



# Infrastructure for the Architecture

Creating an electrical infrastructure that maximizes the reliability of your critical control circuits

## Signal Conditioners - Thermocouple Application Solutions for Long Wire Runs

### Application

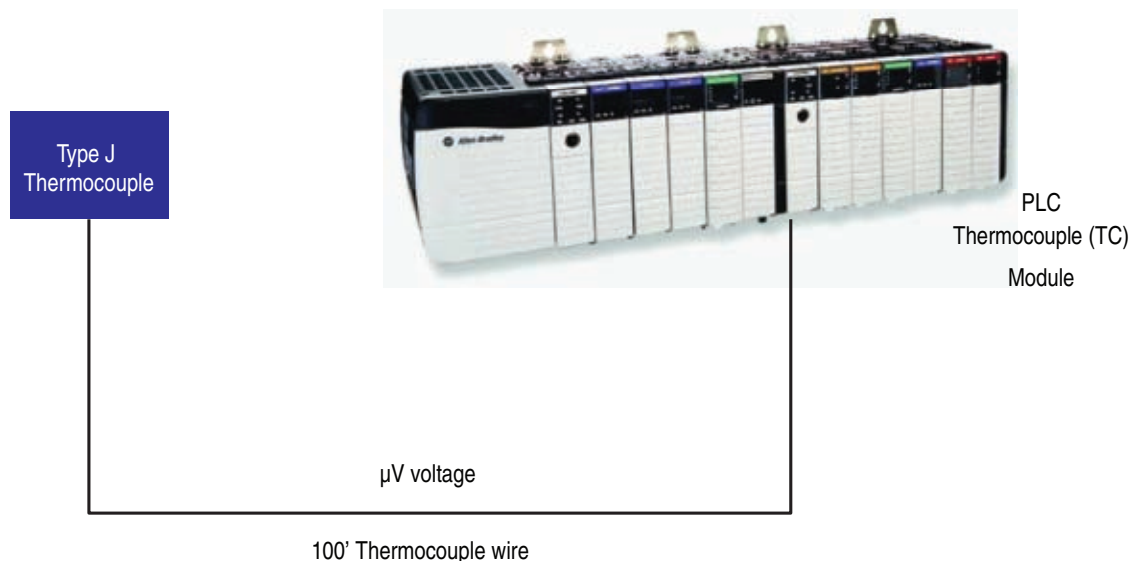
Care needs to be taken when using thermocouples. The entire length of the thermocouple is the sensor, so the shortest possible length is a key consideration. Additionally, the output signal generated by a thermocouple is a low level voltage signal (micro volts) and excessive lengths of thermocouple wire act as an antenna to any stray EMI. So, a 100 foot distance in an industrial environment would eliminate the consideration of a point to point thermocouple wiring scheme.

An additional factor is that the existing ControlLogix analog card does not interface directly with the thermocouple, so either an additional thermocouple Card needs to be used or the thermocouple signal needs to be converted to a standard current (4-20mA) or voltage (0...10VDC) signal.

### Initial Situation

Type J thermocouple positioned 100 ft from the ControlLogix cabinet.

Existing analog input card with an open channel that requires a 4...20mA input signal.



### Advantages

- Direct connection
- No additional components

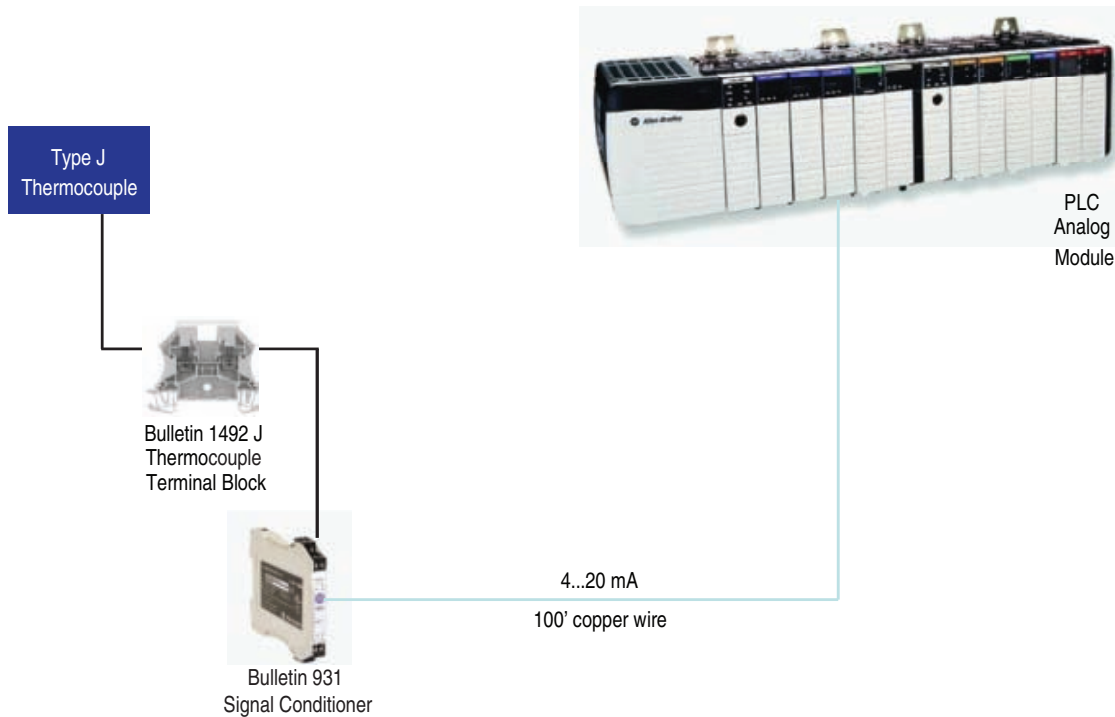
### Disadvantages

- Larger investment for functionality that may not be required/utilized
- Bigger, fixed PLC footprint - due to required and costly thermocouple module
- Uses 100' of costly thermocouple wire
- Susceptible to EMI and ground loops
- Inaccurate temperature

## Component Solution - Signal Conditioner

Type J thermocouple positioned 100 ft from the ControlLogix cabinet.

Bulletin 1492 J thermocouple terminal block and 931 Signal conditioner convert signal and allow for 100' of copper wire - which is more durable and improves the signal quality.



### Component Solution Bill of Materials

Product	Cat. No.	Qty
Terminal Block	1492-JTC3J	1
Signal Conditioner Option1	931H-T1C1D-DC	1
Signal Conditioner Option2	931S-T9C2D-DC	1
Signal Conditioner Option 3	931U-C9C7C-BC	1

### Advantages

- Cost Effective
- Uses existing PLC Analog Module
- Minimal Thermocouple wire
- Uses 100' common copper wire
- Excellent EMI immunity
- Accurate temperature
- Modular panel assembly
- Metal matching of thermocouple terminal block and thermocouple
- Eliminates ground loop potential

### Disadvantage)

- Requires more components
- Requires auxiliary power source

## Summary

The recommended configuration is as follows:



A short length of thermocouple wire can be run from the temperature monitoring point and terminated directly to the 1492 Thermocouple Terminal Block. The 1492 Thermocouple Terminal Block utilizes matching metal contacts, thus eliminating any errors in measurement due to dissimilar metal effects. This 1492 Thermocouple Terminal Block also allows for an efficient modular assembly method that protects the fragile thermocouple wire. Another short length of thermocouple wire is then routed from the 1492 thermocouple terminal block to the input of a 931 signal conditioner. The 931 signal conditioner converts the thermocouple signal to a standard 4-20 mA current loop signal. This current loop signal is then connected over 100' of common copper wire to the available input of the ControlLogix analog card.

An added benefit of the signal conditioner is that it also isolates the thermocouple from the PLC and eliminates any potential ground loops.

Visit [ab.com](http://ab.com) for more information on [Signal Conditioners](#).

ControlLogix, Allen-Bradley and Rockwell Automation are trademarks of Rockwell Automation Inc.

**[www.rockwellautomation.com](http://www.rockwellautomation.com)**

---

**Power, Control and Information Solutions Headquarters**

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846