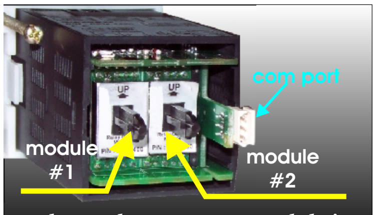
# Z-TRAUQ INC.

## ESM Recipes

**for ESM Indicators xx00 and Controllers xx50**

The ESM series of process/temperature controllers and indicators is the most versatile in the industry.
They can be fitted with outputs. If only one output module is required, it can be inserted into either slot. The ESM will only allow you to program the ones that are installed. The slot closest the communication port is recognized as Output 2; the other is Output 1 and the one which is incorporated into the structure of the ESM is Output 3. The latter is always recognized as Output 3 whether any output modules are plugged in or not. This is true for all ESM xx00 and xx50 series. Other ESM models don't use our smart I/O modular system so outputs carry different nomenclature.




*when only one output module is necessary, either slot can be used.*

**INPUT TYPES**

Can be either a thermocouple (type L, J, K, R, S, T, B, E, N, C) a RTD (two or three wires) or analog (0-50mV, 0-5vdc, 0-10vdc, 0-20mA, 4-20mA).
Of the analog outputs, the most popular is mA.

**DISTANCE & LEVEL - mA INPUT for ESM xx00**

Suppose we want the display to indicate distance. When the object being sensed is furthest away, say 5 metres (≈16 ft), we can live with little resolution. As the distance diminishes, we require greater accuracy. We can use multi-point calibration to accomplish this. We can have 20mA=500cm and 4mA=2cm (or vice versa). The display will read 500 when the object is furthest and as it approaches, the reading will gradually decrease in a non linear fashion.
Enter the programming mode and advance to the Technician's settings. Press the Set button and the PinP parameter appears. Press the Set button again to arrive at iSSL. Press the Up Arrow key three times. Press the Set button to accept the new setting '2' and advance to UASL. Press the Up Arrow until the value is 4. The unit now understands that the input is 4-20mA. Had our input been 0-20mA, we would have stopped at 3. Press the Set key to commit this value to memory and advance to dPnt. One decimal place is wanted; press the Up arrow twice followed by the Set key. This next setting will allow the linear input signal to give us a non-linear reading. Press the Up arrow three times until the display reads 2. Now we can choose the display values that will correspond to the input values (pls see table 1). The first three values decrease by 100 for each additional mA; the next four by 50; the four following these by 20; then two by 5 and the remaining values by 2. The ESM will automatically scale the reading for intermediate values (e.g. 4.2 mA = 480, 18.75 mA = 4.5, etc.). Enter the desired values for each calibration point; then, exit the programming mode.

| Parameter | mA input | Reading | Outputs |
|---|---|---|---|
| P00 | 4 | 500.0 | |
| P01 | 5 | 400.0 | |
| P02 | 6 | 300.0 | |
| P03 | 7 | 250.0 | |
| P04 | 8 | 200.0 | |
| P05 | 9 | 150.0 | |
| P06 | 10 | 100.0 | AL3 N.O. |
| P07 | 11 | 80.0 | |
| P08 | 12 | 60.0 | |
| P09 | 13 | 40.0 | |
| P10 | 14 | 20.0 | |
| P11 | 15 | 15.0 | AL1 |
| P12 | 16 | 10.0 | |
| P13 | 17 | 8.0 | |
| P14 | 18 | 6.0 | |
| P15 | 19 | 4.0 | |
| P16 | 20 | 2.0 | AL2 Latch |

*table 1*

**SETTING UP THE OUTPUTS**

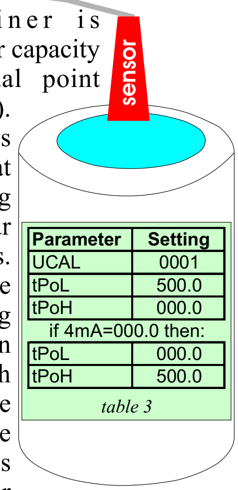
Our example uses Output 3, included in every model, and two additional relay output modules we plugged into our base model.

| Parameter | Value | Result |
|---|---|---|
| Lou1 | 0 | configured as alarm out |
| ALt1 | 1 | output energized when actual value falls below set value (SV) |
| ALH1 | 0 | output deenergizes as soon as actual value exceeds SV |
| Aon1 | 0 | no time delay from fault |
| AoF1 | 0 | no time delay to reset |
| Lou2 | 0 | configured as alarm out |
| ALt2 | 1 | output energized when actual value falls below set value (SV) |
| ALH2 | 0 | output deenergizes as soon as actual value exceeds SV |
| Aon2 | 0 | no time delay from fault |
| AoF2 | LtCH | requires manual reset |
| Lou3 | 0 | configured as alarm out |
| ALt3 | 1 | output energized when actual value falls below set value (SV) |
| ALH3 | 10 | output deenergizes when actual value exceeds SV + 10% |
| Aon3 | 0 | no time delay from fault |
| AoF3 | 0 | no time delay to reset |

*table 2*

It makes no difference to the unit which value is assigned to trigger it. In our example, Output 3 will operate before Output 1 and Output 2 is the last to be affected and it is programmed to remain in the fault mode while the other two will automatically reset when the actual value returns above the alarm values. Output 1 will reset instantly while #3 will reset when the value reaches 110 in view of the values entered for ALH1 and 3 respectively.

**LINEAR APPLICATIONS - LEVEL / CAPACITY**


When the container is symmetrical and level or capacity is desired, select dual point calibration (UCAL = 1). Again, the ESM series can be easily set up so that 4mA = the largest reading or the least. We'll use 0 - 500 for our example. Use table 3 for the settings. Compare the resulting readings in table 4 with those in table 1. You can see that the values displayed for the same input values differ greatly and that those of table 4 descend in equal amounts (full scale reading ÷ full scale input or in this case 500÷16 = 31.25). If our input had been 0 to 20mA, then the display would increase or decrease by 25 for every milliamp of difference (500÷20=25).
Of course, the output(s) are programmed in accordance with table 2.

| Parameter | Setting |
|---|---|
| UCAL | 0001 |
| tPoL | 500.0 |
| tPoH | 000.0 |
| if 4mA=000.0 then: | |
| tPoL | 000.0 |
| tPoH | 500.0 |

*table 3*

| Parameter | mA input | Reading |
|---|---|---|
| tPoL | 4 | 500.0 |
| *In dual point calibration you assign the reading's values to tPoL and tPoH; the rest is done by the ESM.* | 5 | 468.8 |
| | 6 | 437.5 |
| | 7 | 406.3 |
| | 8 | 375.0 |
| | 9 | 343.8 |
| | 10 | 312.5 |
| | 11 | 281.3 |
| | 12 | 250.0 |
| | 13 | 218.8 |
| | 14 | 187.5 |
| | 15 | 156.3 |
| | 16 | 125.0 |
| | 17 | 93.8 |
| | 18 | 62.5 |
| | 19 | 31.3 |
| tPoH | 20 | 000.0 |

*table 4*

**FILL + EMPTY + HIGH ALARM + LOW ALARM**

We'll use a 4-20mA input again and at 20mA the tank is empty and full at 4mA. The display will read 0 - 220 gallons. We want to start a pump when the level reaches 10 gal and would like it to stop at 200 gal. At 200, the signal is given to open a valve. If the level reaches 5 gal or 220 gal, we want to sound an alarm. We'll need a xx50 because we require one of our outputs to operate at two different values - high and low alarms.

Insert two relay outputs. Then program the unit as follows:

**PinP settings to change:**

ISSL = 2 (for analog input)
UASL = 4 (tells unit that the input is 4 - 20mA)
DPnT = 1 (one decimal place)
UCAL = 1 (dual point calibration)
tPoL = 999 (at this time, we will not enter 220 for the two point calibration.)
tPoH = 0 ( 20mA = 0)
LoL = 0
UPL = 999

**IoP1 settings to change:**

OUT1 = L out (logic function)
Lou1 = 0 (alarm output)
Alt1 = 1 (process low alarm)
ALH1 = 190.0 (output 1 will energize at 10 and remain energized until it reaches 200)

**IoP2 settings to change:**

OUT2 = L out
Lou2 = 0
Alt2 = 4 (by using this alarm type, this output will energize at 5 and 220; but, will be de-energized between these two values) This is not available in xx00 models)
ALH2 = 0.0

**out3 settings to change:**

out3 = Lout
Lou3 = 0
Alt3 = 0
ALH3 = 190.0 (this allows this output to energize at 200 and de-energize at 10)

**Now we will enter the set points:**

PSEt = ?
We'll be using the deviation band alarm diagram (in the manual under Alarm Option & Output Forms) to help with this calculation seeing as we've programmed ALr2 to use this alarm form. So, ALr2 = 107.5 and since the Alarm 2 set point is 5, then, PSEt = 5 + 107.5; therefore, PSEt = 112.5)
ALr1 = 10.0 (the value at which we want the pump to start)
ALr2 = 107.5 (this is the mid point between the low and high alarm values)
ALr3 = 200.0 (the value at which we want the valve to open)

Now, go back to the PinP parameters and change tPoL to 220. This will give us our proper dual point calibration so that 4mA = 220 gal. If you try to program this value at the outset, you won't be able to set the HYS1 & 3 values greater than 110 because this parameter is adjustable up to 50% of full scale. By using 999 as our tPoL setting initially, our full scale becomes 999 instead of 220, thus giving us the possibility to set the HYS to 190.

Finally, the high and low alarms will reset automatically when the low value is exceeded and the actual value slips below the high value. These can be programmed to latch, thus requiring manual intervention to reset or a minimum time delay added for the alarm to sound.

**MODIFYING THE INPUT VALUE**

As stated earlier, the ESM family can accept various types of signals. We've looked at a few applications involving mA but the millivolt (mV) is generated by different makes and types of sensors such as strain gauges, pressure transducers, humidity sensors etc. The most common mV output is 0 - 50. These values can give us a full scale reading of -1999 to 9999. BUT what if the output is 1mV for every volt in? Let's say the sensor operates at 24vdc and that for every volt in, it develops 1.3mV thus giving us a maximum output of 24 x 1.5 = 36mV. We are 14mV or more than a quarter shy of the 50 mV value that will give us a full scale deflection. In other words, if this sensor was developing its maximum value, the display would read 36/50 of what we require. Presuming we wanted the maximum output to read 9999, we either apply 33.3 vdc to the sensor to generate the 50 mV (33.3 x 1.5 = 49.95mV) or manipulate the 36 mV otherwise the maximum reading would be 9999 x 36/50 = 7199.

Good thing you purchased an ESM!

Program the unit as follows:

**PinP settings to change:**

ISSL = 2 (for analog input)
UASL = 0 (tells unit that the input is 0-50mV)
DPnT = 0 (no decimal place)
UCAL = 1 (dual point calibration)
CoEF = 1.39 (this multiplier will change our input from 0-36 to 0-50. The ESM will make the necessary calculations to maintain the linear integrity throughout the scale.)
tPoL = 0 (we want 0 mV = to the lowest setting which in this case is 0)
tPoH = 9999 (50mV = the maximum reading)
LoL = 0
UPL = 9999

Remember, as in our previous examples, we could have chosen 0mV = 9999 and 50mV =0.

Now that was EZ!

Speaking of which, we also have some ready made recipes for our EZM Counters and Timers. Just ask! It's, well... easy☺