


# VIDEO PERCEPTION INCORPORATED

## 8 CHANNEL SECURITY DEMONSTRATION BOARD

### BACKGROUND

Video Perception, Inc. presently has a Security Demonstration Board that functions with a single video channel input. It superimposes the alarm status indication and tracking data onto the video signal; this is displayed on a monitor. The board receives an NTSC format video input. It digitizes and processes the image; the processing is done with the IPP3000. The board performs the function of providing visualization of the alarm indication and of the tracking data development for a single channel. It also demonstrates a practical means to transmit the digital data over a common coaxial cable with the video data.

### GOALS

It is one of the goals of the proposed development to provide a means of demonstrating the capability of multiplexing eight video channels. All eight channels will be processed by a single IPP3000 to produce and to transmit alarm status and tracking data. This processor unit would be controlled through an RS-232 link from a computer serial port.

It is also a goal to provide a receiver of this multiplexed data that will de-multiplex the multi-channel video, alarm status, and tracking data. The receiver will be capable of displaying to a monitor any selected channel of video or tracking data. It will monitor the alarm status of all eight video channels concurrently.

It is a secondary goal of this development to produce a circuit board that could be used in an operating security system as an eight-channel satellite multiplexer/processor. The intent of this application would be to reduce the customer's development time to market by making this available as a development tool.

The following are functional goals of the processor board:

1) Accept 8 channel video input. The cameras must be synchronized (from a.c. power).
2) Accept video camera channel inputs of either all NTSC or all PAL format.
3) Display 8 channels of alarm status concurrently. This could be done with 8 LED displays.
4) Provide one video output containing all eight video channels multiplexed onto this single output.

5) Provide one video output containing multiplexed information from all eight video channels. Optional outputs (RS-170 format) may be selected as follows:
   a) Tracking data and alarm status only - Display of the alarm status will appear at the top of the display; the channel number will be encoded. The tracking will be displayed every fourth horizontal scan line of a field; the remaining lines will be black.
   b) Superimposed video - The video data will be displayed during the remaining lines that were black for the previous mode.
6) Provide dynamic 8 channels control of the threshold and tolerance through a micro-processor located on the board.

7) Provide serial port control from an external computer of the following:
   a) Threshold (8 channel)
   b) Tolerance (8 channel)
   c) NTSC/PAL selection
   d) Tracking data singularly/superimposed
   e) Mask On/Off
   f) Single-channel/8-channel operation
   g) Edge/Change Mode
   h) Masking data - up to 8 channels
8) Provide on-board A/D conversion.
9) Provide 8 channel automatic lighting compensation.
10) Provide 8 channel sync detection
11) Provide software menu-controlled operation from a computer
12) Provide I/O needed for customer expansion
   a) Horizontal and latched Vertical addressing
   b) Motion-Out, Motion-Sample, MotionHalo, Halo-Video
   c) Ref-WE-N, Null-N, Ref-In, Mask-WE-N, Mask Data, Mask-In
   d) A/D conversion outputs including strobes

**PROBLEMS TO OVERCOME**

The vertical sync signal (vertical blanking) is generated separately for each of eight channels. The synchronization of the channels is locked to the zero crossing of the power line. It is estimated that this will provide accuracy to synchronize all channels together within three horizontal scan lines. It will not synchronize the horizontal sync timing. The receiving circuit of multiplexed data (either video or alarm/tracking data) will have to synchronize during the vertical sync interval, even if there are as many as three missing horizontal sync intervals.

Each of the eight channels has both an odd and an even field that must be received before a complete video image frame is received. A single field of each channel is processed for motion detection in sequence before receiving the opposite field type for each channel. This is done to increase the sampling rate of motion by approximately a factor of two. It is necessary for the IPP3000 to skip a field (after a sequence of eight) to permit transmission of the opposite field type for each channel. This is not necessary for receipt of the tracking data; however, it is essential for receipt of a two-field image frame.

## SYSTEM DESCRIPTION

Figure 1 illustrates a preferred architecture for a large system. A satellite processor (as described herein) would be placed remotely near a cluster of eight video cameras. The outputs of the unit would be a multiplexed video path and a multiplexed alarm/tracking data path. This would represent all of the available video and tracking data from eight channels; the sample rate of each would be 1/8 the field rate of the cameras. With two coaxial transmission lines, **all of the data all of the time** are transmitted. The centralized receiving station would receive data from multiple satellite processors (probably located within the system computer). The receiving station could evaluate the alarm status of cameras (from multiple satellite clusters of cameras) and identify those cameras in alarm. It could be controlled to automatically display the camera image in alarm or it could permit manual or other automated selections. The computer could process all alarmed camera tracking data to validate a real threat from each camera location. The computer could control when video data should be recorded.

The computer also serves the function of set-up and control for each of the satellite locations through an RS-232 link. The link can be used to set-up threshold, tolerance, masking data, and various operating modes. The masking data are high-resolution areas being inhibited of motion detection. They could be generated using mouse entry of inhibited areas on an overlay of the actual video image from a video monitor (with customer ingenuity). Software support for remote control will be available from Video Perception Inc.

This approach has the big advantage of requiring only the frame grabbers needed to process the maximum anticipated alarmed camera locations of the entire system. Tracking data would be processed only if an alarm exists. The **satellite locations provide all of the alarm data in advance** of receipt at the receiving station. Pre-sorting has been completed.

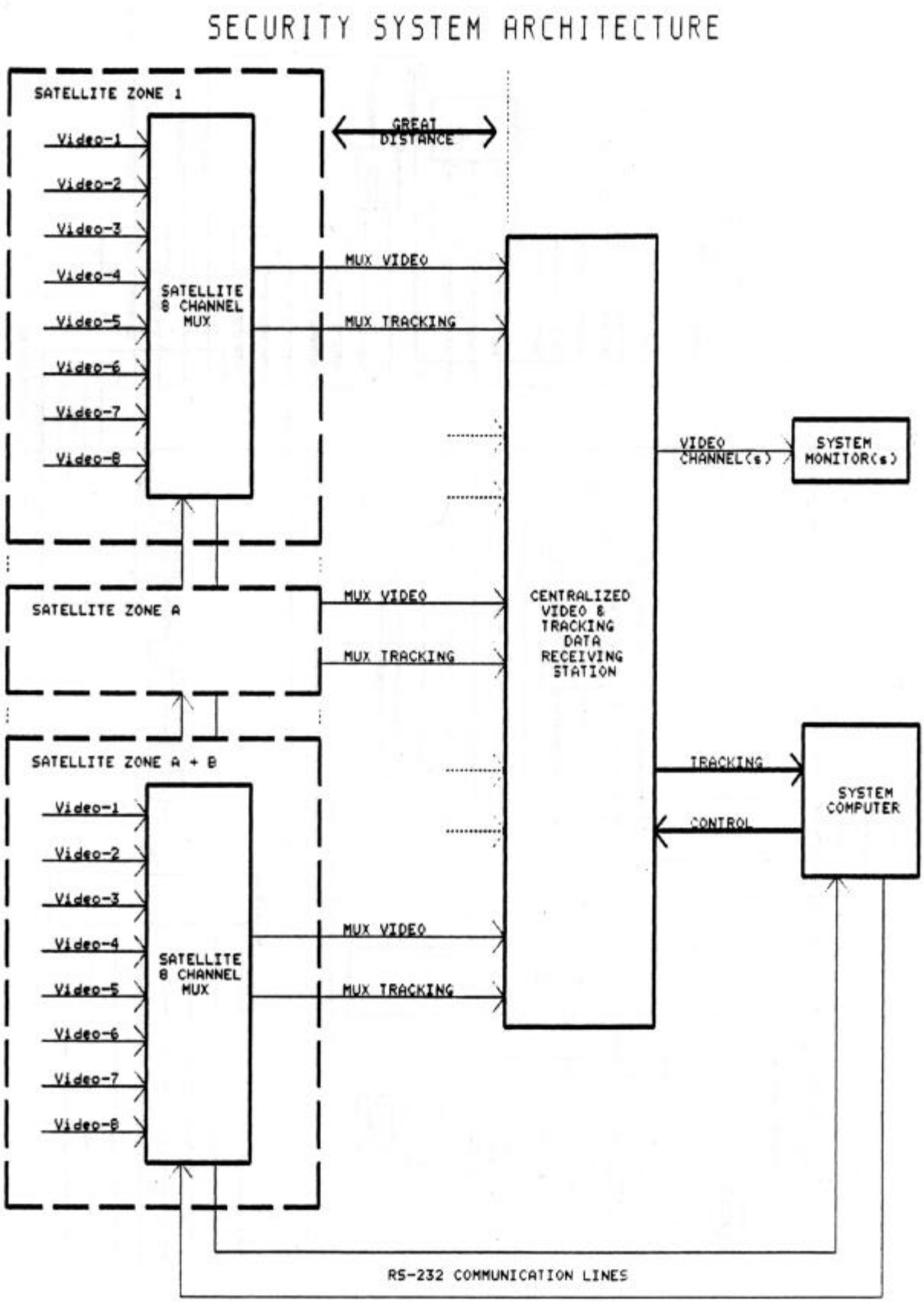
## SATELLITE PROCESSOR

Figure 2 illustrates a block diagram of an eight-channel processor. This approach fulfills the goals listed earlier for this unit. This unit could be used in an operating system without electrical design modification.

## **MUX VIDEO DECODER** (receiving station)

Figure 3 illustrates a Multiplexed Video Decoder; this has many of the features of the receiving station discussed earlier. This unit is directly applicable to the demonstration units only; the design of this unit will serve as a model for customer applications.

**FIGURE 1**


SECURITY SYSTEM ARCHITECTURE
SATELLITE ZONE 1
Video-1
Video-2
Video-3
Video-4
Video-5
Video-6
Video-7
Video-8
SATELLITE 8 CHANNEL MUX
GREAT DISTANCE
MUX VIDEO
MUX TRACKING
SATELLITE ZONE A
MUX VIDEO
MUX TRACKING
SATELLITE ZONE A + B
Video-1
Video-2
Video-3
Video-4
Video-5
Video-6
Video-7
Video-8
SATELLITE 8 CHANNEL MUX
MUX VIDEO
MUX TRACKING
CENTRALIZED VIDEO & TRACKING DATA RECEIVING STATION
VIDEO CHANNEL(s)
SYSTEM MONITOR(s)
TRACKING
CONTROL
SYSTEM COMPUTER
RS-232 COMMUNICATION LINES

# FIGURE 2

BLOCK DIAGRAM OF 8 CHANNEL SECURITY DEMO BOARD

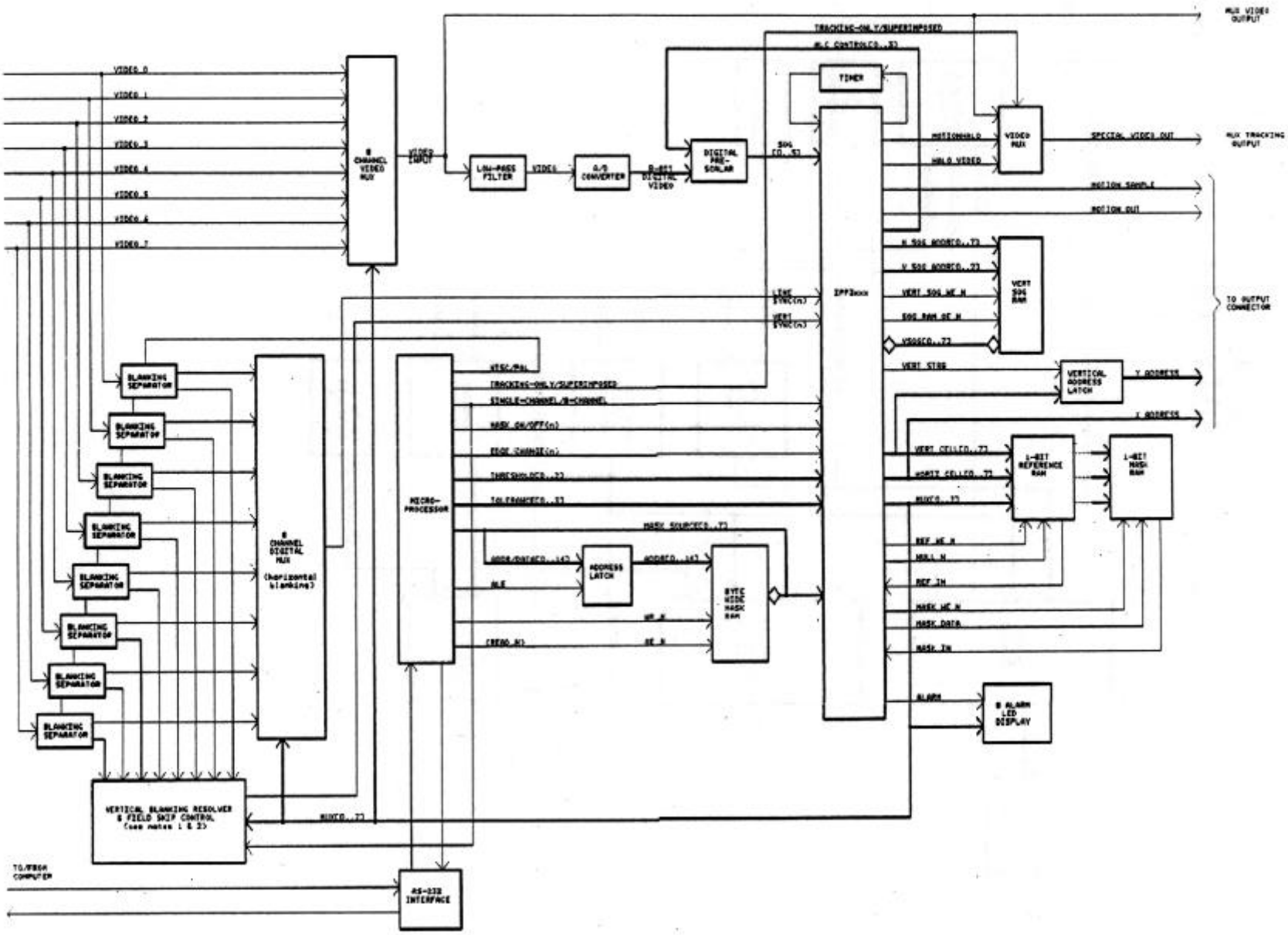
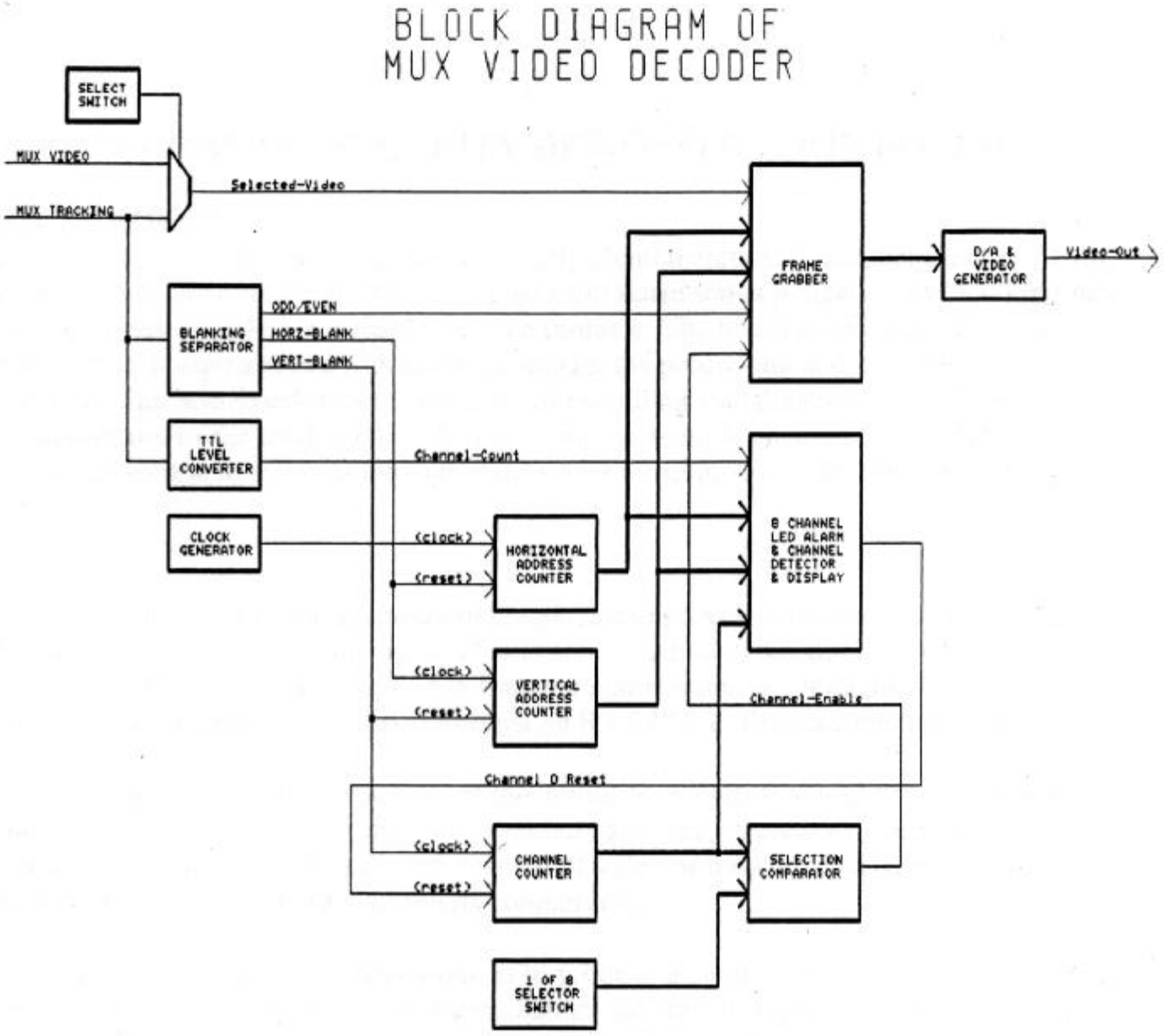


**FIGURE 3**


BLOCK DIAGRAM OF
MUX VIDEO DECODER
SELECT SWITCH
MUX VIDEO
MUX TRACKING
Selected-Video
BLANKING SEPARATOR
ODD/EVEN
HORZ-BLANK
VERT-BLANK
TTL LEVEL CONVERTER
Channel-Count
CLOCK GENERATOR
(clock)
(reset)
HORIZONTAL ADDRESS COUNTER
(clock)
(reset)
VERTICAL ADDRESS COUNTER
Channel 0 Reset
(clock)
(reset)
CHANNEL COUNTER
1 OF 8 SELECTOR SWITCH
FRAME GRABBER
D/A & VIDEO GENERATOR
Video-Out
8 CHANNEL LED ALARM & CHANNEL DETECTOR & DISPLAY
Channel-Enable
SELECTION COMPARATOR