Commodore

Monitor 1403

Service Manual

10/88

Commodore

Table of Contents

Table of Contents (cont'd.)

This manual provides the technician useful references when servicing or maintaining the DM-3014/3015. Also included in this manual are listings of field assembly units and spare parts needed for the maintenance of the equipment. To order the spare parts or additional service manuals, simply fill up and mail the Spare Parts Ordering Form found at the end of this manual.

DISCLAIMERS

1. ADI Corp. expressly disclaims any and all liability arising from use and/or operation of its products, and shall not be liable for any consequential or incidental or collateral damages or injury to persons or property.

2. This manual serves as a reference only. Although utmost care has been taken in preparing this manual, ADI Corp. disclaims responsibility for any omissions and errors contained herein.

3. Some DM-3014/3015 specifications may be modified after publication of this manual. ADI Corp. reserves the right to make any changes and improvements on the equipment without prior notice, and disclaims responsibility for them.

4. Versions of DM-3014/3015 released earlier than the publication of this manual may have some specifications other than those stated within this manual. Please contact your dealers for verification.

Please direct all inquiries and communications regarding this manual to :

ADI Corporation
Sales and Marketing Department
14F, No. 1, Sec. 4, Nan-King East Road
Taipei, Taiwan
Republic of China
Tel. : 886-2-713-3337
Fax : 886-2-713-6555

Federal Communication Commission Requirements (Radio Frequency Interference)

This equipment generates and uses radio frequency. Interference in radio and television reception might result if the equipment is not installed in strict accordance with the manufacturer's instructions.

The DM-3014/3015 has been tested to comply with the limits of a FCC Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when installed in a residential area.

However, there is no guarantee that interference will not occur in any particular installation. If this equipment does interfere with radio or television reception, which can be determined by turning the equipment off and on in the vicinity of the receiver device, the user may use the following methods to rectify the problem:

- Re-orient the receiving antenna.
- Relocate the equipment with respect to the receiver.
- Move the equipment away from the receiver.
- Plug the equipment into a different power source so that the receiver and the equipment are on different circuits.

If the above methods fail to achieve the desired results, the user should consult a qualified dealer or an experienced radio/television technician for advice.

The user may also find the following booklet prepared by the Federal Communications Commission (USA) useful:

How to Identify and Resolve Radio-TV Interference Problems

This booklet is available through the U.S. Government Printing Office, Washington D.C., 20402, stock no. 004-000-00345-4.

=== Section 1 ==========

General Information

==========

This service manual provides qualified technicians with the information necessary to troubleshoot and order spare parts in maintaining the equipment. The manual only contains information on the products described on the cover sheet.

As the need develops, regular updates will be provided. These updates can then be inserted into the sections affected.

1.1. Technical Specifications

The technical specifications contained in this manual reflect the current applicable specifications. They are subject to change at any time without prior notice. Updated supplements contained in an Engineering Change Notice will be provided as major revisions are made.

1.2. Prices

All prices contained in this manual are current prices. The prices are subject to change without prior notice. New price lists will be made available each time prices are changed.

1.3. Ordering Procedures

Spare parts or sub-assembly orders should contain the part number and the model number while service manual orders should indicate the particular model number. Failure to quote any of these numbers could delay filling of the orders received.

1.4. Handling Charges

The following handling charges are to be added to the cost of all orders received:

1.4.1. Orders below US$100

These orders are not accepted and no services will be provided.

1.4.2. Orders between US$100 and US$500

These orders can be shipped either through regular freight or through parcel post. In each case the handling charges are as follows:

A. Regular freight
   Handling charges : US$50
   Freight charges : Collect

B. Air parcel post
   The package weight is limited to two (2) kilograms maximum.
   Handling charges : US$50
   Tax : 10% of the ordering price

1.4.3. Orders above US$500

All handling charges are free.
Freight charges : Collect

1.5. Lead Time

Please allow ninety (90) days from date the spare part orders are received for delivery.

1.6. Warranty

ADI warrants all monitors shipped to be free from defects in workmanship and material for six (6) months from date of shipment. This warranty does not cover shipping damage, or damages due to neglect, normal wear and tear, improper installation, usage or operation. ADI's obligation shall be limited to replacement of defective components only.

ADI warrants all spare parts ordered for a period of ninety (90) days from date of shipment. Any spare parts found defective within this warranty period may be shipped back to ADI to get a full replacement. However, this warranty does not cover shipping damage, or damages due to neglect, improper installation, usage or operation.

=== Section 2 ==========

Engineering Specifications

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Models : DM-3014/3015

Date : June 4, 1987

Description : IBM Personal System/2 models 30, 50, 60 compatible monochrome monitor

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1. Cathode Ray Tube (CRT)

Size	:	14 inch diagonal (DM-3014) 15 inch diagonal (DM-3015)
Deflection Angle	:	90 degrees
Neck Diameter	:	20 ø
Face Treatment	:	dark glass, non-glare
Phosphor	:	H192 or equivalent

2. Power Requirements

Power source	:	110 / 220 volts AC, 0.55 Amp.
Power consumption	:	50 watts

3. Deflection Characteristics

Horizontal		
Frequency	:	31.468 KHz
Blanking time	:	5.72 usec
Vertical		
Frequency	:	50 / 60 / 70 Hz

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* IBM Personal System/2 is a registered trade mark of International Business Machines Corp.

Vertical
  Blanking time :
    a. 50 Hz
       480 lines : 4.236 msec
       400 lines : 6.844 msec
       350 lines : 8.496 msec
    b. 60 Hz
       480 lines : 0.905 msec
       400 lines : 3.511 msec
       350 lines : 5.163 msec
    c. 70 Hz
       400 lines : 1.130 msec
       350 lines : 2.728 msec

4. Video Response

Bandwidth	:	30 MHz (-3dB)
Rise time	:	15 nsec max.
Fall time	:	15 nsec max.
Characters	:	Up to 64 gray shades
Horizontal resolution	:	640 / 720 pixels
Vertical resolution	:	350 / 400 / 480 lines

5. Display Format

Character format	:	8 x 14 matrix 8 x 16 9 x 16
Capacity	:	80 characters x 25 rows 80 characters x 30 rows

6. Input Signal

Video signal	:	0 - 0.7 Vpp
Horizontal drive	:	3.5 Vpp
Vertical drive	:	3.5 Vpp

7. Display Performance

Picture size	DM-3014	DM-3015
Horizontal	: 240 mm $\pm$ 3 mm	250 mm $\pm$ 3 mm
Vertical	: 180 mm $\pm$ 3 mm	190 mm $\pm$ 3 mm

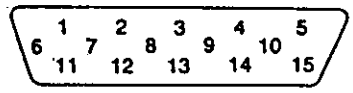
Linearity : Character height or width will not vary for more than 10 % from the average character size.

8. Geometric Distortion

DM-3014 :
Horizontal : ±2 mm
Vertical : ±2 mm

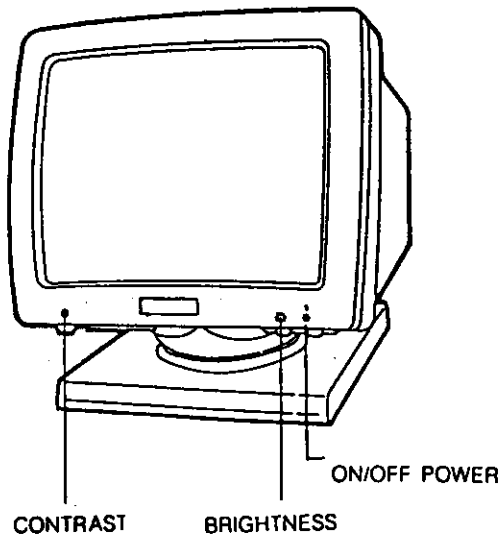
DM-3015 :
Horizontal : ±3 mm
Vertical : ±3 mm

9. Video Cable Input Signals



DM-3014 / DM-3015
Pin 2 - Video
Pin 5 - Self test
Pin 7 - Ground
Pin 10 - Ground
Pin 13 - H-sync
Pin 14 - V-sync

10. External Controls



PS/2 Timing Chart

Vertical resolution : 480 lines

	Vertical frequency (50 Hz)	Vertical frequency (60 Hz)	Vertical frequency (70 Hz)	Polarity Hor.	Polarity Vert.
Video	15.762 ms 496H	15.762 ms 496H		-	-
Front porch	1.716 ms 54H	0.032 ms 1H		-	-
Back porch	2.446 ms 77H	0.794 ms 25H		-	-
Sync	0.063 ms 2H	0.064 ms 2H		-	-

Vertical resolution : 400 lines

	Vertical frequency (50 Hz)	Vertical frequency (60 Hz)	Vertical frequency (70 Hz)	Polarity Hor.	Polarity Vert.
Video	13.156 ms 414H	13.156 ms 414H	13.156 ms 414H	-	+
Front porch	3.019 ms 95H	1.335 ms 42H	0.159 ms 5H	-	+
Back porch	3.749 ms 118H	2.097 ms 66H	0.890 ms 28H	-	+
Sync	0.064 ms 2H	0.064 ms 2H	0.064 ms 2H	-	+

PS/2 Timing Chart

(continued)

Vertical resolution : 350 lines

	Vertical frequency (50 Hz)	(60 Hz)	(70 Hz)	Polarity Hor.	Vert.
Video	11.504 ms 362H	11.504 ms 362H	11.504 ms 362H	+	-
Front porch	3.845 ms 121H	2.160 ms 68H	0.985 ms 31H	+	-
Back porch	4.576 ms 144H	2.924 ms 92H	1.716 ms 54H	+	-
Sync	0.064 ms 2H	0.064 ms 2H	0.064 ms 2H	+	-

Horizontal frequency	:	31.468 KHz
Video	:	26.058 us
Back porch	:	1.589 us
Front porch	:	0.318 us
Sync	:	3.813 us

=== Section 3 ==========

Troubleshooting Procedures

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3.1. Notice for Service Personnels before Servicing

Please read before attempting service.

1. Line voltage must be kept within ±10% of rated voltage.

2. When operating at line voltage, confirm that B+ voltage is 32V DC ± 0.2 V. Adjust VR901 if necessary.

3. Observe proper line voltages when adjusting the horizontal oscillator or the horizontal deflection unit.

4. Do not discharge, arc, or measure high voltage when the high voltage lead is connected to the CRT. Discharge the second anode of the CRT only after the high voltage lead has been disconnected.

   Do not discharge the high voltage lead at any time, or else damage to the transistors will occur.

5. While the monitor is in operation, do not attempt to connect or disconnect any wirings.

6. Make sure that the power cord is disconnected before replacing any parts in the monitor.

7. When the power is on, do not attempt to short any portion of the circuit. This shorting may cause damage to the transistors in the circuit.

8. When servicing the high-voltage area, be sure that the CRT anode is safely discharged to ground before removing the anode cap.

9. VR901 (B+ adjust) and VR809 (H-hold) controls were sealed at the factory after their optimum values were set. Do not attempt to alter these controls during servicing.

   When replacement is needed, replace only with the same type and rating of controls. Be sure to reseal them after replacement and readjustment.

   Recommended sealing epoxy is NANPO 906, HYSOL ES4281 or their equivalents.

3.2. Important service safety information for models DM-3014/3015

Operating the monitor outside of the cabinet or with the back removed involves a shock hazard. Work on these models should only be performed by those who are thoroughly familiar with precautions necessary when working with high voltage equipments.

Exercise care when servicing this chassis with the power applied. Many B+ and high voltage RF terminals are exposed which, when carelessly contacted, can cause serious shock and damage the chassis.

Maintain interconnecting ground lead connections between the chassis and the picture tube dag cluster when operating chassis. The B+ adjust control in this monitor is sealed to protect the user from X-ray radiation, and is not to be readjusted. If adjustment becomes necessary or if the control is replaced due to damage, check the B+ reading to ensure that it is within specifications after servicing. Then seal this control according to the manufacturer's specifications.

Certain high voltage failures can increase X-ray radiation. The monitor should not be operated with the HV levels exceeding the specified level for their chassis type. High line voltages will increase the possibility of HV circuit failures.

It is important to maintain all specified values of all components in the horizontal and high voltage circuit or anywhere else in the monitor that could cause a rise to the high voltage or to the operating power supply.

No changes should be made to the original design of the monitor. Components shown in the shaded areas of the schematic diagram and/or identified by an (*) in the replacement parts list should be replaced only with the exact factory recommended parts.

The use of unauthorized substitute parts may create shock, fire, radiation, or other hazards.

The picture tube used in this monitor employs an integral implosion protection. Replace only with a tube of the same type number for continued safety. Handle the picture tube only when wearing shatter-proof goggles and after discharging the high voltage completely. Keep others without shatter-proof goggles away.

When removing springs and/or spring mountings from the chassis, shatter-proof goggles should also be worn. Keep others without shatter-proof goggles away.

Caution : No modification of any part of the circuit should be attempted. Service should be done only after you are thoroughly familiar with all of the following safety checks.

3.3. Safety Checks and Inspections

Before returning the monitor to the user, perform the following safety checks first:

1. Inspect all lead dresses to make sure that the leads are not pinched and no hardware is logged between the chassis and other metal parts of the monitor.

2. Never release a repair unless all covers, clips, cans, screws, bolts, ground straps, shields, and other hardware have been installed as in the original design.

3. Critical components that are shaded on the schematic diagram and marked with an asterisk on the parts list are used to prevent shock, fire hazard, and excessive X-radiation. All these special components must be replaced only with the same type identical to those in the schematic diagram and parts list.

4. A check for the presence of any leakage current should be made at each exposed metal part having a return path to the chassis (jacks, cabinet metal, screw heads, knobs, etc.) to be sure that no shock hazard exists.

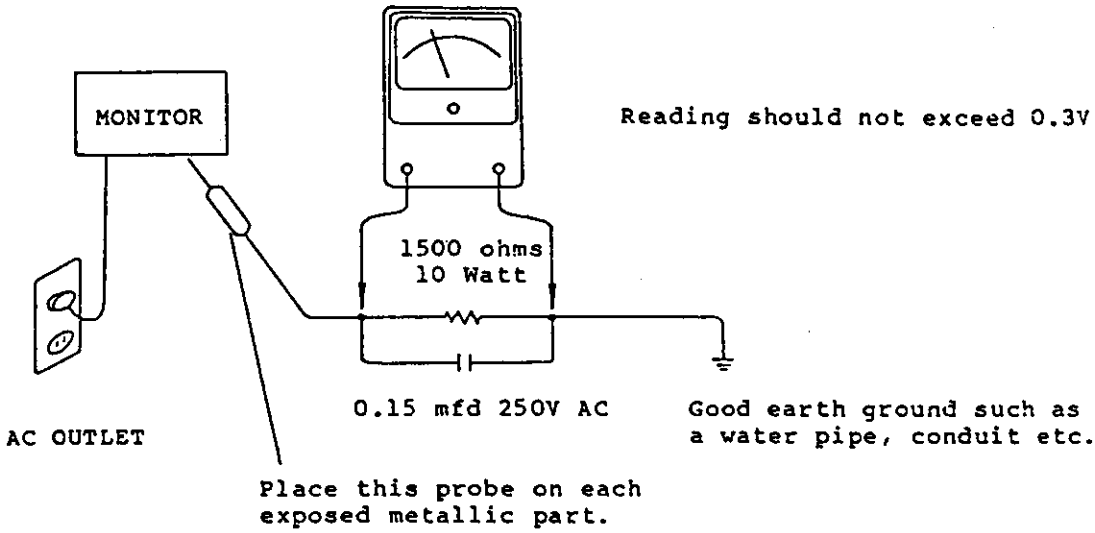
   Do not use a line isolation transformer during this test.

   Use an AC voltmeter having 5000 ohm per volt sensitivity in the following manner:

   a. Connect a 1500-ohm, 10-watt resistor, parallel with a 0.15 mF, 150V AC capacitor, between a known good earth ground (water pipes, conduits, etc.) and the exposed metallic parts one at a time. Measure the AC voltage across the resistor-capacitor network.

   b. The voltage measured should not exceed 0.3V rms, corresponding to 0.2 mA AC. Any value exceeding this limit constitutes a potential shock hazard and should be corrected before returning the monitor to the user.

AC Voltmeter
(5000 ohms per volt or more sensitivity)



Voltmeter hookup for leakage current test.

3.4. Quick Reference for Repair

Turn the power source on and connect the input signal

-· No raster appears.

- The source voltage is abnormal.
  (Check the B+ line and the horizontal output circuit.)

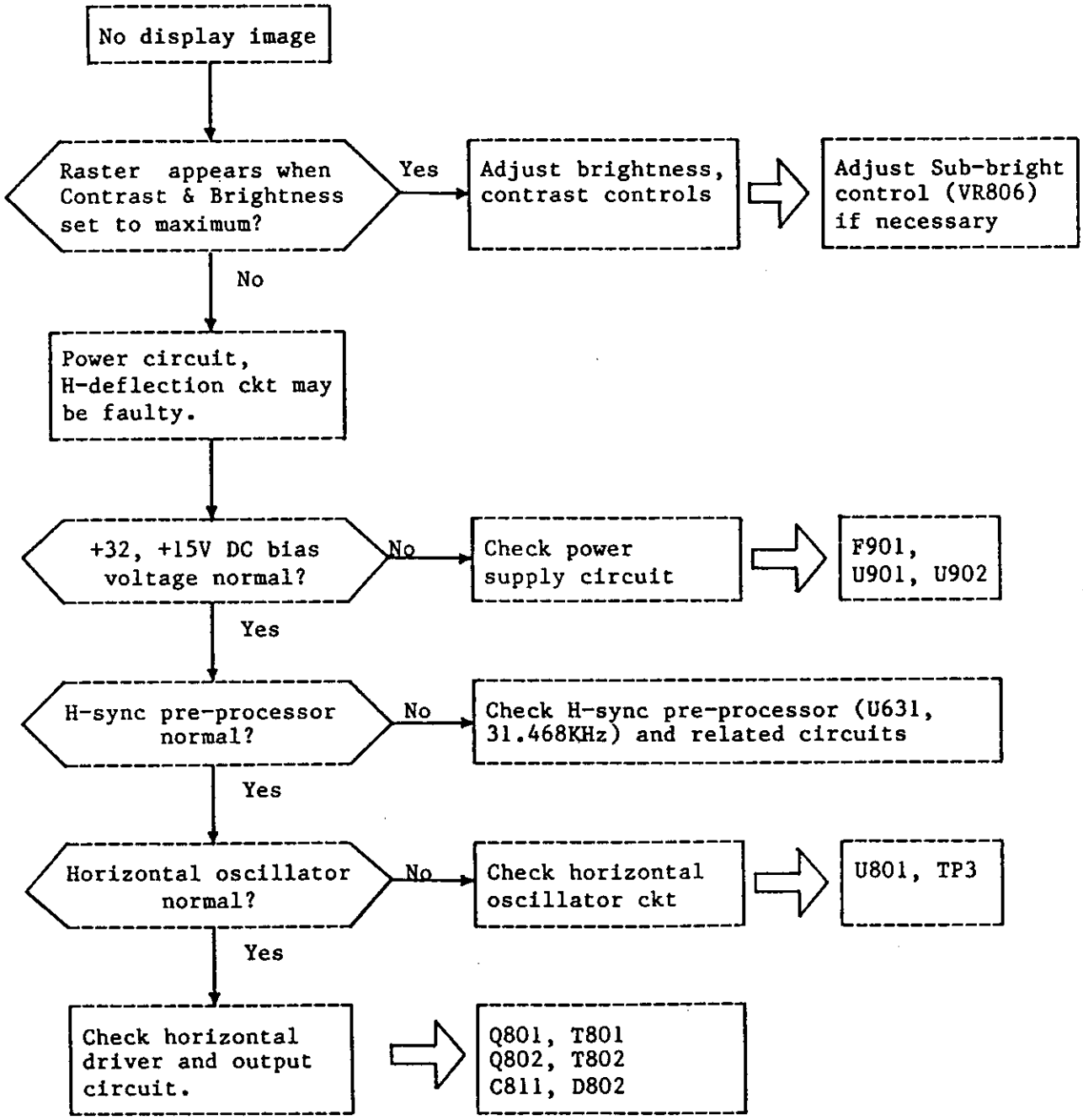
- The source voltage is normal.
  (Check the horizontal circuit, CRT circuit and the video circuit.)
  - o Horizontal stripe on screen.
    (Vertical circuit.)
  - o Vertical stripe on screen.
    (DY circuit.)

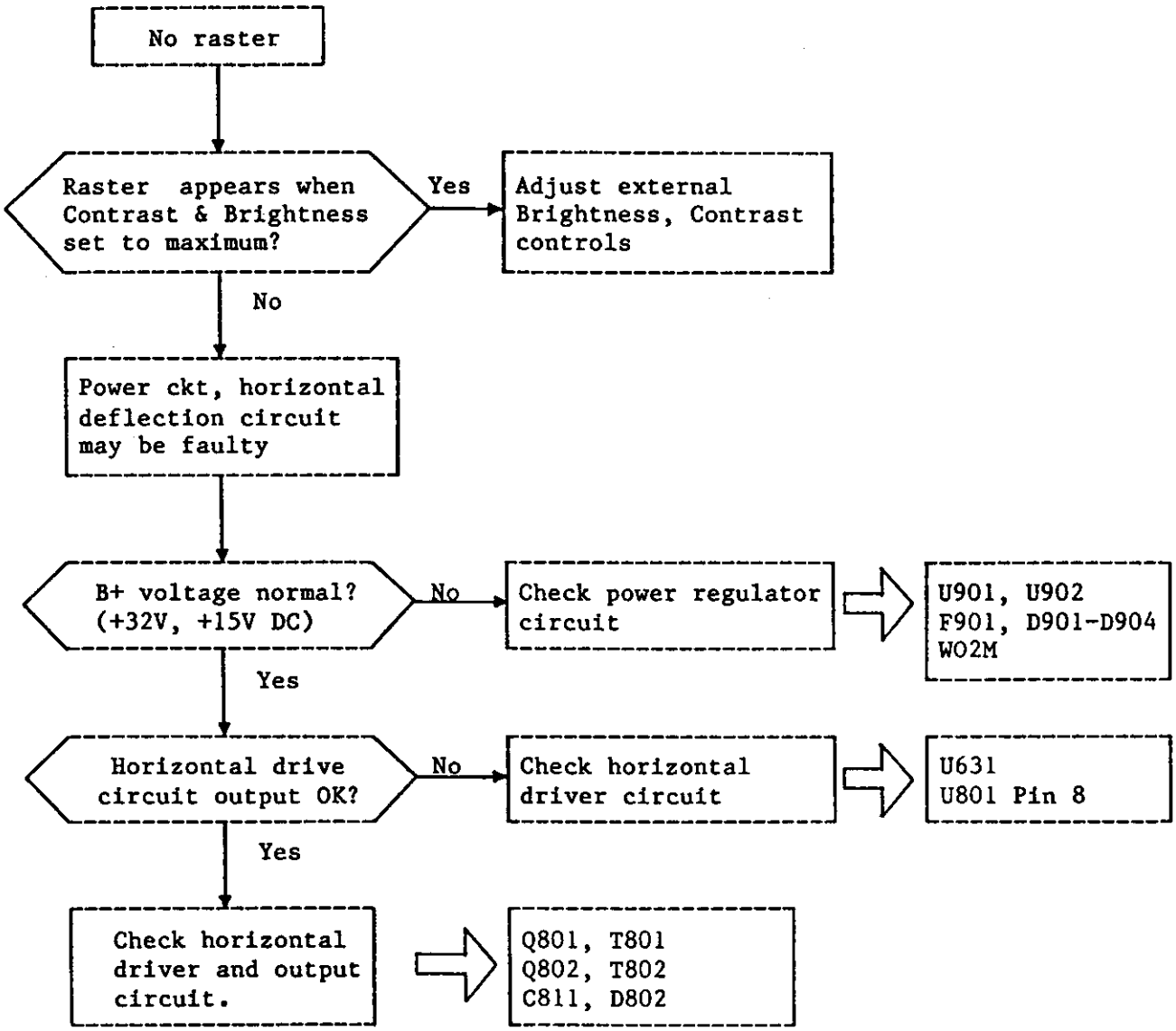
- Raster appears, faulty or no picture.

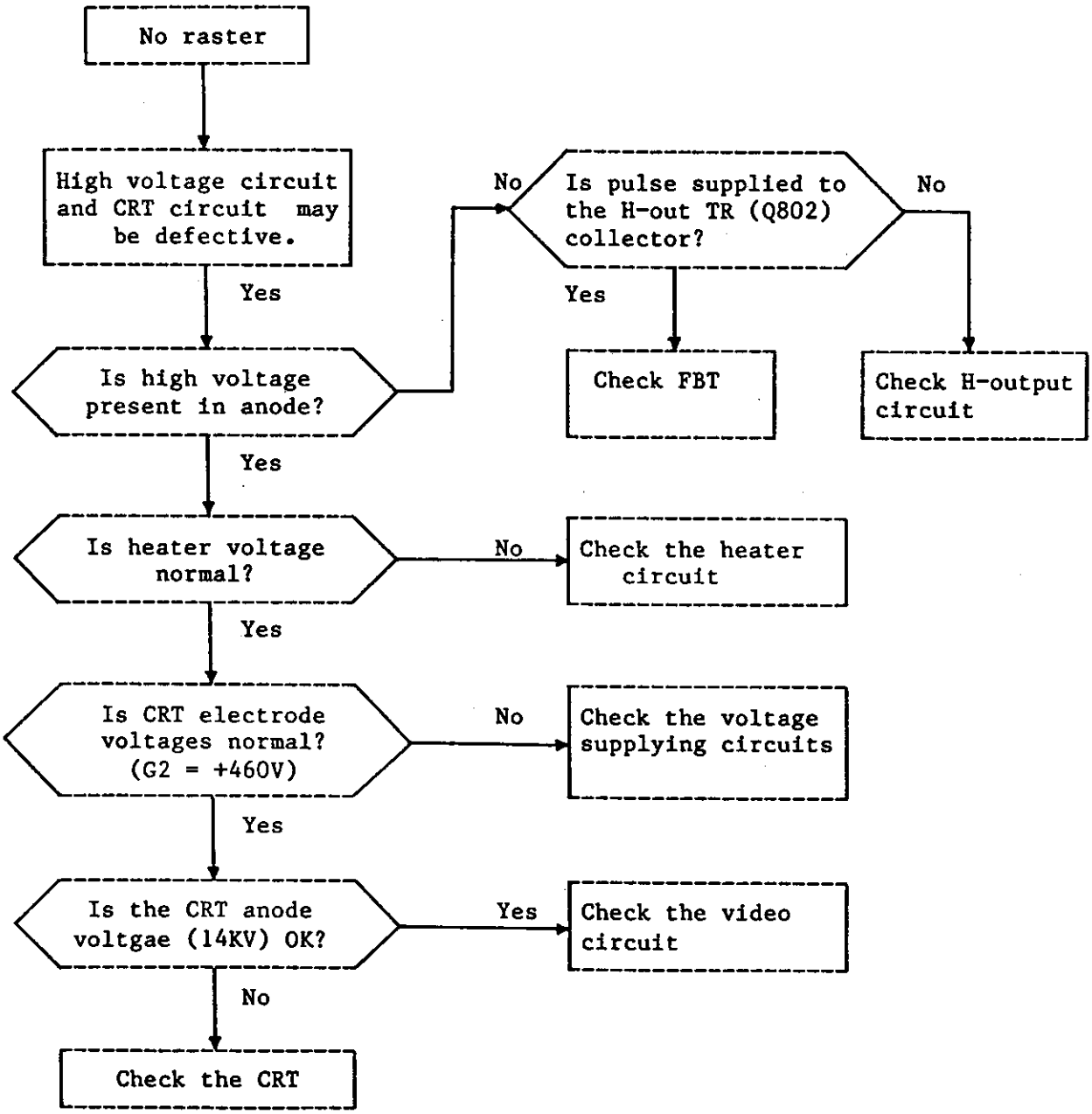
  - No picture.
    (Check the B+ line and the video circuits.)

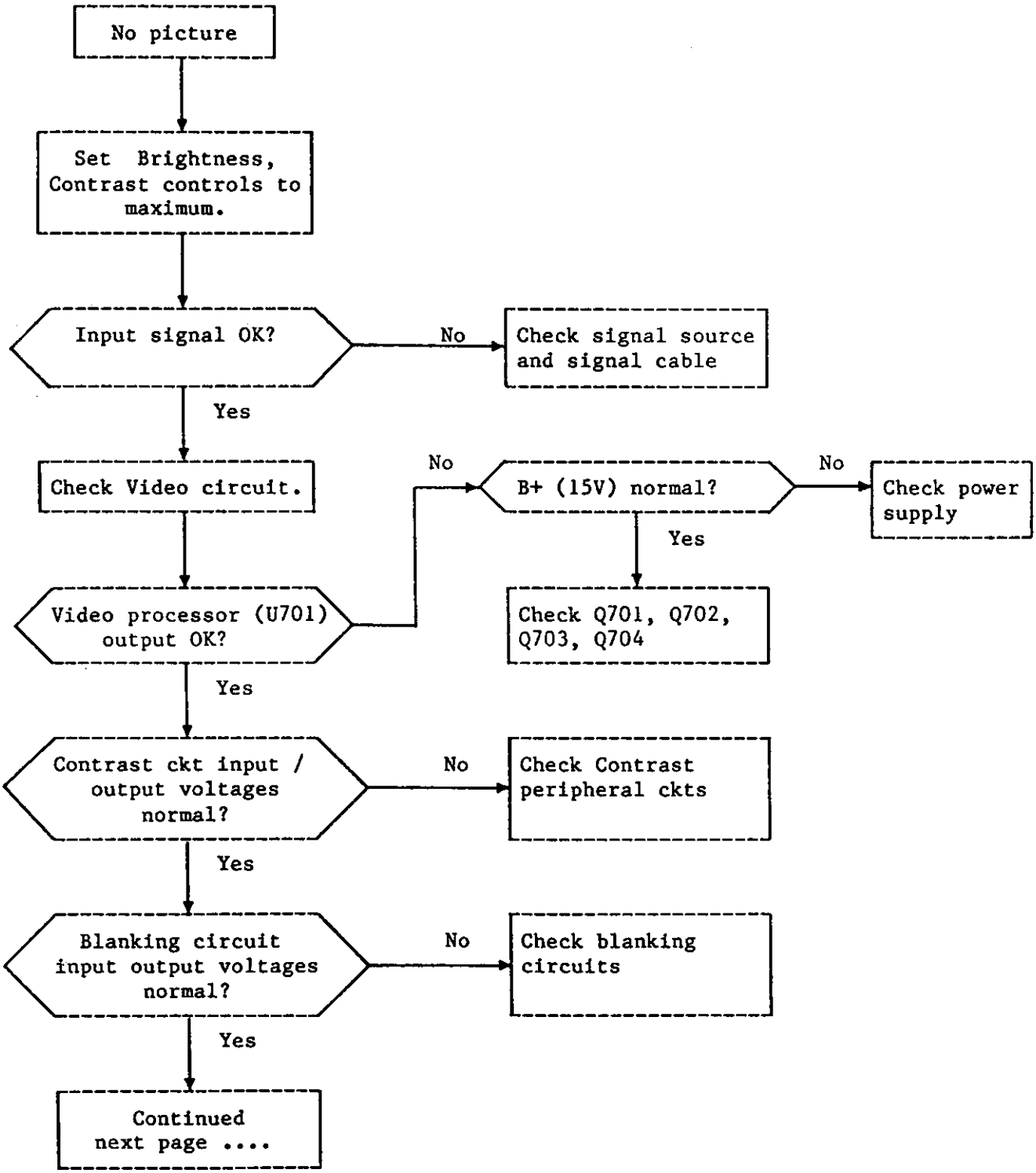
  - Faulty Picture.
    - o The horizontal amplitude is short.
      (Horizontal circuit.)
    - o The vertical amplitude is abnormal.
      (Vertical circuit.)
    - o Dark screen.
      (CRT and its peripheral circuit.)
    - o No horizontal sync.
      (H-osc circuit.)
    - o No vertical sync.
      (Vertical circuit.)
    - o Brightness differs between the vertical and horizontal character dots.
      (Video circuit.)
    - o Poor focus.
      (CRT and its peripheral circuits.)

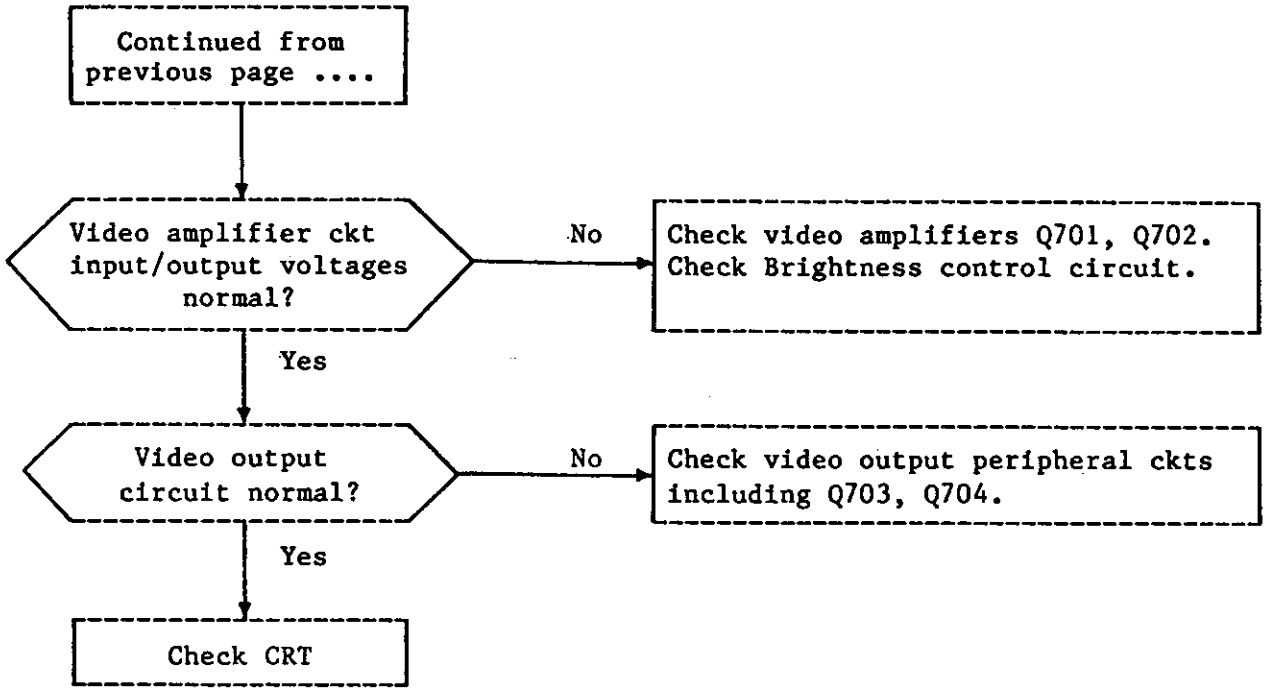
3.5. Troubleshooting Flowcharts

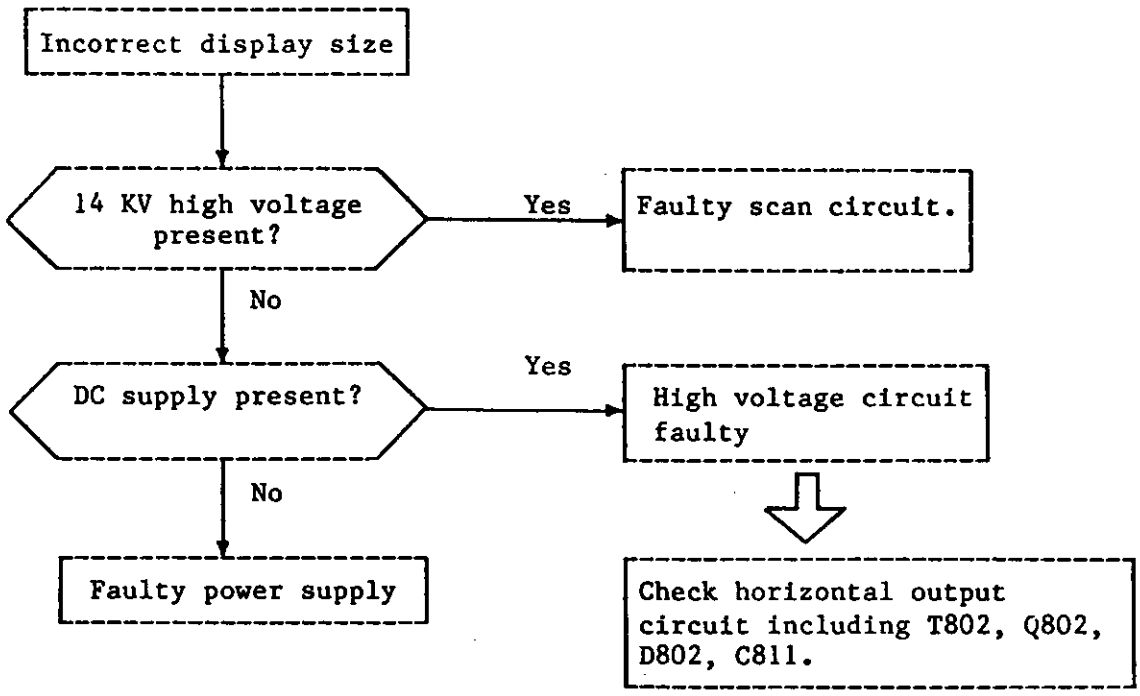


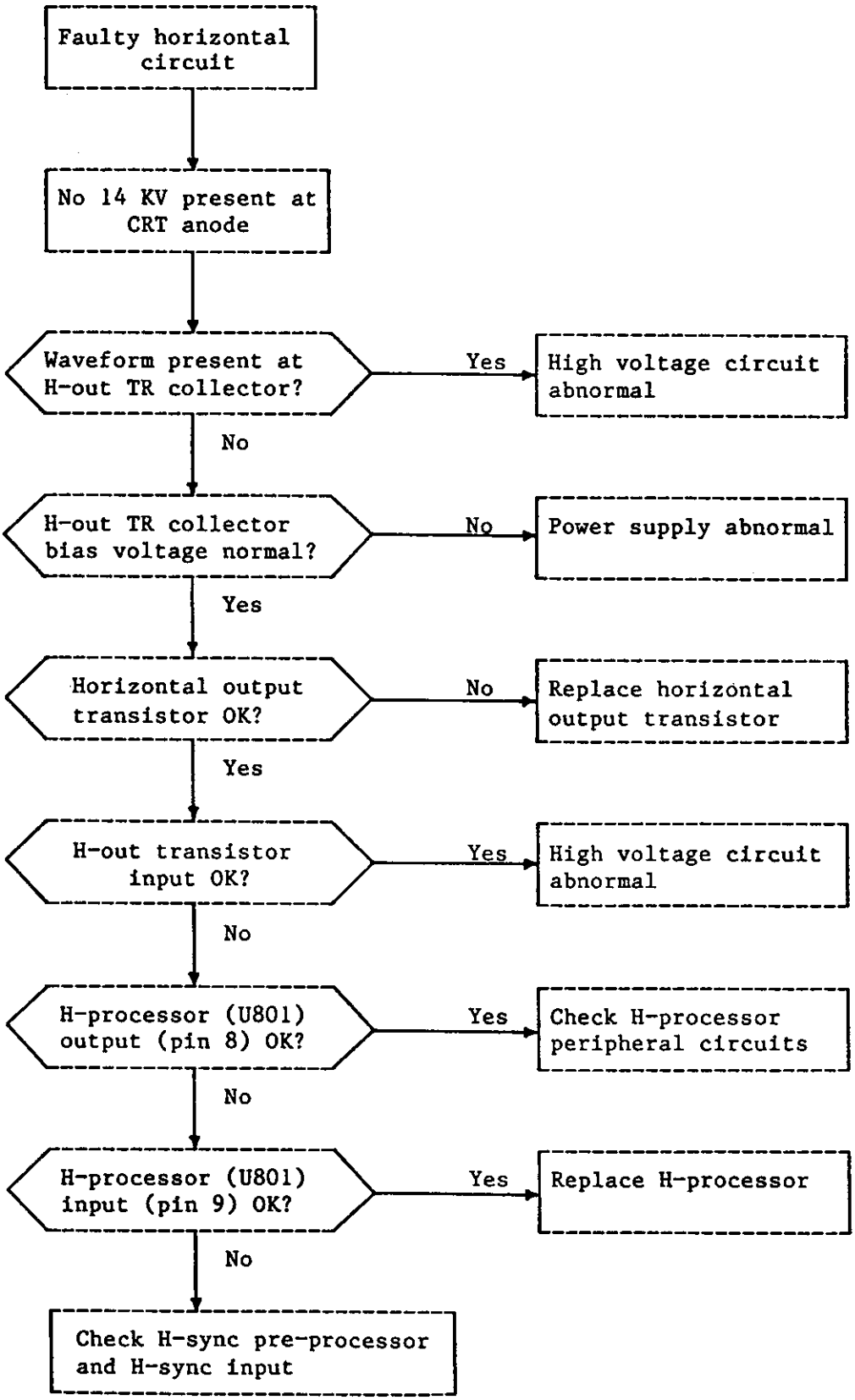

No raster
Raster appears when Contrast & Brightness set to maximum?
Yes
Adjust external Brightness, Contrast controls
No
Power ckt, horizontal deflection circuit may be faulty
B+ voltage normal? (+32V, +15V DC)
No
Check power regulator circuit
U901, U902
F901, D901-D904
WO2M
Yes
Horizontal drive circuit output OK?
No
Check horizontal driver circuit
U631
U801 Pin 8
Yes
Check horizontal driver and output circuit.
Q801, T801
Q802, T802
C811, D802

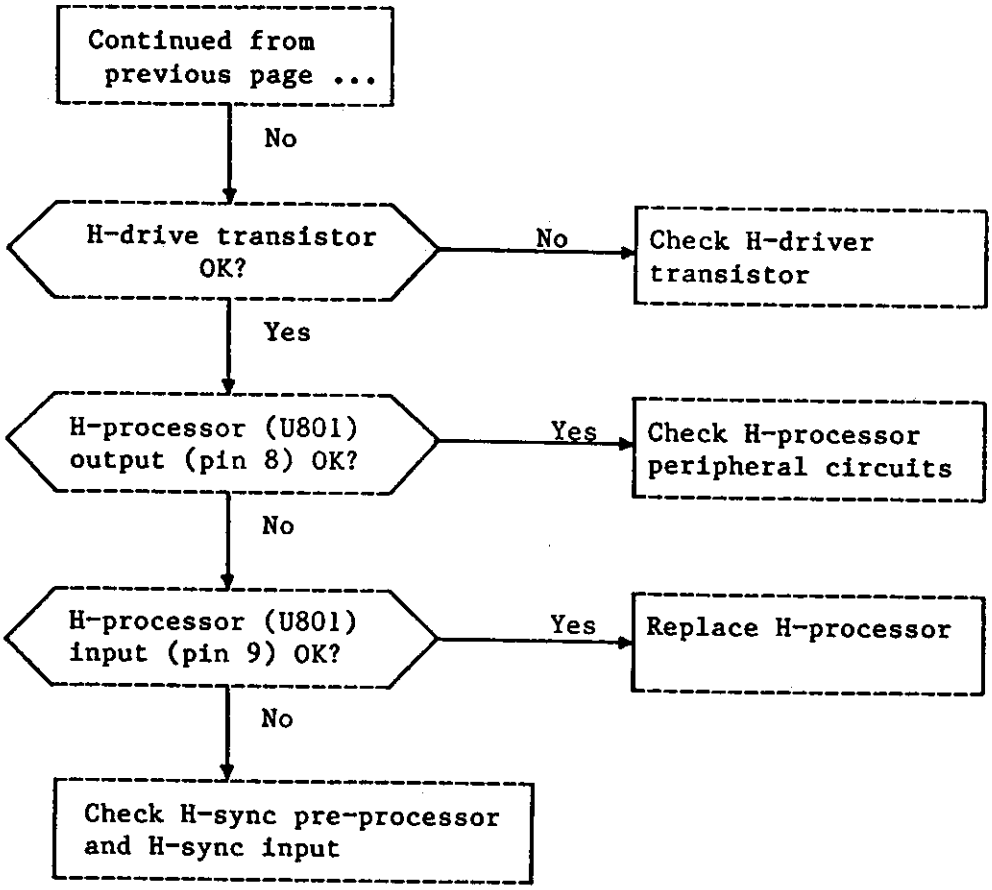

No raster
High voltage circuit and CRT circuit may be defective.
Yes
Is high voltage present in anode?
No
Is pulse supplied to the H-out TR (Q802) collector?
No
Yes
Check FBT
Check H-output circuit
Yes
Is heater voltage normal?
No
Check the heater circuit
Yes
Is CRT electrode voltages normal? (G2 = +460V)
No
Check the voltage supplying circuits
Yes
Is the CRT anode voltgae (14KV) OK?
Yes
Check the video circuit
No
Check the CRT


No picture
Set Brightness, Contrast controls to maximum.
Input signal OK?
No
Check signal source and signal cable
Yes
Check Video circuit.
No
B+ (15V) normal?
No
Check power supply
Yes
Video processor (U701) output OK?
Check Q701, Q702, Q703, Q704
Yes
Contrast ckt input / output voltages normal?
No
Check Contrast peripheral ckts
Yes
Blanking circuit input output voltages normal?
No
Check blanking circuits
Yes
Continued next page ....

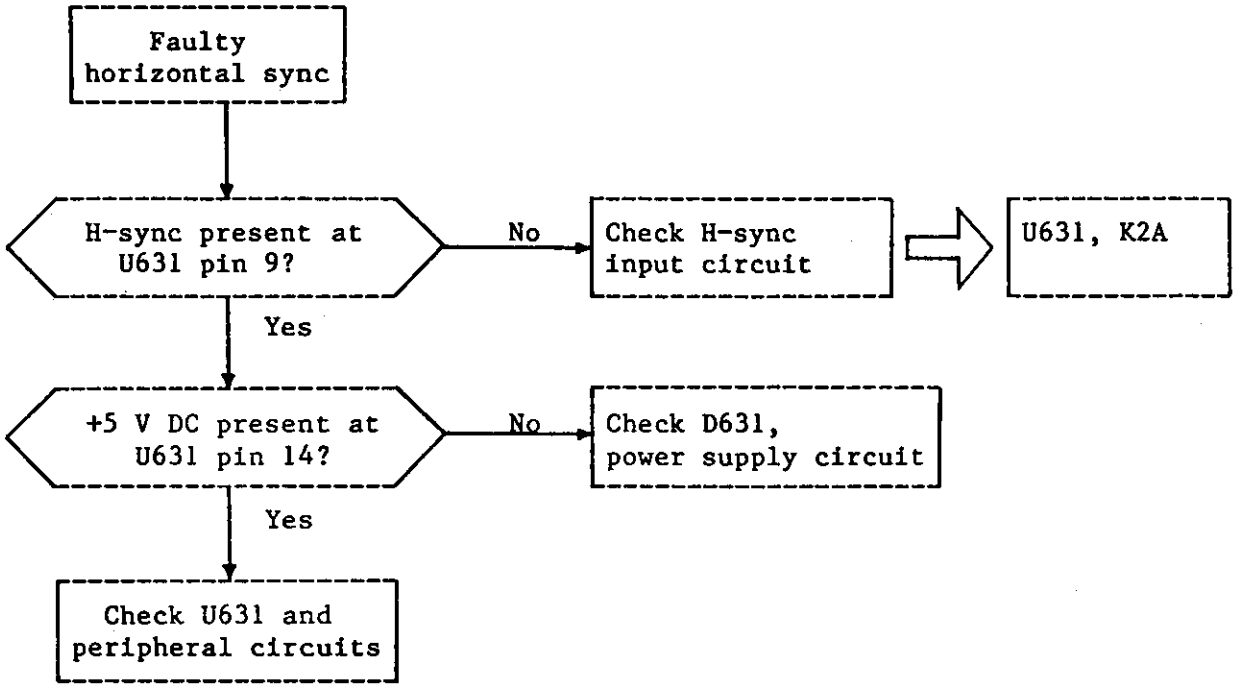

Continued from previous page ....
Video amplifier ckt input/output voltages normal?
No
Check video amplifiers Q701, Q702. Check Brightness control circuit.
Yes
Video output circuit normal?
No
Check video output peripheral ckts including Q703, Q704.
Yes
Check CRT


Incorrect display size
14 KV high voltage present?
Yes
Faulty scan circuit.
No
DC supply present?
Yes
High voltage circuit faulty
No
Faulty power supply
Check horizontal output circuit including T802, Q802, D802, C811.

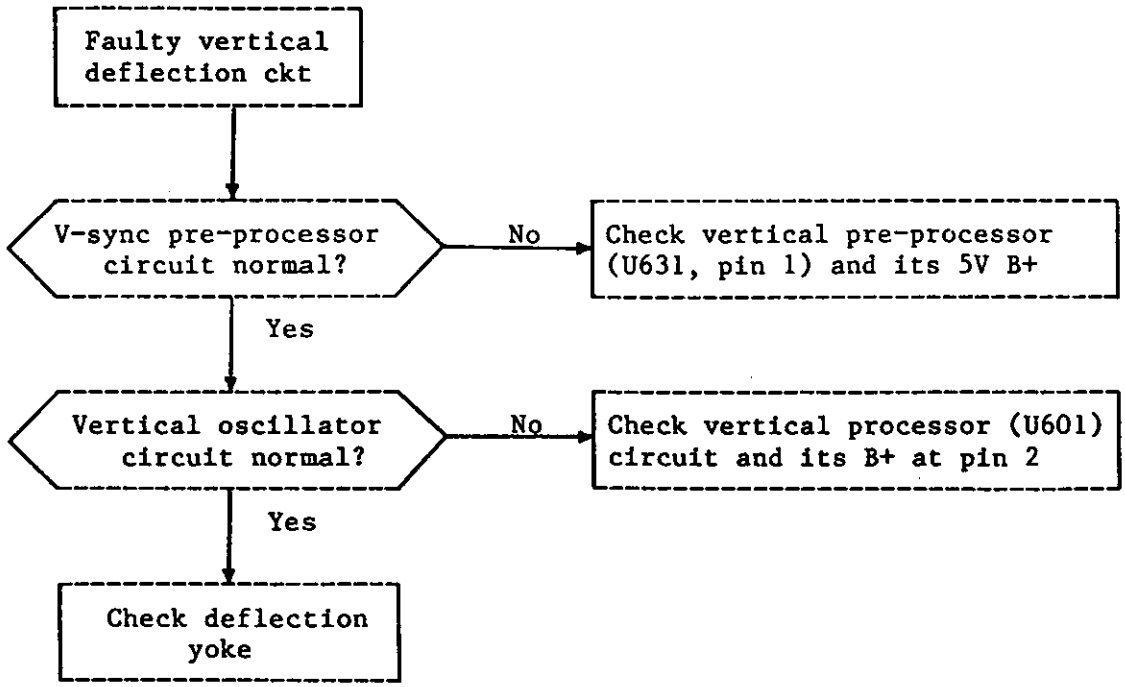

Faulty horizontal circuit
No 14 KV present at CRT anode
Waveform present at H-out TR collector?
Yes
High voltage circuit abnormal
No
H-out TR collector bias voltage normal?
No
Power supply abnormal
Yes
Horizontal output transistor OK?
No
Replace horizontal output transistor
Yes
H-out transistor input OK?
Yes
High voltage circuit abnormal
No
H-processor (U801) output (pin 8) OK?
Yes
Check H-processor peripheral circuits
No
H-processor (U801) input (pin 9) OK?
Yes
Replace H-processor
No
Check H-sync pre-processor and H-sync input


Continued from previous page ...
No
H-drive transistor OK?
No
Check H-driver transistor
Yes
H-processor (U801) output (pin 8) OK?
Yes
Check H-processor peripheral circuits
No
H-processor (U801) input (pin 9) OK?
Yes
Replace H-processor
No
Check H-sync pre-processor and H-sync input

Trouble : Picture rolls diagonally.



Trouble : Only one horizontal line appears on screen.
Picture displayed only on the upper or lower part of the screen.



3.6. Adjustments and Tests

I. Test equipments and special tools

a. Volt-ohm-A meter (Sanwa FD-750C or equivalent)
b. 30KV high voltage probe (HP34111A high voltage probe)
c. Oscilloscope (TEK2235 or equivalent)
d. Signal generator (IBM PC with EGA card and ADI's logical board)
e. Screwdriver (ADI special tool)

II. Adjustments

A. Picture size adjustment

1. Adjust H-Width (L801) so that the horizontal picture width may be :
   DM-3014 : 240 mm $\pm$ 3 mm
   DM-3015 : 250 mm $\pm$ 3 mm

2. Adjust V-Size (VR602) so that the vertical picture height becomes :
   DM-3014 : 180 mm $\pm$ 3 mm
   DM-3015 : 190 mm $\pm$ 3 mm

B. Focus adjustment

Adjust the focus VR (VR805 & VR803) so that the best focus may be obtained over the entire display area.

C. Deflection yoke and centering rings

Loosen the deflection yoke clamp and carefully move the yoke on the neck of picture tube as forward as possible. Rotate the yoke until the top and bottom edges of the raster are straight. Tighten the clamp center of the raster and eliminate the shaded corners by rotating the centering rings until the best effect is obtained.

D. Vertical Height and Linearity

Adjust the V-Linearity control (VR605) to obtain the best linearity. Adjust the V-Size control (VR602, VR603 & VR604) to gain the most preferred picture. Rotate V-Hold control (VR601) completely clockwise or counterclockwise to confirm that the picture rolls up or down at either extreme positions.

E. Sub-bright

Adjust the Brightness control (VR804) to maximum, then properly adjust the Sub-bright (VR806) until the background raster slightly appears.

3.7. Theory of Operation

I. Some DM-3014/3015 features are as follows:

A. IBM Personal System/2 compatible.

B. Horizontal frequency : 35.468 KHz
Vertical frequency : 50 / 60 / 70 Hz
Resolution : 350/400/480 lines

C. Video signal : Analog, 0 - 0.7 Vpp monochrome signal

D. The external sync is provided through a D-sub connector connected to the PS/2. The cable pin assignments are as follows:

D-sub	5-P connector (internal)	3-P connector (internal)
Pin 2		#2 Analog video
Pin 5	#1 Control	
Pin 7		#3 Shield gnd
Pin 12	#3 Ground	
Pin 13	#5 H-sync	
Pin 14	#4 V-sync	
Shield	#2 Shield gnd	#1 Double-shield gnd

E. The polarity of the H-sync and V-sync input determines whether the resolution will be 350, 400 or 480 lines, according to the following table:

	H-sync	V-sync
480 lines	-	-
400 lines	-	+
350 lines	+	-

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* IBM Personal System/2 is a registered trademark of International Business Machines Corp.

F. The H-sync pre-processor (U631) outputs a positive polarity H-sync to the horizontal processor IC (U801). U801 output at pin 3 drives Q801 (driver circuit) and Q802 (output stage).

G. The V-sync pre-processor (U631) outputs a positive polarity V-sync to trigger TDA1170N (U601), which in turn directly drives the vertical yoke.

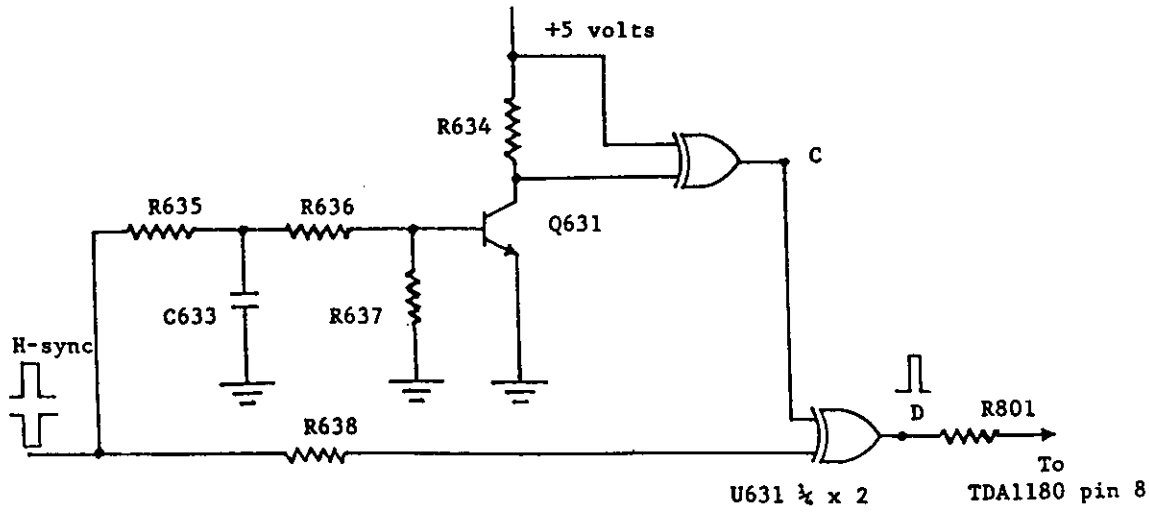
H. The video analog signal, after being processed by M51392, is sent to the CRT cathode via the video output stage.

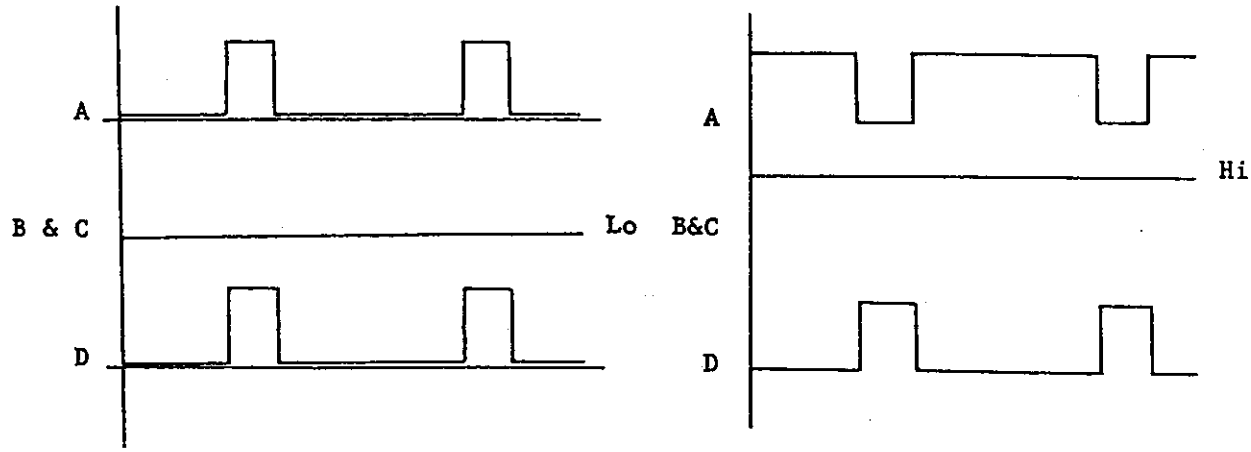
I. The FBT in the horizontal output stage also controls the focus, brightness, B2, G1, G2 and the white pattern circuits.

J. The AC supply voltage is 110V/60Hz or 220V/50Hz selectable through internal jumper settings. The power supply DC output supplies 15V and 32V to the main board and the CRT board.

II. H-sync Pre-processor

The H-sync input, both positive and negative, passes through this circuit and produces a positive H-sync at the circuit output.





III. Horizontal Processor IC (TDA1180)

A. The TDA1180 pin 1 connects to a positive supply of approximately 12 volts.

B. Pin 3 outputs a pulse of less than 50% duty cycle to drive the horizontal driver circuit and horizontal output stage.

C. Pin 5 is the phase shift filter. The TDA1180 compares the flyback pulse at pin 6 with its internal oscillator waveform to regulate the output pulse phase with the aid of a control current input at pin 5.

D. Pin 6 takes the flyback pulse, limited to suitable values by an external resistor, to perform phase shift control.

E. Pin 8 is the sync separator for the H-sync input.

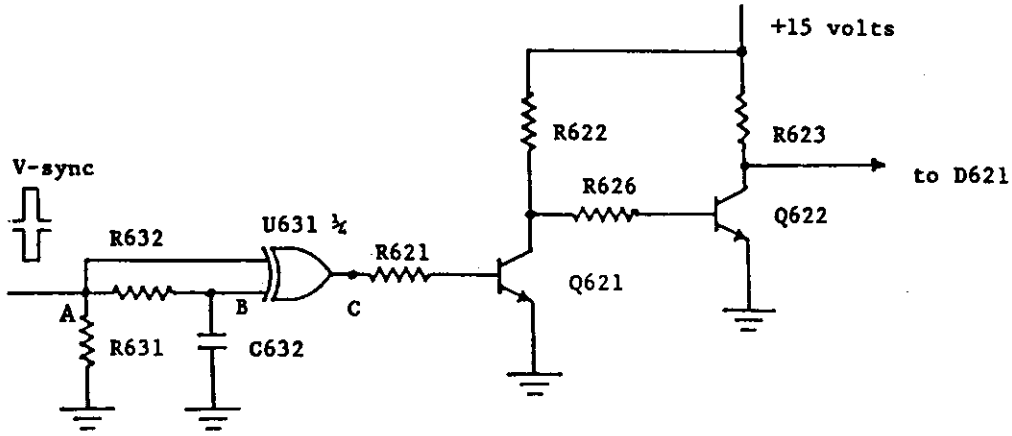
F. Pins 13, 14 and 15 make up the oscillator control circuit with pin 14 connected to the oscillator capacitor and pin 13 acting as the control current output. Pin 15 is the control current input. Adjusting VR809 limits pin 15 input current to control the H-hold.

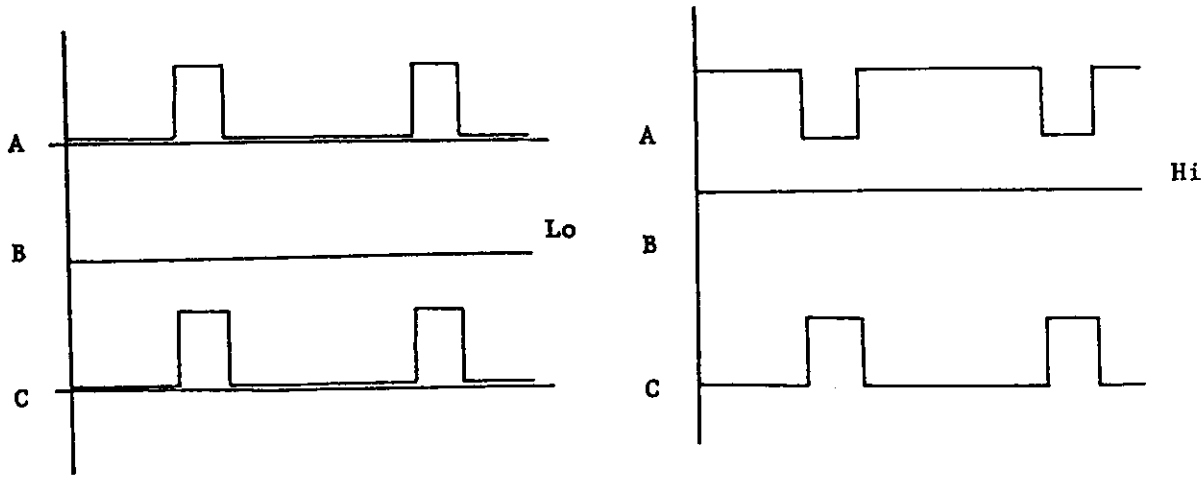
IV. Horizontal Output Stage

The horizontal output stage is made up of Q802, FBT, C811 and D802. The yoke, L801, L802 and C810 are the loading elements. L801 controls the horizontal width. The linearity coil (L802), together with C810 and Cs, is used to control horizontal linearity. The 32V B+ at FBT pin 6 passes through L803 and C814 while FBT pin 7 produces an output of about 300V.

V. V-sync Pre-processor

The V-sync input may either be positive or negative. Operating in the same manner as the H-sync pre-processor, the V-sync pre-processor produces a positive polarity sync at its output. A 15 Vpp V-sync is produced after Q621 and Q622.

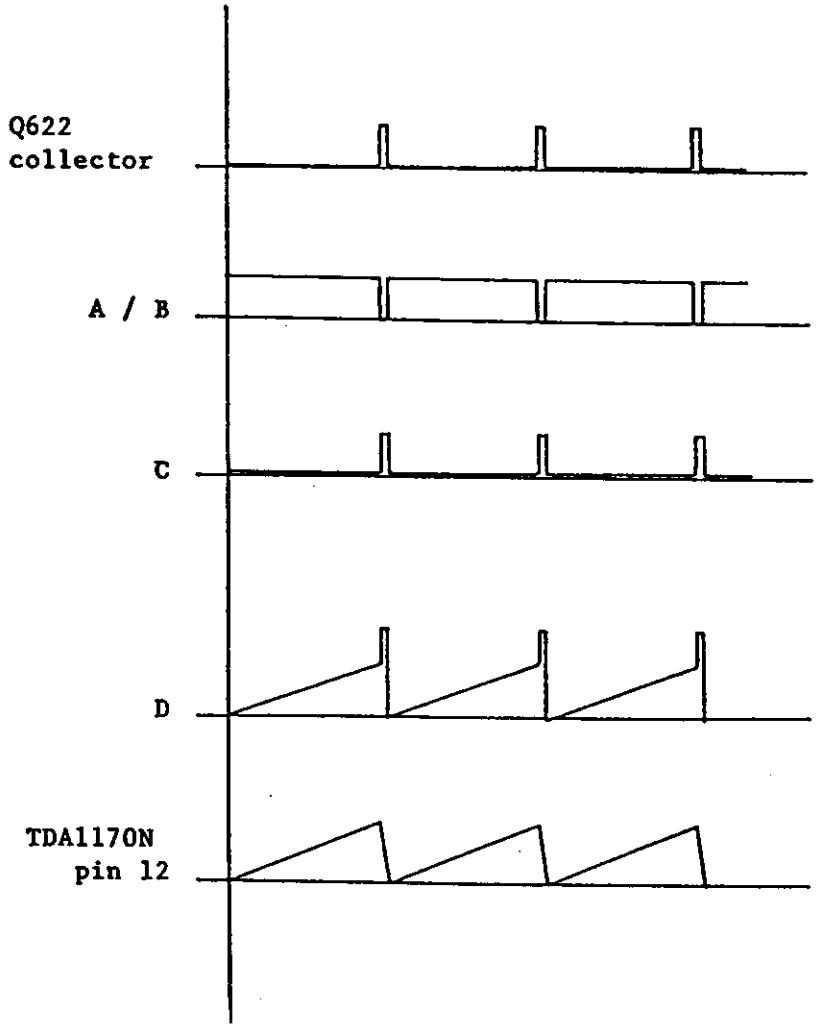




VI. Vertical Processor IC

A. Input sync and oscillator

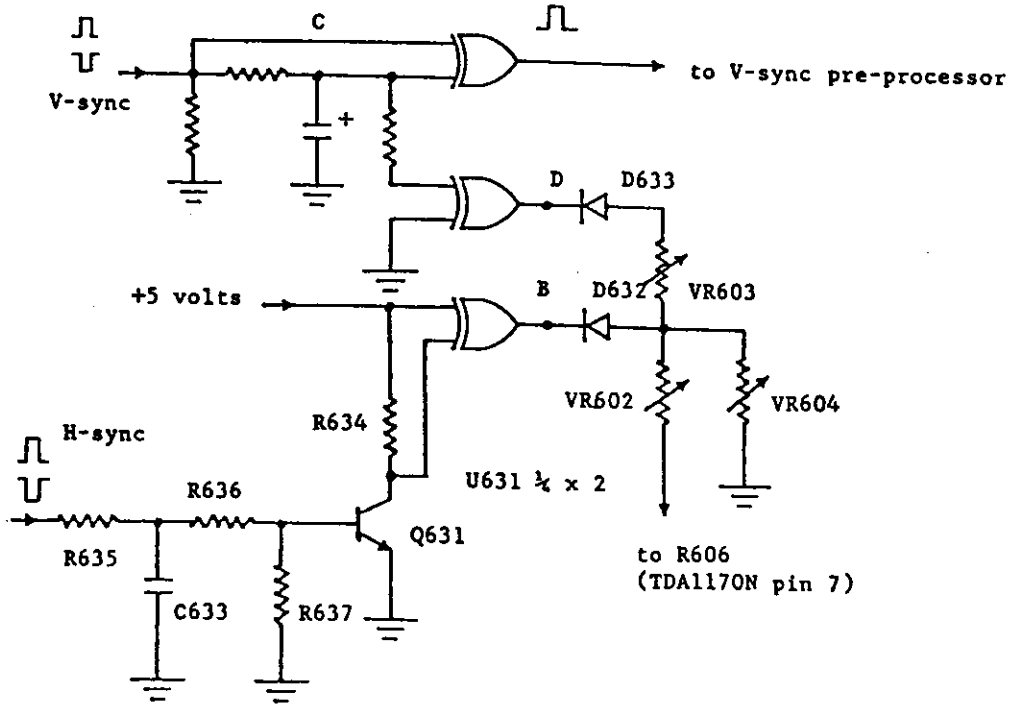
TDA1170N pin 6 and 9 control the free-running oscillator frequency when connected to VR and Cosc. Pin 8 is the normal input used to trigger the output frequency. However, the monitor utilizes a vertical frequency of 50-70 Hz and can not be fully controlled by using pin 8 as triggering. The solution is to use pin 9 to force trigger the oscillator frequency. The timing chart is as follows:



B. V-size control

The external VR connected to pin 7 controls V-size. As the VR is adjusted to minimum, the ramp wave generator output at pin 12 also decreases. Adjusting VR to maximum reverses the above conditions.

When operating under the same frequency with the VR fixed, the monitor would have its smallest display size occuring at 350 line resolution and the largest display size at 480 line resolution. To have uniform display size for all 350/400/480 line resolutions, three VRs with different values are used to control the V-size. The VR controlling the 350 line resolution has the smallest value while that controlling the 480 line resolution has the largest value. The control is achieved as follows:



Resolution	H-sync	V-sync	A/B	C/D	D632	D633	VR (tot)
480	-	-	Hi	Hi	Off	Off	VR602 + VR604 max
400	-	+	Hi	Lo	Off	On	VR602 + VR604||VR603
350	+	-	Lo	Hi	On	Off	VR602 min

Adjustment procedures:
1. 350 lines - adjust VR602
2. 480 lines - adjust VR604
3. 400 lines - adjust VR603

C. V-linearity

Pin 12 is the ramp generator with output at pin 1. The output connects to VR605, R609, C608 and C609 to control vertical linearity.

D. Vertical output

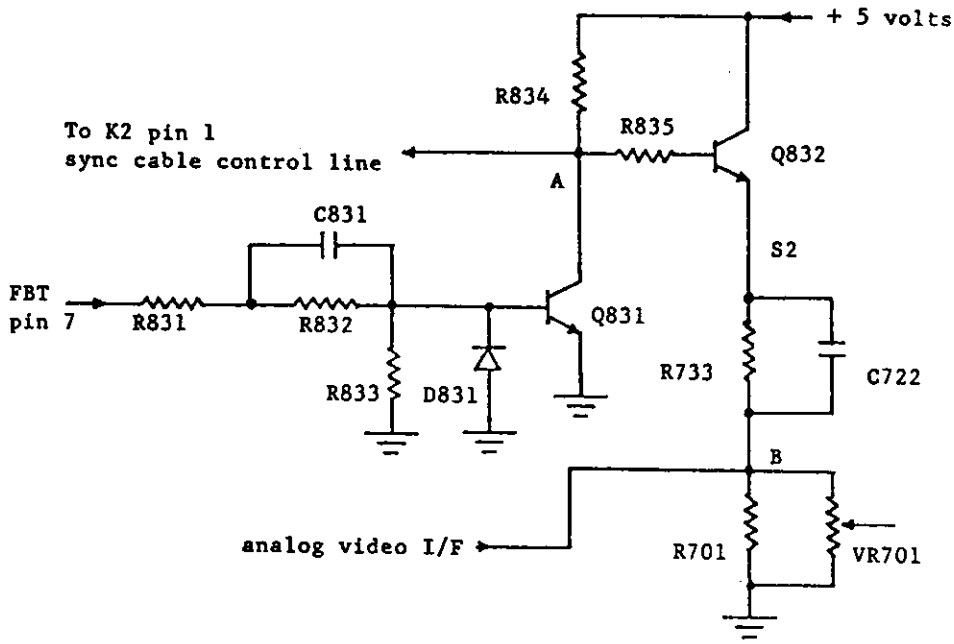
Pin 10 inputs the ramp output waveform to the IC's internal pre-amplifier and power amplifier, whose output appears at pin 4 in turn. Pin 11 is used for compensation.

E. Pin 2 and 5 connects a DC supply voltage of about 14V.

VII. Video Circuit

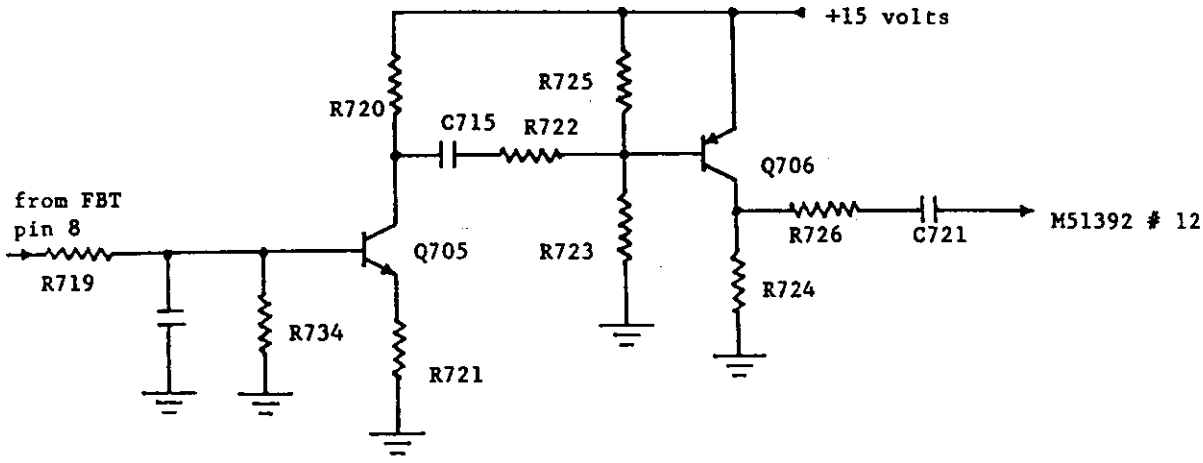
A. White pattern control

With no sync signal applied, the monitor should display an all-white pattern. The operation is as follows:



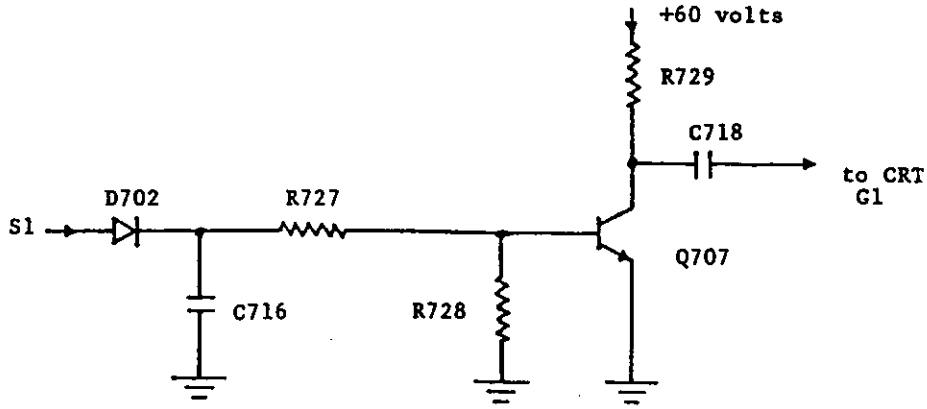
Test points	A	Q832	S2	B
Sync cable connected to PS/2	Lo	Off	floating	video sync
Sync cable not connected to PS/2		active		 white pattern sync

B. Clamp pulse circuit



C. Blanking circuit

S1, taken from TDA1170N pin 3, passes through D702, C716 to prolong the input pulse. The blanking signal is then sent to Q707 which produces a 50 Vpp blanking signal after amplification.



D. The M51392 input signal may be taken from either S2 or VA (video analog). VR701 limits the signal Vpp as C701 and C702 couples it to pin 1. Pin 4 provides contrast control using an external DC. Pin 9 is the clamp level input clamped at around 10V.

E. The M51392 output at pin 8, passing through Q701, is sent to Q703, Q704 for amplification. Q702 provides negative feedback to pin 11.

VIII. Power Supply

A. The input supply voltage is 110V/220V selectable.

B. The power board is divided into two sections. The circuit formed by LM317 is capable of supplying 20-35V DC, and is normally set at +32V. The other is the circuit associated with 7815, which supplies a regulated 15V DC.

C. The +30V is supplied only to the FBT in the horizontal oputput stage while the remaining circuits are supplied with +15V.

=== Section 4 ==========

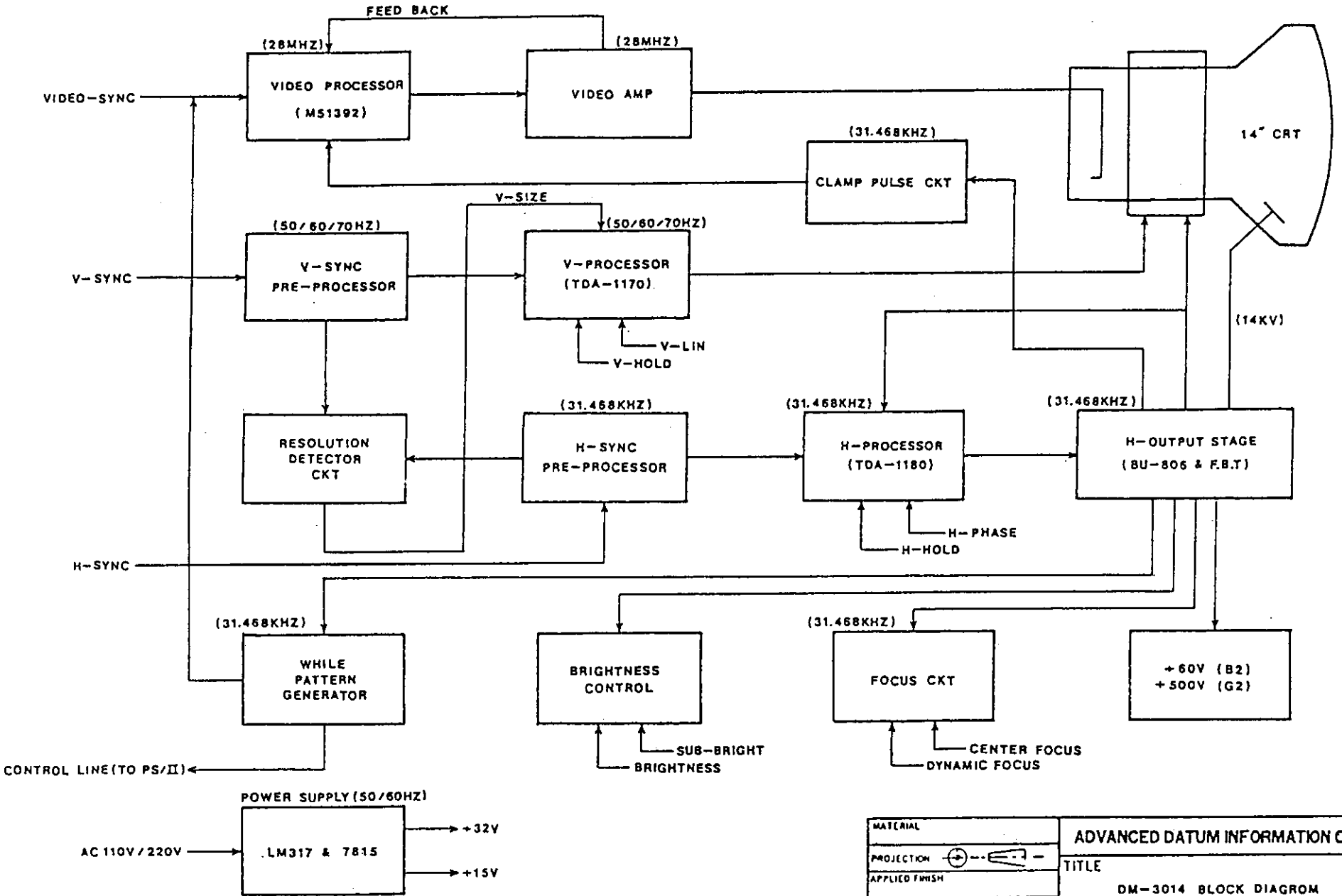
Block Diagram

==========

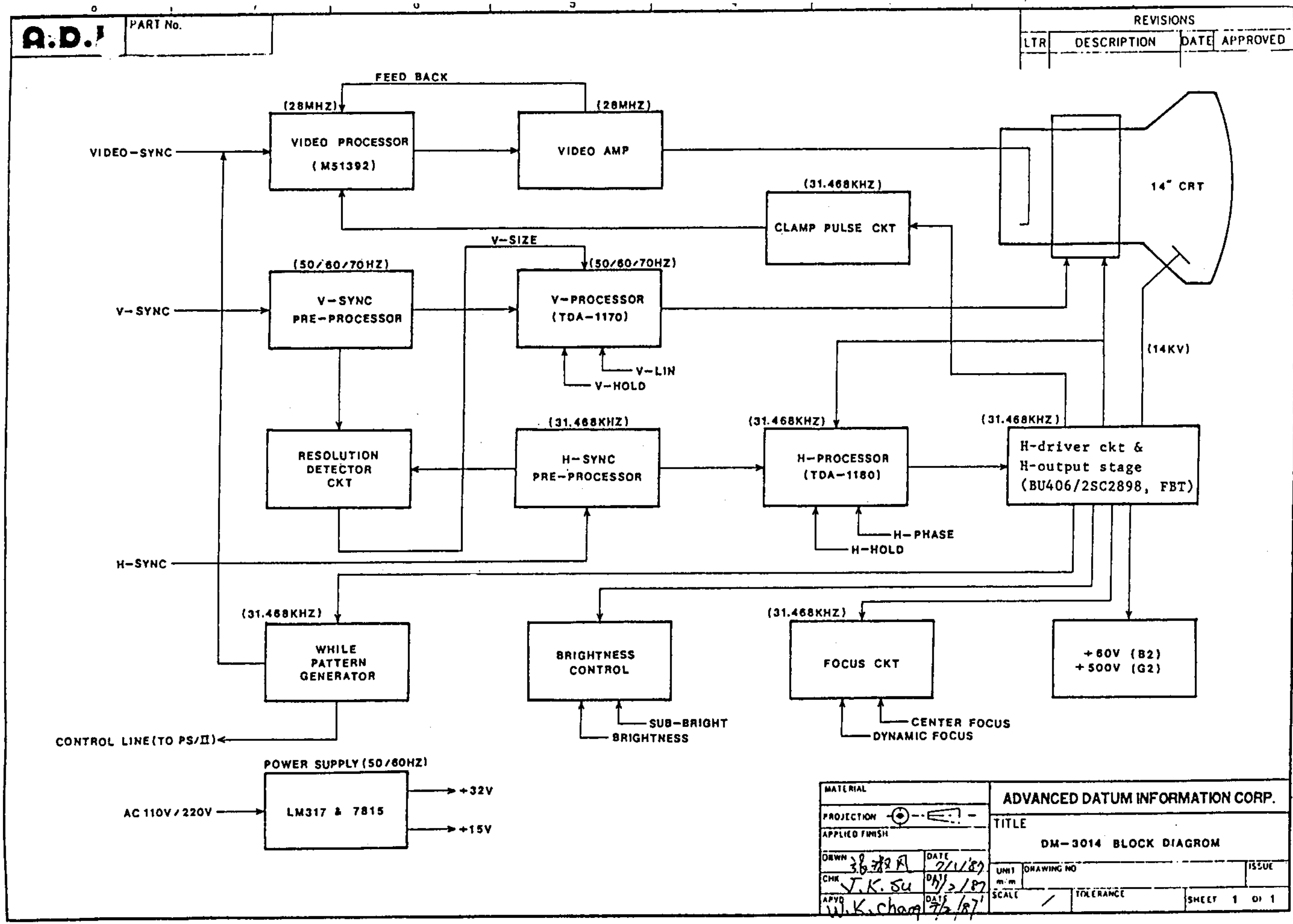
1. DM-3014 block diagram

A.D.I. PART No.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



MATERIAL	ADVANCED DATUM INFORMATION CORP.
PROJECTION	TITLE: DM-3014 BLOCK DIAGROM
APPLIED FINISH	
DRWN 張秀月 DATE 7/1/87	UNIT mm/m DRAWING NO ISSUE
CHK J.K. Su DATE 7/1/87	SCALE / TOLERANCE SHEET 1 OF 1
APVD DATE	

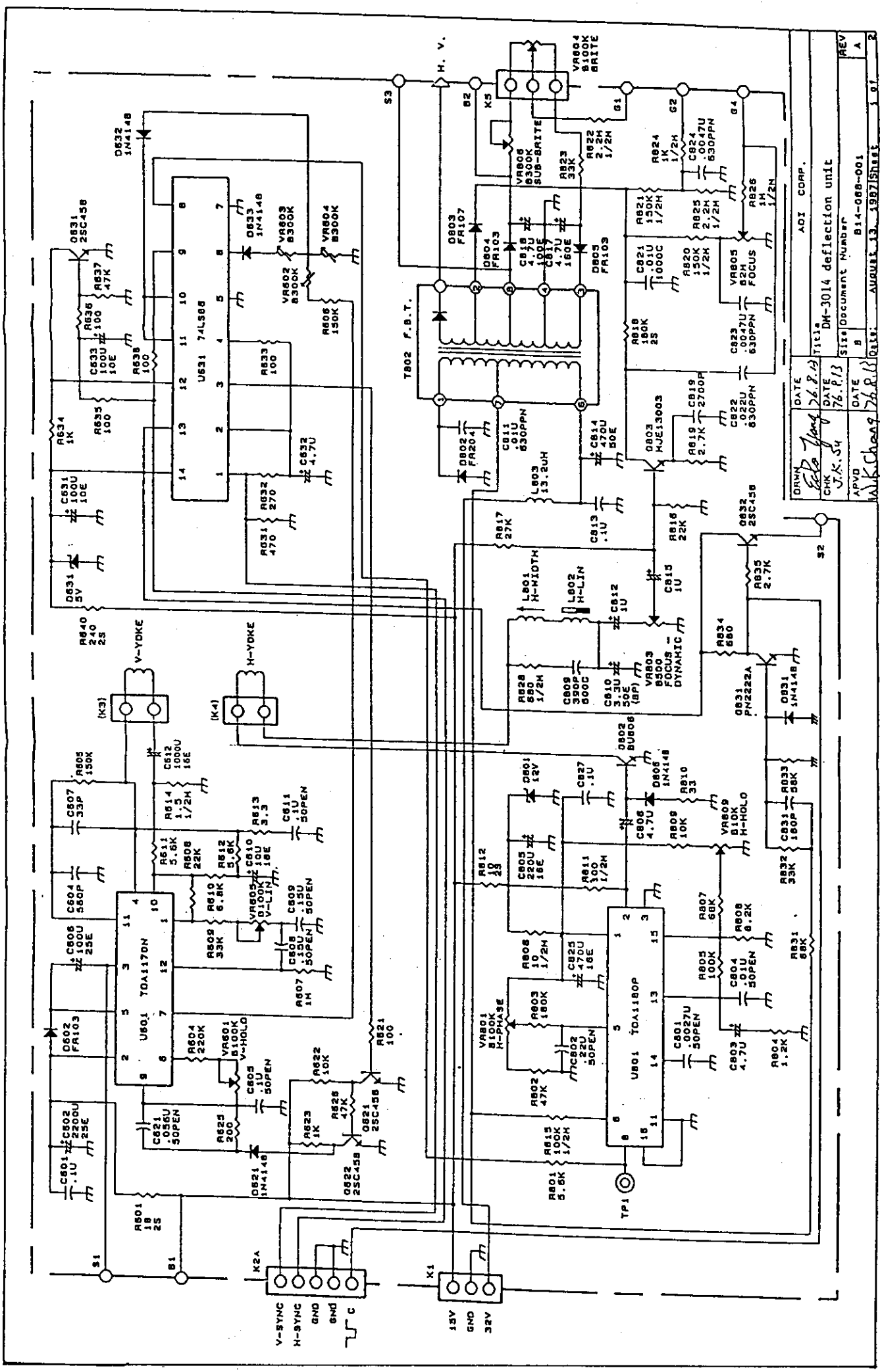

A.D.I
PART No.
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
FEED BACK
(28MHZ)
VIDEO PROCESSOR (M51392)
(28MHZ)
VIDEO AMP
VIDEO-SYNC
14" CRT
(31.468KHZ)
CLAMP PULSE CKT
V-SIZE
(50/60/70HZ)
V-SYNC PRE-PROCESSOR
(50/60/70HZ)
V-PROCESSOR (TDA-1170)
V-SYNC
V-LIN
V-HOLD
(14KV)
RESOLUTION DETECTOR CKT
(31.468KHZ)
H-SYNC PRE-PROCESSOR
(31.468KHZ)
H-PROCESSOR (TDA-1180)
(31.468KHZ)
H-driver ckt &
H-output stage
(BU406/2SC2898, FBT)
H-PHASE
H-HOLD
H-SYNC
(31.468KHZ)
WHILE PATTERN GENERATOR
BRIGHTNESS CONTROL
(31.468KHZ)
FOCUS CKT
+60V (B2)
+500V (G2)
SUB-BRIGHT
BRIGHTNESS
CENTER FOCUS
DYNAMIC FOCUS
CONTROL LINE(TO PS/II)
POWER SUPPLY(50/60HZ)
AC 110V/220V
LM317 & 7815
+32V
+15V
MATERIAL
PROJECTION
APPLIED FINISH
ADVANCED DATUM INFORMATION CORP.
TITLE
DM-3014 BLOCK DIAGROM
DRWN
CHK J.K.Su
APVD W.K.Chang
DATE 7/1/87
DATE 7/2/87
DATE 7/2/87
UNIT m·m
DRAWING NO
ISSUE
SCALE /
TOLERANCE
SHEET 1 OF 1

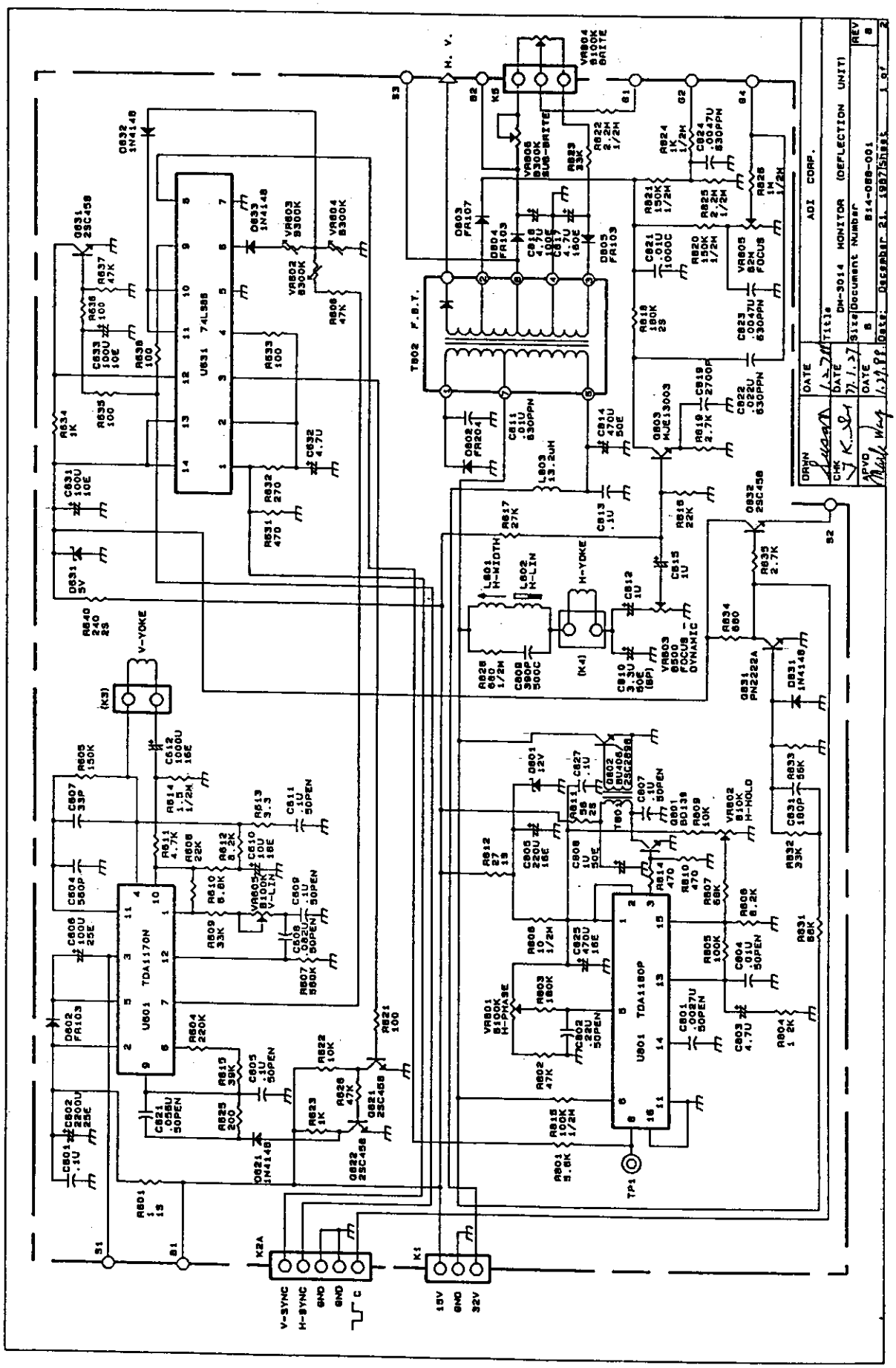
=== Section 5 ==========

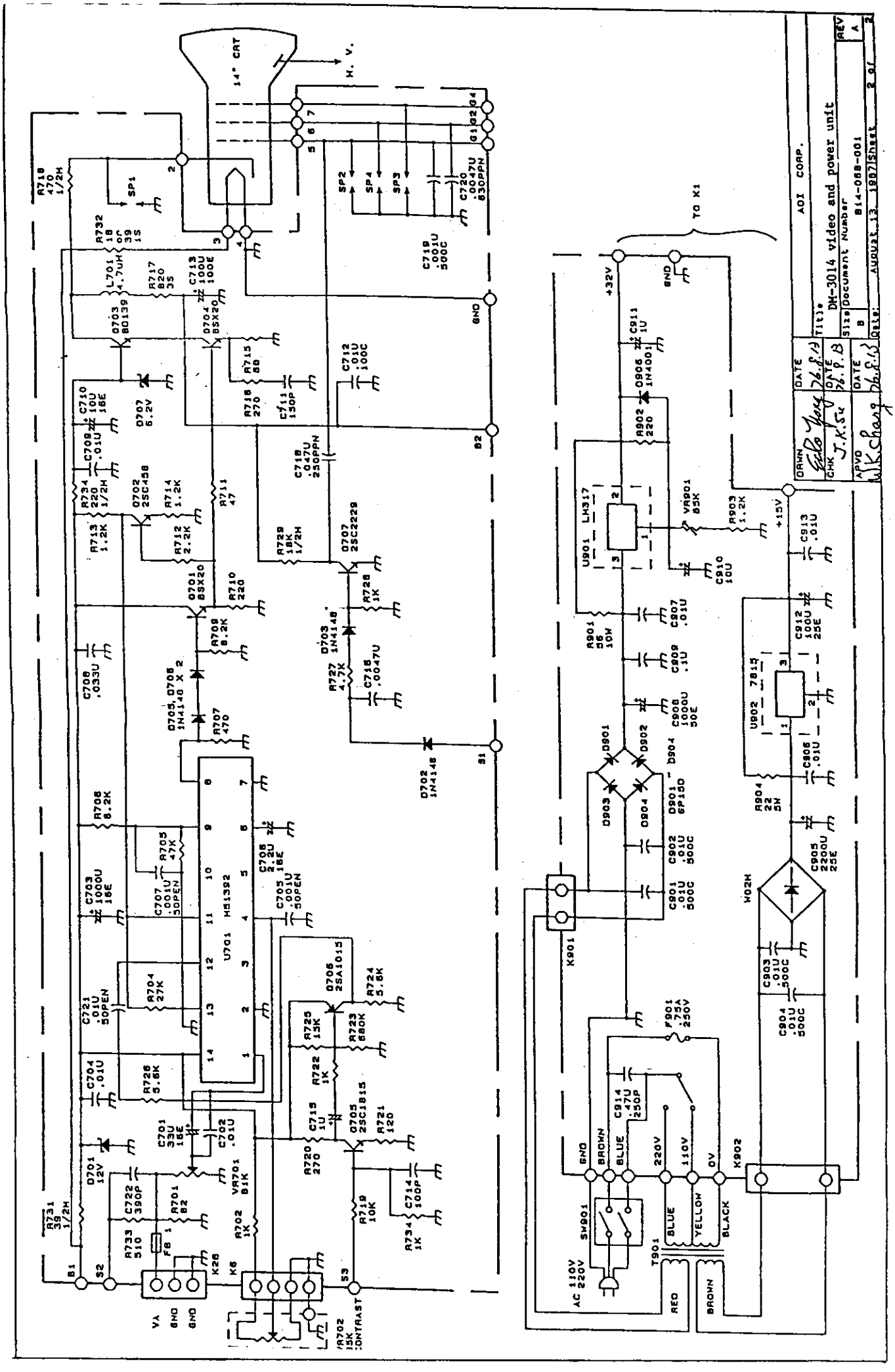
Schematic Diagram

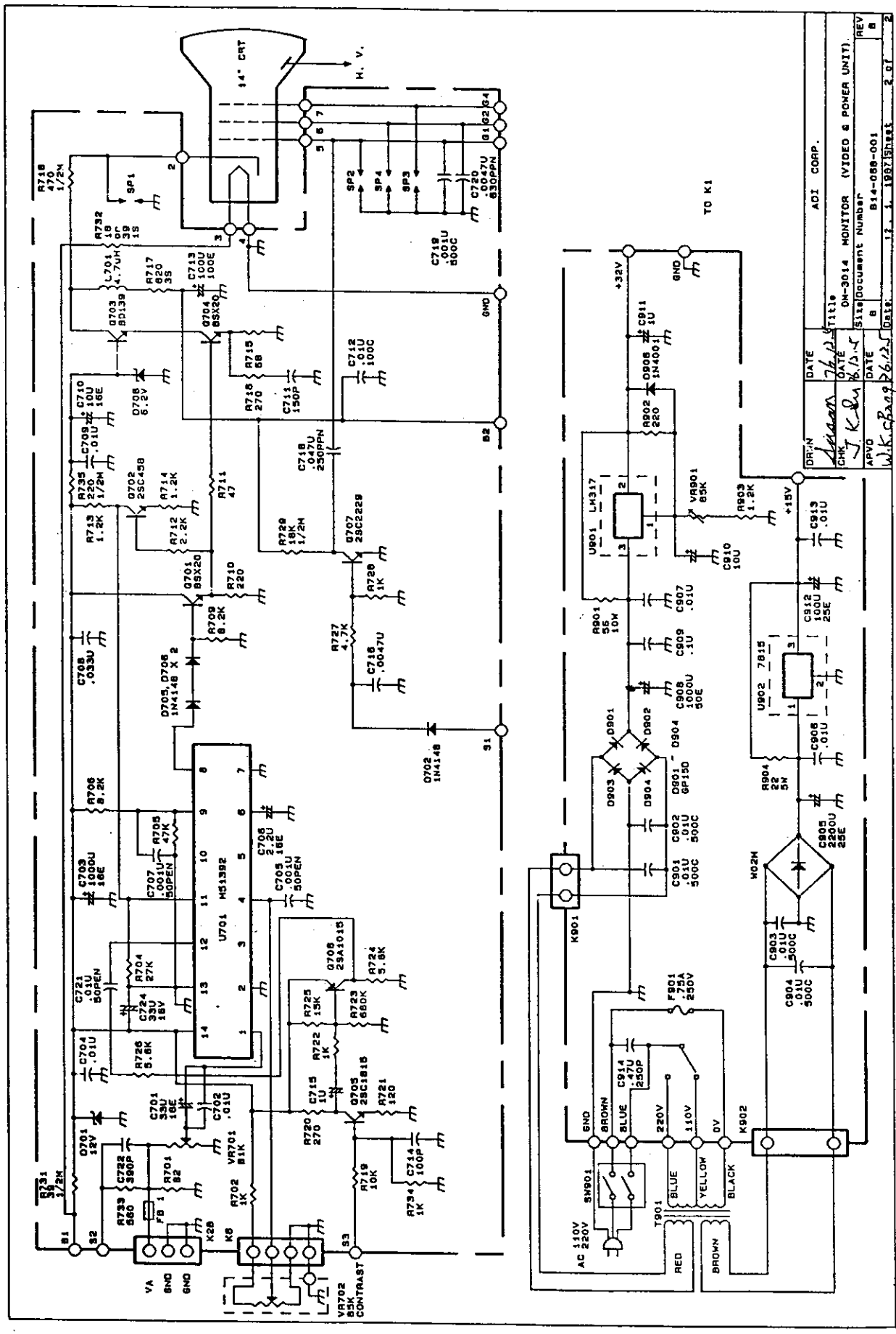
==========

1. DM-3014 deflection unit
2. DM-3014 video and power unit


AOI CORP.
Title DM-3014 deflection unit
Size B
Document Number B14-068-001
REV A
Date: August 13, 1987
Sheet 1 of 2
DRWN
CHK
APVD
DATE
H. V.
F.B.T.
V-YOKE
H-YOKE
V-SYNC
H-SYNC
GND
15V
32V
TDA1170N
TDA1180P


ADI CORP.
DM-3014 MONITOR (DEFLECTION UNIT)
814-088-001
December 21, 1987
U501 TDA1170N
U601 TDA1180P
U631 74LS86
T802 F.B.T.
H-WIDTH
H-LIN
H-YOKE
V-YOKE
V-SYNC
H-SYNC
15V
32V

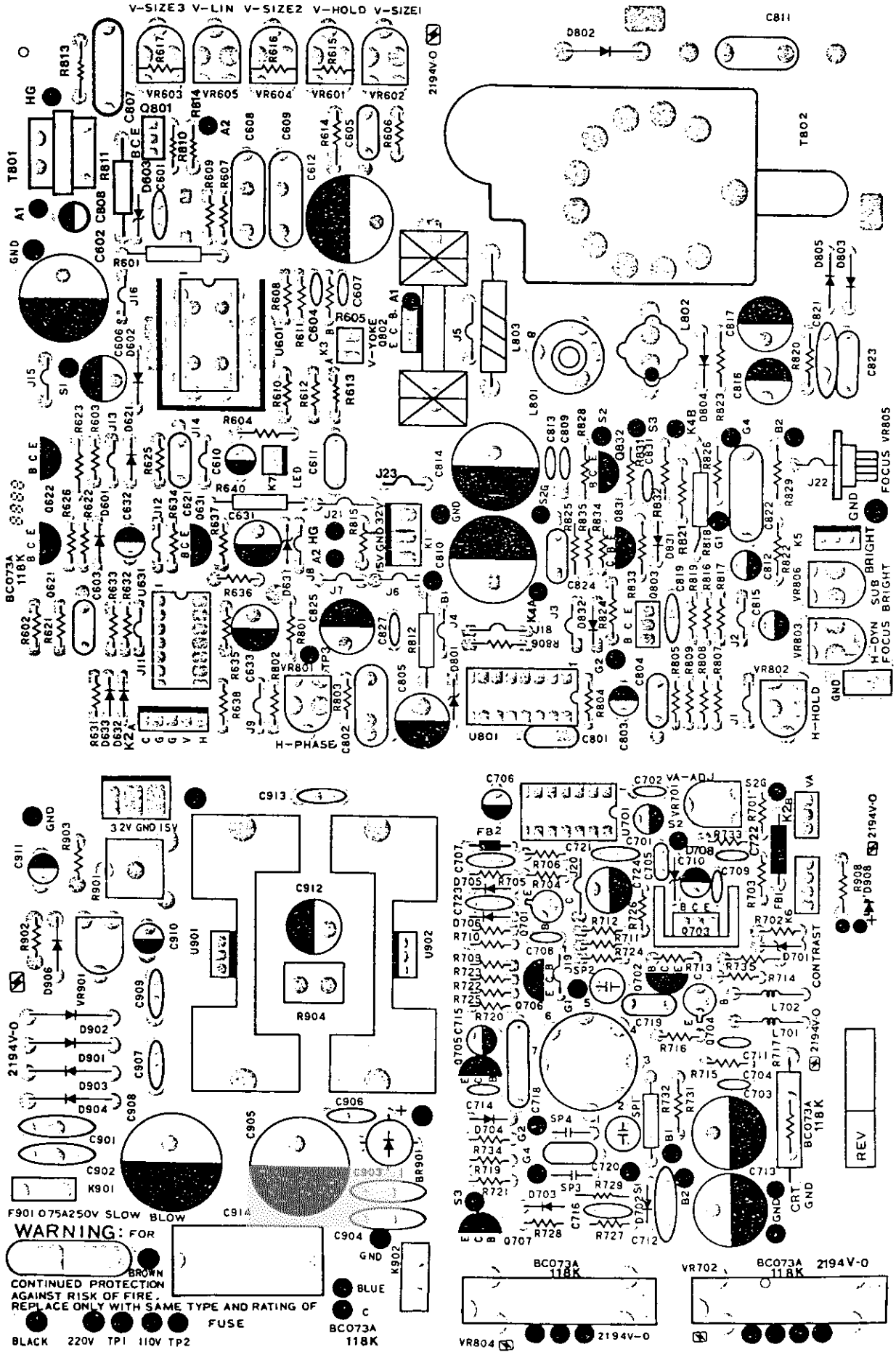

14" CRT
H. V.
TO X1
AOI CORP.
Title: DM-3014 video and power unit
Size: B
Document Number: B14-068-001
Date: August 13 1987
Sheet 2 of 2
REV A
DRAWN
CHK
APVD
DATE
U701 HS1392
U901 LM317
U902 7815
D701 12V
D702 1N4148
D703 1N4148
D704 BSX20
D705,D706 1N4148 X 2
D707 6.2V
D901 6P15D
D902 D903 D904
Q701 BSX20
Q702 2SC458
Q703 BC139
Q704 BSX20
Q705 2SC1815
Q706 2SA1015
Q707 2SC2229
VA701 81K
VA702 15K CONTRAST
VR901 85K
SW901
T901
F901 .75A 250V
F8 1
K901
K902
K26
K6
SP1
SP2
SP3
SP4
B1
S1
S2
S3
B2
GND
+32V
+15V
AC 110V 220V
BROWN
BLUE
YELLOW
BLACK
RED
220V
110V
0V


14" CRT
H. V.
TO K1
ADI CORP.
DH-3014 MONITOR (VIDEO & POWER UNIT)
B14-058-001
U701 M51382
U901 LM317
U902 7815
VR702 85K CONTRAST
VR901 85K
T901
SW901
K901
K902
F901 .75A 250V
AC 110V 220V
BROWN
BLUE
YELLOW
BLACK
RED
GND
+32V
+15V
220V
110V
0V

=== Section 6 ==========

Component Layout

==========


V-SIZE3 V-LIN V-SIZE2 V-HOLD V-SIZE1
VR603 VR605 VR604 VR601 VR602
2194V-O
T801
T802
Q801
V-YOKE
H-PHASE
H-HOLD
H-DYN FOCUS
SUB BRIGHT
FOCUS VR805
U801
U901
U902
32V GND 15V
F901 075A250V SLOW BLOW
WARNING: FOR
CONTINUED PROTECTION
AGAINST RISK OF FIRE.
REPLACE ONLY WITH SAME TYPE AND RATING OF
FUSE
BLACK 220V TP1 110V TP2
BROWN
BLUE
BC073A 118K
VA-ADJ
CONTRAST
CRT GND
REV
VR804
VR702

=== Section 7 ==========

Disassembly and Assembly

==========

This section intentionally left blank

Sub-assembly List

==========

=== Section 9 ==========

Spare parts List

==========

The following parts are not available for ordering:

1. Alloys, resins, adhesives, tapes
2. Carbon resistors less than 1/4 watt
3. Ceramic capacitors less than 50V
4. Electrolytic capacitors less than 50V, 100uF
5. Jumpers, tie wirings, screws, labels, and bare PCB
6. Housing and mechanical parts

MODEL : DM-3014/S00
ASS'NO : S2011----S00

MODULE : PWR+MONITOR BOARD
SUBASS'NO : C2011----S00

ITEM	NPNO	DESCRIPTION	QTY	<-- MATERIAL COST --> U/P	US-AMT	LOCATION
46		TR. POWER, BD139	2.0000	.8	1.6	Q703 Q801
47		TR. S-SIGNAL, 2SC1815Y	1.0000	.4	.4	Q705
48		TR. S-SIGNAL, 2SC458C	1.0000	.4	.4	Q702
49		TR. S-SIGNAL, 2SA1015O	1.0000	.4	.4	Q706
50		TR. S-SIGNAL, 2SC2229O	1.0000	.4	.4	Q707
51		DIODE, S-SIGNAL, 1N4148	1.0000	.4	.4	D702
52		ZENER DIODE, 1/2W 12V, BZX79B12	1.0000	.4	.4	D701
53		SVR. H-M,-S, 1K, VZ084SL3	1.0000	.4	.4	VR701
54		RES. M-OXIDE-S, 1W, 18 OHM J	1.0000	.4	.4	R732
55		RES. M-OXIDE-S, 3W, 820 OHM J	1.0000	.4	.4	R717
56		CAP. ELECT, 100UF 100V	1.0000	.8	.8	C713
57		CAP. CERAMIC, B K, 1000P 500V	1.0000	.4	.4	C719
58		CAP. CERAMIC, B K, 0.01UF 500V	1.0000	.4	.4	C712
59		CAP. PEN, J, 0.047UF 250V	1.0000	.4	.4	C718
60		CAP. PEN, K, 0.0047UF 630V	1.0000	.4	.4	C720
61		ZENER DIODE, 1/2W 6.2V, BZX79B6V2	1.0000	.4	.4	D708
62		DIODE, S-SIGNAL, 1N4148	2.0000	.4	.8	D705 D706
				- TOTAL -	63.9	

--- TO BE CONTINUED ---

***** STANDARD MATERIAL COST *****

JDI CORP.

MODEL : DN-3314:300 MODULE : PWR+MONITOR BOARD
ASS'NO : S2011----300 SUBASS'NO : C2011----300

ITEM	NPNO	DESCRIPTION	QTY	<-- MATERIAL COST --> U/P	US-AMT	LOCATION			
1		IC LINEAR, LM317	1.0000	1.6	1.6	U901			
2		POWER REGULATOR, L7815V	1.0000	.8	.8	U902			
3		DIODE, REC. 1.5A 200V, GP15D	4.0000	.4	1.6	D901	D902	D903	D904
4		DIODE, BRIDGE, 1.5A 200V, WG2M	1.0000	.8	.8	BR901			
5		DIODE, REC. 1A 200V, RGP10D	1.0000	.4	.4	D906			
6		SVR. H-M,-S, 5K, VzO84TL3	1.0000	.4	.4	VR901			
7		RES. W-WOUND, 10W, 56 OHM J	1.0000	.8	.8	R901			
8		CPA, ELECT, 2200UF 25V	1.0000	1.2	1.2	C905			
9		CAP. ELECT, 1000UF 50V	1.0000	1.6	1.6	C908			
10		CAP. CERAMIC, B K, 0.01UF 500V	4.0000	.4	1.6	C901	C902	C903	C904
11		FUSE, SLOW BLOW, 0.75A 250V	1.0000	.4	.4	F901			
12		IC LINEAR, TDA1170N	1.0000	2.1	2.1	U601			
13		IC LINEAR, TDA1180P	1.0000	2.1	2.1	U801			
14		IC TTL, 74LS36	1.0000	.8	.3	U631			
15		TR. POWER, 2SC2898	1.0000	2.4	2.4	Q802			
16		TR. POWER, MJE13003	1.0000	1.6	1.6	Q803			
17		TR. S-SIGNAL, PN2222A	1.0000	.4	.4	Q831			
18		TR. S-SIGNAL, 2SC458C	4.0000	.4	1.6	Q621	Q622	Q631	Q832
19		DIODE, REC. 1A 200V, RGP10D	3.0000	.4	1.2	D602	D804	D805	
20		DIODE, REC. 1A 1KV, RGP10M	1.0000	.8	.8	D803			
21		DIODE, REC. 2A 400V, RGP20G	1.0000	.8	.8	D802			
22		ZENER DIODE, 1/2W 12V, BZX79B12	1.0000	.4	.4	D801			
23		ZENER DIODE, 1/2W 5.1V, HZ5C2	1.0000	.4	.4	D631			
24		DIODE, S-SIGNAL, 1N4148	5.0000	.4	2.0	D621	D632	D633	D831
						D832			
25		F.B.T. 1-482-066	1.0000	9.9	9.9	T802			
26		WIDTH COIL, 1-224-131	1.0000	1.6	1.6	L801			
27		LINER COIL, 1-224-042	1.0000	1.2	1.2	L802			
28		CHOKE, 13uH	1.0000	.4	.4	L803			
29		SVR. H-M,-S, 500, VzO84TL3	1.0000	.4	.4	VR803			
30		SVR. H-M,-S, 10K, VzO84TL3	1.0000	.4	.4	VR802			
31		SVR. H-M,-S, 100K, VzO84TL3	2.0000	.4	.8	VR605	VR801		
32		SVR. H-M,-S, 300K, VzO84TL3	4.0000	.4	1.6	VR602	VR603	VR604	VR806
33		SVR. V-M,-S, 2M, VG152H10S	1.0000	1.2	1.2	VR805			
34		CPA, ELECT, 2200UF 25V	1.0000	1.2	1.2	C602			
35		CAP. ELECT, 4.7UF 100V	1.0000	.4	.4	C816			
36		CAP. ELECT, 4.7UF 160V	1.0000	.4	.4	C817			
37		CAP. ELECT, BP, 3.3UF 50V	1.0000	1.6	1.6	C810			
38		CAP. CERAMIC, B K, 390P 500V	1.0000	.4	.4	C809			
39		CAP. CERAMIC, B K, 0.01UF 1KV	1.0000	.4	.4	C821			
40		CAP. PPN, K, 0.0047UF 630V	1.0000	.4	.4	C823			
41		CAP. PPN, J, 0.022UF 630V	1.0000	.4	.4	C822			
42		CAP. PPN, J, 0.01UF 630V	1.0000	.4	.4	C811			
43		RES. M-OXIDE-S, 2W, 100 OHM J	1.0000	.4	.4	R811			
44		IC LINEAR, M51392P	1.0000	2.2	2.2	U701			
45		TR. S-SIGNAL, BSX20	2.0000	.8	1.6	Q701	Q704		

MODEL : DM-3014/S00
ASS'NO : S2011----S00

MODULE : ELECTRICAL PARTS
SUBASS'NO : E2011----S00

ITEM NPNO	DESCRIPTION	QTY	<-- MATERIAL COST --> U/P	US-AMT	LOCATION
63	CRT, 14" P/W, M32EAA12WD	1.0000	26.1	26.1	CRT
65	YOKE, 1-225-041	1.0000	5.0	5.0	
66	SW. SEESAW, D.P.S.T.	1.0000	1.8	1.8	PWR SWITCH
67	LED, GREEN, 2.0x7.0	1.0000	.4	.4	
69	CABLE WIRE ASS'Y, 6P	1.0000	9.1	9.1	FOR SYNC
70	SL.VR. PCB.-C, 100K, VJ2013PVN5B	1.0000	1.2	1.2	VR804
71	SL.VR. PCB.-C, 5K, VJ2013PVN5B	1.0000	1.2	1.2	VR702
			- TOTAL -	58.2	
----- THE END -----					
64.1	POWER TRANS., UL/CSA USE	1.0000	11.00	11.00	T901
64.2	POWER TRANS., VDE USE	1.0000	12.00	12.00	T901
68.1	CORD, AC PWR, C + NS, UL/CSA	1.0000	2.50	2.50	AC CORD
68.2	CORD, AC PWR, C + NS, VDE	1.0000	3.00	3.00	AC CORD
68.3	CORD, AC PWR, C + NS, BSI	1.0000	3.50	3.50	AC CORD
68.4	CORD, AC PWR, C + NS, SAA	1.0000	2.50	2.50	AC CORD

Appendix

1. List of major ICs

    a. TDA1170N
    b. TDA1180P
    c. 74LS86
    d. LM317
    e. M51392
    f. HA17815

2. Spare Parts Ordering Form

3. Readers' Comment Form

A. TDA1170N Low-noise TV Vertical Deflection System

The TDA1170N is a monolithic integrated circuit packaged in a 12-lead quad in-line plastic package. It is intended for use in black and white and color TV receivers and its low noise characteristics make it particularly suitable for monitor applications.

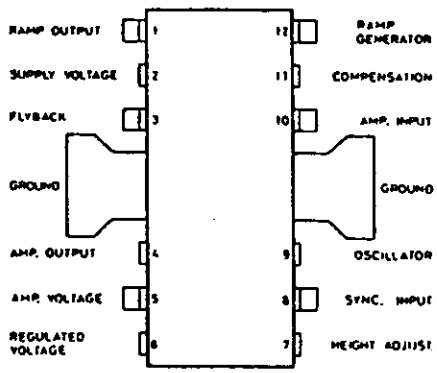
Functions incorporated in the TDA1170N are:

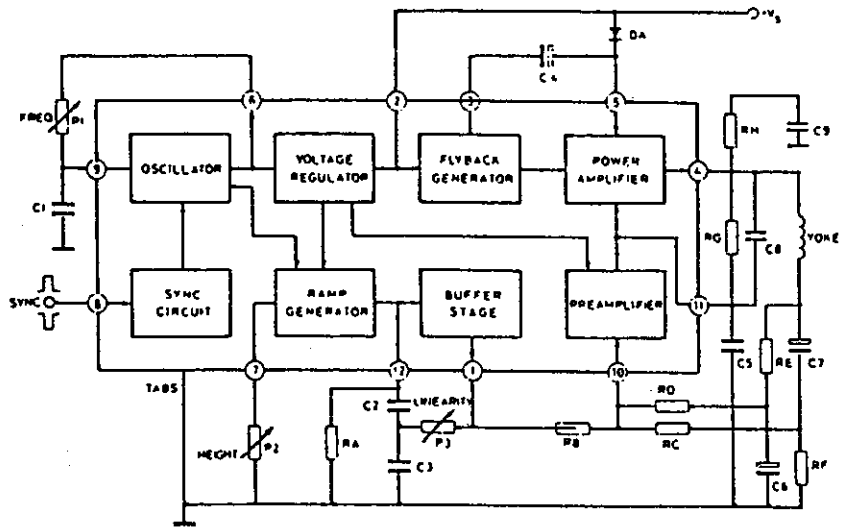
- o synchronization circuit
- o oscillator and ramp generator
- o high power gain amplifier
- o flyback generator
- o voltage regulator

1. Absolute Maximum Ratings

V_s	Supply voltage at pin 2	35	V
V4, V5	Flyback peak voltage	60	V
V10	Power amplifier input voltage	+ 10	V
		- 0.5	V
I_o	Output peak current (non repetitive) at t = 2 msec	2	A
I_o	Output peak current at f = 50 Hz t ≤ 10 µsec	2.5	A
I_o	Output peak current at f = 50 Hz t > 10 µsec	1.5	A
I_3	Pin 3 OC current at V4 < V2	100	mA
I_3	Pin 3 peak to peak flyback current for f = 50 Hz, t_{fly} ≤ 1.5 msec	1.8	A
I_8	Pin 8 current	± 20	mA
P_{tot}	Power dissipation: at T_{tab} = 90°C	5	W
	at T_{amb} = 80°C (free air)	1	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	°C

2. Connection and Block Diagram





3. TDA1170N Electrical Characteristics

I_2	Pin 2 quiescent current	$I_3 = 0$		7	14	mA	1b
I_5	Pin 5 quiescent current	$I_4 = 0$		8	15	mA	1b
$-I_9$	Oscillator bias current	V9 = 1V		0.1	1	µA	1a
$-I_{10}$	Amplifier input bias current	V10= 1V		1	7	µA	1b
$-I_{12}$	Ramp generator bias current	V12= 0		0.02	0.3	µA	1a
$-I_{12}$	Ramp generator current	I_7 = 20 µA V12= 0	19	20	24	µA	1b
$\frac{\Delta I_{12}}{I_{12}}$	Ramp generator non-linearity	ΔV12= 0 to 12V I_7 = 20 µA		0.2	1	%	1b
V_s	Supply voltage range		10		35	V	–
V1	Pin 1 saturation voltage to ground	I_1 = 1 mA		1	1.4	V	–
V3	Pin 3 saturation voltage to ground	I_3 = 10 mA		1.7	2.6	V	1a
V4	Quiescent output voltage	V_s= 10V R1= 10 KΩ R2 = 10 KΩ	4.17	4.4	4.63	V	1a
		V_s= 35V R1= 30 KΩ R2 = 10 KΩ	8.35	8.8	9.25	V	1a
V4L	Output saturation voltage to ground	$-I_4$= 0.1A		0.9	1.2	V	1c
		$-I_4$= 0.8A		1.9	2.3	V	1c
V4H	Output saturation voltage to supply	I_4 = 0.1A		1.4	2.1	V	1d
		I_4 = 0.8A		2.8	3.2	V	1d
V6	Regulated voltage at pin 6		6.1	6.5	6.9	V	1b
V7	Regulated voltage at pin 7	I_7 = 20 µA	6.2	6.6	7	V	1b
$\frac{\Delta V6}{\Delta V_s} : \frac{\Delta V7}{\Delta V_s}$	Regulated voltage drift with supply voltage	ΔV_s= 10 to 35V		1		mV/V	1b
V10	Amplifier input reference voltage		2.07	2.2	2.3	V	–
R8	Pin 8 input resistance	V8 < 0.4V	1			MΩ	1a

B. TDA1180 TV Horizontal Processor

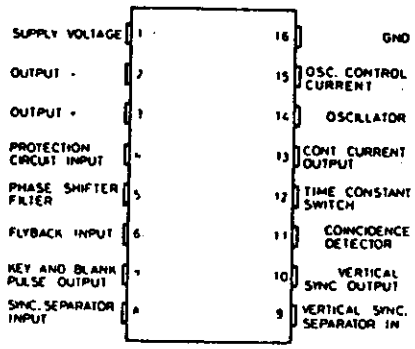
The TDA1180P is a horizontal processor circuit for black & white and color television receivers. It is a monolithic integrated circuit encapsulated in a 16-lead dual-in-line plastic package with the following functions:

- o Noise gated horizontal sync separator.
- o Noise gated vertical sync separator.
- o Horizontal oscillator with frequency range limiter.
- o Phase comparator between sync pulses and oscillator pulses (PLL).
- o Phase comparator between flyback pulses and oscillator pulses (PLL).
- o Loop gain and time constant switching.
- o Composite blanking and key pulse generator.
- o Protection circuits.
- o Output stages with high current capability.

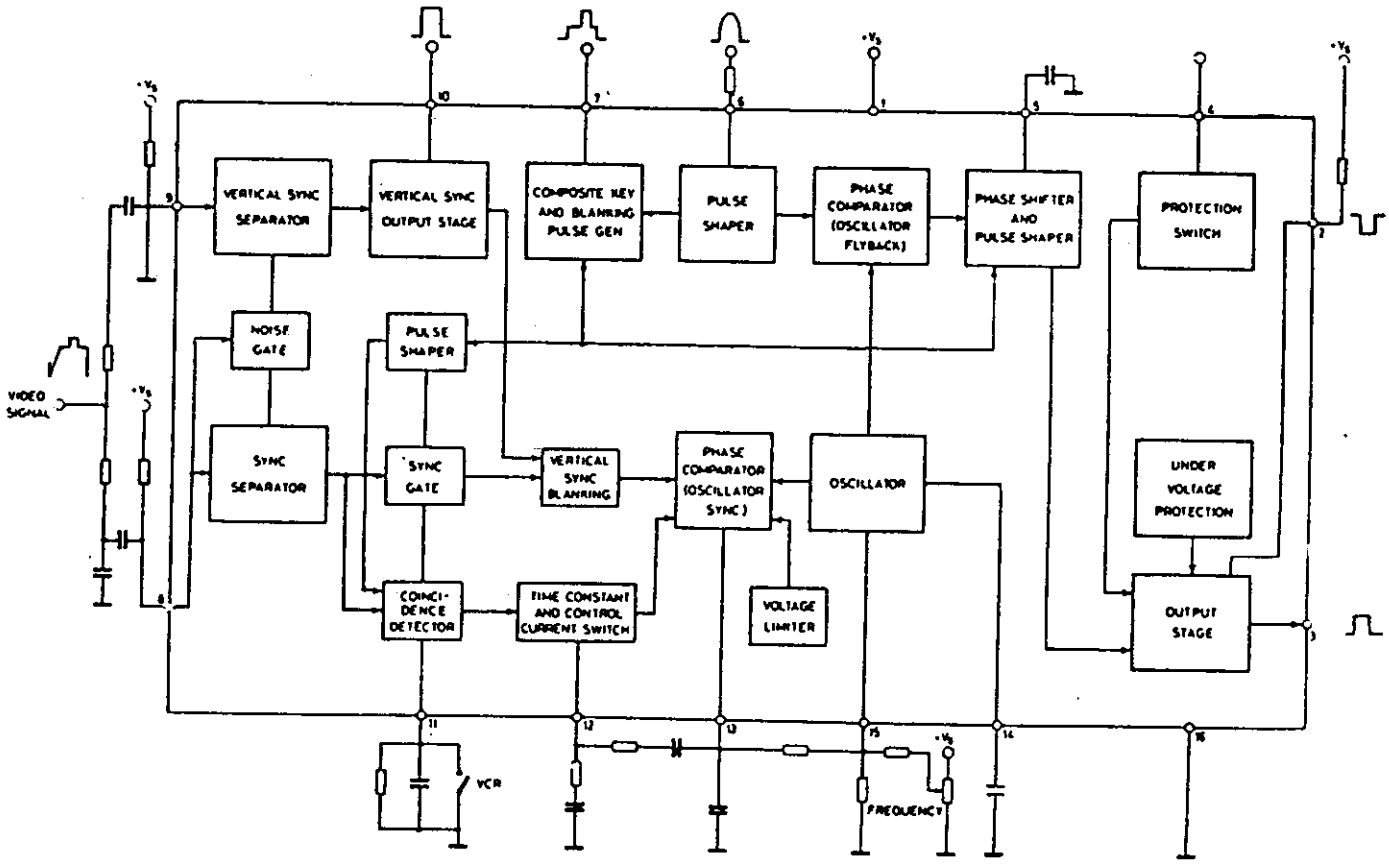
1. Absolute Maximum Ratings

V_s	Supply voltage (pin 1)	15	V
V_2	Voltage at pin 2	18	V
V_4	Voltage at pin 4	V_s	
V_8	Voltage at pin 8	V_s / V_s -6	V
V_9	Voltage at pin 9	+6 / -6	V
V_{11}	Voltage at pin 11	V_s	
I_2	Pin 2 peak current	1	A
I_3	Pin 3 peak current	0.5	A
I_6	Pin 6 current	30	mA
I_7	Pin 7 current	20	mA
I_{10}	Pin 10 current	30	mA
P_{tot}	Total power dissipation at $T_{amb} \leq 70°C$	1	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	°C

2. Connection Diagram



3. TDA1180P Block Diagram



4. Application Information

Pin 1 : positive supply

- o The operating supply voltage of the device ranges from 10V to 13.2V.

Pin 2 and 3 : output

- o The outputs of TDA1180P are suitable for driving transistor output stages, delivering positive pulses at pin 3 and negative pulses at pin 2.

  The negative pulse is used to directly drive an output stage while the positive pulse is used when an additional driver stage is required.

The rise and fall time of the output pulses are about 150 ns to avoid interference due to radiation and the output stages are internally protected against short circuits.

Pin 4 : protection circuit input

- The IC output pulses at pin 2 and 3 are shut off by connecting pin 4 to ground, protecting the final stages from overloads.

  The output pulses are also shut off when the power supply voltage falls below 4V.

Pin 5 : phase shift filter

- To compensate the delay introduced by the final stages, the flyback pulses to pin 6 and the oscillator waveform are compared in the oscillator-flyback pulse comparator.

  The comparison result is a control current which, after it has been filtered by the external capacitor connected to pin 5, is sent to a phase shifter which regulates the phase of the output pulses.

  The maximum phase shift allowable is:

  $$td = tp - tf$$

  where tf is the flyback pulse duration.

  Pin 5 has high input and output resistance.

Pin 6 : flyback input

- The flyback pulse drives the high impedance input through a resistor to limit the input current to suitable maximum values.

  The flyback input pulses are porocessed by a double threshold circuit. The circuit generates the blanking pulses by sensing the low level flyback voltage and pulses to drive the phase comparator by sensing the high level flyback voltage. In this manner, phase jitter normally associated with the flyback pulse is avoided.

Pin 7 : key and blanking pulse output

- The key pulse for taking out the burst from the chrominance signal is generated from the oscillator

ramp and has a fixed position with respect to the sync. This key pulse is then added internally to the blanking pulse obtained by correctly forming the flyback pulse present at pin 6.

The sum of the two signals is a sandcastle pulse available on low impedance at output pin 7.

Pin 8 and 9 : sync separator inputs

- The video signal is applied by two distinct biasing networks to the vertical and horizontal sync separators (pins 8 and 9) of the IC.

  The horizontal sync separator takes the sync pulses out of the video signal and makes them available to the rest of the circuit for further processing.

  An amplitude detector connected to pin 8 blocks operation of the sync separator when interference or noise peak exceeds a certain preset value.

Pin 10 : vertical sync output

- The vertical sync pulse, obtained by internal integration of the synchronization signal, is available at this output. The output impedacne is normally 10K and its lowest amplitude without load is 11V.

Pin 11 : coincidence detector

- A gate pulse 7 usec wide, whose phase position is centered on the horizontal synchronization, is taken form the horizontal oscillator waveform. This gate pulse performs two functions. First, it controls a logic block which permits the sync to reach the oscillator-sync phase comparator only for as long as its duration. Second, it allows oscillator latching and delatching.

  This function is obtained by a coincidence detector which compares the phase of the gate pulses with that of the sync.

  When the two signals are not accurately aligned in time the oscillator is not synchronized. In this case the oscillator acts on the logic block to eliminate its filtering effect and on the time constant block to establish a high impedance on pin 12.

The time constant switching block also acts on the oscillator-sync phase detector to increase its sensitivity and the loop gain of the synchronizing system.

Pin 12 : time constant switch (see pin 11)

Pin 13 : control current output

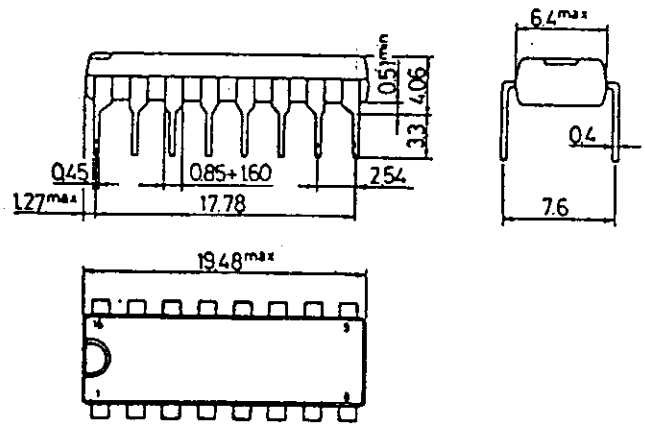
- The oscillator is synchronized by comparing its wavefrom phase with that of the sync pulses in the oscillator-sync phase comparator and sending its output current to pin 15 of the oscillator after it has been filtered properly by an external low-pass circuit.

Pin 14 : oscillator (see pin 13)

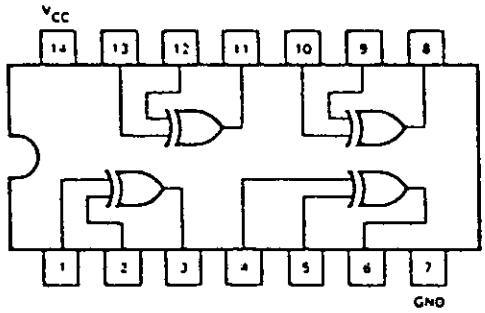
Pin 15 : oscillator control current input (see pin 13)

Pin 16 : ground

5. TDA1180P Mechanical Data



C. 74LS86 Quad 2-input Exclusive OR Gate



TRUTH TABLE

IN		OUT
A	B	Z
L	L	L
L	H	H
H	L	H
H	H	L

1. Operating Ranges

SYMBOL	PARAMETER		MIN	TYP	MAX	UNIT
V_{CC}	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
T_A	Operating Ambient Temperature Range	54 74	−55 0	25 25	125 70	°C
I_{OH}	Output Current — High	54,74			−0.4	mA
I_{OL}	Output Current — Low	54 74			4.0 8.0	mA

2. DC Characteristics over Operating Temperature Range

SYMBOL	PARAMETER		LIMITS MIN	LIMITS TYP	LIMITS MAX	UNITS	TEST CONDITIONS
V_{IH}	Input HIGH Voltage		2.0			V	Guaranteed Input HIGH Voltage for All Inputs
V_{IL}	Input LOW Voltage	54			0.7	V	Guaranteed Input LOW Voltage for All Inputs
		74			0.8		
V_{IK}	Input Clamp Diode Voltage			−0.65	−1.5	V	V_{CC} = MIN, I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	54	2.5	3.5		V	V_{CC} = MIN, I_{OH} = MAX, V_{IN} = V_{IH} or V_{IL} per Truth Table
		74	2.7	3.5		V	
V_{OL}	Output LOW Voltage	54,74		0.25	0.4	V	I_{OL} = 4.0 mA; V_{CC} = V_{CC} MIN, V_{IN} = V_{IL} or V_{IH} per Truth Table
		74		0.35	0.5	V	I_{OL} = 8.0 mA
I_{IH}	Input HIGH Current				40	μA	V_{CC} = MAX, V_{IN} = 2.7 V
					0.2	mA	V_{CC} = MAX, V_{IN} = 7.0 V
I_{IL}	Input LOW Current				−0.8	mA	V_{CC} = MAX, V_{IN} = 0.4 V
I_{OS}	Short Circuit Current		−20		−100	mA	V_{CC} = MAX
I_{CC}	Power Supply Current				10	mA	V_{CC} = MAX

3. 74LS86 AC Characteristics

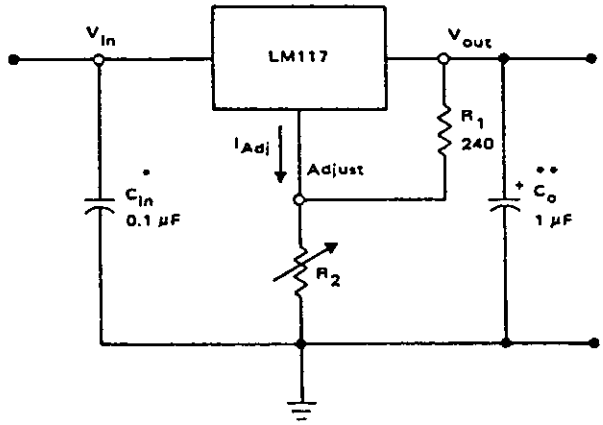
SYMBOL	PARAMETER	LIMITS			UNITS	TEST CONDITIONS
		MIN	TYP	MAX		
t_{PLH} t_{PHL}	Propagation Delay, Other Input LOW		12 10	23 17	ns	V_{CC} = 5.0 V C_L = 15 pF
t_{PLH} t_{PHL}	Propagation Delay, Other Input HIGH		20 13	30 22	ns	

D. LM317 3-terminal Adjustable Positive Voltage Regulator

The LM317 is an adjustable three-terminal positive voltage regulator capable of supplying more than 1.5 A over an output voltage range of 1.2 to 37V. The regulator is easy to use and requires only two external resistor to set the output voltage. It uses an internal current limiter, thermal shutdown, and safe area compensation, making it essentially blow-out proof.

The LM317 has wide variety of applications including local and on-card regulation. The device can also be used to make a programmable output regulator, or by connecting a fixed resistor between the adjustment and the output, the LM317 can be used as a precision current regulator.

1. Standard Application



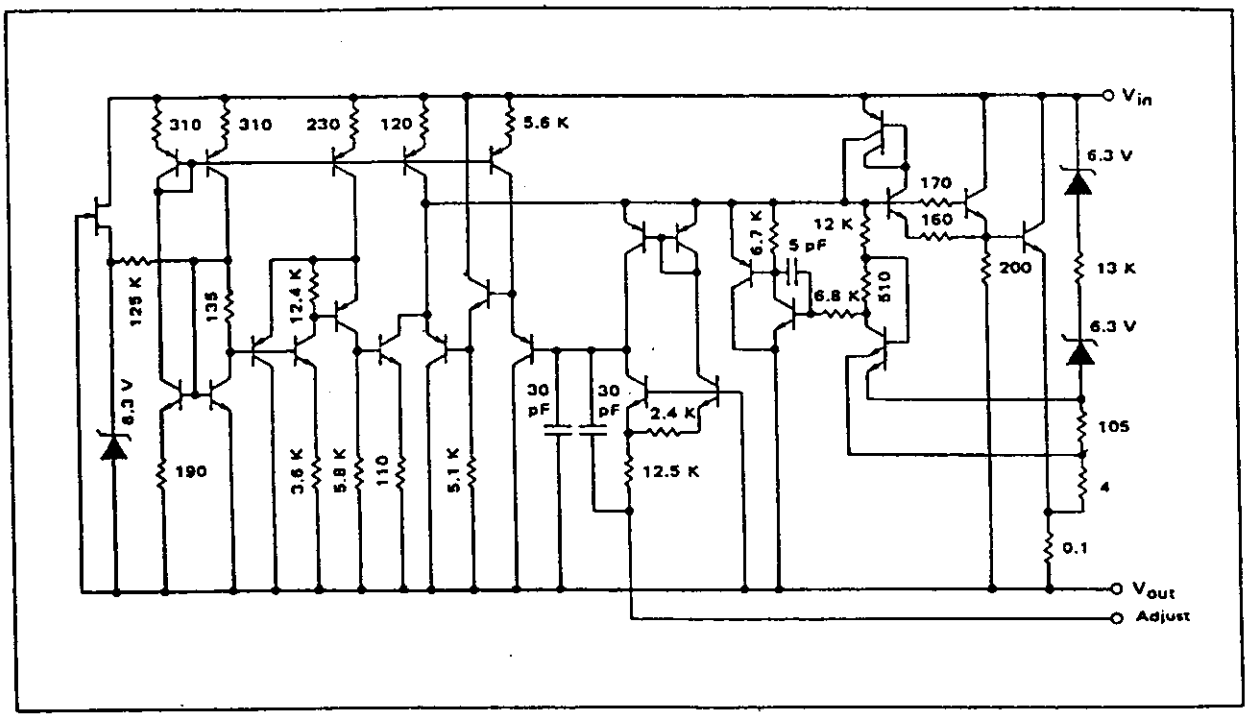
* : Cin is required if the regulator is located at an appreciable distance from the power supply filter.

** : Co is not needed for stability even though it does improve transient response.

2. LM317 Maximum Ratings

Rating	Symbol	Value	Unit
Input-Output Voltage Differential	V_I-V_O	40	Vdc
Power Dissipation	P_D	Internally Limited	
Operating Junction Temperature Range LM117 LM217 LM317	T_J	 -55 to +150 -25 to +150 0 to +125	°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

3. LM317 Schematic Diagram



4. LM317 Electrical Characteristics

Characteristic	Figure	Symbol	LM317 Min	LM317 Typ	LM317 Max	Unit
Line Regulation (Note 3) T_A = 25°C, 3.0 V ≤ V_I-V_O ≤ 40 V	1	Reg_{line}	—	0.01	0.04	%/V
Load Regulation (Note 3) T_A = 25°C, 10 mA ≤ I_O ≤ I_{max} V_O ≤ 5.0 V V_O ≥ 5.0 V	2	Reg_{load}	 — —	 5.0 0.1	 25 0.5	 mV % V_O
Thermal Regulation (T_A = −25°C) 20 ms Pulse		—	—	0.03	0.07	%/W
Adjustment Pin Current	3	I_{Adj}	—	50	100	μA
Adjustment Pin Current Change 2.5 V ≤ V_I-V_O ≤ 40 V 10 mA ≤ I_L ≤ I_{max}, P_D ≤ P_{max}	1,2	ΔI_{Adj}	—	0.2	5.0	μA
Reference Voltage (Note 4) 3.0 V ≤ V_I-V_O ≤ 40 V 10 mA ≤ I_O ≤ I_{max}, P_D ≤ P_{max}	3	V_{ref}	1.20	1.25	1.30	V
Line Regulation (Note 3) 3.0 V ≤ V_I-V_O ≤ 40 V	1	Reg_{line}	—	0.02	0.07	%/V
Load Regulation (Note 3) 10 mA ≤ I_O ≤ I_{max} V_O ≤ 5.0 V V_O ≥ 5.0 V	2	Reg_{load}	 — —	 20 0.3	 70 1.5	 mV % V_O
Temperature Stability (T_{low} ≤ T_J ≤ T_{high})	3	T_S	—	0.7	—	% V_O
Minimum Load Current to Maintain Regulation (V_I-V_O = 40 V)	3	I_{Lmin}	—	3.5	10	mA
Maximum Output Current V_I-V_O ≤ 15 V, P_D ≤ P_{max} K and T Packages H Package V_I-V_O = 40 V, P_D ≤ P_{max}, T_A = 25°C K and T Packages H Package	3	I_{max}	 1.5 0.5 0.15 —	 2.2 0.8 0.4 0.07	 — — — —	A
RMS Noise, % of V_O T_A = 25°C, 10 Hz ≤ f ≤ 10 kHz	—	N	—	0.003	—	% V_O
Ripple Rejection, V_O = 10 V, f = 120 Hz (Note 5) Without C_{Adj} C_{Adj} = 10 μF	4	RR	 — 66	 65 80	 — —	dB
Long-Term Stability, T_J = T_{high} (Note 6) T_A = 25°C for Endpoint Measurements	3	S	—	0.3	1.0	%/1.0 k Hrs.
Thermal Resistance Junction to Case H Package (TO-39) K Package (TO-3) T Package (TO-220)	—	$R_{\theta JC}$	 — — —	 12 2.3 5.0	 15 3.0 —	°C/W

NOTES: (1) T_{low} = −55°C for LM117 T_{high} = +150°C for LM117
= −25°C for LM217 = +150°C for LM217
= 0°C for LM317 = +125°C for LM317

(2) I_{max} = 1.5 A for K (TO-3) and T (TO-220) Packages
= 0.5 A for H (TO-39) Package
P_{max} = 20 W for K (TO-3) Package
= 20 W for T (TO-220) Package
= 2.0 W for H (TO-39) Package

(3) Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

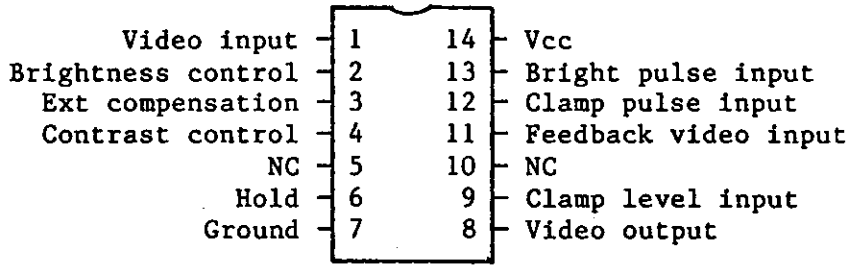
(4) Selected devices with tightened tolerance reference voltage available.

(5) C_{ADJ}, when used, is connected between the adjustment pin and ground.

(6) Since Long-Term Stability cannot be measured on each device before shipment, this specification is an engineering estimate of average stability from lot to lot.

E. M51392P Video Amplifier

1. Pin Connections



2. Absolute Maximum Ratings

	Signal	Limits	Unit
Supply voltage	Vcc	14.4	V
Power dissipation	Pd	1.20	W
Operating temperature	Topr	-20 to +75	C
Storage temperature	Tstg	-40 to +125	C

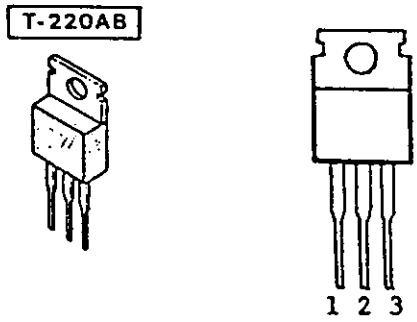
F. HA17815 Fixed Voltage Regulator

The HA17815 is a three-terminal, fixed voltage regulator providing 15 volts output voltage. When a heat sink is used, output current of up to 1 A will be available.

Three built-in protection circuits are included in the device: a curent limiter, a limiter of temperatures at chip junctions, and the other to limit internal power dissipations.

The TO-220A package enables easy mounting and radiation design like transistors.

1. HA17815 Pin Assignments

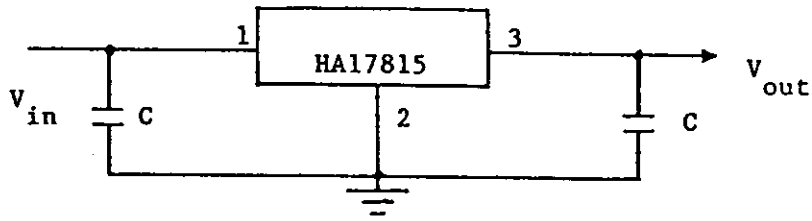


1- Input
2 - Common
3 - Output

2. Absolute Maximum Ratings

Item	Symbol	Ratings
Input voltage	Vin	35 Volts
Power dissipation	PT	15 Watts
Operating ambient temperature	Topr	-20 to +75 C
Operating junction temperature	Tj	-20 to +125 C
Storage temperature	Tstg	-55 to +125 C

3. HA17815 Typical Connecting Circuit



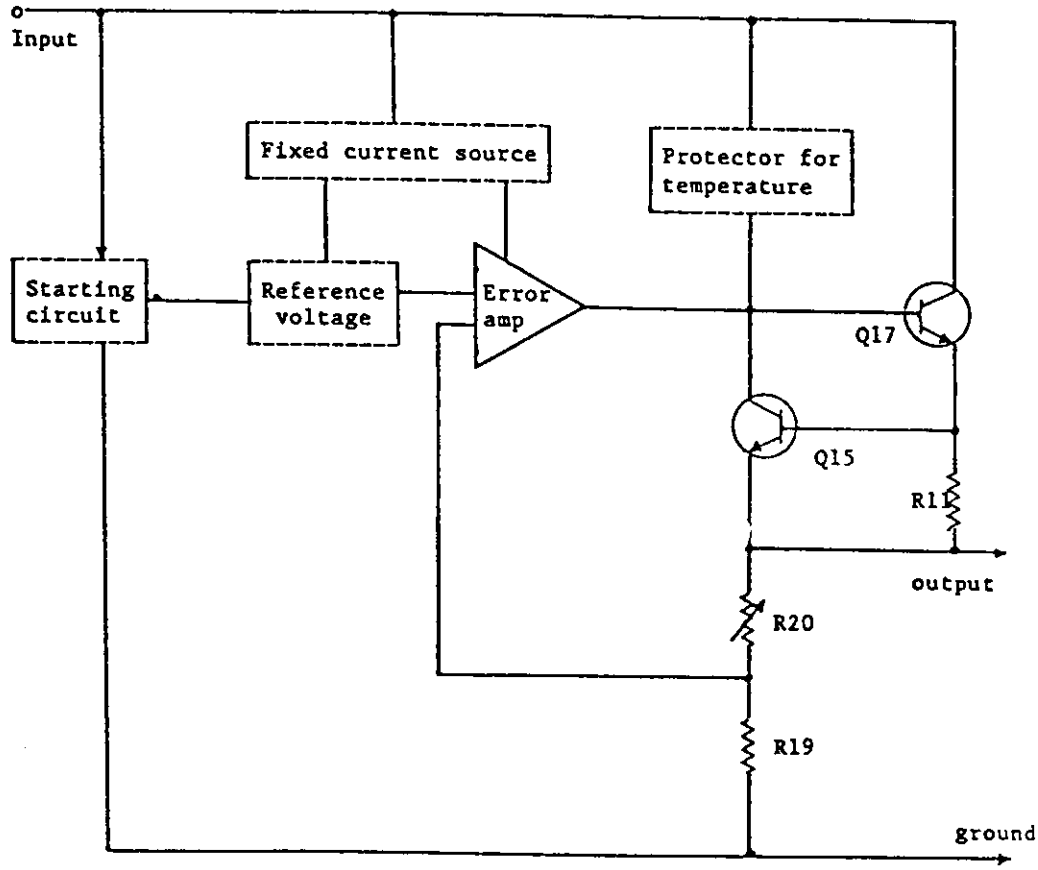
4. HA17815 Electrical Characteristics

Item	Symbol	Test conditions		Min	Typ	Max	Unit
Output voltage	Vout	Tj = 25 C		14.4	15.0	15.6	V
		7V ≤ Vin ≤ 30V 5mA ≤ Iout ≤ 1.0A Pt ≤ 15 watts		14.25	-	15.75	V
Line regulation	δVo line	Tj = 25 C	17.5V ≤ Vin ≤ 30V 20V ≤ Vin ≤ 26 V	- -	11 3	300 150	mV mV
Load regulation	δVo load	Tj = 25 C	5 mA ≤ Iout ≤ 1.5A 250mA ≤Iout ≤750mA	- -	12 4	300 150	mV mV
Quiescent current	Iq	Tj = 25 C		-	4.4	8.0	mA
Quiescent current change	δIq	17.5V ≤ Vin ≤ 30 V 5 mA ≤ Iout ≤ 1.0A		- -	- -	1.0 0.5	mA mA
Output noise voltage	Va	Ta = 25C, 10Hz ≤ f ≤ 100Khz		-	90	-	uV
Ripple rejection ratio	Rrej	f = 120Hz		54	70	-	dB
Voltage drop	Vdrop	Iout = 1.0A, Tj = 25 C		-	2.0	-	V
Output resistance	Rout	f = 1KHz		-	19	-	m
Output short circuit current	Ios	Tj = 25 C		-	230	-	mA
Peak output current	Io peak	Tj = 25 C		-	2.1	-	A
Temperature coefficient of output voltage	δVout/ Tj	Iout = 5mA, 0 C ≤ Tj ≤ 125 C		-	-1.0	-	mV/ C

5. Application Note

The HA17815 eliminates external compensating circuits and employs easy mounting and radiation design using transistor-like TO-220AB package.

Output current above 1A is available when using a heat sink. To protect the device from destruction, these protective circuits -- a current limiter, one against load short circuits, and one to control the operating junction temperatures -- are built in.



Block Diagram of HA17815.

Commodore

Technical Training
Friedrich-Seele-Straße 10
3300 Braunschweig

Tel.: (05 31) 89 50 63 · Fax: (05 31) 8 57 74