OCN-SPL LED Display Technical data

Features: Operating Modes:

• Large 6” 7-Segment Display

• Easily add digits to display higher values

• 2 x opto-isolated inputs

• 1 x 10-bit 0-5V input

• 1 x 10-bit 0-20mA input

• RS485 Serial, TTL Serial

• RS232 Serial or USB Serial with additional

converters

• 12VDC Powered

• 0-5V Scaled

• 0-20mA or 4-20mA Scaled

• Up/Down Counter with Reset and Preset

• Quadrature Up/Down Counter

• Tachometer RPM

• Frequency

• Up/Down Second Timers

• ASCII or Modbus Serial over RS485 or TTL

(or RS232 or USB with additional converters)

Connections:

Connection Usage

+V Power input 12-17V DC

COM Common Ground

5V 5V output

I1+ Opto-Coupled input 1 +ve input

I1- Opto-Coupled input 1 -ve input

I2+ Opto-Coupled input 2 +ve input

I2- Opto-Coupled input 2 -ve input

CI Analog Current Input

VI Analog Voltage Input

COM Common Ground

D+ RS485 Data +

D- RS485 Data -

COM Common Ground

TX TTL Serial Data Transmit

RX TTL Serial Data Receive

MI Initiates default communication parameters when

connected to COM

Have you ever had the need for a display that can be read from across the room? How about across the factory? How about 50m away? This display uses Large 6” (15cm), 7-Segment displays and can be expanded to use up to 10 digits, without costing upwards of a thousand of dollars.

But what does it display? The display has been designed to accept multiple input signals, for maximum flexibility. Parameters are set using a computer and saved to memory.

Input signal types are divided into 3 categories, Analog, Digital and Serial.

Analog: Analog input modes include 0-5V DC and 0-20mA, 4-20mA sensors can also be used easily. These can be scaled to display any value such as temperature, humidity, pressure etc.

Digital: Digital input modes include Counter modes (Quadrature or Up and Down with Reset and Preset), Tachometer RPM, Frequency and Up or Down Timers.

Serial: Serial input modes include RS485, TTL and (with an optional converter) RS232 or USB with the option of ASCII display or Modbus RTU controlled display. Various Baud Rates are supported. The device parameters are also set up using the RS485 / RS232 / USB connection to a computer with provided software or Modbus enabled device.

How does it do all this? The KTA255 Large 7-Segment Controller PCB is mounted to the back of the first digit. The controller PCB includes a microcontroller, constant current LED driver shift register and all circuitry needed to connect the various input signals. The microcontroller reads in the input signals and scales them according to the user settings and then sends out the data to the shift register, which controls the data displayed on the 7-Segment digit. Typically, more than one digit is required and this is where the KTA-256 Large 7-Segment Driver PCB comes in to play. The KTA-256 is a stripped back version of the KTA-255, one is mounted to the back of each additional digit. This PCB only holds another constant current LED driver shift register and IDC header connections for connection to the previous and next digits.

Set up of display mode and parameters is done by using the KTA-255 Configuration software.

User configurable parameters include:

- Number of the digit to display the decimal point on
- Operating mode
- Scaling Values
- Count By Values
- Reset Values
- Display delay time (to reduce flicker)
- Debounce time (so that switch presses do not make multiple counts)
- Modbus Address
- Baud Rate
- Parity

Not all parameters are relevant to each operating mode. The configuration software will hide the parameters which are not used.

To ensure that the configuration software can communicate with the controller, the communications parameters can be loaded to default, at power up, by making a connection between MI and COM on K3 on the side of the PCB. This can be done with a bare wire, or by temporarily soldering a wire in place.

The KTA-255 can be connected using an RS485 connection on the D+ and D- terminals, or by connecting an RS232 to TTL or USB to TTL converter to the K4 header.

Lets take a look at the operating modes in more detail.

Analog 0-5V:

The Analog 0-5V input mode will take a 0-5V signal in on the VI and COM terminals and scale it according to the values used in set up. The allowable range is -32,768 to +32,767 and decimal places can be used as well. Eg. Assuming 5 digits are used, to use it as a volt-meter, measuring the voltage between 0V and 5V, to four decimal places (0.0000 to 5.0000) set the operating mode to 0-5V and the following parameters: Decimal Place = 5 (Show the decimal point on digit 5), 0V Value = 0, 5V Value = 5. That is all that is required, if the display flickers too much, then the display delay time can be increased. If faster changes need to be seen on the display then the display delay time can be decreased.

Analog 0-20mA:

The Analog 0-20mA input is between terminals CI and COM it includes a 250Ω load resistance. It can be easily used with 4-20mA sensors as the software allows either a 0mA or 4mA value to be entered and the other value is automatically calculated. Most industrial sensors will use a 4-20mA signal, a good example is a temperature sensor with 0-100℃ output over 4-20mA. Assuming 5 digits again, we can display to 2 decimal places giving a range of 0.00 to 100.00. The operating mode should be set to 0-20mA, the 20mA value to 100 and the 4mA value set to 0 (this will automatically set the 0mA value to -25). The decimal point position can be set to 3 (or 4 for more accuracy, but at the cost of never actually being able to display 100.000).

Counter:

In counter mode an optically isolated signal on inputs I1+ and I1- will add the “count by” value to the display each time it is triggered. To count down, a negative value can be used in the count by value.

The count by value can be from -32,768 to +32,767 (signed 16-bit), but the displayed values (count total) can be from -2,147,483,648 to +2,147,483,647 (signed 32-bit). Obviously more than 5 digits would be needed to display these values.

The I2+ and I2- terminals are used for another optically isolated signal, this is used to reset the counter to the “reset to” value

When a connection is made from VI to COM the display will subtract the “count by” value from the currently displayed value.

Up/Down Counter:

The Up/Down Counter mode is very similar to the Counter mode, however in this mode the optically isolated signal on I2+ and I2- subtracts the “count by” value and the non-isolated signal on VI and COM resets the display.

Quadrature:

In Quadrature mode a quadrature encoder can be used to count up and down. Phase A should be connected to I1+ and I1-, Phase B should be connected to I2+ and I2-. The non isolated input VI will reset the counter value. It should be noted that each encoder edge is used for a count signal, giving four times the line resolution of the encoder. Ie. A 1000 line encoder will give 4000 counts per revolution.

Tachometer:

A tachometer pulse signal is fed into I1+ and I1-, if more than one pulse is given per revolution then the number of pulses per revolution can be entered into the “division” parameter.

Frequency:

The Frequency mode is much the same as the Tachometer mode, except that the signal is not converted to RPM before being displayed. Maximum measured frequency is approximately 20KHz.

Up Timer:

In Up Timer mode the unit will display hours minutes and seconds, with a decimal point to separate each. The I1+ and I1- input starts the timer, the I2+ and I2- input resets the timer to zero and the VI input pauses the timer.

The timer will count upwards each second until the value set in the configuration is reached, if the set value is zero the counter will keep counting up.

Down Timer:

Similar to Up Timer mode, Down Timer mode counts seconds, however, this time it is downwards. The reset value is set by the configuration software and the timer stops counting at zero.

ASCII:

For easy connection to computer programs and micro-controllers an ASCII mode has been added. Once the display has been put into ASCII mode and the Baud Rate and Parity have been set in the configuration software, a link must be placed between VI and COM to make the device interpret the incoming data as ASCII, not setup instructions. The data bits are always 8 and there is 1 stop bit. TTL serial from microcontrollers and RS485 serial can be sent directly to the controller. For RS232, an RS232 to TTL converter is needed and for USB a USB-TTL Serial converter is needed, these are available from Ocean Controls.

To display numbers, send them to the display, followed by a Carriage Return character. Ie “-1.234<CR>” sent to the display will show “-1.234” on the display.

The carriage return character has a value of 13 or 0x0D.

The space character (32 or 0x20) will leave a blank space.

The DEL character (127 or 0x7F) will clear the display.

Letters can also be shown on the display, sending any of the characters a-z (97-122 or 0x61-0x7A) will show that character. Some characters can not be displayed correctly, but most are intelligible.

If special characters need to be displayed, then the special character DC1 (17 or 0x11) is sent. The character following this is used to turn on each of the individual segments of the 7-segment display.

In the diagram each segment is labelled with a decimal value. To turn on a particular pattern of segments, add their values together and send that value after the special character.

Eg. To turn on the top four segments and display a square the value for each of those segments is added together. 128 + 2 + 32 + 64 = 226, this is shown on the display by sending the value 17 followed by the value 226.

MODBUS:

The display controller can also be used as a Modbus slave. Modbus is an industrial protocol supported by many PLC's and SCADA packages. It consists of 16-bit Holding Registers and Input Registers, as well as 1-bit Coils and Status bits. Only Holding Registers are implemented in the KTA-255 Display Controller. Further information on the Modbus protocol can be found at "www.modbus.org".

If the controller has been put in Modbus mode and the Slave Address, Baud Rate and Parity are set via the configuration software, the controller will then be ready to use on a RS485 Modbus network or via direct connection on RS232, USB or TTL Serial.

To display values the first three holding registers are used. Holding registers 1 and 2 are combined together to give a 32-bit signed value from -2,147,483,648 to +2,147,483,647, holding register 1 holds the lower 16-bits, holding register 2 holds the upper 16-bits. Holding register 3 sets the decimal point position.

To show "-98765.4321" on the display, holding register 1 would be set to 38735, holding register 2 would be set to 50465, these are respectively the lower and upper 16-bits of the signed 32-bit number, these can be easily derived in the controlling application. Holding register 3 would be set to 5 to display the decimal point on the fifth digit.

Modbus Registers:

As well as being able to display values directly from Modbus, the holding registers also hold all the settings for the controller, in fact, the configuration software uses the Modbus protocol to set up the controller.

Holding

Register Function

1 Value to display Low 16-bits

2 Value to display High 16-bits

3 Decimal point position

4 Mode 0= Modbus, 1= 0-5V, 2= 0-20mA, 3= Counter, 4= U/D Counter, 5= Quadrature, 6=Tacho,

7= Frequency, 8= ASCII, 9= Up Timer, 10= Down Timer, 11= Modbus

5 Low Scale, Count by Value, Pulses/Rev (Depending on Mode)

6 High Scale, Reset Value (Depending on Mode)

7 Display Delay Time

8 Debounce Time

9 Modbus Address 1 to 243

10 Baud 0= 9600, 1= 2400, 2= 4800, 3= 9600, 4= 19200, 5= 38400, 6= 57600, 7= 115200

11 Parity 0= None, 1= Odd, 2= Even

In all except for ASCII mode the current displayed value can be read via the first 3 holding registers.

Mounting:

How you mount the displays is really up to you, we have attached them to two sheets of 3mm Acrylic, one tinted Grey and the other tinted Red, this gives a nice dark background and the digits can be clearly read.