Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

TEMPERATURE

☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
☑ Wire: Thermocouple, RTD & Thermistor
☑ Calibrators & Ice Point References
☑ Recorders, Controllers & Process Monitors
☑ Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

☑ Transducers & Strain Gauges
☑ Load Cells & Pressure Gauges
☑ Displacement Transducers
☑ Instrumentation & Accessories

FLOW/LEVEL

☑ Rotameters, Gas Mass Flowmeters & Flow Computers
☑ Air Velocity Indicators
☑ Turbine / Paddlesheel Systems
☑ Totalizers & Batch Controllers

pH/CONDUCTIVITY

☑ pH Electrodes, Testers & Accessories
☑ Benchtop/Laboratory Meters
☑ Controllers, Calibrators, Simulators & Pumps
☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION

☑ Data Acquisition & Engineering Software
☑ Communications-Based Acquisition Systems
☑ Plug-in Cards for Apple, IBM & Compatibles
☑ Datalogging Systems
☑ Recorders, Printers & Plotters

HEATERS

☑ Heating Cable
☑ Cartridge & Strip Heaters
☑ Immersion & Band Heaters
☑ Flexible Heaters
☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

☑ Metering & Control Instrumentation
☑ Refractometers
☑ Pumps & Tubing
☑ Air, Soil & Water Monitors
☑ Industrial Water & Wastewater Treatment
☑ pH, Conductivity & Dissolved Oxygen Instruments

C E

User's Guide

OMEGA ENGINEERING, INC.

An OMEGA Technologies Company
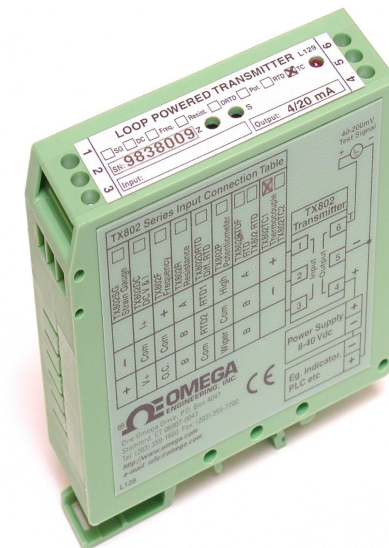
http://www.omega.com
e-mail: info@omega.com

TX802TC SERIES

2 WIRE THERMOCOUPLE TRANSMITTER

OMEGAnet℠ On-Line Service http://www.omega.com	Internet e-mail info@omega.com

Servicing North America:

USA:
ISO 9001 Certified
One Omega Drive, Box 4047
Stamford, CT 06907-0047
Tel: (203) 359-1660   FAX: (203) 359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1
Tel: (514) 856-6928   FAX: (514) 856-6886
e-mail: canada@omega.com

For immediate technical or application assistance:

USA and Canada:
Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA℠
Customer Service: 1-800-622-2378 / 1-800-622-BEST℠
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN℠
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

**Mexico and
Latin America:**
Tel: (95) 800-TC-OMEGA℠   FAX: (95) 203-359-7807
En Espanol: (203) 359-7803   e-mail: espanol@omega.com

Servicing Europe:

Benelux:
Postbus 8034, 1180 LA Amstelveen, The Netherlands
Tel: (31) 20 6418405   FAX: (31) 20 6434643
Toll Free in Benelux: 06 0993344
e-mail: nl@omega.com

Czech Republic:
ul. Rude armady 1868, 733 01 Karvina-Hranice, Czech Republic
Tel: 420 (69) 6311627   FAX: 420 (69) 6311114
e-mail: czech@omega.com

France:
9, rue Denis Papin, 78190 Trappes
Tel: (33) 130-621-400   FAX: (33) 130-699-120
Toll Free in France: 0800-4-06342
e-mail: france@omega.com

Germany/Austria:
Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
Tel: 49 (07056) 3017   FAX: 49 (07056) 8540
Toll Free in Germany: 0130 11 21 66
e-mail: germany@omega.com

United Kingdom:
ISO 9001 Certified
25 Swannington Road,   P.O. Box 7, Omega Drive,
Broughton Astley, Leicestershire, Irlam, Manchester,
LE9 6TU, England   M44 5EX, England
Tel: 44 (1455) 285520   Tel: 44 (161) 777-6611
FAX: 44 (1455) 283912   FAX: 44 (161) 777-6622
Toll Free in England: 0800-488-488
e-mail: uk@omega.com

It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.
WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negliegence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:
1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:
1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

The Proper Installation & Maintenance

MOUNTING

(1) Mount in a clean environment in an electrical cabinet on DIN or EN mounting rail.
(2) Do not subject to vibration or excess temperature or humidity variations.
(3) Avoid mounting in cabinets with power control equipment.
(4) To maintain compliance with the EMC Directives the TX802TC2 is to be mounted in a fully enclosed steel cabinet. The cabinet must be properly earthed, with appropriate input / output entry points and cabling.

WIRING

(1) All cables should be good quality overall screened INSTRUMENTATION CABLE with the screen earthed at one end only.
(2) Signal cables should be laid a minimum distance of 300mm from any power cable.
(3) For 2 wire current loops Austral Standard Cables B5102ES is recommended.
(4) It is recommended that you do not ground current loops and use power supplies with ungrounded outputs.
(5) Lightning arresters should be used when there is a danger from this source.
(6) Refer to diagrams for connection information.

THERMOCOUPLES.

(1) Avoid locating the thermocouple where it will be in a direct flame.
(2) Never insert a porcelain or refactory tube suddenly in a hot area. Pre-heat gradually while installing.
(3) Locate it where the average temperature will be measured. It should be representative of the mass. If necessary use several thermocouples to obtain the average temperature.
(4) Immerse the thermocouple far enough so that the measuring junction is entirely in the temperature to be measured: nine to ten times the diameter of the protection tube is recommended. Heat that is conducted away from the junction causes an error in reading.
(5) If the thermocouple is mounted horizontally and the temperature is above the softening point of the tube, a support should be provided to prevent the tube sagging. Otherwise install the tube vertically.
(6) Keep the junction head and cold junction in the approximation of the ambient temperature. Especially in the Noble Metal Class.

EXTENSION WIRE.

(1) Use the correct thermocouple extension or compensation cable. i.e. Thermocouple type, insulation type, correct colour coding.
(2) If possible install extension or compensation cable in a grounded conduit by themselves. Never run electrical wires in the same conduit.
(3) All wires that must be spliced should be soldered, or a proper thermocouple termination block used.
(4) Lightning arrestors should be used where there is a danger from this source.

COMMISSIONING

(1) Once all the above conditions have been carried out and the wiring checked apply power to the TX802TC2 loop and allow five minutes for it to stabilize.
(2) Due to the limits of error in a standard thermocouple probe, and standard extension wire and compensating wire, an error can occur. For example in a type K thermocouple installation an error of 2.2C or 0.75% FSO (whichever is greater) can occur. To check the variable being measured use a calibration standard thermo couple at the same immersion depth.
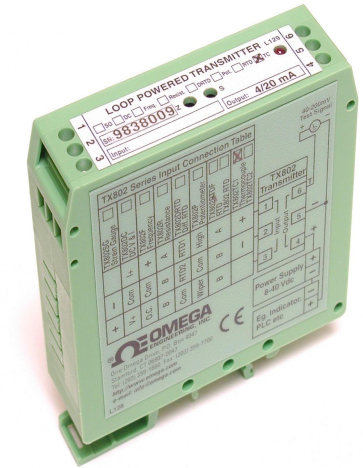
MAINTENANCE

(1) Check thermocouples in place with a calibration thermocouple at the same immersion depth.
(2) Do it regularly - at least once a month.
(3) Replace defective protection tubes - even if they look good they may not be air or gas tight.
(4) Check out extension cable circuits.
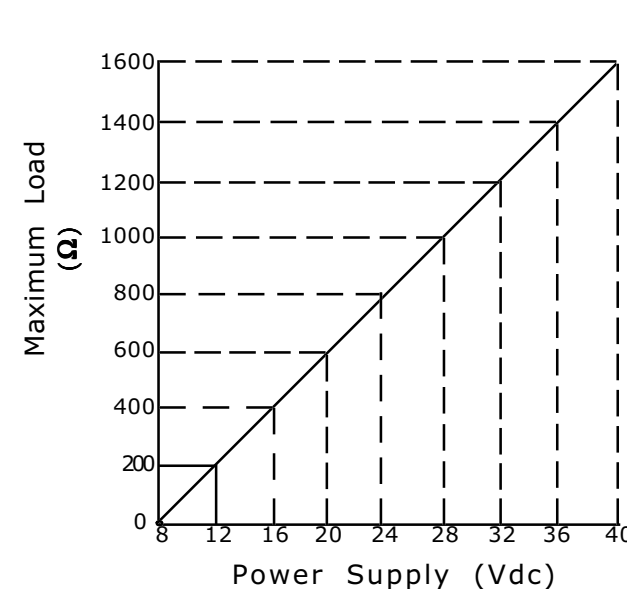
TX802TC1&2 Thermocouple Transmitter.

Isolating Thermocouple Input to 4~20mA Output Loop Powered Transmitter.

Features.

- Available for Types J, K, N, R, S, T.
- Field Programmable Input Ranges.
- Output Linear with Temperature.
- Internal Cold Junction Compensation.
- Isolated Input to Output 2.0kV.
- High Accuracy.
- 40~200mV Output Test Signal.
- LED Indication of Loop Current.
- Low Cost.
- Easy to Install.
- Compact DIN Rail Mount Enclosure.
- Available Standard or Special Calibration.
- Reverse Polarity Protection.
- Corrosion Proofed Circuit Board & Components by Isonel 642. (Except Terminals & DIP Switches)

Graph Of Maximum Load Versus Power Supply.

Maximum Load (Ω) vs Power Supply (Vdc)

Y-axis (Maximum Load Ω): 0, 200, 400, 600, 800, 1000, 1200, 1400, 1600
X-axis (Power Supply Vdc): 8, 12, 16, 20, 24, 28, 32, 36, 40

Enclosure Dimensions.

79.0   22.5
93.0   90.5   85.5
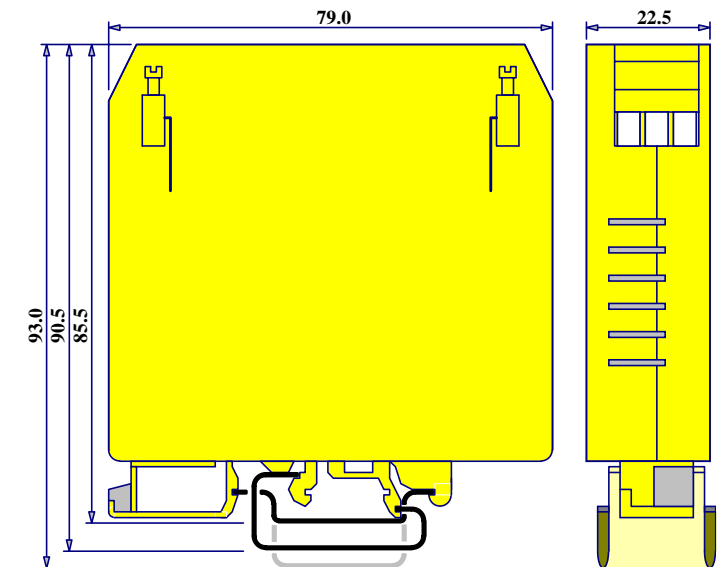
Quality Assurance Programme.

The modern technology and strict procedures of the ISO9001 Quality Assurance Programme applied during design, development, production and final inspection grant the long term reliability of the instrument.

TX802TC2 Specifications.

Input

Note 1: The input range must be within the specified **min / max range** of the thermocouple type.

Note 2: Each transmitter is only rangeable within the specified 'Thermocouple Type'.

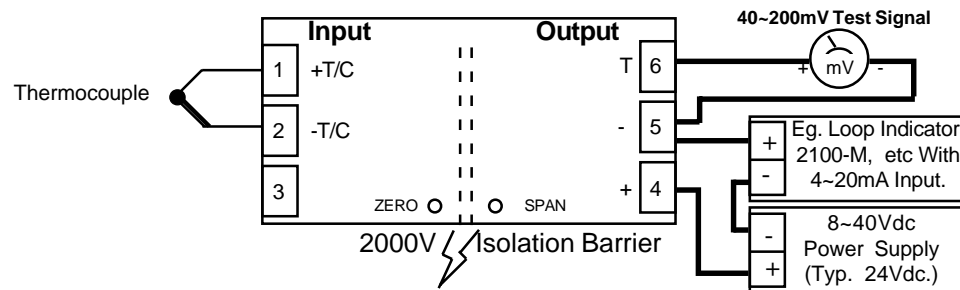| Thermocouple Type			Field Programmable Input Ranges								Linearity and Accuracy:
	Specification	Specification	Zero Offset				Span (Max. In - Zero)				%, ±1C (±2F)
Type	Range (C)	Range (F)	Min.(C)	Max.(C)	Min.(F)	Max.(F)	Min.(C)	Max.(C)	Min.(F)	Max.(F)	
J	0~800	0~1500	0	600	0	1100	200	800	400	1500	0.25
K	0~1200	0~2200	0	1000	0	1800	200	1200	400	2200	0.25
N	0~1200	0~2200	0	1000	0	1800	200	1200	400	2200	0.25
R	400~1700	750~3100	0	1300	0	2400	400	1700	750	3100	0.5
S	400~1700	750~3100	0	1300	0	2400	400	1700	750	3100	0.5
T	-100~200	-150~400	-100	100	-150	200	100	300	200	550	0.5

	- Impedances	Input Impedance = 1MΩ Min.
		Thermocouple Lead Resistance = 100Ω Max.
Cold Junction Compensation Drift		<0.03C/C (0.06F/F) Typical.
Output	-mA	2 wire 4~20mA. (Loop Powered.)
	-mV	40~200mV ∝ 4~20mA. (Indicative Test Signal Only.)
		Other Output Voltages Available. eg 1~5V.
Power Supply		8~40Vdc.
Supply Voltage Sensitivity		<±0.005%/V FSO.
Output Load Resistance		800Ω @ 24Vdc. (50Ω/V Above 8Vdc.)
Maximum Output Current		Limited to <28mA.
Sensor Fail	-Upscale	23mA Min.
	-Downscale	3.6mA Max.
Repeatability		<±0.1% FSO Typical.
Ambient Drift		<±0.02%/C FSO Typical.
Noise Immunity		125dB CMRR Average. (2.0kVac RMS Limit.)
R.F. Immunity		<1% Effect FSO Typical.
Isolation Voltage		2.0kVac/dc Input to Output for 60sec.
Response Time		200msec Typical. (10 to 90% 50msec Typical.)
Operating Temperature		0~70C.
Storage Temperature		-20~80C.
Operating Humidity		90%RH Max. Non-Condensing.
Construction		6.6 Polyamide Thermoplastic Rail Mount Enclosure.

Note 1. Specifications based on Standard Calibration Unit, unless otherwise specified.
Note 2. Due to ongoing research and development, designs, specifications, and documentation are subject to change without notification. No liability will be accepted for errors, omissions or amendments to this specification.
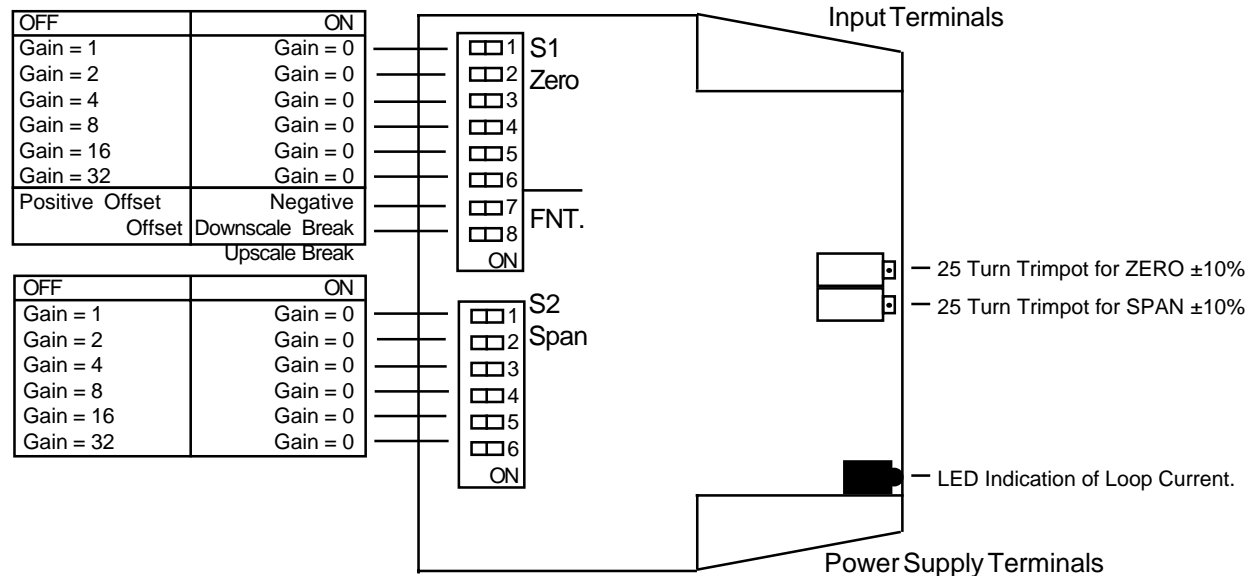
Examples of Input Connection.

2000V Isolation Barrier

Plan View of TX802TC2 Adjustments.

OFF	ON
Gain = 1	Gain = 0
Gain = 2	Gain = 0
Gain = 4	Gain = 0
Gain = 8	Gain = 0
Gain = 16	Gain = 0
Gain = 32	Gain = 0
Positive Offset	Negative Offset
	Downscale Break
	Upscale Break

OFF	ON
Gain = 1	Gain = 0
Gain = 2	Gain = 0
Gain = 4	Gain = 0
Gain = 8	Gain = 0
Gain = 16	Gain = 0
Gain = 32	Gain = 0

Terminations.

Input	1	+T/C
	2	-T/C
	3	
Output	4	+mA
	5	-mA
	6	mV TEST

TX802TC2 ONLY

Input Programming.

If the required input range is not listed in the table below, use the following formulae to calculate the correct Zero and Span DIP switch settings.

SPAN = Maximum Input - Zero Offset

Thermocouple Type Gain Values						
	J	K	N	R	S	T
Y (SPAN)	6000	6000	6000	16000	16000	3000
Z (ZERO)	25	25	25	33.333	33.333	2

deg C SPAN GAIN = $\dfrac{Y}{SPAN}$.

deg F SPAN GAIN = $\dfrac{2 \times Y}{SPAN}$.

deg C ZERO GAIN = $\dfrac{Zero\ Offset}{Z}$

deg F ZERO GAIN = $\dfrac{Zero\ Offset}{2 \times Z}$

e.g. For Type K 200~600C: SPAN = 600 - 200 = 400C.   ZERO OFFSET = 200C.

1/ From the tables, SPAN GAIN = $\dfrac{6000}{400}$ = 15 = 1+2+4+8+0+0 => **S2 = 0 0 0 0 1 1**

2/ ZERO GAIN = $\dfrac{200}{25}$ = 8 = 0+0+0+8+0+0 => **S1 = 1 1 1 0 1 1**

3/ Positive Zero Offset => **S1-7 OFF**   Upscale Sensor Fail => **S1-8 ON**

Notes: i) The input range must be within the specified **min / max** of the thermocouple type.
ii) If ZERO OFFSET is negative, switch S1-7 ON.
iii) If ZERO OFFSET is positive, switch S1-7 OFF.
iv) For downscale sensor fail drive switch S1-8 OFF.
v) For upscale sensor fail drive switch S1-8 ON.

Gain Value	1	2	4	8	16	32
DIP Switch No.	1	2	3	4	5	6

So if a gain value of 28 is required, put DIP switch No's 3, 4, 5 OFF (ie, gains of 4 + 8 + 16 = 28) and all the other DIP switches ON. Dip switches are accessed by seperating the two halves of the enclosure.

Input Range Programming Table.

Note: Switch status: 1 = ON, 0 = OFF, X = DON'T CARE.
'FNT' = Function. (DIP switches S1-7 and S1-8.)

INPUT RANGE (C)	INPUT RANGE (F)	THERMOCOUPLE TYPE																		
		Types J, K, N			Type R, S			Type T		
		S1-ZERO	FNT	S2-SPAN	S1-ZERO	FNT	S2-SPAN	S1-ZERO	FNT	S2-SPAN
		1 2 3 4 5 6	7 8	1 2 3 4 5 6	1 2 3 4 5 6	7 8	1 2 3 4 5 6	1 2 3 4 5 6	7 8	2 3 4 5 6
0~100	0~200	1 1 1 1 1 1	x	1 1 0 0 0 0	- - - - - -	-	- - - - - -	1 1 1 1 1 1	x	1 0 0 0 0 1
0~125	0~250	1 1 1 1 1 1	x	1 1 1 1 1 1	- - - - - -	-	- - - - - -	1 1 1 1 1 1	x	1 1 1 0 0 1
0~150	0~300	1 1 1 1 1 1	x	1 1 1 0 1 0	- - - - - -	-	- - - - - -	1 1 1 1 1 1	x	1 1 0 1 0 1
0~200	0~400	1 1 1 1 1 1	x	1 0 0 0 0 1	- - - - - -	-	- - - - - -	1 1 1 1 1 1	x	0 0 0 0 1 1
0~250	0~500	1 1 1 1 1 1	x	1 1 1 0 0 1	- - - - - -	-	- - - - - -	- - - - - -	-	- - - - - -
0~300	0~600	1 1 1 1 1 1	x	1 1 0 1 0 1	- - - - - -	-	- - - - - -	- - - - - -	-	- - - - - -
0~400	0~800	1 1 1 1 1 1	x	0 0 0 0 1 1	1 1 1 1 1 1	x	1 1 1 0 1 0	- - - - - -	-	- - - - - -
0~500	0~1000	1 1 1 1 1 1	x	1 1 0 0 1 1	1 1 1 1 1 1	x	1 1 1 1 1 0	- - - - - -	-	- - - - - -
0~600	0~1200	1 1 1 1 1 1	x	1 0 1 0 1 1	1 1 1 1 1 1	x	0 0 1 0 0 1	- - - - - -	-	- - - - - -
0~750	0~1500	1 1 1 1 1 1	x	1 1 1 0 1 1	1 1 1 1 1 1	x	0 1 0 1 0 1	- - - - - -	-	- - - - - -
0~800	0~1600	1 1 1 1 1 1	x	1 1 1 1 1 1	1 1 1 1 1 1	x	1 1 0 1 0 1	- - - - - -	-	- - - - - -
0~1000	0~2000	1 1 1 1 1 1	x	1 0 0 1 1 1	1 1 1 1 1 1	x	1 1 1 1 0 1	- - - - - -	-	- - - - - -
0~1200	0~2400	1 1 1 1 1 1	x	0 1 0 1 1 1	1 1 1 1 1 1	x	0 1 0 0 1 1	- - - - - -	-	- - - - - -
0~1400	0~2800	- - - - - -	-	- - - - - -	1 1 1 1 1 1	x	0 0 1 0 1 1	- - - - - -	-	- - - - - -
0~1600	0~3200	- - - - - -	-	- - - - - -	1 1 1 1 1 1	x	1 0 1 0 1 1	- - - - - -	-	- - - - - -
0~1700		- - - - - -	-	- - - - - -	1 1 1 1 1 1	x	0 1 1 0 1 1	- - - - - -	-	- - - - - -
-50~50	-100~100	- - - - - -		- - - - - -	- - - - - -		- - - - - -	0 1 1 0 0 1		1 0 0 0 0 1
-100~100	-200~200	- - - - - -		- - - - - -	- - - - - -		- - - - - -	1 0 1 1 0 1		0 0 0 0 1 1
-100~200	-200~400	- - - - - -		- - - - - -	- - - - - -		- - - - - -	1 0 1 1 0 0 1		1 0 1 0 1 1
100~200	200~400	1 1 0 1 1 0		1 1 0 0 0 0	- - - - - -		- - - - - -	1 0 1 1 0 0 0		1 0 0 0 0 1
200~500	400~1000	1 1 1 0 1 1 0		1 1 0 1 0 1	- - - - - -		- - - - - -	- - - - - -		- - - - - -
500~800	1000~1600	1 1 0 1 0 1 0		1 1 0 1 0 1	- - - - - -		- - - - - -	- - - - - -		- - - - - -
600~1200	1200~2400	1 1 1 0 0 1 0		1 0 1 0 1 1	1 0 1 1 0 1 0		0 0 1 0 0 1	- - - - - -		- - - - - -
1000~1700		- - - - - -		- - - - - -	1 0 0 0 0 1 0		0 0 0 1 0 1	- - - - - -		- - - - - -