MPT-10C PULSE TOTALIZING RELAY INSTRUCTION SHEET

Standard Solid State

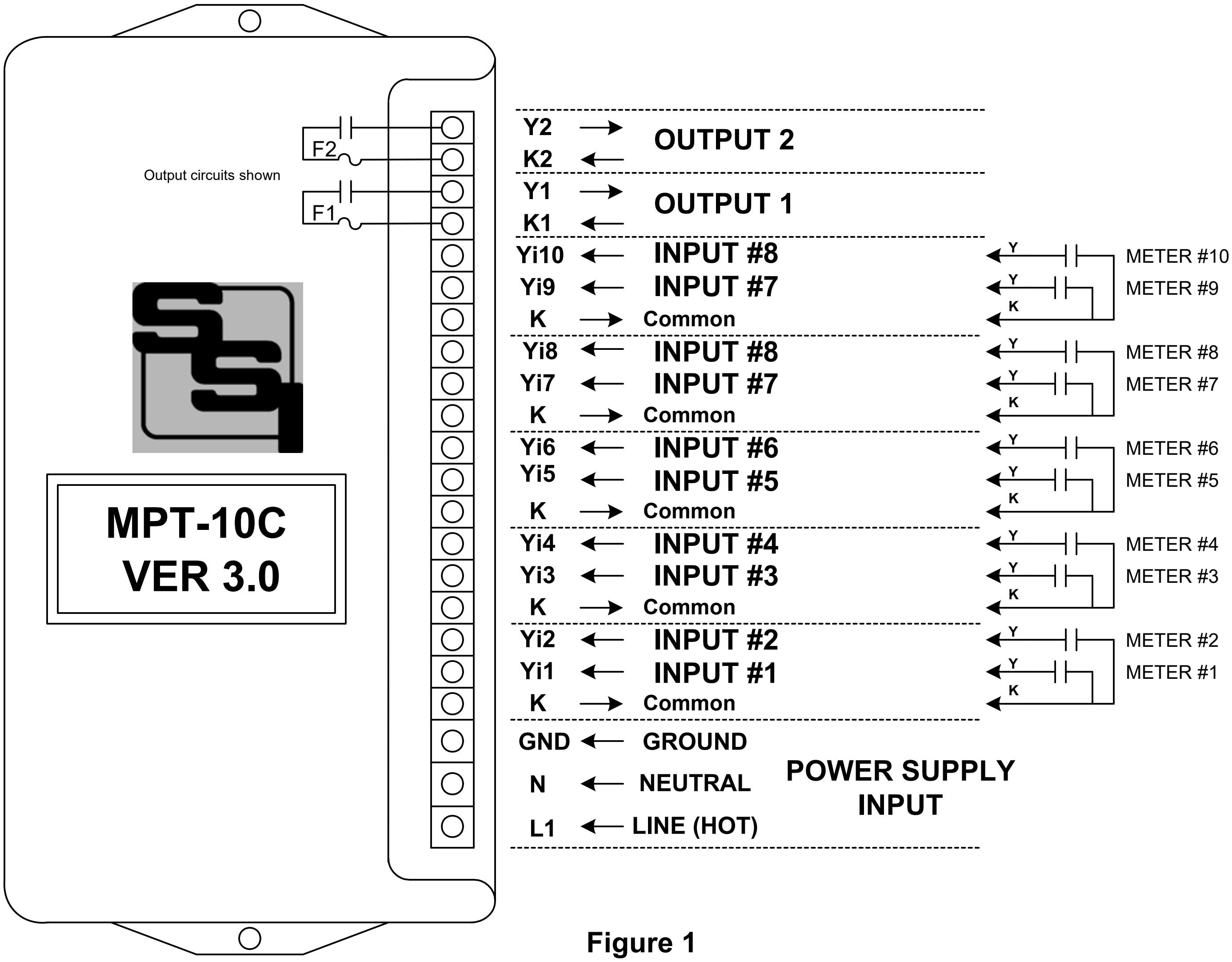

Figure 1

<u>POWER INPUT</u> - To power the MPT-10C, connect the "hot" lead from a 120VAC to 277VAC source to the **LINE** terminal. Connect the neutral lead to the **N** terminal. Connect the **GND** terminal to the electrical system ground. If a true Neutral does not exist at the mounting location, connect both **N** and **GND** to ground. The GND terminal must be connected.

<u>METER CONNECTIONS</u> - The MPT-10C accepts 2-Wire inputs only. The MPT-10C's K terminals provide the common return for all of the meters' K terminals. One K terminal is provided for each set of two Yi_x pulse inputs. Connect each meter's Y output to the desired Yi input terminal. Each Yi input provides its own wetting (sense) voltage to the meter's Y terminal. The meters' pulse outputs must be dry-contact type, either solid-state or electro-mechanical.

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OUTPUTS - Two 2-Wire Form A isolated dry-contact outputs are provided on the MPT-10C. MOV Transient suppression for the contacts of the solid-state relays is provided internally. The output loads should be limited to 1/10 Amp by F1 & F2. Two 1/10 Amp fuses are supplied standard with the unit unless otherwise specified. The fuse is a 3AG (AGC) fast blow type.

OUTPUT CONFIGURATION - The MPT-10's outputs can be configured in the OUT MODE display as either "Toggle" or "Fixed" outputs. The Toggle mode changes to the opposite state Open-to-Close or Close-to-Open upon a pulse being generated, emulating half of a Form C pulse. In Fixed mode the outputs close for a "fixed pulse width as set in the AOUTx MS displays.

2-WIRE (FORM A) OUTPUTS -

The MPT-10C's two K-Y outputs contain two solid-state, Form A, dry-contacts and may be used independently. These outputs can operate in the toggle mode to simulate one side of a 3-Wire Form C KYZ output, or in the fixed or momentary mode, where the outputs close for a fixed period of time then reset to an open state. The pulse value does not change, thus the closure is the pulse and the opening or reset does not have a value.

When the Output Mode display OUT MODE is set to "T", the outputs operate in the Toggle mode. When OUT MODE is set to "F" the outputs operate in the Fixed mode. The Fixed mode's output timing is controlled by the AOUT1_MS and AOUT2_MS settings which allows the output pulse width to be varied from 20 to 1000 mS in 10mS increments.

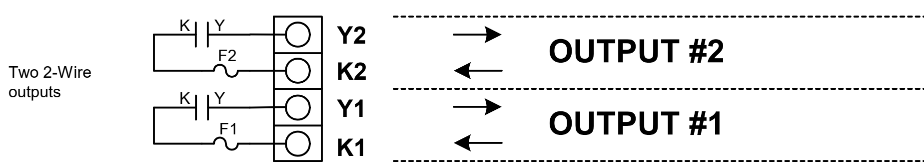

Figure 2

The MPT-10C has two output "Channels" that operate the hardware outputs individually. Each output channel is independently configurable.

Toggle Setting: In Toggle Output mode, output is toggled or switched to the opposite state each time a pulse s generated. This results in an approximate 50/50 duty cycle, given a square wave output where On time and Off Time are approximately equal. This emulates one side or half of a Form C (3-Wire) output. Therefore, the receiving device may have to double its pulse value for the correct equivalent value of energy.

Normal (Fixed) Pulse Width Setting: In Fixed Output mode, each output's "dwell" or closure time is controlled by the AOUT1_MS and AOUT2_MS settings. See the MPT-10C programming manual for more information on these settings. These settings range from 10mS to 1000mS in 100mS increments. It is important to know the minimum pulse width specification of the receiving equipment. The output pulse width time must be set so that pulses will be reliably "seen" by the pulse receiving equipment. If pulses are too short, they will either not be counted at all or may be intermittently received. Most equipment will see pulses down to 50 mS, so 100 mS is a good default value. This value should be kept as short as possible (so as not to skew demand information in the event that pulses are outputted rapidly) but long enough to be reliable. In the event that output pulses cannot be outputted fast enough with the pulse width time selected, a buffer will hold up to 1024 un-outputted pulses. The pulses in the buffer will be outputted as soon as timing allows.

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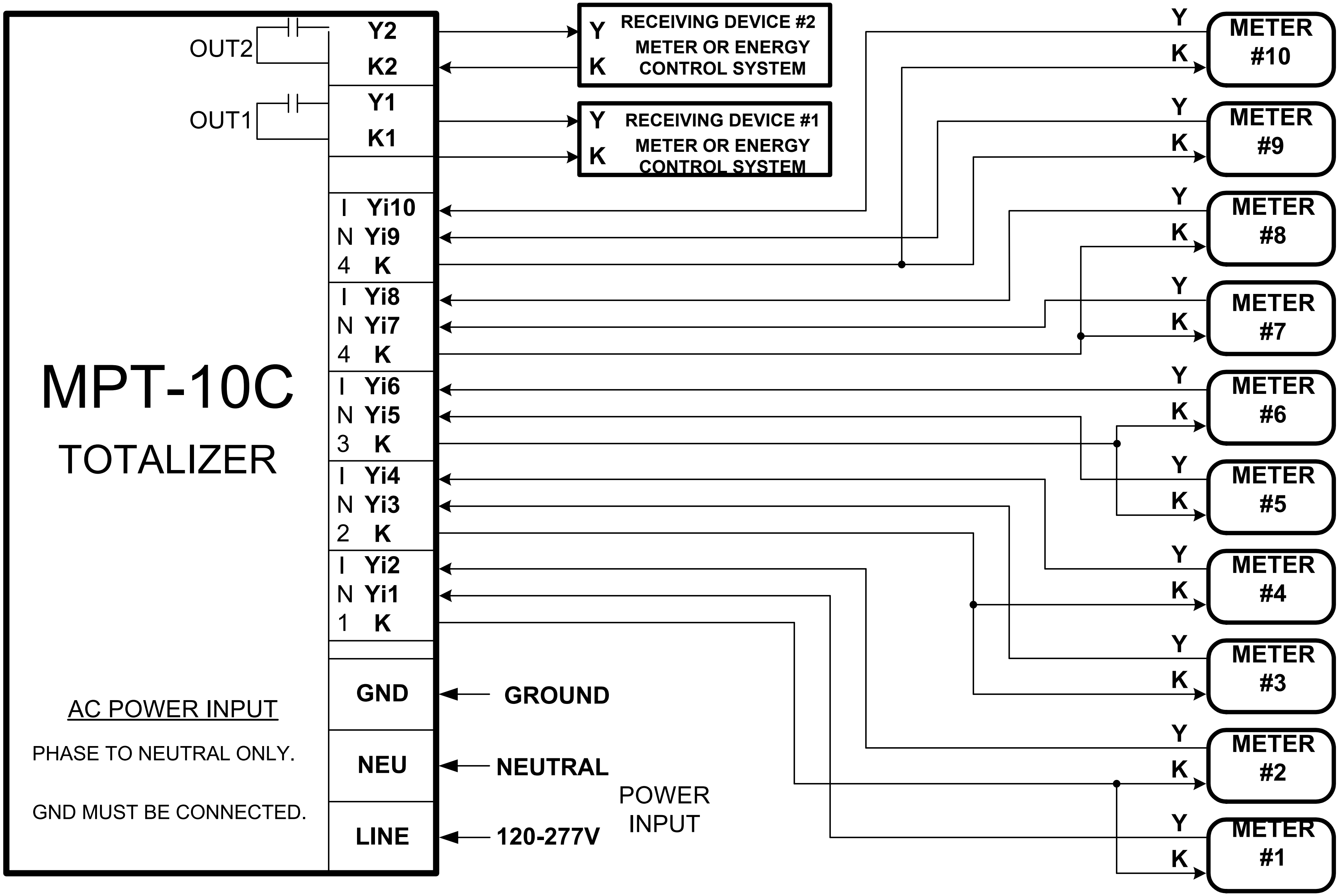
MPT-10C Electrical Wiring

Solid State Instruments, a Division of Brayden Automation Corp., Loveland, Colorado 80538 (970)461-9600



NOTE: A Sense Voltage of +12VDC is applied to the meters via the "Y" leads from the MPT-10C. The "K" lead is the common return.

REV. 4/9/24

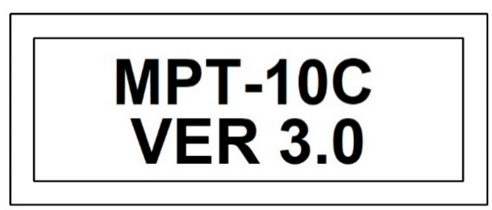
PROGRAMMING THE MPT-10C TOTALIZER

Version 3.0 Software

The MPT-10C Pulse Totalizer is programmed by using the three small pushbutton switches (keys) located just above the LCD display. The left key with the yellow cap is the “Back” or Previous screen key. The middle key with the orange cap is the “Forward” key or Next key and moves the cursor (the dash under a number on the LCD display) forward from display item to item. The right pushbutton switch (key) with the black cap is Change Setting key and is used to change the value in the column above the cursor. If the value above the cursor were 5, pressing the black key three times would change the display above the cursor to 8. Continued pressing of the black key would advance the number to the value 9 and then 0, then 1…2…3…4…5…6…7…8…9…0…and so on. When the desired value is reached, press the orange key to move to the next display item. If the value at the present display position has been changed, the new value will be saved into memory as soon as you move the cursor to the next position. If no change is desired, just press the orange key again. Pressing the yellow key will move you to the previous screen. All functions of the totalizer are accessible by repeatedly pressing the yellow or orange key. Upon reaching the last screen, and pressing the orange key again, the display will loop back and start again at the first display. Consequently, all the inputs can be changed and saved with a combination of pushes of the yellow, orange and black keys, as the instructions that follow will illustrate.

<u>START-UP DISPLAY: DISPLAYS SOFTWARE VERSION</u>

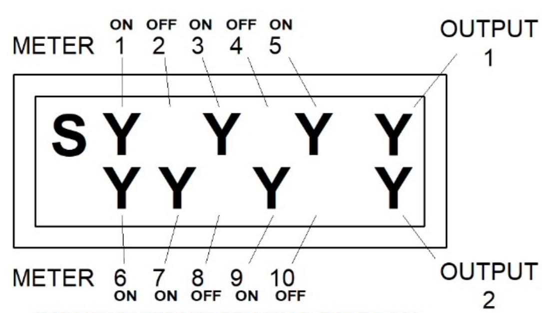
When the MPT-10C is powered up, the start-up screen will be displayed. This screen displays the Model Number on the top line and software version number of the totalizer on the bottom line. **THE DISPLAY WILL AUTOMATICALLY GO TO THE FIRST DISPLAY SCREEN AFTER 5 SECONDS.**



START-UP DISPLAY

<u>FIRST DISPLAY: STATUS OF INPUTS/OUTPUT</u>

The Status display shows the current state of all inputs and outputs. Upon a closure (input pulse) of the “Y2” input, meter #2’s status shown here on the display will change to a “Y”. The current status of each input of the MPT-10C is displayed. Any input which is not used or open will have a “-“displayed in its position.

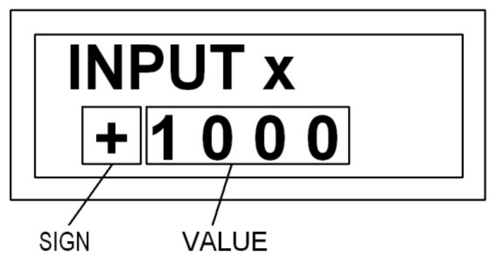


INPUT/OUTPUT STATUS DISPLAY

Two output characters are be displayed at the right end of the display. Output #1 is shown on the top line and Output #2 is shown on the bottom line. See the Status Display shown above. A “Y” will be displayed upon a pulse output for the time duration specified in the AOUT TMS settings in the Fixed Mode. In the Toggle Mode, the “Y” will be displayed when the output is closed and no character will be displayed with the output is open. When the outputs are open (no pulse output occurring) the display will show a “-“. Upon power-up, the outputs are set in the open position and a “-“will be shown in both output character positions. **PRESS THE ORANGE KEY TO GO TO NEXT DISPLAY.**

PULSE INPUTS

The MPT-10C has ten pulse inputs and each input screen consists of three pieces of information that must be programmed. These are the pulse sign, the pulse value and pulse input type. The pulse sign determines if the pulse is positive or negative. The pulse value is the numerical value that represents what a pulse is worth. The pulse type is Form A (2-Wire) only on the MPT-10C. Only the K and Y inputs are used.

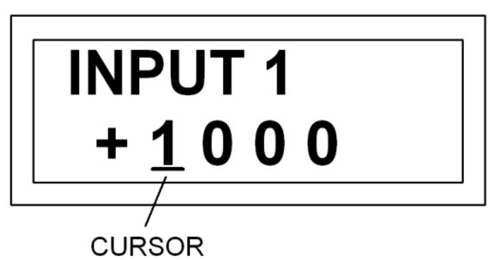


INPUT MASK

The Pulse Sign is used for adding or subtracting the pulse value from the pulse value (“PV”) register. It can be used to “net out” energy used where some values are positive and negative, like energy delivered and received, for example. If all inputs are positive, then the totalizer will simply add all input pulse values. At least one input must always be a positive sign. Four negative inputs are not allowed for obvious reasons.

The Pulse Value is the actual numerical value that a pulse is worth, or the “pulse weight”. This can be expressed in kilowatt-hours, watt-hours, or var-hours or any other appropriate unit of measure. All inputs must have the same units.

SECOND DISPLAY: METER #1 INPUT VALUES

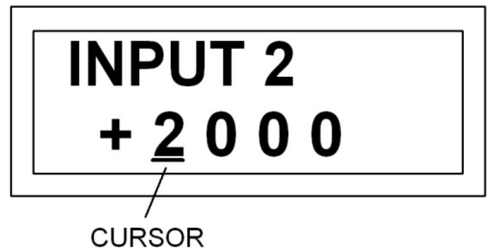


METER #1 KWH/P VALUE DISPLAY

The second display is the pulse sign, value and type programmed in for METER #1. The value or setting of each digit may be changed by first moving the cursor to the digit desired using the **ORANGE KEY.** To change the digit’s value, press the **BLACK KEY.** Press this key any number of times until the desired number is displayed. Press the **ORANGE KEY** once to advance the cursor to the next position to the right. Again, enter the correct number with the **BLACK KEY**. Press the **ORANGE KEY** once. Enter the third number with the **BLACK KEY**. Press the **ORANGE KEY** once and enter the fourth number with the **BLACK KEY**. Press the **ORANGE KEY** once and enter the type with the **BLACK KEY**. This time when you press the **ORANGE KEY**, you will advance to the third display.

<u>THIRD DISPLAY: METER #2 INPUT VALUES</u>

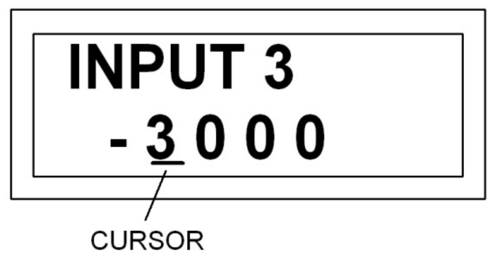
The third display works to input values for METER #2 in the same manner as display #2 worked for METER #1.



METER #2 KWH/P VALUE DISPLAY

<u>FOURTH DISPLAY: METER #3 INPUT VALUES</u>

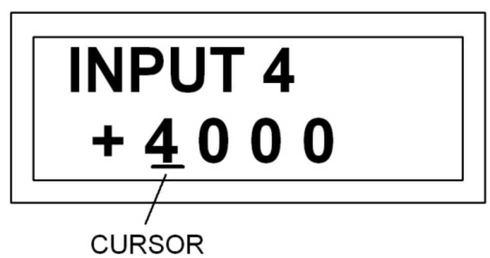
The fourth display works to input values for METER #3 in the same manner as display #2 worked for METER #1.



METER #3 KWH/P VALUE DISPLAY

<u>FIFTH DISPLAY: METER #4 INPUT VALUES</u>

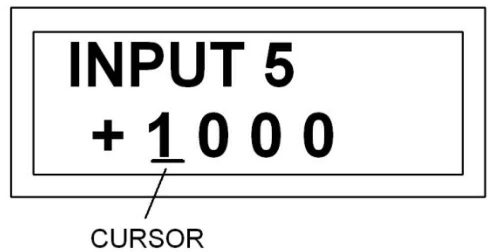
The fifth display works to input values for METER #4 in the same manner as display #2 worked for METER #1.



METER #4 KWH/P VALUE DISPLAY

SIXTH DISPLAY: METER #5 INPUT VALUES

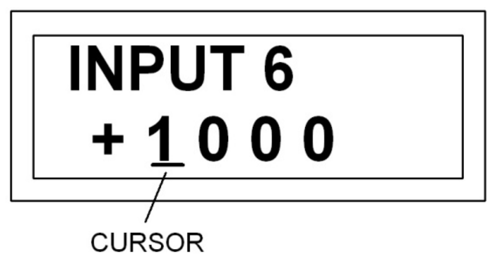
The sixth display works to input values for METER #5 in the same manner as display #2 worked for METER #1.



METER #5 KWH/P VALUE DISPLAY

SEVENTH DISPLAY: METER #6 INPUT VALUES

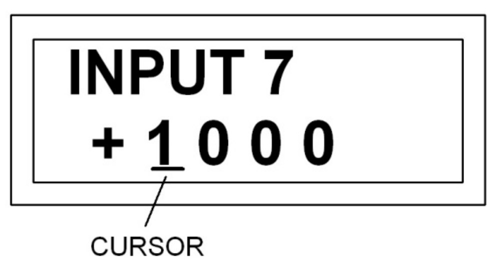
The seventh display works to input values for METER #6 in the same manner as display #2 worked for METER #1.



METER #6 KWH/P VALUE DISPLAY

EIGHTH DISPLAY: METER #7 INPUT VALUES

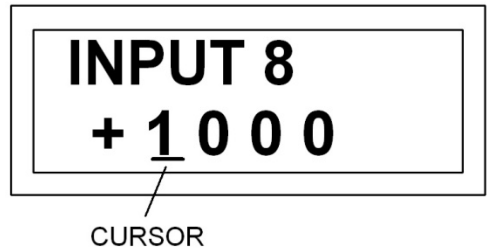
The eighth display works to input values for METER #7 in the same manner as display #2 worked for METER #1.



METER #7 KWH/P VALUE DISPLAY

NINTH DISPLAY: **METER #8 INPUT VALUES**

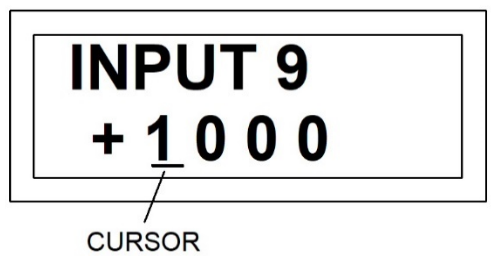
The ninth display works to input values for METER #8 in the same manner as display #2 worked for METER #1.



METER #8 KWH/P VALUE DISPLAY

TENTH DISPLAY: **METER #9 INPUT VALUES**

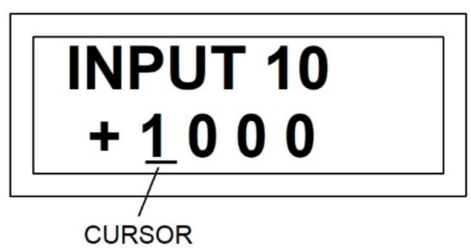
The tenth display works to input values for METER #9 in the same manner as display #2 worked for METER #1.



METER #9 KWH/P VALUE DISPLAY

ELEVENTH DISPLAY: **METER #10 INPUT VALUES**

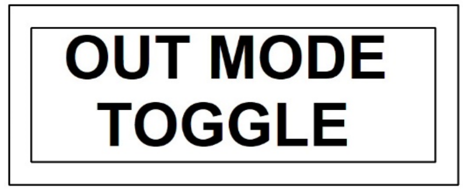
The eleventh display works to input values for METER #10 in the same manner as display #2 worked for METER #1.



METER #10 KWH/P VALUE DISPLAY

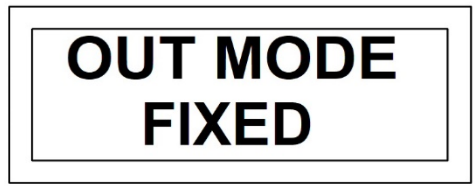
TWELFTH DISPLAY: OUTPUT MODE

The twelfth display shows the Output Mode selection. You can select either a “Toggle” output for a 50/50 duty cycle pulse output or “Fixed” for a fixed width output pulse.



OUTPUT MODE DISPLAY

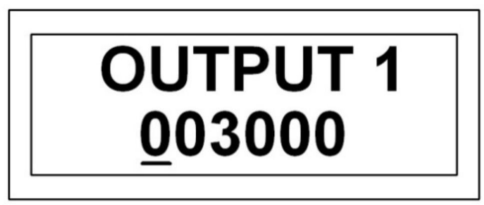
When the “Fixed” or momentary mode is selected, the outputs close for a fixed time \duration specified in the display called “AOUT1_mS and AOUT2_mS. Press the **BLACK** key to toggle back and forth between the Toggle or Fixed selection. Press the **ORANGE** key to move to the next display.



OUTPUT MODE DISPLAY

THIRTEENTH DISPLAY: TOTALIZER OUTPUT#1 KWH/PULSE VALUE

The thirteenth display, unlike the input meter value displays, has 6 digits that may be set. The value (or weight) of Output #1 is set in the same manner as the meter input displays by moving the cursor across the display using the **ORANGE** button. When the Pulse Value Total register equals or exceeds the set value, the output pulse value is subtracted from the PV Total and causes an output pulse to occur. The outputted pulse has a closure time specified by the output time display AOUT1_mS if in the Fixed output mode, otherwise the output is simply toggled to the opposite state. This value must be greater than or equal to 1 (one). If the user inadvertently puts zero (0) in this field such that all six digits are zeros, a one (1) will be automatically placed on the LCD in the furthest right position. The desired output value may then be entered.



OUTPUT KWH/P VALUE DISPLAY

FOURTEENTH DISPLAY: TOTALIZER OUTPUT#2 KWH/PULSE VALUE

OUTPUT 2
000540

OUTPUT KWH/P VALUE DISPLAY

The fourteenth display, like the thirteenth display, has 6 digits that may be set. The value (or weight) of Output #2 is set in the same manner as the meter input displays. When the Pulse Value Total register equals or exceeds this value, the output pulse value is subtracted from the PV Total and causes an output pulse (a change of state of the output relay) to occur. The outputted pulse has a closure of a time specified by the output time display AOUT2_mS. This value must be greater than or equal to 1 (one). If the user inadvertently puts zero (0) in this field such that all six digits are zeros, a one (1) will be automatically placed on the LCD in the furthest right position. The desired output value may then be entered.

FIFTEENTH DISPLAY: PULSE OUTPUT #1 TIME

AOUT1_MS
0100

PULSE OUTPUT #1 TIME DISPLAY

The fifteenth display allows you to set the time of a FORM A output on Output #1. The time may be set in 100-millisecond increments. The minimum time is 100 milliseconds. The maximum time is 1000 milliseconds (1 second). Thus only digits 1 and 2 of this display are programmable. The entry method is the same as that used to set the meter input values. The AOUTx_MS displays only show up in the Fixed Mode.

SIXTEENTH DISPLAY: PULSE OUTPUT #2 TIME

AOUT2_MS
1000

PULSE OUTPUT #2 TIME DISPLAY

The sixteenth display allows you to set the time of a FORM A output on Output #2. The time may be set in 100-millisecond increments. The minimum time is 100 milliseconds. The maximum time is 1000 milliseconds (1 second). Thus only digits 1 and 2 of this display are programmable. The entry method is the same as that used to set the meter input values.
WARNING: Care should be taken not to make FORM A output pulses any longer than necessary since it may cause problems in periods of high demand if pulse values are too small. The AOUTx_mS displays only show up in the Fixed Mode.

SEVENTEENTH DISPLAY: PULSE VALUE REGISTER CONFIGURATION

If inputs #1-10 are all positive (+), this display automatically is skipped and the display sequence skips to the eighteenth display. This display allows you to configure the PULSE VALUE TOTAL register to allow both a positive or negative balance, OR a positive balance only. The default setting is "Y" (for "yes") - to allow the register balance to go negative. Press the **ORANGE** key to move to the next setting.

ALLW NEG
Y

ALLOW NEGATIVE ACCUMULATOR DISPLAY

If you desire to set the MPT-10C so that the pulse value register will be positive (or zero) ONLY, press the **BLACK** key to change the "Y" to an "N". If you select the "N" (or "no") value to this setting, the register will count down to zero but will not go negative. It will remain at zero until such time that enough positive pulses occur to make the pulse value register increment upwards. Press the **ORANGE** key to move to the next setting. If the MPT-10C has been running and has accumulated a negative value in the PV TOTAL register, AND the user changes the ALLW NEG value from "Y" to "N", the PV TOTAL value is reset to zero (0). Note: This display will not show up in the display sequence if all inputs are a positive value.

ALLW NEG
N

DO NOT ALLOW NEGATIVE ACCUMULATOR DISPLAY

EIGHTEENTH DISPLAY: PULSE VALUE DISPLAY FORM A OUTPUT MODE, OUTPUT #1

The eighteenth display shows Output #1's accumulated numerical pulse value contained within the processor's memory at any given time. For example, assume that you have set METER #1's input pulse value to 2000, an OUTPUT pulse value of 005000 and a TIME BETWEEN PULSES value of 500 mS. Upon receiving three (3) pulses at METER #1's input, several things happen. First, the pulse accumulator registers a value of 6000 (3 pulses X 2000/pulse). Since the accumulator is greater than the Output Pulse Value setting (5000), an output pulse occurs. Next, 5000 (the output value) is subtracted, leaving a display of 1000 in the PV1TOTAL display. Finally, if the total in the PV had still exceeded 5000, then after 500mS, another output pulse would have occurred. The remainder will

PV1TOTAL
000840

PULSE VALUE DISPLAY

usually be smaller than the output pulse value and is only awaiting sufficient pulses at the meter inputs before a new output pulse is generated and a new smaller remainder calculated. This setting is stored in non-volatile memory upon loss of power.

NINETEENTH DISPLAY: PULSE VALUE DISPLAY FORM A OUTPUT MODE, OUTPUT #2

The nineteenth display shows Output #2's accumulated numerical pulse value contained within the processor's memory at any given time. This setting is stored in non-volatile memory upon loss of power.

PULSE VALUE DISPLAY

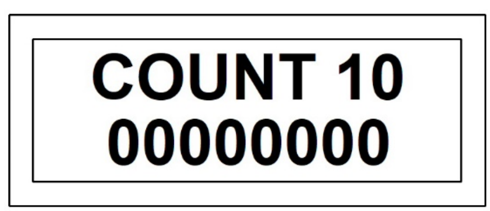
TWENTIETH DISPLAY: INPUT PULSE COUNT – METER #1

The twentieth display allows you to see the number of raw pulses that have been counted by input #1 since the last reset. This number is simply a counter that increments by one (1) count each time a pulse is recorded by meter input #1. This value is non-weighted and represents the number of counts only. This count is saved in non-volatile memory upon loss of power. Nothing on this display can be changed. It is informational only. Press the **ORANGE KEY** to advance to the next display.

METER #1 PULSE COUNT DISPLAY

21ST THROUGH 29TH DISPLAYS: INPUT PULSE COUNT–METERS #2-10

The next 9 displays show the total number of pulses for each meter for meters #2 thru 10. Each display shows the raw pulse count since last reset. This counter increments by one (1) count each time a pulse is recorded by meter each meter input. This value is non-weighted and represents the number of counts only. This count is saved in non-volatile memory upon loss of power. Press the **ORANGE KEY** to advance to the next display.



METER #8 PULSE COUNT DISPLAY

THIRTIETH DISPLAY: OUTPUT PULSE COUNT-OUTPUT #1

OUTP CT1
00000000

OUTPUT 1 PULSE COUNT DISPLAY

The thirtieth display allows you to see the total number of FORM A output pulses on Output #1 that have been outputted since the last reset. This number represents a pulse counter that increments by one (1) count each time a pulse is sent to the output relay #1. This value is non-weighted and represents the raw number of output #1's counts only. This count is saved in non-volatile memory upon loss of power. Press the **ORANGE KEY** to advance to the next display.

THIRTY-FIRST DISPLAY: OUTPUT PULSE COUNT-OUTPUT #2

OUTP CT2
00000000

OUTPUT 2 PULSE COUNT DISPLAY

The thirty-first display allows you to see the total number of FORM A output pulses on Output #2 that have been outputted since the last reset. This number represents a pulse counter that increments by one (1) count each time a pulse is sent to the output relay #2. This value is non-weighted and represents the raw number of output #2's counts only. This count is saved in non-volatile memory upon loss of power. Press the **ORANGE KEY** to advance to the next display.

THIRTY-SECOND DISPLAY: RESET COUNTERS

RST ALL?
N

RESET COUNT DISPLAY

The thirty-second display allows you to reset the ten INPUT counters, the OUTPUT counter(s), and the PV TOTAL register(s), all at one time. The default of this display is "N" for no. To go back to the status display and not reset the totals, press the **ORANGE KEY**.

RST ALL?
Y

RESET COUNT DISPLAY

To reset all counters to zero, press and hold down the **BLACK KEY** for 3 seconds. A "Y" will be displayed, indicating that you are correctly pressing the key.

Once the MPT-10C has correctly reset all counters to zero, the display will indicate DONE. Let off the **BLACK KEY**. Upon releasing the **BLACK KEY,** the display will automatically jump back to the first display, the Status display.

RST ALL?
DONE

RESET COUNT DISPLAY

INFORMATION ON SCALING OF VALUES FOR DATA ENTRY

The MPT-10C is a ratio device. The term “ratio device” means that if the number in the right most column of the value for meter #1 is the “ones” value for KWH/PULSE, then all other values in the far right-hand column will also represent “ones”. The second column to the left of the right column represents “tens” values. The third column represents “hundreds” values, etc. This means that the decimal point, when used, can be located between any two columns or to the left or right of the first or last digit. However, once the decimal point is decided on and <u>“mentally placed”</u> in a column, it must run top to bottom in that position only for all input settings. **The decimal point does not actually appear on the display. You simply decide where the decimal point is going to be.**

EXAMPLES

<u>CORRECT</u>		**<u>CORRECT</u>**	
METER #1	**.1000**	**METER #1**	**1.000**
METER #2	**.1234**	**METER #2**	**1.234**
METER #3	**.2345**	**METER #3**	**2.345**
METER #4	**.3456**	**METER #4**	**3.456**
OUTPUT	**05.0000**	**OUTPUT**	**05.000**

<u>INCORRECT</u>		**<u>INCORRECT</u>**	
METER #1	**.1000**	**METER #1**	**1000.**
METER #2	**1.234**	**METER #2**	**123.4**
METER #3	**.2345**	**METER #3**	**23.45**
METER #4	**345.6**	**METER #4**	**3.456**
OUTPUT	**05.0000**	**OUTPUT**	**00.5000**

While we have used KWH/PULSE for the pulse values throughout this document, the values could be watts, megawatts, gallons, or any other common unit of measure.

NOTE ON OUTPUT PULSE VALUES
In general, it is bad practice to make the output pulse value(s) smaller than the smallest input value. This is because you will often get two pulses out for each input pulse in, in rapid succession, in the worst-case scenario. Too many pulses out with erratic timing will cause peak demand management systems to incorrectly register the instantaneous or current demand. It is recommended that the output pulse value(s) be larger or equal to the largest input pulse value.

TECHNICAL SUPPORT
For additional information or technical help, call Brayden Automation Corp./Solid State Instruments division at (970) 461-9600 or toll free at (888) BRAYDEN.

INSTALLATION RECORD

NAME/SITE…………………………………………………………
DATE INSTALLED……………………………………………………….
TOTALIZER TYPE………..MPT-10C
SOFTWARE VERSION …. VERSION 3.0
MANUFACTURER……….. SOLID STATE INSTRUMENTS
A division of Brayden Automation Corp.
6230 Aviation Circle
Loveland, CO 80538
TECH SUPPORT ………… (970) 461-9600

FILL OUT BEFORE PROGRAMMING TOTALIZER

METER # 1 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 2 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 3 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 4 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 5 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 6 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 7 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 8 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 9 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

METER # 10 AREA OR NAME ……………… …. …. …. …. KWH/PULSE

OUTPUT #1 VALUE ………………….. …. …. …. …. …. …. …. KWH/PULSE

OUTPUT #2 VALUE ………………….. …. …. …. …. …. …. …. KWH/PULSE

NOTE: The MPT-10C does not actually display a decimal point. Simply decide where you want the decimal point to be and enter all numbers accordingly. When entering your values on the above record/worksheet, all decimals for data entries **must** be in a vertical straight line for the math to work correctly. The decimal point may be between, before or after any column.

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