IRt/c™
Tech Note #94

IN-LINE PRE-CALIBRATED TRANSMITTER FOR EASY, RELIABLE INSTALLATION

Model t/c.XMTR™- * - ** 4-20 mA Transmitter

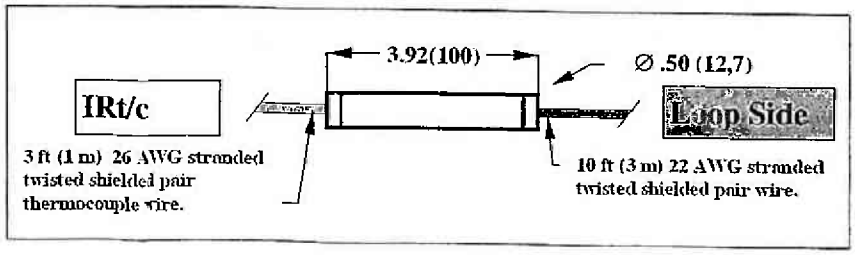
Current loop transmitters for thermocouples have traditionally been designed as "hockey pucks" in order to fit thermowell heads, thus complicating installation for applications not using a thermowell, and requiring a housing for protection. Additionally, they generally have to be calibrated to a specific range, usually with thermocouple simulators or other such device, thus requiring significant set up time and the possibility of unauthorized recalibration.

Of greatest concern is the general stability and accuracy of cold junction compensation systems in conventional transmitters, in PLC input cards, etc. High performance temperature control systems, such as those employing IRt/c's, require accurate stable cold junction references over a wide range of ambient temperatures, since any error in the cold junction system appears as a full error in control, i.e. a 1° shift at the cold junction results in a 1° error in control.

The t/c.XMTR is designed to overcome all of these costly inconveniences by:

- In-line design is only slightly larger than the cable and requires no mechanical support.
- Pre-calibrated for thermocouple type and temperature range eliminates all adjustments, requirements for simulators, etc.
- Hermetically sealed stainless steel construction is suitable for the harshest service without any additional packaging.
- Super-efficient internal thermal design eliminates gradients that cause errors.

The t/c.XMTR is specifically designed to interface to any model IRt/c (or any conventional thermocouple) by a simple thermocouple connector or splice. The 2-wire current loop can be used in any conventional current loop circuit that is scaled for the temperature range of interest.



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Model Selection

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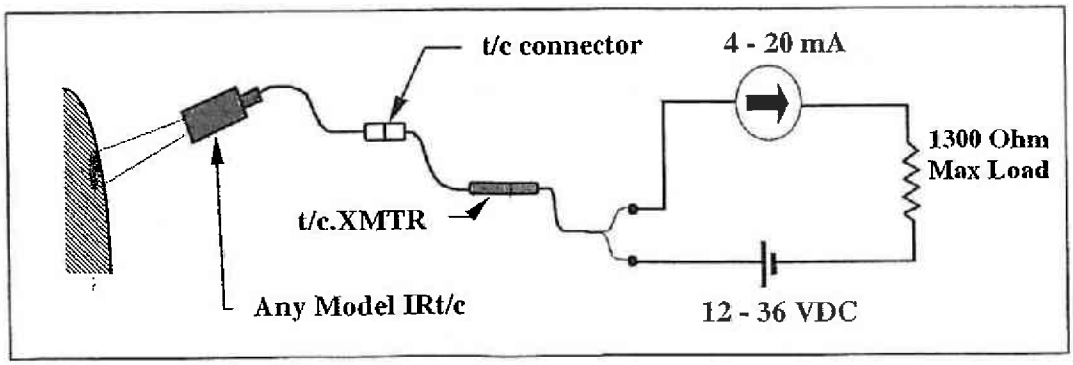
1. Select the correct IRt/c model for the application: target temperature, target material, field-of-view.
2. Select the t/c.XMTR model for the t/c type and temperature range from the table below.

Model Numbers *example: t/c.XMTR-J-150*	**J150 K150**	**J500 K500**	**J1200 K1200**	**K2100**	**S3000**
Temperature at 4 mA	32°F (0°C)				
Temperature at 20 mA	150°F (65°C)	500°F (260°C)	1000°F (540°C)	2000°F (1100°C)	3000°F (1650°C)

Installation

1. Install IRt/c as normal.
2. Connect IRt/c output cable to the thermocouple input side of the transmitter using standard t/c connector, splice, or other standard method of connecting thermocouple cables. Transmitter should be located in a an environment no higher than 158°F (70°C) in temperature. Additional t/c extension wire may be added as required. Use of twisted shielded t/c wire is recommended (same as on the IRt/c and transmitter), and maintain shield connections.
3. Check load on transmitter and power supply voltage for correct range (12 VDC minimum @ 10Ω; to 36 VDC minimum @ 1KΩ).
4. Set readout device (controller, computer, PLC, etc.) for 4 to 20 mA range to match the t/c.XMTR model range.
5. Perform final calibration of IRt/c installation in accordance with IRt/c instructions, using offset on current loop readout device.
6. Installation complete.



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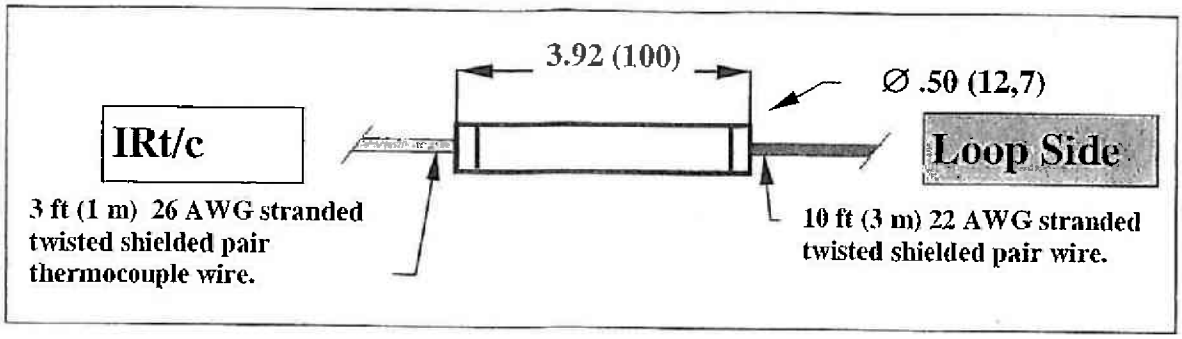
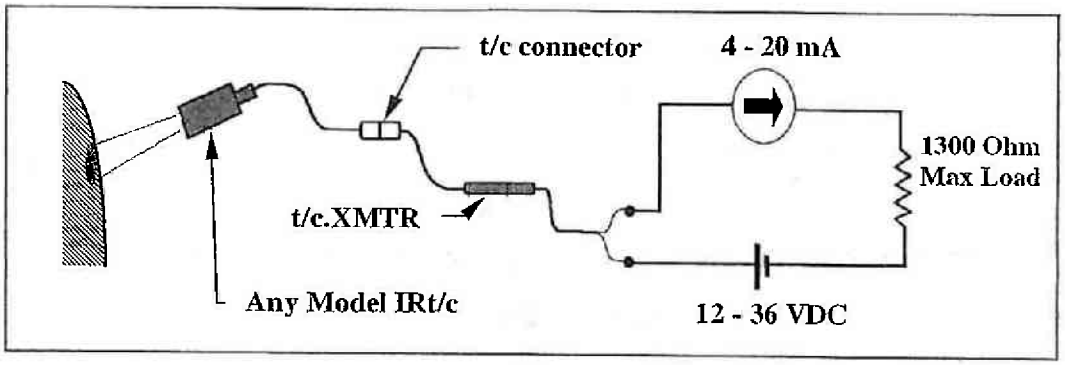
t/c.XMTR™

In-Line Pre-Calibrated 4-20 mA Thermocouple Transmitter





Model Numbers *example: t/c.XMTR-J-150*	J150 K150	J500 K500	J1200 K1200	K2100	S3000
Temperature at 4 mA	32°F (0°C)				
Temperature at 20 mA	150°F (65°C)	500°F (260°C)	1000°F (540°C)	2000°F (1100°C)	3000°F (1650°C)
Accuracy	± 0.1% F.S. conversion of thermocouple mV input to mA output				
Speed of Response	160 msec (10Hz bandwidth)				
Operating Range	32 to 158°F (0 to 70°C)				
Temperature Drift	< 0.02% F.S. per °C				
Output Noise	< 1μV rms (100Hz bandwidth)				
Input Break Indication	Upscale: goes to > 20 mA				
Power Supply @ Load	12 VDC minimum @ 10Ω; to 36 VDC minimum @ 1KΩ				
Storage Temperature	-85 to 257°F (-65 to 125°C)				
Weight	4.1 oz (116 g) with cables				
Housing	Stainless steel, hermetically sealed, meets or exceeds all applicable NEMA ratings, housing electrically isolated from signal.				

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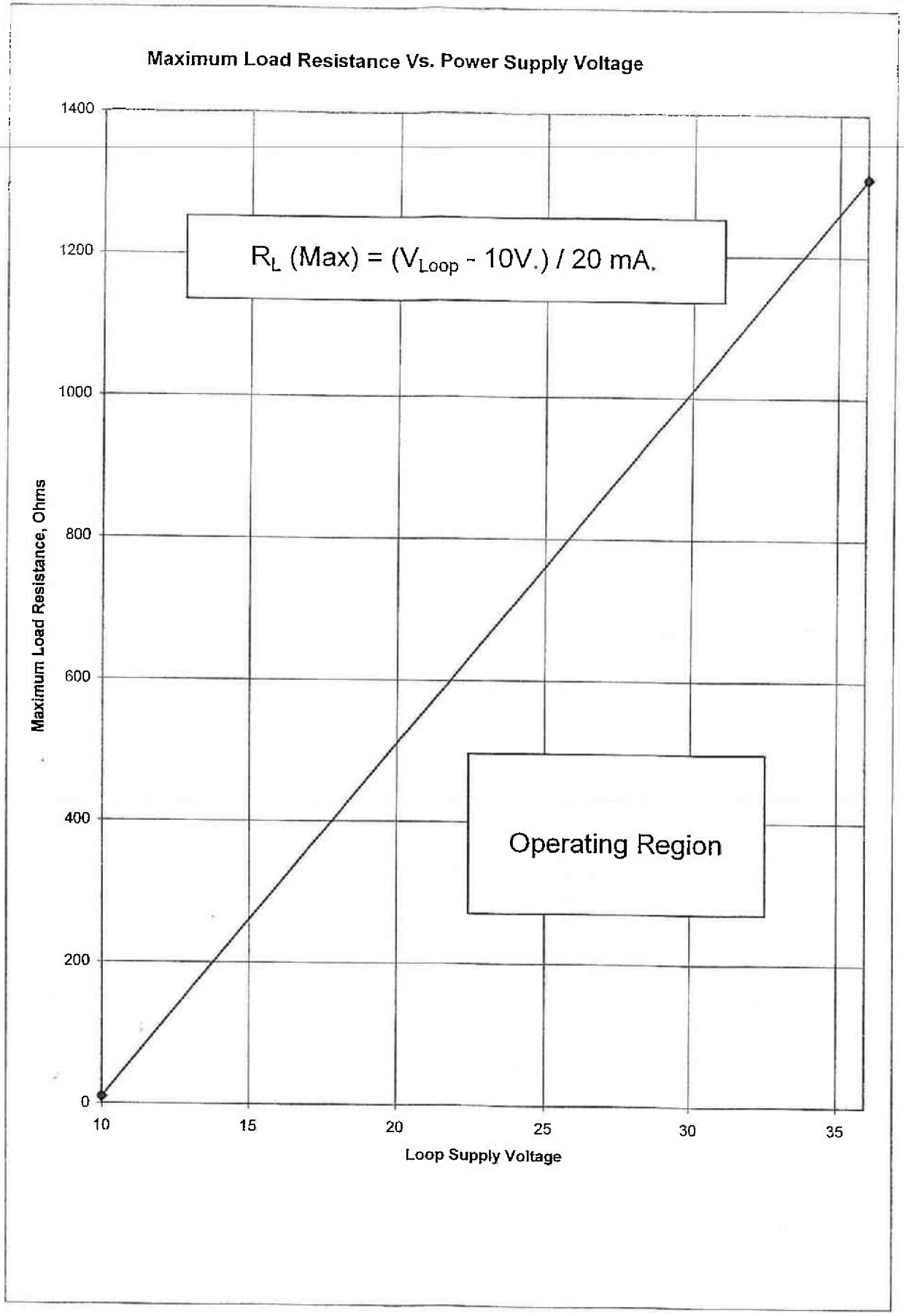
IRt/c Transmitter Installation

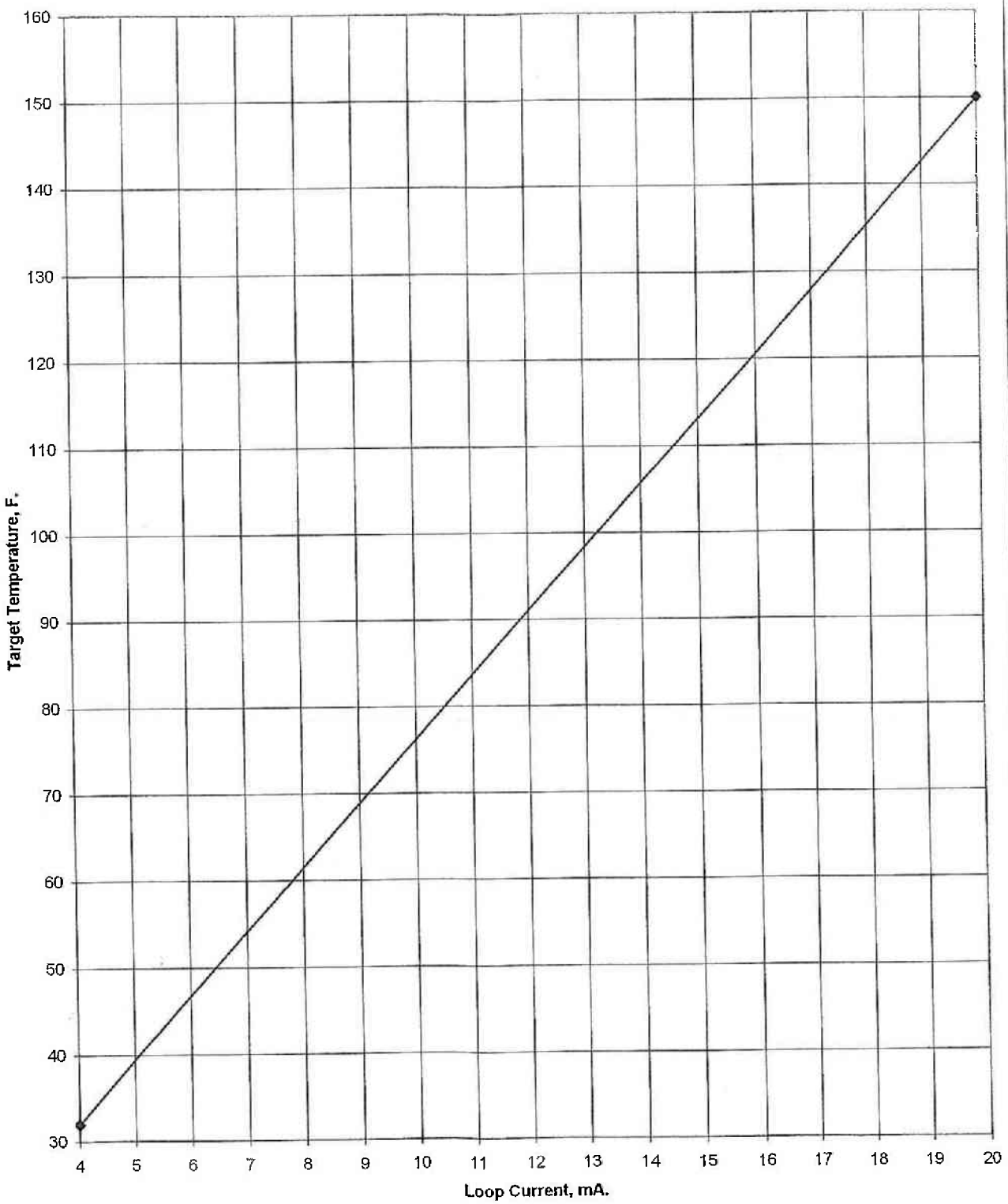
When installing the IRt/c Transmitter, connecting the metal stainless steel transmitter body to an earth ground is strongly recommended. The IRt/c body (if used) or the shield drain wires may be connected to the earth ground, however, best results will be obtained when connecting the transmitter body itself to the earth ground. This will protect the temperature measurement system in two ways:

- It will protect the transmitter (and IRt/c, if used) against damage due to static electricity discharge by providing a low impedance path to ground. Static electricity discharge can (and does!) cause irreparable damage to the internal components of the devices.
- The transmitter body acts as an overall shield for the internal components. It is also electrically connected to the drain wire of the shielded thermocouple cable. If the transmitter body (or IRt/c body) is connected to earth ground the low level electrical thermocouple signals will be protected against the undesirable effects of stray electric and magnetic fields.

For optimum performance, thermocouples attached to the input of the transmitter should have shielded wire leads and have the drain wire of the thermocouple shield connected to the drain wire of the shielded transmitter thermocouple input. Additionally, to minimize pickup of 'noise' from the surrounding environment, do not coil together long lengths of current loop cable or thermocouple wire.


Maximum Load Resistance Vs. Power Supply Voltage
1400
1200
1000
800
600
400
200
0
Maximum Load Resistance, Ohms
R_L (Max) = (V_{Loop} - 10V.) / 20 mA.
Operating Region
10
15
20
25
30
35
Loop Supply Voltage

Temperature/Current Conversion
J, K - 150 Model t/c Transmitters



Temperature/Current Conversion
J,K - 500 Model t/c Transmitter