INTRODUCTION / DESCRIPTION

This manual describes the installation of Durant Eclipse series 5770X-46X digital temperature meters. This manual steps through the installation of the temperature meters in a logical order. First is a brief description of the base unit and the plug-in option boards. Next comes mounting information, wiring diagrams (including DIP switch settings), and programming instructions. That is followed by the operation section. Finally, this manual contains diagnostic test and calibration information and specifications.

DESCRIPTION

Base Unit

The temperature meter converts analog signals from J, K, or T thermocouples, or four wire, 100Ω (ohms) Pt RTDs into a digital readout for the observer. The display units can be °Fahrenheit or °Celsius and may be locked to one unit or may be toggled between units. The base unit contains slots for mounting optional, plug-in circuit boards for relay output, analog retransmission, and serial communication capabilities.

Relay Output Option Board

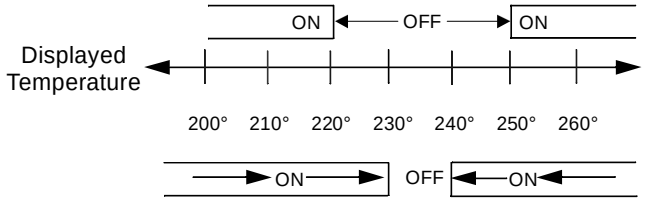
The optional relay board contains two form C (normally open and normally closed contacts) relays. Each relay has an adjustable high and low setpoint. The relays act as alarms by turning ON when the displayed temperature is greater than the high setpoint OR less than the low setpoint. If the low setpoint is greater than the high setpoint, the relay turns ON when the temperature meets both conditions; less than the low setpoint AND greater than the high setpoint.

Once a relay turns ON, it stays ON until the temperature returns back across the setpoint “and then some”. The “and then some” is called hysteresis. Hysteresis is a programmable value that is common to both setpoints and both relays. This means that a relay turns OFF when the display is less than or equal to the high setpoint minus the hysteresis value, or when the display is greater than or equal to the low setpoint plus the hysteresis value. Should an overlap occur between ON and OFF conditions, the ON condition overrides the OFF condition.

DESCRIPTION cont.

Example: Relay Output Operation

High Setpoint = 250	Relay ON above 250°
Low Setpoint = 220	Relay ON below 220°
Hysteresis = 10	Relay OFF between 230° and 240°



Analog Retransmission Option Board

The optional analog output board provides linear 0-10 V and 4-20 mA signals. When the displayed value is equal to the programmed output offset value, the output voltage is zero and the output current is 4 mA. When the displayed value is equal to the programmed output full scale value, the output voltage is 10 V and the output current is 20 mA.

When the displayed value is between the output offset and output full scale value:

1. The output voltage = $10 \frac{(\text{displayed temp - offset value})}{(\text{Full scale value - offset value})}$ V,

2. The output current = $16 \frac{(\text{displayed temp - offset value})}{(\text{Full scale value - offset value})}$ mA + 4 mA

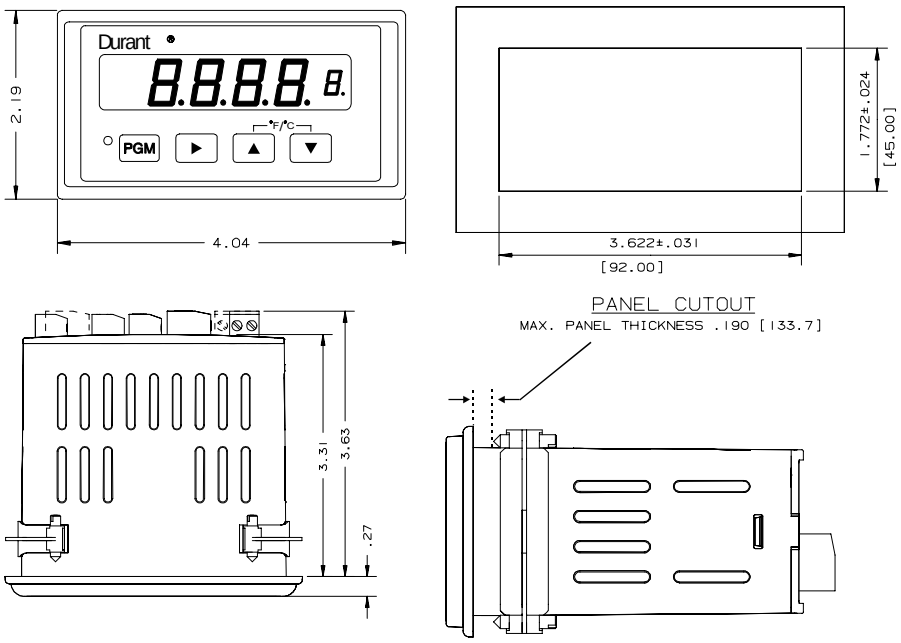
RS 485 Serial Communications Option Board

The optional serial communication board allows a host device to download and read programming parameters and to read status information from the temperature meter, such as display value, relay status, etc.

This manual does not contain information on the serial communication protocol or the serial command list. That information is contained in the 57700 serial specification and is obtainable by contacting the Durant Literature Department at 800-540-9242 (U.S. and Canada), or 920-261-4070, or by FAX at 920-261-9097.

MOUNTING

Mounting



Mounting clips and screws shown in installed positions.

Mounting Instructions

1. Slide mounting gasket (not shown) over unit body until adhesive surface makes contact with the front bezel.

2. Slide unit into cutout in panel.

3. Attach mounting clips and screws.

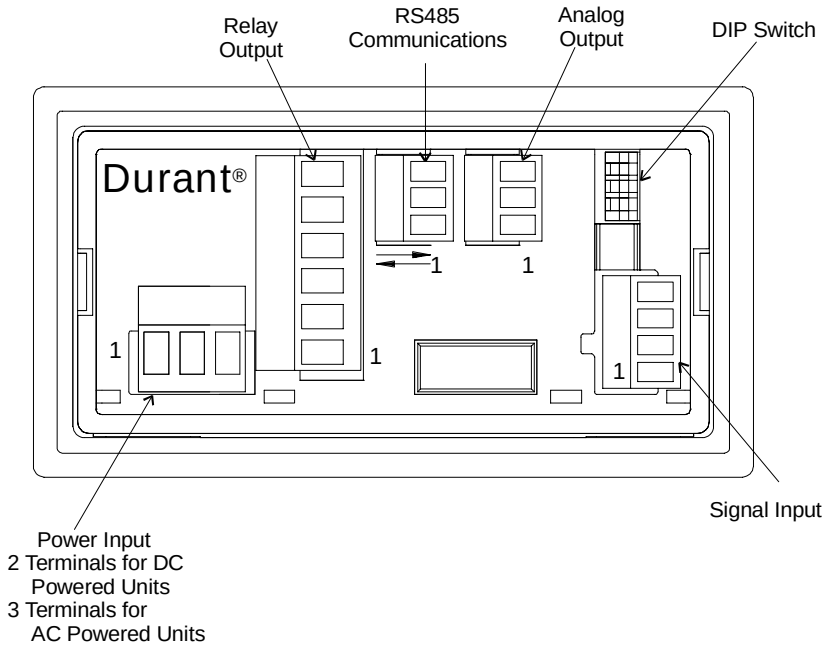
4. Tighten screws until unit is firmly in place. DO NOT OVERTIGHTEN screws to the point of squeezing the gasket out from behind the bezel.

WIRING

All wiring to the temperature meter is done via rear terminal, de-pluggable connectors. Up to five headers accept the wired connectors on the temperature meter. All units have at least two headers, power input and signal input. Any combination of three additional circuit boards with headers may be installed. These option boards are relay output, RS 485 serial communications, and analog retransmission. The option boards occupy specific locations in the temperature meter and are not interchangeable.

Disconnect all power before wiring terminals. A safety hazard exists if this precaution is not observed. Treat all control and count inputs as hazardous since they may carry line voltage.

Rear Terminal Layout



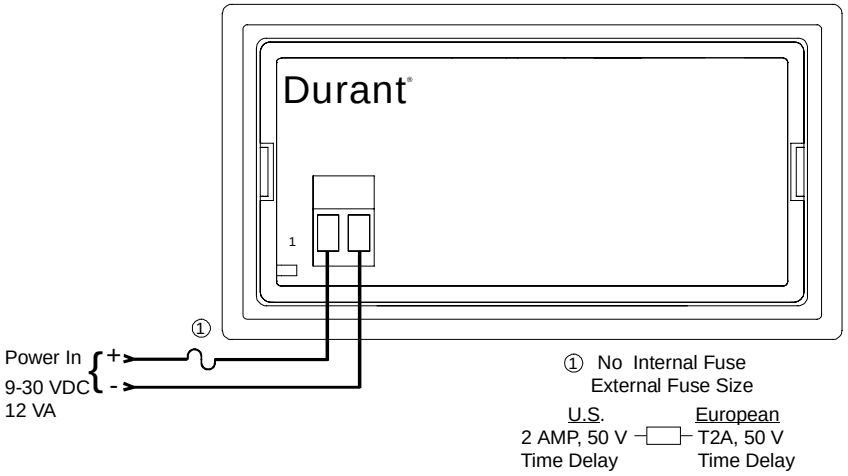
Terminal Connector Ratings

AC or DC Power Input / Relay Output: 10A, 250VAC;
Wire size: 12-24AWG (3.1mm^2 - 0.24mm^2), 600V.
RS485 / Analog Output / Signal Input: 8A, 125VAC;
Wire size: 16-28AWG (1.3mm^2 - 0.1mm^2), 300V.

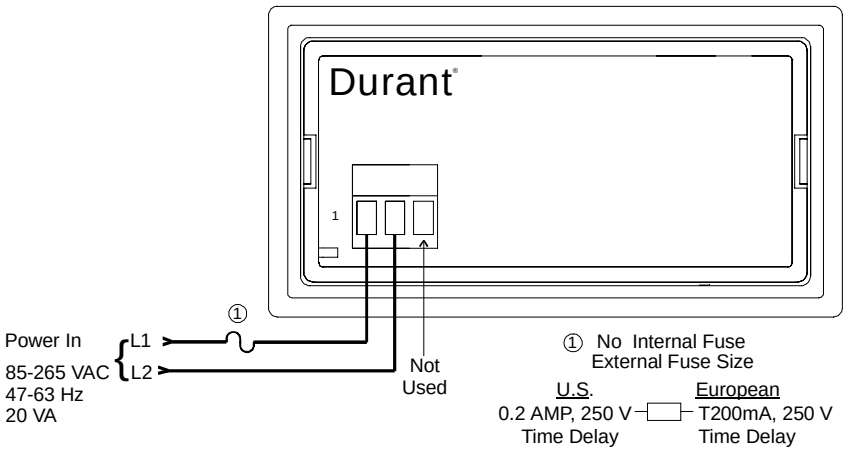
WIRING cont.

Wiring and DIP Switches

DC Power Input (for DC powered models 57700-46X)

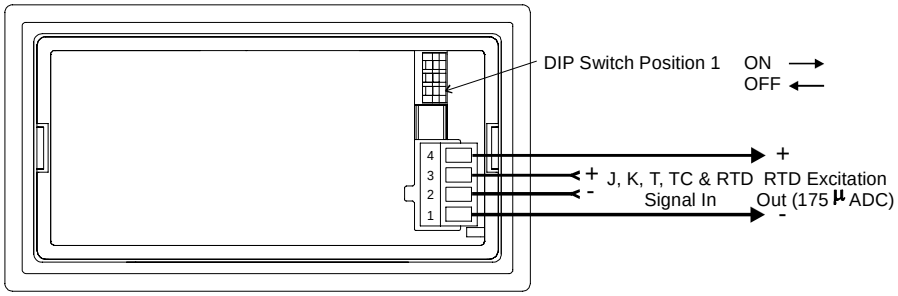


AC Power Input (for AC powered models 57701-46X)



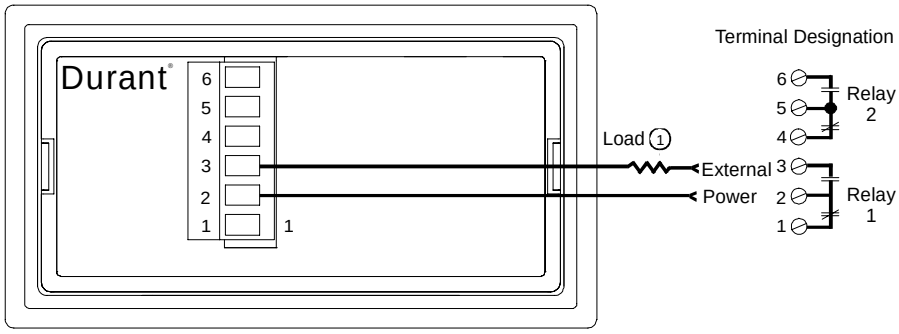
WIRING cont.

Signal Input



Input Impedance: 22 M ohms
Overrange: 5V Max
DIP Switch Position 1: ON for J, K, T Thermocouples
OFF for RTD

Relay Output Option Board
Typical Wiring

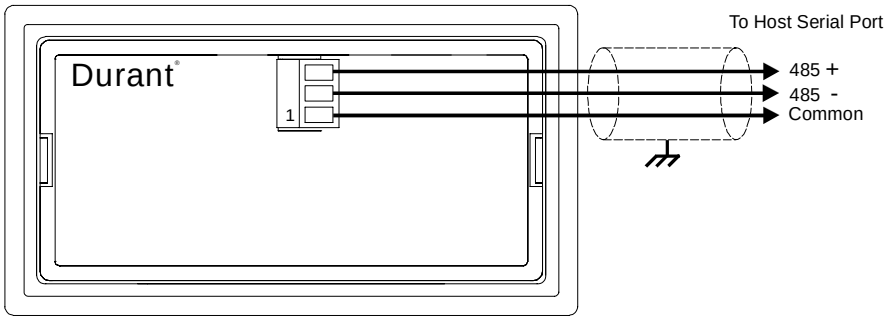


(1) An RC surge suppressor is recommended across all inductive loads.

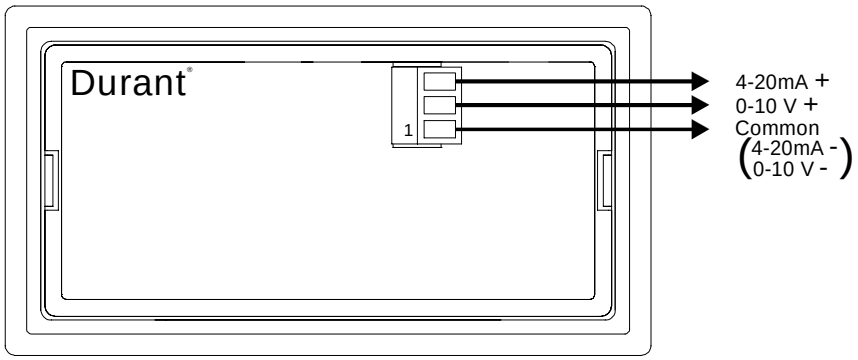
Contact Ratings
5 A @250 VAC or 30 VDC maximum

WIRING cont.

RS 485 Communication Option Board



Analog Output Option Board



Output Ratings

4-20 mA into 750 Ω (Ohms) maximum
0-10 V into 2500 Ω (Ohms) minimum

A switch shall be included in the building installation:

- It shall be in close proximity to the equipment and within easy reach of the operator.
- It shall be marked as the disconnecting device for the equipment.
- Switches and circuit breakers in Europe must comply with IEC 947.

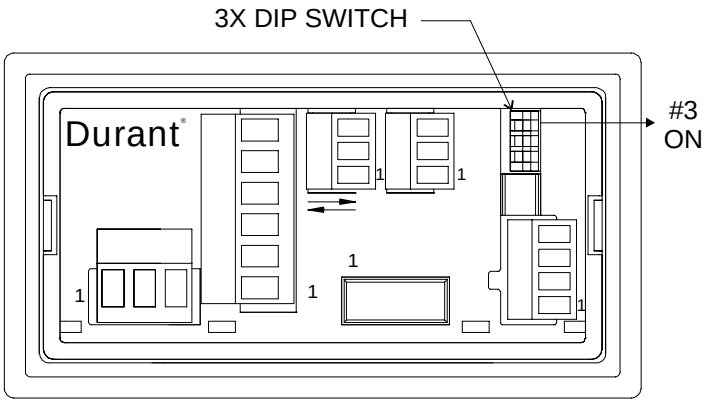
PROGRAMMING

Entering the Program Mode

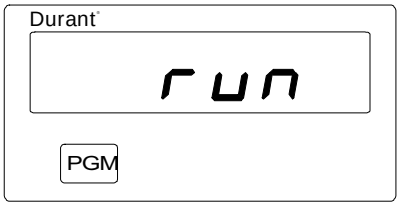
Note: If the optional relay output and/or analog output board(s) are installed in the temperature meter, entering the program mode will cause both relays to turn OFF and the analog output to go to its minimum values (0V and 4 mA) regardless of the input signal value.

To enter the program mode:

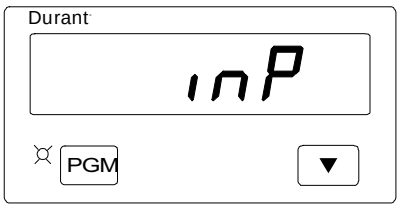
1. Flip the rear terminal program enable DIP Switch ON.



2. Press and hold the front panel program key (PGM); the display will say run:



3. Press the up or down arrow key (▲ or ▼) while holding (PGM); the program LED will turn on and the display will show a parameter name.



PROGRAMMING

Programming Parameters

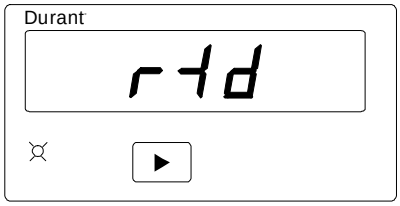
Programming customizes the temperature meter's functions to fit the application. All programming may be done by using the front panel program (PGM) and arrow keys - up (▲), down (▼), and right (▶). Programming is done by entering the proper value into each programming parameter. The parameters each have a name and a value, and are shown in the program list starting on page 11. The programming parameters associated with the optional RS 485 communications board, the analog retransmission board, and the relay output board only show in the program list if the corresponding option board is installed in the temperature meter.

To navigate through the parameter list, use the program key and the up and down arrow keys.

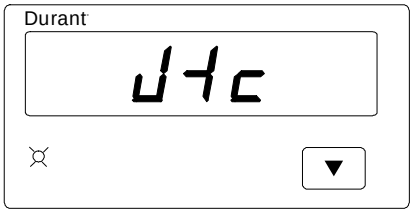
1. The parameter name is displayed by pressing and holding the program key (PGM).
2. The value of the parameter is displayed by releasing the program key.
3. While holding the program key (PGM), the unit scrolls down one parameter name each time the down arrow (▼) key is pressed, and scrolls up one parameter name each time the up arrow (▲) key is pressed. When the PGM key is released, the display shows the value of the selected parameter.

To change the value of the selected parameter:

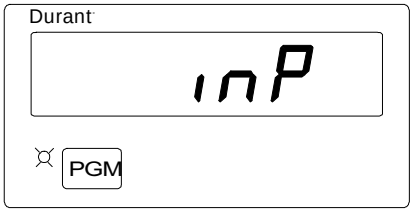
1. Press the right arrow key (▶) for numeric values such as serial address, offset, full scale, setpoints, and hysteresis; the most significant digit will flash.



2. Press the ▲ or ▼ key to change the selection. The numeric entries for serial address, output offset, output full scale, relay setpoints, and relay hysteresis are edited one digit at a time. The plus/minus sign is selected with the most significant digit. Press ▶ to select which digit to change (flash), then use ▼ or ▲ to change the value of the flashing digit. After all digits have been edited, press PGM to go back to the parameter name.



3. Press PGM to go back to the parameter name.



The Parameter List

The following list shows all programming parameter names, the default value for each, and the selection range for each. A programmed unit may be restored to default settings by pressing both the program (PGM) and right arrow (▶) keys for one second. The display will show dFL while the keys are pressed and blink off momentarily when the default is done.

PROGRAMMING cont.

Parameter Name	Default Value	Description/ Range
inP	rtd	Temperature Sensor Input type. Select one of the following: rtd RTD Jtc J Thermocouple Ktc K Thermocouple ttc T Thermocouple
F-C	YES F	Fahrenheit-to-Celsius Display Toggle Enable and Basic Temperature Scale Choice. YES allows the operator to toggle the display between Fahrenheit and Celsius, no disables the front panel display toggle switches. The small F or C on the right hand side of the display sets the power-up display to F or C and sets the programming paramater and serial communications units for relay setpoint and hysteresis and for the analog output zero and full scale values. Choices are YES F YES C no F no C
Add	00	Serial Address. Enter the serial address for the temperature meter. All commands sent to the temperature meter must contain this address. If two or more temperature meters are connected in a network, each must have a unique address. Range: 00-99.
br	1.20	Baud Rate. Select the rate in kBaud at which to receive and transmit serial information. 1.20 2.40 4.80 9.60 19.2

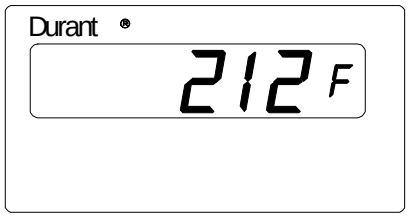
PAr	no	Parity. Select the type of parity used for serial communications. no none Eun even odd odd
oOF	-999	Analog Output Offset Value. Enter the temperature that corresponds to the minimum analog output (0V and 4 mA). Range: -999 to 2999.
oFS	2999	Analog Output Full Scale Value. Enter the temperature that corresponds to the maximum analog output (10V and 20 mA). Range: -999 to 2999.
1Hi	2999	Relay 1 High Alarm Setpoint. Enter the temperature at which relay 1 will turn on if the temperature goes above this value. Range: -999 to 2999.
1Lo	-999	Relay 1 Low Alarm Setpoint. Enter the temperature at which relay 1 will turn ON if the temperature goes below this value. Range: -999 to 2999.
2Hi	2999	Relay 2 High Alarm Setpoint. Enter the temperature at which relay 2 will turn ON if the temperature goes above this value. Range: -999 to 2999.
2Lo	-999	Relay 2 Low Alarm Setpoint. Enter the temperature at which relay 2 will turn ON if the temperature goes below this value. Range: -999 to 2999.
HYS	0000	Relay Hysteresis. Enter the difference in degrees between the relay turn ON temperatures (setpoints) and relay turn OFF temperatures. Range: 0 to 999.

RUN MODE / DIAGNOSTICS

Run Mode

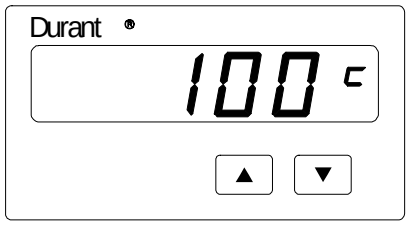
There is only one operator function of the temperature meter: the ability to toggle the display between Fahrenheit and Celsius scale. The display toggle function is enabled or disabled via the Fahrenheit-to-Celsius Toggle Enable programming parameter. If the value selected for this parameter is YES F or YES C, the operator may use the front panel ▲ and ▼ keys to toggle between a display in the Fahrenheit scale and a display in the Celsius scale. If the value for this parameter is no F or no C, the display is locked to the Fahrenheit scale or Celsius scale respectively.

To change the temperature scale on the display,



Display reads 212F

press the ▲ and ▼ keys simultaneously.



Display reads 100C

DIAGNOSTICS

Self Diagnostics and Error Messages

Each time power is applied to the temperature meter, it performs a series of internal diagnostic tests. A lamp test (all display segments ON) is conducted while these tests are in progress. If a failure occurs, an error message will appear on the display. Additionally, once the unit is up and running, an out of range message (flashing OL or -OL) may occur, indicating that the signal from the temperature sensor is outside of the temperature range specified for the particular type of sensor for which temperature meter is programmed.

The diagnostic tests are checksum calculations of internal ROM and NOVRAM memory and a read/write test for internal RAM. Programming and calibration data is stored in NOVRAM (non-volatile RAM). The checksum test verifies that data stored

in NOVRAM at power down is still there, uncorrupted, at power up. The first tests are performed on ROM and RAM. Failure results in an error message Err. This error is non-recoverable, and the unit should be returned to the factory for repair. A failure in the programming section of NOVRAM results in the displayed error message PrG. This message remains on the display until power to the temperature meter is cycled OFF, then ON, or until a key is pressed. This error is recoverable by re-programming the unit. If subsequent PrG errors occur, the NOVRAM itself may have failed, and the unit should be returned to the factory for repair. An error message CAL indicates that the calibration section of NOVRAM has been corrupted. THERE IS NO DIAGNOSTIC TEST TO DETERMINE THAT THE TEMPERATURE METER IS CALIBRATED! If the signal input board has been changed to a different type, the unit must be calibrated (see Calibration, p 16). If the failure was caused by any other reason, the unit should be returned to the factory for repair.

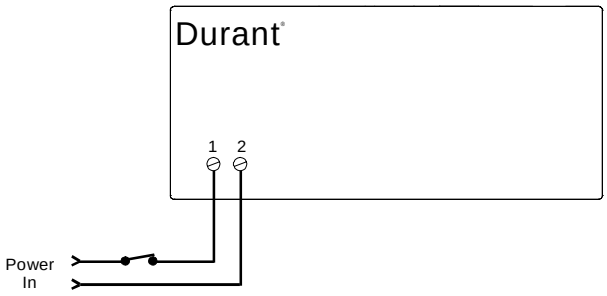
Keyboard Diagnostic Mode

The keyboard diagnostics allows the user to test each of the front panel keys, the display, and the analog retransmission and relay outputs if those optional boards are installed.

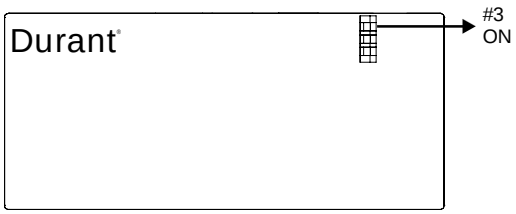
Caution: performing the diagnostic tests will turn ON the analog transmission and relay outputs if those options are installed. Remove power from the temperature meter and disconnect the outputs before entering the keyboard diagnostic mode. If the optional RS 485 communication board is installed, the temperature meter will respond with the temperature to the QST command.

To enter the keyboard diagnostic mode:

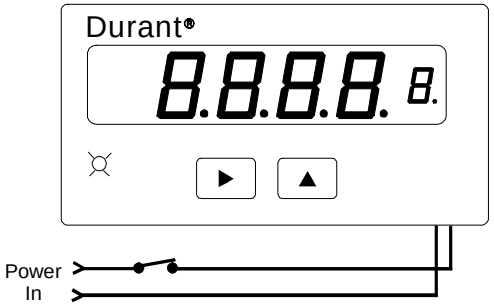
1. Turn power to the unit OFF.



2. Flip the rear terminal program enable DIP switch ON.



3. While holding both the right arrow key (▶) and the up arrow key (▲), turn unit power ON.



The program LED and all display segments will be ON. If present, both relays will be OFF (coils de-energized) and the analog output will be at minimum value (4 mA and 0V).

There are four keyboard diagnostic tests, one for each key. The tests are performed by pressing each key. The temperature meter's response is maintained as long as the key is held.

Test Key		Unit Response
Program	PGM	Display shows software part number.
Right Arrow	▶	All display segments and the program LED turn off and the analog output goes to maximum value (20 mA and 10V).
Up Arrow	▲	Each display digit will turn on, one at a time, and relay 2 will turn on.
Down Arrow	▼	Each display segment of all displays will turn on, one segment at a time, and relay 1 will turn on.

To exit the diagnostic mode, turn unit power off.

SPECIFICATIONS

MECHANICAL

Cutout Dimensions:	3.62” W x 1.77” H (92mm x 45mm) DIN standard
Outline Dimensions:	4.04” W x 2.19” H x 3.87” D (103mm x 56mm x 98mm) 3.60” (92mm) maximum depth in panel
Enclosure:	Plastic with polyester front label
Connectors:	Up to five de-pluggable terminal blocks

INPUT POWER

AC Powered Models (57701-4XX)

Input Power:	85-265 VAC, 47-63 Hz, 20 VA
External Fuse:	0.2A, 250 VAC, Time Delay (T200mA, 250V)
Isolation Dielectric Strength:	2300 VAC

DC Powered Models (57700-4XX)

Input Power:	9-30 VDC, 12 VA
External Fuse:	2.0A, 50 VDC, Time Delay (T2A, 50V)
Reverse Voltage Protection:	Yes
Isolation Dielectric Strength:	2300 VAC to signal inputs and relays, 500 VAC to RS 485 and analog outputs

HUMAN INTERFACE

Display:	4 digits
Type:	.56” high, seven segment, red LED
Indicator:	One red LED program/calibration indicator
Update Time:	0.5 seconds

DATA RETENTION

Memory Type:	EEPROM, no batteries required
Duration:	100 years

SIGNAL INPUT

Sensor Types:	J, K, and T thermocouples and four (4) wire Pt 100 RTD (IEC 751)

Ranges:	J	-200° to 760°C (-328° to 1400°F)
	K	-200° to 1370°C (-328° to 2498°F)
	T	-200° to 400°C (-328° to 752°F)
	RDT	-200° to 850°C (-328° to 1562°F)

Accuracy:	+/- 1 degreeC and +/- 100PPM/C (ambient) plus +/- 1 degreeC thermocouple cold junction

RTD Excitation:	175 μ ADC
Impedance:	22M Ohms
Overrange:	5V Maximum

SPECIFICATIONS cont.

OPTIONAL OUTPUTS

Relay Board

Number of relays:	2
Contact type:	1 set form C per relay
Contact rating:	5A, 250 VAC or 30 VDC
Isolation dielectric strength:	2300 VAC

Analog Retransmission

Output signals:	4-20 mA (<750 Ω) and 0-10 V (>2500 Ω)
Accuracy:	0.13% full scale and 100 PPM /°C (and 0.07% full scale change over 4-20 mA load ranges
Isolation dielectric strength:	2300 VAC to signal inputs, relays, and AC power inputs, 500 VAC to RS 485 and DC power inputs

RS 485 Serial Communications

Baud Rate:	1200, 2400, 4800, 9600, or 19,200, programmable
Parity:	Even, odd, or no parity
Address Range:	00 to 99 decimal
Protocol:	Opto 22® compatible
Isolation Dielectric Strength:	2300 VAC to signal inputs, relays, and AC power inputs, 500 VAC to analog outputs and DC power inputs

ENVIRONMENTAL

Operating Environment:		Indoor use to 2000 meters
Temperature:	Operating:	0 to 50°C
	Storage:	-20 to 70°C
Humidity:	0 to 85% RH, non-condensing	
Vibration:	2.5 g's, 30 to 200 Hz	
Shock:	30 g's, 11 msec half sinewave	
EMC:	Immunity to EN 50082-2 (Heavy Industrial) Emissions to EN 50081-2 (Heavy Industrial)	
Front Panel:	NEMA 4X when mounted with gasket provided	
Agency Approval:	UL, cUL listed, CE compliant CE EMC immunity and emissions requirements were met using shielded wiring on the RS-485, analog output, and RTD input lines. The shields were connected to earth ground at the Eclipse end of the shields.	
Pollution Degree 2	Overvoltage category II	

WARRANTY

Eaton warrants all products against defects in material and workmanship for a period of one (1) year from the date of shipment to Buyer. This is a limited warranty limited to its terms. This warranty is void if the product has been altered, misused, taken apart or otherwise abused. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE.

BUYERS REMEDIES: Eaton's obligations and liabilities under the foregoing warranty are limited to repair or replacement of the product without charge. To receive the required Return Goods Authorization number (RGA), contact your local Durant distributor or call 800-410-2910. A charge is made for repairing after the expiration of the warranty. IN NO EVENT SHALL EATON BE LIABLE FOR CLAIMS BASED UPON BREACH OF EXPRESS OR IMPLIED WARRANTY OR NEGLIGENCE OR ANY OTHER DAMAGES WHETHER DIRECT, IMMEDIATE, FORESEEABLE, CONSEQUENTIAL OR SPECIAL OR FOR ANY EXPENSES INCURRED BY REASON OF THE USE OR MISUSE, SALE OR FABRICATION OF PRODUCTS WHICH DO OR DO NOT CONFORM TO THE TERMS AND CONDITIONS OF THIS CONTRACT.

INDEMNIFICATION: Buyer agrees to hold Eaton harmless from, defend, and indemnify Eaton against damages, claims and expenses arising out of subsequent sales of Durant products or products containing components manufactured by Eaton and based upon personal injuries, deaths, property damage, lost profits, and other matters for which Buyer, its employees or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L.92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L.93.637), as now in effect or as amended hereafter. The warranties and remedies provided for herein are available to Buyer and shall not extend to any other person.

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In the construction of the Control described herein, the full intent of the specifications will be met. Eaton Corp., however reserves the right to make, from time to time and without proper written notice, such departures from the detail specifications as may be required to permit improvements in the design of the product.

The information included herein is believed to be accurate and reliable; however no responsibility is assumed by Eaton Corp., for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

This equipment is capable of generating radio frequency energy. If not installed and used in accordance with the instructions, this unit may interfere with radio communications.

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www.durant.com

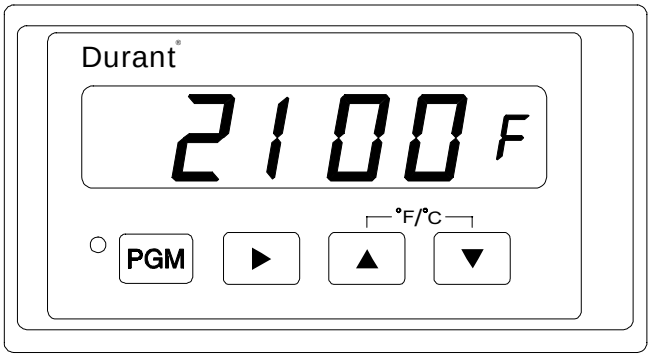
Durant®

Installation and Operation
Manual Number 57700-960-03

Eclipse Series Digital Temperature Meters

Models: 5770X-46X

CE



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