Nextion-Library

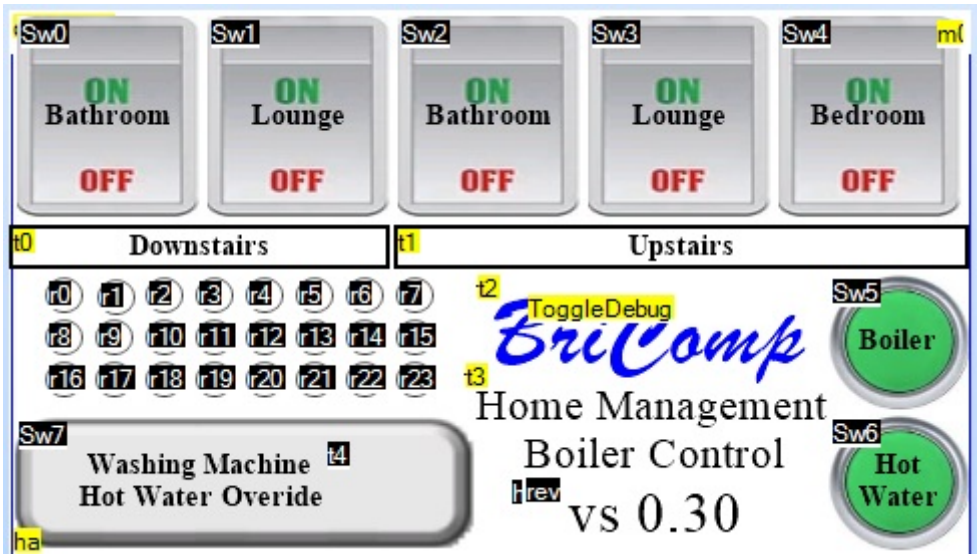
PLEASE ALSO READ THE Nextion.h DOCUMENT IN Resources

This ReadMe is a little wordy but tries to explain all the nuances of using Nextion. For a more concise explanation see the Nextion.h file or the information in resources.

Use this code as a framework to produce your own Nextion Library.
See Resources for Printable Word/pdf documents.

Code by Robert E Bridges.
This library is intended to be used to create your own Nextion Library. Most of it is done for you.

Below is the page0 screen of my Nextion Project which led to the development of this Library.



The function that you will mostly alter is the "respondToReply()" function.
I developed this library to control the valves in my Home Heating system, so there are functions that pertain to the opening/closing of valves. This can be used as an example as to how to use/develop
the Library.

I mostly communicate with the nextion through the passing of data into/from numeric variables.

I have a TimerEvent which runs at 600mS intervals, slow I know but fast enough for my current needs.

When, for example, this timer notices that the numeric variable "SetTime" is not zero it takes the value
from this variable and sets the Nextion time.

The format of the data in this variable is (in HEX) "HHMMSS".
After having set the time the variable is set back to 0 again.

Other variables are interrogated and responded to in a similar way by the code for this Timer Event.
An example is to give an impression of a flashing led, turning on or off a radio button, with a different
colour for on and off.

Below is the Nextion code snippet to set the RTC time.

```
            //================================
            //Set RTC time if SetTime > 0  NOTE: Variables declared in Nextion
Programs.s
            //================================
            if(SetTime!=0)
            {
              xx=SetTime
              xx=xx>>16
              rtc3=xx               // Set the hour
              xx=SetTime
              xx=xx&0xFF00
              xx=xx>>8              // Set the minutes
              rtc4=xx
              xx=SetTime&0xFF
              rtc5=xx               // Set the seconds
              SetTime=0
            }
```

To include the Nextion Library simply `#include "Nextion.h"` at the head of your program.

To create an instance of the code use `Nextion display(&NextionDisplay);`

where NextionDisplay is the serial stream used, i.e. Serial1, Serial2, etc.

In my latest code I use:-

`#define NextionDisplay Serial5`

To setup the Nextion code in "`setup()`" use the command:-

`display.begin(nextionBaudRate, setTeensyBaud);`

where `nextionBaudRate` is the baud rate to be used to communicate with the Nextion and `setTeensyBaud` is a teensy callback function to set the baudrate on theTeensy.

A suitable function is shown below:-

```
    void setTeensyBaud(uint32_t baud) {
    #ifdef debugst
        Serial.print("Setting Teensy baudrate to "); Serial.println(baud);
    #endif
        NextionDisplay.end();
        delay(100);
        NextionDisplay.begin(baud);
    }
```

...now we must set the baud rate on the Teensy port:-

```
            NextionDisplay.begin(display.baudRate);
```

The variable `display.baudRate` returns the baudrate expected by the Nextion.

Now we are able to check that we can communicate with the Nextion. Use the function `display.commsOk();`

This will return **true** if all is ok.

It may be that the Nextion had been setup to communicate at, for instance, 115200 baud and we are trying to communicate at the initial 9600 baud. In this case communications will not be possible.

Never fear, all is not lost, simply use the function `display.recoverNextionComms()`. This will cycle through all the valid baud rates until communications are established. If no communications can be established 0 will be returned.

If comms are not established you could try re-setting the Nextion with the code `display.reset()`. This is a last resort and likely not successful as it requires comms to the Nextion in order to send the "rest" command.

A suitable startup for your program could be as below:-

```
#define NextionDisplay Serial5

elapsedMillis   nextionTime;
Nextion     display(&NextionDisplay);
nextionBaudRate = 9600;

void setTeensyBaud(uint32_t baud) {
#ifdef debugst
    Serial.print("Setting Teensy baudrate to "); Serial.println(baud);
#endif
    NextionDisplay.end();
    delay(100);
    NextionDisplay.begin(baud);
}

void setup() {
    Serial.begin(9600);
    while (!Serial && millis() < 5000) {}

    display.begin(nextionBaudRate, setTeensyBaud);

    Serial.println(display.baudRate);
    NextionDisplay.begin(display.baudRate);

    Serial.println("Starting up");
    display.printAnyReturnCharacters(nextionTime, 1);
    if (!display.commsOk()) {
        Serial.print("No Comms. Attempting to Recover......");
        display.printAnyReturnCharacters(nextionTime, 1-1);
        if (display.recoverNextionComms() == 0) {
            display.printAnyReturnCharacters(nextionTime, 1-2);
            Serial.print("Unable to recover, trying Reset.....");
            if (!display.reset()) {
                display.printAnyReturnCharacters(nextionTime, 1-3);
                Serial.println("CRITICAL ERROR: Unable to communicate with
Nextion");
                while (1){}
            } else
            {
                Serial.println("Ok Just Reset, Should be Ok now");
```

```
            }
        } else
        {
            Serial.println("Now got Comms");
        }
    }
}
```

In the above code you will see the function `display.printAnyReturnCharacters(nextionTime, 1);` that we have not discussed yet.

This function simply gathers any Nextion returned characters and prints them to the SerialUsb (Serial) port. If there is any data returned it first prints the "nextionTime" (which is in ms) followed by the returned bytes in HEX format followed by id. This is useful in debugging when a bad situation occurs. It should be used where you don't expect any returned characters. I.e. a returned character is an indication that something has gone wrong.

There are more configuration routines/functions, but first let's get to a state where your code is usable.

If a relevant function does not already exist in the Library then use the command

`sendCommand( command );` as in, for example, `display.sendCommand( "tsw 255,0" );`

There is no need to worry about the \xFF\xFF\xFF characters, they will be sent automatically over the previously setup Serial stream.

Of course there should not be any reply from the Nextion unless the *bkcmd* level has been set to 1 or 3. This will be discussed later when describing the setBkCmdLevel function.

Of course the Nextion is a HMI (Human Machine Interface) and it would be expected that there will be some output from the Nextion.

This is handled by the `getReply(timeout)` and `respondToReply()` functions.

The *getReply()* function can be used in two forms `display.getReply()` and `display.getReply(timeout)`. In the first the serial port is simply checked for any returned characters. If there are none then *false* is returned. In the second form the function waits for timeout ms or a character to appear.

If there is a reply from Nextion then the reply char (id) is received and the required number of following char/bytes dependant upon the value of the Id. The first character returned is known as the id character.

A *nextionEventType* variable (called *nextionEvent*) is used for all communications from the Nextion.

The Id char is placed in *nextionEvent.id*. The number of remaining char/bytes to be received is dependant upon the value of the *id*. The remaining chars are placed in *nextionEvent.reply8* ready to be decoded.

A *true* is returned if there is an *Id* char and the required number of chars are returned from the Nextion. Otherwise *false* is returned. If the first char is received within timeout a further timeout of up to 1 second is allowed for remaining characters. This proc does NOT get any strings returned from Nextion. Use `display.respondToReply()` for that.
*

respondToReply()

This is where it is going to get **heavy**.

After having used `display.getReply()` to determine that there is a response from the Nextion and to have gotten that reply, `display.respondToReply()` is used to decode the reply and take the required action. As was mentioned earlier this is where it is likely that you will need to add code.

respondToReply() - returns true if something needs responding to.
This is where you need to put your code. Use getReply() to get any info from the Nextion (see above) and this function to decode the reply and respond to it. It returns true if further response is needed.

I like to have requests from the Nextion Display embedded into numbers.

Within this code I want to turn valves on or off. The number returned by the Nextion contains the valve to be moved and whether it should be opened or closed (0 or 1).

If you have handled the Nextion response fully then set *needsResponse* to *false*.

Below is the listing for *respondToReply*.

```
bool Nextion::respondToReply() {   //returns true if something needs responding
to

  bool     needsResponse = true;
  uint16_t zz;
  uint32_t valve;
  bool   how;

  switch (nextionEvent.id) {
    case invalidInstruction:    // Returned when instruction sent by user has
failed
    case instructionSuccess:    // (ONLY SENT WHEN bkcmd = 1 or 3 )
        comdExecOk = true;
    case invalidComponentId:    // Returned when invalid Component ID or name
was used
    case invalidPageId:         // Returned when invalid Page ID or name was
used
    case invalidPictureId:      // Returned when invalid Picture ID was used
    case invalidFontId:         // Returned when invalid Font ID was used
    case invalidFileOperation:  // Returned when File operation fails
    case invalidCrc:            // Returned when Instructions with CRC
validation fails
                                // their CRC check
    case invalidBaudRateSetting:// Returned when invalid Baud rate was used
    case invalidWaveformIdChan: // Returned when invalid Waveform ID or
                                // Channel # was used
    case invalidVarNameAttrib:  // Returned when invalid Variable name or
invalid
                                // attribute was used
    case invalidVarOperation:   // Returned when Operation of Variable is
invalid.ie:
                                // Text assignment t0.txt = abc or t0.txt = 23,
    case assignmentFailed:      // Returned when attribute assignment failed to
assign
```

```
    case EEPROMOperationFailed: // Returned when an EEPROM Operation has failed
    case invalidQtyParams:      // Returned when the number of instruction
parameters
                                // is invalid
    case ioOperationFailed:     // Returned when an IO operation has failed
    case invalidEscapeChar:     // Returned when an unsupported escape character
is used
    case variableNameToLong:    // Returned when variable name is too long.Max
length is
                                // 29 characters: 14 for page + “.” + 14 for
component.
    case serialBufferOverflow:  // Returned when a Serial Buffer overflow occurs
                                // Buffer will continue to receive the current
                                // instruction, all previous instructions are
lost.
        if (nextionEvent.id != instructionSuccess) {
            nextionError = true;
            errorCode    = nextionEvent.id;
        }
        break;
    case touchEvent:
    //      Serial.println("Touch Event");
        break;
    case currentPageNumber:
    //      Serial.println("Current Page Number");
        break;
    case touchCoordinateAwake:
    //      Serial.println("Touch Coordinate Awake");
        break;
    case touchCoordinateSleep:
    //      Serial.println("Touch Coordinate Sleep");
        break;
    case stringDataEnclosed:
    //      Serial.println("String Data Enclosed");
        if (!GetNextionString()) {
            nextionError = true;
            errorCode    = invalidNumCharsReturned;
        };
        break;
    case numericDataEnclosed:
        zz = nextionEvent.reply7.num[0];  //
(uint16_t)nextionEvent.reply7.ans[0] * 256 +
                                          //
(uint16_t)nextionEvent.reply7.ans[1];
        switch (zz) {
            case 0x0000: //Switch/Valve 0 off
            case 0x0001: //Switch/Valve 0 on
            case 0x0100: //Switch/Valve 1 off
            case 0x0101: //Switch/Valve 1 on
            case 0x0200: //Switch/Valve 2 off
            case 0x0201: //Switch/Valve 2 on
            case 0x0300: //Switch/Valve 3 off
            case 0x0301: //Switch/Valve 3 on
            case 0x0400: //Switch/Valve 4 off
            case 0x0401: //Switch/Valve 4 on
```

```
            case 0x0500: //Turn Boiler Off
            case 0x0501: //Turn Boiler On
            case 0x0600: //Turn Hot Water Off
            case 0x0601: //Turn Hot Water On
                valve = zz / 0x100;
                how = ((zz % 0x100) == 1);
                turnValveOnOrOff(valve, how);
                needsResponse = false;
                break;
            case 0xFA00: //Nextion Set baudrate back to 9600
                SetTeensyBaud(9600);
                if (nextionAutoBaud){
                    needsResponse = false;
                }
            case 0xFDFD: // Indicates Nextion Serial Buffer Clear
                serialBufferClear   = true;
                needsResponse       = false;
            default:
                Serial.print("Some other NumericDataEnclosed data|: ");
                Serial.print(nextionEvent.reply7.num[0], HEX); Serial.print("
");
                Serial.print(nextionEvent.reply7.num[1], HEX); Serial.println();
                break;
        }
        break;
    case autoEnteredSleepMode:
    //      Serial.println("Auto Entered Sleep Mode");
        break;
    case autoAwakeFromSleepMode:
    //      Serial.println("Auto awake mode");
        break;
    case nextionReady:
    //      Serial.println("Nextion Ready");
        break;
    case powerOnMicroSDCardDet:
        break;
    case transparentDataFin:
    //      Serial.println("Transparent data finished");
        break;
    case transparentDataReady:
    //      Serial.println("Transparent data ready");
        break;
    default:
        Serial.print("How did I get here:"); Serial.println(nextionEvent.id,
HEX);
        _s->flush();
        clearBuffer();
        break;
   }
   return needsResponse;
}
```

The first 19 responses, except for `instructionSuccess` are errors. Their value is placed in the variable `display.errorCode` and the variable `display.nextionError` is set to *true*. Note that `display.nextionError` is set to false when using `display.getReply()` and valid data is returned.

When `display.respondToReply()` returns *true* (response needed) it is the programmers responsibility to determine if an error has occurred.

The next four categories, which are NOT currently handled, are `touchEvent, currentPageNumber, touchCoordinateAwake` and `touchCoordinateSleep`. If any of these are likely to be returned by your implementation then they will need code to handle them. Currently for these entries `display.respondToReply()` returns *true*, *response required*.

The next item is a Nextion string return. The (private) function `GetNextionString()` gathers the Nextion string data and sends it to the string setup using `display.setTextBuffer` (see later). If this has not been setup or there are more characters than will fit in the string they are sent to Serial (the Screen). If a *string* has been successfully received then `display.stringWaiting` is set to *true*.

Now we get to an interesting bit (at least for me), `numericDataEnclosed`. I have a number of dual-state buttons on my Nextion implementation. I use the following Nextion code in the *Touch Release Event*.

```
    swResult=0x0200+Sw2.val
    get swResult
```

This is picked up by the `case 0x0200: //Switch Valve 2 off` or `case 0x0201: //Switch Valve 2 on` and the following code to switch a valve on or off.

```
            valve = zz / 0x100;
            how   = ((zz % 0x100) == 1);
            turnValveOnOrOff(valve, how);
            needsResponse = false;
```

The default entry for the `numericDataEnclosed` category is to indicate that a condition exists that the numeric data is not handled correctly.

The next six categories are also not currently handled autoEnteredSleepMode, autoAwakeFromSleepMode, nextionReady, powerOnMicroSDCardDet, transparentDataFin and transparentDataReady.

The default setting for the main Case is to indicate that a situation has occurred where the Nextion has responded with an unrecognised response, perhaps due to an error condition.

It should be noted that the main loop should look something like below:-

```
        void loop()
            if (getReply()){
                if (respondToReply()){
                    // data NOT handled by respondToReply()
                    // must be handled here.
                    // look at: display.nextionError .. has an error occurred
                    //          or stringWaiting has a string been received
                    //          or the other rteturn categories not already
handled.
                }
            }
            // do something else
        }
```

Nextion Return Format

When the Nextion sends data to the Teensy it first sends an identification character followed by a number of characters, dependant upon the type of data being returned. This is decoded by `display.respondToReply`. These id's and their response is listed in the Nextion.h file and also in .\Resources\Nextion.h\A4 Landscape.pdf or .docx. The latter two documents are provided so that they can be printed out for viewing purposes.

If you scroll down to the 5th page you will see listed all the Nextion return id values followed by the number of bytes/chars returned after the id, and an explanation of the format of the returned data.

If we examine the `numericDataEnclosed` id we see that seven bytes/chars will be returned. Now looking at page 4 and the `nextionEventType` we see that it can be made up of a number of data types. In the case of the numeric data return we expect seven chars. This is handled by the `reply7Type` and `reply7intType`. The reply7IntType (bottom of Page 3) can be interpreted in 3 ways, as an array of 4 chars, as an array of 2 unsigned integers or as one 32 bit signed integer. The reply7Type also holds the Nextion returned 0xFF0xFF0xFF. If the reply7Type is used instead then it can be interpreted as an unsigned 32 bit integer instead of signed.

If you want to print out the first byte/char then use something like `Serial.print(display.nextionEvent.reply7.ans[0]);` or to print out the first 16bit uint use `Serial.print(display.nextionEvent.reply7.num[0]);` and to print out the data as 32bit integer use `Serial.print(display.eventType.reply7int.number32bitInt);`

Using the information above you should be able to investigate any of the remaining returned types of data.

Ok, let's start going through the Commands

bool reset(uint32_t br = 0);

Resets the Nextion Display and sets the baud rate to "baudRate"

Sends a reset command ("rest") to the Nextion.

Sets the Teensy baud rate to 9600 if that baud rate NOT already in use (upon reset the Nextion defaults to this baud rate) and waits for a valid reply. The Teensy baud rate is set using the callBack function registered using the display.begin function. When a valid reply has been seen the Nextion AND Teensy have their buadRate changed to the baud rate passed in the function

call. The function returns true if valid comms with the Nextion can be established. Sets bkcmd to onFailure (Default)

Usage:

- reset() - If no baud rate is passed then the baudRate defaults to the reset 9600
- reset(1) - Sets the Baud Rate to that in use at the entry to the Reset function.
- reset(115200) - Will do a reset and set the baudRate to 115200

void setNextionBaudRate(uint32_t br);

Sets the baud rate on Nextion and Teensy.

This routine saves the current baud rate in a variable recoveryBaudRate so that recoveryBaudRate can be tried first by the recoverNextionComms() function, thus saving some time in the recovery.

In order for this function to work correctly it requires that the setNextionBaudCallbackFunc was passed to the Library with the Nextion.display.begin function.

If not it will be the responsibility of the calling program to set the Teensy BaudRate accordingly.

void setBkCmdLevel(bkcmdStateType level);

Sets Nextion bkcmd value.

The default value is onFailure (2). When set to 1 or 3, use the command bool `lastComdCompletedOk(uint32_t timeout)` below after a command or before the next command to determine that the (last) command completed ok. The variable `display.bkcmd` is set to the requested level.

level is ONLY allowed to be 1 or 3 if compiled with #define bkcmd1or3allowed in Nextiopn.cpp.

On the Nextion bkcmd sets the level of Return Data on commands processed over Serial.
min 0, max 3, default 2
– Level 0 is Off – no pass/fail will be returned
– Level 1 is OnSuccess, only when last serial command successful.
– Level 2 is OnFailure, only when last serial command failed (default)
– Level 3 is Always, returns 0x00 to 0x23 result of serial command.

Result is only sent after serial command/task has been completed, as such this provides an invaluable status for debugging and branching. See table on Page 6 of Nextion.h.A4 Landscape.docx or .pdf.

Nextion Return Data is not subject to bkcmd, i.e. if a command normally returns data, the return of the data is the "handshake" function.

If a command does not normally return a value, such as this command, and bkcmd is set to 1 or 3 then the Nextion returns `0x01 0xFF 0xFF 0xFF`

The current state of bkcmd can be determined by examining `display.bkcmd`.

bool lastComdCompletedOk(uint32_t timeout);

Returns ret true/false if last comd completed ok after allowing timeout ms for the reply to be made.

This command is to be used if bkcmd level is set to 1 or 3 and ONLY where a command is used to set a state on the Nextion.

Where a request for information is sent to nextion, as in "get varName", the returned value is the handshake.

If other bkcmd values are in use (0 or 2) it is transparent and will return true. This is not an indication that the command completed ok as handshaking is off.

The process of setting bkcmd to 1 or 3 is as below:

```
    display.setBkCmdLevel(1);
    if (!display.lastComdCompletedOk(10){
        Serial.Println("Last command (setBkCmd(1)) did NOT return expected
value.");
    }
```

int32_t getNumVarValue(const char* varName);

Gets the value of Nextion Variable varName.

Waits for up to 100ms for a reply. If no reply returns 0xFFFF.

In reality this command should only be sent when the Nextion Serial buffer is empty otherwise, any reply may be from previously stacked up Nextion commands and therefore be erroneous.

The varName MUST exist.

```
int32 sys0Value;

sys0value = display.getNumVarValue("sys0");
if (sys0value==0xFFFF){
    Serial.println("Unable to get value of sys0");
}
```

void setTextBuffer(const char* textBuffer, uint8_t textBufferSize);

Set the Text Area to be used for the Return of Text data from Nextion.

If text is sent from the Nextion (following the 0x70 identifier) it will be sent to SerialUsb if this function has not been used to specify a variable to hold the text data. The parameter must be the size of the textBuffer variable. If more text is returned than there is space for in textBuffer it will be sent to the SerialUsb.

```
    char buffer[100];
    display.setTextBuffer(buffer, sizeof(buffer));
```

bool getStringVarValue(const char* varName);

Gets the text from Nextion Variable.

Waits for up to 100ms for a reply. If no reply returns false.

In reality this command should only be sent when the Nextion Serial buffer is empty otherwise, any reply may be from previously stacked up Nextion commands and therefore be erroneous.

The varName MUST exist.

The result is placed in the string setup with the setTextBuffer function.

If no screen has been setup it will simply be echoed to the screen (Serial).

Returns true if string returned successfully. stringWaiting is also set to true.

```
    char buffer[100];

    display.setTextBuffer(buffer, sizeof(buffer));
    display.printCommandOrErrorTextMessage("C", "Just set text buffer", true);
    //Puts Nextion manipulated text into "page1.va0.txt" before displaying on
screen
    if (display.getStringVarValue("page1.va0.txt")) {
        Serial.print("page1.va0.txt = ");
        Serial.println(buffer);
    }else
    {
        Serial.println("Unable to get value of page1.va0.txt.");
        Serial.println(buffer);
    }
```

bool setNumVarValue(const char* varName, int32_t var);

Sets Nextion Variable to var.

The varName MUST exist.

```
    display.setNumVarValue("sys0",1000000);
```

void clearBuffer();

Clears the Teensy (Nextion) serial input.

Use where things have perhaps gone wrong and you need to clear out erroneous replies from the Serial input buffer.

void askSerialBufferClear();

Ask Nextion if it's input Serial Buffer Clear (Empty - No command stacked up)

Sends "get clrBufr" to Nextion. Nextion will reply with 0xFDFD when it gets to this request in the SerialBuffer, indicating it has executed this last command in the Serial Buffer.

If other commands are sent after this one the Serial Buffer WILL NOT BE CLEAR.

Use the command isSerialBufferClear(), below to confirm Serial Buffer Clear.

Requires this line "int clrBufr=65021" in Nextion Program.s

bool isSerialBufferClear();

Query answer from `askSerialBufferClear()` above.

NOTE that if other commands are stacked up which will give a reply from Nextion, they will be handled by the calls to `getReply` and `respondToReply` used by this function. They may return a reply, but if it is NOT a Numeric reply with 0xFDFD they will NOT return true.

bool askSerialBufferClear(uint32_t timeout);

As above but waits for a reply.

Combines `askSerialBufferClear()` and `isSerialBufferClear()` with a timeout to determine if the Nextion input Serial Buffer is Clear.

This function can be used where a lot of data is being sent to the Nextion and there is a serious risk of buffer overrun on the Nextion.

```
    for (n = 0; n < 250; n++) {
        display.printCommandOrErrorTextMessage("C", "Hello from Teensy ",
false);
        display.printNumericText((uint32_t)n, true);
        delay(10);
        if ((n>0) && (n % 50) == 0) {  // Every 50 lines of text allow the
Nextion input                if (display.askSerialBufferClear(10000)) {  // to
Empty.
                Serial.println("Serial buffer clear");
            } else
            {
                display.printAnyReturnCharacters(nextionTime, 102);
            };
        }
        display.printAnyReturnCharacters(nextionTime, 103);
    }
```

void sendCommand(const char* command);

void sendCommand(const char* command, uint32_t num);

void sendCommand(const char* command, const char* txt, bool encloseText);

sendCommand(const char* command); - Sends command to Nextion.

sendCommand(const char* command, uint32_t num); - Sends command & num to Nextion.

sendCommand(const char* command, uint32_t txt, encloseText); - Sends command & text

In the 3rd form above, if encloseTxt is true then txt is enclosed between quotation marks ".

So `sendCommand( "page0.CommentBox.txt=","Hello There",true);` results in

`page0.CommentBox.txt="Hello There"\xFF\xFF\xFF` being sent to the Nextion.

Sends the command to Nextion. If `bkcmd` level has been set to 1 or 3 the code is setup to look for a response from the Nextion.

if `bkcmd` set to 1 or 3, use the command `display.lastComdCompletedOk(uint32_t timeout)` above after a command or before the next command to determine that the (last) command completed ok.

```
display.sendCommand("sys0=1000000");
// OR
int32 sys0Val = 1000000
display.sendCommand("sys0=",sys0Val);
```

Commands which require specific settings on Nextion.

Time Functions

void setTime(uint32_t time);

Sets the time on the Nextion.

The time is sent as HEX HHMMSS in the variable "SetTime=HHMMSS0xFF0xFF0xFF"

When the Nextion sees that SetTime is not zero it sets the Nextion time.

The SetTime variable is then set to 0.

```
    if (rtc.updateTime()) //Updates the time variables from RTC
    {
        uint32_t time = getHours() * 0x10000 + getMinutes() * 0x100 +
getSeconds();
        display.setTime(time);
    }
```

The time on the Nextion is held in variables rtc0 to rtc6.

rtc3 is hour 0 to 23, rtc4 is minute 0 to 59, rtc5 is second 0 to 59.

The following code is setup in a Nextion timer which runs every 600ms.

The 600ms is peculiar to my use and suits me.

```
//Nextion CODE
//==================================
//Set RTC time if SetTimeVar >0
//==================================
if(SetTime!=0)
{
  xx=SetTime
  xx=xx>>16
  rtc3=xx
  //  h.val=xx.val
  xx=SetTime
  xx=xx&0xFF00
  xx=xx>>8
  rtc4=xx
  //  m.val=xx.val
  xx=SetTime&0xFF
  rtc5=xx
  //  s.val=xx.val
  SetTime=0
}
// Blink time separator
if(blink==1)
{
  blink=0
  timeSep.txt=""
}else
{
  blink=1
  timeSep.txt=":"
}
```

I have Nextion numeric variables hour and minute and a text variable called timeSep with it's txt component set to ":".

I have a timer called MinuteTmr which runs every 60000ms. i.e. once a minute.

The code for that timer is:-

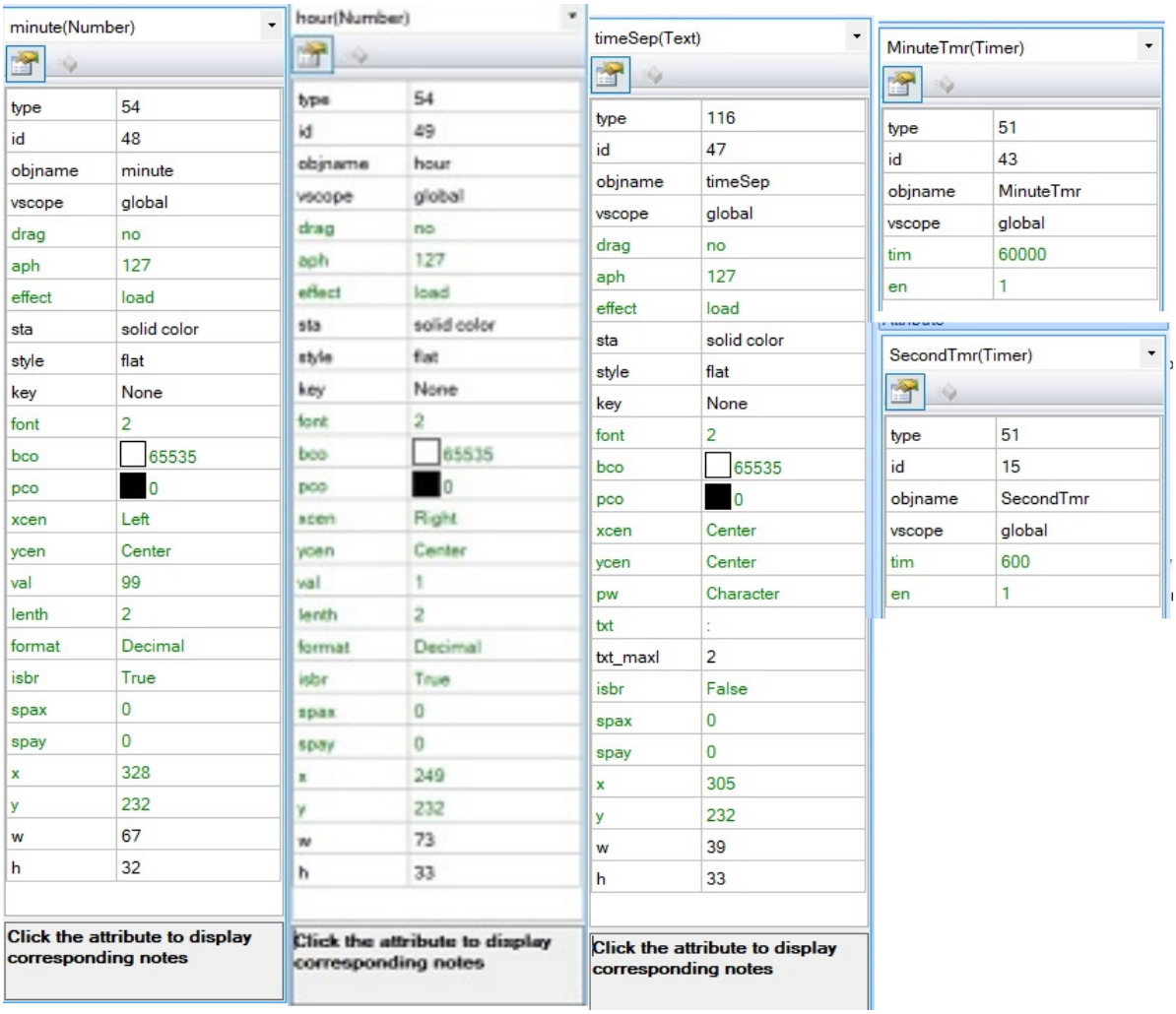
```
// Nextion CODE
if(minute.val!=rtc4)
{
  minute.val=rtc4
  if(bst==1)
  {
    hour.val-=1
    if(hour.val!=rtc3)
    {
      hour.val=rtc3
    }
    hour.val+=1
  }else
```

```
  {
    if(hour.val!=rtc3)
    {
      hour.val=rtc3
    }
  }
}
```

With the above Nextion Code I can display the time in HH:MM format with a flashing ":" separator.

The attributes for the Nextion components are shown below.

All that is needed now is to align the hour, timeSep and minute on the screen.



bool setDaylightSavingOn(bool on);

Turn Nextion daylight saving variable on or off

Usage:

setDaylightSavingOn(true) - Turn on

setDaylightSavingOn(false) - Turn off

The observant of you will have noticed the use of a Nextion variable bst which was not described in the discussion above.

This variable serves to add 1 hour to the time if bst is == 1. In the UK daylight saving is BST - British Summer Time.

This function just serves to set bst to 0 or 1 as appropriate.

Text Terminal Functions

void printTextToNextion(const char* p, bool transmit);

Sends Text to Nextion to be placed in variable `page1.va0.txt`.

If transmit is set to true the text is terminated with a " character and `m0,0` is clicked to cause the screen on `page1` to be updated using the `finishNextionTextTransmittion()` command (see below).

The procedure sends `page1.va0.txt="` to the Nextion followed by the text.

Usage: `printTextToNextion( "This is a load of text for page1", true );`

void printTimeEmbeddedTextToNextion(const char* p, bool transmit);

Sends Text to Nextion to be placed in the variable `page0.msg.txt`. If transmit is set to true the text is terminated with a " character and `m0,1` is clicked to cause the screen on page1 to be updated using the `finishNextionTextTransmittion()` command (see below).

The procedure sends `page0.msg.txt="` to the Nextion followed by the text.

Usage: printTimeEmbeddedTextToNextion("This is a load of text for page1", true);

A string representing the Nextion time in the format " HH:MM:SS " is inserted AFTER the first character.

This is carried out by the Nextion display.

void printMoreTextToNextion(const char* p, bool transmit);

It is the same as the printTextToNextion function except that the `page0.msg.txt="` is NOT sent.
Usage: `printMoreTextToNextion( "This is a load more text for page1", true );`

NOTE: DO NOT use this without first using `printTextToNextion( "text", false );`

Typical usage might be:

```
char studentName[20];

if (GetStudentName(studentName)){
    display.printTextToNextion("Student Name: ", false)
    display.printMoreTextToNextion(studentName,true);
}
```

Sends the following to Nextion Display:

```
page1.va0.txt="Student Name: Fred Bloggs"
click m0,1
```

void printNumericText(uint32_t num, bool transmit);

Sends number to Nextion. This command MUST have been preceeded by one of the `printTextToNextion` commands shown above. If transmit is set to true the text is terminated with a `"` character and `m0` is clicked to cause the screen on `page1` to be updated using the `finishNextionTextTransmittion()` command (see below).

Usage: `printNumericText( n, true );` // where n is an int32_t

NOTE: DO NOT use this without first using `printTextToNextion( "text", false );` (or `printTimeEmbeddedTextToNextion(...`).

Typical usage might be:

```
int numberOfStudents;

numberOfStudents = 10;
display.printTextToNextion("I have , false);
display.printNumericText(numberOfStudents,false);
display.printMoreTextToNextion(" Students",true);
```

Sends the following to Nextion Display:

```
page1.va0.txt="I have 10 Students"
click m0,1
```

void finishNextionTextTransmittion();

Terminate the text transmitted to Nextion with a " character and terminate the command correctly.

Also issues the relevant click m0 command dependant upon which printText command was used to cause the screen on page1 to be updated. (Uses "click m0,1" or "click m0,0" as appropriate)

Usage: finishNextionTextTransmittion()

void printCommandOrErrorTextMessage(const char* commandOrError, const char* textMessage, bool transmit);

I like to keep a monitor of what has happened in the system. This display is on `page1` of the Nextion display. I use the first character position to indicate the type of message/source of message. e.g. C for command, E for error message. After this character I insert the Time in " HH:MM:SS " format. This is done by the Nextion Display.

`printCommandOrErrorTextMessage` - sends the commandOrError charater followed by the textMessage to the Nextion using the `printTimeEmbeddedTextToNextion` command above.

If transmit is set to true the text is terminated with a `"`character and `m0` is clicked to cause the screen on `page1` to be updated using the `finishNextionTextTransmittion()` command (see above).

void preserveTopTextLine();

Using this function it is possible to preserve the top text line on page1 as a header line.

All general text commands do NOT use the top line if this command is executed and this line will NOT scroll with the other lines.

void writeToTopTextLine(const char* textMessage);

Write to the top text line (header line) using this function.

void releaseTopTextLine();

Releases the top text line to act as any other text line and may be scrolled with the other text.

void clearTextScreen();

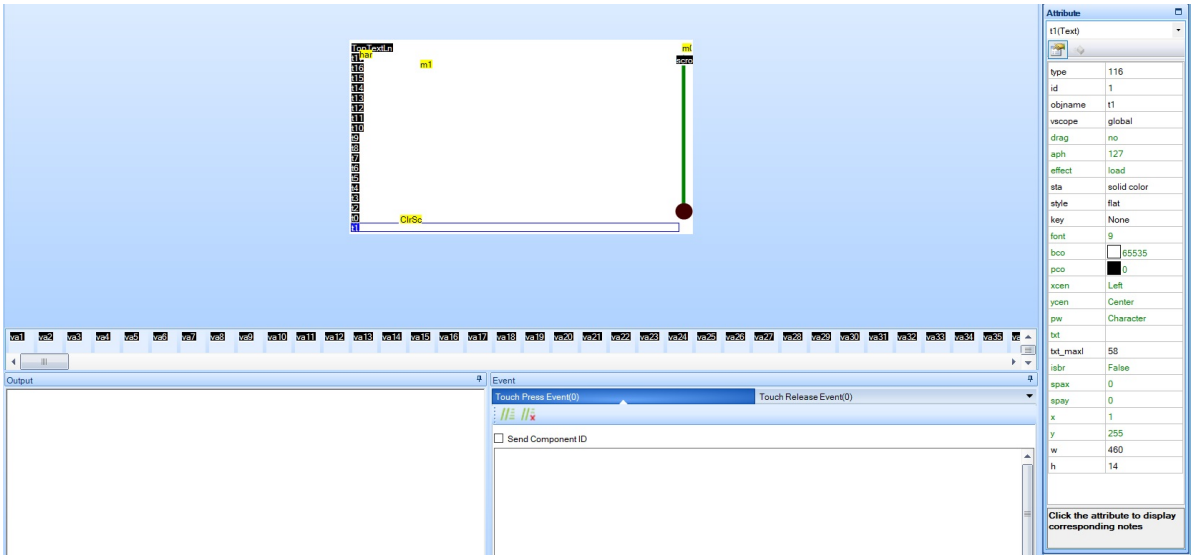
Clears the Nextion Text Screen (page1)

If the Top Line is preserved that is not cleared, use clearTopTextLine() below instead.

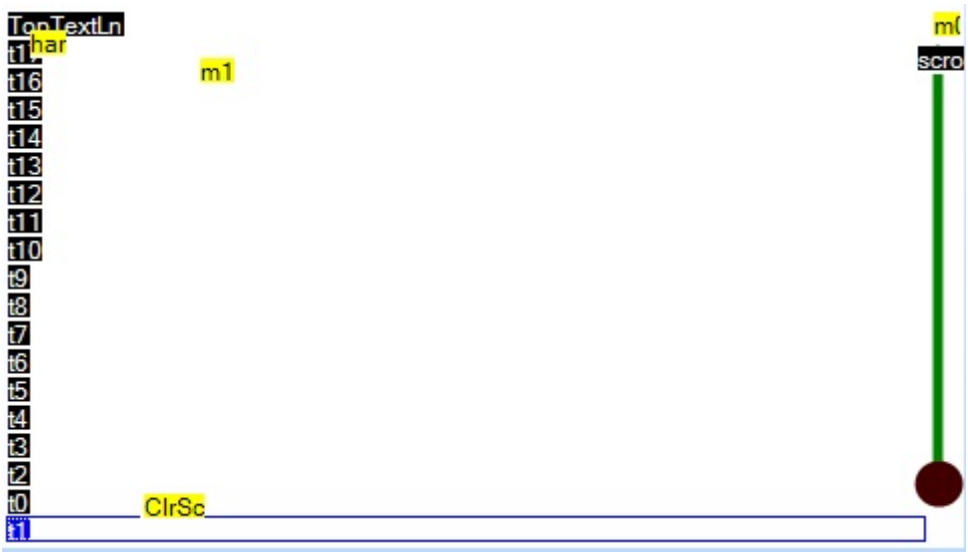
void clearTopTextLine();

Clears the Nextion page1 Text screen Top Line.

Nextion Text Page Format

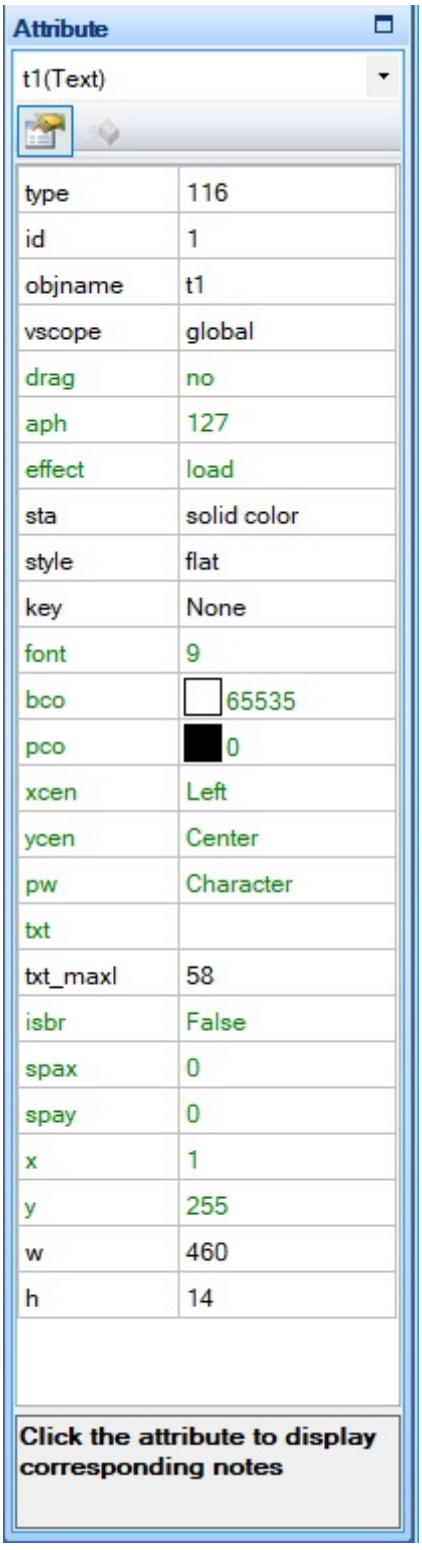


The page1 is shown above in the Nextion Editor View.



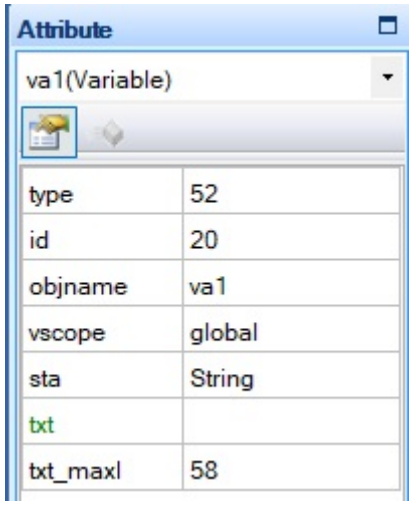
The actual screen has text lines, obviously, ranging with a component id of 1 at the bottom up to 19 at the top. The top text line is called TopTextLn. It is important that this name is maintained as this is used when writing to or clearing the top line.

The format of the text lines is as shown below.



page1 also has text variables (named va0..va201). It is MANDATORY that the text variables, starting at va1, have ids from 20 to 220 with NO GAPS in the numbering. va0 can have any id number except 1..220 and it's variable name MUST remain at va0 (that's va + zero).

The attributes of the txt Variables is as below:



All of the above need some Nextion Variables, Components and code. This is described below.

Program.s Variables

int yOffset=0,linesOccupied=0,topScrlTxtLn=19,histHi=19,histLo=19,bufLn=0,maxScrLn=220,scrLn=0,tmpNum=0

yOffset is used when using the scroll bar to scroll through the text buffer.

linesOccupied holds the number of text lines used, up to the maxScrLn - 19.

topScrlTxtLine This is used to preserve the top line.

histHi, histLo are used to hold the HiWater and LoWater position in the rotating screen buffer.

bufLn - The line in the buffer to write.

maxScrLn - The maximum number of screen lines in the buffer

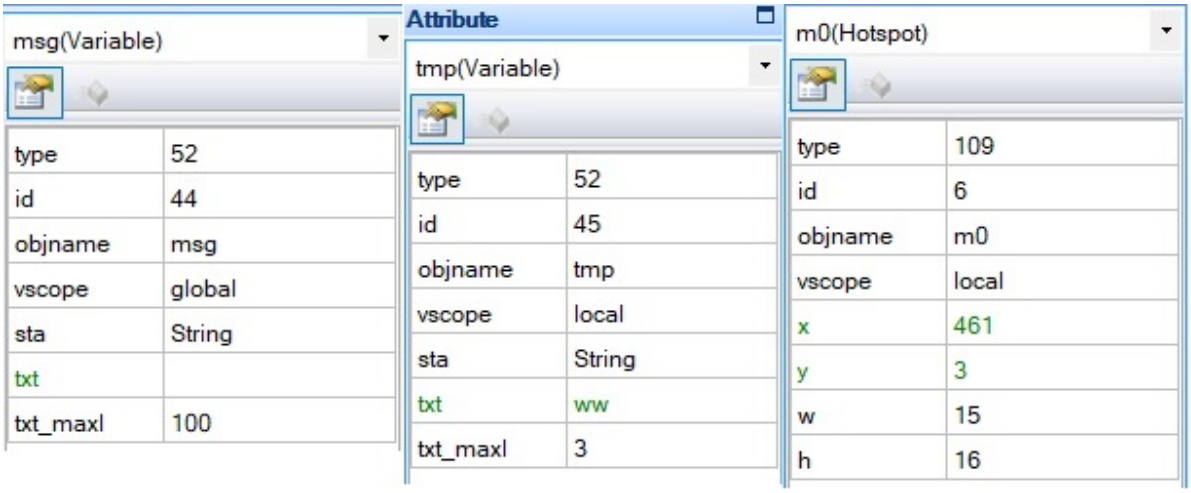
scrLn - The current screen line to be written.

tmpNum - Temporary variable for computation

page0 Variables and Components

msg (Variable:txt), tmp (Variable:txt), m0 (Hotspot)

Their attributes are as shown below:



The m0 code is shown below.

m0 Touch Press Event Code

```
substr page0.msg.txt,page1.va0.txt,0,1
page1.va0.txt+=" "
substr page0.msg.txt,page0.msg.txt,1,100
covx rtc3,tmp.txt,2,0
page1.va0.txt+=tmp.txt
page1.va0.txt+=":"
covx rtc4,tmp.txt,2,0
page1.va0.txt+=tmp.txt
page1.va0.txt+=":"
covx rtc5,tmp.txt,2,0
page1.va0.txt+=tmp.txt
page1.va0.txt+=" "
page1.va0.txt+=page0.msg.txt
yOffset=0
if(linesOccupied<topScrlTxtLn)
{
  p[1].b[topScrlTxtLn-linesOccupied].txt=page1.va0.txt//19=t18 id
  p[1].b[20+linesOccupied].txt=page1.va0.txt//38=equivalent in behind buffer
  histHi+=1
  if(histHi==20)
  {
    histLo=20
  }
  page1.scrollSlider.maxval=0//disable scrollSlider
}else
{
  // first the background buffer
  histHi+=1
  if(histHi>maxScrLn)
  {
    histHi=20
  }
  if(histHi==histLo)
  {
    histLo+=1
    if(histLo>maxScrLn)
    {
      histLo=20
    }
  }
  p[1].b[histHi].txt=page1.va0.txt
  // now the displayed screen
  bufLn=histHi
  for(scrLn=1;scrLn<=topScrlTxtLn;scrLn+=1)// full screen occupied now must also
scroll data
  {
    p[1].b[scrLn].txt=p[1].b[bufLn].txt
    bufLn-=1
    if(bufLn<20)
    {
      bufLn=maxScrLn
    }
  }
```

```
}
if(linesOccupied<201)//220-19
{
  linesOccupied+=1
}
```

...now the m0 Touch Release Event Code

```
![page1attribs](C:\Arduino
Programs\LIBRARIES\Nextion\Resources\page1attribs.jpg)yOffset=0
if(linesOccupied<topScrlTxtLn)
{
  p[1].b[topScrlTxtLn-linesOccupied].txt=page1.va0.txt//19=t18 id
  p[1].b[20+linesOccupied].txt=page1.va0.txt//38=equivalent in behind buffer
  histHi+=1
  if(histHi==20)
  {
    histLo=20
  }
  page1.scrollSlider.maxval=0//disable scrollSlider
}else
{
  // first the background buffer
  histHi+=1
  if(histHi>maxScrLn)
  {
    histHi=20
  }
  if(histHi==histLo)
  {
    histLo+=1
    if(histLo>maxScrLn)
    {
      histLo=20
    }
  }
  p[1].b[histHi].txt=page1.va0.txt
  // now the displayed screen
  bufLn=histHi
  for(scrLn=1;scrLn<=topScrlTxtLn;scrLn+=1)//full scrn occupied now must also
scroll data
  {
    p[1].b[scrLn].txt=p[1].b[bufLn].txt
    bufLn-=1
    if(bufLn<20)
    {
      bufLn=maxScrLn
    }
  }
}
if(linesOccupied<201)//220-19
{
  linesOccupied+=1
}
```

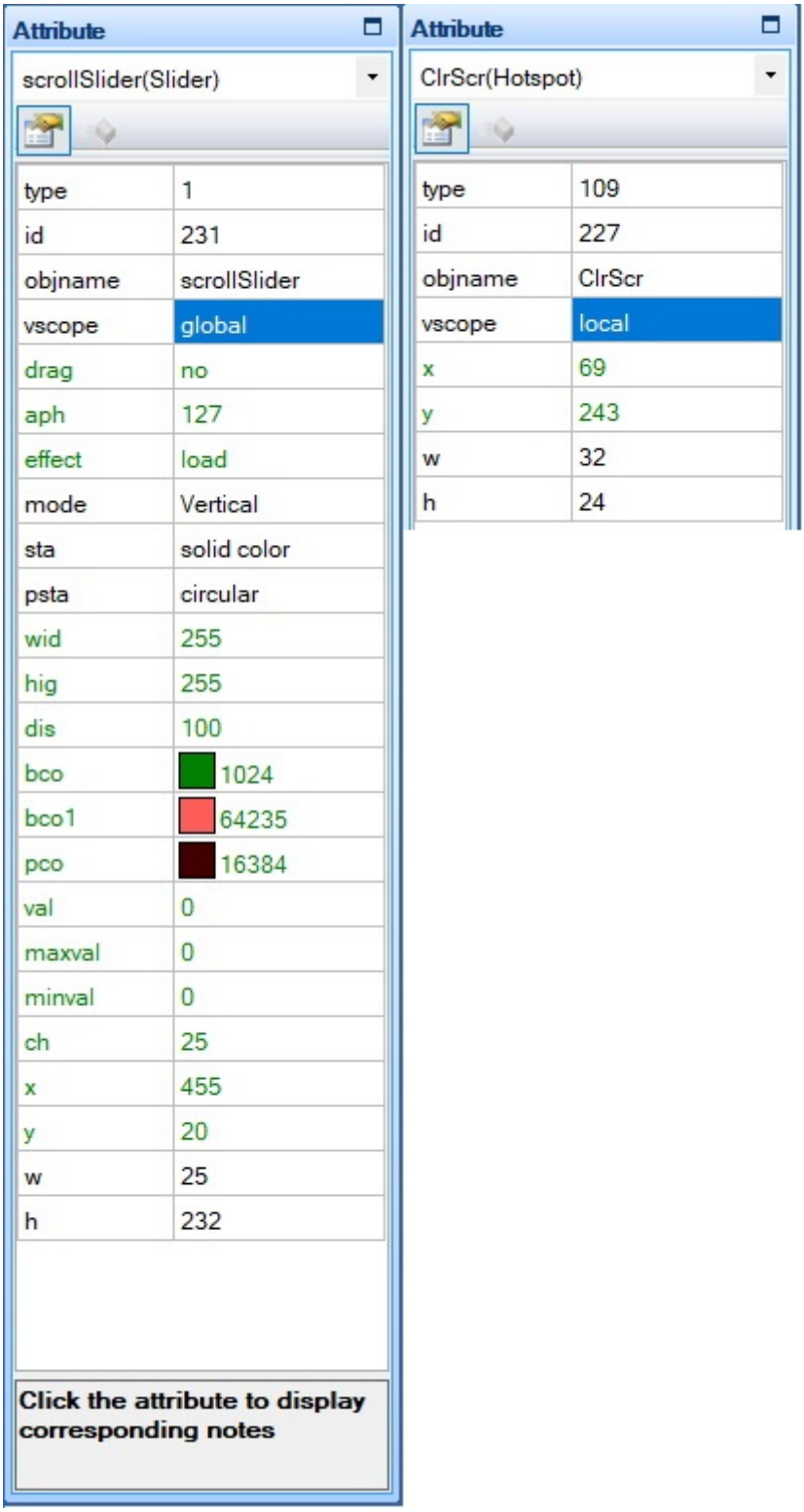
You might have noticed that the only difference between these two sets of code is that the first 13 lines of the m0.1 code are missing. It's the m0.1 code that inserts the time into the string and sends it to va0. Both sets of code then print va0 onto the page1 screen and buffer.

page1 Variables and Components

The text screen variables t0..t17, and TopTextLine and the buffer variables va1..va201 plus va0 have already been described.

The same as page0 the variable tmp must exist with the same attributes as was the case with page0. Likewise an m0 hotspot component must exist with the same attributes and code as per page0.

Further to the above a hotspot ClrScr must exist along with a Slider variable named scrollSlider. Their attributes are as shown below:



The ClrScr Touch Press Event Code is shown below

```
if(topScrlTxtLn<19)
{
  tmpNum=19
}else
{
  tmpNum=0
}
for(scrLn=1;scrLn<=120;scrLn++)
{
  if(scrLn!=tmpNum)
  {
```

```
    p[1].b[scrLn].txt=""
  }
}
linesOccupied=0
histHi=19
histLo=19
```

ScrollSlide Code: Touch Release Event and Touch Move (both the same)

```
if(linesOccupied>topScrlTxtLn)
{
  yOffset=scrollSlider.val
  // now the displayed screen
  // histHi points to last entry..destined for bottom screen line
  bufLn=histHi-yOffset
  if(bufLn<20)
  {
    bufLn=bufLn+201//220-19
  }
  for(scrLn=1;scrLn<=topScrlTxtLn;scrLn+=1)//full scrn occupied now must also
scroll data
  {
    p[1].b[scrLn].txt=p[1].b[bufLn].txt
    bufLn-=1
    if(bufLn<20)
    {
      bufLn=maxScrLn
    }
  }
}else
{
  scrollSlider.val=0
}
```

So with all the above Text Screen information you can have a Text Terminal on your Nextion complete with the ability to scroll back through 200 lines of previous text (actually 182 lines).

Leds - Flashing, On and Off

On my page0 screen I have 24 simulated leds in three rows of 8 leds.

These functions allow the state of the leds to be changed and displayed.

void setLedState(topMidBottmType whichLed, uint8_t which/*0..7*/, onOffFlashingType state);

setLedState - Sets the state of the leds in top, middle or bottom Row.

which = led (0..7) and state is on (1), off (0) or flashing (2)

Just sets the state in variable holding leds row state. There is no change to the leds display until `setNextionLeds( row )` is used (see below).

Usage: `setLedState( mid, 4, flashing );`

void setNextionLeds(topMidBottmType which);

setNextionLeds actually sends command to Nextion to change the state of which leds (top, middle or bottom row) set with `setLedState` function above.

Usage: `setNextionLeds( top );`

void clearLeds();

clearLeds sets the leds state variable to all (top, middle and bottom) off.

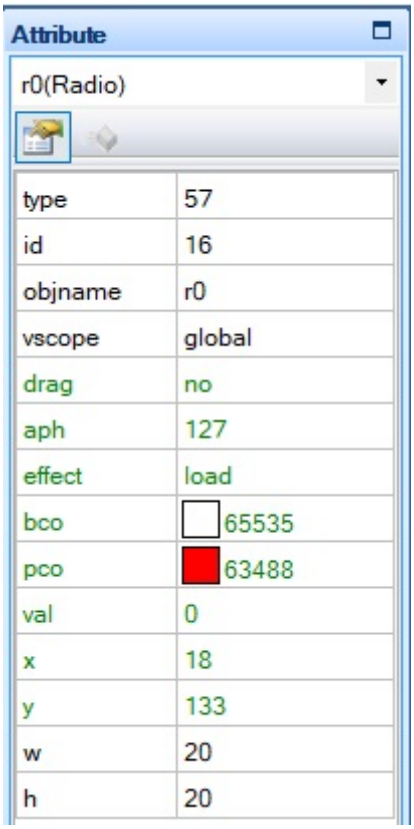
Uses setNextionLeds to send command to update all rows on Nextion.

Typical usage:

```
    display.clearLeds();
    uint8_t how = 1; // 0=off, 1=on, 2=flashing, 3=invalid
// Turn the leds on, one by one
    for (uint8_t p = 0; p < 3; p++) {
        for (uint8_t n = 0; n < 8; n++) {
            display.setLedState((topMidBottmType)p, n, (onOffFlashingType)how);
            display.setNextionLeds((topMidBottmType)p);
            if (how == 2) delay(1200); else delay(600);
        }
        how++;
        if (how == 3) how = 1;
    }
    display.clearLeds()
// Now turn them all on together with no delay
    how = 1;
    for (uint8_t p = 0; p < 3; p++) {
        for (uint8_t n = 0; n < 8; n++) {
            display.setLedState((topMidBottmType)p, n, (onOffFlashingType)how);
        }
        display.setNextionLeds((topMidBottmType)p);
        how++;
        if (how == 3) how = 1;
    }
```

Nextion Leds Format

Within each of the 3 rows of 8 leds, made from Radio components with the following attributes



It is important that all the leds in each row are in increasing id values with no gaps. In my case the top row have ids from 16..23, middle row 26.33 and the bottom row 34..41.

The following variables MUST exist in Program.s

int TopLed=2,MidLed=0,BotmLed=0,blink=0

int xx=0,zz=0,r=0

The code to control the leds is within the timer called SecondTmr. The Timer Event code is as below:

```
//====================
//objname: SecondTmr
//tim           600
//en             1
//====================
//Led status occupies 2 bits
// 0=off (00), 1=on( 01), 2 = flashing (10)
// idx is the start index of the first led in the row
// r is a loop counter
// xx is the value from the led status variable
//Set the leds on / off / flashing
xx=TopLed
if(blink==1)
{
  blink=0
  timeSep.txt=""
}else
{
  blink=1
  timeSep.txt=":"
}
for(r=r0.id;r<=r7.id;r++)
```

```
{
  zz=xx&3
  if(zz==2)  // Blink
  {
    b[r].val=blink
  }else
  {
    b[r].val=zz
  }
  xx=xx>>2
}
xx=MidLed
for(r=r8.id;r<r16.id;r++)
{
  zz=xx&3
  if(zz==2)  // Blink
  {
    b[r].val=blink
  }else
  {
    b[r].val=zz
  }
  xx=xx>>2
}
xx=BotmLed
for(r=r16.id;r<=r23.id;r++)
{
  zz=xx&3
  if(zz==2)  // Blink
  {
    b[r].pco=64512  //Orange
    b[r].val=blink
  }else
  {
    b[r].pco=63488
    b[r].val=zz
  }
  xx=xx>>2
}
```

The state of the leds is controlled by setting their values in the three variables TopLed, MidLed and BotmLed each holding the state of 8 leds.