VDL-7014
Video Delay Amplifier

VM-7014-02

Introduction

The VDL-7014 Video Delay Amplifier provides a convenient, compact and high-quality way to delay video signals so that system timing can be maintained. In addition to being used in video paths, this amplifier can be used to delay timing reference signals such as subcarrier or color black.

Frequency response over the whole delay range has been considerably improved by using active delay stages rather than passive delay lines.

Coarse delay is set with four jumper plugs. The total delay obtainable with the basic amplifier is 635 ns. Optional module VDM-7014 which attaches to the main amplifier board provides an additional 600 ns. Fine delay is continually adjustable over +/- 6 ns.

The differential input ensures excellent system performance by virtually eliminating common mode ground loop hum.

The cable equalizer will be very useful in many system situations as it compensates fully for the frequency response loss of up to 500 ft. (150 m) of associated Belden 8281 cable.

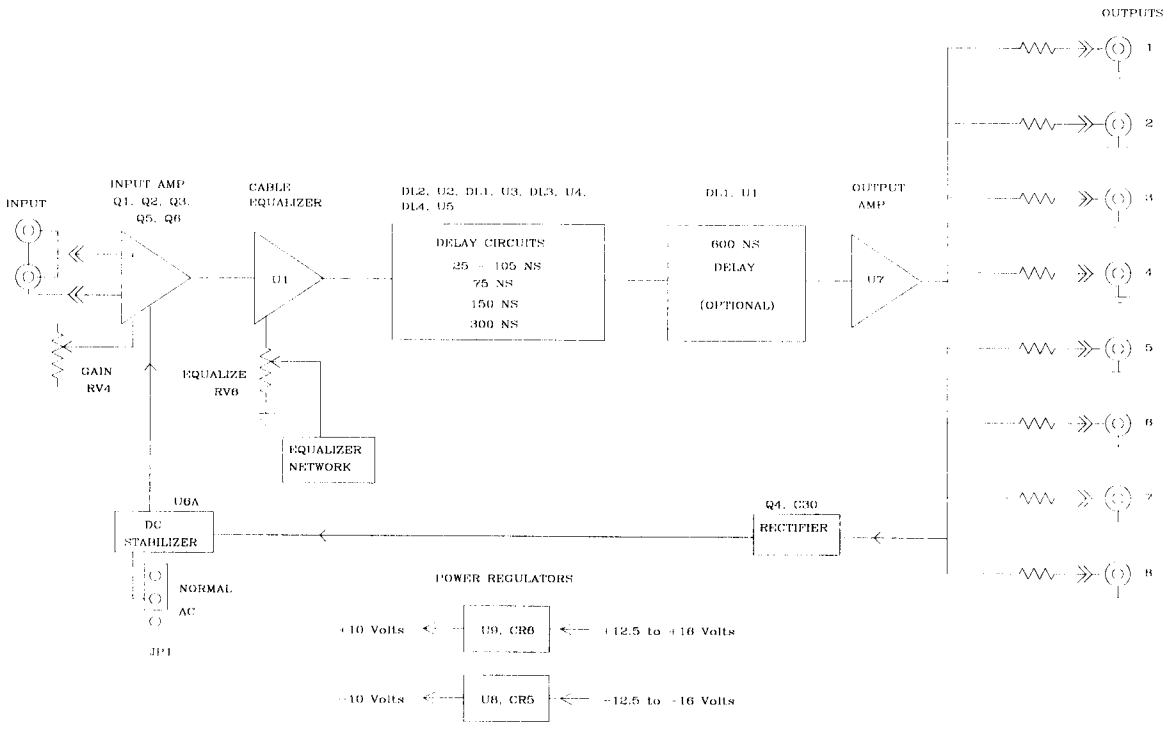
The amplifier occupies a single slot in a Ross VFR-7210 frame or Leitch* 680 series frames.

Features

- 8 Outputs
- Delay continuously adjustable from 30 to 635 ns
- Optional 600 ns module increases total delay to 1.24 us
- Differential Input eliminates ground loop hum
- Cable equalizer for 500 ft of 8281 cable
- Excellent performance
- Power to each card is individually fused
- 5 year transferable warranty
- An alternative to the Leitch* SVD 600/680 DA's
- Also fits Leitch* 680 Series Frames

*Leitch is a trademark of Leitch Technology Corporation

VEA-7014
Block Diagram



Installation

> Note: Use of an extender board will make it easier to set the delay jumpers. This can be done with power on.

Do not disturb any adjustments other than those mentioned below. This equipment has been precisely factory-calibrated for the best frequency response and may not perform to specifications if any preset adjustments are disturbed.

1. Check the video gain and if necessary adjust the gain control RV4 located on the card front edge for flat sweep response or correct chroma level.

2.Check the frequency response. If necessary, adjust the cable equalizer RV6 located on the front card edge.

3. Check the setting of the coupling jumper JP5

NORM	The normal position for all signals having sync pulses
AC	Use this for component signals if they do not

4. Set the Delay 1 jumper to mid-position.

5. Set jumpers Delay 2 (75 ns), Delay 3 (150 ns) and Delay 4 (300 ns) to obtain as close as possible to the desired delay.

6. The 600 ns delay jumper should be set to the "0" position. If more delay is required, optional delay module VDM-7504 should be installed and the jumper set to the "600"position. It will provide an additional 600 ns of delay.

7. Set the final position of the Delay 1 jumper then adjust the Fine Delay control CV4 on the card edge to precisely set the delay. It may be necessary to re-select some of the previous jumper settings.

Circuit Description

Please refer to the schematic, sheet 1.

The incoming video is amplifier by a differential amplifier consisting of Q1, Q2, Q3, Q5 and Q6. The output appears at Q6 emitter.

Cable equalizer U1 inverts to video and provides equalization for up to 500 ft of 8281 cable. It also drives the delay circuits, to be described later.

The delayed video passes to output stage U7, which inverts the video and provides power to drive the 8 outputs. This stage also includes the fine delay control CV4.

DC stabilization of the output signal is accomplished by U6A and Q4. Q4 rectifies the sync tip level to provide a correction voltage. In the NORM position of the jumper, this voltage is amplified by U6A and fed to Q5 to correct the input signal. By keeping the output sync tip correctly biased, the back porch will be maintained approximately at ground level. The jumper AC position is used with signals that do not have sync such as analog component waveforms.

U9 and U8 filter and regulate the DC power.

Please refer to the schematic, sheet 2.

All delay circuits located on the main circuit board are covered by this page of the schematic.

The signal from U1 pin 6 is fed to tapped delay line DL2. JP6 and JP7 allow the signal to be delayed in 8ns steps to a total delay of 80ns. Because this is in addition to the basic amplifier delay, the range covered is approximately 25 to 105 ns. The output is amplified by U3.

DL1 provides a delay of 75ns, the output being amplified and response corrected by U3. Similar delay stages involving DL3, U4, DL4 and U5 add delays of 150ns and 300ns respectively. Each delay stage is calibrated for flat frequency response and unity gain.

For the optional 600 ns Video Delay Module, please refer to schematic VDM-7014, sheet 1. This schematic diagram covers the circuit which is identical to that of the above 75, 150 and 300ns delay stages.

Alignment

IMPORTANT: All amplifiers have been very accurately calibrated at the Ross factory. Alignment should only be attempted if absolutely necessary and the required precision sweep measuring equipment is available.

1. INITIAL AMPLIFIER SETTINGS

Put the amplifier on an extender board and set the amplifier controls as follows:

JP1-JP4 - in 0 position.
JP5 - NORM
JP7 - NOT INSTALLED
JP6 - in 0 position.

Rotate RV6 EQUALIZE fully counter clockwise.

2. GAIN CALIBRATION

Set up a method of accurately measuring amplifier gain, using a window or pulse & bar signal. Set equalization control (RV6) to minimum. Adjust the GAIN control (RV4) to obtain unity gain.

3. FREQUENCY RESPONSE, 0 Delay

Connect a sweep signal to the amplifier input. Adjust CV5 and RV5 for a response up to 6 MHz of +/-.15 dB. Rotate CV4 fully. The frequency response should not go out of spec +/-.15 dB to 6 MHz, at any point of CV5's rotation. If the frequency does not meet spec, adjust CV5 and RV5 and repeat this step until the frequency response spec is met. Adjust the fine delay (CV4) on the DA and the phase knob on the vector scope to centre the vector dot on the horizontal axis (same amount of travel both up and down). You must have 8 degrees of adjustment both up and down on the vectorscope.

4. FREQUENCY RESPONSE, 8 - 80ns of Delay

Move the "DELAY 1" jumper to the "8" position and adjust RV7 and CV7 to obtain the flattest response, ensuring that the it falls within the response limits of up to 6 MHz of +/- .15 dB.

Note: The over all gain will vary as you select different delay taps on the delay line. You can adjust the GAIN control RV4 to centre the trace when checking for response. Select in turn the remaining nine DELAY 1 jumper positions and ensure that for each of the positions the response remains within the limits described above.

Note: it maybe necessary to re-adjust CV5 and RV5 "0" response so that all of the tap positions fall in to the described limits. If so, repeat steps 3 and 4.

Return the jumper to the 0 position and adjust the gain control RV4 to centre the trace.

5. FREQUENCY RESPONSE, 75ns of DELAY

Move DELAY 2 to the "75ns" position and adjust RV4 (Gain), CV1 and RV1 to achieve a response up to 6 MHz of +/- .15 dB. Return DELAY 2 to the 0 position.

6. FREQUENCY RESPONSE, 150ns of DELAY

Move DELAY 3 to the "150ns" position and adjust RV4 (Gain), CV2 and RV2 to achieve a response up to 6 MHz of +/- .15 dB. Return DELAY 3 to the 0 position.

7. FREQUENCY RESPONSE, 300ns of DELAY

Move DELAY 4 to the "300ns" position and adjust RV4 (Gain), CV3 and RV3 to achieve a response up to 6 MHz of +/- .15 dB (+/- 2.0 scope divisions). Return DELAY 4 to the 0 position.

8. FREQUENCY RESPONSE, 600ns of DELAY

Move the 600 ns DELAY jumper (JP4) to the 600 ns position, and adjust RV4 (GAIN) on the VDL-7014 and CV1 and RV1 on hte VDM-7504 to achieve a response of +/- 0.15 dB up to 6 MHz.

9. COMBINATION DELAYS:

Move DELAY 1 to "75ns" and DELAY 2 to "150ns". Check that the frequency response meets spec. If it does not, adjust CV1, RV1, CV2, RV2 as needed and repeat steps 5 and 6.

Next, move DELAY 4 to "300ns" (DELAY 2 in "75ns" and DELAY 3 in "150ns"). Check that the frequency response meets spec. If not, adjust CV3, RV3, CV2, RV2, CV1, RV1 as needed and repeat steps 5, 6, 7 and COMBINATION DELAYS section.

Next, move DELAY 3 to "0" (DELAY 2 in "75ns" and DELAY 4 in "300ns"). Check that the frequency response meets spec. If not, adjust CV3, RV3, CV1, RV1 as needed and repeat steps 5, 7, and COMBINATION DELAYS section.

Next, move DELAY 2 to "0" (DELAY 3 in "150ns" and DELAY 4 in "300ns"). Check that the frequency response meets spec. If not, adjust CV2, RV2, CV3, RV3 as needed and repeat steps 6, 7 and COMBINATION DELAYS section.

Return DELAY 2, DELAY 3, and DELAY 4 to their "0" positions.

10. EQUALIZER CALIBRATION - 500 Ft

Connect 500 ft of 8281 or equivalent cable in series with the sweep signal to the amplifier input. Adjust the EQUALIZE control (RV6) to maximum and set CV6 for flattest response to 8 MHz. You may have to back off RV6 a little bit to get the 500 Ft. response to match the 0 feet response. Rotate the EQUALIZE control fully counter clockwise. This completes the response alignment. Seal RV1, RV2, RV3, RV5, RV7.

Specifications

Input		Performance	
Video Input Level	1 V pp	Gain range	+3 dB to -3 dB
Input Impedence	75 Ω bridging	Gain stability	<0.1% per 10°C
Input Return Loss	46 dB to 5 MHz	Frequency response	± 0.15 dB to 6 MHz
Max DC on input	+1V, -15V	Line rate window tilt	< 0.2%
Max Common mode signal	10 V pp	Field rate window tilt	< 0.2%
Common mode rejection	60 dB at 50/60 Hz	50/60 Hz square wave tilt	< 0.1%
Output		Bounce (black to white)	< 0.5%
Number of outputs	8	Differential gain (10%-90% APL)	< 0.35%
Output impedance	75Ω	Differential phase (10%-90% APL) all outputs loaded	< 0.35°
Ouput return loss	40 dB to 5MHz	RMS noise 0-5 MHz (unweighted)	66 dB
Output isolation	38 dB to 5MHz	Chrominance/luminance delay	< 2.0 ns
D.C. Offset	<50 mV	K rating 1T	0.3%
Output loading per termination at 6 MHz	0.01 dB	Electrical Length	26 ns (34.0 degrees at 3.58 MHz) (42.0 degrees at 4.43 MHz)
Equalization			
Cable accuracy 0 to 500 feet	±0.04 dB to 6 MHz (8281 cable)		
Delay			
Total Range	Continuously variable 30 to 635 ns		
Fine Control Range	+/- 6 ns		
Optional Module Delay	600 ns additional delay from module VDM-7014		

Specifications and designs are subject to change without notice.

Ordering Information

VDL-7014	Video Delay Amplifier
VDM-7014	Video Delay Module (600 ns)
VFR-7210	Video Frame 2 RUs, holds 10 amplifiers
PS-7103	Power Supply (85 - 250 volts)
EXT-7200	Extender Board

Note: The video frame does not include power suppplies. The frame requires one or two supplies, the second supply for redundancy.

The Ross Video frame will accept any Leitch* compatible card.

Leitch* is a trademark of Leitch Technology Corporation.

VEA-7014
Bill Of Materials

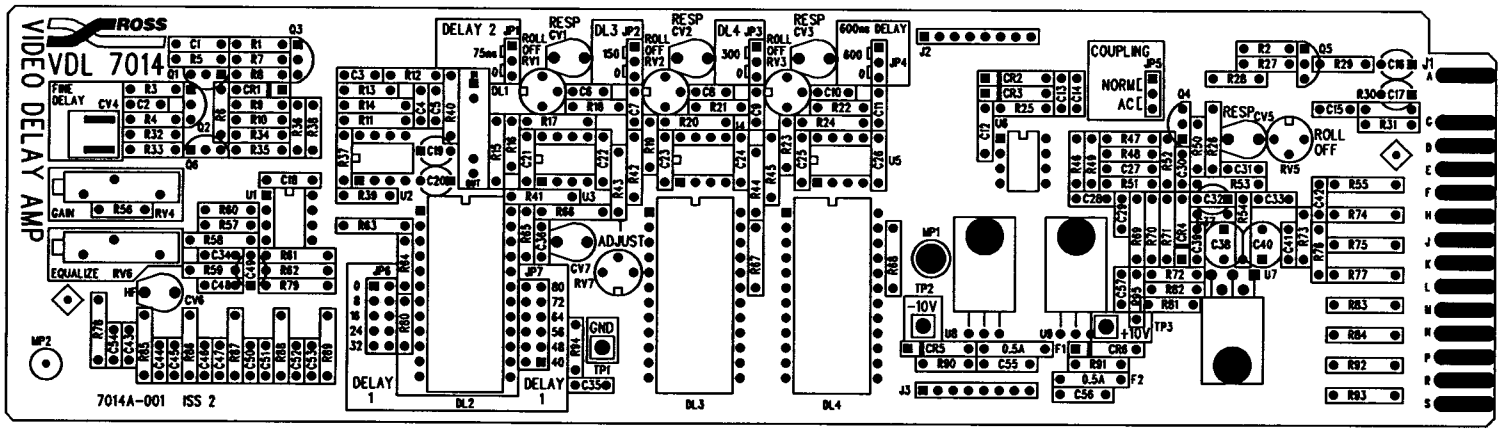
7014001-.02A

Item	QTY	Description		Part #	REF
1	1	NOT A BOUGHT PART		-------	J1
2	14	NO VALUE,CAP,DCAP\SR21		-------	C2,C3,C4,C7,C9,C11,C29, C36,C42,C43,C45,C46,C50, C54
3	5	NO VALUE,RES,5%		-------	R18,R21,R22,R46,R76
4	2	NO VALUE,TEST POINT		-------	TP2,TP3
5	1	CAP,CER,100V,0.25PF,2p7		200-270	C8
6	1	CAP,CER,100V,0.25PF,3p3		200-330	C53
7	1	CAP,CER,100V,0.25PF,3p9		200-390	C34
8	1	CAP,CER,100V,0.25PF,4p7		200-470	C44
9	2	CAP,CER,100V,0.25PF,6p8		200-680	C6,C37
10	1	CAP,CER,100V,2%,10p		201-100	C47
11	2	CAP,CER,100V,2%,15p		201-150	C51,C31
12	1	CAP,CER,100V,2%,18p		201-180	C10
13	1	CAP,CER,100V,2%,27p		201-270	C52
14	1	CAP,CER,100V,2%,33p		201-330	C35
15	1	CAP,CER,100V,2%,47p		201-470	C48
16	1	CAP,CER,100V,2%,56p		201-560	C33
17	1	CAP,CER,100V,2%,68p		201-680	C57
18	1	CAP,CER,100V,2%,n12		202-120	C28
19	1	CAP,CER,100V,2%,n47		202-470	C13
20	1	CAP,CER,2n2		203-220	C5
21	2	CAP,CER,10n		204-100	C15,C30
22	3	CAP,CER,50V,20%,1u0		206-100	C14,C39,C41
23	12	CAP,GLAS,100n		225-100	C1,C12,C18,C21,C22,C23, C24,C25,C26,C27,C55,C56
24	3	CAP,TANT,4u7		250-007	C19,C20,C49
25	3	CAP,TANT,10V,100u		250-010	C16,C17,C32
26	2	CAP,ALUM,16V,22u		250-011	C40,C38
27	6	CAP,TRIM,6p5-40p		270-005	CV1,CV2,CV3,CV5,CV6,CV7
28	1	CAP,TRIM,4-20p		270-007	CV4
29	2	MICRO CLIP		305-005	MCLIPCV4A,MCLIPCV4B
30	1	DL,150ns,2211-150B,24P,DIP,0.6		352-051	DL3
31	1	DL,80ns,2214-80A,24P,DIP,0.6		352-052	DL2
32	1	DL,300ns,100R,FIX		352-053	DL4
33	1	DL,75ns,1514-75Y,7P,SIP,0.6		352-054	DL1
34	1	DIODE,SIGNAL,GP		360-005	CR1
35	5	DIODE,ZENER		360-012	CR2,CR3,CR4,CR5,CR6
36	1	EJECTOR,PCB		365-001	MP2
37	1	HDR,10P,2 ROW,PL.23,BL.1,LL.1,M		403-004-10	JP6
38	1	HDR,12P,2 ROW,PL.23,BL.1,LL.1,M		403-004-12	JP7
39	5	HDR,3P,1 ROW,PL.23,BL.1,LL.1,M		403-013-03	JP1,JP2,JP3,JP4,JP5
40	2	HDR,8P,1 ROW,PL.23,BL.1,LL.1,M		403-013-08	J2,J3
41	1	REGULATOR,POSITIVE VOLTAGE	THL	500-015	U9
42	1	REGULATOR,NEG,VOLTAGE	THL	500-020	U8
43	1	OP-AMP,DUAL,JFET-I/P	THL	500-075	U6
44	1	AMP,120MHz,CURRENT FEEDBACK	THL	500-102	U1
45	1	AMP,70MHz,1A,VIDEO	THL	504-097	U7
46	4	AMP,VIDEO,100MHz,TEMP/STAB	THL	504-100	U2,U3,U4,U5
47	6	JUMPER,2-POS,LOW PROFILE		603-005	JPPLUG1,JPPLUG2,JPPLUG3, JPPLUG4,JPPLUG5,JPPLUG6
48	3	NUT,HEX		650-012	NUTU7,NUTU8,NUTU9
49	1	VIDEO DELAY AMP ----------	PCB	7014-001-02	PCB1
50	1	TRIMPOT,1/4 DIA,1T,50R		710-001	RV7
51	1	TRIMPOT,1/4 DIA,1T,500R		710-004	RV5
52	1	TRIMPOT,1/4 DIA,1T,1K		710-005	RV3
53	2	TRIMPOT,1/4 DIA,1T,5K		710-007	RV2,RV1
54	2	TRIMPOT,20T,1K		720-001	RV4,RV6
55	1	RES,1/4W,5%,10M		807-100	R26
56	2	RES,1/4W,1%,1R		810-100	F2,F1
57	1	RES,1/4W,1%,24R9		811-249	R66

58	1	RES,1/4W,1%,49R9	811-499	R63
59	1	RES,1/4W,1%,88R7	811-887	R69
60	1	RES,1/4W,1%,90R9	811-909	R62
61	5	RES,1/4W,1%,100R	812-100	R43,R44,R61,R67,R68
62	2	RES,1/4W,1%,150R	812-150	R71,R70
63	1	RES,1/4W,1%,237R	812-237	R54
64	2	RES,1/4W,1%,294R	812-294	R14,R45
65	1	RES,1/4W,1%,309R	812-309	R78
66	1	RES,1/4W,1%,324R	812-324	R15
67	3	RES,1/4W,1%,332R	812-332	R11,R17,R24
68	1	RES,1/4W,1%,562R	812-562	R79
69	1	RES,1/4W,1%,750R	812-750	R58
70	1	RES,1/4W,1%,931R	812-931	R42
71	1	RES,1/4W,1%,1K	813-100	R20
72	1	RES,1/4W,1%,1K07	813-107	R53
73	1	RES,1/4W,1%,4K75	813-475	R85
74	1	RES,1/4W,1%,7K5	813-750	R86
75	1	RES,1/4W,1%,16K5	814-165	R87
76	1	RES,1/4W,1%,27K4	814-274	R89
77	1	RES,1/4W,1%,39K	814-390	R88
78	1	RES,1/2W,5%,4R7	824-470	R73
79	1	RES,1/2W,5%,10R	825-100	R2
80	1	RES,1/2W,5%,15R	825-150	R30
81	1	RES,1/2W,5%,22R	825-220	R72
82	1	RES,1/2W,5%,47R	825-470	R60
83	4	RES,1/2W,5%,100R	826-100	R1,R6,R82,R95
84	11	RES,1/2W,5%,150R	826-150	R5,R7,R13,R16,R19,R23, R37,R39,R50,R57,R65
85	3	RES,1/2W,5%,220R	826-220	R29,R64,R80
86	1	RES,1/2W,5%,270R	826-270	R34
87	1	RES,1/2W,5%,390R	826-390	R3
88	1	RES,1/2W,5%,470R	826-470	R81
89	1	RES,1/2W,5%,620R	826-620	R9
90	1	RES,1/2W,5%,1K	827-100	R56
91	2	RES,1/2W,5%,1K2	827-120	R94,R4
92	2	RES,1/2W,5%,1K5	827-150	R59,R33
93	1	RES,1/2W,5%,1K8	827-180	R32
94	1	RES,1/2W,5%,3K3	827-330	R48
95	1	RES,1/2W,5%,7K5	827-750	R8
96	1	RES,1/2W,5%,9K1	827-910	R35
97	3	RES,1/2W,5%,10K	828-100	R38,R90,R91
98	1	RES,1/2W,5%,18K	828-180	R36
99	1	RES,1/2W,5%,20K	828-200	R12
100	1	RES,1/2W,5%,22K	828-220	R28
101	1	RES,1/2W,5%,47K	828-470	R27
102	1	RES,1/2W,5%,51K	828-510	R51
103	1	RES,1/2W,5%,150K	829-150	R10
104	1	RES,1/2W,5%,470K	829-470	R52
105	4	RES,1/2W,5%,1M	830-100	R25,R31,R47,R49
106	10	RES,1/4W,0.5%,75R	840-004	R40,R41,R55,R74,R75,R77, R83,R84,R92,R93
107	3	SCREW,4-40,1/4,BIND,PHILIPS	850-040	SCRWU7,SCRWU8,SCRWU9
108	1	TEST POINT	910-010	TP1
109	5	TRANSISTOR,N-P-N	950-016	Q1,Q2,Q3,Q5,Q6
110	1	TRANSISTOR,P-N-P	950-018	Q4
111	3	WASHER,SPRING,4-40	960-015	WSHRU7,WSHRU8,WSHRU9

Notes

SQUARE PIN DESIGNATIONS:
INTEGRATED CIRCUIT = PIN 1
TRANSISTOR = EMITTER
DIODE = CATHODE (BAR)
POLARIZED CAPACITOR = POSITIVE PIN (+)
RESISTOR NETWORK = PIN 1
RV = NO VALUE COMPONENT (INSTALLED BY TEST)
LED = POSITIVE PIN (LONG LEG)



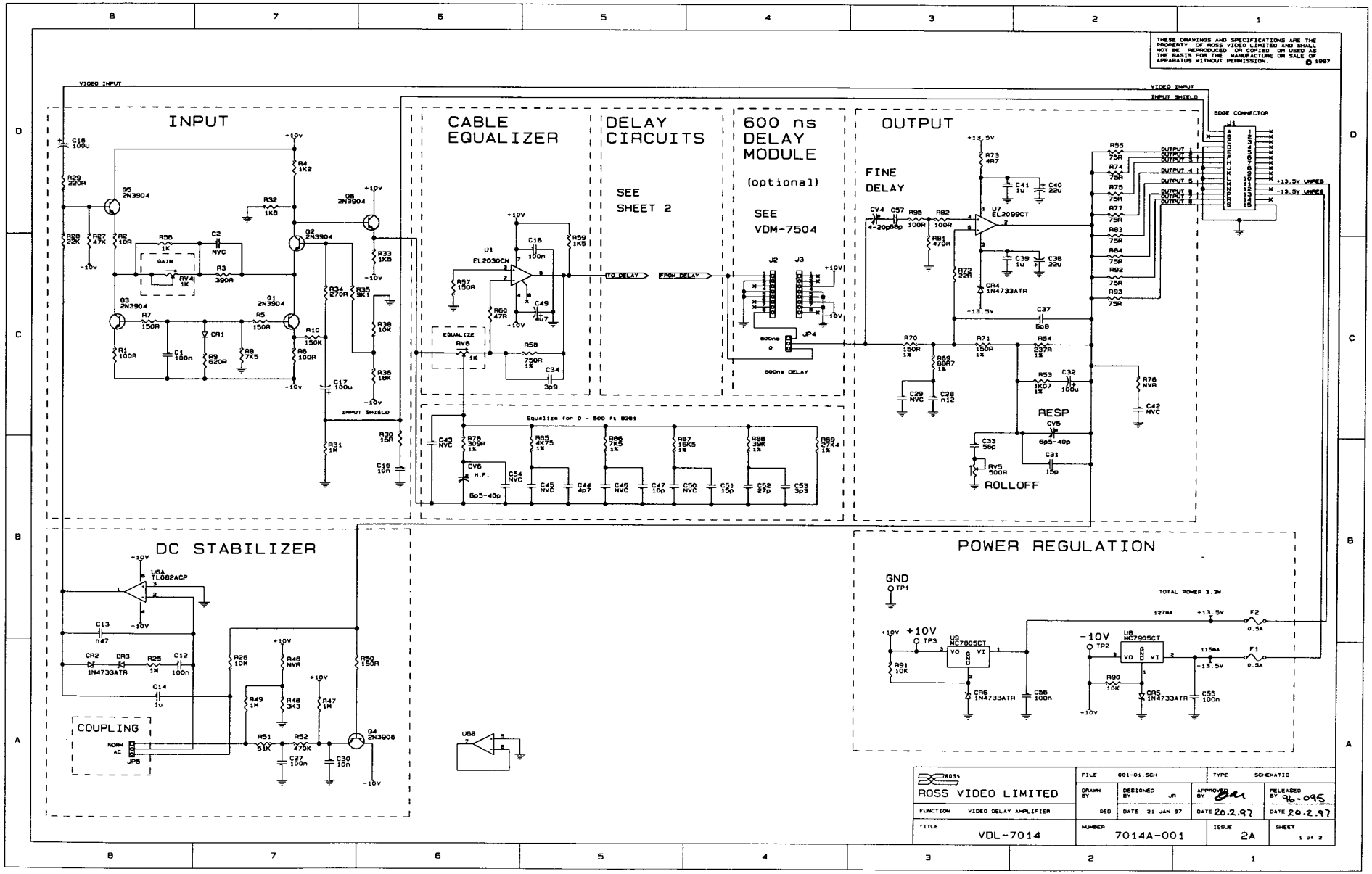
CV1 = 75ns DELAY RESPONSE
CV2 = 150ns DELAY RESPONSE
CV3 = 300ns DELAY RESPONSE
CV4 = FINE DELAY
CV5 = RESPONSE
CV6 = HIGH FREQUENCY
CV7 = T ADJUST
F1 = 0.5A FUSE
F2 = 0.5A FUSE

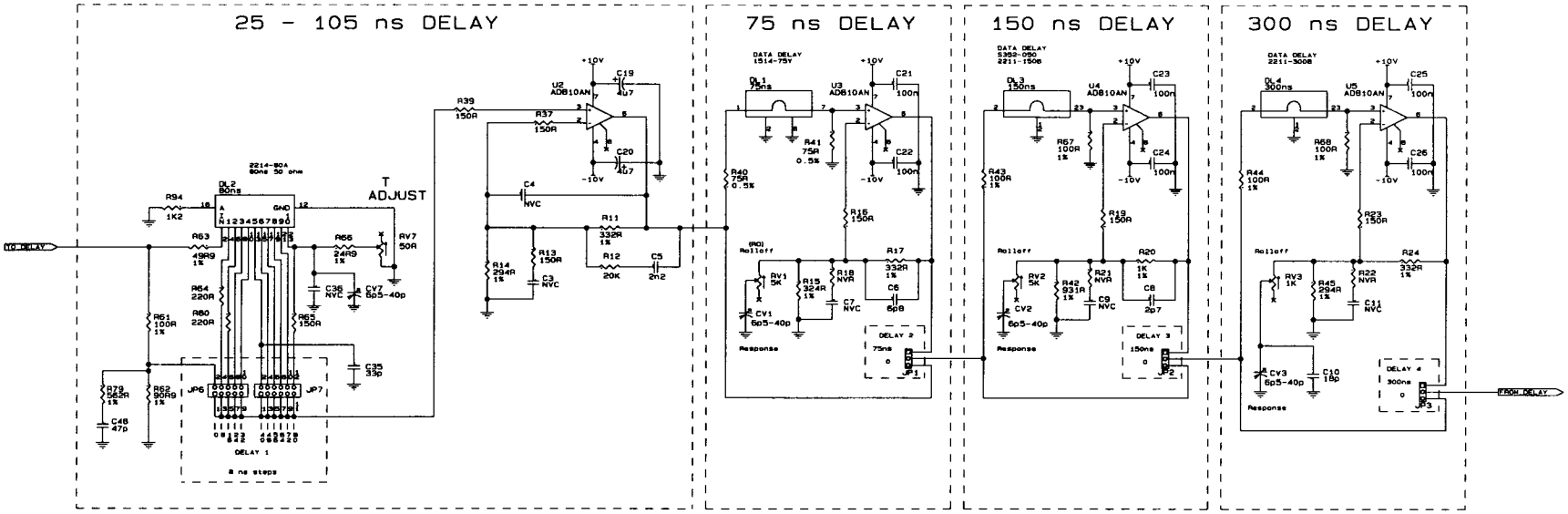
JP1 = DELAY 2 75ns/0
JP2 = DELAY 3 150ns/0
JP3 = DELAY 4 300ns/0
JP4 = 600ns DELAY 600ns/0
JP5 = COUPLING NORM/AC
JP6 = DELAY 1 0/8/16/24/32ns DELAY
JP7 = DELAY 1 40/48/56/64/72/80ns DELAY

RV1 = DELAY2 ROLLOFF
RV2 = DELAY 3 ROLLOFF
RV3 = DELAY 4 ROLLOFF
RV4 = GAIN
RV5 = ROLLOFF
RV6 = EQUALIZE
RV7 = T ADJUST

TP1 = GND
TP2 = -10V
TP3 = +10V

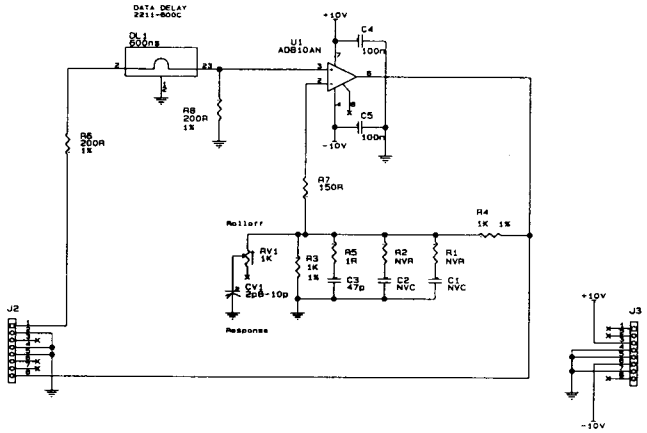
ROSS VIDEO LIMITED	FILE: L0700-L002	TYPE: LAYOUT		
FUNCTION: VIDEO DELAY AMP	DRAWN BY: KEN	DESIGNED BY: J.R	APPROVED BY:	RELEASED BY:
		DATE: 18 OCT 95	DATE:	DATE:
TITLE: VDL 7014	NUMBER: 7014A-001	ISSUE: 02	SHEET: 1 of 1	


INPUT
CABLE EQUALIZER
DELAY CIRCUITS
SEE SHEET 2
600 ns DELAY MODULE
(optional)
SEE VDM-7504
OUTPUT
FINE DELAY
RESP
ROLLOFF
DC STABILIZER
COUPLING
POWER REGULATION
VIDEO INPUT
INPUT SHIELD
EDGE CONNECTOR
TO DELAY
FROM DELAY
GND
+10V
-10V
TOTAL POWER 3.3W
ROSS VIDEO LIMITED
VDL-7014
7014A-001
2A
SCHEMATIC



ROSS VIDEO LIMITED	FILE 001-02.SCH		TYPE SCHEMATIC	
	DRAWN BY GEO	DESIGNED BY JR	APPROVED BY [signature]	RELEASED BY 96-095
FUNCTION VIDEO DELAY AMPLIFIER		DATE 21 JAN 97	DATE 20.2.97	DATE 20.2.97
TITLE VDL-7014	NUMBER 7014A-001		ISSUE 2A	SHEET 2 of 2

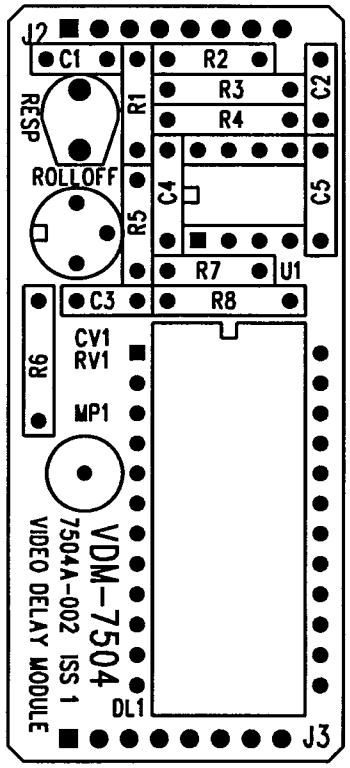
600 ns DELAY



ROSS VIDEO LIMITED	FILE 001-02.SCH		TYPE SCHEMATIC	
	DRAWN BY JR	DESIGNED BY JR	APPROVED BY	RELEASED BY PR.460
FUNCTION VIDEO DELAY MODULE (600ns)		DATE 28 Aug 96	DATE 6.9.96	DATE 6.9.96
TITLE VDM-7504	NUMBER 7504A-002		ISSUE 01	SHEET 1 OF 1

REVISION RECORD

ISSUE	REV BY	BCN	APP BY	DATE



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POLARIZED CAPACITOR = POSITIVE PIN (+)
RESISTOR NETWORK = PIN 1
NV = NO VALUE COMPONENT (INSTALLED BY TEST)
LED = POSITIVE PIN (LONG LEG)

CV1 – RESPONSE
RV1 – ROLLOFF

ROSS VIDEO LIMITED	FILE LA7504-2.001	TYPE LAYOUT	
FUNCTION VIDEO DELAY MODULE	DRAWN BY BWK	DESIGNED BY JD DATE 29 Aug 96	APPROVED BY DATE 6.9.96
TITLE VDM-7504	NUMBER 7504A-002	ISSUE 01	SHEET 1 of 1

ROSS

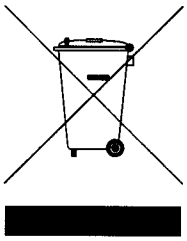
Cool Practical Technology™

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performances of our products.

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DISTRIBUTION PRODUCTS
WARRANTY and REPAIR POLICY

1. Ross Video Limited (the Company) warrants its products to be free from defects in workmanship and material under normal use and service for a period of **FIVE** years from the date of shipment. If, within the warranty period, the customer notifies the Company that a product is defective, the Company will correct the defect, either by repairing the defective product or if not repairable, by shipping a replacement product to the customer, as determined by the Company.

2. Liabilities under this warranty is limited to the repair or replacement of the product as determined by the company and is in lieu of all other warranties expressed or implied.

3. This warranty does not extend to any product which has been subjected to misuse, neglect, accident, improper installation or application, nor does it extend to products which have been repaired or altered outside the factory by personnel other than those of the Company, unless expressly authorised in writing by the Company.

4. Warranty repairs will be made at the Company's plant unless otherwise specified in writing by the Company. All packing, shipping, and special handling costs will be paid for by the customer.

5. Non-warranty repair service made at the factory will be at customer expense. Cost of repairs will be quoted following examination of the product by Company personnel.

6. In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits).