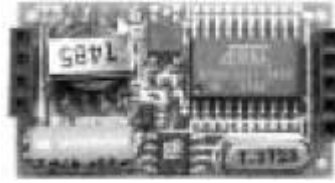


# Future Design Controls 300 Series DIN Controls Retransmission Modules: CM94-3, CM94-4 and CM94-5

## 1: Features:

- High Precision: 15-bit resolution
- High Linearity: +/- 50 PPM of Range
- High Stability: +/- 25 PPM/ C
- Output – Configurable
  - 4-20mA or 0-20mA
  - 1-5 VDC or 0-5VDC
  - 0-10 VDC
- Digital Calibration
- Input/output optically isolated



### CM94-X Module

- CM94-3 = mA output
- CM94-4 = 1-5/0-5 VDC output
- CM94-5 = 0-10 VDC output

## 2: Introduction

The CM94-X [X = 3, 5 or 5] are optional retransmission modules for the following 300 Series products: FDC 2500, 9300, 8300 & 4300 temperature/process controllers. The modules accept a serial digital data from the 300 Series internal microprocessor converting the data into an analog current or voltage output with each model providing a different output type: mA, 0-5VDC and 0-10VDC.

The modules contain a 15-bit digital to analog converter, a dc-to-dc voltage converter, photo-coupler for input/output isolation and digital calibration circuit. Each module is calibrated during production. The calibration data are stored permanently in re-programmable flash ROM to prevent long-term drift. The modules output vary with part number: as shown above below the module picture. The conversion characteristics are shown in the following diagrams.

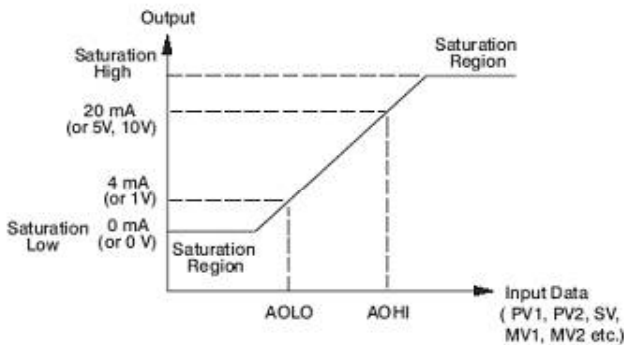


Fig.1 4-20mA Characteristic

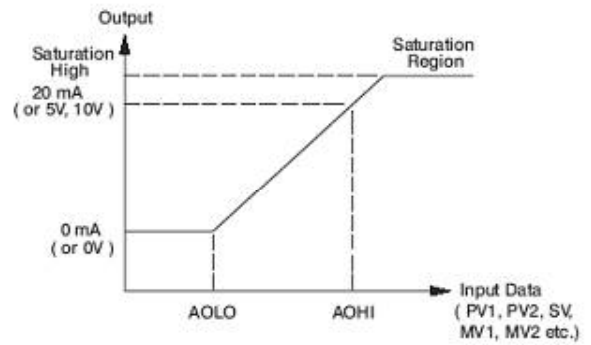


Fig.2 0-20mA Characteristic

### Note:

The AOLO is analog output low scale value preset by the user.  
The AOHI is analog output high scale value preset by the user.

The output signal is determine by the following formulas:

(1) 4-20 mA (1-5 V), PV1, PV2, or SV conversion

$$\text{mA (or V)} = 4\text{mA (1V)} + \frac{\text{PV1 (or PV2, SV)} - \text{AOLO}}{\text{AOHI} - \text{AOLO}} \times 16\text{mA (4V)}$$

(3) 0-20mA (0-5 V, 0-10V), PV1, PV2 or SV conversion

$$\text{mA (or V)} = \frac{\text{PV (or PV2, SV)} - \text{AOLO}}{\text{AOHI} - \text{AOLO}} \times 20\text{mA (5V, 10V)}$$

(2) 4-20mA(1-5V), MV1 or MV2 conversion

$$\text{mA (or V)} = 4\text{mA (1V)} + \frac{\text{MV1 (or MV2)}}{100.0} \times 16\text{ mA (4V)}$$

(4) 0-20mA(0-5V, 0-10V), MV1 or MV2 conversion

$$\text{mA (or V)} = \frac{\text{MV1 (or MV2)}}{100.0} \times 20\text{ mA (5V, 10V)}$$

### 3. Setup procedures

- (1) Select a correct part number of the retransmission module for the specific product. Fits the module in the product.
- (2) Select an appropriate code for the COMM parameter to specify a desired output function according to the following table:

Part No	CM94-3		CM94-4		CM94-5
Function	4-20 mA	0-20 mA	1-5V	0-5V	0-10V
COMM Code	4-20	0-20	1-5V	0-5V	0-10

- (3) Adjust AOF (analog output function ) balue to specify which parameter is desired to be retransmitted according to the following table:

AOF Code	PV1	SV	PV2	MV1	MV2
Retransmit	Input 1	Setpoint	Input 2	Output 1	Output 2

- (4) Adjust AOLO value to meet the desired output zero (corresponding to 4mA, 0mA, 1V or 0V).
- (5) Adjust AOHI value to meet the desired output span (corresponding to 20mA, 5V or 10V).
- (6) Check if the function and accuracy are acceptable.

### 4. Re-calibration

The modules are calibrated during production. Since there is no variable resistor inside, the users can't re-calibrate modules by themselves without the aid of a specific calibration system. If the user intends to change the output value, he can adjust AOLO value for output zero and adjust AOHI value for the output span. The procedure should be performed several times until the output values meet the requirements because the span adjustment may affect the zero value. The user also can apply the previous formulas to solve the equations and obtain the new values of AOLO and AOHI directly to prevent a trial and error process. The above re-calibration method can not apply for the MV1 or MV2 retransmission because zero and span for MV1 and MV2 are fixed (i.e. 0 and 100.0%). Since the modules have good stability, the accuracy is beyond the industrial requirement, the re-calibration is unnecessary for the most applications.

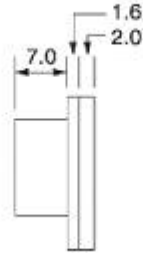
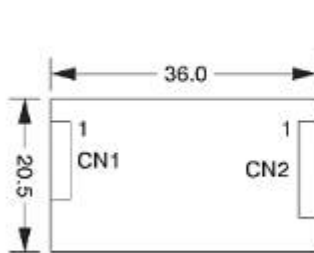
### 5. Specifications

Resolution: 15 bits  
Accuracy: +/- 0.05% of span +/- 0.0025%/ C  
Load resistance: 0-250 ohms (for current output)  
1K ohms minimum (for voltage output)  
Output Regulation: 0.01% for full load change  
Output Setting Time: 0.1 sec. (stable to 99.9%)  
Isolation Breakdown Voltage: 1000 VAC Minimum

Integral Linearity Error: +/-0.005% of span  
Temperature Effect: +/- 0.0025% of span / C  
Saturation Low: 0 mA (or 0V)  
Saturation High: 22.2mA min. (or 5.55V, 11.1V min)  
Linear Output Range: 0-22.2ma(0-20mA or 4-20mA)  
0-5.55V (0-5V, 1-5V)  
0-11.1V (0-10V)

## 6. Mechanical Data and Pin Assignment

### CM94-3, CM94-4, CM94-5



#### Pin Function: CN1-1:

CN1-2:

CN1-3: TX1(+) (Output +)

CN1-4: TX1(-) (Output -)

CN2-1:

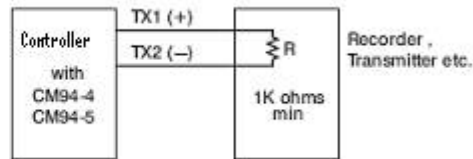
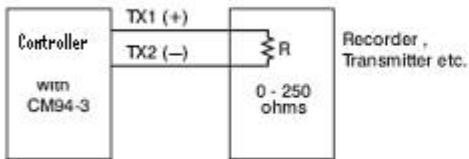
CN2-2: VCC (+5V Power In)

CN2-3: GND( Power Return )

CN2-4: SI (Serial Data In)

CN2-5:

## 7. Connection Diagram



## 8. Ordering Information

Part No	CM94-3	CM94-4	CM94-5
Function	0-20mA / 4-20mA	0-5V / 1-5V	0-10V
Applicable Products	FDC-9300, 2500, 4300, 8300		