



# UDC 3500 Application Note

## Options Set Up Group

### Introduction

The Options group lets you configure the remote mode switch (Digital Inputs) to a specific contact closure response, or configure Second Current Output or Third Current Output to be a specific selection with desired scaling.

The UDC3500 has three current outputs, two of which are configured in this Set Up Group.

The UDC3500 has four digital inputs. Loop assignments are made in this Set Up Group.

### Function Prompts

**Table 1 OPTION Group Function Prompts**

Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<p><b>CUR OUT2</b></p> <p><b>ATTENTION</b> Prompts for the Second Current Output Selection appear only if the Second Current Output option is installed.</p>	<p>DISABLE</p> <p>INPUT 1</p> <p>INPUT 2</p>	<p><b>SECOND CURRENT OUTPUT SELECTION</b></p> <p>This selection provides a milliamp output representing one of several control parameters. The display for the Second Current Output viewing will be in engineering units for all but output. Output will be displayed in percent.</p> <p><b>ATTENTION</b> Other prompts affected by these selections: 4mA VAL and 20mA VAL.</p> <p><b>ATTENTION</b> OUTPUT cannot be configured when Three Position Step Control is used.</p> <p><b>ATTENTION</b> When Loop 2 Output is configured for CURRENT and there is no Third Current Output option installed, the Second Current Output is forced to "OUTPUT 2".</p> <p><b>NO SECOND CURRENT OUTPUT</b>—Current Output disabled and output set to 0 mA.</p> <p><b>INPUT 1</b>—This represents the configured range of Input 1.</p> <p>FOR EXAMPLE:            Input 1 Type = J Thermocouple (0 °F to 1600 °F)            Second Current Output Low Scale Value = 0.0            Second Current Output High Scale Value = 1600            CO Range = 4-20 mA</p> <p>Then:            0 °F display = 0 % output (4 mA)            800 °F display = 50 % output (12 mA)            1600 °F display = 100 % output (20 mA)</p> <p><b>INPUT 2</b>—Same as Input 1</p>



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	INPUT 3  INPUT 4  INPUT 5  CB OUT     PV  DEV	<p><b>INPUT 3</b>—Same as Input 1</p> <p><b>ATTENTION</b> Do not configure Input 3 when Input 3 is used for Slidewire or Slidewire emulation.</p> <p><b>INPUT 4</b>—Same as Input 1</p> <p><b>INPUT 5</b>—Same as Input 1</p> <p><b>CONTROL BLOCK OUTPUT</b>—Output as calculated by the control block (such as PID A). When using one of the characterizers, OUTPUT is the output value after it passes through the characterizer. CB OUT is the control block output before it passes through the characterizer.</p> <p><b>ATTENTION</b> CB OUT cannot be configured when Three Position Step Control is used.</p> <p><b>PROCESS VARIABLE</b>—Represents the value of the Process Variable.</p> <p><b>DEVIATION (PROCESS VARIABLE MINUS SETPOINT)</b>—Represents -100 % to +100 % of the selected PV span in engineering units.</p> <p>Zero deviation will produce a center scale (12 mA or 50 %) output. A negative deviation equal in magnitude to the Output High Scaling Factor will produce a low end output (4 mA or 0 %) output. A positive deviation equal in magnitude to the Output High Scaling Factor will produce a high end output (20 mA or 100 %).</p> <p>FOR EXAMPLE: Configuration is as follows:            Input 1 = Type T High Thermocouple            PV range = -300 °F to +700 °F            PV span = 1000 °F            Deviation Range = -1000 to +1000 °F = 2000 °F            Second Current Output Low Scale Value = 0.0            Second Current Output High Scale Value = 1000            CO Range = 4-20 mA</p> <p>If PV = 500 °F and SP = 650 °F            then Deviation Display = -150 °F, which is  <math>-150 / 2000 = -7.5\%</math> of the Deviation Range, so            Second Current Output = <math>50\% - 7.5\% = 42.5\%</math>            which is <math>0.425 \times 16 \text{ mA} + 4 \text{ mA} = 10.8 \text{ mA}</math></p>



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	OUTPUT     SP   LSP 1  RSP  IN ALG1  IN ALG2	<p><b>OUTPUT</b>—Represents the displayed controller output in percent (%).</p> <p><b>ATTENTION</b> Also see CB OUT when using a characterizer on the output value.</p> <p><b>ATTENTION</b> When Position Proportional Control is configured as the Output Algorithm, OUTPUT represents the actual Slidewire Position whether in Automatic or Manual Mode. Should the Slidewire input fail for any reason, the Auxiliary Output will go to the value configured for FAILSAFE OUTPUT VALUE in the Control Setup Group.</p> <p><b>ATTENTION</b> When Three Position Step Control (TPSC) is configured as the Control Algorithm, OUTPUT represents only the estimated motor position, not the actual motor position.</p> <p><b>SETPOINT</b>—Represents the value of the setpoint currently in use (LSP1, LSP2, LSP3, RSP or CSP) and is shown in the same units as those used by the PV.</p> <p><b>LOCAL SETPOINT ONE</b>—Output represents Local Setpoint 1 regardless of active setpoint.</p> <p><b>REMOTE SETPOINT</b>—Represents the configured RSP regardless of the active SetPoint.</p> <p><b>INPUT ALGORITHM 1 OUTPUT</b>—Represents the output from input algorithm 1.</p> <p><b>INPUT ALGORITHM 2 OUTPUT</b>—Represents the output from input algorithm 2.</p>
<b>C2 RANGE</b>	4-20mA 0-20mA	<p><b>SECOND CURRENT OUTPUT RANGE</b>—Allows the user to easily select 4-20mA output or 0-20mA output operation without the need for recalibration of the instrument.</p> <p><b>ATTENTION</b> Changing the Current Output Range will result in the loss of Field Calibration values and will restore Factory Calibration values.</p>
<b>LOW VAL</b>	Low Scale Value within the range of the selected variable to represent the minimum output (0 or 4 mA)	<p><b>OUTPUT LOW SCALING FACTOR</b>—This is a value in engineering units used to represent all configured parameters except Output.</p> <p>For Output, this is a value in percent and can be any value between -5 % and +105 %. However, keep in mind that relay output types can only be scaled 0 % to 100 %.</p>





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<b>HIGH VAL</b>	High Scale Value within the range of the selected variable to represent the maximum output (20 mA)	<b>OUTPUT HIGH SCALING FACTOR</b> —This is a value in engineering units used to represent all configured parameters except Output. For Output, this is a value in percent and can be any value between –5 % and +105 %. However, keep in mind that relay output types can only be scaled 0 % to 100 %.
<b>CUR OUT3</b> <b>ATTENTION</b> Prompts for the Third Current Output Selection appear only when the Third Current Output option is installed.	Same selections as for CUR OUT2	<b>THIRD CURRENT OUTPUT SELECTION</b> —Provides a milliamp output representing one of several control parameters. The display for Third Current Output viewing will be in engineering units for all but output. Output will be displayed in percent. <b>ATTENTION</b> Other prompts affected by these selections: 4mA VAL and 20mA VAL. <b>ATTENTION</b> When Loop 2 Output is configured for CURRENT, the Third Current Output is forced to “OUTPUT 2”. <b>ATTENTION</b> CB OUT cannot be configured when Three Position Step Control is used.
<b>C3 RANGE</b>	4-20mA 0-20mA	<b>THIRD CURRENT OUTPUT RANGE</b> —Allows the user to easily select 4-20mA output or 0-20mA output operation without the need for recalibration of the instrument. <b>ATTENTION</b> Changing the Current Output Range will result in the loss of Field Calibration values and will restore Factory Calibration values.
<b>LOW VAL</b>	Low Scale Value within the range of the selected variable to represent the minimum output (0 or 4 mA)	<b>OUTPUT LOW SCALING FACTOR</b> —This is a value in engineering units used to represent all configured parameters except Output. For Output, this is a value in percent and can be any value between –5 % and +105 %. However, keep in mind that relay output types can only be scaled 0 % to 100 %.
<b>HIGH VAL</b>	High Scale Value within the range of the selected variable to represent the maximum output (20 mA)	<b>OUTPUT HIGH SCALING FACTOR</b> —This is a value in engineering units used to represent all configured parameters except Output. For Output, this is a value in percent and can be any value between –5 % and +105 %. However, keep in mind that relay output types can only be scaled 0 % to 100 %.



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<p><b>DIG INP1</b></p>		<p><b>DIGITAL INPUT 1 SELECTIONS</b>—All selections are available for Input 1. The controller returns to its original state when contact opens, except where noted or when overruled by the keyboard.</p>
	NONE	<p><b>NO DIGITAL INPUT SELECTION</b></p>
	TO MAN	<p><b>TO MANUAL</b>—Contact closure puts the affected loop into manual mode. Contact open returns controller to former mode.</p>
	TO LSP	<p><b>TO LOCAL SETPOINT</b>—When a remote setpoint is configured, contact closure puts the controller into local setpoint 1. When contact opens, the controller returns to former operation—local or remote setpoint—unless  key is pressed while digital input is active. If this happens, the controller will stay in the local setpoint mode when contact opens.</p>
	TO 2SP	<p><b>TO LOCAL SETPOINT TWO</b>—Contact closure puts the controller into local setpoint 2.</p>
	TO 3SP	<p><b>TO LOCAL SETPOINT THREE</b>—Contact closure puts the controller into local setpoint 3.</p>
	TO 4SP	<p><b>TO LOCAL SETPOINT FOUR</b>—Contact closure puts the controller into local setpoint 4.</p>
	TO DIR	<p><b>TO DIRECT ACTION</b>—Contact closure selects direct controller action.</p>
	TO HOLD	<p><b>TO HOLD</b>—Contact closure suspends Setpoint Program or Setpoint Ramp. When contact reopens, the controller starts from the Hold point of the Ramp/Program unless the Ramp/Program was not previously started via the  key. This selection applies to either loop.</p>
	TO PID2	<p><b>TO PID2</b>—Contact closure selects PID Set 2.</p>
	TO PID3	<p><b>TO PID3</b>—Contact closure selects PID Set 3.</p>
	TO PID4	<p><b>TO PID4</b>—Contact closure selects PID Set 4.</p>
	PV 2IN	<p><b>PV=INPUT 2</b>—Contact closure selects PV = Input 2.</p>
PV 3IN	<p><b>PV=INPUT 3</b>—Contact closure selects PV = Input 3.</p>	



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	RERUN	<p><b>RERUN</b>—Allows the Setpoint Programmer to be reset to the initial segment of its current cycle, unit stays in previous mode.</p>
	TO RUN	<p><b>RUN</b>—Contact closure starts a stopped SP Ramp or Program. Upper left character blinks “R”. Reopening the contact has no effect.</p> <p>This selection applies to either loop.</p>
	ToBEGIN	<p><b>EXTERNAL SP PROGRAM RESET</b>—Contact closure resets SP Program back to the beginning of the first segment in the program and places the program in the HOLD mode. Program cycle number is reset to the configured value. Reopening switch has no effect.</p> <p>This selection applies to either loop.</p> <p><b>ATTENTION</b> Once the last segment of the setpoint program has timed out, the controller enters the mode of action specified in the configuration data and the program cannot be reset to the beginning of the first segment by digital input closure if the program is disabled.</p>
	STOP I	<p><b>INHIBIT INTEGRAL (RESET)</b>—Contact closure disables PID Integral (Reset) action.</p>
	MAN FS	<p><b>MANUAL FAILSAFE OUTPUT</b>—Controller goes to Manual mode, output goes to the Failsafe value.</p> <p><b>ATTENTION</b> This will cause a bump in the output when switching from Automatic to Manual. The switch back from Manual to Automatic is bumpless. When the switch is closed, the output can be adjusted from the keyboard.</p>
	TO LOCK	<p><b>KEYBOARD LOCKOUT</b>—Contact closure disables all keys. Lower display shows LOCKED if a key is pressed.</p>
	TO Aout	<p><b>AUTOMATIC OUTPUT</b>—Contact closure sends output to the value set at the prompt AUTO OUT in the Control or Control 2 Set Up Group when the controller is in the Automatic mode. Reopening the contact returns the controller to its normal output.</p> <p><b>ATTENTION</b> Does not apply to Three Position Step Control.</p>
	TIMER	<p><b>TIMER</b>—Contact closure starts timer, if enabled. Reopening the switch has no effect.</p>









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	AM STA	<p><b>TO AUTO/MANUAL STATION</b>—Contact closure causes the control loop to perform as follows:            PV = Input 2            Action = Direct            Control algorithm = PD+MR            PID SET = 2            SP = LSP 2</p>
	TO TUNE	<p><b>INITIATE LIMIT CYCLE TUNING</b>—Contact closure starts the tuning process. The lower display shows TUNE ON. Opening the contact has no effect.</p>
	SP Init	<p><b>SETPOINT INITIALIZATION</b>—Contact closure forces the setpoint to the current PV value. Opening the contact has no effect.</p>
	TRACK 1	<p><b>OUTPUT 1 TRACKS INPUT 2</b>—Contact closure allows Output to track Input 2. While the switch is open, the output is in accordance with its pre-defined functionality. When the switch is closed, the output value (in percent) will track the Input 2 percent of range value. When the switch is reopened, the output will start at this last output value and normal PID action will then take over control. The transfer is bumpless.</p>
	TRACK 2	<p><b>OUTPUT 2 TRACKS INPUT 2</b>—Contact closure allows Output 2 to track Input 2. While the switch is open, the output is in accordance with its pre-defined functionality. When the switch is closed, the output value (in percent) will track the Input 2 percent of range value. When the switch is reopened, the output will start at this last output value and normal PID action will then take over control. The transfer is bumpless.</p>
	To OUT2	<p><b>OUTPUT 2 OVERRIDES OUTPUT 1</b>—Contact closure forces Output 1 to track Output 2. Opening the contact restores normal operation.</p> <p><b>ATTENTION</b> Does not apply to Three Position Step Control.</p>
	TO RSP	<p><b>TO REMOTE SETPOINT</b>—Contact closure selects the Remote setpoint.</p>
	D L1/2	<p><b>LOOP DISPLAY</b>—Contact closure displays the loop not currently being displayed. Opening contact returns to the original loop display.</p>
	RST FB	<p><b>EXTERNAL RESET FEEDBACK</b>—Contact closure allows Input 2 to override the internal reset value.</p>



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	To PURGE	<p><b>TO PURGE</b>—Contact closure forces the loop to Manual mode with the output set to the Output High Limit configuration. MAN lights and the Output value is shown on the lower display. Opening the switch has no effect.</p> <p style="text-align: center;"></p> <p>Pressing the  key returns the instrument to Automatic Mode.</p> <p><b>ATTENTION</b> Does not apply to Three Position Step Control.</p>
	PURG AX	<p><b>PURGE AUXILIARY OUTPUT</b>—When the switch is closed, any Auxiliary Output configured for OUTPUT will go to 100% (20 mA). When switch reopens, the Auxiliary Output resumes normal operation.</p>
	Lo FIRE	<p><b>LOW FIRE</b>—Contact closure forces the loop to Manual mode with the output set to the Output Low Limit configuration. MAN lights and the Output value is shown on the lower display. Opening the switch has no effect.</p> <p style="text-align: center;"></p> <p>Pressing the  key returns the instrument to Automatic Mode.</p> <p><b>ATTENTION</b> Does not apply to Three Position Step Control.</p>
	MAN LAT	<p><b>MANUAL LATCHING</b>—Contact closure transition forces the loop to Manual mode. Opening the switch</p> <p style="text-align: center;"></p> <p>has no effect. If the  key is pressed while the switch is closed, the loop will return to Automatic mode.</p>
	RES TOT	<p><b>RESET TOTALIZER</b>—Contact closure transition resets the accumulated Totalizer value to zero. Opening the switch has no effect.</p>
	PV HOLD	<p><b>PROCESS VARIABLE HOLD</b>—When the switch is closed, PV is frozen at last value. When switch opens, PV resumes normal operation after 2 seconds.</p>
<p><b>Digital Input prompts for Software Options</b></p>		<p><b>SOFTWARE OPTIONS DIGITAL INPUTS</b>—The following Digital Input selections appear only when the HealthWatch Software Option is installed.</p>



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<b>Digital Input Prompts for HealthWatch</b>	RESETT1 RESETT2 RESETT3 R ALL T RESETC1 RESETC2 RESETC3 R ALL C RALLTC	<b>TIMER 1</b> will be reset when contact closes. <b>TIMER 2</b> will be reset when contact closes. <b>TIMER 3</b> will be reset when contact closes. <b>ALL TIMERS</b> will be reset when contact closes. <b>COUNTER 1</b> will be reset when contact closes. <b>COUNTER 2</b> will be reset when contact closes. <b>COUNTER 3</b> will be reset when contact closes. <b>ALL COUNTERS</b> will be reset when contact closes. <b>ALL TIMERS AND COUNTERS</b> will be reset when contact closes.
<b>DIG1COMB</b>	DISABLE +PID2 +TO DIR +TO SP2 +DIS AT +TO SP1 +RUN +To SP3	<b>DIGITAL INPUT 1 COMBINATION SELECTIONS</b> — This selection allows the specified function to occur in addition to the one chosen for DIG IN 1. <b>DISABLE</b> —Disables combination function. <b>PLUS PID2</b> —Contact closure selects PID Set 2. <b>PLUS DIRECT ACTION</b> —Contact closure selects direct controller action. <b>PLUS SETPOINT 2</b> —Contact closure puts the controller to Local Setpoint 2. <b>PLUS DISABLE ADAPTIVE TUNE</b> —Contact closure disables Accutune process. <b>PLUS SETPOINT 1</b> —Contact closure puts the controller to Local Setpoint 1. <b>PLUS RUN SETPOINT PROGRAM/RAMP</b> — Contact closure starts SP Program/Ramp if enabled. <b>PLUS SETPOINT 3</b> —Contact closure puts the controller to local setpoint 3.
<b>DIG INP2</b>	Same selections as for Digital Input 1	<b>DIGITAL INPUT 2 SELECTIONS</b>
<b>DIG2COMB</b>	Same selections as Digital Input 1 Combinations	<b>DIGITAL INPUT 2 COMBINATIONS</b>
<b>DIG INP3</b>	Same selections as for Digital Input 1	<b>DIGITAL INPUT 3 SELECTIONS</b>
<b>DIG INP4</b>	Same selections as for Digital Input 1	<b>DIGITAL INPUT 4 SELECTIONS</b>
<b>Dion LP2</b>		<b>DIGITAL INPUTS ON LOOP 2</b> —Used when Two Loops or Internal Cascade are configured. Digital Inputs are assigned to Loop 2 per this configuration. All other Digital Inputs are assigned to Loop 1



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	NONE DI 2 DI 2, 3 DI2, 3, 4	<p><b>NONE</b>—No Digital Inputs on Loop 2, all on Loop 1</p> <p><b>DI 2</b>—Assign Digital Input 2 to Loop 2</p> <p><b>DI 2,3</b>—Assign Digital Inputs 2 and 3 to Loop 2</p> <p><b>DI 2,3,4</b>—Assign Digital Inputs 2, 3 and 4 to Loop 2</p> <p><b>ATTENTION</b> When Setpoint Program is configured to operate on both control loops, then any digital input configured for TO RUN, TO HOLD, RERUN, or To BEGIN will control the setpoint program regardless of the loop to which the Digital Input is assigned.</p>