positive value > vp2.	Vp3= 2.3
Vn1=	Increase or decrease the overall sensitivity of the fine exhaust control valve. See 'gains?' Command for an initial starting value. Vn1 must be a negative value that is smaller than vn2 and vn3.	Vn1=-.09
Vn2=	Increase or decrease the overall sensitivity of the medium exhaust control valve. See 'gains?' Command for an initial starting value. Vn2 must be a negative value that is smaller than vn3 and greater than vn1.	Vn2=-1.0
Vn3=	Increase or decrease the overall sensitivity of the course exhaust control valve. See 'gains?' Command for an initial starting value. Vn3 must be a negative value that is greater than vn1 and vn2.	Vn3=-2.2

4. Normal Operation

The 9414 should simplify operation over the combined APC600 / 9411 system. Once power is applied,

1. Each channel should be supplied a pressure setpoint (SetP1=, SetP2=....)
2. The vacuum should be enabled
3. The supply should be enabled.
4. Each channel to be used should be placed in the control mode (ModeP1=CTRL.....)
5. The sequence type should be selected. This determines whether the tank remains in the system when readings are taken, or if the controller is still controlling when readings are taken, etc.
6. The SETWINDOW= command should be set to the allowed pressure window. This determines an acceptable control tolerance and the recharge time.
7. The normal operation loop should consist of
 - A. Checking to see if the channel is ready and returns a Yes to the ReadyP1? (ReadyP2?, ReadyP3?...) query
 - B. Place the channel in the standby mode (ModeP1=STBY, ModeP2=STBY....)
 - C. Read the remote transducer using X1? Or X2? Query... OR
 - D. Run the pressure sequence using the SeqP1 (SeqP2, SeqP3 or SeqP4) command. And read the transducer data with the Data? Query.
 - E. Place the channel back into the control mode (ModePx=CTRL) and Go to next pressure....(step 7A)

5. Normal Shutdown Sequence

The normal shutdown mode should place each channel of the 9414 in the measure mode. The VAC enable and the AIR enable valves can be de-energized. Remote transducers should be isolated or vented. Power can be removed from the system or left on. If power is removed, the system will default to a save mode with pressure and vacuum supplies disabled and will start venting the storage tanks at a safe discharge rate. Discharging the tanks especially at higher pressures may take a few minutes.

6. Emergency Shutdown Sequence

The emergency shutdown mode is entered when the red emergency shutdown switch is depressed. This effectively removes power from the electronics and de-energizes solenoid valves. The effect is that source air and vacuum are shut off, internal source pressures are vented through the booster, and the four storage tanks are discharged at a safe discharge rate. If the manual shutoff valves on the rack are closed, this procedure can trap a small amount of air in the lines between the rack and the device under test. The volume involved is typically small and usually dissipates as the fittings are loosened. This can also be manually vented by opening the manual shutoff valves once the tank pressures are near atmospheric pressure.

Rotating the emergency shutdown button clockwise allows power to be re-applied to the system. The normal power up sequence should be followed to re-establish operating conditions.

7. Calibration

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Calibration of the pressure equipment should be performed periodically. The main pressure standards for the system are intended to be externally mounted Mensor Series 6100 or 6180 Digital Pressure Transducers mounted in the remote transducer module. The range on these transducers is application specific. The Mensor Model 9414 Quad Controller also incorporates four 300 psi Absolute (~2068 kPa) or 233 psi (~16 bar) Series 6100 or Series 6180 transducers internally. The Mensor Series 6100 Digital Pressure Transducer(s) should be initially checked at 180 day intervals until confidence in the devices has been established. The Series 6180 transducers have a recommended annual calibration interval. As each application is slightly different so are the requirements that go with the application. The calibration interval can be extended or compressed based on needs and test results.

The transducers in the 9414 are not intended as the primary pressure standard in the system. They are intended to operate as feedback devices for the pressure regulators. If calibration of these devices is desired, they can be calibrated in the unit or externally. (Contact Mensor if this option is preferred.) The 9414 allows commands to it to pass to the transducers using the 'PASS=' command prefix. In order to read the zero offset of transducer A, send "PASS=#AZC?" (#AZC? is the 6100/6180 command to read the zero correction from transducer addressed as A.) The Mensor Series 6100 operator's manual describing the calibration process is included in the appendix. All transducers utilize full duplex RS-485 communications with 8 data bits, 1 stop bit, no parity at 19200 baud.

The following commands can be used to calibrate the Mensor Series 6100 / 6180 transducers in the system.

Command	Description	Example
Pass=	Passes the command information directly from the 9414 serial interface to the transducer communication bus. This allows any command found in the Mensor Series 6100 manual to be directly sent to a transducer. This is useful in calibrating or troubleshooting transducers in the 9414 or attached remote transducer module.	Pass= #1id?
Zc0?	Returns the stored zero offset value of transducer 0 (control channel P1)	
Zc0=	Sets a new zero offset value in transducer 0 (control channel P1). This value must be saved with the 'save0=' command to be retained through power down cycles.	
Zc1?	Returns the stored zero offset value of transducer 1 (control channel P2)	
Zc1=	Sets a new zero offset value in transducer 1 (control channel P2). This value must be saved with the 'save1=' command to be retained through power down cycles.	
Zc2?	Returns the stored zero offset value of transducer 2 (control channel P3)	
Zc2=	Sets a new zero offset value in transducer 2 (control channel P3). This value must be saved with the 'save2=' command to be retained through power down cycles.	
Zc3?	Returns the stored zero offset value of transducer 3 (control channel P4)	
Zc3=	Sets a new zero offset value in transducer 3 (control channel P4). This value must be saved with the 'save3=' command to be retained through power down cycles.	
Sc0?	Returns the stored span multiplier value of transducer 0 (control channel P1)	
Sc0=	Sets a new span multiplier value in transducer 0 (control channel P1). This value must be saved with the 'save0=' command to be retained through power down cycles.	
Sc1?		
Sc1=		
Sc2?		
Sc2=		
Sc3?		
Sc3=		

Command	Description	Example
Id0?		
Id1?		
Id2?		
Id3?		
Save0=		
Save1=		
Save2=		
Save3=		

8. Storage and Transportation

The system can be stored for a reasonable amount of time without any adverse effects. Storage temperature should not exceed 70C or drop below -20 C. The humidity should not be so high as to cause condensation in the system. Once the system brought back on line, it should be allowed to stabilize within its normal operating temperature range before power is applied. The pressure ports should be covered, but not completely sealed to prevent contamination in the system.

9. Maintenance

Standard maintenance may include checking for loose fitting and screws and general housekeeping. Make sure moving mechanical parts are not hindered with dust, dirt and are properly lubricated. This is especially true of the cooling fan in the rear of the unit. The calibration of the Mensor Series 6100/ 6180 Digital Pressure Transducers should be periodically checked.

10. Connections

Remote Module: 25 pin Female D-Sub

Pin	Function	Pin	Function
1	S4 Drive	14	S4 Common
2	S5 Drive	15	S5 Common
3	S6 Drive	16	S6 Common
4	S7 Drive	17	S7 Common
5	S10 Drive	18	S10 Common
6	S12 Drive	19	S12 Common
7	S14 Drive	20	S14 Common
8	S16 Drive	21	S16 Common
9	-Rx (xdcr pin 1)	22	N/C
10	+Tx (xdcr pin 2)	23	N/C
11	-Tx (xdcr pin 3)	24	N/C
12	+Rx (xdcr pin9)	25	Gnd (xdcr pin 5)
13	+12 v (xdcr pin 6)1		

Operation

9 pin signals (labeled Air Supply)

Pin	Function	Pin	Function
1	12 vdc Drive	6	Common
2	12 vdc Drive	7	Common
3	12 vdc Drive	8	Common
4	N/C	9	N/C
5	N/C		

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