SCC Inc.

Water Level Control Systems

Introduction

Many options are available for water level control systems. This application guide will explain the setup and operation of the most common options.

Table of Contents

Water Level Control Components

	7MF0340-DISP (4-button)	Sitrans 4-20 mA output differential pressure transmitter with display Includes mounting bracket & hardware *See Document SEN-3000*
	7MF0340-NODISP (4-button)	Sitrans 4-20 mA output differential pressure transmitter with no display Includes mounting bracket & hardware *See Document SEN-3000*
	7MF4433-DISP (3-button) (obsolete)	Obsolete Sitrans 4-20 mA output differential pressure transmitter with display
	7MF4433-NODISP (3-button) (obsolete)	Obsolete Sitrans 4-20 mA output differential pressure transmitter with no display
	Series 193/194 (by others)	McDonnell & Miller 0-135 ohm low water cutoff and pump controller Model 193 with 7B head shown

Water Level Control Components (cont.)
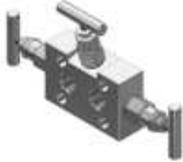
	A6X30004061	Three-valve manifold for any 7MF… differential pressure transmitter Mounting hardware included *See Document SEN-3000*
	7MF9408-2CL-Z E34	Oval flange for any 7MF… differential pressure transmitter ½" NPT threaded connections Includes mounting hardware & gasket
	7MF7900-2AB	Steel mounting bracket for 7MF0340… differential pressure transmitters
	7MF9411-5DB	Spare hardware kit for 3-valve manifold

Water Level Control Components (cont.)

	RWF50.30A9	Universal controller with analog output 1/16 DIN cutout *See Document u7866en*
	RWF55.50A9	Universal controller with analog output and alarm relay 1/8 DIN cutout *See Document u7867en*

Water Level Control Components (cont.)

	SKx62UA Actuator	Electronic valve actuator, 24 VAC, with proportional control SKB62UA: 3/4" stroke, 120 seconds, 630 lb$_f$ SKC62UA: 1-1/2" stroke, 120 seconds, 630 lb$_f$ SKD62UA: 3/4" stroke, 30 seconds, 225 lb$_f$ *See Document 155-717*
	599 Valve	Two-way threaded valves for make-up water or feedwater. 50 psid max - bronze body. *See Document 155-184P25*
	HFV Valve	Two-way valves for feedwater applications. 150 psid max — stainless steel body. *See Document FED-2000*

Water Level Control Components (cont.)

	ASC9.3	Auxiliary switch for SKB/C/D actuators
	Touchscreen Panel	SCC touchscreen panel used to integrate and monitor water level controls *See Document TS-1000*
	TS-TR-24VAC-40VA	24 VAC transformer (40VA) for SKB/C/D actuators

Basic On/Off Valve Control

Required Components
1. SKx62UA actuator
2. 599 valve
3. McDonnell & Miller LWCO & pump controller

Basic On/Off Control Installation Instructions

To connect the McDonnell & Miller head to the SKx62UA actuator, wire the pump control terminals to the on/off terminals of the loop powered SKx62UA actuator as shown in the wiring diagram below.

SIEMENS
SKB/C/D 62UA

120 VAC   24 VAC

GO   G   Z

SET SKx.62UA DIP SWITCHES:

ON

1 2 3 4

MCDONNELL & MILLER
150S/157S, 93/94/193/194
PUMP SWITCH

NOTE: CONFIGURATION SHOWN
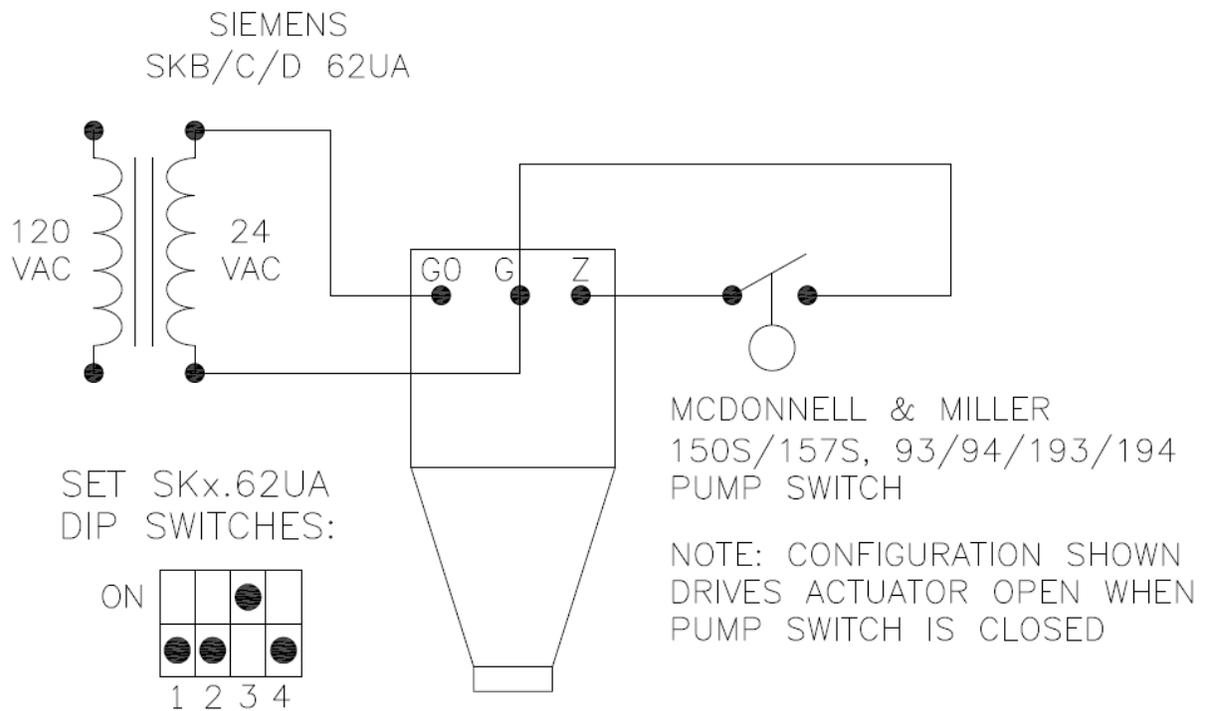DRIVES ACTUATOR OPEN WHEN
PUMP SWITCH IS CLOSED

Figure 1: On/off Control

Basic Proportional Control

This method connects a 0-135 ohm slide wire potentiometer directly to a Siemens SKx62UA actuator. The McDonnell & Miller 7B head has a 0-135 ohm slide wire that follows a float in the cast iron housing of the McDonnell & Miller Model 93. When the float is in the down or "empty" position, this causes the wiper arm on the slide wire to rise. Conversely, when the float is up or in the "full" position, this causes the wiper arm to fall.

The effective span of the 0-5 volt signal corresponds to an approximately 1-1/16" change in water level. Since this is the case, the SKx62UA actuator works in a straight proportional mode and the proportional band is 1-1/16".

Required Components
1. SKx62UA Actuator
2. 599 valve
3. McDonnell & Miller LWCO & pump controller with 7B head

Basic Proportional Control Installation Instructions

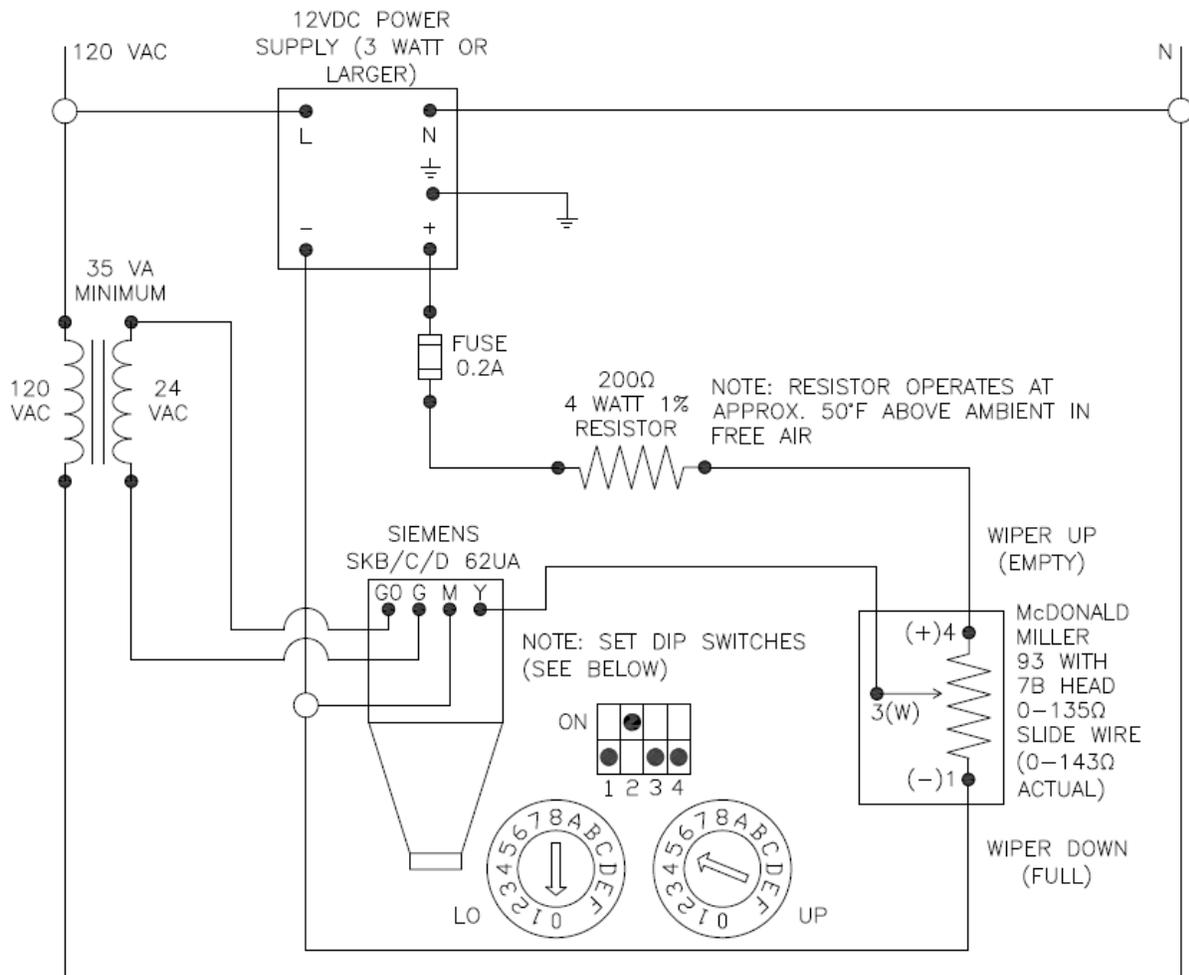Figure 2 below shows the wiring setup for basic proportional control.

Figure 2: Basic Proportional Control

Basic Proportional Control Installation Instructions (cont.)

Circuit Analysis
The circuit analysis for the circuit shown on the previous page is as follows:

<table>
<tr><td colspan="2">Main Loop – 4 to 3 continuity:
Empty position, 12 VDC</td><td colspan="2">Main Loop - 3 to 1 continuity:
Full position, 12 VDC</td></tr>
<tr><td>Potentiometer</td><td>143 Ω</td><td>Potentiometer</td><td>0 Ω</td></tr>
<tr><td>Resistor 1</td><td>200 Ω</td><td>Resistor 1</td><td>200 Ω</td></tr>
<tr><td>Power Supply</td><td>12 V</td><td>Power Supply</td><td>12 V</td></tr>
<tr><td>Loop Resistance</td><td>343 Ω</td><td>Loop Resistance</td><td>200 Ω</td></tr>
<tr><td>Loop Current</td><td>0.035 A</td><td>Loop Current</td><td>0.060 A</td></tr>
<tr><td>Loop Power</td><td>0.420 W</td><td>Loop Power</td><td>0.720 W</td></tr>
<tr><td>Total V drop</td><td>12 V</td><td>Total V drop</td><td>12 V</td></tr>
<tr><td>Resistor 1 V drop</td><td>6.997 V</td><td>Resistor 1 V drop</td><td>12 V</td></tr>
<tr><td>Res 1 Power Dis</td><td>0.245 W</td><td>Res 1 Power Dis</td><td>0.720 W</td></tr>
<tr><td>Pot V drop</td><td>5.003 V</td><td>Pot V drop</td><td>0 V</td></tr>
<tr><td>Pot Power Dis</td><td>0.175 W</td><td>Pot Power Dis</td><td>0 W</td></tr>
</table>

Notes:
- The 200 ohm resistor dissipates about 0.720 watts of power when the wiper is in the "full" position.

- The resistor dissipating 0.720 watts will cause the resistor to have a temperature rise of about 50°F as compared to the ambient air temperature. It is recommended to have the resistor in free air, not up against other components.

- A resistor rated for 4 watts is used since it is larger and dissipates the heat that is generated better than a smaller resistor.

- A resistor with a heat sink can be used if a lower temperature rise is desired.

- The voltage output of the circuit can be fine-tuned by adjusting the output of the DC power supply. Most power supplies have a small screw where the output voltage can be adjusted up or down slightly. This can be used to compensate for resistor / potentiometer tolerances and wire resistance.

PID Control - McDonnel & Miller with 7B Head

This method makes use of a 0-135 ohm slide wire potentiometer connected to an RWF5x PID controller.

The McDonnell & Miller 7B head has a 0-135 ohm slide wire that follows a float in the cast iron housing of the McDonnell & Miller Model 93. When the float is in the down or "empty" position, this causes the wiper arm on the slide wire to rise. Conversely, when the float is up or in the "full" position, this causes the wiper arm to fall. Combined with the circuits and configurations on the previous change, this enables the RWF5x controller to read the water level as sensed by the 0-135 ohm slide wire.

This document outlines two different methods to connect a 0-135 ohm slide wire potentiometer directly to a Siemens RWF5x PID controller.

Required Components
1.   SKx62UA actuator
2.   599 valve
3.   McDonnell & Miller LWCO & pump controller with 7B head
4.   RWF5x PID controller

PID Control Installation Instructions

The first method for connecting the 0-135 ohm slide wire potentiometer to the RWF5x is shown in Figure 3 below.
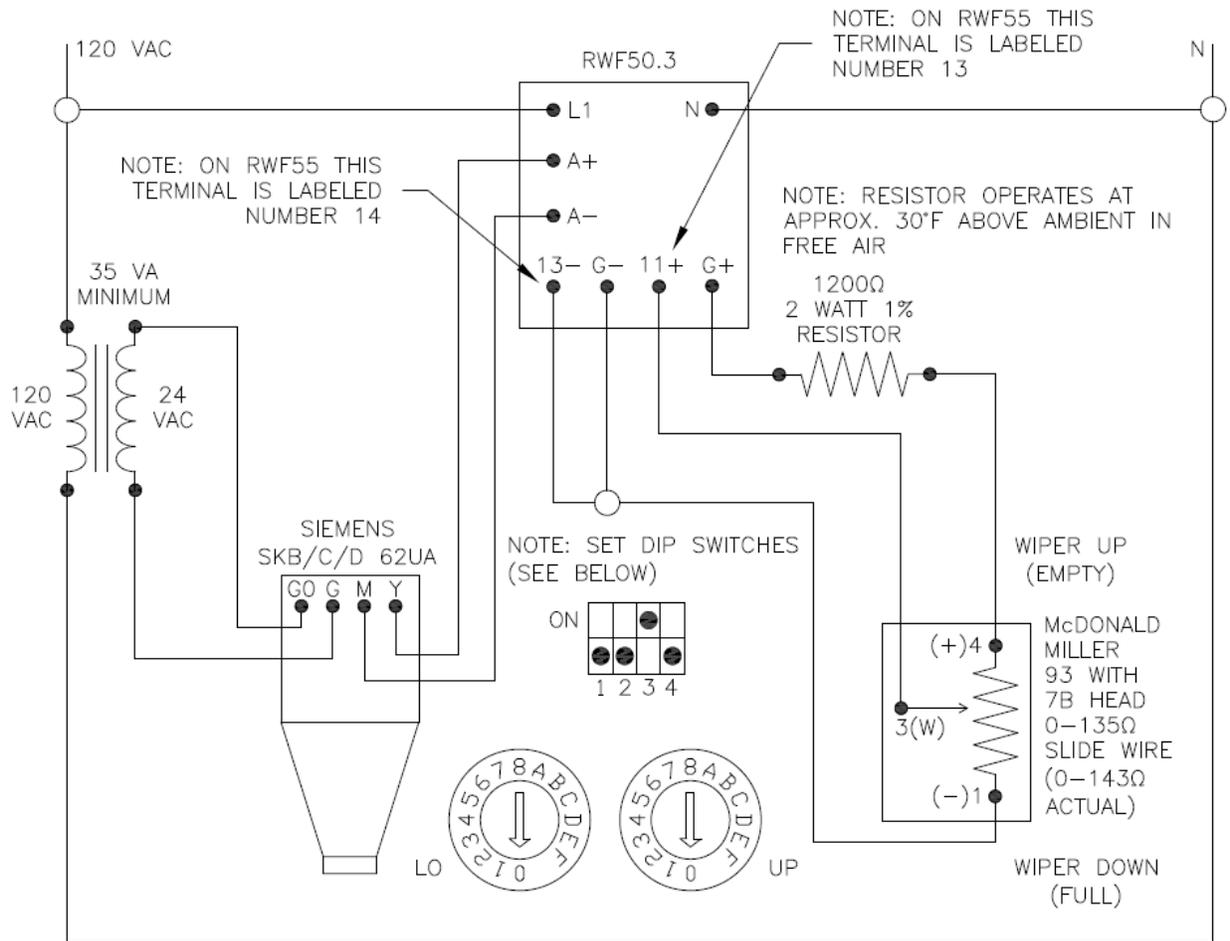

Figure 3: Wiring Method 1 with 0-5 VDC Input to RWF50.3

PID Control Installation Instructions (cont.)

The circuit analysis for the circuit shown on the previous page is as follows:

Main Loop – 3 to 4 continuity:
Empty, 24 VDC

Potentiometer	143 Ω
Resistor 1	1200 Ω
Power Supply	24 V
Loop Resistance	1343 Ω
Loop Current	0.018 A
Loop Power	0.429 W
Total V drop	24 V
Resistor 1 V drop	21.445 V
Res 1 Power Dis	0.383 W
Pot V drop	2.555 V
Pot Power Dis	0.046 W

Main Loop – 3 to 1 continuity:
Full, 24 VDC

Potentiometer	0 Ω
Resistor 1	1200 Ω
Power Supply	24 V
Loop Resistance	1200 Ω
Loop Current	0.020 A
Loop Power	0.480 W
Total V drop	24 V
Resistor 1 V drop	24 V
Res 1 Power Dis	0.48 W
Pot V drop	0 V
Pot Power Dis	0 W

Notes:
- The 1200 ohm resistor dissipates about 0.480 watts of power when the wiper is in the "full" position.
- The resistor dissipating 0.480 watts will cause the resistor to have a temperature rise of about 30°F as compared to the ambient air temperature. It is recommended to have the resistor in free air, not up against other components.
- A resistor rated for 2 watts is used since it is larger and dissipates the heat that is generated better than a smaller resistor.
- A resistor with a heat sink can be used if a lower temperature rise is desired.
- The signal to the RWF5x will range from 0 to approximately 2.5 volts DC.

PID Control Installation Instructions (cont.)

RWF5x Programming – Method 1

The following parameters need to be changed from default in the RWF5x controller.

PArA	**Pb1**	80
	rt	80
	dt	8
	HYS1	0
	HYS3	4
ConF > InP > InP1	**SEn1**	18
	Unit	2
	SCL1	100
	SCH1	-104
ConF > Cntr	**SPH**	95

The potentiometer in the 7B head is not exactly the same unit to unit, so the scale high (SCH1) may need to be adjusted slightly. The offset parameter (OFF1) can be used as well to correct for small bias errors. The RWF5x controller should read 0 at the empty position and 100 at the full position.

The digital filter (ConF -> InP -> InP1 -> dF1) may also need to be set if the reading is fluctuating. Values of 5 or more for the digital filter should be adequate to stop reading fluctuation.
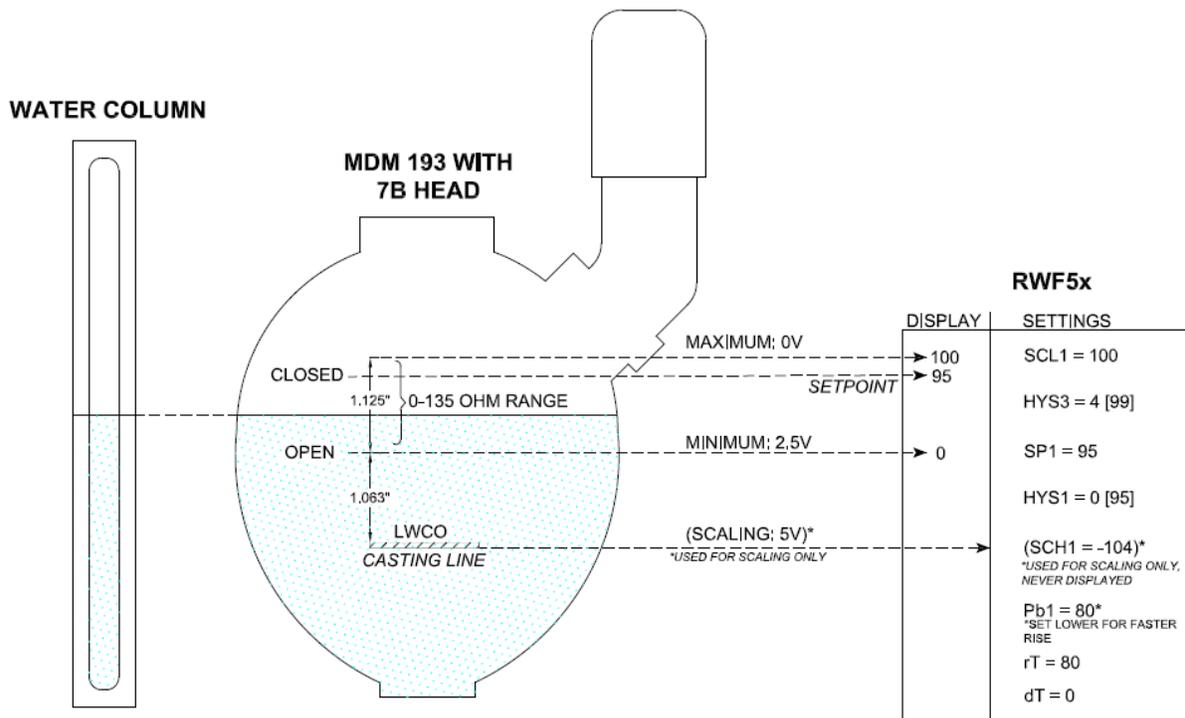

Figure 4: McDonnell & Miller 193 to RWF Settings Relationship

DP Control with 7MF…

Differential pressure control provides the most precise control over water level using differential pressure measurements and PID controls.

The differential pressure transmitter measures the differential pressure between the *reference leg* and the *working leg.* The suggested setup is to have the reference leg piped into the negative side of the transmitter. The instructions below are written with this configuration assumed.

For proper operation, it is critical that the reference leg remains full. Often, if the reading of the DP transmitter is incorrect, it is due to the reference leg missing water. It may also be necessary to flush sediment that has settled on either side of the DP transmitter manifold, and then refill the reference leg after flushing. Refer to the troubleshooting section on pages 27 and 28 for more information.

It is helpful to understand the way the water level is measured and translated to a 4-20 mA signal at each step of the process. When the DP transmitter measures the differential pressure, it produces a larger mA signal for a lower water level, because the differential pressure is greater. This is why SCL1 on the RWF5x controller corresponds to a full tank level, as it receives a 4 mA signal, while SCH1 corresponds to a 20 mA signal at an empty tank.

When the RWF5x controller outputs a signal, it is telling the actuator how far to open the valve, so a higher mA signal is output when the water level is lower. The proportional band reduces the opening of the valve linearly until the setpoint is achieved, at which point the valve should be closed. The integral band will add to the output based on how far away the water level is from setpoint over time, and can be used if necessary to achieve the setpoint. The derivative is generally left at 0 for differential pressure water level control, making this a P or PI system.

Required Components
1. SKx62UA Actuator
2. 599 valve
3. RWF5x PID controller
4. 7MF… DP transmitter

Optional Components
5. Touchscreen kit

DP Control Installation Instructions

Figure 5 below shows the wiring for a loop-powered DP transmitter, SKx62UA actuator, and RWF5x PID controller.
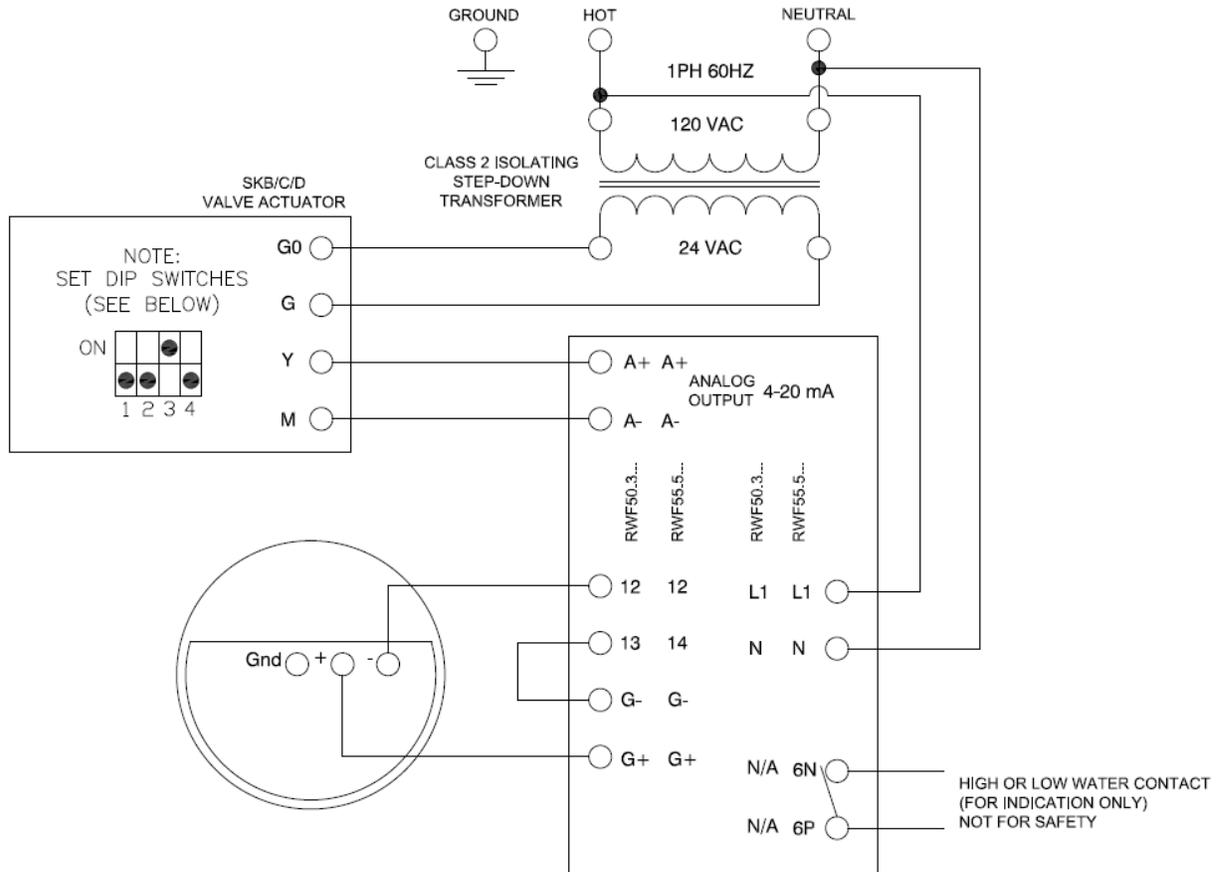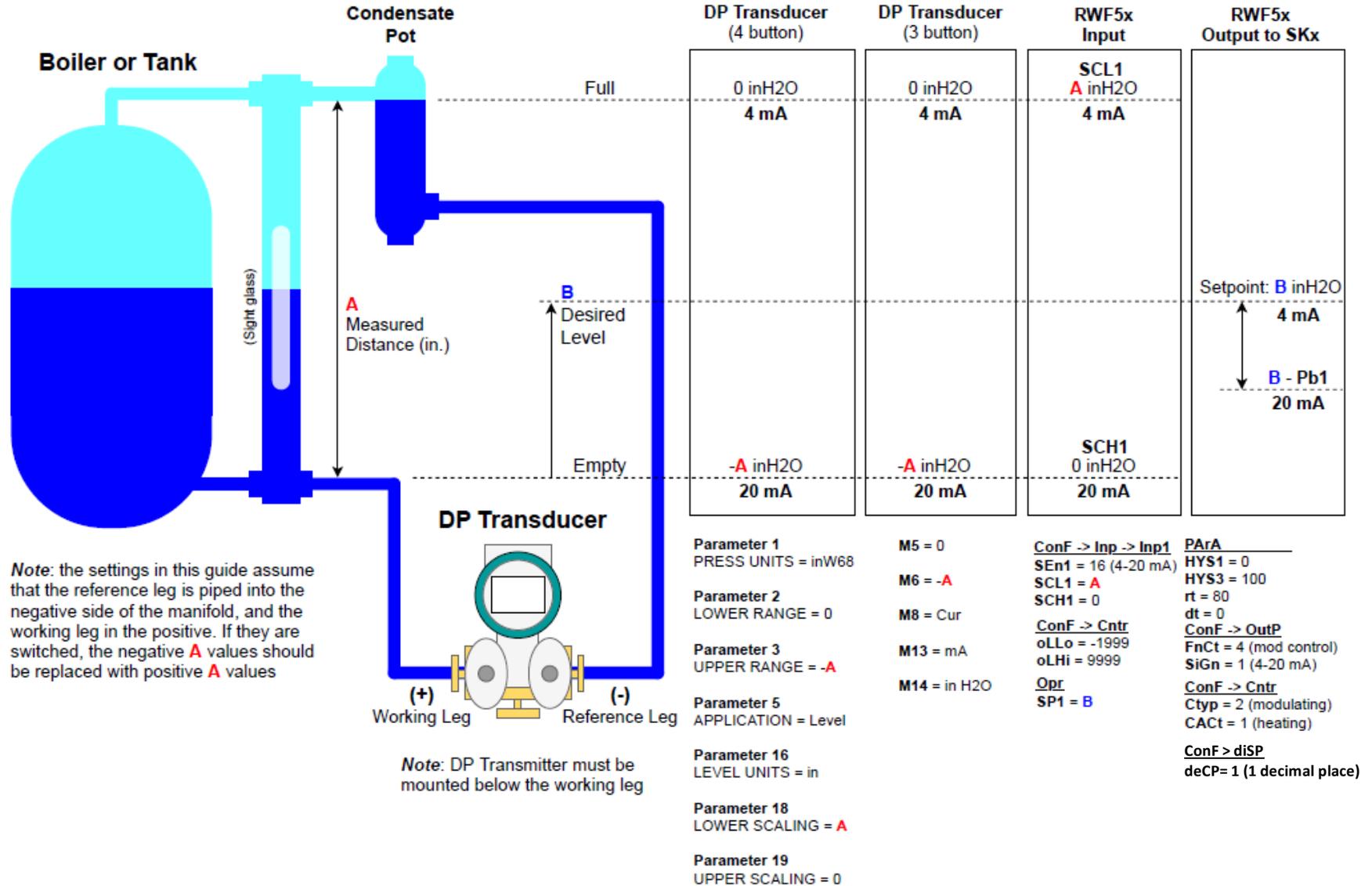

Figure 5: Wiring for DP Water Level Control System

The diagrams on the following pages show proper parameterization of the 7MF… DP transmitter and RWF5x controller for three configuration options. Note that between 7MF0340… and 7MF4433…, only one is needed. Both are shown in case the obsolete transmitter is being used.

DP Control Application Guide

Method 1: Setpoint = Desired Level

Boiler or Tank

(Sight glass)

Condensate Pot

A Measured Distance (in.)

B Desired Level

DP Transducer

(+) Working Leg

(-) Reference Leg

Note: the settings in this guide assume that the reference leg is piped into the negative side of the manifold, and the working leg in the positive. If they are switched, the negative A values should be replaced with positive A values

Note: DP Transmitter must be mounted below the working leg

	7MF0340 DP Transducer (4 button)	7MF4433 DP Transducer (3 button)	RWF5x Input	RWF5x Output to SKx
Full	0 inH2O / 4 mA	0 inH2O / 4 mA	SCL1 A inH2O / 4 mA	
				Setpoint: B inH2O / 4 mA
				B - Pb1 / 20 mA
Empty	-A inH2O / 20 mA	-A inH2O / 20 mA	SCH1 0 inH2O / 20 mA	

7MF0340 DP Transducer (4 button)

Parameter 1
PRESS UNITS = inW68

Parameter 2
LOWER RANGE = 0

Parameter 3
UPPER RANGE = -A

Parameter 5
APPLICATION = Level

Parameter 16
LEVEL UNITS = in

Parameter 18
LOWER SCALING = A

Parameter 19
UPPER SCALING = 0

7MF4433 DP Transducer (3 button)

M5 = 0

M6 = -A

M8 = Cur

M13 = mA

M14 = in H2O

RWF5x Input

ConF -> Inp -> Inp1
SEn1 = 16 (4-20 mA)
SCL1 = A
SCH1 = 0

ConF -> Cntr
oLLo = -1999
oLHi = 9999

Opr
SP1 = B

RWF5x Output to SKx

PArA
HYS1 = 0
HYS3 = 100
rt = 80
dt = 0

ConF -> OutP
FnCt = 4 (mod control)
SiGn = 1 (4-20 mA)

ConF -> Cntr
Ctyp = 2 (modulating)
CACt = 1 (heating)

ConF > diSP
deCP= 1 (1 decimal place)

DP Control Application Guide

Method 2: Setpoint = 0

Boiler or Tank

Condensate Pot

(Sight glass)

A Measured Distance (in.)

B Desired Level

DP Transducer

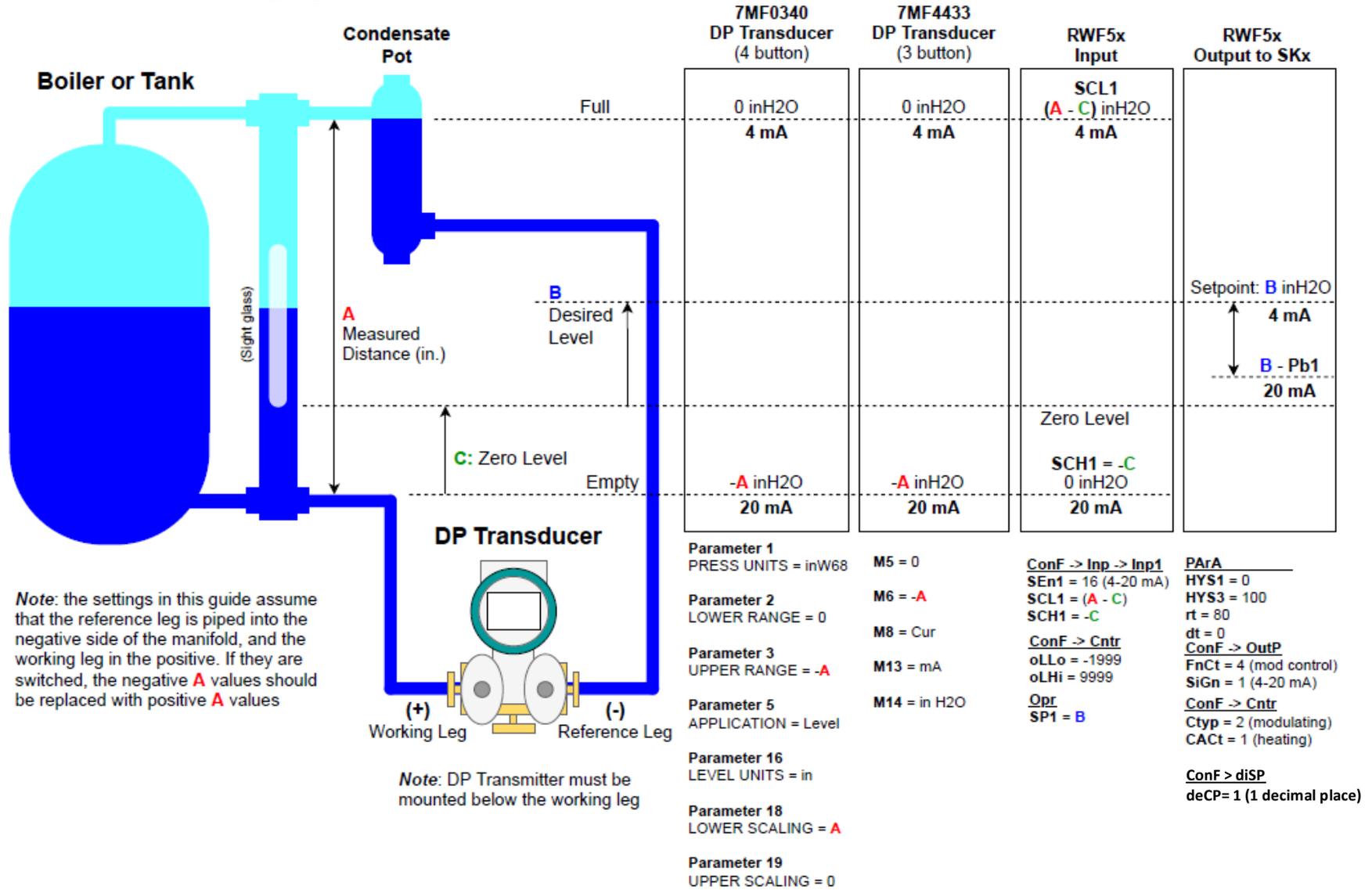*Note*: the settings in this guide assume that the reference leg is piped into the negative side of the manifold, and the working leg in the positive. If they are switched, the negative **A** values should be replaced with positive **A** values

(+) Working Leg

(-) Reference Leg

Note: DP Transmitter must be mounted below the working leg

	7MF0340 DP Transducer (4 button)	7MF4433 DP Transducer (3 button)	RWF5x Input	RWF5x Output to SKx
Full	0 inH2O 4 mA	0 inH2O 4 mA	SCL1 (A - B) inH2O 4 mA	
				Setpoint: 0 inH2O 4 mA
				-Pb1 20 mA
Empty	-A inH2O 20 mA	-A inH2O 20 mA	SCH1 -B inH2O 20 mA	

Parameter 1
PRESS UNITS = inW68

Parameter 2
LOWER RANGE = 0

Parameter 3
UPPER RANGE = -A

Parameter 5
APPLICATION = Level

Parameter 16
LEVEL UNITS = in

Parameter 18
LOWER SCAL. = (A-B)

Parameter 19
UPPER SCALING = -B

M5 = 0

M6 = -A

M8 = Cur

M13 = mA

M14 = in H2O

ConF -> Inp -> Inp1
SEn1 = 16 (4-20 mA)
SCL1 = A - B
SCH1 = -B

ConF -> Cntr
oLLo = -1999
oLHi = 9999

Opr
SP1 = 0

PArA
HYS1 = 0
HYS3 = 100
rt = 80
dt = 0

ConF -> OutP
FnCt = 4 (mod control)
SiGn = 1 (4-20 mA)

ConF -> Cntr
Ctyp = 2 (modulating)
CACt = 1 (heating)

ConF > diSP
deCP= 1 (1 decimal place)

DP Control Application Guide
Method 3: Limit scale to sight glass

Boiler or Tank

Condensate Pot

(Sight glass)

A
Measured
Distance (in.)

B
Desired
Level

C: Zero Level

Full

Empty

DP Transducer

(+)
Working Leg

(-)
Reference Leg

Note: the settings in this guide assume that the reference leg is piped into the negative side of the manifold, and the working leg in the positive. If they are switched, the negative **A** values should be replaced with positive **A** values

Note: DP Transmitter must be mounted below the working leg

7MF0340 DP Transducer (4 button)

0 inH2O
4 mA

-A inH2O
20 mA

Parameter 1
PRESS UNITS = inW68

Parameter 2
LOWER RANGE = 0

Parameter 3
UPPER RANGE = -A

Parameter 5
APPLICATION = Level

Parameter 16
LEVEL UNITS = in

Parameter 18
LOWER SCALING = A

Parameter 19
UPPER SCALING = 0

7MF4433 DP Transducer (3 button)

0 inH2O
4 mA

-A inH2O
20 mA

M5 = 0

M6 = -A

M8 = Cur

M13 = mA

M14 = in H2O

RWF5x Input

SCL1
(A - C) inH2O
4 mA

Zero Level

SCH1 = -C
0 inH2O
20 mA

ConF -> Inp -> Inp1
SEn1 = 16 (4-20 mA)
SCL1 = (A - C)
SCH1 = -C

ConF -> Cntr
oLLo = -1999
oLHi = 9999

Opr
SP1 = B

RWF5x Output to SKx

Setpoint: B inH2O
4 mA

B - Pb1
20 mA

PArA
HYS1 = 0
HYS3 = 100
rt = 80
dt = 0
ConF -> OutP
FnCt = 4 (mod control)
SiGn = 1 (4-20 mA)
ConF -> Cntr
Ctyp = 2 (modulating)
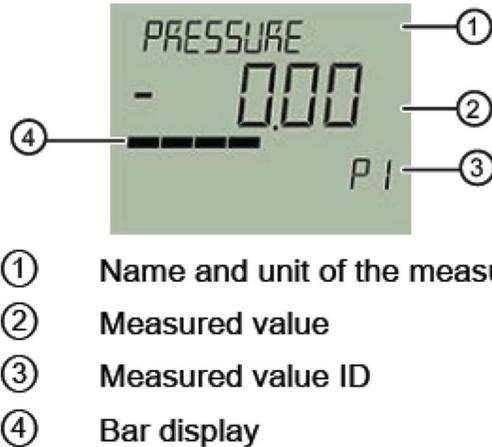CACt = 1 (heating)

ConF > diSP
deCP= 1 (1 decimal place)

7MF0340… Parameter Setup

Figure 6 and Table 1 below show the measured value parameters on the initial screen of the 7MF0340… DP transmitter.

① Name and unit of the measured value (alternating)

② Measured value

③ Measured value ID

④ Bar display

Figure 6: Measured Value Screen

Table 1: Table of Measured Valves for Level Control Application

Measured Value ID	Measured Value Name	Description
P1	PRESSURE	Pressure
P2	SENSOR TEMP	Sensor temperature
P3	ELECTR TEMP	Electronics temperature
P4	LEVEL	Level
P8	USER DEFINED	Customized characteristic curve
P9	% OF RANGE	Percent of range
PA	LOOP CURRENT	Loop current
PB	CURR VOLTAGE	Terminal voltage

7MF0340… Parameter Setup (cont.)

To access the parameters of the 7MF0340…, perform the following:
1. Push the right arrow button. Once in the parameter screen, use the up and down buttons to scroll through the available parameters.
2. To edit a parameter, push the right arrow button on that parameter.
    a. The "EDIT" symbol in the bottom right-hand corner will begin to flash, indicating that the device is in edit mode and the parameter value can be changed.
3. Once the correct value is selected, push the right arrow button again.
    a. The "EDIT" symbol will now be solid, indicating that the parameter has been stored.
4. If in edit mode but a parameter does not need to be changed, push the left arrow button to cancel the selection.
5. To go back to the measured values screen, simply push the left arrow button.

Note that not all parameters are visible and will only appear depending on the application setting (parameter 05).
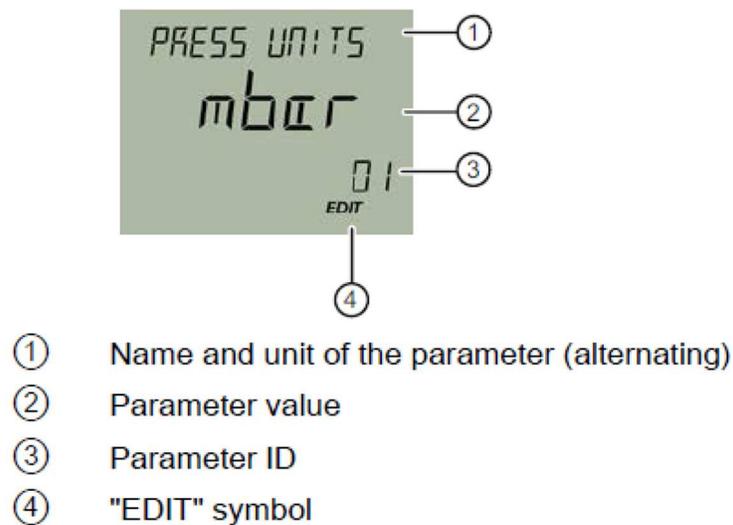

①   Name and unit of the parameter (alternating)
②   Parameter value
③   Parameter ID
④   "EDIT" symbol

Figure 7: Parameter Screen

7MF0340… Parameter Setup (cont.)

Table 2: Parameter List for Level Control Setup

Parameter Name	Parameter	Example Setting	Function	Comment
PRESS UNITS	1	inW68	Units for pressure measurement	Selecting inW68 will give pressure readings in inches of water column.
LOWER RANGE	2	0	Lower range value	Differential pressure when the tank is full resulting in a 4mA output.
UPPER RANGE	3	-**A**	Upper range value	Differential pressure when the tank is empty resulting in a 20mA output.
DAMPING	4	2	Damping value	Influences reaction time of the device. A larger value results in a longer response time.
APPLICATION	5	LEVEL	Application	Sets the application of the device for level measurement.
ZERO POINT	7	0	Zero point adjustment	Using a 3-valve manifold, close both isolation valves, open the bypass valve, change parameter to 0, re-close bypass valve, re-open isolation valves.
APPLY LRV	8		Live lower range value setting	(Not Recommended) Live setting when the tank is full. Only set this parameter if the tank and reference leg are full. This parameter will overwrite parameter 2.
APPLY URV	9		Live upper range value setting	(Not Recommended) Live setting when the tank is empty. Only set this parameter if the tank is empty and the reference leg is full. This parameter will overwrite parameter 3.
FAULT CURR	10		Select fault current	In the case of a fault the setting of UPPER gives an output of 20.5mA and a setting of LOWER gives an output of 3.8mA.
LEVEL UNITS	16	in	Units for level measurement	Selecting in will give level readings in inches.
LOWER SCALING	18	**A**	Lower scaling point	Scales top of water level value.
UPPER SCALING	19	0	Upper scaling point	Scales bottom of water level value.
LOOP TEST	31		Set output current for testing	Force an output of 3.55, 4, 12, 20 or 22.8mA. Selecting USER will let the user manually select an output current to test.
START VIEW	32	LEVEL	Main screen view	With a setting of LEVEL, the actual water level will be displayed on the main screen.

Note: Shaded parameters must be set for level control.

7MF4433… Parameter Setup

Table 3: Parameter List for Level Control Setup

Mode	Recommended	Function	Comment	Notes
4.0000 2 mA	Not used	"Live setting" Start of scale	**Not recommended** Value will be overwritten by Mode 5	Apply Live pressure to DP, Hold both ^ and v keys to set 4 mA
4.0000 3 mA	Not used	"Live setting" Full scale	**Not recommended** Value will be overwritten by Mode 6	Apply Live pressure to DP, Hold both ^ and v keys to set 20 mA
0.0 4 S	0.0	Electronic Damping	Set to 0 (Time in seconds) (Factory default)	Hold both ^ and v keys to set to zero
0.00 5 inH2O	0.0 in H2O	"Blind setting" Start of scale	Set to 0.00 (inH2O)	Full tank = min differential = 4 mA output
–**A** 6 mA	-**A** See diagram	"Blind setting" Full scale	Set to -**A** inH2O	Empty tank = Max differential = 20 mA output (Actual measurement)
0.00 7 inH2O	0.00	Zero adjustment	Using the 3 valve manifold, close both isolation valves, open bypass valve, hold both ^ and v keys to set to zero, re-close bypass, re-open isolations	Hold both ^ and v keys to set to zero
Cur 8	Cur	Current transmitter	Displays the current differential pressure	Hold both ^ and v keys to force an output of 3.6, 4.0, 12.0, 20.0, 22.8 mA. M key brings you back to current value.
3.6 9 inH2O	3.6	Output if error occurs	If an error occurs, you can choose the output	Choices are 3.6 mA or 22.8 mA
0 10	0	Keys enable/disable Set to 0	Choices are 0, LA, LO, L5, L	Hold M key for 5 sec to set to zero
Lin 11	Lin	Characteristic	Lin means the 4-20mA output is linear	Linear is recommended
12	(N/A)	Characteristic sq. root	N/A (Normally not shown)	ONLY used/displayed if mode 11 is sq. root
P 13 mA	mA	Displayed measured value	3 choices [Mode 14 unit], %, mA	mA is recommended
0.00 14 inH2O	in H2O	Display unit	Many choices…	inH2O is recommended

RWF5x… Default and Suggested Settings

			Value Range	Factory Setting	Suggested	Notes
			RWF55 Menu Options			
Parameters			**Value Range**	**Factory Setting**	**Suggested**	**Notes**
Opr	SP1		SPL…SPH	60	see diag.	
	SP2		SPL…SPH	0		Only if bin1 = 1
PArA	Pb1		1…9999	10	5	
	dt		0…9999 sec	80	0	
	rt		0…9999 sec	350	80	
	db		0.0…999.9	1		Only if CtYP = 1
	HYS1		-1999…0.0	-5	0	Only if CACt = 1
	HYS3		0.0…9999	5	100	Only if CACt = 1
ConF	Inp	Inp1	SEn1	1…19 →	1	16	1 = Pt-100 3-wire, 2 = Pt100 2-wire, 3 = Pt1000 3-wire, 4 = Pt1000 2-wire, 5 = Ni1000 3-wire, 6 = Ni1000 2-wire, 7 = 0-135 Ohm, 8 = T, 9 = J, 10 = K, 11 = N, 12 = S, 13 = R, 14 = B, 15 = 0-20 mA, 16 = 4-20 mA, 17 = DC 0-10 V, 18 = DC 0-5 V, 19 = DC 1-5 V
			OFF1	-1999…9999	0		
			SCL1	-1999…9999	0	see diag.	
			SCH1	-1999…9999	100	see diag.	
			dF1	0.0…100.0 sec	0.6		
			Unit	1, 2	1		1 = Celsius, 2 = Fahrenheit
	Cntr	CtYP	1, 2	1	2	1 = 3-position, 2 = modulating
		CACt	0, 1	1	1	0 = cooling, 1 = heating
		SPL	-1999…9999	0		
		SPH	-1999…9999	100		
		oLLo	-1999…9999	-1999		
		oLHi	-1999…9999	9999		
	AF	FnCt	0…12	0		0 = no function, 1 = lk1 input 1, 2 = lk2 input 1, 3 = lk3 input 1, 4 = lk4 input 1, 5 = lk5 input 1, 6 = lk6 input 1, 7 = lk7 input 1, 8 = lk8 input 1, 9 = lk7 input 2, 10 = lk8 input 2, 11 = lk7 input 3, 12 = lk8 input 3
		AL	-1999…9999	0		Only if FnCt ≠ 0
		HYSt	0…9999	1		Only if FnCt ≠ 0
		ACrA	0, 1	0		0 = switched off, 1 = on (only if Fnct ≠ 0)
	OutP	FnCt	0, 1, 2, 3, 4	4	4	0 = no function, 1 = analog input 1, 2 = analog input 2, 3 = analog input 3, 4 = controller angular position
		SiGn	0, 1, 2	0	1	0 = 0-20 mA, 1 = 4-20 mA, 2 = DC 0-10 V
		r0ut	0…101	0		
		0Pnt	-1999…9999	0		
		End	-1999…9999	100		

RWF5x Default and Suggested Settings (cont.)

ConF	diSP	diSU	0, 1, 2, 3, 4, 6, 7	1		0 = disconnected, 1 = analog input 1, 2 = analog input 2, 3 = analog input 3, 4 = controller angular position, 6 = setpoint, 7 = thermal shock end value
		diSL	0, 1, 2, 3, 4, 6, 7	6		0 = disconnected, 1 = analog input 1, 2 = analog input 2, 3 = analog input 3, 4 = controller angular position, 6 = setpoint, 7 = thermal shock end value
		tout	0…255 sec	180		
		dECP	0, 1, 2	0	1	0 = no decimal place, 1 = one decimal, 2 = two decimals
		CodE	0, 1, 2, 3	0		0 = no lockout, 1 = config level, 2 = parameter and config level, 3 = keyboard lockout

Troubleshooting

7MF0340 DP Transmitter
(4-button)

7MF… showing incorrect level	1. Check that the reference leg is full of water. 2. Check that Application is set to "LEVEL". 3. Check that Lower Range is 0 and Upper Range is set according to the maximum differential. 4. On parameter 7 (Zero Point) ensure that it shows zero when the isolation valves are closed and bypass valve is open.
RWF… flashing -1999 or 9999 (signal out of range)	1. Check wiring of 7MF to RWF. 2. Force output signal from 7MF to RWF using the Loop Test parameter (31) on 7MF. 3. Measure mA signal from 7MF to RWF with clamp-on ammeter, or multimeter in series, to verify between 4-20 mA. If signal is valid but RWF says out of range, check parameters oLLo and oLHi on RWF. If signal is not within range, check signal setting of 7MF.
Overshooting setpoint	1. Change P value on RWF to a higher number. 2. If rt is not 0, try increasing the value of rt. 3. Ensure dt on RWF is set to 0.
Not reaching setpoint, or reaching very slowly	1. If rt is set to 0, try adding in an rt value of 80 on RWF.

Troubleshooting (cont.)

7MF4433 DP Transmitter
(3-button, obsolete)

|	
7MF showing incorrect level	1. Check that the reference leg is full of water 2. Check that Mode 5 is 0 and Mode 6 is set according to the maximum differential. 3. Ensure that Mode 7 shows zero when the isolation valves are closed and bypass valve is open.
RWF flashing -1999 or 9999 (signal out of range)	1. Check wiring of 7MF to RWF. 2. Force output signal from 7MF to RWF using the Loop Test parameter (31) on 7MF to test RWF. 3. Measure mA signal from 7MF to RWF with clamp-on ammeter, or multimeter in series, to verify signal is between 4-20 mA. If signal is valid but RWF says out of range, check parameters oLLo and oLHi on RWF. If signal is not within range, check signal setting of 7MF.
Overshooting setpoint	1. Change P value on RWF to a higher number. 2. If rt is not 0, try increasing the value of rt. 3. Ensure dt on RWF is set to 0.
Not reaching setpoint, or reaching very slowly	1. If rt is set to 0, try adding in an rt value of 80 on RWF

Touchscreen Integration

Water level control systems can be integrated with SCC touchscreen systems so that data is accessible in the touchscreen environment. There are three integration methods, which are briefly covered below.

Method 1: Using RWF

With the RWF set up properly for the feedwater application and connected to the touchscreen, feedwater is enabled in the **CONTROLS** configuration screen of the **OPTIONS** menu.
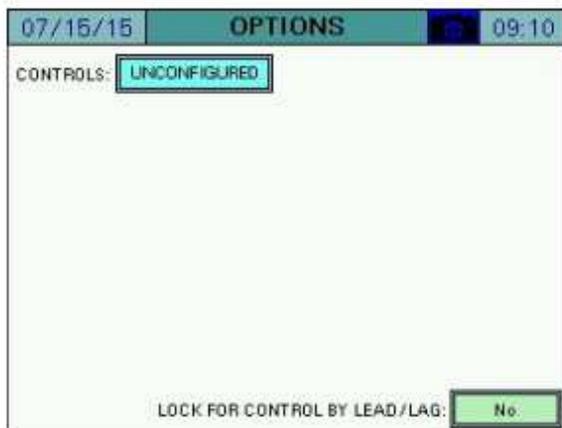
Once enabled, the **FEEDWATER** option on the main menu will be available, which allows access to the feedwater detail screen.
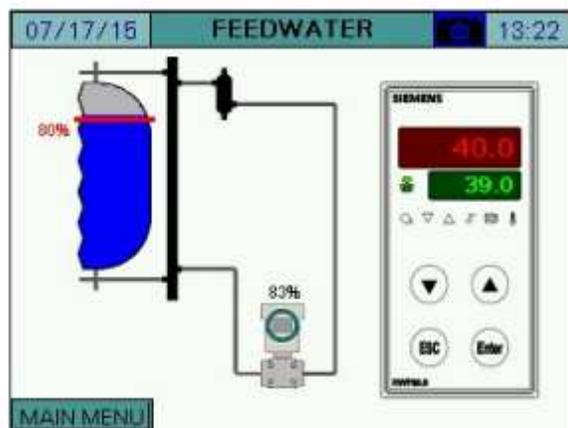
The vessel will animate to show the level of fill based upon the scaling of the input in the RWF. The setpoint (in percent of fill) will appear as a red line. The actual fill percent will appear at the differential pressure transmitter graphic. Touching the setpoint on the RWF (green display) will allow the feedwater setpoint to be changed (TECH level login required).

Touchscreen Integration (cont.)

The following two methods require a touchscreen with a software version of 19F1 or newer. More information on setup of methods 2 and 3 can be found in the touchscreen application guide, Document TS-1250.

Method 2: Single-Element Feedwater Control

Single-element feedwater control utilizes a drum level transmitter along with the touchscreen PLC's internal PID loop controller to modulate the feedwater valve based on the current water level. This requires a touchscreen with a PLC, one available analog input, and one available analog output.

Figure 10 on the following page shows the typical field connections for a single-element feedwater application.

To setup single-element feedwater control, use methods 1-3 shown on pages 18-20. You must swap the values for parameters 2 and 3, and parameters 18 and 19. Refer to Figures 8 and 9 below.

Parameter 1
PRESS UNITS = inW68

Parameter 2
LOWER RANGE = 0

Parameter 3
UPPER RANGE = -A

Parameter 5
APPLICATION = Level

Parameter 16
LEVEL UNITS = in

Parameter 18
LOWER SCALING = A

Parameter 19
UPPER SCALING = 0

Parameter 1
PRESS UNITS = inW68

Parameter 2
LOWER RANGE = -A

Parameter 3
UPPER RANGE = 0

Parameter 5
APPLICATION = Level

Parameter 16
LEVEL UNITS = in

Parameter 18
LOWER SCALING = 0

Parameter 19
UPPER SCALING = A

Figure 8: 4-Button DP Traditional Setup   **Figure 9: 4-Button DP Touchscreen Setup**

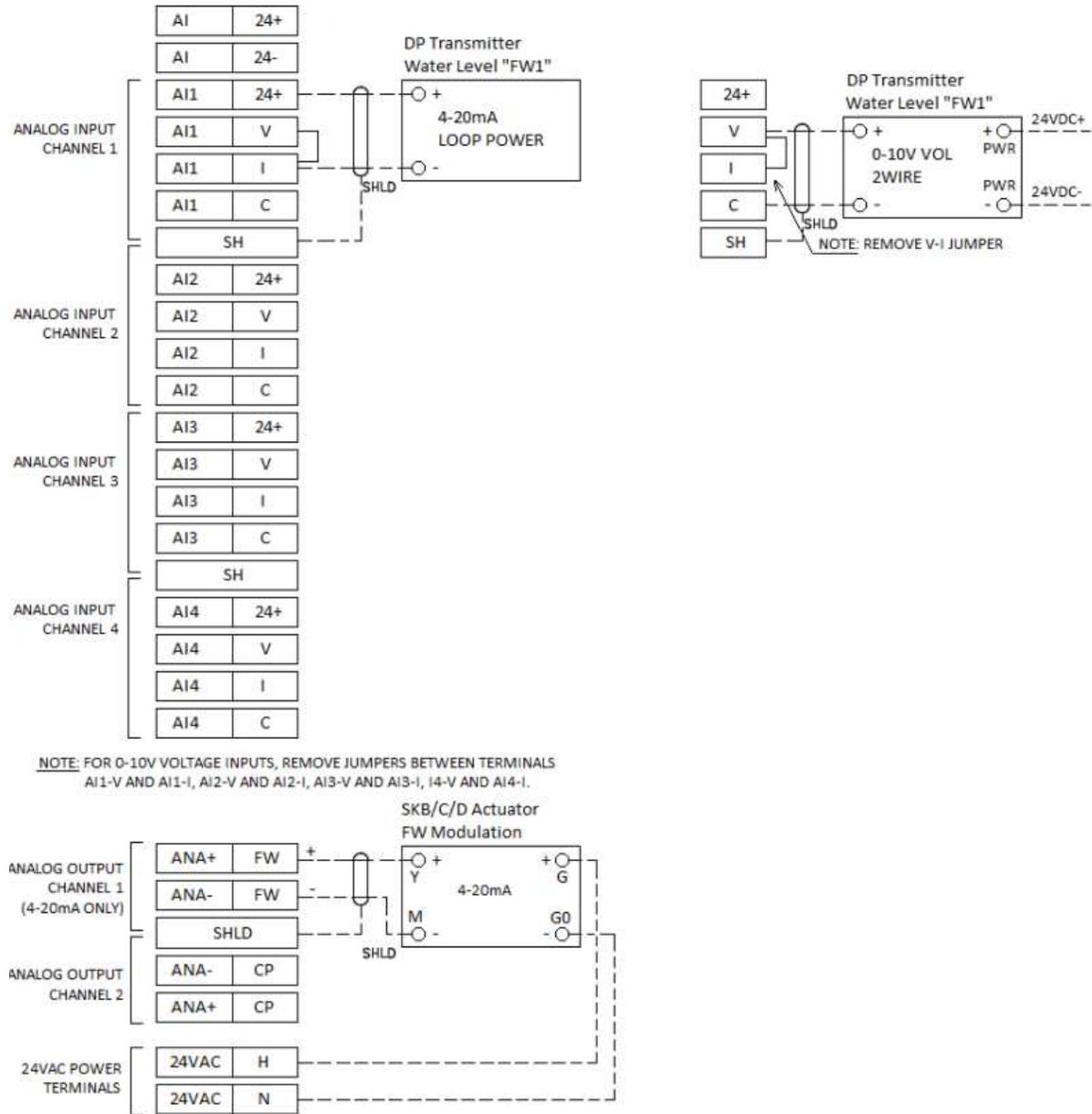# Touchscreen Integration (cont.)

Figure 10: Typical Single-Element Field Connections

Touchscreen Integration (cont.)

Method 3: Three-Element Feedwater Control

Three-element feedwater control utilizes a drum level transmitter along with a steam flow transmitter and feedwater flow transmitter to continuously monitor the boiler water level, boiler steam flow, and boiler feedwater flow. The PID loop controller built into the PLC will match steam flow to feedwater flow while controlling actual water level compared to setpoint. This requires a touchscreen with a PLC, three available analog inputs, and one available analog output.

Figure 11 on the following page shows the typical field connections for a three-element feedwater application.
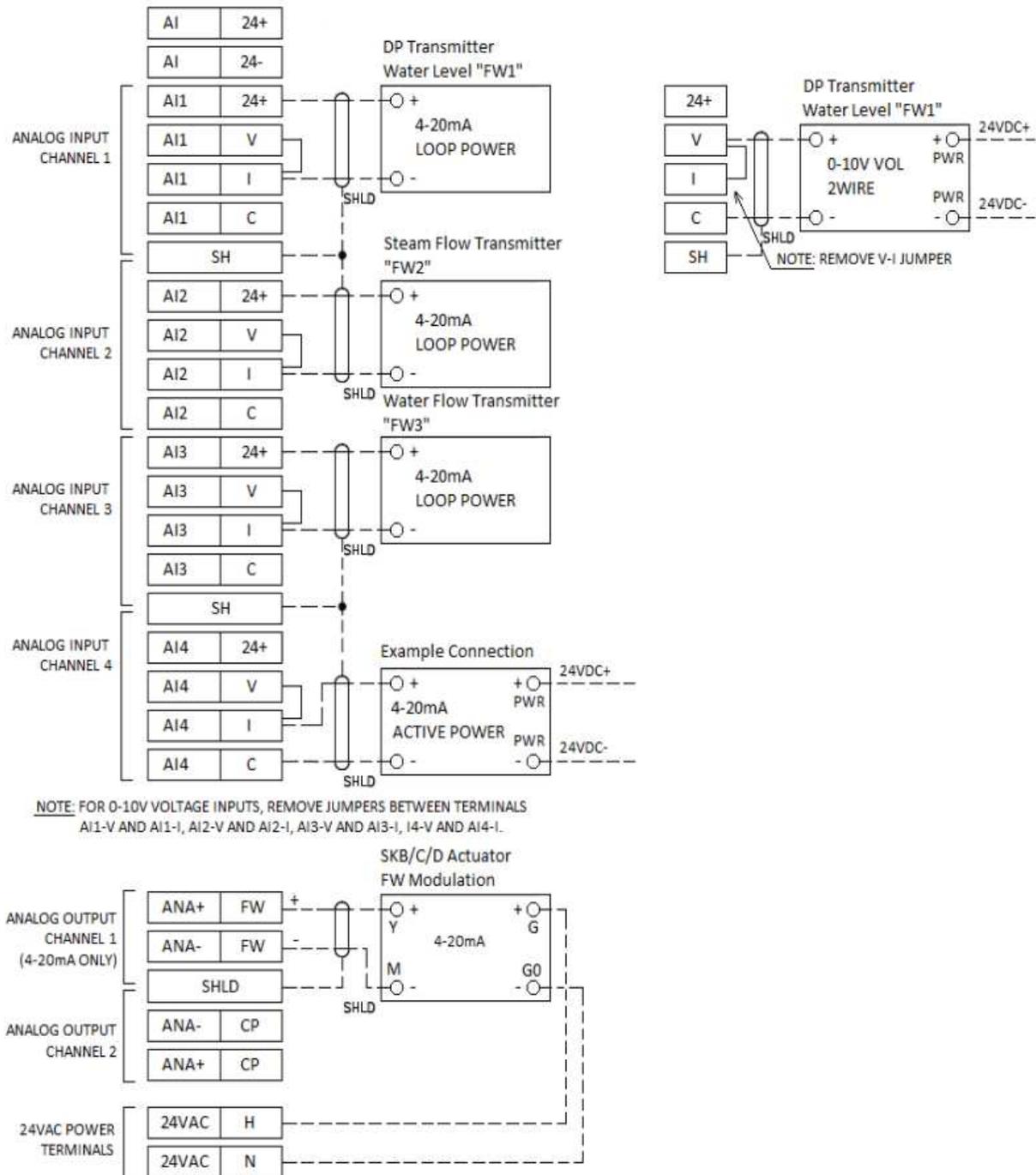
Touchscreen Integration (cont.)

Figure 11: Typical Three-Element Field Connections

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