

Water In, Sample Results Out - How Does That Work?

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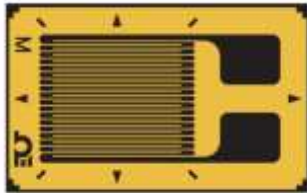


What we'll Look at

- **Pressure transducer**
- **Magnetic flow meter**
- **Ultrasonic level transducer**
- **Chlorine residual analyzer**
- **How the values are communicated to a PLC**
- **Converting to a digital signal for network communication**
- **Communication protocol**
- **Communications path**
- **HMI display**
- **SCADA and beyond**

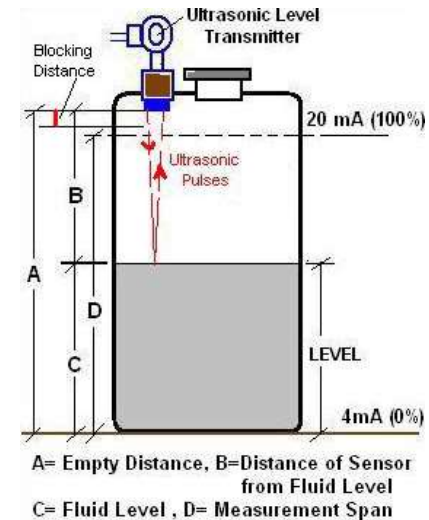
Pressure Transducers

- **Thin-film sensors**
- **Thick-film sensors**
- **Piezo-resistive sensors**



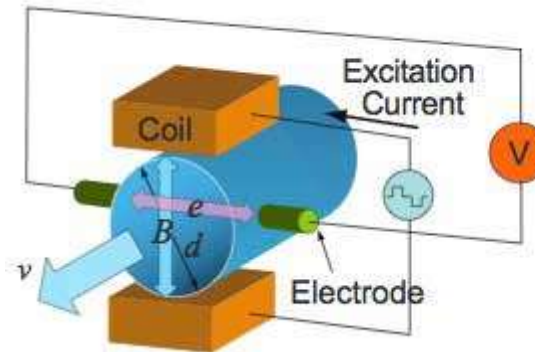
Ultrasonic - Level

- Ultrasonic level sensors are used for non-contact level sensing of liquids and solids.
- Uses high frequency (20 kHz to 200 kHz) acoustic waves
- The time it takes, “Time of Flight,” the sound to travel to and from the material



Magnetic Flow Meter

- A magnetic flowmeter operates by generating a magnetic field between a controlled volume of liquid flowing through the pipe.
- Faraday's law of induction
- Faster the flow greater the voltage



$$B \propto N \cdot I_{ex}$$

B: Magnetic Flux Density

N: Number of Coil Turns

I_{ex}: Excitation Current

$$e = k \cdot B \cdot v \cdot d$$

e: Electromotive Force

k: Constant

v: Mean Flow Velocity

d: Internal Diameter

CL2 Residual

- These devices work by using a chemical reaction with the water to separate electrodes that are used to determine chlorine concentration.
- **Colorimetric**
 - Brightness of light
- **Amperometric**
 - Current change



Input into a PLC

Analog Signal

- ± 5 V, ± 10 V, 0 V to 5 V, 0 V to 10 V, 4 to 20 mA, or 0 to 20 mA.

A to D Conversion



ELECTRICAL SYMBOL FOR ANALOG TO DIGITAL CONVERTER (ADC)

Digital

- Modbus
- Profibus
- HART



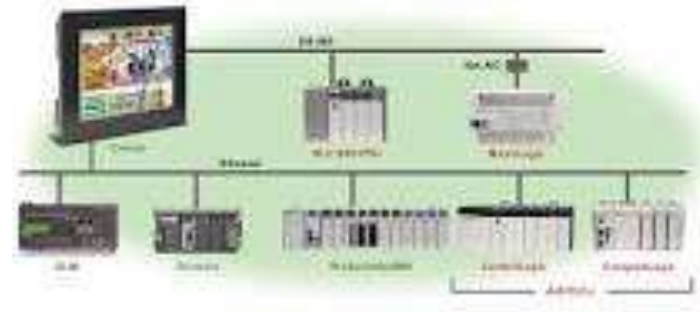
Output to a Network

Local Network Protocols

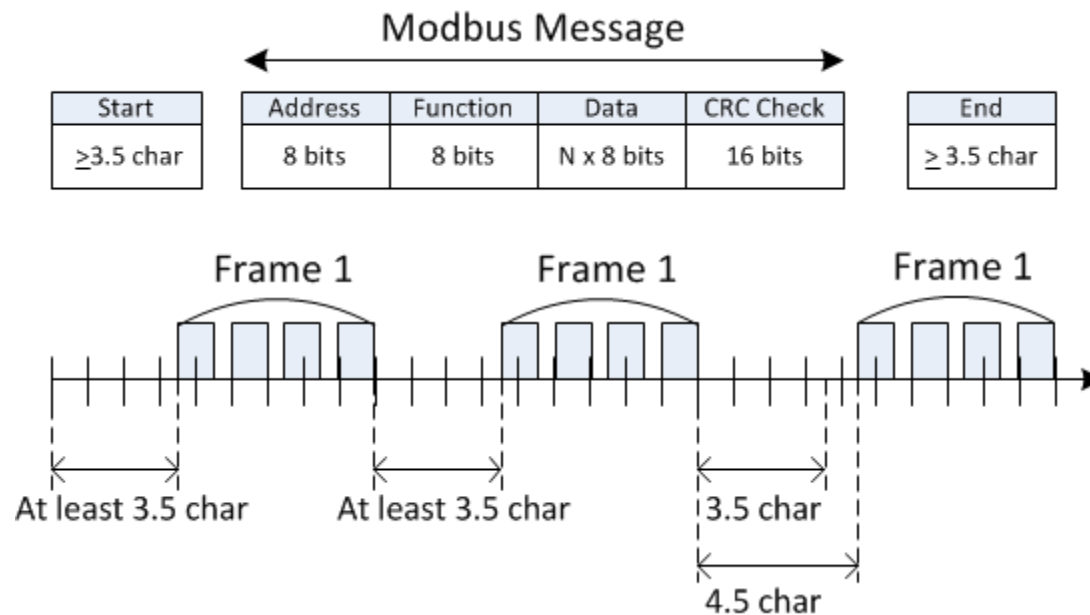
- OPC
- IGS
- Ethernet/IP
- DF1

Remote Protocols

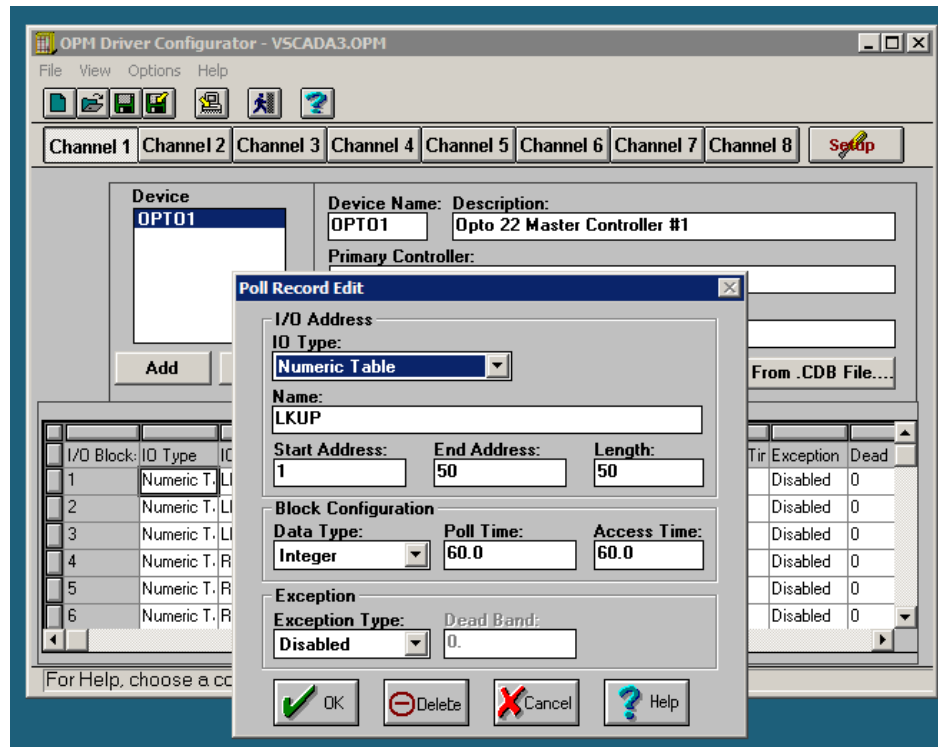
- DNP3
- Modbus
- Custom



Protocol Driver



Protocol Driver



HMI Database

Basic Alarm Advanced Proficy Historian

Tag Name : BRIARHILL_A11_PSI
 Description : Briarhill Booster 1, 2 & 3 Dpsi
 Previous : [] Next : [] ...

Addressing
 Driver : OPM Opto22 Mistic v6.006.00 (Test#042400) I/O Configuration ...
 I/O Address : OPTO3.NTBL.RTU3.1
 Signal Conditioning : 16BN Hardware Options: []

Scan Settings
 Process By Exception
 Scan Time : 15
 Phase At : []

Engineering Units
 Low Limit : 0
 High Limit : 600
 Units : psi

Linear Scaling
 Enabled
 Clamping
 Use EGU
 Raw Low : 0 Scale Low : 0
 Raw High : 65.535 Scale High : 600

Analog Alarm [?] [X]

Basic Alarm Advanced Proficy Historian

Enable Alarming

Alarm Options
 Remote Ack : []
 Alarm Suppression : []
 Target Value : []

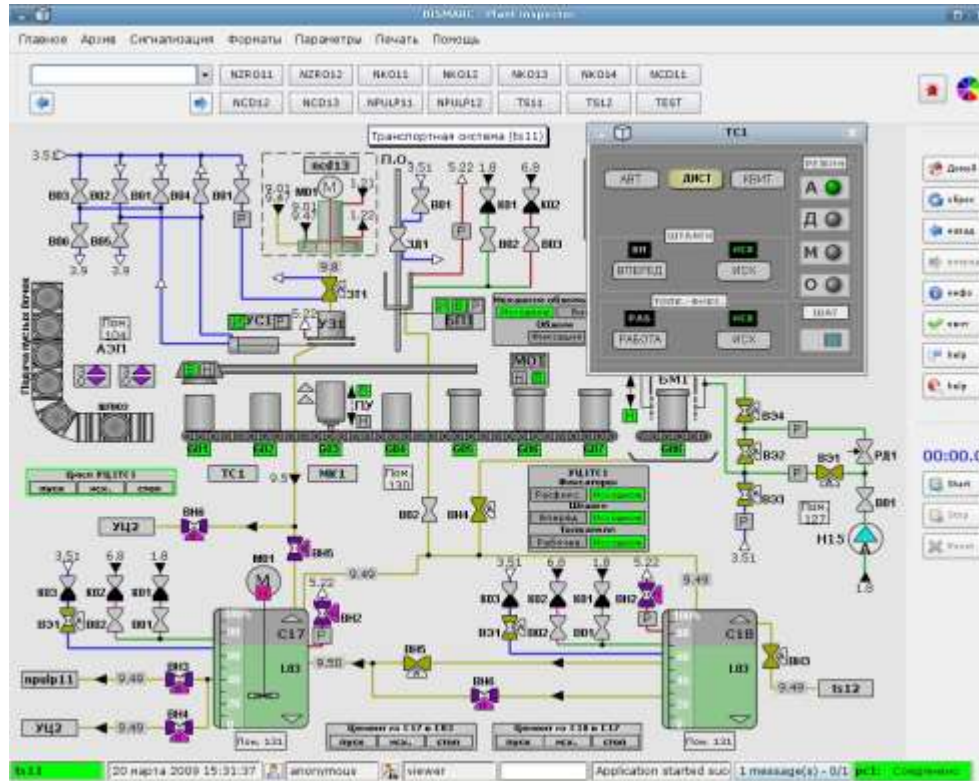
Alarm Areas
 VICTORY

Alarm Options

Type	Value	Priority	Contact	Out Mode	DelayTime	Re-Alarm
High High	200	HIGH			00:00	00:00
High	185	HIGH			03:00	00:00
Low	130	HIGH			03:00	00:00
LowLow	0	HIGH			00:00	00:00
RDC	200	LOW			00:00	00:00
DEV	10	LOW			00:00	00:00
Other		LOW			00:00	00:00

Dead Band : 1 Continuous Output Suppress COMM Alarm

HMI Display



- **SCADA and beyond**
- **Energy Management**
- **Chemical Storage Management**
- **Maintenance Management**
- **Hydraulic Modeling**



Summary

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Questions?

Thank you!

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