

**NEW**

**D. C. SIGNAL POWERED FOR V, 4-20 & mADC  
( & EXTERNALLY POWERED FOR OTHER SIGNALS)  
3 1/2" ANALOG METER REPLACEMENT**

**MODEL  
DCS**

**LED**



3 1/2 Digits

**FEATURES:**

- \* >20 Signal Conditioners
- \* 0.6" 3 1/2 Digit LED or
- \* 0.5" 4 1/2 Backlit LCD
- \* Fits Standard 3 1/2 Barrel Meter
- \* Same 2-Wire Connection
- \* Zero & Span Adjustment
- \* Replaces OTEK's "590" Series
- \* Also Externally Powered for > 30 Inputs
- \* Lifetime Warranted

**LCD**



4 1/2 Digits

**DESCRIPTION:**

By popular demand we bring back the old "**590**" but with *New Patented Technology* so you can replace the old needle, fragile and inaccurate 19th Century Technology analog meters without changing your panel or wiring.

**Signal Powered:** 4-20mA current loop and 4-30VDC, VAC, AAC, WAC & Hz-ideal for power line monitoring.

**Externally Powered:** V & mADC, V & mA RMS, TC, RTD, Frequency (40-20KHz), pH (0-14), %RH, and customs.

The external power options cover the entire industrial range of 5-32 VDC and 100-240VAC. Zero and Span adjustments (12 Turn Pots) are conveniently located on the front.

**Signal Conditioners:** 20+ signal conditioners are available (see description) for Powerless (Signal Powered) or externally powered applications.

The **LCD** version is red backlit (Option 1), and consumes only 15mA (supplied by the signal). If this is too much, order the externally powered or non-backlit (Option 2), it only requires 1mA to operate!

The **DCS** performs a self-test (C.O.P.) on power up

**SPECIFICATIONS @ 25°C :**

**Signal Powered:**

- \* Accuracy & Linearity:  $\pm 0.05\%$  of F.S.
- \* 4-20mA Loop Burden: <5VDC
- \* VDC Current Burden: LED:  $\leq 15\text{mA}$   
LCD with Backlight: 15mA, Without Backlight: 1mA
- \* Intensity: Brightest at 20mA, Dimmest at 4mA
- \* Min.-Max. VDC Signal: 3-52VDC
- \* Measuring Method: RMS Calibrated
- \* Humidity: 5-95% RH, N.C.
- \* CMBTF: >100,000 Hours
- \* Connector: #10 Lug
- \* LCD Image: Positive (Std.) Negative on Request

**Externally Powered:**

- \* Loop Burden: 0.5V @ 20mA
- \* VDC Signals: 10M Ohm Impedance
- \* Power Consumption: 0.075W
- \* A/D Technique: Sigma-Delta
- \* CMRR: 100dB @ 50-60Hz
- \* Hz V Range: 5-200VRMS, 50-20KHz
- \* TC, RTD, pH & %RH Specs.: Same as Sensor
- \* Op/Storage Temp.: 0-70°C/-20 + 80°C

**OTHER RELATED PRODUCTS:**

- ACS:** AC Signal Powered Meters, V, A, W, Hz, AC
- LPE:** LED 4 1/2 Digit Loop Powered
- LPM:** LCD 4 1/2 Digit Loop Powered
- LPI:** Loop Powered Isolator
- LPT:** Loop Powered Wireless Transmitter
- LPX:** Loop Powered Explosion Proof

**IF YOU DON'T SEE IT  
ASK FOR IT!**



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MADE  
IN  
USA

## DCS continued

### HOW IT WORKS:

**Current Loop Powered:** We use a Zener to clamp the voltage to 5V max. and monitor the Loop's current (we invented it in 1974). (Digit 2, Option 0).

**VDC Signal Powered:** We monitor the voltage with high impedance and clamp it to a safe level to power the **DCS**. (Digit 2, Option 2).

**AC Signal Powered (Pat. #: 4,908,569):** For VAC & Hz we use a capacitor limiting rectifier to power the **DCS** and monitor the VAC with an RMS-DC converter. For Hz we use an F-V for accurate conversion. For A.A.C. we invented (Pat. # 7,626,378) a C-V converter to extract the current from your C.T. for power and monitor the signal with RMS-DC. (Digit 2, Options Q-T).

**Externally Powered:** Non-Isolated 5VDC or isolated 5-32VDC or 90-265VAC 50/60Hz is optional (Digit 3, Options 1-7). Max Power: 150mW.

### THE SIGNAL CONDITIONERS:

(2nd Digit)

#### **Option 0: 4-20mA Loop Powered:**

First introduced in 1975, the current flows through a Zener and "Shunt" resistor. The Zener clamps the voltage to about 3.5 Volts and the voltage across the Shunt is measured and displayed. Because an LED acts as a Zener, instead of a Zener the LEDs of the backlite are used to power the meter. If the "burden" (3.5 - 4.5V) is too high for your application, use the externally powered version.

#### **Option 1: 4-20mA Externally**

**Powered:** It only drops 0.1V @ 20mA (5 Ohms) but the "**DCS**" needs 5VDC @ 20mA to operate (including the backlight or LEDs). Power Input must be Option 0 (Powerless).

**Accuracy:**  $\pm 0.05\%$  of F.S.

#### **Option 2: 4-30VDC**

##### **Signal Powered:**

Another **OTEK** innovation. The voltage signal powers an **LDO** to protect the **DCS** and a divider network is used to measure and display the signal. If the input resistance of this Option is too low (~ 500 Ohms), use option 9 and specify. Power Input must be Option 0 (Powerless).

**Accuracy:**  $\pm 0.1\%$  of F.S.

#### **Options 3-6: VDC & mADC**

##### **Externally Powered:**

Input impedance is 1 Mega Ohms on all VDC ranges and 100 Ohm on 2mA and 1 Ohm on 200 mADC ranges.

**Accuracy:**  $\pm 0.05\%$  of F.S.

#### **Options 7, 8 & A:**

**V & mA RMS:** Here we use a **True RMS-DC** Converter for accurate ( $\pm 0.05\%$ ) measurement of sine waves up to 10KHz ( $\pm 0.1\%$  for 10-20KHz) and SCR;s fired to  $\pm 1\%$ . Input impedances vs. range are the same as for VDC & mADC ranges. **Warning: No Isolation!**

**Accuracy:**  $\pm 0.05\%$  of F.S.

**Option 9: Custom:** Use this option to describe any custom input, scale or modification to the **DCS** and contact us for feasibility and cost.

#### **Option B: 5Amps AC:**

Specifically for current transformers (**C.T.**) this option requires an externally mounted (supplied) 0.05 Ohm, 0.1% 5 Watt resistor.

You

can mount the "Shunt" at your **C.T.** or next to the **DCS** but make sure the connections are "Perfect" to electrical codes. The C.T. might have "**Lethal**" **High Voltage** without a "Shunt" (Open) and the **DCS** will "Smoke". See **OTEK**'s New **ACS** & **CTT** models for **C.T.** powered instruments (Patented.)

**DCS continued**

**Option E: RTD (PT100):** We excite your 2 wire RTD with 200µA to avoid the "self heating" effect. The range of the **DCS** is the same as your **RTD** typically -200°C to +800°C (-328 + 1562°F). You can place the decimal point at will (typically -200.0 to 800.0 (-328.0 to 1562.0)). The **PT100** has a temperature coefficient of 0.00385 Ohms/Ohm/°C. (For legacy 0.00392 TC (known as ANSI 392) or 10 Ohm copper, contact **OTEK** and use Option 9.)

**Accuracy:** ±0.5% of F/C plus sensor's error.

**Option F: RTD (PT1000):** Same as PT100 except it is 1000 Ohms at 0°C instead of 100 Ohms @ 0°C. The same technique is used. For copper **RTD** (10 Ohm), contact **OTEK**. Same connection as Option E apply. Max Distance <30' (10M).

**Accuracy:** ±0.05% of F/C plus sensor's error.

Note: For long distances use a 4-20mA transmitter such as our **900** or **LPT** series.

**Option G: Thermocouple (Type J):** This **TC** has a range of -210 to +760°C (-350 + 1390°F). Its color is white (+) and Red (-), cold junction (CJ) is inside the **DCS** at the connector base. Make sure the connections from the **DCS** and your **TC** are as close to the **DCS's** entrance as possible to avoid errors. If you short out the **DCS's** +**TC** & -**TC** together, the **DCS** will read the ambient temperature due to its built-in C.J.C. (Cold Junction Compensation).

**Accuracy:** ± 2° F/C of signal input.

**Option H: TC (Type K):** This is yellow (+) and red (-) and has a range of -270 + 1370°C (-440 + 2500°F). The same notes as Option G applies.

**Accuracy:** ± 2° F/C of signal input

**For Other TC use #9 and Specify**

**Options J&K: Frequency Input:** We use an **F-V** to accept frequencies from 40 - 20KHz and amplitudes from 1-400V peak or dry contact or open collector transistor (O.C.T.). For 50 or 60Hz power line frequency measurement. Use Option K or see our **ACS** Powerless™ Series.

**Accuracy:** ±0.05% of F.S.

**Option L: %RH:** This conditioner is designed to interface to a typical (capacitance type) 2-3pF/% of **RH** made by several manufacturers. Use Option 9 and contact **OTEK** to specify your sensor's specifications.

**Accuracy:** ± 2% RH of signal input.

**Option M: pH (Acidity):** We use a FET input (10<sup>15</sup>) amplifier and calibrate the **DCS** for 0-14.00 pH using the Industry's standard ± 413 mV = ± 7pH coefficient.

Note: Not temperature compensated.

**Accuracy:** ±0.05% of F.S.

**Option N: ORP (Oxygen Reduction Potential):** Our FET amplifier (10<sup>9</sup>) accepts the industry standard 2000mV F.S. of the probe and the **DCS** displays it in % (0-100.00%).

**Accuracy:** ±0.05% of F.S.

## DCS SERIES continued

**Option P: Hi Speed Peak & Hold (P&H):** Now you can capture fast transients greater than 5 microseconds (even faster soon) with resolution greater than 0.1% of F.S. and retention of greater than 10 years (Thanks to OTEK's new and patent-pending **P&H Option**).

**Input:** 2VDC F.S. or mADC (Specify Range). Contact OTEK for V/mA RMS or Loop Powered (Patent Pending).

**Accuracy:** +/- 0.1% of F.S. +/- 1 Digit

**Linearity & Resolution:** +/- 0.1% of F.S.

**Response time:** >20KHz (<50us)

**Retention:** > 10 years (with power on)

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**Note: Options Q-T only available with Powerless™**

**Signal power input (Option 0, Digit 3).**

(PAT. #: 4,908,569)

**Option Q: VAC Signal Powered:**

**Warning! No Isolation!** This option uses the AC Voltage Signal to power the **LBD**. Since the **LBD** uses about 30mA @ 5VDC, we use a coupling capacitor AC-DC converter to generate 5VDC and not to "Load" the signal with a transformer. Consequently, your signal source should be capable of producing about 150mW without overloading it, otherwise use Options 7 or 8 (externally powered). Range: 50-150VAC; Method: RMS Calibrated; Accuracy & Linearity: ±0.5% of F.S. Best and safest when driven by a P.T. (Potential Transformer). **Always turn power off before connecting!**

**Option R: AAC Signal Powered:**

**Warning! No Isolation!** (Pat. #7,626,378)

OTEK's Patented technique permits the extraction of power from a regular **C.T.** (Current Transformer) to power the **DCS** without distorting the signal. Since this option is designed to be powered from a C.T., it should not be connected directly to the mains without limiting the current and proper electrical grounding. **Lethal Voltage** might be present at the C.T. secondary (output) if the secondary is open.

**Always turn power off before connecting!** Range (at C.T. output): 0.1-5AAC; Overload: 50%/30 seconds; Peak: 100%/1 second; Conversion: True RMS; Accuracy & Linearity: ±0.05% of F.S.; Burden on C.T.: <150mW.

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**Option S: Hertz (Frequency) Signal Powered: Warning! No Isolation!**

This option uses the same power technique as Option Q above and the same precautions and warnings apply. Here we use a "Zero Crossing" detector and a F-V converter to give you the **A.C.** line frequency display with 0.1 Hz resolution. Range: VAC: 50-150VAC/Frequency: 30-100Hz; for 400 Hz line use option #9 and specify; 400Hz +/-10% range. Accuracy & Linearity: ±0.05% of F.S.

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**Option T: Signal Powered AC Watts: Warning! No**

**Isolation!** Here we combine the powerless VAC & AAC options to arrive at real power calculations through our **CPU** and **DAC**. The same warnings and precautions of Options Q & R apply. Range: VAC: 50-150; AAC: 0.1 - 5A; Frequency: 40-450Hz; Accuracy & Linearity: ±0.1% of F.S.; Conversion: True RMS.

Contact **OTEK** for other functions.

**DCS SERIES continued**

**Power/Input (Digit 3):**

**Option 0: Powerless <sup>TM</sup>** The **DCS** is powered from the signal that it measures. **ONLY** available for options 0, 2, and Q through T of input signal (Digit 2).

**WARNING:** Options Q-T (Digits 2 & 3) could have lethal potentials!

**Options 3-7: Isolated Power**

These options offer minimum isolation of 500 VAC or DC and their efficiency is about 80%. All input ranges are +/-5%.

**Option 1 & 2: Non-Isolated 5 or 6-16 VDC Power:**

All listed I/O options (except Powerless <sup>TM</sup>) are available. Power requirements vary with options included. The **DCS** requires under 150 mW (30 mA@5VDC) for LED and under 100 mW with LCD & backlite display.

**Decimal Points (Digit 4):** The DCS has internal D.P. selection, specify or open unit and change jumpers on display board.

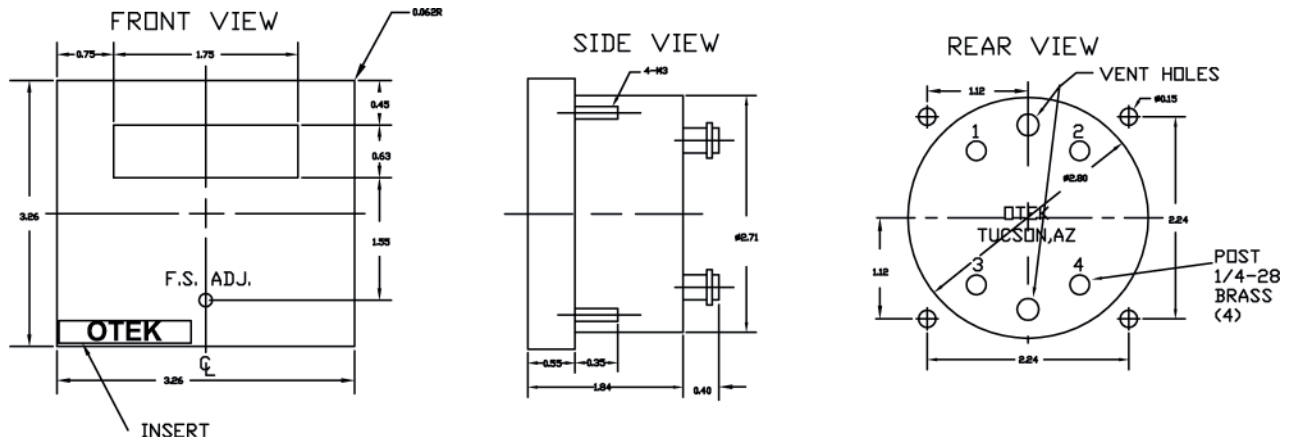
# ORDERING INFORMATION 7/21/10

Model: DCS -	1	2	3	4
<b>DISPLAY &amp; BACKLITE (1)</b>				
0.....	3 1/2 Digit LED			
1.....	4 1/2 Digit LCD Backlight			
2.....	4 1/2 Digit LCD No Backlight			
9.....	Custom (Specify)			
<b>E.S. INPUT SIGNAL/Z in (2, 3, 5)</b>				
0.....	4-20mA Loop Powered			
1.....	4-20mA External Powered			
2.....	4-30VDC Signal Powered			
3.....	200mVDC/1M Ohms			
4.....	500 VDC/1M Ohms			
5.....	2mADC/100 Ohms			
6.....	200mADC/1 Ohms			
7.....	200mVRMS/1M Ohms			
8.....	500VRMS/1M Ohms			
9.....	Custom (Specify)			
A.....	2mARMS/100 Ohms			
B.....	5ARMS/0.05 Ohms			
E.....	RTD PT100 (100 Ohms)			
F.....	RTD PT1000 (1K Ohms)			
G.....	TC Type J			
H.....	TC Type K			
J.....	Frequency 40-20 KHz			
K.....	Frequency 50-60Hz Line			
L.....	%RH (Specify Sensor)			
M.....	pH (0-14.00)			
N.....	ORP (0-2000 mV)			
P.....	High Speed Peak & Hold, 2 V			
Q.....	VAC Signal Powered (P.T.)			
R.....	AAC Signal Powered (5A C.T.)			
S.....	40-70 Hertz Signal Powered (P.T.)			
T.....	Watts AC Signal Powered (P.T. & C.T.)			
<b>DEC. POINT / RANGE / CALIBRATION(4)</b>				
0.....	Standard with NO DEC. POINT			
1.....	1.XXXX & Std			
2.....	1X.XXX & Std			
3.....	1XX.XX & Std			
4.....	1XXX.X & Std			
9.....	Custom (Specify)			
<b>POWER INPUT (3)</b>				
0.....	Signal Powered			
1.....	Non-Isolated 5VDC			
2.....	Non-Isolated 6-16VDC			
3.....	Isolated 5VDC			
4.....	Isolated 12VDC			
5.....	Isolated 24VDC			
6.....	Isolated 48VDC			
7.....	Isolated 100-240VAC			
9.....	Custom (Specify)			

**NOTES:**

1. Option 2 on digit 1 only requires 1mA.
2. See description. Use #9 and specify for input not listed.
3. Options 1 & 3-P (on 2nd Digit) must have options 1-7 on 3rd digit.
4. Specify calibration if other than standard 0-F.S. (1999 or 19999). D.P. is internally selectable
5. Specify sensor manufacturer and type for pH & % RH.
6. Zero adjustment is internal.

## MECHANICALS



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