



Operation
Manual

control The logo for controlDEK features the word "control" in a black, sans-serif font, followed by a blue square containing a white right-pointing arrow, and then the letters "DEK" in a bold, blue, sans-serif font.

Programmable Logic Controller

controlDEK

OPERATION MANUAL

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CUSTOMER SERVICE

Contact information



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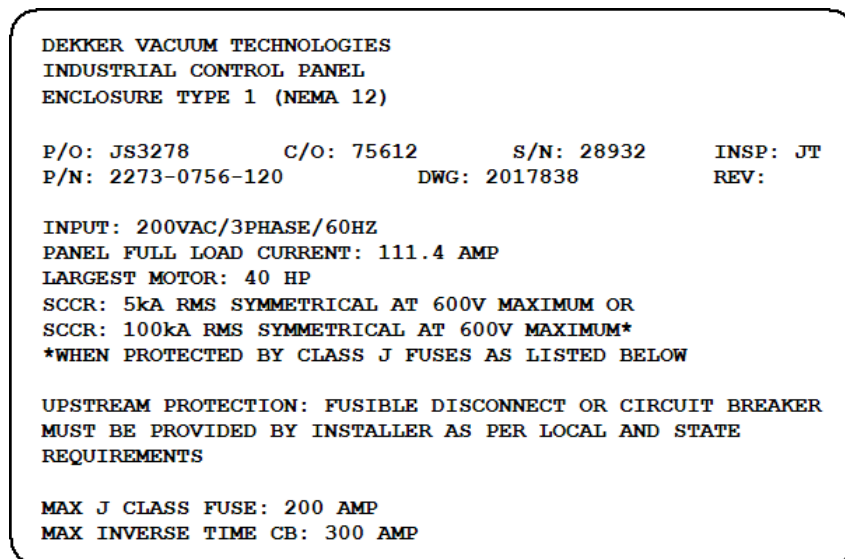
Bus. Hours: 7:30 a.m. – 4:30 p.m. CST

Website: www.DEKKERvacuum.com

E-mail: AfterSales_Support@DEKKERvacuum.com

Order Information

When calling for service, parts or system information always have the pump or system model number and serial number(s) ready. Refer to the bill of lading or the gold-colored system information plate attached to the system (see image below).



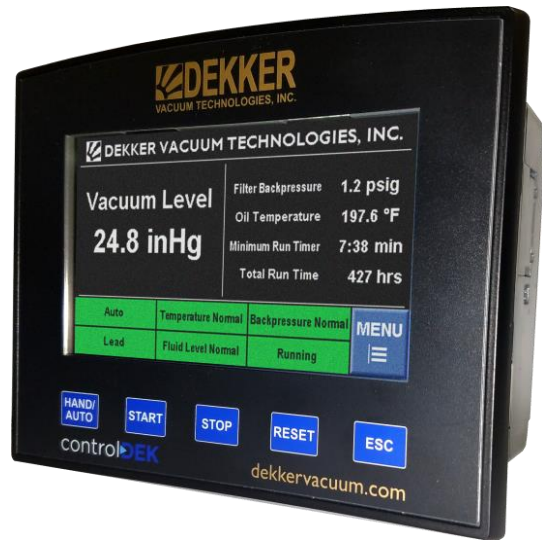
Control panel nameplate label

Parts should be purchased from the nearest authorized DEKKER Vacuum Technologies, Inc. (hereafter referred to as DEKKER) representative (visit www.dekkervacuum.com to find a distributor near you via the [Distributor Locator](#)) or from the vacuum pump system supplier. If, for any reason parts, cannot be obtained in this manner, contact the factory directly.

INTRODUCTION

The ControlDEK PLC is a combination PLC and HMI mounted on the door of the panel. The ControlDEK panel may include expansion I/O which is located inside the panel on the backplane. The standard ControlDEK panel is designed for a Simplex system, but can be easily expanded. A Duplex system would have two ControlDEK panels; a Triplex System would have three ControlDEK panels.

The screen displays can be broken down into four categories: 1) process screen, 2) menu screens, 3) system screens, and 4) setup screens. Each group is described separately, below.



THE PROCESS SCREEN

The Process Screen provides an overview of the unit operation as a whole. The process screen also displays a number of important process variables.



1	System Vacuum Level
2	Circulation Pump Pressure (if equipped)
3	Oil (Seal Fluid) Temperature
4	Filter Backpressure
5	Minimum Run Timer
6	Total Run Time
7	Vacuum Setpoint (VFD only)
8	Hand/Auto Switch Status
9	Seal Fluid Temperature Status
10	Backpressure Status
11	Lead/Lag Status
12	Fluid Level Status (if equipped)
13	Motor Starter Status
14	Menu Soft Button
15	Hand/Auto Button
16	Start Button
17	Stop Button
18	Reset Button
19	ESC Button

The system vacuum level (1) is featured prominently on this screen along with Circulation Pump Pressure (if equipped) (2), Oil Temperature (3), Filter Backpressure (4), Minimum Run Timer (5), and Total Run Time (6). If equipped with a VFD, the Vacuum Setpoint (7) for the VFD is also displayed. The vacuum set point can be changed by touching the set point numeric value, which will bring up an editor screen.

Quick Status/Alarm Indicators

Along the bottom of the process screen are six status and alarm indicators. These indicators provide an at a glance view of system status. For each indicator, normal status is displayed in green; warning status is displayed in yellow; and fault status is displayed in red.

Hand/Auto Switch Status Indicator

The top-left status indicator is the Hand/Auto Switch indicator (8). It simply indicates whether the panel is set to Hand or Auto. Pressing the HAND/AUTO button (15) will change this status indicator. Hand mode is displayed in orange; Auto mode is displayed in green.

Temperature Status Indicator

The top-middle status indicator is the Seal Fluid Temperature Status indicator (9). This indicator displays temperature status measured by the RTD. The temperature status is based on the set points within the set points menu. This indicator displays a High Temperature in yellow for Warning; and a High Temperature in red for a Fault.

Backpressure Status Indicator

The top-right status indicator is the Backpressure Status indicator (10). This indicator displays backpressure status as measured by a transducer. The backpressure status is based on the set points within the set points menu. This indicator displays a Backpressure High in yellow for a Warning; and a Backpressure High in red for a Fault.

Lead/Lag Status Indicator

The bottom-left status indicator is the Lead/Lag Status indicator (11). This indicator displays the lead/lag status for a multiplex system. A simplex machine will show Lead status when placed in auto mode. Lead, 1st Lag, and 2nd Lag are displayed in green. In addition, this indicator will display Hand in orange if the machine is in Hand mode, and Fault in red if the machine is faulted.

Fluid Level Status Indicator

The bottom-middle status indicator is the Fluid Level Status indicator (12). This indicator displays the fluid level status based on level switch inputs. If the Low Level Switch opens, the indicator displays Low Level Fault in red. If the High Level Switch opens, the indicator displays High Level Fault in red. If neither switch is equipped, the indicator will always display Fluid Level Normal in green.

Motor Starter Status Indicator

The bottom-right status indicator is the Motor Starter Status indicator (13). This indicator displays faults related to the motor starter. The motor starter statuses are as follows:

- Status Normal – There are no motor faults and the unit has not been started.
- No Contact – The motor contactor has been sent a start command, but has not started.
- VFD Failed to Start – The VFD has been sent a start command, but has not started.
- Motor Overload – The Motor Overload has tripped.
- VFD Fault – A fault has occurred on the VFD.
- Running – The Motor is running.
- Standby – The controller is set to Auto mode, but there is not demand for vacuum.
- Circ Pump Overload – The Circulation Pump Motor Overload has tripped.
- Fan Overload – The Fan Motor Overload has tripped.

THE MENU SCREENS

There are two menu screens: 1) System Menu and 2) Setup Menu. The System Menu contains navigation buttons to the various process and alarm screens, while the Setup Menu contains navigation buttons to the setting screens.

The ESC button (19) on any screen will take the operator back to the process screen. Pressing “<--” will return the operator to the previous screen. The operator may switch between the two menu screens using the System Menu and Setup Menu navigation buttons on the menu screens.

System Menu			
Process Data	Network Data	Alarms	
Trends	Historical Trends	VFD Data	
Dekker Info	Reset Default	Factory Setup	Setup Menu

Setup Menu			
Process Setpoints	Vacuum Setpoints (Lead/Lag)	Vacuum Adjust	Customer Modbus Settings
Multiplex Pump Rotation Schedule	Multiplex Addressing	PID Loop Tuning (VFD Control)	
Dekker Info	SD Card	System Time & Date	System Menu

THE SYSTEM SCREENS

The system screens are used to view various settings and parameters of the unit. There are up to six screens, each used to view a different aspect of the unit.

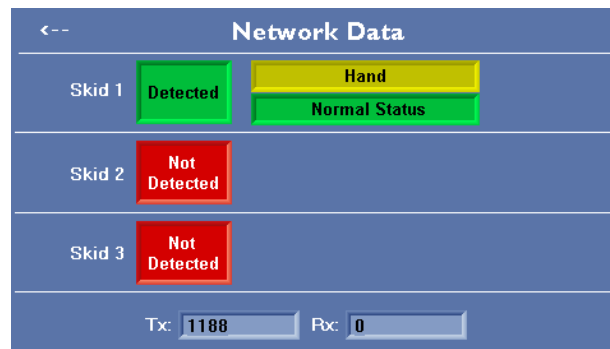
Process Data

The Process Data button brings the operator back to the Process Screen. The Process Screen is described in detail on page 5 of this manual.

Network Data

The ControlDEK panels have been designed as expandable simplex systems. This means that panels can be networked together via CANbus to expand to duplex or triplex system.

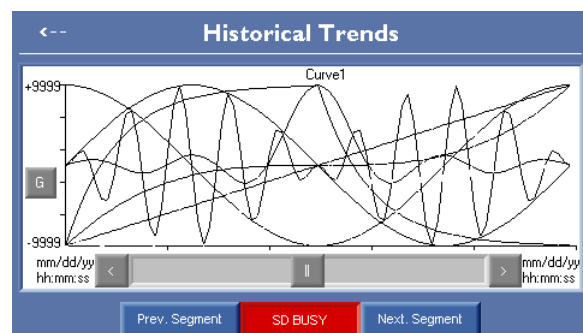
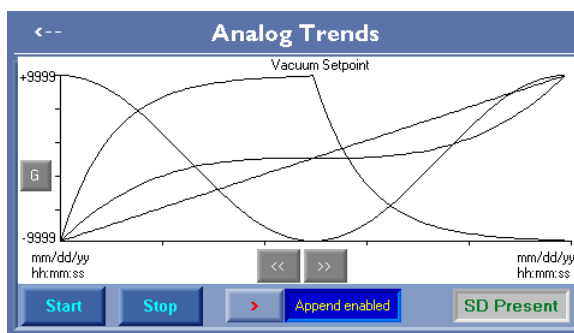
The Network Data screen displays a simple status of all ControlDEK controllers connected via the CANbus network. On a simplex system, Skid 2 and Skid 3 will display as Not Detected.



Trends/Historical Trends

The Trends and Historical Trends screens both display the vacuum set point, vacuum level, backpressure, and seal temperature. An operator can press the G or M button to switch between the data gathering and data browsing modes. In the browsing mode, the operator can use the Forward (>>) and Backward (<<) buttons to scroll through the data in the PLC buffer.

The PLC buffer is not large enough to store weeks or months of trend data, however, the PLC features historical trending where the data is written to an onboard SD card.



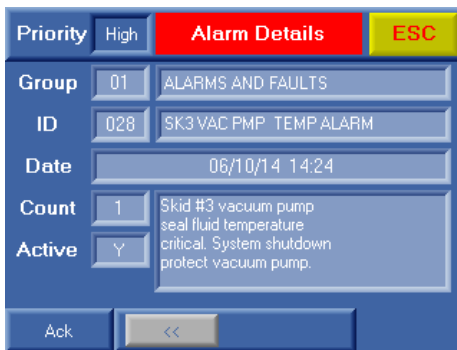
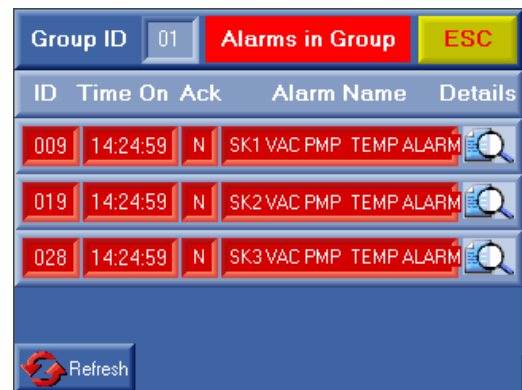
Alarms

The Alarm screen can be called into view via the System Menu screen.



The count value indicates how many alarms are active. To see a listing of the alarms for a group, press the magnifying glass symbol on the group banner. This will bring up the Alarms in Group screen.

The Alarms in Group screen will list the individual alarms for the group. Each alarm is listed with an ID, Time On (elapsed time of active alarm), Ack (alarm acknowledgement), and Alarm Name. The magnifying glass symbol on an alarm banner will open the Alarm Details screen, which provides details for an individual alarm.



The Alarm Details screen shows all information about the chosen alarm. The Group, Group Name, ID, Alarm Name, Timestamp, Count, Active State and Alarm Description are shown. There is also an Acknowledge button at the bottom of the screen.

If multiple alarms exist, a set of navigation buttons are displayed allowing the operator to scroll between alarms.

VFD Data (if equipped)

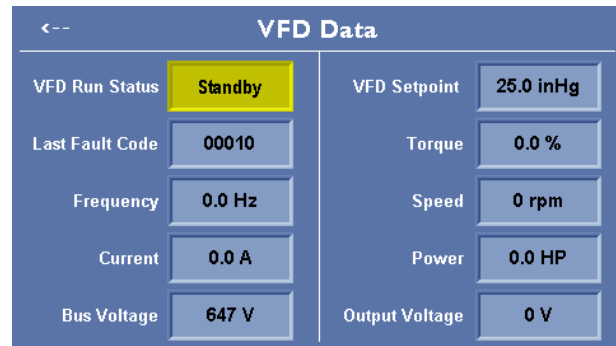
In systems that include a Variable Frequency Drive, the VFD Data screen is available. The VFD data screen shows various parameters gathered from the Drive. The parameters are VFD Run Status, VFD set point, Last Fault Code, Torque, Frequency, Speed, Current, Power, Bus Voltage, and Output Voltage.

VFD Run Status

VFD Run Status displays the run status of the Drive. The available statuses are VFD Off, VFD Running, VFD Fault, Standby, or Hand.

VFD Setpoint

Rather than running off of Lead and Lag set points, the VFD systems target a specific set point. The VFD speed will be adjusted based on the relation between the actual vacuum level and the VFD set point.



VFD Data	
VFD Run Status	Standby
Last Fault Code	00010
Frequency	0.0 Hz
Current	0.0 A
Bus Voltage	647 V
VFD Setpoint	25.0 inHg
Torque	0.0 %
Speed	0 rpm
Power	0.0 HP
Output Voltage	0 V

Last Fault Code

This is the last code communicated by the VFD. This fault code can help with troubleshooting if the VFD is faulted. On its own the fault code does not present any concerns.

Torque

The torque load of the motor measured in percent (%).

Frequency

The current speed of the motor measured in Hertz (Hz).

Speed

The current speed of the motor in rotations per minute (rpm).

Current

The current in amps (A) being drawn by the motor.

Power

The current power consumption of the motor in horsepower (HP).

Bus Voltage

The voltage of the drive's DC Voltage bus.

Output Voltage

The output voltage of the drive. This is the effective input voltage to the motor.

THE SETUP SCREENS

The setup screens are used to configure the vacuum system to run as needed in the customer facility. There are a maximum of seven screens, each used to define a different aspect of system performance.

Process Setpoints

This screen allows the warning and alarm setpoints to be set for the seal fluid temperature and pump backpressure.

The warning is solely to alert operators that the temperature or backpressure is above normal. A warning will not shut down the unit.

An alarm is a shutdown event. If an alarm condition occurs, the cause of the alarm should be investigated before the alarm is cleared and the unit restarted.

The screenshot shows the 'Process Setpoints' screen with a back arrow in the top left. It contains four input fields arranged in a 2x2 grid. The top row shows 'Backpressure Warning Setpoint' at 5.0 psig and 'Oil Temperature Warning Setpoint' at 210.0 °F. The bottom row shows 'Backpressure Alarm Setpoint' at 8.0 psig and 'Oil Temperature Alarm Setpoint' at 225.0 °F. At the bottom, there is a note: 'Use this screen to set the warning and alarm setpoints. These setpoints must be set on each controller.'

Vacuum Setpoints (Lead/Lag)

This screen displays the vacuum setpoints for adding and dropping pumps in response to vacuum demand. If the installed system is Simplex, only the Lead Pump values are needed.

When the system vacuum falls below the Lead Pump On level, the lead pump will come on line. The lead pump remains running until the system vacuum reaches the Lead Pump Off set point, assuming the pump has been running for ten minutes. The Lag 1 and Lag 2 set points are the same as the lead set points, only set at a shallower vacuum level than the lead pump.

If the system vacuum is below the Lag 2 Pump On set point, all three pumps will start. Each pump will be turned off when its respective pump off set point has been reached, assuming the ten minute minimum run timer has been reached.

NOTE: The vacuum pump off set points must be below the maximum vacuum that the system can achieve. If not, pump(s) may remain running and never stop.

The screenshot shows the 'Multiplex Vacuum Setpoints' screen with a back arrow in the top left. It contains six input fields arranged in three rows and two columns. The first row shows 'Lead Pump On' at 21.5 inHg and 'Lead Pump Off' at 23.5 inHg. The second row shows 'Lag 1 Pump On' at 21.0 inHg and 'Lag 1 Pump Off' at 23.0 inHg. The third row shows 'Lag 2 Pump On' at 20.5 inHg and 'Lag 2 Pump Off' at 22.5 inHg. At the bottom, there is a note: 'Set Vacuum Cut In and Vacuum Cut Out Setpoints for Multiplex Operation. These setpoints only need to be set on one controller all settings are transferred.'

Vacuum Adjust

The Vacuum Adjust screen allows the operator to adjust the system vacuum. The vacuum adjust value will be added to the system vacuum as measured by the PLC. If the PLC is reading a vacuum level of 18.7" Hg, a value of 2" HgV on the Vacuum Adjust screen would change the PLC reading to 20.7" Hg.

The screenshot shows the 'Vacuum Adjustment' screen with a back arrow in the top left. In the center, there is a large input field containing the value '0.0 HgV'. At the bottom, there is a note: 'Use this screen to adjust for small variations in altitude or match a gauge.'

Customer Modbus Settings

The Customer Modbus screen allows the operator to adjust the PLC Modbus settings. The Modbus settings screen is always available whether or not Modbus is actually available.

Customer Modbus Settings

Modbus Address, 1-255 13

The customer can assign Modbus addresses compatible with their network to each skid.

Modbus Baud Rate 115200

The customer Modbus communications parameters are 8 data bits, 1 stop bit, no parity. Baud rate may be selected above.

System Time and Date

The Time and Date screen serves two functions. The first is to allow the operator to set the PLC real time clock date and time. The second is to sync the time across all networked controllers.

Set PLC Real Time Clock

11/17/17 10:30:45

Set Current Time and Date (Time= Military)

11/17/17 10:30:49

Sync Current Time and Date Data to all connected controllers.

Pump Rotation Schedule

The Pump Rotation Schedule screen allows the operator to set the pump rotation. A pump rotation will occur at the selected time on the selected days. The time is entered as 24 hour time. In addition, this screen shows at a glance Lead/Lag status of the specific pump.

NOTE: Rotation is based on Run Hours. If Run Hours are already balanced, rotation will not occur.

Pump Rotation Schedule

SUN	MON	TUE
WED	THU	FRI
SAT		

Rotation Time (Military) 22:00

Lead

Rotation is based on Run Hours. If Run Hours are already balanced, Rotation will not occur.

Multiplex Addressing

The Multiplex Addressing screen allows the operator to set the ID of each pump for multiplex operation. From the factory, all simplex pumps are set to an ID of 1. If two simplex machines are connected as a duplex, one of the pumps will need to be changed to an ID of 2.

NOTE: If two pumps share the same Skid ID multiplex operation will not function properly.

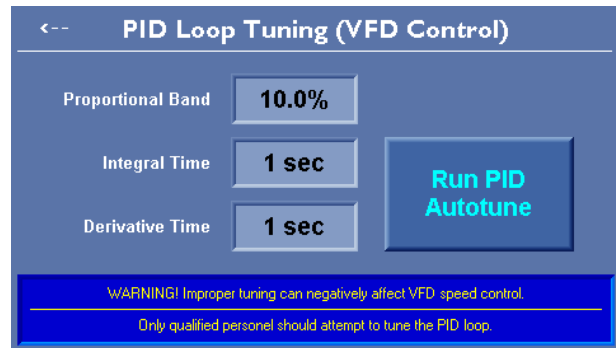
Skid ID (Multiplex System)

Skid ID 1

Assign the first skid an ID of 1.
Assign the second skid an ID of 2.
Assign the third skid an ID of 3.

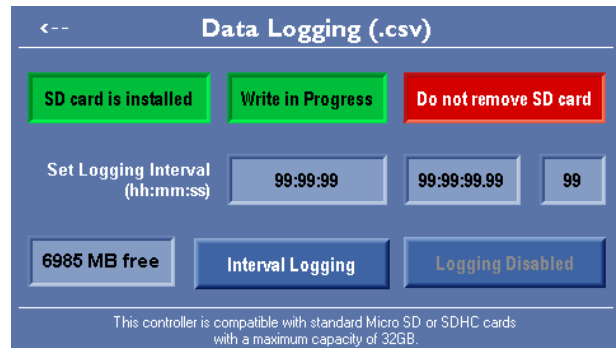
PID Loop Tuning (if VFD equipped)

This PID Loop Tuning screen is an adjustment for the PID control of the VFD. In order to optimize the VFD control for the customer facility, the Run PID Autotune button can be used. Aside from the PID Autotune, these settings should typically not need adjustment.



SD Card

Each ControlIDEK PLC includes a MicroSD card. The software is set to log data to a CSV file on the included MicroSD card. The Data Log for the ControlIDEK PLC can be set for **Events Only** or **Interval Logging**. Interval Logging writes a line of data at a user set interval. In addition, interval logging will write a line of data for any of the event triggers. Events Only logging will write data only at Event Triggers. Events Only logging is often times easier to read, but may not offer enough information to determine why a fault occurred.



For example: The Events Only log shows that a High Temperature Warning and High Temperature Alarm occurred, but does not show the information leading up to those faults. Interval logs show all of this data.

Editing Values

Any editable HMI field has an associated editor screen that will pop up when the editable field is touched. An example editor screen is shown here. The Esc button will close the editor without accepting an entered value. The arrow keys will reposition the cursor to allow entry at a particular location. Pressing the enter key after entering a valid value will close the editor and update the HMI field and associated PLC register.

Several fields have limits that prevent entry of values that are outside of a valid range. If an invalid value is entered, the editor will not close and the display will revert to the previous value.

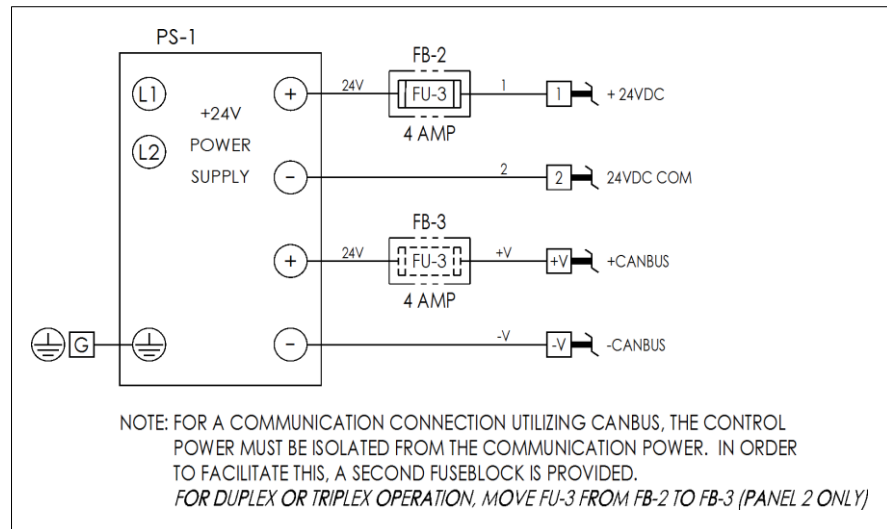


MULTIPLEX SYSTEMS

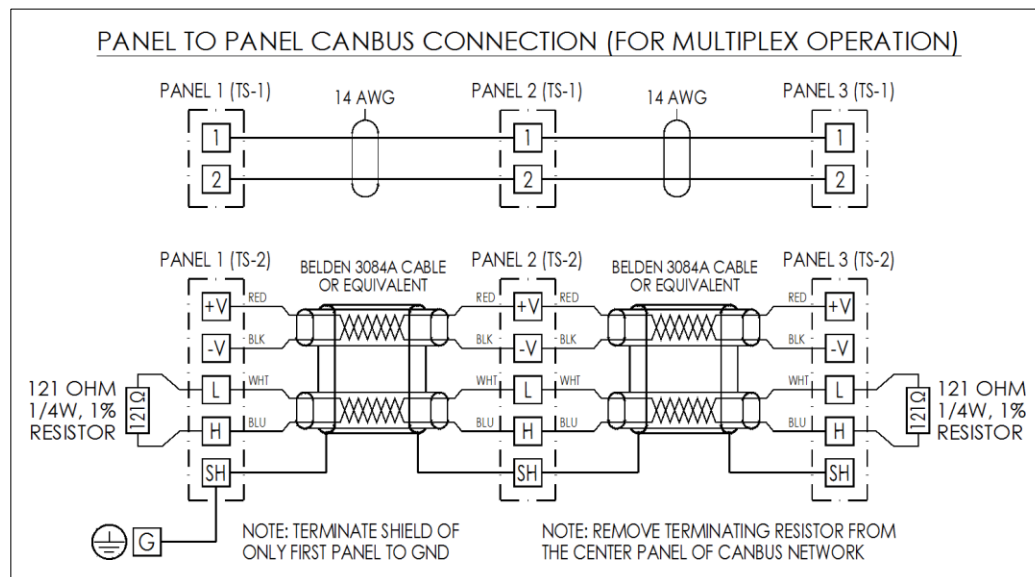
The ControlDEK controller was designed for expandable simplex vacuum systems. The ControlDEK can be ordered as a simplex, duplex, or triplex system. A duplex system would include two ControlDEK panels, and a triplex would include three ControlDEK panels. Due to this design, a simplex can be expanded in the field by adding up to two more simplex systems and networking the controllers together.

Multiplex Wiring

In order to multiplex ControlDEK panels, certain considerations need to be made. Each ControlDEK panel would require its own power feed, and wiring needs to be added in between panels. The ControlDEK controllers communicate with each other using CANbus. For a communication connection utilizing CANbus, the control power must be isolated from the communication power. In order to facilitate this, an extra fuse block is provided. In one panel of a duplex or triplex system, the power supply output fuse should be moved from the control fuse block to the communication fuse block.



In addition the installer must add wiring in between the panels. The CANbus terminals are labeled as "H", "L", "V+", "V-", and "SH". These terminals must be connected together for each panel. As well as terminals "1" and "2".



Controller Multiplex Setup

When operating as a Duplex or Triplex system, the ControlDEK requires an ID to be assigned to each pump controller. Within the setup menu select the Multiplex Addressing menu. Each pump controller requires a unique ID. Pump 1 should be set to an ID of 1, Pump 2 should be set to an ID of 2, and Pump 3 should be set to an ID of 3.