red lion

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MODEL DP5 – 1/8 DIN ANALOG INPUT PANEL METERS

- *PROCESS, VOLTAGE, CURRENT, AND TEMPERATURE INPUTS*
- 5-DIGIT 0.56" HIGH LED DISPLAY
- *PROGRAMMABLE FUNCTION KEYS/USER INPUT*
- *9 DIGIT TOTALIZER (INTEGRATOR) WITH BATCHING*
- *OPTIONAL CUSTOM UNITS OVERLAY W/BACKLIGHT*
- *NEMA 4X/IP65 SEALED FRONT BEZEL*

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IND. CONT. EQ.
51EB

GENERAL DESCRIPTION

The DP5 Panel Meters offer many features and performance capabilities to suit a wide range of industrial applications. These meters are available in three different models to handle various analog inputs, including DC Voltage/Current, Process, and Temperature Inputs. Refer to pages 4 and 5 for the details on the specific models.

The meters provide a MAX and MIN reading memory with programmable capture time. The capture time is used to prevent detection of false max or min readings which may occur during start-up or unusual process events.

The signal totalizer (integrator) can be used to compute a time-input product. This can be used to provide a readout of totalized flow, calculate service intervals of motors or pumps, etc. The totalizer can also accumulate batch weighing operations.

Once the meters have been initially configured, the parameter list may be locked out from further modification.

The meters have been specifically designed for harsh industrial environments. With NEMA 4X/IP65 sealed bezel and extensive testing of noise effects to CE requirements, the meter provides a tough yet reliable application solution.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in this literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

CAUTION: Risk of Danger.
Read complete instructions prior to installation and operation of the unit.

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)

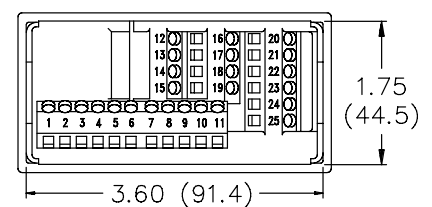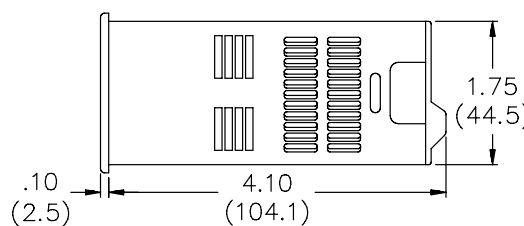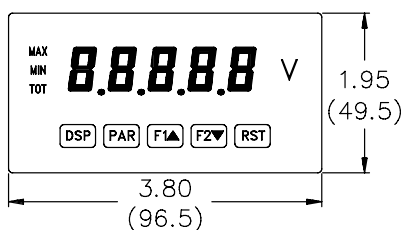Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.4) H x 5.0" (127) W.
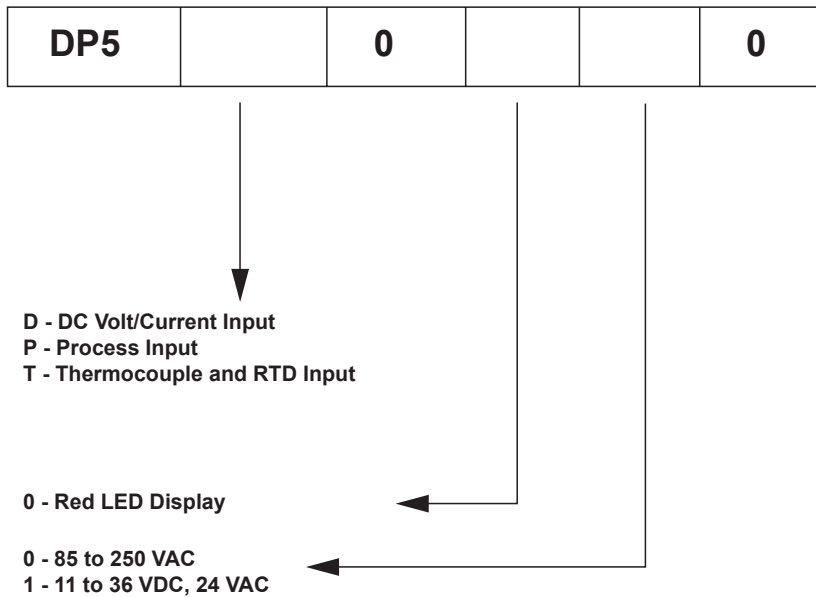
TABLE OF CONTENTS

ORDERING INFORMATION

Meter Part Numbers

DP5		0			0

D - DC Volt/Current Input
P - Process Input
T - Thermocouple and RTD Input

0 - Red LED Display

0 - 85 to 250 VAC
1 - 11 to 36 VDC, 24 VAC

Accessories Part Number

TYPE	MODEL NO.	DESCRIPTION	PART NUMBERS
Accessories	PAXLBK	Units Label Kit Accessory (Not required for DP5T)	PAXLBK10

GENERAL METER SPECIFICATIONS

1. **DISPLAY**: 5 digit, 0.56" (14.2 mm) red LED, (-19999 to 99999)
2. **POWER**:
   AC Versions:
      AC Power: 85 to 250 VAC, 50/60 Hz, 10 VA
      Isolation: 2300 Vrms for 1 min. to all inputs.
   DC Versions:
      DC Power: 11 to 36 VDC, 11 W
      AC Power: 24 VAC, ± 10%, 50/60 Hz, 10 VA
      Isolation: 500 Vrms for 1 min. to all inputs (50 V working).
3. **ANNUNCIATORS**:
   MAX - maximum readout selected
   MIN - minimum readout selected
   TOT - totalizer readout selected, flashes when total overflows
   Units Label - optional units label backlight
4. **KEYPAD**: 3 programmable function keys, 5 keys total
5. **A/D CONVERTER**: 16 bit resolution
6. **UPDATE RATES**:
   A/D conversion rate: 10 readings/sec.
   Step response: 200 msec. max. to within 99% of final readout value
      (digital filter and internal zero correction disabled)
      700 msec. max. (digital filter disabled, internal zero correction enabled)
   Display update rate: 1 to 10 updates/sec.
   Max./Min. capture delay time: 0 to 3275 sec.
7. **DISPLAY MESSAGES**:
   "OLOL" - Appears when measurement exceeds + signal range.
   "ULUL" - Appears when measurement exceeds - signal range
   DP5T: "OPEN" - Appears when open sensor is detected.
   DP5T: "SHrt" - Appears when shorted sensor is detected *(RTD only)*
   ". . . ." - Appears when display values exceed + display range.
   "- . . ." - Appears when display values exceed - display range.
8. **INPUT CAPABILITIES**: See specific product specifications, pages 4-5
9. **EXCITATION POWER**: See specific product specifications, pages 4-5
10. **LOW FREQUENCY NOISE REJECTION**:
   Normal Mode: > 60 dB @ 50 or 60 Hz ±1%, digital filter off
   Common Mode: >100 dB, DC to 120 Hz
11. **USER INPUT**: One software defined user input
   Max. Continuous Input: 30 VDC
   Isolation To Sensor Input Common: Not isolated. Do not tie commons together.
   Response Time : 50 msec. max.
   Logic State: Jumper selectable for sink/source logic

INPUT STATE	SINKING INPUTS 22 KΩ pull-up to +5 V	SOURCING INPUTS 22 KΩ pull-down
Active	V_{IN} < 0.9 VDC	V_{IN} > 3.6 VDC
Inactive	V_{IN} > 3.6 VDC	V_{IN} < 0.9 VDC

12. **TOTALIZER**:
   Time Base: second, minute, hour, or day
   Time Accuracy: 0.01% typical
   Decimal Point: 0 to 0.0000
   Scale Factor: 0.001 to 65.000
   Low Signal Cut-out: -19,999 to 99,999
   Total: 9 digits, display alternates between high order and low order readouts
13. **MEMORY**: Nonvolatile E^2PROM retains all programmable parameters and display values.

14. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature Range: 0 to 50°C
   Storage Temperature Range: -40 to 60°C
   Operating and Storage Humidity: 0 to 85% max. RH non-condensing
   Altitude: Up to 2000 meters
15. **CERTIFICATIONS AND COMPLIANCES**:
   SAFETY
      UL Recognized Component, File #E179259, UL61010-1, CSA C22.2 No. 61010-1
         DP5T Only: File # E156876, UL873, CSA C22.2 No. 24
         Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
      UL Listed, File # E137808, UL508, CSA C22.2 No. 14-M95
         LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
      Type 4X Enclosure rating (Face only), UL50
      IECEE CB Scheme Test Certificate #US/8843A/UL
         CB Scheme Test Report #04ME11209-20041018
            Issued by Underwriters Laboratories, Inc.
         IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part I
         IP65 Enclosure rating (Face only), IEC 529
         IP20 Enclosure rating (Rear of unit), IEC 529
   ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2

Electrostatic discharge	EN 61000-4-2	Level 2; 4 Kv contact Level 3; 8 Kv air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m [1] 80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4	Level 4; 2 Kv I/O Level 3; 2 Kv power
RF conducted interference	EN 61000-4-6	Level 3; 10 V/rms 150 KHz - 80 MHz
Simulation of cordless telephones	ENV 50204	Level 3; 10 V/m 900 MHz ±5 MHz 200 Hz, 50% duty cycle

Emissions to EN 50081-2

RF interference	EN 55011	Enclosure class A Power mains class A

Notes:
1. Self-recoverable loss of performance during EMI disturbance at 10 V/m: Measurement input signal may deviate during EMI disturbance.
   For operation without loss of performance:
      Unit is mounted in a metal enclosure (Buckeye SM7013-0 or equivalent) I/O and power cables are routed in metal conduit connected to earth ground.
Refer to EMC Installation Guidelines section of the bulletin for additional information.

16. **CONNECTIONS**: High compression cage-clamp terminal block
   Wire Strip Length: 0.3" (7.5 mm)
   Wire Gage: 30-14 AWG copper wire
   Torque: 4.5 inch-lbs (0.51 N-m) max.
17. **CONSTRUCTION**: This unit is rated for NEMA 4X/IP65 outdoor use. IP20 Touch safe. Installation Category II, Pollution Degree 2. One piece bezel/case. Flame resistant. Synthetic rubber keypad. Panel gasket and mounting clip included.
18. **WEIGHT**: 7 oz. (200 g)

MODEL DP5D - UNIVERSAL DC INPUT

- FOUR VOLTAGE RANGES (300 VDC Max)
- FIVE CURRENT RANGES (2A DC Max)
- 24 VDC TRANSMITTER POWER

DP5D SPECIFICATIONS

INPUT RANGES:

INPUT RANGE	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)	IMPEDANCE/ COMPLIANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
±200 µADC	0.03% of reading +0.03 µA	0.12% of reading +0.04µA	1.11 Kohm	15 mA	10 nA
±2 mADC	0.03% of reading +0.3 µA	0.12% of reading +0.4 µA	111 ohm	50 mA	0.1 µA
±20 mADC	0.03% of reading +3µA	0.12% of reading +4 µA	11.1 ohm	150 mA	1 µA
±200 mADC	0.05% of reading +30 µA	0.15% of reading +40 µA	1.1 ohm	500 mA	10 µA
±2 ADC	0.5% of reading +0.3 mA	0.7% of reading +0.4 mA	0.1 ohm	3 A	0.1 mA
±200 mVDC	0.03% of reading +30 µV	0.12% of reading +40 µV	1.066 Mohm	100 V	10 µV
±2 VDC	0.03% of reading +0.3 mV	0.12% of reading +0.4 mV	1.066 Mohm	300 V	0.1 mV
±20 VDC	0.03% of reading +3 mV	0.12% of reading +4 mV	1.066 Mohm	300 V	1 mV
±300 VDC	0.05% of reading +30 mV	0.15% of reading +40 mV	1.066 Mohm	300 V	10 mV

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28°C and 10 to 75% RH environment; and accuracy over a 0 to 50°C and 0 to 85%RH (non-condensing environment). Accuracy over the 0 to 50°C range includes the temperature coefficient effect of the meter.

EXCITATION POWER:
Transmitter Power: 24 VDC, ±5%, regulated, 50 mA max.

MODEL DP5P - PROCESS INPUT

- DUAL RANGE INPUT (20 mA or 10 VDC)
- 24 VDC TRANSMITTER POWER

DP5P SPECIFICATIONS

SENSOR INPUTS:

INPUT (RANGE)	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)	IMPEDANCE/ COMPLIANCE	MAX CONTINUOUS OVERLOAD	DISPLAY RESOLUTION
20 mA (-2 to 26 mA)	0.03% of reading +2 µA	0.12% of reading +3 µA	20 ohm	150 mA	1 µA
10 VDC (-1 to 13 VDC)	0.03% of reading +2 mV	0.12% of reading +3 mV	500 Kohm	300 V	1 mV

* After 20 minute warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28°C and 10 to 75% RH environment; and accuracy over a 0 to 50°C and 0 to 85%RH (non-condensing environment). Accuracy over the 0 to 50°C range includes the temperature coefficient effect of the meter.

EXCITATION POWER:
Transmitter Power: 24 VDC, ±5%, regulated, 50 mA max.

MODEL DP5T - THERMOCOUPLE AND RTD INPUT

- THERMOCOUPLE AND RTD INPUTS
- CONFORMS TO ITS-90 STANDARDS
- TIME-TEMPERATURE INTEGRATOR

DP5T SPECIFICATIONS

READOUT:
Resolution: Variable: 0.1, 0.2, 0.5, or 1, 2, or 5 degree
Scale: F or C
Offset Range: -19,999 to 99,999 display units

THERMOCOUPLE INPUTS:
Input Impedance: 20 MΩ
Lead Resistance Effect: 0.03μV/ohm
Max. Continuous Overvoltage: 30 V

INPUT TYPE	RANGE	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)	STANDARD	WIRE COLOR	
					ANSI	BS 1843
T	-200 to 400°C -270 to -200°C	1.2°C **	2.1°C	ITS-90	(+) blue (-) red	(+) white (-) blue
E	-200 to 871°C -270 to -200°C	1.0°C **	2.4°C	ITS-90	(+) purple (-) red	(+) brown (-) blue
J	-200 to 760°C	1.1°C	2.3°C	ITS-90	(+) white (-) red	(+) yellow (-) blue
K	-200 to 1372°C -270 to -200°C	1.3°C **	3.4°C	ITS-90	(+) yellow (-) red	(+) brown (-) blue
R	-50 to 1768°C	1.9°C	4.0°C	ITS-90	no standard	(+) white (-) blue
S	-50 to 1768°C	1.9°C	4.0°C	ITS-90	no standard	(+) white (-) blue
B	100 to 300°C 300 to 1820°C	3.9°C 2.8°C	5.7°C 4.4°C	ITS-90	no standard	no standard
N	-200 to 1300°C -270 to -200°C	1.3°C **	3.1°C	ITS-90	(+) orange (-) red	(+) orange (-) blue
C (W5/W26)	0 to 2315°C	1.9°C	6.1°C	ASTM E988-90***	no standard	no standard

*After 20 min. warm-up. Accuracy is specified in two ways: Accuracy over an 18 to 28°C and 15 to 75% RH environment; and Accuracy over a 0 to 50°C and 0 to 85% RH (non condensing) environment. Accuracy specified over the 0 to 50°C operating range includes meter tempco and ice point tracking effects. The specification includes the A/D conversion errors, linearization conformity, and thermocouple ice point compensation. Total system accuracy is the sum of meter and probe errors. Accuracy may be improved by field calibrating the meter readout at the temperature of interest.

** The accuracy over the interval -270 to -200°C is a function of temperature, ranging from 1°C at -200°C and degrading to 7°C at -270°C. Accuracy may be improved by field calibrating the meter readout at the temperature of interest.

*** These curves have been corrected to ITS-90.

RTD INPUTS:
Type: 3 or 4 wire, 2 wire can be compensated for lead wire resistance
Excitation current: 100 ohm range: 165 μA
10 ohm range: 2.6 mA
Lead resistance: 100 ohm range: 10 ohm/lead max.
10 ohm range: 3 ohms/lead max.
Max. continuous overload: 30 V

INPUT TYPE	RANGE	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)	STANDARD ***
100 ohm Pt alpha = .00385	-200 to 850°C	0.4°C	1.6°C	IEC 751
100 ohm Pt alpha = .003919	-200 to 850°C	0.4°C	1.6°C	no official standard
120 ohm Nickel alpha = .00672	-80 to 260°C	0.2°C	0.5°C	no official standard
10 ohm Copper alpha = .00427	-100 to 260°C	0.4°C	0.9°C	no official standard

DIRECT READOUT:
Input range: -10 to 65 mV
0 to 400 ohms, high range
0 to 25 ohms, low range
Display range: -19999 to 99999

INPUT TYPE	RANGE	ACCURACY* (18 to 28°C)	ACCURACY* (0 to 50°C)
Direct mV range	-10 to 65mV (1 μV res.)	0.02% of reading + 4μV	0.12% of reading + 5μV
Direct 100 ohm range	0 to 400 Ω (10 MΩ res.)	0.02% of reading + 0.04 Ω	0.12% of reading + 0.05 Ω
Direct 10 ohm range	0 to 25 Ω (1 MΩ res.)	0.04% of reading + 0.005 Ω	0.20% of reading + 0.007 Ω

ACCESSORIES

**UNITS LABEL KIT (PAXLBK) - Not required for DP5T**

Each meter has a units indicator with backlighting that can be customized using the Units Label Kit. The backlight is controlled in the programming.

Each DP5T meter is shipped with °F and °C overlay labels which can be installed into the meter's bezel display assembly.

1.0 INSTALLING THE METER

Installation

The DP5 meets NEMA 4X/IP65 requirements for indoor use when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the unit into the panel cutout.
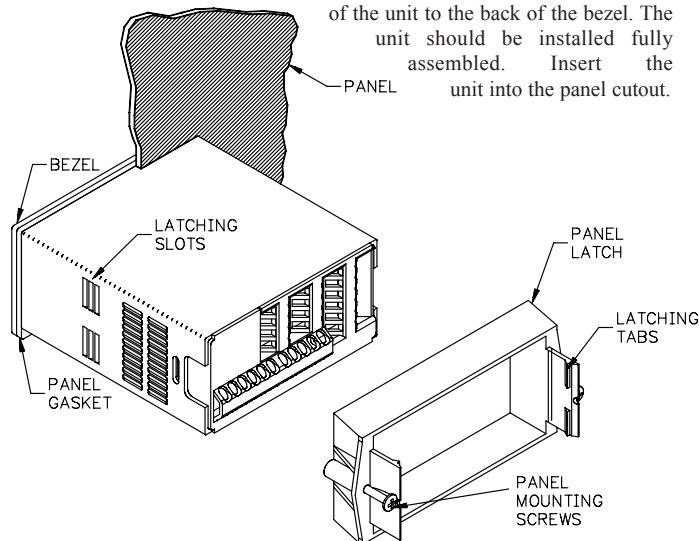
While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approximately 7 in-lbs [79N-cm]). Do not over-tighten the screws.

Installation Environment

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

PANEL CUT-OUT

$3.62 ^{+.03}_{-.00}$
$(92 ^{+.8}_{-.0})$

$1.77 ^{+.02}_{-.00}$
$(45 ^{+.5}_{-.0})$
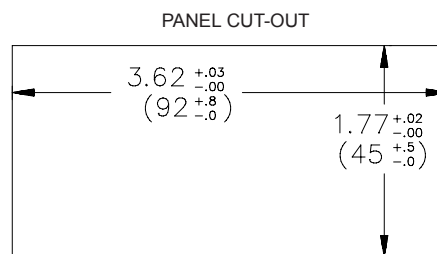
2.0 SETTING THE JUMPERS

The meter can have up to two jumpers that must be checked and / or changed prior to applying power. The two jumpers are: Input Range and User Input Logic. The following Jumper Selection Figures show an enlargement of the jumper area.

To access the jumpers, remove the meter base from the case by firmly squeezing and pulling back on the side rear finger tabs. This should lower the latch below the case slot (which is located just in front of the finger tabs). It is recommended to release the latch on one side, then start the other side latch.
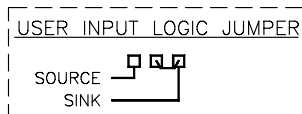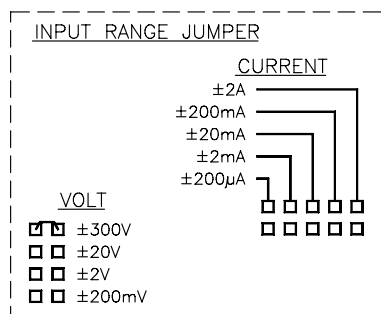
User Input Logic Jumper

This jumper selects the logic state of the user input. If the user input is not used, it is not necessary to check or move this jumper.
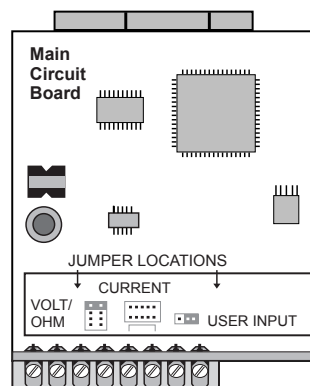
DP5D Jumper Selection
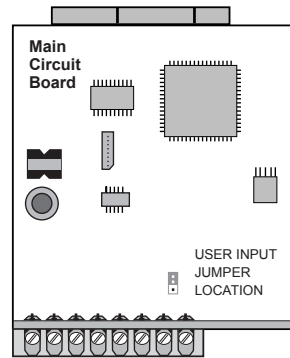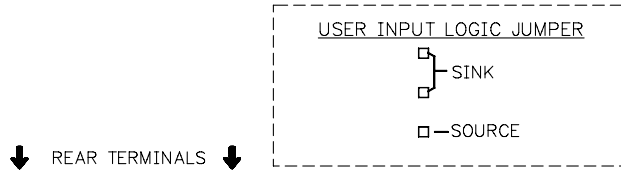
Input Range Jumper

One jumper is used for voltage or current input ranges. Select the proper input range high enough to avoid input signal overload. Only one jumper is allowed in this area. Do not have a jumper in both the voltage and current ranges at the same time. Avoid placing the jumper across two ranges.
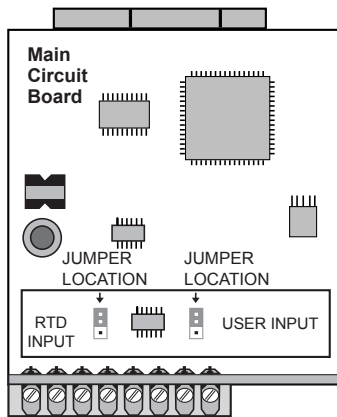
JUMPER SELECTIONS
The ⌒ indicates factory setting.

INPUT RANGE JUMPER

CURRENT
±2A
±200mA
±20mA
±2mA
±200µA

VOLT
±300V
±20V
±2V
±200mV

USER INPUT LOGIC JUMPER

SOURCE
SINK

Main Circuit Board

JUMPER LOCATIONS

CURRENT
VOLT/OHM
USER INPUT

DP5P Jumper Selection

JUMPER SELECTIONS
The ⌒ indicates factory setting.

USER INPUT LOGIC JUMPER

SINK

SOURCE

REAR TERMINALS

Main
Circuit
Board

USER INPUT
JUMPER
LOCATION
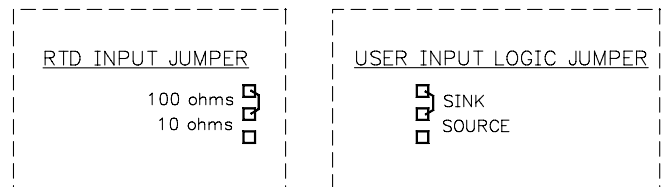
DP5T Jumper Selection

RTD Input Jumper
One jumper is used for RTD input ranges. Select the proper range to match the RTD probe being used. It is not necessary to remove this jumper when not using RTD probes.

Main
Circuit
Board

JUMPER   JUMPER
LOCATION   LOCATION

RTD   USER INPUT
INPUT

JUMPER SELECTIONS
The ⌒ indicates factory setting.

RTD INPUT JUMPER

100 ohms
10 ohms

USER INPUT LOGIC JUMPER

SINK
SOURCE

REAR TERMINALS

3.0 WIRING THE METER

WIRING OVERVIEW

Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter's voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

When wiring the meter, compare the numbers embossed on the back of the meter case against those shown in wiring drawings for proper wire position. Strip the wire, leaving approximately 0.3" (7.5 mm) bare lead exposed (stranded wires should be tinned with solder). Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.) Each terminal can accept up to one #14 AWG (2.55 mm) wire, two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).

EMC INSTALLATION GUIDELINES

Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, its source or the method of coupling into the unit may be different for various installations.Listed below are some EMC guidelines for successful installation in an industrial environment.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.

c. Connect the shield to common of the unit and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
     Fair-Rite # 0443167251 (RLC #FCOR0000)
     TDK # ZCAT3035-1330A
     Steward #28B2029-0A0
   Line Filters for input power cables:
     Schaffner # FN610-1/07 (RLC #LFIL0000)
   Schaffner # FN670-1.8/07
     Corcom #1VR3
   Note: Reference manufacturer's instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.
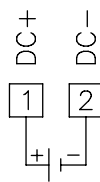   Snubber: RLC#SNUB0000.

3.1 POWER WIRING

AC Power
Terminal 1: VAC
Terminal 2: VAC
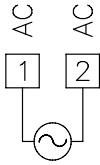
DC Power
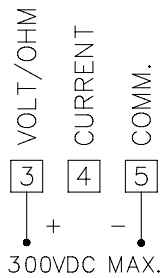Terminal 1: +VDC
Terminal 2: -VDC

3.2 INPUT SIGNAL WIRING

DP5D INPUT SIGNAL WIRING

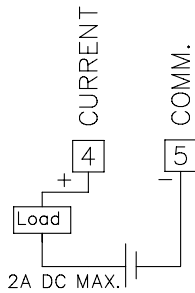Before connecting signal wires, the Input Range Jumper should be verified for proper position.

Voltage Signal (self powered)
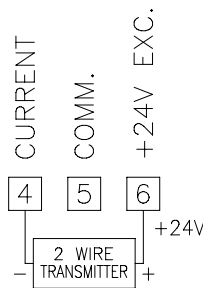Terminal 3: +VDC
Terminal 5: -VDC

300VDC MAX.

Current Signal (self powered)
Terminal 4: +ADC
Terminal 5: -ADC

2A DC MAX.

Current Signal (2 wire requiring excitation)
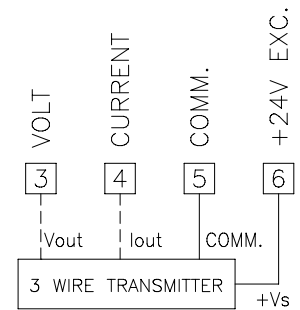Terminal 4: -ADC
Terminal 6: +ADC

Current Signal (3 wire requiring excitation)
Terminal 4: +ADC (signal)
Terminal 5: -ADC (common)
Terminal 6: +Volt supply

Voltage Signal (3 wire requiring excitation)
Terminal 3: +VDC (signal)
Terminal 5: -VDC (common)
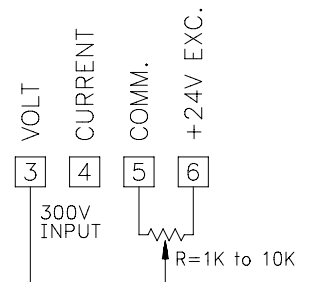Terminal 6: +Volt supply

CAUTION: *Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Input and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common.*

Potentiometer Signal (3 wire requiring excitation)
Terminal 3: Wiper
Terminal 5: Low end of pot.
Terminal 6: High end of pot.
Input Range Jumper: 300 Volt
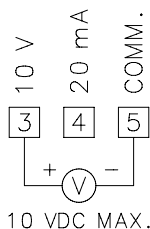Module 1 Input Range: 300 Volt
  Note: The Apply signal scaling style should be used because the signal will be in volts.

R=1K to 10K

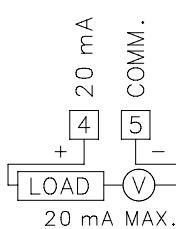## DP5P INPUT SIGNAL WIRING

Voltage Signal (self powered)
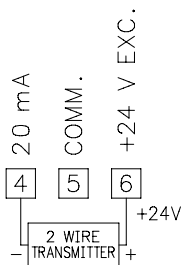Terminal 3: +VDC
Terminal 5: -VDC

10 VDC MAX.

Current Signal (self powered)
Terminal 4: +ADC
Terminal 5: -ADC

20 mA MAX.

Current Signal (2 wire requiring excitation)
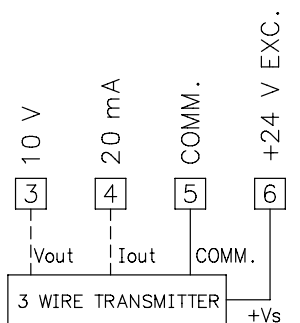Terminal 4: -ADC
Terminal 6: +ADC

Current Signal (3 wire requiring excitation)
Terminal 4: +ADC (signal)
Terminal 5: -ADC (common)
Terminal 6: +Volt supply

Voltage Signal (3 wire requiring excitation)
Terminal 3: +VDC (signal)
Terminal 5: -VDC (common)
Terminal 6: +Volt supply

CAUTION: *Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Input and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common.*

DP5T INPUT SIGNAL WIRING
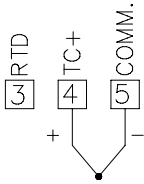
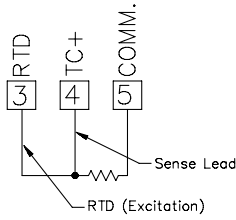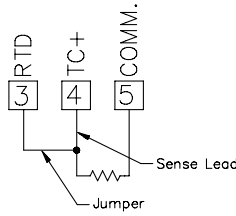**Thermocouple**   **3-Wire RTD**   **2-Wire RTD**

⚠ *CAUTION: Sensor input common is NOT isolated from user input common. In order to preserve the safety of the meter application, the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Input and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common.*

3.3 USER INPUT WIRING

Before connecting the wires, the User Input Logic Jumper should be verified for proper position. If not using the User Input then skip this section.

Sinking Logic

Terminal 8:
Terminal 7: } Connect external switching device between the User Input terminal and User Comm.

In this logic, the user input of the meter is internally pulled up to +5 V with 22 K resistance. The input is active when it is pulled low (<0 .9 V).
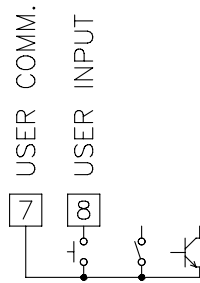
Sourcing Logic

Terminal 8: + VDC thru external switching device
Terminal 7: -VDC thru external switching device

In this logic, the user input of the meter is internally pulled down to 0 V with 22 K resistance. The input is active when a voltage greater than 3.6 VDC is applied.
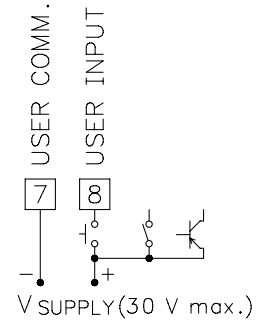
4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

Display Readout Legends*
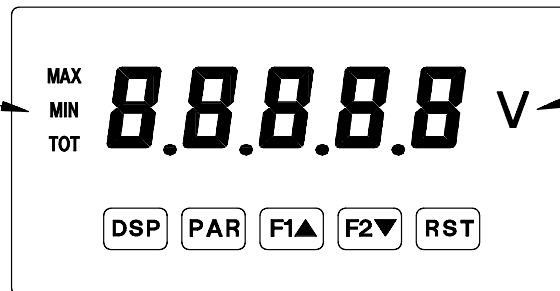
Optional Custom Units Overlay

KEY	DISPLAY MODE OPERATION	PROGRAMMING MODE OPERATION
DSP	Index display through max/min/total/input readouts	Quit programming and return to display mode
PAR	Access parameter list	Store selected parameter and index to next parameter
F1▲	Function key 1; hold for 3 seconds for Second Function 1**	Increment selected parameter value
F2▼	Function key 2; hold for 3 seconds for Second Function 2**	Decrement selected parameter value
RST	Reset (Function key)**	Hold with F1▲, F2▼ to scroll value by x1000

* Display Readout Legends may be locked out in Factory Settings.

** Factory setting for the F1, F2, and RST keys is NO mode.

5.0 PROGRAMMING THE METER

OVERVIEW

PROGRAMMING MENU
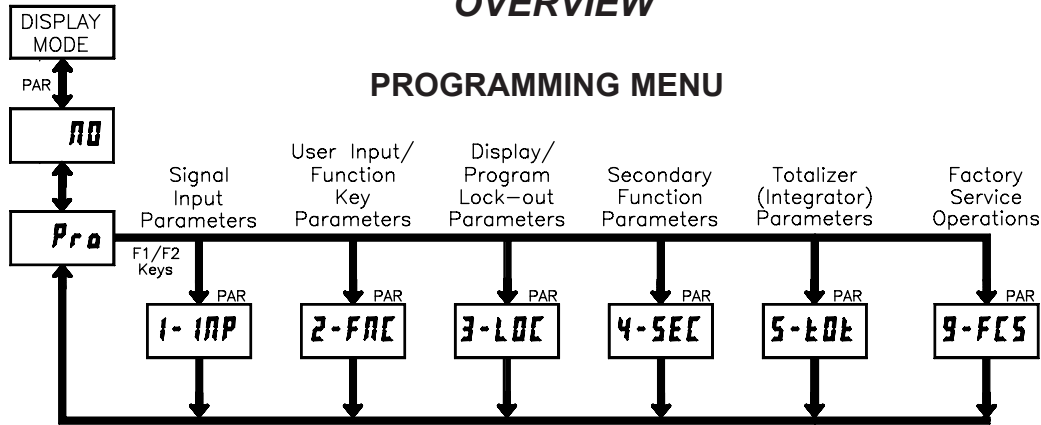
DISPLAY MODE

The meter normally operates in the Display Mode. In this mode, the meter displays can be viewed consecutively by pressing the **DSP** key. The annunciators to the left of the display indicate which display is currently shown; Max Value (MAX), Min Value (MIN), or Totalizer Value (TOT). Each of these displays can be locked from view through programming. (See Module 3) The Input Display Value is shown with no annunciator.

PROGRAMMING MODE

Two programming modes are available.

Full Programming Mode permits all parameters to be viewed and modified. Upon entering this mode, the front panel keys change to Programming Mode operations. This mode should not be entered while a process is running, since the meter functions and User Input response may not operate properly while in Full Programming Mode.

Quick Programming Mode permits only certain parameters to be viewed and/or modified. When entering this mode, the front panel keys change to Programming Mode operations, and all meter functions continue to operate properly. Quick Programming Mode is configured in Module 3. Throughout this document, Programming Mode (without Quick in front) always refers to "Full" Programming Mode.
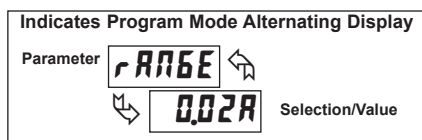
PROGRAMMING TIPS

The Programming Menu is organized into nine modules (See above). These modules group together parameters that are related in function. It is recommended to begin programming with Module 1 and proceed through each module in sequence. If lost or confused while programming, press the **DSP** key to exit programming mode and start over. When programming is complete, it is recommended to record the meter settings on the Parameter Value Chart and lock-out parameter programming with a User Input or lock-out code. (See Modules 2 and 3 for lock-out details.)

FACTORY SETTINGS

Factory Settings may be completely restored in Module 9. This is a good starting point if encountering programming problems. Throughout the module description sections which follow, the factory setting for each parameter is shown below the parameter display. In addition, all factory settings are listed on the Parameter Value Chart following the programming section.

ALTERNATING SELECTION DISPLAY

In the module description sections which follow, the dual display with arrows appears for each programming parameter. This is used to illustrate the display alternating between the parameter (top display) and the parameter's Factory Setting (bottom display). In most cases, selections or value ranges for the parameter will be listed on the right.

STEP BY STEP PROGRAMMING INSTRUCTIONS:

PROGRAMMING MODE ENTRY (PAR KEY)

The Programming Mode is entered by pressing the **PAR** key. If this mode is not accessible, then meter programming is locked by either a security code or a hardware lock. (See Modules 2 and 3 for programming lock-out details.)

MODULE ENTRY (ARROW & PAR KEYS)

Upon entering the Programming Mode, the display alternates between *Pro* and the present module (initially *no*). The arrow keys (**F1▲** and **F2▼**) are used to select the desired module, which is then entered by pressing the **PAR** key.

PARAMETER (MODULE) MENU (PAR KEY)

Each module has a separate parameter menu. These menus are shown at the start of each module description section which follows. The **PAR** key is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to *Pro no*. From this point, programming may continue by selecting and entering additional modules. (See **MODULE ENTRY** above.)

PARAMETER SELECTION ENTRY (ARROW & PAR KEYS)

For each parameter, the display alternates between the parameter and the present selection or value for that parameter. For parameters which have a list of selections, the arrow keys (**F1▲** and **F2▼**) are used to sequence through the list until the desired selection is displayed. Pressing the **PAR** key stores and activates the displayed selection, and also advances the meter to the next parameter.

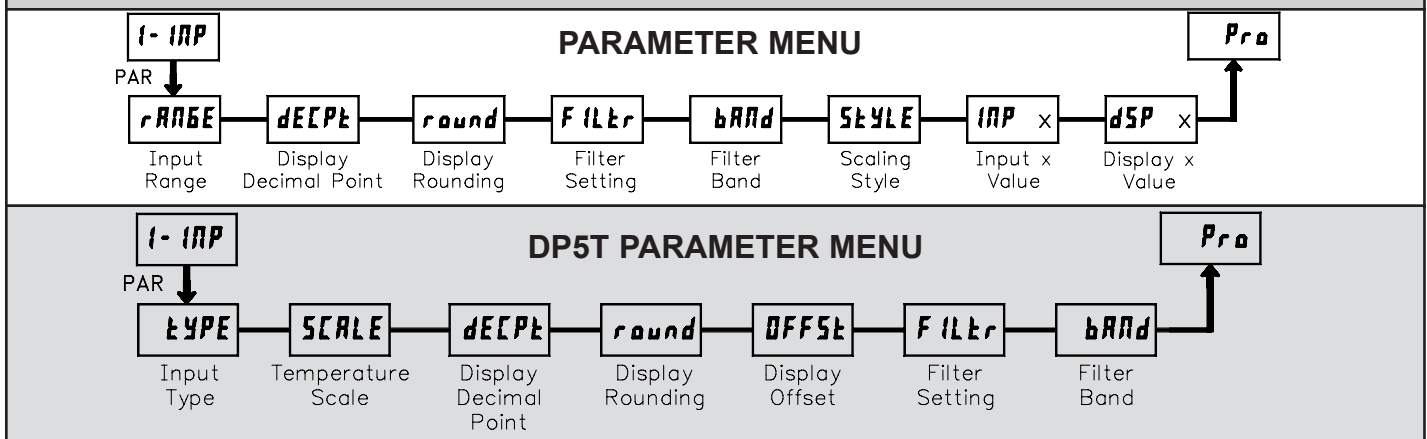### NUMERICAL VALUE ENTRY (ARROW, RST & PAR KEYS)

For parameters which require a numerical value entry, the arrow keys can be used to increment or decrement the display to the desired value. When an arrow key is pressed and held, the display automatically scrolls up or scrolls down. The longer the key is held, the faster the display scrolls.

The **RST** key can be used in combination with the arrow keys to enter large numerical values, when the **RST** key is pressed along with an arrow key, the display scrolls by 1000's. Pressing the **PAR** key stores and activates the displayed value, and also advances the meter to the next parameter.

PROGRAMMING MODE EXIT (DSP KEY or PAR KEY at *Pro no*)

The Programming Mode is exited by pressing the **DSP** key (from anywhere in the Programming Mode) or the **PAR** key (with *Pro no* displayed). This will commit any stored parameter changes to memory and return the meter to the Display Mode. If a parameter was just changed, the **PAR** key should be pressed to store the change before pressing the **DSP** key. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

5.1 MODULE 1 - SIGNAL INPUT PARAMETERS ($1\text{-}INP$)

PARAMETER MENU

$1\text{-}INP$ — PAR

rANGE	dECPt	round	F ILtr	bANd	StYLE	INP x	dSP x	→ Pro
Input Range	Display Decimal Point	Display Rounding	Filter Setting	Filter Band	Scaling Style	Input x Value	Display x Value	

DP5T PARAMETER MENU

$1\text{-}INP$ — PAR

tYPE	SCALE	dECPt	round	OFFSt	F ILtr	bANd	→ Pro
Input Type	Temperature Scale	Display Decimal Point	Display Rounding	Display Offset	Filter Setting	Filter Band	

Refer to the appropriate Input Range for the selected meter. Use only one Input Range, then proceed to Display Decimal Point.

DP5D INPUT RANGE

rANGE / 300u

SELECTION	RANGE RESOLUTION	SELECTION	RANGE RESOLUTION
200uA	±200.00 µA	0.2u	±200.00 mV
0.002A	±2.0000 mA	2u	±2.0000 V
0.02A	±20.000 mA	20u	±20.000 V
0.2A	±200.00 mA	300u	±300.00 V
2A	±2.0000 A		

Select the input range that corresponds to the external signal. This selection should be high enough to avoid input signal overload but low enough for the desired input resolution. This selection and the position of the Input Range Jumper must match.

DP5P INPUT RANGE

rANGE / 0.02A

SELECTION	RANGE RESOLUTION
0.02A	±20.000 mA
10u	±10.000 V

Select the input range that corresponds to the external signal.

DP5T INPUT TYPE

tYPE / tc-J

SELECTION	TYPE	SELECTION	TYPE
tc-t	T TC	tc-c	C TC
tc-E	E TC	Pt385	RTD platinum 385
tc-J	J TC	Pt392	RTD platinum 392
tc-K	K TC	n.672	RTD nickel 672
tc-r	R TC	Cu427	RTD copper 10 Ω
tc-S	S TC	ULt	Direct mV range
tc-b	B TC	rES-H	Direct ohms range high
tc-n	N TC	rES-L	Direct ohms range low

Select the input type that corresponds to the input sensor. For RTD types, check the RTD Input Jumper for matching selection. For sensor verification and testing, use the direct readout modes.

TEMPERATURE SCALE

SCALE / oF

oF   oC

Select the temperature scale. This selection applies for Input, MAX, MIN, and TOT displays. This does not change the user installed Custom Units Overlay display. If changed, those parameters that relate to the temperature scale should be checked.

DISPLAY DECIMAL POINT

dECPt / 0

0   0.0   0.00   0.000   0.0000

These selections are not available for DP5T.

Select the decimal point location for the Input, **MAX** and **MIN** displays. (The **TOT** display decimal point is a separate parameter.) This selection also affects round, dSP1 and dSP2 parameters.

DISPLAY ROUNDING*

round / 1

1   2   5
10   20   50   100

These bottom selections are not available for DP5T.
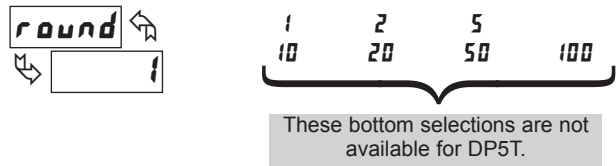
Rounding selections other than one, cause the Input Display to 'round' to the nearest rounding increment selected (ie. rounding of '5' causes 122 to round to 120 and 123 to round to 125). Rounding starts at the least significant digit of the Input Display. Remaining parameter entries (scaling point values, etc.) are not automatically adjusted to this display rounding selection.

DP5T: TEMPERATURE DISPLAY OFFSET*

OFFSt / 0

-19999 to 99999

The temperature display can be corrected with an offset value. This can be used to compensate for probe errors, errors due to variances in probe placement or adjusting the readout to a reference thermometer. This value is automatically updated after a Zero Display to show how far the display is offset. A value of zero will remove the affects of offset.

FILTER SETTING*

`F ILtr` ⇧
⇩ `1.0`
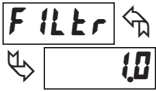
0.0 to 25.0 seconds

The input filter setting is a time constant expressed in tenths of a second. The filter settles to 99% of the final display value within approximately 3 time constants. This is an Adaptive Digital Filter which is designed to steady the Input Display reading. A value of '0' disables filtering.

FILTER BAND*

`bANd` ⇧
⇩ `10`

0.0 to 25.0 display units

The digital filter will adapt to variations in the input signal. When the variation exceeds the input filter band value, the digital filter disengages. When the variation becomes less than the band value, the filter engages again. This allows for a stable readout, but permits the display to settle rapidly after a large process change. The value of the band is in display units, independent of the Display Decimal Point position. A band setting of '0' keeps the digital filter permanently engaged.

The remaining parameters in Module 1 do not apply to the DP5T.

SCALING STYLE

`StYLE` ⇧
⇩ `KEY`

KEY   key-in data
RPLY   apply signal

If Input Values and corresponding Display Values are known, the Key-in (KEY) scaling style can be used. This allows scaling without the presence or changing of the input signal. If Input Values have to be derived from the actual input signal source or simulator, the Apply (RPLY) scaling style must be used. After using the Apply (RPLY) scaling style, this parameter will default back to KEY but the scaling will be shown from the previous applied method.

INPUT VALUE FOR SCALING POINT 1

`INP 1` ⇧
⇩ `0.00`

- 19999 to 99999

For Key-in (KEY), enter the known first Input Value by using the arrow keys. (The Input Range selection sets up the decimal location for the Input Value). For Apply (RPLY), apply the input signal to the meter, adjust the signal source externally until the desired Input Value appears. In either method, press the **PAR** key to enter the value being displayed. The **DSP** key can be pressed without changing the previously stored `INP 1` value in the RPLY style.

Note: RPLY style - Pressing the RST key will advance the display to the next scaling display point without storing the input value.

DISPLAY VALUE FOR SCALING POINT 1

`dSP 1` ⇧
⇩ `0.00`

- 19999 to 99999

Enter the first coordinating Display Value by using the arrow keys. This is the same for KEY and RPLY scaling styles. The decimal point follows the dECPt selection.

* Factory Setting can be used without affecting basic start-up.

INPUT VALUE FOR SCALING POINT 2

`INP 2` ⇧
⇩ `100.00`

- 19999 to 99999

For Key-in (KEY), enter the known second Input Value by using the arrow keys. For Apply (RPLY), adjust the signal source externally until the next desired Input Value appears.

DISPLAY VALUE FOR SCALING POINT 2

`dSP 2` ⇧
⇩ `100.00`

- 19999 to 99999

Enter the second coordinating Display Value by using the arrow keys. This is the same for KEY and RPLY scaling styles.

General Notes on Scaling

1. Input Values for scaling points should be confined to the limits of the Input Range.
2. The same Input Value should not correspond to more than one Display Value. (Example: 20 mA can not equal 0 and 10.) This is referred to as read out jumps (vertical scaled segments).
3. The same Display Value can correspond to more than one Input Value. (Example: 0 mA and 20 mA can equal 10.) This is referred to as readout dead zones (horizontal scaled segments).
4. The maximum scaled Display Value spread between range maximum and minimum is limited to 65,535. For example using +20 mA range the maximum +20 mA can be scaled to is 32,767 with 0 mA being 0 and Display Rounding of 1. (Decimal points are ignored.) The other half of 65,535 is for the lower half of the range 0 to -20 mA even if it is not used. With Display Rounding of 2, +20 mA can be scaled for (32,767 x 2 =) 65,535 but with even Input Display values shown.
5. For input levels below the first programmed Input Value, the meter extends the Display Value by calculating the slope from the first two coordinate pairs (`INP 1` / `dSP 1` & `INP2` / `dSP2`). If `INP 1` = 4 mA and `dSP 1` = 0, then 0 mA would be some negative Display Value. The calculations stop at the limits of the Input Range.
6. For input levels beyond the last programmed Input Value, the meter extends the Display Value by calculating the slope from the two sequential coordinate pairs. The calculations stop at the limits of the Input Range.

5.2 MODULE 2 - User Input and Front Panel Function Key Parameters (2-FNC)
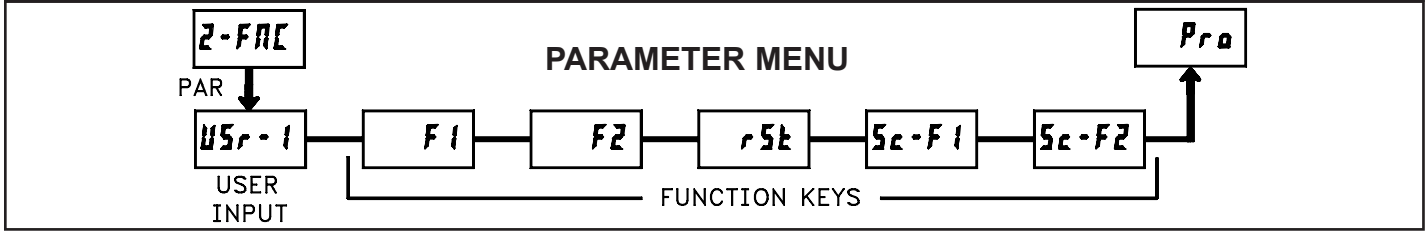
The user input is programmable to perform specific meter control functions. While in the Display Mode or Program Mode, the function is executed the instant the user input transitions to the active state.

The front panel function keys are also individually programmable to perform specific meter control functions. While in the Display Mode, the primary function is executed the instant the key is pressed. Holding the function key for three seconds executes a secondary function. It is possible to program a secondary function without a primary function.

In most cases, if the user input and/or one of the function keys is programmed for the same function, the maintained (level trigger) actions will be performed while the user input or at least one of the function keys are activated. The momentary (edge trigger) actions will be performed every time the user input or function keys transition to the active state.

Note: In the following explanations, not all selections are available for both the user input and front panel function keys. Alternating displays are shown with each selection. Those selections showing both displays are available for both. If a display is not shown, it is not available for that selection. USr-1 will represent the user input. F1 will represent all five function keys.

NO FUNCTION

No function is performed if activated. This is the factory setting for the user input and all function keys. No function can be selected without affecting basic start-up.

PROGRAMMING MODE LOCK-OUT
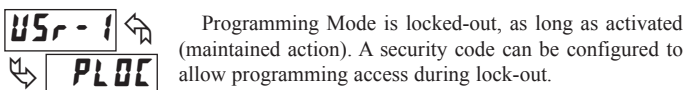
Programming Mode is locked-out, as long as activated (maintained action). A security code can be configured to allow programming access during lock-out.

ZERO (TARE) DISPLAY

The Zero (Tare) Display provides a way to zero the Input Display value at various input levels, causing future Display readings to be offset. This function is useful in weighing applications where the container or material on the scale should not be included in the next measurement value. When activated (momentary action), rESEt flashes and the Display is set to zero. At the same time, the Display value (that was on the display before the Zero Display) is subtracted from the Display Offset Value and is automatically stored as the new Display Offset Value (OFFSt). If another Zero (tare) Display is performed, the display will again change to zero and the Display reading will shift accordingly.

RELATIVE/ABSOLUTE DISPLAY

This function will switch the Input Display between Relative and Absolute. The Relative is a net value that includes the Display Offset Value. The Input Display will normally show the Relative unless switched by this function. Regardless of the display selected, all meter functions continue to operate based on relative values. The Absolute is a gross value (based on Module 1 **DSP** and **INP** entries) without the Display Offset Value. The Absolute display is selected as long as the user input is activated (maintained action) or at the transition of the function key (momentary action). When the user input is released, or the function key is pressed again, the input display switches back to Relative display. Ab5 (absolute) or rEL (relative) is momentarily displayed at transition to indicate which display is active.
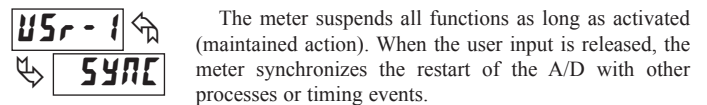
HOLD DISPLAY
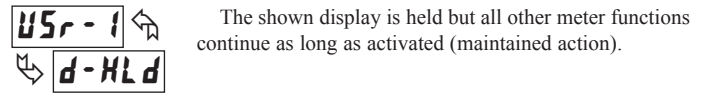
The shown display is held but all other meter functions continue as long as activated (maintained action).

HOLD ALL FUNCTIONS
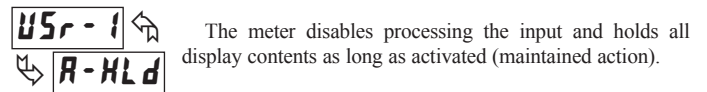
The meter disables processing the input and holds all display contents as long as activated (maintained action).

SYNCHRONIZE METER READING

The meter suspends all functions as long as activated (maintained action). When the user input is released, the meter synchronizes the restart of the A/D with other processes or timing events.

STORE BATCH READING IN TOTALIZER

The Input Display value is one time added (batched) to the Totalizer at transition to activate (momentary action). The Totalizer retains a running sum of each batch operation until the Totalizer is reset. When this function is selected, the normal operation of the Totalizer is overridden.
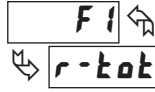
SELECT TOTALIZER DISPLAY
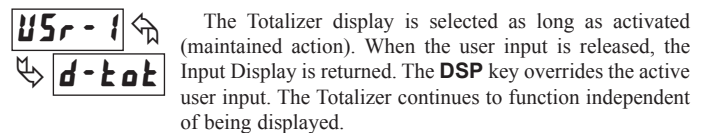
The Totalizer display is selected as long as activated (maintained action). When the user input is released, the Input Display is returned. The **DSP** key overrides the active user input. The Totalizer continues to function independent of being displayed.
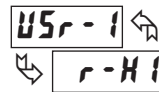
RESET TOTALIZER
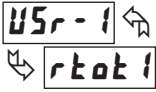
`USr - 1` ⇗
⇘ `rtot1`

When activated (momentary action), `rESEt` flashes and the Totalizer resets to zero. The Totalizer then continues to operate as it is configured. This selection functions independent of the selected display.
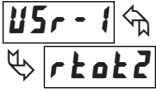
RESET AND ENABLE TOTALIZER

`USr - 1` ⇗
⇘ `rtot2`

When activated (momentary action), `rESEt` flashes and the Totalizer resets to zero. The Totalizer continues to operate while active (maintained action). When the user input is released, the Totalizer stops and holds its value. This selection functions independent of the selected display.

ENABLE TOTALIZER

`USr - 1` ⇗
⇘ `E-tot`

The Totalizer continues to operate as long as activated (maintained action). When the user input is released, the Totalizer stops and holds its value. This selection functions independent of the selected display.

SELECT MAXIMUM DISPLAY

`USr - 1` ⇗
⇘ `d-H1`

The Maximum display is selected as long as activated (maintained action). When the user input is released, the Input Display returns. The **DSP** key overrides the active user input. The Maximum continues to function independent of being displayed.

RESET MAXIMUM

`F1` ⇗
⇘ `r-H1`

When activated (momentary action), `rESEt` flashes and the Maximum resets to the present Input Display value. The Maximum function then continues from that value. This selection functions independent of the selected display.

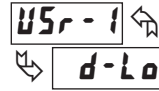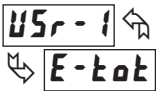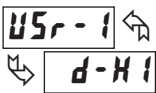### RESET, SELECT, ENABLE MAXIMUM DISPLAY

`USr - 1` ⇗
⇘ `r-H1`

When activated (momentary action), the Maximum value is set to the present Input Display value. Maximum continues from that value while active (maintained action). When the user input is released, Maximum detection stops and holds its value. This selection functions independent of the selected display. The **DSP** key overrides the active user input display but not the Maximum function.

SELECT MINIMUM DISPLAY

`USr - 1` ⇗
⇘ `d-Lo`

The Minimum display is selected as long as activated (maintained action). When the user input is released, the Input Display is returned. The **DSP** key overrides the active user input. The Minimum continues to function independent of being displayed.

RESET MINIMUM

When activated (momentary action), `rESEt` flashes and the Minimum reading is set to the present Input Display value. The Minimum function then continues from that value. This selection functions independent of the selected display.
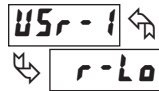
`F1` ⇗
⇘ `r-Lo`

RESET, SELECT, ENABLE MINIMUM DISPLAY
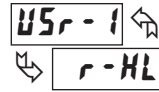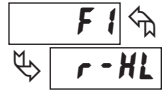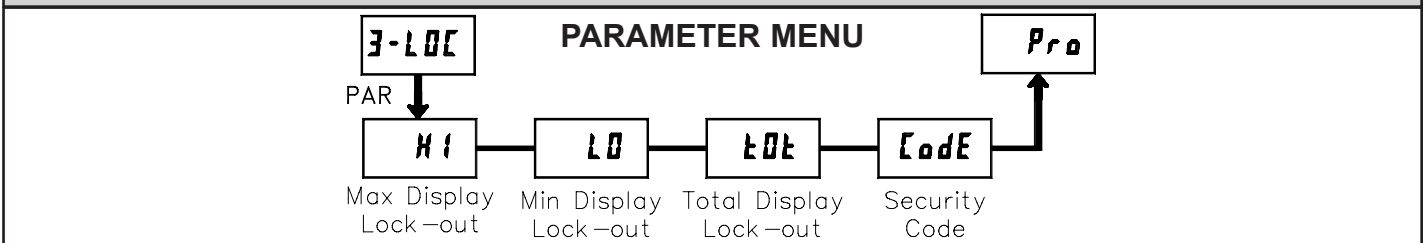
`USr - 1` ⇗
⇘ `r-Lo`

When activated (momentary action), the Minimum value is set to the present Input Display value. Minimum continues from that value while active (maintained action). When the user input is released, Minimum detection stops and holds its value. This selection functions independent of the selected display. The **DSP** key overrides the active user input display but not the Minimum function.

### RESET MAXIMUM AND MINIMUM

`USr - 1` ⇗
⇘ `r-HL`

`F1` ⇗
⇘ `r-HL`

When activated (momentary action), `rESEt` flashes and the Maximum and Minimum readings are set to the present Input Display value. The Maximum and Minimum function then continues from that value. This selection functions independent of the selected display.

5.3 MODULE 3 - DISPLAY AND PROGRAM LOCK-OUT PARAMETERS (`3-LOC`)

PARAMETER MENU

`3-LOC`
PAR ↓

`Pro`

`H1` — `LO` — `tot` — `CodE` →

`H1`	`LO`	`tot`	`CodE`
Max Display Lock—out	Min Display Lock—out	Total Display Lock—out	Security Code

MAXIMUM DISPLAY LOCK-OUT*
MINIMUM DISPLAY LOCK-OUT*
TOTALIZER DISPLAY LOCK-OUT*

`H1` ⇗
⇘ `LOC`

`LO` ⇗
⇘ `LOC`

`tot` ⇗
⇘ `LOC`
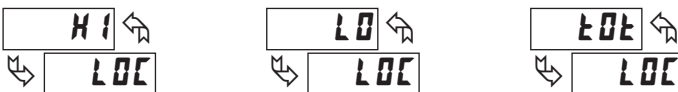
These displays can be programmed for `LOC` or `rEd`. When programmed for `LOC`, the display will not be shown when the **DSP** key is pressed regardless of Program Lock-out status. It is suggested to lock-out the display if it is not needed. The associated function will continue to operate even if its display is locked-out.

PROGRAM MODE SECURITY CODE*

`CodE` ⇗   `0` to `250`
⇘ `0`

By entering any non-zero value, the prompt `CodE 0` will appear when trying to access the Program Mode. Access will only be allowed after entering a matching security code or universal code of `222`. With this lock-out, a user input would not have to be configured for Program Lock-out. However, this lock-out is overridden by an inactive user input configured for Program Lock-out.

* Factory Setting can be used without affecting basic start-up.

5.4 MODULE 4 - SECONDARY FUNCTION PARAMETERS (4-SEC)

PARAMETER MENU

```
4-SEC
 ↓ PAR
                                                          NOT        DP5T
                                                          DP5T       ONLY       Pro
                                                                                 ↑
 HI-t  ──  LO-t  ──  dSP-t  ──  b-LIt  ──  OFFSt  ──  ICE  ──┘

Max. Capture  Min. Capture  Display Update  Units Label  Display Offset  Ice Point
Delay Time    Delay Time    Time            BackLight    Value           Compensation
```

MAX CAPTURE DELAY TIME*

HI-t
0.1
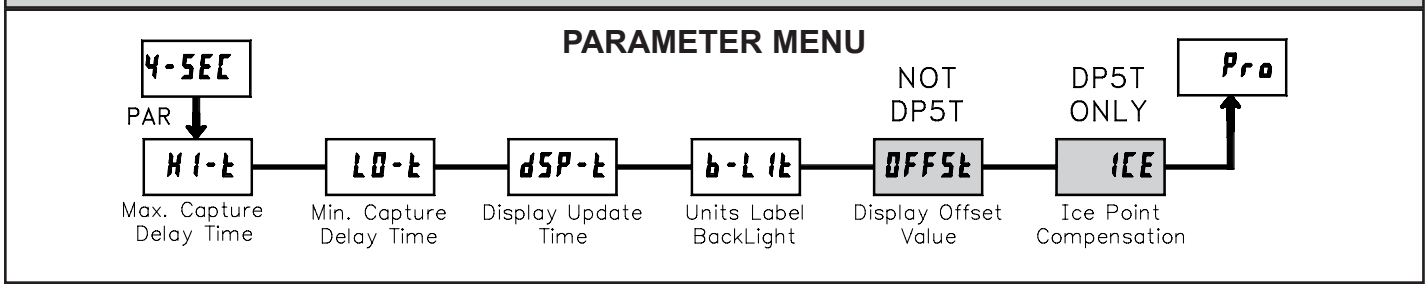
0.1 to 3275.0 sec.

When the Input Display is above the present MAX value for the entered delay time, the meter will capture that display value as the new MAX reading. A delay time helps to avoid false captures of sudden short spikes.
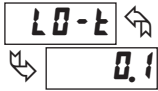
MIN CAPTURE DELAY TIME*

LO-t
0.1

0.1 to 3275.0 sec.

When the Input Display is below the present MIN value for the entered delay time, the meter will capture that display value as the new MIN reading. A delay time helps to avoid false captures of sudden short spikes.
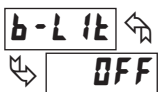
DISPLAY UPDATE RATE*

dSP-t
2

1   2   5   10 updates/sec.

This parameter determines the rate of display update. When set to 10 updates/second, the internal re-zero compensation is disabled, allowing for the fastest possible output response.

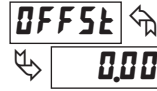### UNITS LABEL BACKLIGHT*

b-LIt
OFF

ON   OFF

The Units Label Kit Accessory contains a sheet of custom unit overlays which can be installed in to the meter's bezel display assembly. The backlight for these custom units is activated by this parameter.

DISPLAY OFFSET VALUE*

This parameter does not apply for the DP5T.

OFFSt
0.00

-19999 to 19999

Unless a Zero Display was performed or an offset from Module 1 scaling is desired, this parameter can be skipped. The Display Offset Value is the difference from the Absolute (gross) Display value to the Relative (net) Display value for the same input level. The meter will automatically update this Display Offset Value after each Zero Display. The Display Offset Value can be directly keyed-in to intentionally add or remove display offset. See Relative / Absolute Display and Zero Display explanations in Module 2.

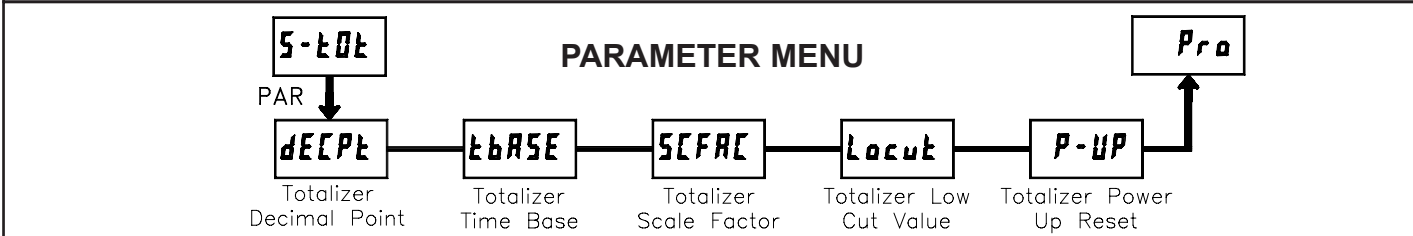### DP5T: ICE POINT COMPENSATION*

ICE
ON

ON   OFF

This parameter turns the internal ice point compensation on or off. Normally, the ice point compensation is on. If using external compensation, set this parameter to off. In this case, use copper leads from the external compensation point to the meter.

Factory Setting can be used without affecting basic start-up.

5.5 MODULE 5 - TOTALIZER (INTEGRATOR) PARAMETERS (5-ᴜOᴜ)

| 5-ᴜOᴜ | **PARAMETER MENU** | Pro |

PAR ↓

| dECPᴜ | ᴜbASE | SCFAC | Locuᴜ | P-UP |
| Totalizer Decimal Point | Totalizer Time Base | Totalizer Scale Factor | Totalizer Low Cut Value | Totalizer Power Up Reset |

The totalizer accumulates (integrates) the Input Display value using one of two modes. The first is using a time base. This can be used to compute a time-temperature product. The second is through a user input or function key programmed for Batch (one time add on demand). This can be used to provide a readout of temperature integration, useful in curing and sterilization applications. If the Totalizer is not needed, its display can be locked-out and this module can be skipped during programming.

TOTALIZER DECIMAL POINT*

| dECPᴜ ⬆ |
| ⬇ 0.00 |

    0   0.0   0.00   0.000   0.0000

For most applications, this matches the Input Display Decimal Point (dECPᴜ). If a different location is desired, refer to Totalizer Scale Factor.

TOTALIZER TIME BASE

| ᴜbASE ⬆ | SEC - seconds (÷ 1)   hour - hours (÷ 3600) |
| ⬇ _ʰᵐ | _ʰᵐ - minutes (÷ 60)   dAY - days (÷ 86400) |
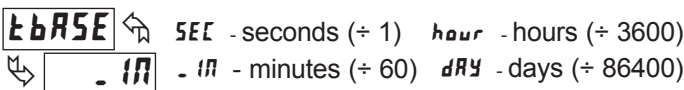
This is the time base used in Totalizer accumulations. If the Totalizer is being accumulated through a user input programmed for Batch, then this parameter does not apply.

TOTALIZER SCALE FACTOR*

| SCFAC ⬆ |
| ⬇ 1.000 |

    0.001 to 65.000

For most applications, the Totalizer reflects the same decimal point location and engineering units as the Input Display. In these cases, the Totalizer Scale Factor is 1.000. The Totalizer Scale Factor can be used to scale the Totalizer to a different value than the Input Display. Common possibilities are:
1. Changing decimal point location (example tenths to whole)
2. Changing engineering units (example inches to meters)
3. Changing both decimal point location and engineering units.
4. Average over a controlled time frame.
Details on calculating the scale factor are shown later.

If the Totalizer is being accumulated through a user input programmed for Batch, then this parameter does not apply.

TOTALIZER LOW CUT VALUE*

| Locuᴜ ⬆ |
| ⬇ -19999 |

    -19999 to 99999
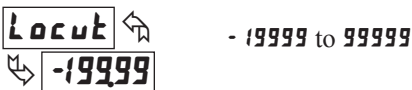
A low cut value disables Totalizer when the Input Display value falls below the value programmed.

TOTALIZER POWER UP RESET*

| P-UP ⬆ |
| ⬇ NO |

    NO   Do not reset buffer
    rSᴜ   Reset buffer

The Totalizer can be reset to zero on each meter power-up by setting this parameter to reset.

* Factory Setting can be used without affecting basic start-up.

TOTALIZER HIGH ORDER DISPLAY

When the total exceeds 5 digits, the front panel annunciator **TOT** flashes. In this case, the meter continues to totalize up to a 9 digit value. The high order 4 digits and the low order 5 digits of the total are displayed alternately. The letter "ʰ" denotes the high order display.

TOTALIZER BATCHING

The Totalizer Time Base and scale factor are overridden when a user input or function key is programmed for store batch (bAᴜ). In this mode, when the user input or function key is activated, the Input Display reading is one time added to the Totalizer (batch). The Totalizer retains a running sum of each batch operation until the Totalizer is reset. This is useful in weighing operations, when the value to be added is not based on time but after a filling event.

TOTALIZER USING TIME BASE

Totalizer accumulates as defined by:

$$\frac{\text{Input Display x Totalizer Scale Factor}}{\text{Totalizer Time Base}}$$

Where:
   Input Display - the present input reading
   Totalizer Scale Factor - 0.001 to 65.000
   Totalizer Time Base - (the division factor of ᴜbASE)

Example: The input reading is at an average of 10.0°C per hour. The Totalizer is used to verify this average reading in a controlled time frame of 4 hours. Because the Input Display and Totalizer are both in tenths of °C, the Totalizer Scale Factor is 1. However, the Totalizer Time Base is hours (3600) divided by the 4 hours in the controlled time frame to yield a Totalizer Scale Factor of 0.250. By placing these values in the equation, the Totalizer will accumulate every second as follows:

$$\frac{10.0 \times 0.250}{3600} = 0.00069 \text{ accumulates each second}$$

This results in:
 0.04167 accumulates each minute
 2.5 accumulates each hour
 10.0 reached at the end of 4 hours

TOTALIZER SCALE FACTOR CALCULATION EXAMPLES

1. When changing the Totalizer Decimal Point (dECPᴜ) location from the Input Display Decimal Point (dECPᴜ), the required Totalizer Scale Factor is multiplied by a power of ten.
Example: Input (dECPᴜ) = 0.0   Input (dECPᴜ) = 0.00

Totalizer dECPᴜ	Scale Factor		Totalizer dECPᴜ	Scale Factor
0.00	10		0.000	10
0.0	1		0.00	1
0	.1		0.0	.1
x10	.01		0	.01
x100	.001		x10	.001

(x = Totalizer display is round by tens or hundreds)

2. When changing the Totalizer engineering units, the Totalizer Scale Factor is the known conversion multiplier from Input Display units to Totalizer units.
   Example: If Input Display is feet and the Totalizer needs to be in yards, the conversion multiplier from feet to yards is 0.333. Enter 0.333 as the Totalizer scale factor.
3. When changing both the Totalizer engineering units and Totalizer Decimal Point the two calculations are multiplied together. Example: Input Display = feet in tenths (0.0) with Totalizer = whole yards (0), the scale factor would be 0.033.
4. To obtain an average reading within a controlled time frame, the selected Totalizer Time Base is divided by the given time period expressed in the same timing units.
   Example: Average temperature per hour in a 4 hour period, the scale factor would be 0.250. To achieve a controlled time frame, connect an external timer to a user input programmed for rᴜoᴜ2. The timer will control the start (reset) and the stopping (hold) of the totalizer.

5.9 MODULE 9 - FACTORY SERVICE OPERATIONS (9-FCS)

PAR

Factory
Service Code

PARAMETER MENU
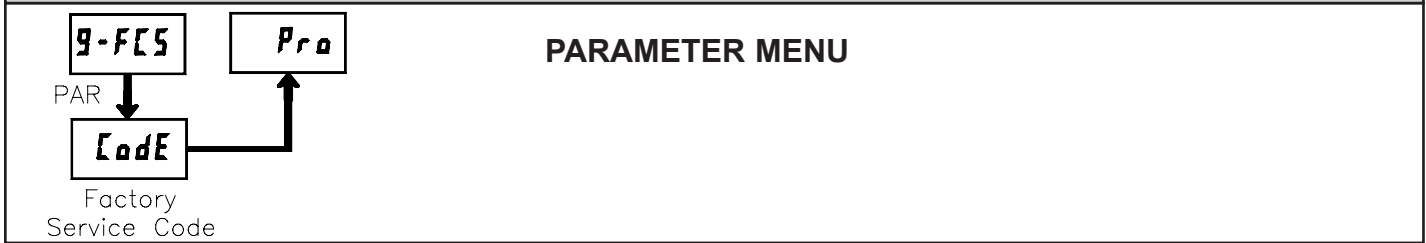
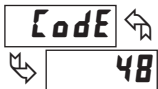## RESTORE FACTORY DEFAULTS

Use the arrow keys to display `CodE 66` and press **PAR**. The meter will display `rESEt` and then return to `CodE 50`. Press **DSP** key to return to Display Mode. This will overwrite all user settings with the factory settings.

CALIBRATION

The meter has been fully calibrated at the factory. Scaling to convert the input signal to a desired display value is performed in Module 1. If the meter appears to be indicating incorrectly or inaccurately, refer to Troubleshooting before attempting to calibrate the meter.

When recalibration is required (generally every 2 years), it should only be performed by qualified technicians using appropriate equipment. Calibration does not change any user programmed parameters. However, it may affect the accuracy of the input signal values previously stored using the Apply (`APLY`) Scaling Style.

Calibration may be aborted by disconnecting power to the meter before exiting Module 9. In this case, the existing calibration settings remain in effect.

DP5D - Input Calibration

 WARNING: *Calibration of this meter requires a signal source with an accuracy of 0.01% or better.*

Before starting, verify that the Input Ranger Jumper is set for the range to be calibrated. Also verify that the precision signal source is connected and ready. Allow a 30 minute warm-up period before calibrating the meter. `no` and **PAR** can be chosen to exit the calibration mode without any changes taking place.

Then perform the following procedure:
1. Use the arrow keys to display `CodE 48` and press **PAR**.
2. Choose the range to be calibrated by using the arrow keys and press **PAR**.
3. When the zero range limit appears on the display, apply the appropriate:
   - Voltage ranges: dead short applied
   - Current ranges: open circuit
4. Press **PAR** and `----` will appear on the display for about 10 seconds.
5. When the top range limit appears on the display, apply the appropriate:
   - Voltage ranges: top range value applied (The 300 V range is the exception. It is calibrated with a 100 V signal.)
   - Current ranges: top range value
6. Press **PAR** and `----` will appear on the display for about 10 seconds.
7. When `no` appears, press **PAR** twice.
8. If the meter is not field scaled, then the input display should match the value of the input signal.
9. Repeat the above procedure for each input range to be calibrated.

DP5P - Input Calibration

 WARNING: *Calibration of this meter requires a signal source with an accuracy of 0.01% or better.*

Before starting, verify that the precision signal source is connected to the correct terminals and ready. Allow a 30 minute warm-up period before calibrating the meter. `no` and **PAR** can be chosen to exit the calibration mode without any changes taking place.

Then perform the following procedure:
1. Use the arrow keys to display `CodE 48` and press **PAR**.
2. Choose the range to be calibrated by using the arrow keys and press **PAR**.
3. When the zero range limit appears on the display, apply the appropriate:
   - Voltage range: dead short applied
   - Current range: open circuit
4. Press **PAR** and `----` will appear on the display for about 10 seconds.
5. When the top range limit appears on the display, apply the appropriate:
   - Voltage range: 10 VDC
   - Current range: 20 mADC
6. Press **PAR** and `----` will appear on the display for about 10 seconds.
7. When `no` appears, press **PAR** twice.
8. If the meter is not field scaled, then the input display should match the value of the input signal.
9. Repeat the above procedure for each input range to be calibrated.

DP5T - Input Calibration

 Warning: *Calibration of this meter requires precision instrumentation operated by qualified technicians. It is recommended that a calibration service calibrates the meter.*

Before selecting any of the calibration procedures, the input to the meter must be at 0 mV or 0 ohms. Set the digital filer in Module 1 to 1 second. Allow a 30 minute warm-up period before calibrating the meter. The `no` and **PAR** can be chosen to exit calibration mode without any changes taking place.

10 OHM RTD Range Calibration
1. Set the Input Range Jumper to 10 ohm.
2. Use the arrow keys to display `CodE 48` and press **PAR**. Then choose `r. 10` and press **PAR**.
3. At `0 r`, apply a direct short to input terminals 3, 4 and 5 using a three wire link. Wait 10 seconds, then press **PAR**.
4. At `15 r`, apply a precision resistance of 15 ohms (with an accuracy of 0.01% or better) using a three wire link, to input terminals 3, 4 and 5. Wait 10 seconds, then press **PAR**.
5. Connect the RTD, return to the Display Mode and verify the input reading (with 0 Display Offset) is correct. If not correct repeat calibration.

100 OHM RTD Range Calibration
1. Set the Input Range Jumper to 100 ohm.
2. Use the arrow keys to display `CodE 48` and press **PAR**. Then choose `r- 100` and press **PAR**.
3. At `0 r`, apply a direct short to input terminals 3, 4 and 5 using a three wire link. Wait 10 seconds, then press **PAR**.
4. At `300 r`, apply a precision resistance of 300 ohms (with an accuracy of 0.01% or better) using a three wire link, to terminals 3, 4 and 5. Wait 10 seconds, press **PAR**.
5. Connect the RTD, return to the Display Mode and verify the input reading (with 0 Display Offset) is correct. If not correct repeat calibration.

THERMOCOUPLE Range Calibration

1. Use the arrow keys to display `CodE 48` and press **PAR**. Then choose `tC` and press **PAR**.
2. At `0.0 u`, apply a dead short or set calibrator to zero to input terminals 4 and 5. Wait 10 seconds, then press **PAR**.
3. At `50.0 u`, apply 50.000 mV input signal (with an accuracy of 0.01% or better) to input terminals 4 and 5. Wait 10 seconds, then press **PAR**.
4. Return to the Display Mode.
5. Continue with Ice Point Calibration.

ICE POINT Calibration

1. The ambient temperature must be within 20°C to 30°C.
2. Connect a thermocouple (types T, E, J, K, or N only) with an accuracy of 1°C or better to the meter.
3. Verify the readout Display Offset is 0, Temperature Scale is °C, Display Resolution is 0.0, and the Input Range is set for the connected thermocouple.
4. Place the thermocouple in close thermal contact to a reference thermometer probe. (Use a reference thermometer with an accuracy of 0.25°C or better.) The two probes should be shielded from air movement and allowed sufficient time to equalize in temperature. (A calibration bath could be used in place of the thermometer.)
5. In the Normal Display mode, compare the readouts.
6. If a difference exists then continue with the calibration.
7. Enter Module 9, use the arrow keys to display `CodE 48` and press **PAR**. Then choose `ICE` and press **PAR**.
8. Calculate a new Ice Point value using: existing Ice Point value + (reference temperature - Display Mode reading). All values are based on °C.
9. Enter the new Ice Point value.
10. Return to the Display Mode and verify the input reading (with 0 Display Offset) is correct. If not correct repeat steps 8 through 10.

TROUBLESHOOTING

PROBLEM	REMEDIES
NO DISPLAY	CHECK: Power level, power connections
PROGRAM LOCKED-OUT	CHECK: Active (lock-out) user input ENTER: Security code requested
MAX, MIN, TOT LOCKED-OUT	CHECK: Module 3 programming
INCORRECT INPUT DISPLAY VALUE	CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level, Module 4 Display Offset is zero, press DSP for Input Display PERFORM: Module 9 Calibration (If the above does not correct the problem.)
"OLOL" in DISPLAY (SIGNAL HIGH)	CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level
"ULUL" in DISPLAY (SIGNAL LOW)	CHECK: Module 1 programming, Input Range Jumper position, input connections, input signal level
JITTERY DISPLAY	INCREASE: Module 1 filtering, rounding, input range CHECK: Wiring is per EMC installation guidelines
ERROR CODE (Err 1-4)	PRESS: Reset KEY (If cannot clear contact factory.)

For further assistance, contact technical support at the appropriate company numbers listed.

PARAMETER VALUE CHART
DP5 Model Number

Programmer _____ Date _____

_____ Meter# _____ Security Code _____

1-INP Signal Input Parameters

DISPLAY	PARAMETER	FACTORY SETTING	USER SETTING
rANGE	INPUT RANGE		_____
tYPE	DP5T: INPUT TYPE	tc-J	_____
SCALE	DP5T: TEMPERATURE SCALE	°F	_____
dECPt	* DISPLAY RESOLUTION	0	_____
round	DISPLAY ROUNDING INCREMENT	1	_____
OFFSt	DP5T: DISPLAY OFFSET	0	_____
FILtr	FILTER SETTING	1.0	_____
bANd	FILTER ENABLE BAND	10	_____
StYLE	SCALING STYLE - NOT DP5T	KEY	_____
INP 1	* INPUT VALUE 1	0.000	_____
dSP 1	* DISPLAY VALUE 1	0	_____
INP 2	* INPUT VALUE 2	1.000	_____
dSP 2	* DISPLAY VALUE 2	1000	_____

2-FNC User Input and Function Key Parameters

DISPLAY	PARAMETER	FACTORY SETTING	USER SETTING
USr-1	USER INPUT 1	NO	_____
F1	FUNCTION KEY 1	NO	_____
F2	FUNCTION KEY 2	NO	_____
rSt	RESET KEY	NO	_____
Sc-F1	2nd FUNCTION KEY 1	NO	_____
Sc-F2	2nd FUNCTION KEY 2	NO	_____

3-LOC Display and Program Lockout Parameters

DISPLAY	PARAMETER	FACTORY SETTING	USER SETTING
HI	MAX DISPLAY LOCKOUT	LOC	_____
LO	MIN DISPLAY LOCKOUT	LOC	_____
tOt	TOTAL DISPLAY LOCKOUT	LOC	_____
CodE	SECURITY CODE	0	_____

4-SEC Secondary Function Parameters

DISPLAY	PARAMETER	FACTORY SETTING	USER SETTING
HI-t	MAX CAPTURE DELAY TIME	0.1	_____
LO-t	MIN CAPTURE DELAY TIME	0.1	_____
dSP-t	DISPLAY UPDATE TIME	2	_____
b-LIt	UNITS LABEL BACKLIGHT - DP5T ON	OFF	_____
OFFSt	DISPLAY OFFSET - NOT DP5T	0.00	_____
ICE	DP5T: ICE POINT COMPENSATION	ON	_____

5-tOt Totalizer (Integrator) Parameters

DISPLAY	PARAMETER	FACTORY SETTING	USER SETTING
dECPt	* TOTALIZER DECIMAL POINT	0	_____
tbASE	TOTALIZER TIME BASE	-IN	_____
SCFAC	TOTALIZER SCALE FACTOR	1.000	_____
Locut	* TOTALIZER LOW CUT VALUE	-19999	_____
P-UP	TOTALIZER POWER-UP RESET	NO	_____

* Decimal point location is model dependent.

DP5 PROGRAMMING QUICK OVERVIEW

Pro

Pro

F1/F2 Keys

1-INP

- rANGE — Input Range
- dECPt — Display Resolution
- round — Display Rounding
- FiLtr — Filter Setting
- bANd — Filter Band
- StYLE — Scaling Style
- INP x — Input x Value
- dSP x — Display x Value

DP5T ONLY

1-INP

- tYPE — Input Type
- SCALE — Temperature Scale
- dECPt — Display Decimal Point
- round — Display Rounding
- OFFSt — Display Offset
- FiLtr — Filter Setting
- bANd — Filter Band

2-FNC — FUNCTION KEYS

- USr-I — User Input
- F1
- F2
- rSt
- Sc-F1
- Sc-F2

3-LOC

- HI — Max. Display Lock-out
- LO — Min. Display Lock-out
- tOt — Total Display Lock-out
- CodE — Security Code

4-SEC

- HI-t — Max. Capture Delay Time
- LO-t — Min. Capture Delay Time
- dSP-t — Display Update Time
- b-Lit — Units Label BackLight
- OFFSt — Display Offset Value (NOT DP5T)
- ICE — Ice Point Compensation (DP5T ONLY)

5-tOt

- dECPt — Totalizer Decimal Point
- tbASE — Totalizer Time Base
- SCFAC — Totalizer Scale Factor
- Locut — Totalizer Low Cut Value
- P-UP — Totalizer Power Up Reset

9-FCS

- CodE — Factory Service Code