

**VIDEO CONTROL INPUT MODULE  
Operator/Service Manual**

Models 1300 and 1300S

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SCHEMATICS AND ASSEMBLY DRAWINGS

Video Control Board schematic 060-03645-D  
Video Control Board assembly 080-03473-C

PARTS LIST

4 VIDEO INPUT CONTROL MODULE

4.1 Introduction

The Video Input Control Module is available in NTSC, PAL, and SECAM versions. It measures the time difference between a video feed signal and a synchronized or reference video signal, determines the delay time needed to compensate for the difference by adding the time difference to a fixed delay (selected with the BASE DELAY switch), and applies the total delay to the audio input signal. Both the reference and video feed signals must be standard EIA RS170 composite.

The Video Input Control Module also includes a frame control input to accept a frame hysteresis signal from a standards converter or frame synchronizer and internal adjustments for controlling frame and line hysteresis. Hysteresis is described in greater detail in Sec. 4.4.

Figure 4.1 is a connection diagram for a typical system configuration employing the Model 1300S with a Video Input Control Module.

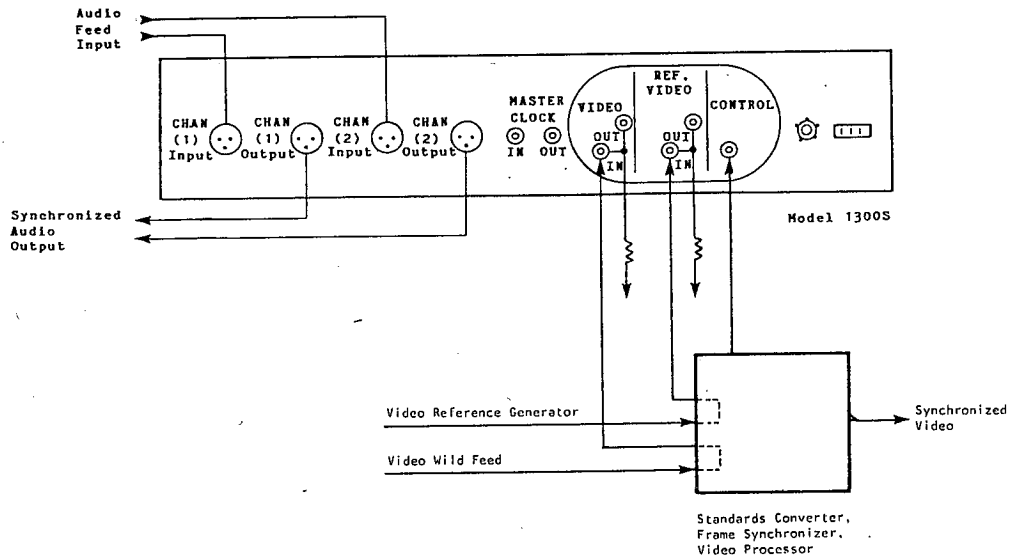


Fig. 4.1. Connection Diagram for Typical System Configuration for the Video Input Control Module.

4.2 Basic Operation

Turn on the 1300 by plugging it in.

Set the front-panel toggle switch labeled DISPLAY to show delay time in either frames or milliseconds. Next, set the four-position BASE DELAY switch (comprising four rotary thumb-wheel switches) to the appropriate fixed delay time (in milliseconds) required (for example, a known delay introduced by a satellite link or land lines).

Compensated delay time is automatically determined by the microprocessor in the Video Input Control Module. When the front-panel COMP toggle switch is set to IN, the control module determines the amount of delay that compensates for the difference between the reference video and video feed signals; it then adds the compensated delay to the fixed delay determined by the BASE DELAY switch and applies the total delay to the audio input signal. When the COMP switch is set to OUT, the 1300 applies only the delay time determined by the BASE DELAY switch to the audio input signal.

Delay processing is completely bypassed by setting the front-panel toggle switch labeled AUDIO to BYPASS.

4.3 Theory of Operation

Figure 4.2 shows a generalized block diagram of the Video Input Control Module, and the remainder of this section describes how the module functions. For convenience, the theory is divided into input/output control, microprocessor, and firmware.

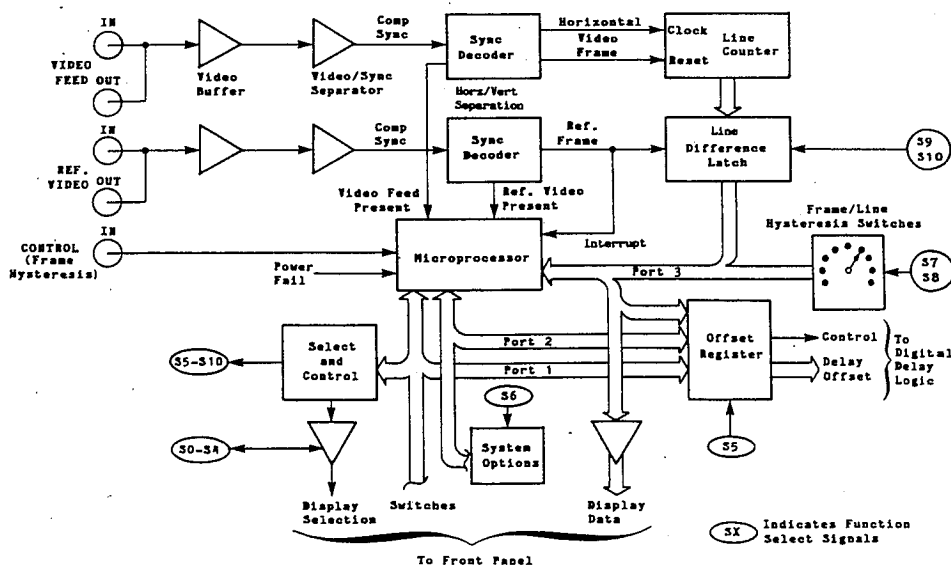


Fig. 4.2. Video Input Control Module Block Diagram.

## Input/Output Control

Video Feed and Video Reference Signals. Both reference video and video feed input signals (composite) pass through identical sync separation circuits that strip off horizontal and vertical sync signals. Figure 4.3 shows a timing diagram for this process. In this process for each signal, an emitter follower (Q1 or Q2) first unloads, buffers, and biases the composite video signal, and a parallel-tuned, series trap circuit (T1 or T2) removes the color burst signal from the horizontal back porch, preventing its interference with the sync tip level. Both signals are then amplified (U29 or U31) with a limited bandwidth. This gain provides about a 1-V horizontal sync pulse detectable by a comparator (U28). dc restoration of the sync tip is performed by C56 (or C62) and CR6 (or CR9) into the comparator (U28 or U30), which is biased to detect approximately 50% of the sync tip.

In both sync separation circuits, the positive-going horizontal sync pulses trigger a 6.2-us one-shot (U26) that extends beyond the sync period (4.7 us). U26 clocks a field flop (U23) causing it to toggle when a vertical period level occurs. For each horizontal period (64 us), U26 also retriggers U22, permitting U22 to announce to the processor which video signal is present. Serration detector one-shots (U27) then place a window (of 32 us) around the center of the horizontal period to mask all other pulses of the serration periods, thereby eliminating a 2X horizontal rate. This window is also used to identify an odd or even field by its phase (see Fig. 4.3), preventing the frame flop (U20) from firing on an even field. The frame flop can then toggle to field 1 or 2.

Line Difference. To determine the difference in the number of lines from the onset of a video frame period and the onset of a reference signal frame period, three actions are necessary. First, a counter must be reset and started at the onset of a video feed frame. Second, the count must be transferred to a latch at the onset of the corresponding video reference frame. And, third, the line count must be read into the microprocessor so that it can determine the amount of compensating delay.

To perform these operations, a difference window flop (U11) is clocked by the video feed horizontal pulses (from U26) and sets when it receives a video reference signal from U20. A horizontal counter (U19 and U21) for counts horizontal pulses and resets to 0 at the beginning of each video feed frame period. When the difference window flop (U11) sets, it transfers the current horizontal line count to a difference latch and interrupts the processor. Therefore, the processor is interrupted at the onset of each video reference frame and determines the amount of delay required based on the latched line count. When the processor reads the second latch (U16), via signal S10, it also clears the interrupt by resetting flops U11 and U20.

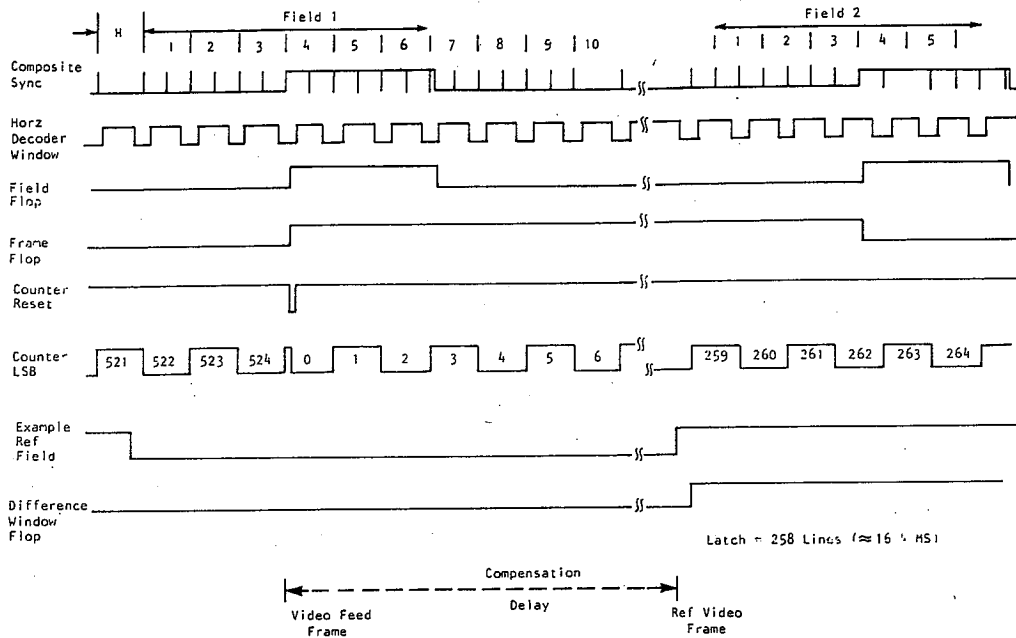


Fig. 4.3. Timing Diagram -- Video Input Control Module.

**Frame Control.** The frame control signal (generated by a standards converter, frame synchronizer, or other digital device) clocks into the difference latch with the line counter. Frame hysteresis is described in greater detail in Sec. 4.4.

**Microprocessor**

The 1300 uses an 8-bit microprocessor with three 8-bit I/O data ports. Port 1 controls a function-select decoder, provides 2 bits of the delay offset word and control data (bypass, fade, and mute signals), and reads all front-panel switches. Port 2 reads jumper assignments for options and configurations and outputs 8 bits of the delay offset word. Port 3, the address port, reads the difference latch and the internal frame and line hysteresis switches and outputs information to the front-panel LED driver and 8 bits of the delay offset word.

The microprocessor communicates with all hardware functions through a function-select decoder (U6) that generates signals S0 to S10 to perform various functions. To operate the front-panel display, the microprocessor (through the function-select decoder) uses S0 through S3 to activate the digits in the front-panel window and read the settings of the Base Delay switch. Signal S4 is used to activate front-panel LEDs and to monitor all front-panel toggle switches. Signal S5 is used to output the offset delay word (if it's ready) to an offset latch; S6 is used to read jumper assignments. S7 is used to read the internal frame hysteresis switches, and S8 the video present signals and internal line hysteresis switches. Signals S9 and S10 are used to permit reading the line counter latch via the microprocessor address port.

All of the microprocessor's ports must simultaneously transfer the 18-bit delay offset word to a 24-bit register (U4, U7, U8). This transfer is accomplished by loading S5 into U6; setting offset bits 0 to 7 on port 2, bits 8 to 15 on the address port, bits 16 and 17 on port 1; and then enabling S5 by setting port 1 bit 0 to 0. This process permits the time-for-write (TFW) pulses to clock the port parallel data into the offset register in sync with the delay logic. By disabling U6 and waiting a while, the offset sync flop (U11) clocks off and prevents further loading of the microprocessor's output ports into the offset latches. When loading an offset word into the offset register, the remaining bits of U7 must contain the appropriate control signals: bypass, fade, and mute.

### Firmware

The microprocessor performs the previously described control and computational tasks by executing a series of factory preset instructions in a specific repetitive sequence. Table 4.1 lists function-select decoder signals, their functions, and the order in which the microprocessor performs them.

Table 4.1. Sequence of Microprocessor-controlled Tasks.

Sequence No.	Function-Select Decoder Signal	Function
1	S0	Activate front-panel digit 0 and read Base Delay switch SW0
2	S2	Activate front-panel digit 1 and read Base Delay switch SW1
3	S2	Activate front-panel digit 2 and read Base Delay switch SW2
4	S3	Activate front-panel digit 3 and read Base Delay switch SW3
5	S4	Activate front-panel LEDs and read all front-panel toggle switches
6	S5	Output offset delay word (if ready) to the offset latch
7	S6	Read jumper assignments for options and configurations
8	S7	Read internal frame hysteresis switches
9	S8	Read internal line hysteresis switch and video present signal

Any change in video input signals or base delay settings causes a momentary break from this sequence to perform display and delay updates.

The system scan sequence program cycles repetitively supporting the front-panel display and monitoring switches for any change. If a change occurs, it is ignored for about 1 second while scan cycles continue, then computation takes place. S9 and S10 are activated when a reference video frame interrupts the processor.

#### 4.4 Hysteresis

##### Frame Hysteresis

Frame hysteresis occurs when a video signal has been delayed greater than a frame period. Because the Video Control Module cannot measure delay times greater than 1 frame period, an external frame hysteresis signal must be supplied to provide reference information.

To ensure that the video frame counter value represents true frame offset, the Video Input Control Module has a dedicated logic input (CONTROL) to accept hysteresis reference signals from a video control signal source; the processor uses the information to determine if frame hysteresis is occurring. An active-low hysteresis signal indicates frame hysteresis.

Depending on the hysteresis decoding scheme employed, various windows can be used to sample the hysteresis signal. A typical window is 15 lines; whereby, if the hysteresis signal is asserted between lines 0 to 15 of the offset period, hysteresis is in effect. If, however, the hysteresis signal is not asserted within this window (lines 0 to 15), hysteresis is not in effect, irrespective of whether or not the hysteresis signal is asserted at any other time.

Internal Adjustments. Frame hysteresis adjustments are required if video processing equipment maintains synchronization beyond one complete frame of delay. Two digit switches (SW1 and SW2) on the Video Input Control Module adjust the size of the frame hysteresis window from 00 to 99 lines (see Figs. 4.4 and 4.5). Adjustments are made by inserting a small flat-blade screwdriver into each switch and turning it until the arrow points to the number desired. The frame hysteresis window is factory preset to 00, which means that unless adjusted, frame offset is the counter value alone, and frame hysteresis is not included in the total compensated audio delay.

##### Line Hysteresis

To prevent the 1300 from inappropriately tracking line jitter and constantly correcting for inconsequential line drift, the Video Input Control Module has a switch to adjust the line hysteresis window, allowing an operator to determine the number of lines of drift significant to require delay correction.



Internal Adjustments. The line hysteresis digit switch (SW3) is next to the frame hysteresis switches (see Figs. 4.4 and 4.5). This switch adjusts the line hysteresis window of from +1 to +128 lines. Table 4.2 shows the equivalent value of each switch setting (the switch is factory preset to 5, corresponding to a 20-line window).

Table 4.2. Line Hysteresis Switch Settings.

Switch Setting	+ Number of Lines
0	1
1	2
2	4
3	6
4	8
5	10
6	16
7	32
8	64
9	128

#### 4.5 Delay Change

The 1300/S performs changes in delay either instantaneously or gradually; when the Compensation switch is off, the 1300/S changes delay instantly, and with the Compensation switch on, delay changes are performed gradually at a rate of 0.6 to 0.7 frames per second, depending on the transmission standard.

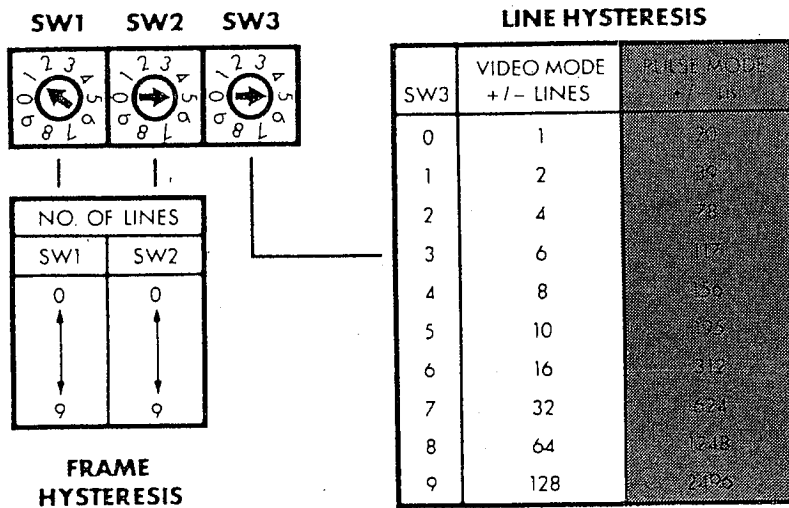
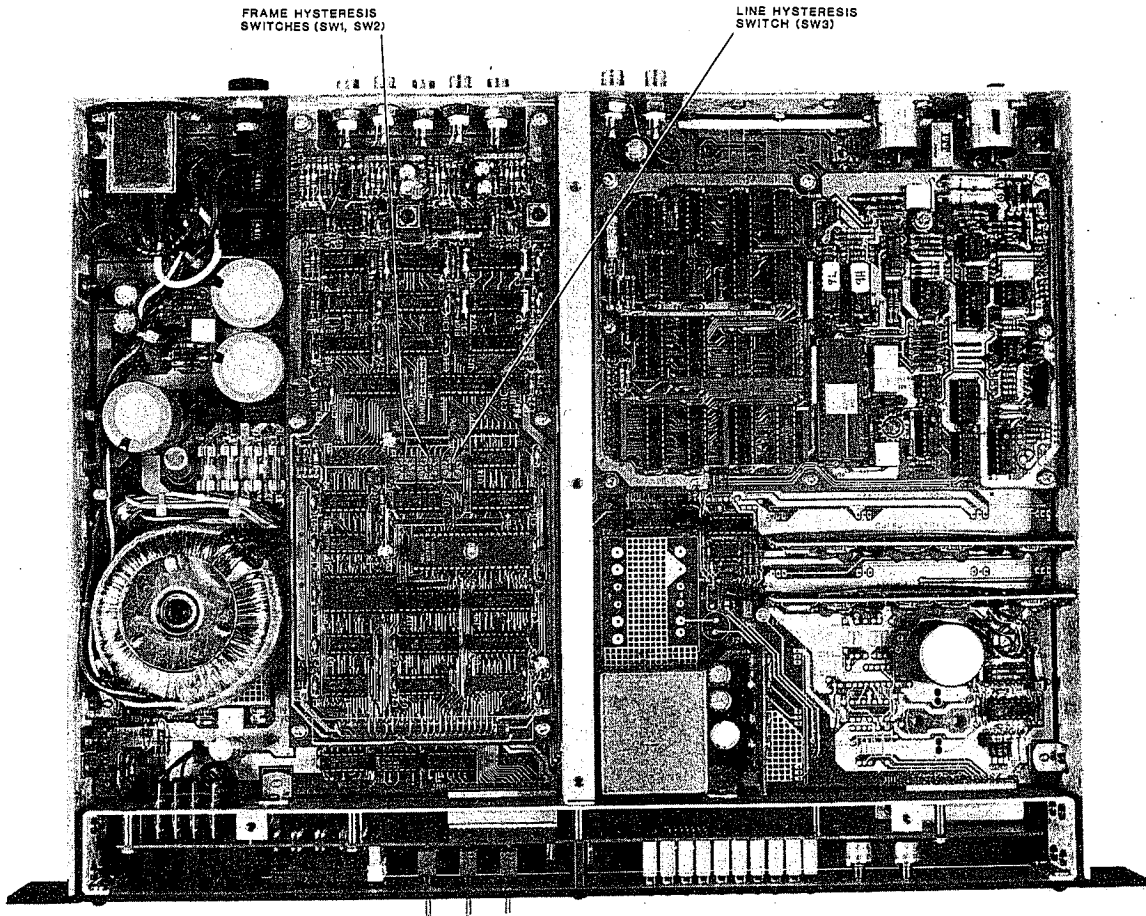


Fig. 4.5. Frame and Line Hysteresis Switch Settings.

## 4.6 Specifications

### General Performance

Resolution of Video-Compensated Delay Nominally 21 us

#### Configurations

1-in/1-out mono -- 1300  
2-in/2-out stereo -- 1300S

#### Delay Change

Compensation off: Instantaneous  
Compensation on: Gradual: 0.56 frames/second for 50 Hz and  
0.67 frames/second for 60 Hz

### Controls and Indicators

#### Front Panel

Units/Mode LEDs, 4 LED indicators: REF, VIDEO, ms, and Frames

#### Rear Panel

Video Compensation I/O

VIDEO - IN/OUT

Loop-through BNC connector, EIA RS170

REF. VIDEO - IN/OUT

Loop-through BNC connector, EIA RS170

CONTROL - IN

Input BNC connector, TTL

### Versions

<u>Video</u>	<u>Pulse</u>	<u>Television Transmission System</u>
1.0B	2.0A	525 line/60 Hz M-NTSC M-PAL
1.1A	2.1A	625 line/50 Hz N-NTSC B, G, H, I-PAL K, L, III, IV-SECAM
1.2A	2.1A	819 line/50 Hz E-SECAM

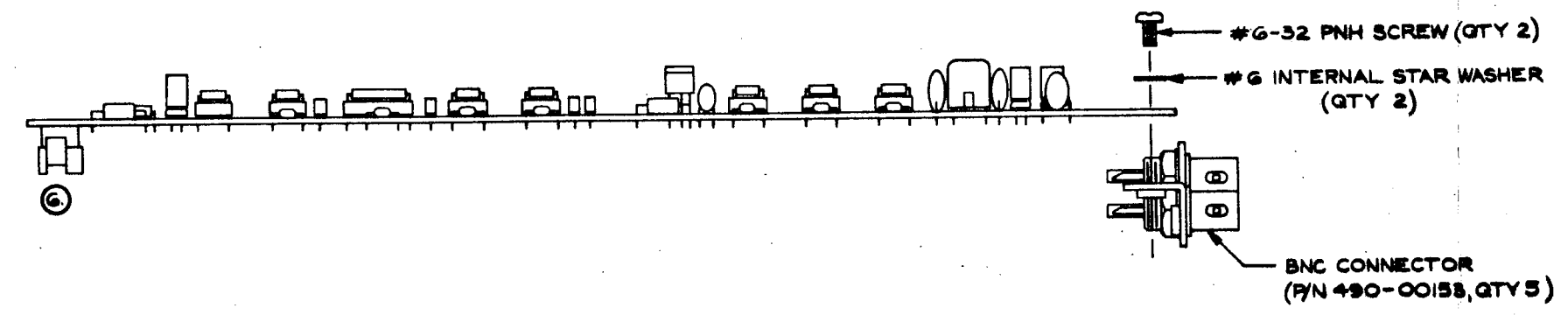
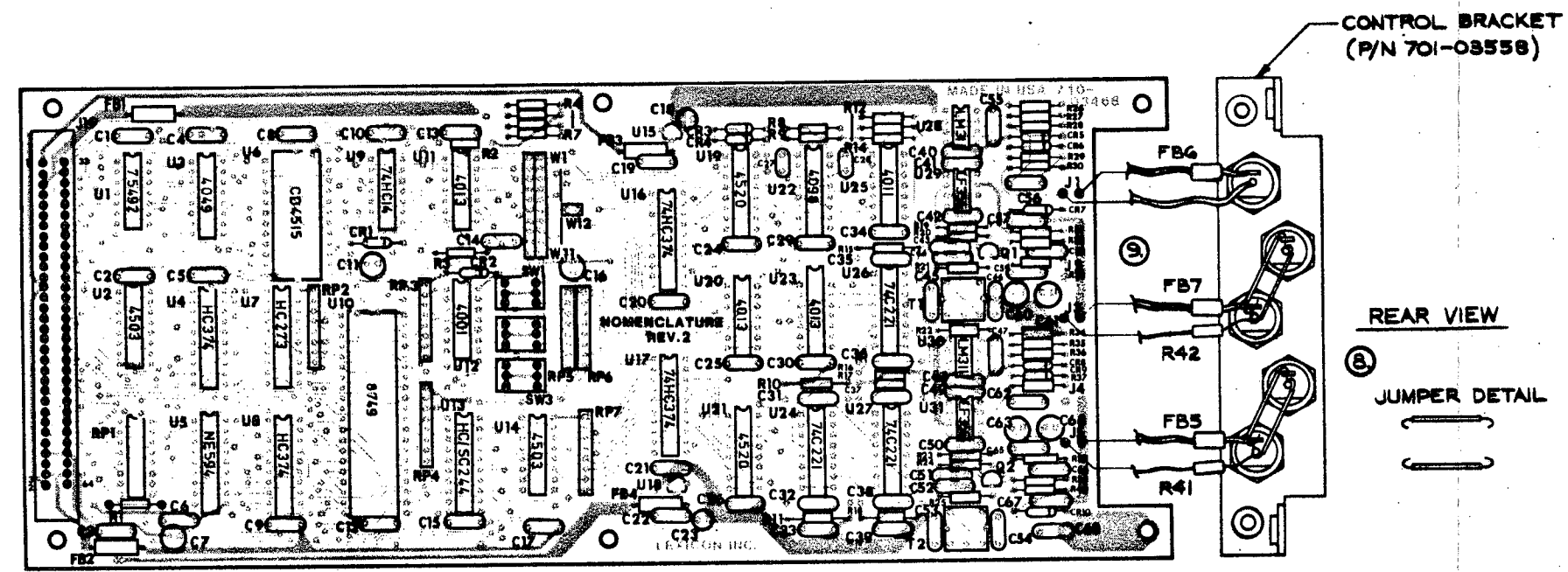
4 3 2 1

D  
C  
B  
A

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
0	PRODUCTION RELEASE	5/14/83	
1	REVISED PER ECO NO. 83103-00 AND 840104-00.	1/8/84 JCR	92672/101 EG 1-11-84
2	STEREO PRODUCTION RELEASE.	2/1/84 JCR	137808/200 24 FEB 84

NOTES

- REFER TO BOM NO. 025-03518 AND 024-03512.
- SOLDER MASK HOLES ARE INDICATED BY SOLID CIRCLES ●.
- COMPONENT HEIGHT .500" MAXIMUM.
- SOLDER TAIL PROTRUSION .080" MAX.
- SOCKET ALL IC POSITIONS EXCEPT U15, U18 AND RPI.
- CONNECTOR PI IS INSERTED FROM SOLDER SIDE AND SOLDERED FROM COMPONENT SIDE. USE SIDE VIEW (NOT PIN NUMBERS) AS A GUIDE.
- APPLY A DAB OF SILICONE ADHESIVE TO FB1-FB4.
- CONNECT J2 TO J3 AND J4 TO J5 DIRECT USING .75" JUMPER WIRES (P/N 670-02722) AS SHOWN.
- INSTALL R41 FROM J5 BNC CENTER PIN TO J5 INPUT PAD ON ETCH SIDE. INSTALL R42 FROM J3 THE SAME WAY. INSTALL WIRES (P/N 675-02884) WITH FERRITE BEADS AS SHOWN.
- OBSERVE STATIC PRECAUTIONS.



QTY REQD	CODE IDENT	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES XXX .XXX		CONTRACT NO. <b>lexicon</b>		
MATERIAL		APPROVALS	DATE	PC ASSEMBLY DRAWING VIDEO CONTROL BOARD, M1300
FINISH		DRAWN JCR	1/8/84	
NEXT ASSY	USED ON	CHECKED <i>DNA</i>	ISSUED <i>DNA</i>	SIZE FSCM NO. C
APPLICATION		DO NOT SCALE DRAWING		DWG. NO. 080-03473
				REV. 2
				SHEET 1 OF 1

4 3 2 1

## 1300/S VIDEO CONTROL OPTION — MONO &amp; STEREO

Part No.	Qty/Description	Ref.
CUST LITERATURE		
070-03761	1 MANUAL,SUPPL,M1300/S,VID CTL	
CARBON FLM RES		
202-00512	4 RES,CF,5%,1/4W,75 OHM	R29,33,37,38
202-00529	4 RES,CF,5%,1/4W,1K OHM	R13,14,26,34
202-00533	2 RES,CF,5%,1/4W,2K OHM	R21,25
202-00535	2 RES,CF,5%,1/4W,2.4K OHM	R19,23
202-00538	2 RES,CF,5%,1/4W,3.3K OHM	R41,42
202-00542	6 RES,CF,5%,1/4W,4.7K OHM	R3,30,31,32,39,40
202-00549	5 RES,CF,5%,1/4W,10K OHM	R1,R2,4-6
202-00557	2 RES,CF,5%,1/4W,24K OHM	R27,35
202-00558	2 RES,CF,5%,1/4W,27K OHM	R8,9
202-00562	2 RES,CF,5%,1/4W,39K OHM	R12,22
202-00570	3 RES,CF,5%,1/4W,100K OHM	R7,28,36
202-02649	2 RES,CF,5%,1/4W,300 OHM	R20,24
METAL FLM RES		
203-00480	2 RES,MF,1%,1/8W,15.0K OHM	R17,18
203-00487	2 RES,MF,1%,1/8W,30.1K OHM	R10,11
203-02352	2 RES,MF,1%,1/8W,24.9K OHM	R15,16
NETWORK RES		
205-00241	6 RES,NET,SIP,2%,4.7KX7	RP2-7
205-02900	1 RES,NET,DIP,2%,120X8	RP1
ELECTROLYT CAP		
240-00614	7 CAP,ELEC,47uF,16V,RAD	C7,11,16,60,61,63,64
TANTALUM CAP		
241-00652	2 CAP,TANT,4.7uF,25V,RAD	C18,23
PCRB/PP CAP		
244-00660	2 CAP,MYL,.01uF,100V,10%,RAD	C27,28
244-00662	2 CAP,MYL,.1uF,5%,RAD	C56,62
244-01151	4 CAP,PP,1000pF,2.5%	C31,32,37,38
244-01166	2 CAP,PP,240pF,2.5%	C35,36
CERAMIC CAP		
245-00586	2 CAP,CER,30pF,100V,10%	C43,51
245-00588	2 CAP,CER,100pF,1000V,10%	C46,54
245-00594	3 CAP,CER,.001uF,500V,10%,Z5F	C45,53,68
245-01258	1 CAP,CER,470pF,10%,Z5F	C14
245-03609	22 CAP,CER,.1uF,50V,Z5U,AX	C1,3,6,12,19,22,40-42,44,47-50 C52,55,57-59,C65-67
245-03610	19 CAP,CER,.01uF,50V,Z5U,AX	C2,4,5,8-10,13,15,17,20,21 C24-26,29,30,C33,34,39

## 1300/S VIDEO CONTROL OPTION — MONO &amp; STEREO (cont'd.)

Part No.	Qty/Description	Ref.
INDUCTORS		
270-00779	7 FERRITE,BEAD	FB1-7
DIODES		
300-01029	9 DIODE,1N914 AND 4148	CR2-10
300-02401	1 DIODE,BAR 35,SCHOTTKY,LOW VF	CR1
TRANSISTORS		
310-01003	2 TRANSISTOR,MPS2369	Q1,2
DIGITAL/CMOS IC		
330-00765	1 IC,DIGITAL,4001,CMOS	U12
330-00766	1 IC,DIGITAL,4011,CMOS	U25
330-00767	3 IC,DIGITAL,4013,CMOS	U11,20,23
330-00768	1 IC,DIGITAL,4049,CMOS	U3
330-02707	2 IC,DIGITAL,4503,CMOS	U2,14
330-03496	1 IC,DIGITAL,CD4515,CMOS	U6
330-03583	4 IC,DIGITAL,74HC374	U4,8,16,17
330-03585	1 IC,DIGITAL,74HC14	U9
330-03586	1 IC,DIGITAL,74HC/SC244	U13
330-03611	1 IC,DIGITAL,74HC273	U7
330-03612	3 IC,DIGITAL,74C221	U24,26,27
330-03615	1 IC,DIGITAL,4098,CMOS	U22
330-03616	2 IC,DIGITAL,4520,CMOS	U19,21
LINEAR IC		
340-00725	2 IC,LINEAR,LM311	U28,30
340-00744	1 IC,LINEAR,78L05	U18
340-01183	2 IC,LINEAR,LF 356	U29,31
340-03652	1 IC,LINEAR,79L05,-5V REG	U15
INTERFACE IC		
345-00751	1 IC,INTER,75492,LED DRVR	U1
345-02913	1 IC,INTER,NE594,DSP DRVR,8-SEG	U5
PC DIP/PROG SW		
455-03573	3 SW,DIP,RTY,BCD,COMP	SW1-3
TRANSFORMERS		
470-00037	2 XFORMER,4.4MHZ	T1,2
CABLE CONN		
490-00153	5 CONN,BNC;1FC,MB,ISOLATED	J1-5
490-02356	4 CONN,JUMPER,.1X025,2FCG	
PC EDGE CONN		
500-03619	1 CONN,EURO,C,ROW a+c,MALE,INV	P1

## 1300/S VIDEO CONTROL OPTION -- MONO &amp; STEREO (cont'd.)

Part No.	Qty/Description	Ref.
PC MNT CONN		
510-01067	4 CONN,POST,100X025,HDR,12MCG	W1-12,W1-11
SOCKETS		
520-00941	4 IC SCKT,8 PIN,PC,LO-PRO	U28-31
520-00942	7 IC SCKT,14 PIN,PC,LO-PRO	U1,9,11,12,20,23,25
520-00943	9 IC SCKT,16 PIN,PC,LO-PRO	U2,3,14,19,21,22,24,26,27
520-00945	1 IC SCKT,24 PIN,PC,LO-PRO	U6
520-00946	1 IC SCKT,40 PIN,PC,LO-PRO	U10
520-01361	6 IC SCKT,20 PIN,PC,LO-PRO	U4,7,8,13,16,17
520-02177	1 IC SCKT,18 PIN,PC,LO-PRO	U5
MACHINE SCREWS		
640-03713	2 SCRW,6-32X1/4,PNH,PH,SEMS,ZN	CONTROL BRKT MTG
BULK WIRE		
670-02722	4 WIRE,JMP,22AWG,.75",TEF,WHT	
PRE-CUT WIRE		
675-02884	6 WIRE,24G,WHT,1.5",ST&T1/4X1/4	
BRACKETS		
701-03558	1 BRACKET,CONTROL,M1300	
PC BOARDS		
710-03468	1 PC BD,CNTRL,VIDEO,M1300	
MICROPROC IC		
365-03774	1 IC,uPROC,8749,EPROM,NTSC V1.0.1	U10
365-03775	1 IC,uPROC,8749,EPROM,PAL/SECAM V1.1.0	U10
365-03776	1 IC,uPROC,8749,EPROM,SECAM V1.2.0	U10

## 5 SERVICE/WARRANTY

### 5.1 Returning Units for Service

If the 1300 must be returned to Lexicon or a designated facility for service, Lexicon assumes no responsibility for the units in shipment from customer to factory, whether in or out of warranty. All shipments must be well packed (using the original packing materials, if possible), properly insured, and consigned to a reliable agent, such as UPS or Federal Air Express. If original packing materials are not available, procure a new packing kit from Lexicon.

**Always Consult with Lexicon Before Returning a Unit To Determine a Problem's Extent and the Shipping Procedure.**

When returning a unit for service, include the following information:

Name  
Address  
City, State, ZIP  
Telephone Number  
Description of Problem  
Desired Return Date  
Preferred Method of Shipment

Also include reference to conversations (if any) with Lexicon personnel regarding a problem or problems. Do **not** include accessories, such as power cords or manuals.

### 5.2 Ordering Parts

Replacement parts can be ordered from

**Lexicon, Inc.**  
60 Turner Street  
Waltham, MA 02154 USA  
(617) 891-6790  
Telex 923 468  
Attn: Customer Service

Parts are shipped FOB Waltham, MA. Customers are charged the price in effect at the time of the order. Lexicon welcomes parts quotations any time during business hours.

When ordering parts, give the following information:

1. Part number and I.D., if available
2. Item description
3. Quantity desired
4. 1300 serial number.



### 5.3 Module Exchange Program

If a defective module is clearly identified, Lexicon can usually provide a repair/exchange module within 24 hours in advance of receipt of the defective module. If a fast turnaround is required, Lexicon can ship a module by Federal Air Express or other expedited air service, resulting in 24-hour delivery if the customer is near a major airport. For this service, the customer is expected to pay shipping charges.

**Important:** When shipping a module for repair or exchange, always call Lexicon before packaging it for shipment; Lexicon ships modules in reuseable static protective bags with appropriate packing materials -- use these materials or procure new materials from Lexicon. Lexicon is not liable for damage resulting from unauthorized shipping procedures.

### 5.4 Limited Warranty

Lexicon warrants each Model 1300 to be free from defects in material and workmanship under normal use and service for one year. This warranty begins on the date of delivery to the purchaser or his authorized agent or carrier. During the warranty period, Lexicon will repair, or at its option replace, at no charge components that prove to be defective provided that the equipment is returned, shipping prepaid, to Lexicon's factory or designated service facility.

The warranty is null and void under the following conditions:

1. Abuse, neglect, alteration, or repair by unauthorized personnel
2. Damage caused by improper use or operation from an incorrect power source
3. Damage caused by accident, act of God, war, or civil insurrection.

Lexicon is not responsible for loss or damage, direct or consequential, resulting from machine failure or the inability of the product to perform. Lexicon is not responsible for damage or loss during shipment to or from its factory or designated service facility.

Lexicon reserves the right to make changes or improvements in the design or construction of the machine without obligation to make such changes or improvements in the purchaser's machine.

No equipment may be returned under this warranty without prior authorization from Lexicon. Shipments must be packed in authorized Lexicon packing material, fully insured, and prepaid.

This warranty is in lieu of all other warranties, expressed or implied, and of any other liabilities on Lexicon's part; in addition, Lexicon does not assume or authorize anyone to make any warranty or assume any liability not strictly in accordance with the above.