SCC Inc.

Application Guide

Document No. TS-1250

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TS Series Application Guide

Description

The Touchscreen series Application Guide includes typical wiring, configuration, and examples of the control and operating features for some common applications.

Table of Contents

Single Element or Three Element Feed Water Control

Introduction:

If water level control via the annunciation PLC of the TS-1000 is optioned:

1- Single element feed water control requires a drum level transmitter to continuously monitor the boiler water level. The PID loop controller built into the PLC modulates a feedwater valve open or close based on the actual water level compared to setpoint.

2- Three element feed water control requires a drum level transmitter, steam flow transmitter and feedwater flow transmitter to continuously monitor the boiler water level, boiler steam flow, and boiler feed water flow. The PID loop controller built into the PLC will match steam flow to feedwater flow while controlling actual water level compared to setpoint.

3- Single or three element feed water control also requires a feedwater valve and actuator that can accept a modulating analog input signal from the PLC.

Minimum annunciation selection for the TS-1000 kit:

PLC Feedwater, water level or Circulating Pump VFD control

3 = PLC three element~~s~~ feedwater and level control

4 = PLC single element feedwater and level control

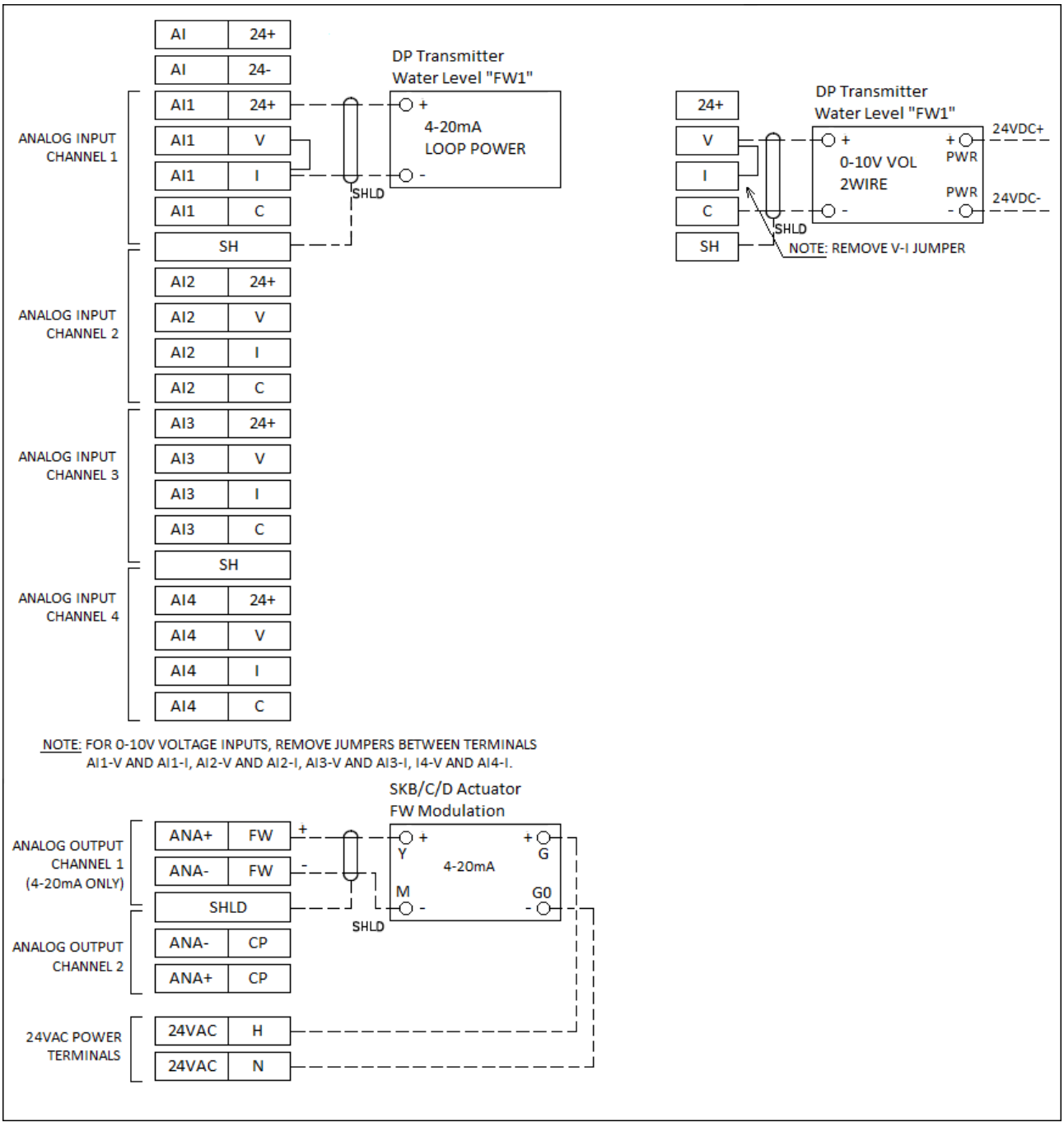
Notes:

1- For single element feedwater level control, one analog input and one analog output will be dedicated for this function.

2- For three element feedwater level control, three analog inputs and one analog output will be dedicated for this function.

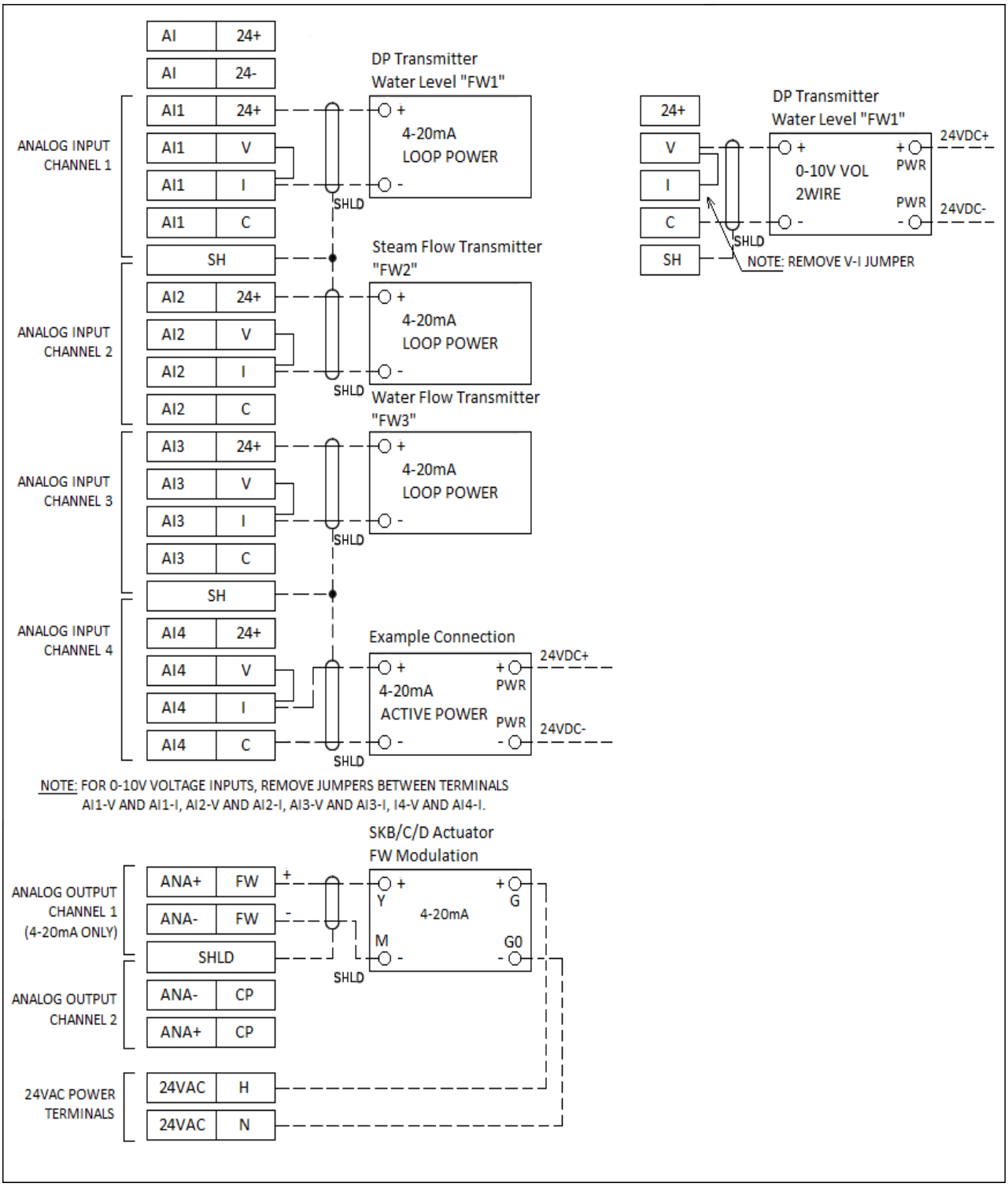
Single or Three Element Feed Water Control (continued)

Typical Field Connections Single Element Feed Water Level Control:



Single or Three Element Feed Water Control (continued)

Typical Field Connections Three Element Feed Water Level Control:



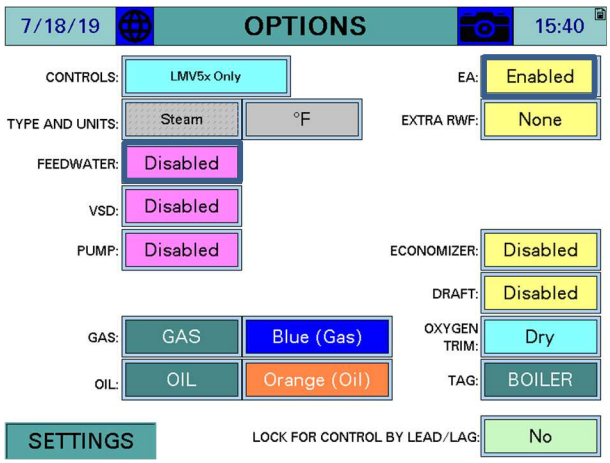
Single or Three Element Feed Water Control (continued)

Procedure:

1. Install and wire the water level transmitter for single element drum level control, and the steam flow and water flow meters/transmitters with the water level transmitter for the three-element feed water level control.
2. Install and wire the feedwater valve and actuator.
3. Calibrate the valve and actuator as required by the O&M manual.
4. Set the span of each meter to match the analog input configuration of the PLC.

Touchscreen settings:

1. Main Menu > Login > System Settings > Options > EA Enabled
2. Select Feedwater type: Single Element or Three Element

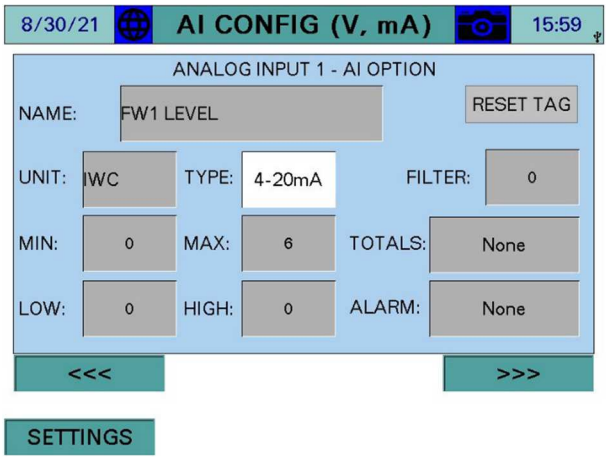


Single or Three Element Feed Water Control (continued)

Analog Input setting for single element drum level control:

3. Main Menu > Login > System Settings > Expanded Annunciator Options

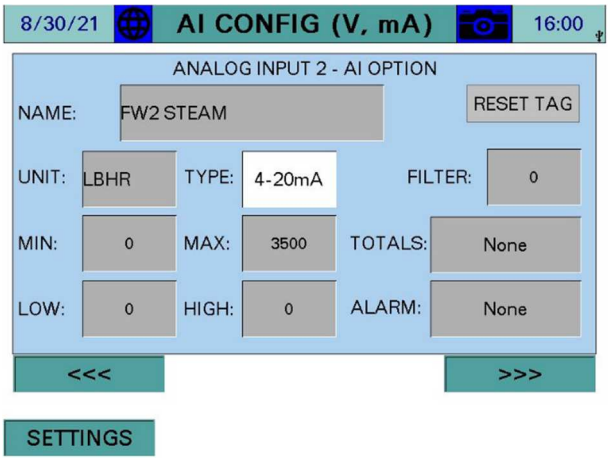
   At the AI Config (V, mA) screen, Analog Input 1 – AI Option.
   Enter Input Name “FW1 XXXX” for water level transmitter, enter Unit, enter Type, enter Min and Max Span, enter Alarm setpoints Low and High if desired > No totalization > activate alarms if desired.

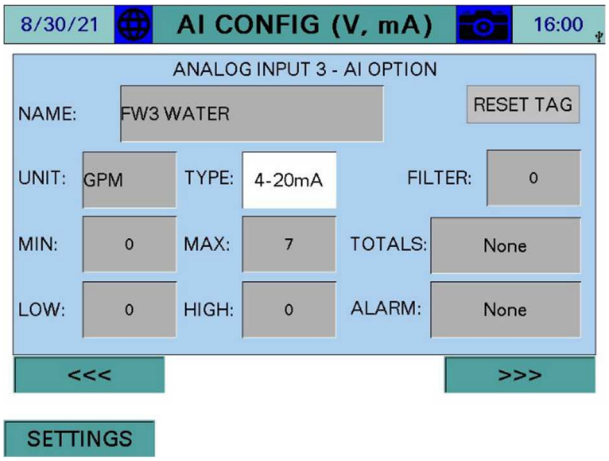


Analog Input setting for three element drum level control:

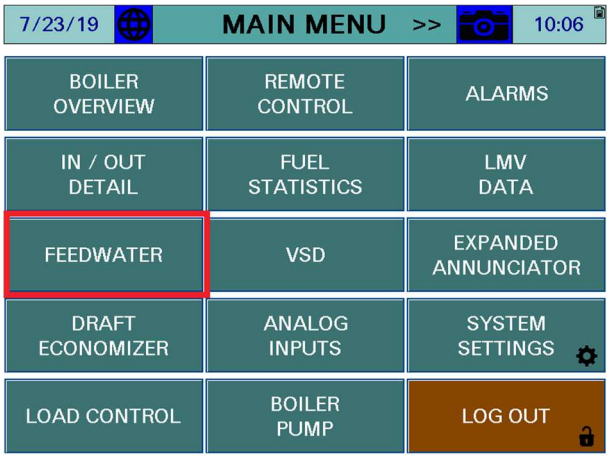
1. Main Menu > Login > System Settings > Options > Enable Annunciation.
2. Main Menu > Login > System Settings > Expanded Annunciator Options.
3. At the AI Config (V, mA) screen, Analog Input 1 – AI Option, enter Input Name “FW1 XXXX” for water level transmitter, enter Unit, enter Type, enter Min and Max Span, enter Alarm setpoints Low and High if desired, no totalization, activate alarms if desired.
4. Touch >>> to navigate to Analog Input 2 – AI Option. Enter Input Name “FW2 XXXX” for steam flow meter, enter Unit, enter Type, enter Min and Max Span, enter Alarm setpoints Low and High if desired, activate totalization if desired, activate alarms if desired.
5. Touch >>> to navigate to Analog Input 3 – AI Option. Enter Input Name “FW3 XXXX” for water flow meter, enter Unit, enter Type, enter Min and Max Span, enter Alarm setpoints Low and High if desired, activate totalization if desired, activate alarms if desired.

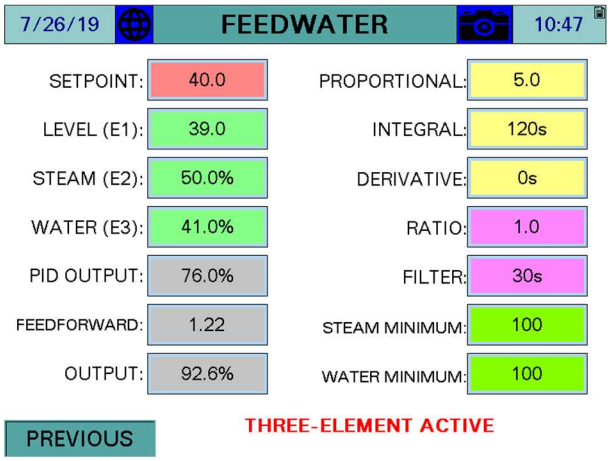
Single or Three Element Feed Water Control (continued)





Operation:





Single or Three Element Feed Water Control (continued)

At the FEEDWATER screen Enter desired setpoint, observe operation, adjust PI if needed, leave derivative settings at 0.

In single element mode, PID control is used to control the measured water level to the setpoint.

In three element mode, a feedforward multiplier is applied to the PID output to compensate for the difference between the steam flow and the feedwater flow. If the flows are equal, a multiplier of 1.0 is applied. If the steam flow is greater than the feedwater flow, the output is increased by a multiplier greater than 1.0. If the steam flow is less than the feedwater flow, the output is decreased by a multiplier less than 1.0. The default multiplier of 1.0 can be adjusted if desired to better tune the process. In order for the three element control to work properly, it is important that the steam flow meter and feedwater flow meter are measuring properly. If they are not, operation will automatically changeover to single element (level only) mode. Minimum flows are entered for the steam flow and feedwater flow and if either is below the respective minimum for the duration of the filter time, that reading will be disregarded and single element control will occur until the respective flow meter reading is above the minimum.

SCC Documents:

1- SEN-3000: 7MF series differential pressure transmitter for level measurement
2- 155-717 SKB/C/D: Electronic feedwater valve actuator installation instructions
3- TS-1100 Touchscreen Kits Installation Instructions
    a. Expanded Annunciator Options Setup and Feedwater sections

PLC Load Controller

Introduction:

When the TS-1000 PLC annunciation is optioned, the PID load controller built into the PLC, controls any end device (such as an actuator, VFD, parallel positioning system, etc.) that will accept a modulating analog input signal. The end device will be modulated open/close, high/low, based on a preselected setpoint for a process variable.

The PID loop load controller requires an analog input or temperature sensor (RTD for instance) for the process variable (actual measurement) from the modulated device.

Minimum annunciation selection for the TS-1000 kit:

For Analog 4-20 ma or 0-10 VDC process variable

B = (14) 120 VAC inputs, (4) analog inputs with totalization, and (2) analog outputs

For RTD 1000 ohm or 100 Ohm process variable

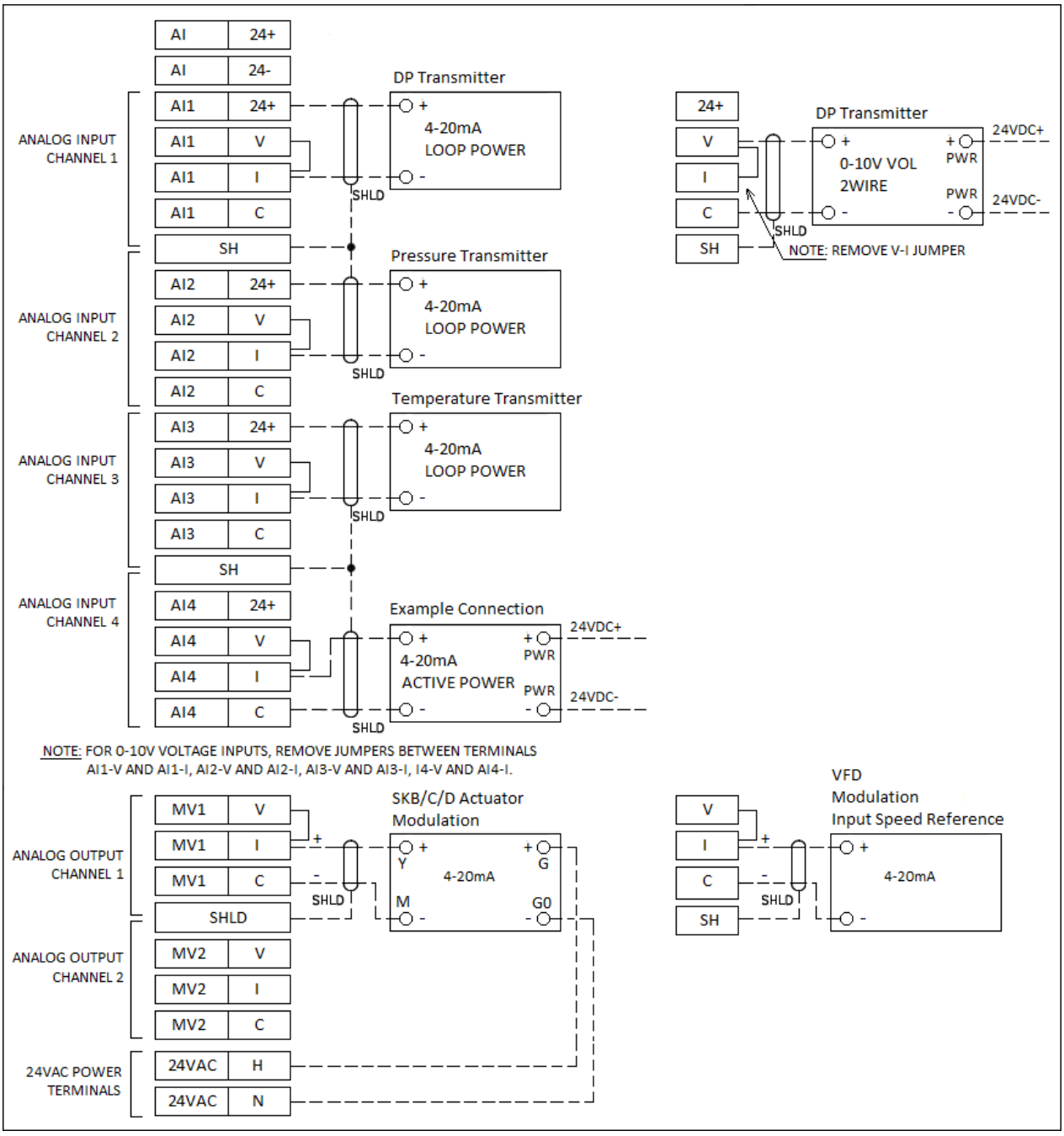
F = (14) 120 VAC inputs, (4) analog inputs with totalization, (4) universal inputs* (AI, RTD, or TC), and (2) analog outputs

Notes:

3- For load control operation, one analog input or one universal input, one analog output, and one digital output (MV3 for start-stop) will be dedicated for the operation.
If an alarm output is desired a second digital output will be dedicated for the alarm operation (MV4).

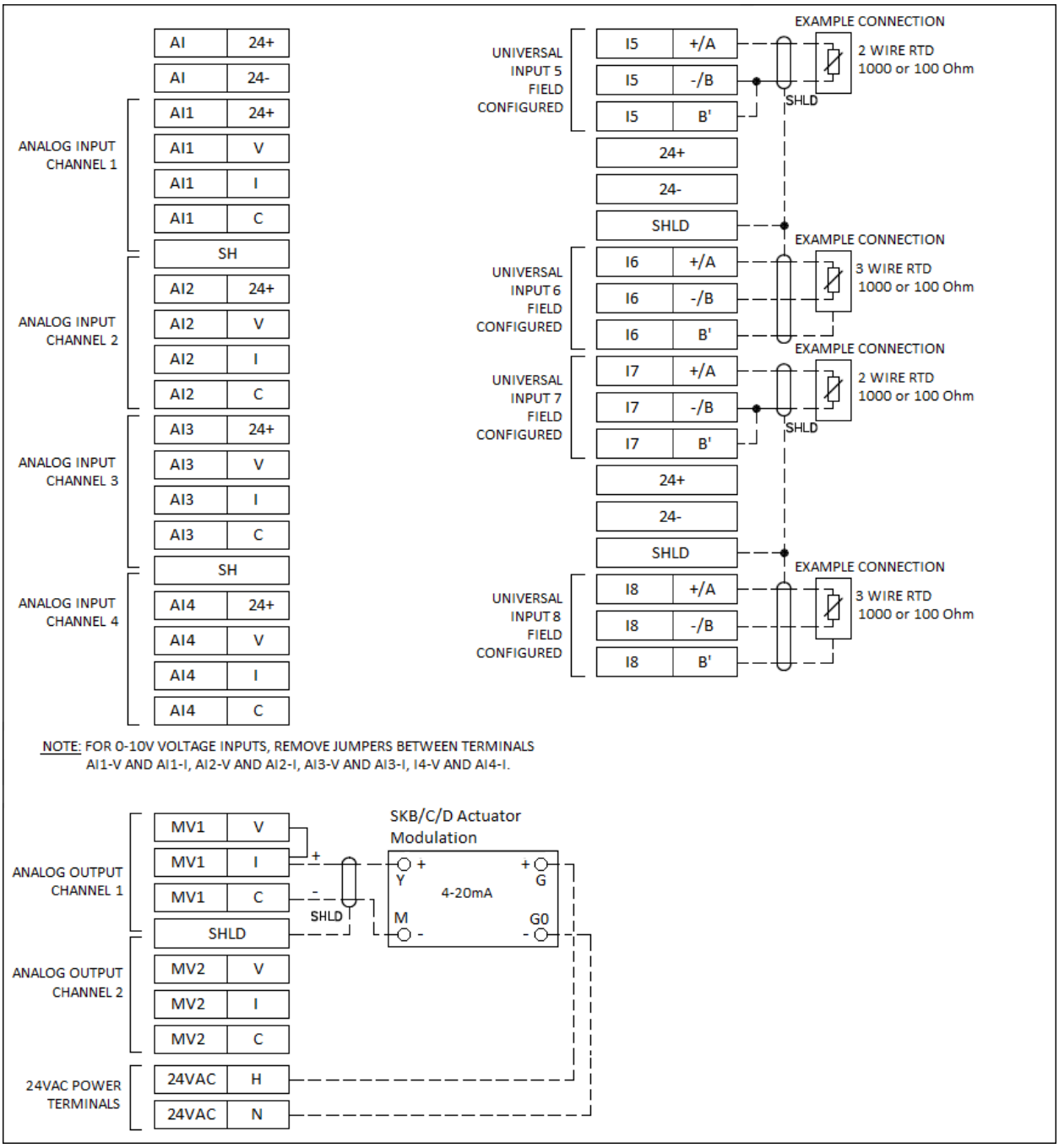
PLC Load Controller (continued)

Typical Field Connections: 4-20ma Process Variable:



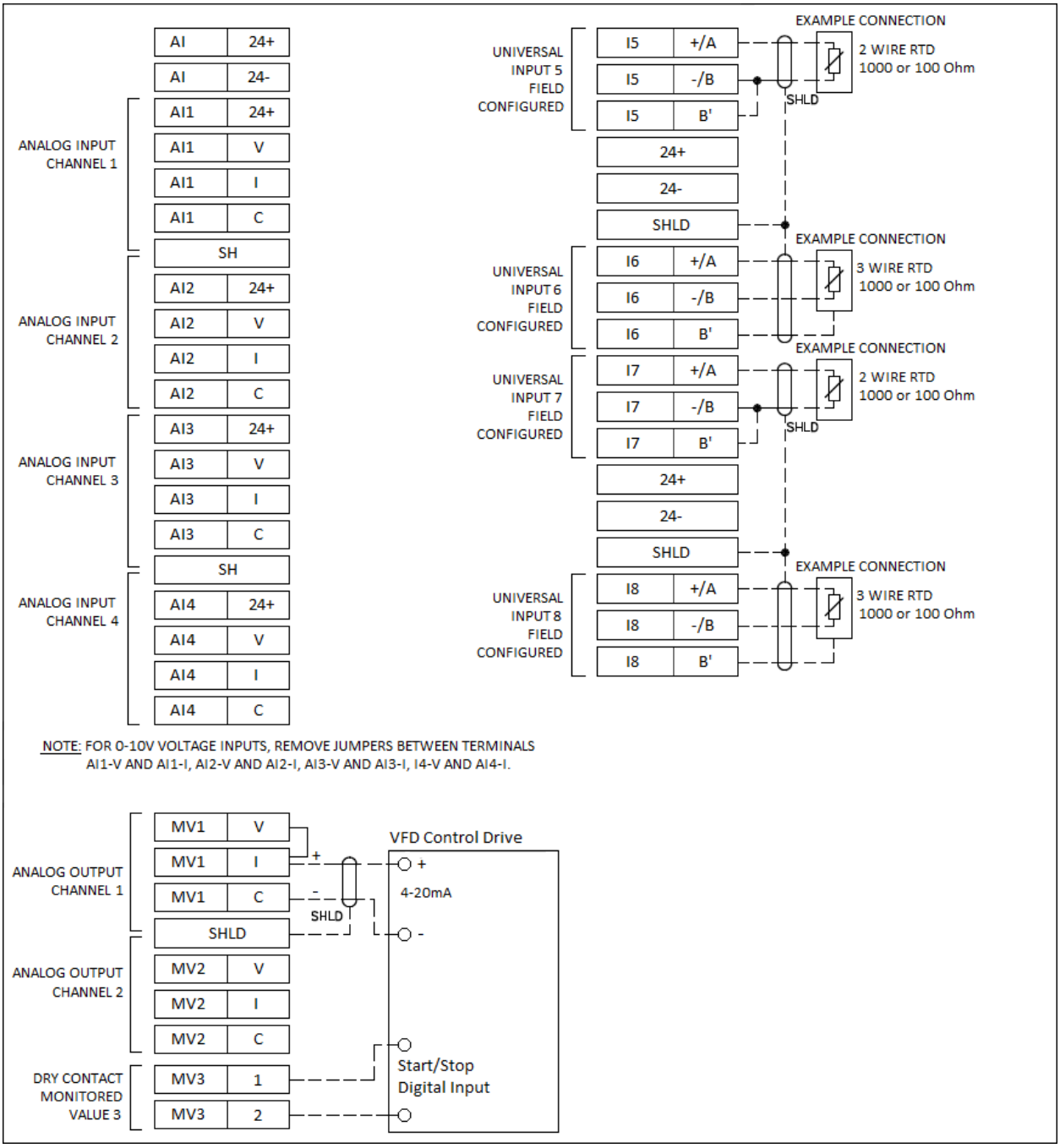
PLC Load Controller (continued)

Typical Field Connections: RTD 1000 or 100 Ohm Process Variable



PLC Load Controller (continued)

Typical Field Connections: 1000 or 100 Ohm RTD, Delta temperature process variable with VFD control



PLC Load Controller (continued)

Procedure:

1- Install and wire the Process Variable transmitter or temperature sensor.
2- Install and wire SKB/C/D Actuator, VFD or applicable device.
3- Set the controlled device for the appropriate input type.
4- If the controlled device is a VFD:
    a. Enter appropriate VFD settings for the application
    b. Set the span for min and max RPMs for the VFD parameters
    c. Set the accel-decel speed for the VFD parameters

Touchscreen Settings:

Note: Any analog input or RTD input can be used for the process variable transmitter/sensor connection.

4-20 ma process variable
Enter the settings into the touchscreen for the load controller.

- Main Menu > Login > System Settings > Options > Enable Annunciation.
- Main Menu > Login > System Settings > Expanded Annunciator Options.
- At the AI Config (V, mA) screen, Analog Input 1 – AI Option. Enter Input Name "E1 XXXX" for load controller PV transmitter, enter Unit, enter Type, enter Min and Max Span, enter Alarm setpoints Low and High if desired, no totalization, activate alarms if desired.

RTD process variable
Enter the settings into the touchscreen for the load controller.

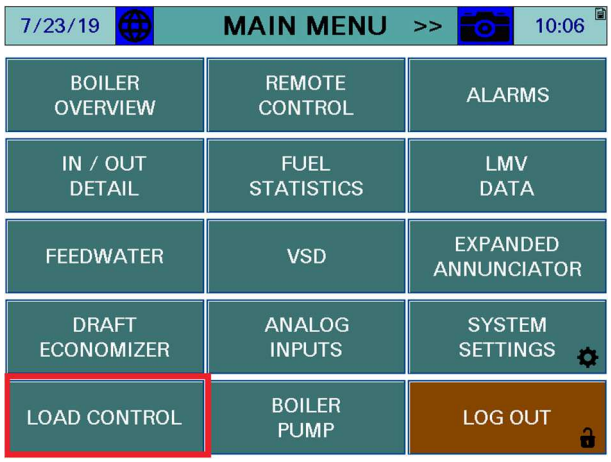
- Main Menu > Login > System Settings > Options > Enable Annunciation.
- Main Menu > Login > System Settings > Expanded Annunciator Options
- At the AI Config > Analog Input 1 – AI Option touch >>> to navigate to AI Config RTD
- At RTD (Pt 1000/LG Ni 1000) Input 5 – 16 (based on the kit provided modules) Enter Input Name "E1 XXXX" for PV transmitter, select Type of Sensor, enter low and high alarms setpoints points if desired, Activate the alarms if desired.

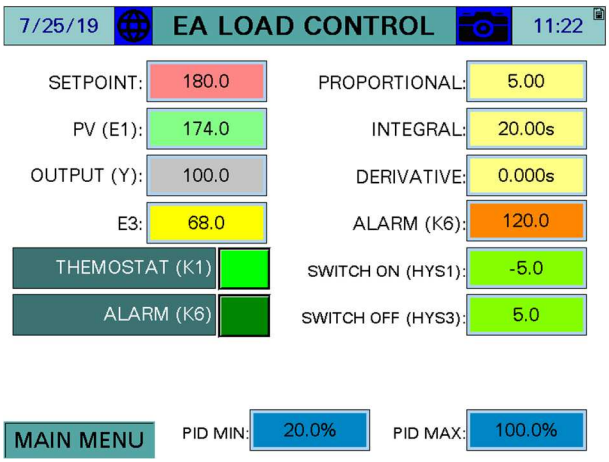
PLC Load Controller (continued)

RTD process Delta temperature variable
Enter the settings into the touchscreen for the load controller.

- Main Menu > Login > System Settings > Options > Enable Annunciation.
- Main Menu > Login > System Settings > Expanded Annunciator Options
- At the AI Config > Analog Input 1 – AI Option touch >>> to navigate to AI Config RTD
- At RTD (Pt 1000/LG Ni 1000) Input 5 – 16 (based on the kit provided modules). Enter Input Name “E1 XXXX” for PV transmitter, select Type of Sensor, enter low and high alarms setpoints points if desired, Activate the alarms if desired.
- Touch >>> to navigate to AI Config RTD 2, or to navigate to the desired related RTD input 5 – 16 (based on the kit provided modules). Enter Input Name “E3 XXXX” for PV transmitter, select Type of Sensor, enter low and high alarms setpoints points if desired, Activate the alarms if desired.

Operation:





At the EA LOAD CONTROLLER screen Enter desired setpoint, observe operation, adjust PI if needed, leave derivative settings at 0.

If the load controller is optioned, touch **LOAD CONTROL** on the second page of the main menu to access that screen. The operation of the Expanded Annunciator load controller is modeled after the operation of the RWF load controller. Similar nomenclature is used for the inputs and outputs. To option the load controller, one of the analogs or RTD input names must contain the

PLC Load Controller (continued)

string "E1". This is the process variable. A second input can be used for shell temperature if it contains the string "E3". The alarm output (K6) can be used if "LFH" or "HIF" are included in the

name string of "E3". "LFH" will alarm when the process variable is below the ALARM (K6) setpoint and "HIF" will alarm when the process variable is above the ALARM (K6) setpoint. If either alarm is used, the output will automatically go to the minimum when the alarm condition is present. Note that both "E1" and "E3" can be applied to the same input, meaning low-fire hold could be used from the same outlet water temperature sensor if desired. A delta between two inputs can also be used as the process variable if the input to be subtracted from "E1" contains the string "DL".

Note that using the load controller option will displace monitored output 1 (analog) which will be the source of the modulating signal. It will also displace monitored output 3 (digital) as the K1 relay and monitored output 4 (digital) as the K6 relay. If "E3" is not used, then monitored output 4 will still be available for general use.

RWF55 Load Controller, Third Party Flame Safeguard, and SCC Master Lead Lag Panel

Introduction:

The SCC Master Lead Lag Panel can be configured to control boilers that do not utilize SCC Touchscreen Kits, LMV3s, or LMV5s. This is only possible if the RWF55.50A9 is used as the load controller for each burner/boiler. The following procedure describes how to wire and configure the RWF55.50A9 for this application. For information on how to configure the Master Panel please see the Master Panel Installation Instructions (TS-2100).

Typical Field Connections:

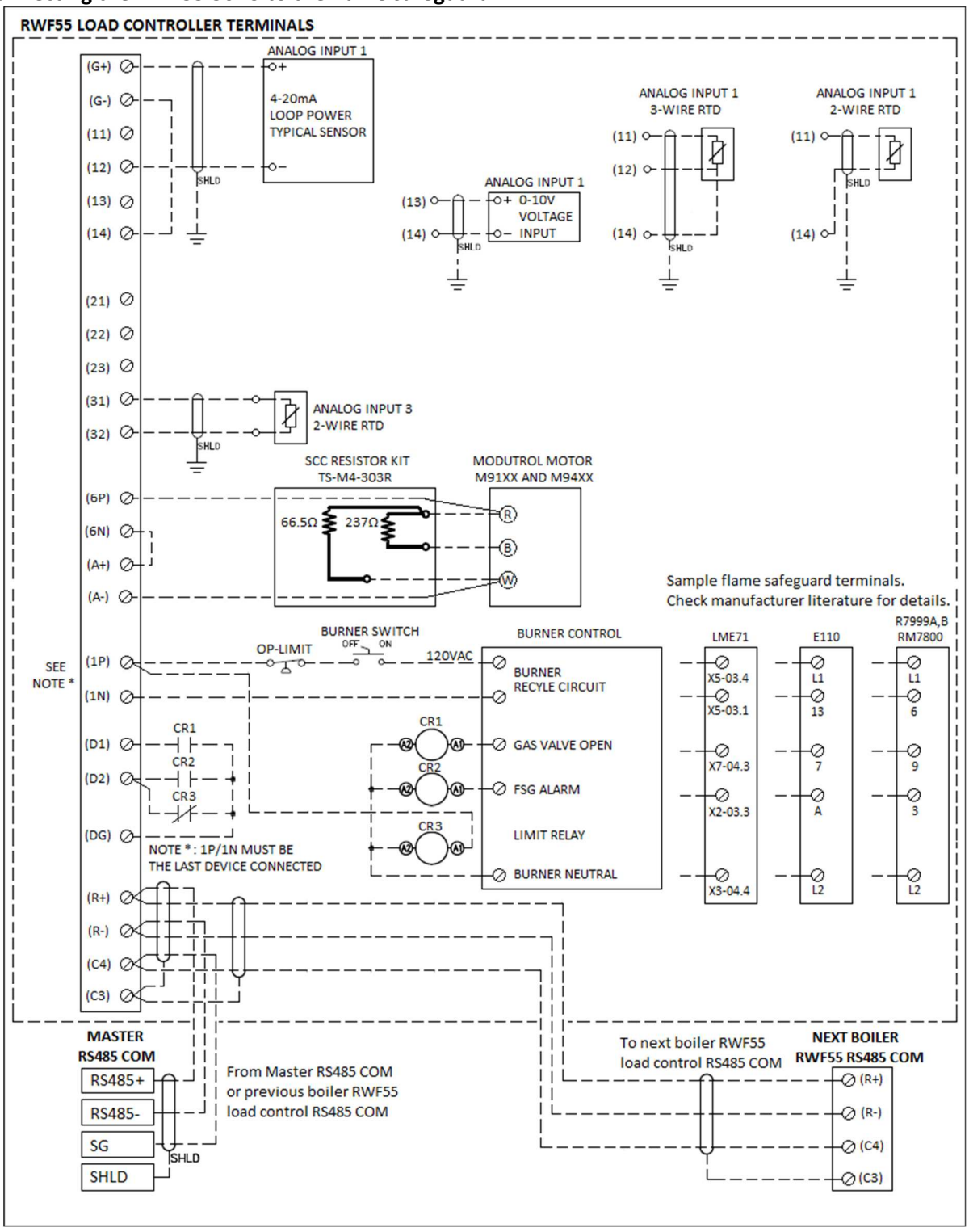
In order for the Master Panel to control the burner/boiler properly the RWF55.50A9 must be wired as shown in the following wiring diagrams. Three interposing relays CR1, CR2, and CR3 are required and must be wired as shown. The purpose of these relays is described in the sequence of operations below.

The RWF55.50A9 can output a 0-20mA, 4-20mA, or 0-10V modulation signal (4-20mA is typical). If a 0-135 ohm signal is required set the RWF55.50A9 for a 4-20mA output and use SCC part number TS-M4-303R (resistor kit for signal conversion). This configuration is shown in the following diagram.

The RWF55.50A9 can be programmed for low fire hold (also known as cold start). When controlling a steam boiler, the RWF55.50A9 utilizes an RTD wired to input 3 and the internal K6 relay to perform this function. When controlling a hot water boiler, the RWF55.50A9 will utilize the main water temp sensor wired to input 1 and the K6 relay. When the RWF55.50A9 is connected to the Master Panel the Master Panel can use the information gathered by the RTD to perform the low fire hold function as well as warm standby (see Master Panel Installation Instructions TS-2100). The following wiring diagram shows how to connect an RTD to input 3 and how to wire the modulation signal through the K6 relay. This is typical for a steam boiler. If the application is for a hot water boiler and low fire hold is desired simply omit the RTD wired to terminals 31 and 32. If low fire hold is not needed, an RTD does not need to be wired to terminals 31 and 32, nothing should be wired to the 6N or 6P terminals, and the modulation signal will come directly out of the A+ and A- terminals.

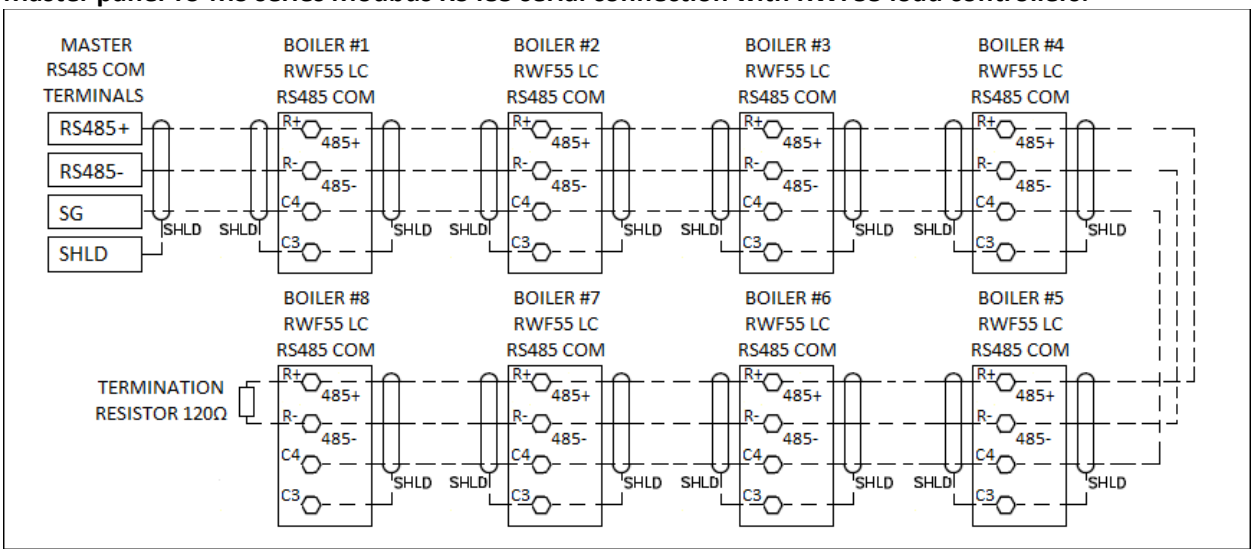
RWF55 Load Controller, Third Party Flame Safeguard, and SCC Master Lead Lag Panel (continued)

Connecting the RWF55.50A9 to the flame safeguard:



RWF55 Load Controller, Third Party Flame Safeguard, and SCC Master Lead Lag Panel (continued)

Master panel TS-MS series Modbus RS485 serial connection with RWF55 load controllers:



Note: For all RS485 connections, use Belden Cable 3106A (multi-conductor cable with twisted pair, EIA Industrial RS485 PLTC/COM) or equivalent.

Table 1: Belden Cable 3106A Wire Color Designation

Electrical Diagram	Belden Cable 3106A
Red (RS485+)	Orange (RS485+)
Black (RS485-)	White (RS485-)
White (SG)	Blue (SG)

RWF55 Load Controller, Third Party Flame Safeguard, and SCC Master Lead Lag Panel (continued)

Sequence of Operations:

1. Each boiler will be available to run by the Master Panel only when the following criteria are met. The status of each criterion can be viewed by navigating to the Boiler Available detail screen on the Master Panel.
    1- H-O-A Switch in Auto (This is found on the master panel)
    2- RWF55.50A9 is not in alarm (CR2 deenergized)
    3- RWF55.50A9 burner on (120V on the 1P terminal of the RWF55.50A9)
    4- Communication OK (Modbus connection to Master Panel is working)

   Boilers that are not on will be labeled Phase 12 - Standby Stationary
2. When there are one or more boilers available, and the system process variable is below the system set point, the Master Panel will call for the lead boiler to turn on.
3. The Master Panel will close the 1N/1P relay in the RWF55.50A9 for the lead boiler which will close the recycle circuit and send a call for heat to the flame safeguard. The flame safeguard will then start the boiler.
4. Once the main gas valves are opened CR1 will energize closing the contact between D1 and DG on the RWF55.50A9. The Master Panel will now show the boiler in Phase 60 – Running.
5. The Master Panel will now modulate the lead boiler via the RWF55.50A9 according to the modulation parameters set up in the Master Panel (see Master Panel Installation Instructions TS-2100).
6. If additional boilers are needed the Master Panel will turn them on with the same procedure as above according to the modulation parameters set up in the Master Panel.
7. If the flame safeguard of an available boiler goes into alarm and the FSG alarm output is energized, it will energize CR2 which will close the contact between D2 and DG. The Master Panel will then declare a flame safeguard alarm, the 1N/1P relay in the RWF55.50A9 will be deenergized, and the boiler will become unavailable.
8. If a device in the operating limit is open resulting in no voltage on the 1P terminal, CR3 will be deenergized causing the contact between D2 and DG to close. The Master Panel will then declare a flame safeguard alarm, the 1N/1P relay in the RWF55.50A9 will be deenergized, and the boiler will become unavailable.

RWF55 Load Controller, Third Party Flame Safeguard, and SCC Master Lead Lag Panel (continued)

RWF55 Configuration:

The RWF55.50A9 must be properly configured for use with the Master Panel and a third-party flame safeguard. To adjust parameters in the RWF55.50A9 begin by pressing Enter. The green display should read “Opr”. Use the up and down arrow buttons to navigate through the menus and the Enter button when the desired menu is selected. Use Esc to go back to the previous menu. When a parameter needs to be changed, the up and down arrow buttons allow the value to be changed and pressing Enter confirms the change. The parameter name will flash on the green display when the parameter entry mode is entered. Press the Esc button to return after the change is made.

Begin by configuring the Modbus parameters using the following menu paths:

ConF > IntF > r485 > bdrt = 2 (19200 bit/s baud rate)
ConF > IntF > r485 > dtt = 30 (timeout)
ConF > IntF > r485 > Adr = <(boiler number x 10) + 2> (Boiler 1 = 12, Boiler 2 = 22, etc.)

Configure the load controller parameters:

ConF > Inp > Inp1 > Sen1, Analog input 1 sensor type = 16 for 4-20ma, for others refer to RWF55 tables
ConF > Inp > Inp1 > SCL1, Analog input 1 scale low, default = 0
ConF > Inp > Inp1 > SCH1, Analog input 1 scale high, default = 100, to be changed to the high span of the installed tansmitter
ConF > Inp > Inp1 > Unit, Temperature unit = 2 for Fahrenheit, or = 1 for Celsius
ConF > Cntr > CtYP, Controller type = 2 for modulating
ConF > Cntr > CACt, Operation action = 1 for heating application
ConF > Cntr > SPL, Setpoint low limit, default = 0, set to minimum desired setpoint
ConF > Cntr > SPH, Setpoint high, default = 100, set to the maximum allowed setpoint
ConF > OutP > FnCt, Analog output function = 4 for controller angular position
ConF > OutP > SiGn, Analog output signal type = 1 for 4-20ma output, 2 for DC 0-10V, or 0 for 0-20 ma
ConF > OutP > 0Pnt, Re-transmit scale low = 20, when the RWF55.50A9 receives the minimum firing rate value of 20% (via Modbus) from the Master Panel the RWF55.50A9 will output 4mA, assuming SiGn = 1.
ConF > OutP > End, Re-transmit scale high = 100, when the RWF55.50A9 receives the maximum firing rate value of 100% (via Modbus) from the Master Panel the RWF55.50A9 will output 20mA, assuming SiGn = 1.
ConF > binF > bin1, Binary input 1 function = 0

RWF55 Load Controller, Third Party Flame Safeguard, and SCC Master Lead Lag Panel (continued)

Opr > SP1, Local boiler setpoint when in hand, it is recommended to make this equal to W1+Local Boiler Offset (Master Panel parameters)

PArA > Pb1, Proportional band, factory default set to 10 (Adjust as needed for hand operation)
PArA > dt, Derivative time, factory default set to 80 (Adjust as needed for hand operation)
PArA > rt, Integral time, factory default set to 350 (Adjust as needed for hand operation)
PArA > HYS1, switch-on threshold, factory default -5 (adjust as needed for hand operation)
PArA > HYS3, switch-off threshold, factory default 5. The HYS3 value is added to the current setpoint to determine when the boiler will be switched off. When operating in hand (without Master Panel), HYS3 is added to SP1. When the RWF55.50A9 is being controlled by the Master Panel, the Master Panel transmits a remote firing rate as well as a remote setpoint to the RWF55.50A9. The remote setpoint that is transmitted is equal to the W1 Setpoint + the Local Boiler Offset (Master Panel setpoint parameters). Therefore, when the RWF55.50A9 is being controlled by the Master Panel the off point will be equal to the W1 Setpoint + the Local Boiler Offset + HYS3. To prevent the boiler from being shut off unnecessarily when being controlled by the Master Panel, HYS3 should be set as high as possible, within reason. It is recommended that the off point created by HYS3 be slightly less than the mechanical operating limit. For example: If W1 Setpoint = 100PSI, Local Boiler Offset = 5PSI, and the mechanical operating limit is set to 130PSI it is recommended to set HYS3 to 24 creating an off point of 100 + 5 + 24 = 129PSI.

Configure low fire hold (K6 and Input 3) parameters:

If low fire hold is not required:
ConF > AF > FnCt, Alarm limit function = 0 for no function
ConF > InP > InP3 > SEn3, Analog input 3 sensor type = 0 for switched off

If low fire hold is required on a steam boiler and a water temp sensor is wired to Input 3:
ConF > AF > FnCt, Alarm limit function = 11 for Ik7 input 3
ConF > AF > AL, Alarm limit value = Low fire hold temperature setpoint
ConF > AF > HYSt, Switching difference (hysteresis) = total hysteresis around AL value. It is recommended to set this at 5, but can be adjusted per the application.
ConF > InP > InP3 > SEn3, Analog input 3 sensor type = 1 for PT1000 or 2 for LG-Ni1000
ConF > InP > InP3 > dF3, Analog input 3 filter time constant = 0

If low fire hold is required on a hot water boiler:
ConF > AF > FnCt, Alarm limit function = 7 for Ik7 input 1
ConF > AF > AL, Alarm limit value = Low fire hold temperature setpoint
ConF > AF > HYSt, Switching difference (hysteresis) = total hysteresis around AL value. It is recommended to set this at 5 but can be adjusted per the application.
ConF > InP > InP3 > SEn3, Analog input 3 sensor type = 0 for switched off

RWF55 Load Controller, Third Party Flame Safeguard, and SCC Master Lead Lag Panel (continued)

When the RWF55.50A9 is being controlled by the Master Panel (boiler running in Auto), the Master Panel will use the information gathered by the water temperature sensors to perform the low fire hold and warm standby functions as programmed in the Master Panel parameters. The K6 relay will be strictly controlled by the Master Panel, and the local AL and HYSt parameters will have no effect. When the RWF55.50A9 is operating in hand the above parameters will dictate how the low fire hold function operates.

Note: Adhere to the burner specifications set by the original equipment manufacturer when setting all parameters in the above instructions.

Hot Water or Coil Boilers Circulating Pump VFD Control

Introduction:

If boiler circulating pump control via the annunciation PLC of the TS-1000 is optioned.

The TS-1000 series touchscreen kit with annunciation has a built-in boiler circulating pump control for VFD controlled pumps.

Minimum annunciation selection for the TS-1000 kit:

PLC Feedwater, water level or Circulating Pump VFD control

5 = PLC circulation pump VFD, and water level control

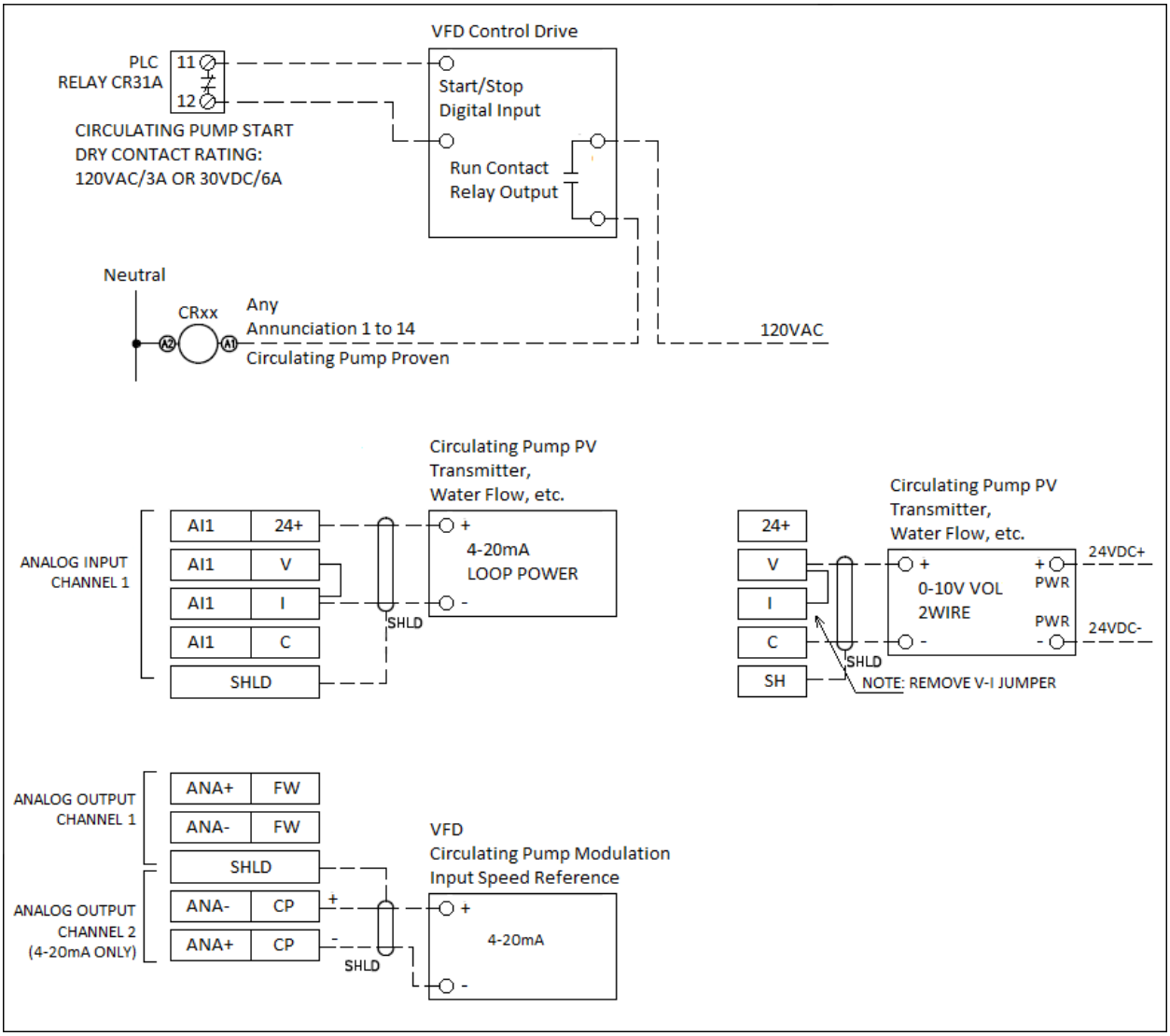
Annunciations and Monitoring (Touchscreen Required)

B = (14) 120 VAC inputs, (4) analog inputs with totalization, and (2) analog outputs

The provided analog output is an output that is in 1:1 ratio with the firing rate or an external input. If an analog input name contains the string "CP", that input will replace the firing rate for scaling the analog output. This 1:1 ratio is set up by specifying the minimum and maximum input signal which will linearly equate to a minimum and maximum output signal.

Hot Water or Coil Boilers Circulating Pump VFD Control (continued)

Typical Field Connections:



Hot Water or Coil Boilers Circulating Pump VFD Control (continued)

Procedure:

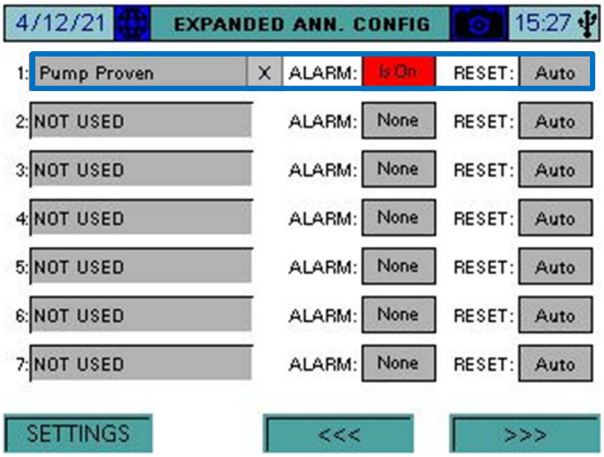
1. Wire the boiler pump VFD start input directly to the dry contact relay output as shown in the typical field connections section.
2. Wire the feedback from the VFD start proven output, or a flow proven switch, as shown in the typical field connections section. It could be wired to any available annunciation relay to be dedicated for the pump start proven feedback. There are 14 annunciation relays included when the annunciation PLC is optioned with the touch screen kit.
3. Wire the VFD speed reference input to the analog output terminals as shown in the typical field connections section. The actual speed reference in this case would be the actual firing rate percentage as a process variable.
4. IF the process variable for this process is not desired to be the actual firing rate, then an analog input could be dedicated for a flow transmitter or any transmitter, to be used as the process variable to increase and decrease the speed of the circulating pump through the variable speed drive.

Touchscreen Settings:

1- Boiler circulating pump is controlled by a VFD.

Main Menu > Login > System Settings > Expanded Annunciator Digital Inputs.

- Select one of the available 14 annunciator digital inputs.
- Enter information as shown below.



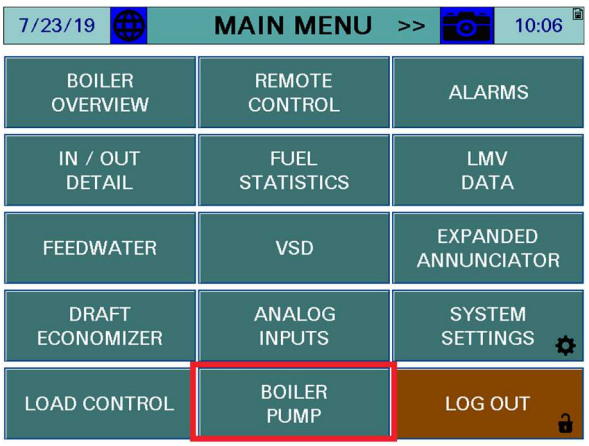
Hot Water or Coil Boilers Circulating Pump VFD Control (continued)

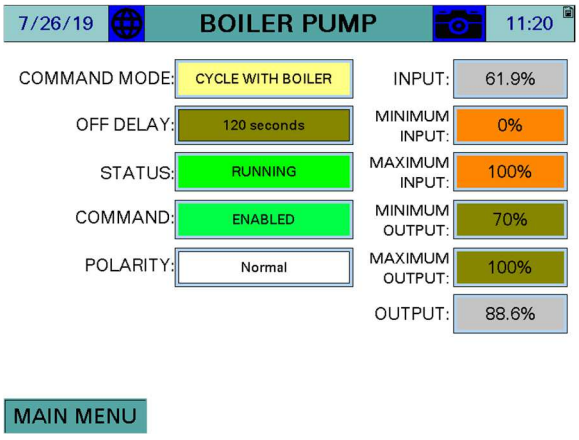
If the circulating pump VFD to be controlled by a process variable other than firing rate, i.e., flow transmitter, then one of the annunciation PLC analog inputs needs to be configured for this process variable. The analog input name should contain the string "CP", that input will replace the firing rate for scaling the analog output. This ratio is set up by specifying the minimum and maximum input signal which will linearly equate to a minimum and maximum output signal.

- Main Menu > Login > System Settings > Options > Enable Annunciation.
- Main Menu > Login > System Settings > Expanded Annunciator Options
- At the AI Config (V, mA) screen, Analog Input 1 – AI Option, enter Input Name “CP XXXX” for load controller PV transmitter, enter Unit, enter Type, enter Min and Max Span, enter Alarm setpoints Low and High if desired, enable totalization if desired.

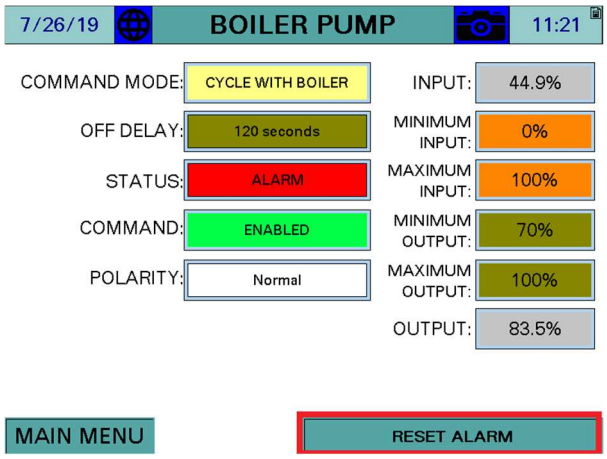
Operation:

If the boiler pump option is configured with the Expanded Annunciator, touch **BOILER PUMP** to access the detail screen. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels. One of the digital inputs must be named "Pump Proven" for connection to the flow, differential pressure or current switch that proves pump operation. Failure to prove pump operation within 30 seconds of being commanded on will result in a pump alarm.





Hot Water or Coil Boilers Circulating Pump VFD Control (continued)



Operation:

COMMAND MODE – Selects the command mode is the method of pump control used. Setting may only be changed at the SETUP access level (TECH required).

- **CYCLE WITH BOILER:** The pump will be commanded on when the boiler is commanded on. The pump will remain on after the boiler command is removed for the duration of the off-delay period.
- **CONTINUOUS RUN:** The pump will be commanded on as long as the HAND-OFF-AUTO switch is not in OFF on the REMOTE OPERATION screen.

OFF DELAY – Sets the amount of time that the pump stays on after the boiler turns off when the pump is set to mode 'CYCLE WITH BOILER' (TECH required).

STATUS – Displays the status of the pump.

- **RUNNING:** The pump is currently on.
- **IDLE:** The pump is currently off because it is commanded to be off.
- **ALARM:** The pump is currently off because it is in alarm.

COMMAND – Displays whether the pump is currently being commanded on.

- **ENABLED:** The pump is being commanded on.
- **DISABLED**: The pump is being commanded off.

Hot Water or Coil Boilers Circulating Pump VFD Control (continued)

OUTPUT – Sets the logic of the pump output (TECH required).

- **NORMAL:** The pump is output is normally open.
- **REVERSE:** The pump is output is normally closed.

INPUT – Displays the current input percent. This may be the current firing rate or from an external analog input.

MINIMUM INPUT – Sets the minimum input signal to apply to the output ratio calculation. This will normally equal the minimum firing rate or the minimum span of the external input (TECH required).

MAXIMUM INPUT – Sets the maximum input signal to apply to the output ratio calculation. This will normally equal the maximum firing rate or the maximum span of the external input (TECH required).

MINIMUM OUTPUT – Sets the minimum output signal that the output ratio calculation will provide. This will normally equal the minimum speed in percent at which that the circulating pump VSD should operate (TECH required).

MAXIMUM OUTPUT – Sets the maximum output signal that the output ratio calculation will provide. This will normally equal the maximum speed in percent at which that the circulating pump VSD should operate (TECH required).

OUTPUT – Displays the applied analog output in percent.

To reset a pump alarm, touch **RESET ALARM** on the BOILER PUMP screen. The pump will automatically reset if operation is proven while an alarm is present.

Draft Control

Introduction:

If draft control via the PLC annunciation is optioned.

Draft Control requires a draft range DP transmitter to continuously monitor the boiler draft (Differential pressure before the draft damper to atmosphere), a PID loop controller built into the PLC, that controls a Siemens SQM5 actuator with an “A” board to be modulated open or closed to maintain the preset setpoint.

The draft control system requires a stack DP switch for high pressure shutdown, an SQM5 actuator with an “A” board, a coupling between the damper shaft and the SQM5 square shaft, and an optional SCC bracket for the SQM5 for replacing third part modulating motors (Check SCC Inc offered brackets).

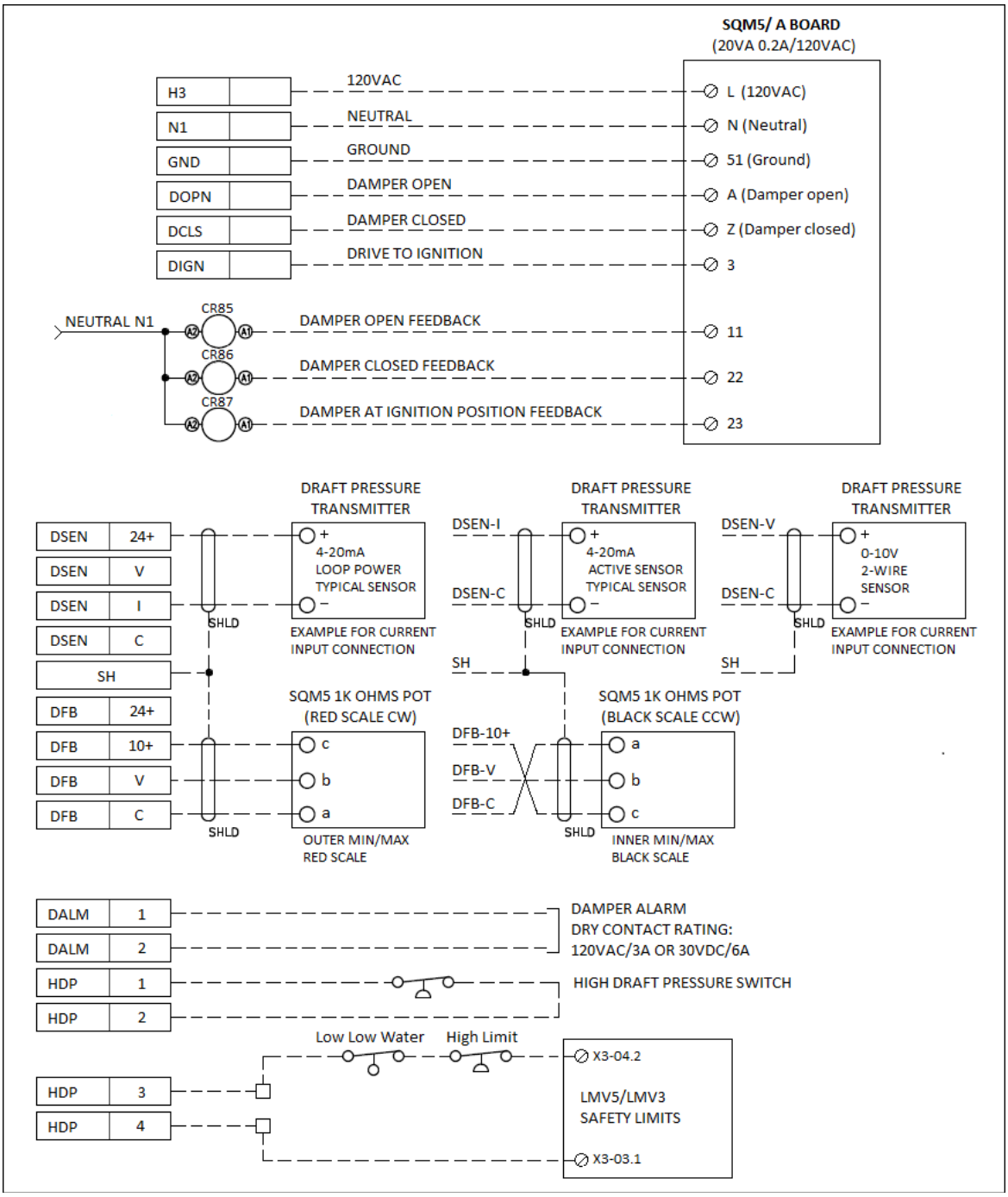
Minimum requirement for the TS-1000 kit selection with a touchscreen

Draft Control

D = Draft control

Draft Control (continued)

Typical Field Connections:



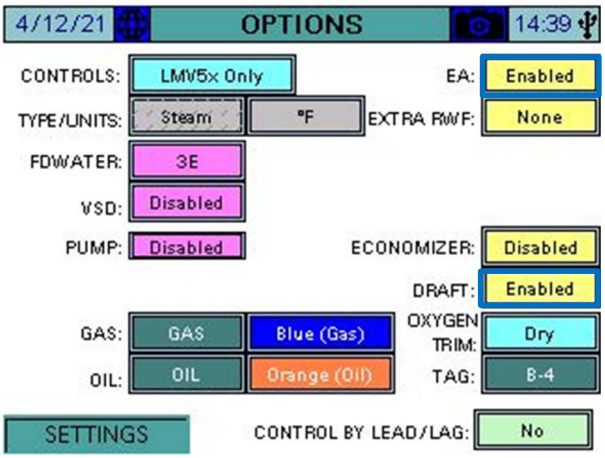
Draft Control (continued)

Procedure:

1. Install the draft control damper.
2. Install the SQM5 actuator, align the SQM5 shaft load side of the actuator with the damper shaft, secure coupling, and SQM5 actuator.
3. Install the draft DP transmitter with the positive side connected and piped to the damper upstream side (based on the flow away from the boiler) and the negative side to atmosphere. Install provided muffler screen adapter.
4. Check the draft DP installation and pipping methods in TS-7400 for reference.
5. Check the damper open and close orientation, in relation to the SQM5 actuator, select red or black scale on the SQM5 based upon direction of rotation.
6. Adjust the open, close, and ignition position switches for the SQM5 actuator CAM.
7. Wire the SQM5 actuator, the DP transmitter, and the DP high pressure switch to the SCC Inc. TS-1000 kit.
8. Terminate and connect all the wires to SCC Inc. TS-1000 kit terminals based on the provided job specific electrical drawings.
9. Reference the illustration below from TS-1000 technical instructions, Figure 1, for reference and guidance.

Touch screen Setting:

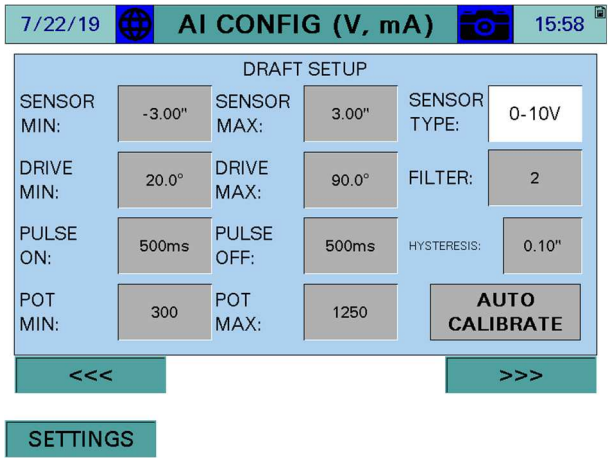
Main Menu > Login > System Settings > Options > Enable Annunciation > Enable Draft



Draft Control (continued)

Draft Control Analog input configuration and settings.

- Main Menu > Login > System Settings > Expanded Annunciator Options
- Touch <<< to navigate to AI Config (V, mA) Draft Setup.



SENSOR TYPE – Select between 0-10V, 2-10V, 0-20mA, or 4-20mA.

FILTER – Sets the filter time used to average the incoming signal. This is useful when the signal is not steady.

HYSTERESIS – Sets allowable discrepancy between the setpoint and draft sensor. Used to lower the duty cycle on the draft actuator.

SENSOR MIN, SENSOR MAX – Sets the range of the input. The minimum may be a negative number.

DRIVE MIN, DRIVE MAX – Sets the limits of the damper in angular degrees.

PULSE ON, PULSE OFF – Sets the duration of the on and off damper drive pulses.

POT MIN, POT MAX – Sets the range of the feedback pot to scale from 0 to 90 degrees.

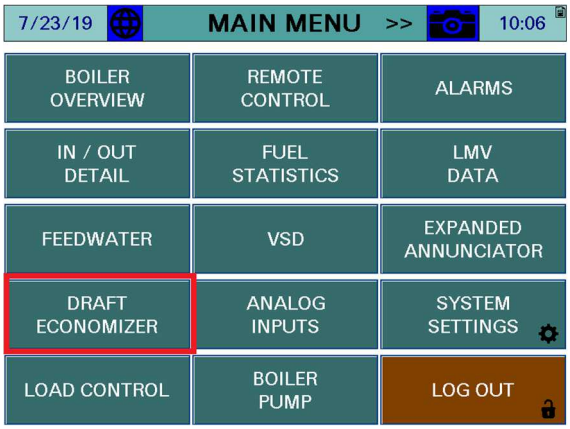
AUTO CALIBRATE – Manually activates the potentiometer calibration. This can only be performed when the LMV is in phase 12 (idle). The damper is paced from open to close, and the potentiometer readings are recorded. The potentiometer will automatically re-calibrate each end position with every cycle of the damper.

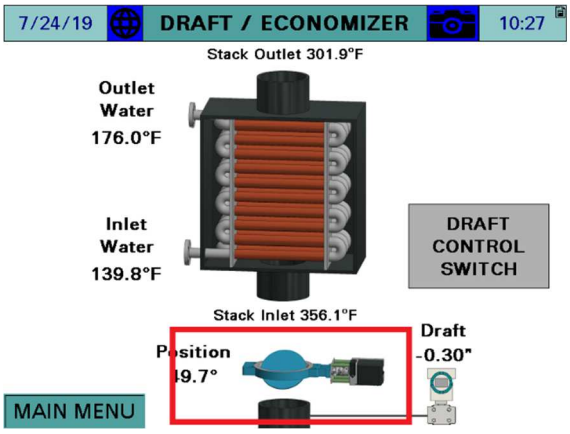
Draft Control (continued)

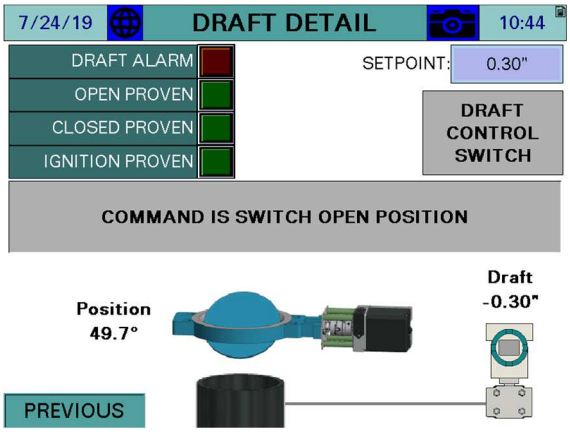
Operation:

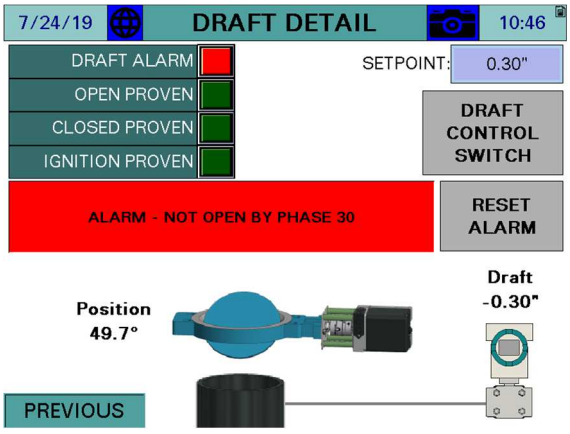
Access level: USER/TECH/SETUP

Touch **DRAFT** or **DRAFT ECONOMIZER** to access the detail screen. If only draft control is optioned, the button will link directly to the DRAFT DETAIL screen, if not it will link to the DRAFT/ECONOMIZER overview. This screen can be accessed from the USER level, but settings may only be changed from the TECH or SETUP levels.









DRAFT ALARM – A draft alarm is currently active.

OPEN PROVEN – The draft damper has proven the open position switch.

CLOSED PROVEN – The draft damper has proven the closed position switch.

Draft Control (continued)

Operation:

IGNITION PROVEN – The draft damper has proven the ignition position switch.

SETPOINT – Sets the desired draft setpoint (TECH or SETUP required).

DRAFT CONTROL SWITCH – Displays the draft control Open/Auto switch.

CURRENT STATUS – Displays the current status or alarm message.

RESET ALARM – Draft alarms must be manually reset using this button, or **RESET EA ALARMS** at the alarms screen.

POSITION – Displays the current position in angular degrees.

DRAFT – Displays the current draft reading.

Monitored Value Digital Dry Contact Output

Introduction:

There are two monitored value relays that can be used for this function (MV3 and MV4). They will not be available if circulating pump PLC control or load control operations are selected. The MV3 and MV4 monitored relay outputs will be dedicated for those processes.

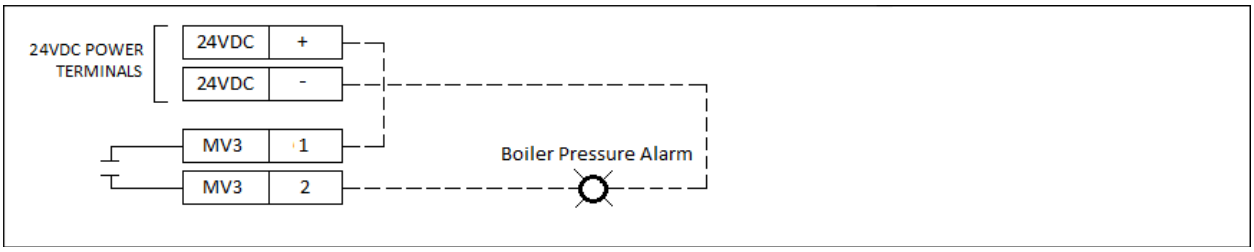
If circulating pump or a load control is not selected, then the monitored digital outputs can be configured to take an action based upon the value in any of the Modbus registers. Each monitored digital output can consider two conditions using a logical function.

Minimum requirement for the TS-1000 kit selection:

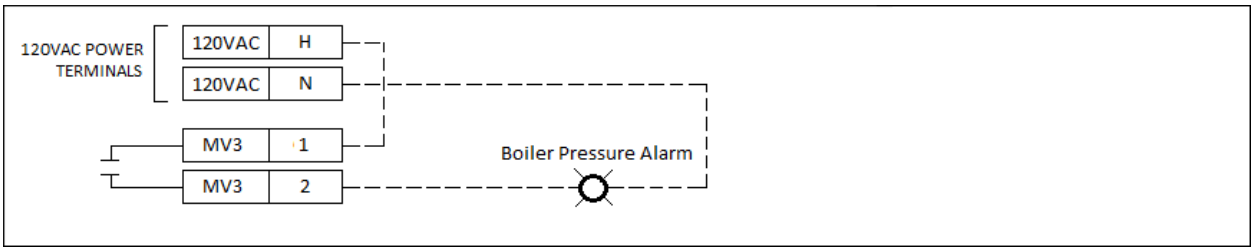
Annunciations and Monitoring (Touchscreen Required):

standard with any PLC annunciation selection

Typical field wiring for 24 VDC field device:



Typical Field Connections for a 120VAC field device:

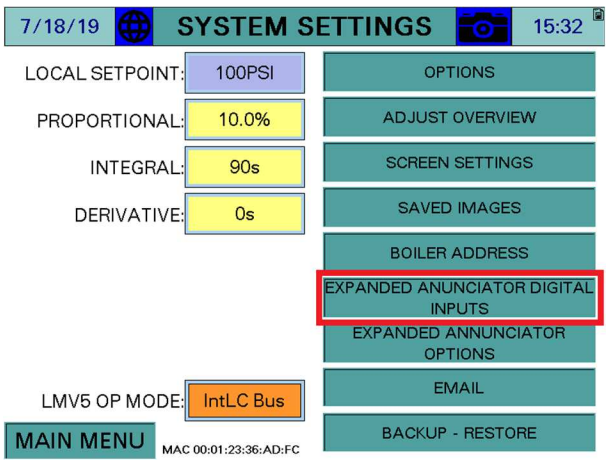


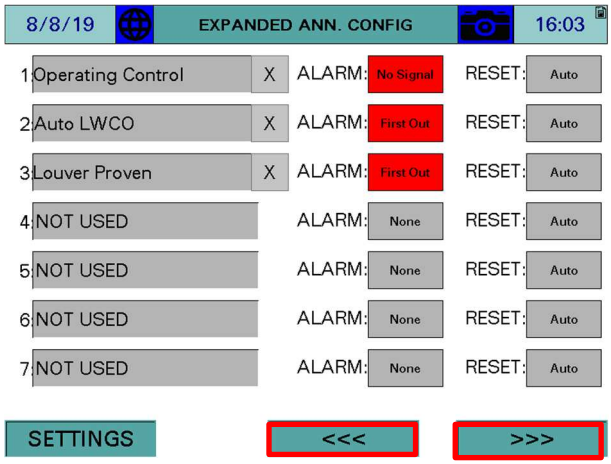
Monitored Value Digital Dry Contact Output (continued)

Touchscreen setting:

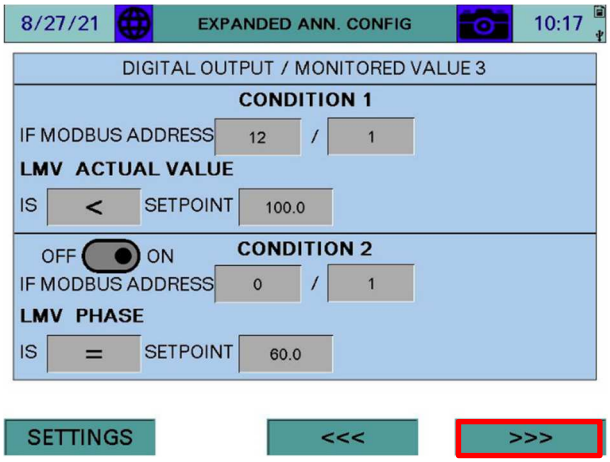
Touch **EXPANDED ANNUNCIATOR DIGITAL INPUTS** to configure base Expanded Annunciator settings. Use the arrows to scroll between the configuration pages. This is an example to set an external alarm when the boiler pressure every time drops below 100PSI, with an ON delay of 10 seconds, and when the boiler is in phase 60 (Firing).

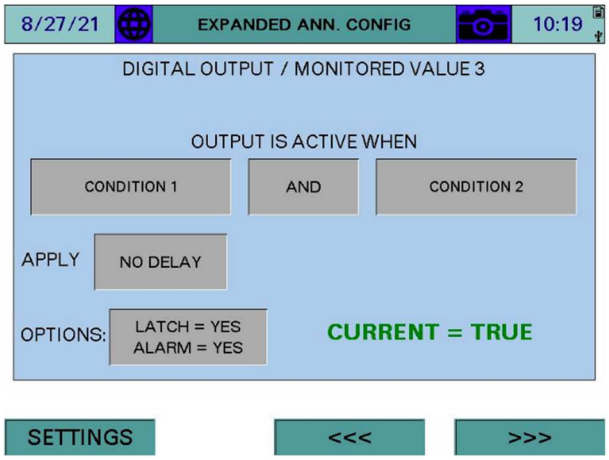
- Main Menu > Login > System Settings > Options > Enable Annunciation.
- Main Menu > Login > System Settings > Expanded Annunciator Digital Inputs
-





Touch one of the two buttons <<< or >>> to navigate to Digital Outputs/Monitored Value 3 or 4





Monitored Value Digital Dry Contact Output (continued)

From the TS-1100 Modbus registers mapping list starting on page 104, find the related Modbus registers required for the operation.

LMV actual value (Steam actual pressure) Modbus register is “12“

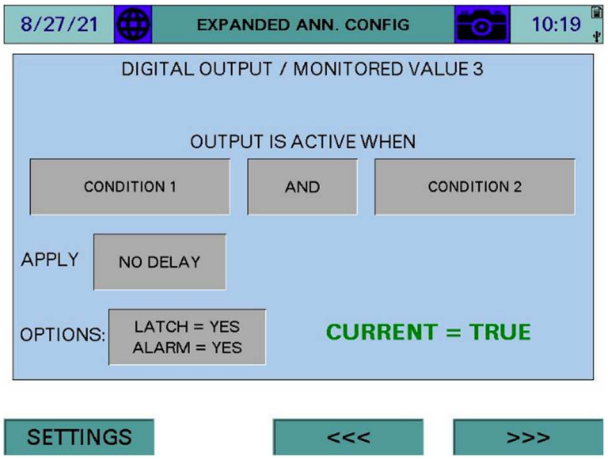
LMV Phase register is “0“

Enter condition 1 and condition 2 information, see image above.

To enable the second condition for the LMV seconds Modbus register, touch OFF-ON slider switch.

Touch >>> to navigate to Digital output /Monitored Value 3 screen to select to when the output will be active or True.

Operation:



By selecting the “AND” for condition 1 and condition 2, the output MV3 is active when condition 1 and condition 2 are true, the actual boiler pressure is below 100 PSI and the LMV is in phase 60. You could also apply a delay for the output to be true. The output relay could be latched on after it becomes true, and to be unlatched only by resetting the EA alarms at the alarms screen. Selecting YES for the alarm, the alarm banner will be active, and the alarm will be logged at the alarms history screen.

Monitored Value Analog Output

Introduction:

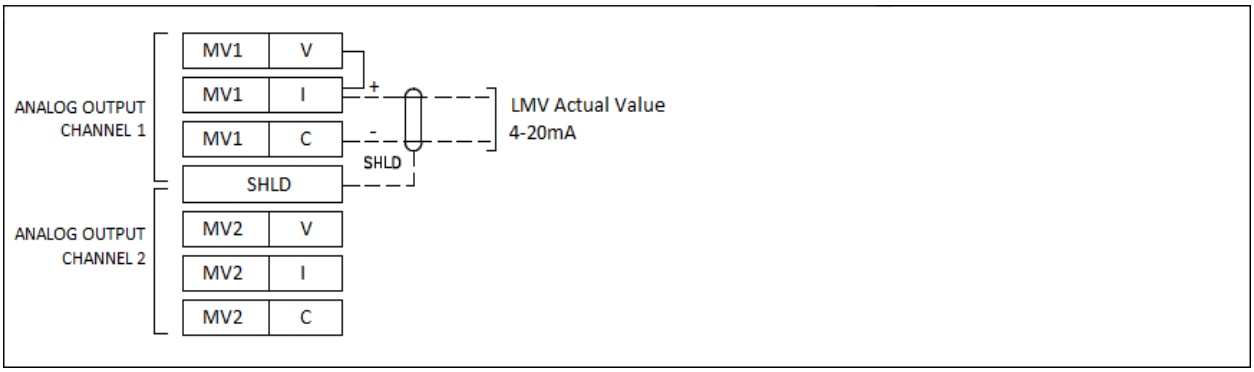
There are two monitored value outputs that can be used for this operation (MV1 and MV2). They will not be available if circulating pump PLC control or load control operations are selected. The MV3 and MV4 monitored outputs will be dedicated for those processes.

If circulating pump or a load control is not selected, then the monitored analog outputs can be configured to transfer an analog value for any analog available Modbus registers in 4-20 ma form (i.e. for example boiler LMV actual value).

Minimum annunciation selection for the TS-1000 kit:

Annunciations and Monitoring
B = (14) 120 VAC inputs, (4) analog inputs with totalization, and (2) analog outputs

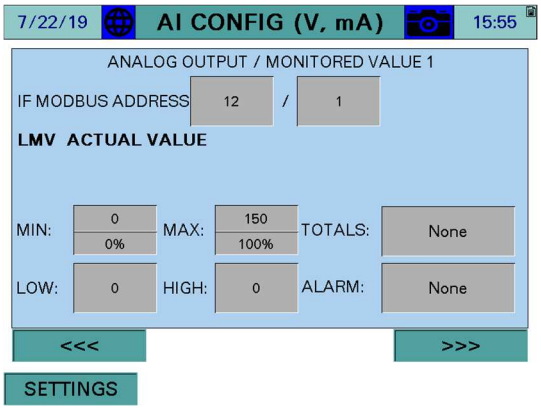
Typical connection diagram:



Monitored Value Analog Output (continued)

Touchscreen setting:

The monitored analog outputs can be configured to take an action based upon the value in any of the Modbus registers.



IF MODBUS ADDRESS – Sets the Modbus register index to monitor and the divider to apply to it. The name of the chosen address will then be displayed.

MIN, MAX – Sets the monitored range for the analog output. If the actual value falls outside of this range, the minimum or maximum value will be the output. The percentages shown set the scale of the physical analog output. If the minimum is more than the maximum, the output will be reverse-acting (maximum output indicates low range, minimum output indicates high range).

TOTALS, LOW, HIGH, ALARM – These options are identical to and configured the same way as the analog input options of the same names.

Operation:

Example: Address 12, 'LMV ACTUAL VALUE' is being monitored with a range of 0-150 (psi). If the physical scale is set from 0% to 100% (full range for 0-10V or 0-20mA), a reading of 75psi would yield an output of 5V or 10mA. If that scale was set from 20% to 100% (full range for 2-10V or 4-20mA), the output would be 6V or 12mA.