

UDC2000 Universal Digital Controller

Product Manual 51-52-25-14F

Addendum (Rev.0)

Overview

Honeywell ACCUTUNE II tuning algorithm for the UDC2000 Controller incorporates new **Fuzzy Overshoot Suppression** and **TUNE** Autotuning. These provide faster tuning, reduced overshoot, ability to tune integrating type processes, and the ability to retune while at a fixed setpoint.

Fuzzy Overshoot Suppression

Fuzzy Overshoot Suppression minimizes overshoot after a setpoint change or a process disturbance. This is especially useful in processes which experience load changes or where even a small overshoot beyond the setpoint may result in damage or lost product.

It operates independently from Accutune Tuning. It does not change the PID constants. The fuzzy logic observes the speed and direction of the PV signal as it approaches the setpoint and temporarily modifies the internal controller action to suppress overshoot as necessary. This allows more aggressive tuning to co-exist with smooth process variable response.

It can be enabled or disabled depending on the application or the control criteria.

TUNE Autotuning

TUNE provides foolproof, trouble-free on demand tuning in the UDC2000 Controller. No knowledge of the process is required at start-up. The operator simply enters the desired setpoint and initiates the tuning.

The UDC controller immediately starts controlling to the setpoint while it identifies the process, calculates the tuning constants, and begins PID control with the correct tuning parameters.

This works with any process, including integrating processes, and allows retuning at a fixed setpoint.

Additions and Changes to the manual

Please make additions and changes to the UDC2000 Controller Product Manual to reflect the addition of the new Accutune II.

Attached are configuration and operation information that has been expanded to include the new Accutune II selections.

Subsection 3.9 - Accutune Set Up Group Function Prompts expanded to include "FUZZY" and "TUNE".

Subsection 4.5 - Accutune Function Prompt Definitions expanded to include "FUZZY" and "TUNE".

Subsection 5.12 - Fuzzy Overshoot Suppression Operation subsection added.

Subsection 5.13 - Accutune II Introduction and Operation of "TUNE" added.

"AT ENB"(original Autotune) tuning works as stated in

Subsection 5.12 in the Product Manual

3.9 ATUNE Set Up Group

Accutune II

Accutune II automatically calculates Gain, Rate, and Reset Time (PID) Tuning constants for your control loop. Perform Accutune after you have configured the controller.

Function prompts

Table 3-6 lists all the function prompts in the “ATUNE” Set Up group.

Table 3-6 “ATUNE” Group Function Prompts

Function Prompt <small>Lower Display</small>	Function Name	Selections or Range of Setting <small>Upper Display</small>	Factory Setting
FUZZY	Fuzzy Overshoot Suppression	DIS ENAb	DIS
TUNE	New PID Tuning (ACCUTUNE II)	DIS ENAb	DIS
AT ERR	Accutune II Error Codes	Read Only (See Section 5)	
AT ENB	(original)	DIS ASTP MSTP	DIS
OUT STP		-100 to 100% of output in 1% increments	10
AT ERR		Read Only (See Section 5)	

4.5 ATUNE Set Up Group

Introduction

Accutune II automatically calculates GAIN, RATE, and RESET TIME (PID) tuning constants for your control loop. When initiated on demand, the Accutune algorithm measures a process step response and automatically generates the PID tuning constants needed for no overshoot on your process.

Fuzzy Overshoot Suppression when enabled will suppress or minimize any overshoot that may occur as a result of the existing tuning parameters.

ATUNE group prompts

Table 4-4 lists all the function prompts in the ATUNE setup group and their definitions.

Table 4-4 ATUNE Group Definitions

Lower Display Prompt	Upper Display Range of Setting or Selection	Parameter Definition
FUZZY	DIS ENAb	FUZZY OVERSHOOT SUPPRESSION FEATURE - DISABLE - Disables Fuzzy Overshoot Suppression ENABLE - The UDC will use Fuzzy Logic to inherently suppress or minimize any overshoot that may occur as a result of the existing tuning parameters. It does NOT change the PID parameters.
TUNE	DIS ENAb	ACCUTUNE II - On demand tuning algorithm DISABLE - Disables ACCUTUNE II ENABLE - The UDC will "TUNE" whenever the AUTOTUNE key is pressed. It will enter new PID parameters when tuning is complete.
AT ERR	Read only (see Section 5)	ACCUTUNE II ERROR CODES – only displays ABORT if "TUNE" has been aborted. See <i>Section 5 — Operation</i>
ATENB	DIS ASTP MSTP	AUTOTUNE (Original) DISABLE – Disables the Autotune function. AUTOSTEP – Automatic steps lets you perform an Autotune with a step size automatically generated. MANUAL STEP – Lets you choose an output step size in percent, that will be large enough to result in a PV change. The value of the output step size is selected under function prompt "OUT STP."
OUTSTP	-100 to 100% of output in 1% increments	OUTPUT STEP SIZE – Choose an output step size, in percent, that will be applied to the output of the controller when Autotune is initiated. This step must be large enough to result in a process variable (PV) change of at least 2.5% of span. This step can be predetermined by stroking the process in manual mode. • The process can be tuned using either an upscale or downscale step change.
AT ERR	Read only (see Section 5)	AUTOTUNE ERROR CODES –See <i>Section 5 — Operation</i> for a list of error prompts.

5.12 Fuzzy Overshoot Suppression

Introduction

Fuzzy Overshoot Suppression minimizes Process Variable overshoot following a setpoint change or a process disturbance. This is especially useful in processes which experience load changes or where even a small overshoot beyond the setpoint may result in damage or lost product.

How it works

The fuzzy logic observes the speed and direction of the PV signal as it approaches the setpoint and temporarily modifies the internal controller response action as necessary to avoid an overshoot. There is no change to the PID algorithm, and the fuzzy logic does not alter the PID tuning parameters. This feature can be independently Enabled or Disabled as required by the application to work with “TUNE” (On-Demand) Accutune II tuning algorithm or the “AT ENB” (original Autotune) tuning algorithm.

Configuration

To configure this item, refer to Section 3 - Configuration:

- Set Up Group “**ATUNE**”
 - Function Prompt “**FUZZY**”
 - Select “**ENAB**”(enable) or “**DIS**” (disable) Use ▲ or ▼.
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5.13 Accutune™

Introduction

There are two types of Accutune from which to choose:

- **TUNE** - This is the new Accutune II tuning algorithm which is done on demand by pressing the Autotune key.
- **AT ENB** - This is the original Autotune which will adjust the Gain or Proportional Band (P), Reset (I), and Rate (D) tuning constants in response to an Output step introduced into the process.

Configuration

To configure this item, refer to Section 3 - Configuration:

- Set Up Group “**ATUNE**”
- Select “**TUNE**”, OR “**AT ENB**”
- Select “**ENAb**” or “**DIS**” (▲ or ▼)

If “**AT ENB**” Selected:

- Select Auto Step (ASTP) or manual Step (MSTP)
- If you select “ASTP”, enter an output Step Size at Function prompt “OUTSTP”.

Rules and regulations

Table 5-16 is a list of rules and regulations for Accutune.

Table 5-16 Rules and Regulations for Accutune

“TUNE”	“ATENB”	Applicable Rule or regulation
X		TUNE (On Demand) tuning will work for all Control Algorithms except “On/Off”.
X		TUNE (On Demand) tuning works for Integrating Processes.
	X	AT ENB tuning will work only for algorithm PID-A , i.e. it will NOT work with ON/OFF, THREE POSITION STEP, or PD+MR control algorithms.
	X	AT ENB can tune on all Local setpoints <i>except ramping setpoints</i> , i.e. cannot be done during SP Ramp or SP Program .
X	X	Tuning is done in Automatic mode.
X	X	Tuning can be aborted by Man-Auto/Reset key, disabling via configuration, or power cycling the device.

“TUNE” or “AT ENB” Tuning - when tuning is in progress, the word “TUNE” will alternately flash in the upper display until tuning is completed.

Continued on next page

5.13 Accutune™, Continued

How “TUNE” (Accutune II) tuning works

“TUNE” (Accutune II) algorithm provides foolproof, trouble-free on-demand tuning in the UDC2000 controller. No knowledge of the process is required at start-up. The operator simply enters the desired setpoint and initiates the tuning.

The UDC controller immediately starts controlling to the setpoint while it identifies the process, calculates the tuning constants and enters them into the Tuning group, and begins PID control with the correct tuning parameters. This works with any process, including integrating type processes, and allows retuning at a fixed setpoint.

The tuning sequence will cycle the controller’s output two full cycles between 0% and 100 % while allowing only a very small Process Variable change above and below the SP during each cycle. “TUNE” flashes in the upper display until tuning is completed.

Starting TUNE

After “TUNE” has been enabled, use the procedure in Table 5-17 to start tuning

Table 5-17 Procedure for Starting “TUNE”

Step	Action
1	Set the Setpoint to the desired value.
2	Switch to “Automatic” mode - <input type="text" value="Man-Auto/Reset"/> key. (Man/Auto models)
3	Initiate Tuning by pressing the <input type="text" value="Autotune"/> key

5.13 Accutune™, Continued

TUNE for Duplex (Heat/Cool)

“TUNE” can be done for applications using Duplex (Heat/Cool) control. During tuning, Accutune II assumes SP 1 will cause a Heating demand, and then the calculated tuning parameters will be automatically entered as PID SET 1. Likewise, it assumes tuning at Local SP 2 will cause a Cooling demand, and the cooling parameters will be entered as PID SET 2

Configuring TUNE for Duplex (Heat/Cool)

To configure this item, refer to Section 3 - Configuration:

- Set Up Group “ATUNE”
- Select “TUNE”
- Select “ENAb” or “DIS” (▲ or ▼)

Using TUNE at Start-up for Duplex (Heat/Cool)

After “TUNE” has been enabled, use the procedure in Table 5-18 to use “TUNE” at Start-up for Duplex (Heat/Cool) control.

Table 5-18 Procedure for Using TUNE at Start-up for Duplex

Step	Action
1	<p>Heat Zone:</p> <p>a. Adjust the Local SP1 to a value within the Heat Zone.</p> <p>b. Insure that the UDC is in <i>Automatic</i> mode.</p> <p>c. Press the Autotune key to initiate Heat zone tuning.</p> <p>The output will cycle between 50% and 100%.</p> <p>“TUNE” flashes in the upper display until tuning is completed and final Heat parameters are entered for PID Set 1 in the Tuning group.</p>
3	<p>Cool Zone:</p> <p>a. Adjust the Local SP2 to a value within the Cool Zone.</p> <p>b. Insure that the UDC is in <i>Automatic</i> mode.</p> <p>c. Press the Autotune key to initiate Cool tuning.</p> <p>The output will cycle between 0% and 50%.</p> <p>“TUNE” flashes in the upper display until tuning is completed and final Cool parameters are entered for PID Set 2 in the Tuning group.</p>

NOTE: “AT ENB”, the original Autotune works as stated in the Product Manual in Subsection 5.12.