

EnviroRanger ERS 500 Control Strategy Implementation

Monitoring Open Channel Flow Over A Motorized Control Gate

Objective: To configure the EnviroRanger ERS 500 to calculate flow rate and totalized flow over a motorized control gate, where zero head is a variable dependent on the gate adjustment, rather than a fixed linear dimension.

Equipment:

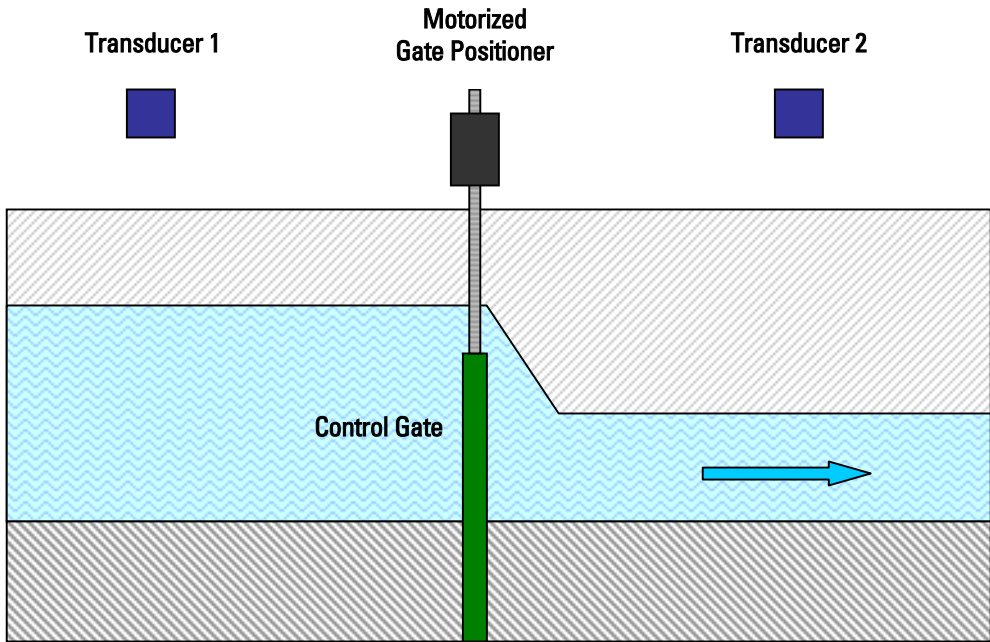
- EnviroRanger ERS 500 level controller (software revision 5.01 or greater)
- Infra-red hand programmer (or other instrument configuration method)

While every effort was made to verify the following information, no warranty of accuracy or usability is expressed or implied.

Overview

The EnviroRanger ERS 500 is capable of calculating dynamic flowrate and totalizing flow volume through a Primary Measuring Device such as a flume or weir with a fixed zero head dimension. The ERS 500 is also capable of controlling a penstock or sluice gate using time-step relay control and level monitoring feedback to adjust a motorized controlled gate.

This guide details how to configure the ERS 500 to base the flow calculation on a variable zero head input, so that monitoring and totalizing flow over a motorized control gate is possible.



MILLTRONICS

Variable Zero OCM Related Parameters

These parameters functions are only available in software revision 5.01 and greater. Consult your Siemens Milltronics equipment supplier if you have an earlier software revision installed.

P001 Operation

The new OCM with Variable Zero function sets up various I/O and parameters to suit this application.

When P001 = 9

- Transducer 1 is allocated as the upstream transducer
- Transducer 2 is allocated as the downstream transducer
- The Empty (P006) setting of each transducer may differ
- The Span (P007) setting of each transducer must be set to report the same level (wrt sea level) at 100% head.
- mA input 1 is allocated for the gate position mA input
- mA input 1 is scaled to the Span (P007) of transducer 1
- Zero Head (P605) is not applicable
- The Primary Reading default is flow (P920). P737 may be used to display total or to alternate flow and total.
- The Auxiliary Reading defaults are:
 - Index 1 = Transducer 1 level
 - Index 2 = Transducer 2 level
 - Index 3 = Control Gate level

P111 Relay Function

The Gate Control function sets up various I/O and parameters to suit this application.

When P111 = 63

- Relay 1 is allocated for gate control to raise the gate
- Relay 2 is allocated for gate control to lower the gate
- P165 becomes Gate Control Manual Override. Enter as x:y value (x = DI number, y = override action). When y = 1, the indexed relay is forced ON, when y = 2, the indexed relay is forced OFF. (P500 must be set for manual.)
- P500 specifies the DI that enables manual Relay 1 and 2 override per P165. 0 = none (factory setting).
- P502 specifies the DI used to detect control gate power failure. 0 = none (factory setting). When asserted, Relay 1 and 2 auto control is disabled, and automatically re-enabled when the condition subsides.
- P503 and P504 are not applicable
- All latching Pump Fault and Reset parameters (P505, P506, P507, etc.) pertain to Gate faults and affect both Relay 1 and 2.
- Relevant Modbus Registers 41400 – 41474 may be used to effect remote gate control via communications when the ERS 500 is in the Auto mode (per P500). Both gate relays cannot be turned on at the same time.

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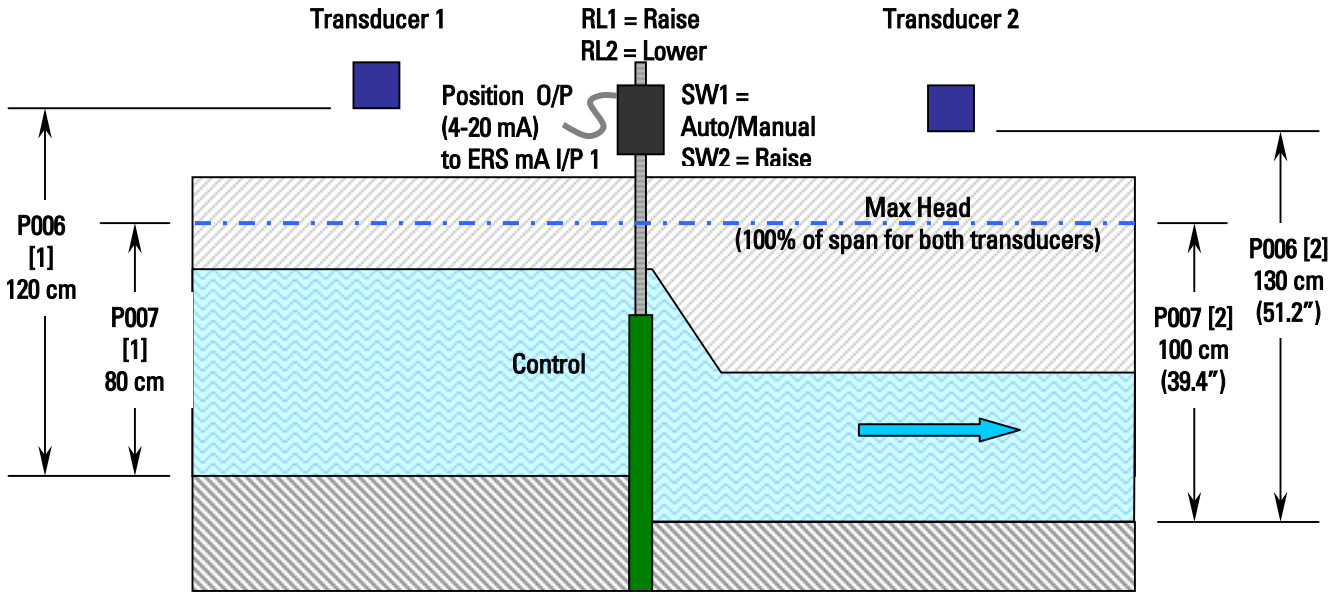
Application Example

Open Channel Control Gate

A remote site open channel is equipped with a motorized control gate constructed such that all flow must pass over the gate (not under or around it). The gate height must be controlled to maintain the downstream head within specified limits. Additionally, the flowrate and volume over the gate must be measured.

For this application, the EnviroRanger ERS 500 may be configured to monitor upstream and downstream head, control the motorized gate automatically, calculate the flowrate and totalize flow, and provide manual and remote communications overrides.

Flow is only calculated and totalized when the upstream level (Transducer 1) is greater than both the gate height (mA I/P # 1) and the downstream level (Transducer 2). Negative flow is not calculated nor totalized.



The following parameter values marked with an asterisk (*) are application dependent. The values shown are for illustration purposes only. Refer to the instruction manual for assistance selecting the actual values required for your application.

Quick Start Parameters

Parameter	Index	Value	Description
P001	0	9	Operation = OCM with variable zero
P002	0	1	Material = liquid
P003	1 and 2	2*	Max Process Speed = medium
P004	1 and 2	112*	Transducer = XRS-5
P005	0	2 (or 5)*	Units = cm (or inches)
P006	1	120*	Transducer 1 Empty = 120 cm (or 47.2")
	2	130*	Transducer 2 Empty = 130 cm (or 51.2")
P007	1	80*	Transducer 1 Span = 80 cm (or 31.5")
	2	100*	Transducer 2 Span = 100 cm (or 39.4")

Note: 100% span must equal common max head

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Relay Parameters

Parameter	Index	Value	Description
P111	1	63	Relay Function = Gate Control
P112	1	70*	Operate RL1 (raise the gate) when Transducer 2 head ≥ 70 cm
P114	1 and 2	0.1*	Continue operating the gate for 0.1 minutes (6 seconds)
P115	1 and 2	0.02*	Hold the gate for 0.02 hours (72 seconds) for head to stabilize
P111	2	63	Relay Function = Gate Control
P112	2	60*	Operate RL2 (lower the gate) when Transducer 2 head ≤ 60 cm
Additional alarm relay operation may be desired to warn high and low head levels, configure as usual			
P165	1	1:1	Override RL1 with manual "raise" switch connected to DI # 1.
P165	2	2:1	Override RL2 with manual "lower" switch connected to DI # 2.

mA Input Parameters

Parameter	Index	Value	Description
P250	1	2*	mA Input Range = 4 – 20 mA
P251	1	50*	4 mA = 50 cm (Minimum gate height wrt Transducer 1 empty)
P252	1	65*	20 mA = 65 cm (Maximum gate height wrt Transducer 1 empty)
The gate position mA output scaling and P251/P252 values must be precise for best system accuracy.			

Discrete Input Parameters

Parameter	Index	Value	Description
P270	1	2	Assert RL1 P165 manual override when NO switch on DI # 1 closes
P270	2	2	Assert RL2 P165 manual override when NO switch on DI # 2 closes
P270	3	2	Enable RL1/RL2 manual override when NO switch on DI # 3 is open
Manual mode must be enabled (P500 per P270-3) before "P165" overrides (per P270-1/2) are enabled			

Auto / Manual Parameter

Parameter	Index	Value	Description
P500	1 and 2	3	Enable override switches (P165) with "manual" switch on DI # 3
The ERS 500 must be in "manual" mode for P165 overrides, and Auto for "communications" overrides			

OCM Parameters

Parameter	Index	Value	Description
P600	0	1*	PMD = Exponential Device
P601	0	1.5*	Flow Exponent = 1.5 (typical of suppressed rectangular weir)
P603	0	30*	Max Head = 30 cm (Transducer 1 Max Head – Gate Min Height)
P604	0	100*	Max Flow = 100 m ³ / hour at Max Head
P605	0	----	Zero Head = not used (variable zero head = scaled mA input)
P606	0	4*	Time Units = hours (per Max Flow input value)