Gardner Denver

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DIGIPILOT CONTROLLER OPERATING MANUAL

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General Description

The Gardner Denver rotary screw compressor package is pre–wired with all controls, motor, and frequency converter for 460 volts at the time of ordering. External transformers are used for other voltages. It is necessary only to connect the compressor unit to the correct power supply and to the shop air line (and to the appropriate water supply if water cooled). A standard compressor unit consists of the compressor, oil reservoir, oil cooling system and filter, motor type as specified, NEMA 12 starter / control box, and control components as described in the package instruction manual.

This compressor unit features the DigiPilot controller, which integrates all the control functions under microprocessor control. Its functions include safety and shutdown, compressor regulation, operator control, and advisory / maintenance indicators. The keypad and display provide the operator with a logical control of the compressor and indication of its condition. A second keypad and display are used to indicate frequency converter operation.

Electrical Wiring

The compressor package is factory wired for internal motors and controls. Connections from the electrical supply are made to the three phase terminals and one ground terminal located inside the main controls enclosure. Wiring must be performed only by qualified electricians.

Perform all wiring in accordance with the National Electrical Code (NFPA–70) and any applicable local electrical codes. Note that section 430–2 applies to this package; refer to the frequency converter nameplate for the model, rated voltage, and rated current. To minimize effects of harmonic currents, do not connect to the same feeder as sensitive equipment. Specific instructions for wiring are in the Vacon NX User's Manual.

Operation

Refer to Figure 1, page 2. To start compressor operation, press the green start button on the large control keypad. To stop operation, press the red stop button on the large control keypad. The display to the left of these buttons indicates the plant pressure, compressor discharge temperature, and a text description of the current operating state.

⚠ WARNING

Automatic restarting or electrical shock can cause injury or death. Open and lock main disconnect and any other circuits before servicing unit.

Operation may also be controlled by remote controls. If this is done, the green start button no longer functions. Refer to "Connection to External Controls", page 22, for more details.

The emergency stop pushbutton removes power from the controller outputs regardless of controller status. It is located in the center of the control panel. This should be used for emergency purposes only –– use the keypad stop button for normal controlled stopping.

The small frequency converter keypad is provided to display converter information only. Use the large buttons on the large keypad.

When you start controller operation, it automatically will operate the compressor unit in the most efficient manner for the demand of the air system. It will start and load the compressor near the programmed load pressure setting. The compressor speed will be constantly adjusted to deliver the same air flow that the plant is demanding, and to maintain pressure near the programmed load pressure. If demand becomes very light, the compressor will run at its minimum speed. If the pressure rises to the programmed unload pressure, the compressor will completely unload and relieve all internal pressures. It will continue to run idle for a brief period, and will stop completely if no further demand is sensed. When demand is later resumed, the controller will start and operate the compressor automatically to serve the demand.

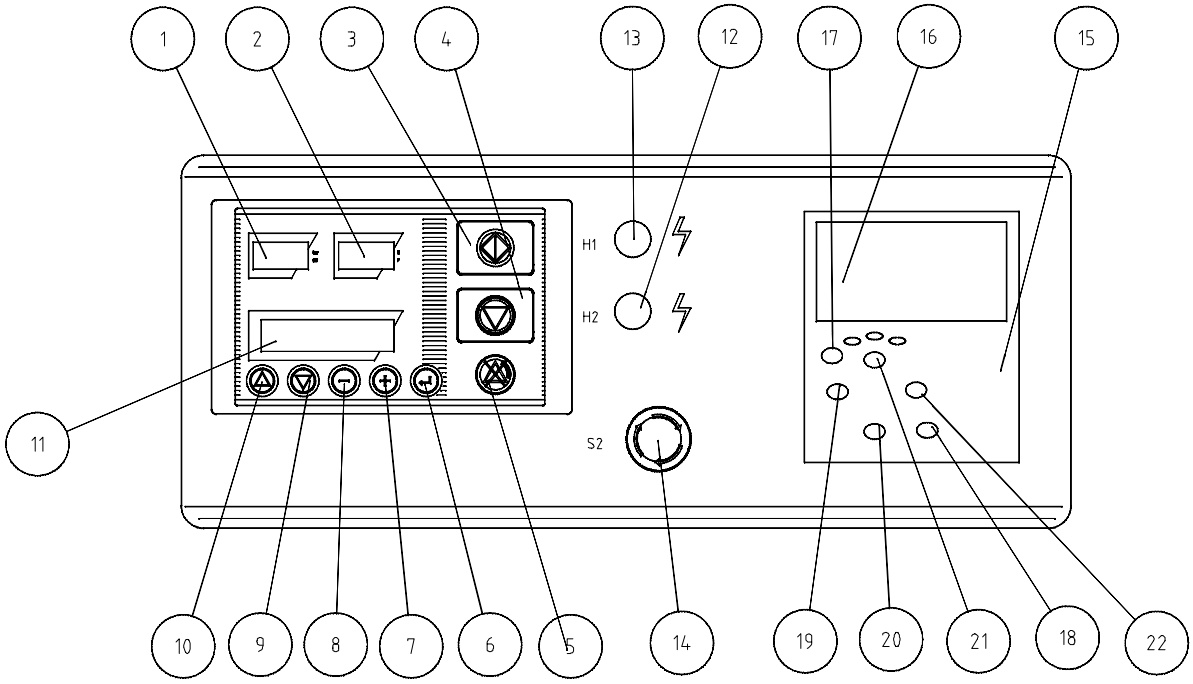

Figure 1 Digipilot Compressor Control Panel

Ref. No.	Name of Part	Ref. No.	Name of Part
1	Plant pressure display	12	Alarm indicator light
2	Compressor discharge temperature display	13	Power indicator light
3	Compressor package Start button	14	Emergency Stop button
4	Compressor package Stop button	15	Vacon controller
5	Controller Reset button	16	Vacon display
6	Controller programming Enter button	17	Vacon Reset button
7	Controller programming + button	18	Vacon Enter button
8	Controller programming – button	19	Vacon Left Arrow ◀ button
9	Controller programming ▼ button	20	Vacon Down Arrow ▼ button
10	Controller programming ▲ button	21	Vacon Up Arrow ▲ button
11	Text display	22	Vacon Right Arrow ▶ button

Digipilot Controller Display

Electrical power illuminates the power indicator light (13) when power is applied to the package. The plant pressure (1) and compressor discharge temperature (2) are always displayed while the package is energized. The display (11) above the keypad provides operating information to the user. If a shutdown has occurred, the display indicates the cause.

During normal operation, the display shows the operation state on the top line. Alternate lower line displays are available by pressing the keypad ▼ or ▲ cursor keys, and will be identified on the display. The controller always returns to this display when the – button is pressed, or if no buttons are pressed after a time delay. These include displays similar to the following:

Air/oil separator temperature	”Air temp. 85□F”
Oil reservoir pressure	”P.Rcvr 98 PSI”
Date and time	”04 MAY Thu 16:16”

Status	+ –	Fault	+ –	Timers	+ –	Operation	+ –*
▲▼		▲▼		▲▼		▲▼	
Air temp		Fault 1 **		Runn.hrs		P.unload	
▲▼		▲▼		▲▼		▲▼	
P.Rcvr		Fault 2 **		Load.hrs		P.load	
▲▼		▲▼		▲▼		▲▼	
Date, Time		Fault 3 **		Air fl tm		P.schedule	
		▲▼		▲▼		▲▼	
		Fault 4 **		Oil fl tm		Press.schedule	+ –*
		▲▼		▲▼		▲▼	
		Fault 5 **		Oil sep tm		Run on tm	
		▲▼		▲▼		▲▼	
		Fault 6 **		Oil chg tm		Drain sp tm	
		▲▼				▲▼	
		Fault 7 **				Drain dw tm	
		▲▼					
		Fault 8 **					
		▲▼					
		Fault 9 **					
		▲▼					
		Fault 10 **					

* refer to the adjustments and programming section

** Press the □ button to display the time of the fault

Figure 2 Operating Display Flow Chart

To display additional service information, press the + button to select another column. Press the ▲ or ▼ button to select individual displays within the column. The displays include:

A list of the most recent faults	”Fault log nr. 1”	” Emergency stop ”
Total running hourmeter	”Timers	” ”Runn.hrs 518h”
Compressor loaded hourmeter	”Timers	” ”Load.hrs 483h”
Time until next Air filter change	”Timers	” ”Air fl tm 982h”
Time until next Oil filter change	”Timers	” ”Oil fl tm 482h”
Time until next separator change	”Timers	” ”Oil sep tm 3482h”
Time until next oil change	”Timers	” ”Oil chg tm 5482h”

Vacon Frequency Converter Display

The smaller keypad is useful for displaying information about the frequency converter. These displays are identified with a ”V_” and descriptive text. If other displays are shown, press the ◀ button to get back to the main menu, use the ▲ or ▼ buttons to select ”M1 Monitor”, and press the ▶ button to enter the monitor menu. Displays within the menu are selected with the ▲ or ▼ buttons. Note that some displays are not relevant in this application. The following are useful to monitor the compressor operation:

		:
		▲▼
		:
		V1.14 MotorServTime
		:
		▲▼
		:
	◀ ▶ C*	V1.9 Unit Temperature
▲▼		▲▼
M6 System Menu	◀ ▶ H_*	V1.8 DC–link voltage
▲▼		▲▼
M5 Fault History	◀ ▶ F1*	V1.7 Motor voltage
▲▼		:
M4 Active Faults	◀ ▶ B_*	▲▼
▲▼		:
M3 User Setting	◀ ▶ R1*	V1.3 Motor speed
▲▼		▲▼
	◀ ▶ G_,P_*	V1.2 FreqReference
▲▼		▲▼
M1 Monitor	◀ ▶	V1.1 Output frequency

* refer to Vacon User’s Manual for details

Figure 3 Vacon Monitor Flow Chart

V1.1, V1.2 and V1.3 indicate the speed of the compressor. These are continuously adjusted by the DigiPilot when delivering air in normal operation. Select one of these for ”normal” viewing.

V1.10 displays the actual signal from the DigiPilot to the frequency converter. This display is useful for servicing if problems with speed control are encountered.

V1.4, V1.7, and V1.8 are useful for electrical evaluations. At full speed, the converter output should be near 460 volts; low voltage indicates losses in the wiring to the compressor package. At low speeds, the voltage will be reduced by the converter, to match the motors’ characteristics. Note that the motor current is different than compressor supply current.

V1.9 should be monitored if high temperature faults are encountered. Ensure that the compressor package has adequate ventilation to reduce high operating temperatures.

V1.14 indicates the time until next motor bearing lubrication (use right type and amount of grease).

Refer to the Vacon NX User's Manual for information about other displays.

Vacon controller adjustments

The frequency converter has been factory programmed for the specific compressor package. Do not alter any of these adjustments. Figure 4, page 6 is an overall flowchart of Vacon displays. Several displays are useful during service of the compressor package.

M3 User Setting

To display, press the ◀ key repeatedly until an M_ screen is displayed. Use the ▲ or ▼ keys to select M3. Use the ▲ and ▼ keys to select parameters. When done, use the ▲ or ▼ keys to select M1, then press ▶ to return to monitoring displays. See page 27.

M4 Active faults

To display, press the ◀key repeatedly until an M_ screen is displayed. Use the ▲ or ▼ keys to select M4. This will display any faults which are currently detected by the controls of the frequency converter. This display remains until the fault condition is corrected and the reset button is pressed. When done, use the ▲ or ▼ keys to select M1, then press ▶ to return to monitoring displays.

M5 Fault history

To display, press the ◀ key repeatedly until an M_ screen is displayed. Use the ▲ or ▼ keys to select M5. Press ▶ to enter the fault history submenu. This will display the most recent six faults. Use the ▲ or ▼ keys to select faults in the list. When done, press the ◀ key to return to the M5 display. Use the ▲ or ▼ keys to select M1, then press ▶ to return to monitoring displays.

M6 System Menu

This shows Vacon system settings. To display, press the ◀ key repeatedly until an M_ screen is displayed. Use the ▲ or ▼ keys to select M6. Use the ▲ and ▼ keys to adjust the display for the most readable contrast. When done, use the ▲ or ▼ keys to select M1, then press ▶ to return to monitoring displays.

Refer to the Vacon NX User's manual for a complete description of all adjustments and functions. Note that many of these adjustments are critical. Others are not relevant to the application.

CAUTION

The startup report contains a complete listing of all Vacon adjustments, both during manufacturing and during machine commissioning. Do not alter these, except as directed in the steps above.

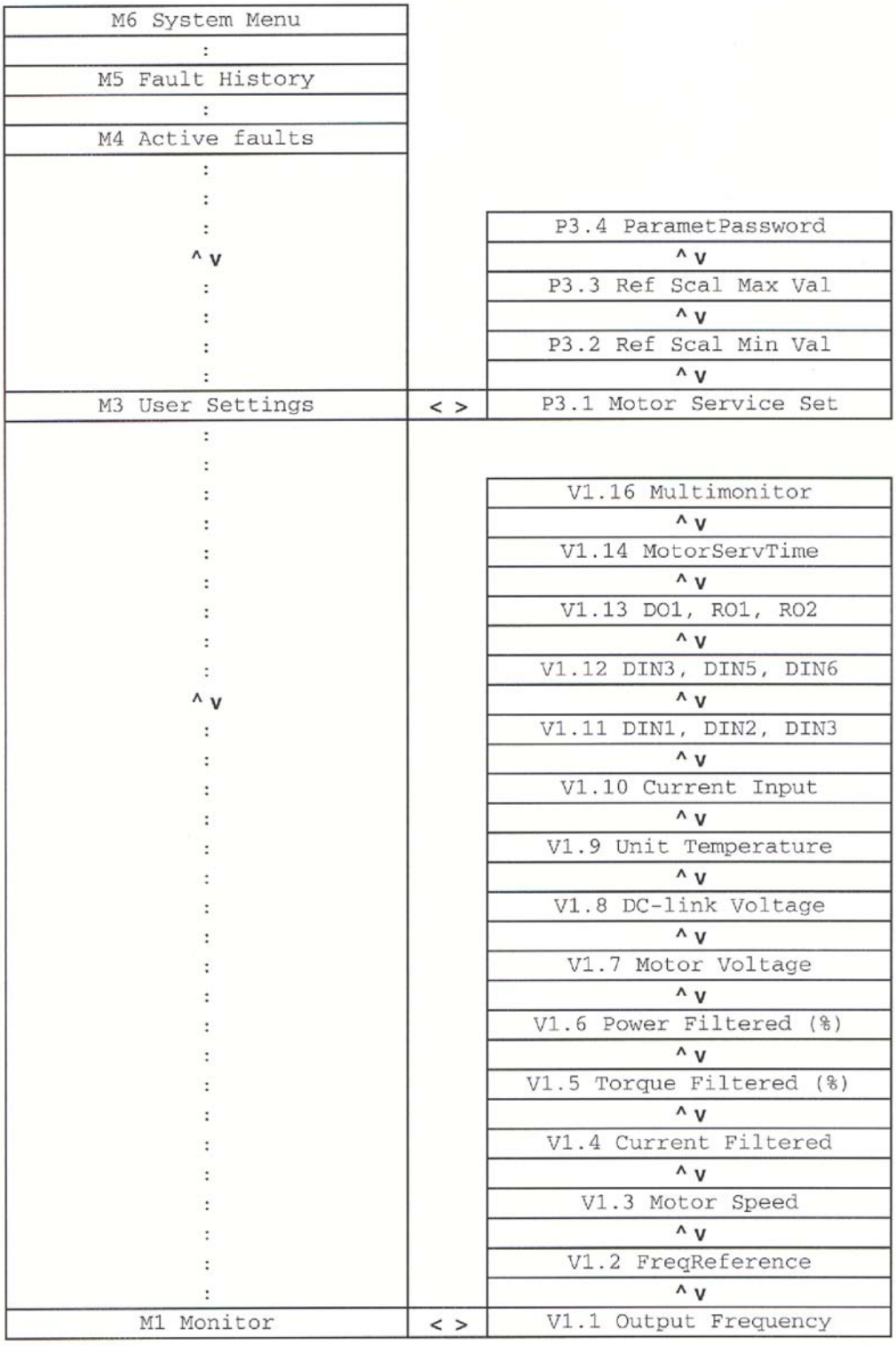

Figure 4 Flow Chart of Vacon Displays

Control Protections

The display is also used as a service reminder for normal maintenance items. If service is recommended, the red alarm light will come on, and a message will be shown on lower line display. These messages are intended to advise of conditions which may lead to a shutdown. If a protective shutdown occurs, the red alarm light will come on and the display will indicate the cause of the shutdown. When any of these occur, perform the necessary corrections, then press the Reset button.

Message	Display text	Limit	Description	Correction
Emergency stop	Emergency stop		Motor does not start if Emergency Stop button is depressed	Release the Emergency Stop button
Output temp	Comp temp fault	225□F	Output temperature is too high	See the compressor troubleshooting table
Pressure sensor	High press fault	Rated +10psi	Pressure safety limit was exceeded	See the compressor troubleshooting table
Pressure sensor	Pres probe fault	No signal	No pressure sensor signal. Short circuit in measuring circuit.	Check cable connections, change sensor if necessary
Temp. sensor	Temp probe fault	No signal	No temp. sensor signal. Short circuit in measuring circuit.	Check cable connections, change sensor if necessary.
Motor over temperature	Main motor fault		Motor thermistor has tripped	Check motor
Frequency converter or overload relay	Main motor fault		Converter fault	Check Vacon display and service manual.
Blow–out time	Blowing down	1 minute	After emergency stop, blow–out time is 1 minute.	Wait
Short circuit in digital outputs	Power failure		Control voltage not high enough for controller. Short circuit in solenoid valve or relay coil.	Check power supply to controller. Check wiring and coils.
Power failure	Power failure		If ”automatic restart after power failure” is not set, compressor must be restarted manually.	

Message	Display text	Limit	Description	Correction
Output temp.	Comp temp warn	212□F	Warning of high temperature	See the compressor troubleshooting table
Oil filter operating hours	Oil flt chng due	1000hour-stypical	Oil filter is beyond recommended service time.	See the compressor troubleshooting table
Air filter pressure difference	Air filt P warn	50 mbar	Warning of high pressure drop across the air filter.	See the compressor troubleshooting table
Air filter operating hours	Air flt chng due	1500 hour-stypical	Air filter is beyond recommended service time.	See the compressor troubleshooting table
Oil separator pressure difference	Oil sep P warn	10 psid	Warning of high pressure drop across the separator	See the compressor troubleshooting table
Oil separator operating hours	Sep. change due	4000 hour-stypical	Oil separator is beyond recommended service time	See the compressor troubleshooting table
Operating hours of oil	Oil change due	Varies with oil type	Oil is beyond recommended service time	See the compressor troubleshooting table
High temperature at the separator	Air temp. warning	212□F	Warning of high temperature	See the compressor troubleshooting table

Figure 5 Digipilot Protection

Refer to the compressor package operating and service manual for detailed instructions on servicing the compressor. Refer to the Vacon user's manual for detailed instructions on the frequency converter protections. Reset the frequency converter before resetting the DigiPilot compressor controller.

Digipilot Controller Adjustments

Refer to figure 6 for a complete listing of controller displays and user adjustments. The Status, Fault, and Timers branches are described above in ”DigiPilot controller display.” When making any adjustment, follow the directions indicated for that step. The setting will flash when it is open for adjustment. Use the + or – keys to alter, then press the □ key to save the adjustment.

Operation menu

This menu contains adjustments which would normally be used to tailor compressor operation for a plant. From the status display, press the + button to select the ”Operation” column. Press the ▼ or ▲ button to select individual displays within the column. These may then be displayed or adjusted as needed. When done, press the – key to step back to the normal status display.

P.unload

This is the highest pressure at which the compressor will deliver air to the plant system. In normal operation, the frequency converter will adjust the air delivered to match the air demanded by the plant. If the plant demand is less than the minimum delivery of the compressor, the pressure will rise. If the pressure reaches the unload pressure, the compressor will be completely unloaded, and will relieve internal pressures and stop. To adjust, press the □ key, and use the + or – keys to adjust the setting.

P.load

This is the lowest pressure at which the compressor will deliver air to the plant system. In normal operation, the frequency converter will adjust the air delivered to match the air demanded by the plant to maintain this pressure. If the compressor was previously completely unloaded or stopped, it will start or reload as necessary. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting. Do not adjust higher than the rated pressure of the compressor package. When done, press the □ key again to save the new setting.

⚠ WARNING

Automatic restarting or electrical shock can cause injury or death. Open and lock main disconnect and any other circuits before servicing unit.

Note that a small difference between the load and unload pressures may result in frequent unloads. The factory setting of 10 psi difference may be narrowed for large systems with small pressure overshoots during initial fill. It should be wider for small systems to allow the frequency converter to slow down the compressor.

P.schedule

Operation of the compressor may be controlled to start or stop, or vary pressure, by the DigiPilot controller. To enable this, set P.schedule to ”on”, otherwise leave this setting as ”off.” To change, press the □ key, and use the + or – keys. When done, press the □ key again to save the new setting.

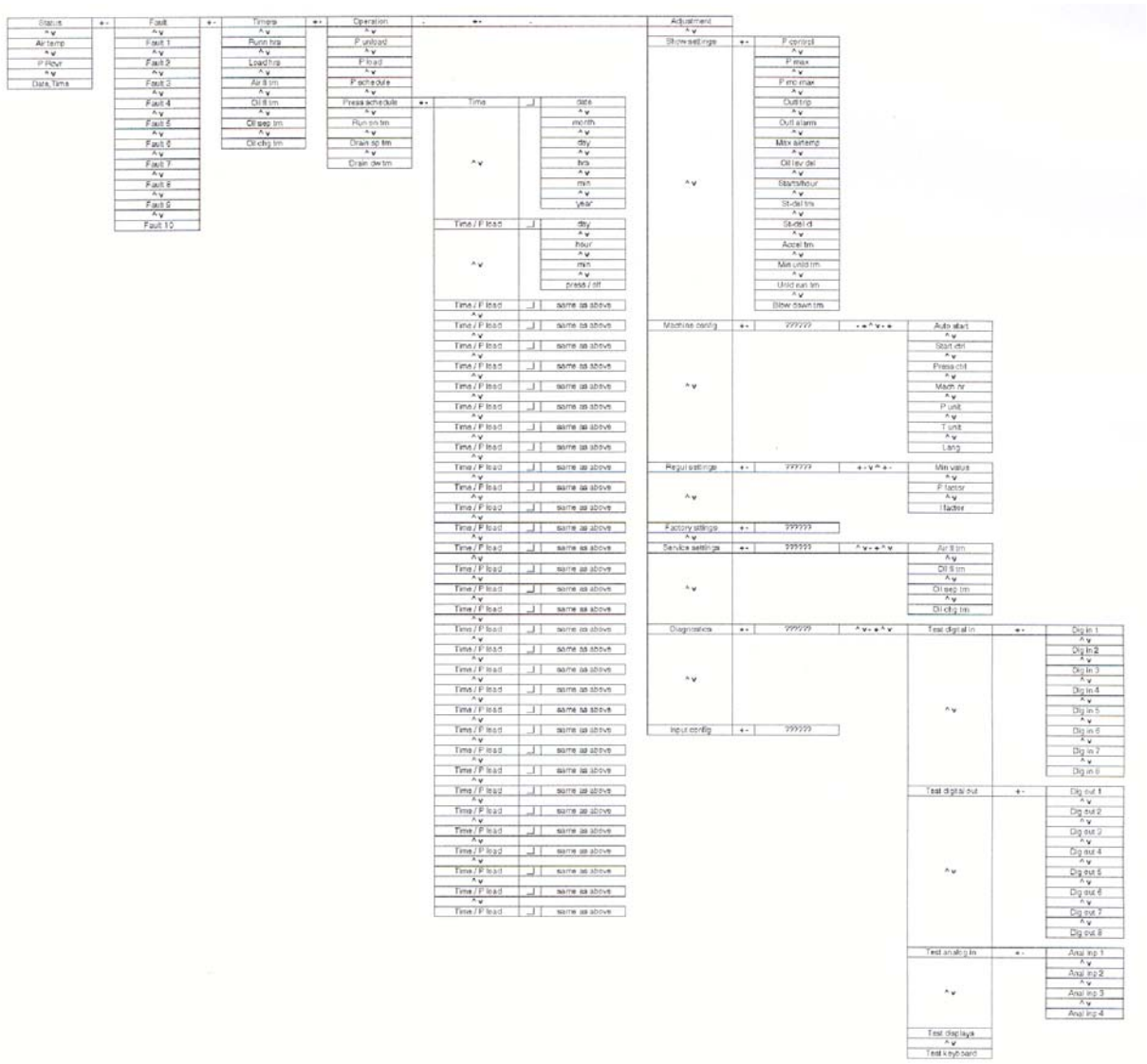

Figure 6 Digipilot Adjustment Flow Chart

Press schedule

This is the access point to set the DigiPilot clock or adjust the pressure plan settings. If adjustments are needed, press the + key to proceed to the setting submenu. When adjustments in the submenu are completed, press the – key to return to this point. Otherwise, press the ▼ or ▲ keys to proceed to other Operation adjustments. These continue with ”Run on tm” below.

Time

This step sets the DigiPilot clock for local time. To adjust, press the □ key. Select the desired adjustment by using the ▲ or ▼ keys, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Time/P.load

There are 32 of these steps for setting up a pressure plan for the compressor package. In each, set the desired time for a change in operation, and the desired new load pressure setting. These are adjustable from 44 psig up to the P.load setting in the operation adjustments, or may be set to ”off.” To adjust, press the □ key. Select the desired adjustment by using the ▲ or ▼ keys, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting. If a pressure plan is not used, proceed back to the P.schedule step in the operation adjustments, and set it back to ”off.”

When changing values or setting new ones, the whole lower line starts blinking if ▼ is pressed after changing the target pressure. By pressing the □ key now, the blinking pressure plan setting is deleted from the pressure plan settings.

Run on tm

This timer controls how long the compressor idles after it completely unloads (as described in P.unload) in automatic operation. This is factory set at five minutes, but may be set longer to avoid frequent stops and starts in a small air system. Note that the compressor will continue to run idle if the compressor has exceeded the maximum number of starts per hour. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

⚠ WARNING

Automatic restarting or electrical shock can cause injury or death. Open and lock main disconnect and any other circuits before servicing unit.

Drain sp tm

This adjustment controls the length of time that the DigiPilot will open a condensate drain valve. This, and the following adjustment, may be used for electronic controls of a valve based on internal timers. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Drain dw tm

This adjustment controls the length of time that the DigiPilot will close a condensate drain valve. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Note that too brief sp time, or too long dw time will not adequately drain all condensate from the package. Excessive sp time or too short dw time will blow excess air from the compressor package. These must be adjusted for the operating conditions (flow, temperature, and humidity) of the installation. Check that the water separator is completely drained on each cycle.

Adjustment menu – show settings

This group provides a list of factory settings which have been made to the controller. These are based on the physical construction of the package, and are not adjustable. To access this menu from the normal status display, press the + key four times to reach the ”Show settings” prompt, then press the + key one more time to display the list. Press the ▼ or ▲ button to select individual displays within the column. When done, press the – key to step back to the normal status display.

P.control

This indicates the control mode for the compressor package operation. Variable–speed packages use the ”PIA” mode. This indicates automatic operation with flow regulation.

P.max

This indicates the maximum pressure allowed before the controller detects a fault. This is normally set 20 psig higher than the rating of the compressor package. If this is exceeded, the compressor will shut down immediately and the controller will indicate a high pressure fault.

P.mc.max

This is the maximum pressure for pressure adjustments. It is set equal to the rated pressure of the compressor package.

Outl trip

This indicates the maximum allowed operating temperature at the compressor discharge. This is set to 225 degrees F. If this temperature is exceeded, the compressor will immediately shut down and the display will indicate a high temperature fault.

Outl alarm

This indicates the temperature at which a high temperature warning will be displayed. This is factory set at 212 degrees F.

Max.airtemp

This indicates the maximum allowed operating temperature at the separator. This is set to 225 degrees F. If this temperature is exceeded, the compressor will immediately shut down and the display will indicate a high temperature fault.

Oil lev del

This is not used on this package.

Starts/hour

This is set to 15 for a EGE package. If automatic operation calls for more than 15 stops per hour, the compressor will continue to run idle instead of stopping. This prevents frequent stops and restarts.

St-delt tm

Compressor runs off loaded at start during this time before Accel.tm. This is set to 2 seconds.

St-delt dl

This is not used on this package.

Accel.tm

This provides an unloaded pause at the end of starting, prior to opening the inlet valve. This is set to 6 seconds.

Min unld tm

This is not used on this package.

Unld run tm

When stopped manually, the compressor will unload immediately and run unloaded for this period. This is set at 60 seconds.

Blow down tm

When the motor is stopped, no restart is allowed for a brief period. This is set to 2 seconds.

Adjustment menu – Machine config.

This group provides settings to the controller, based on the installation and application of the package. These adjustments are normally done during package startup. To access this menu from the normal status display, press the + key four times to reach the ”Show settings” prompt, press the ▼ or ▲ key to select ”Machine config.”, then press the + key one more time to display the password prompt. Press – + ▲ ▼ – + to enter the menu. Press the ▼ or ▲ button to select individual displays within the column. When done, press the – key to step back to the normal status display.

Auto start

The bottom line indicates either ”OFF” or a number of seconds. The factory setting is ”OFF” and the controller must be manually restarted following a loss of power. Set this feature on when it is necessary to have the compressor automatically restart after a power interruption. This feature should be enabled only when the owner determines that it is safe to do so. It is recommended that compressor access be limited to only trained service personnel when this feature is used. To enable , set a delay time, otherwise leave this setting as ”off.” To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

When enabled, the controller will recall if it had been running prior to the power interruption. If it was, the controller displays ”Standby”, pauses for the time interval noted, and then resumes automatic operation. If the compressor was stopped (either manually or because of a fault) prior to the interruption, the controller will display ”Ready to start” and must be manually restarted. Check the fault log if a fault is suspected prior to the power interruption.

Start ctrl

Use this feature if it is necessary to control the compressor operation from a remote device. The factory setting is ”LOC” for local control with the start and stop keys on the keypad. When set to ”ETN”, the keypad start key will not function, and control is passed to an external contact. See ”Connections to external controls” To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Press.ctrl

The factory setting is ”LOC” for local control. Use ”ETN” only for MultiPilot controls. Refer to the MultiPilot manual for further information.

Mach.nr.

Compressor’s identifier for MultiPilot controls. Refer to the MultiPilot manual for further information.

P.unit

The factory setting is PSI. This may be changed to BAR if desired. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

T.unit

The factory setting is F. This may be changed to C if desired. To adjust, press the key, and use the + or – keys to adjust the setting. When done, press the key again to save the new setting.

Lang

The factory setting is English. This may be changed to other languages if desired. To adjust, press the key, and use the + or – keys to adjust the setting. When done, press the key again to save the new setting.

Adjustment menu – Regul settings

This group provides settings to the PIC or PIA gains of the controller. These adjustments are normally done in the factory, and are suitable for general purpose applications. To access this menu from the normal status display, press the + key four times to reach the ”Show settings” prompt, press the ▼ or ▲ key to select ”Regul settings”, then press the + key one more time to display the password prompt. Press + – ▼ ▲ + – to enter the menu. Press the ▼ or ▲ button to select individual displays within the column. When done, press the – key to step back to the normal status display.

Min value

This adjusts the minimum output for flow regulation. It should always be set to 0 for frequency converter applications. If it has been altered, set it back to zero. To adjust, press the key, and use the + or – keys to adjust the setting. When done, press the key again to save the new setting.

P factor

This adjusts the proportional gain of the DigiPilot flow control. It is factory set at 40%, and is suitable for most applications. To adjust, press the key, and use the + or – keys to adjust the setting. When done, press the key again to save the new setting.

I factor

This adjusts the integral gain of the DigiPilot flow control. It is factory set at 10%, and is suitable for most applications. To adjust, press the key, and use the + or – keys to adjust the setting. When done, press the key again to save the new setting.

D factor

This is the correction factor for the control.

Adjustment menu – Service settings

This group provides settings of recommended service intervals in the controller. These adjustments are normally done in the factory, as appropriate for the renewable parts supplied. These may be altered if replacement parts or harsh service require different intervals. These timers must be reset whenever replacement service is performed. To access this menu from the normal status display, press the + key four times to reach the ”Show settings” prompt, press the ▼ or ▲ key to select ”Service settings”, then press the + key one more time to display the password prompt. Press ▲▼ – + ▲▼ to enter the menu. Press the ▲ or ▼ button to select individual displays within the column. When done, press the – key to step back to the normal status display.

Air fl tm

This adjusts the number of hours between recommended air filter replacements. The factory setting is 1500 hours for a new filter. Note that there is also a differential pressure sensor for the filter, to alert earlier if the filter becomes clogged. Reset this timer whenever an air filter is replaced. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Oil fl tm

This adjusts the number of hours between recommended oil filter replacements. The factory setting is 1000 hours for a new filter. Reset this timer whenever an oil filter is replaced. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Oil sep tm

This adjusts the number of hours between recommended air/oil separator replacements. The factory setting is 4000 hours for a new separator. Note that there is also a differential pressure sensor for the filter, to alert earlier if the separator becomes clogged. Reset this timer whenever a separator is replaced. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Oil chg tm

This adjusts the number of hours between recommended oil changes. Oil change intervals should be adjusted for high temperature operation; refer to details in the lubrication section of the compressor manual. The settings for recommended oils are:

Discharge Temperature	AEON 2000 Change Interval	AEON 4000 Change Interval	AEON 9000 Change Interval
UP TO 180□ F (82□ C)	2000 hours	4000 hours	6000 hours *
180□ F TO 190□ F (82□ C TO 88□ C)	1500 hours	3000 hours	6000 hours
190□ F TO 200□ F (88□ C TO 93□ C)	1000 hours	2000 hours	4000 hours
200□ F AND HIGHER (93□ C)	500 hours	1000 hours	2000 hours

* Please note that the oil can operate for 8000 hours @ 180□ F discharge temperature. However, the controller maximum oil life setting is 6000 hours.

Figure 7 Oil Change Interval

Reset this timer whenever oil is replaced. To adjust, press the □ key, and use the + or – keys to adjust the setting. When done, press the □ key again to save the new setting.

Adjustment menu – Diagnostics

NOTICE

These tests can be done only while the compressor is stopped.

This group provides a check of controller inputs and outputs. These steps may be an aid in some service and troubleshooting. To access this menu from the normal status display, press the + key four times to reach the ”Show settings” prompt, press the ▼ or ▲ key to select ”Diagnostics”, then press the + key one more time to display the password prompt. Press ▲▼ – + ▲▼ to enter the menu. Press the ▲ or ▼ button to select individual displays within the column. When done, press the – key to step back to the normal status display.

Test digital in

This provides a check of all the digital inputs to the DigiPilot controller. To check, press the + key to enter the submenu. Press the ▼ button to move to ”test digital out”, or press the – key to step back to the normal status display.

Dig in

Select the desired digital input by pressing the ▼ or ▲ keys. The lower line indicates whether the input is open or closed. When done, press the – key to return to the diagnostic menu.

Test digital out

This provides a check of all the digital outputs from the DigiPilot controller. To check, press the + key to enter the submenu. Press the ▼ button to move to ”test analog in”, or press the – key to step back to the normal status display.

Dig out

Select the desired digital output by pressing the ▼ or ▲ keys. The lower line indicates whether the output is on or off. All outputs are off while the compressor package is stopped. To manually control, press the □ key and use the + or – keys to change the output.

DANGER

The ”Dig out 1” starts the compressor to run at minimum speed (even if mA signal is 4 mA).

Test briefly, and return the output to off. When done, press the – key to return to the diagnostic menu.

Dig out 8

Select the digital input 8 by pressing the ▼ or ▲ keys. The lower line indicates 0% while the compressor is stopped. On the Vacon keypad, select display V14. This should be less than 4 mA. To manually control, press the □ key and use the + or – keys to change the output. Adjust to 100%; the Vacon display should indicate 20mA. Hold the – key, and adjust back to 0%. When done, press the – key to return to the diagnostic menu.

Test analog in

This provides a check of all the analog inputs to the DigiPilot controller. To check, press the + key to enter the submenu. Press the ▼ button to move to ”test displays”, or press the – key to step back to the normal status display.

Anal inp

Select the desired analog input by pressing the ▼ or ▲ keys. The lower line indicates the measurement in the controller’s native units. When done, press the – key to return to the diagnostic menu.

Test displays

This provides a check of all the lights and displays of the DigiPilot controller. To check, press the + key to start the test. Press the – key to stop the test. Press the ▼ button to move to ”test keyboard”, or press the – key to step back to the normal status display.

Test keyboard

This provides a check of all the keys of the DigiPilot controller. To check, press the + key to start the test. Press individual keys; the display acknowledges each that is working okay. Press both ▼and ▲ simultaneously to exit the test. Press the ▼ button to move to ”test digital in”, or press the – key to step back to the normal status display.

CAUTION

The startup report contains a complete listing of all DigiPilot adjustments, both during manufacturing and during machine commissioning. Do not alter these, except as directed in the steps above

Other Control Features

Auto Restart After Power Failure

The DigiPilot controller normally displays ”Ready to start” after power has been interrupted and restored. Press the green start button to restart compressor operation.

If programmed for automatic restart, the DigiPilot will recall what it had been doing prior to the interruption. If it was manually stopped or faulted prior to the interruption, it will display ”Ready to start” after power has been interrupted and restored. Press the green start button to restart compressor operation. If the compressor was operating prior to the interruption (whether running or standby), it will proceed to place itself back into operation.

The DigiPilot controller first pauses to ensure that power is completely restored and stable. This time is adjustable in the programming steps noted above. This must be at least 20 seconds, but may be set longer to allow other plant loads to start up first. After the pause is complete, the DigiPilot controller resumes automatic operation.

Operation with other Compressors

The DigiPilot will function well with other compressors controlled by AUTO SENTRY□ ES+, RS2000, or AIRPILOT+ controllers. For operation as a system, pipe all compressors into a common header and provide adequate air storage volume to minimize starting and stopping during transient demands. The companion packages should be less than 80% capacity of the EGE for stable operation. This may be a single compressor package, or a group of packages operating as a sequenced system. Refer to the AUTO SENTRY Operating Instructions for a complete description of the sequencing operation.

When used with a package controlled with an AUTO SENTRY ES+ controller, set its ”IV CONTROL MODE” to ”LOAD/UNLOAD”. When used with RS2000, or AIRPILOT+ controllers, adjust their pilot controls (if present) so that the packages run in load/unload mode. This ensures that the variable speed package will always serve as a trim unit, and the companions will always be used in their most efficient modes. Besides improving efficiency, the variable speed unit also reduces the number of starts and stops of the base load unit(s).

Adjust the ”RESET PRESSURE” or ”LOAD PRESSURE” of the companion unit(s) to 1–2 psi above the minimum desired pressure. The air storage will service any increase in demand when the pressure drops below this, and added units are started. Adjust the ”SET PRESSURE” or ”UNLOAD PRESSURE” of a single companion unit to 1–2 psi below the maximum desired pressure, or sequenced units equal to the maximum. Adjust the P.load of the EGE to the midpoint of these two pressures. Adjust the P.unload of the EGE to the maximum desired pressure.

The DigiPilot will always attempt to match delivery to the demand, and maintain pressure near the center of the programmed pressure band. If its range is exceeded, an additional base load unit will automatically be added or unloaded, and the DigiPilot will once again be able to maintain the flow and pressure.

For example, imagine a system requiring 85–100 psig, 0–600 CFM. This will be served with a single variable–speed unit rated 400 CFM, and three RS2000 controlled units rated 300 CFM each. The RS2000 units are adjusted to 90/100 psig and operated in sequence. The variable–speed package is adjusted to 95/105 psig. Figure 8, page 21, illustrates the operation of this system for all demands from 0 to 1300 CFM. While operating in any of the stable

states in the center column, the DigiPilot will continuously adjust its delivery to maintain a "cruising" pressure of 95 psig. If its range is exceeded, the pressure falls to 90 psig and another base unit is added. If the demand drops below the range in one of these states, the pressure rises towards 100 psig, and a base unit is unloaded. Note that there is about 25 CFM difference in the loading and unloading flows to prevent short-cycling of base units if the demand is hovering near a step.

As with any good design, a complete analysis of the compressor room's demands must be done before specifying the packages. The variable speed package maintains excellent operating efficiency, and eliminates the frequent pressure fluctuations of a traditional load/unload system. Note that the growth capability is also provided, as another base unit may simply be added to the sequence deck for reserve or for increased demand.

The DigiPilot may be used with other compressor types or non-cascading systems in a similar manner. Refer to the manufacturer's instructions for setup and adjustment.

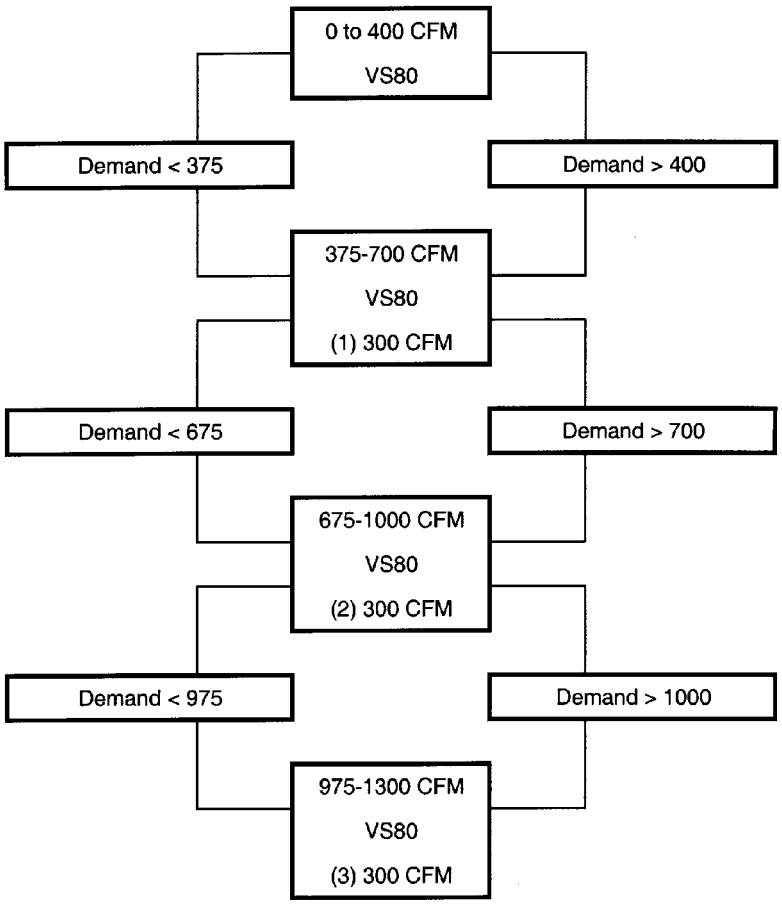

Figure 8 Multi Unit Flow Chart

Connection to External Controls

The DigiPilot controller offers interconnection points for external controls and indicators. This allows simple connection to remote controls and indicators, or integration into any plant–wide controls system.

Remote On / Off

Remote on–off control of the system requires only a simple two–wire control, with an isolated contact. This may be a switch, a timer contact, a relay contact, or a PLC output. To connect, simply run the two wires to the control enclosure, remove the jumper between terminal 22 and terminal 30 on the terminal strip, and connect the two wires to terminal 22 and terminal 30. Proceed through adjustments to Adjustment menu > Machine config.>Start ctrl. Change this to ETN for external control.

Compressor operation will now be controlled by the external contact. To start operation, the contact must first be open. When it closes, automatic operation is enabled, and the compressor will operate appropriately as long as the contact remains closed. When it is opened, the compressor will pass through unloading and blowdown as required, and will stop operating.

The start key on the keypad will no function while Start ctrl is set to ETN. The stop button will stop a running compressor, but it will be automatically started by remote controls when the contact opens and re–closes

WARNING

Automatic restarting or electrical shock can cause injury or death. Open and lock main disconnect and any other circuits before servicing unit.

Alarm Relay

The DigiPilot controller is provided with an alarm relay which may be connected to a remote mounted indicator light, horn, or into a PLC input of a plant–wide control system. The relay is turned on whenever power is on and there are no active faults. It is turned off when there is a fault condition requiring service at the compressor, or power off conditions. The external connections from the controller are from an isolated form C (single–pole, double–throw) contact. This allows control of either a ”compressor okay” or a ”compressor shutdown” remote indicator.

To use this relay, connect the supply wire for the remote circuit to terminal 60 (relay common) on the terminal strip. Connect a wire to the indicator from either terminal 61 (normally open) or from terminal 62 (normally closed). Connect the other side of the indicator to its neutral.

Running signal

The DigiPilot controller is provided with a ”running” relay which may be connected to a remote mounted indicator light, horn, or into a PLC input of a plant–wide control system. The relay is turned on whenever the compressor is running. It is turned off when the compressor is manually stopped, when there is a fault condition requiring service at the compressor, or power off conditions. The external connections from the controller are from an isolated form C (single–pole, double–throw) contact. This allows control of either a ”compressor running” or a ”compressor not running” remote indicator.

To use this relay, connect the supply wire for the remote circuit to terminal 50 (relay common) on the terminal strip. Connect a wire to the indicator from either terminal 51 (normally open) or from terminal 52 (normally closed). Connect the other side of the indicator to its neutral.

Wiring Diagrams

Refer to the wiring diagram with the spare part lists, pages 38 to 44.

Limiting Function

The controller has a built–in limiting function for max. and min. output, if the compressor is used in exceptional circumstances.

Current limiting

If motor current exceeds the constant maximum current for the motor or the frequency converter, the maximum frequency is limited or the minimum frequency is raised until current is within a safe range.
Possible causes: Low voltage or clogged filters.

Frequency converter protection

If the temperature of the frequency converter heat sink rises over the allowed limit, the maximum or minimum frequency is limited until the temperature drops to a safe value.
Possible causes: Overload, dirt, or high ambient temperature.

Motor protection:

If the compressor is running at maximum capacity and the ambient temperature is above 40°C, the maximum capacity is limited to approx. 90%. The compressor can now be operated in ambient temperatures up to 45°C.
The minimum capacity can be used for raising the minimum speed of rotation in order to improve the cooling of the motor in temperatures exceeding 40°C.

The limiting function may be activated if the cooler is dirty.

EGE
Startup and Maintenance – Variable Speed Package Date:

Company Name: _____

Address: _____

. _____

. _____

Machine S/N:_____ Machine Model:_____

Package nameplate:	Box nameplate:	VSD nameplate:
Code:_____	Drwg#_____	Type:_____
Year:_____	Date:_____	Sno:_____
Capacity: _____ CFM	Volt:_____V	Input:_____V
Max Press:_____ PSI	Freq:_____Hz	I1: _____A
Speed:_____ RPM	FL Cur:_____A	P1: _____KW
ElSupply:_____ V/H	MainMtr:_____A	IP:_____Type:_____

Main Motor Nameplate:	Fan Motor Nameplate (if applicable):
Motor Mfg:_____	Motor Mfg: _____
Serial No:_____	Serial No: _____
Model:_____	Model: _____
Nominal : 400V □ 87Hz_____	Nominal : 440V □ 60Hz_____
KW:_____ RPM:_____ A:_____	KW:_____ RPM:_____ A:_____

Check off the following, note any comments or deviations.

☐ 1– Application: What is the targeted pressure band?_____
Note other packages to co–ordinate, other control issues.

☐ 2– Overall inspection of package – repair as needed and take notes
- ☐ Overall appearance and condition of unit is good, except as noted.
- ☐ Ample space is provided around the compressor for air circulation, maintenance, and repairs.
- ☐ Surface supports the weight of the compressor
- ☐ Floor makes 100% contact with rails of compressor base
- ☐ Hold down bolts/capscrews properly torqued
- ☐ All pipe fittings and connections checked
- ☐ Pressure relief valve(s) installed where needed and properly sized
- ☐ Inlet piping is properly sized, inspected, and cleaned
- ☐ Inlet or air filter is properly sized and assembled
- ☐ Oil is filled to proper level
- ☐ Check for current operating manual, parts list, wiring diagrams

☐ 3– Water cooled units only
  ☐ Water shutoff valve installed
  ☐ Inlet water temperature between 60–90 DegF
  ☐ Piping sized for adequate flow rate
  ☐ Water PSIG between 40–75 PSIG at full flow rate
  ☐ Discharge water temperature=_____ DegF

☐ 4– Electrical Connections
  ☐ Wiring checked per print and machine properly grounded
  ☐ All connections checked for tightness and good contact

☐ 5– Check airend sheave for proper drive ratio:

100 psig – 236/150 (9.3/5.9 in dia)	150 psig – 236/170 (9.3/6.7 in dia)
125 psig – 236/150 (9.3/5.9 in dia)	175 psig – 200/170 (7.9/6.7 in dia)

☐ 6– Record all adjustments and history from the Vacon Drive – initial

☐ 7– Check all adjustments against recommended settings

☐ 8– Record all adjustments and history from the DigiPilot – initial

☐ 9– Check all adjustments against recommended settings

☐ 10– Set DigiPilot clock to local time

☐ 11– Adjust DigiPilot pressures and Vacon speeds for application

100 psig – 20–111Hz	150 psig – 25–109Hz
125 psig – 20–107Hz	175 psig – 33–111Hz

☐ 12– Adjust DigiPilot Oil Change Interval for the Oil used:

AEON 2000	2000 hours
AEON 4000	4000 hours
AEON 6000FG	4000 hours
AEON 9000	6000 hours
AEON BIO	6000 hours

☐ 13– Check 4–20mA loop min & max. See DigiPilot: Adjustments/Diagnostics/TestDigitalOut/Dig out 8.

☐ 14– Only for units with a separate fan motor : Check fan rotation between 5–60 seconds of stop busy. Check that air flows up (not down) through cooler. Swap two phases at fan line contactor if required.

☐ 15– Start compressor. Check overall pressure stability after flow change, adjust DigiPilot P & I

☐ 16– Record all adjustments and history from the VS Drive – final

☐ 17– Record all adjustments and history from the DigiPilot – final

☐ 18– Describe application and installation conditions

☐ 19– Record measurements while stopped, light demand and heavy demand

☐ 20– Review the installation with owner personnel
- ☐ Correct operating procedures
- ☐ Safety precautions
- ☐ Recommended routine maintenance
- ☐ Controller adjustments
- ☐ Review sections of operating manual, parts list, wiring diagrams
- ☐ Leave a set of manuals and diagrams at the compressor
- ☐ Recommend Evacuator instead of timed drain

Started by: _____

Company Represented: _____

Customer contact: _____

Phone: _____

Owner Signature: _____

EGE Vacon Drive settings

Index	Variable Text	Value	Unit	Min	Max
P 3.1	MotorServiceSet	0 / No Set		0	1
P 3.2	Ref Scal Min Val	100psig – 20,00 125psig – 20,00 150psig – 25,00 175psig – 33,00	Hz	0,00	111,00
P 3.3	Ref Scal Max Val	100psig – 111,00 125psig – 107,00 150psig – 109,0 175psig – 111,00	Hz	0,00	320,00
P 3.4	ParametPassword	0		0	10000

P 3.1 Set interval for motor service interval counter

When the service interval counter resets to zero and the controller gives a service alarm, carry out the required service procedure. Then reset the service interval counter as follows:
Go to the relevant point in the menu. Depress the ▶ key to enter editing mode. The display will not show NO SET flashing. Change it to Set Time, use the Enter key to reset the service interval counter.
This function is disabled when the motor is running.

P 3.2 Minimum frequency

P 3.3 Maximum frequency

P 3.4 Password for hidden Parameter Menu (M2)

7, 8, 18 – 100psig DigiPilot Adjustments

Fault Log	nr.1		_____
	nr.2		_____
	nr.3		_____
	nr.4		_____
	nr.5		_____
	nr.6		_____
	nr.7		_____
	nr.8		_____
	nr.9		_____
	nr.10		_____

Timers	Runn.hrs		_____
	Load.hrs		_____
	Air fl tm	1500h–run hrs	_____
	Oil fl tm	1000h–run hrs	_____
	Oil sep tm	4000h–run hrs	_____
	Oil chg tm	OilChange–run hrs	_____

Operat.settings	P.unload		_____
		100psig:110psi	150psig:160psi
		125psig:135psi	175psig:185psi
	P.load		_____
		100psig:100psi	150psig:150psi
		125psig:125psi	175psig:175psi
	P.schedule	OFF	☐
	Press.schedule	Set Local Time	☐
	Run on tm	5m	☐
	Drain sp tm	1s	☐
	Drain dw tm	180s	☐

Show settings:	P.control	PIA	☐
	P.max		☐
		100psig:120psi	150psig:170psi
		125psig:145psi	175psig:195psi
	P.mc max		☐
		100psig:110psi	150psig:160psi
		125psig:135psi	175psig:185psi

	Outl trip	225°F	☐
	Outl alarm	212°F	☐
	Max.airtemp	212°F	☐
	Oil lev del	20s	☐
	Starts/hour	15	☐
	St–delt tm	2s	☐
	St–delt dl	50ms	☐
	Accel.tm	6s	☐
	Min unld tm	0s	☐
	Unld run tm	60s	☐
	Blow down tm	2s	☐
Machine config.	Auto start	OFF	☐
(– + ^ v – +)	Start ctrl	LOC	☐
	Press.ctrl	LOC	☐
	Mach.nr.	1	☐
	P.unit	PSI	☐
	T.unit	°F	☐
	Lang	English	☐
Regul settings	Min.value	0%	☐
(+ – v ^ + –)	P Factor	40%	☐
	I Factor	10%	☐
	D Factor	10%	☐
Service settings	Air fl tm	1500h–run hrs	_____
(^ v – + ^ v)	Oil fl tm	1000h–run hrs	_____
	Oil sep tm	4000h–run hrs	_____
	Oil chg tm	OilChange–run hrs	_____
Diagnostics@ 0psig, 81 / 91F			
(^ v – + ^ v)			
Test digital in	Dig in 1	CLSD	☐
	Dig in 2	OPEN	☐
	Dig in 3	OPEN	☐
	Dig in 4	OPEN	☐
	Dig in 5	OPEN	☐
	Dig in 6	CLSD	☐
	Dig in 7	CLSD	☐
	Dig in 8	CLSD	☐
Test digital out	Dig out 1	OFF	☐
	Dig out 2	OFF	☐
	Dig out 3	OFF	☐
	Dig out 4	OFF	☐
	Dig out 5	OFF	☐
	Dig out 6	OFF	☐
	Dig out 7	OFF	☐
	Dig out 8	0%	☐

		Adjust to 100%	☐
		V14 of Vacon 20mA	☐
		Adjust to 20%	☐
		V14 of Vacon <4mA	☐
		Adjust to 0%	☐
Test analog in	Anal inp 1	202	☐
	Anal inp 2	481	☐
	Anal inp 3	494	☐
	Anal inp 4	202	☐
	Test displays	Check	☐
	Test keyboard	Check	☐

20 –Record:		off	light demand	heavy demand
	Vab	_____V rms	_____V rms	_____V rms
	Vbc	_____V rms	_____V rms	_____V rms
	Vca	_____V rms	_____V rms	_____V rms
	Ia		_____A rms	_____A rms
	Ib		_____A rms	_____A rms
	Ic		_____A rms	_____A rms
	Onload %		_____%	_____%
	DP System Pressure		_____PSIG	_____PSIG
	DP Discharge Temp		_____DegF	_____DegF
	DP Reservoir Press		_____PSIG	_____PSIG
	DP Reservoir Temp		_____DegF	_____DegF
V1.1	Output frequency		_____Hertz	_____Hertz
V1.3	Motor speed		_____RPM	_____RPM
V1.4	Motor current		_____Amps	_____Amps
V1.7	Motor voltage		_____Volts	_____Volts
V1.8	DC–link voltage		_____Volts	_____Volts
V1.9	Unit temperature		_____□C	_____□C
V1.10	Current Input		_____mAmp	_____mAmp
	Ambient Temp		_____DegF	_____DegF

Notes: