features:  
• USB/RS232/RS485/I/O  
• √, +, -, X ÷ Math Functions  
• 4 Digit Red for Count  
• 4 Digit Green for Preset  
• Front Panel Presettable  
• Manual Panic/Override  
• Dry Contact to 24VDC Input  
• SPDT 1A Relay Out (4)  
• 4-20mA Out for Proportional Control  
• Programmable Time Base For Up/Down Timer  
• RTC/Julian Clock  
• Analog In for flow totalizer  

DESCRIPTION:  
OTEK's new PBC multipurpose up/down counter is a timer, clock, integrator, accumulator and square root extractor indicator/controller with math functions (+, -, X, ÷, √), X-Y tables and polynomials (9th).  

The PBC was originally designed for the Nuclear industry to automatically/manually replenish the coolant in a reactor vessel. We took the original PBC and added new and powerful firmware and modular hardware to meet your demands.  

We have added:  
1. Analog Output (4-20mA) for proportional control.  
2. Four (4) relays (SPDT) for ON-OFF control and alarms.  
3. V-F front end for integration of analog signals (4-20mA).  
4. RTC Julian clock for real time control.  
5. Universal power inputs for 5-32VDC and 90-265 VAC.  
6. Universal serial communications or RS232, 485 & USB (Ethernet on request).  
7. Rear terminals for remote keypad (normally open contacts).  
8. All of above in a compact 1/8 DIN (48x92mm) only 2.5” deep.  

Now that you know what's inside the new PBC, think of the possibilities!  

FUNCTIONS OPERATING MODES  
Note: This data sheet is a detailed description (and user's manual) of the PBC family of instruments. Please refer to the specific function/section of interest.  

All mechanical functions of the keypad (and much more) are available via the serial port with simple commands.  

MATHEMATICAL FUNCTIONS: The PBC software has been verified (SV&V) for flawless operation by a nuclear client (see our Model TBD). This assures you that all functions, including math equations, polynomials, X-Y look up tables, and √ extractor (specially useful in Flow and Volume) will perform as specified.  

0. Input Debouncer: Mostly used with relay contact inputs or switches to eliminate multiple triggering. For solid state input you can disable it to obtain maximum speed response of 1 MHz. Programming is not available via keypad, only through the serial port.  

Commands:_____________________________  

1. Analog Output: Standard is 4-20mA with 30VDC compliance capable of driving loads ≤ 1K Ohm. You can program for Zero, Span, Offset, Positive or Negative Slope or Bipolar (4-12-20mA). In addition you can assign the DAC (analog out) to the count input value for proportional valve control (i.e.: Fully open at start, fully close at end of count), or you can control it via the serial port.  

Commands:_____________________________  

2. Relays: All 4 relays are floating, meaning that you can assign them to any stream of data, such as Zero (0). Hi Hi Limit, Hi Limit, Low Limit and Lo Lo Limit, or master power fail safe. Note: By factory default, relay K1 is programmed to operate at zero (0) count in count/timer down mode or limit on Up count/timer mode. See paragraphs A.3, A.5, A.7.2 (along with same numbered paragraphs for B, C and D functions).
3. Analog Input Signals: This input option accepts 4-20mA (most popular) or 0-10 VDC (others on request) and converts the input via a V-F converter (voltage to frequency) to pulses equivalent to the signal's amplitude. This factor is programmable via the serial port or can be factory programmed if requested.

Example: Assume your flow transducer transmits 4-20mA where 4mA = no flow (0) and 20mA = 100 gallons. Since the span of zero to F.S. is 16mA (20-4), then the factor would be 100÷16/UofT=6.25mA/unit of time. If you select UofT to be one (1) second, it would mean that if the input signal was to be 12mA for 1 second, the PBC would accumulate (add to count) 50 counts (gallons); if it was 16mA, it would accumulate 75 counts; if it was 8mA, it would accumulate 25 counts and so on.

Flow and Volume: (Also used on radiation, lumens, etc.) You can use the PBC dual display to indicate flow (G/Min) and volume (total). With the PBC square root function, you can easily and economically display/control the flow using a differential pressure transducer transmitter (see math functions).

4. RTC (Real Time Clock): The PBCs RTC contain a Julian clock (year/month/day/24 or 12/hour/minute/second and millisecond (.001 sec.). It’s back up battery is rated for ~ 10 years of uninterrupted operation. You can program the PBC to start or stop certain operations automatically controlled by the RTC with or without a fail safe contact or serial command.

Example: Assume a batch is to star on 2013/2/20/11h/20m/10.000S at a remote location only if (and only if) the water is flowing at a selected rate >1000 G/Hr (1000÷3600> =0.277G/S). Set the PBC to measure the flow and it’s flow low limit at 0.277 GPS, and set its volume low limit to desired volume (i.e. >9,0000 gallons) and its analog output (4-20mA) to the volume stream and any of its relays to Hi Limit (9,000 G) and Hi-Hi limit to a safe level (i.e. 9500 G) just in case. Have the PBC notify you via USB (cell phone) when the batch is done or of any emergency at any time any place (almost). You can even program it for emergency shut down if it doesn't get your command (reply) after a programmed elapse time.

5. Universal Power Inputs: You can power the PBC with non-isolated 5 VDC (lowest cost), non-isolated 6-32 VDC; isolated 5 VDC, isolated 6-32 VDC (48 & 72 VDC on request) for 90-265VAC 50/60 Hz (440 Hz on request). The power consumption varies with options selected from 1 watt (basic/instrument) to 5 watts fully loaded.

6. Universal Serial Communications: From Legacy RS232C, RS485, USB (V2.0) to Ethernet (on request)-all open protocol, ASC II, 8N1 setting band rate from 4,800 to 96.8 KBD. No handshake required (CAN, Modbus, DNP 3.0 on request). Total addresses 255 (000=factory default).

7. Remote Keypad: This option allows you to externally and remotely (< 5 Ft/2 M) locate your 4 key keypad (not supplied). This option requires N.O. contacts and eliminates the keypad on the PBC.

8. Connectors: All connectors (except serial I/O) are plug-in 2 piece, euro style that accept 16-26 GA wire: RS232: DB9 Male; RS485: 3 terminal euro wire; USB: client "B" type; Ethernet RJ45 (standard).
A.1 Down Counter To 0000: On power up, the PBC will light all its segments and D.P. (lamp test) and after C.O.P., it will flash the green MSD to prompt you to enter your preset value. If you want to do it later, press the  to put it on standby. (Only D.P. will be on.)

EQUIVALENT COMMAND: STANDBY/DOWN COUNT

NOTE: To turn "ON" the PBC, press the (power on/off symbol) for more than one (1) second. All digits (red and green) will display "0000". Nothing else occurs. Enter your password. (Default: 0000)

A.2 Preset: Press the key momentarily (<1 second) and the MSD of the Preset (Green) display will flash (3/sec) prompting a new value. If Zero is desired for the MSD, press the key to move to the next digit, otherwise press the key to scroll up (0, 1...9) to the desired value. Pressing the key will move flashing to the next digit. Once finished the presetting of all 4 digits, press the key for more than one (1) second and both the red (count) and green (preset) displays will have the same value and the preset (green) display will flash indicating ready to Start (Go to A.3) unless the preset value is "0000" (illegal). In this case, the PBC will display Errr (Error) only on its red display and blank on its green display. Nothing else occurs. If an "ERROR" occurs, press >1 second to go back to standby. Press again >1 second to go back to Step A.1.

EQUIVALENT COMMAND: PRESET NNNN

A.3 Start: If the presetting is successful (other than 0000), press the key for >1 second, the green display will stop flashing and relay K1 will energize switching its contacts N.O. (terminal #____) becomes closed and N.C. (terminal #____) becomes open to its common (terminal #____). Your PBC is ready to accept pulses.

EQUIVALENT COMMAND: START/XXX (XXX=AFTER DELAY) BATCH #NNNN (DATE AND TIME)

A.4 Count Down: Upon receipt of a complete pulse (Lo-High) [see debouncer description], the PBC will decrement its count on the red display only (9999-9999-9997, etc).

Note: The green (top) display does not change. Important Note: The PBC will decrement its count only when the pulse full cycle (+Debounce) has completed (L-H-L).

A.4.1 Engineering Units Count: This option is programmed to convert pulses to engineering units such as 1 pulse = 55 gallons, = 12 inches, = 25.4mm, 5 pulses = 1 meter, etc. See math functions.

EQUIVALENT COMMAND: ENG UNIT

A.5 End of Batch: When the count (red display) reaches "0000," relay K1 will de-energize reversing its contacts as in power off (fail safe mode) and the red (count) display will show steady END to indicate "end of batch."

SERIAL MESSAGE: END OF BATCH #NNNN (DATE AND TIME)

A.6 Repeat Same Value of Batch: If no changes on the preset value are desired and after the previous batch has been completed (red display END), press twice the key for >1 second to start the new cycle (see A.3 above).

EQUIVALENT COMMAND: REPEAT/XXX (XXX=AFTER DELAY)

A.7 Pause: Pressing the key <1 second will stop the cycle, de-energize the relay and flash the red (count) display on the value prior to the "STOP" command. (Only valid if batch is running)

EQUIVALENT COMMAND: PAUSE

A.7.1 To resume (only valid after pause) at the same count prior to pause, press the key <1 second. This will energize relay K1 (as on "START") (See A.3 Above) and be ready to accept pulses again.

EQUIVALENT COMMAND: RESUME/XXX (XXX=AFTER DELAY)

A.7.2 Abort The Batch: Press the key >1 second, the PBC will de-energize relay K1 and prompt you to enter new preset value (See A.2 above). (Only valid if batch is running) The count (red) display will show the last count prior to aborting, but will update to new preset value.

EQUIVALENT COMMAND: ABORT/XXX (XXX=AFTER DELAY)

A.7.3 OFF: To keep the PBC "off" of operation, press key for >1 second. Only the decimal points will be lit indicating power to the PBC and its relay "OFF" (stand-by).

EQUIVALENT COMMAND: OFF/XXX (XXX=AFTER DELAY)

A.7.4 START After "STANDBY" (Only D.P. On) or OFF: Repeat A.1 through A.3 steps above.

Note: If no power has been removed from the PBC, pressing >1 second, the PBC will display all zeros on both displays.

EQUIVALENT COMMAND: START/XXX (XXX=AFTER DELAY)

A.7.5 Manual K1 Relay Control: (Only during batch cycle) The relay K1 can be manually turned on and off by pulsing once <1 second. The red display (count) will flash indicating the relay is off and steady if it is on.

EQUIVALENT COMMAND: KNMAN ON/OFF (N=RELAY #)

A.8 Tamper Proof: Pressing any key except while the PBC is "counting" has no effect. Any other key pressing other than the sequence listed above (A.1 through A.7) has no effect.
B.1 Up Counter to Limit: On power up, the PBC will light all its segments and D.P. (lamp test) and after C.O.P., it will flash the green MSD to prompt you to enter your preset value. If you want to do it later, press the START/XXX key to put it on standby. (Only D.P. will be on.)

EQUIVALENT COMMAND: STANDBY/UP COUNT

NOTE: To turn "ON" the PBC, press the START/XXX (power on/off symbol) for more than one (1) second. All digits (red and green) will display "0000". Nothing else occurs. Enter your password. (Default: 0000).

B.2 Limit: Press the MSD of the Limit display will flash (3/sec) prompting a new value. If Zero is desired for the MSD, press the MSD key to move to the next digit, otherwise press the MSD key to scroll up (0, 1 . . . 9) to the desired value. Pressing the MSD key will move flashing to the next digit. Once finished the presetting of all 4 digits, press the MSD key for more than one (1) second. The Limit (green) display will lock on the limit value and the red display will show "0000". If the limit value (green) displays "0000" also, the PBC will flash Errr (error) and blank out its green display. Press >1 second (to standby) and again >1 second to go back to B.1 above.

EQUIVALENT COMMAND: LIMIT NNNN

B.3 Start: If the limit setting is successful (other than 0000), press the MSD key for >1 second, the green display will stop flashing and relay K1 will energize switching its contacts N.O. (terminal #____) becomes closed and N.C. (terminal #____) becomes open to its common (terminal #____). Your PBC is ready to accept pulses.

EQUIVALENT COMMAND: START/XXX (XXX=AFTER DELAY IN SECONDS BATCH # {DATE & TIME})

B.4 Unit Count: Every pulse received by the PBC will increment its count (red) display by one count until it reaches the limit value.

B.4.1 Engineering Units Count: This option is programmed to convert pulses to engineering units such as 1 pulse = 55 gallons, = 12 inches, = 25.4mm, 5 pulses = 1 meter, etc. See math functions.

EQUIVALENT COMMAND: ENGUNIT

B.5 End of Batch: When the count (red) display reaches the limit, relay K1 will de-energize reversing its contacts as in power off (fail safe mode) and the red (count) display will flash END to indicate "end of batch".

SERIAL MESSAGE: END OF BATCH #NNN (DATE & TIME)

B.6 Repeat Same Value of Batch: If no changes on the preset value are desired and after the previous batch has been completed (red display flashing END), press twice the MSD key for >1 second to start the new cycle (see A.3 above).

EQUIVALENT COMMAND: REPEAT/XXX (XXX=AFTER DELAY)

B.7 Pause: Pressing the MSD key <1 second will stop the cycle, de-energize its relay and flash the red (count) display on the value prior to the "STOP" command. (Only valid if batch is running)

EQUIVALENT COMMAND: PAUSE

B.7.1 To resume (only valid after pause) at the same count prior to pause, press the MSD key <1 second. This will energize the relay (as on "START") (See A.3 Above) and be ready to accept pulses again.

EQUIVALENT COMMAND: RESUME/XXX (XXX=AFTER DELAY)

B.7.2 Abort The Batch: Press the MSD key >1 second, the PBC will de-energize its relay and prompt you to enter new limit value (See A.2 above). (Only valid if batch is running.) The count (red) display will show the last count prior to aborting, until you Start the cycle again (See B.2) when it will reset.

EQUIVALENT COMMAND: ABORT/XXX (XXX=AFTER DELAY)

B.7.3 OFF: To keep the PBC off of operation, press MSD key for >1 second. Only the decimal points will be lit indicating power to the PBC and its relay "OFF" (Stand-By).

EQUIVALENT COMMAND: OFF/XXX (XXX=AFTER DELAY)

B.7.4 START After "STANDBY" (Only D.P. On) or OFF: Repeat A.1 through A.3 steps above. Note: If no power has been removed from the PBC, pressing MSD >1 second, the PBC will display all zeros on both displays.

EQUIVALENT COMMAND: START/XXX (XXX=AFTER DELAY)

B.7.5 Manual Relay Control (Only After Batch Cycle): The relay can be manually turned on and off by pulsing MSD <1 second. The red display (count) will flash indicating the relay is off and steady if it is on.

EQUIVALENT COMMAND: KNMAN ON/OFF (N=RELAY #)

B.8 Tamper Proof: Pressing any key except MSD while the PBC is "counting" has no effect. Any other key pressing other than the sequence listed above (A.1 through A.7) has no effect.
C.1 Down Timer To 0000: On power up, the PBC will light all its segments and D.P. (lamp test) and after C.O.P., it will flash the green MSD to prompt you to enter your preset value. If you want to do it later, press the ⬇️ key to put it on standby. (Only D.P. will be on.)

EQUIVALENT COMMAND: STANDBY/DOWN TIMER

NOTE: To turn "ON" the PBC, press the ⬇️ key. If Zero is desired for the MSD, press the ⬇️ key for >1 second to go back to Step A.1. Pressing the ⬇️ key will move to the next digit, otherwise press the ⬆️ key to scroll up (0, 1 ... 9) to the desired value. Pressing the ⬆️ key will move flashing to the next digit. Once finished the presetting of all 4 digits, press the ⬇️ key to start the cycle. If error repeat ⬆️ and ⬇️ key to scroll up (0, 1 ... 9) to the desired value. Pressing the ⬇️ key for >1 second will stop the cycle, de-energize relay K1 and prompt you to enter new preset value (See A.3 above).

EQUIVALENT COMMAND: UOFT/NNNN.MM (N=Seconds, M=Milliseconds.)

C.2 Preset: Press the ⬆️ key momentarily (<1 second) and the MSD of the Preset (Green) display will flash (3/sec) prompting a new value. If Zero is desired for the MSD, press the ⬆️ key to move to the next digit, otherwise press the ⬆️ key to scroll up (0, 1 ... 9) to the desired value. Pressing the ⬆️ key will move flashing to the next digit. Once finished the presetting of all 4 digits, press the ⬆️ key for more than one (1) second and both the red (count) and green (preset) displays will have the same value and the preset (green) display will flash indicating ready to Start (Go to A.3) unless the preset value is "0000" (illegal). In this case, the PBC will display Err (Error) only on its red display and blank on its green display. Nothing else occurs. If an "ERROR" occurs, press ⬆️>1 second to go back to standby. Press ⬆️ again >1 second to go back to Step A.1.

EQUIVALENT COMMAND: PRESET NNNN

C.3 Start: If the presetting is successful (other than 0000), press the ⬆️ key for >1 second, the green display will stop flashing and relay K1 will energize switching its contacts N.O. (terminal #____) becomes closed and N.C. (terminal #____) becomes open to its common (terminal #____). Your PBC is ready to accept pulses.

EQUIVALENT COMMAND: START/XXX (XXX=SECONDS AFTER DELAY) BATCH # NNNN (DATE AND TIME)

C.4 Count Down: Upon receipt of a complete pulse (Lo-High-Lo) [see debouncer description], the PBC will decrement its count on the red display only (9999-9998-9997, etc).

C.4.1 Engineering Units Count: This option is programmed to convert pulses to engineering units such as 1 pulse = 55 gallons, = 12 inches, = 25.4mm, 5 pulses = 1 meter, etc. Note: The green (top) display does not change. Important Note: The PBC will decrement its count only when the pulse full cycle is complete (L-H-L).

C.5 End of Batch: When the count (red display) reaches "0000," relay K1 will de-energize reversing its contacts as in power off (fail safe mode) and the red (count) display will show steady END to indicate "end of batch."

EQUIVALENT COMMAND: END OF BATCH # XXX (DATE AND TIME)

C.6 Repeat Same Value of Batch: If no changes on the preset value are desired and after the previous batch has been completed (red display END), press twice the ⬇️ key for >1 second to start the new cycle (see A.3 above).

EQUIVALENT COMMAND: REPEAT/XXX (XXX=AFTER DELAY)

C.7 Pause: Pressing the ⬆️ key <1 second will stop the cycle, de-energize the relay and flash the red (count) display on the value prior to the "STOP" command. (Only valid if batch is running)

EQUIVALENT COMMAND: PAUSE

C.7.1 To resume (only valid after pause) at the same count prior to pause, press the ⬆️ key <1 second. This will energize relay K1 (as on "START") (See A.3 Above) and be ready to accept pulses again.

EQUIVALENT COMMAND: RESUME/XXX (XXX=AFTER DELAY)

C.7.2 Abort The Batch: Press the ⬇️ key >1 second, the PBC will de-energize relay K1 and prompt you to enter new preset value (See A.2 above). (Only valid if batch is running) The count (red) display will show the last count prior to aborting, but will update to new preset value.

EQUIVALENT COMMAND: ABORT/XXX (XXX=AFTER DELAY)

C.7.3 OFF: To keep the PBC off of operation, press ⬇️ key for >1 second. Only the decimal points will be lit indicating power to the PBC and its relay "OFF" (stand-by).

EQUIVALENT COMMAND: OFF/XXX (XXX=AFTER DELAY)

C.7.4 START After "STANDBY:" (Only D.P. On) or OFF: Repeat A.1 through A.3 steps above. Note: If no power has been removed from the PBC, pressing ⬆️ >1 second, the PBC will display all zeros on both displays.

EQUIVALENT COMMAND: START/XXX (AFTER DELAY)

C.7.5 Manual K1 Relay Control: (Only during batch cycle) The relay K1 can be manually turned on and off by pressing ⬆️ on and off <1 second. The red display (count) will flash indicating the relay is on and steady if it is on.

EQUIVALENT COMMAND: KN MAN ON/OFF (N=RELAY #)

C.8 Tamper Proof: Pressing any key except ⬇️ while the PBC is "counting" has no effect. Any other key pressing other than the sequence listed above (A.1 through A.7) has no effect.
D.1 Up Timer to Limit: On power up, the PBC will light all its segments and D.P. (lamp test) and after C.O.P., it will flash the green MSD to prompt you to enter your preset value. If you want to do it later, press the (5) to put it on standby. (Only D.P. will be on.)

EQUIVALENT COMMAND: STANDBY/DOWN TIMER

NOTE: To turn "ON" the PBC, press the (power on/off symbol) for more than one (1) second. All digits (red and green) will display "0000". Nothing else occurs. Enter your password. (Default: 0000).

D.1.1. Unit of Time (UoT) or Time Base: Select the time base desired (UoT) by pulsing ( and ) simultaneously and then pulsing (up) until the desired time base is displayed incrementally in milliseconds (ms). For next decade (of time) pulse (up). If error repeat ( and ).

D.2 Limit: Press the (up) key momentarily (< 1 second) and the MSD of the (Limit) display will flash (3/sec) prompting a new value. If Zero is desired for the MSD, press the (down) key to move to the next digit, otherwise press the (up) key to scroll up (0, 1 . . . 9) to the desired value. Pressing the (up) key will move flashing to the next digit. Once finished the presetting of all 4 digits, press the (down) key for more than one (1) second. The Limit (green) display will lock on the limit value and the red display will show "0000". If the limit value (green) displays "0000" also, the PBC will flash Err (error) and blank out its green display. Press (up)=1 second (to standby) and again >1 second to go back to B.1 above.

EQUIVALENT COMMAND: LIMIT NNNN

D.3 Start: If the limit setting is successful (other than 0000), press the (down) key for > 1 second, the green display will stop flashing and relay K1 will energize switching its contacts N.O. (terminal #____) becomes closed and N.C. (terminal #____) becomes open to its common (terminal #____). Your PBC is ready to accept pulses.

EQUIVALENT COMMAND: START XXX (XXX=AFTER DELAY) BATCH # NNNN (DATE AND TIME)

D.4 Count Up: (TTL/CMOS 5V Standard, Others on Request) Equivalent Command:__________________________

D.4.1 Unit Count: Every pulse received by the PBC will increment its count (red) display by one count until it reaches the limit value.

D.4.2 Engineering Units Count: This option is programmed to convert pulses to engineering units such as 1 pulse = 55 gallons, = 12 inches, = 25.4mm, 5 pulses = 1 meter, etc.

EQUIVALENT COMMAND: ENGUNIT (See math functions)

D.5 End of Batch: When the count (red) display reaches the limit, relay K1 will de-energize reversing its contacts as in power off (fail safe mode) and the red (count) display will flash END to indicate "end of batch".

SERIAL MESSAGE: END OF BATCH # NNNN (DATE AND TIME)

D.6 Repeat Same Value of Batch: If no changes on the preset value are desired and after the previous batch has been completed (red display flashing END), press twice the (down) key for > 1 second to start the new cycle (see A.3 above).

EQUIVALENT COMMAND: REPEAT/XXX (XXX=AFTER DELAY)

D.7 Pause: Pressing the (power on/off symbol) key <1 second will stop the cycle, de-energize the relay and flash the red (count) display on the value prior to the "STOP" command. (Only valid if batch is running)

EQUIVALENT COMMAND: PAUSE

D.7.1 To resume (only valid after pause) at the same count prior to pause, press the (power on/off symbol) key < 1 second. This will energize the relay (as on "START") (See A.3 Above) and be ready to accept pulses again.

EQUIVALENT COMMAND: RESUME/XXX (XXX=AFTER DELAY)

D.7.2 Abort The Batch: Press the (power on/off symbol) key > 1 second, the PBC will de-energize its relay and prompt you to enter new limit value (See A.2 above). (Only valid if batch is running.) The count (red) display will show the last count prior to aborting, until you Start the cycle again (See B.2) when it will reset.

EQUIVALENT COMMAND: ABORT/XXX (XXX=AFTER DELAY)

D.7.3 OFF: To keep the PBC off of operation, press (power on/off symbol) key for > 1 second. Only the decimal points will be lit indicating power to the PBC and its relay "OFF" (Stand-By).

EQUIVALENT COMMAND: OFF/XXX (XXX=AFTER DELAY)

D.7.4 START After "STANDBY" (Only D.P. On) or OFF: Repeat A.1 through A.3 steps above.

Note: If no power has been removed from the PBC, pressing (power on/off symbol) >1 second, the PBC will display all zeros on both displays.

EQUIVALENT COMMAND: START/XXX (XXX=AFTER DELAY)

D.7.5 Manual Relay Control (Only After Batch Cycle): The relay can be manually turned on and off by pulsing (power on/off symbol) <1 second. The red display (count) will flash indicating the relay is off and steady if it is on.

EQUIVALENT COMMAND: KN MAN ON/OFF (N=RELAY #)

D.8 Tamper Proof: Pressing any key except (power on/off symbol) while the PBC is "counting" has no effect. Any other key pressing other than the sequence listed above (A.1 through A.7) has no effect.
E. Analog Input Rate/Totalizer (AKA: Integrator, Flow [Rate]Meter/Flow Totalizer/Dose Meter):

HOW IT WORKS: A flow transducer (any of many types and technologies) converts the flow of gas, liquid or solids in a carrier (pipe/conveyor) to an electrical signal which a transmitter then transmits (most common is 4-20mA) to a distant receiver. The receiver then converts it to your engineering units (gallons, liters, barrels, RADS, tons, FT³, etc.).

DIFFERENTIAL OR LINEAR PRESSURE TRANS-DUCER?

E.1 A differential pressure transducer uses 2 pressure XDCRS to give you a signal (4-20mA most popular/accurate) representative of the instantaneous flow, but it requires a square root (✓) [if not included in your transmitter] extractor (see math functions text) to convert it to actual flow (see wikipedia.org).

E.2 A linear pressure transducer converts the pressure to 4-20mA (most popular) that is mostly used in static (or slow changing) applications such as volume measurements/control. Please see math functions, polynomial/linearizer and X-Y tables for odd shape volume/weight containers.

E.3 Rate and Volume (all in one) is done with the PBC and a DPT (diff. press. XMTR) by enabling the ✓ function [if not included in your transmitter] (Command: SQR) entering the scale factor (Command: SF), selecting the display (Command: DISPT or DISPB) and the function for each display (Command: FLO or VOL). For FLO you must select the desired time base (Command: TBNN.MM). For Volume you must select the UP or DN command. And don't forget limits and the analog output (if required).

HOW DOES THE PBC WORK?
It converts the analog input (4-20mA, 0-20mA, 1-5V, 5-10V, etc.) to a unit of measure (UM) based on the output specifications of your transmitter (GPM, LPS, TPM, RPM [Rads Per Minute] etc).

WHAT DO I NEED TO KNOW?
R=1/S+Z=1/F÷16+Z, where R=Rate (on the display), S (Scale Factor)=Full Scale Flow÷by Signal Span (16mA in the case of a 4-20mA signal), F=flow at full scale signal (100 in our example) and Z=Zero Offset (4mA in the case of a 4-20mA signal). That's all!

Example: Assume a flow transmitter rated at 100 Gal/Sec=20mA output (F); then S=100/16=0.16mA/GPS (remember 0.16). So 4.00mA=No Flow, 4.16=1 GPS, 8mA=25 GPS (remember the 4mA zero offset!), 12mA=50 GPS (1/16x800=50), 75 GPS at 16mA and at 20mA, 100 GPS! Consequently, the scale factor number to enter in the PBC is 0.16 (if you want the resolution to be in 1Gal/Sec). For other engineering units (liters, barrels, see transducer MFR. specs or convert to desired E.U. (1Gal=3.785412L [1/(378.5412÷16]=0.0422675mA/LPS)).

So the scale factor would be 0.0422675 (instead of 0.16) x 378.5412=15.9999.....9+4 (offset)=20mA. Makes sense?

How About GPM, LPH, BPS? Just select the time base desired using the PBC's unlimited time bases from the RTC.

Linearize? Want to linearize it? Use the PBC's polynomials (9th), the X-Y tables (25 point) or it's math functions (+, -, X, ÷ and ✓).

Rate or Volume or Both? Select the proper display.

Up or Down Volume? Select either down or up mode.

Want Proportional Valve Control? Use the analog output see Analog Output (#1).

Want Alarms/On/Off Control? Use the 4 relay option see Relays (#2).

Want a Wake Up Call? Use the RTC and Ethernet/USB options (see # 4 & #6).

TYPICAL RATE & VOLUME PROGRAMMING
Mechanicals

ACTUAL DISPLAY WILL VARY

ACTUAL CONNECTORS WILL VARY
### Programmed Function (3)

<table>
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<tr>
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<tbody>
<tr>
<td>0</td>
<td>Down Counter to Zero</td>
<td>Up Counter to Limit</td>
<td>Down Timer to Zero</td>
<td>Up Timer to Limit</td>
<td>Rate</td>
<td>Volume Up to Limit</td>
<td>Volume Down to Zero</td>
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<tr>
<td>9</td>
<td>Custom (Contact OTEK)</td>
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### Grade (1)

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<td>M</td>
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### Input Signal (2)

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<tr>
<td>0</td>
<td>Pulse</td>
<td>Analog (4-20mA)</td>
<td>Pulse &amp; Analog</td>
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### Serial I/O (4)

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### Case (5)

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### Control & Power Out (4)

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<tr>
<td>0</td>
<td>None</td>
<td>Relays (4)</td>
<td>O.C.T. (4)</td>
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<td>Isol. 30VDC For XMTR</td>
<td>Relays &amp; Isol. 4-20mA</td>
<td>O.C.T. &amp; Isol. 4-20mA</td>
<td>Relays &amp; Isol. 30VDC For XMTR</td>
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<td>Non-Isol. 4-20 mA Out</td>
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### Power Input

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<td>Isolated 5VDC</td>
<td>Isolated 7-32VDC</td>
<td>Isolated 90-265VAC</td>
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<td>Isolated 48VDC</td>
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<td>Custom (Contact OTEK)</td>
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### Notes:

The **PBC** has space for many hardware and firmware options not listed. Contact **OTEK** for your applications.

1. Contact **OTEK** with your Mil-Std. specs. for M Grade. "N" Grade to 10CFR50-B requirements (to be qualified). Otek will build to certain MIL-standards but testing and confirmation of compliance, if required, will need to be done by a third party and at customer's expense.

2. See text for counting **down** or **up** modes. As a **timer**, the time base if factory programmed for 1 second on LSD (9,999 seconds total). Use Option 2 for your custom time base and contact OTEK.

3. All listed functions are field configurable. Unit is shipped with option selected. For options 0 & 1: Eng Unit: 1:1; For options 2 & 3: UofT (Time Base): one (1) second; For Option 4: 20mA=1,000 counts/second; For Options 5 & 6: 20mA=10,000 counts: limits set at 10% (LL); 20% (L); 80% (H) and 90% (HH).

4. Serial I/O is NOT isolated from signal input.

5. Nema 4X (IP65) front panel only.