# PROPORTIONAL FEEDBACK

- Direct vs. Indirect Measurement
- Continuous vs. Discrete sensors
- Incremental and absolute



# DIRECT VS. INDIRECT

- Measuring position of a carriage is better than measuring rotation of leadscrew
- Measuring level in a tank or weight of a product is better than measuring flow
- Measuring temperature of an oven is better than measuring heater current
- Budget usually dictates whether direct or indirect measurement will be used

## CONTINUOUS AND DISCRETE SENSORS

- Most sensors are analog, and give readings on a continuous scale that must be quantized for use with a PLC.
- Position sensing can be done with encoders that give a quantized reading to start with
- Linearity and temperature coefficient are usually limiting factors on accuracy of continuous, analog sensors. Discrete sensors are limited by resolution.

# ABSOLUTE VS. INCREMENTAL

- An absolute sensor gives a single, unambiguous reading for a given position
- An incremental sensor indicates an incremental change in position
- Incremental sensors require a separate means of establishing "home" position



## INCREMENTAL ENCODERS

# Incremental encoders give relative position information

- count + and relative motion
- index pulse gives a once-per-revolution signal
- Resolution = 4x number of slots
  establish absolute ref point each power-on



## INCREMENTAL ENCODERS

- Quadrature signal outputs
- Single-ended vs. differential output



## Absolute Encoders

- doubling resolution requires adding another photodiode/LED pair
- cost is much higher than incremental
- does not require seeking to establish reference location



## HYBRID INCR/ABSOLUTE ENCODERS

 add more information to index channel to reduce amount of seeking required to find reference position.

Pseudorandom

#### POTENTIOMETER

 A potentiometer (or pot) is a variable resistor wired to obtain a variable DC voltage proportional to position



## MAGNETOSTRICTIVE SENSOR



# HIGH SPEED INPUT/OUTPUT

- High speed counters
   Use XO,X1, and X2
- Pulse Output

   Uses YO and Y1
   Uses YO and Y1
- One of six modes can be used

   Mode 10: High speed counter
   Mode 20: Quadrature counter
  - Mode 30: Pulse Output
  - Mode 40: High speed interrupt
  - Mode 50: Narrow pulse capture
  - Mode 60: Narrow pulse reject (normal mode)



8 Discrete Inputs

- Up counter, counts to 99,999,999
- Up to 5kHz input rate (incr. on XO low->hi)

74 1-35

- Count is compared to preset values to generate events.
- Reset can be X2 or ladder logic









In

 Setup consists of writing values to several special memory locations

put	Configuration Register	Function	Hex Code Required
(0	V7634	Counter Clock	0001
(1	V7635	Filtered Input	xx06, xx = filter time 0 - 99 ms (BCD)
(2	V7636	Counter Reset (no interrupt)	0007* (default) 0207*
		Counter Reset (with interrupt)	0107* 0307*
		Filtered Input	xx06, xx = filter time 0 - 99 ms (BCD)

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Preset	Preset V-memory Regis- ter	Special Relay Number	Preset	Preset V-memory Regis- ter	Special Relay Number
1	V2321 / V2320	SP540	13	V2351 / V2350	SP554
2	V2323 / V2322	SP541	14	V2353 / V2352	SP555
3	V2325 / V2324	SP542	15	V2355 / V2354	SP556
4	V2327 / V2326	SP543	16	V2357 / V2356	SP557
5	V2331 / V2330	SP544	17	V2361 / V2360	SP560
6	V2333 / V2332	SP545	18	V2363 / V2362	SP561
7	V2335 / V2334	SP546	19	V2365 / V2364	SP562
8	V2337 / V2336	SP547	20	V2367 / V2366	SP563
9	V2341 / V2340	SP550	21	V2371 / V2370	SP564
10	V2343 / V2342	SP551	22	V2373 / V2372	SP565
11	V2345 / V2344	SP552	23	V2375 / V2374	SP566
12	V2347 / V2346	SP553	24	V2377 / V2376	SP567





# TROUBLESHOOTING MODE 10

- Won't count:
  - check ladder logic (using CT76?)
  - check wiring and signals (sinking/sourcing, pulse width)
  - check reset input status
  - check parameters (use Data View)
- Presets don't do anything
  - check preset values (BCD, correct addresses)
  - check interrupt routine (int #0, enabled at start, int rtn at end of ladder)
  - check special relay numbers
- Counts, but won't reset
  - check reset input or internal reset logic

## MODE 20 QUADRATURE COUNTER



# MODE 20

• Must have an encoder that will work with 12-24VDC, or use external convertor



## MODE 20 CONFIGURATION

Input	Configuration Register	Function	Hex Code Required
X0	V7634	Phase A	0002 (default) quadrature, absolute 0 to 99999999
			0012 quadrature, absolute -8388608 to 8388607
X1	V7635	Phase B	0000
X2	V7636	Counter Reset (no interrupt)	0007
		Discrete filtered input	1006





Load constant K20 into the accumulator. This selects Mode 20 as the HSIO mode.

Output this address to V7633, the location of the HSIO Mode select register.

Load the constant required to configure X0 as Phase A input.

Output the constant to V7634, the location of the setup register for X0.

Load the constant required to configure X1 as Phase B input.

Output the constant to V7635, the location of the setup register for X1.

Load the constant required to configure X2 as an external reset.

Output the constant to V7636, the location of the setup register for X2.

Set C0 on at powerup to enable counting.

### MODE 20 LOGIC

