

NEW

Signal Powered!

**FLAT PACK PANEL METERS
NEED NO PANEL CUT OUT**

**5-28VDC
Ext. Powered!**

**MODEL
FPM**



LED

FEATURES:

- 4 1/2 Digit (1.9.9.9.9) LED or LCD
- Signal Powered or
- Externally Powered
- High Accuracy & Resolution
- Self Diagnostics; Peak & Hold
- Signal Conditioners Embedded
- Installation Time: 2 Minutes
- NEMA 4X Case - No Adjustments
- Lifetime Warranted (LTD)



LCD

DESCRIPTION

Our New **FPM** Series is the 2nd generation of four famous "No Panel Cut-Out Required" meters introduced in 1976! The **FPM** uses ASIC and Nanotechnology to bring you a universal meter for all your applications (See Ordering Information For Listing of Input Functions).

Mounting: Just drill a 3/8" Ø (10mm) hole, pass the wires through it and connect them, that's all!

Displays: Choice of bright 0.6" **LED** or backlit **LCD**. Either positive or negative image, red or green backlite.

Power Supply: Not needed for current loops or VDC signal inputs. That is why we call it **Powerless™** (5VDC for other input signals).

Signal Inputs: Signal Powered: 4-20, 10-50mA or 3-30VDC. **Externally Powered (5VDC):** V/mA DC & RMS, Strain-Gage, RTD, TC, Hertz, %RH, pH, ORP, Peak & Hold or your custom inputs!

Peak & Hold: The FPM has **Peak & Hold** with about 300us(3/sec) response. For high speed (>20KHz) see Option 37 Description.

Case:

- **NEMA 4X** (no adjustments)
- **NEMA 3** (Zero and Span adjustment holes)
- **Sanitary** to 250°F Steam Cleaning
- **Custom** (?)

The FPM replaces models:

516, 518, 521, 522, 523, 524, 525, 526, 527 and 528 with the newest technology!



**If You Don't See It
Ask For It!**

SPECIFICATIONS @ 25°C(+/- 2 Digits)

Current Loop Powered:

- Accuracy & Linearity: ± 0.01%
- Burden: 4.5V @ 20mA, 3.5V @ 4mA
- Min-Max Current: 3-36mA
- Standard Calibration: 4-20 = 0-10,000 Counts
- Zero & Span: ± 3000 Counts
- Max. Open Loop volts: 30/1 Sec.

VDC Signal Powered:

- Accuracy & Linearity: ± 0.03%
- Quiescent Current: ≤ 20mA
- Min-Max Input: See Ranges
- Standard Calibration: See Ranges
- Zero & Span: ± 3000 Counts
- A.C. Signal Powered; see Options 40 & 41

Externally Powered: (See Options)

- Power: 5VDC @ 20mA Plus Signal Conditioner
- Loop Burden (4-20mA): 1 Volt
- Impedance (VDC): 100M Ohms
- V/mA RMS: True RMS Accy. & Lin.: +/- 0.5%
- Strain-Gage: Accy. & Lin.: +/- 0.5%
- RTD: PT100 (-200 + 800°C or °F)+/- 1% of F.S.
- TC: J or K 0°C to Max. +/- 2% of F.S.
- Hz: 30-20,000 Hz +/- 1%
- pH: 10¹⁵ Zin, 0-14pH +/- 0.1 pH
- % RH: To your Probe Specifications

Other Specifications:

- Displays: 0.6" LED, 0.5" LCD
- Viewing Angle: LCD: 6 O'Clock
- Conversion Rate: 3/Second
- CMRR: 100dB (50-60Hz)
- Input Type: S.E./Differential
- Max. C.M.V.: 2VDC
- Op/Storage Temp: -10 + 70°C/-30 + 80°C
- Temp. Coefficient: 50PPM/°C
- CMTBF: >100,000 Hours

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MADE
IN
USA



THE SIGNAL CONDITIONERS:

Option 00: 4-20mA 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 Option 01.

Connections:

Red: +Loop

Black: - Loop

Option 01: 4-20mA Externally

Powered: It only drops 1V @ 20mA (10 Ohms) but the "FPM" needs 5VDC @ 20mA to operate (including the backlight or LEDs).

Connections:

Red: V+

Black: Ground

Yellow: +Loop

White: -Loop

Option 02: 4-30VDC Signal Pow-

ered: Another OTEK innovation. The voltage signal powers an LDO to protect the FPM and a divider network is used to measure and display the signal. If the relatively low impedance (500 Ohms) and current (3-20mA) required by this Powerless™ technique is unacceptable, use Options 04-08 (externally powered).

Connections:

Red: V+

Black: V-

Option 03: 20-50VDC Powerless™

To this we add a Zener in series with the LDO (of Option 02) to extend its range. Use Options 04-08 if your signal cannot drive the FPM's load of about 1K Ohm and 20mA. Options 02-03 are used normally to monitor power supplies. Use Option "09" for 50V + input signals.

Connections:

Red: V+

Black: V-

Options 04-08: VDC Externally

Powered: Input impedance is 1Mega Ohms. (See power input Digit 4).

Connections:

Red: V+

Black: Ground

Yellow: +Signal

White: -Signal

Option 09: Custom: Use this option to describe any custom input, scale or modification to the FPM and contact us for feasibility and cost.

Connections:

To Be Determined

Options 10-13: 20mA - 200mADC:

Since the FPM is 200mV full scale (20,000 Counts) the "Shunt" resistors used are 1K, 100, 10 or 1 Ohm. Don't forget that maximum display is 19,999 not 20,000!.

Connections:

Red: V+

Black: Ground

Yellow: +Signal

White: -Signal

Options 14-22: V & mA RMs: Here we use a True RMS-DC Converter for accurate ($\pm 0.05\%$) measurement of sine waves up to 10KHz ($\pm 0.5\%$, 10-20KHz) and SCR;s fired to $\pm 2\%$. Input impedances vs. range are the same as for VDC ranges.

Connections:

Red: V+

Black: Ground

Yellow: AC High

White: AC Low

Option 23: 5Amps AC: Specifically for current transformers (C.T.) this option requires an externally mounted (supplied) 0.05 Ohm, 0.1% 3 Watt resistor. You can mount the "Shunt" at your C.T. or next to the FPM but make sure the connections are "Perfect" to electrical codes. The C.T. might have "Lethal" High Voltage without a "Shunt" (Open) and the FPM will "Smoke". See OTEK's New ACS & CTT models for C.T. powered instruments (Patent Pending).

Connections:

Red: V+

Black: Ground

Yellow: AC High

White: AC Low

Option 24: Strain-Gage

(**<350Ohm Type**): Here we use a "tracking" \pm excitation of ± 2.5 VDC and a differential amplifier to convert the 2 or 3mV/V (typical) sensitivity of your "Loadcell". Specify your Strain-Gage sensitivity and full scale and the FPM's display at Zero and Full Scale Please!

Connections:

Red: V+

Black: Ground

Yellow: +Signal

White: -Signal

Red/White: +Excitation

Black/White: -Excitation

Option 25: Strain-Gage (>1K <

5K Ohm): These are typically "Monolithic" S-G that require constant current (preferably) excitation. We use 100 μ A and diff. op. amp for high stability and accuracy. **Specify** your S-G impedance and sensitivity and the FPM's display at Zero and Full Scale.

Connections:

Red: V+

Black: Ground

Yellow: +Signal

White: -Signal

Red/White: +Excitation

Black/White: -Excitation

Option 26: RTD (PT100): We excite your 2, 3 or 4 wire RTD with 200uA to avoid the "self heating" effect. The range of the FPM 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) contact OTEK and use Option "09".

Connections:

Red: +V

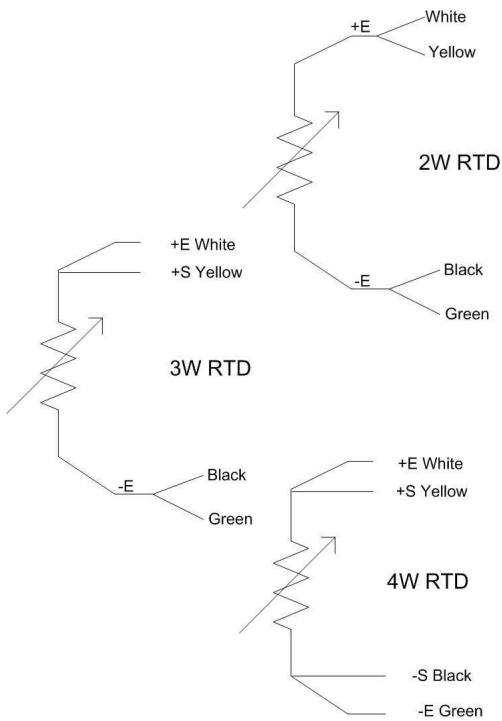
Black: -RTD

Yellow: +RTD Signal

White: +E

Green: -E

White/Black: Ground



Option 27: 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**.

Connections:

- Red: +V
- Black: -RTD
- Yellow: +RTD Signal
- White: +E
- Green: -E
- White/Black: Ground

Option 28: 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 **FPM** at the connector base. Make sure the connections from the **FPM** 6" wires and your **TC** are as close to the **FPM's** entrance as possible to avoid errors and calibrate after connecting. If you short out the **FPM's** TC wires together, the **FPM** will read the ambient temperature due to its built-in C.J.C.

Connections:

- Red: V+
- Black: Ground
- Yellow: TC+(White)
- White: TC-(Red)

Option 30: TC (Type K): This is yellow (+) and red (-) and has a range of -270 + 1370°C (-440 + 2500°F). Use same notes as Option 28.

Connections:

- Red: V+
- Black: Ground
- Yellow: TC+(Yellow)
- White: TC-(Red)

Option 31: TC (Type T): This blue (+) and red (-) **TC** wire has the range of -270 + 400°C (-440 + 750°F). Use same notes as Option 28.

Connections:

- Red: V+
- Black: Ground
- Yellow: TC+(Blue)
- White: TC-(Red)

Options 32-33: 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 # "33" or see our **ACS** Powerless™ Series.

Connections:

- Red: V+ Yellow: Hi
- Black: Ground White: LO

Option 34: %RH: This conditioner is designed to interface to a typical (capacitance type) 2-3pF/% of **RH** made by several manufacturers. Use Option "09" and contact **OTEK** to specify your sensor's specifications.

Connections:

- Red: V+
- Black: Ground
- Yellow: + Sense
- White: - Sense

Option 35: pH (Acidity): We use a FET input (10¹⁵) amplifier and calibrate the **FPM** for 0-14.00 pH using the Industry's standard + 413 mV = +7pH coefficient.

Accuracy: +0.05% of F.S.

Connections:

- Red: V+
- Black: Ground and Shield
- Yellow: + Signal
- White: - Signal

Option 36: ORP(Oxygen Reduction Potential):

Our FET amplifier (109) accepts the industry standard 2000mV.F.S. of the probe and the FPM displays it in % (0-100.00%)

Connections:

- Red: V+
- Black: Ground and Shield
- Yellow: + Signal
- White: - Signal

Option 37: Hi Speed Peak & Hold (P&H):

Now you can capture fast transients greater than 50 microseconds (even faster soon) with resolution greater than 0.1% of F.S. and retention of greater than 10 years (Due to OTEK's new and patent-pending **P&H Option**).

Input: V or mADC (Specify Range). Contact OTEK for V/mA RMS or Loop Powered).

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

Linearity & Resolution: +/- of F.S.

Response time: >20KHz (<50us)

Retention: >10 years (with power on).

Option 40: Signal Powered for VAC: No power supply req'd! Just connect to your P.T.(non-isolation) and display value. Analog meter replacement, range: 40-150VAC, 50-400Hz. Burden 0.1W, Accy.& Lin. :+/- 0.5% of F.S.

Connections: Warning:

No Isolation
 Yellow: A.C. High
 White: A.C. Low
 Note: Connect required Dec. Point before connecting A.C

Option 41: Signal Powered Amps AC: No Power Supply Req'd! Just connect to your C.T. & P.T. range: VAC: 40-150; AAC; 0-5Amp; 50-400Hz; burden; 0.1W Accy. & Lin.; +/- 0.5% of F.S.

Note: NO Isolation, use with P.T. & C.T. only. Must use shunt on C.T. 0.05% Ohm, 3W. **Warning** No isolation connect D.P. if req'd before Powering.

Yel: VAC Hi, White & Black VAC Lo & Amp Lo, Red: Amp Hi.

More: New Signal Conditioners will be added as per your requests and popularity, such as Ohms, Conductivity, Shock, Vibration, Position etc. Contact **OTEK**.

TYPICAL CONNECTIONS
(See Description for Specific Option)

NOTES:

1. Self Diagnostics: The **FPM** will test all segments and I/O Signals for about 5 seconds.
2. "X" = any Option Listed

WIRE	FUNCTION
RED	+VDC in / + Loop Powered
BLACK	Power GND /- LOOP Powered
YELLOW	+SIGNAL in (External Powered)
WHITE	-SIGNAL in (External Powered)
ORANGE	HOLD (Connect to Green to Enable)
BROWN	PEAK (Connect to Green to Enable)
BLUE	DP2 (See Table Below)
GRAY	DP1 (See Table Below)
WHITE/BLACK STRIPE	OPTION GROUND (Loop Powered Ground)
GREEN	+ 5VDC OUT (Only for Signal Enable)
VIOLET	DPON (Open for D.P., GND for no D.P.)

1) To change the decimal points connect Blue and/or Gray to Option Ground.

DECIMAL LOCATION	OPTION GROUND (Black or White/Black)
1XXXX	VIOLET Grounded (For No D.P.)
1.XXXX	VIOLET Open (For any D.P.)
1X.XXX	BLUE Grounded
1XX.XX	GRAY Grounded
1XXX.X	BLUE & GRAY Grounded

- 1) See options description for green, black, yellow, white & red.
- 2) For units with NO White/Black striped wire use the Black wire.

FPM SERIES

ORDERING INFORMATION 11-17-09

1 2 3 4 5 6

Model: FPM -

INPUT SIGNAL (1)

- 00 Loop Powered 4-20mA
- 01 External Power 4-20mA
- 02 Signal Powered 3-30VDC
- 03 Signal Powered 20-50VDC
- 04 ±200mVDC
- 05 ±2VDC
- 06 ±20VDC
- 07 ±200VDC
- 08 ±50mVDC
- 09 Custom (Specify)
- 10 ± 200µADC
- 11 ±2mADC
- 12 ±20mADC
- 13 ±200mADC
- 14 200mV RMS
- 15 2V RMS
- 16 20V RMS
- 17 200V RMS
- 18 50mV RMS
- 20 2mA RMS
- 21 20mA RMS
- 22 200mA RMS
- 23 5 Amp RMS
- 24 Strain-Gage (350 Ohm)
- 25 Strain-Gage (>1K Ohm)
- 26 RTD (PT100)
- 27 RTD (PT1000)
- 28 TC (Type J)
- 30 TC (Type K)
- 31 TC (Type T)
- 32 Frequency (40-20KHz)
- 33 Frequency (50-60Hz Line)
- 34 % RH (Specify Sensor)
- 35 pH (0-14.00)
- 36 ORP (0-2000mV)
- 37 High Speed Peak & Hold (2VDC)
- 40 VAC Signal Powered (P.T.)
- 41 AAC Signal Powered (P.T. & C.T.)

CASE (5)

- 0 NEMA 4X - No Adjustments
- 1 NEMA 3
- 2 Sanitary
- 9 Custom (Specify)

CALIBRATION/RANGE (4)

- 0 Standard
- 9 Custom (Specify)

POWER INPUT (1)

- 0 Powerless™
- 1 5VDC
- 2 6-15VDC
- 3 10-28VDC
- 4 120VAC External
- 9 Custom (Specify)

DISPLAY TYPE

- 0 LED
- 1 LCD Positive Red Backlite
- 2 LCD Negative Red Backlite
- 3 LCD Positive Green Backlite
- 4 LCD Negative Green Backlite
- 5 Reflective
- 9 Custom (Specify)

NOTES:

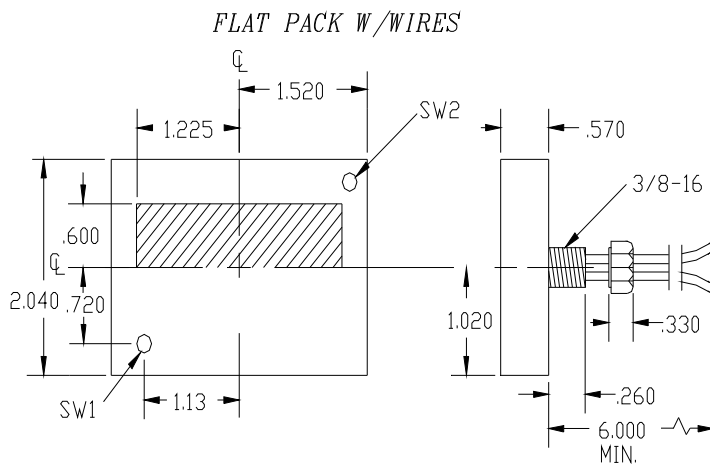
1. Options 00, 02, 03, 40 and 41 must use Option 0 (Powerless) on Digit 4. Others must use Options 1-4 or 9 on Digit #4. See signal cond. description. Options 26-31 must specify range of interest within 300^o (F or C) span.
3. 120VAC (Option 4) is AC Duplex Plug-In Module.
4. Standard calibration is 0-20,000 counts for V Input, 0-10,000 for 4-20mA (0-100.00%) or per sensor's range.
5. NEMA 4X has no Zero and Span Pots.

Mounting Instructions:

1. Drill a 3/8 - 1/2" diameter hole.
2. Attach supplied double sided tape to back of FPM.
3. Pass wires through hole.
4. Align and Press FPM on panel (that is all!)

MECHANICAL

413 FLAT PACK MECHANICALS & TYPICAL CONNECTIONS



Sanitary Case (Option 2)

