

**NEW**

**CYBER SECURITY SAFE**

**100% ANALOG METER REPLACEMENT  
FOR SIGNAL & EXTERNALLY POWERED:  
Current Loops, AC (V, A, W, Hz) and DC (V, A & W)  
CLASS 1E, APP. B & MIL/AEROSPACE GRADES AVAILABLE**

**SSAM-N**  
(Patent Pending)

**NOW WITH H.V. ALARMS & 4-20mA OUT**



**REPLACES DB40 F.F.&F.  
ANSI 4" SWITCHBOARD**

**HIGHLIGHTS:**

- \* No Microprocessors, just CMOS Logic ∴ Not **cyber security** vulnerable.
- \* 100% Signal Powered (like analog meters) for 4-20 & 10-50mA current loops, AC Volts, Amps, Hertz and Watts and DC V, mA & Watts or external power.
- \* Our patented **Signal Failure Alarm** warns you of a lost signal or power.
- \* 100% Form, Fit & Function (wire-by-wire) plug & play replaces analog meters
- \* 101 LED segment bar for 1% resolution with custom colors for alarm zones (bar)
- \* 4 1/2 digit (1.9.9.9.9) bright 0.6" LED display; 0.1% accuracy
- \* Optional Isolated H.V. Alarms for enunciator panel lamps & 4-20mA Outputs. USB out only on request.

**Otek Maintains a  
10CFR50  
Appendix B Quality  
Assurance Program**

**SPECIFICATIONS (@25° C)  
(Preliminary)**

- \* Accuracy: Digits:  $\pm 0.1\%$  of F.S.,  $\pm 1$  LSD
- \* Accuracy: Bar:  $\pm 1\%$  of Full Scale
- \* Conversion Rate: 3/second
- \* Display Brightness: Adjustable 50-100%
- \* Signal Power Required: 10-100mW
- \* Input Signal Range: Current Loops: 3.9-26 or 9-55 mA; VDC: 7-130V; VAC: 50-140V; AAC: 1-4A; WAC: 100-400W; Hertz: 30- 450 Hz
- \* **Note:** You must use C.T. & P.T. with all A.C. Signal Powered options.
- \* **Note:** If your signal can produce  $>10mW$ , you can use the **SSAM** or contact Otek.
- \* Temperature Coefficient:  $\pm 100PPM/°C$
- \* Operating Temperature: -10 to +60; Storage: -20 to +70°C
- \* CCMR:  $>90dB@50-60Hz$
- \* Humidity: 5-95% RH non-condensing
- \* Front Panel: NEMA 3. NEMA 4X optional
- \* Failed Signal Detect: ~ 30 minutes duration after  $> 1$  hour "On"  $@>50\%$  of F.S.
- \* Calibration Check: 2 years recommended.

**Note 1:** Electrical specifications for E and M grades are the same as Industrial, unless otherwise specified and accepted.

**FEATURES:**

- \* Cyber Security Safe (Not a Critical Digital Asset)
- \* H.V. Isolated Alarm Outputs (3)
- \* 101 Bars and Numerical Display
- \* Unlimited Custom Colors with pure white LEDs (See P. 8)
- \* Post Mortem Signal Fail Alarm
- \* Failsafe H.V. Alarm Outputs (2)
- \* Lifetime Warranty
- \* Customs Welcome

520-748-7900

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**OTEK**™ CORP.

SINCE 1974  
As of 9/18/18

A CLASS  
1E  
COMPANY

4016 E. TENNESSEE ST.  
TUCSON, AZ. 85714 U.S.A.

MADE  
IN  
USA



See Ordering Information Notes on Page 3.

## ORDERING INFORMATION



9-18-18

SSAM-N    -    -

Reserved For Future Control Functions

**GRADE & CASE (1, 2)**

- 0.....Industrial & Plastic
- 1.....Industrial & Metal
- 2.....Industrial & Plastic NEMA 4X
- 3.....Industrial & Metal NEMA 4X
- M.....To Mil-Spec & Metal (Contact OTEK)
- E.....To EPRI-Nuclear & Metal (Contact OTEK)
- 9.....Custom (Contact OTEK)

**RANGE/CALIBRATION**

- 0.....Standard (0-F.S. & 0.0-100.0%)
- 9.....Custom (Contact OTEK)

**SCALE PLATE & COLORS (3, 5)**

- 0.....Standard (Percent & All Green)...See Fig. 1 on Page 7
- 1...Tricolor (Percent & Red/Yellow/Green)...See Fig. 2 on Page 9
- 9.....Custom Colors (Contact OTEK)

**BAR & DIGIT (3, 5, 6)**

- 0.....Digits Only
- 1.....Bargraph Only
- 2.....Bargraph & Digits
- 9.....Custom (Contact OTEK)

**4-20mA RETRANSMISSION (4)**

- 0.....None
- 1.....Included
- 9.....Custom (Contact OTEK)

**Note:** Digit 7, Option 1 (4-20mA Out) requires 7-32VDC@25mA.

**INPUT SIGNAL (ALL SIGNAL POWERED)**

- 00.....4-20mA Current Loop (Powerless™)
- 01.....Range: 50-140.....Volts A.C.
- 02.....Range: 1.3-4.....5 Amps A.C.
- 03.....Range 80-600.....Watts A.C.
- 04.....Range: 50-140V/30-70.....Hertz A.C.
- 09.....Custom (Contact OTEK)
- 16.....7-130 Volts D.C., Signal Power
- 17.....10-50mA, Current Loop (Powerless™)

**EXTERNAL POWER INPUT SIGNAL (4)**

- 20.....4-20mADC External Power
- 21.....100mV DC F.S.
- 22.....1VDC F.S.
- 23.....10VDC F.S.
- 24.....100VDC F.S.
- 25.....10mADC F.S.
- 26.....100mADC F.S.
- 27.....Watts DC (1Vx1A) F.S.
- 28.....Watts DC (1Vx1V) F.S.
- 29.....Custom (Contact OTEK)
- 30.....0.1V RMS F.S.
- 31.....1V RMS F.S.
- 32.....10V RMS F.S.
- 33.....150V RMS F.S.
- 34.....250 V RMS F.S.
- 35.....0.1A RMS F.S.
- 36.....1A RMS F.S.
- 37.....5A RMS F.S.
- 38.....WRMS (1VACx1VAC) F.S.
- 40.....WRMS (120VAC/5AAC) F.S.
- 41.....Frequency (10KHz/5V Logic) F.S.
- 42.....Hertz (120VAC/40-100 Hz) F.S.
- 43.....Hertz (240VAC/30-100 Hz) F.S.
- 44.....Hertz (120VAC/500 Hz) F.S.
- 45.....Strain-Gage (≥300<4K Ohm)
- 47.....2, 3 or 4 Wire.....RTD (PT100)
- 48.....2, 3 or 4 Wire.....RTD (PT1000)
- 50.....TC (Type J)
- 51.....TC (Type K)
- 52.....TC (Type T)
- 53.....pH (0-14.00)
- 54.....ORP (0-2000mVDC)
- 55.....% RH (Specify Sensor)
- 56.....Resistance (0-10KΩ)
- 57.....10-50mA F.S.

**ALARM (HI-LO) OUTPUT (4, 7)**

- 0.....None
- 1.....“HI” O.C.T. (30V/30mA)
- 2.....“LOW” O.C.T. (30V/30mA)
- 3.....“HI & LOW” O.C.T. (30V/30mA)
- 4.....“HI” S.P.D.T. 1A Relay
- 5.....“LOW” S.P.D.T. 1A Relay
- 6.....“HI & LOW” S.P.D.T. 1A Relays
- 7.....“HI” H.V. Reed Relay
- 8.....“Low” H.V. Reed Relay
- 9.....Custom (Contact OTEK)
- A.....“HI & LOW” H.V. Reed Relays
- B.....“HI” H.V. MOSFET
- C.....“LO” H.V. MOSFET
- D.....“HI & LOW” H.V. MOSFET

**POWER INPUT**

- 0.....Signal Power (For Digits 3 & 4, options 00-17 only)
- 1.....Non-Isolated 5VDC Power (For Digits 3 & 4, options 20- 57)
- 2.....Isolated 5VDC Power (For Digits 3 & 4, options 20- 57)
- 3.....Isolated 7-32VDC Power (For Digits 3 & 4, options 20- 57)
- 4.....Isolated 90-265 VAC Power (For Digits 3 & 4, options 20- 57)
- 9.....Custom (Contact OTEK)

**SEE ORDERING INFORMATION NOTES ON PAGE 3.**



# ORDERING INFORMATION NOTES

## Notes:

1. Grade 0: Plastic Case; 1. Metal case; M: To agreed-to MIL-Stds (Contact Otek); E: To agreed-to EPRI standards (Contact Otek); 9: Custom (Contact OTEK).
2. Otek will build to certain Nuclear or MIL-Standards but testing and confirmation of compliance, if required, will be quoted as a separate line item.
3. For custom colored translucent scale plates for the bargraph and digit section, use Digit 9, option 9 and contact Otek.
4. Digit 6 options 1 & 2 for NPN Open Collector Transistors (OCT) require external VCC <30VDC <30mA sink or source. Options 4, 5 & 6 require external 5VDC@50mA/relay. Options 1, 2, 3, 7, 8, A, B, C & D are internally powered. See description on page 6. Digits 6 (Alarms) & 7 (Analog Out) share the same PCB location. Maximum of 2 total. Either 1 alarm (Option 1, 2, 4, 5, 7, 8, B or C & Retransmission (Digit 7, Option 1) or HI & LOW alarms, but Digit 7 must be Option 0. In other words, if Digit 6 is 3, 6, A or D, then Digit 7= 0.
5. The display is available as digits only (option 0), bar only (option 1), or both bar & digits (option 2). The standard color for bar & digits are all green. Use Option 9 on Digit 9 for custom colors; specify and provide colored drawings. See photos on pages 7 & 9.
6. Digit display is 100% bipolar (+/-); bargraph is unipolar (positive signals only).
7. For fail safe operation of alarm outputs (see Page 6), use option 9 and specify: Digit 6, Option N (1, 3 or 5) set for **fail safe**.

## SSAM IS CYBER SAFE: HOW DO WE DO IT?

We replaced any and all “digital assets,” (microprocessors, etc..) with non-digital components (as defined by NEI 08-09), replaced them with the latest hardware and added our patented (and patent pending) technology. We married this to the most advanced LED technology (approaching organic LED) to give you super bright bargraph and numerical displays. These displays are visible across the room when viewed in a typical Instrument & Control Room (I&C) because we incorporate “**pure white**” LEDs only, with the option for custom tinted scale plates to meet your needs. Conclusion: The only analog portion of the **SSAM** is the input signal!

**Why WHITE LEDs? The Power of the Powerless™!** To design an automatic tricolor LED bargraph (as on our **NTM & UPM** series) it would require a microprocessor or excessive hardware. Our customer base, nuclear, MIL and aerospace, depends on our reliability for 100% operation 24/7, and access to spare units is not always an option. That’s why we have designed the **SSAM** with identical hardware on all models and white LEDs. So if you need a spare for any function, location or input, all you do is change the scale plate (containing your custom color bands such as **red** for alarm, **yellow** for caution and **green** for normal), change the plug-in jumpers and recalibrate (if needed) the Zero & Span. That’s all. One (1) model does it all, as long as its housing mechanical is the same! That’s why we call it **SSAM**.

Otek specializes in customization and the reverse engineering of obsolete meters. Send us your challenge!

**Alarms:** 100% signal or externally powered, H.V. relays or MOSFETS to control your process.

### Powerless™ Controller:

Yes! You can replace 1:1 analog meters powered by the signal and have it control your process all in one. The **SSAM** offers optional 4-20mA current loop output, open collector NPN transistors (up to 2) and a 1 Amp S.P.D.T relay (up to 2) while it’s signal powered and its controlling outputs are externally powered. See page 6.

-3-

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**OTTEK**™  
CORP.

SINCE 1974  
As of 9/18/18



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TUCSON, AZ. 85714 U.S.A.

MADE  
IN  
USA



**GRADE (DIGIT 2):**

Options 0 & 2 are 94VO black plastic. Options 1 & 3 are 6061 aluminum nickel plated and black powder coated bezel only, which allows you to make electrical contact with your grounded panel via its case. Option **M** is to customer specified MIL-Stds and uses the metal case of option 1. Option **E** is to **EPRI TR102323 (Rev 3)**, plus your specified and accepted nuclear standards. See notes #1 & #2 of the ordering information on page 2.

Otek's QA program complies with **10CFR50 Appendix B** and **ANSI/ASME NQA-1**.

**SIGNAL POWERED (SIGNAL INPUT) OPTIONS****INPUT SIGNAL SPECIFICATIONS (DIGITS 3 & 4)**

**Note:** See Digit 6 Notes

**Note:** All  $\pm 1$  LSD and 100% full scale range unless noted and refers to numerical display, bar is  $\pm 1$  bar (1%).

**OPTION 00 & 17 FOR LOOP POWER ONLY:**

**Option 00, 4-20mA Loop Powered:** Burden:  $>3V@4mA, \leq 5V@20mA$ ; Range: 3-26mA; Accuracy & Linearity:  $\pm 0.1\%$  of F.S.

**Option 17: 10-50mA Loop Powered:** Burden:  $\leq 5V$ ; Range: 5-50mA; Accuracy & Linearity:  $\pm 0.1\%$  of F.S. **Burden:** See Important Note on Retransmission on Page 6!

**Options 01 Through 04, A. C. Signal Powered Only:**

**FUSE IT!** Use external 1/2 ASB for Volts and 6 ASB for Amps. The SSAM has internal 1 Amp and 5 Amp fuses.

**Important Notes:**

1) **C.T.** are sensitive and limited to the secondary (output) impedance. OTEK A.C. signal powered products present an input impedance of  $\sim 0.2$  Ohms. Make sure your C.T. can drive a  $>0.3$  Ohm load without saturating or losing linearity. Contact Otek for assistance. Best C.T. to use:  $>100:5$  ratio.

2) All inputs for 50-60 Hz lines. Contact Otek for 400 Hz lines.

**Option 01, VAC (P.T.):** Burden:  $<100mW$ ; Range: 50-140V/40-70Hz; Accuracy & Linearity:  $\pm 0.5\%$  of F.S. Best operating range: 90-140VAC to specifications.

**Option 02, 5 AMP A.C. (C.T.):** Burden:  $<100mW$ ; Range: 0.5-4A Full Scale; Accuracy & Linearity:  $\pm 0.5\%$  of F.S. Best range: 2-4 Amps. Maximum input: 5 Amps AC for 10 seconds.

**Options 01 Through 04 & 16, A. C. Signal Powered Only: (Continued)**

**Option 03, Watts A.C. (C.T. & P.T.):** Range:  $>100<600W/50-60Hz$ ; Accuracy & Linearity:  $\pm 0.5\%$  of F.S. at 90-140VAC & 1-4AAC. Best operating range: 100-500 Watts. For 400 Hz lines, use option 09 and specify (i.e. Option 09=400 Hz line) after the complete part number.

**Option 04, Hertz VAC:** Range:  $>50V<140V$  &  $>30<70Hz$ ; Accuracy & Linearity:  $\pm 0.5\%$  of F.S. For 400 Hz lines, use option 09 and specify (i.e. option 09=400 Hz line) after the complete part number.

**OPTION 16, VDC SIGNAL POWER ONLY:**

**Option 16, 7-130VDC:** Now you can monitor and control your AC line, UPS, battery bank or power supply with only power from the signal. The SSAM requires  $>10<80mW$  ( $\sim 3mA-20mA$ ). Imagine the possibilities!

**Scaling:** 7-130 Volts in = 7.0-130.0 Numerical Display & 5-100% bargraph. See Digits 9 & 10 for custom calibration and scale.

**Accuracy & Linearity:**  $\pm 0.5\%$  of full scale over temp. range.

**EXTERNAL POWER INPUT SIGNALS:**

**NOTE:** Digits 3 & 4, Options 20-57 are available on the SSAM, but must be externally powered (at present). Select input option (20-57), then power input Digit 5, options 1-4 or 9.

**Option 20, 4-20mA:** Burden:  $<5$  Ohm (0.1V); Range: 3-26mA; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**Options 21 through 24, VDC:** Input impedance 1M  $\Omega$ ; Range: Per Option; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**Options 25 & 26, mADC:** Input impedance Option 25: 10 $\Omega$ ; Option 26: 1 $\Omega$ ; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**Option 27, Watts DC (1Vx1A DC):**  $V_{Zin}$ : 1M  $\Omega$ / $A_{Zin}$ : 0.1 $\Omega$ , 5W; Range: 1W; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.



## NOTES AND DESCRIPTIONS (Continued)

### INPUT SIGNAL SPECIFICATIONS (DIGITS 3 & 4)

#### Options 20 through 58, For Externally Powered Only: (Continued)

**Option 28, Watts DC (1Vx1V):** VZin: 1M for both inputs; Range: 0-1V; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**Options 30 through 34:** VRMS: Zin: 1M $\Omega$ ; Range; per options; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**Options 35-37, Amps RMS:** Zin: Option 35 (0.1A): 1 $\Omega$ ; Option 36 (1 A): 0.1 $\Omega$ ; Option 37 (5A): 0.02 $\Omega$ ; Range: Per option; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**Option 38: Watts RMS (1Vx1V AC):** Zin: 1M $\Omega$  for both inputs; Range: 1V RMS; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**NOTE:** Always use P.T. or C.T. with H.V. or Amps lines.

**Option 40, Watts RMS (120VAC P.T. x 5AAC C.T.):** Zin: 1M for V & 0.02 $\Omega$  for I; Range: 0-600W; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit Note: Shunt resistor (0.02 $\Omega$ ) supplied.

**Option 41, Frequency (10KHz/5V Logic):** Zin: 1M; Range: 30-10KHz; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit

**Option 42, Hertz (120V, 40-100Hz):** Zin: 1M; Range: 50-150V/30-100Hz; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit. Use P.T.

**Option 43, Hertz (240V, 40-100Hz):** Zin 1 M; Range: 100-260V/40-100Hz; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit. Use P.T.

**Option 44, Hertz (120V, 500 Hz):** Zin: 1 M; Range: 50-150V/300-500Hz; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit. Use P.T. for 240V/400 Hz line, use Option 09 and specify: 9=240V/400 Hz input.

**Note on Strain Gage:** Specify S-G, sensitivity, range (cal. resistor value) and calibration. Example: 350 Ohms, 2mV/V, 20mV=0-100%.

**Options 45, Strain Gage ( $\geq 300 < 4K$  Ohm):** Excitation: 4.096V, 50 PPM/ $^{\circ}$ C Range:  $\pm 300-4K$   $\Omega$ ; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

#### Options 20 through 58: For Externally Powered Only: (Continued):

**Option 47 & 48, RTD:** 47: 100  $\Omega$  (PT100); 48: 1K  $\Omega$  (PT1000); Range: same as RTD; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit; 2, 3 or 4 wire RTD. For 3 wire, connect -E to -S. For 2 wire, also connect +E to +S. Warning: Max distance to sensor:  $\sim$  300 Feet (100M) or use our NTT transmitters.

**Note for Options 47-52:** Specify  $^{\circ}$ F or  $^{\circ}$ C calibration after part number. Default:  $^{\circ}$ F (not field selectable).

**Option 50, Type "J" TC: Range:** -210 to 760 $^{\circ}$ C; Colors: red and white; CJC: Included; Accuracy & Linearity:  $\pm 2^{\circ}$ C of F.S.

**Option 51, Type "K" TC: Range:** -270 to 1370 $^{\circ}$ C; Colors: Yellow and red; CJC: Included; Accuracy & Linearity:  $\pm 2^{\circ}$ C of F.S.

**Option 52, Type "T" TC: Range:** -270 to 400 $^{\circ}$ C; Colors: blue and red; CJC: Included; Accuracy & Linearity:  $\pm 2^{\circ}$ C of F.S.

**Note for Thermocouples (TC):** Shorting out the +/-TC terminals will display the ambient temperature of the C.J.C. at the terminals.

**Option 53, pH: Range:** 0-14.00; Zin:  $>10^{15}$  $\Omega$ ; Temperature compensation: None; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit. Contact Otek for customs.

**Option 54, ORP: Range:** 0-2000mV; Zin: $>10^9$   $\Omega$ ; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

**Option 55, % RH: Range:** Per sensor; Input Type: 2-3 pF/% Capacitors; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit. State sensor's specifications. Contact Otek for customs.

**Option 56, Resistance Range:** 0-10K  $\Omega$ =0-100%=0-100.0; Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit. Ideal for linear transducers. Contact Otek for customs.

**Option 57, 10-50mA Range:** 2 Ohms input resistance Accuracy & Linearity:  $\pm 0.5\%$  of F.S.  $\pm 1$  Digit.

Otek is  
now  
Appendix  
B



Save!  
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**POWER SUPPLY (DIGIT 5):**

**Option 0** only for Powerless™ signal input options 00-17. **Option 1** for non-isolated 5VDC power; **Option 2** for isolated 5 VDC power; **Option 3** for isolated 7-32 VDC power; **Option 4** for isolation 90-265VAC, 50-60 Hertz. All options are  $\pm 10\%$  input range.

**Note:** When ordering digits 3 & 4 (Input Signal) options 20-57, or digit 6 (Alarm Output) options 1-4 or 9, you must select power input options 1-9 on Digit 5 (max power required is 100mW).

**ALARM OUTPUT (DIGIT 6):****NOTE: Digit 6 (Alarms) & 7 (Retransmission):**

Your SSAM can have a **maximum of two (2) output modules** as listed on Digits 6 & 7. Each adds a burden to your loop (if loop powered) of  $\sim 250$  Ohms for a maximum drop of  $\sim 10V@20mA$  on your loop, for a total of  $15V@20mA$ , including the **SSAM** drop. If externally powered or AC/DC signal powered, the maximum "drop" on your loop is 0.5V each. Alarms are factory set for HI or LOW per ordering information and calibrated via internal potentiometers for tripping point.

**Fail Safe:** If "Fail Safe" is required, the selected alarm # will be set for "HI" at its **lowest signal value**. The result: upon detection of a valid signal, the relay will switch its contacts and remain "ON" unless the signal or power drops below its setting of near zero, at which point, the contacts will reverse to their resting position (**FAIL SAFE**), which you can use to alarm your system.

**Standard Limits of Calibration:** Matches the Color-X scale plate per Digit 9, option 1 or per custom option Digit 9, option 9. See page 7.

**Field Limits Recalibration:** Simply remove the back cover, apply signal and/or power and load to its output. Adjust potentiometer to desired limit PCB, turn clockwise to increase or counter-clockwise to decrease the tripping point. Double check for proper operation and replace back cover. For "Fail Safe," use a "HIGH LIMIT" module (usually SC-4), turn potentiometer full counter-clockwise (12 turn Pot.). The Result: Upon sensing signal  $> 0$  (0), the relay (or MOSFET) will energize and remain so until the signal (or power) drops  $\sim 1\%$  to or below zero (F.S.).

**Digit 6 Descriptions:**

**Option 0:** No alarms included.

**Option 1:** Open Collector NPN Transistors (O.C.T.): Normally "Off," can switch up to  $30VDC@30mA$  load and will turn "On" when signal is  $>$  than limit set (HI limit) or  $> 90\%$  of standard. (PCB #: 80-SC-AL-1)

**ALARM OUTPUT (DIGIT 6) {Continued}::**

**Option 2:** O.C.T. Normally "Off" (same as option 1 above) and will turn "On" when signal is  $<$  limit set (low limit) or  $<10\%$  of standard. (PCB #: 80-SC-AL-1)

**Option 3:** One each of the above options 1 & 2 for Hi and Low alarms. (PCB # 80-SC-AL-1)

**Options 4-6:** SPDT 1 Amp@120VAC or 30VDC mechanical relay. If **signal powered** (Digit 5, option 0), relays must be externally powered with 5 VDC@50mA each on SC4 or SC5, terminal #1 and ground (5V return) on ST1, terminal 2. (PCB #: 80-SC-AL-1)

**Options 7, 8 & A:** SPDT H.V. Reed Relays (100% signal or externally powered), 120 VAC/DC; up to 100mA switching vacuum sealed contacts (dry contacts). Ideal for annunciators. (PCB #: 80-SC-AL-2)

**Option 9:** Custom: Per your specs and our acceptance.

**Options B, C & D:** SPDT H.V. MOSFET (100% signal or externally powered): 250 VAC/DC; up to 50mA switching true "Break Before Make" action,  $<1K$  Hz Line. Minimum switching current:  $50\mu A$ , voltage: 3V DC/AC. (PCB #: 80-SC-AL-0)

**RETRANSMISSION (DIGIT 7):** Must be externally powered (see Digit 5). Accuracy:  $\pm 0.5\%$  of signal input. Maximum Load: 1K Ohm. (PCB #: 80-SC-TR-1)

**IMPORTANT NOTE FOR NON-ISOLATED RETRANSMISSION:** When used with Powerless™ (Digits 3 & 4, Options 00-17): Total 4-20mA input burden is increased BY  $<0.2$  V, but the 4-20mA output must be **externally powered** ( $<200mW$ ). See Digit 5 for power input choices. See figures 10-13 on Page 9.

The SC-TR-1 will convert the loop (or VDC) signal to 4-20mA output directly and it is calibrated as follows:

**Input Signal Option 00:** 4mA out at 4mA input & 20mA out at 20mA input (retransmission).

**Input Signal Option 01 (50-140VAC):** Range: 4-20mA Out (0.1428mA/V in); 50VAC: 7.143mA; 120VAC: 17.136mA; 140VAC: 19.992mA, or custom.

**Input Signal Option 02 (1.3-4AAC)** Range: 4-20mA out (4mA/AAC); 1.0 AAC: 4mA; 4AAC (F.S.): 16mA; 5 AAC: 20mA absolute maximum for  $<10$  seconds, or custom.

**Input Signal Option 03 (80-600 WAC):** Range: 4-20mA (0.333ma/WAC); 120 WAC: 4mA; 600WAC: 19.98mA absolute maximum for  $<20$  seconds, or custom.



# NOTES AND DESCRIPTIONS (Continued)

### RETRANSMISSION (DIGIT 7): (Continued)

**Input Signal Option 04 (30-70 Hertz {at 50-140VAC}) Range:** 4-20mA out (0.286mA/Hz); 30 Hz: 8.571mA; 50 Hz: 14.3mA; 60 Hz: 17.16mA; 70 Hz: 20.02mA (or custom).

**Input Signal Options 16 & 17:** It follows the input signal range (4-20mA out=7-140VDC input or 4-20mA out at 10-50mA signal input).

**For Powered Input Signal Options 20-57:** 4-20mA output = 0-Full scale input signal, as published (see ordering information digits 3 & 4). For custom outputs, use options 9 on Digit 7 and specify.

**CALIBRATION:** The SSAM has internal (behind the rear cover) zero & span 12-turn potentiometers to set the 4 & 20mA output range. By default (unless specified otherwise when ordering using Digit 10, option 9) the 4-20mA output is: Zero to Full Scale Input=4-20mA output.

### DIGIT 8: BARGRAPH OR DIGITS OR BOTH?

**NOTE:** Digit display is 100% bipolar (+/-); bargraph is unipolar (positive signals only).

The SSAM is available with digits only as a D.P.M. (Option 0) or with bargraph only like analog meters (Option 1) or both (Option 2). The bargraph section has a zero (0) bar that is also used as a "pilot" light to indicate "Presence of Signal" or "Below Range" input.

### DIGIT 8: (Continued)

**Power Fail Detect:** the SSAM's patented input signal failure detect/alarm uses the excess energy from the input signal to store energy and use it if/when the signal fails. The unit will remain "ON" without a signal for ~ 30 minutes. No more stuck needles.

### SCALE PLATE COLORS (DIGIT 9):

Otek's exclusive **Color-X™** technique allows you to choose specific color bands for any portions of the bargraph and digits. We use super-high efficiency **white** LEDs and we color the filter with transparent colored sections to meet your needs. See page 10 for selections. The **standard** bar and digit color is green. See the SSAM photo below. For typical customized colors, specify your custom bar and digit colors by using option 9. Digits are always green unless specified otherwise.

STANDARD COLOR DIGIT 9, OPTION 0      CUSTOM COLOR (Example) DIGIT 9, OPTION 9

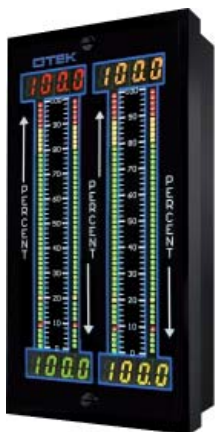


Fig. 1



## OTHER CLASS 1 E PRODUCTS AVAILABLE IN THE NEW TECHNOLOGY SERIES

### NTM SERIES (NEW TECHNOLOGY METER)



22 Models

### UPM SERIES (UNIVERSAL PANEL METER)

10 Models



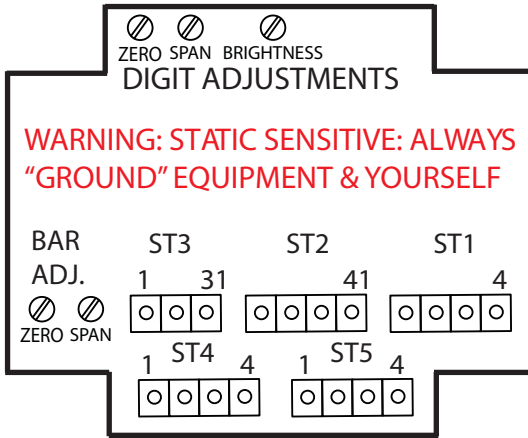
It's a DPM, Counter, Timer or Controller!

### NTT SERIES (NEW TECHNOLOGY TRANSMITTERS)



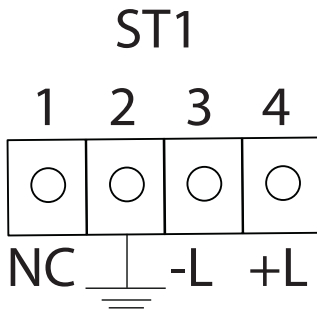
6 Models





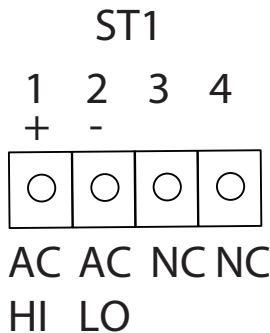
**FIG. 01: LOOP POWER**

Digits 3 & 4, Options 00 & 17



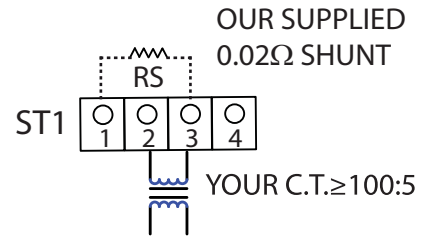
**FIG. 02: VAC, HERTZ OR VDC SIGNAL POWER**

Digits 3 & 4, Options 01, 04 & 16



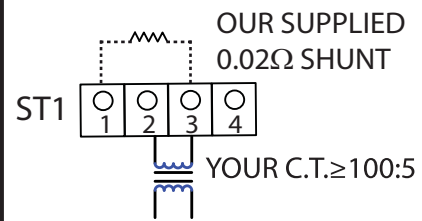
**FIG. 03: AAC SIGNAL POWER**

Digits 3 & 4, Option 02

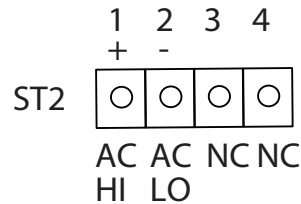


**FIG. 04: WATTS SIGNAL POWER**

Digits 3 & 4, Option 03

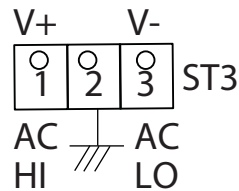


**AC VOLTS**



**DIGIT 5: POWER INPUT**

ALL/ANY OPTION



**FIG. 05**

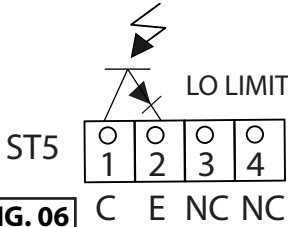
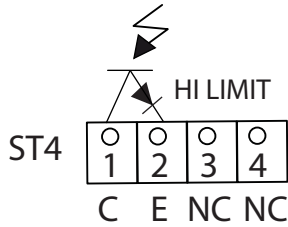
**NOTE:** Options 3-6 have 150V MOVs (2) across their contacts.





**DIGIT 6: ALARM OUTPUTS**

Options 1, 2 or 3 (O.C.T.)  
(Max Load:  $\leq 30\text{mA}@30\text{VDC}$ )

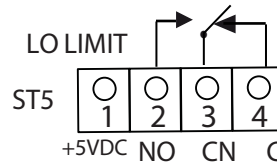
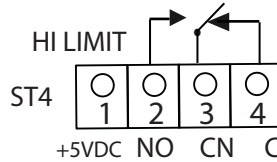


**FIG. 06**

**DIGIT 6: ALARM OUTPUTS**

Options 4, 5 & 6 (Relays)  
MAX LOAD:  $1\text{A}@120\text{VAC}/30\text{VDC}$

**NOTE:** If Loop Powered, connect your 5VDC to ST4 and/or ST5 (Pin #1) and ground to ST1-2 (See figure 01).  $\leq 50\text{mA}$  Each



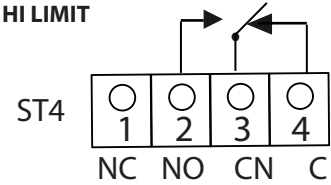
**FIG. 07**

150V MOVs INCLUDED ACROSS CONTACTS.

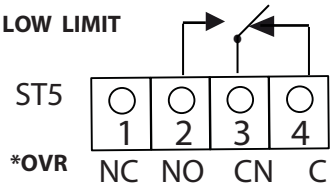
**DIGIT 6: ALARM OUTPUTS**

Options 7, 8 or A (H.V. Relays)  
MAX LOAD:  $100\text{mA}@140\text{VAC}/\text{DC}$  Resistive

**HI LIMIT**



**LOW LIMIT**



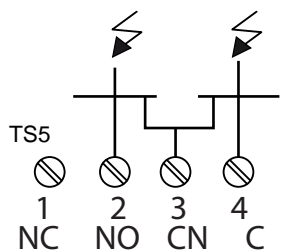
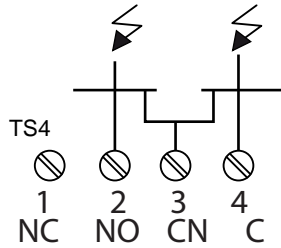
**FIG. 08**

150V MOVs INCLUDED ACROSS CONTACTS.

**\*OVR:** On Options 7, 8 & A you can override (turn on) relays by connecting ST4-1 or ST5-1 to ST1-3 (Ground).

**DIGIT 6: SPDT H.V. MOSFETS**

Digit 6, Options B & D

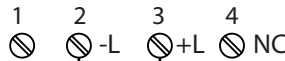


**FIG. 09**

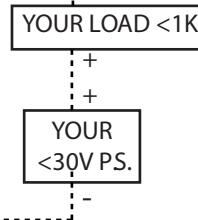
**NOTE:** Options 3-6 have 150V MOVs (2) across their contacts.

**DIGIT 7: 4-20mA RETRANSMISSION**

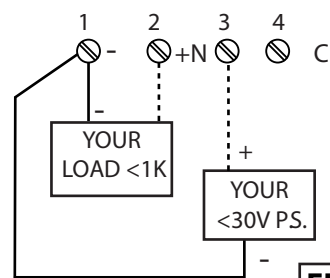
Loop Powered  
(If Digits 3 & 4 is option 00):



4-20mA Out  
"Sinking"  
(ST4 or ST5)



"Sourcing" (ST4 or ST5)



**FIG. 10**

Either 2 alarm output or 1 alarm & 1 retransmission or Custom (Digit 6 & 7, option 9).

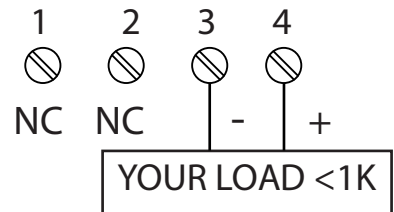
**DIGIT 7**

**4-20mA RETRANSMISSION**

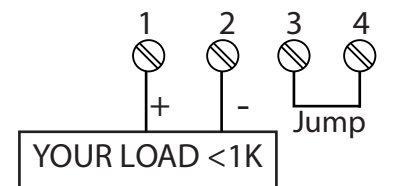
Signal or Externally Powered

(If Digits 3 & 4 are options 01, 02, 03, 04, 16 & 17 and Digit 5 is option 0 or if Digits 3 & 4 are options  $\geq 20-56$  and Digit 5 is option 1-4.

"Sinking"  
(ST4 or ST5)



"Sourcing"  
(ST4 or ST5)



**FIG. 11**



## SCALE PLATE (DIGIT 9):

Standard scale plate printing is 0-100% (see picture on page 1). For custom scale printing, use option 9 on Digit 9 and specify.

## RANGE & CALIBRATION (DIGIT 10):

Standard range and calibration is 0-100% of full scale per input signal selected on Digits 3 & 4. For custom calibration, use option 9 on Digit 10 and specify.

## ISOLATED USB SERIAL OUTPUT (CUSTOM):

Contact Otek for serial **output only** via **USB** (no input) from the SSAM.

## OTEK'S COLOR-X SYSTEM

**AVAILABLE COLORS USING OTEK'S COLOR-X™ OVERLAY**  
(Select Digit 9, Option 9 and provide the range and color number(s).)

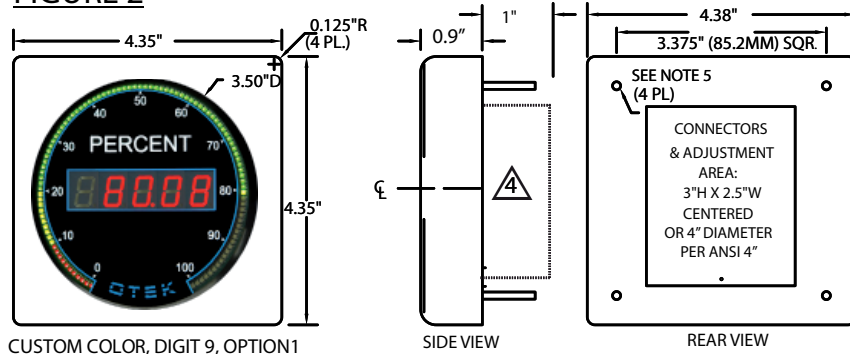
BROWN RED ORANGE YELLOW GREEN BLUE VIOLET GREY WHITE



Note: If required, specify the specific colors for the bar and the digits. Example (Digit 9, Option 9): Bar: 0-10 red, 11-20: yellow; 21-80: green; 81-90: yellow; 91-100: red. Digits: All blue.

## SSAM-N MECHANICAL DRAWING

FIGURE 2



### NOTES:

- STANDARD PANEL MOUNTING PER ANSI 4" (3.375") CASE CAN ALSO BE MOUNTED IN 1/4 DIN PANEL CUTOUT (92x92mm).
- CONNECTORS AND 3.375" STUDS SPACING MEET ANSI39.1 STANDARD FOR SWITCHBOARD METERS. CONNECTORS FALL WITHIN EXISTING "BARREL" (IF ANY) CUTOUT (4"Ø).
- WIRE: 26-16GA
- SHIELDED VERSIONS WILL EXTEND ~1.5" BEHIND THE PANEL.
- METAL VERSION HAS #8-32X 3/4" MOUNTING STUDS; PLASTIC HAS #4-40X1/2" MOUNTING STUDS.
- CLASS 1E IS 6061 ALUMINUM, NICKEL PLATED, WITH A BLACK FRONT WITH EMI/RFI FILTERED CONNECTORS PER EPRI 102323.