

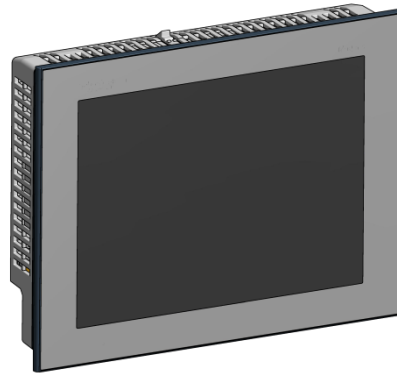
# SCC Inc.

# Technical Instructions

Document No. TS-8000

March 16, 2016

## TS Series Application Guide



### Description

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The TS Series Application Guide includes programming, wiring, and operation examples of the control system for the most common applications.

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## Table of Contents

### Remote Monitoring - Vijeo Design Air

Introduction.....	4
Procedure .....	4
iOS .....	4
Android .....	7
Running On PC Using Android Emulator.....	10

### Loading Software Updates

Introduction.....	12
Procedure .....	12
Copying Files To Touchscreen.....	14
Copying Files To PLC.....	15
Master PLC Activation.....	16
Annunciator PLC Activation .....	17

### Additional Options Master

Introduction.....	18
Procedure .....	18
Disable Watchdog Timer.....	18
Outside Air Temperature From BMS .....	18
Direct Control of Lead Boiler .....	19
Direct Control of Load Demand .....	19
Setting Options Via TS Series Protocol Converter .....	20

### Lead/Lag Master DHW Priority

Introduction.....	21
Procedure .....	21
Using Digital Input From Thermostat .....	21
Using Analog or RTD Input.....	22
Wiring .....	24

## Table of Contents (continued)

### Lead/Lag Master Warm Weather Shutdown

Introduction.....	25
Procedure .....	25
Wiring .....	27

### Using Monitored Digital Outputs For Soft Limits

Introduction.....	28
Procedure .....	28
Wiring .....	29

### Using Monitored Digital Outputs For Time-Based Action

Introduction.....	30
Procedure .....	30
Wiring .....	31

### Using Monitored Digital Outputs For Pump Control

Introduction.....	32
Procedure .....	32
Wiring .....	33

## Remote Monitoring - Vijeo Design Air

**Applies To:** All TS Series

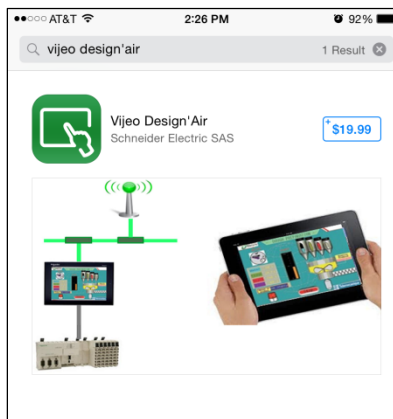
### Introduction

Remote monitoring of a touchscreen is possible using an Android or iOS device (phone or tablet). The touchscreen display can be viewed or manipulated as if the user was at the actual touchscreen, in real time. To establish a connection, the phone or tablet must be connected to the same network as the touchscreen. This requires that the network for the touchscreen contain a wireless access point.

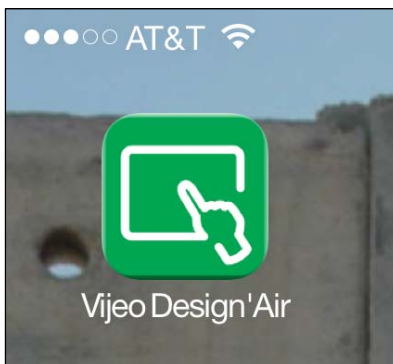
### Procedure

#### iOS

To download the app, search for 'Vijeo Design Air' on the App Store.

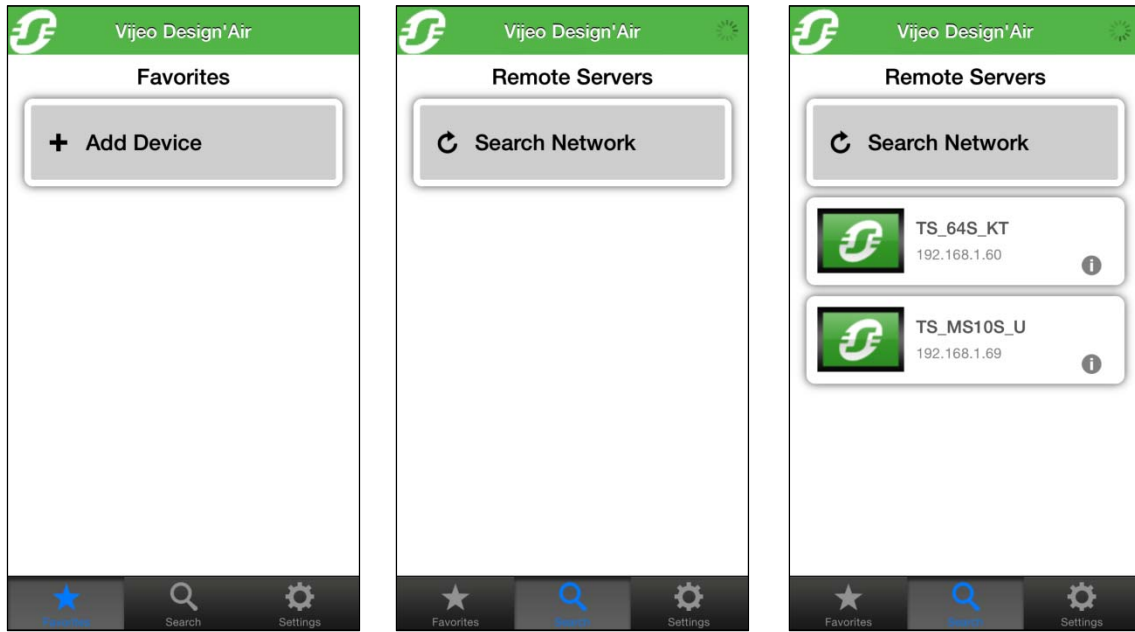


Once downloaded, open the app.



## Remote Monitoring - Vijeo Design Air (continued)

Once open, navigate from 'Favorites' to 'Search' using the tabs at the bottom of the screen. The app will automatically search for available devices. Alternatively, touch 'Add Device' and the IP address of the desired touchscreen can be entered.



Touch the device to connect to. Acknowledge the warning shown if remote control is desired, then touch 'OK'. If view-only access is desired, touch 'View-only'.

Depending on the security design of this HMI Project, all touch objects might be accessible for touch and input on this remote device. Accidental touches can cause unintended operations to run in the system.

**⚠ WARNING**

**UNINTENDED EQUIPMENT OPERATION**

- You must take all necessary steps to prevent accidental touches.
- Know and understand the hazards surrounding equipment movement started by remote operation. You must satisfy all gates and interlocks for protecting people and equipment.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

I understand and accept responsibility regarding use of this functionality.

Alternatively, you can continue in the View-only mode.

Depending on the security design of this HMI Project, all touch objects might be accessible for touch and input on this remote device. Accidental touches can cause unintended operations to run in the system.

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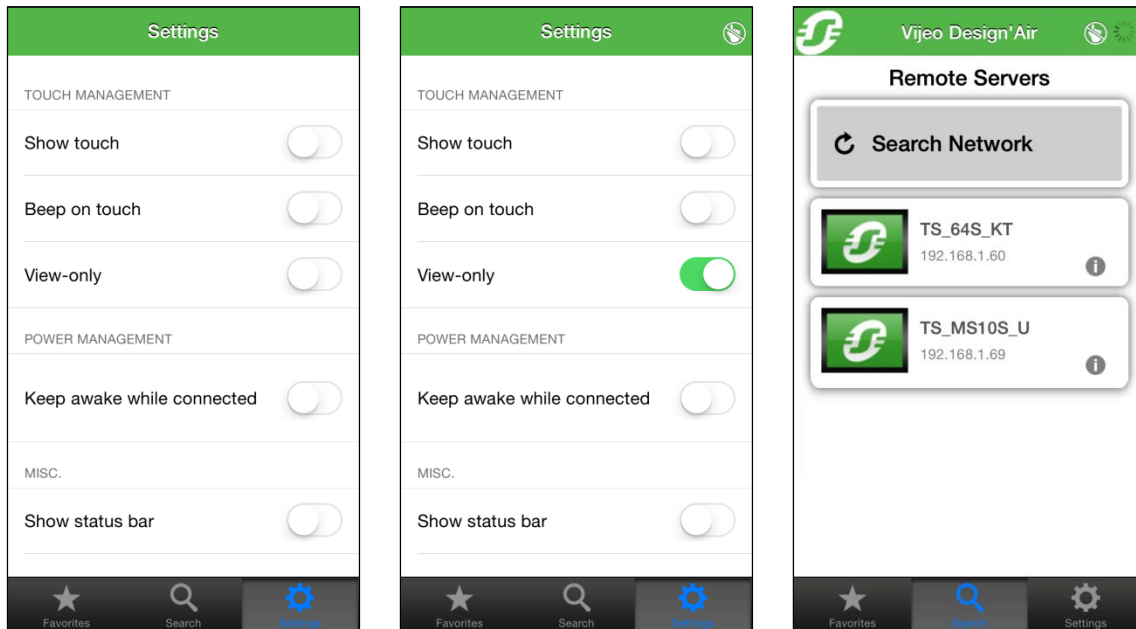
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

I understand and accept responsibility regarding use of this functionality.

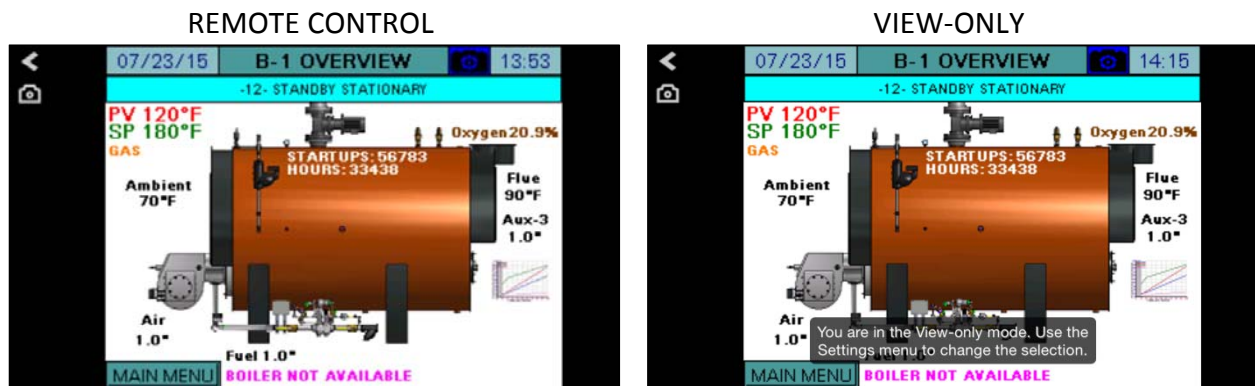
Alternatively, you can continue in the View-only mode.

## Remote Monitoring - Vijeo Design Air (continued)

Navigate to the 'Settings' tab to change settings. Note that when 'View-only' is selected, an icon appears on the top right corner of the screen. Selecting 'Keep awake while connected' will keep the screen lock from activating.



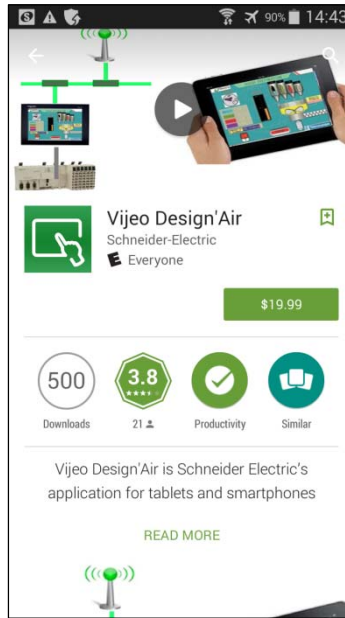
The remote device is now connected. If remote control was enabled, touching the display will manipulate the touchscreen remotely, otherwise a message will appear stating that 'View-Only' mode was selected.



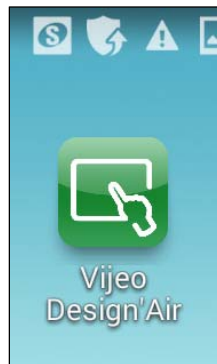
## Remote Monitoring - Vijeo Design Air (continued)

### Android

To download the app, search for 'Vijeo Design Air' on the Google Play Store.

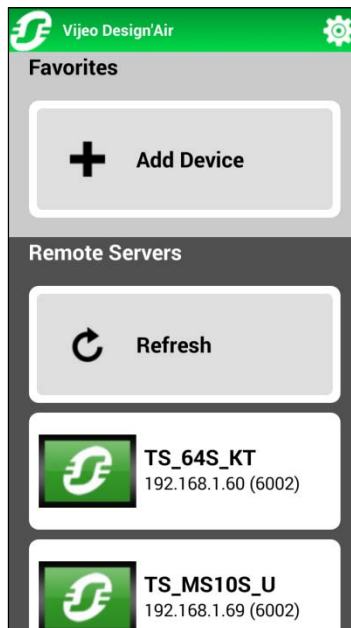


Once downloaded, open the app.

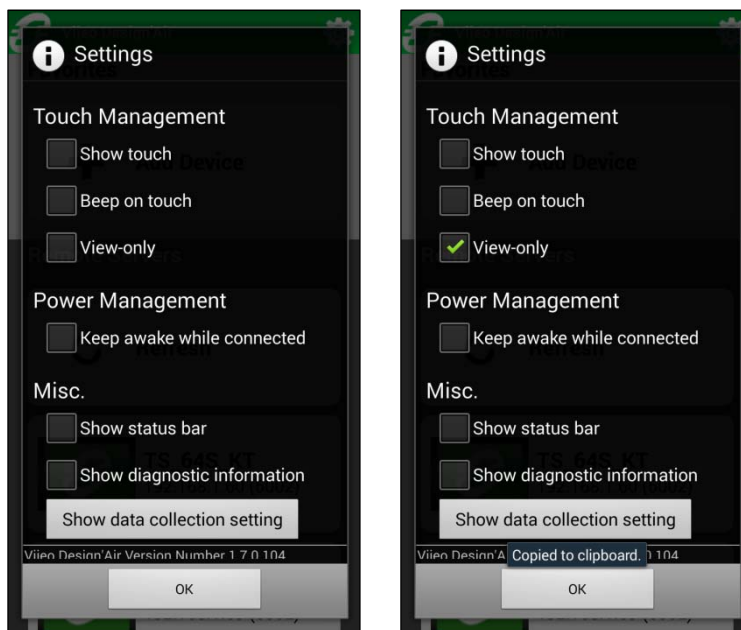


## Remote Monitoring - Vijeo Design Air (continued)

Once open, the app will automatically search for available devices. Alternatively, touch 'Add Device' and the IP address of the desired touchscreen can be entered.

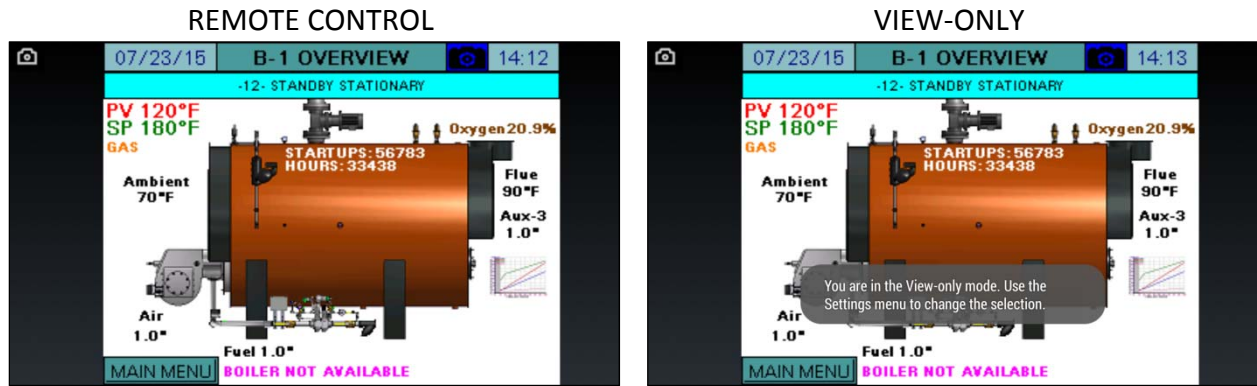


Navigate to the gear icon to change settings. Note that when 'View-only' is selected, an icon appears on the top right corner of the screen. Selecting 'Keep awake while connected' will keep the screen lock from activating.



## Remote Monitoring - Vijeo Design Air (continued)

The remote device is now connected. If remote control was enabled, touching the display will manipulate the touchscreen remotely, otherwise a message will appear stating that 'View-Only' mode was selected.



## Remote Monitoring - Vijeo Design Air (continued)

### Running On PC Using Android Emulator

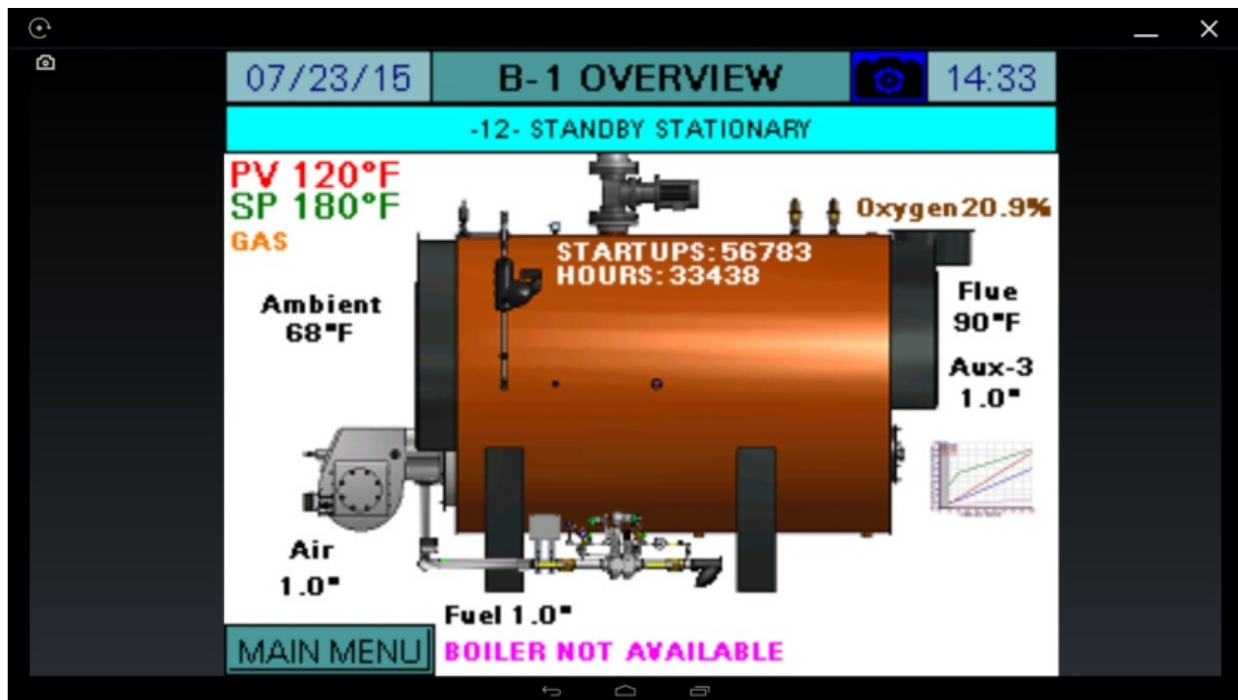
Vijeo Design Air can be installed on a PC if it is run in an Android emulator. Two Android emulators have been tested using this method:

- **AMIDuOS:** [www.amiduos.com](http://www.amiduos.com), 30-day trial available, \$9.99 to purchase (7/2015)
- **BlueStacks:** [www.bluestacks.com](http://www.bluestacks.com), freeware w/ads

After installing one of the emulators, install Vijeo Design Air through the Google Play Store as described in the *Android* section. Shown below are some screen captures using AMIDuOS.



## Remote Monitoring - Vijeo Design Air (continued)



## Loading Software Updates

**Applies To:** All TS Series

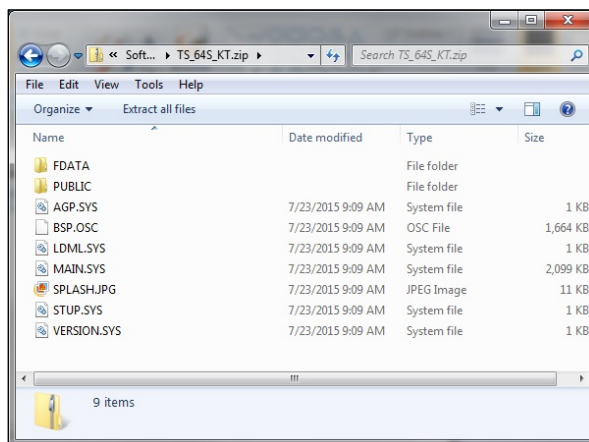
### Introduction

Software updates can be easily applied using a USB drive (touchscreens) or an SD card (PLCs).

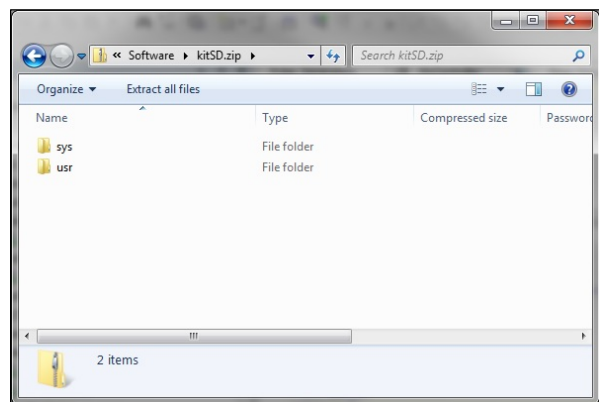
### Procedure

If a software update is necessary, the files will be distributed by SCC in a ZIP folder. To load the contents to the device, the contents of the ZIP folder must be copied to the root directory of a USB drive or SD card.

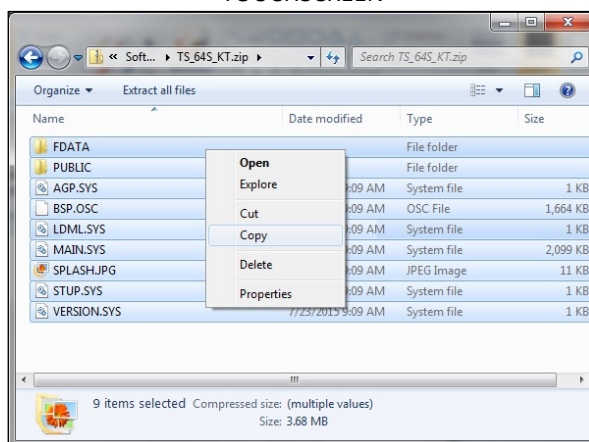
TOUCHSCREEN



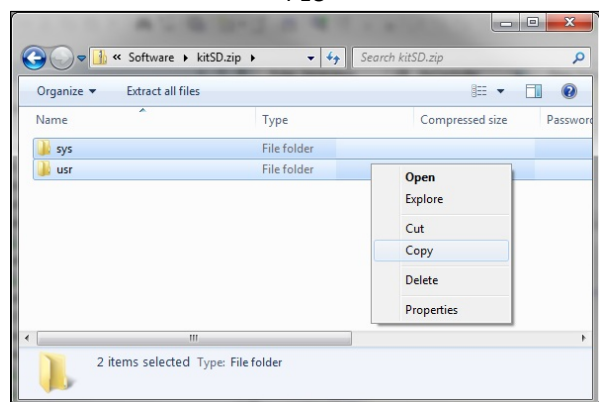
PLC



TOUCHSCREEN



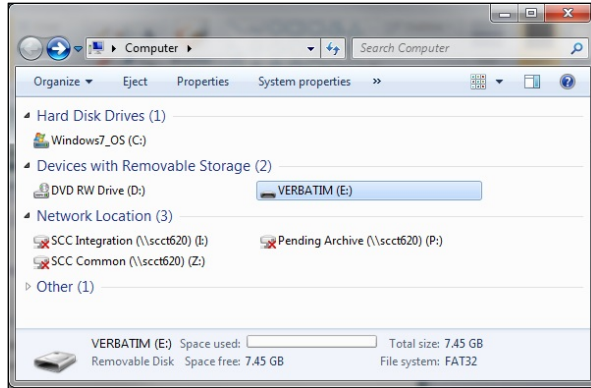
PLC



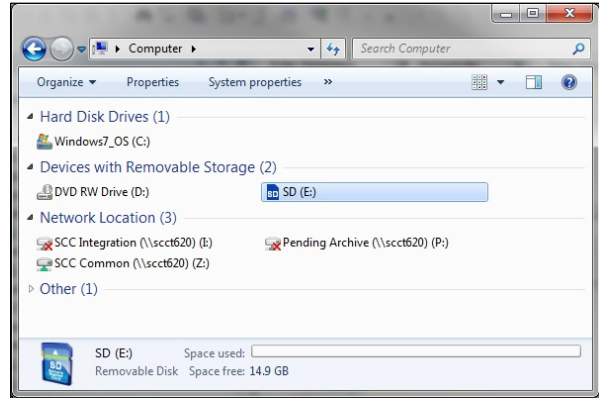
## Loading Software Updates (continued)

Ensure that the USB drive or SD card is completely empty, then paste the contents.

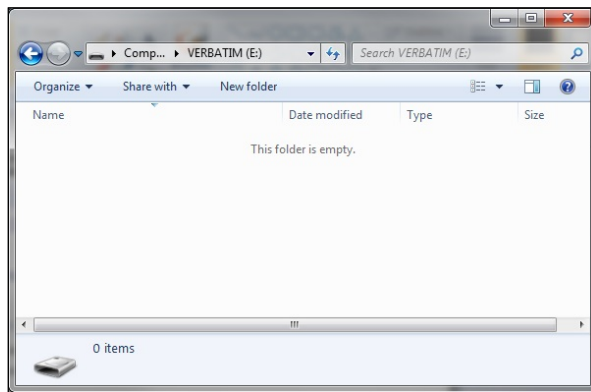
TOUCHSCREEN



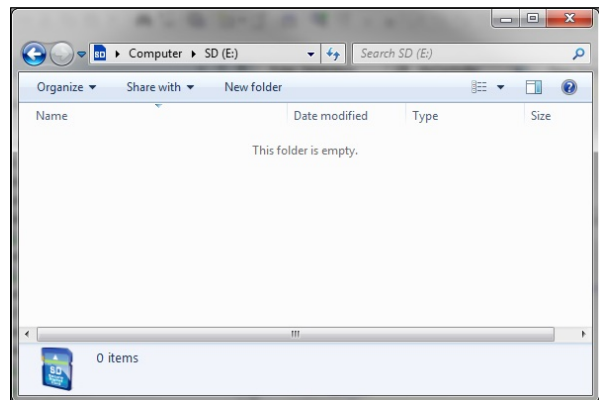
PLC



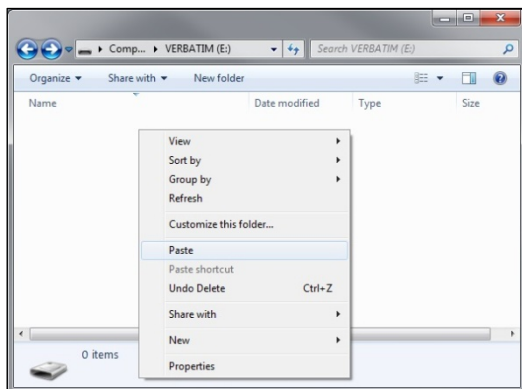
TOUCHSCREEN



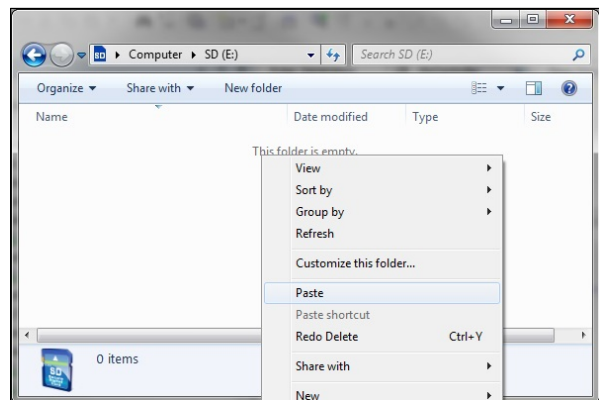
PLC



TOUCHSCREEN

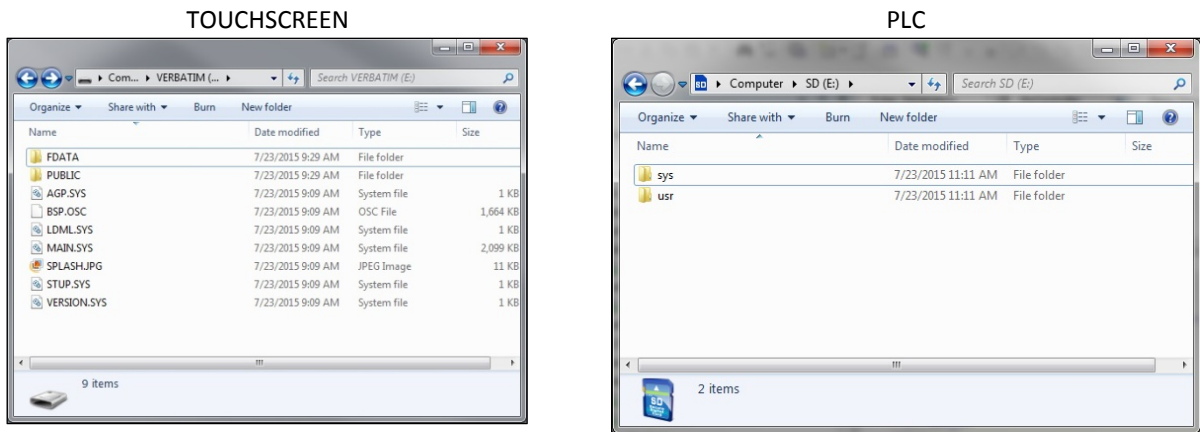


PLC



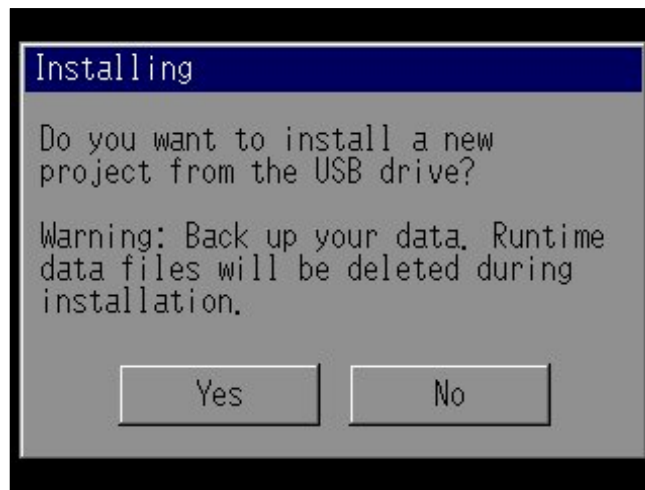
## Loading Software Updates (continued)

Check that the contents are as follows before proceeding. This should match the contents of the ZIP folder.



### Copying Files To Touchscreen

To copy the files into a touchscreen, insert the USB drive, then press **YES** when asked if you want to proceed with the installation.



## Loading Software Updates (continued)

When the installation is complete, remove the USB drive and press **Restart**.



The device will then reboot with the new software and the process is complete. If an activation is necessary, contact SCC with the activation code displayed and enter the key given to complete the activation process.

### Copying Files To PLC

To copy the files into a PLC, first power the device off. Once it is powered off, insert the SD card. When the device is powered on, the 'SD' LED will flash as the device loads the software. When it is finished loading, the 'SD' LED will be a steady green and the 'ERR' LED will be flashing red. Eject the SD card and the PLC will reboot with the new software (no power cycle required).



If both PLC software and firmware are to be installed, the steps must be completed separately to load both. Each will be provided as a separate ZIP folder. Load any firmware first and software second.

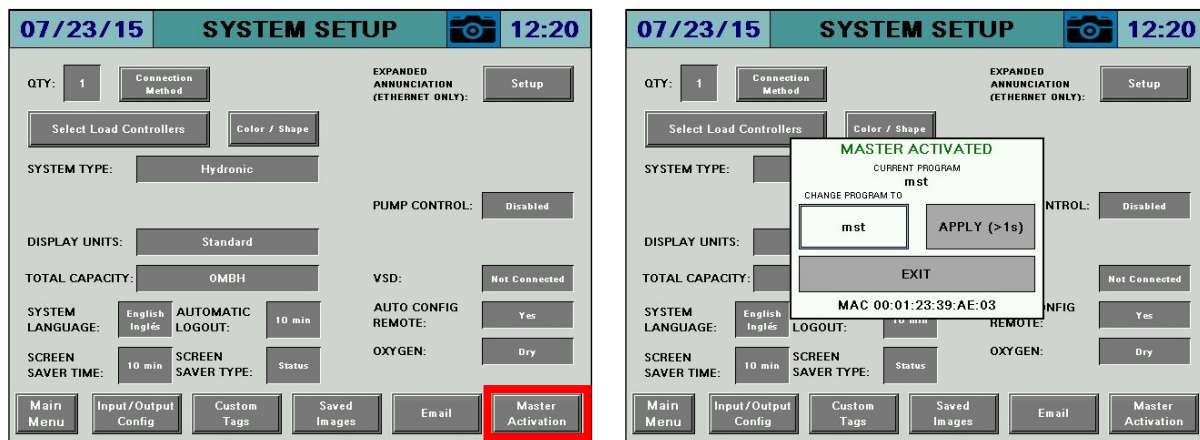
## Loading Software Updates (continued)

The master or annunciator PLC may require activation when the updates are complete. An activation screen will automatically appear if necessary, otherwise activation is in place. If activation is required, contact SCC with the activation code displayed and enter the key given to complete the activation process.

If the PLC software is updated, it must be confirmed that the proper version of the software is running. There are multiple combinations of analog and RTD expansion modules possible and all of these versions of the software are loaded into the PLC. Applying the correct version can be done from the touchscreen. If the 'I/O' LED is illuminated, this indicates that the software version may be incorrect or the touchscreen is not connected.

### Master PLC Activation

To access the menu for the annunciator PLC software first login using the user name SETUP. Then navigate to *Main Menu* → *System Setup* → *Master Activation*. Then press the title bar for > 1s to display the software menu.



The current version is displayed. Choose which version is desired, then press **APPLY (>1s)** for > 1s. The PLC will reboot with the correct software and the 'I/O' LED should not be illuminated.

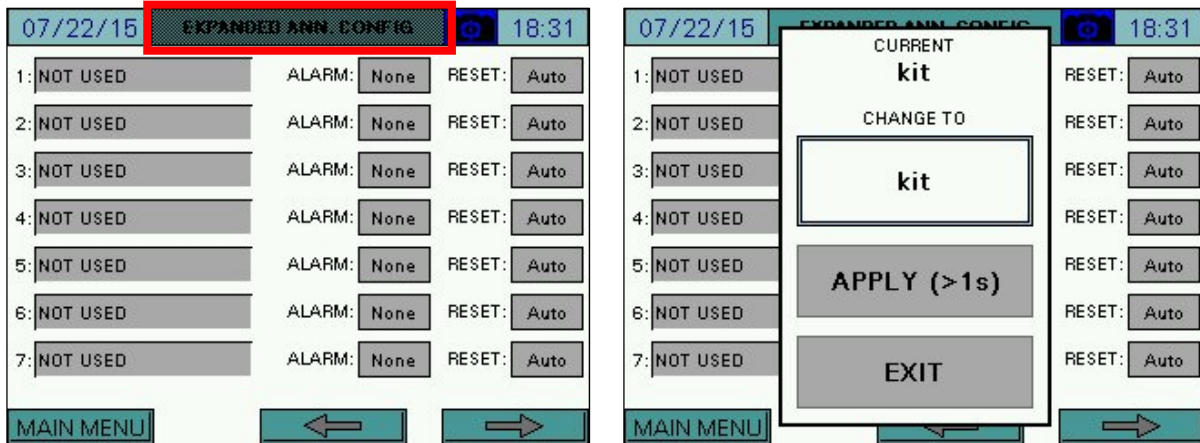
These are the possibilities (must be installed in the order shown):

- **mst**: no additional options
- **mstA**: analog input module TM3AM6
- **mstR**: RTD input module TM3TI4
- **mstAR**: analog input module TM3AM6, RTD input module TM3TI4

## Loading Software Updates (continued)

### Annunciator PLC Activation

To access the menu for the annunciator PLC software first login using the user name SETUP. Then navigate to *Main Menu* → *Settings* → *EA Base Config*. Then press the title bar for > 1s to display the software menu.



The current version is displayed. Choose which version is desired, then press **APPLY (>1s)** for > 1s. The PLC will reboot with the correct software and the 'I/O' LED should not be illuminated.

These are the possibilities (must be installed in the order shown):

- **kit**: no additional options
- **kitA**: analog input module TM3AM6
- **kitR**: RTD input module TM3TI4
- **kitE**: economizer input module TM3TI4
- **kitAR**: analog input module TM3AM6, RTD input module TM3TI4
- **kitAE**: analog input module TM3AM6, economizer input module TM3TI4
- **kitRE**: RTD input module TM3TI4, economizer input module TM3TI4
- **kitARE**: analog input module TM3AM6, RTD input module TM3TI4, economizer input module TM3TI4

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## Additional Options Master

**Applies To:** TS Series Lead/Lag Master

### Introduction

Additional options exist in the lead/lag master that can be activated if needed. This can be done through the Modbus TCP/IP connection or through the TS Series Protocol Converter.

### Procedure

The additional options are all activated from a single word, Modbus address 27. In Document No. TS-2100, this is labeled as 'LLM EXTRA OPTIONS'. Each option is represented as a bit. To write bits, take the sum of their decimal values (bit 0 = 1, bit 1 = 2, bit 2 = 4 and bit 3 = 8). For example, to write bits 0 and 2, the sum would be 5 and this would be written to Modbus address 27.

#### Disable Watchdog Timer

Bit = 0 (decimal value 1)

Normally, using a BMS connection to provide a remote enable or setpoint requires that the signal is refreshed on a regular interval. This is called a watchdog timer. If this is not done, the lead/lag master will revert to running on the local setpoint. This is known as 'fail to heat' mode. If the BMS system cannot work with the watchdog timer or if it is not otherwise desired, it can be disabled with this bit. If this is done, the GATEWAY/BMS screen on the lead/lag master will display 'EXTERNAL WATCHDOG DISABLED BY USER OPTION'. Note that if this action is taken, a loss of communication with the BMS will result in the last commanded option remaining in effect until a power cycle or until communication is re-established.

#### Outside Air Temperature From BMS

Bit = 1 (decimal value 2)

In a hydronic system if an outside air temperature sensor is connected it can be used to implement an outside air setpoint reset. Normally this sensor is connected to an analog or RTD input. If this bit is enabled, the system will take the outside air temperature from Modbus address 17. In Document No. TS-2100, this is labeled as 'LLM EXTRA INPUT'. The value written must be 120°F or less in order to be considered valid.

## **Additional Options Master (continued)**

### Direct Control Of Lead Boiler

Bit = 2 (decimal value 4)

If this bit is set, the BMS can control the lead boiler selection by writing to Modbus address 3. In Document No. TS-2100, this is labeled as 'LLM LEAD BOILER'. This converts that address from read-only to read/write. The lead mode selected does not matter when direct BMS control is selected. When active, the LEAD SELECTION screen will display 'AUTOMATIC ALTERNATION CONTROLLED BY GATEWAY'. Note that if a boiler that isn't available is selected as lead this can cause system issues since the lead boiler will not be able to run. The total number of available boilers as well as individual boiler available statuses can be checked via Modbus.

### Direct Control Of Load Demand

Bit = 3 (decimal value 8)

If this bit is set, the BMS can control the load demand directly by writing to Modbus address 26. In Document No. TS-2100, this is labeled as 'LLM LOAD DEMAND'. This converts that address from read-only to read/write. The modulation mode still applies for sequencing when direct BMS control is selected. When active, the SYSTEM OVERVIEW screen will display 'GATEWAY xxx% DEMAND'. The BMS demand is in the format of 0-100% and must be in this range to be valid. This will be translated into the percent of total demand, i.e. if there are three boilers for a total of 300%, a BMS demand of 50% will equal 150% for the purposes of lag start/stop points.

## Additional Options Master (continued)

### Setting Options Via TS Series Protocol Converter

To apply these options to the TS Series Protocol Converter, enter the calculated word value for the desired options onto the web configuration page in the option labeled 'other\_option'. After the value is entered, click 'Submit'. There will be a corresponding point for 'LLM EXTRA INPUT', 'LLM LEAD BOILER' and 'LLM LOAD DEMAND' to write the control data to.

The screenshot shows a web browser window with the URL `192.168.1.70/app/profiles/profiles.htm`. The page contains the following configuration options:

- network\_number** (BACnet Network Number): Input field contains `50`.
- bac\_cov\_option** (BACnet COV): Input field contains `COV_Disable`.
- bac\_bbmd\_option** (BACnet/IP BBMD): Input field contains `-`.
- watchdog\_time** (Watchdog Time): Input field contains `90`.
- other\_option** (Additional Option Codes): Input field contains `0`. This field is highlighted with a red border.

Below the options is a section titled "Active profiles" with a table:

Nr	Node ID	Current profile	Parameters
<a href="#">Add</a>			

At the bottom of the page is a navigation bar with the following buttons: [HELP \(?\)](#), [Network Settings](#), [Clear Profiles and Restart](#), and [System Restart](#).

## Lead/Lag Master DHW Priority

**Applies To:** TS Series Lead/Lag Master

### Introduction

Domestic hot water (DHW) priority can be implemented using the W2 setpoint.

### Procedure

Changing over to the W2 setpoint is accomplished via the 'W2 Setpoint' digital input. When activated, the W2 setpoint has priority over all other setpoint sources. The W2 setpoint is changed from the SETPOINTS screen on the Lead/Lag Master.

#### Using Digital Input From Thermostat

The easiest way to implement DHW priority is to connect a thermostat control directly to the 'W2 Setpoint' digital input. This is a low-voltage 24VDC connection.

## Lead/Lag Master DHW Priority (continued)

### Using Analog or RTD Input

If one of the analog or RTD inputs is configured to monitor the temperature of the DHW tank, this can be used as a monitored digital output in order to activate the 'W2 Setpoint' digital input. See Document No. TS-2100 for additional detail on configuring analog, RTD and monitored digital outputs.

First, configure the analog or RTD input.

**ANALOG INPUT 1**

NAME:	DHW Tank	RESET TAG			
UNIT:	F	TYPE:	4-20mA	FILTER:	0
MIN:	50	MAX:	250	TOTALS:	None
LOW:	0	HIGH:	0	ALARM:	None

Exit

## Lead/Lag Master DHW Priority (continued)

Next, configure the monitored digital output to activate when the DHW tank temperature is below the desired DHW setpoint. This is shown under 'CONDITION 1'. The DHW tank temperature is connected to analog input 1, so that is the value to monitor. From the Modbus mapping, it is known that this value is represented x10, so it is necessary to apply a divider of 10. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value is below the setpoint, choose < as the function.

'CONDITION 2' will not be used, so set the slider switch to **OFF**. Apply an off delay to provide a minimum run time to prevent short cycling of the input.

**MONITOR OUTPUT 3 (DIGITAL)**

---

**CONDITION 1**

MODBUS ADDRESS TO MONITOR:  /

**LLM ANALOG INPUT 1 U16**

WHEN  SETPOINT

---

OFF  ON **CONDITION 2**

MODBUS ADDRESS TO MONITOR:  /

**UNUSED OR PARTIAL REGISTER**

WHEN  SETPOINT

---

**OUTPUT IS ACTIVE WHEN**

APPLY DELAY OFF

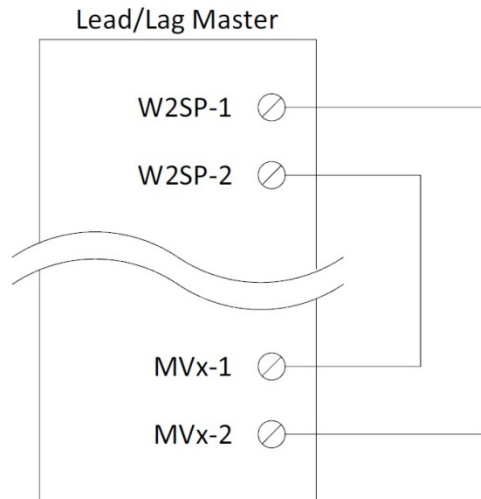
OPTIONS:

Exit

## Lead/Lag Master DHW Priority (continued)

### Wiring

Wire the monitored digital output to the 'W2 Setpoint' digital input to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (i.e. monitored output 3 would use terminals MV3-1 and MV3-2).



## Lead/Lag Master Warm Weather Shutdown

**Applies To:** TS Series Lead/Lag Master

### Introduction

Warm weather shutdown can be implemented using the 'Remote Disable' digital input or by using the 'W2 Setpoint' digital input.

### Procedure

Using the 'Remote Disable' digital input requires that the system is in REMOTE mode. Putting the system in LOCAL mode will override the warm weather shutdown. This method can be used in conjunction with a BMS that is providing remote signals via the bus, or can be in parallel with another disable command if isolated by a relay.

Using the 'W2 Setpoint' digital input requires that a low W2 setpoint is entered so that the system will appear satisfied and no demand will be generated. When activated, the W2 setpoint has priority over all other setpoint sources. The W2 setpoint is changed from the SETPOINTS screen on the Lead/Lag Master.

One of the analog or RTD inputs must be configured to monitor the outside air temperature. This will then be used as a monitored digital output in order to activate the 'Remote Disable' or 'W2 Setpoint' digital input. See Document No. TS-2100 for additional detail on configuring analog, RTD and monitored digital outputs.

First, configure the analog or RTD input.

ANALOG INPUT 1			
NAME:	OUTSIDE AIR	RESET TAG	
UNIT:	F	TYPE:	4-20mA
		FILTER:	0
MIN:	0	MAX:	120
		TOTALS:	None
LOW:	0	HIGH:	0
		ALARM:	None
Exit			

## Lead/Lag Master Warm Weather Shutdown (continued)

Next, configure the monitored digital output to activate when the outside air temperature is above the desired warm weather shutdown setpoint. This is shown under 'CONDITION 1'. The outside air temperature is connected to analog input 1, so that is the value to monitor. From the Modbus mapping, it is known that this value is represented x10, so it is necessary to apply a divider of 10. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value is above the setpoint, choose > as the function.

'CONDITION 2' will not be used, so set the slider switch to **OFF**. Apply an off delay to provide a minimum run time to prevent short cycling of the input.

**MONITOR OUTPUT 3 (DIGITAL)**

**CONDITION 1**

MODBUS ADDRESS TO MONITOR: 13 / 10

LLM ANALOG INPUT 1 U16

WHEN > SETPOINT 80.0

**CONDITION 2**

OFF  ON

MODBUS ADDRESS TO MONITOR: 99 / 1

UNUSED OR PARTIAL REGISTER

WHEN = SETPOINT 999.0

**OUTPUT IS ACTIVE WHEN**

CONDITION 1 OR CONDITION 2

APPLY DELAY OFF OF 300s

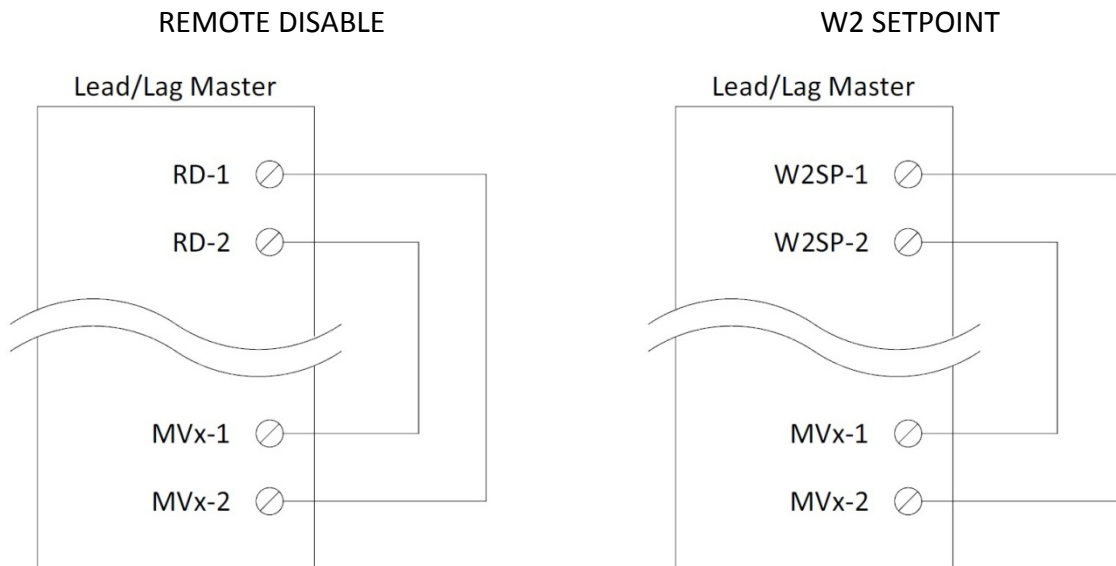
OPTIONS: LATCH = NO  
ALARM = NO  
**CURRENT = TRUE**

Exit

## Lead/Lag Master Warm Weather Shutdown (continued)

### Wiring

Wire the monitored digital output to the 'Remote Disable' or 'W2 Setpoint' digital input to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (i.e. monitored output 3 would use terminals MV3-1 and MV3-2).



## Using Monitored Digital Outputs For Soft Limits

**Applies To:** TS Series Touchscreen Kit (With Annunciation Option)

### Introduction

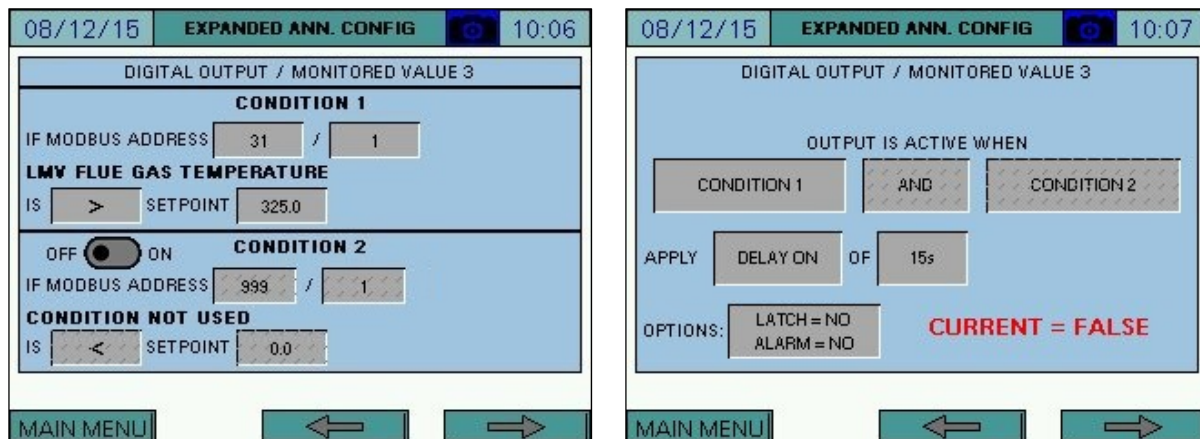
Monitored digital outputs can be configured to provide soft (non safety-related) limits.

### Procedure

An example of a soft limit is a high flue temperature shutdown on the operating limits (control switch input).

Configure the monitored digital output to activate when the flue temperature is above the desired shutdown setpoint. This is shown under 'CONDITION 1'. The flue temperature is available from the LMV5 via Modbus. From the Modbus mapping, it is known that this value is represented without a divider, so a divider of 1 is entered. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value is above the setpoint, choose > as the function.

'CONDITION 2' will not be used, so set the slider switch to **OFF**. Apply a short on delay to provide a filter time to verify a steady signal.

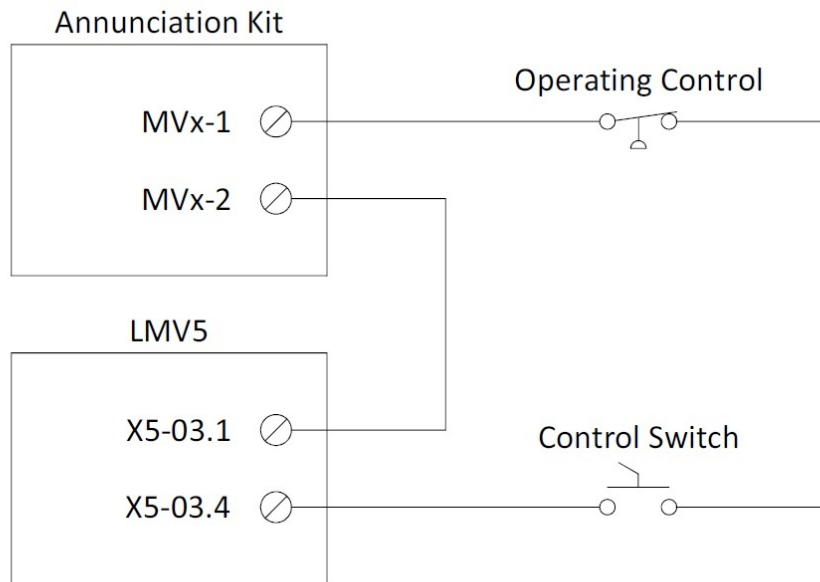


If desired, the action can be latched and/or create an alarm when true. Latching would require a manual reset via the ALARMS screen to clear the condition.

## Using Monitored Digital Outputs For Soft Limits (continued)

### Wiring

Wire the monitored digital output into the control switch string in series with the existing limits to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (i.e. monitored output 3 would use terminals MV3-1 and MV3-2).



## Using Monitored Digital Outputs For Time-Based Action

**Applies To:** TS Series Lead/Lag Master, TS Series Touchscreen Kit (With Annunciation Option)

### Introduction

Monitored digital outputs can be configured to provide a time-based action such as a valve opening.

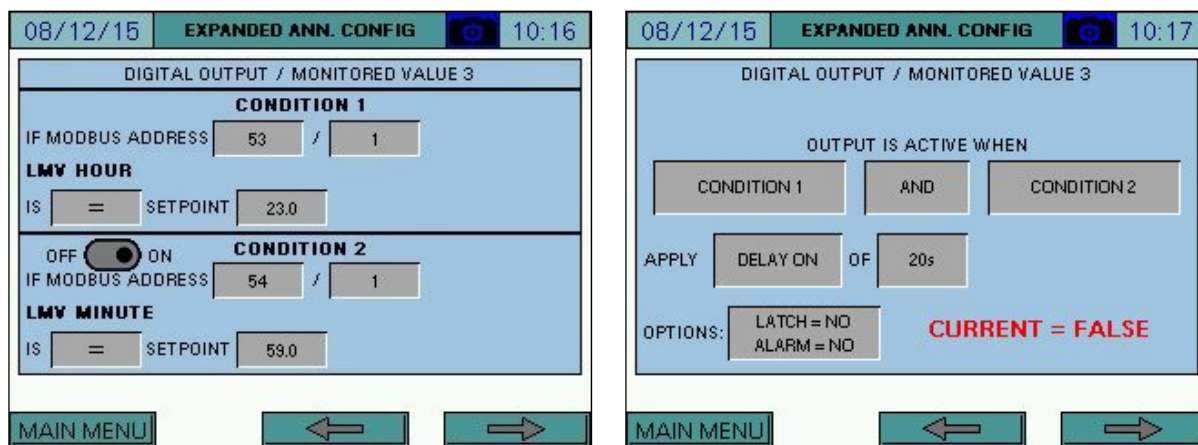
### Procedure

An example of a time-based action could be a blowdown valve that opens once a day for 30 seconds. The time selected for this action will be 23:59.

Configure 'CONDITION 1' of the monitored digital output to activate when the hour is equal to '23'. The time and date data is available from the LMV5 via Modbus. From the Modbus mapping, it is known that this value is represented without a divider, so a divider of 1 is entered. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value equals the setpoint, choose = as the function.

Activate 'CONDITION 2' by setting the slider switch to **ON**, then configure the monitored digital output to activate when the minute is equal to '59', following the above guidelines.

Choose **AND** as the logic applied between the conditions. Apply a 20 second on delay to keep the output inactive for the first 20 seconds of the condition being true. This is done since the action is only desired for 30 seconds instead of the full minute. Allow some extra time for communication of the data.



If desired, the action can be latched and/or create an alarm when true. Latching would require a manual reset via the ALARMS screen to clear the condition.

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## Using Monitored Digital Outputs For Time-Based Action (continued)

### Wiring

Wire the monitored digital output into the external action to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (i.e. monitored output 3 would use terminals MV3-1 and MV3-2).



## Using Monitored Digital Outputs For Pump Control

**Applies To:** TS Series Touchscreen Kit (With Annunciation Option)

### Introduction

Monitored digital outputs can be configured to provide pump control for feedwater pumps or blend pumps based on the current LMV phase.

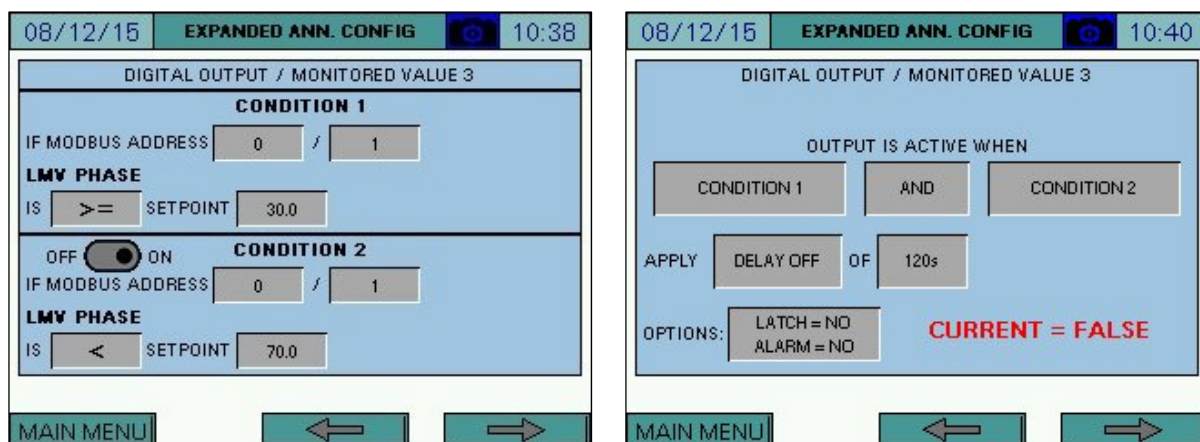
### Procedure

An example could be a blend pump that needs to circulate when a boiler is operating, with an off delay to allow for extra circulation after the boiler shuts down.

Configure 'CONDITION 1' of the monitored digital output to activate when the phase is greater than or equal to '30' (prepurge begins). The phase data is available from the LMV5 via Modbus. From the Modbus mapping, it is known that this value is represented without a divider, so a divider of 1 is entered. If the value is copied using the register lookup function, this will be done automatically. Since the action should be true when the monitored value is greater than or equal to the setpoint, choose  $\geq$  as the function.

Activate 'CONDITION 2' by setting the slider switch to **ON**, then configure the monitored digital output to activate when the phase is greater than '70' (afterburn begins), following the above guidelines.

Choose **AND** as the logic applied between the conditions. Apply a 120 second off delay to keep the output active for an additional 120 seconds.

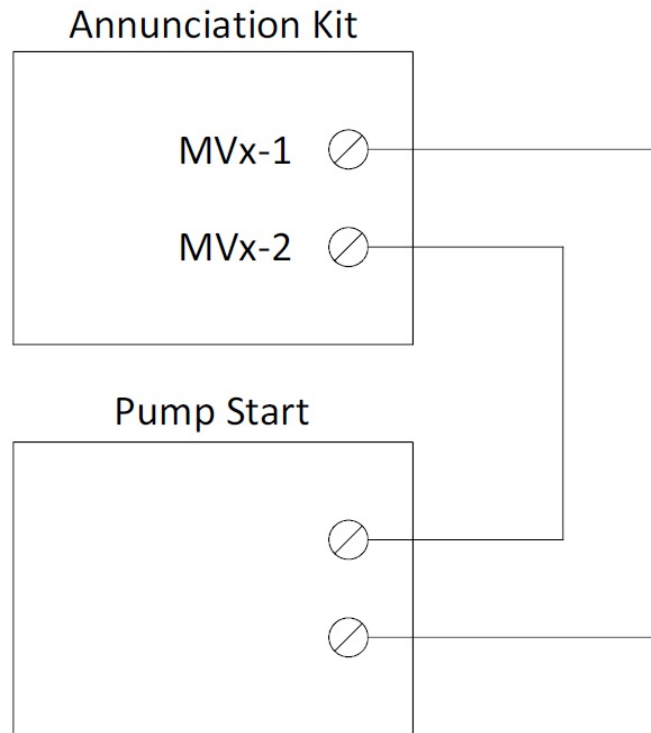


If desired, the action can be latched and/or create an alarm when true. Latching would require a manual reset via the ALARMS screen to clear the condition.

## Using Monitored Digital Outputs For Pump Control (continued)

### Wiring

Wire the monitored digital output into the pump start contact to complete the process. Note that the terminals MVx-1 and MVx-2 refer to the specific monitored output used (i.e. monitored output 3 would use terminals MV3-1 and MV3-2).



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