



Application Bulletin

000-1079 REV. C

SUBJECT: Model 1250 Hydroelectric Applications

Purpose:

- The INCON model 1250 Programmable Position Monitor has many applications in monitoring the rotary position of a synchro (Sel-Syn[®]) transmitter. This bulletin explains how to use the 1250 for those applications in a hydroelectric facility.

Scope:

- This bulletin applies to all models of 1250A and 1250B.

Associated Documents or Data:

- 000-1077 1250 Installation and Programming Manual

Introduction:

The model 1250 is a field programmable rotary position monitor that can be programmed for any engineering units. It eliminates the need for angular adjustment of the transmitter by use of a programmable position pre-set. The 1250 can provide a proportional analog signal, which can be interpreted as gate position, level, limit, etc...

A common application of five-wire synchro position indicator circuits is found at hydroelectric installations where they are used for remote indication of water level, gate position, gate limit position, and runner blade pitch. As more facilities are seeking to automate their control and data acquisition, these mechanical indication-only circuits lack the ability to interface to the digital control systems. The 1250 can be installed alongside of, or as a replacement to an existing mechanical synchro position indicator and will interface to the control system through an analog or digital signal as needed.

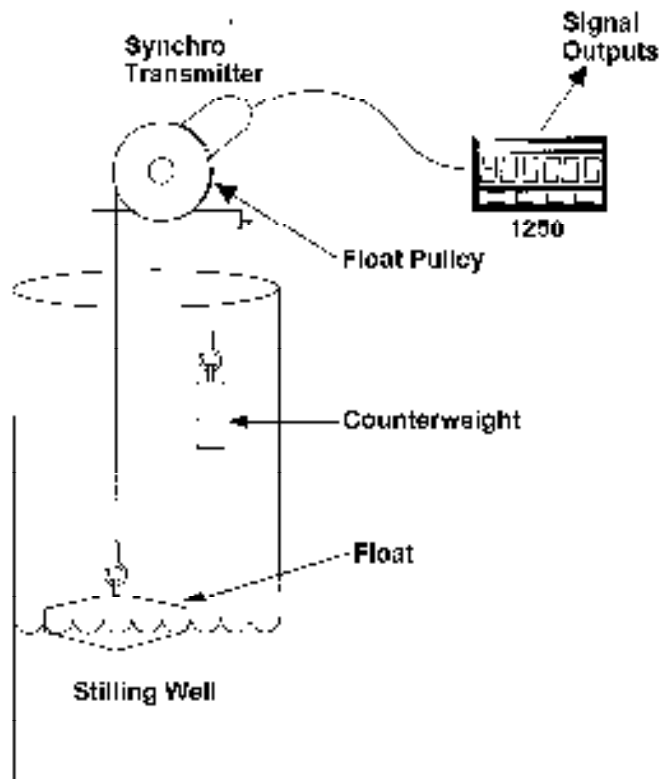
Applications:

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Water Level:

Water level management in a river system is crucial. Many utilities are seeking to monitor pond level, or headwater and tail water levels with SCADA. The 1250 can provide a SCADA compatible signal relative to water level. The headwater level or net head level signal is also important to the governor system as it regulates the speed and power output of the generator.

When coupled to a **Stevens Water Monitoring** (or equivalent) float level transmitter, the INCON 1250 can be used to monitor pond level, head water level, or tail water level with accuracy of +/- 0.003". The indicated level can be transmitted to supervisory systems via RS-232, RS-485, BCD, or analog signals. 1250's equipped with the RS-232 option can be programmed for a data-logging mode. The RS-232 output will interface with a serial ASCII printer.

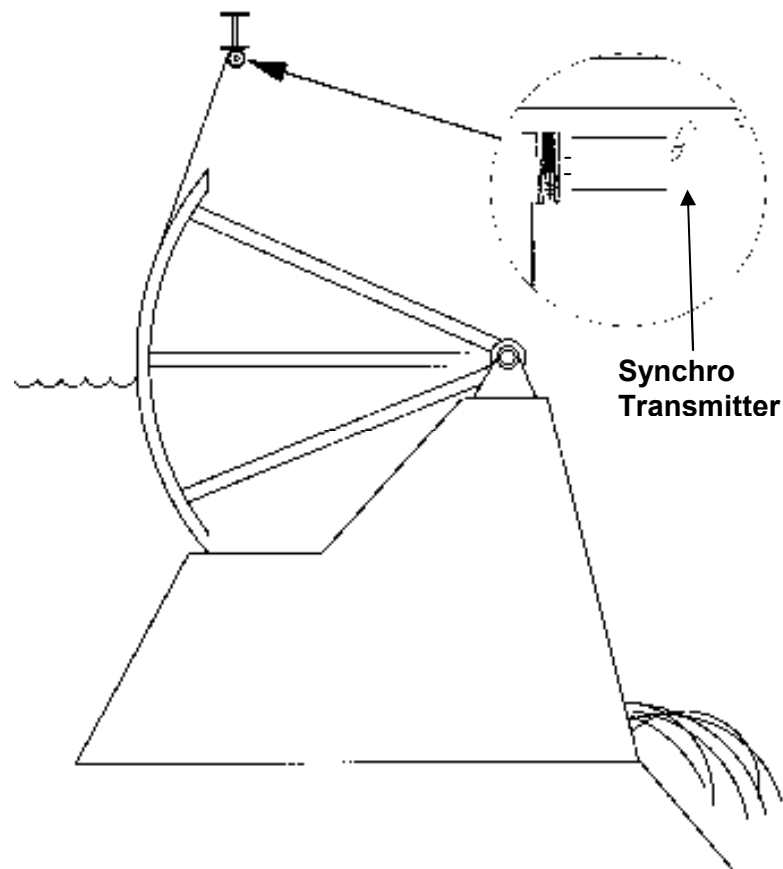


To program the 1250 for this application, the Linear Scaled Mode (see page 12 in the manual, Mode 1) is used. The circumference of the Float Pulley, in whatever units of measure you wish the display to read, would be programmed into the Scaled Mode Counts per Turn (see "OP 3" in the manual on page 8). Use the Set Present Position and Load Present Position functions (see "OP 17" and "OP 18" in the manual on page 8) to assign the present water level value. The analog output can be programmed to span a portion of the range of water level. Section 3.1.1 in the manual describes programming the analog output span. High and Low water level alarm limits can be programmed. Section 3.2 in the manual describes programming the relay limits.

Spillway Gate Position:

Spillway gates, Tainter gates, and log sluice gates serve as a means of evacuating water and debris from the reservoir to the downstream side of the dam. These devices are usually raised by means of a hoist system. They often employ a five-wire synchro circuit to transmit their position to the control room. The INCON 1250 can be used to monitor the position of a spillway gate and interface to SCADA or control systems.

The 1250 can be programmed to readout in any desired units of measure, percent, feet, cubic feet per minute, etc... If there is a non-linear relationship between the synchro transmitter rotation and the units of measure over the range of movement, this can be accommodated by programming a non-linear conversion table for the full span of movement.

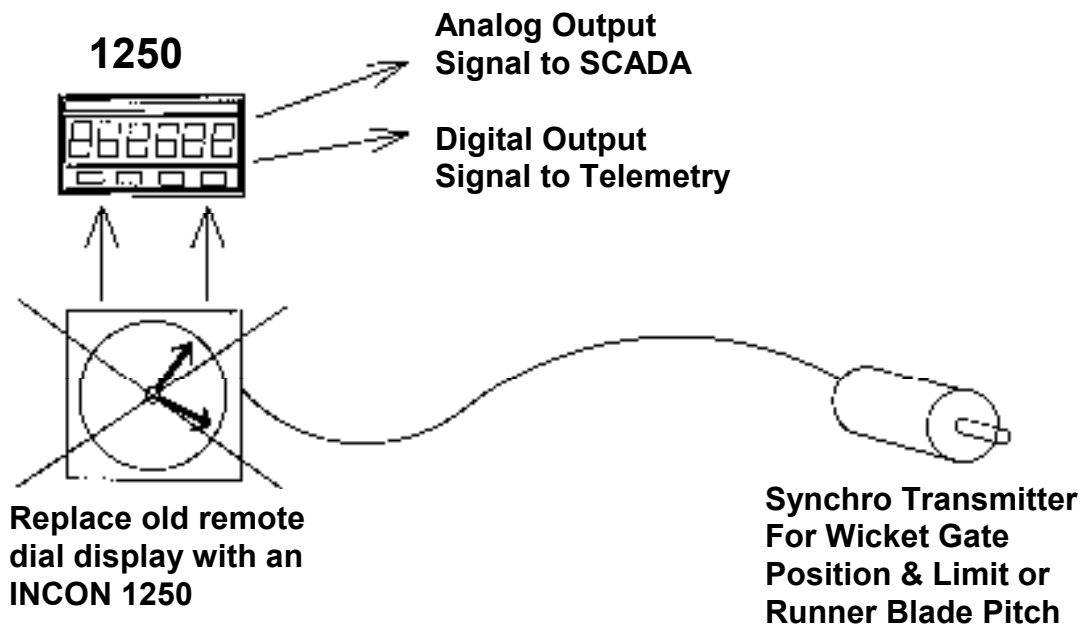


To program the 1250 for this application, the Non-Linear Scaled Mode (see page 12 in the manual, Mode 2) should be used. In this mode a Non-Linear conversion table must be programmed. This can be done manually, by entering the data point pairs (see page 12 in the manual), or automatically learned (see page 13). Using the automatic learning function is the easiest way to enter this data. The gate would be stopped in several positions from full closed to full open. The desired display value would be assigned for each position. The analog output can be programmed to span the full range of gate position. Section 3.1.1 in the manual describes programming the analog output span.

Wicket Gate Position and Limit, Runner Blade Pitch:

Wicket gates are a series of gates surrounding the inlet of the generator turbine. They are used to control the speed of the turbine by controlling the volume of water passing through the turbine. The wicket gates are controlled by a combination of gate limits, which some utilities use as a coarse speed adjustment, and speed governors, which serve as the fine adjustment. Five-wire synchro circuits are used to display the gate position and limit in the control room.

The Runner Blade Pitch is crucial to turbine efficiency. The governor controls this movement through a system of cams, cables, and pulleys. A five-wire synchro circuit is used to display the blade pitch in the control room. The INCON 1250 can be used to monitor the position of these key movements in a governor system and provide feedback to SCADA or control systems.



To program the 1250 for this application, the Linear Scaled Mode (see page 12, Mode 1) is used. A scale factor would have to be calculated to convert the degrees of transmitter rotation to the units of measure you wish the display to read. Use the formula $\frac{\text{\# of display counts changed in full range movement}}{\text{\# of transmitter degrees changed in full range of movement}}$ to calculate this scale factor value. This value would be programmed into the Scaled Mode Counts per Turn (see "OP 3" on page 8). Use the Set Present Position and Load Present Position functions (see "OP 17" and "OP 18" on page 8) to assign the present position value. The analog output can be programmed to span any range of position movement. Section 3.1.1 in the manual describes programming the analog output span.