A. SUPPLEMENT 1 VACUUM CONTROLLER 2

a.1. INTRODUCTION 2
a.2. WHAT IS THE VACUUM CONTROLLER? 2
a.2.1. Vacuum Chamber Example 3
a.3. VACUUM CONTROLLER FUNCTIONALITY 4
a.3.1. Setpoints 4
a.3.2. Low Vacuum Gauge 5
a.3.3. High Vacuum Gauge 5
a.3.4. Gauge Linearisation 5
a.3.5. Roughing Pump Timeout 5
a.3.6. Leak Detection 5
a.3.7. Gauge Switchover 6
a.4. WIRING CONNECTIONS 7
a.5. SWITCH ON 8
a.6. OPERATION 9
a.6.1. To Access the Vacuum Controller Parameters 9
a.7. PARAMETER TABLES 10
a.7.1. High Vacuum Parameter Tables 10
a.7.2. Low Vacuum Parameter Tables 11
a.7.3. Backing Vacuum Parameter Tables 11
a.7.4. Gauge Switching Parameter Tables 12
a.7.5. Setpoint Parameter Tables 12
a.7.6. Pump Control Parameter Tables 13
a.7.7. Leak Detect Parameter Tables 13
a.7.8. Vacuum display Parameter Tables 14
a.8. CONFIGURATION LEVEL 15
a.8.1. To Configure the Vacuum Summary as the HOME Page 15
a.8.2. To Customise the Vaccum Summary Page 16
a.8.3. Vacuum Function Block 17
a.9. VACUUM CONTROLLER WIRING EXAMPLES 18
a.9.1. Simple Temperature and Vacuum Control 18
a.9.2. To Scale Vacuum Readout in Other Units 20
a.10. INTERNATIONAL SALES AND SERVICE 1

a. Supplement 1 Vacuum Controller

a.1. INTRODUCTION

The aim of this addendum is to describe the operation and configuration of the 2704 controller fitted with the vacuum function block. It should be used together with the Installation and Operation Handbook part no. HA026502, and the Engineering Handbook part no. HA026933. It is assumed that the reader is familiar with vacuum production and measurement.

a.2. WHAT IS THE VACUUM CONTROLLER?

The 2704 Vacuum Controller is designed for a variety of applications including:-

- Melting/Casting furnaces
- Annealing/Sintering furnaces
- Brazing/CVD furnaces
- Freeze Dryers
- Diffusion/MBE furnaces
- Autoclaves

It can be used for vacuum control only and can be supplied for use with one vacuum gauge or three gauges. Alternatively, the vacuum block can be used together with another control loop, such as temperature control, in the same unit.
Analogue and digital IO is achieved using the fixed IO and plug in modules described in the above handbooks.

Note:

- For measurement of temperature use the standard PV Input (terminals V- to VH) or the PV Input module (part no. HA026359)
- For measurement of vacuum use the standard PV Input, the PV Input module or the Analogue Input module (part no. HA026686).
- Additional analogue and digital IO can be achieved with further plug in modules or the IO Expander unit.

a.2.1. Vacuum Chamber Example

Figure a-1 shows a diagrammatic representation of a vacuum furnace or freeze drier using a diffusion and roughing pump to achieve the required vacuum levels. The roughing pump is used to achieve the first level of vacuum in the region of 10^{-2} mBar. At this point the diffusion pump is switched on to remove the atmosphere down to a 10^{-5} mBar region. Valves, used in conjunction with the pumps, are also switched by the 2704 vacuum controller. When the vacuum reaches the required level it is possible to start a temperature profile.
There are other variations to this system, for example, a cryogenic pump may be used in place of the diffusion pump with appropriate changes to pipe and valve layout.

The 2704 vacuum controller allows for the use of up to three measurement gauges. Typically these are low vacuum gauges such as the Pirani, or higher vacuum gauges such as the Penning or Inverted Magnetron. It is generally required to turn the power off to the higher vacuum level gauge when the vacuum is below its working range.

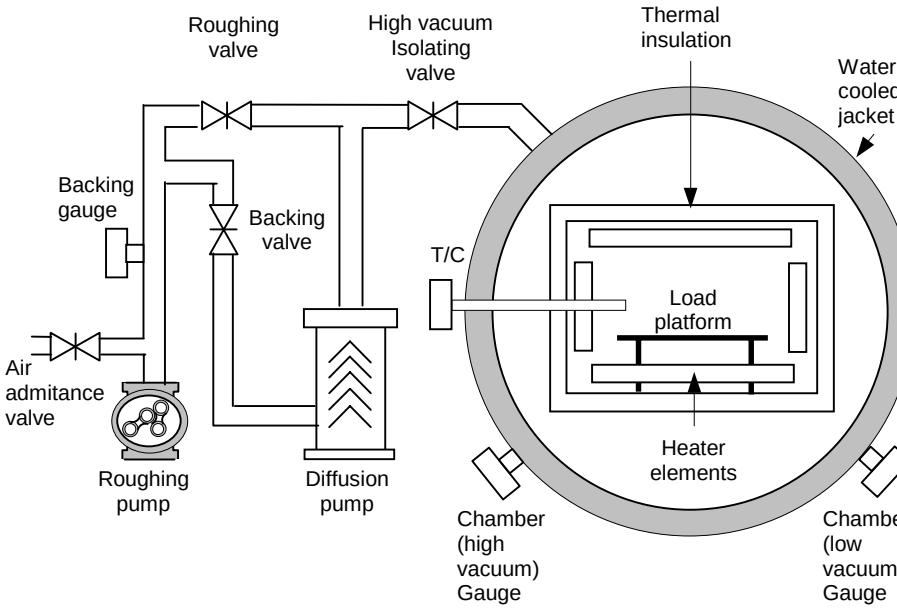


Figure a-1: Representation of a Vacuum Chamber

a.3. VACUUM CONTROLLER FUNCTIONALITY

The 2704 vacuum controller provides on/off outputs to the vacuum system, but, used in conjunction with the existing PID loops, provides the ability to control the temperature within the chamber or furnace. It provides the following features

1. Vacuum probe switchover
2. High vacuum gauge power up when required vacuum level is achieved
3. Backing chamber pressure measurement and setpoint output
4. Gauge status inputs
5. Leak detection
6. Roughing pump timeout
7. Gauge calibration

a.3.1. Setpoints

Six setpoint outputs are provided. These can be used to turn on and off vacuum gauges or other external devices or to set up internal conditions such as temperature program wait signals. Each setpoint may be configured with an on and off value. The two values are used to provide switching hysteresis on the setpoint output.

For example:-

1. If On SP< Off SP
   Output = True if Input < On SP
   Output = False if Input > Off SP

2. If On SP > Off SP
   Output = True if Input > On SP
   Output = False if Input < Off SP

Figure a-2 shows the first case. The On SP is a lower vacuum than the Off SP or in other words the SP is On when the vacuum is larger than the On SP. Vacuum values are given for reference purposes only.

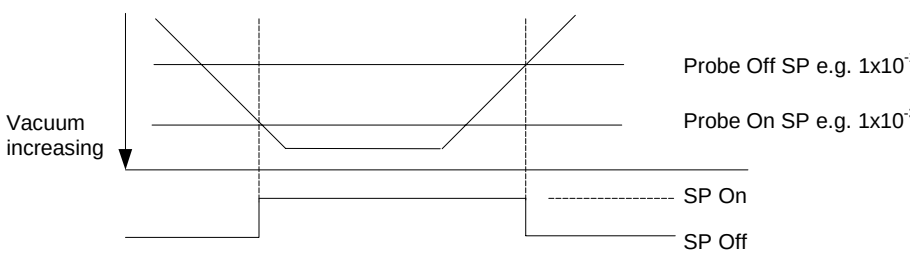


Figure a-2: Setpoint Output Status when On SP < Off SP

Each setpoint is also provided with a user text string. This is displayed in the vacuum setpoint message box, shown in Figure a-5. If more than one setpoint output is 'On' the message box cycles the messages.

a.3.2. Low Vacuum Gauge

The block will accept an input from a low vacuum gauge, typically used to measure vacuum in the range 10^{1} to 10^{-4} mBar.
A probe status logic input is also provided. When the probe status is bad or the probe measurement is bad, the fault output from the block will be set and Sensor Break displayed.

a.3.3. High Vacuum Gauge

The block will accept an input from a low vacuum gauge, typically used to measure vacuum in the range 10^{-2} to 10^{-9} mBar.
A probe enable input is provided in the form of two setpoints and a logic output, and is operationally the same as the setpoint feature described in section a.3.1. When the probe status is bad or the probe measurement is bad, the fault output from the block will be set and 'Sensor Break' displayed.
Assuming a module slot is available, the transmitter power supply module can be used to power the gauge. The gauge used, of course, must be within the specification of the module as shown in Appendix C of the Installation or Engineering manuals.

a.3.4. Gauge Linearisation

This uses the linearisation ability of the analogue inputs described in Chapter 11 of the Engineering Handbook. Three linearisation curves are available which can be downloaded for each type of probe using iTools configuration software. The curve downloaded must correspond to the atmospheric gas being used. If further customised curves are required contact your supplier with details of the gauge characteristics.

a.3.5. Roughing Pump Timeout

When starting the chamber the roughing pump is run to get the chamber down to an initial level before the high vacuum pump is started. If a level of vacuum is not reached in a time (both of which are settable by the user) then the roughing pump timeout status is set.
The roughing pump timeout can be configured such that the vacuum measurement used for the timeout can be either the low vacuum gauge or the backing vacuum gauge.

When the roughing pump is started the **PUMP TOUT** (Figure a-5) indicator flashes and continues to flash until the timeout is complete. If at the end of the timeout the required vacuum level is not reached the indicator stays permanently on.

a.3.6. Leak Detection

Vacuum chamber leaks are typically categorised into two areas, virtual leaks and real leaks. A virtual leak is a decrease in vacuum caused by outgassing of the workpiece and the chamber material/gaskets, e.t.c. Therefore, in order for a leak to be detected, the reduction in vacuum must be monitored over a period of time with the pumps turned off. If there is a real leak the vacuum will continue to reduce, whereas if a virtual leak is present the vacuum will appear to decrease at a constant rate but then level off to give a steady vacuum reading.

The leak detection provides a measure of the rate of change of vacuum in vacuum-units/min. This is compared with an acceptable leak rate value after a timeout period. If the leak rate is not acceptable a leak fault will be indicated using the leak status parameter. When the measurement is being made the **LEAK DET** (Figure a-5) indicator on the summary screen flashes. It remains permanently lit if a fault is detected.

a.3.7. Gauge Switchover

Gauge switchover allows the chamber vacuum measurement to transfer from one gauge to another in a controlled (bumpless) way. The switchover block, described in Chapter 11 of the Engineering Handbook, performs this. Figure a-3 below gives an example of how the gauge outputs relate to the switch over settings. Vacuum values are given for reference purposes only.

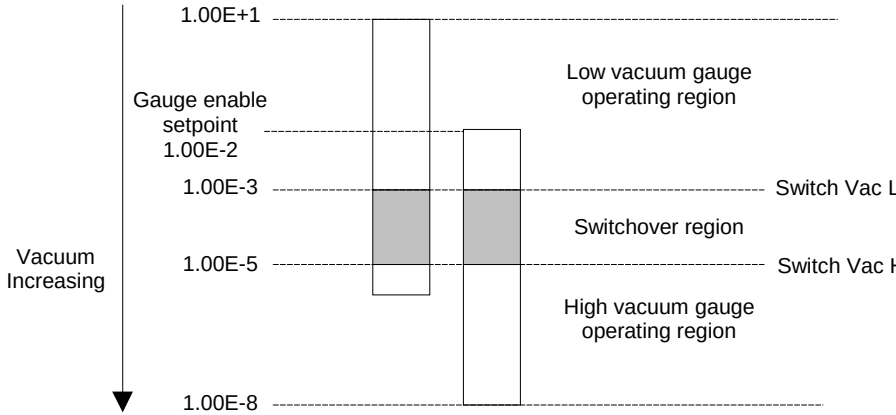


Figure a-3: Gauge Switchover

The operating regions of each gauge must be chosen such that the gauge output is guaranteed. The switchover region should be selected such that both readings are valid and the error is minimal. The high gauge must be enabled before the lowest setting of the switchover point.

The gauge enable setpoint consists of a pair of gauge on and gauge off values. These should be chosen to give sufficient hysteresis such that the gauge output has a decisive on/off action. Both gauges read outside the switchover region even though the output has switched to the other gauge. This region of the gauge is usually very non-linear and typically has a high degree of error. This area of operation is only selected if the currently selected gauge goes into sensor break. The minimum vacuum and maximum vacuum values are defined as the total operating range of the two gauges and define the total range of the chamber.

a.4. WIRING CONNECTIONS

The actual wiring of the vacuum controller depends upon the number and type of modules fitted. Figure a-4 below shows wiring for the following configuration:-

- Fixed PV Input assigned as Thermocouple Input
- PV Input module fitted in slot 3 assigned as High Vacuum Input
- PV Input module fitted in slot 4 assigned as Backing Gauge Input
- PV Input module fitted in slot 6 assigned as Low Vacuum Input
- SP 1 turns on/off the roughing pump via fixed digital output 1
- The AA Relay turns on/off an external power supply to the high vacuum gauge
- Module 1 fitted as an analogue output to drive a thyristor unit for temperature control

Before proceeding further, please read Appendix B, Safety and EMC Information, found in the Installation or Engineering Handbooks.

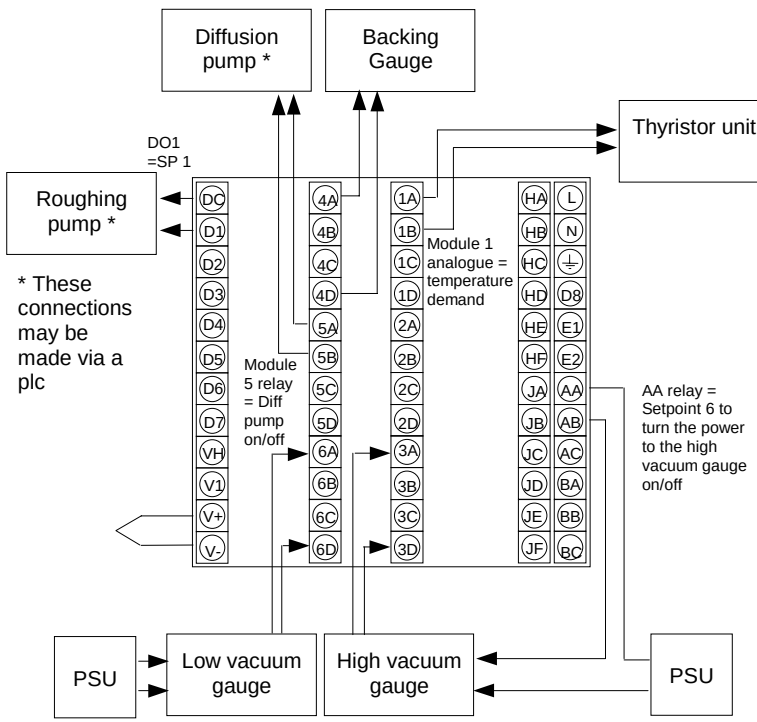


Figure a-4: Example Wiring Connections

a.5. SWITCH ON

Install and wire up the controller in accordance with the types of modules fitted and the configuration of the controller and switch on. A short self-test sequence takes place during which the controller identification is displayed together with the version number of the software fitted. For the vacuum controller the version number must be greater than 3.0.

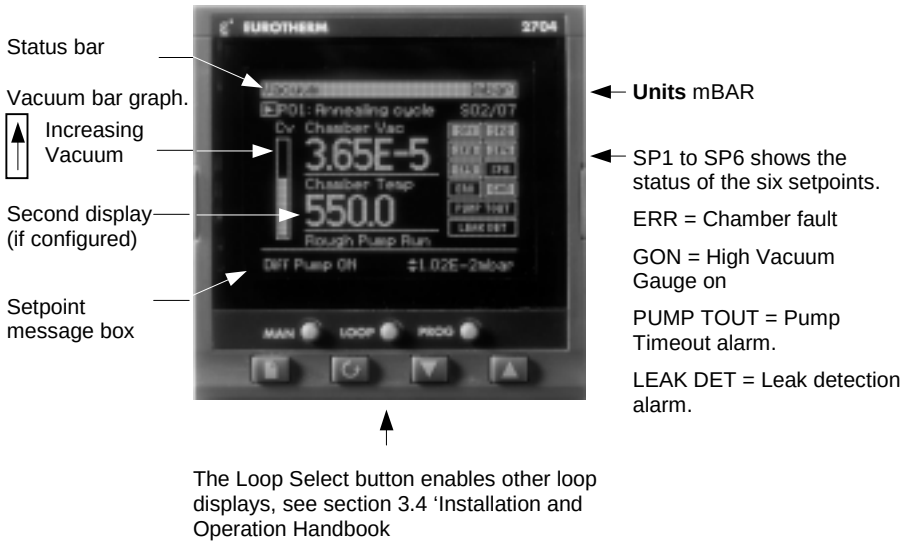


Figure a-5: Operator View

This display is configurable by the user. The following may differ on your controller:-

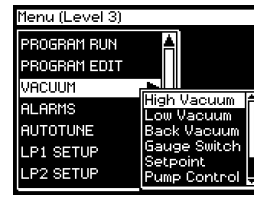
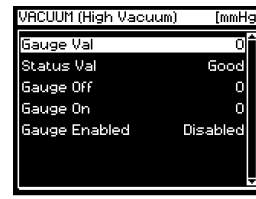
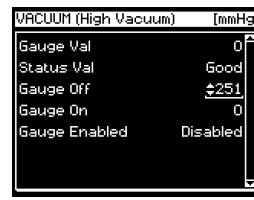
Chamber vacuum	Either switchover output or low vacuum outputs
Chamber text	Selected from a user text string
Second display	Only shown if a second function is configured, e.g. a temperature control loop.
Resolution	Decimal point may be selected as appropriate
Pump Timeout	Only shown if configured, (Vacuum Select ≠ None, Table a.7.6.)
Leak Detect	Only shown if configured, (Vacuum Select ≠ None, Table a.7.7.)

a.6. OPERATION

On a new instrument the vacuum controller can only be operated in access level 3. To enter access level 3 see Chapter 4 of the Installation and Operation handbook or the Engineering handbook.
However, it is possible to promote commonly used parameters to level 1. If this has been done the principle of operation in level 1 is the same as described below. To promote parameters, see Chapter 5 of the Engineering Handbook.

a.6.1. To Access the Vacuum Controller Parameters

The vacuum controller parameters are grouped under page headings in exactly the same way as other parameters.

Do This	This Is The Display You Should See	Additional Notes
1. From any display press [D] as many times as necessary to access the page header menu 2. Press [▲] or [▼] to select **'VACUUM'**		
3. Press [↵] to display the list of sub-headers 4. Press [▲] or [▼] to scroll through the list of sub-headings and to select the one required		The parameters are grouped by subject under the following sub-headings:- High Vacuum gauge Low Vacuum gauge Backing Vacuum gauge Gauge Switch Setpoint Pump Control Leak Detect Display These are listed in section a.7.
5. Press [↵] to display the parameter list 6. Press [▲] or [▼] to scroll through the list of parameters associated with the chosen subject		
To change the parameter value 7. Press [▲] or [▼] to scroll to the required parameter 8. Press [↵] to underline the parameter 9. Press [▲] or [▼] to change its value		

a.7. PARAMETER TABLES

The following tables list all parameters, which are available in all levels (including configuration level).
They are accessed using the principle described in the previous section.

a.7.1. High Vacuum Parameter Tables

Table Number: a.7.1.	**These parameters allow you to set up and configure the high vacuum gauge parameters. See also a.3.3.**			***High Vacuum* or takes a user name**
Parameter Name	**Parameter Description**	**Value**	**Default**	**Access Level**
Gauge Src	The source from which the high vacuum gauge is wired	Modbus address		Config
Gauge Val	The value read by the high vacuum gauge	Vacuum Display range		L3 R/O
Status Src	The source from which the gauge status is wired	Modbus address	None	Config
Status Val	The status condition	Good Bad		L3 R/O
Enable Select	The source from which the gauge enable is wired	Modbus address	None	L3
Gauge Off	The value at which the high vacuum gauge is switched off	Vacuum Display range		L3
Gauge On	The value at which the high vacuum gauge is switched on	Vacuum Display range		L3
Gauge Enabled	High vacuum gauge setpoint output	Enabled Disabled	Disabled	L3 R/O
Gauge Name	A user defined name for the high vacuum gauge	Usr 01 to 50	Default Text	Config

a.7.2. Low Vacuum Parameter Tables

Table Number: a.7.2.	These parameters allow you to set up and configure the low vacuum gauge parameters. See also a.3.2.			*Low Vacuum* or takes a user name
Parameter Name	**Parameter Description**	**Value**	**Default**	**Access Level**
Gauge Src	The source from which the low vacuum gauge is wired	Modbus address		Config
Gauge Val	The value read by the low vacuum gauge	Vacuum Display range		L3 R/O
Status Src	The source from which the gauge status is wired	Modbus address	None	Config
Status Val	The status condition	Good Bad		L3 R/O
Gauge Name	A user defined name for the low vacuum gauge	Usr 01 to 50	Default Text	L3

a.7.3. Backing Vacuum Parameter Tables

Table Number: a.7.3.	These parameters allow you to set up and configure the backing vacuum gauge parameters			*Back Vacuum* or takes a user name
Parameter Name	**Parameter Description**	**Value**	**Default**	**Access Level**
Gauge Src	The source from which the backing vacuum gauge is wired	Modbus address		Config
Gauge Val	The value read by the backing vacuum gauge	Vacuum Display range		L3 R/O
Status Src	The source from which the gauge status is wired	Modbus address	None	Config
Status Val	The status condition	Good Bad		L3 R/O
Gauge Name	A user defined name for the backing vacuum gauge	Usr 01 to 50	Default Text	L3

a.7.4. Gauge Switching Parameter Tables

Table Number: a.7.4.	These parameters allow you to set up the conditions for transfer from one gauge to another. See also a.3.7.			Gauge Switch	
Parameter Name	**Parameter Description**		**Value**	**Default**	**Access Level**
Active Gauge	Selected input		High Vac Low Vac Both		L3 R/O
Min Vac	Display high		Vacuum Display range		L3
Max Vac	Display low				L3
Switch Vac Lo	High switch over	See Figure a3			L3
Switch Vac Hi	Low switch over	See Figure a3			L3
Enable Switch	Enable gauge switching		Off On	Off	L3
Chamber Vac	Current chamber vacuum		Vacuum Display range		L3 R/O
Op Status	Gauge status		Good Bad		L3 R/O

a.7.5. Setpoint Parameter Tables

Table Number: a.7.5.	These parameters allow you to set up and configure the six setpoints. See also a.3.1.			Setpoint	
Parameter Name	**Parameter Description**		**Value**	**Default**	**Access Level**
Setpoint 1 Sel	Select the source of the vacuum value for SP1		None Low Vac High Vac Backing Vac Chamber Vac	None	L3
Setpoint 1 Off	Value to turn off output		Vacuum Display range		L3
Setpoint 1 On	Value to turn on output				L3
Setpoint 1 Out	Current value of setpoint 1 output		Off On		L3 R/O
Setpoint 1 Str	Name for setpoint 1		Usr 01 to 50	Default Text	Config
The above parameters are repeated for setpoints 2 to 6					

a.7.6. Pump Control Parameter Tables

Table Number: a.7.6.	These parameters allow you to set up and configure the pump parameters such as timeout. See also a.3.5.			Pump Control
Parameter Name	**Parameter Description**	**Value**	**Default**	**Access Level**
Vacuum Select	Select the source of the vacuum	None Low Vac High Vac Backing Vac Chamber Vac	None	L3
Pump Running Src	Select the source to turn the pump on	Modbus address		Config
Pump Running	To turn the pump on	No Yes	No	L3
R Pump TimeOut	To set the timeout period	0:00:00.0	0:00:00.0	L1
R Pump TimeRem	Time remaining	0:00:00.0		L1 R/O
R Pump SP	To set the target vacuum for the timeout alarm	Vacuum Display range	0.000E+0	L1
R Pump Status	Pump Timed Out	Good Bad		L3

a.7.7. Leak Detect Parameter Tables

Table Number: a.7.7.	These parameters allow you to set up and configure the leak detection criterion. See also a.3.6.			Leak Detect
Parameter Name	**Parameter Description**	**Value**	**Default**	**Access Level**
Vacuum Select	Select the source of the vacuum	None Low Vac High Vac Backing Vac Chamber Vac	None	Config
Vac Rate	Rate of change of vacuum	Vacuum Display range	0.00E+0	L3 R/O
Tgt Leak Rate	To set the target leak rate		0.00E+0	L3
Turn Off Pump	Turn pump off during leak detection	Off On	Off	L3 R/O
Leak Status	Leak detected	Off On		L3 R/O
Leak Test Src	Leak test source	Modbus address		Config
Leak T Start	Start leak test	No Yes	No	L3
Leak T Time	To set the leak test time	0:00:00.0	0:00:00.0	L3
Leak T Rem	Leak time remaining	0:00:00.0		L3 R/O

a.7.8. Vacuum display Parameter Tables

Table Number: a.7.8.	These parameters allow you to set up the vacuum overview display. See also a.5.		Display	
Parameter Name	**Parameter Description**	**Value**	**Default**	**Access Level**
Show Sec Val	To configure the second display	Yes No		Config
Second Value	The current value of the above source	Display range		L3
Sec Val Src	To configure the source of the value shown on the second display	Modbus address		Config
Sec Val Name	To configure a user defined name for the second display	Usr 01 to 50	Default text	Config
Resolution	This configures the display resolution.	XXXXX XXXX.X XXX.XX XX.XXX X.XXXX SCI = 0.00E±0		Config
Units	To configure the vacuum units	mbar mmHg psi bar		Config
Chamber Status	Chamber fault as determined by ORing the status of each gauge	Good Bad		L3 R/O
Chamber Vac	Current chamber vacuum	Vacuum display range		L3 R/O
Graph Vac Lo	High point for graph scaling	Vacuum display range		L3
Graph Vac Hi	Low point for graph scaling	Vacuum display range		L3
Chamber Name	A user defined name for the chamber	Usr 01 to 50	Default Text	Config

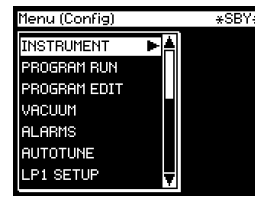
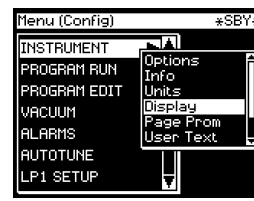
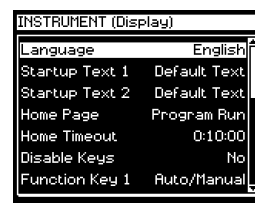
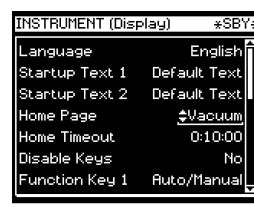
Note:- Text shown in *italics* is the default which may be changed by the user.

a.8. CONFIGURATION LEVEL

In configuration level you can choose the way in which you want the controller to operate, the format of the operator display, the name of the chamber in use and the names of the gauges. The parameters available have already been listed in the preceeding tables. This section includes some examples of the configuration of a vacuum controller.

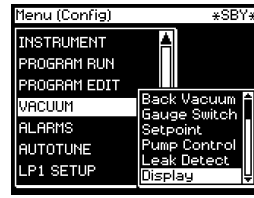
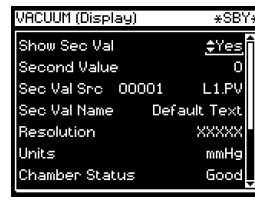
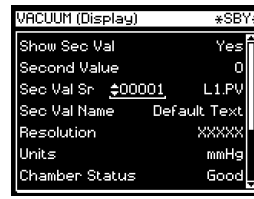
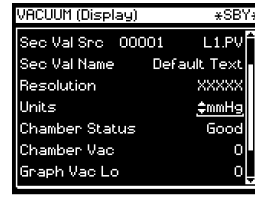
a.8.1. To Configure the Vacuum Summary as the HOME Page

The vacuum summary display, shown in Figure a-5, can be configured to be the start up page when the controller is powered up or when entering a new access level from configuration level.

Do This	This Is The Display You Should See	Additional Notes
1. From any display press [page] as many times as necessary to access the page header menu. 2. Press [▲] or [▼] to select **'INSTRUMENT'**		
3. Press [↵] to select sub-headers 4. Press [▲] or [▼] to scroll to **'Display'**		Note: The vacuum block can be Enabled or Disabled in the INSTRUMENT/Options menu. If it is disabled none of the vacuum parameters are shown.
5. Press [↵] to enter the 'INSTRUMENT/Display' parameter list		
6. Press [▲] or [▼] to scroll to **'Home Page'** 7. Press [↵] to underline the parameter 8. Press [▲] or [▼] to select **'Vacuum'**		

a.8.2. To Customise the Vaccum Summary Page

The vacuum summary page can be customised using the parameters listed in table a.7.8.

Do This	This Is The Display You Should See	Additional Notes
1. Select the **VACUUM/Display** page as described in section a.6.1.		
2. Press [↵] to enter the parameter list 3. Press [↵] to select **'Show Sec Val'** 4. . Press [▲] or [▼] to choose **'Yes'** or **'No'**	**To Select the Second Display** 	If 'Yes' is selected the operator view will show the second display, as shown in Figure a-5.
5. Press [↵] to display '**Sec Val Src'** 6. Press [▲] or [▼] to choose the source of the second value	**To Select the Source of Second Display** 	The value which will be displayed on the vacuum summary display is sourced from the PV Input. In the examples given in this supplement this is chamber temperature.
7. Press [▲] or [▼] to scroll to **'Units'** 8. Press [▲] or [▼] to select the units which will be displayed in the Status bar	**To Select Vacuum Units** 	**Note:** **In the current issue of software this does not scale the units.** **See a.9.2. for an explanation of how to do this.** Units which can be selected are: mmHg, psi, bar, mbar,

Other parameters which can be customised in the summary display include:
A Name for the Second Display, chosen from User Text
Resolution of the values displayed
A Name for the Chamber, chosen from User Text

a.8.3. Vacuum Function Block

A description of function blocks is given in Chapter 2 of the Engineering handbook. The function block for the vacuum controller is shown in Figure a-6 below and allows the user to soft wire to other devices within the controller to produce an individual control strategy.

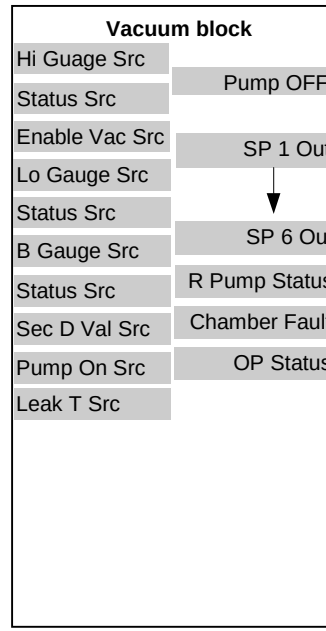


Figure a-6: Vacuum Function Block

a.9. VACUUM CONTROLLER WIRING EXAMPLES

The vacuum function block may be internally wired in software to controll specific applications. Soft Wiring is described in Chapter 3 of the Engineering manual.

a.9.1. Simple Temperature and Vacuum Control

The following example is included to show the principle of wiring between function blocks. It is not necessarily intended to be a complete solution to an application.
The vacuum function block has inputs from three vacuum gauges. A number of outputs are available as listed in the parameter tables. The example shows wiring from three of the setpoint outputs and a digital output used to turn the pump off. This example corresponds to the physical wiring diagram, Figure a-4. The principle of wiring to other outputs is the same.
A PID control block is used for temperature control receiving its setpoint from a programmer function block. The output from the PID block typically drives an analogue output to a thyristor unit. Further examples of PID block wiring are given in the Engineering handbook.

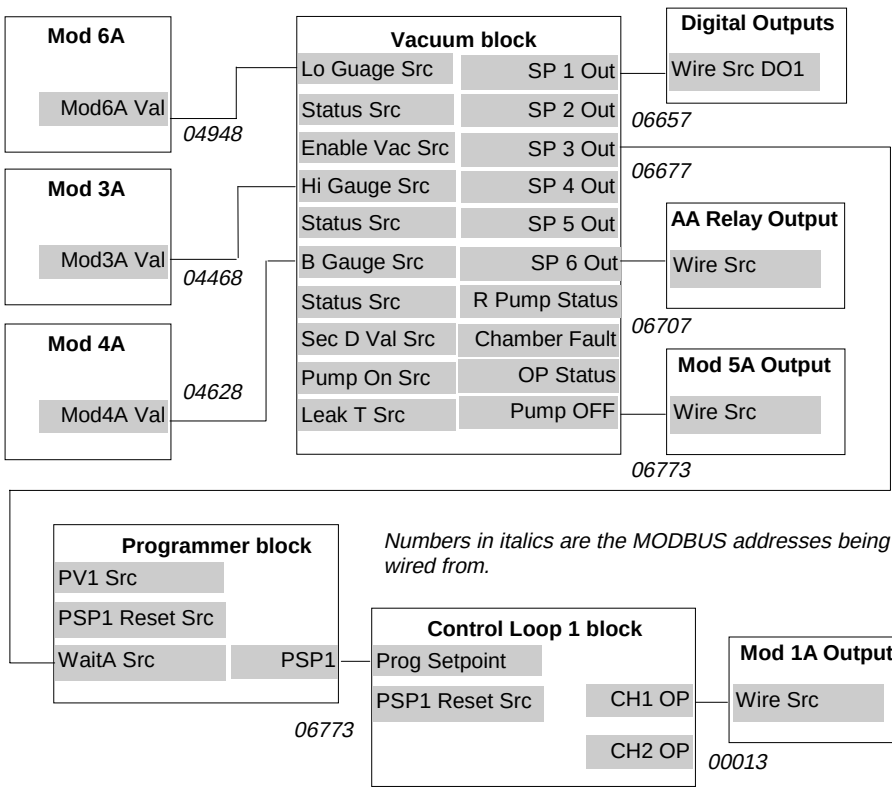


Figure a-7: Vacuum/Temperature Control Wiring Example

a.9.1.1. Implementation

1. In VACUUM/Low Vacuum Page (Table a.7.2)	set 'Gauge Src' = 04948: Mod6A.Val This connects the low vacuum gauge, connected to module 3 input,to low vacuum gauge source
2. In VACUUM/High Vacuum Page (Table a.7.1)	set 'Gauge Src' = 04468: Mod3A.Val This connects the high vacuum gauge, connected to module 6 input,to high vacuum gauge source
3. In VACUUM/Back Vacuum Page (Table a.7.3)	set 'Gauge Src' = 04628: Mod4A.Val This connects the backing vacuum gauge, connected to module 4 input,to high vacuum gauge source
4. In STANDARD IO/Dig IO) 1 Page (See Engineering handbook, Table 17.5.1)	set 'Channel Type' = On/Off set 'Wire Src' = 06657 This configures Dig IO1 as a digital output and connects it to setpoint 1 output
5. In STANDARD IO/AA Relay Page (See Engineering handbook, Table 17.4.1)	set 'Channel Type' = On/Off set 'Wire Src' = 06707 This configures the AA relay as an on/off output and connects it to setpoint 6 output
6. In MODULE IO/Module 5A Page (See Engineering handbook, Table 18.4.2)	set 'Channel Type' = On/Off set 'Wire Src' = 06773 This configures module 5 relay as an on/off output and connects it to the pump off output
7. In LP1 SETUP/Options Page (See Engineering handbook, Table 9.9.1)	set 'Prog Setpoint' = PSP1 set 'Wire Src' = 06773 Connects PSP1 to become the program setpoint for loop 1
8. In MODULE IO/Module 1A Page (See Engineering handbook, Table 18.4.1)	set 'Channel Type' = Volts (or mA) set 'Wire Src' = 00013:L1.Ch1.OP This configures module 1 analogue output to volts (or mA) output and connects it to the Loop 1 PID output
9. In PROGRAM EDIT/Wiring Page (Table a.7.2)	Set 'WaitA Src' = 06677 This connects Setpoint 3 output to the Wait A input of the programmer block

a.9.2. To Scale Vacuum Readout in Other Units

The vacuum units in the software version covered by this supplememt are mbar only. To scale to alternative units use 'Analogue Operators' described in the Engineering Handbook Chapter 14.
In a two gauge system it is necessary to scale both gauges independently. In a single gauge system the low vacuum gauge is taken as the reference.

The following example shows a two gauge system, as wired in section a.9.1. The units convertion will be from mbar to mmHg, where 1mmHg = 1.333mbar

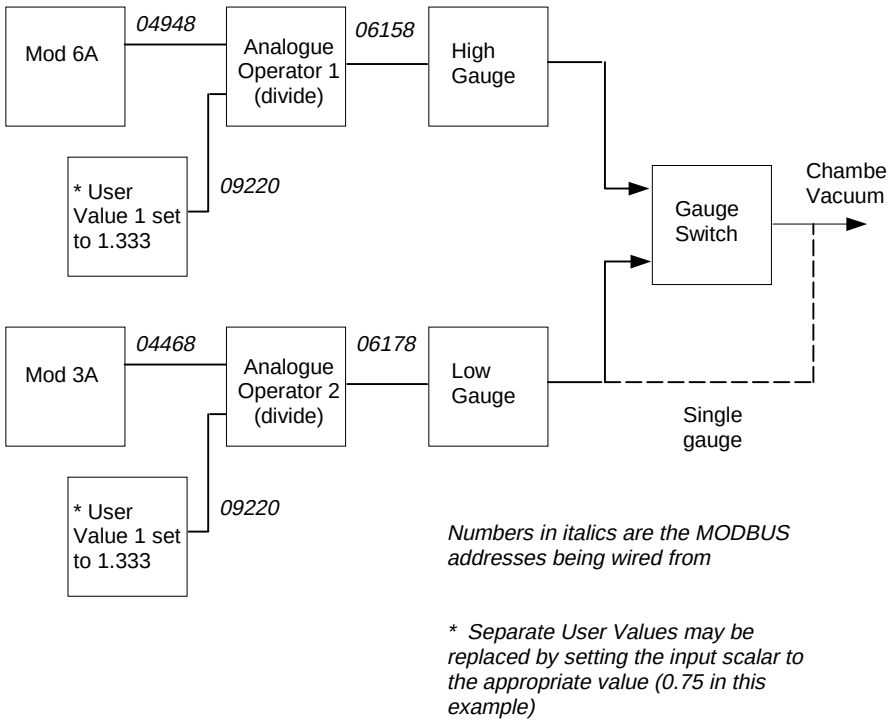


Figure a-8: Scaling units in a two gauge system

a.9.2.1. Implementation

1. In USER VALUES/User Val 1* Page (Chapter 13 Engineering Handbook) * Or use any unused User Val	set 'Resolution' = X.XXXX set 'User 1 Value' = 1.333 (It may also be necessary to set the High Limit to > 1.333) Copy the Modbus address of this parameter by pressing the MAN button
2. In ANALOGUE OPERS/An 1* Page (Chapter 13 Engineering Handbook) * Or use any unused analogue operator	set 'Input 2 Src' = 09220: UVal1.Val The LOOP button will paste this value from the previous copy procedure. set 'Input 1 Src' = 04948: Mod6A.Val set 'Operation' = Divide This will divide the high level gauge signal by 1.333 to convert to mmHg.
3. In ANALOGUE OPERS/An 2* Page (Chapter 13 Engineering Handbook) * Or use any unused analogue operator	set 'Operation' = Divide set 'Input 1 Src' = 04468: Mod3A.Val set 'Input 2 Src' = 09220: Uval1.Val This will divide the low level gauge signal by 1.333 to convert to mmHg.
4. In VACUUM/*High Vacuum* Page (Table a.7.1.)	set 'Gauge Src' = 06158 AnOp1.OP This connects the high vacuum gauge PV from the analogue operator 1 output
5. In VACUUM/*Low Vacuum* Page (Table a.7.2.)	set 'Gauge Src' = 06178 AnOp2.OP This connects the low vacuum gauge PV from the analogue operator 2 output
6. In VACUUM/Display (Table a.7.8.)	set 'Units' = mmHg This configures the units shown on the banner to mmHg.

Text shown in *italics* may be customised