The waveforms are created digitally. A counter (PAL U82) outputs an address to a PROM (U85) containing a parabola look-up table. The PROM outputs 8-bit data to three multiplying DACs (U76, U77, U78). As a result, the DACs output parabolic waveforms during each scan line. The amplitude of each waveform is controlled by a pair of voltages from an I^2C octal DAC (U79), one pair for each waveform. One voltage controls the amplitude on the left side of the waveform and the second controls the amplitude on the right side of the waveform. The voltages are switched in the middle of each scan line by toggling a triple analog switch (U80) with the most significant bit of the count.

3.3 Character Generator

The Character Generator creates text and test patterns for on-screen display. Text is used for menus, help pages, slidebars and other visual elements of the projector's user interface. Test patterns are provided to aid in setup of the projector. The Character Generator also generates G2 control voltages for the red, green and blue CRTs.

Eight signals created by the Character generator are output from the Control Module. Red internal video (R-INT-VID), green internal video (G-INT-VID), blue internal video (B-INT-VID), and INT-EXT are sent to the Video Input Module (VIM). The VIM uses INT-EXT to switch the displayed image between internal and external video on a pixel-by-pixel basis. The TARGET signal is output to the optional ACON module. It goes high to identify characters used as targets by the ACON sensor. R-G2-CONT, G-G2-CONT, and B-G2-CONT are G2 control voltages for the red, green and blue CRTs, respectively. They are sent to the High Voltage Power Supply (HVPS) which generates the actual G2 voltages.

The Character Generator inputs five control signals generated by the DPB; PIXCLKB, START-HB, V-DRIVE, CLAMP-DP and HBLANK. PIXCLKB is a clock signal with approximately 256 cycles in the active scan. It is used to create the video pixels. START-HB is a pulse occurring once every scan line which determines where the video signals start on the left edge of the image. V-DRIVE is the vertical drive pulse. It resets the character generator's counter circuitry at the end of each video field. CLAMP-DP is a pulse created within the horizontal flyback interval. It controls when video clamping occurs. Finally, HBLANK is the horizontal blanking pulse.

3.3.1 Text

Text is displayed on a 64 column by 24 row matrix. The location of each character on the screen is mapped to an address in RAM. A 16-bit word is stored for each screen location. The least significant byte, stored in RAM U97, specifies one of 256 available characters (letters, numbers, graphics symbols, etc.) for display. The most significant byte, stored in RAM U98, specifies how the character will look (eg. its color). It is called the "attribute" byte. To display a screen of text, the 68000 microprocessor writes the appropriate codes into the RAMs for each screen location. The 68000 accesses the RAMs through buffers U92, U93, U95 and U96. PAL U118 decodes the address space defined by chip select CS-CHAR* (and a delayed version CS-CHARD*) to provide the required read and write control signals.

Half of the RAM space is allocated for the screen map. The other half stores bitmaps for all 256 possible characters. These are permanently stored in EPROM U35 and copied into the RAMs by the 68000 at projector power-up. Each bitmap is 8 pixels wide by 16 pixels tall, stored as 16 words. Only the most significant byte of each word is displayed. The most significant bit of this byte is the first pixel scanned out to the display.

Pixels are either "off" (0) or "on" (1). Their appearance on-screen is determined by the attribute byte stored for each screen location. "Off" pixels normally appear black while "on" pixels display one of eight colors (red,