LEVEL & FLOW MEASUREMENT FOR RECTANGULAR WEIR

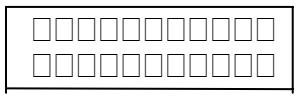
INTRODUCTION

The instruction manual is the proper document to be used for the installation, setup and calibration of the Model 7000 Excalibur. However, due to the instruction manual's size and the number of options, it gives the appearance of being very complicated and tends to be intimidating. Therefore, this document was created to provide a simplified illustration of various setup and calibration procedures based upon the type of measurement desired. Only illustrations of the more common types of measurements are shown here, however, they may still be of some help. This document is not intended to replace the instruction manual and is not applicable unless the control unit, PFM Transmitter and probe have been properly installed.

If the instrument is to be used as a PID Controller, first perform the setup and calibration with the PID Control off as specified in this guide. Then refer to the setup & calibration guide for the PID Controller.

The key to understanding the Model 7000 is knowing how to navigate through the menu. The following describes the various displays and keys used for setup and calibration:

DISPLAYS



VFD Line 1 – indicates the mode to be setup or calibrated.
VFD Line 2 – indicates the sub-mode and/or value being entered.

KEYS

SETUP	To put the instrument into the setup mode.
CALIBRATE	To put the instrument into the calibrate mode.
ENTER	To put the instrument into a sub-mode and to store data.
NEXT △	To scroll up through the menu.
LAST ▽	To scroll down through the menu.
NUMERIC	To enter data.
CLEAR	To return to the previous mode (to back out of a mode). Also used to erase a keypad entry before pressing the ENTER key.

HELPFUL HINTS

✶Scrolling, as indicated by either△ or▽ can be done in either direction regardless of the direction shown.
✶After energizing the instrument, but before starting the setup and calibration procedure, check to make sure that the LED in the PFM Transmitter is pulsing.
✶If attempts were made to setup and calibrate the instruments and it is desirable to return to the default condition, perform the initialization procedure (Initialize database).
✶Do not be concerned with the error light before setup and calibration is complete.
✶Do not be concerned if "WARNING Excessive Head Height" briefly flashes on the VFD before performing the input.

INITIALIZE DATABASE

KEYPAD ENTRY	REMARKS
SETUP	**Access Level** appears in VFD line 2.
ENTER	**Limited** appears in VFD line 2.
LAST ▽	Scroll until **Full** appears in VFD line 2.
ENTER	**Password?** Appears in VFD. *********->**
NUMERIC	Enter password using appropriate keys. 12345 is default password
ENTER	**Full** appears in VFD line 2.
CLEAR	**Access Level** appears in VFD line 2.
LAST ▽	Scroll until **Diagnostics** appears in VFD line 2.
ENTER	**PFM Input Test** appears in VFD line 2.
LAST ▽	Scroll until **Initialize Database** appears in VFD line 2.
ENTER	**All Except PFM Input** appears in VFD line 2.
LAST ▽	Scroll until **Full Initialization** appears in VFD line 2.
ENTER	**Initialize Database** appears in VFD line 2 after a short wait.
CLEAR	**Diagnostics** appears in VFD line 2.
CLEAR	VFD line 2 is blank.

Initialization complete.

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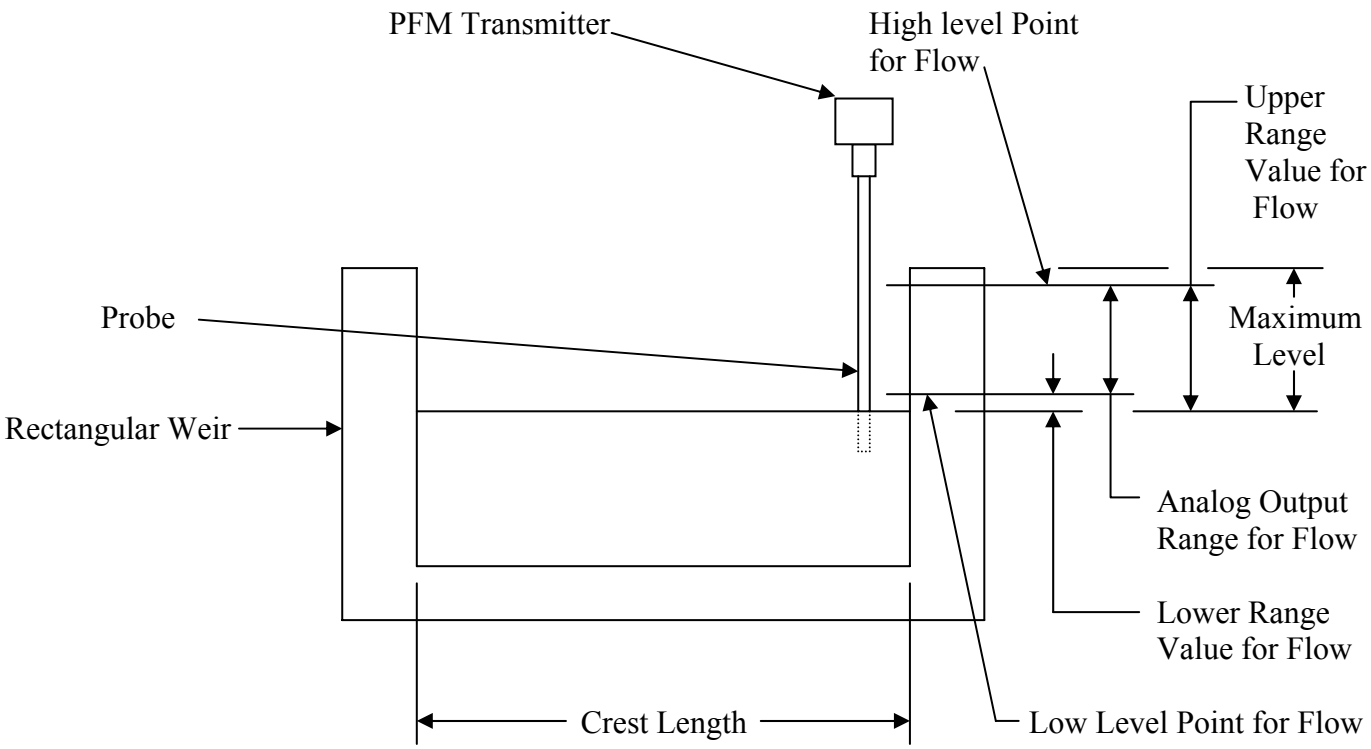
SETUP AND CALIBRATION



Determine the Maximum Level. This is the highest point that can possibly be measured. This is usually, but not always, the same as the height of the throat. Fill in the value below.

The Upper Range Value for Level should be the same as the Maximum Level. For the Lower Range Value for Level use 0. Fill in the values below.

Determine the Lower Range Value for Flow. This point is usually on the active portion of the probe as it is normally the lowest point that can be measured. (No indication of level or flow change can occur when the process drops below the end of the probe.) This is the point at which the ERROR LED will light on decreasing level and, when the instrument has an analog output, it is the point at which the output is 4 ma. Fill in the values below.

Determine the Upper Range Value for Flow. When the instrument has an analog output it is the point at which the output is 20 ma. If the instrument does not have an analog output the Upper Range Value should be the Flow at the Maximum Level. Fill in the values below.

The following values should be filled in before proceeding. They will be required during calibration.

Crest Length:_____ Maximum Level:_____

Lower Range Value – Flow: _____ Lower Range Value - Level: 0

Upper Range Value – Flow: _____ Upper Range Value - Level: _____

KEYPAD ENTRY	REMARKS
SETUP	**Access Level** appears in VFD line 2.
ENTER	**Limited** appears in VFD line 2.
LAST ▽	Scroll until **Full** appears in VFD line 2.
ENTER	**Password?** appears in VFD line 2. ✶✶✶✶✶✶✶->
NUMERIC	Enter password using appropriate keys. 12345 is default password.
ENTER	**Full** appears in VFD line 2.
CLEAR	**Access Level** appears in VFD line 2.
NEXT △	Scroll until **Measurement Mode** appears in VFD line 2.
ENTER	**Level Only** appears in VFD line 2.
LAST ▽	Scroll until **Level & Flow** appears in VFD line 2.
ENTER	**Measurement Mode** appears in VFD line 2.
NEXT △	Scroll until **PID Mode** appears in VFD line 2.
ENTER	**Off** appears in VFD line 2.
ENTER	**Setup Menu** appears in VFD line 1. **PID Mode** appears in VFD line 2.
See note→	If VFD does not look like the above press **CLEAR**.
NEXT △	Scroll until **PV Display Variable** appears in VFD line 2.
ENTER	**Level** appears in VFD line 2.
NEXT △	Scroll until **Flow** appears in VFD line 2.
ENTER	**PV Display Variable** appears in VFD line 2.
NEXT △	Scroll until **SP Display Variable** appears in VFD line 2.
ENTER	**Level** appears in VFD line 2.
ENTER	**SP Display Variable** appears in VFD line 2.
NEXT △	Scroll until **VFD Line 1 Variable** appears in VFD line 2.
ENTER	**Output %** appears in VFD line 2.
ENTER	**VFD Line 1 Variable** appears in VFD line 2.

KEYPAD ENTRY	REMARKS
NEXT △	Scroll until **VFD Line 2 Variable** appears in VFD line 2.
ENTER	**Output %** appears in VFD line 2.
LAST ▽	Scroll until **PFM Input Counts** appears in VFD line 2.
ENTER	**VFD Line 2 Variable** appears in VFD line 2.
CLEAR	**XX.XX percent** appears in VFD line 1 **XXXXX usec** appears in VFD line 2.

Setup is complete.

CALIBRATE	**Level** appears in VFD line 2.
ENTER	**Units** appears in VFD line 2.
ENTER	**Inches** appears in VFD line 2.
△ ▽	Scroll until desired units appears in VFD line 2.
ENTER	**Units** appears in VFD line 2.
NEXT △	Scroll until **Maximum Level** appears in VFD line 2.
ENTER	**Maximum Measurement** appears in VFD. **XX.XX->**
NUMERIC	Enter Maximum Level using appropriate keys.
ENTER	**Maximum Level** appears in VFD line 2.
NEXT △	Scroll until **Upper Range Value** appears in VFD line 2.
ENTER	**Upper Range Value** appears in VFD. **XX.XX->**
NUMERIC	Enter Upper Range Value using appropriate keys.
ENTER	**Upper Range Value** appears in VFD line 2.
LAST ▽	Scroll until **Lower Range Value** appears in VFD line 2.
ENTER	**Lower Range Value** appears in VFD. **XX.XX->**
NUMERIC	Enter Lower Range Value (0) using appropriate keys.
ENTER	**Lower Range Value** appears in VFD line 2.

KEYPAD ENTRY	REMARKS
NEXT △	Scroll until **Damping Time** Appears in VFD line 2.
ENTER	**Level Damping Time** appears in VFD. **X.X->**
NUMERIC	Enter 0. If a damping time is desired, it is recommended that it be added after the system is in operation.
ENTER	**Damping Time** appears in VFD line 2.
CLEAR	**Level** appears in VFD line 2.
NEXT △	Scroll until **Flow** appears in VFD line 2.
ENTER	**Units** appears in VFD line 2.
ENTER	**cubic feet/second** appears in VFD line 2.
▽ △	Scroll until desired units appears in VFD line 2.
ENTER	**Units** appears in VFD line 2.
LAST ▽	Scroll until **Element Type** appears in VFD line 2.
ENTER	**V-Notch Weir** appears in VFD line 2.
NEXT △	Scroll until **Rectangular Weir** appears in VFD line 2.
ENTER	**Weir Crest Length** appears in VFD. **X.XXXX->** appears in VFD line 2.
NUMERIC	Enter Weir Crest Length using the appropriate keys.
ENTER	**Rectangular Weir** appears in VFD line 2.
CLEAR	**Element Type** appears in VFD line 2.
LAST ▽	Scroll until **Upper Range Value** appears in VFD line 2.
ENTER	**Upper Range Value** appears in VFD. **XXX.XX->**
NUMERIC	Enter Upper Range Value (Flow) using the appropriate keys.
ENTER	**Upper Range Value** appears in VFD line 2.
LAST ▽	Scroll until **Lower Range Value** appears in VFD line 2.
ENTER	**Lower Range Value** appears in VFD. **X.XX->**
NUMERIC	Enter Lower Range Value (Flow) using the appropriate keys.

KEYPAD ENTRY	REMARKS
	Lower Range Value appears in VFD line 2.
ENTER	
CLEAR	**Flow** appears in VFD line 2.
▽ △	Scroll until **Input** appears in VFD line 2.
ENTER	**Two Point** appears in VFD line 2.
ENTER	**Lo Level Input Cal** appears in VFD. **X.XX->**
NUMERIC	With the process in the vessel at any known level, preferably low, enter that level using the appropriate keys.
ENTER	**Hi Level Input Cal** appears in VFD. **XX.XX->**
NUMERIC	With the process in the vessel raised to a higher level (preferably quite higher), enter that level using the appropriate keys.
ENTER	**Two Point** appears in VFD line 2.
CLEAR	**Input** appears in VFD line 2.
CLEAR	**XX.XX percent** appears in VFD line 1. **XXXXX usec appears in VFD line 2.**

Calibration is complete. Proceed to the Setting The Alarms.

SETTING THE ALARMS

There are 4 process alarms which may be used to indicate an alarm condition at a predetermined level or flow. There are also 2 output alarms which may be used to indicate an alarm condition at a predetermined % of the 4-20 ma output span or, if no 4-20 ma output, % of span between the Lower Range Value and the Upper Range Value.

Any, or all of the alarms may be enabled. For disabled alarms use the instructions below. For enabled alarms skip this page and proceed to the next applicable page.

DISABLED ALARMS

KEYPAD ENTRY	REMARKS
CALIBRATE	**Level** appears in VFD line 2.
△ ▽	Scroll until **Alarms** appears in VFD line 2.
ENTER	**Process Alarm #1** appears in VFD line 2.
△ ▽	Scroll until desired Alarm appears in VFD line 2.
ENTER	**Status** appears in VFD line 2.
ENTER	**Disable** appears in VFD line 2.
ENTER	**Status** appears in VFD line 2.
CLEAR	**Xxxxxxx Alarm #X** appears in VFD line 2.
△ ▽	If additional alarms are to be disabled, scroll until the next desired Alarm appears in VFD line 2 and repeat the above. After all desired alarms have been disabled, proceed as follows.
CLEAR	**Alarms** appears in VFD line 2.
CLEAR	**XX.XX percent** appears in VFD line 1. **XXXXX usec** appears in VFD line 2.

ENABLED ALARMS

Before proceeding, determine at which point each enabled alarm is to be set, whether it is to be LLFS (Low Level Failsafe) or HLFS (High level Fail Safe), and if it is to have a differential. Fill in the information below as this will be required when setting up the alarms.

PROCESS ALARM SETTINGS

	ALARM #1	ALARM #2	ALARM #3	ALARM #4
STATUS Enable or Disable				
MEASUREMENT Level or Flow				
FAILSAFE MODE LLFS or HLFS				
ALARM TYPE FXD or ADJ Differential				
LOW SETPOINT See Note 1 below				
HIGH SETPOINT See Note 2 below				
OFF DELAY				
ON DELAY				
OUTPUT RELAY None, #1, #2, #3 or #4				

OUTPUT ALARM SETTINGS

	ALARM #1	ALARM #2
STATUS Enable or Disable		
FAILSAFE MODE LLFS or HLFS		
ALARM TYPE FXD or ADJ Differential		
LOW SETPOINT See Note 1 below		
HIGH SETPOINT See Note 2 below		
OUTPUT RELAY None, #1, #2, #3 or #4		

NOTES:
1. LOW SETPOINT is applicable only if the alarm FAILSAFE MODE is LLFS or if the ALARM TYPE is ADJ.

2. HIGH SETPOINT is applicable only if the alarm FAILSAFE MODE is HLFS or if the ALARM TYPE is ADJ.

ENABLED PROCESS ALARMS

KEYPAD ENTRY	REMARKS
CALIBRATE	**Level** appears in VFD line 2.
△ ▽	Scroll until **Alarms** appears in VFD line 2.
ENTER	**Process Alarm #1** appears in VFD line 2.
△ ▽	Scroll until desired Process Alarm appears in VFD line 2.
ENTER	**Status** appears in VFD line 2.
ENTER	**Disable** appears in VFD line 2.
△ ▽	Scroll until **Enable** appears in VFD line 2.
ENTER	**Status** appears in VFD line 2.
NEXT △	Scroll until **Measurement** appears in VFD line 2.
ENTER	**Level** appears in VFD line 2.
ENTER	**Measurement** appears in VFD line 2.
NEXT △	Scroll until **Failsafe Mode** appears in VFD line 2.
ENTER	**LLFS** appears in VFD line 2.
△ ▽	Scroll until desired Failsafe Mode appears in VFD line 2.
ENTER	**Failsafe Mode** appears in VFD line 2.
NEXT △	Scroll until **Alarm Type** appears in VFD line 2.
ENTER	**Fixed Differential** appears in VFD line 2.
△ ▽	Scroll until desired Alarm Type appears in VFD line 2.
ENTER	**Alarm Type** appears in VFD line 2.
NEXT △	Scroll until **Low Setpoint** appears in VFD line 2. Only set this feature if the alarm is for LLFS and/or has an Adjustable Differential.
ENTER	**X.XX->** appears in VFD line 2.
NUMERIC	Enter Low Setpoint using appropriate keys.
ENTER	**Low Setpoint** appears in VFD line 2.
NEXT △	Scroll until **High Setpoint** appears in VFD line 2. Only set this feature if the alarm is for HLFS and/or has an Adjustable Differential.
ENTER	**XX.X->** appears in VFD line 2.

KEYPAD ENTRY	REMARKS
	Enter High Setpoint using appropriate keys.
NUMERIC	
ENTER	**High Setpoint** appears in VFD line 2.
NEXT △	Scroll until **Off Delay** appears in VFD line 2.
ENTER	**X.X->** appears in VFD line 2.
NUMERIC	Enter **0** or desired Off Delay time.
ENTER	**Off Delay** appears in VFD line 2.
NEXT △	Scroll until **On Delay** appears in VFD line 2.
ENTER	**X.X->** appears in VFD line 2.
NUMERIC	Enter **0** or desired On Delay time.
ENTER	**On Delay** appears in VFD line 2.
NEXT △	Scroll until **Output Relay** appears in VFD line 2.
ENTER	**NONE** appears in VFD line 2.
△ ▽	Scroll until desired **Relay** or **None** appears in VFD line 2.
ENTER	**Output Relay** appears in VFD line 2.
CLEAR	**Process Alarm #X** appears in VFD line 2.
△ ▽	If additional Process Alarms are to be enabled, scroll until the next desired process Alarm appears in VFD line 2 and repeat the above. After all desired Process Alarms have been enabled, proceed as follows:
CLEAR	**Alarms** appears in VFD line 2.
CLEAR	**XX.XX percent** appears in VFD line 1. **XXXXX usec** appears in VFD line 2.

If any Output Alarm is to be enabled, proceed to next page. If not, Calibration is complete.

ENABLED OUTPUT ALARMS

KEYPAD ENTRY	REMARKS
CALIBRATE	**Level** appears in VFD line 2.
△ ▽	Scroll until **Alarms** appears in VFD line 2.
ENTER	**Process Alarm #1** appears in VFD line 2.
△ ▽	Scroll until desired Output Alarm appears in VFD line 2.
ENTER	**Status** appears in VFD line 2.
ENTER	**Disable** appears in VFD line 2.
△ ▽	Scroll until **Enable** appears in VFD line 2.
ENTER	**Status** appears in VFD line 2.
NEXT △	Scroll until **Failsafe Mode** appears in VFD line 2.
ENTER	**LLFS** appears in VFD line 2.
△ ▽	Scroll until desired Failsafe Mode appears in VFD line 2.
ENTER	**Failsafe Mode** appears in VFD line 2.
NEXT △	Scroll until **Alarm Type** appears in VFD line 2.
ENTER	**Fixed Differential** appears in VFD line 2.
△ ▽	Scroll until desired Alarm Type appears in VFD line 2.
ENTER	**Alarm Type** appears in VFD line 2.
NEXT △	Scroll until **Low Setpoint** appears in VFD line 2. Only set this feature if the alarm is for LLFS and/or has an Adjustable Differential.
ENTER	**X.XX->** appears in VFD line 2.
NUMERIC	Enter Low Setpoint using appropriate keys.
ENTER	**Low Setpoint** appears in VFD line 2.
NEXT △	Scroll until **High Setpoint** appears in VFD line 2. Only set this feature if the alarm is for HLFS and/or has an Adjustable Differential.
ENTER	**XX.X->** appears in VFD line 2.
NUMERIC	Enter High Setpoint using appropriate keys.
ENTER	**High Setpoint** appears in VFD line 2.

KEYPAD ENTRY	REMARKS
NEXT △	Scroll until **Output Relay** appears in VFD line 2.
ENTER	**NONE** appears in VFD line 2.
△ ▽	Scroll until desired **Relay** or **None** appears in VFD line 2.
ENTER	**Output Relay** appears in VFD line 2.
CLEAR	**Output Alarm #X** appears in VFD line 2.
△ ▽	If the other Output Alarm is to be enabled, scroll until it appears in VFD line 2 and repeat the above. After all desired Output alarms have been enabled, proceed as follows:
CLEAR	**Alarms** appears in VFD line 2.
CLEAR	**XX.XX percent** appears in VFD line 1. **XXXXX usec** appears in VFD line 2.

Calibration is complete.