



SMART DRYKEEP INSTALLATION, COMMISSIONING, OPERATION, MAINTENANCE AND DRAWING MANUAL FOR 60HZ UNITS

Moisture is the enemy.... DryKeep® is the answer.

We reserve the right to make changes to any described details and technical data contained herein. Continuous product enhancement by DryKeep® and local conditions may result in deviations from this standard product installation.

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INSTALLATION INTRODUCTION

DryKeep® is shipped from the factory fully assembled as shown in figure 1 below.



Although not shown, the installation for the single cylinder model SMART RT-3 is exactly the same.

Figure 1: DryKeep® system layout

The cylinders are factory filled with transformer oil and molecular sieve adsorbent beads. The unit can be mounted as received, or the cylinders can be removed prior to mounting to lighten the load and ease the installation process. The rest of the components are to be left on the framework. The DryKeep® system must be mounted vertically with inlet valve and the pump located at the bottom and de-aerator at the top. (Refer to Figure 1).

The installed location of DryKeep® is flexible. It can be installed wherever the customer prefers. For simple installation and optimal performance, DryKeep® should be installed as close to the transformer as possible. Some users elect to bolt or tack-weld the DryKeep® frame directly to the transformer tank as shown in Figure 2 below. Other options include hanging the DryKeep® frame on a wall near the transformer or securing the DryKeep® frame to a stand-alone frame adjacent to the transformer as shown in Figure 3. Contact DryKeep® USA for a recommended fabrication drawing. This remote, stand-alone frame is usually lag bolted to the concrete pad. If the optional climate-control enclosure is furnished, it is a free-standing enclosure which can also be lag bolted to a concrete pad.



Figure 2: DryKeep® installed directly on transformer



Figure 3: Installation adjacent to transformer on customer-fabricated free-standing frame

NOTE: We suggest that when installing the DryKeep® system on to a reactor that it be mounted on a free-standing frame or an adjacent structure due to possible vibration influence on pipe work and connections. If mounted directly to the reactor structure, use vibration dampers. Contact us for further details.

MECHANICAL CONNECTIONS (FOR TRANSFORMERS IN-SERVICE):

For safety purposes, the transformer should be switched off and made safe before installation commences.

- 1) Upon receipt at the installation site, remove the top of the shipping crate and unscrew the four (4) 1½" lag screws used to bolt the DryKeep® frame to the shipping crate. *Units with optional free-standing enclosures are not bolted to the crate.*
- 2) Remove the system from the shipping crate and install the DryKeep® on the transformer, free-standing frame, wall or other structure, or position the optional free standing enclosure to the location desired. *LED stack lights ship inside SMART enclosure. Remove cap from top of SMART enclosure, install stack lights, and install cap on top of stack lights.*
- 3) *Refer to Figures 1, 4, and 5.* To connect DryKeep® to the transformer, first remove the shipping plugs from the DryKeep® inlet and outlet valves.
- 4) Select the transformer drain or other valve located at the bottom of the transformer to connect a supply hose to the DryKeep inlet valve. Select the transformer fill valve or other valve located at the top of the transformer main tank to connect a return hose from the DryKeep outlet valve back to the transformer. The return point should be as far away from the supply point as possible and **must be below the top oil line**. Most transformer valves have a threaded center plug that can be removed to connect the supply and return hoses. If the transformer valve flanges do not have a center plug, remove the existing flange and replace with flange adapters having a ½" NPT center hole. (Flange adapters can be provided with our optional installation kit and other installation arrangements are possible. Contact your rep or DryKeep for more information.)
- 5) Using two (2) static dissipative core tube, 304 stainless steel braided, PTFE hoses (not supplied), or other suitable hosing/piping, connect the bottom transformer valve to the DryKeep® inlet valve. To return the oil back to the transformer main tank, make a similar connection from the DryKeep outlet valve to the top transformer valve selected. *Optional climate-controlled enclosed units will need to have entry points drilled on the bottom and top of the right side of the enclosure. Use 1/2 in. stainless steel Liquidtight cord connector and wire mesh grips (not supplied) to route hoses through enclosure wall to the inlet and outlet valves.*



Figure 4: Connection from transformer to DryKeep® inlet valve.

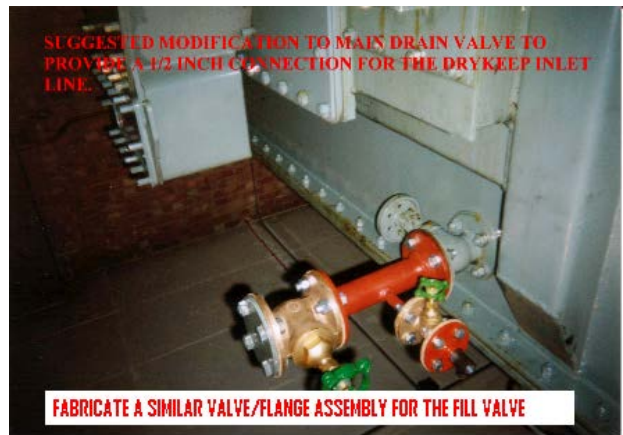


Figure 5: Drain valve adapted for DryKeep® installation

An optional installation kit containing ½" NPT flexible stainless steel braided PTFE hoses, flange adapters and fittings to connect to the transformer at the inlet and outlet is available. Contact DryKeep® USA for details.

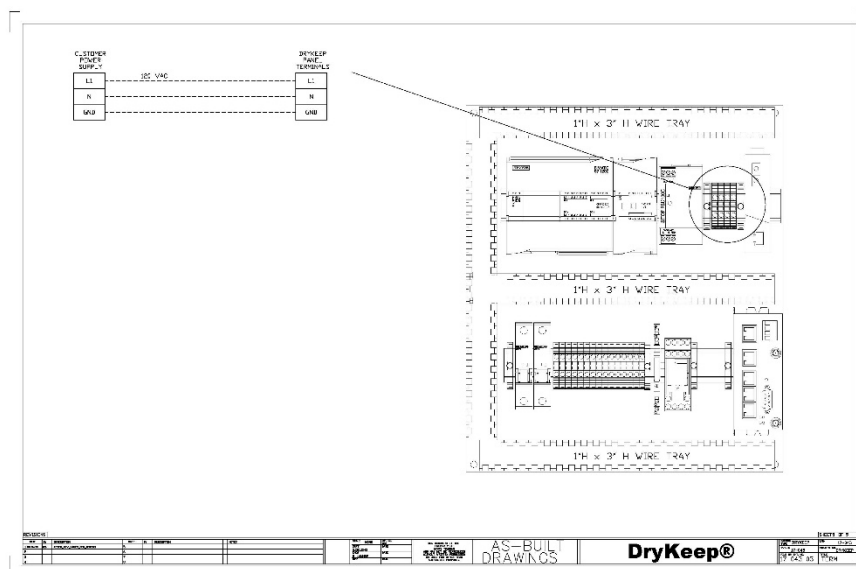
FOR TRANSFORMERS NOT IN SERVICE:

For transformers under repair and not containing oil, modifications can be made to the transformer tank to add entry and exit fittings for the DryKeep® system. The entry and exit fittings need to be diagonally apart from each other (i.e. if top left, then bottom right) to avoid re-circulating the just-dried oil. If this is not an option, DryKeep® can still be installed in the same manner as described above for a transformer in service by using the drain and fill valves of the transformer.

ELECTRICAL CONNECTIONS:

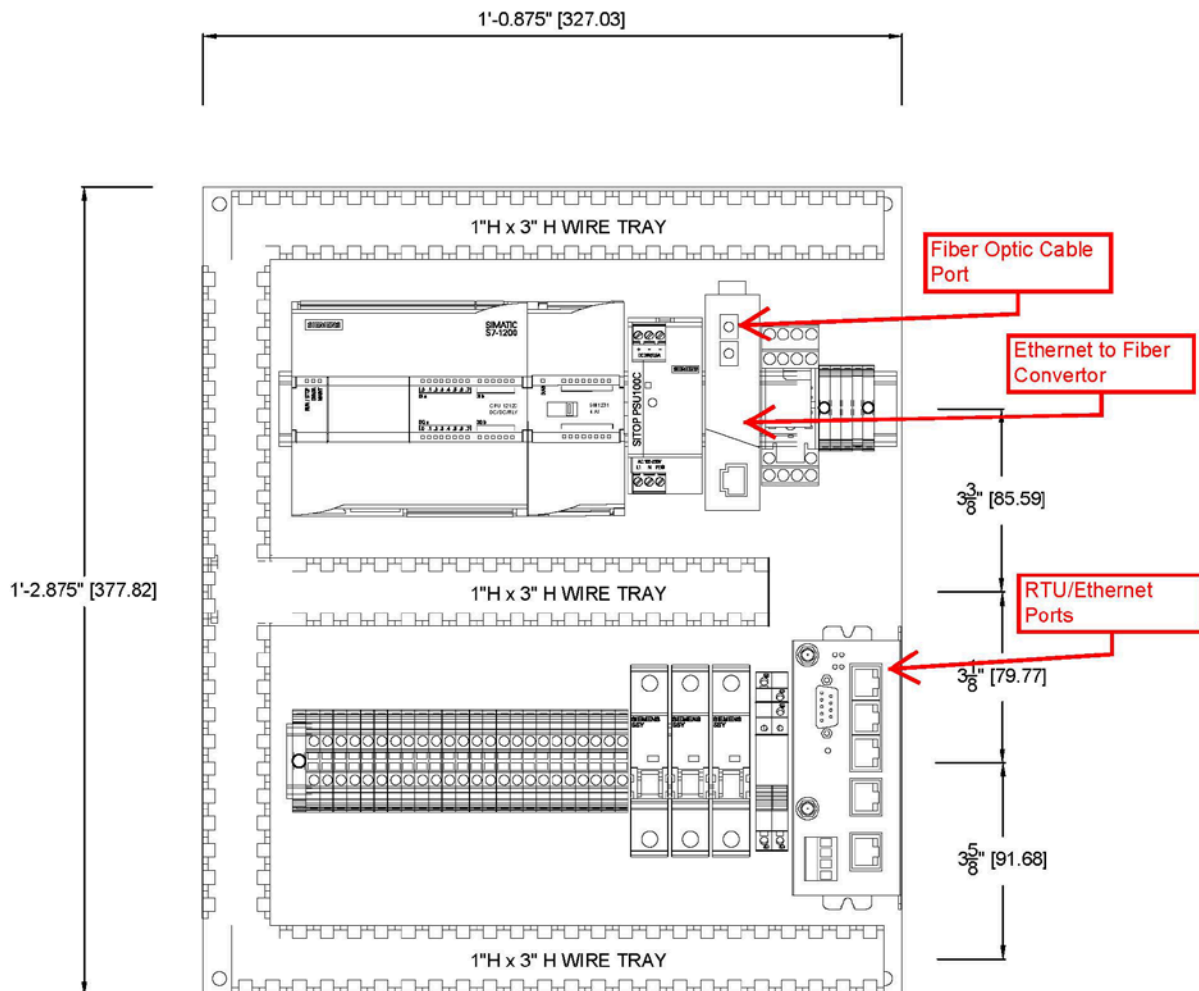
The DryKeep® SMART instrumentation components and pump are shipped internally pre-wired for operation. Only a single-phase 60 Hz, 115V (+/- 10%) AC power source needs to be provided. Full load current is 6.5 amps at 115 V, 60Hz. Units with optional climate control package require an additional three wire 240V (+/- 10%) AC power source. The full load current of the climate control package is 11.4 amps.

- 1) Remove the 4 screws in each corner and open the outside door of the instrumentation cabinet. *(Outside door is not supplied when unit is mounted inside the optional free-standing enclosure.)*
- 2) Remove the top-right and bottom right screws on inner swing panel with LCD screen to open inner swing panel. *Units with the optional free-standing enclosure will have the stack lights shipped uninstalled. The stack lights will be shipped inside the instrumentation cabinet. The stack light base is installed on the top-right of the free-standing enclosure and is pre-wired for operation. To install the stack lights, line up the arrow on the stack lights with the arrow on the mounting base, push down and turn.*
- 3) Drill a hole in the instrumentation cabinet sized to accommodate the conduit using the appropriately sized Liquidtight fitting (not supplied)**.
- 4) Refer to the supplied electrical wiring diagram. Connect the 115V (+/- 10%) AC power supply by removing wire duct cover and lay supply wire into the wire duct.
- 5) Connect 115V (+/- 10%) AC power supply ground wire to green/yellow ground terminal block.
- 6) Connect 115V (+/- 10%) AC power supply neutral wire to white terminal block labeled N.
- 7) Connect 115V (+/- 10%) AC power supply line wire to white terminal block labeled L1.



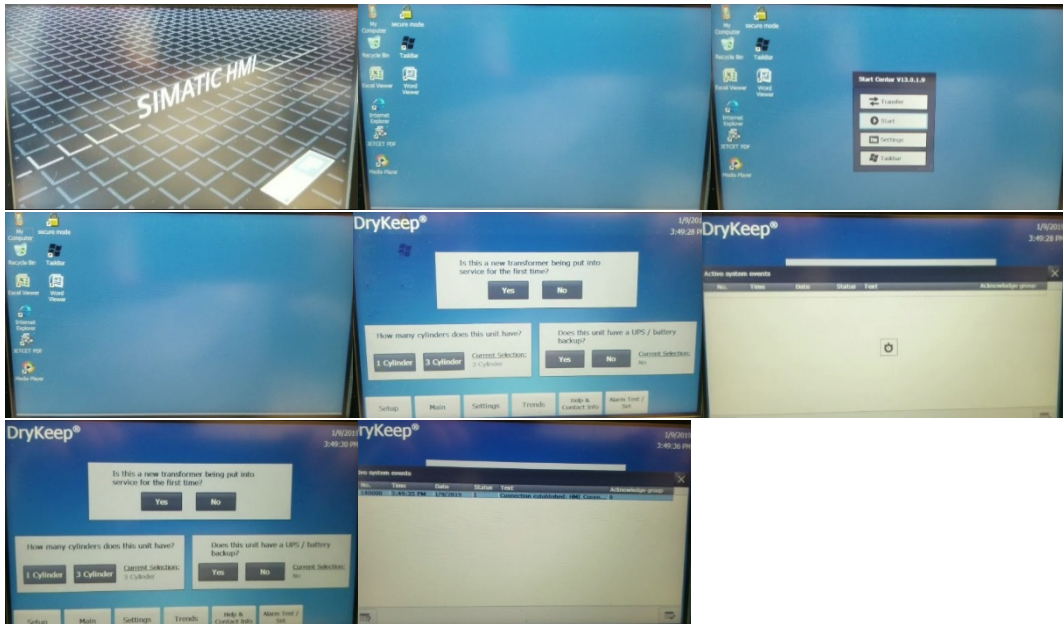
- 8) If connecting SMART DryKeep to SCADA or other CPU retrieval system, drill a second hole into the cabinet and run Ethernet or fiber optic cable into the instrumentation cabinet using the appropriately sized Liquidtight fitting (not supplied)**.
- 9) Connect Ethernet cable to an available Ethernet port on the Red Lion RTU. Connect fiber optic cable to the fiber port on the Ethernet to fiber convertor.
- 10) Close inner swing panel and replace screws to secure it to the instrumentation cabinet. Close outer enclosure door (if supplied).

**** For units mounted inside the optional free-standing enclosure, drill a hole in the free-standing enclosure sized for the conduit. Run the 115V (+/- 10%) AC power supply into the free-standing enclosure using the appropriately sized Liquidtight fitting (not supplied) and connect to the SMART cabinet as per above. Do the same for Ethernet/fiber optic cable for SCADA or CPU connection. For units with the optional climate control package, terminate the additional three wire 240V (+/- 10%) AC power source to the heavy-duty safety switch terminal lugs (min/max wire size #14-#2 alu or cu). Safety switch is mounted to the outside of the free-standing enclosure.**



COMMISSIONING:

- 1) Check to ensure that the quick couplers on the top and bottom of each cylinder are fully tightened. Hand-tighten only. Do not use wrenches.
- 2) Refer to Figure 1. Ensure that the DryKeep® manual outlet valve is closed. Open the manual inlet valve of the DryKeep® system. *The inlet and outlet solenoid safety valves will remain closed until the pump is powered on as explained below.*
- 3) Turn main power switch on the right side of the instrumentation cabinet to the “on” position. The inlet and outlet solenoid safety valves will open, and the pump motor will begin to run.
- 4) Refer to Figure 1. Now that the pump is running, slowly open the bleed valve on the de-aerator tank. It is recommended that the installer have a vessel on hand to capture any oil that may come out of the bleed valve tube while it is open. Ensure that all the trapped air in the system escapes through the bleed valve tube on the de-aerator tank.
- 5) Close the bleed valve on the de-aerator tank and slowly open the manual outlet valve of the DryKeep® system.
- 6) Open the bleed valve again after about 15 minutes to remove any additional air from the system that may have collected in the top of the de-aerator. Again, it is recommended that the installer has a vessel on-hand to capture any oil that may come out of the bleed valve tube while it is open.
- 7) After the main power switch is turned on, the controller system will take approximately 30 seconds to cycle and start up. As the system cycles, you will see the following flash on the screen in succession:



Once all connections are made and the system has completed the startup cycle, the SMART setup screen will display as shown in Figure 7 below.

- 8) The default setup is a 3-cylinder system with no UPS/battery backup. If you have a SMART RT-3 system with only one cylinder, you can change the system to a single cylinder system by pushing the 1-Cylinder button. Similarly, if you have a UPS/battery backup option, push the Yes button under that question to change the current selection.

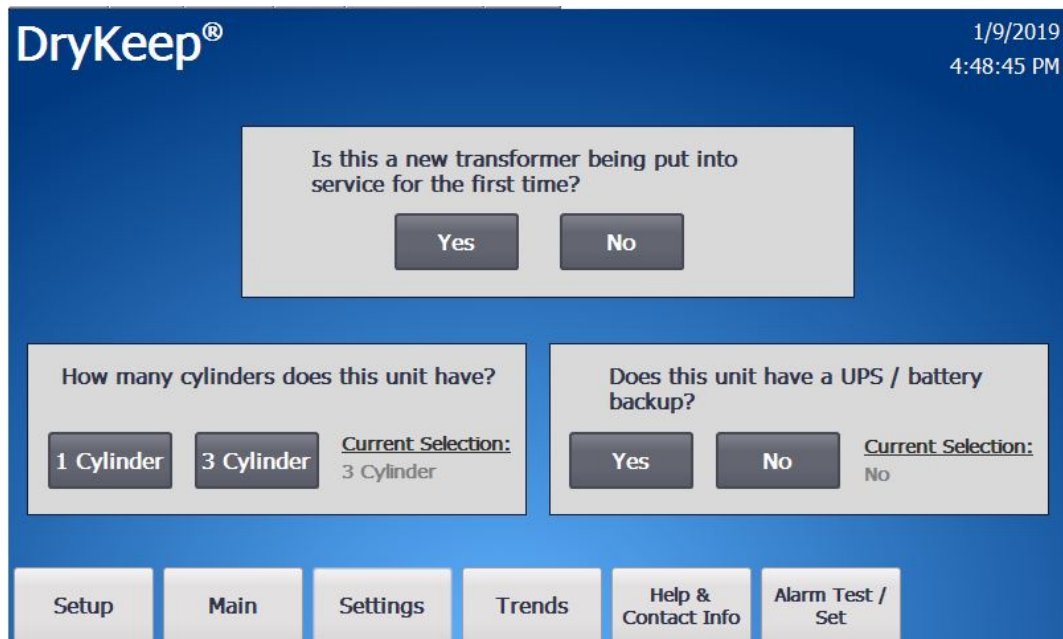


Figure 7: Initial setup screen

- 9) For new transformers being placed into service for the first time, pushing “YES” on the top question will set the SMART system to the Always Active cycle. The pump will run continuously to remove residual or new moisture. The SMART display will go to the Main screen shown in Figure 8.

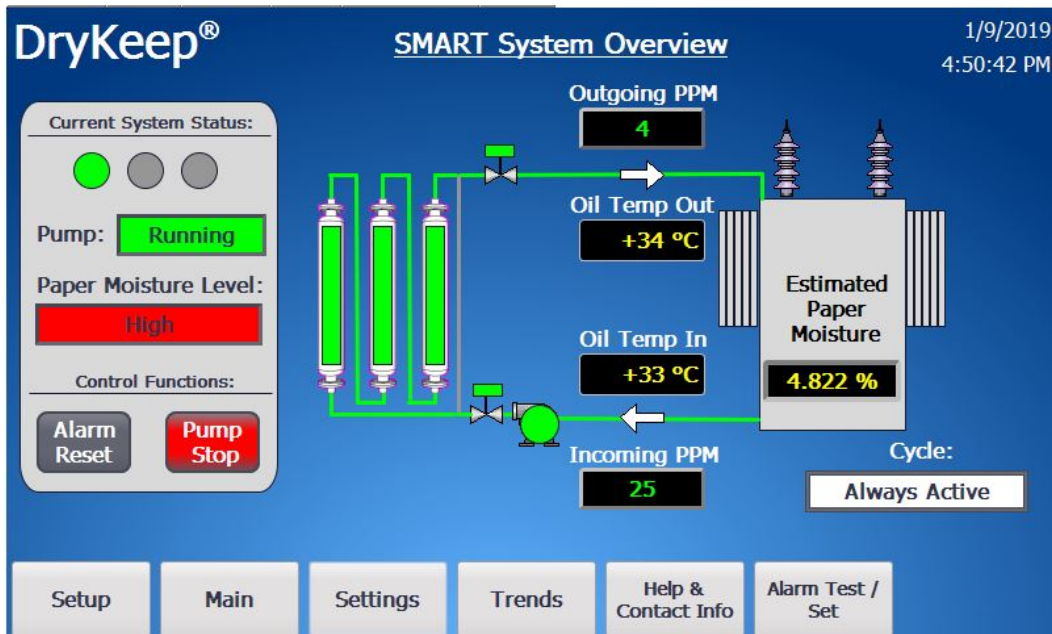


Figure 8: Main screen in Always Active Cycle for new transformers

- 10) If it is not a new transformer, answering “no” to the first question will bring you to the second setup screen shown in Figure 9.

Figure 9: Second startup screen when system is ready to be put in service

- 11) For transformers that have just been dried down to sufficiently bring the level of moisture in the paper down to the acceptable level (at or below 1.3%) just prior to DryKeep® being installed, selecting YES will set the SMART system to the Always Active cycle. The pump will run continuously to remove residual or new moisture. The SMART display will go to the Main screen shown in Figure 8.
- 12) For transformers that are in-service and are considered “wet”, selecting “NO” will start the SMART DryKeep system in the “Active” cycle. The SMART display will go to the Main screen shown in Figure 10 on the next page.

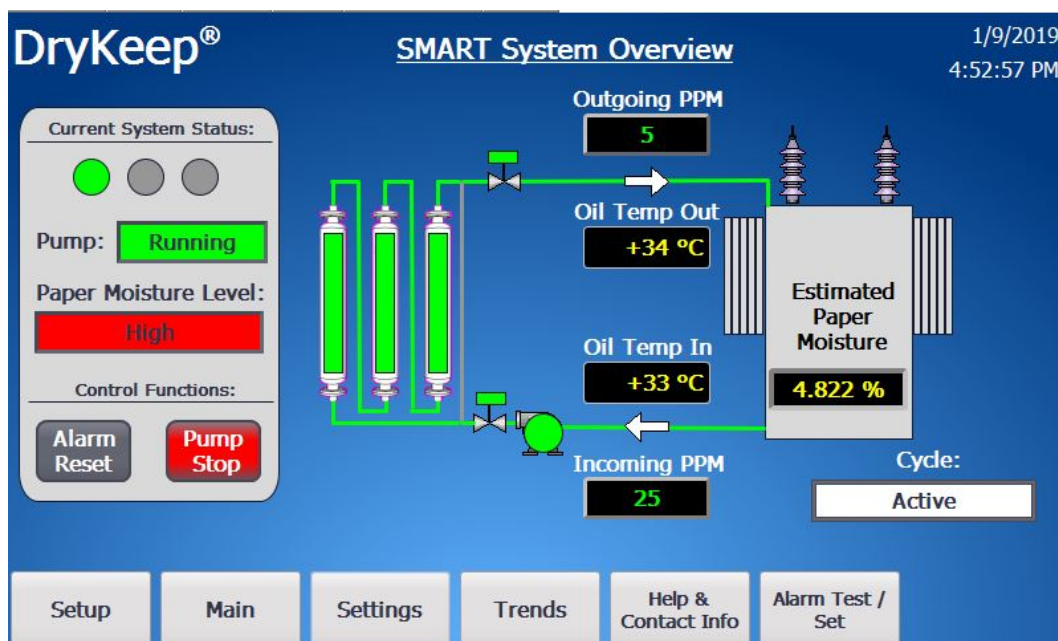


Figure 10: Main screen in Active Cycle for “wet” transformers

- 13) Monitor the system closely for 20 minutes to check for oil leaks, oil flow, and for any abnormalities. Once again, open the bleed valve on the de-aerator tank to remove any remaining air. Close the bleed valve.
- 14) Verify the time and date on the top right corner of the screen. If they are not correct, go to page 42 of this manual to adjust.
- 15) The pump flow rate is factory set at a nominal 0.7GPM. Verify the actual flow rate shown on the flow indicator switch. If the flow is above or below the pointer, remove the four screws on the flow meter faceplate, loosen the switch glide screw one (1) turn and slide the switch to the desired position along the flow rate scale. When the pointer is pointing to the desired flow rate, re-tighten the switch glide screw and reattach the faceplate. Click on the Alarm Test/Set tab on the HMI screen and adjust the flow rate to the actual flow rate in the field.
- 16) In the Active cycle as shown above, the controller will constantly monitor the oil as it enters the system from the transformer and calculate the estimated percent moisture in the paper. When the controller sees that the safe level of moisture has been reached, the controller will signal the T-divertor valve actuator to change the path of the oil flow to Position 2 to bypass the drying cylinder(s) after a time-delay of one full day (24 hours) to prevent over drying. During the time delay, the main screen will show the system as Active*. If the estimated percent moisture in

paper has remained at or below the safe level during the time-delay, the system will be placed in Bypass mode. The system pump will continue to run so the oil can flow past the moisture in oil sensors to continue to provide all system data and monitor the estimated percent moisture in paper. The drying cylinder(s) will be bypassed to prevent over drying. If the system sees the percent moisture in paper rise above the safe level, the system will signal the T-divertor valve actuator to change the path of the oil flow to Position 1 after a time-delay of one full day (24 hours) to pass through the drying cylinders to remove moisture until the safe level is reached again. During the time delay, the main screen will show the system as Bypass*.



Figure 10A: Bypass valve control scheme

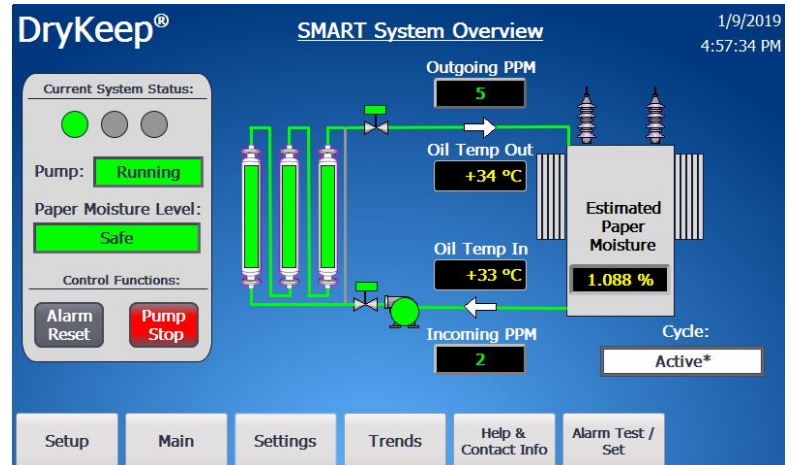


Figure 10B: System in time-delay before going into Bypass.

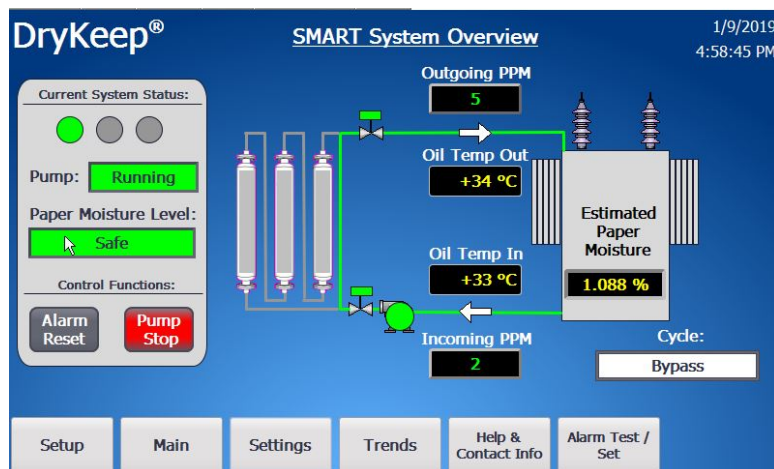


Figure 10C: System in Bypass mode. Pump continues to run to allow for sensor data. Drying cylinders are bypassed to prevent over-drying

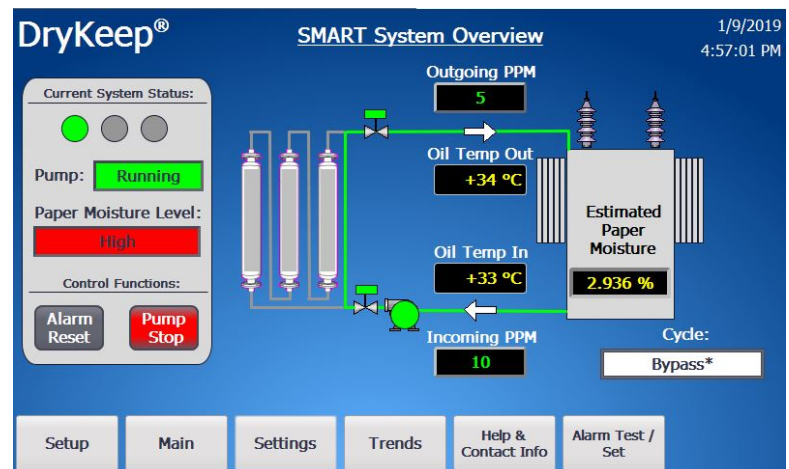


Figure 10D: System in time-delay before going to Active mode.



Figure 11: Settings screen

- 17) At any time, the user can change the T-Divertor Valve position and thus the system cycle manually by going to the Settings screen and selecting the “Next Cycle” button on the HMI as shown in Figure 11.
- 18) Selecting the Settings tab at the bottom of the screen brings you to the Setting screen shown in Figure 11. From the Settings screen the user can:
- Change the initial settings by selecting DryKeep Setup,
 - Change the temperature unit in the main screen display to either Celsius or Fahrenheit,
 - See the total system running time, current cycle running time, time since the last cylinder regeneration was performed and the total moisture removed from the transformer,
 - Reset the cylinder regeneration runtime and lifetime moisture remove counters,
 - Exit the Runtime to enter the operating system settings (Only at the instruction of DryKeep to change the system time zone/time/date, for software updates, or other troubleshooting).
- 19) Selecting the Alarm Test/Set tab at the bottom of the screen brings you to the Alarm testing and time delay setting screen shown in Figure 12. From the Alarm Test/Set screen the user can:
- Press the Test Alarm buttons to confirm the low flow and saturated cylinder alarms are functioning correctly locally and remotely through SCADA or SMS
 - Change the oil type from the default standard transformer oil to FR3 if the unit was ordered for FR3 use
 - Adjust the alarm time-delays
 - Adjust the flow rate from the nominal default rate to the actual rate observed on the flow rate monitor to calibrate the calculated hourly and accumulated moisture removal data.
 - Adjust the Active/Bypass percent moisture in paper threshold. This threshold is factory-set at 1.3% based on decades of experience that show that this is the minimum recommended level of moisture in paper before over-drying can occur in a previously wet transformer. **To prevent over-drying, it is strongly suggested not to adjust this setting.*****

DryKeep® **Alarm Test / Set** 2/25/2020 7:16:14 PM

Low Flow Alarm	Cycle Test
Test Alarm Alarm Time: 600 s	Next Cycle
Cylinder Saturation Alarm	Oil Type
Test Alarm Alarm Time: 5760 m	Mineral FR3
Note: Updated alarm times will activate on the next run cycle. Restart pump to immediately activate new time(s).	Flow Rate (Q) For Moisture Removal
	0.70 G / min
	Active / Bypass Paper Moisture % Threshold
	1.3%

Setup Main Settings Trends Help & Contact Info Alarm Test / Set

SCADA/CPU DATA RETRIEVAL

All SMART DryKeep® systems support DNP3 – slave and MODBUS RTU/TCP/ASCII/RTU SCADA protocols. Cellular alarming is also provided with multi-carrier 4G LTE support with 3G and 2G fallback. (Customer needs to provide their own SIM card with data plan for cellular alarming).

The default IP addresses are as follows:

PLC IP: 192.168.2.70

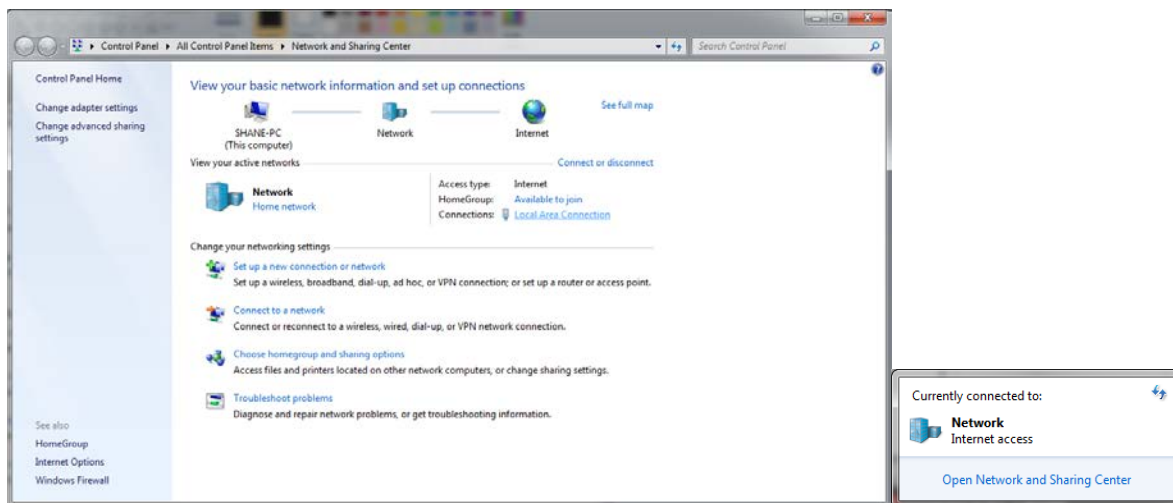
HMI IP: 192.168.2.71

Red Lion SIXNET RTU IP: 192.168.2.72

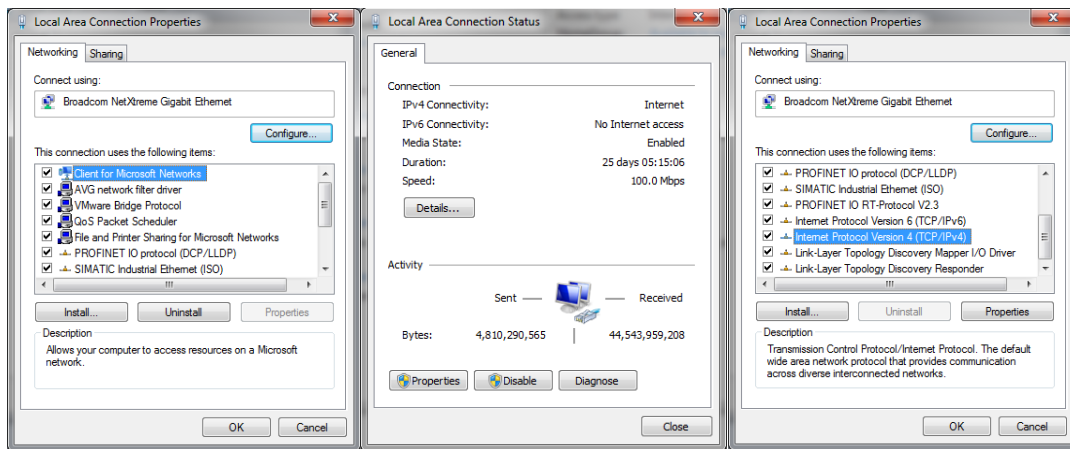
To get the data via Modbus/DNP3 set up the IP address of the Sixnet RTU (192.168.2.72) in your client as a server/slave and have your PC or client setup as a Master.

If the Red Lion SIXNET RTU IP address does not comply with your SCADA network security standards, you can easily change the WAN address of the unit as follows:

1. To access the web interface of the Red Lion Sixnet Cellular RTU, using a CAT-5 Ethernet cable connect a laptop to the SMART DryKeep® system through the RJ45 Ethernet Panel Interface Connector mounted on the inner swing panel of the controller enclosure.
2. To access the SMART DryKeep® network your computer will need an assigned IP address on the network. To do this, access your internet settings. In Windows 7 there will be an icon in the bottom right hand side of the screen. Other operating systems will have something similar.

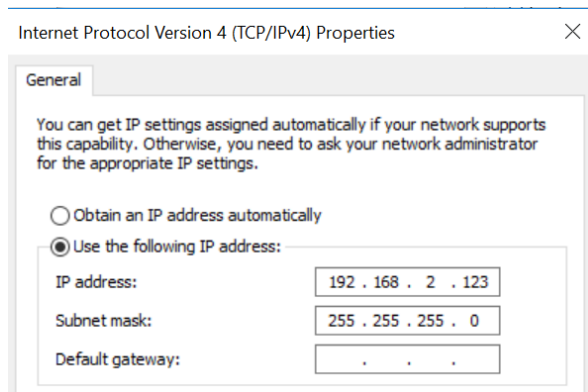


Direct wired connections will show up under “Local Area Connection” in the Network and Sharing Center (Windows 7).



When on the “Local Area Network Status” page, click “Properties” at the bottom left. The window from above in the 2nd and 3rd figures will pop-up. Scroll to “Internet Protocol Version 4 (TCP/IPv4)” and click on the “Properties” button.

This will open the page to configure an IP address. By default, it is typically set to “Obtain an IP address automatically”. For this, we will need to select “Use the following IP address” instead.

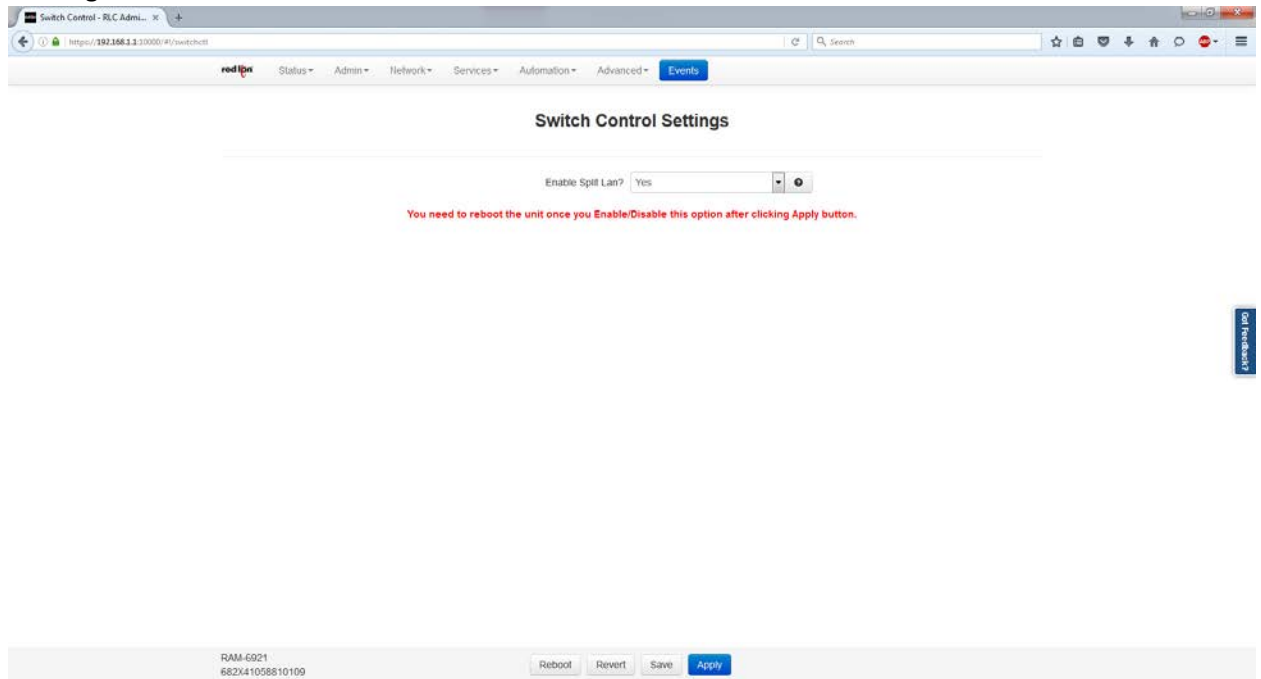


Copy the settings from above. IP address: 192.168.2.123. Subnet Mask: 255.255.255.0. Default gateway can be left blank.

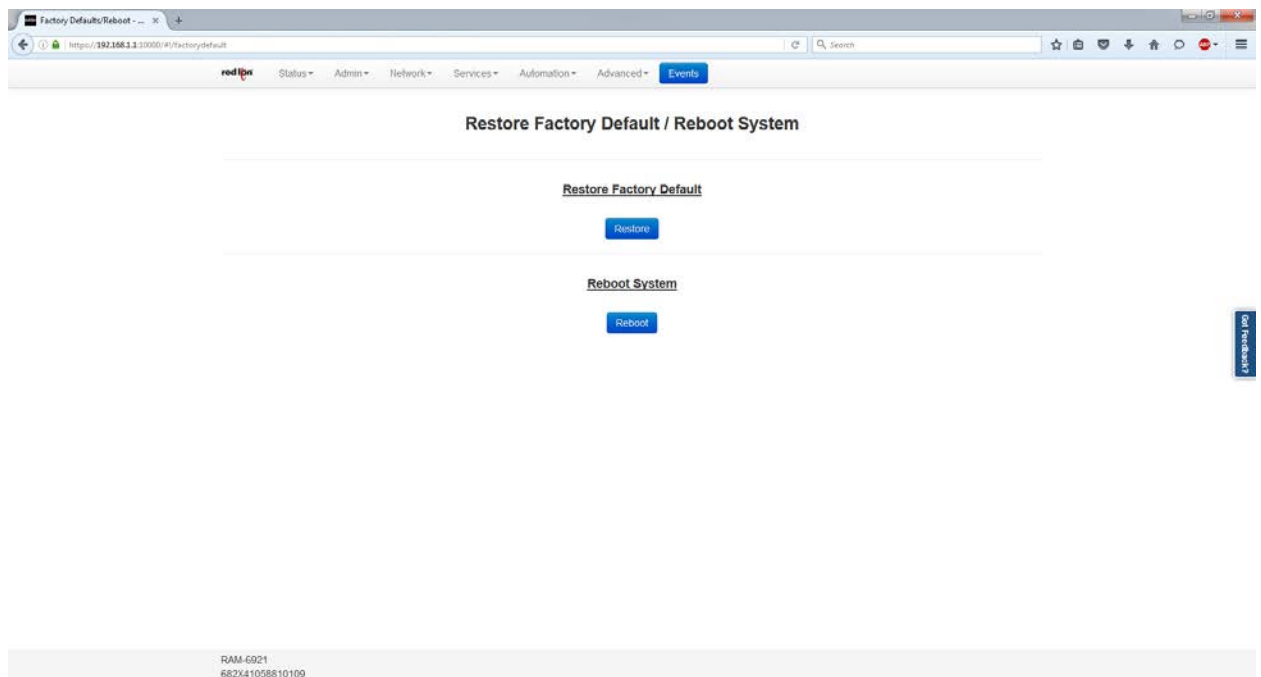
Pressing “OK” at the bottom of the window will assign an IP address on the SMART DryKeep® network.

- Once connected to the SMART DryKeep network, open a web browser on the laptop and type <http://192.168.2.72:10000> into a web browser address bar. The login is Username: admin Password: Last 6 digits of the serial number on the Sixnet unit. Ex: 570075.

4. Navigate to Network -> Interfaces -> Switch Control.



5. Modify 'Enable Split LAN' from No to Yes, then click 'Apply'. The unit will now need to reboot in order for changes to take effect. Navigate to Admin -> Factory Default/Reboot screen and select Reboot System. Process could take 5+ minutes before the web interface comes back online.



6. Once the unit comes back online, navigate to Network -> Interfaces. There will now be an option for LAN and WAN. To change WAN to the necessary IP address, click 'eth0 (WAN)'.

7. Ensure eth0 interface is enabled, and modify the IP address and subnet to the desired network. Example shown below.

Ethernet Interface eth0 (WAN)

Enable eth0 Interface?

Interface Speed/Duplex:

Obtain Network Addresses via DHCP?

Enter IP Address: **Required**

Enter Subnet Mask: **Required**

Use Remote Gateway as Default Route?

Enter Remote Gateway:

Enter Maximum Transmission Unit (MTU): **Required**

Interface Aliases

Sub-Interface	IP Address	Subnet Mask

Add
 Edit
 Delete
 Up
 Down

RAM: 6921
682X41058810109

Reboot Refresh Save Apply

Last Refresh:
A few seconds ago

8. After modifications, click 'Apply'. Repeat the reboot sequence and the WAN network will be accessible from the Ethernet port on the Sixnet unit labeled WAN.

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The data addresses to retrieve data remotely from the system are as follows:

Modbus Mapping

Variable Name	Data Type	Modbus Object Type	Modbus Address
Pump Status	UINT (16 bit)	Analog Output / Holding Register	40001
Cycle Status	UINT (16 bit)	Analog Output / Holding Register	40002
Low Oil Flow Alarm	UINT (16 bit)	Analog Output / Holding Register	40003
Cylinder Saturated Alarm	UINT (16 bit)	Analog Output / Holding Register	40004
Temperature Units	UINT (16 bit)	Analog Output / Holding Register	40005
New Transformer Status	UINT (16 bit)	Analog Output / Holding Register	40006
Total Runtime	UINT (16 bit)	Analog Output / Holding Register	40007
Current Runtime	UINT (16 bit)	Analog Output / Holding Register	40008
Cylinder Regen Runtime	UINT (16 bit)	Analog Output / Holding Register	40009
Incoming Temperature	INT (16 bit)	Analog Output / Holding Register	40010
Outgoing Temperature	INT (16 bit)	Analog Output / Holding Register	40011
Incoming PPM	UINT (16 bit)	Analog Output / Holding Register	40012
Outgoing PPM	UINT (16 bit)	Analog Output / Holding Register	40013
Estimated Percent Moisture in Paper	UINT (16 bit)	Analog Output / Holding Register	40014
Total Moisture Removed (L)	UINT (16 bit)	Analog Output / Holding Register	40015
Reboot Alarm	UINT (16 bit)	Analog Output / Holding Register	40016

DNP3 Mapping

Variable Name	Data Type	DNP3 Object Type	DNP3 Address
Pump Status	UINT (16 bit)	16-Bit Analog Output	1
Cycle Status	UINT (16 bit)	16-Bit Analog Output	2
Low Oil Flow Alarm	UINT (16 bit)	16-Bit Analog Output	3
Cylinder Saturated Alarm	UINT (16 bit)	16-Bit Analog Output	4
Temperature Units	UINT (16 bit)	16-Bit Analog Output	5
New Transformer Status	UINT (16 bit)	16-Bit Analog Output	6
Total Runtime	UINT (16 bit)	16-Bit Analog Output	7
Current Runtime	UINT (16 bit)	16-Bit Analog Output	8
Cylinder Regen Runtime	UINT (16 bit)	16-Bit Analog Output	9
Incoming Temperature	INT (16 bit)	16-Bit Analog Output	10
Outgoing Temperature	INT (16 bit)	16-Bit Analog Output	11
Incoming PPM	UINT (16 bit)	16-Bit Analog Output	12
Outgoing PPM	UINT (16 bit)	16-Bit Analog Output	13
Estimated Percent Moisture in Paper	UINT (16 bit)	16-Bit Analog Output	14
Total Moisture Removed (L)	UINT (16 bit)	16-Bit Analog Output	15
Reboot Alarm	UINT (16 bit)	16-Bit Analog Output	16

Modbus -> DNP3 Mapping Conversion (Via Sixnet)

Data Type	Modbus	DNP
Boolean Inputs	Discrete Input	Binary Input
Boolean Outputs	Coil	Control Relay Output Block (CROB)
Double-bit Boolean Inputs	No	Double Bits
16-bit Input	Input Register	16-bit Counter 16-bit Frozen Counter 16-bit Analog Input 16-bit Frozen Analog Input
16-bit Output	Holding Register	16-bit Analog Output Block
32-bit Input	No	32-bit Counter 32-bit Frozen Counter 32-bit Analog Input 32-bit Frozen Analog Input
32-bit Output	No	32-bit Analog Output
32-bit Floating Point (IEEE-754)	No	Short Floating Point Analog Input
64-bit Floating Point (IEEE-754)	No	Long Floating Point Analog Input
32-bit Floating Point Output (IEEE-754)	No	32-bit Floating Point Output
64-bit Floating Point Output (IEEE-754)	No	64-bit Floating Point Output
Analog Deadband	No	Analog Input Reporting Deadband
Strings	No	Octet string
Virtual Terminal	No	Virtual Terminal Output Block
Time and Date	No	Time and Date Time Delay
File Transfer	No	File Transfer

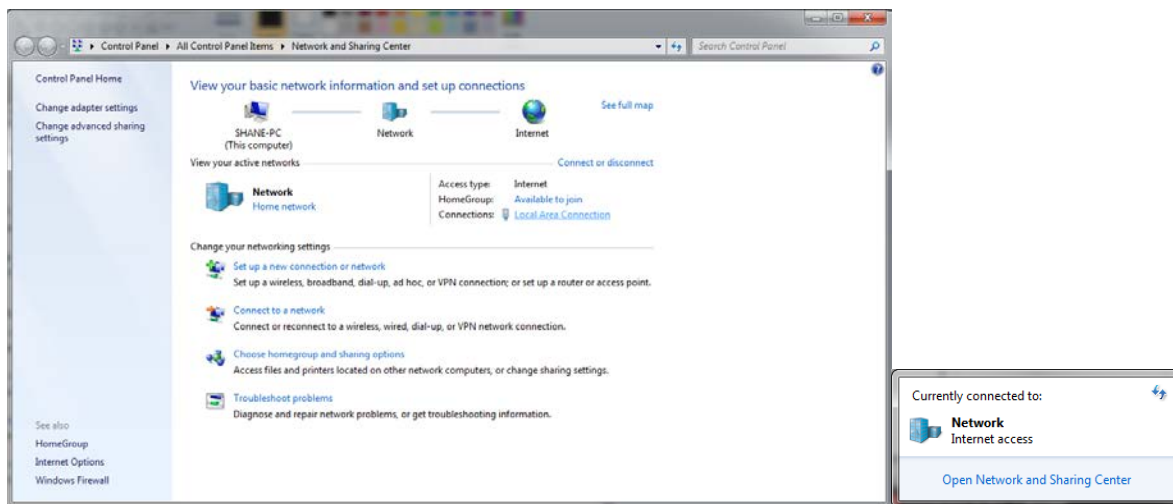
16-bit output is the only one used by SMART DryKeep®. SMART DryKeep® data will be the first 16 addresses of each object type (i.e. Holding Register, 16-bit Analog Output Block) for both Modbus and DNP3.

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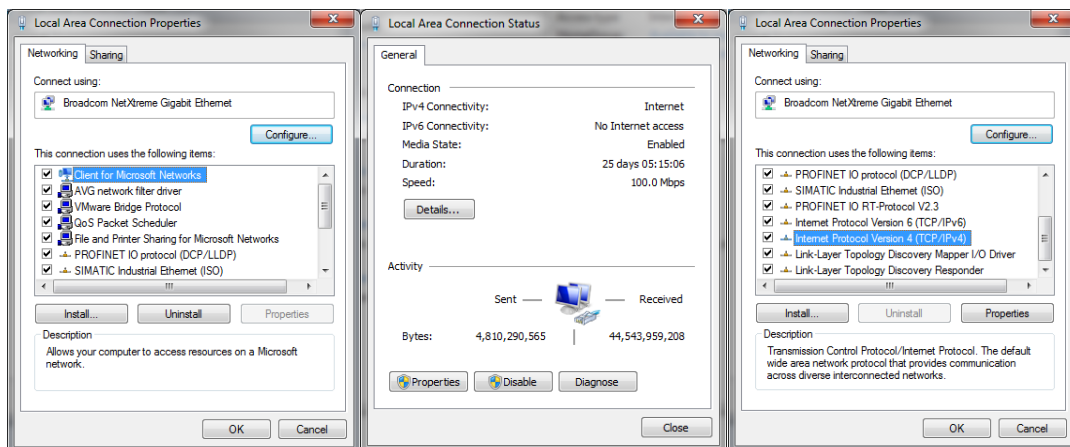
SETTING UP OPTIONAL CELLULAR ALARMING FEATURE

All SMART DryKeep® units have the ability to send the saturated cylinder and leak detection alarms directly to appropriate personnel's mobile devices via cellular service. To set up this feature:

1. Once an activated SIM card from a carrier is obtained, the card is placed in the slot on the top of the Red Lion Sixnet Cellular RTU located inside the SMART instrumentation panel as is facing in the panel. The cut side of the card will be sided forward and left. A pen or small screwdriver will be necessary to push the card into the module, and you will know it is complete when the card clicks in.
2. To access the web interface of the Red Lion Sixnet Cellular RTU, using a CAT-5 Ethernet cable connect a laptop to the SMART DryKeep® system through the RJ45 Ethernet Panel Interface Connector mounted on the outside of the enclosure.
3. To access the SMART DryKeep® network your computer will need an assigned IP address on the network. To do this, access your internet settings. In Windows 7 there will be an icon in the bottom right hand side of the screen. Other operating systems will have something similar.

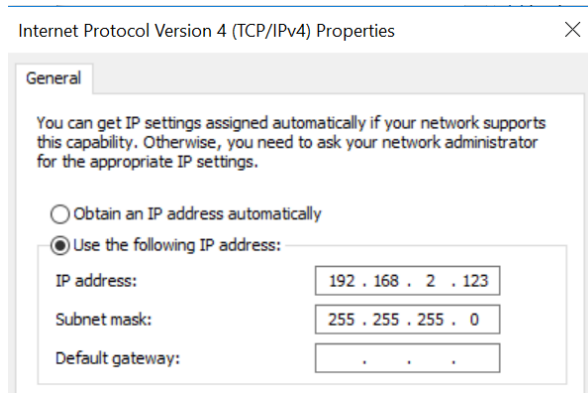


Direct wired connections will show up under “Local Area Connection” in the Network and Sharing Center (Windows 7). Click the link to go to the page below.



When on the “Local Area Network Status” page, click “Properties” at the bottom left. The window from above in the 2nd and 3rd figures will pop-up. Scroll to “Internet Protocol Version 4 (TCP/IPv4)” and click on the “Properties” button.

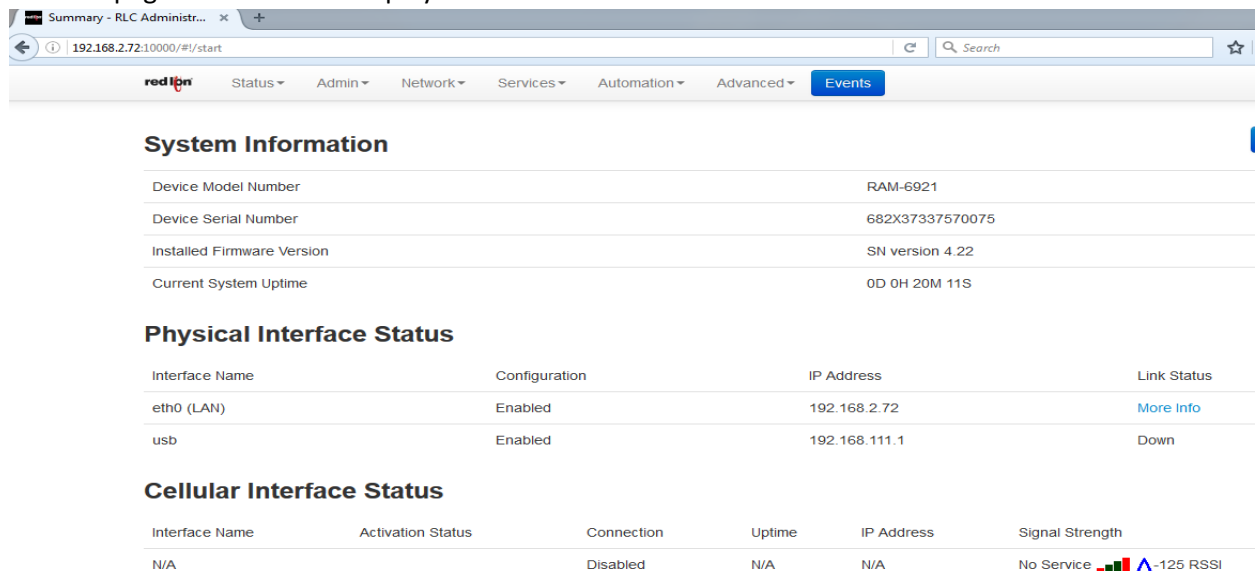
This will open the page to configure an IP address. By default, it is typically set to “Obtain an IP address automatically”. For this, we will need to select “Use the following IP address” instead.



Copy the settings from above. IP address: 192.168.2.123. Subnet Mask: 255.255.255.0. Default gateway can be left blank.


Pressing “OK” at the bottom of the window will assign an IP address on the SMART DryKeep® network.

4. Once connected to the SMART DryKeep network, open a web browser on the laptop and type <http://192.168.2.72:10000/> into a web browser address bar. The login is Username: admin Password: Last 6 digits of the serial number on the Sixnet unit. Ex: 570075.
5. The first page that loads will display the status of the cellular connection.



System Information	
Device Model Number	RAM-6921
Device Serial Number	682X37337570075
Installed Firmware Version	SN version 4.22
Current System Uptime	0D 0H 20M 11S

Physical Interface Status			
Interface Name	Configuration	IP Address	Link Status
eth0 (LAN)	Enabled	192.168.2.72	More Info
usb	Enabled	192.168.111.1	Down

Cellular Interface Status					
Interface Name	Activation Status	Connection	Uptime	IP Address	Signal Strength
N/A		Disabled	N/A	N/A	No Service  -125 RSSI

- First, click on the Network tab and go to Configuration under the Cellular Connection link.

Network Services Automation Advanced Events

Cellular Connection Configuration

Interfaces
Firewall
Tunneling
DNS Settings
Static Routes
TCP Global Settings

Config Status Provisioning

Cellular Config

Detected Modem: MC73xx
Detected Carrier:

Enable Interface: Yes

APN: vzwadmin (APN for context 3 is '3:vzwadmin')

Show Advanced Configuration: No

- For 'Enable Interface' select Yes and enter the APN provided from the carrier of the SIM card.
- From this point, if the card is activated, the Sixnet has all the information it needs for the cellular connection. It may take 5-10 minutes to fully connect. On the Status->Summary page, you will know it is complete when an IP address and uptime show up under the Cellular Interface Status.

Cellular Interface Status

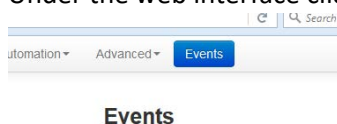
Interface Name	Activation Status	Connection	Uptime	IP Address	Signal Strength
wwan0	Reg Home	Enabled	0D 0H 0M 6S	100.107.212.102	CDMA 1xRTT -96 RSSI

Every SMART DryKeep® system will have three alarms pre-configured at the factory:

- RebootAlert1:** Alarm sent via SMS and/or SCADA when AC power is provided to the system at initial power-up and when there is a loss and subsequent restoration of power. This alarm does not appear on the HMI screen.
- CylinderSaturationAlarm:** Alarm for when the DryKeep drying cylinders are saturated and need to be regenerated.
- LowOilFlowAlarm:** Alarm when the system has detected an oil flow that is outside the preset range that causes the system pump to shut down and close the solenoid safety valves to isolate the system from the transformer.

To edit the mobile number you want those alarms to be sent to:

- Under the web interface click the blue 'Events' button.



- For each of the alarms, click on the event and click the 'Edit' option beside them.

Status

Event	Name	Condition	Last Active	Duration	Clear Alarm
1	RebootAlert1	Active	01/09/2019 14:49:14	01:38:00	Auto
2	CylinderSaturationAlarm	Inactive	01/09/2019 14:49:14	01:38:00	Auto
3	LowOilFlowAlarm	Inactive	01/09/2019 14:49:14	01:38:00	Auto

[Update Status](#)

[Add Reboot Alert](#)
[Add Data Usage Alert](#)

Configuration

Event	Name	Enable	Data Source	Details	Event Type	SP	Alarm	Action Type	Details
1	RebootAlert1	Yes	IODB	Uptime_Days	Absolute Low		1	SMS	9126607053
2	CylinderSaturationAlarm	Yes	IODB	4:00004	Data Match		1	SMS	9126607053
3	LowOilFlowAlarm	Yes	IODB	4:00003	Data Match		1	SMS	9126607053

[Add](#)
[Edit](#)
[Delete](#)
[Copy](#)

[Up](#)
[Down](#)

[View Tags](#)
[View Events Log](#)

- This will load a popup to modify the event. Scroll through the options using the 'Next' button until you get to a page that says 'Recipient'. Type in your number with the X-XXX-XXX-XXXX format. Hit 'Finish' when done.

Edit Event Configuration

Action Type: Send SMS Message

Recipient: 1-912-247-7772

Message Format: Custom

Custom Active Message: DryKeep urgent alert. Frame #1 Required

Custom Inactive Message: Low Flow Alarm Gone!

Edge Triggering: Rising Only

Level Triggering: No

[Back](#)
[Finish](#)

- If the Red Lion Sixnet Cellular RTU has been successfully connected via cellular, the events will be ready to send out texts when an alarm status is detected.
- To add additional alarm recipients, select the alarm in the configuration chart (it will highlight it in blue as shown above) and click copy. This will make a copy of original recipient's alarm event. You can then go in and change the recipient number as explained above for the second recipient to be added. You can edit or delete recipients by highlighting the alarm event and using the "Edit" and "Delete" buttons on the configuration screen.

ON-SITE LOGGED DATA RETRIEVAL VIA RJ45 ETHERNET PANEL INTERFACE CONNECTOR

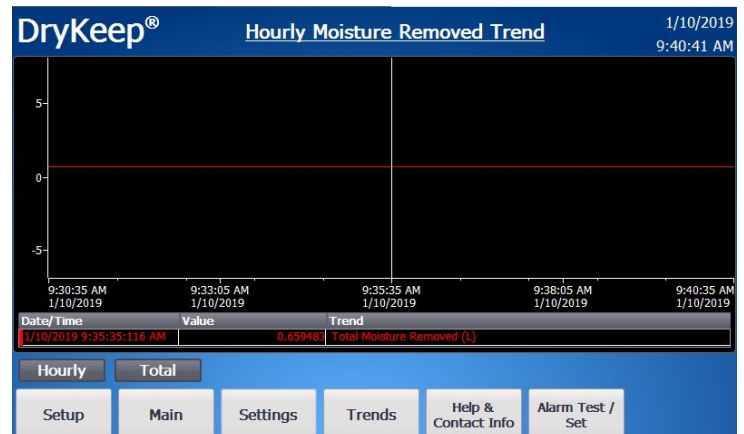
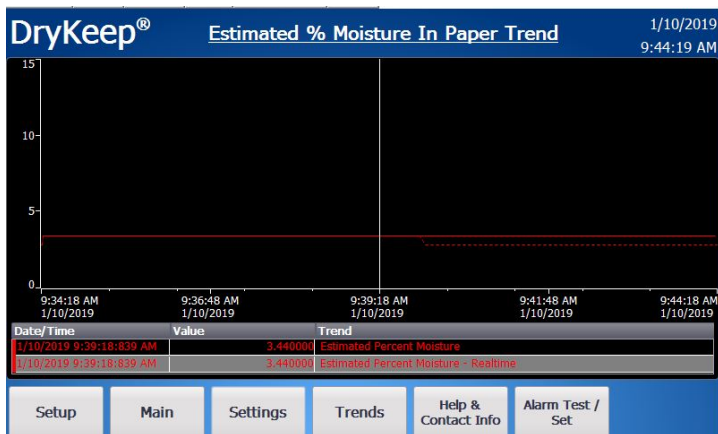
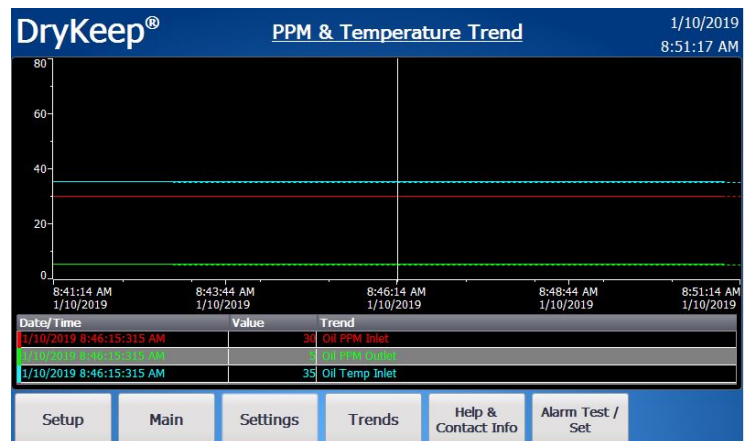
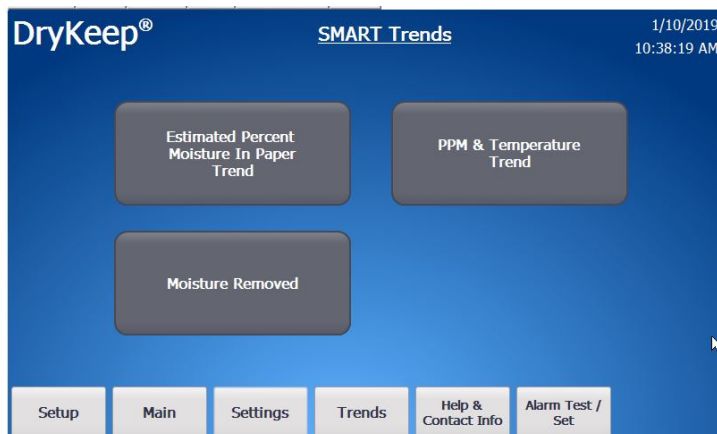
All SMART DryKeep® systems log the following information:

- 1) System cycle status changes (Always Active, Active, Active*, Bypass*, Bypass)
- 2) All alarm events
- 3) Inlet and outlet sensor PPM of moisture in the oil (Live value twice per day and 24-hour average)
- 4) Inlet oil temperature (Live value twice per day and 24-hour average)
- 5) Estimated percent moisture in paper (Live value twice per day and 24-hour average)
- 6) Moisture removed per hour
- 7) Total moisture removed

The live value of the inlet PPM, inlet temperature, outlet PPM, and estimated percent moisture in the paper are logged twice per day at 6am and 6pm. All 4 values are also logged on a daily average.

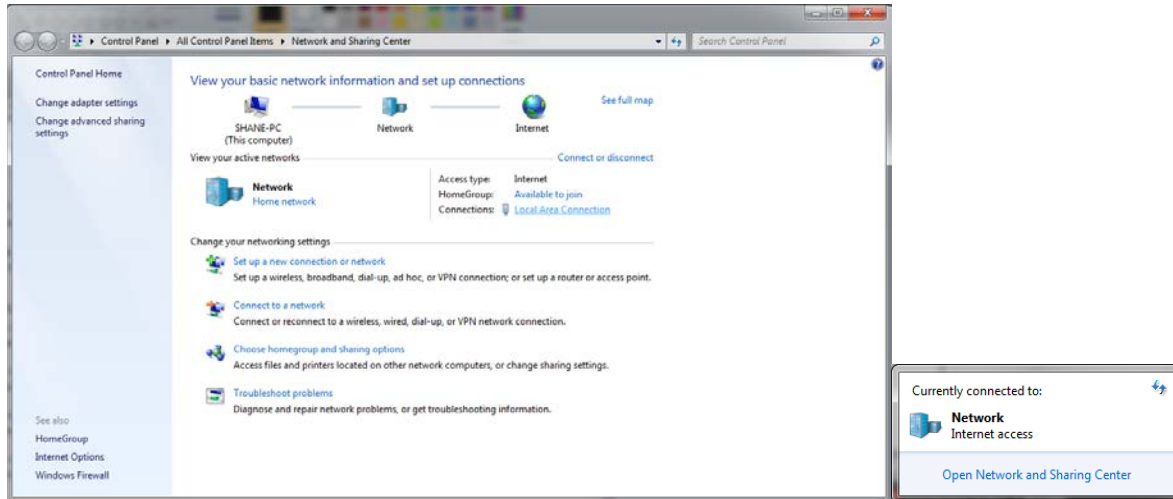
Three trend analysis graphs are also available under the Trends screen:

- 1) Live values of the inlet PPM, outlet PPM, inlet oil temperature,
- 2) Live and average estimated percent moisture in paper,
- 3) Total moisture removed.

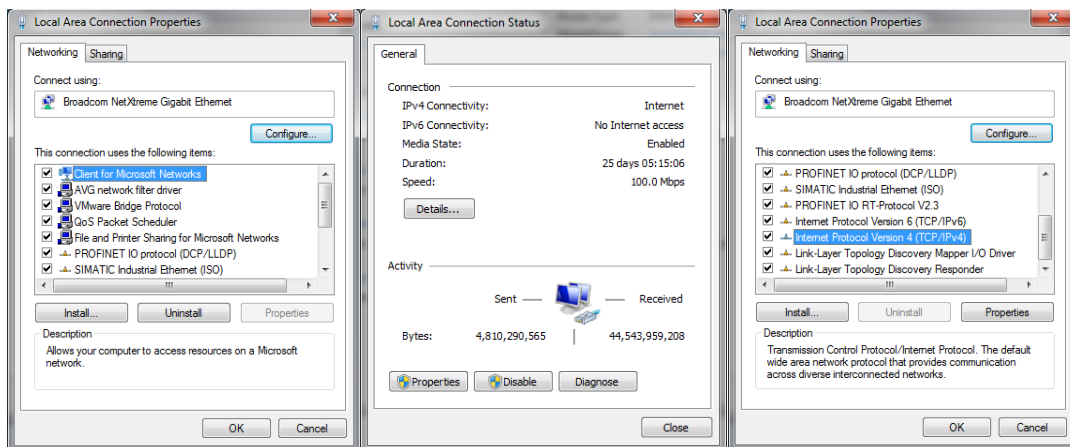


All logged data can easily be downloaded to a laptop in .CSV format through the RJ45 Ethernet Panel Interface Connector mounted on the outside of the enclosure. To download the data:

- 1) Using a CAT-5 Ethernet cable, connect the laptop to the SMART DryKeep® system through the RJ45 Ethernet Panel Interface Connector mounted on the outside of the enclosure.
- 2) To access the SMART DryKeep® network your computer will need an assigned IP address on the network. To do this, access your internet settings. In Windows 7 there will be an icon in the bottom right hand side of the screen. Other operating systems will have something similar.

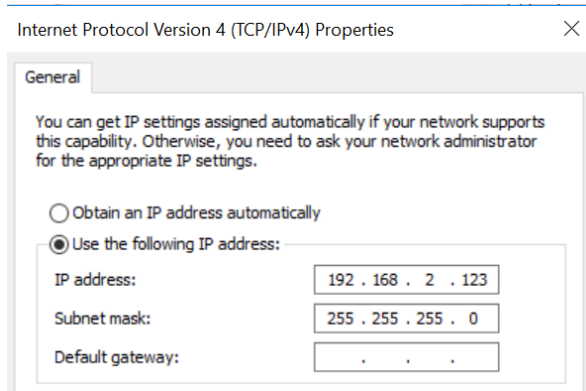


Direct wired connections will show up under “Local Area Connection” in the Network and Sharing Center (Windows 7). Click the link to go to the page below.



When on the “Local Area Network Status” page, click “Properties” at the bottom left. The window from above in the 2nd and 3rd figures will pop-up. Scroll to “Internet Protocol Version 4 (TCP/IPv4)” and click on the “Properties” button.

This will open the page to configure an IP address. By default, it is typically set to “Obtain an IP address automatically”. For this, we will need to select “Use the following IP address” instead.

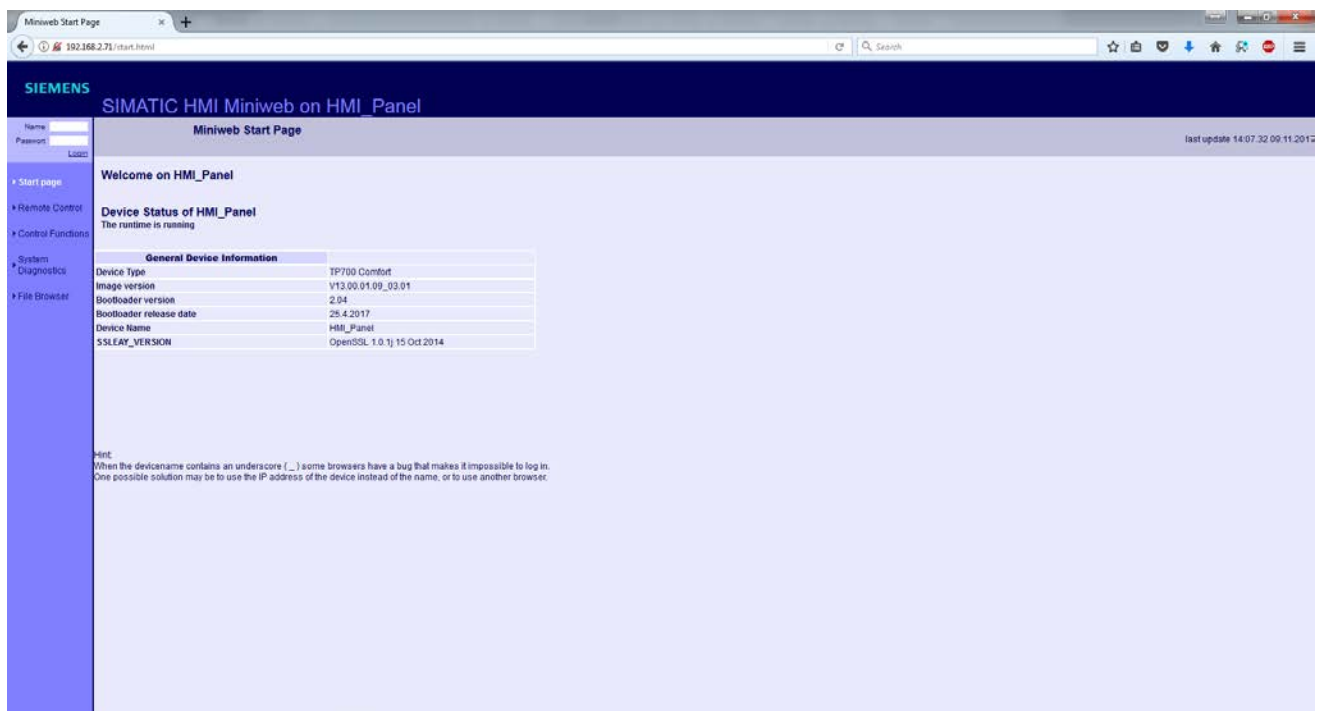


Copy the settings from above. IP address: 192.168.2.123. Subnet Mask: 255.255.255.0. Default gateway can be left blank.

Pressing “OK” at the bottom of the window will assign an IP address on the SMART DryKeep® network.

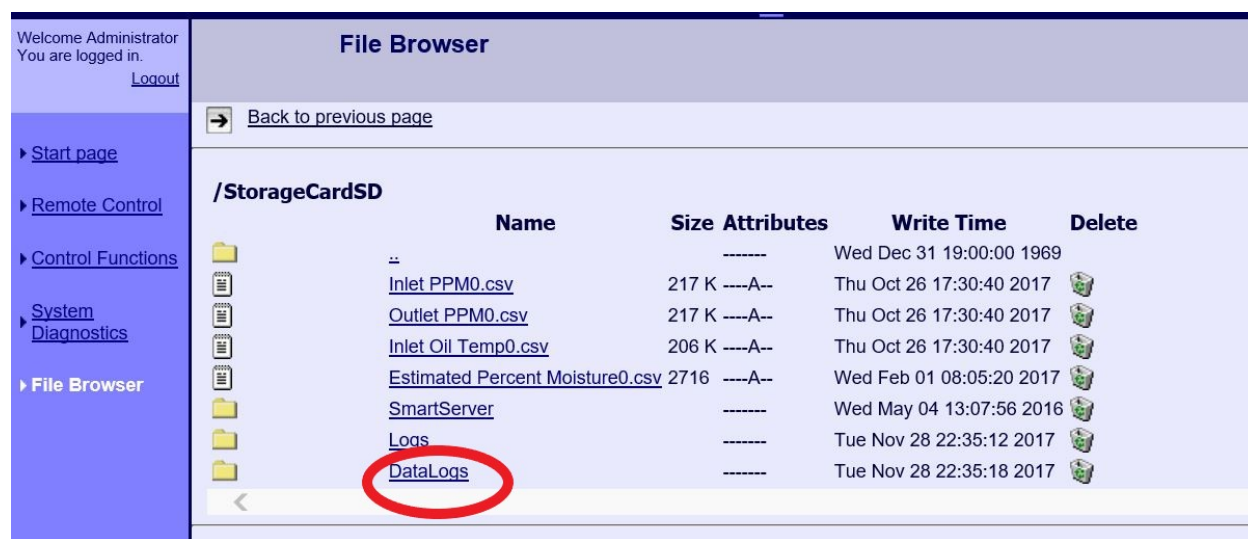
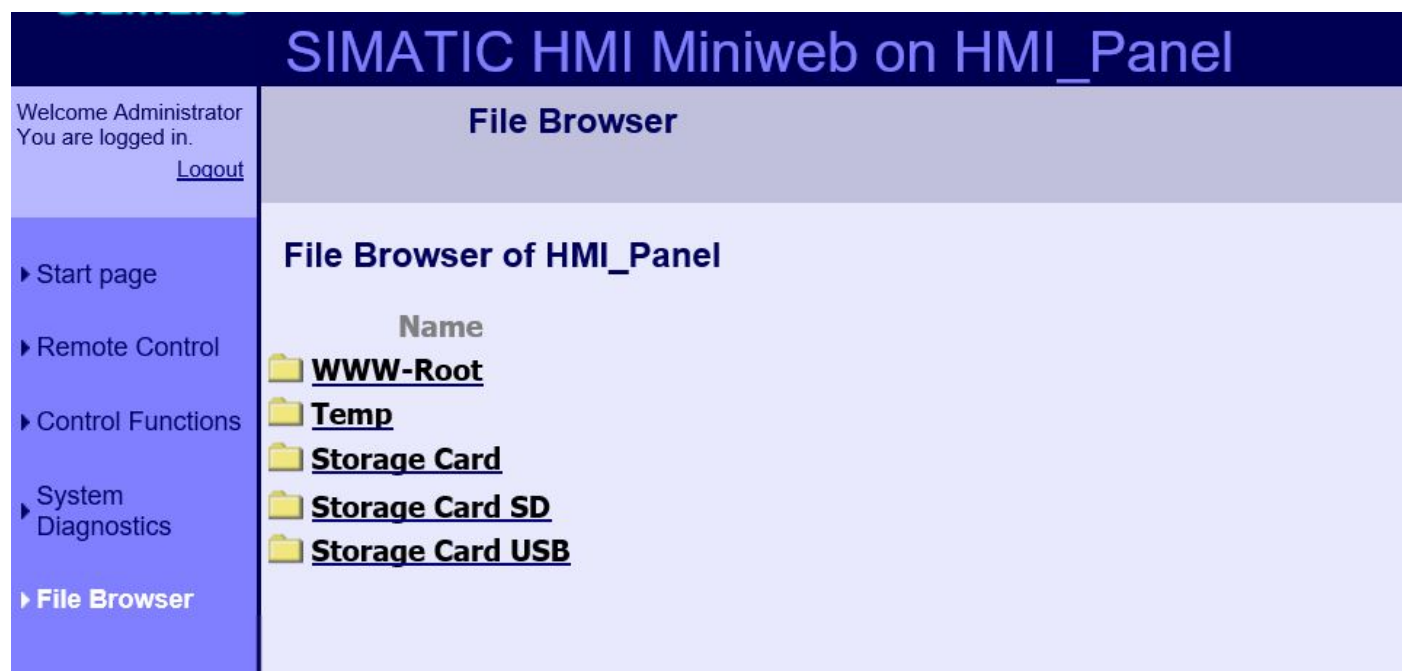
- 3) Once connected from Steps 1 and 2 above, open up a web browser and type in the following into the address bar: <http://192.168.2.71>.

If connected correctly, the web page below will load.



Login using the login field in the top left of the web page. Username is “Administrator” and password is “admin”.

Once logged in, navigate to the “File Browser” link from the left sidebar. All logs will be stored on the “Storage Card SD”. Click on “DataLogs” to see the logs available for download.



All logs are in .CSV format and can be downloaded to your computer and opened directly in Excel without conversion. Adjust column widths as required to see data completely. Change the number format in columns B and C on the MoistureData.csv file to “Number” to change from scientific values to numbers and increase decimal places as desired.

SIMATIC HMI Miniweb on HMI_Panel

Welcome Administrator
You are logged in.
[Logout](#)

- ▶ [Start page](#)
- ▶ [Remote Control](#)
- ▶ [Control Functions](#)
- ▶ [System Diagnostics](#)
- ▶ **File Browser**

File Browser

➔ [Back to previous page](#)

/StorageCardSD/DataLogs

	Name	Size	Attributes	Write Time	Delete
	..		-----	Wed Dec 31 19:00:00 1969	
	CycleData.csv	5783	----A--	Wed Jan 09 18:15:44 2019	
	AlarmData.csv	994	----A--	Wed Jan 09 11:50:48 2019	
	DrykeepData.csv	386 K	----A--	Thu Jan 10 09:53:00 2019	
	MoistureData.csv	4515	----A--	Thu Jan 10 09:08:00 2019	

AutoSave CycleData - Excel

	A	B	C	D	E	F	G	H
1	*****							
2								
3								
4								
5	Date / Timestamp	Cycle Status						
6	1/9/2019 11:45	Active						
7	1/9/2019 11:46	Active*						
8	1/9/2019 11:46	Bypass						
9	1/9/2019 11:47	Bypass*						
10	1/9/2019 11:47	Active						
11	1/9/2019 15:49	Active*						
12	1/9/2019 15:49	Bypass						
13	1/9/2019 16:35	Bypass*						
14	1/9/2019 16:35	Bypass						
15	1/9/2019 16:35	Bypass*						
16	1/9/2019 16:36	Active						
17	1/9/2019 16:50	Always Active						
18	1/9/2019 16:52	Active						
19	1/9/2019 16:56	Active*						
20	1/9/2019 16:56	Bypass						
21	1/9/2019 16:56	Bypass*						

CycleData

AutoSave AlarmData - Excel

	A	B	C	D	E
4					
5	Date / Timestamp	Alarm Type	Alarm Status		
6					
7	1/9/2019 11:30	Low Oil Flow Detected	Activated		
8	1/9/2019 11:30	Low Oil Flow Detected	Deactivated		
9	1/9/2019 11:32	Cylinders Are Saturated	Activated		
10	1/9/2019 11:32	Cylinders Are Saturated	Deactivated		
11	1/9/2019 11:41	Cylinders Are Saturated	Activated		
12	1/9/2019 11:41	Cylinders Are Saturated	Deactivated		
13	1/9/2019 11:50	Low Oil Flow Detected	Activated		
14	1/9/2019 11:50	Low Oil Flow Detected	Deactivated		
15	1/9/2019 11:50	Cylinders Are Saturated	Activated		
16	1/9/2019 11:50	Cylinders Are Saturated	Deactivated		
17					
18					
19					
20					
21					
22					
23					
24					

AlarmData

MoistureData - Read-Only - Excel

	A	B	C	D	E
1	*****				
2					
3		DryKeep Moisture Log			
4					
5	Date / Timestamp	Total Moisture Removed (Litres)	Moisture Removed Hourly (Litres)		
6					
7	1/9/2019 16:08	0.6009849000000000	0.0012817790000000		
8	1/9/2019 17:08	0.6016900000000000	0.0007050930000000		
9	1/9/2019 18:08	0.6017347000000000	0.0000447257300000		
10	1/9/2019 19:08	0.6038330000000000	0.0020982480000000		
11	1/9/2019 20:08	0.6078079000000000	0.0039749860000000		
12	1/9/2019 21:08	0.6117829000000000	0.0039749860000000		
13	1/9/2019 22:08	0.6157579000000000	0.0039749860000000		
14	1/9/2019 23:08	0.6197329000000000	0.0039749860000000		
15	1/10/2019 0:08	0.6237078000000000	0.0039749860000000		
16	1/10/2019 1:08	0.6276828000000000	0.0039749860000000		
17	1/10/2019 2:08	0.6316578000000000	0.0039749860000000		
18	1/10/2019 3:08	0.6356328000000000	0.0039749860000000		
19	1/10/2019 4:08	0.6396077000000000	0.0039749860000000		
20	1/10/2019 5:08	0.6435827000000000	0.0039749860000000		

DrykeepData - Saved

	A	B	C	D	E	F	G	H	I	J
1	*****									
2										
3						DryKeep Data Log				
4										
5	Date / Timestamp	Inlet PPM (Raw)	Outlet PPM (Raw)	Inlet Temp (Raw)	Estimated Percent Moisture (Raw)	Inlet PPM (Avg)	Outlet PPM (Avg)	Inlet Temp (Avg)	Estimated Percent Moisture (Avg)	Cycle Status
7	1/10/2019 9:22	30	5	35	5.05	27	5	35	4.668888	Active
8	1/10/2019 9:23	30	5	35	5.05	27	5	35	4.671103	Active
9	1/10/2019 9:24	30	5	35	5.05	27	5	35	4.673294	Active
10	1/10/2019 9:25	30	5	35	5.05	27	5	35	4.675458	Active
11	1/10/2019 9:26	30	5	35	5.05	27	5	35	4.677598	Active
12	1/10/2019 9:27	30	5	35	5.05	27	5	35	4.679715	Active
13	1/10/2019 9:28	30	5	35	5.05	27	5	35	4.681807	Active
14	1/10/2019 9:29	30	5	35	5.05	27	5	35	4.683875	Active
15	1/10/2019 9:30	30	5	35	5.05	27	5	35	4.68592	Active
16	1/10/2019 9:31	15	5	35	3.44	27	5	35	4.687943	Active
17	1/10/2019 9:32	15	5	35	3.44	27	5	35	4.681048	Active
18	1/10/2019 9:33	15	5	35	3.44	27	5	35	4.674229	Active
19	1/10/2019 9:34	15	5	35	3.44	27	5	35	4.667485	Active
20	1/10/2019 9:35	15	5	35	3.44	27	5	35	4.660814	Active
21	1/10/2019 9:36	15	5	35	3.44	26	5	35	4.654215	Active
22	1/10/2019 9:37	15	5	35	3.44	26	5	35	4.647686	Active

REMOTE MONITORING AND SYSTEM CONTROL VIA VPN

All SMART DryKeep® systems can be accessed remotely from a computer that has access to the Internet. All that is required for the SMART DryKeep® system is a customer-supplied data SIM card with a static (public) IP address installed in the Sixnet RTU. The client computer that will access the SMART DryKeep® system remotely will require OpenVPN and the appropriate security certificate. Once the client computer is connected to the Sixnet RTU through the VPN, you will gain access to the SMART DryKeep® HMI for remote monitoring and control of the SMART DryKeep® system and will be able to download the logged data to the accessing computer.

NOTE: By default, cellular carriers will provide a SIM card with a dynamic IP address. You must request a publicly accessible IP address (static IP address) from your cellular carrier in order to access the SMART DryKeep® system.

NOTE: For cyber-security purposes, only a single port will be opened up for communication. Double authentication is required between two security certificate keys that reside on the accessing computer and on the Sixnet RTU.

DOWNLOADING AND CONFIGURING OPENVPN ON THE CLIENT COMPUTER:

The OpenVPN program can be downloaded onto any computer for free from the OpenVPN website. You can use the following link to select the appropriate installer for your operating system:

<https://openvpn.net/index.php/open-source/downloads.html>

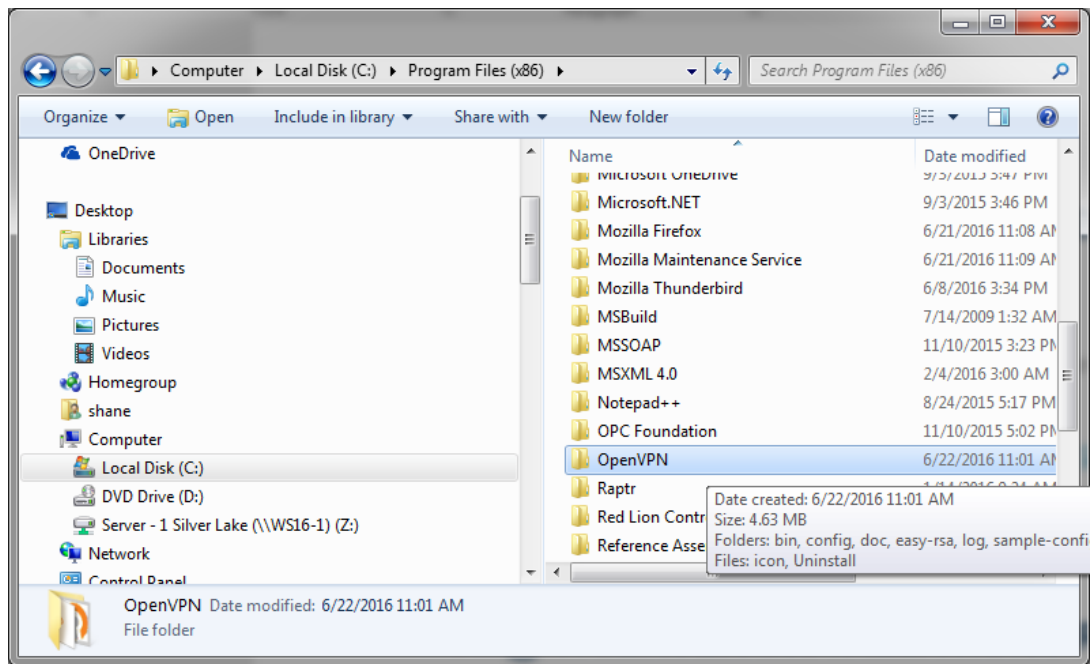
Extract the files to a Program Files directory.

Next use the following link to download the client ZIP folder from the DryKeep website:

<https://www.drykeep.com/wp-content/uploads/config.zip>

Navigate to zip folder on your computer and extract the files. Select all of the files inside the folder where they are extracted to and copy and paste them into the OpenVPN/config folder on your computer.

Name	Type	Compressed size	Password pr...	Size	Ratio
ca	Security Certificate	1 KB	No	2 KB	42%
client2	Security Certificate	3 KB	No	4 KB	49%
client2.key	KEY File	1 KB	No	1 KB	22%
README	Text Document	1 KB	No	1 KB	34%
Sixnet - Location	OpenVPN Config File	2 KB	No	4 KB	56%



Once the files are placed in the Program Files folder, navigate into the folder and to OpenVPN/config and open the file Sixnet – Location OpenVPN Config Flie with Notepad or a similar text editing utility.

```

22 # the firewall for the TUN/TAP interface.
23 ;dev tap
24 dev tun
25
26 # Windows needs the TAP-Win32 adapter name
27 # from the Network Connections panel
28 # if you have more than one. On XP SP2,
29 # you may need to disable the firewall
30 # for the TAP adapter.
31 ;dev-node MyTap
32
33 # Are we connecting to a TCP or
34 # UDP server? Use the same setting as
35 # on the server.
36 proto tcp
37 ;proto udp
38
39 # The hostname/IP and port of the server.
40 # You can have multiple remote entries
41 # to load balance between the servers.
42 remote 192.168.0.1 1194
43 ;remote my-server-2 1194
44
45 # Choose a random host from the remote
46 # list for load-balancing. Otherwise

```

The only modification that needs to be made is changing the line:

remote 192.168.0.1 1194

To:

remote XXX.XXX.XXX.XXX 1194 **where the XXX.XXX.XXX.XXX needs to be changed the public static IP address assigned by the cellular carrier.**

Save changes to finalize settings. Some operating system versions will not allow you to save the file in the OpenVPN/config folder. You may have to save it to your desktop first and then copy and paste it into your OpenVPN/config. Make sure once it is placed in the OpenVPN/config folder that it shows up as a OpenVPN Config File (.ovpn)

The file name 'Sixnet – Location' can also be renamed to a more detailed reference name for clarity/convenience. This is especially useful if you will be remoting into several DryKeep units as you can name the .ovpn file for each connection after each transformer or substation or other reference you choose.

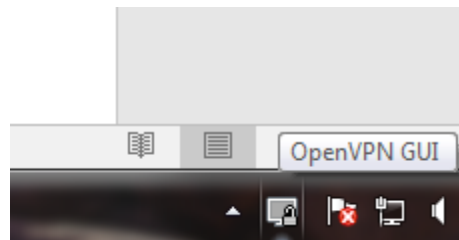
FUTURE EXPANSION

The OpenVPN software can be used to access multiple SMART DryKeep systems. If another unit is added in the future, all that is needed is to copy the before-mentioned 'Sixnet – Location.ovpn' (or renamed) file, rename it to reference the new system, and change the IP address using Notepad or your other text editor to the public IP address of the new unit as done in Step 1 above.

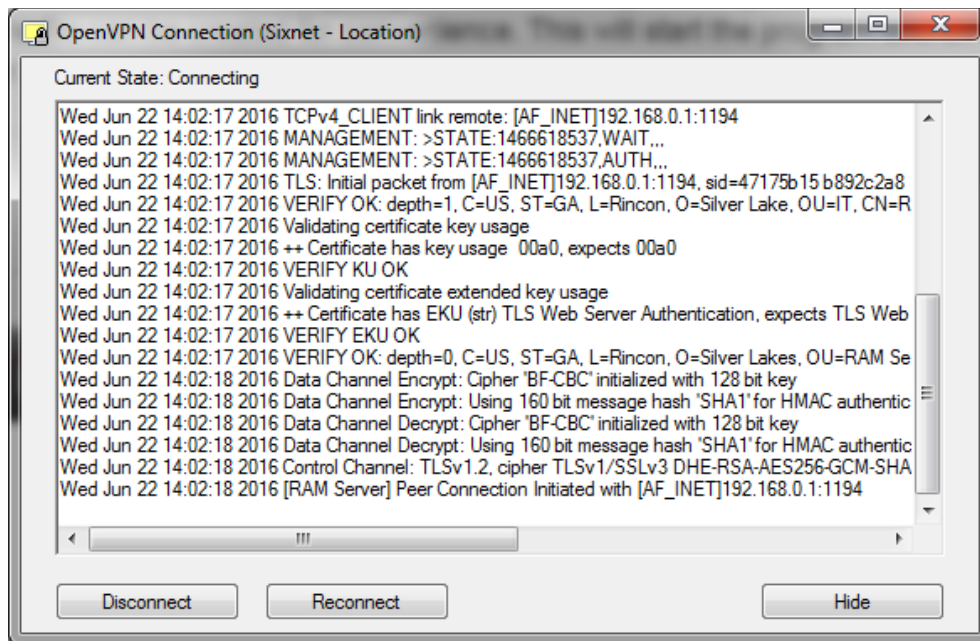
OPENVPN CONNECTION ON CLIENT COMPUTER

1. Open Software

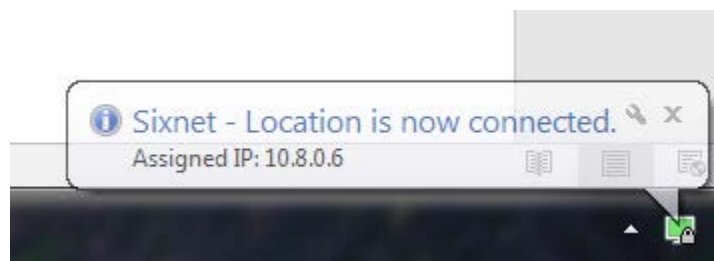
The OpenVPN software can be started by navigating to and executing the Program Files/OpenVPN/bin/openvpn-gui.exe. A shortcut to the file can be created for convenience. This will start the program and an icon will appear on the bottom right taskbar.



By right clicking the icon, a menu will pop-up. Click the 'Connect' option to open the VPN tunnel to the Sixnet unit.



A window will load showing the connection status. When successful it will display as 'Connected' and close the window, showing the notification below.



The VPN tunnel to the Sixnet is now open and the SMART DryKeep® HMI can be accessed.

ACCESSING THE SMART DRYEEP® HMI REMOTELY VIA OPENVPN

Once connected via OpenVPN, the HMI can be accessed through the client computer's web browser at <http://192.168.2.71>.

Note: Java is required to run this remote application. Google Chrome does not support Java. You must use a web browser that supports Java such as Internet Explorer or Firefox.

The default login will be:

User: Administrator

Pass: admin

SIEMENS

SIMATIC HMI Miniweb on HMI_Panel

Welcome Administrator
You are logged in.
[Logout](#)

Miniweb Start Page

Welcome on HMI_Panel

Device Status of HMI_Panel
The runtime is stopped

General Device Information	
Device Type	TP1200 Comfort
Image version	V13.00.01.06_03.01
Bootloader version	1.10
Bootloader release date	22.2.2012
Device Name	HMI_Panel
SSLEAY_VERSION	OpenSSL 1.0.1j 15 Oct 2014

Select the 'Remote Control' link on the left navigation pane.

SIMATIC HMI Miniweb on HMI_Panel

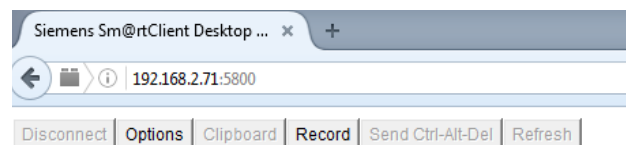
Remote Control

Remote Maintenance over the Internet Explorer

Internet Explorer V6.0 SP1 or higher is required for remote maintenance. For further information, refer to the service downloads.

[Start Sm@rtClient](#)

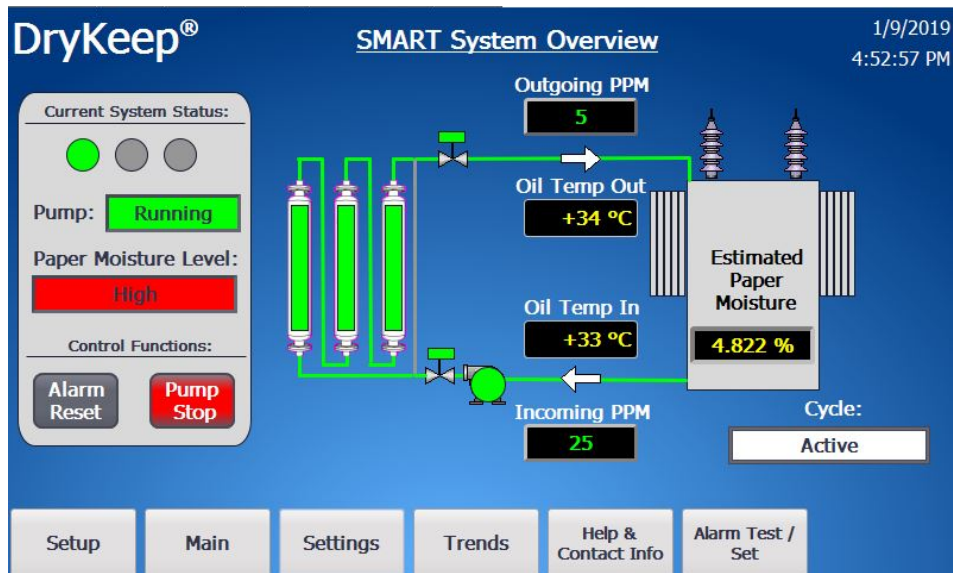
On the next page, click the link to Start Sm@rtClient. This will redirect to a page where the HMI can be controlled and monitored. **Java is required to run this application.** Modern browsers will prompt the user to the correct download if they do not have it installed.



VNC Authentication

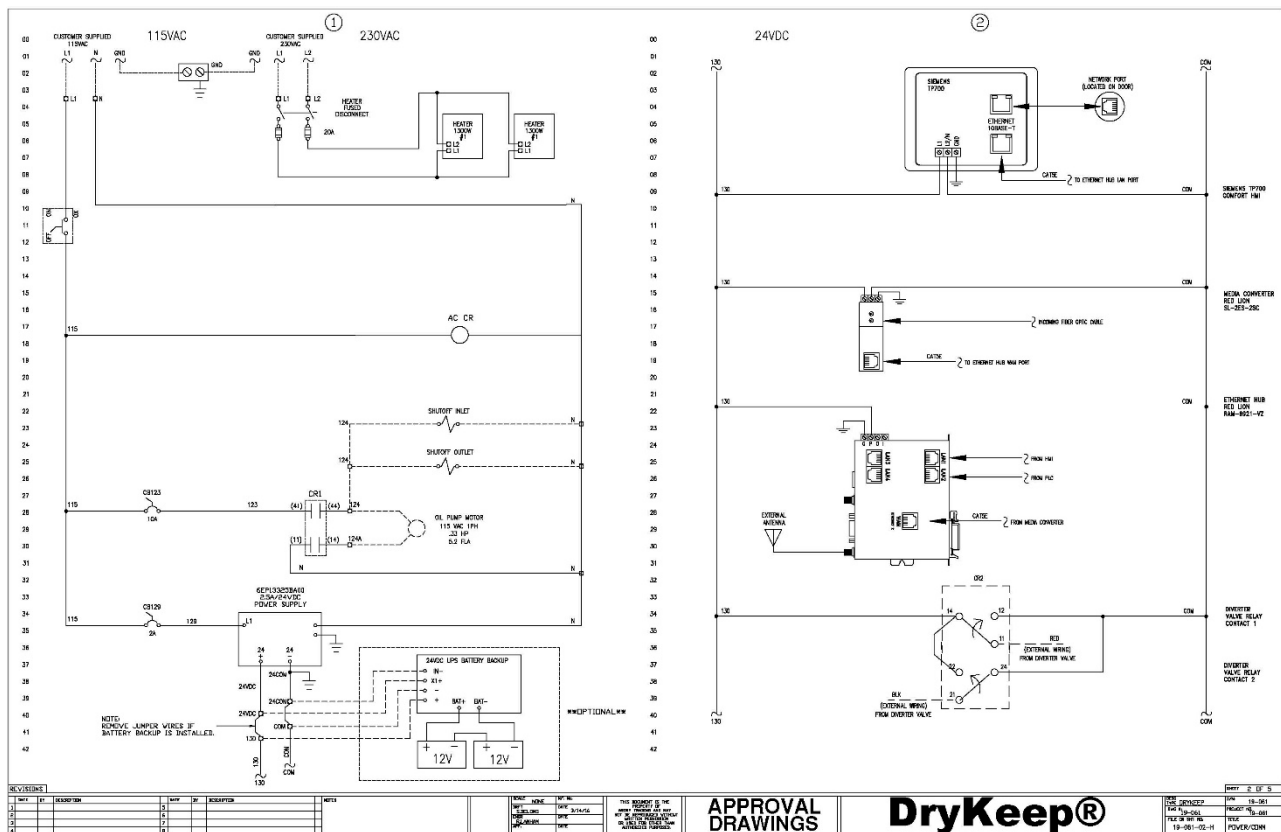
Password:

After being redirected, a password is needed to log in to Sm@rtserver. The password is 'drykeep'. After submitting the password, the HMI view will display as below. Anything that could be done locally at the HMI is available to monitor or control through this application.



ACCESSING THE SMART DRYKEEP® HMI REMOTELY VIA WIRELESS (WLAN) CONNECTION

This SMART DryKeep unit comes with a WLAN access point, client with two internal antennas (MIMO) WLAN 802.11 a, b, g, n, frequency: 2.4 GHz, 5 GHz for LAN, web, http/https. The SSID is DryKeep. The password is Drykeep1. Once connected wirelessly to the DryKeep network, the HMI can be accessed through the client computer's web browser at <http://192.168.2.71> by following the same procedures as outlined above in the ON-SITE LOGGED DATA RETRIEVAL section.



SMART DryKeep® Power Wiring Diagram

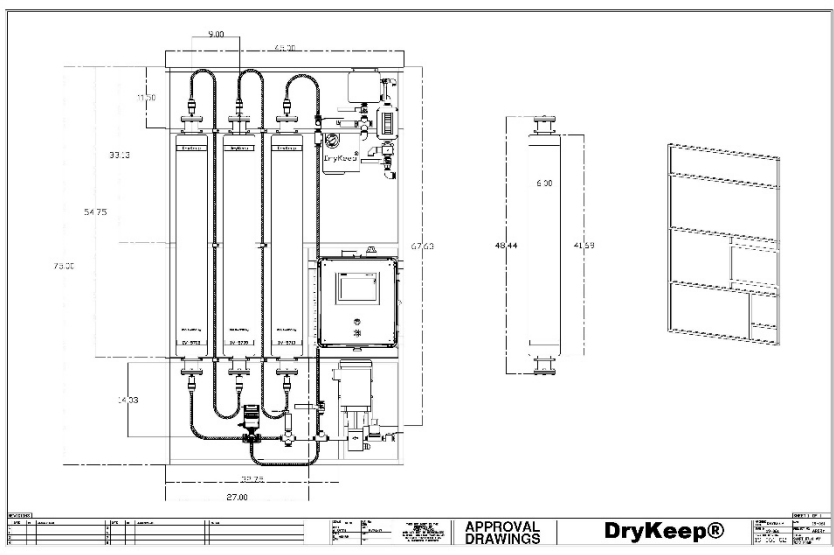


Figure 14: SMART RT-9 dimensional drawing

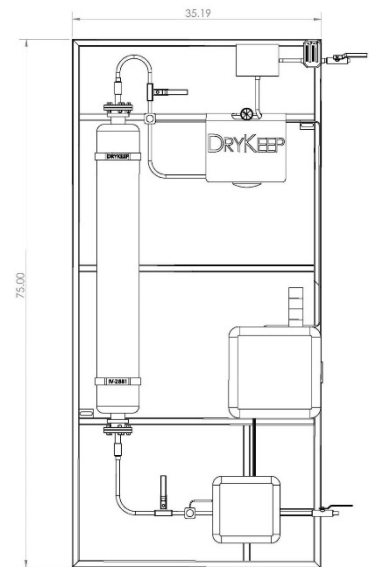


Figure 15: SMART RT-3 dimension drawing

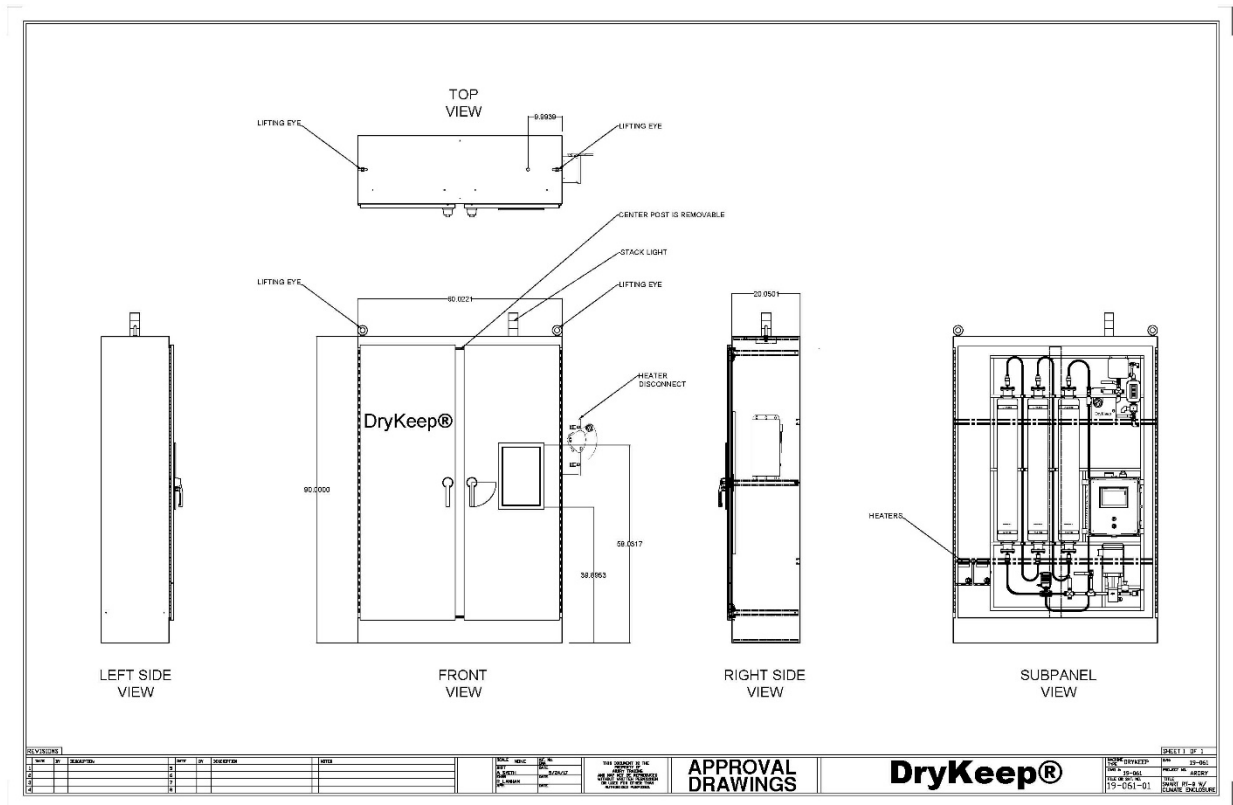


Figure 16: RT-9 Enclosure Drawing

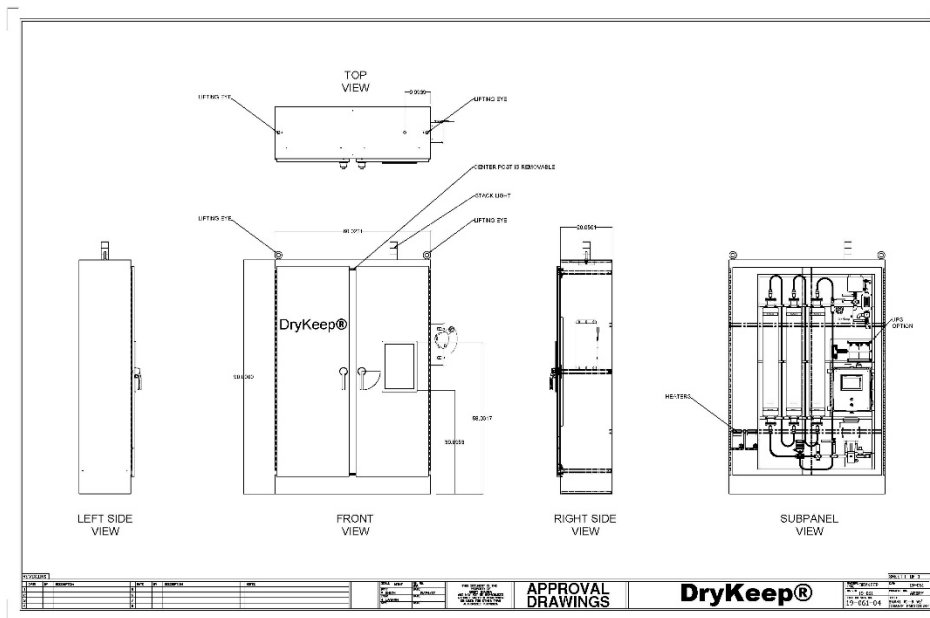


Figure 17: RT-9 Enclosure Drawing with UPS option

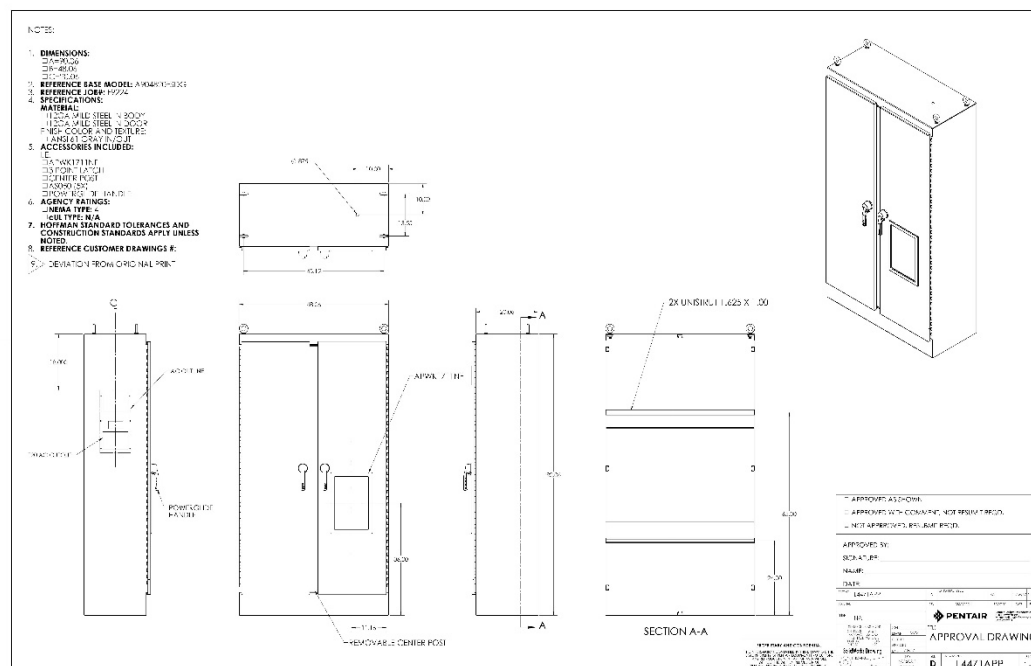
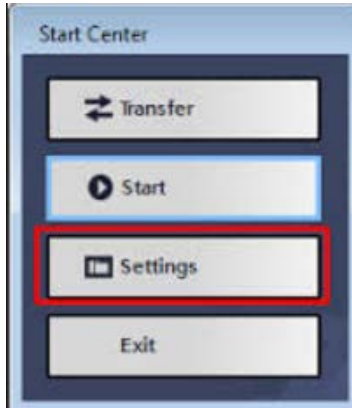


Figure 18: RT-3 Enclosure Drawing

We reserve the right to make changes to any described details and technical data contained herein. Continuous product enhancement by DryKeep® and local conditions may result in deviations from this standard product installation.

Procedure to Reset HMI Password for DryKeep SMART VPN Remote access

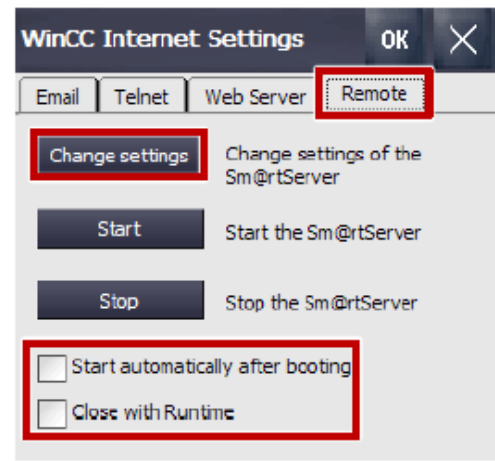
1. The Smart DryKeep system will need to be powered down and restarted to access the Start Center Screen on the HMI. This can be done via circuit breaker CB129 behind the deadfront panel, or if access behind the deadfront panel is restricted/unauthorized, by using the main power button on the side of the controller enclosure.
2. While the HMI is booting up, a **Start Center Screen** will appear with a settings tab.
Click This Settings Tab.



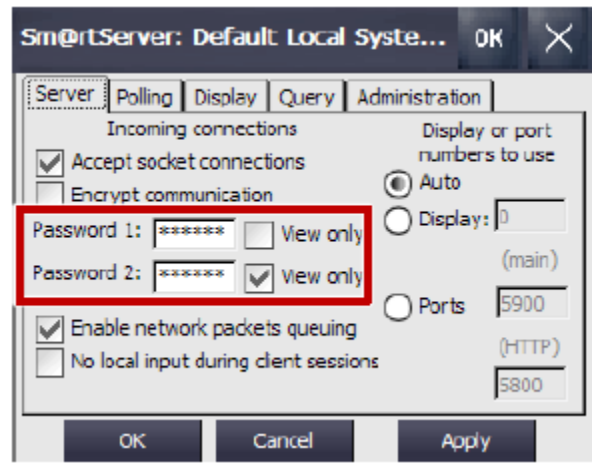
3. This Tab will lead to the setting for the HMI. Once in the settings, double click on the **“WinCC Internet Settings”**.



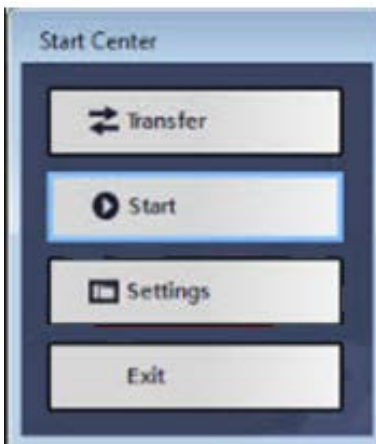
4. Next, click on the **Remote Tab**, and then press the **Change Settings** Button. (Note: The **Start Automatically after Booting** box should have a check.)



5. This will bring up the **Sm@rtServer Setting Screen**. From this screen, click on the **Server Tab**.



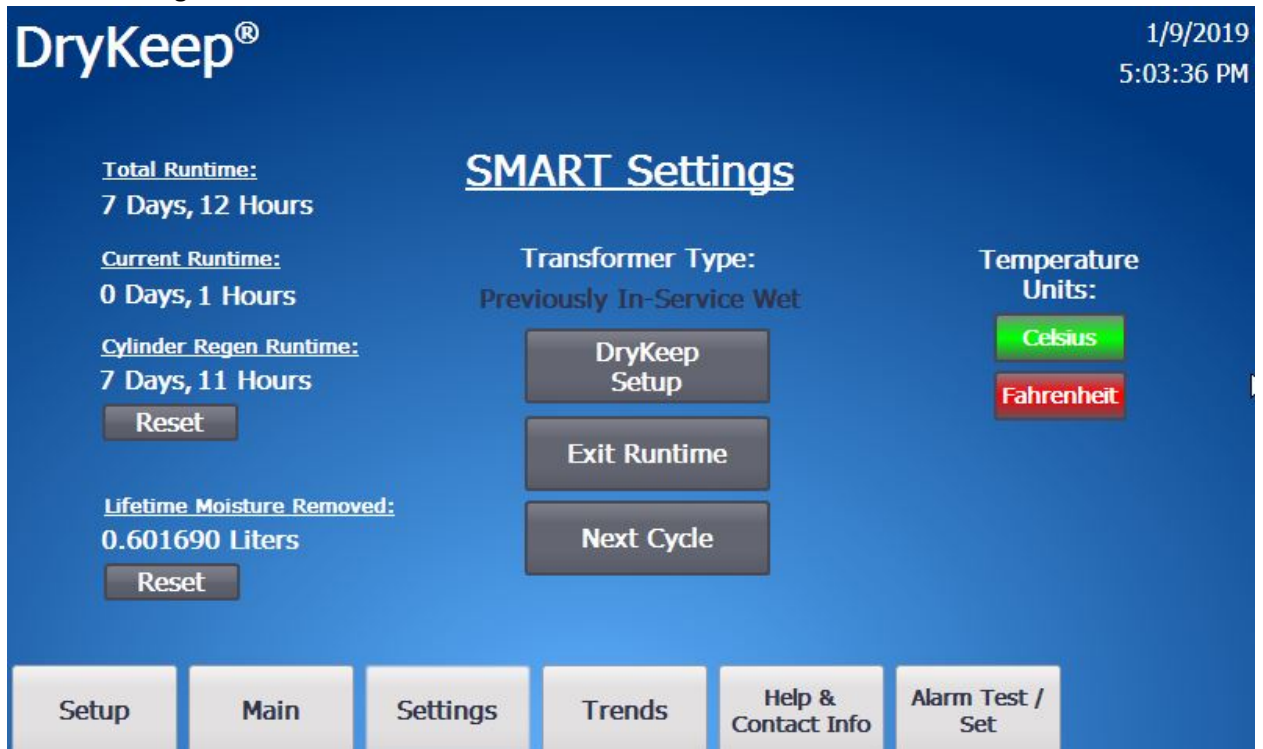
6. Under the **Server Tab**, there will be a place to enter a **Password 1** and a **Password 2**.
7. Enter secure passwords for access to the operator's panel. The view only box should be checked if the user is only monitoring the operator panel with the password. These passwords will be used to grant access from remote locations.
8. Click the **Apply Button**, then the **OK Button**.
9. When the **Ok Button** is pressed you will be then prompted to restart the remote server automatically. Click the **Yes Button**.
10. Close all screens until you reach the **Start Center Screen**. Click the **Start Tab** to proceed to the operator panel.



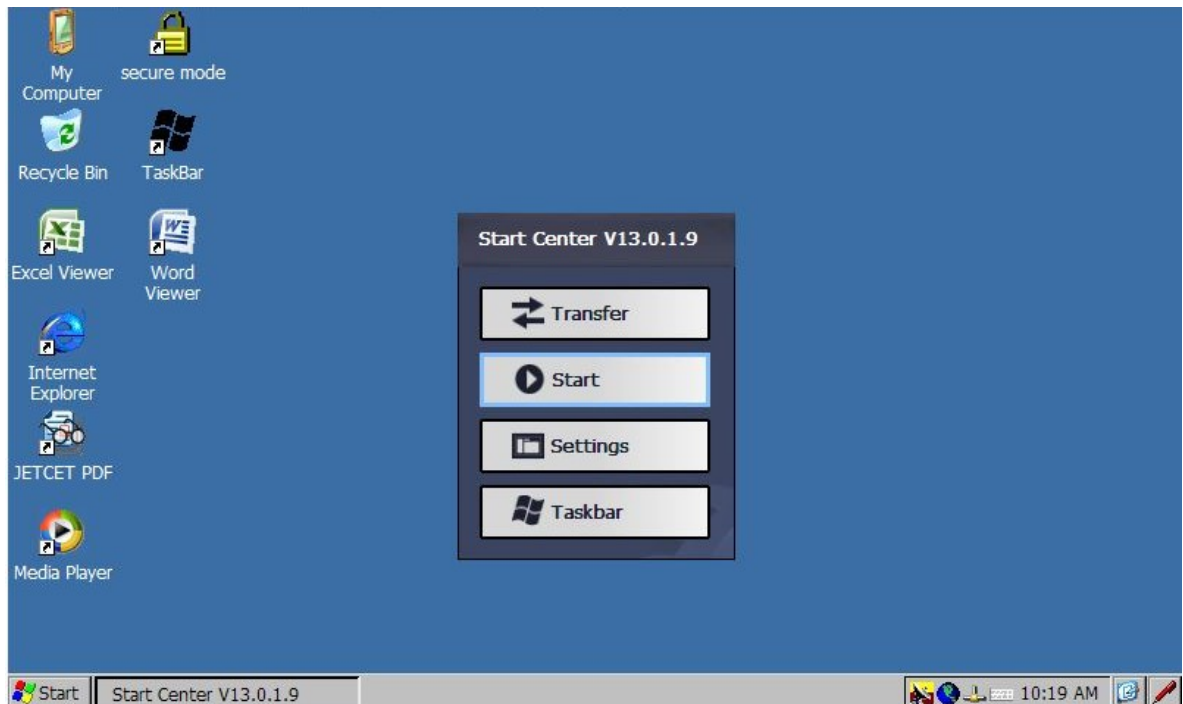
Procedure to Adjust Time Zone, Date and Time

If you need to adjust the Time Zone, Date or Time on the SMART system, follow the following procedure:

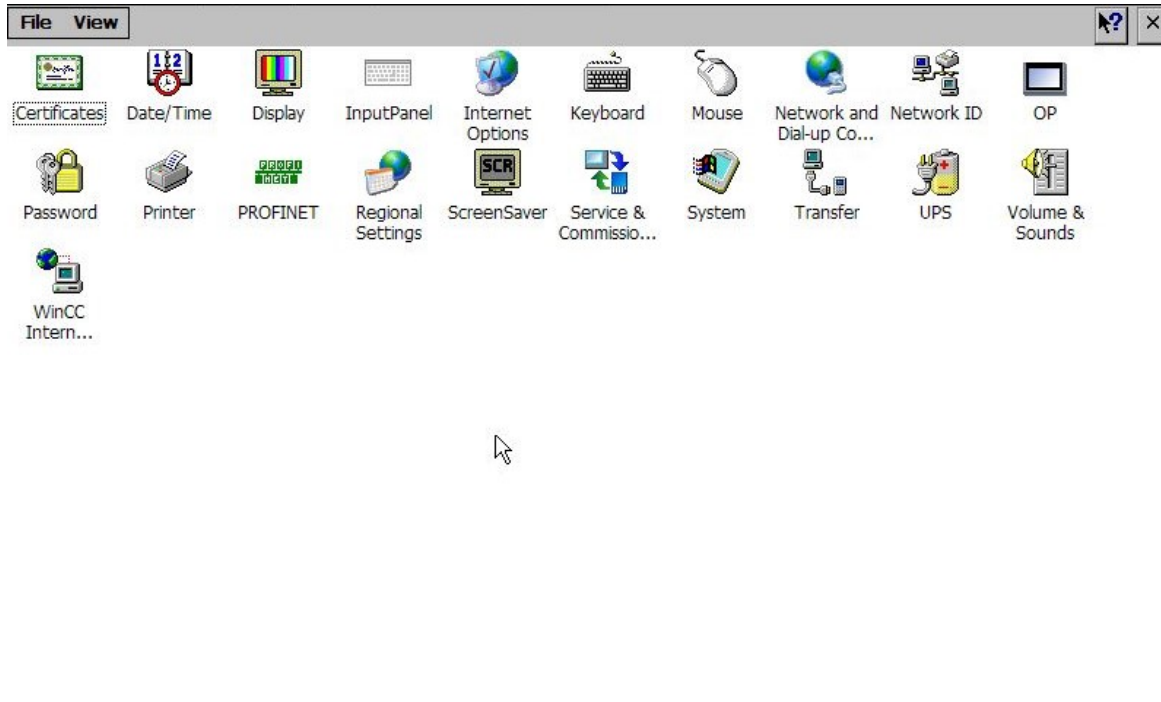
- 1) Got the Settings screen and touch the Exit Runtime Button



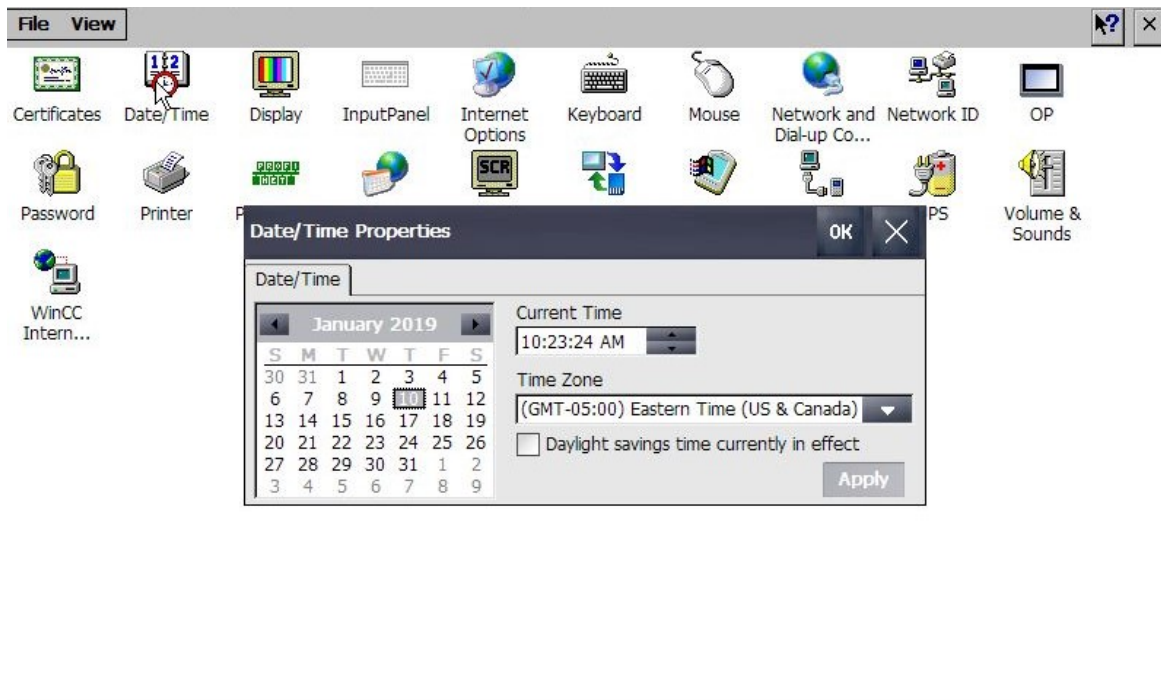
- 2) When the 4-button screen shown below appears, select "Settings".



- 3) A list of icons will appear in the window of the HMI (figure below). Double click the option 'Date / Time'.

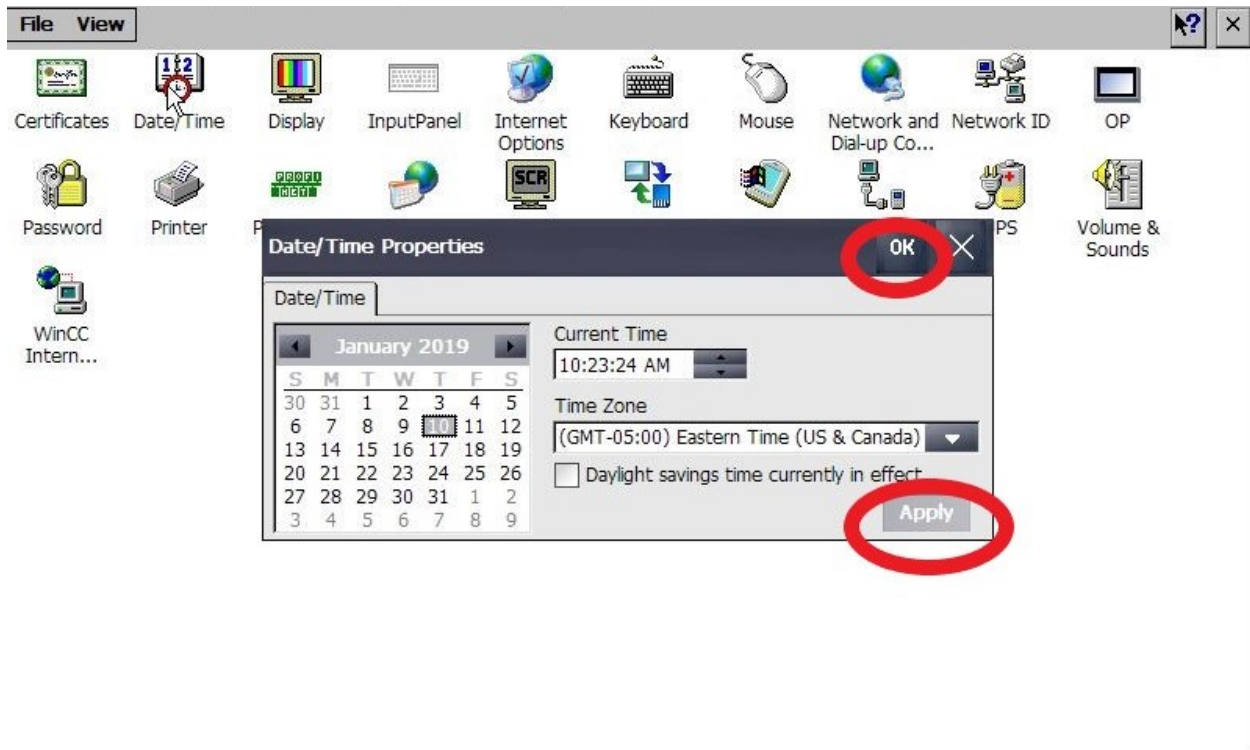


A menu will pop up where the local time zone can be selected using the drop-down menu.

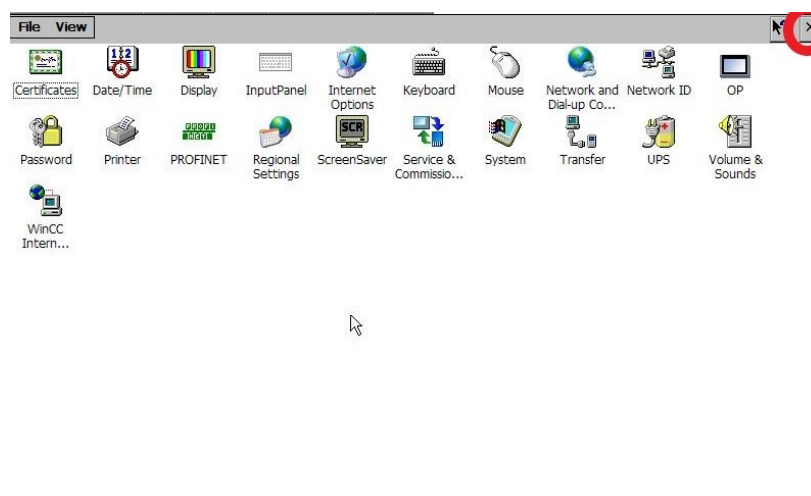


Within the same menu, the time and date can also be set. To select a date, press the corresponding day, month, and year from the calendar. The arrows on either side of the calendar allow for scrolling through the months. For the time, it can be selected in the same menu under 'Current Time'. Selecting the touch screen over the area that needs to change (Ex: Hour, Minutes, AM/PM, etc) will allow use of the up and down arrow keys to modify the values until the correct time is reached.

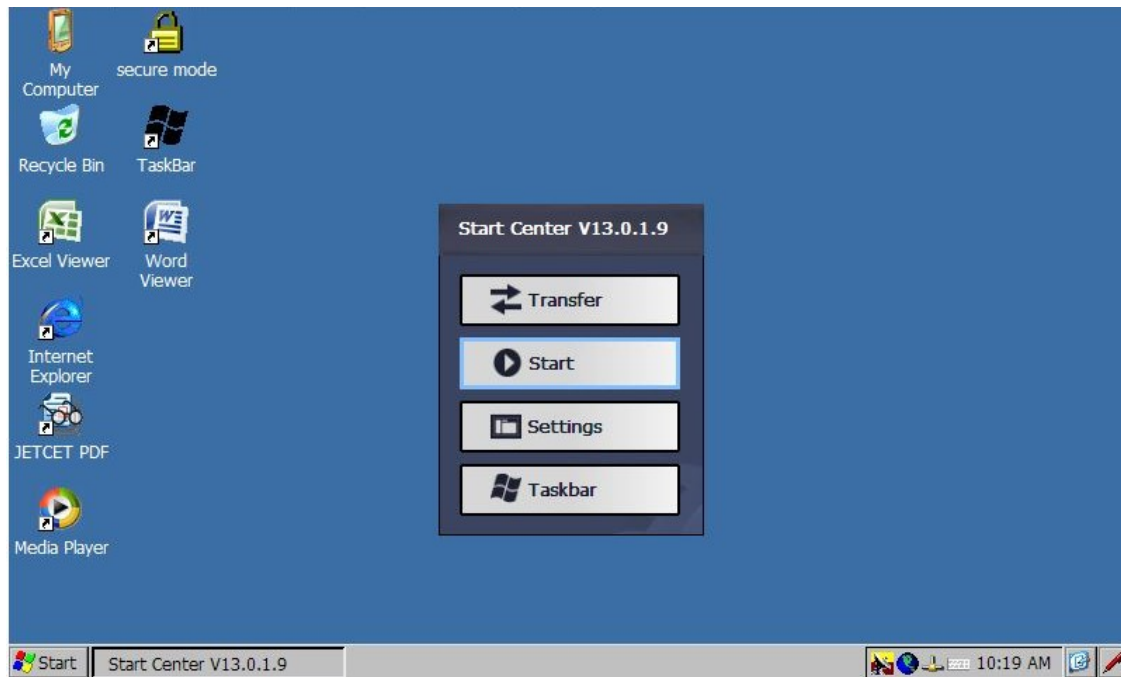
You must select both "Apply" on the bottom right corner of the menu and then "OK" at the top before hitting the "X" to close the menu for the changes to take effect



Once you exit the Date/Time Properties menu by selecting X at the top right, you will be returned to the icon screen. Select the X at the top right.



When the 4-button screen shown below appears, select “Start”, allow the SMART DryKeep system to cycle through the startup connections, and select “Main” to go back to the main SMART screen.



DRYKEEP SATURATED CYLINDER AND ADSORBENT MATERIAL REPLACEMENT PROCEDURE

Personal Protective Equipment: Chemical-type goggles or face shield is recommended for transformer oil. Goggles, cotton gloves, and work clothing sufficient to prevent skin contact is recommended for beads. Refer to bead and oil MSDS for complete details.

PURPOSE

To provide a controlled method for the replacement and regeneration of the cylinders of all SMART DryKeep® systems.

SCOPE

This instruction is applicable to all SMART DryKeep® systems.

METHOD

Once the cylinders have been saturated with moisture they need to be replaced with new or regenerated cylinders. The following procedure details how to replace and regenerate saturated cylinders on all SMART DryKeep® systems.

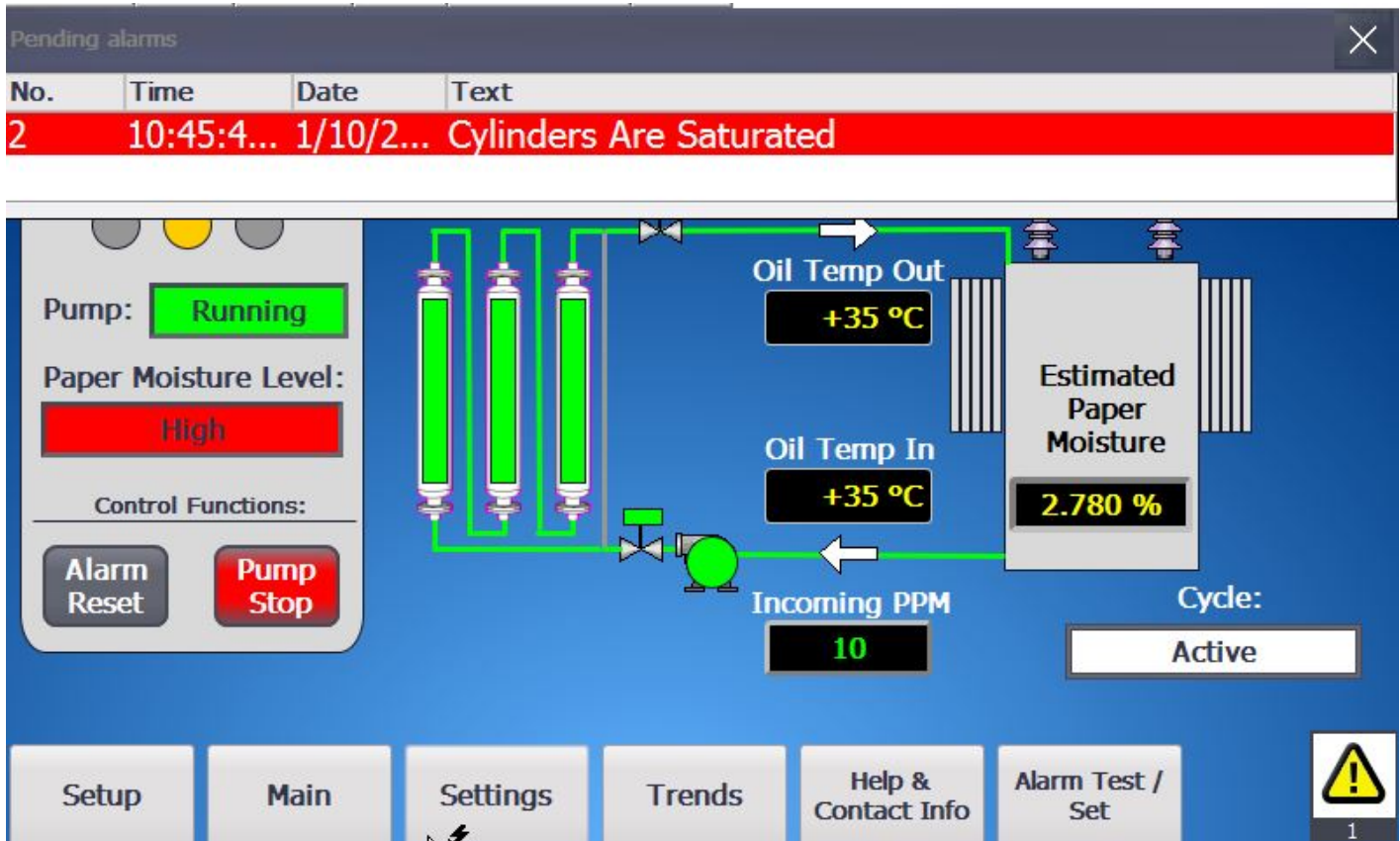
Reference Figure 1 for system layout. Although not shown, the procedure for the single cylinder model SMART RT-3 is the same, just with one cylinder.



Figure 1: DryKeep® system layout

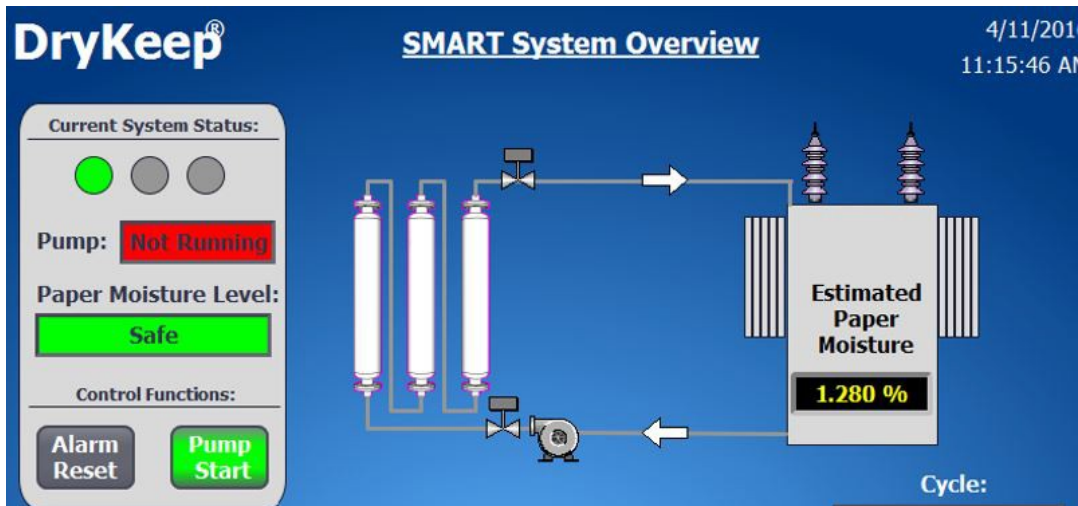
DRYKEEP SATURATED CYLINDER REPLACEMENT PROCEDURE

DryKeep® saturated cylinders can be removed while the transformer remains under load and energized. All SMART DryKeep® systems will alarm when the cylinder(s) are saturated. Locally the amber stack light will illuminate to indicate cylinder saturation. The alarm will be displayed on the system HMI display screen. Remotely, the saturated cylinder alarm is sent through the user's SCADA system (if applicable) and via SMS to appropriate personnel (if applicable).



- 1) Press the “Pump Stop” button under the Control Functions on the main HMI screen to turn the DryKeep® pump off. This action will close the incoming and outgoing safety solenoid valves.

Note: Visual indication that the pump is off is shown by the absence of the green in the piping and cylinders on the Main Screen. The Pump Stop button will change to green and will show Pump Start as well. (See next page)



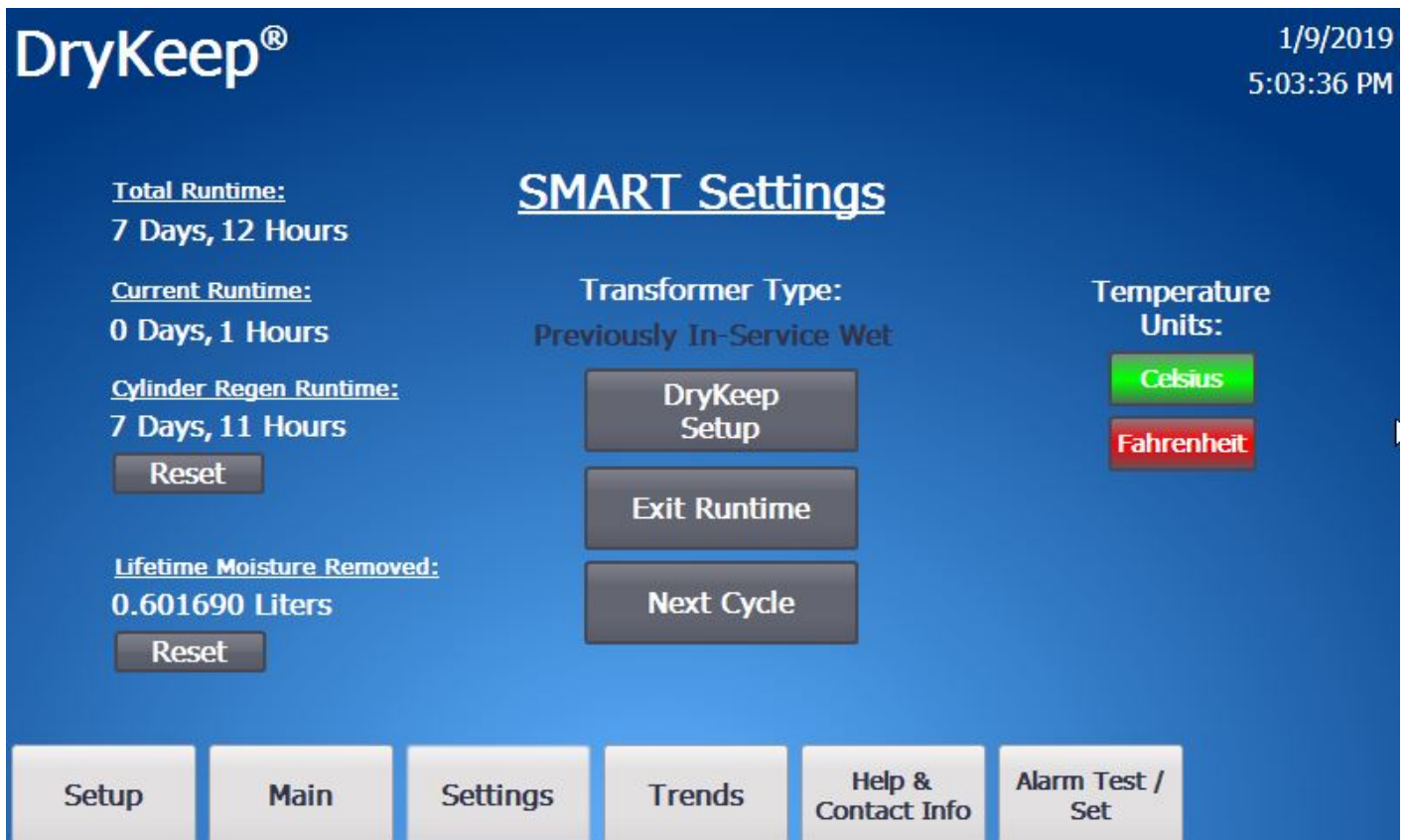
- 2) Close the manual inlet valve at the bottom of the DryKeep[®] system.
- 3) Close the manual outlet valve at the top of the DryKeep[®] system.
- 4) Starting from the left-hand cylinder and working towards the right-hand cylinder manually unscrew the two sets of male/female quick couplers of each cylinder.
- 5) Disengage the quick couplers by pulling apart in the sequence below:
 - 1st - bottom of left-hand cylinder.
 - 2nd - top of left-hand cylinder.
 - 3rd - bottom of the center cylinder.
 - 4th - top of center cylinder.
 - 5th - bottom of right-hand cylinder.
 - 6th - top of the right-hand cylinder.

The quick couplers are self-sealing on removal. Any of the cylinders can now be removed from the frame by removing the 9/16" hex bolts on the top and bottom clamps on each cylinder. Two persons are required. Use the two handles on each cylinder. Be careful, as each saturated cylinder can weigh over 90 lbs (40 kgs).
- 6) Position and secure the replacement cylinder(s) onto the frame by using the lifting handles and clamps.
- 7) Replace the pipes/hoses by engaging the quick couplers and manually tighten the couplers.

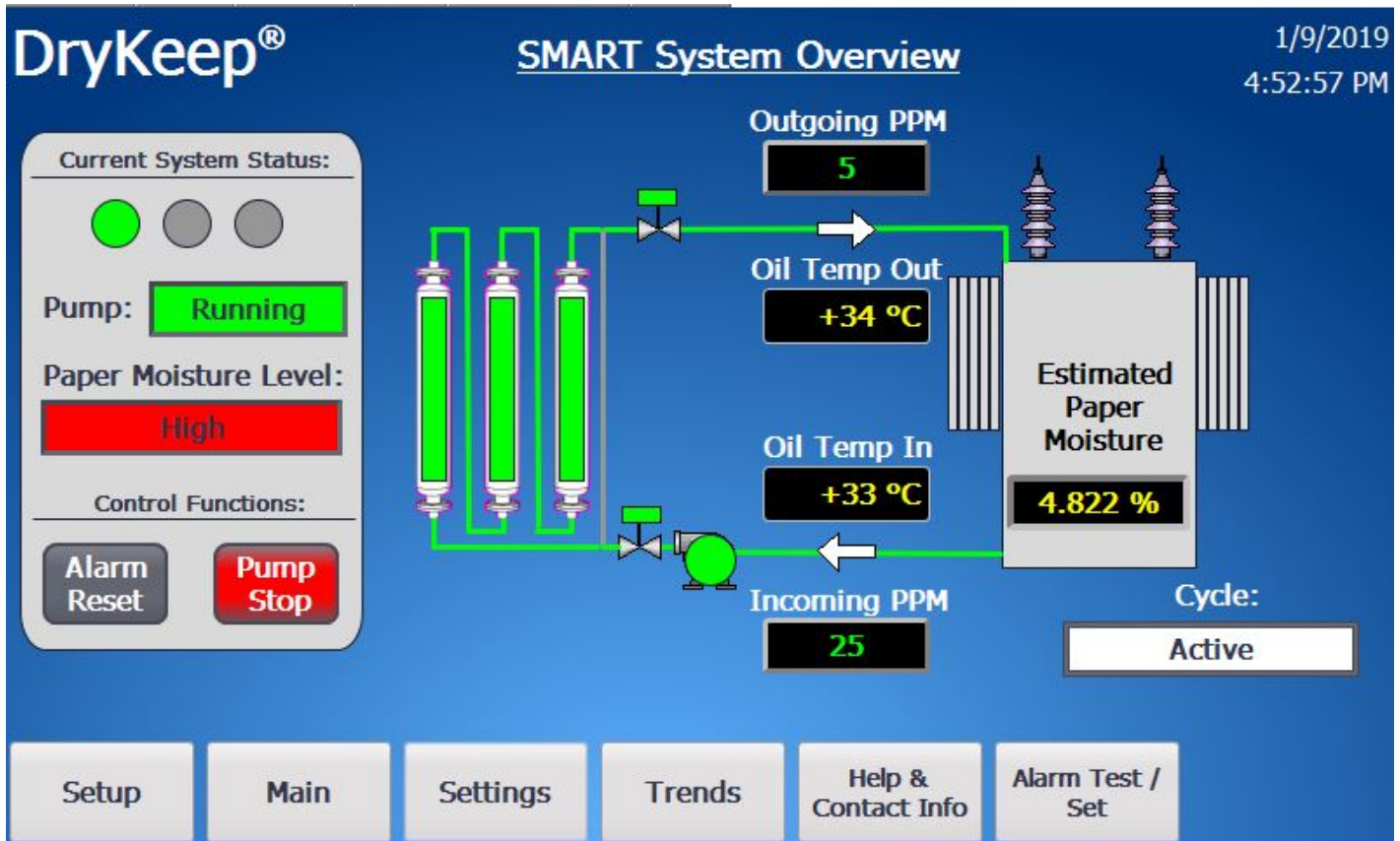
The system is now ready to be re-commissioned. The recommissioning procedure follows below.

RECOMMISSIONING:

- 1) Check to ensure that the quick couplers on the top and bottom of each cylinder are fully tightened. Hand-tighten only. Do not use wrenches.
- 2) Refer to Figure 1. Ensure that the DryKeep® manual outlet valve is closed.
- 3) Open the manual inlet valve of the DryKeep® system. *The inlet and outlet solenoid safety valves will remain closed until the pump is powered on as explained below.*
- 4) Push the Settings tab on the Main HMI display screen. Under Cylinder Regen Runtime, push Reset to restart the cylinder runtime



- 5) Push the Main tab at the bottom of the Settings screen to return to the Main screen. Under the Control Functions, push the Alarm Reset button. This will clear the alarm, open the incoming and outgoing solenoid safety valves, and re-start the system pump.



- 6) Refer to Figure 1. Now that the pump is running, slowly open the bleed valve on the de-aerator tank. It is recommended that the installer have a vessel on hand to capture any oil that may come out of the bleed valve tube while it is open. Ensure that all the trapped air in the system escapes through the bleed valve tube on the de-aerator tank.
- 7) Close the bleed valve on the de-aerator tank and slowly open the manual outlet valve of the DryKeep® system.
- 8) Open the bleed valve again after about 15 minutes to remove any additional air from the system that may have collected in the top of the de-aerator. Again, it is recommended that the installer has a vessel on-hand to capture any oil that may come out of the bleed valve tube while it is open.
- 9) Monitor the system closely for 20 minutes to check for oil leaks, oil flow, and for any abnormalities. Once again, open the bleed valve on the de-aerator tank to remove any remaining air. Close the bleed valve. The system is now ready and running.

DRYKEEP ADSORBENT MATERIAL REPLACEMENT PROCEDURE

STEP 1: Install saturated cylinder vertically onto a handling stand similar to the DryKeep® USA regeneration workstation photos below.



*DryKeep USA
Cylinder Regeneration*

Workstation



*View of top of DryKeep cylinder
clamped to handling stand*



*View of bottom of DryKeep
cylinder secured to handling
stand with two L-brackets*

Step 2: Place an oil recovery pan with at least a 3-gallon capacity below the cylinder.

Step 3: Remove the bottom flange of the cylinder by removing the four 16-mm or five 3/8" bolts. Remove and discard gasket(s). The oil should begin to flow out of the cylinder.

Step 4: Remove the dust cap on the top quick coupler.

Step 5: Insert a small screwdriver or a small rod into the top coupler and push down onto the ball bearing to allow air to flow through the top opening. This will allow the oil to drain faster through the bottom of the cylinder.

Step 6: When the oil has fully drained, remove the oil pan and replace it with a second pan to capture the saturated beads.

Step 7: Depending on the cylinder design, remove the bottom strainer flange by

- A) Unscrewing the two 6-mm countersunk screws,
- B) Unscrewing the two Philips head countersunk screws, or
- C) Unscrewing the threaded strainer flange with the spanner wrench from the DryKeep® USA supplied regeneration kit.

The beads will pour out of the bottom of the cylinder after the strainer flange is removed.

Tap the sides of the cylinder to dislodge any remaining beads.

Step 8: Once all beads are removed, turn the entire cylinder upside down on the rack.

Step 9: Using a funnel, fill the cylinder with the new beads from the DryKeep® USA supplied regeneration kit.

Step 10: Fill the cylinder with new transformer oil (not supplied), reinstall the strainer flange, install new gasket(s) from the DryKeep® USA supplied regeneration kit, and reinstall the top cylinder flange with the bolts removed in step 3. The cylinder flange bolt torque for 16-mm bolts is 65 lb-ft or 88 nm. The cylinder flange bolt torque for 3/8" bolts is 40 lb-ft or 54 nm.

Waste Disposal

- Store the waste oil in a waste oil drum.
- Transfer the oily beads to a waste bead drum.
- Arrange with a waste removal company to collect and dispose.

