







UDC 3500 Application Note

Function Prompt Lower Display	Selections or Range of Setting Upper Display	Parameter Definition
<p>PID SETS (continued)</p>	2PV SW	<p>TWO SETS PV AUTOMATIC SWITCHOVER— When the process variable is LESS than the value set at prompt SW VALUE (Switchover Value), the controller will use Gain, Rate, Reset, and Cycle Time. The active PID SET can be read in the lower display.</p> <p>When the process variable is GREATER than the value set at prompt SW VALUE, the controller will use Gain #2, Rate #2, Reset #2, and Cycle #2 Time. The active PID SET can be read in the lower display.</p> <p>ATTENTION <i>Other prompts affected: SW VALUE</i> Note: This operation is different from other UDC Controllers.</p>
	2SP SW	<p>TWO SETS SP AUTOMATIC SWITCHOVER— When the setpoint is LESS than the value set at prompt SW VALUE (Switchover Value), the controller will use Gain, Rate, Reset, and Cycle.</p> <p>When the setpoint is GREATER than the value set at prompt SW VALUE, the controller will use Gain #2, Rate #2, Reset #2, and Cycle #2.</p> <p>ATTENTION <i>Other prompts affected: SW VALUE.</i> Note: This operation is different from other UDC Controllers.</p>
	4SP SW	<p>FOUR SETS SP AUTOMATIC SWITCHOVER— When the setpoint is LESS than the value set at prompt SW VALUE (Switchover Value), the controller will use Gain, Rate, Reset, and Cycle.</p> <p>When the setpoint is GREATER than the value set at prompt SW VALUE, the controller will use Gain #2, Rate #2, Reset #2, and Cycle #2.</p> <p>Similarly, the controller switches between the other PID sets based upon the values configured for SW VAL 2 and SW VAL 3.</p> <p>ATTENTION <i>Other prompts affected: SW VALUE, SW VAL 2 and SW VAL 3.</i></p>




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SW VAL12	Value in engineering units within PV or SP range limits	<p>AUTOMATIC SWITCHOVER VALUE—This is the value of Process Variable or Setpoint at which the controller will switch from Tuning Constant Set #1 to Set #2.</p> <p>ATTENTION Only appears when PID SETS selection is configured for 2 or 4 PID Sets.</p>
SW VAL23	Value in engineering units within PV or SP range limits	<p>AUTOMATIC SWITCHOVER VALUE—This is the value of Process Variable or Setpoint at which the controller will switch from Tuning Constant Set #2 to Set #3.</p> <p>ATTENTION Only appears when PID SETS selection is configured for 4 PID Sets.</p>
SW VAL34	Value in engineering units within PV or SP range limits	<p>AUTOMATIC SWITCHOVER VALUE—This is the value of Process Variable or Setpoint at which the controller will switch from Tuning Constant Set #3 to Set #4.</p> <p>ATTENTION Only appears when PID SETS selection is configured for 4 PID Sets.</p>
LSP'S	<p>1 ONLY</p> <p>TWO</p> <p>THREE</p>	<p>LOCAL SETPOINT SOURCE—This selection determines what your local setpoint source will be.</p> <p>LOCAL SETPOINT—The setpoint entered from the keyboard.</p> <p>TWO LOCAL SETPOINTS—This selection lets you switch between two local setpoints using the  key.</p> <p>THREE LOCAL SETPOINTS—This selection lets you switch between three local setpoints using the  key</p>
	FOUR	<p>FOUR LOCAL SETPOINTS—This selection lets you switch between four local setpoints using the  key</p>
RSP SRC		<p>REMOTE SETPOINT SOURCE—This selection determines what your remote setpoint source will be when toggled by the  key or Digital Input.</p>



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	NONE INPUT 1 INPUT 2 INPUT 3 INPUT 4 INPUT 5 IN ALG1 IN ALG2	<p>NONE—No remote setpoint. INPUT 1—Remote Setpoint using Input 1. INPUT 2—Remote Setpoint using Input 2. INPUT 3—Remote Setpoint using Input 3. INPUT 4—Remote Setpoint using Input 4. INPUT 5—Remote Setpoint using Input 5. IN AL1—Remote Setpoint using Input Algorithm 1. IN AL2—Remote Setpoint using Input Algorithm 2.</p> <p>ATTENTION To cycle through the available local setpoints and remote setpoint, press and hold in the  key. When the key is released, the setpoint selection currently displayed will be the new setpoint selection.</p>
AUTOBIAS	DISABLE ENABLE	<p>AUTOBIAS—Used for bumpless transfer when transferring from local setpoint to remote setpoint. Auto Bias calculates and adds a bias to remote setpoint input each time a transfer is made. Only available if no tracking is selected.</p> <p>DISABLE—Disables auto bias. ENABLE—Enables auto bias.</p>
SP TRACK	NONE PV RSP	<p>SETPOINT TRACKING—The local setpoint can be configured to track either PV or RSP as listed below. Not configurable when Auto Bias is set.</p> <p>ATTENTION For selections other than NONE, LSP is stored in nonvolatile memory only when there is a mode change; i.e., when switching from RSP to LSP or from Manual to Automatic. If power is lost, then the current LSP value is also lost.</p> <p>NO TRACKING—If local setpoint tracking is not configured, the LSP will not be altered when transfer from RSP to LSP is made.</p> <p>PV—Local setpoint tracks the PV when in manual. RSP—Local setpoint tracks remote setpoint when in automatic. When the controller transfers out of remote setpoint, the last value of the remote setpoint (RSP) is inserted into the local setpoint.</p>
PWR MODE	MANUAL	<p>POWER UP CONTROLLER MODE RECALL—This selection determines which mode and setpoint the controller will use when the controller restarts after a power loss.</p> <p>MANUAL, LSP—At power-up, the controller will use manual mode with the local setpoint displayed.</p>



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	A LSP A RSP AM SP AM LSP	<p>AUTOMATIC MODE, LAST LSP—At power-up, the controller will use automatic mode with the last local setpoint used before power down displayed.</p> <p>AUTOMATIC MODE, LAST RSP—At power-up, the controller will use automatic mode with the last remote setpoint used before power down displayed.</p> <p>LAST MODE/LAST SETPOINT—At power-up, the controller will use the last mode and last Setpoint used before power down.</p> <p>LAST MODE/LAST LOCAL SETPOINT—At power-up, the controller will use the last mode and last Local Setpoint used before power down.</p>
<p>PWR OUT For Three Position Step Control Only</p> <p>(Note 3)</p>	LAST F'SAFE	<p>THREE POSITION CONTROL STEP OUTPUT START-UP MODE—This selection determines what position the motor will be in when powered up or in the failsafe position.</p> <p>LAST OUTPUT—At power-up in automatic mode, the motor position will be the last one prior to power down. When the unit goes into FAILSAFE, it will stay in automatic mode; motor will not be driven to the configured failsafe position.</p> <p>FAILSAFE OUTPUT—At power-up in manual mode, the motor will be driven to either the 0 % or 100 % output position, whichever is selected at prompt FAILSAFE. For Burnout/None, when the unit goes into FAILSAFE, it will go to manual mode; motor will be driven to the configured failsafe position.</p>
SP HiLIM	NOTE 5	SETPOINT HIGH LIMIT * —This selection prevents the local and remote setpoints from going above the value selected here. The setting must be equal or less than the upper range of the inputs.
SP LoLIM	NOTE 5	SETPOINT LOW LIMIT * —This selection prevents the local and remote setpoints from going below the value selected here. The setting must be equal or greater than the lower range of the inputs
* The local setpoint will automatically adjust itself to be within the setpoint limit range. For example, if SP = 1500 and SP HiLIM is changed to 1200, then the SP will be changed to 1200.		
ACTION	DIRECT REVERSE	<p>CONTROL OUTPUT DIRECTION—Select direct or reverse output action.</p> <p>DIRECT ACTING CONTROL—The controller's output <i>increases</i> as the process variable increases.</p> <p>REVERSE ACTING CONTROL—The controller's output <i>decreases</i> as the process variable increases.</p>



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OUT RATE	ENABLE DISABLE	OUTPUT CHANGE RATE —Enables or disables the Output Change Rate. The maximum rate is set at prompt PCT/M UP or PCT/M DN. Only available for PID-A, PID-B, PD+MR control algorithms. ENABLE —Allows output rate. DISABLE —Disables output rate.
PCT/M UP	0 to 9999 % per minute	OUTPUT RATE UP VALUE —This selection limits the rate at which the output can change upward. Enter a value in percent per minute. Appears only if OUT RATE is enabled. “0” means no output rate applied.
PCT/M DN	0 to 9999 % per minute	OUTPUT RATE DOWN VALUE —This selection limits the rate at which the output can change downward. Enter a value in percent per minute. Appears only if OUT RATE is enabled. “0” means no output rate.
OUTHILIM	0 % to 100 % –5 % to 105 %	HIGH OUTPUT LIMIT —This is the highest value of output beyond which you do not want the controller automatic output to exceed. For relay output types. For current output types
OUTLoLIM	0 % to 100 % –5 % to 105 %	LOW OUTPUT LIMIT —This is the lowest value of output below which you do not want the controller automatic output to exceed. For relay output types. For current output types
I Hi LIM (Note 4)	Within the range of the output limits	HIGH RESET LIMIT —This is the highest value of output beyond which you do not want reset action to occur
I Lo LIM (Note 4)	Within the range of the output limits	LOW RESET LIMIT —This is the lowest value of output beyond which you do not want reset action to occur.
DROPOFF (Note 4)	–5 to 105 % of output	CONTROLLER DROPOFF VALUE —Output value below which the controller output will drop off to the low output limit value set in prompt OUTLoLIM
DEADBAND	–5.0 to 25.0 % 0.0 to 25.0 % 0.5 to 5.0 %	DEADBAND —An adjustable gap between the operating ranges of output 1 and output 2 in which neither output operates (positive value) or both outputs operate (negative value). Time Duplex On-Off Duplex Position Proportional and Three Position Step



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OUT HYST	0.0 to 100.0 % of PV span	HYSTERESIS (OUTPUT RELAY) is an adjustable overlap of the ON/OFF states of each control output. This is the difference between the value of the process variable at which the control outputs energize and the value at which they de-energize. Only applicable for ON/OFF control.
FAILMODE	NoLATCH LATCH	FAILSAFE MODE NON LATCHING —Controller stays in last mode that was being used (automatic or manual); If unit was in Automatic mode, then the output goes to the failsafe value. (NOTE 1, NOTE 2) LATCHING —Controller goes to manual mode; If unit was in Automatic mode, then the output goes to the failsafe value. (NOTE 2)
FAILSAFE	0 to 100 %	FAILSAFE OUTPUT VALUE —The value used here will also be the output level when you have Communications SHED set to failsafe or when NO BURNOUT is configured and the PV Source fails. ATTENTION Applies for all output types <i>except</i> Three Position Step Control.
	0 PCT 100 PCT	THREE POSITION STEP FAILSAFE OUTPUT 0 PCT —Motor goes to closed position. 100 PCT —Motor goes to open position.
SW FAIL	0 PCT 100 PCT	Position Proportional motor position when slidewire fails. 0 PCT —Motor goes to closed position. 100 PCT —Motor goes to open position. ATTENTION PWR OUT must be configured for FSAFE.
MAN OUT	0 to 100 %	POWER-UP PRESET MANUAL OUTPUT —At power-up, the controller will go to manual and the output to the value set here. (NOTE 1)
AUTO OUT	0 to 100 %	POWER-UP PRESET AUTOMATIC OUTPUT —At power-up, the controller will begin its automatic control at the output value set here. (NOTE 1)
PBorGAIN (selection is used for both loops)		PROPORTIONAL BAND UNITS —Select one of the following for the Proportional (P) term of the PID algorithm:



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	PB PCT	PROPORTIONAL BAND selects units of percent proportional band for the P term of the PID algorithm. <i>Where:</i> $PB \% = \frac{100 \% FS}{GAIN}$
	GAIN	GAIN selects the unitless term of gain for the P term of the PID algorithm. <i>Where:</i> $GAIN = \frac{100 \% FS}{PB\%}$
MINUTESorRPM (selection is used for both loops)	RPM	RESET UNITS —Selects units of minutes per repeat or repeats per minute for the I term of the PID algorithm. 20 Repeats per Minute = 0.05 Minutes per Repeat. REPEATS PER MINUTE —The number of times per minute that the proportional action is repeated by reset.
	MINUTES	MINUTES PER REPEAT —The time between each repeat of the proportional action by reset.

NOTE 1: Does not apply to Three Position Step Control.

NOTE 2: If controller is in Manual mode when a failure occurs, then the output will maintain its value.

NOTE 3: These selections appear when:

A) Control Algorithm is selected for 3PSTEP.

B) Control Algorithm is selected for PD+MR and Output Algorithm is selected for Position Proportional.

NOTE 4: Reset limits and Dropoff are not displayed when Three Position Step Control is configured.

NOTE 5: If PV source is one of the Analog Inputs, then the SP HiLIM and SP LoLIM values must be between the Input High and Input Low values for the input type configured. If the PV source is an Input Algorithm configured for:

- Carbon Potential; then the SP HiLIM and SP LoLIM values must be between 0.000 and 2.000
- Dew Point; then the SP HiLIM and SP LoLIM values must be between -50 and +100
- Oxygen; then the SP HiLIM and SP LoLIM values must be between 0 to 40.00
- Weighted Average, Summer, Subtractor, High or Low; then the SP HiLIM and SP LoLIM values must be between the configured CALC HI and CALC LOW values. CALC HI and CALC LOW can be set anywhere between -999 and 9999.
- Math A, Math B, Math C or Math D; then the SP HiLIM and SP LoLIM values can be set anywhere between -999 and 9999 and are not limited to the CALC HI and CALC LOW values