to hold the telephone speaker in the other hand adjacent to the user's ear. The inverting of the image can be accomplished by several different techniques including by software and hardware methods. One such method is to use a bi-directional shift register and shift the direction of the register to invert the image. Another technique is to change the method by which the data is pulled out of memory using the software.

[0107] Lines **118** control vertical and horizontal pulse, vertical and horizontal clock, even and odd row enable signals and the horizontal multiplying pulse signal. Digital to analog converters **113**, memories **107**, **108**, **109**, converter **105** and control circuit **110** can be mounted on a common circuit board with display **112**, or they can be split onto separate circuit boards or integrated circuits within the telephone housing, the pager housing, the docking element housing, or other housing described in greater detail below depending on the geometry and operational requirements of the specific embodiment. In addition to placing the digital to analog converters, memories, converter and control circuit **110** on a common circuit board, they can be all located on a single monolithic integrated circuit (IC), represented by a dash line **101**. The placing of a components on a single IC reduces the internal capacitance and therefore the power consumption of the circuit.

[0108] Another preferred embodiment of a display control circuit is illustrated in connection with **FIG. 2C**. In this embodiment, a digital circuit **120** is used to control color sequential display operation. The processor **134** receives serial digital image data at **121** and sends display data to memory **124**. An optional additional non-volatile, such as flash memory or SRAM circuit **125** can also be included to store graphics data where that is in addition to text stored at **124** using a serial bus **127**. Timing control circuit **122** receives clock and digital control signals from processor **134** and transmits control signals to the backlight **111** and display **112** along lines **115**, **116**, **117**, and **118**, respectively. Lines **128** direct ready, reset, write enable, output enable, color enable, address and data signals to memory to control deliver of image frames to the display **112**. This circuit can be used within a telephone housing or the docking element housing described in greater detail below depending on the geometry and operational requirements of the specific embodiment. A switch can be provided to allow the user to reverse the image on the display left to right or right to left. This can be useful for the telephone user who may select one hand to hold the telephone during use and simply press a button on the housing so that the image is inverted for presentation to the other eye of the user when electing to hold the telephone speaker in the other hand adjacent to the user's other ear.

[0109] Power management circuit **123** receives control signals along line **126** from circuit **122** to lower power consumption of the circuit **120**. Circuit **123** is used to control power during display operation, and is connected to flash memory circuit **125**, the digital to analog converter, the buffer/inverter and the display **112** by a line **129**. This capability arises from the use of a transferred thin film active matrix circuit described previously which has an ability to store charge between vertical synchronization pulses. This storage capacity enables lower power consumption of the display and backlight at less than 0.2 Watts. Thus, after a frame of data is written on the display, power is lowered until the next frame is written. This lengthens battery cycle time of portable communication devices as described herein. The power can be lowered by periodically stopping the clock to the display as described below.

[0110] **FIG. 2D** illustrates a method of displaying information on the display in which large amounts of information are contained in each image. For such high information images it may be desirable to enlarge a selectable portion of that image on the display. For example, the full image **130** has a region **131** in which a cursor **133** can be positioned. The user can position the cursor using a mouse or button control element anywhere within region **131** and identify a subregion **132**. The user selects the image of subregion for display on the full display area.

[0111] If the data provided by the processor **134** is greater than that displayed on the display **112**, the image can be written to the display by underscanning; e.g. only every fourth bit of display is written. In order to display the image of a subregion as the entire image, every bit of display is written, but only for that specific region. If the subregion **132** is to be displayed on the full display area, the data for the rows above subregion **132** are not forwarded to the display **112** by the timing control circuit **122**, and only the columns that are included in subregion **132** are forwarded.

[0112] **FIG. 2E** illustrates a timing diagram that illustrates a preferred method of operating a microdisplay in accordance with the invention. The video signal is sent to the display **112** both as actual video and inverted video. The odd-numbered pixel columns receive video from the top column driver and the even-numbered columns receive video from the bottom column driver as described above with Reference to **FIG. 2A**. Referring to the embodiment of **FIG. 2**E, the odd-numbered pixels, which receive actual video, are driven between the common voltage (V_{COM}), the voltage applied to the counterelectrode, and the supply voltage source (V_{DD}). The even-numbered pixels, which receive the inverted video, are driven between V_{COM} and the supply voltage sink (V_{EE}). After the entire frame is scanned into the display and there is a delay to allow the liquid crystal to twist, the backlight is flashed to present the image. In a preferred embodiment, V_{DD} is 9 volts, V_{EE} is 2 volts and V_{com} is 5.5 volts. The technique of alternating the video on each column is called column inversion and helps prevent a DC voltage from building up on the liquid crystal material and additionally prevents cross talk.

[0113] Another preferred embodiment of a display control circuit is illustrated in connection with **FIG. 2F**. In this embodiment, a digital circuit **1120** is used to control color sequential display operation as described in relation to **FIG. 2C**. Additionally, the circuit has the features of a modulating common voltage and a heater, as described below. The processor **1104** receives image data at **1121** and sends display data to memory **1124** and flash memory **1125** via the timing control circuit **1122**. The image data can be in a variety of forms including serial or parallel digital data, analog RGB data, composite data or s-video. The processor **1104** is configured for the type of image data received, as is well known in the art. The timing control circuit **1122** receives clock and digital control signals from the processor **1104** and-transmits control signals to the backlight **1111** along lines **1115**. The timing control circuit **1122** transmits control signals, such as vertical start pulse, vertical clock,