PRODUCT SAFETY SERVICING GUIDELINES FOR AUDIO-VIDEO PRODUCTS

IMPORTANT SAFETY NOTICE

This manual was prepared for use only by properly trained audio-visual service technicians.

When servicing this product, under no circumstances should the original design be modified or altered without permission from Zenith Electronics Corporation. All components should be replaced only with types identical to those in the original circuit and their physical location, wiring and lead dress must conform to original layout upon completion of repairs.

Special components are also used to prevent x-radiation, shock and fire hazard. These components are indicated by the letter “x” included in their component designators and are required to maintain safe performance. No deviations are allowed without prior approval by Zenith Electronics Corporation.

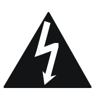
Circuit diagrams may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the set is not delayed until the new service literature is printed.

CAUTION: Do not attempt to modify this product in any way. Never perform customized installations without manufacturer's approval. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury.

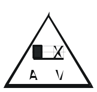
Service work should be performed only after you are thoroughly familiar with these safety checks and servicing guidelines.

GRAPHIC SYMBOLS

The exclamation point within an equilateral triangle is intended to alert the service personnel to important safety information in the service literature.



The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the service personnel to the presence of noninsulated “dangerous voltage” that may be of sufficient magnitude to constitute a risk of electric shock.



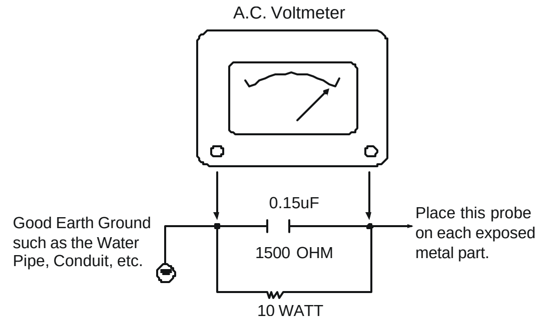
The pictorial representation of a fuse and its rating within an equilateral triangle is intended to convey to the service personnel the following fuse replacement caution notice:
CAUTION: FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ALL FUSES WITH THE SAME TYPE AND RATING AS MARKED NEAR EAch FUSE.

SERVICE INFORMATION

While servicing, use an isolation transformer for protection from AC line shock. After the original service problem has been corrected, make a check of the following:

FIRE AND SHOCK HAZARD

1. Be sure that all components are positioned to avoid a possibility of adjacent component shorts. This is especially important on items transported to and from the repair shop.
2. Verify that all protective devices such as insulators, barriers, covers, shields, strain reliefs, power supply cords, and other hardware have been reinstalled per the original design. Be sure that the safety purpose of the polarized line plug has not been defeated.
3. Soldering must be inspected to discover possible cold solder joints, solder splashes, or sharp solder points. Be certain to remove all loose foreign particles.
4. Check for physical evidence of damage or deterioration to parts and components, for frayed leads or damaged insulation (including the AC cord), and replace if necessary.
5. No lead or component should touch a receiving tube or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces must be avoided.
6. After reassembly of the set, always perform an AC leakage test on all exposed metallic parts of the cabinet (the channel selector knobs, antenna terminals, handle and screws) to be sure that set is safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER DURING THIS TEST. Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner: Connect a 1500 ohm, 10 watt resistor, paralleled by a .15 mfd 150V AC type capacitor between a known good earth ground water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination of 1500 ohm resistor and .15 mfd capacitor. Reverse the AC plug by using a non-polarized adaptor and repeat AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 0.75 volts RMS. This corresponds to 0.5 milliamp AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



X-RADIATION

1. Be sure procedures and instructions to all service personnel cover the subject of x-radiation. The only potential source of x-rays in current TV receivers is the picture tube. However, this tube does not emit x-rays when the HV is at the factory-specified level. The proper value is given in the applicable schematic. Operation at higher voltages may cause a failure of the picture tube or high-voltage supply and, under certain circumstances may produce radiation in excess of desirable levels.
2. Only factory-specified CRT anode connectors must be used.
3. It is essential that the service personnel have available an accurate and reliable high-voltage meter.
4. When the high-voltage circuitry is operating properly, there is no possibility of an x-radiation problem. Every time a color Chassis is serviced, the brightness should be run up and down while monitoring the high voltage with a meter, to be certain that the high voltage does not exceed the specified value and that it is regulating correctly.
5. When troubleshooting and making test measurements in a product with a problem of excessively high voltage, avoid being unnecessarily close to the picture tube and the high voltage power supply. Do not operate the product longer than necessary to locate the cause of excessive voltage.
6. Refer to HV, B+, and shutdown adjustment procedures described in the appropriate schematics and diagrams (where used).

IMPLOSION

1. All direct view picture tubes are equipped with an integral implosion protection system; take care to avoid damage during installation.
2. Use only the recommended factory replacement tubes.

TIPS ON PROPER INSTALLATION

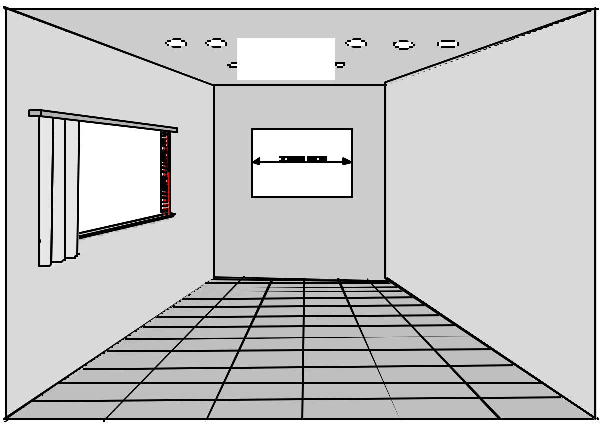
1. Never install any receiver in a closed-in recess, cubbyhole, or closely fitting shelf space over, or close to, a heat duct, or in the path of heated air flow.
2. Avoid conditions of high humidity such as: outdoor patio installations where dew is a factor, near steam radiators where steam leakage is a factor, etc.
3. Avoid placement where draperies may obstruct venting. The customer should also avoid the use of decorative scarves or other coverings that might obstruct ventilation.
4. Wall- and shelf-mounted installations using a commercial mounting kit must follow the factory-approved mounting instructions. A product mounted to a shelf or platform must retain its original feet (or the equivalent thickness in spacers) to provide adequate air flow across the bottom. Bolts or screws used for fasteners must not touch any parts or wiring. Perform leakage tests on customized installations.
5. Caution customers against mounting a product on a sloping shelf or in a tilted position, unless the receiver is properly secured.
6. A product on a roll-about cart should be stable in its mounting to the cart. Caution the customer on the hazards of trying to roll a cart with small casters across thresholds or deep pile carpets.
7. Caution customers against using a cart or stand that has not been listed by Underwriters Laboratories, Inc. for use with its specific model of television receiver or generically approved for use with TVs of the same or larger screen size.
8. Caution customers against using extension cords. Explain that a forest of extensions, sprouting from a single outlet, can lead to disastrous consequences to home and family.

TABLE OF CONTENTS

Installation guidelines

Careful consideration of things such as image size, ambient light level, projector placement and type of screen to use are critical to optimize the use of the projection system.

Environment
Do not install the projection system in a site near heat sources such as radiators or air ducts, or in a place subject to direct sunlight, excessive dust or humidity. Be aware that room heat rises to the ceiling; Make sure the temperature near the installation site is not excessive.



What about ambient light ?
The ambient light level of any room is made up of direct or indirect sunlight and the light fixtures in the room. The amount of ambient light will determine how bright the image will appear. So, avoid direct light on the screen as much as possible.

Windows that face the screen should be covered by opaque drapery while the set is being viewed. It is desirable to install the projecting system in a room whose walls and floor are of non-reflecting material. The use of recessed ceiling lights and a method of dimming those lights to an acceptable level is also important. Too much ambient light results in a 'wash out' of the projected image. This appears as less contrast screen is minimal.

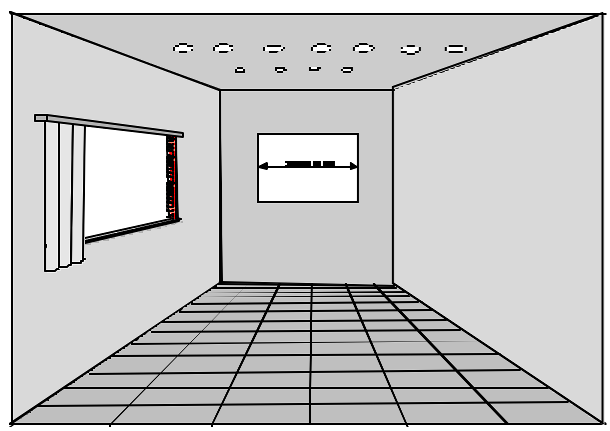
Which screen type?
There are two major categories of screens used for projection equipment. Those used for front projected images and those for rear projection applications.

Screens are rated by how much light they reflect (or transmit in case of rear projection systems) given a determined amount of light projected toward them. The 'GAIN' of a screen is the term used. Front and rear screens are both rated in terms of gain. The gain of screens range from a white matte screen with a gain of 1 (x1) to a brushed aluminized screen with a gain of 10 (x10) or more. Another important consideration is the degree the screen's gain varies with the horizontal and vertical viewing angle. The choice between higher and lower gain screens is largely a matter of personal preference.

In considering the type of screen to choose, determine where the viewers will be located and go for the highest gain screen possible. A high gain screen will provide a brighter picture but reduce the viewing angle.

For more information about screens, contact your local screen supplier.

What image size? How big should the image be?
The projector is designed for projecting an image width from 1.4m (4.6') to 6m (20') with an aspect ratio of 4 to 3. It leaves the factory, adjusted as a ceiling/front projector for a screen width of 2.4m (7.8').
Changing the image size from the factory preset size requires a realignment of the projector.



Where to install the projector ?
To indicate a correct installation position it is necessary to know :

- The distance from projector to ceiling in case of Ceiling mounted or the distance from projector to floor in case of Table mounted;
- The distance from projector to screen.

INSTALLATION GUIDELINES

To find the correct position for the projector, equipped with HD8 lenses, use the following formulas:

Abbreviations used in the calculations and the drawings :

B = Distance between ceiling and top of the screen (Ceiling mounted) or distance between floor and bottom of the screen (Table mounted).

A = Correction Value, extra value to be added to B to obtain the correct installation position (In some cases the A value can be negative).

In metric :

PD[cm] = SW (cm) *1.1358 + 18.53 (cm)

A[cm] = SW (cm) *0.142 - 25.26 (cm)

CD = Total distance between projector and ceiling (Ceiling mounted) or total distance between projector and floor (Table mounted). CD = A + B.

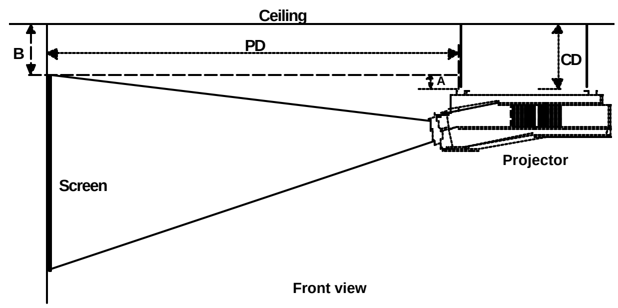
Ceiling Mounted : when the result is negative, enlarge the distance between ceiling and top of the screen, mount screen lower, until CD becomes zero or positive.

Table Mounted : when the result is negative, enlarge the distance between floor and bottom of the screen, mount screen higher, until CD becomes zero or positive.

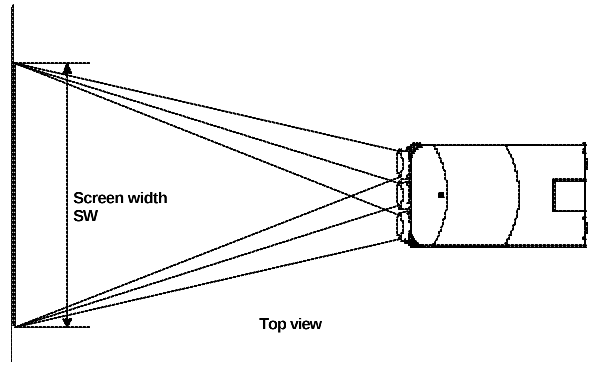
SW = Screen width.

PD = Perpendicular distance between screen and projector's mount.

To obtain the right values, you can make use of the new option included in the Installation Adjustment Mode to let the projector calculate the parameters automatically. Please refer to Chapter 8 for details.



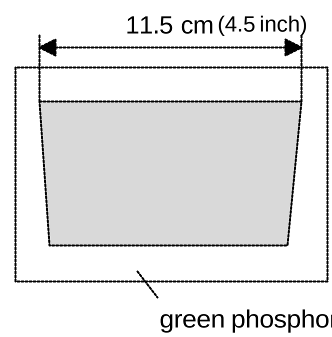
Front view



Top view

- Install the projector water levelled in both directions
- Install the projector perpendicular to the screen

Used phosphor width on the CRT faceplate (e.g. green CRT)



Mounting Configuration

Ceiling Mount

To install the ZENITH PRO1200 in the Ceiling configuration, use ZENITH'S *Ceiling Mount Kit - Order Number PJR1200CE*. Installation instructions are included with this kit.

WARNING :
Risk of electric shock !
Installation only by Zenith authorized service personnel !

Access to Controls

Opening the top cover

During the projector setup and installation it is necessary to open the top cover. Follow the procedure described below :

- Turn the locking screw with a screwdriver counter clock-wise;
- Lift up and pivot the top cover.

WARNING :

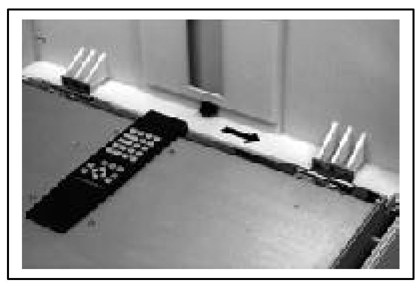
The projector's top cover is ***not*** supported with locking hinge. Open with care and support the cover with your hand.

Removing the top cover

During some installations, it will be convenient to remove the top cover from the projector totally.

Proceed as follows :

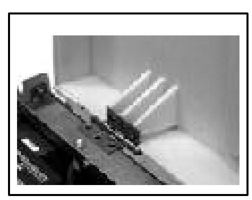
- Pivot the top cover backwards 90° (fully extended);
- Push carefully the top cover to the left side (viewing from the rear of the projector) until the hinges are disengaged. This can be facilitated by pressing downwards on the spring tabs next to the hinges. Slide the top cover off the projector.

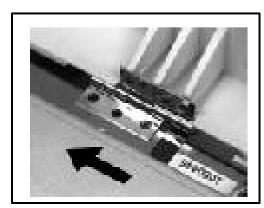


Reinstalling the top cover

To reinstall the top cover on the projector :

- Place the top cover in front of the hinges (as shown in the picture) and push in the direction of the black arrow until the cover locks into the hinges;
- Pivot the top cover to close;
- Secure the locking screw by turning it clockwise with a screwdriver.





Scan Adaptation

The scan switches must be placed in the correct position which corresponds to the desired scanning configuration.

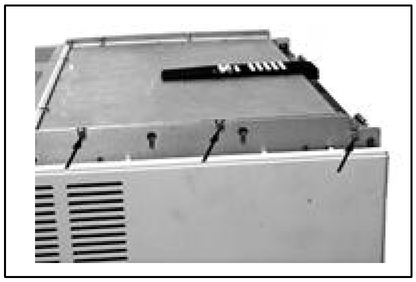
To change the scanning, it is necessary to remove the projector top cover and to open the protection plate.

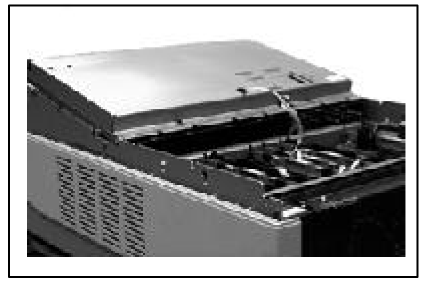
For opening the projector's top cover, see 'Access to controls'.

WARNING !
TURN OFF PROJECTOR AND UNPLUG THE POWER CORD BEFORE CHANGING THE SCAN DIRECTION.

Getting access to the scan switches

- Open the top cover and remove it from the projector (see p.4-1);
- Loosen the 3 retaining screws on each side of the projector;
- Open the protection plate and pivot it forward (toward lenses).



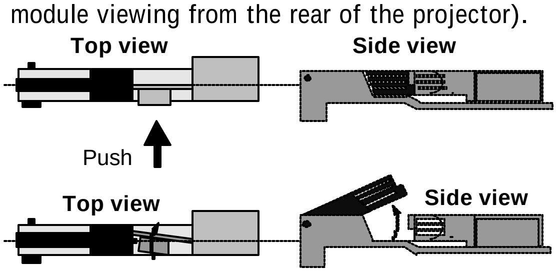


Horizontal Scan Switches

Three switches are used, one for each CRT. When changing the horizontal scan, insure that all three switches are set in the same position. See positions of the switches (diagram on next page) for the corresponding projector configuration.

To set the scan switches :

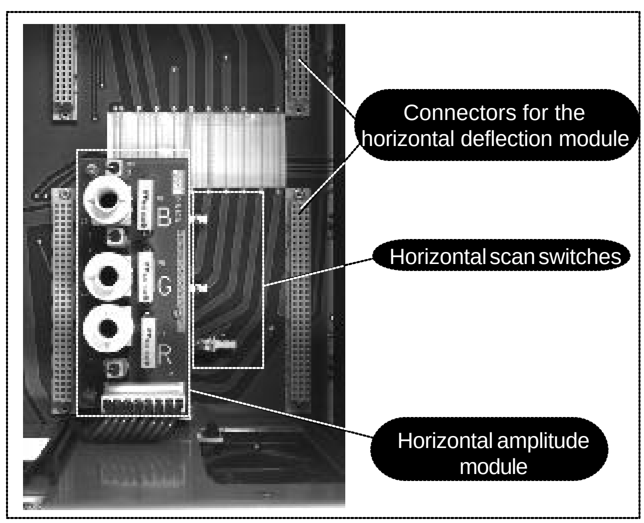
- Remove the horizontal deflection module (the second module viewing from the rear of the projector).



To remove the horizontal deflection module :

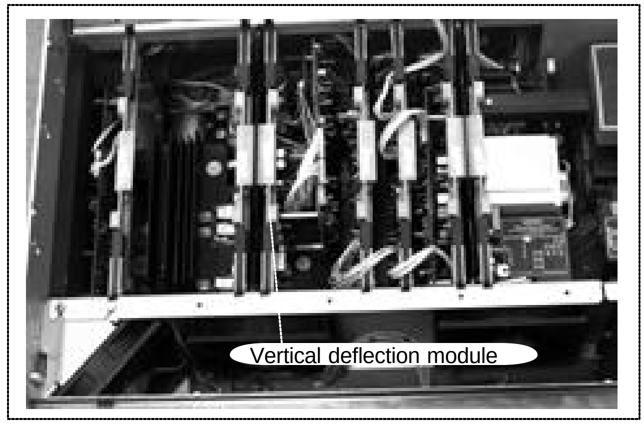
- Press the module lock and lift up the module handle;
- Repeat this action on both sides of the module and extract the module out of the main frame.

- Toggle the 3 horizontal scan inversion switches (located just underneath the horizontal amplitude module) to the correct positions (see p.4-3).
- Reinstall the horizontal deflection module.



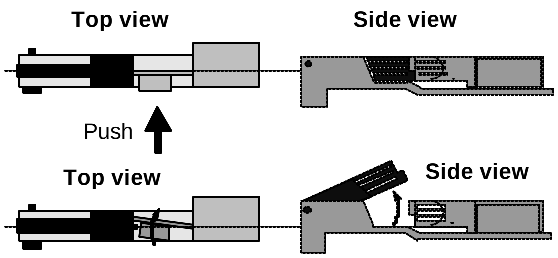
Vertical Scan Switch

One vertical switch is used for the three CRT's. See position of the switch (diagrams) for the corresponding projector configuration.



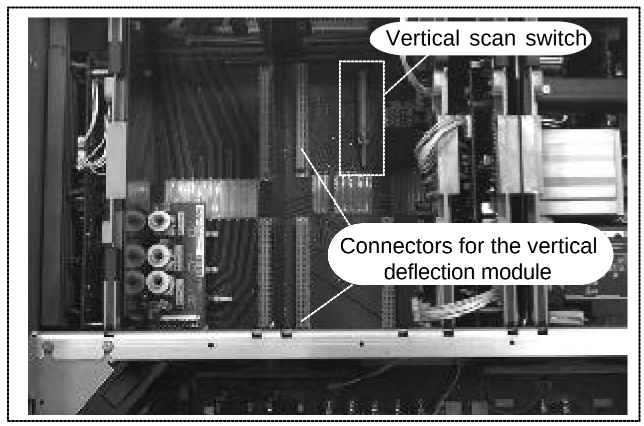
To set the vertical scan switch :

- Remove the vertical deflection module (the third module



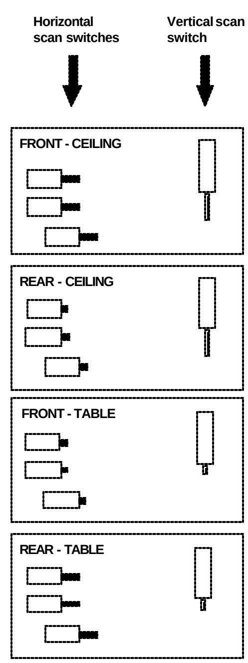
  viewing from the rear of the projector).
  To remove the vertical deflection module :

  - Press the module lock and lift up the module handle;
  - Repeat this action on both sides of the module and extract the module out of the main frame.
- Toggle the vertical scan inversion switch to the correct position.
- Reinstall the vertical deflection module.



Positions of the scan switches for the different mounting configurations are illustrated on the right side.

After setting the scan switches, close the metal protection plate and secure it with the retaining screws.



Close the top cover and reconnect the power cord to the wall outlet.

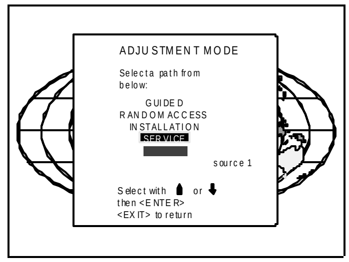
Note : Switching over from Floor to Ceiling or vice versa requires a complete readjustment of picture geometry and convergence.

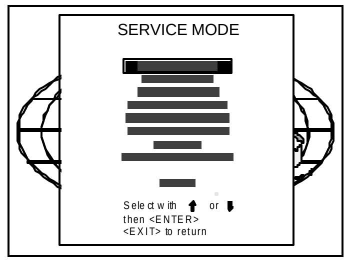
To check the current positions of the scan switches, proceed as follows:

Attention : This procedure can only be done after power (mains) connection. So, first continue with the projector setup and the connections and then return to this procedure.

- Switch on the projector. The projector starts up on the last selected source.
- Press the <*ADJUST*> key.
- Highlight *'SERVICE'* by pushing the control Pad forward or backward and press the <*ENTER*> *key*: the *'SERVICE MODE MENU'* will be displayed.
- Highlight *'IDENTIFICATION'* by pushing the control stick forward or backward and press the <*ENTER*> *key*.

The projector will display the *'IDENTIFICATION SCREEN'*.





This screen gives the current information about the projector configuration in the line entitled *'Config'*.

All projectors leave the factory set for a ceiling/front configuration.

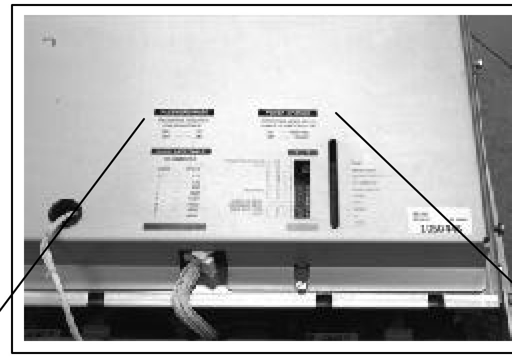
The DIP switches on the controller board allow the *SETUP* of the projector :

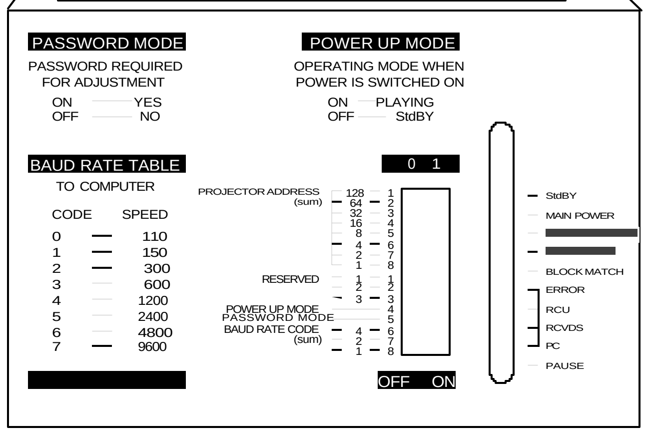
- 8 DIP switches for setting the projector address.
- 1 DIP switch for setting the powerup mode.
- 3 DIP switches for setting the baud rate for communication.
- 1 DIP switch for setting the password mode.

To gain access to the DIP switches :

- Open the top cover.
- Loosen the retaining screws of the metal protection plate and pivot this plate to the lens side (Please refer to Chapter 4 'Installation setup').

The DIP switches are located on the back side of this metal protection plate.



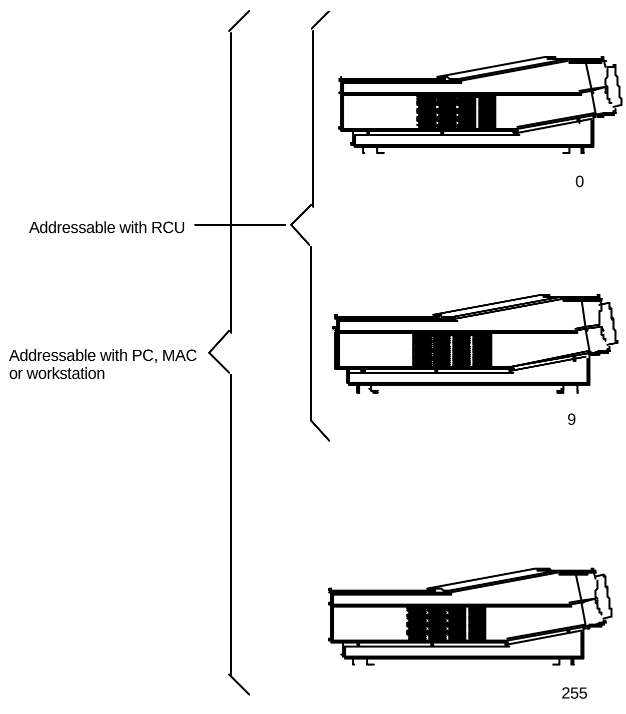


Setting the projector address

The projector's address may be set to any value between 0 and 255.

When the address is set, the projector can be controlled now by :

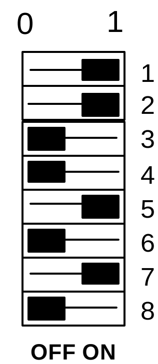
- RCU for addresses between 0 and 9.
- IBM PC (or compatible) or Apple MAC for addresses between 0 and 255.



Setting the address is a hardware SETUP of your projector which must be done during installation. Use the 8 DIP switches provided on the controller board labelled 'Projector Address'.

Each DIP switch has its own decimal value. The sum of the values associated to those DIP switches gives the address. As shown in the table, if Switch No. 1 is set to ON, it represents a decimal value of 128, Switch No.2 for 64, Switch No.3 for 32, and so forth.

Switch No	Value
1	128
2	64
3	32
4	16
5	8
6	4
7	2
8	1

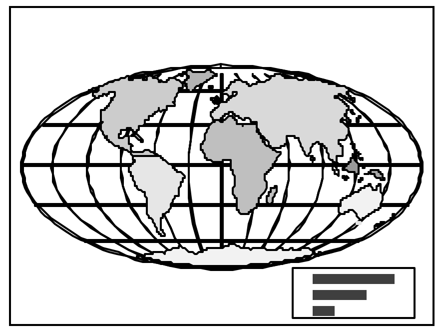


In the given example, the projector address is set to *202 :*

DIP switch No. : 1 2 3 4 5 6 7 8
Position ON/OFF : 1 1 0 0 1 0 1 0

Sum:
1x128 + 1x64 + 0x32 + 0x16 + 1x8 + 0x4 + 1x2 + 0x1 = 202

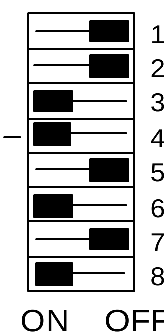
Factory preset address = 0



Note :
When the address button on the RCU is pressed, the projector will display its own address on the screen. Once the address button is pressed, to continue using your RCU, it is necessary to enter an address, even when the displayed address is correct. Use the numeric keys to enter the address. For more information, please refer to the projector Owner's Manual .

Powerup mode
The projector can start up in two different modes. The start-up mode is determined by the position of DIP Switch No. 4 of another set of 8 DIP switches on the controller board (one set of 8 switches are used for projector address setting).

Power-up mode



Position of the DIP Switch No. 4 (powerup mode) :

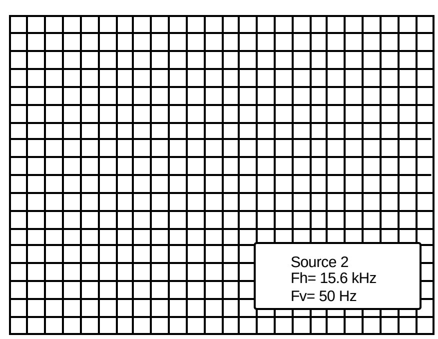
ON : operational mode.

OFF : standby mode (Factory preset).

- **Operational mode**

When the power switch on the rear of the projector is pressed, the projector displays the last selected source if

available, otherwise it remains on that source number until the source becomes available.



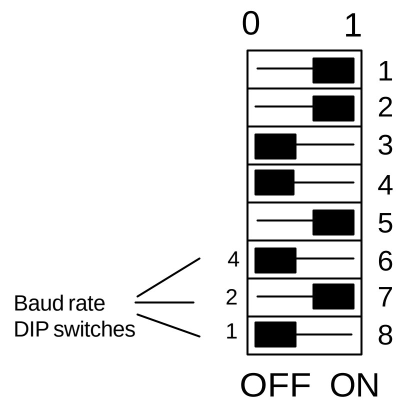
The on screen indication is only available when the "Text" function is set to "ON".

- **Standby mode**

When the power switch on the rear of the projector is pressed, the projector starts up in the standby mode. The standby key on the RCU is used to turn the projector ON and OFF.

Baud Rate for communication with a computer

The communication speed between the projector and the computer has 8 possible settings. With DIP Switch No. 6, No.7 and No.8 of the 8 DIP switches on the controller board, labelled as 'Baud rate code (sum)', it is possible to select the baud rate (communication speed). Each DIP switch has its own decimal value. The sum of the values associated to those DIP switches gives the baud rate code. Each baud rate code corresponds an communication speed.



Position of DIP switches and baud rate codes :

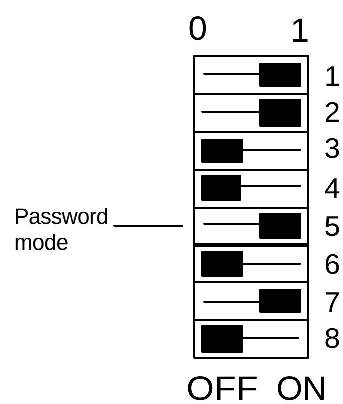
Binary	Baud Rate Code	Speed
000	0	110
001	1	150
010	2	300
011	3	600
100	4	1200
101	5	2400
110	6	4800
111	7	9600

Factory preset baud rate = 9600

More information about computer communication with the PRO 1200 is available in the Projector Control Software manual.

Password mode

With DIP Switch No.5 of the second set of 8 DIP switches on the controller board, the projector adjustments can be protected with a password. When the password feature is enabled, the user has to enter a password before he can enter the adjustment mode (For more information about password setting and reprogramming the password, see Installation Adjustment).



When the password menus are disabled (adjust mode is unprotected), the adjust mode can be selected by pressing the *<ADJUST>* key. This position of the DIP switch is useful for qualified service technicians because they do not need a password to enter the adjust mode.

Position of DIP Switch No.5 :

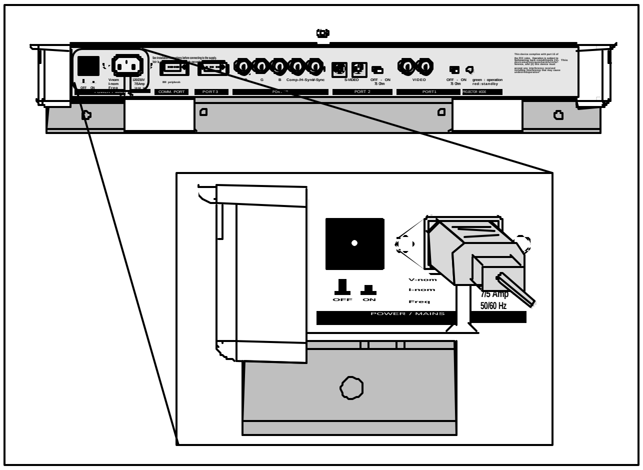
ON : password mode enabled.
OFF : password mode disabled.

Factory preset password mode : OFF.

AC POWER CONNECTION

AC Power (mains) cord connection
Use the supplied cord to connect your projector to the wall outlet. Plug the female power connector into the male connector at the back of the projector.

This projector may be connected to an IT-power system. The IT-power system is a power distribution system having no direct connection to earth. Instead, the exposed conductive parts of the electrical installation are earthed.



AC Power check
Check the power voltage which is determined by the ART. NR. (Article number) included in the label pasted on the backside of the projector.

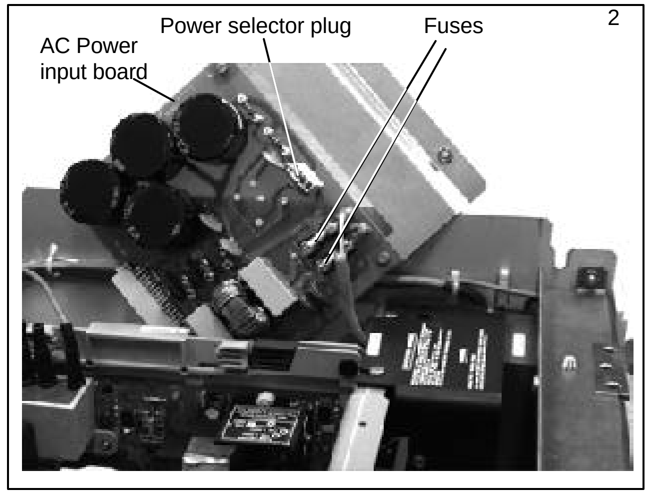
Projectors with the ART. NR. R9000901 and R9000902 must be connected to a 230 VAC power source.
If the indicated voltage is different from that of the wall outlet, call a qualified technician for power adaptation of the projector.

AC Input power (mains) voltage adaptation
Attention !
The *ZENITH PRO 1200 - R9000908* and *R9000907* leave the factory to operate on a mains (power) input of *120 Vac*.

Adaptation of the power input of the projector between 230 Vac and 120Vac or vice versa is possible.

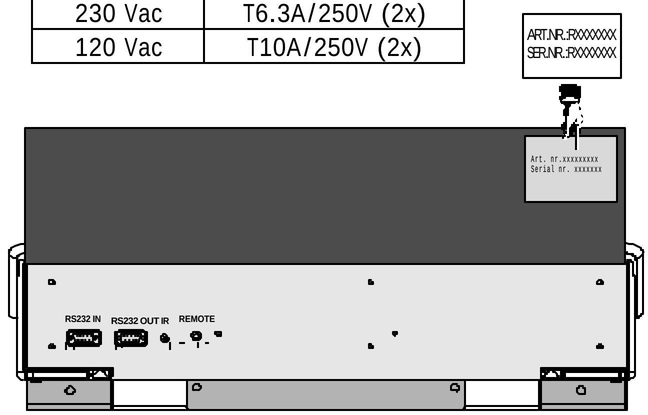
Follow the procedure as described below to adapt the voltage :

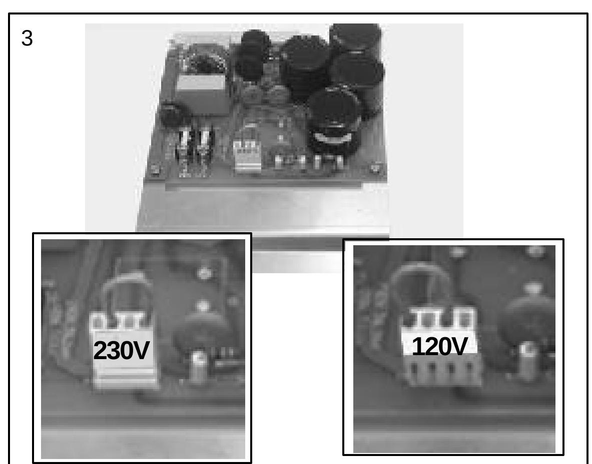
- ***WARNING: turn off the projector and be sure the AC Power Cord is unplugged before starting the procedure!***
- Open the top cover (see 'Access to controls' on p.4-1).
- Unscrew the retaining screws of the AC power input board and remove this board.
- Pull out the 'Power selector plug' (Photo 2) and reinsert it as illustrated in Photo 3, depending on the AC power of the wall outlet in the room.
- Pull out the fuses and place the correct fuses in their sockets. See the table below for the correct type of fuses.
- Reinsert the power input board and secure it with the retaining screws.



Fuses
If AC level is changed Fuse Replacement is necessary

AC Power	Fuse
230 Vac	T6.3A/250V (2x)
120 Vac	T10A/250V (2x)



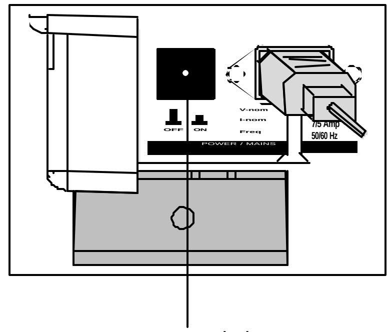


Power selector on 230V
Power selector on 120V

Switching on the projector

Push the power (mains) switch located on the rear panel of the projector to switch the projector ON and OFF :

- If the switch is pressed in : ON
- If the switch is Not pressed in : OFF



power switch

The projector can be started up in the 'Operational mode' (image displayed) or in the 'Standby mode', depending on the position of the 'Powerup' DIP switch on the controller board (see p.5-2). This DIP switch is set during installation by a qualified technician. If you want to change this start-up mode, call a qualified technician.

Power indication lamp :

OFF : no power.
Green : projector in operational mode.
Red : projector in standby mode.

When switching on the projector, with the power switch or via the standby key on the RCU, the projector can start up in two ways if the "CRT run in cycle" option is switched OFF :

- A full white image (projector warm up) or
- Immediately image display.

The way of starting up can be set in the service mode.

Starting up with a full white image

When the projector is set to start up with a full white image, the "Projector warm up" menu will be displayed for 30 seconds.

Start up with "Warm up period"

If no action is taken, a white image will be displayed for 20 minutes.
This white image will be shifted on the faceplate of the CRT to avoid CRT burn-in.
During this warm up period, it is possible to interrupt this white image projection by pressing the *<EXIT>* key. The "Projector warm up" menu will be redisplayed for another 30 seconds but with the remaining time indicated.
If the *<EXIT>* key is pressed again, the remaining warm up period will be skipped.

During the warm up period, every 30 seconds a text box with the remaining time will be displayed on the screen for 2 seconds. This text box will be displayed every time on another place to avoid CRT burn-in.
If a key, other than the *<EXIT>* key, is pressed, a text box with the following text will be displayed :

"Please use <EXIT> to leave this procedure."

Start up without "Warm up period"

If the *<EXIT>* key is pressed, the warm up period will be skipped and the projector is immediately ready for use.

Warning : Skipping this warm up procedure can reduce the initial picture quality of the projected image.

PROJECTOR WARM UP

A FULL WHITE PATTERN WILL BE GENERATED FOR 20 MINUTES.

FOR IMMEDIATE USE OF THE PROJECTOR, PRESS <EXIT>.

WARNING: SKIPPING THIS PROCEDURE CAN REDUCE THE INITIAL PICTURE QUALITY OF THE PROJECTED IMAGE.

THIS OPTION CAN BE DISABLED IN THE SERVICE MENU.

REMAINING PROJECTOR WARM UP TIME 18.5 MIN

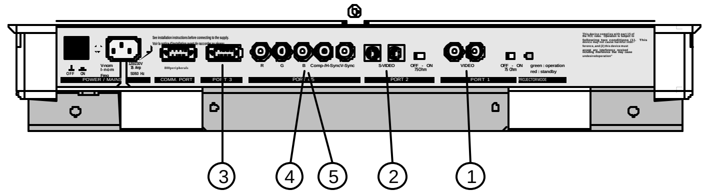
PLEASE USE <EXIT> TO LEAVE THIS PROCEDURE

SOURCE CONNECTIONS

Signal input connection

The following signals can be connected to the projector through the inputs on the back panel of the projector :

- Composite Video
- S-Video
- RGB
- Component Video
- RGB with Tri-level sync
- Component video with Tri-level sync



Port No	Projector input	Numeric button	Description of input signal
1	Composite Video	1	
2	S-Video / Composite Video	2	S-video : Y/C (luma/chroma). The Composite video can also be connected to Port 2. It can be selected inside the "Picture Tuning" menu. Please refer to the Owner's Manual of this projector.
3	RGB	3	R, G and B with composite sync on Green; R, G and B with separate composite or with separate Horizontal and Vertical sync.
4/5	RGB	4 or 5	R, G and B with composite sync on Green; R, G and B with separate composite or with separate Horizontal and Vertical sync.
4/5	Component video	6	R-Y, Y, B-Y with composite sync on Y; or with separate composite or with separate Horizontal and Vertical sync.
4/5	RGB with Tri-level sync	7	R, G and B with Tri-level sync on Green; R, G and B with separate Tri-level sync or with separate Horizontal and Vertical Tri-level sync.
4/5	Component video with Tri-level sync	8	R-Y, Y, B-Y with Tri-level sync on Y; or with separate Tri-level sync or with separate Horizontal and Vertical Tri-level sync.

Connecting a Composite Video source to Port 1

Composite video signals coming from a VCR, OFF air signal decoder and so on can be connected to Port 1.

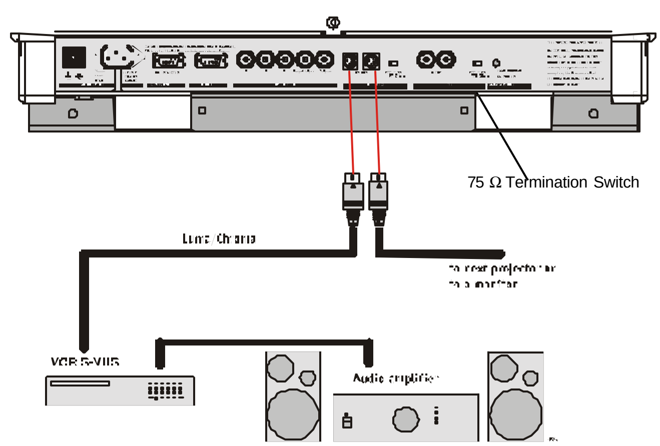
To select the video input :

Press the *numeric button 1* on the RCU or the local keypad.

75 W Termination Switch for Video

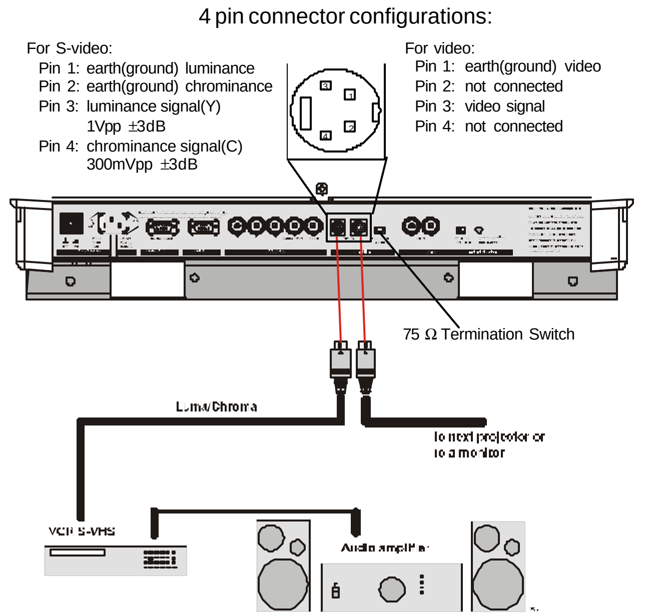
Terminate the video input of the projector using the 75W switch next to the video input, when the projector operates alone or when the projector is the last unit in a loop-through configuration.

The switch is set to "ON" : signal terminated.
The switch is set to "OFF" : signal not terminated.



Connecting a S-Video (or Composite Video) source to Port 2

Separate Y-luma/C-chroma signals for higher quality play-back of Super VHS signals can be connected to Port 2 . The composite video can also be connected to this port.



To select the S-video input :

Press the *numeric button 2* on the RCU or the local keypad.

In case of using Port 2 for connecting the Composite Video, the selection of this source have to be done inside the "Picture Tuning" menu. Please refer to the Owner's Manual of this projector.

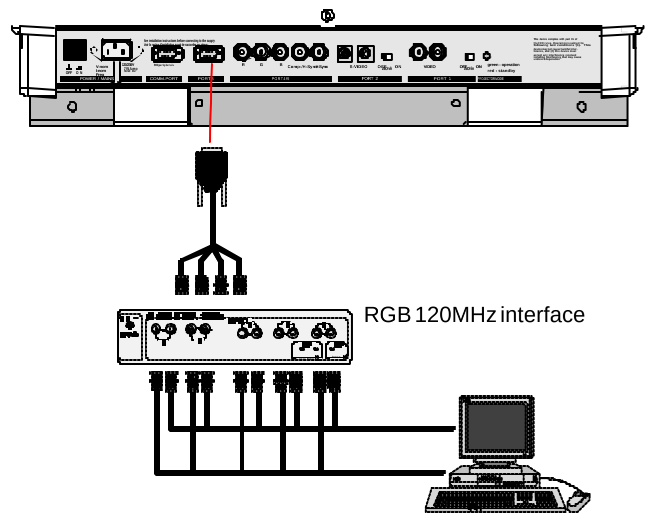
75 W Termination Switch for S-video

Terminate the S-video input of the projector using the 75 W switch next to the S-video input when the projector operates alone or when the projector is the last unit in a loop-through configuration.

The switch is set to "ON" : signal terminated.
The switch is set to "OFF" : signal not terminated.

Connecting a RGB Analog source to Port 3

Connect a RGB Analog signal via an interface (e.g. RGB 120MHz interface to Port 3: RGB analog input with automatic sync detection (Separate H and V sync inputs, with composite sync input or with sync signals on green).



Pin configuration of the D9 (male) connector of the Analog input :

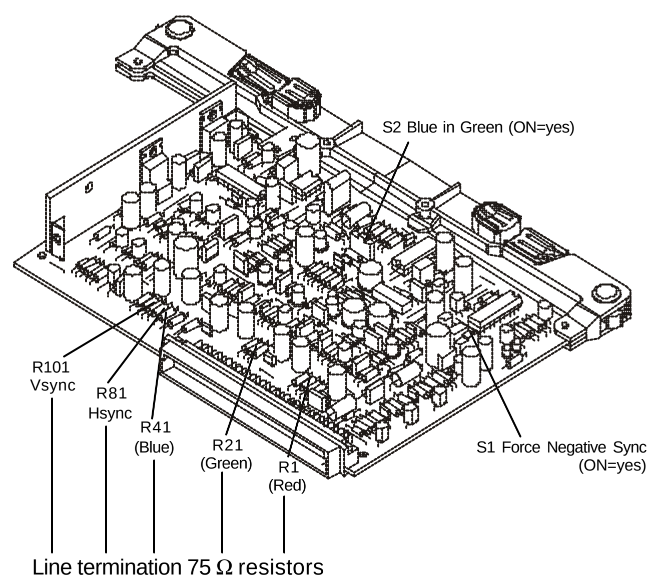
1	not connected
2	ground RGBS
3	RED
4	GREEN
5	BLUE
6	ground RGBS
7	ground RGBS
8	Horizontal /composite sync
9	Vertical sync

To select the RGB analog Input :

Press the *numeric button 3* on the RCU or the local keypad.

Locations of the Termination Resistors and Switches on the RGB Input Auto Sync Tracking Module

When changing a switch position or removing a resistor, turn off the projector and unplug the power cord from the wall outlet.



75 W Termination resistors

In case of chaining (loop-through) the projectors, the 75W line termination resistors must be removed from the RGB Input Auto Sync Tracking Module when the projector is <u>NOT</u> the last unit in the chain.

In case of a stand-alone projector, do not remove the resistors.

75 W resistors on the module	:line terminated.
75 W resistors removed	:line not terminated.

Procedure to remove the line termination resistors :

- Turn off the projector and unplug the projector power cord.
- Remove the top cover from the projector.
- Remove the RGB Input Auto Sync Tracking Module from the main frame.
- Unsolder and remove the resistors.
  To remove the RGB Input Auto Sync Tracking Module, follow the same procedure as described in the adjustment section for removing the Horizontal Deflection module :
- Press the module lock and lift up the module handle;
- Repeat this action on both sides of the module and extract the module out of the main frame.

Blue in Green Switch on the RGB Input Auto Sync Tracking Module

Blue characters are difficult to read, therefore the blue text will be displayed as cyan so that the readability becomes better.

Switch in the ON position	:Blue in Green active.
Switch in the OFF position	:Blue in Green disabled.

WARNING : Leaving the switch in the ON position will result in abnormal color balance of the projected image.

Force Negative Sync on the RGB Input Auto Sync Tracking Module

Switch in the ON position	: the sync pulses must be negative.
Switch in the OFF position	: the sync polarity will be automatically detected.

Connecting a RGB Analog source to Port 4/5

RGB analog input terminals with separate H and V sync inputs, composite sync input or sync signals on green can be connected to the projector via Port 4/5. The projector automatically detects where the sync signal is located.

An interface is recommended when connecting a computer and local monitor to the projector.

To select the RGB input :

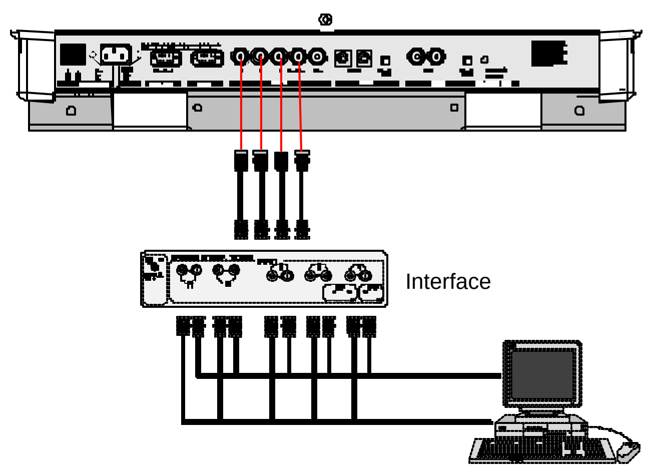
Press the *numeric button 4 or 5* on the RCU or the local keypad.

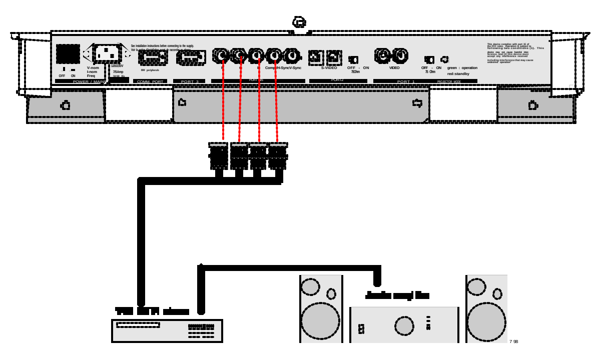
Connecting a Component Video source to Port 4/5

A component video (R-Y, Y, B-Y) with sync signals can be connected to the projector via Port 4/5. The projector automatically detects where the sync signal is located.

To select the component video input :

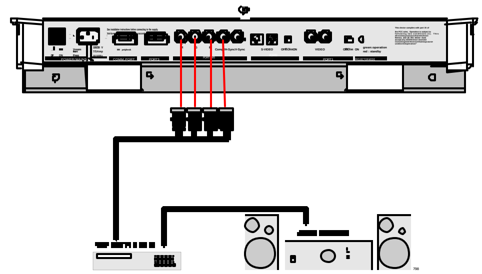
Press the *numeric button 6* on the RCU or the local keypad.





Connecting a RGB Analog source with Tri-level sync to Port 4/5

RGB analog input terminals with Tri-level sync input or with Tri-level sync on green can be connected to the projector via Port 4/5. The projector detects automatically where the sync signal is located.

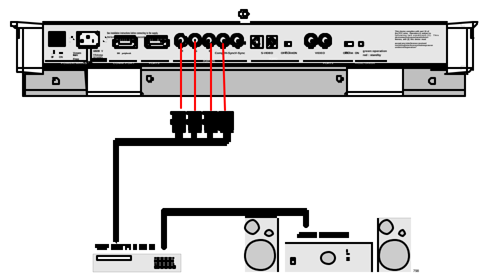


To select the input :

Press the *numeric button 7* on the RCU or the local keypad.

Connecting a Component Video source with Tri-level sync to Port 4/5

Component video inputs with Tri-level sync signal can be connected to the projector via Port 4/5. The projector detects automatically where the sync signal is located.



To select the input :

Press the *numeric button 8* on the RCU or the local keypad.

Before starting any adjustment.

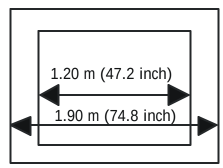
The ZENITH PRO 1200 is factory optimized for a screen with range 1.9m (74.8 inch) to 3.2m (126.0 inch)

You wish an optimal focused image for a screen width between 1.2m to 1.9m or between 3.2m and 6m? then, carry out the following mechanical adaptation :

Mechanical adaptation procedure (adding washers between lens and picture tube support) The screen width adjustment for the installed lens is divided into 3 ranges. Within these ranges, the focus can be optimal adjusted.

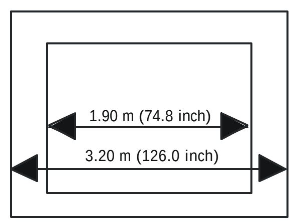
range 1

min. SW : 1.20 m (47.2 inch)
max. SW : 1.90 m (74.8 inch)



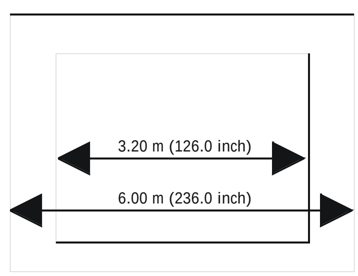
range 2

min. SW : 1.90 m (74.8 inch)
max. SW : 3.20 m (126.0 inch)



range 3

min. SW : 3.20 m (126.0 inch)
max. SW : 6.00 m (236.0 inch)



Scheimpfuge Adjustment (Diagonal image focusing)
With the diagonal image focusing corrections , it is possable to obtain uniform focus for the total projected image .

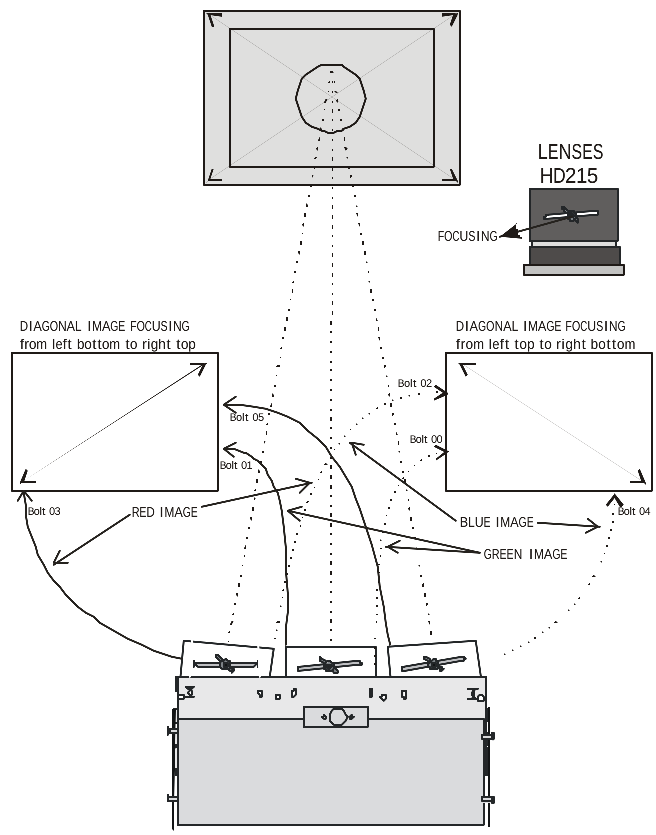
These corrections must be repeated for each color . The Diagonal image focusing is repeated 3 times , first the green , then the red and then for blue .

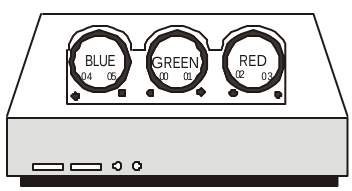
First , be sure that the CRT projection angle is correctly adjusted , otherwise it is not possible to obtain proper overall focus of the image .

Press: the <ENTER> key to start the green adjustment.
Press: the <EXIT> key to return to CRT Projetion Angle Adjustment .
Press: the <ADJUST> key to return to Operational mode .

Adjustment procedure :
Example : diagonal focusing of the green image .
Equalize diagonally the focus from left (bottom) to right (top) by turning
screw 01 of the projected color .
Equalize now diagonally the focus from left (top) to right (bottom) by turning screw 00 located unde the green lens .

Repeat the same procedure for the red and blue image using the corresponding screws.
To optomize the image focusing, repeat the optical lense focusing .





	LEFT → RIGHT	RIGHT ← LEFT
GREEN	00	01
RED	02	03
BLUE	04	05

INSTALLATION ADJUSTMENT MODE

Access to Installation Adjustment Mode

It will be necessary to perform several mechanical adjustments while in the Installation Adjustment Mode. It will be required to open and remove the projector's top cover in order to gain access to the adjustment points.

To enter into the installation adjustment mode :

- Press the <*ADJUST*> key to start up the adjustment mode.
- Push the up Arrow or Down Arrow to highlight the path *INSTALLATION* in the "Adjustment mode" menu and then press the <*ENTER*> key.
- A warning will be displayed on the screen. If you are a qualified and authorized service person, press the <*ENTER*> key to start up the installation mode. Otherwise, press the <*EXIT*> key to return.
- When entering the installation mode, the projector will automatically switch to the internal pattern on 15 kHz/50 Hz.
- When the password mode is active , you will be requested to enter the 4 digit password.

  Enter the digits with the numeric keys on the RCU or the local keypad.

  Example : Password as 2 3 1 9

  For each digit entered, a 'X' appears on the screen under the displayed text 'enter password'.

  If the entered password is correct, you get access to the 'Installation Adjustment Mode'.

  If the entered password is wrong, The message *"Wrong password!!!"* will be displayed. The projector stays on the previous selected item.

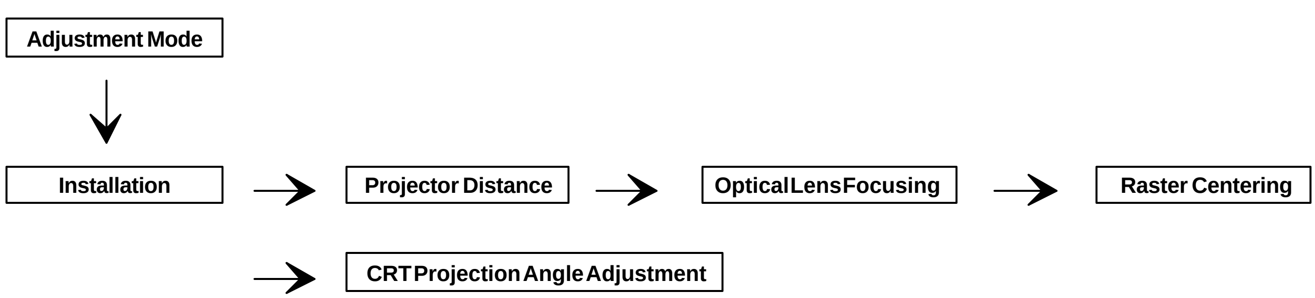
  Factory programmed password :

  0 0 0 0

Overview flowchart of the Installation Adjustment Mode

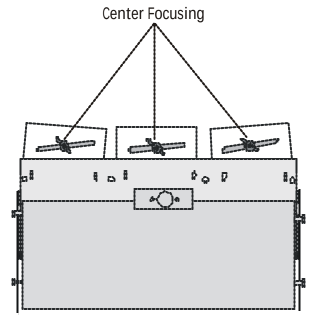
Important : Access to adjustments

The top cover of the projector should be removed in order to gain access to the adjustments.



Projector Distance

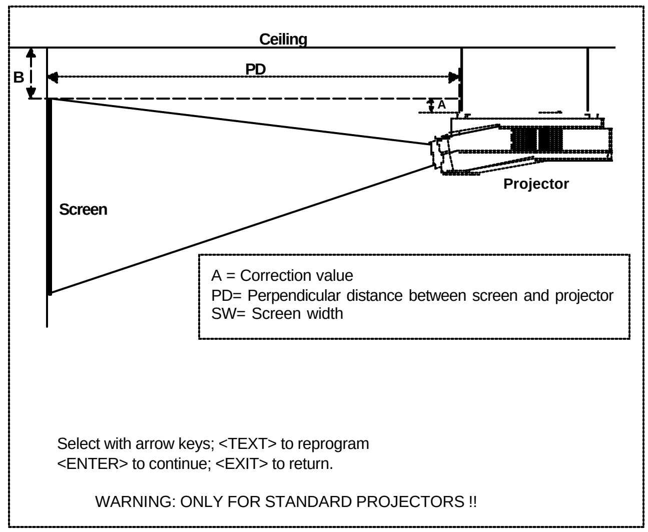
On the screen, a drawing will be displayed together with parameters indicating a correct installation position.



To change the screen width :

- Push the left or right arrow keys to highlight the item *SW* in the "Projector Distance 1" menu and then press the <*TEXT*> key.
- If the <*ENTER*> key is pressed, the "Optical Lens Focusing" will be displayed.
- If the <*EXIT*> key is pressed, the projector will return to the previous menu.
- After the <*TEXT*> key is pressed, the next menu "Projector Distance 2" will be displayed on the screen. It allows the user to change the Screen width.
- Push the control stick to the left or to the right to highlight the digit needed to be changed, and enter the desired digit with the numeric keys on the RCU or the local keypad.
- Press the <*ENTER*> key to confirm the changes. The projector will redisplay the "Projector Distance 1" menu with updated values for the three parameters.
- Press the <*ENTER*> key to continue with the "Optical Lens Focusing".

  If the <*EXIT*> key is pressed, the projector will return to the previous menu.



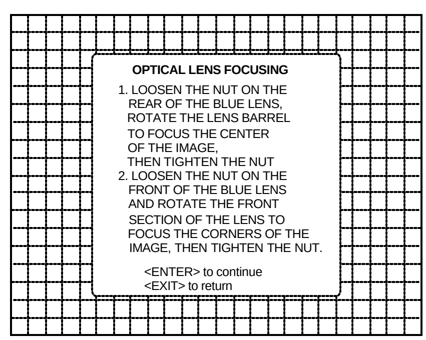
The same applies to the PD (projector distance). You can use the above-mentioned procedure to obtain a correct up-dated value of SW (screenwidth) after entering a new value of PD (projector distance).

Optical Lens Focusing

The optical focusing procedure is performed separately for each lens. The appropriate CRT will be switched on as the user proceeds through the optical focusing adjustment sequence.

Each lens has one focus adjustment point. The center of the projected image is focused by loosening the wing nut at the rear end of the lens and rotating the lens barrel until the center of the image is clearly focused.

Press the <*ENTER*> key to continue. After finishing focusing of the three lenses, press the<*ENTER*> key to enter the Raster centering.
Press the <*EXIT*> key to return to operational mode.
Press the <*ADJUST*> key to return to operational mode.

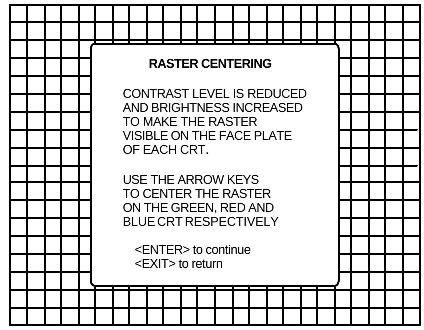


Raster Centering

The raster must be centered on the CRT faceplate of each tube, therefore, it is necessary to look into the lenses.

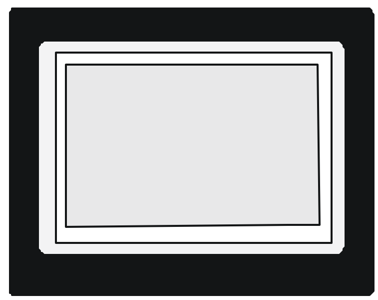
Caution : To avoid eye discomfort while performing these adjustments, reduce the contrast and gradually increase the brightness level until the raster becomes visible behind the image.

Warning : In order to ensure maximum CRT longevity and to avoid CRT damage, do not shift the raster outside the phosphor area of the CRT.



Press the <*ENTER*> key to display the raster on the green CRT.

Look into the green lens and shift the raster with the control stick until it is centered in the middle of the CRT faceplate.



Correct Raster Position

Press the <*ENTER*> key to activate the raster on the Red CRT faceplate.
Shift the Red raster with the control stick until the raster is centered on the CRT faceplate.

Press the <*ENTER*> key to activate the raster on the Blue CRT faceplate.
Shift the Blue raster with the joy stick until the raster is centered on the CRT faceplate.

Press the <*ENTER*> key to continue with the CRT projection angle adjustment.

Press the <*EXIT*> key to return to Optical focusing.
Press the <*ADJUST*> key to return to Operational mode.

CRT Projection Angle Adjustment

The projection angle of the red and blue CRT's is dependent on the desired size of the projected image. If the centers of green, blue and red do not coincide, the CRT projection angle must be adjusted.

NOTE : Never try to correct this misalignment with the shift correction or the static convergence controls. These controls may only be applied to correct small errors which cannot be corrected by the CRT angle adjustment.
Note: The Horizontal Shift and Vertical Shift for Red and Blue should be set near 50%.

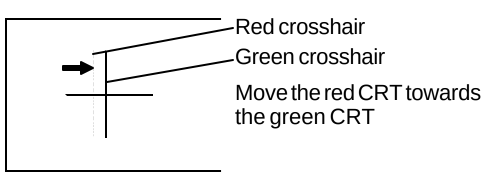
Be sure that the rasters are centered on the CRT faceplate.

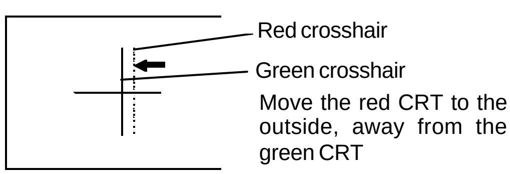
Press: the <*ENTER*> key to start the CRT angle adjustment procedure.
Press: the <*ENTER*> key to continue with the second part of the CRT projection angle adjustment.

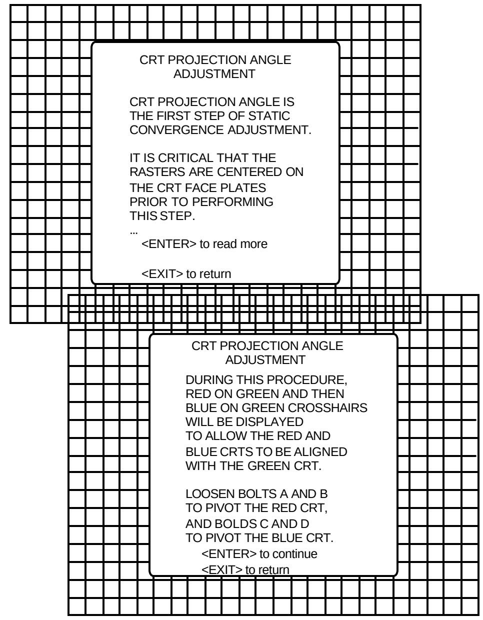
Press: the <*ENTER*> key to continue with the crosshairs alignment.
Press: the <*EXIT*> key to return to the previous menu.
Press: the <*ADJUST*> key to return to Operational mode.

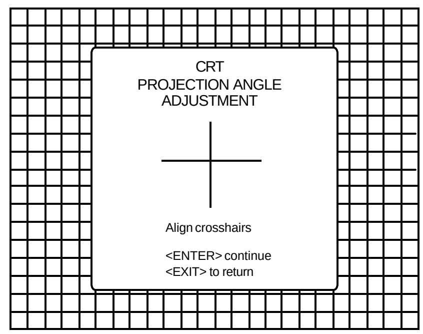
Loosen bolts A, B, C and D to pivot the red CRT until the center of the Red image and the center of the Green image coincide. When the angle of the red CRT is corrected, tighten the four bolts.
Press: the <*ENTER*> key to continue with blue and green crosshairs.
Press: the <*EXIT*> key to return to the CRT projection angle adjustment menu.

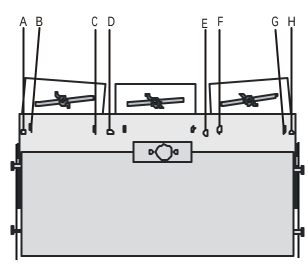
Loosen bolts E, F, G and H to pivot the blue CRT until the center of the Blue image and the center of the Green image coincide. When the angle of the blue CRT is corrected, tighten the four bolts.
Press: the <*ENTER*> key to continue with the diagonal focusing menu.
Press: the <*EXIT*> key to return to the CRT projection angle adjustment.

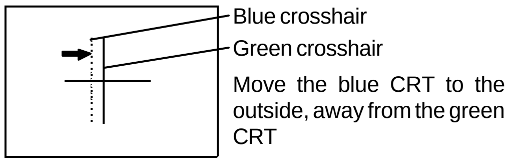


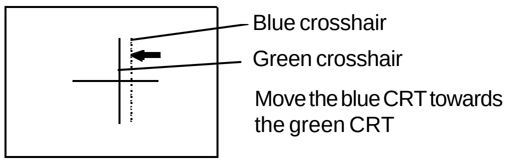




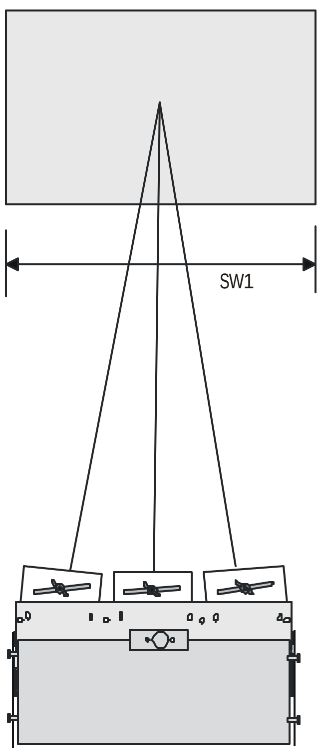


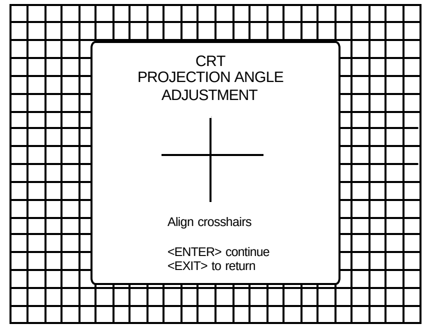




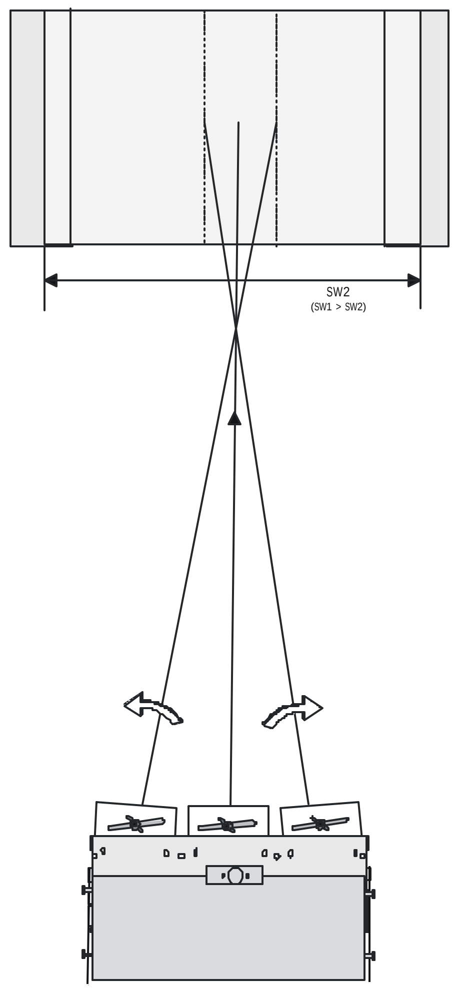


Projection angle correctly aligned for screen width SW1.





The same projection angle is misaligned for new screen width SW2. Realignment is necessary. Each screen width change requires readjustment of the projection angle.



Geometry Adjustments

The geometry adjustments have to be done only on the green image. These adjustments are automatically implemented for the other color images : Left-right (EW) and Top-Bottom Corrections, Blanking, Horizontal Amplitude, Vertical Amplitude, Vertical Linearity and Horizontal Phase.

Highlight *GEOMETRY* by pushing the control disk up or down and press **ENTER** to display the geometry menu.

ENTER will display Geometry menu.
EXIT will return to Internal Crosshatch Selection or Setup Pattern Selection Menu.
ADJUST returns to operational mode.

Within the Geometry Adjustment menu, the following adjustments are available :

- Horizontal Phase (not for internal # pattern).
- Raster Shift
- Left-Right Corrections
- Left Side Corrections
- Top-Bottom Corrections
- Horizontal Size
- Vertical Linearity
- Vertical Size
- Blanking

The convergence corrections are disabled during geometry corrections. The blanking corrections are only enabled during the blanking adjustments.

Horizontal Phase Adjustment

Push the control disk up or down to highlight *H PHASE* on *Geometry menu* and then press **ENTER**.

Note : No horizontal phase adjustment is available on the internal # pattern.

For external sources :
If the raster shift is correctly adjusted, the H Phase text box is projected in the middle of the raster. At that moment, the "><" icon indicates the middle of the raster.
Adjust the H Phase control until the middle of the projected image is equal with the middle of >< icon.

Note: If the genlocked pattern was selected, the external source will be displayed.

A bar scale and a number indicator (between 0 and 100) on the screen give a visual indication of the horizontal phase adjustment.

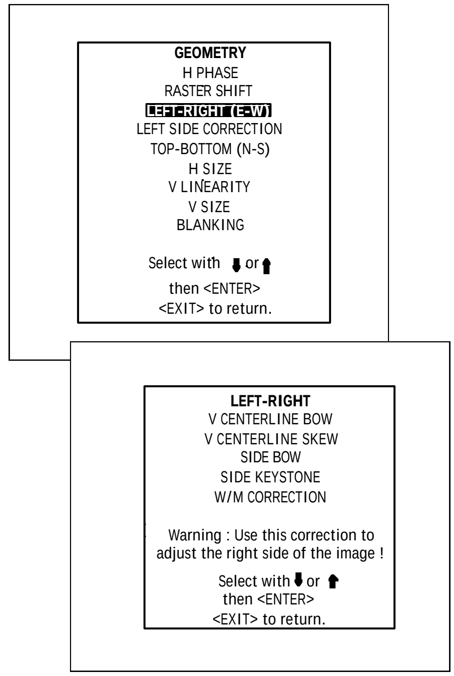
ENTER continues to geometry menu .

Left-Right (east-west) Adjustments

Left-right adjustments affect only the vertical lines of the projected image. Only the green image is displayed while making left-right adjustments. The red and blue images will automatically be corrected in the same manner. Convergence corrections are automatically disabled for the duration of these adjustments.
The following adjustments can be executed :

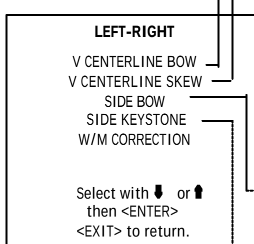
- Vertical Centerline Bow
- Vertical Centerline Skew
- Side Bow
- Side Keystone
- W/M correction

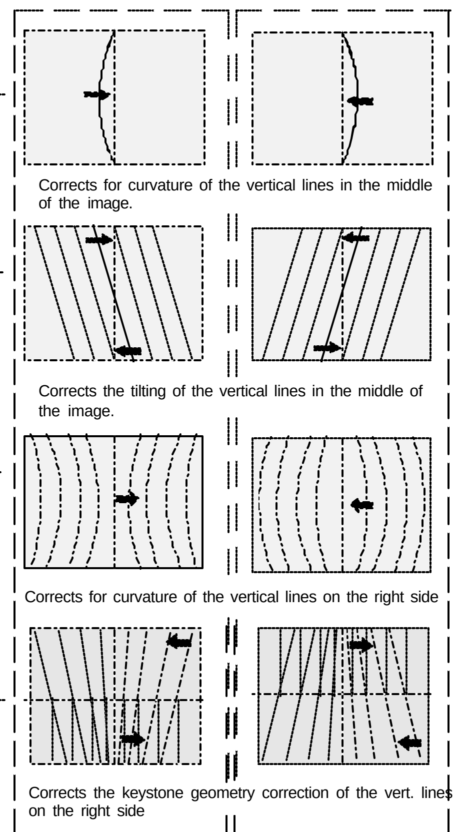
Push the control disk up or down to highlight *LEFT-RIGHT (E/W)* on the geometry menu and then press **ENTER**.



ENTER will select Left-Right adjustment menu.
EXIT returns to random access adjustment mode main menu.
ADJUST returns to operational mode.

The warning : "Use this correction to adjust the right side of the image" appears on the screen when selecting 'Side Bow' or 'Side Keystone'. When the right side is correctly adjusted, use 'Left Side Correction' to correct the left side of the image.





Correct by pushing the control stick to the right

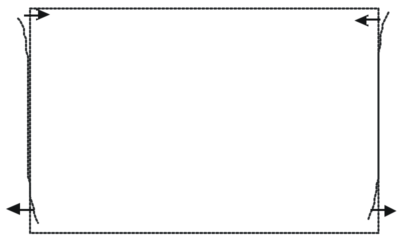
Correct by pushing the control stick to the left

All adjustments are indicated on the screen with the function name, a bar scale and a number between 0 and 100. Adjust the next alignments until the vertical lines are straight. For side bow and side keystone, look only to the right side of the image.
To enter an alignment, push the control disk up or down to highlight a function and press **ENTER** to activate this function.
Press **EXIT** to return.

W/M Correction (Vertical)
Use this correction only if, after adjusting the vertical lines with the side bow or side keystone, still a 'S' deformation is visible on the left and the right side of the image.
The default value on the bar scale for this correction is 50.

Push the control disk up or down to highlight *W/M CORRECTION* on the Left-Right menu and then press **ENTER**.

Eliminate the deformation by pushing the control disk to the left or to the right until a straight line is obtained.



Left Side Correction

Left side corrections affect only the vertical lines of the set up pattern. Only the green image is displayed while making the left side adjustments. The red and blue images will automatically be corrected in the same manner.

Convergence corrections are automatically disabled for the duration of these adjustments.

Look only to the left side of the image while adjusting these fine tunings (bow and keystone). Before starting the left side correction, insure that the side bow and keystone adjustments are done prior to these fine adjustments !
The following adjustments can be executed :
- Left keystone
- Left bow

Push the control disk up or down to highlight *LEFT SIDE CORRECTION* on the geometry menu and then press **ENTER**.

All adjustments are indicated on the screen with the function name, a bar scale and a number between 0 and 100. Adjust the next alignments until the vertical lines on the left side are straight.

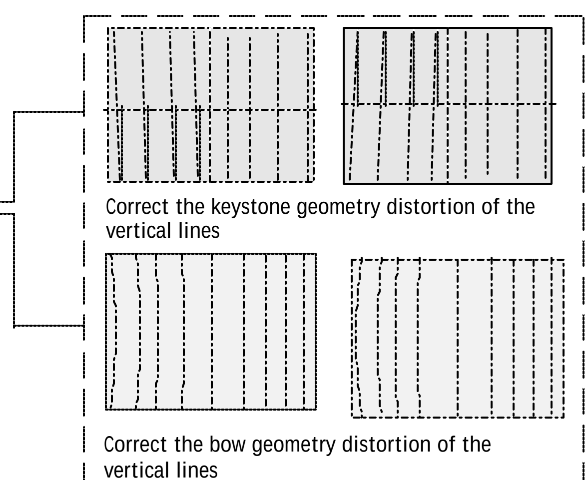
To enter an alignment, push the control disk up or down to highlight a function and press **ENTER** to activate this function.
Press **EXIT** to return.

LEFT SIDE CORRECTION

LEFT KEYSTONE
LEFT BOW

Ensure that the side bow and keystone adjustments are done prior to these fine adjustments !

Select with ⬇ or ⬆
then <ENTER>
<EXIT> to return.



Correct by pushing the control disk to the right

Correct by pushing the control disk to the left

ENTER will select the Left Side Correction menu.
EXIT will return to the random access adjustment menu.
ADJUST returns to operational mode.

Top-Bottom (north-south) Adjustments

Top-Bottom and center adjustments affect only the horizontal lines of the projected image.

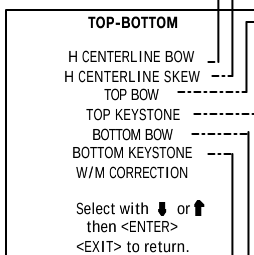
To start up the Top-Bottom and center corrections, follow the next procedure :

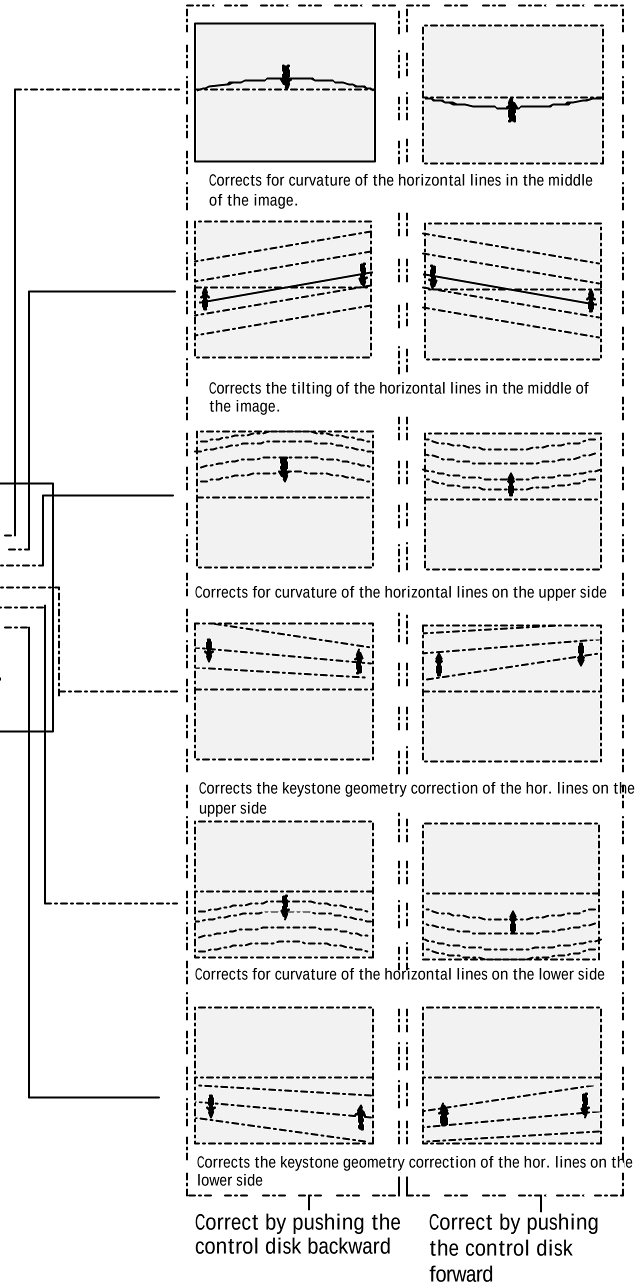
Push the control disk up or down to highlight *TOP-BOTTOM (N/S)* on the geometry menu and then press **ENTER**.

Only the green image is displayed while making top-botton adjustments. The red and blue images will automatically be corrected in the same manner. Convergence corrections are automatically disabled for the duration of these adjustments.

The following adjustments can be executed :

- Horizontal centerline bow
- Horizontal centerline skew
- Top bow
- Top keystone
- Bottom bow
- Bottom keystone
- W/M correction





All adjustment are indicated on the screen with the function name, a bar scale and a number between 0 and 100.

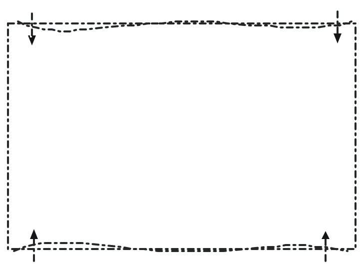
Adjust the next alignments until the vertical lines are straight.

To enter an alignment, push the control disk up or down to highlight a function and press **ENTER** to activate this function.

Press **EXIT** to return.

W/M Correction (Horizontal)
Use this correction after the image has been adjusted with top and bottom bow and keystone. If still a deformation (like a W/M) on top and bottom of the image is visible, proceed to the W/M correction. Due to interaction, it is possible that the top and bottom bow have to be readjusted after adjusting the W/M correction to obtain an improved image. The default value on the bar scale of this correction is 50.
Push the control disk up or down to select the 'W/M Correction' and press **ENTER** to select.
Eliminate the deformation by pushing the control disk up or down until a straight line is obtained.

ENTER will return to Top-Bottom adjustment menu **EXIT** will return to Geometry menu



Horizontal Size Adjustment
Push the control disk up or down to highlight *H SIZE* on the Geometry menu and then press **ENTER**.

ENTER will select horizontal size adjustment.
EXIT returns to random access adjustment mode menu.
ADJUST returns to operational mode.

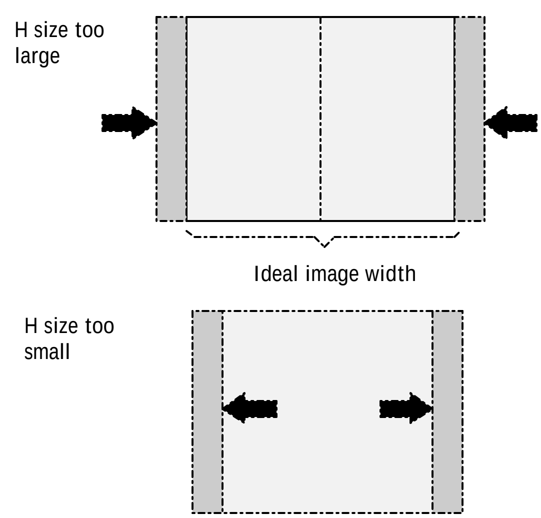
Adjust the horizontal size by the control disk to the right or to the left until the exact image width is obtained.

Note: If the internal # pattern was selected, this pattern remains on the screen.
If the genlocked pattern was selected, the external source will be displayed.

A bar scale and a numeric indicator help to gauge the horizontal size adjustment.

Hint : In order to avoid loss of resolution in the projected image and to ensure maximum CRT longevity, do not use an excessively small horizontal size setting.

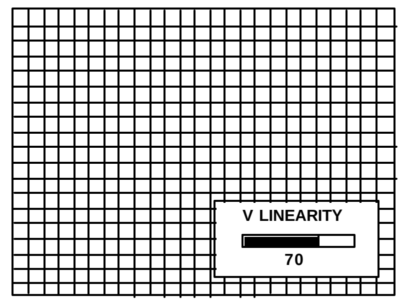
EXIT will return to Geometry



Vertical Linearity Adjustment

The vertical linearity adjustment function corrects for vertical non-linearities which extend from the center of the image to the top and bottom of the image.
Push the control disk up or down to highlight *V LINEARITY* on the Geometry menu and then press **ENTER**.

ENTER will select vertical linearity adjustment.
EXIT returns to random access adjustment mode menu.
ADJUST returns to operational mode.



Adjust the vertical linearity with the control disk until the distances between the horizontal lines of the set up pattern are equal from top to bottom.

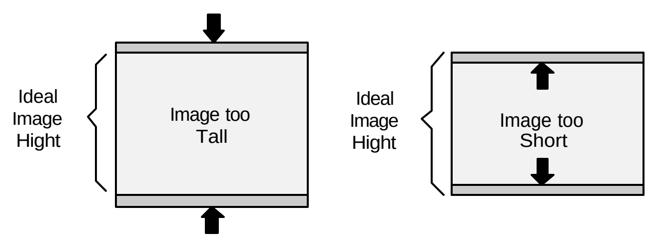
EXIT will return to the Geometry menu

Vertical Size Adjustment

Push the control disk up or down to highlight *V SIZE* on the Geometry menu and then press **ENTER**.

ENTER will select vertical size adjustment.
EXIT returns to random access adjustment mode menu.
ADJUST returns to operational mode.

Adjust the vertical size by pushing the control disk up or down until the correct image height is obtained.



Note: -if the internal # pattern was selected, this pattern remains on the screen.
- if the genlocked pattern was selected, the external source will be displayed.

A bar scale and a numeric indicator give a visual indication of the vertical size adjustment.

Hint : In order to avoid loss of resolution in the projected image and to ensure maximum CRT longevity, do not use an excessively small vertical size setting.

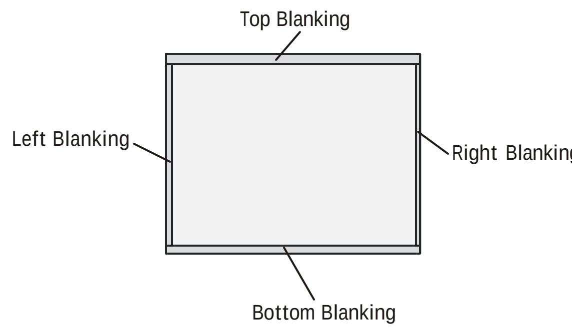
EXIT will return to Geometry

Blanking Adjustments

Blanking adjustments affect only the edges of the projected image and are used to frame the projected image on to the screen and to hide or black out unwanted information (or noise). A 0% on the bar scale indicates no blanking.

To start up the Blanking adjustments, follow the next procedure :

Push the control disk up or down to highlight *BLANKING* on the Geometry menu and then press **ENTER**.

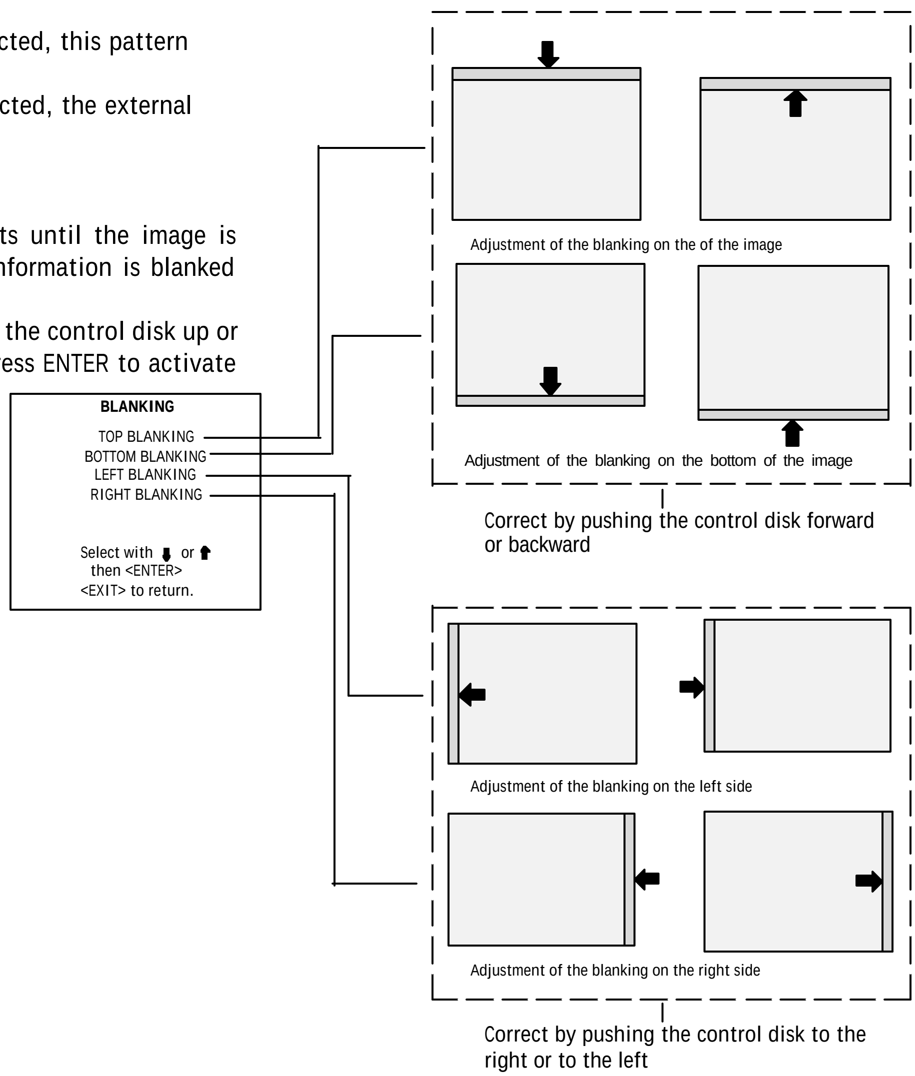


The following blanking corrections are possible :
- Top blanking
- Bottom blanking
- Left blanking
- Right blanking

Therefore :
- If the internal # pattern was selected, this pattern remains on the screen.
- If the genlocked pattern was selected, the external source will be displayed.

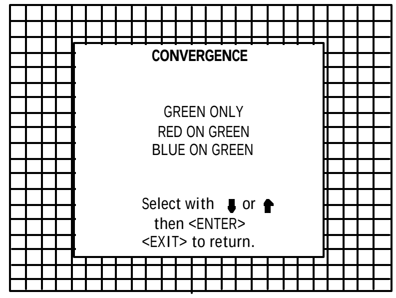
Adjust the next blanking alignments until the image is correctly framed or the unwanted information is blanked out.
To enter a blanking alignment, push the control disk up or down to highlight a function and press ENTER to activate this function.

Press **EXIT** to return.



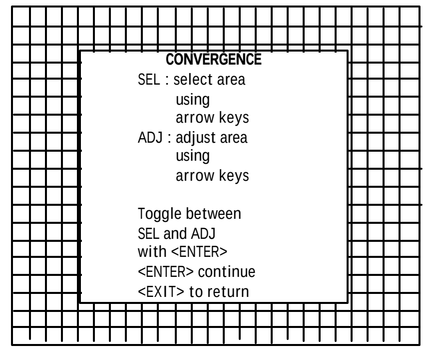
Convergence Adjustment

Convergence adjustments affect both the horizontal and vertical lines of the setup pattern. These adjustments are performed on the red image while superimposed on the green image and then on the blue image while superimposed on the green image.



Note : the green convergence adjustments can be added as an option. When these are available, always start with 'green only'. This option will also be indicated on the convergence menu.

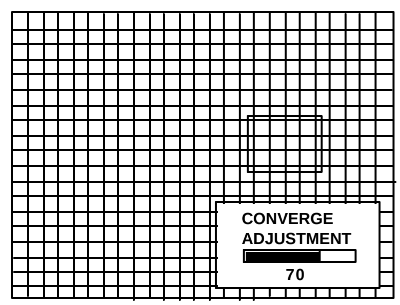
Highlight first 'Green only' when available with the control disk and press **ENTER** to display the convergence adjustment menu.



The screen area is divided into 25 areas. Use the control disk to move the box to the desired zone and then press **ENTER** to begin the convergence adjustment. Start the convergence adjustment with zone one and continue as mentioned in the diagram hereafter.

25	23	9	15	17
24	22	8	14	16
5	4	1	2	3
20	18	6	10	12
21	19	7	11	13

Use the control disk to make horizontal or vertical convergence adjustments in the selected zone and then press **ENTER** to move the box to another zone or **EXIT** to return to the Convergence menu.
ENTER toggles the control disk between zone selection and zone adjustment.
EXIT returns to convergence menu.



Random access adjustment mode selection menu.

This is the main menu for the Random Access adjustment mode.

Through this menu, the following adjustments and features are accessible :

- Picture Tuning
  - Enhanced Blue (only for RGB)
  - Sync slow/fast(video/s-video)
  - Color Balance
- Focusing
- Geometry
- Convergence
- Color select

And also Orbiting, Contrast modulation and Soft Edge.

Picture Tuning

Highlight *Picture tuning* by pushing the control disk up or down and press **ENTER**.

The Picture tuning menu will be displayed.

Depending on the input source, the Picture tuning menu will display different items.

For Video input sources :
Color Balance
Port 2 : Video or S-Video (only when source 2 is selected)

For RGB analog sources :
Color Balance
Sync slow/fast
Peaking
Clamp Tuning

For Component input and RGB on 15 kHz.
Color Balance
Sync slow/fast
Peaking
Clamp Tuning

Color Balance

The Color Balance function is used to select or adjust the color temperature of white used by the projector.

The Color Balance can be adjusted on two different ways :
- Fixed color balance. You have the choice between 3200 K (reddish), 4900 K, 6500 K (white) or 9300 K (bluish).
- Custom white and black balance.

Fixed Color Balance.

Highlight *one of the 4 preprogrammed color temperatures* with the control disk and press **ENTER** to display the desired color balance.

Custom Color Balance.

Select custom Red & Blue gain with the control disk and press **ENTER** to start the adjustment.

Push the control disk up or down to adjust the red gain and push the control disk to the left or to the right to adjust the blue gain. A bar scale indicates the amount of adjustment.

Select custom Green gain with the control disk and press **ENTER** to start the adjustment.

Push the control disk up or down to adjust the green gain.

Select custom R & B cut off with the control disk and press enter to start the adjustment. Push the control disk up or down to adjust the red cut-off and push the control disk to the left or to the right to adjust the blue cut-off.

Select custom Green cut off with the control disk and press enter to start the adjustment. Push the control disk up or down to adjust the red cut-off.

EXIT returns to the Picture tuning menu.

Sync Fast/Slow Adjustment

The sync function is used to minimize horizontal jittering or tearing at the top to the displayed image.

Highlight *SYNC* by pushing the control disk up or down and press **ENTER** to toggle between *FAST* and *SLOW*.

Note: SYNC is normally used in the SLOW position. For Video and S-Video the sync is automatically set to FAST.

ENTER will toggle Sync between FAST and SLOW.
EXIT will return to the random access selection menu.

Peaking

Peaking improves the contours in an projected image.

Highlight *PEAKING* by pushing the control disk up or down and press **ENTER** to display the peaking menu.

During the creation of new settings for a RGB source the corresponding peaking is switched on as default.

For frequencies between :
15 kHz - 45 kHz : Low frequency peaking.
45 kHz - 85 kHz : Mid frequency peaking.
85 kHz - 110 kHz :High frequency peaking.

If another peaking is desired, use the control disk to highlight 'low', 'mid' or 'high' frequency or to switch off the peaking.

Clamp Tuning

Highlight *CLAMP TUNING* by pushing the control disk up or down and press **ENTER** to toggle between NORMAL and RESTORATION.

Select Normal : - For all standard sources and all sources with a backporch > 0.8µs,
- For sources with noise and spikes in the signal.

Select Restoration : - For standard sources with a backporch between 0.4 µs and 0.8 µs,
- For sources with sync separate or sync on Green.

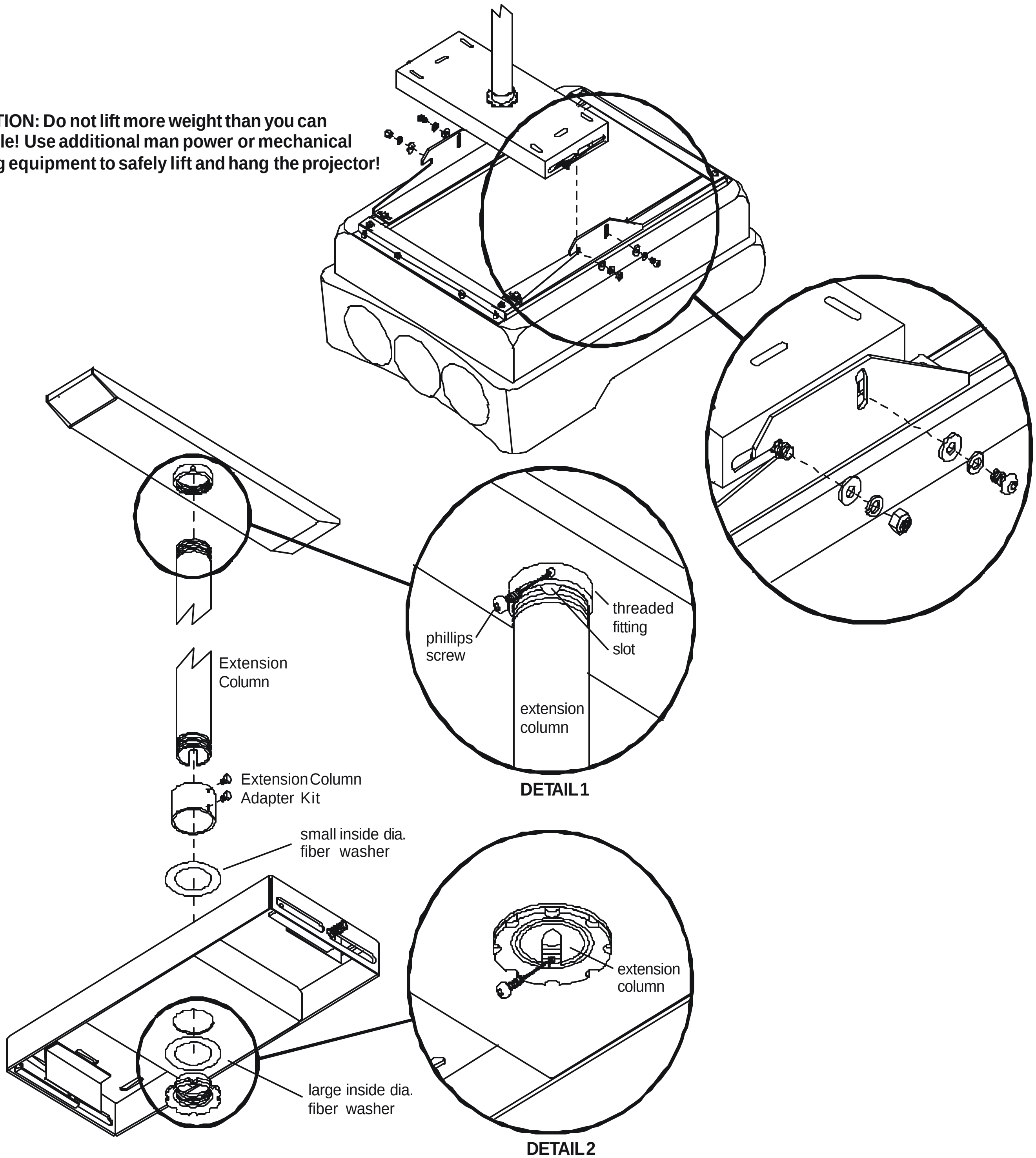
SOURCE 01 **Fh= 15.6 kHz** **Fv= 050 Hz**	When selecting a new source, information about this source will be displayed on the screen. Source number, horizontal and vertical frequencies of the displayed source.
WARNING : **source not available**	The input is a valid input but the source is not connected to the input terminals or the input source is switched off.
SOURCE 01 **Fh= 15.6 kHz** **Fv= 050 Hz**	Announcement of the selected source.
WARNING : **invalid key entry**	When a wrong key is pressed on the RCU.
enter password xxxx	Message to enter your password. Password contains 4 digits.
WARNING : **invalid code entry**	Message when the entered password is wrong.
text on **text off**	These messages will be displayed on the screen when pushing the <*TEXT*> key. Text ON : the *'Bar scale indication'* will be enabled during the change of an analog control in the *'Operational mode'.* All warning and failure messages will be displayed. Text OFF : the *'Bar scale indication'* will be disabled during the change of an analog control in the *'Operational mode'.* All warning and failure massages will not be displayed.
WARNING : **end of adjust range**	End of adjustment range.
WARNING : **input no longer available**	Message will be displayed when the input source is no longer available. The following message then appears: *'check input signal or select new source'*.
PROJECTOR ADDRESS : 003	Indication of the projector address when activating the *'ADDRESS'* button on the RCU with a pencil or other small object.
check input signal or select new source	This message will be displayed after the message *'input no longer available'*. It asks to check the connections between the source and the projector or to check if the source is switched on.
WARNING : **input not available**	When using the projector with the RCVDS, this warning will be displayed when selecting an input slot of an RCVDS where the input board is missing.
WARNING : **input selector not available**	It warns you to check the power connection or the power status of the RCVDS. Next message will appear immediately on the screen : *'go to standby'*.

Message	Description
WARNING : go to stand by	Projector will switch to *'Standby'* when the RCVDS is no longer available.
WARNING : invalid frequency input	The entered frequency or applied frequency of the source is out of the projector's range.
WARNING : default settings loaded in the E2PROM	Adjustment settings are lost. Reload using Projector Control Software via PC or MAC (if this option is available), or readjust image.
table is deleted	Message to inform that selected table is deleted. This message will be followed by *'confirm message'*, on which the user has to answer.
FAILURE invalid RWI soft version	Wrong software version in your projector. Call for technical support.
FAILURE I²C error addr. : 7FH3	Hardware failure. Call a qualified service technician for repair.
FAILURE short circuit on I²C bus	Hardware failure. Call a qualified service technician for repair.
FAILURE RCVDS com- munication error	Serial communication error between RCVDS and projector.
FAILURE RWI commu- nication error	Hardware failure. Call a qualified service technician.
FAILURE PROVERGE commu- nication error	Communication error between PROVERGE and the projector. Call a qualified service technician.
WAIT starting up PROVERGE	Message during the start up of the PROVERGE. Message will disappear when the PROVERGE is ready to accept commands.

CEILING MOUNT SUPPORT

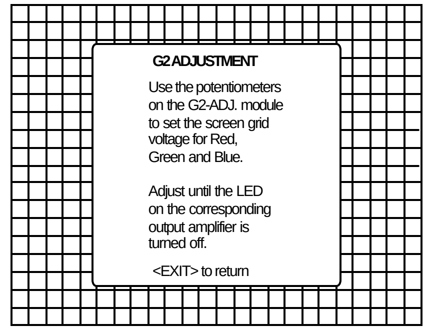
WARNING: Fine tune the tilt and position of the projector. When adjustments are complete BE SURE TO TIGHTEN ALL FASTENERS SECURELY!

CAUTION: Do not lift more weight than you can handle! Use additional man power or mechanical lifting equipment to safely lift and hang the projector!



G2 ADJUSTMENT

Once the on-screen menu "G2 ADJUSTMENT" is displayed, proceed as follows :



- Remove the top cover from the projector and open the front metal protection cover by turning out the 3 retaining screws on both sides.
- A green LED is mounted on each of CRT sockets .
  When selecting the G2 adjustment menu, these green LEDs must be out. If not, follow the procedure below to adjust the G2 :
  - Open the second metal cover by turning out the retaining screws on both sides and pivot the cover to the front side of the projector
  - Adjust the G2 potentiometers very slowly with a plastic tweaker until the LED of the corresponding amplifier just stops illuminating. Repeat the adjustment for the other colors;
  - After the three G2 potentiometers have been correctly adjusted, close both metal covers and secure with the retaining screws.

After finishing the adjustments :

Press the *<ENTER>* key to continue with the *"SERVICE"* menu.
Press the *<EXIT>* key to return to the *"SERVICE"* menu.
Press the *<ADJUST>* key to return to Operational mode.

Focusing

Before starting the 'focusing' adjustment, be sure the lenses are correctly focused.
Push the control disk up or down to select 'Focusing' and press **ENTER**.

ENTER continues to the Focusing color select menu.
EXIT returns to Internal Crosshatch Selection or Setup Pattern Selection menu.
ADJUST returns to operational mode.

Focusing color select.

The focusing has to be done for the three colors separately. Therefore, start by selecting Green by pushing the control disk up or down and adjust Midpoint, top, bottom left and right focusing.
Return to this focusing color select menu and continue with Red and Blue. Repeat for both colors Midpoint, top, bottom left and right focusing.

ENTER selects the focusing menu for the selected color.
EXIT returns to the Random access main menu.

Midpoint focusing

Push the control disk up or down to select midpoint and press **ENTER** continue with the midpoint focusing.

Adjust by pushing the control disk to the left or to the right until the center of the image is sharp.
Press **ENTER** to return to the focusing menu.

Top image focusing

The same procedure has to be repeated as for the midpoint focusing.
Push the control disk up or down and press **ENTER** to continue to the top focusing.
Push the control disk to the left or to the right to adjust the top focusing. Adjust until the upper part of the image is sharp.
ENTER to return to the Green Focusing menu.

Bottom image focusing

The same procedure has to be repeated as for the midpoint focusing.
Push the control disk up or down to select bottom and press **ENTER** to continue to the bottom focusing.
Push the control disk up or down to adjust the bottom focusing. Adjust until the lower part of the image is sharp.
ENTER to return to the Green Focusing menu.

Left image focusing

The same procedure has to be repeated as for the midpoint focusing.
Push the control disk up or down to select LEFT and press **ENTER** to continue to the left focusing.
Push the control disk up or down to adjust the left focusing. Adjust until the left part of the image is sharp.
ENTER to return to the Green Focusing menu.

Right image focusing

The same procedure has to be repeated as for the midpoint focusing.
Push the control disk up or down to select RIGHT and press **ENTER** to continue to the right focusing.
Push the control disk to the left or to the right to adjust the right focusing. Adjust until the right part of the image is sharp.
ENTER to return to the Green Focusing menu.
When on the Green Focusing menu, press EXIT to return to the focusing color select menu and continue with the other colors.

Blue on source

After focusing the three color, and a discoloring on a normal image is still visible, select *'Blue on source'* on the Focusing menu and repeat the above steps for Midpoint, top, bottom left and right focusing.

Press **EXIT** to return to focusing menu.

When entering the gamma corrections, a warning will be displayed :

"RISK OF INCORRECT ADJUSTMENT OF THE PROJECTOR. THE GAMMA CORRECTIONS ARE FACTORY ADJUSTED USING AN ACTAS COLOR ANALYZER ! THEREFORE, ONLY QUALIFIED INSTALLATION OR SERVICE PERSONNEL SHOULD PERFORM THESE ADJUSTMENTS ! "

If you are qualified, press the <ENTER> key to continue.

Gamma Corrections

Three items can be selected inside the "Gamma Corrections" menu: the Blue Gamma Correction, the R & B midlights and the factory preset.

To carry out the Blue Gamma Correction :

- Push the control disk forward or backward to highlight the item BLUE GAMMA CORRECTION in the menu and then press the <ENTER> key.

  If the <EXIT> key is pressed, the projector will return to the Service menu.
- After the <ENTER> key is pressed, a text box with the message, "Adjust with arrow key", will be displayed on the screen.
- Push the control disk forward or backward to adjust the slope, a text box with a bar scale (Min to Max) will be displayed to visualize the magnitude of the correction.
- Push the control disk to the left or to the right to adjust the breakpoint, a text box with a numeric bar scale (0-99) will be displayed to visualize the magnitude of the correction.
- Press the <ENTER> key to return to the "Gamma Corrections" menu.

To carry out the Red and Blue Midlights Correction :

- Push the control disk forward or backward to highlight the item R & B MIDLIGHTS in the menu and then press the <ENTER> key.

  If the <EXIT> key is pressed, the projector will return to the Service menu.
- After the <ENTER> key is pressed, a text box with the message "Adjust with arrow key", will be displayed on the screen.
- Push the control disk forward or backward to adjust the Red Midlights, a text box with a bar scale (0-16) will be displayed to visualize the magnitude of the correction.
- Push the control disk to the left or to the right to adjust the Blue Midlights, a text box with a bar scale (0-16) will be displayed to visualize the magnitude of the correction.
- Press the <ENTER> key to return to the "Gamma Corrections" menu.

To set the parameters back to the factory preset values :

- Push the control disk forward or backward to highlight the item FACTORY PRESET in the menu and then press the <ENTER> key.
- Press the <EXIT> key to return to the Service menu.

Technical Description EHT module 809-10458
Introduction
On this board, the EHT drive pulses for the EHT power supply are generated. The primary circuit for the EHT power supply receives its 300VDC supply from the Main. In the event of a failure, either because the EHT is too high, too much current in the EHT circuit or a horizontal or vertical scan failure condition exists, the EHT voltage is discontinued.
We will discuss the generation of the EHT pulses, its regulation, and, the different protection circuits.

DC controlled multivibrator (Page 6-5 Sect. E-5)
The EHT multivibrator is set up around two Schmidt Trigger NAND gates in IC2. The frequency of this oscillator is typically around 80 kHz. Two time constants are involved in this circuit: C7 / P3 + R11 and in the feedback loop C8 / R10 + transistor Q2.

The first time constant is invariable and determines the OFF time of the power switch Q7 and is tuned with P3 to 10 µS. The second time constant is variable and depends on the current flow through Q2. By a change of the bias voltage on the base of transistor Q2, this time constant can be regulated.
Q1 receives at its base the FBHV voltage (feedback voltage from the divider). This is the EHT voltage divided by a factor 1000 on the splitter. The emitter of Q1 is set at a reference of +33 volts by zener IC4. The duty cycle or the on/off time of the power switcher Q7 is consequently regulated by the voltage difference detected by Q1.

The squared waveform at pin 3 of the NAND gate is, via a fast switching and inverting FET Q3, sent to the opto-coupler IC1. This opto-coupler is necessary because the remainder of the circuit is supplied with the +17M' and the +300M which are not isolated from the Main. The +17M voltage is obtained from a special winding on the SMPS and the +300M is the rectified Main voltage (GNDM is Main or hot ground).

Caution: Any servicing on a board that uses both a Main Ground and a Chassis ground should involve the use of an Isolation Transformer, especially when using an oscilloscope, or other equipment connected to the main AC source. Do not connect the Main and Chassis Ground together at any time.

As this board is supplied with the +300M as soon the Main switch is pushed, it is not recommended to remove this board any more even when the projector is in a stand-by position. This can damage the contacts of the board.

The output of the opto-coupler IC1 drives a FET Q6 which on its turn drives the push-pull stage Q4/Q5. The pulses are capacitively coupled with C11 to the gate of Q7. The 20 volts zener Z3 has two purposes.
The negative level of the pulses is clamped at -0.6 volt, and on the other hand the gate-source voltage is limited (protected) to 20 volt DC, in order to protect the switcher Q7.

The drain (DHV) of the power switcher is connected with the primary winding of the EHT transformer. Transformer and quadrupler are in the same unit.
The +300M enters the board and is passing a filter L1/C29 and a fuse before it supplies the Transformer / Quadrupler unit.

Protections
a) EHT Hold down: (Page 6-5)
The EHT of the projector must be switched off in the event of a failure in the regulating circuit or an absence of the feedback voltage. Moreover, when the current in one or more tubes is excessively high (leaking of a tube), the projector must be switched off via the EHT Hold Down rather than via the main switch. As the spot suppression does not work, the CRTs could be damaged when switched off via the main switch.
1. EHT Hold Down due to fault in the regulating circuit (FBHV too high) (Page 6-5 Sect. C-2)
The slider voltage of P2 (“hold down adjust” potentiometer) is sent to the base of Q8 and its emitter is set at a threshold of 5.6 volt by Z4. As soon the EHT rises beyond 36.5kV, transistor Q8 starts conducting, turning on Q9. The Schmidt-trigger pins 8 - 9 of IC2 go high and the corresponding output pin 6 goes low. D6 pulls pin 6 of IC2 low in order to stop the EHT multivibrator, halting the EHT.

The low at 12-13 means that the output of IC2, pin 11, goes high (inverting) in order to forward bias LED D8 indicating the EHT HOLD DOWN condition. The feedback resistor R30 maintains the hold down condition (lock-down), until the projector is powered off to reset the circuit.

2. EHT Hold Down due to a feedback loop fault condition (Page 6-5 Sect. E-7)
The EHT hold down protection must also operate when there is an “open loop”, or no EHT feedback voltage +FBHV from the splitter. If that were the condition, there would be no way to monitor the EHT, and it could go higher than the 36.5kV, since there is no FBHV voltage available. Another reason is that the maximum voltage on the MOSFET switcher is limited to 960V as well. The detection for “open loop” is built around the EHT “flyback” pulses taken from the drain of Q7.

These pulses are rectified with D42 and the resulting pulsating DC is filtered by C30, divided down with R70/ R35+R38 and applied to the base of Q10. A threshold level of 4.7 volt is installed at the emitter with Z8. From 5.6 volt base voltage onwards Q10 starts conducting, turning fully on Q18. In the LED of the opto-coupler there is small current flow from the +300M through R9. When Q18 gets forward biased, this current increases heavily and the output pin 5 drops. Via the forward biased Z5, the emitter of Q8 is lowered and Q9 is turned on introducing the EHT HOLD DOWN .

Note that the same opto-coupler and transistor Q15 are used to remove the influence of the hum on the +300M supply via the feedback voltage. The +300M is, via a filter C24+R51/R9, supplying current to the opto-coupler (pin 1 of IC5). The voltage, containing this Main hum, is taken from the collector of Q15 and capacitively added to the FBHV input .

3. EHT Hold Down in the event of an excessive amount of CRT beam currents (Page 6-5 Sect. B-7)
Finally, in the event of an excessive amount of CRT beam current, the negative HVL voltage can charge up C39 to the -0.6V threshold and Q9 conducts to introduce the EHT HOLD DOWN condition. The delay is determined by the time constant R102/C39 and the amplitude of the HVL voltage.
Note that a beam current proportional voltage (BCL) is also sent to the RGB-Decoder drive board to reduce the contrast and brightness from some level onwards.

As a summary, the EHT Hold Down is active for:

- too high EHT, information coming from the feedback line FBHV
- too high EHT in “open loop” via Q10/Q18 and the opto-coupler IC3.
- too high beam current lasting for some time (short in a crt).

b) Switching off the EHT when a Horizontal or Vertical scan failure occurs. (Page 6-5 Sect. F-6)
In the event of a horizontal and/or vertical scan failure, the SF line is dropped to around zero volt. Q16 is blocked turning on Q6 on the subunit. D3 becomes forward biased and pulls pin 6 of the multivibrator at ground level, stopping the EHT.
When the scan fail line goes high again prior to switching off the projector, C45 has to charge up first. This prevent oscillations and further delays the action of the slow start circuit (Q11-Q13).

c) Overcurrent protection of the Q7 switcher.

The drain-source current of Q7 is measured by the resistor R21 in the source. This voltage developed across the sensing resistor is applied to the base of Q14 via a divider R40/R15.

The purpose of the circuit is to stop temporarily the EHT when the beam current tends to go beyond a maximum to avoid damage of the phosphor coating of the CRTs.

However, the pin 4 output of the opto-coupler may only affect the EHT multivibrator ‘s duty cycle at the moment there is a positive drive pulse on the common bases of the push-pull stage.
Therefore, when the drain voltage of Q6 is high, D5 is reverse biased and Q14 can work. When on the other hand the common bases are low, Q14 is inhibited as the current through R69 is flowing away through D5 and Q6 to ground.

Slow start up of the EHT (Page 6-5 Sect. F-4)
When the projector is switched on, the EHT voltage must gradually be built up to prevent mechanical damage of the gun.
The reference voltage grows slowly because of the delay circuit around Q11.
The main delay at start-up is obtained by the circuit on the subunit. As soon the feedback voltage would like to rise beyond the reference voltage, Q6, gets forward biased, drives Q7 on and the latter drives Q10 into saturation. Thereby, D222 goes into conduction and the multivibrator is stopped. The feedback voltage drops and Q6 turns off. This phenomenon is repeated all the time at start up. Consequently, the EHT rises to its maximum in steps.

When the unit is switched off, C40 is quickly discharged via D9, taking the EHT reference voltage for the zener IC4 quickly down, and therefore the EHT itself goes down. The discharging of C40 turns quickly on Q11 because its base is pulled in a negative direction.

Delay of the power switch drive
Fet Q30 is used to keep a drive pulse from driving Q7, until the EHT pulse on the Drain of Q7 has not fully dropped to its minimum. The EHT pulse is coupled to the gate of Q30 and keeps the drain of Q6 at a low level as long it is saturated. This prevents driving the power switch Q7 the moment the drain has not yet dropped to a minimum.
TECHNICAL DESCRIPTION SECOND RGB INPUT
Red, Green and Blue Inputs (Page 6-46 Sect. A-2)
Three identical differential amplifiers are switched to “active” with the ON voltage. This ON voltage is obtained from the +PORT 3 voltage arriving at contact 28

(=former +TTL voltage) and the transistors Q50 and Q53. Note that the 75 Ohm termination is not switchable.

The **Red** signal is taken from the collector of Q2 and fed to the current driver Q4. The collector resistor of the latter is on the RGB SW + Input board. G OUT and B OUT are got in a similar way.
The green signal is also sent to Q60 and used for synchronisation if “Sync on Green” has been detected (see further).
The blue output at Q23 is also supplying Q15. When the Blue in Green switch S2 is in a closed position, Q16 is blocked and Q15 adds some amount of blue into the green channel via D25 . If however S2 is open Q16 is saturated and Q15 does not get enough base voltage and is consequently blocked.

Note: The “Blue in Green” of the first analog input is switchable via the remote control, thus via software control. Here, the blue in green is switched with S2 and is not affected by the software.

Vertical Sync Input - Automatic Polarity (Page 6-46 Sect. B&C-4)
If separate vertical sync pulses are available and applied to the Q41 / Q43 input they arrive on the Q39 amplifier / inverter. The inverted pulses are now inverted or not inverted depending on the voltage level of pin 12.
Assume the pulses at the drain are positive. Then Q46 is regularly switched on by these pulses and the average voltage at the collector or at pin 12 is low. In such case the output pin 11 follows the input pin 13, which means that the pulses are positive at pin 11.

If the pulses are of a negative polarity at the drain, Q39 never gets in conduction and the level at pin 12 is “high” through R127. The input pulses are inverted by the exclusive OR gate.
The polarity of the pulses at pin 11 is thus always positive irrelevant of the input polarity.
These pulses are proceeding to the base of Q47 via D54 and to the multiplexer / demultiplexer 4053B, pin 11. The +RGBS voltage provides the necessary biasing for Q47.
The 4053B is triple two-channel multiplexer, having three separate digital control inputs. One of these control inputs is pin 11.
If VS pulses are applied to the input, then the HS/CS output must be the HS input. The selection between HS or CS happens in the second multiplexer. On other words, as soon VS pulses are applied, the HS pulses must also be selected.

The presence of the VS pulses determine the correct voltage at pin 9 in order to select the pin 3 input (Shaped Horizontal Sync).

Horizontal Sync/Composite Sync(Page 6-46 Sect. C-4)
The HS / CS signal, taken from the collector of Q32, is passing a similar automatic polarity circuit as the VS pulses.
When no pulses at all are applied to this circuit, the monoflop IC3 is never re-triggered and the output re-Main all the time “low”. This output is filtered and is the control voltage of the multiplexer.
The “0” output is then connected to pin 15 which is at ground level. This all means that Q58 is saturated and the **+RGsB** voltage becomes available for further switching. The LED D50 comes on to indicate the RGsB mode.
When the monoflop is constantly triggered with pulses the output is switched “high” and then the “1” output of the multiplexer is connected to the grounded input (pin 15). This now provides the +RGBS voltage instead.

When no VS pulses are available, the “0” input pin 5 of the multiplexer is chosen. The “1/13 DUTY-CYCLE Control System “ circuit cannot be used in this case due to the presence of the VS pulses in the composite sync.

1/13 Duty-Cycle Control System (Page 6-48 Sect. F-5)
When separate HS pulses are used for synchronisation, the width of the pulses is all the time adjusted to 1/13th of the line period.
Positive horizontal pulses are applied to the leading edge input pin 12.
The output pulses are integrated by R177/C87 and applied to the non-inverting input pin 3 of the (Miller-integrating) OPAMP IC4. The other input is installed at a voltage set by R180/R178 (6 volts).

This integrated voltage is proportional with the width of the pulses and inversely proportional with the line period. The output of the Miller-integrator (=OPAMP) determines the current flowing in Q63.
This all means that the width of the sync pulse depends on the line period and the feedback systems provides a setting to 1/13th of the line period.

These SHAPED HORIZONTAL SYNC pulses proceed now to the multiplexer and if VS is available, these pulses are selected and Q48 brings them to the output.

TECHNICAL DESCRIPTION SWITCHED MODE POWER SUPPLY

Generation of the line frequency independent voltages. (Page 6-2 Sect. D-2)
The Main voltage is rectified by the bridge D100 and the +300 volts is now the supply voltage for the power

switches Q100 and Q101 on the main board.

The connector J2 brings this voltage to the subunit where it is used for the production of the stand-by voltages (-) and (+) SB.

We assume that the thyristor TIC106D is conducting (its gate is not clamped at ground level, see later).

The positive halfwave of the Main voltage (START) charges C102 via D104 . The gate of the thyristor is set at 11 volts with the zener Z100 through R101 from the +300volts.

As soon as the capacitor voltage of C102 reaches approximately 12 volts, the IC can start up by driving the base of the power switch.

The diode D104 stops conducting as its anode is at about (11 + 0.6) volts.

The thyristor gets blocked as well, because its cathode equals the gate voltage.

In the meantime the IC102 has started up and the voltage at pin 9 receives its supply voltage now from the winding 24-22 of the T2 transformer via D109, stabilized with IC130.

The push-pull outputs, pins 7 and 8, drive the Q101 power switch and during the off time of the latter the accumulated energy in the primary winding is transferred to the secondary capacitors via the rectifying diodes (flyback principle).

The feedback winding 20-22 provides two informations for the control IC:
Firstly, the waveform is sent to pin 2 where the **zero passages** are detected, useful to drive the power switch on at the exact moment.

The base drive is delayed until the energy in the transformer has been completely transferred to the secondary side. By this measure, the current through the power switch is reduced to a minimum.

Secondly, the negative amplitude is rectified by D111 and compared with the reference 4 volts that is available at pin 1.

The error voltage is now sent to pin 3 and serves as a control voltage to adjust the duty cycle and frequency of the switcher.

The windings P18-P22 also serves as a help at start up. This windings provides energy the moment the P22-P24 winding does not. The rectified voltage (D131) passes to pin 9 up to the moment that pin has reached 12 volts.

The current through the power switch is at all times checked and if too high (in the event of a short on the secondary side) the comparator 393 (IC101) output drops the error voltage in order to adapt the duty cycle of the switcher.

Note that a ”special” winding is provided, delivering **+17M**, or, a voltage related to the **Main** ground and not the chassis ground. This voltage is utilized on the EHT board, because the drive circuit for the power switcher is **Main ground and <u>not</u> Chassis ground**. (see description EHT board).

Generation of the +HTHD voltage (scan voltage).

This voltage is linked with the horizontal deflection board as it has to be adapted to the scanning frequency. A feedback voltage (FBHD) is for that reason arriving on the subunit.

This feedback voltage, at contact J4(8) (FBHD’) of the subunit, is sent to the base of the error amplifier Q6. The potentiometer P2 allows an adjustment of this feedback, or in other words, the horizontal width can be aligned with P2.

The emitter of Q6 is set at a reference zener voltage, adjustable with the voltage at the regulating pin of Z8. This voltage is the result of the output of the DC-amplifier- buffer 353, combined with the +HTHD voltage.

By this measure, we reduce the range of the horizontal width at high scanning frequencies. Indeed, at standard video frequency we need much more range to overscan.

The collector current of the regulating transistor Q6 flows into the opto-coupler IC5 and the phototransistor of this insulating device (pin5-FB2) is now regulating via connector J6 (pin 1) the DC voltage at pin 3 of IC100, in order to stabilize the +HTHD voltage for one typical line frequency and amplitude setting.

The transistor Q7 is a 5mA current generator and D10 a **green** LED to visualise the +HTHD voltage.

Overvoltage protection (Page 6-3 Sect. B-7)
Pin 2 of the 393 (IC4) is set at 5.6 volts with Z10 and, the other input, pin 3 is the scan voltage divided by R38/R50/R39.

As soon this input exceeds the zener voltage, the output switches high and saturates transistor Q9. The saturated transistor Q9 pulls pin 2 of IC5 at ground level. The incorporated Led has its max emission whereas pin 5 is pulled at ground level via R44. This ground level, applied to IC100, drops the +HTHD voltage to a low level.

The original overvoltage protection is now is causing an undervoltage protection.

Undervoltage protection (Page 6-3 Sect. C-5)
The stabilized zener voltage with Z8 is used as reference voltage for the comparator 393, pin 6. Now, the other pin 5 is the +HTHD voltage.

If the pin 5 drops below the reference voltage, the output switches low, and the transistor Q8 saturates, pulling again pin 2 of IC5 low.

Protection, too low +17 volts (Page 6-3 Sect. B-9)
If, for some reasons, the +17 volts (and all the other voltages as well) are, even temporarily, too low, it is then advised to shut down the +HTHD voltage (coming from the other SMPS).

The pin 6 of IC3 is factory preadjusted, at 14 volts with P1 (refer to the adjustment procedure)

This happens with the comparator in IC3 and its output pin 7 saturates again Q8.

Stand-by / ON-OFF switching (Page 6-3 Sect. F-3)
An oscillator is built up around Q1/Q2 and the transformer T1.
Q1 gets its base current via R3. The collector current of the latter flows in the winding 1-3 and induces a voltage in the winding 5-4 ‘ encouraging’ the base current.

As soon the emitter voltage of Q1 can drive the Q2 and saturate it, this transistor clamps the base of Q1 at ground level and cuts off Q1. The cycle starts all-over again.

Two opposite polarity SB voltages (+/- 9 volts) are available at the secondary side.

a) Stand-by mode (OFF) (Page 6-3 Sect. E-2)
The voltage at contact 4 of the J4 connector (‘OFF’) is in this case ‘high’ and this means for the optocoupler IC1 that the phototransistor is not conducting.

The transistor Q3 is thus saturated as R6 can provide the required base-emitter current.

The collector ‘ON/OFF primary’ of Q3 is ‘low’. Furthermore, via connector J1 (pin 2), the pin 5 of IC102 is below its “active level” via the diode D105, disabling the drive output.

As a conclusion, only the stand-by voltages +/- 9 SB voltages are available.

b) Operational mode (ON) (Page 6-3 Sect. E-2)
The I/O block of the controller board (collector of a transistor) pulls now contact 4 of J4 at a low level ‘ON’ to light the LED in the opto-coupler IC1.

Now, the phototransistor of the latter is saturated and brings the base of Q3 at nearly ground level. This means now for this transistor an OFF state.
The zener Z100 on the motherboard can now install +11 volts at the gate of the thyristor allowing the charge of the capacitor C102.

DC Fan control of the fans (Page 6-3 Sect. A-2&3)
The speed of the fans is regulated by means of a sensor (NTC resistor) mounted close to the heatsink of the SMPS board.

IC2 is an integrated circuit regulating the speed of the fans by adapting the duty cycle of the output drive for the power transistor Q4. L1 and C7 filters the output voltage.

The feedback is applied to pin 5 which is protected against arcing with D4/D5.

MC34063 is a switching regulator. An oscillator trimmed with C6 is applied together with a dc voltage to an RS-flipflop via an AND gate. That DC voltage now is the result of a comparator output receiving an internal reference voltage of 1.25 volts and the feedback voltage at pin 5 (comp). Consequently, the duty cycle depends on the DC voltage that is built up as follows:

- it is determined by the output voltage via R13 / R14 / R11 in order to stabilize the latter for a well-determined value of the NTC resistor.
- it is equally influenced by any change of the NTC resistor itself, sensing the heatsink of the SMPS board.

The minimun voltage is set by Z5 at approximately 7.5 volts and the maximum speed by Z4 + Z4. at 15 volts.

The maximum current output is limited by R10, and an RC feedback straight from the output to pin 5 provides a more regular speed at any time.

Power supply for the EHT generator.

The EHT generator is supplied directly from the rectified Main voltage. The +300M volts is leaving the board at the contacts 31/32 of the J8A connector for the EHT board (see description of that board)

By above measure, we eliminate the influence of the EHT load on the performance of the power supply, and the maximum peak current of the EHT generator is increased.

HORIZONTAL DEFLECTION 809-10448 (Page 6-6)

Preparation of the drive pulses.

The horizontal deflection circuit uses two MOSFETS in series in order to be capable of handling more than 1000 volt pulses. Therefore, two drive pulses on different ground reference levels are required.

The “bottom” MOSFETS are driven by a pulse train referenced to ground or chassis ground, the “top” MOSFETS by drive pulses referenced to the mid-point of the two series connected MOSFETs, the **HDM** point.

The power supply for generating the “top drive pulses” is taken from the +17 volt via diode D33 to block the pulses, as HDM, the reference ground for the top drive pulses, carries line pulses.

The hor. drive pulses, prepared on the *“UN SYNC+VERT DEFL*” board, are sent to the amplifier Q13. By using a transformer T2, a “floating” drive pulse referred to HDM for the top Mosfets can easily be obtained.

When the flyback pulse is present during retrace, D33 becomes reversed biased and act like an open circuit to the 17VDC line. At that time, the drive circuit receives its voltage supply from the charge stored in C48.

The “high” drive pulses reach the gate-source of the top Mosfets, and the “low” drive pulses drive the bottom Mosfet switches.

Modulation of the scan voltage

East-West correction (Page 6-7 Sect. E-5)

The +HTHD voltage from the SMPS board is modulated in Q3 by the East-West correction signal prepared on the “Sync + Vert Defl” board. Z2 protects the transistor and SR2 limits the charging current of this coupling capacitor through the zener. Transistor Q2 is used to discharge the boosting capacitor C31 at the start of a vertical scan. A vertical flyback pulse, derived from VDH B (Vertical Deflection High Blue) is sent to the gate. This minimizes keystone problems at the top due to a remaining charge on C31 after the vertical retrace. It causes the charge on C31 to always start from the same amplitude after each vertical retrace, regardless of the voltage that was built up at the end of the vertical scan.

Horizontal linearity tracking control.

The problem we meet with such a big frequency range, is the frequency dependent characteristic of the linearity coil. At a higher scanning frequency, the impedance of the linearity coil would increase.

To overcome this, a second coil T1 is magnetically coupled to the standard linearity coil. This current in this modulating coil is delivered by a Mosfet Q1.

The needed current for tracking is got via the biasing circuit of the gate of Q1 (LIN HIGH) as follows.

The drive pulses trigger a one-shot in IC1 at the positive going transient input. The output pulses are then applied to the gate of a Mosfet Q8 and at the drain split to two circuits:

- the simple integrator R20 / C3, the obtained voltage across the capacitor is consequently a voltage proportional with the line frequency labelled *“LIN REF”.*
- the push-pull Q5 / Q6 and the top/top detector just to obtain a negative voltage to supply amongst others the OPAMP IC2.

The DC level of this LIN REF voltage is not correct to drive the Mosfet Q1 and a level shift is realised with the OPAMP 1-2-3 of IC2.

This OPAMP receives at the inverting input a voltage that is proportional with the line frequency, the amplitude adjustment does not affect this LIN REF voltage.

The other non-inverting input receives a voltage that is proportional with the scan voltage. This voltage is proportional with the line frequency <u>and</u> with the amplitude adjustment. The influence of the amplitude adjustment must be minimized and this done as follows.

For one typical frequency, we obtain one typical LIN REF voltage. The HTHD voltage however depends also on the horizontal amplitude. Any change in the emitter voltage of Q4 is compensated via the feedback Q7 - base Q4.

Protection circuits.

a) Overcurrent protection (Page 6-7 Sect. F-5)

If the sum of the currents of the three scan coils exceeds a pre-determined level, the drive is inhibited as follows:

The wire J2-J3 in series with the three scan coils, acts as a low value resistor and is connected across the base-emitter of Q16. When a 0.6 volt or greater voltage is dropped across the wire, Q16 starts to conduct and triggers the monoflop Q10/Q14.As long Q10 is blocked, the drive transistor Q13 reMain “on”, inhibiting the drive. BY re-applying the drive pulse to the base of Q10 via D9 (a kind of feedback), a faster reaction on the overcurrent can be obtained.

b) Overvoltage protection.

The sum of flyback pulses on each of the series connected Mosfets are checked by a rectifier network consisting of diodes D30, D31 and D32 and common decoupling capacitors. The pulses at the drain of the two Mosfets (HDM) are rectified with D24 . This voltage must be half of the total flyback voltage in order to protect the mosfets against overvoltage. This is realised with the circuit R73/C46/ D24/SR5/ R56/C32.

The rectified voltage is dropped with R52 / P2 / R51 and sent to two level detectors. The threshold level is set by a zener at 6.2 volt with Z5. At the moment pin 6 of IC2 exceeds the threshold, the horizontal amplitude is reduced with Q11. This will avoid the action of the "Hold Down Deflection" protection circuit.

If for any reason, the 1950V level is reached the HOLD DOWN DEFLECTION circuit is activated.

1) The drive is inhibited through the DEFL OFF.

2) The input pin 6 reMain "high" as transistor Q12 is blocked and D18 conducts via R28 to keep pin 6 of IC1 high. This requires that the set be powered off to reset this circuit.

3) The red LED D10 (HOLD DOWN DEFLECTION) is illuminated in order to show that "scan hold down" has occurred.

4) As the deflection is stopped, there is also a horizontal scan failure and the associated circuit will drop the EHT voltage and blank the three CRT's to prevent damage to the CRT phosphorus.

c) Too low drive protection (+17V monitoring) (Page 6-7 Sect. A-8)

It is imperative that the Mosfets are fully switched on, so that the internal resistance will be as low as possible. Due to the large deflection current, even a small amount of excess resistance, will cause the Mosfets to generate too much heat.

This Mosfet drive pulse amplitude depends in part on the **+17 volt** supply and the voltage supplied from the +17VDC line . The drive signals are developed from the 17VDC and to prevent damage, due to insufficient drive, if this voltage becomes too low, IC1 pin 3 gets low and inhibits the drive signal via the 'DEFL OFF'.

The DEFL OFF is connected with the R(eset) of the monoflop in IC1. The function of the latter will be explained hereafter.

d) Input protection (Page 6-7 Sect. A-8)

The H DR from the UN SYNC + VERT DEFL has as task to start and stop the conduction of the Mosfets. If however the Mosfets are in conduction and there is a "stop" that does not arrive, there is a risk of damaging the power switchers.

In such case, a stop pulse will be automatically generated by the monoflop in IC1, output 7. This output reMain low as low the input is retriggered at pin 5. When such a trigger pulse is absent, the output switches high after a time determined by the time constant R25 / C5 + current delivered by Q9. This current is tracked with the line frequency by using the scan voltage as emitter supply.

e) Horizontal scan failure (Page 6-7 Sect. F-2)

Horizontal pulses are fed into the transistors Q17, Q21 and Q19. As long as there are horizontal pulses on the base of these transistors, they are conducting for each horizontal period, and the collectors are held "low" by C33, C44 and C37. These smoothed collector voltages keep the gating diodes D28, D29 and D26 blocked.

If either one of the pulses or all pulses are missing, Q15 transistor gets in conduction and turns its collector at low level. The SF line will be pulled low and the scan fail condition will be met.

Feedback to the SMPS (to stabilise the horizontal width) (Page 6-7 Sect. A-6)

The scan voltage +HTHD has to track the line frequency in order to regulate the horizontal width of the picture. The amplitude of the flyback pulses at the connection of the top and bottom Mosfets (=HDM) is a direct result of the horizontal width and can be taken as a reference. These pulses are coupled and isolated by transformer T3, rectified by D34 and the **FBHD** voltage is sent to the SMPS, to regulate the HTHD.

This voltage is proportional to the width of the raster on the CRT faceplate.

Picture tube burn-in protection (Page 6-7 Sect. E-9)

When the module with the horizontal width coils is not connected, the deflection circuit is limited to the Horizontal shift circuitry, causing burning-in of the picture tubes (SF can not be detected).

This situation is protected with the OPAMP IC6. The inverting input (pin 5) receives the LIN_REF voltage (a voltage proportional with the line frequency) and the non-inverting input the HDL _REf voltage (+HTHD voltage modulated by the E-W correction signal).

When the module is not connected, the HDL_REF voltage becomes higher than the LIN_REF and consequently the "scan hold down" circuit is activated, indicated by the illumination of the red LED D10.

TECHNICAL DESCRIPTION "UN SYNC + VERT DEFL"

809-10456 (Page 6-9 Sect. B&C-9)

a) Vertical Oscillator

The principle of the oscillator is to determine the appropriated charging current of the real oscillator, proportional to the vertical frequency, by generating a stable simulated vertical sawtooth.

We find two current sources Q38,and Q37 driven by the output of the Miller integrator output pin 7 of IC16. The minimum or initial charge current is determined by R168. The capacitor C13 is charged up and discharged when Q19 is driven on with the V Syn pulse. The sawtooth is buffered and integrated (= average) and the obtained voltage is compared with the level set by P1 (ADJUSTMENT VERTICAL HOLD). The charging current is adapted via R161 / D50 until both voltages at the input are identical. When the feedback is stable, the two current sources send current to two circuits:

1. Sawtooth simulator as explained above for vert. autolock.
2. Second sawtooth oscillator for the V_ST signal.

With P1 we can adjust the average output voltage of the integrator. The potentiometer must be adjusted in order to obtain vertical lock, the frequency is irrelevant.

The sawtooth is buffered and feeds one potentiometers in IC2. The VO0 output is buffered with Q27/28 and AC coupled to the power amplifiers.

The linearity control is built around the diff. Amplifier IC8, which receives at the non inverting input the V_PAR' signal and at the other the adjusted V_PAR'. The output, pin 14, is added to the V_ST signal in order to compress or decompress the ramp at the top or bottom. The linearity is controlled by a potentiometer in IC2.

The Vertical oscillator is synchronized as follows:

1)By means of the composite sync(Page 6-9 Sect.A-3)

The composite video **(VID)**, composite sync **(CS)** or Hor Sync **(HS)** is, at any time, applied to pin 2 of IC14, a typical sync separator. The output pin 1 serves the digital PLL IC6 for all modes.

If D606 is in conduction (depends on the DC level of the input signal) the video composite also passes on to Q2, for serving the TDA2595. In this case D601 is blocked and the output pin 1 of the LM1881 is not used.

The TDA2595 is used as sync separator for video composite since its input is noise - integrating. In that case the transistor Q596 is saturated and D601 is blocked.

If the sync input is HS or CS, then, the LM1881 is used as sync separator since it has no integrator at the input.

The composite sync output HS / CS, pin 1, is proceeding to IC1 via a buffer Q2 (Q596 is not saturated then).

The output pin 9 of IC1 is providing composite sync pulses which are now sent to the base of Q7 through the Vert. Sync separator circuit, built around the OP AMP IC9 with output pin 7. If we assume that the switcher Q6 is conducting (see later), the negative pulses on the collector of Q7 can trigger the vertical oscillator.

The oscillator can also be triggered by means of the vertical pulses **V Sync,** which come straight from an BNC input (via the differential input, at the base of Q4.

Note that an optional HDTV interface with tri-level sync may be connected to the J7 connector.

2) By means of the vertical pulses VSync, if applied separately (Page 6-9 Sect. A-7)

These vertical pulses enter the board at contact 13 of the J4A connector and are capacitively coupled to the base of Q4.

The amplified negative pulses on the collector trigger the oscillator now via D10 / D7.

To prevent triggering via Q7, the fet Q6 is now blocked as follows:

Each time a VS pulse arrives on the base of Q4, capacitor C23 is charged via D9 / Q4. Consequently, the gate of Q6 is low and Q6 is blocked, to disconnect the emitter of Q7.

c) 4 x digital controlled potentiometer (Page 6-9 Sect. E-2)

The voltage or waveform, applied between **VRPx** and **VRNx,** the two extremities of a potentiometer**,** is adjustable in 128 steps through the remote control (I2C bus). The output, or, the 'slider' voltage is available at **VOx**. The corresponding pins are eg. VRP**1,** VRN**1** and VO**1.**

We find **4** of such potentiometers **in one chip**, and there are three of these chips on the subunit: IC1, IC2 and IC3, which we will meet in the explanations hereafter.

The output waveform or voltage is controlled by the **SCL**

(Serial Clock) and **SDA** (Serial Data) lines which are connected to the microprocessor of the controller board.

The address info, arriving via the data SDA line, is identified by a hardware connection of the address pins of the chip (the address pins are differently connected for each chip).

Obviously, as there are 4 potentiometers, the address of the chip is followed by a '*slave- address*' to drive the requested potentiometer in the chip itself.

d) Vertical Linearity control (Page 6-9 Sect. C-2)

The V PAR (Vertical Parabola) signal at the emitter of Q2 is divided by R23 / R100 and applied to the potentiometer "1" of IC2 (pin 19). The adjusted parabola at output VO1, pin 25, is now sent to the non-inverting input of IC8 whereas the full amplitude of the parabola is applied to the inverting input of the OPAMP
(voltage difference amplifier). The output is then added to the V ST (Vertical Sawtooth) at pin 17 of the same IC2.

e) Generation of ABL pulses.

Two pulses are generated with the two monoflops in IC15. The first monoflop is triggered with V_ST and the second one with the inverted output pulse of the first one.

*ABL DEFL PULSE: this pulse causes an overshoot in the vertical deflection at the end of the vertical retrace time in order to make invisible the spot, as, during this time the blanking is disabled.

*ABL PULSE: this pulse determines the exact time of implementation of the black current and the measurement of this implemented current.

f) Vertical output stages - Vertical shift - Vertical amplitude.

Vertical amplitude - ABL Deflection Overshoot (Page 6-12 Sect. F-3&4)

The vertical sawtooth V_STat the buffer output pin 14 is leaving the main board and reaches the subunit to be applied to IC2 (VRN0 and VRP0). The output is VO0 (pin 24) and is coming back to the board at J4 (4) of the edge connector.

It is now buffered twice with Q27 and Q28.

The switcher Q29 at the base of Q28 is driven with the ABL DEFL PULSE in order to cause an overshoot in the vertical deflection during the time the ABL circuit is active.

It is now capacitively coupled to the inverting inputs of the power amplifiers IC11 / IC12 / IC13 together with a DC-voltage (Vertical Shift voltage).

The amplitudes for the red and blue can be adjusted by P626 and P627 to allow a matching with the green and to minimize the convergence corrections.

Vertical shifts (Page 6-12 Sect. D-4)

These DC voltages are adjusted in IC3 of the subunit (outputs 25, 26, 27).

The big tolerances on the deflection units and the stigmators require a coarse alignment of the shift for red and blue in order to improve the resolution of the digital potentiometers.

This pre-alignment or coarse alignment is done by the multiturn potentiometers P620 and P621. The voltages applied to the extremities of these potentiometers are inversed when moving the vertical scan inversion switch (switching from ceiling to table or vice versa).

An " **VS I** " info is therefore sent to the switching transistors Q611 / Q612.

This "VS I " is at ground level or not at ground (= 'open'). It is a info coming from the contact of the vertical scan inversion switch on the frame.

One of the two transistors is in conduction, depending on the voltage at Q611's base.

When the green raster is moving on the screen, the red and blue rasters move also allowing a quick adjustment of the three colors.

Vertical output stages (Page 6-10)

The amplified sawtooth output currents flow in the respective scan coils and find their way back to ground through the feedback resistors R44 / R97 / R79.

The amplitude of the waveforms across these resistors is proportional with the vertical amplitude and can obviously be utilized as feedback to stabilize the vertical amplitude.

The TDA8172 has an internal boost up circuit which allows a short vertical retrace time by boosting the supply voltage during the retrace time.

At the end of the scan time, the voltage across the capacitors C35, C55 and C52 is switched in series with the supply voltage of +8 volts by means of a transistor in the chip .

As a result, the voltage during flyback is approximately 8 + (8+17) = **33 volts.**

This boosting up means a possible **rapid change** of the current in the coils in order to realize a short flyback time.

g) Vertical scan fail detection (Page 6-10 Sect. C-9)
The sawtooth waveforms across the feedback resistors of 2E2 are capacitively coupled to the base of a transistor. The conduction time of these transistors is proportional to the amplitude of the sawtooth. In normal scanning conditions, the average DC voltages on the three collectors is too low to forward bias Q14.
As soon as one amplitude is too low or absent, Q14 is saturated and the SF line is dropped to ground level.

The diode D16 and the saturated Q14 **cause a permanent conduction of the Q15** transistor (via D16).

The **V BL** (Vertical Blanking) output is permanently high and this means a total blanking or **cut-off of the three crt's.**

h) Vert blanking during retrace (Page 6-10 Sect. E-8)
Vertical flyback pulses are picked up at pin 6 of the blue output stage and are applied through C63, D41 and R306 at the base of Q20. D41 prevents the BL pulses to penetrate into the vertical output stages.

On the same base arrive the pulses **BL** for the top and bottom blanking. These pulses are adjusted on the subunit (see further top / bottom blanking).
Tr Q20 drives Q15 and the **V BL** pulses leave at A, C(26) of the J4B edge connector to the decoder, where they are mixed with the horizontal blanking pulses.

A differentiated vertical sawtooth is added to the base of Q15 in order to blank from the start of the flyback. The flyback pulse from the output stage is slightly delayed.

II. EAST - WEST Correction

a) Generation of a frequency independent vertical sawtooth (Page 6-11 Sect. F-2)
This generator is built around Q4 / Q11 / Q10 / IC7. The vertical sawtooth **"V ST"** is buffered and then differentiated to get pulses driving on and off the switching Fet Q10.

When this Fet is on, the output is shorted to the input. This input is approximately ground level since the other input of the OPAMP, pin 10, is connected to ground. The time that Q10 is not in conduction, C18 is charged from the output voltage at pin 8 via D6 / R46 toward the negative voltage at pin 14 of IC7.
The charging current depends upon this negative voltage and the latter is the averaged sawtooth obtained by integration.

By doing this, a constant sawtooth amplitude of 1.9Vpp is found at pin 8. The sawtooth starts from 0 volts due to the clamping transistor Q10.

b) Trapezoidal distortion correction (on the subunit)**:**
(Page 6-11 Sect. F-3)
The sawtooth waveform at pin 8 of IC7, is applied to the inverting pin 2 of IC7 in order to obtain two opposite phase sawtooth waveforms.

These two signals are now entered into a digital potentiometer in IC1 (pins 16 / 17 or VRN**0** and VRP**0**). The corresponding output is VO**0** and via R45 the adjusted sawtooth (in amplitude and phase) reaches the adder-amplifier TL084, pin 5.

c) Parabolic or pincushion distortion correction
(Page 6-11 Sect. E&F-5)
To generate the parabolic waveform, a multiplier is used.

The MC1495 is a wideband monolithic four-quadrant multiplier. The output is a linear product of the two input voltages.
In this case the two input signals are the same (a sawtooth voltage).
One of the sawtooths is applied between pins 4 and 8. The second (and same sawtooth) is applied between pins 9 and 12.
Since pins 4 - 12 and 9 - 8 are connected together, the output is a parabolic shaped waveform (= product of two linear ramps).
The open collector outputs are pulled to the + supply line and sent to an OPAMP in IC8

The parabolic signal is then capacitively coupled to an inverter - OPAMP. The two opposite phased signals are sent to a digital potentiometer in IC1 for the pincushion correction.

Output VO2 is now mixed with the previously discussesawtooth output and crosses the line frequency. The parabolic waveform is amplified by Q3 and led out by the buffer Q2 to the focus board.

d) Frequency dependent correction

(Page 6-11 Sect. D-3)

The gain of the OP AMP in IC7 is variable and depends on the divider R31 / Q1. The Fet Q1 is biased by the output of another OP AMP (integrator-comparator) in IC7 (pin 1).

The DC level of the non-inverting input, pin 3, is set by R30 / R24. This DC voltage is amplified by a factor determined by the ratio R31 / Q1. The east - west waveform undergoes the same gain.

The output (sum of DC and east-west waveforms) is sent to a ‘comparator’ in IC7. The east - west waveform is filtered out by the R55 / C28 network. This resulting amplified dc voltage is compared to a portion (R28 / R22) of the HTHD voltage which is applied to the non-inverting input. The output of the comparator is sent to the gate of Q1 via a filter network.

This filter network also depends on the state of Q306. The VSI line can switch on and off Q306 in order to add or disconnect R309 / C304. There is thus a correction depending upon the ceiling table position.

Note: The J6 contacts must be shorted for an off-axis projection.

For IN - AXIS projection it is recommended to remove the strap to guarantee an optimum geometry.

This gate voltage changes or adapts the gain of the named amplifier as long as the voltages at the comparator inputs are not the same.

An increase of the line frequency means an increase of the +HTHD voltage, thus an increase of pin 5 voltage and a change of the Q1 / R31 ratio or of the gain.

By this looped circuit we obtain an automatic tracking of the east-west correction with the line frequency without any alignment.

d) Power amplifier (Page 6-12 Sect. D-9)

The sum of the corrections is sent back to the motherboard to be amplified by IC10 (TDA2030) before reaching the hor. defl. board to modulate the scan voltage HTHD for the horizontal deflection circuits.

III. Phase control - Skew and Bow

Introduction (Page 6-12 Sect. B-5)

The midline bow and skew dynamic corrections are added to the DC phase control of the picture. These corrections change the horizontal phase of the picture during the vertical scan in a dynamic manner.

The position of the HS pulse at pin 4 of the TDA2595 is determined by the position of the pulse sent to pin 2 (Flyback Pulse Simulation). The second PLL of the TDA2595 adjusts the Hor drive output pin 4 back in time in accordance with the position of the simulated pulse.

The original pulse may now be delayed to determine the start of the scanning with respect to the reference video (phase control).

This delay happens in two steps by means of two monoflops. The first one realizes the phase control. The second one the skew and bow corrections. The width of the final pulse **“H PULS”** is significant for the total delay and the falling edge of this pulse triggers a third monoflop IC5 on the main board which also sets the width of the real horizontal drive pulse.

The same pulse, H PULS, is also sent to the microprocessor board to lock the text and generate the pixelclock.,

a) Phase control (IC12) (Page 6-11 Sect. C&D-9)

The HS pulse at pin 4 triggers the monoflop IC12 on the positive going edge. The absolute value of the phase control may be lower for the high scanning line frequencies than for the low scanning frequencies. This is automatically realized by a loop system:

The pulse train at pin 5 ‘s output is integrated with R78 / C43. The obtained DC voltage across C43 is proportional with the width of the pulses (= adjusted phase) and the line frequency. The required phase shift is applied to the base of Q7 via R84 from IC2.

The voltage difference between the two collectors of Q7 is the base-emitter voltage of Q6.

This transistor is the current source for pin 7 (Rx / Cx) and automatically adapts the length of the output pulse to the line frequency.

The width of the output pulse is regulated by the current generator as long as the voltages at the bases of Q7 are not the same (balanced).

b) Skew and Bow Corrections

(Page 6-11 Sect. F-2 &F-4)

The sawtooth (skew), adjusted at 50%, and parabolic (bow) waveforms are added to R44 and R42, and sent to an inverting OP AMP in IC8.

The monoflop in IC12 is triggered on the positive going edge of the pulse of pin 12. The width of the output pulse is modulated by the waveform applied via D16. Here the range is tracked with the line frequency by applying the HTHD voltage through R77 / R75.

The output pulse of pin 4 is inverted with Q8 and the **H PULS** is sent to the last monoflop (IC5) in the row located on the main board.

Note: Skew and Bow are performed by the convergence board.

V. Horizontal oscillator - Horizontal autolock.

a) Horizontal autolock (Page 6-9 Sect. A-3)

The sync separator IC14 serves Q1 with composite sync.

The amplified sync is then split to the PLL (IC6) and transistor Q17 of the coincidence detector.

The line oscillator in the TDA2595 is locked to its exact frequency by a PLL in the chip. The latter has a limited lock range of approx. 1.2 khz and cannot lock the range from 15 to 92 khz.

An extra PLL is utilized, the **4046** (IC6), for the **coarse alignment**. The fine tuning is performed by the PLL in the TDA2595 itself.

This PLL - IC consists of two phase comparators, and a VCO.

For this application the second phase comparator only is used.

The **signal input** (pin 14) is the line oscillator of TDA2595 (squared hor. drive output of the TDA2595). **Comparator input** (pin 3) is the composite sync, inverted by Q1. The corresponding output is pin 13, a three-state output, and, initially biased at 6 volts with R89 / R92.

If the output is high impedance or open (in the locked state) the voltage is **set at 6 volts** with R92/89.

This voltage is buffered by a voltage follower in IC7 and then, reaching pin 5 of another OPAMP, acts as a voltage comparator in IC7.

The other input, pin 6 of IC7 is set at approximately 7.7 volts with R94 / R90.

Consequently, the **COIN NEG (pin 7) is low in the locked position.**

b) Line oscillator lower than the horizontal sync

(Page 6-9 Sect. F-6)

If the local oscillator frequency is lower than the hor. sync pulses, the voltage on C8 decreases (pull down state). This voltage is buffered and sent to pin 5 of IC7.

Because of zener Z3, this voltage cannot decrease and stays at approximately 6 volts.

Pin 6 is initially at 7.7 volts (divider R90/R94). This voltage decreases because transistor Q17 discharges the capacitor C97 as follows:

The squared hor. drive of pin 4 switches on and off Q18.

When the frequency of the local line oscillator is different from the hor sync some pulses arrive on the base of Q17 at the moment Q18 is not saturated.

These hor sync pulses turn on Q17 and C97 is discharged. The voltage at pin 6 drops and becomes lower than input pin 5.

The output **COIN NEG (pin 7) switches 'high' in the unlocked state.**

The gate of mosfet Q9 is now positive and Q9 conducts to connect output pin 8 of the PLL (IC7) to inverting input pin 2 of the next 'proportional - integrating' OP AMP.

The decreasing voltage output of the PLL is inverted by IC7 and transistor Q21 draws more current out of pin 14 of the TDA2595 in order to increase the frequency of the line oscillator.

As the line oscillator frequency is increasing, the PLL output also increases.

This continues until there is coincidence between the hor. drive and the hor. sync at the base of Q17.

Once coincidence is reached, the voltage at pin 6 is again 7.7 volts and the state of the Mosfet Q9 changes again to a stable and blocked position.

We have now reached the capture range of the PLL in the TDA2595. Now the PLL in the TDA2595 takes over as follows:
As long there is no coincidence, Q33 is blocked and the PLL output pin 17 is disconnected from the VCO input pin 14. Q33 is closed the moment there is coincidence.

The line frequency is fine tuned by the PLL output pin 17 of the TDA2595 as long this PLL output has not reached the 6 volts installed at pin 3 of IC7.

Pin 17 output is sent to pin 2 of the integrating OP AMP.

In the locked state of the PLL of TDA2595, this output is 6 volts.

Any change in frequency is now compensated or corrected by the PLL of TDA2595 and 4046 is switched off.

The above circuit does not require any alignment. It is completely self-aligning and guarantees a correct locking to the center of the lock range of the PLL system in TDA2595.

c) Line oscillator higher than the hor sync:
A similar explanation applies here, although, in this case the PLL's output is increasing. Zener diode Z3 does not limit the voltage because the voltage across it is not 6 volts. Pin 5 'follows' the PLL output.

As there is no coincidence, the other input of the comparator goes down resulting in a 'high' output for pin 7.

Q9 is turned on and the PLL output can correct the line oscillator frequency.

VI. Adjustable TOP / BOTTOM BLANKING
(Page 6-12 Sect. D-6)
On the subunit, blanking pulses are generated for an adjustable blanking of the top and bottom of the picture by the user.

To achieve a high accuracy, the sawtooth is passed into a so-called **'dead band response amplifier'** built up around an OP AMP in IC8.

The sawtooth is entered at pin 9 of IC8. The output is inverted and the ramp is steepened at the start and the end.

Two clipping levels are installed by clamping circuits in order to obtain a complete feedback between these levels (= center of the screen).

As soon the first clipping level is reached, the output is invariable. No further change in the output is noticed.

The transformed waveform is now sent to two level detectors in IC9.

The voltage clipping levels of the other inputs of the comparators are regulated by the potentiometers in IC2 and IC3.

VII. Simulation of the Flyback pulse for the PLL of TDA2595.
A 'simulated' line (flyback) pulse is generated by the monoflops in IC4. The first monoflop introduces a small delay for the pulse and the second one determines the width.

The introduced delay is used to 'mislead' the PLL to allow a 'negative' phase alignment. This phase comparator (PLL) determines the phase of the squared output at pin 4.
It normally has to compensate for the delays in the power switching of the deflection circuits. If we mislead this PLL by giving 'wrong' info, the hor. output at pin 4 anticipates the reference (video).
This allows a range for the phase going from a negative phase shift to a positive one.

VIII. BLANKING - COINCIDENCE (Page 6-10 Sect. F-9)
In the event of a non - coincidence, transistor Q16 reaches complete saturation since the **COIN NEG** signal is at a high level.

This results in:
- Led D20 comes on to show the non - coincidence situation.

- if the strap J5 is in position, transistor Q15 is also saturated and causes a total blanking of the three crt's.

TECHNICAL DESCRIPTION "FOCUS - SHIFT"
A. Electromagnetic Focus principle.
In this form of focusing, a strong magnetic field produced by an electromagnet or a permanent magnet mounted behind the yoke on the neck of the CRT forces divergent electrons to take a helical (coil-like) path to reach the CRT faceplate. The helical path is usually only one turn long. With the proper magnetic field strength oppositely divergent electrons will move forward along coil-like paths that rotate in opposite directions and meet at the phosphor screen, thereby bringing the electrons together again to form a small spot.

a) At line frequency (Page 6-18 Sect. C&D-5)
A sawtooth generator is built around Q300 / 301. C302 charges up via the variable (line tracked) current generator Q300, and discharges via Q301 when a horizontal pulse is sent to its base. This pulse starts slightly before

the end of the horizontal scan in order to obtain sufficient energy at the start of the horizontal scanning. The trigger pulse is generated in two steps by the two monoflops of IC401. Integration (= averaging) of the pulse train at the output pin 13 results in an automatic tracking of the trigger moment with the line frequency.

C302 then charges, and its rate of charge is determined by the condition of the current generator Q300. Q300 is supplied with the **+ FOC**us voltage from the SMPS, which is proportional to the line frequency. A vertical parabola is added to this charging current via C422.

Because of this, a tracking of the amplitude sawtooth signal with the line and vertical frequencies is developed.

The sawtooth signal is now applied to:

- a multiplier IC301 in order to generate a symmetrical parabolic waveform, regardless of the line frequency.

- a level detector in IC307 pins 3, 2 and 1 to produce a left-right squarewave which is buffered by Q307 and feeds the switchers-clampers Q309 and Q310 with a correct DC level (note that Q307 is supplied with + / - 12 volts).

- the inverting input of another level detector of IC307, pin 6, to produce a left-right squarewave (DRIVER) opposite in phase to the one on pin 1 of IC307. This squarewave is used on the main board to boost the supply voltage of the line power amplifiers during the second half of the horizontal scan.

The parabolic signal from the multiplier, IC301 is buffered with Q302, clamped and buffered. The signal then goes to the non-inverting inputs of two voltage-followers in IC309 (MC34084).

Clamper Q310 shorts to ground the parabolic waveform, during the first half of the horizontal scan, and Q309 shorts the signal during the second half of scan.

The buffered signals are now adjusted in amplitude with IC311, IC312 and IC313 for the three colors. The outputs are summed and sent to the power amplifiers at a suitable level.

b) At vertical frequency (Page 6-18 Sect. B-6)

The vertical sawtooth **"VDL"** is DC coupled to a buffer IC308 pin 3 and then applied to:

- the multiplier IC302 to generate a vertical parabola.

The parabola is inverted with Q304, clamped, buffered, and feeds two buffers in IC309.

- a level detector IC308 input, pin 5, to produce a top-bottom squarewave. The output is buffered and feeds the clampers Q311 / Q312 with a correct DC level for grounding the input at either the top or bottom half of the raster.

The two remaining potentiometers of IC311, IC312, IC313 are used to adjust the top / bottom waveforms which are again summed and leave the subunit to be amplified by the power amplifiers on the main board.

c) Static or average focus (center focus)

Three voltages **R STATIC, G STATIC and B STATIC**, adjustable between + / - 1.5 volts with potentiometers in IC303 are added to the feedback of the vertical focus power amplifiers.

d) Power amplifiers:

1. CORNER - H (Page 6-18 Sect. G&F-9)

The left / right adjusted waveforms, summed on the subunit IC309 output, are amplified to generate the required magnetic field for focusing of the beam during the horizontal scan. Because of the high scanning range, a good slew rate of these amplifiers is necessary. This is especially critical during the second part of the horizontal scan. This can be realized by boosting the supply voltage during this time.

Boosting the +FOC voltage is done in the circuit around Q190 - 193. The squarewave drives the push-pull stage Q190 / Q191, which in turn drives the MOSFETs Q192 - Q193 . The +FOC voltage is boosted during the second part of the horizontal scan and is now referred to as **+V[DYN].**

Three identical amplifier stages with feedback to the inverting input of the OPAMPs in IC100 deliver current to the horizontal focus coils.

2. CORNER - V / STATIC.

Since the vertical scanning frequencies are much lower than the horizontal frequencies, a TDA2030 may be used. For stability, a similar feedback voltage is applied on the inverting input, together with a DC-voltage (=static, for the center).

B. Horizontal SHIFT (Page 6-15 Sect. C-5)

The + / - SHIFT voltages are not returned to chassis ground, but to the **HDL** (Horizontal Deflection Low, which is basically HTHD). Therefore, the adjusted shift voltages may not be referenced to chassis ground, but to the same HDL.

The digital potentiometer IC (IC52) has to be supplied with the + / - SHIFT voltages from the SMPS.

The I2C-bus lines **SDA** and **SCL** must drive the above-mentioned chip via an isolation circuit, using an opto-coupler.

The opto-coupler IC50 is used to isolate the SDA and SCL lines, referenced to a cold (chassis) ground, from the shift circuits in IC52.

The SCL pulses are sent to pin 1 of IC52 via an opto-coupler in IC50, whereas the SDA data line is connected with pin 2 through the other opto-coupler in IC50.

At the moment an "Acknowledgment" bit is returned to the Controller, another opto-coupler IC51 takes over. To avoid a return to IC52 via the first opto-coupler, MOSFETs are automatically switched on and off.

The **HSI** (Horizontal Scan Identification) information from one of the horizontal scan switches on the "Scan Switching" module, allows an inversion of the supply voltages for the multiturn potentiometers P1 and P2. These potentiometers are the factory set *coarse alignments* of the shift, to be adjusted prior to the digital control.

The SHIFT voltages control an average DC current through the horizontal yoke windings in order to horizontally shift the rasters.

809-10457

Technical description "2nd SMPS G2 + DIAGNOSTIC"

A. SMPS for +/- CONV and +FOC voltages

(Page 6-4 Sect. F-3)

This power supply uses the same TDA4601 as the main SMPS. This description is limited to the differences and the control loop to generate the correct amplitudes of these voltages. Refer to the description of this module for more details.

Because of the high scanning range of the projector, from 15khz to 105khz, the needed amplitude for the convergence corrections is much higher for the frequencies (around 100khz) than for the standard frequency.

Permanently supplying a high power supply to the power end stages in the convergence results in heat dissipation for the lower frequencies being quite high. A better solution is to 'track' the power supply with the line frequency. This means the power supply for the power convergence stages increases with the line frequency.

The available information on the line frequency is the +HTHD voltage. This voltage increases in a linear way and is used for tracking.

TDA4601 (IC179) totally relies on the +17 MAIN delivered by the first or main SMPS and the +300V. If for some reason the + 17 MAIN is not available, the SMPS cannot start up.

The +17 MAIN is stabilised to +15 volts with IC217 and supplies pins 9 and 5.

The transformer and rectifier circuit provide the +FOCUS, +/- CONV and the +CONV' for the feedback control loop discussed hereafter.

B. Control loop / Feedback / Adaptation.

The supply voltage of the convergence and focus power stages has to change when the horizontal frequency of the projector changes. A portion of the +HTHD voltage is applied to the base of Q208 to change the emitter voltage of Q203.

The +CONV' voltage is biasing the base of the Q203 amplifier. The amplitude of the feedback depends on the status of the output of the level detector LM393, pin 1.

Pin 2 of the LM393 is set at 5.6 volt with Z197.

Via an insulating opto-coupler, the collector current of Q203 is transferred to pin 3 of the regulating TDA4601.

The +CONV' voltage is also applied to another detector in IC216, pin 5. The same reference voltage of 5.6 volts is found at pin 6. When an overvoltage situation occurs, Q227 is saturating and shortens the collector of Q203 at ground level. The SMPS switches into a safe loop, whereas the output voltage is dramatically dropped.

C. Monitoring the +230V (Page 6-4 Sect. B-6)

A very stable Vref voltage is formed with IC2 / Z1 and buffered with an OPAMP.

IC2 provides a 33 volts which is then divided with R14/R1 to exactly 10 volt and buffered to provide sufficient current.

If the +230V were absent, the Vref would disappear and the monitoring circuit cannot work. The +9V takes over in such case and installs a reference voltage via Z1.

This Vref of 10 volt is used for the level detectors monitoring the supply voltages of the video power stages, the +230V.

The absence of one or both of these voltages can damage the picture tubes. Scan Fail is becoming active with Q1 as soon one of the voltages drops below some level.

D. G2 voltages (Page 6-4 Sect. F-8&9)

The G2 voltages must be very stable to avoid thermal drift, and, they must be adjustable between 400V and 1020 volt.

The voltage coming from unit is already very stable since it is coming from a stabilized source, the EHT.

The series output resistor in the unit forms, together with P2, P3, P4 and R17, a divider. If we stabilize the voltage at the **R253** "Adjust for 1020V with P1" we also have a stable G2 voltage on the sliders.

That 1020 volt point is sensed with the divider R15 / R13/ P1. Since the Vref is 10 volt, the output of the OPAMP will change until pin 13 is at the same voltage level of 10 volt.

Any voltage difference due to a change of the 1020 volt is adjusted by Q2 which will feed a current from R252 to the (negative) output of the OPAMP.

Q2 is needed because the 1020 volt is a too high voltage for the OPAMP. A high voltage transistor such as BU508A is therefore required.

E. LEDs for diagnosis (Page 6-4 Sect. A-3 to 6)

The presence of the various voltages are all displayed with green LEDs. The variable voltages, like the +HTHD and +CONV, drive an LED through a transistor to obtain a constant light output of the LED.

The scan fail diode D16 is red and shows a problem in the horizontal or vertical deflection.

809-10466

The Power (Main) Input provides protection against interference when operated in a commercial environment and contains the user setting for 230Vac or 120Vac.

1. Power (Main) filter

The power filter consists of coil L1 with four windings, and capacitor C3. It is a filter, blocking all high and low frequency noise towards the outlet.

NTC-resistors NTC1, NTC2 and NTC3 limit the start up current. Fuses F1 and F2 prevent damage to the power input board and the Switched Mode Power Supply in the event of short circuit or wrong 230/120Vac setting.

2. 230 Vac operation

Diode bridge D100 of the Switch Mode Power Supply is connected to the power Input board. It operates as a bridge rectifier, and we get an output DC-voltage of approximately +300 Volts.

Capacitor C103 forms a capacitive load on the Switch Mode Power Supply, to flatten the AC-ripple on the +300 DC-voltage. Resistor R103 discharges this capacitor quickly when the projector is switched off.

3. 120 Vac operation

The diode bridge of the Switch Mode Power Supply is connected to the Main Input/Output board during 130Vac operation and operates as a voltage multiplier. (Note that NTC1, NTC2, and NTC3 only play a roll during start up, and R3 and R4 are only important while switching off.)

During the negative half period of the power (Main) voltage, capacitors C11-C12 are charged through the bridge rectifier. During the positive half of the power (Main) voltage, capacitors C9-C10 are charged through the bridge rectifier with a voltage which is the input voltage together with the load on the capacitors C11/ C12.

In this way a DC-voltage of approximately +300 Volts is built across the capacitor C.

MAIN (POWER) ADAPTATION PROCEDURE:

1. Switch off the projector and unplug the power plug from the wall outlet.
2. Open the Top and the Module rack cover
3. Loosen the lock screw of the power input module and pull out this module.
4. Pull out the "POWER SELECTOR PLUG" and re-insert it as illustrated below depending of the wall outlet in the room.
5. Replace the fuses.
6. Re-insert the power input module and secure it with the lock screw.
7. Reconnect the power cord with the wall outlet and switch on the projector.

Scan inversion

S1, S2 and S3 allow the horizontal scan to be inverted to adapt the projector for a front or rear projection.

S3 is also used to provide the HSI_[CTRL] information to the controller board, so that the controller board will know the configuration of the horizontal scan switches.

S3 is also used to provide the HSI_[FOC] information to the "HOR SHIFT" module and is used by Q1 and Q2 to invert the shift voltages on P1 and P2 (horizontal shift Red and Blue).

Note that the main board also contains the switch for the inversion of the vertical scan. The VSI [CTRL] info is used for the controller and the VSI [VERT] info for the Vert Defl board (similar to Hor Defl).

The Scan Fail loop (SF0-SF1-SF2-SF3-SF4-SF5-SF6) passes through two contacts of the deflection connectors and two contacts of the connector on the Deflection Switching module. In the event that one of these yoke connectors or Deflection Switching module is disconnected, the projector will go into scan fail, terminating the EHT.

Note: HDM is the midpoint of the two series connected deflection MOSFETS. HDL is the common connection to the three horizontal yoke windings, that supplies the yokes with the +HTHD voltage, after passing through Q3 and the linearity coil.

TECHNICAL DESCRIPTION "CONTROLLER" 809-10453

Introduction.

The controller module can be divided into four blocks: the RWI (Real World Interface), CTRL (Controller), ASIC and PLL.

Each block has a typical function, but needs information from the other blocks. These connections are realized by the address / data bus or by "handshake" signals. Address and data are split by a GAL - ADEC (**A**ddress DECoder).

The schematic diagram consists of 4 sheets: Sheet 1=Controller, Sheet 2=ASIC+PLL, Sheet 3=RWI and Sheet 4=I/O + Power Supplies.

Real World Interface

The RWI is responsible for the communication with the peripheral circuitry of the projector, particularly the PPM (Pulse Position Modulated) commands. These commands can come in via the IR receiver, coming straight from the attached keypad, via the PC communication (RS232) port or the RCVDS port.

This electronic part must be supplied from the +9V**SB** supply line, as it must be ready in stand-by to respond to an ON command. The state of the switching transistor Q23 (on the I/O) is determined by the *"SMPS"* line. This is the output pin 11 of IC28, which is supplied from the micro-controller IC19. Whether this line is high or low at the moment the Main is supplied, depends on the DIP switch position "Power ON/OFF" (S2, switch 4).

The data bus of the RWI micro-controller IC19 is connected with the main controller IC2 via a bi-directional buffer IC23.

The multiplexed address/data bus P0 of the microcontroller drives the LEDs D30 - D37 and the DIP switches via the buffer IC24 (74HCT573).

Watchdog - 9 Volt Watch (Page 6-32 Sect. F-2)

The watchdog is built around IC25 pins 1 - 2 - 3 and Q20 transistor. At switching on the projector, the +5VSB is supplied to this circuit. As C68 is not charged at switching on, the output pin 1 is high for a moment in order to reset the microcontroller at pin 10 of IC19 (RST). Pin 3 of IC25 is set at half the supply voltage. The microcontroller triggers the watchdog via C67 in order to keep capacitor C68 charged by conduction of Q20.

If the processor gets blocked, the level detector output pin 1 becomes high and resets the controller as described before. The watchdog has the task of restarting the controller when it gets blocked.

Arcing in a CRT will temporarily short the +5V supply. This can damage the microprocessor. For that reason, the other level detector in IC25 monitors the 9V (9VWATCH). The output of this detector is connected to the **INT0** of the processor.

Controller (CTRL) (Page 6-32)

The Controller is built around the chipset 68000 microprocessor, 68230 and 68901. The chip 68230 and 68901 provide the in-/output bit (e.g. PLL-drive, I^2C coincidence...), the bus connection with the RWI, the serial communication with the RCVDS and the interrupt-inputs.

The Gal IC7 is the address decoder; all I/O are memory mapped. At the same time IC7 provides the DTACK (data acknowledge) of the other components to the 68000.

The Gal IC8 provides for the interrupt management and separates RD and WR from RD/WR.

The information adjusted by the user regarding the settings of the different blocks (memory blocks) are stocked in the E^2PROM IC6.

The clock generator is built around IC1/XT1. The buffered TXDRCV and RXDRCV are the communication lines with the switcher / selector RCVDS800 or RCVDS05. The RDY line (Ready line) informs the microprocessor on the status of the switcher (powered up or powered down).

ASIC (Page 6-34)

The ASIC IC17 integrates different functions and is custom made for this application. This chip is, with others, responsible for the generation and synchronization of the text that must be projected on request. The text or pixel information is loaded by the controller into the RAM IC18. Eight bytes are loaded into the RAM via the ASIC during the HFB time. (The controller cannot start up when there are no HFB pulses available from the ASIC).

When an external source is selected, the ASIC measures the line and vertical frequencies and informs the main processor if there are changes (change of resolution mode or change of source).

The pixel clock, generated by the VCO of the PLL, is sent to the ASIC where it is divided down to *HFB* and returned to the phase comparator of the PLL.

When an internal pattern is selected, required by the user or automatically at start up, the ASIC generates sync signals HSO and VSO.
The R, G and B together with the INSERT are buffered with IC31 and further proceed to the RGB INPUT + SW module.

PLL (Page 6-34 Sect. G-6)
The PLL consists of the digitally edge controlled phase comparator IC15, the low pass filter around IC14, the VCO (Q1 - Q12) and the internal divider in the ASIC. The VCO is a sawtooth generator. C36 is charged up via Q5, driven in the base with the low pass filter output. Note that 0 volts on the base means the maximum frequency. The VCO_0/1/2 lines can turn transistors on and then additional current is available for the generator.
Via the emitter/follower Q1 and the buffer in IC39, the pixel clock is applied to the CPP input of the ASIC. The PLL phase comparator has a double task. Tune the frequency of the VCO to a multiple of the line frequency and lock the position of the text to the deflection.
The active line period is divided into 256 pixels to position 32 characters on a line in the low frequency range and into 512 pixels (64 characters) in the high freq. range (see Hor defl module) .
The *HFM* line informs the processor and thus the PLL on the flyback time, this information is needed to determine the pixel frequency of the PLL.

Coincidence
The coincidence of the line oscillator is important information for the controller. At start up, the controller always generates first internal sync, which must lead to a coincidence situation.
If an external source is selected, the controller waits for coincidence and the timings of the selected source. These timings are needed to choose the memory block corresponding with the source. If the coincidence is not active, the projector reMain blanked (black screen).

809-10452
Technical description "Convergence OUTPUT"
(Page 6-31)
The purpose of the power amplifiers is to bring the adjusted signals to a sufficiently high level that the convergence coils can be fully driven. It is Important that the drift be kept as low as possible and that the signals be carried to the coils without using coupling capacitors.

The coils react differently on signals at a high (line) frequency than on low frequency signals. Much more power is required for the high scanning than for the low scanning range. The power supply + / - CONV for these power amplifiers is a variable line frequency tracked voltage delivered by the "G2 + Diagnostic" board.

Six identical amplifiers feed the six convergence coils, two for each picture tube. We present only the amplifier served with *"RHin" (Red Horizontal).*

Note that "Horizontal" here relates to the moving direction (of lines of a crosshatch pattern) and not to the "horizontal" frequency. The "RHin" signal contains waveforms at line and vertical frequency.
That is also the reason the amplifier stages are identical.

The signal RHin is passed on to the power amplifier IC1, pin 6. These power amplifiers are fully integrated hybrid amplifiers supplied with +CON and -CON.

The output current flows in a 150 Ohm damping resistor across the convergence coils and a series feedback resistor of 4.7 Ohm. The voltage developed across this resistor is sent back to the inverting input of the amplifier for stability.

Note that the jumpers J12 and J13 can be removed in order to isolate the power stages of the convergence and thus to investigate whether an excessive load on the supply voltages of the whole convergence board is caused by one of these amplifiers (or caused by another power amplifier of this convergence module).

The current of the +CON and -CON is permanently monitored by Q50 and Q51. The current from the + CON develops a voltage across SR1 that is applied to the base of Q50. The current taken from the - CON does the same for Q51. As soon as Q51 is switched on, the (I) Limiter turns on Q22 on the Convergence Driver PCB and the sawtooth generator is inhibited.

809-10463
Technical Description
" DYNAMIC ASTIGMATISM " (Page 6-20 to 6-23)
The waveforms for the dynamic astigmatism are parabolic and resemble the waveforms for the convergence corrections. The adjusted waveforms in the Bella's are delivered by, and come from, the convergence driver board.

These waveforms are carried to the module via connectors J6 / J7 / J8. These connectors carry the split (clamped) parabolic waveforms at horizontal and vertical frequency and opposite polarity.

Each correction consists of an orthogonal spot correction *(*X)* and a diagonal spot correction *(*Y)*. To facilitate the correction a separate center or 'screen axis' and corner 'screen corners' is provided.

The 12 Bella's for these corrections are found on sheet 1 of the schematics. As the waveforms have opposite polarity, the supply voltages for these Bella's are +3.2V and -1.8V taken from the convergence board.

The "corner" and "axis" corrections are added per color and then passed on to the power amplifiers. These power amplifiers are fully integrated hybrid amplifiers supplied with + / - DYN.
The supply voltages for these amplifiers are **+30V** (+ DYN) and **- 17V** (- DYN) **.**
Output current flows in 150 Ohm damping resistor across the stigmator coils and a series feedback resistor of 4.7 Ohm. The voltage developed across this resistor is sent back to the inverting input of the amplifier for stability.

Note that the jumpers J3 and J4 can be removed in order to isolate the power stages of the astigmatism and thus to investigate whether an excessive load on the supply voltages of the whole convergence board is caused by one of these amplifiers (or caused by another power amplifier of this convergence module).

809-10451

Technical description 'CONVERGENCE DRIVER' module

Introduction (Page 6-24 to 6-30)
The Surface Mounted Devices (SMD) technology applied in the driver module makes servicing of the module difficult and requires correct tools. The description of the schematics is limited to the essential functions.

Two trigger pulses are generated to trigger the sawtooth generator and the dynamic boosting of the power supply of the end stages. The sawtooth waveforms are clamped to ground level during one part of the scanning (left/right or top/bottom) and adjusted in amplitude for a linear correction on the scan for red and blue color (except when the "convergence on green " option is mounted).

Multipliers produce parabolic waveforms which undergo the same kind of flow for the non linear corrections. A combination of the clamped signals, and a modulation on either a sawtooth or parabola is needed for the corner convergence. All the waveforms for one color are summed with an OPAMP and amplified by a DC amplifier in the OUTPUT module.

Trigger Pulse generation

Pulse 1 and 2 (Page 6-30 Sect. D-4)
The HDR_CONV is speeded up and inverted by Q603. The negative pulse at the collector triggers monoflops IC9 and IC19.

Pulse 1: (trigger of the sawtooth generator).
The width of the positive output pulse at pin 13 of IC9 is adjusted with P1. The pulse train at the output pin 13 is integrated with R34/C620 and applied to one input (+) of the OPAMP IC15. The voltage across C620 is proportional to the width of the pulse and the line frequency. The output of this OPAMP determines the current of the current source Q9. This current adjusts the width of the pulse at the output pin 7 of IC19. The time constant of this one shot is designed to be a little less than the time period. That time constant needs to be tracked with the line frequency and this is realized as follows. The opposite polarity output pin 7 is integrated by R677 / C663 and applied to the inverting input of the same OPAMP.
The pulse at pin 7 *(Pulse 1)* starts consequently just before the end of the scanning and is used to trigger the horizontal sawtooth generator.

Pulse 2: (dynamic boosting of power supply).
The pulse output at pin 13 triggers on the positive going transient the second monoflop in IC9. The width of the output pulse at pin 5 is adjusted with P2. Through the buffer Q5 the pulse is available for boosting the supply voltage of the power end stages. Note that this pulse 2 is also added via D38 to pulse 1.

Horizontal axis convergence (Page 6-24 Sect. C-2)
Horizontal sawtooth generator.

C602 is charged by the current source Q2. In order to stabilize the amplitude the charging current is tracked with the line frequency as follows. The sawtooth is buffered and an average value of the amplitude is obtained by integration with IC3 / C7 . The resulting output voltage adjusts the charging current of the current source Q2. The amplitude is set by the voltage at the other input of the OPAMP, thus by R2 / R602.
The sawtooth is inhibited by the clamper Q22 when the current consumption of the power end amplifiers is too big (see Power Output stages).
OPAMP IC3 (5-6-7) amplifies the sawtooth in order to

supply IC4, IC16 and the multiplier IC20.

Preparation of the waveforms

The voltage comparator IC16 (5-6-7) transforms the sawtooth into a squared Horizontal 'Switch Pulse' of 24 V_{pp} (+ / - 12V). This switch signal is used to clamp either the sawtooth or the parabola during the first or second half of the horizontal scanning. Note that the clipping level is variable with the voltage that drives the current source of the sawtooth generator. The multiplier IC20 (AD633) generates a horizontal parabola **HP+**.

The next OPAMP shifts the DC level by clamping the middle of the parabola to a voltage adjusted by P5 (approx. 0 volts) in order to compensate the tolerances of the multiplier.

The convergence at horizontal frequency with the ramp and parabola waveforms in the zones 11 - 14 are adjusted in IC1-IC2-IC601-IC602.

The waveforms are clamped with a clamping transistor served by the horizontal switch pulse. Two opposite phased waveforms are applied to the potentiometers in the Bella's (digital potentiometer or D/A convertors).

Vertical axis convergence (Page 6-25 Sect. E-6)

The vertical sawtooth generator is generated in a similar way as the horizontal sawtooth generator, discussed above. The much lower frequencies here allow the use of the MUXDMUX IC46 (4053) instead of the clampers.

The "Vertical Switch Pulse" is passed through the RS flip-flop IC39 which is clocked with the pulse 1 in order to make the transition coincide with the trigger or the start of the horizontal sawtooth. This avoids a jitter for interlaced signals.

North-South / East-West and Midline corrections

(Page 6-26 Sect. C-2)

For these corrections we need horizontal waveforms with an amplitude depending on the vertical position or vertical scanning. The horizontal waveforms must be modulated on a vertical sawtooth or parabola. This modulation is performed by IC29 (MLT04). The four different waveforms are all applied to the "X" and "Y" inputs and the modulated waveforms are the "W1 - W4" pins.

The corrections, called *GEOMETRY* corrections, are added to the *CORNER* and *AXIS* corrections in the *"Summing Amplifiers"*.

East - West corrections (Page 6-26 Sect. E-2, F-2, F-5)

Two kind of corrections (referred to as "skew" and "bow") are required to correct the projection angle and aberrations of the optical system.

The HSVS (**H**orizontal **S**awtooth modulated on a **V**ertical **S**awtooth) and HSVP are used for this purpose.

The HSVS is first amplified with an OPAMP in IC30 and then clamped with Q11 and Q10 which are 'served' with the "R" and "S" switching signals. The *LS+* and *LS-* (Left Skew) and *RS+ / RS-* (Right Skew) are fed to two digital potentiometers in IC13 and the adjusted outputs are sent simultaneously to the three convergence coils.

HSVP is first inverted and amplified and then clamped during the first or second half of the scan. The RB+/- and LB+/- are applied to the digital potentiometers in the same IC13 and the outputs also feed the three convergence coils.

North - South Corrections (Page 6-26 Sect. C-2)

Two type of waveforms are modulated on a vertical sawtooth VS, Horizontal Sawtooth (HS) and Horizontal Parabola (HP).The HSVS from IC29 (sheet 3) is capacitively coupled to the MUX DMUX IC46 (sheet 2) and instead of clamping, the signal is switched with the "vertical switch pulse" for a split of top and bottom.

The TK (**T**op **K**eystone) and BK (**B**ottom **K**eystone) signals are adjusted in IC14. Since there is a correction per color the different outputs of the digital potentiometers are gathered per color and will be added to the other corrections in the "summing amplifiers".

Midline Corrections (Page 6-26 Sect. D-8)

For the vertical and horizontal midline skew and bow corrections, the non-modulated waveforms HP- / +, HS+ / - are adjusted in amplitude with IC42 and simultaneously applied to the vertical and horizontal convergence coils of the three CRTs.

Corner convergence.

The four corners are further divided (split) into 4 zones. The generation of the convergence signals for the corners is similar for these four corners. The only difference is the clamping or switching period. A split top / bottom is realized with a MUXDMUX switcher and a left / right split with fast switching clamping transistors.

We limit the explanation to one corner and one zone **(Zone 1)** .

Zone 1 is the cross section of the extreme left vertical axis and the extreme top horizontal axis. We start with a Horizontal Parabola (extreme left vertical axis) modulated on Vertical Parabola (extreme top horizontal axis). This signal is called *HPVP* in sheet 5. The clamping transistor Q16 clamps this signal during the second half of the horizontal scan and then the signal is called *Z1+Z20*. This signal is now split into top / bottom (Z1 and Z20) by the MUXDMUX IC12 (see sheet 4). Z1 and Z20 are now prepared for the digital potentiometer IC35 by the buffer - OPAMP IC37 to get *Z1+* and *Z1-* (same signal with opposite polarity). These signals are then adjusted in IC35 and used for red and blue. The outputs are added in the summing amplifier to the rest of the corrections. (*Geometry* and *Axis*).

Summing amplifiers.

All the corrections for the horizontal convergence coils are added per color and amplified with an MC34081. These OPAMP's are supplied with + / - 12V and since the non-inverting input is at ground level, the average output of these OPAMPs is around zero volts. This is required by the output power amplifiers for a balanced load of the (complementary) output stage.

809-10454

Technical description of the R-G-B driver General

(Page 6-49 Sect. E&F-3)

The black level of the Red, Green and Blue signals have been clamped at zero volt and the amplitude adjusted to 0.7V on the Input board. The signal is now ready to undergo the Brightness and Contrast controls before reaching the video power amplifiers.

The optional contrast modulation can also be added to the contrast voltages if implemented.

Furthermore, as a color temperature adjustment is also possible, the gain and black levels are controllable per color and tracked to maintain the color temperature over the full range.

The red, green and blue colors pass through identical circuits but, as a gamma correction is implemented, the red and blue channels are a bit different from the green (master) channel. We discuss the green channel and limit the discussion of the red and blue to the differences from the green.

Green video channel (Page 6-51 Sect. E-3)

a) Contrast / Green Gain / Contrast Modulation.

The video signal is terminated at 50 Ohm with R300 (coax cable is 50 Ohm), clamped at 0V and has an amplitude of 0.7V on the input board. IC301 is an analog multiplier and its output $W = (X1-X2) \times (Y1-Y2) + Z$.

The video signal at pin Y1 is thus multiplied with the voltage at pin X1, since X2 and Y2 are both at zero level.

The Z input is connected to ground level so the black level at the output is also 0V.

The *GAIN_GREEN* voltage changes from 0.05V —> 1.2V. This voltage is the result of the general contrast, the individual gain adjustment of the green channel and the contrast modulation board. IC304 (HF A100) amplifies this signal 5.7 times.

b) Brightness / Black level offset controls

(Page 6-51 Sect. A-5)

The positive bias voltage obtained by R319/R317 installs a negative black level output in order to use the full output swing of this amplifier. This black level is then again pulled up with R324 and the current generator Q300. C317 means a bypass for the video frequencies.

The green video is applied to the base of Q302 via Q301 and R329. The latter is, together with Q303/Q304, a non-inverting amplifier with a low impedance drive output, necessary to match the 75 Ohm cable impedance.

The required biasing current is obtained with R337, which determines together with R340 the gain of this amplifier.

The output signal *G_OUT* and the current from the *DC_GREEN* voltage (black level offset voltage) is compared with the reference of +2V in IC305(2,3,6) during the *CP* pulse time window.

If, for example, the output voltage is too high, the output of the comparator increases and the current generator Q300 draws less current through R324. The voltage drop across this resistor decreases and compensates the too high DC output level.

c) Peaking adjustment (Page 6-51 Sect. B-8)

By adding an overshoot and undershoot to the video transitions, the picture looks sharper. If these over/undershoots are adjustable in amplitude and width, we can adjust an overshoot matching the bandwidth and the scanning frequency of the signal.

If for example the *PEAKING_1* line is high, there is a current flowing in R330/D303/R331 towards the emitter of Q302. The RLC circuit L33/C319/R331 is then in parallel across the emitter resistor. A critically damped sinus peak is seen at the output.

PEAKING_1 gives the smallest peak and must be selected for the highest scanning frequencies.

Three selections are possible related to the scanning frequencies: low / mid and high range.

If no peaking is wanted, R336 means a compensation, in order not to change the gain of this stage.

d) Spot killer.

During operation, the gate of Q301 is at +12V and the latter is fully conducting (5 Ohm resistance). At switching off the projector, the *SPOT_KILL* line is dropped very quickly to 0V and Q301 is immediately blocked. This avoids any undesired voltage peaks that could cause a spot on the CRT.

Red video channel (Page 6-50)

The in and output circuits are identical to the green channel. In between the contrast adjustment and the x 5.7 amplifier, a gamma correction network is incorporated. This gamma correction is based on the red CRT characteristic which is different from the green one.

The relation light output / drive voltage for the red CRT is more linear for the red CRT phosphor than for the green phosphor.

With IC202/IC203 a non-linear correction in the mid-grey zones is now possible.

The (original) video signal is applied to the X1 (pin 8) input of the multiplier IC203.

Pin 7 (X2) is fixed at 0.7V with R212/R214.

The same video signal is sent through a step attenuator. By switching on one of the switchers of IC202 the video signal is divided with R204, R206, R208, R210 and the common R213. With the *MIDLIGHTS_1, 2, 3, 4* lines one can select between 15 possible steps. The attenuated signal is then applied to the Y2 input whereas the Y1 is at 0V.

The output W, pin 5, is (X1-X2) x (Y1-Y2).

Assume the input is a linear ramp from 0 -100% or from 0 - 0.7V. The output of the multiplier is then a positive parabola with a maximum at 50% of the ramp and zero at 0 and 100% of the ramp. The amplitude of this parabola is determined by the step attenuator. This parabola is sent to the inverting input of IC204 via R217 and subtracted from the original ramp.

As a result, we obtain a new non-linear ramp where the 50% zone has a decreased amplitude and the 0 and 100% zones are not affected. With this step attenuator, the light output / drive voltage of the red CRT can be adjusted to match the green one.

Blue video channel.

a) Gamma correction (Page 6-52 Sect. E&F-5)

The light output / drive voltage of the blue CRT is less linear than the green one. We can obtain a matching when the polarity of the parabola is inverted compared to the red one. This is done by swapping the Y1 and Y2 inputs of the multiplier IC403.

If we assume a linear ramp input, the parabola of the output W of IC403 is negative. The final result at output pin 6 of IC404 is a non-linear ramp with an increased amplitude in the grey zones.

b) Blue correction circuit (Page 6-52 Sect. F9)

The blue phosphor saturates from some drive voltage onwards. This saturation point depends on the CRT phosphor, the spot size, frequency of scanning, temperature, etc...

To resolve this problem, the blue signal undergoes an increased gain from some level onwards (the breakpoint level) .

This level can be adjusted by software and is the *BLUE_BRKPNT* voltage. As soon the emitter voltage of Q402 exceeds the *BLUE_BRKPNT* level with 0.3V diode voltage drop), the diode D412 gets forward biased and R456 is added to the emitter load. The slope of the correction is further adjusted by means of the *BLUE_CORR 1,2,3* voltages. This will add to the emitter load one of the feedback resistors R454, R455, R456 or a combination of these.

c) DC stabilization, additional clamping

(Page 6-52 Sect. F-8)

Without further measures, the DC level of the emitter voltage would not be stable. It is temperature dependent and it varies with the bias current through the stage. An additional clamping is required.

This clamper compares the output voltage with the emitter voltage during the *CP* timing window. The output voltage drives Q407 which is part of the biasing resistor (drain connected to -12V).

Q408 provides a lower impedance for the source of Q407, as the current flow through R437 and Q407 depends also on the video signal.

Blanking (Page 6-48 Sect. F-8)

The composite blanking pulses are the result of the sum of different individual blanking informations added together in the NAND IC104 after modeling to the correct TTL amplitude.

If there is no blanking necessary, the output pin 8 of the NAND is low level and this forward biases Q107 and Q109. The current flowing through the latter installs around +11V at the *BL* output.

In case of blanking, the TTL high level output of IC104 forward biases Q108 and through Q110 the BL output is at around -16V.

D114 - D117 avoid saturation of the transistors and improve switching.

Following blanking informations are input to the NAND gate IC104:

- *LP* (line pulses):

are dropped in amplitude with R116/R117/R140 limited with D102/D103, inverted by IC103 (5,6) and input to pin 1. (Page 6-48 Sect. D&E-6)

(note: the same negative line pulses are inverted again with IC103(1,2) and then referred to as *HFB* to be used in the optional Contrast modulation board.

- *V BL* (Vertical Blanking):

these pulses are also dropped to TTL level, inverted and applied to pin 2.

- *SPOT_KILL* (pin 5):

The line SPOT_KILL is +12V during operation and drops to zero level at switching off the projector to blank the picture.

- *SCAN FAIL* (pin 6):

This line is high when there is no scan fail and drops to zero when scan fail has been detected.

(note: The scan fail condition also drops the SPOT_KILL line to an active low level and hence switches off the video output stages of the UN DRIVE board.

- Supply voltages controls (pin 3,4):

The +/- 12V and +/-5V supply voltages are checked with the window detector IC105. If one voltage fails or is not within the desired window, the output switches low and the same pins 3, 4 are pulled low level. Note that this will mean a scan fail condition and the SPOT_KILL line will be active as well.

- *LEFT/RIGHT* blanking:

The blanking pulses for the beginning of the scan (left blanking) are generated by IC108 (output 4) by triggering the monoflop on the positive transition of the *LP* pulses. The output pulse train of pin 13 is integrated with R138/C108 and compared with the *LEFT_BLANKING* voltage. The output of the Miller integrator drives the current source Q104 which determines the pulse width of the blanking pulses.

The pulses for the end of the scan are generated by the other monoflop in IC108. Here, the monoflop is triggered by the negative transition and the positive pulses at pin 5 output are used. Consequently, the low level of these pulses is the blanking time. It is obvious that, in this case, the negative pulses at pin 12 are integrated and the obtained voltage is used to adapt the pulse width in conjunction with the *RIGHT_BLANKING* voltage.

The integration of the pulses (average voltage) means a tracking of the range with the line frequency. The absolute value of the required blanking is much smaller for the higher scanning than for the lower scanning signals.

Another tracking is also got by a correction current via D122 and D124 by switching on Q111 with *HFB* pulses.

I²C Interfacing (Page 6-48 Sect. G-2&3)

IC100: the *MIDLIGHTS_RED* and *_BLUE* switching on/off voltages.

IC101: 3 outputs are the *PEAKING* adjustments.

(Page 6-48 Sect. D&E-2)

If no peaking is needed, the three outputs are at approx. -11V and hence Q112 and Q113 are both conducting. The output *NO_PEAKING* is then at about +12V.

As soon one output of a comparator switches to a positive high, due to the resistive dividers R171/R172/R173, the emitter of Q112 jumps at -3.5V and the latter gets blocked.

The *NO_PEAKING* line is then at about -5V and D123 is forward biased to keep the impedance of the *NO_PEAKING* line low and avoid distortions in the RGB DRIVE stages.

IC100 uses the same address of IC601 on the INPUT board. The data line *SDA* of either one of these I²C interfaces can be disconnected via a switching Mosfet. To select this IC100, output port P7 of IC101 must be low level, blocking Q103 and via R113, Q102 is forward biased.

IC109 (Page 6-48 Sect. C-2)

two outputs are used for the Left/Right blankings and VO3 is the Blue breakpoint output. The DC range is corrected with IC102 (8, 9, 10).

7. Spot suppression (Page 6-48 Sect. A-3)

There are two actions at switching off the projector:

- via the **G1 grid**:

The G1 grid voltage is at approximately 0V via D101. During normal operation and on condition the +17V is correct (sufficiently high) Q100 is saturated and Q101 is off as its base is lower than 0.6V. The collector of Q101 is then at 150V or the voltage drop across Z101. C100 is consequently charged up to 150V.

At switching off, the +17V drops very quickly to zero and the +210V rather decays slowly. The moment Q100 shuts off and Q101 gets forward biased, the collector of the latter drops to zero and the - of the capacitor C100 drops also instantly with the same amplitude to -150V. The G1's are dropped to -150V and the CRT's are blanked.

- via the **cathodes** (drive voltage):

The *SPOT_KILL* line is in normal operation at +12V via R106. When the projector is switched off, the line is dropped to 0V via D100. This zero level cuts the output via the mosfets Q201, Q301, Q401.

Contrast, brightness and gain adjustments

Contrast / Gain (Page 6-53 Sect. C-4&5)

The general (common) contrast and the individual gain controls are first combined with the (optional) contrast modulation waveforms and as such used in a multiplier (a variable gain amplifier) to adjust the amplitudes.

The contrast voltage is generated by the IC3 *VO0* output and ranges from +1V (minimum) to +3V (maximum). The multiplier requires just the opposite, hence, the contrast voltage is inverted by IC5 (8,9,10). R54 and D8 prevent this contrast voltage from exceeding +3V as this would mean that the multiplier inverts the polarity of the videosignal.

This contrast voltage is now three times multiplied with the gain control of each color. This is realized by using the contrast voltage as the *VRP3, VRP2* and *VRP1* supply for the potentiometers *1, 2* and *3* of the Bella IC3. The other end of the potentiometers *(VRN*)* is connected to the +3V, or the minimum contrast.

The outputs *VO1,2,3* are the result of the general contrast and the individual gain controls.

The output range of the Bella's is not what is needed by the multipliers. Therefor the OPAMP's / inverters in IC4 adapt the range to 0.05V <—> 1.19V which is the needed range of the multipliers.

BCL / IBCL / Drive modes(Page 6-53 Sect. D&E-3, A8)

The contrast voltage can be reduced by the *BCL* and *IBCL* informations. The negative *BCL* voltage from the EHT board drives Q2 on from the -0.6V level onwards. This will turn on Q1. The *INT*ernal *CONTRAST* voltage or the *BCL_LINK* voltage cannot further increase.

The *IBCL* voltages are slightly smoothed and compared to an adjustable voltage *(IBCL_VALUE)* from the potentiometer *"0"* of IC2. This value depends on the Eco / Normal / Boost mode drive, set by software.

As soon an *IBCL_** voltage reaches the *IBCL_VALUE* the corresponding comparator drops the contrast through one or more of the conducting diodes D4, D5, D6.

ABL trigger generator.

The ABL circuits of the RGB video amplifiers are triggered by a pulse of 20 µS and an amplitude of 12V. This pulse is added to the *IBCL* lines as these lines are not carrying any valid information during this time. The *ABL* pulse is here ac coupled to the lines through C19, C20 and C21.

As the ABL trigger pulse is generated on the *UN SYNC+ VERT DEFL* board and superposed on the *V BL* (has an amplitude from 17V - 34V), the *V BL* is dropped by 20V with Z3 and Q3 will conduct during this *V BL* pulse time. The differentiator C18/R70 drives Q4 into conduction for 20µS and via R73/C19, C20, C21 they are AC coupled into the IBCL lines.

Brightness / Black Level.

Introduction.

The brightness control is nearly identical to the contrast. The general brightness is combined with the individual *BLACK_LEVEL_** and the resulting *OUTPUT_DC_** voltage is an offset of the reference black level of +2V.

At 50% brightness setting, the black level of the output signal of the *RGB DRIVE* board must be clamped at +2V. This condition is translated into a 2V output for the potentiometers *VO1, VO2, VO3* of IC1 **and** IC2. Only then, there is no current flow in R7, R8, R9, R10, R11 and R12. The +2V *OUTPUT_DC* is now the same as the reference voltage of the inverters/comparators IC205, IC305, IC405.

Circuit Implementation.

As *VRN0* = +3V and *VRP0* = +1V the brightness voltage at *VO0* of IC1 changes from +3V (min. brightness) to +1V(max. brightness). This brightness voltage is applied again to the *VRP1,2,3* of three potentiometers in IC1. The other end *VRN1,2,3* of these potentiometers is the reference voltage **+2V.**

These three potentiometers in IC1 obtain the same settings of the gain controls in IC3.

If the brightness voltage is +2V (50%) the outputs *VO1,2,3* of IC1 are ALWAYS at +2V, irrelevant of the gain setting.

Any change of the brightness and gain settings change the output voltage(s). With above **"gain scaled brightness voltages"** the black level is tracked with the gain adjustment in order to not deteriorate the color temperature with contrast.

We can add to these "gain scaled brightness voltages" an extra offset via R10, R11, R12 to adjust the low lights.

Technical description Video Amplifier 809-10450

Video Amplifier (Page 6-53 Sect. D-3)

The video signal arrives at pin 2 of J1 and is terminated into 75W the resistors R1...6. The first half of IC2 switches the base of Q2 between this video signal (no ABL-Automatic Black Level) and the reference voltage on pin 1 of IC10 (during ABL).

Via buffer Q1 and D3, the signal is fed to the input of a non-inverting amplifier formed by Q2 and Q3. Diode D3 protects Q1 against high inverse Vbe voltage during blanking. Resistors R13, R14 form, together with R15 and R104, a divider that limits the voltage at the emitter of transistor Q1 during overdrive conditions of the input. This prevents saturation of the amplifier.

The amplified signal arrives at pin 4 of VPH08. Feedback for the previous amplifier is taken from pin 3 of VPH08. Potentiometer P1 determines the GAIN and C1/R21 improves the frequency response.

IC1 (VPH08) is a cascade class A amplifier with built in buffer stage and external load resistor, formed by R32...35.

Via pin 2 of J3 and J4. The signal goes to the IBCL (Individual Beam Current Limiting) and ABL measurement stages and finally arrives at the cathode of the CRT. The components D4..D7,C49, R103, D28, B1, B2 and R95 protect the amplifier against arcing.

IBCL measurement

With transistor Q4, the mean cathode current is measured. The current flows via D12, D13 and Q5 and through Q4 to R45. There, the current is converted into a voltage and is sent to the RGB driver module. Capacitor C10 prevents high frequency currents from flowing through Q4. The resistor R46 and zener Z4 form a protection network.

ABL measurement+ Switch

During the non-ABL period, the base-emitter junction of the transistor Q6 is shorted by transistor Q5. The cathode current flows through R51 and Q5 to the IBCL measurement stage. If the cathode current is high, the voltage drop across resistor R51 increases and D12/D13 also come into conduction. The gate of Q5 is held at +5.6V with Z1 and R49/R50.

During the ABL interval, optocoupler IC7 comes into conduction and shorts the gate-source of Q5. Now the cathode current can flow through transistor Q6, R52 and R53 to the ABL control loop. By shorting transistor Q6 outside the ABL interval, smearing is prevented.

The optocoupler is controlled by the circuit around transistors Q10 and Q11. During blanking, the BL-signal (Blanking) is negative (-15V). The pulse is integrated by R80/C22. During blanking, the BL-signal is wide enough to get Q10, Q11 and IC7 into conduction until after the vertical blanking.

ABL Control Loop (Page 6-53 & 54)

This circuit has to keep the cathode current just above the black level constant. The ABL measurement is performed at the end of the vertical flyback, when the electron beam is moved outside the phosphor screen of the CRT in order not to see these measurements lines.

The ABL interval is initiated by a 12V pulse of 20ms, which is AC coupled on the IBCL line. The pulse is coupled via R54 and C13 to the base of Q7. Resistor R55 keeps diode D15 into conduction if there is no pulse to prevent false triggering. The pulse at the emitter of Q7 and MP7 is used to perform the leakage current measurement and is now called leakage pulse. With the trailing edge of this pulse, the transistor Q8 starts to conduct through the network C14, R59 and R60 for about 20ms. This pulse at MP6 is now called the measurement pulse. The total ABL interval is 40ms wide and is electrically formed by D17, D18 on R61 and C15.

This pulse is used to inhibit the blanking and to switch Q1 to the reference voltage. This voltage is formed by R78 and R79 during the measurement pulse and is then +2.4V.

During the leakage measurement transistor Q16 is in conduction and lowers this reference with R101 to +2.0V. IC10 buffers this voltage and can sink the base current of Q1.

Leakage current enters the control loop through pin 10 of J3/J4 and is converted to a voltage with R71. This voltage is first amplified with IC9 pins 1, 2 and 3 with a factor 90. Diodes D22 and D23 limit the input levels.

During the leakage measurement the emitter of the transistor Q7 is high and pins 1, 10 of the switch IC4 are closed. The amplified voltage comes on C18 and is compared with ground by IC9, pins 5, 6 and 7 which adjusts the bottom of R71 until steady state. This system compensates for leakage currents that might flow out of the cathode.

During the measurement pulse is the level at MP6 high and the switch IC4 pin 3, 4 and 9 is closed. The input reference is now 2.4V at the base of the transistor Q1 and this should give a cathode current of about 20ms.

The amplified voltage that corresponds to this current comes on capacitor C19 and is buffered by IC3 pin 5, 6 and 7. The voltage is compared by IC3 pin 1, 2 and 3 with a reference and adjusts the output DC level at the collector of Q3 trough R30.

During the leakage measurement the input voltage at Q1 is 2V, and the output voltage should be 185V. This voltage is divided with R68, R69, R70 and P30 to 0V. This voltage is buffered by IC6 pins 5, 6, 7, and compared by the comparators IC5 with 2 references. Potentiometer P30 is aligned so that the LED D30 is turned off at an output black level of +185V. The G2 potentiometers can then easily be adjusted (if the LED D30 turns off, the G2 is at the correct level because the cathode is at 185V black level.

Regulated Power Supply

The Power Supply had to be regulated to guarantee the performance of the VPH08 and to eliminate variations on the +210V Power Supply. The +200V is divided by

R90, R91, R92 and P3 to 0V and compared with ground by IC6 pins 1, 2 and 3. If the output voltage is too low, pin 1 goes higher and more current is flowing through Q15, Q13 and Q14 as to raise the output until steady state. The transistor Q12 limits the peak current.

CIRCUIT DESCRIPTION " DECODER + COMB FILTER "
809-10455 (Page 6-36)

General.

The decoder section of this board with comb filtering uses decoder chips TDA4650 / TDA4665 / TDA 4565.

The implementation of the *adaptive digital comb filter* for PAL and NTSC 3.58 (not for SECAM and NTSC 4.43) has changed the input switching circuit and two ICs for the digital comb filtering have been added. The first IC generates sync and sampling pulses. The second IC is performing the adaptive digital comb filtering.

Filter Switching (Page 6-36 Sect. F-3)

In decoder IC 11 the VID/ LUM input signal passes an emitter follower in order to supply the provided filters.
Multistandard Decoder chip IC 11 sequentially checks the information on the backporch of the horizontal sync.
When the right system is identified, the appropriate output PAL/SECAM/NTSC4.43 or NTSC3.58 is put at a high level. The filters for the Luma signal are an all pass, a rejector at 4.43 MHz and a Luma Comb filter (via Q41). The filters for the Chroma signal are a high Pass 2.5MHz, a Chroma Comb filter (via Q40) and a SECAM BELL filter (via Q10).
The switching outputs of TDA4650 are supplied to a GAL (IC14), where the decoder mode will be recognized. The programmed GAL IC14 takes care, using the two outputs SwBit0 and SwBit1 as address inputs for the IC18, that the correct signal on the 4-channel Analog Multi-/ Demultiplexer IC18 is switched through.

The filters are switched in the following way:
The two output signals of the 4-channel Analog Multi-/ Demultiplexer IC18 (Page 6-7 Sect. F6), respectively Chr_Sw and Y_Sw, are the supply signals for the Decoder IC's.
Next, the composite video is split into luminance and chrominance. This split depends on the color system.
For PAL and NTSC 3.58 this is done by an adaptive digital comb filter. For SECAM this is done by passive filtering. For NTSC4, digital bandpass and band reject filters are used.

The chrominance is applied to the decoder IC in order to furnish the color difference signals -(R-Y) and -(B-Y). These signals are then applied to the "baseband delay line" IC to add the chroma information of two subsequent lines.
(With NTSC3.58, the digital comb filter has already done a similar action, this delay line IC is bypassed for NTSC3.58.)
The CTI IC is supplied with the color difference signals and the luminance. The same CTI chip is also responsible for the luminance delay in order to correct the phase difference between the two signals due to the color decoding process.
Finally, the luminance passes a "sharpness control" and the three signals leave the decoder via current sources.

Sync Processor CXA1686M (Page 6-37 Sect. B-4)

The bloc schematic shows that the sync processor has three inputs: *VID IN, C IN* and *Y IN.*

There are two PLL's in the IC. The first one generates a stable **B**urst **G**ate **P**ulse. The second one generates a sampling frequency of 4 x Fsc (4 times the color subcarrier) required by the digital comb filter IC.

Note that the color subcarrier is 3.58Mhz in NTSC3 and 4.43Mhz in PAL. The required frequencies are consequently:

For NTSC: 4 x 3.58Mhz = 14.318 Mhz (VCO1 in the bloc diagram)
For PAL : 4 x 4.43Mhz = 17.734 Mhz (VCO2 in the bloc diagram).

In order to generate these stable frequencies the second PLL is used. This PLL consists of an **APC** (Automatic Phase Control), a **VCO** (Voltage Controlled Oscillator) and a **divider** by 4 *(1/4).*

The *APC* receives the oscillator frequency divided by 4, and, the burst which must be gated out of the chrominance. Stable burst gate pulses "**BGP**" are generated by the aid of the first PLL running at approximately 32 x Fh (32 times the line frequency) or approx. 500khz.

The BGP pulses, besides internal use in the sync processor itself, are also used by the comb filter (pin 17).

The reference frequency for the first PLL is provided by the ceramic filter KF100 connected at pin 5.

The video signal first passes a " *sync separator* " which is used in the IC itself to lock the first PLL (500khz).

Pin 10 accepts information concerning the color system to the sync processor. The color decoder IC 11 delivers this information. This pin is at a high level in NTSC3.58 and low level for PAL and NTSC4.43.

This switching voltage activates either the oscillator around XT11 (4 x 3.58Mhz = 14.318 Mhz) in NTSC3.58 or the oscillator around XT10 (4 x 4.43Mhz = 17.734Mhz).

The video signal from input 26 is amplified by 6db and via the pin 30 output capacitively coupled to the AD input pin 25 of the comb filter chip IC16.

The VID/LUMA undergoes a frequency limiting to 6Mhz with FI12 driven by Q49. This frequency limiting will avoid saturation later in the AD and DA convertors of the Comb Filter IC16.

Comb Filter CXD2024AQ.

The above IC can be supplied either with digital or analog signals. In our application the analog inputs and outputs are used. As pin 10 INSL is here at ground level for Video PAL, N3 and N4, we use (activate) the analog inputs and outputs. For the other modes (see table 'Filter switching') pin 10 is at high level, setting the outputs at a DC level.

Processing for filtering the chrominance out of the luminance is done with digital circuits. The analog video is converted to digital using the sampling clock generated in the sync processor.

Note that the signal passing through this IC undergoes a delay of approximately 1 and 2 lines in NTSC and in PAL. This can cause synchronization and clamping problems if not taken care of. (see Input switching - synchronization).

The AYO (luminance) output at pin 31 passes through a low pass filter FI11 and is then buffered with Q41 to feed the 4-channel Analog Multi-/Demultiplexer IC18, pin 1 Y_Comb. This filter prevents the clock frequencies of the DA converter from passing through.

The ACO (Chrominance) output undergoes a frequency limitation with the filter FI10 before supplying the pin 12 Chr_Comb of the 4-channel Analog Multi-/ Demultiplexer IC18.

The voltage at pin 21 determines the DC clamping level of the ADC.

The voltage at pin 41 (CVRF) is the gain of the chrominance output and pin 33 (YVRF) of the luminance output.

Pin 70 tells the IC whether the color system is PAL or NTSC3.58; This determines the number of line delays for the adaptive digital filtering.

Synchronization.

The first selection of the sync signal is done in the source input selection. This produces the SYNC-EX which is available at pin 7 of the J313 connector.

a) Video / S-Video (Page 6-37 Sect. G-8)

When a video composite or S-Video source is selected the +VID voltage is high

and the transistor Q42 gets forward biased just like Q43. Pin 7 of connector J314 receives the signal via these transistors. This signal has undergone some delays depending on the standard.

To ensure that the SYNC-EX does not get through, Q36 is saturated to short the SYNC-EX line to ground. The collector DC voltage of Q43 is blocked with D24.

b) RGB .

The selection of an RGB source simply means that the SYNC-EX signal is passed through D24 and feeds the Input+Selection board.

Decoder - Sharpness.

This presentation is limited to the differences with the former version.

a) Comb filtering in NTSC3.58 (Page 6-36 Sect. D&E-6)

As for NTSC3.58 comb filtering is done by the digital comb filter, the dual baseband CCD delay IC must be bypassed. This happens with Q13 - Q15 and Q12- Q14 when NT3 is at a high level.

b) Sharpness control.

In this version, sharpness is done with discrete components. A DAC TDA8444 provides the adjustable voltage: *SHARPNESS*.

The sharpness control is based on combining two signals, one with a 'max negative' sharpness together with an amplitude adjusted sharpness signal.

The signal is delayed twice by two delay lines of 180ns. A combination of signals produce the max. neg. sharpness signal on the junction R62, R65 and R68 and the sharpness correction signal on the junction R52, R55 and R61. The latter signal is amplitude adjusted in IC12 by the sharpness voltage. The two formed signals are combined on junction R73/R78 and this signal is further used as Luma signal.

924-10073

Technical description of the Infra Red transmitter

Introduction (Last page)

The SAA1250 in the RCU R791664 is replaced by PIC16C55, an EPROM-Based 8-Bit CMOS Microcontroller with hardware selectable enhancements.

PIC16C55

Pin functions:

VDD: **Power Supply**

Vss: **Ground connection**

Oscillator**: Use of a 429kHz Ceramic resonator with 2 load capacitors of 82pF.**

MCLR Reset Input: **to be activated in 2 cases:**

- *Power On*: all memory locations are initialized.
- *Awake from sleep*: option jumpers are scanned and memorized, keyboard matrix is scanned, key entries are processed, and the device goes back to sleep.

RA0: IR-Pulse driver Output**: active=H**

RA2: Backlight driver Output**: active=high**

Turns on for 13s when key on row0/column0 is hit. This period is retriggered when any key is hit. During this period, the PIC doesn't enter sleep.

RA3: 'Option jumpers' scan Output: **active=high**

RB0..RB7: Keyboard Sense Inputs

RC0..RC7: Keyboard Scan Outputs

active=low

Operating

During the idle time of the RCU, the IC PIC is in the sleep mode and all scan outputs are low.

Any key action will discharge the RESET timing capacitor C3 through the involved sense input pull up resistor (R1..R8). When the C3 voltage drops to $0.15V_{DD}$, the PIC resets and puts the scan outputs in the Hi_Z state. Capacitor C3 recharges through resistor R14 and when the $0.15V_{DD}$ is reached, the PIC starts running.

Since this is a reset from sleep, a 'warm reset' procedure is started, which reads 'in' the option jumpers: the scan pin is put to low momentarily, during which time the 8 sense inputs are read and stored in the memory. After that, key debounce is done by a 20ms delay loop.

Next, the keyboard matrix is scanned: one after another the columns are forced to low through the scan pins RC0..RC7 and the bit pattern of the column is read through the sense inputs RB0..RB7.

The whole matrix is always scanned to detect simultaneously pressed keys, in which case the scan results are ignored. The scan pulses only last 20 oscillator periods, short enough to have no influence on the reset pin voltage.

Depending on which key was pressed, the following actions can be taken:

1. Backlight key:

Backlight is lit, the 13 seconds countdown starts, the sleep mode is not entered during this time. The countdown retriggers at any key actuation while the backlight is on.

2. Address key:

The 'ADDR' command is transmitted along with the 'always listen' address value (address '10'). A 5 second countdown starts, during which 1 or 2 numeric key entries are expected. Each numeric key entry is followed by a 260 ms holdoff and restarts the countdown, but now for 2 seconds. If the initial time window elapses without a numeric key entry, or if an invalid address is entered, the RCU address is reset to the 'always listen' value.

3. Other keys:

The corresponding command is transmitted along with the address last entered.

The command bits are related to the matrix co-ordinates as follows:

*command=row *8 +column*

e.g. button S41 pressed

command= (row)2 x 8+ (column)7 = 23

After transmitting, the keyboard is scanned once more to detect if a key is still pressed. This keeps the repetition rate controllable at exactly 130ms, because the reset timing is offside now.

Power Supply

The IC1 needs to run from +5V typically, which should be made from the 9V-battery voltage. The circuit around transistor Q5 and zener Z1 is very common, but its transistor has an extremely high current gain, because zener bias should be very low to prevent excessive quiescent current, and so extend battery life.

IR LED Driving

Transistors Q1, Q2 and Q3 drive the IR LED's in a constant current figuration. The current is determined from the battery voltage by the emitter resistor.

An emitter follower Q4, which follows the pulse output RA0 of IC1, provides the drive current for the base of the three IR LED's drivers.

The base signal of the transistor Q4 is short-circuited to ground by the saturated transistor Q7 through the diode D19 when the Jack Cable is inserted between the RCU and a powered-up Projector. Transistor Q7 is driven through R25 from the projector's +9V.

The capacitor C5 acts as a buffer for delivering the high current pulses. The battery can not supply high currents, due to its internal resistance.

Backlight LED driving

Transistor Q8 drives the 12 LED's via their load resistors R18..R21. The On/Off status is imposed by IC1, output RA2, which handles the switch-on criteria.

When the Jack cable connection is installed, transistor Q8 is shunted by the saturated transistor Q7 (see above) through D19, causing the backlight to be lit continuously.

Indicator LED driving

Transistor Q6 drives LED D22 via resistor R28. The latter needs to have a rather small value because the driving pulses are very short.

3.5mm Jack Cable Connection

The 'hot' conductor of the Jack cable, is driven by transistor Q6. This line is supplied on the RS232 Communication Interface by the +9VSB. Resistor R26 determines the amplitude of the current pulses, detected on the series resistor of the pulse detection circuit built around transistor Q52 on the RS232 Com. Interface. Series diode D23 ensures that transistor Q7 is only driven if the jack connection is installed, and not via R28/D22.

Field Service

The IC1 RESET (pin 28): needed to wake up the microcontroller. A downward pulse should be visible at pin 28 each time a key is pressed (except while an address entry is expected, or when the backlight is still lit).

Oscillator (pin 26,27): as soon as IC1 wakes up, its oscillator should start .

PPM Ouput (pin 6): after a debounce time of about 20ms, a train of 13 pulses of 10us should be present at pin 6, repeating itself every 130ms. (Except while the IC waits for an address entry, or after pressing the backlight key).

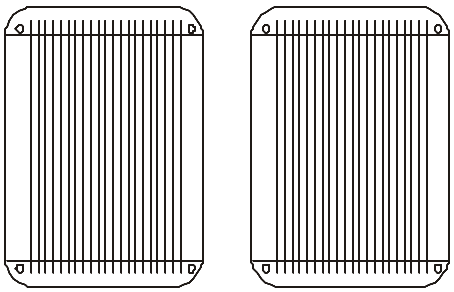
CRT PROJECTOR SERVICE KIT 868-10003

Making adjustments on the Zenith Pro1200 projector is made possible by using the extension boards and the extension cable units. These parts are sold as a service kit.

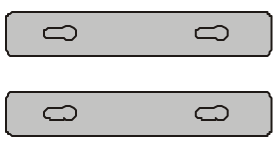
The parts consists of:

Qty. **Part#**

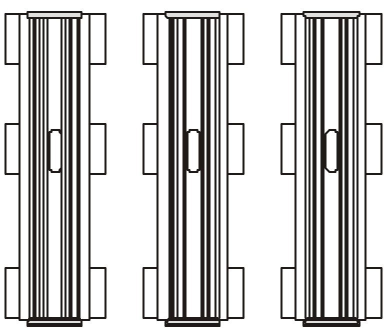
(2) Vertical PCB Extensions



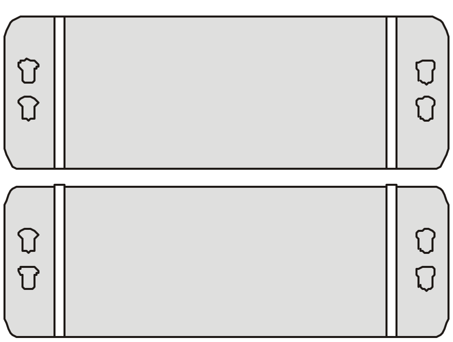
(2)



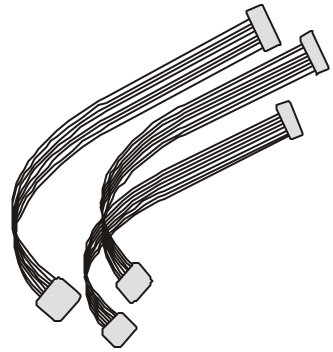
(3)



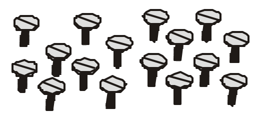
(2)



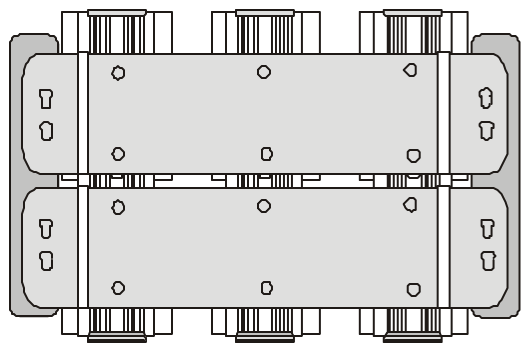
(3)



(16)

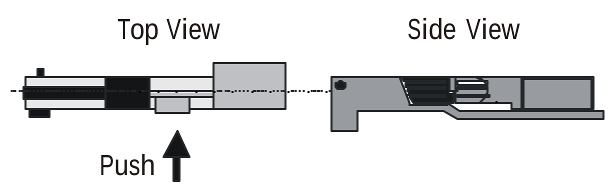


Below is the assembled Convergence Extension Assmebly.

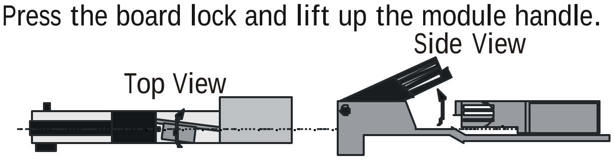


To remove any vertically mounted module, proceed as follows:

Refer to illustration:



Press the board lock and lift up the module handle.



Repeat this action on both sides of the module and extract the module out of the main frame.

EHT MODULE

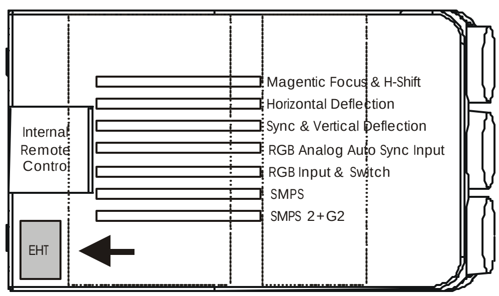


Fig. A

Schematic Reference:
Page: 6-3
Sect: E-5

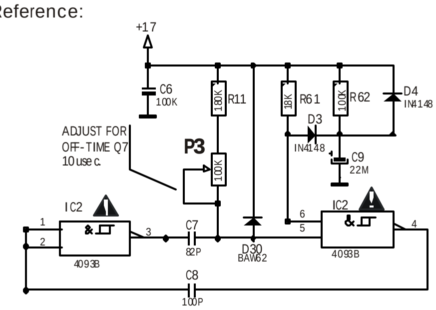


Fig. C

A. Preparation

Warning: Unit must be disconnected form power source or AC prior to removing any connector from circuit board or unit. Failure to do so may result in severe damage to the projection unit. Section A-C must be completed for proper adjustment.

Note: G2 adjustment, see INSTALLATION SECTION

1. Remove fuse “F2A”
2. Put the potentiometers P1 and P2 in their minimum position (turning clockwise!) .

Note: See Figure B

Schematic Reference:
Page: 6-5
Sect: C-2

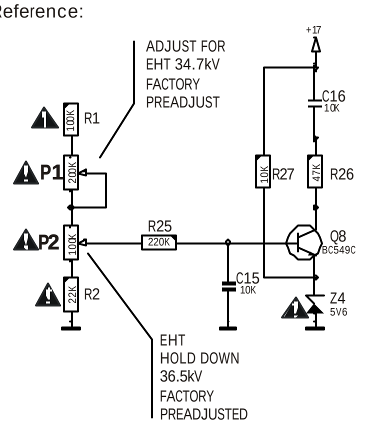


Fig. B

3. Pull out one CRT-HV cable of the HV splitter.
4. Insert in the free EHT connector the **precision** EHTprobe (ratio 1000/1).

Warning: read carefully all safety instructions, mentionned in the user's manual of the precision high voltage probe.

B. DRIVE ADJUSTMENT

1. Connect the oscilloscope to the gate of switching transistor Q7)
2. Switch on the projector.
3. Adjust potentiometer P3 for a drive pulse 'time OFF' width of 10 us.
4. Remove A/C and reinstall fuse to continue.

P1 High Voltage Adj.
P2 Hold Down

C. HIGH VOLTAGE ADJUSTMENT

1. Re-apply A/C and switch on the projector
2. Adjust potentiometer P1 "High Voltage Adj." until the EHT voltage reaches 36.5kV.

Note: See Figure B

3. Turn potentiometer P2 "Hold Down" until the Hold Down LED lights up. The projector switches at that moment into the Hold Down mode, picture disapears.
4. Put the potentiometer P1 again in its minimum position (turning clockwise!!).
5. Turn the power switch in its OFF position (not-pressed) and switch on the projector again (press the power switch).
6. Adjust the potentiometer P1 for an EHT voltage of 34.7kV.

Important: The EHT splitter, on which a potentiometer is mounted , leaves the factory as a factory pre-adjusted unit. A readjustment of the mentionned potentiometer is in no case allowed.

SMPS

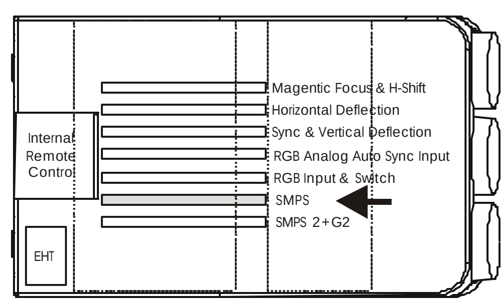


Fig. D

PREPARATION

1. Remove A/C and install PCB extension kit.
2. Select the internal generated test pattern or an input source at standard frequency (refer to owner's and installation manual).

Set brightness and Contrast level in mid position.

The internal # pattern menu will be displayed if the internal cross hatch pattern has been selected or if no source is connected to the projector.

The table below lists 8 fixed factory preset frequencies available. Another 8 are custom programmable.

Adjust settings with arrow keys. **ENTER** = accept.

FREQUENCY CHART	
kHz/Hz	SIGNAL TYPE
15.7/60	NTSC 4:3
15.7/60	NTSC 16:9
31.5/60	VGA 400L
31.5/50	VGA 480L
33.7/60	HD 1080i
45.0/60	HD720p
48.3/60	XGA
64.0/60	QUAD 4:3
64.0/60	QUAD 16:9

Note: The SMPS must be adjusted when the projector displays a picture of the internal generated test pattern or of an input signal at standard line- and frame frequency.

Adjustment on main board

a) Adjusting Vout P100

1. Connect a voltmeter to the provided test point 'J8' (+17.2V). Adjust potentiometer P100 for +17.2V on testpoint.

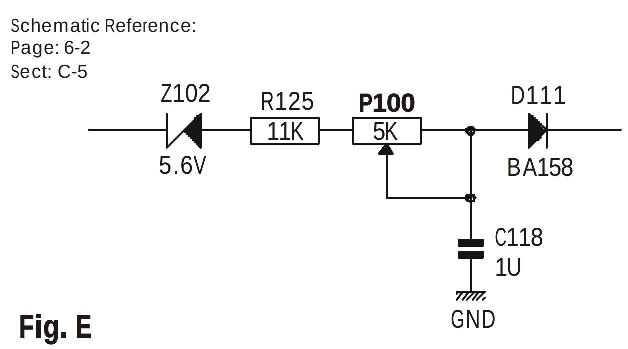


Fig. E

b) Adjusting +FiL Voltage P70

Important: P70 is factory pre-adjusted. A readjustment is **only** necessary after a replacement of a defective component in the Filament Voltage stabilization circuit.

Adjustment procedure: Connect a voltmeter between the +Fil and -Fil, respectively contact A26 and A27 of module connector J20. Adjust potentiometer P70 for +6.6V Filament Voltage.

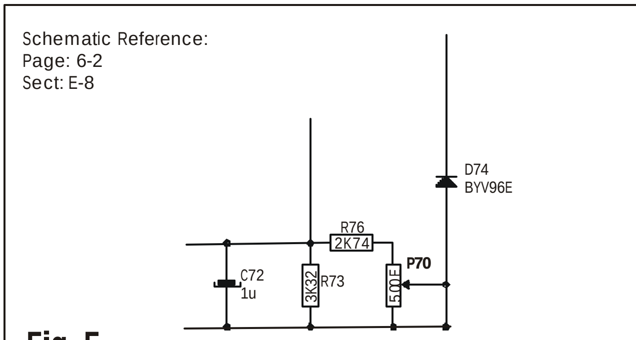


Fig. F

Adjustments on sub-board

b) Adjusting +14V P1

Note: P1 is factory pre-adjusted. A readjustment is **only** necessary after a replacement of a defective component in the +17V drop circuit.

Adjustment procedure: Connect a voltmeter to the anode of Z6. Adjust potentiometer P1 for +14V on that anode.

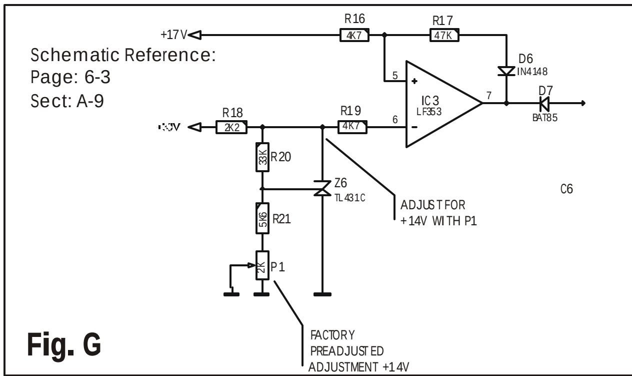


Fig. G

c) Adjusting MAX HOR SIZE/P2 (at standard frequency)

Adjust the Horizontal Size of the displayed picture by means of the Remote to its maximum (bar scale on screen indicates **99**). In Random Access Adjustment Mode go to Horizontal Size Adjustment. Push the **UP/ DOWN** keys to select HSIZE on the Geometry Menu and then press **ENTER**.

ENTER will select horizontal size adjustment
EXIT returns to random access adjustment mode menu
ADJUST returns to operational mode

1. Adjust horizontal size by the right or left arrow keys on the remote, until the exact image width is obtained. For this adjustment set width to **99**.

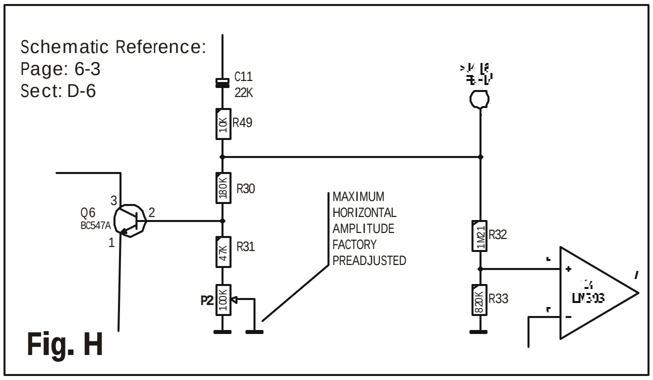


Fig. H

2. Connect a voltmeter to the collector of transistor Q13 on the Hor. Defl. board. Adjust potentiometer P2 for +48V on collector.

Note: If Connector J5 is Short Circuited, disables Standby Operation.

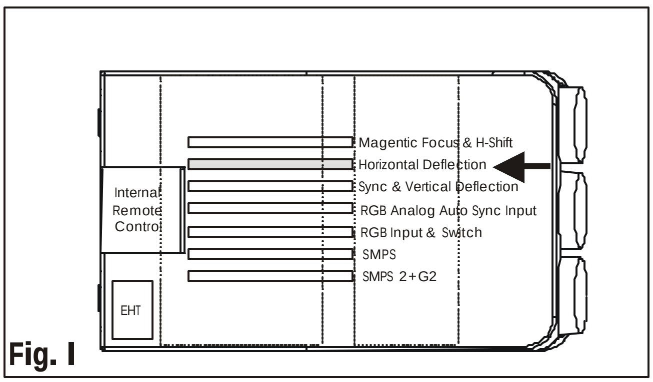


Fig. I

HORIZONTAL DEFLECTION

Overvoltage protection

Preparation

1. Unplug Projector and install PCB Extension.

2. Adjust P2 and P2 "MAX HOR. AMPL." **on the SM Power Supply** to its minimum (turning counter-clockwise).

3. Switch **ON** the projector.

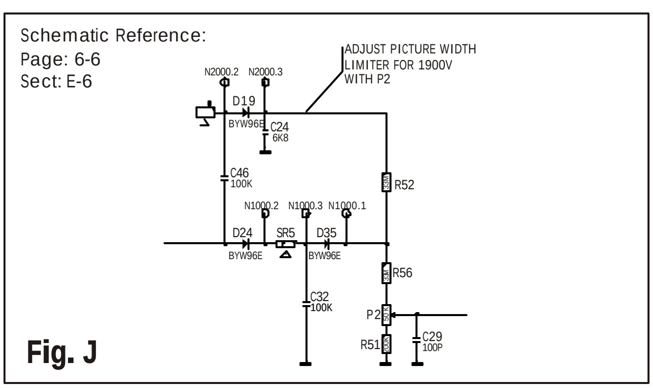


Fig. J

4. With respect to chassis ground, measure the dc voltage at the cathode of D19 (use a digital multimeter capable of measuring the voltage of more than 1000V).

Adjust P2 **on the SM Power Supply** for 1950Vdc.

5. Adjust P2 (turning clockwise) until the scan hold down LED D10 lights up. (Projector is now in hold down)

Reduce the HOR. AMPL. P2 setting (turning counter-clockwise)

6. Restart the projector (power switching Off/On)

7. Re-adjust P2 as explained in the adjustment procedure of the SM Power Supply (refer to corresponding service scheet) See Section 2, B, 3

B. Horizontal linearity

The Linearity adjustments corrects for improper horizontal grid spacing on an image (Select therefore a grid test pattern).

1. Adjust the core of the linearity coil using a 15 kHz input source for equal horizontal grid spaces.
2. Adjust P1 using a 18 kHz input source for equal horizontal grid spaces.

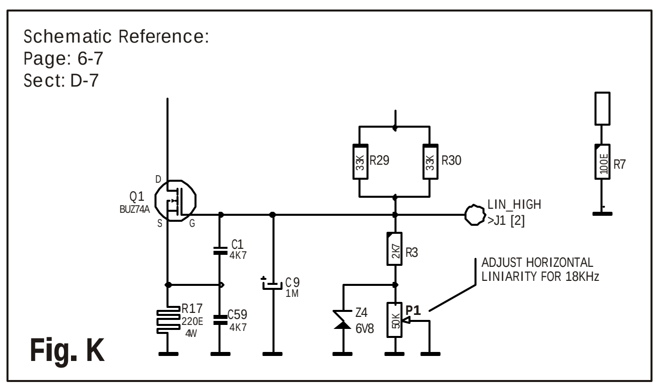


Fig. K

Note: If a 18 kHz input source is not available, then any source close

SYNC+VERT DEFLECTION MODULE

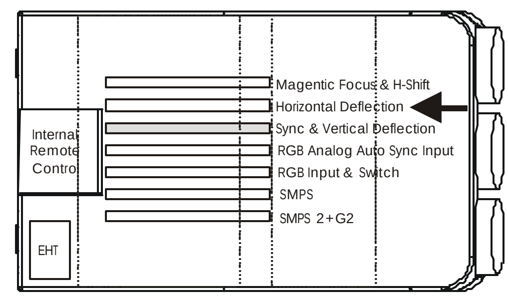


Fig. L

MAIN BOARD

Remove A/C and install PCB Extension

a. Vertical Hold P1 (Located on Main Module)

Important: to adjust the Vertical Hold, switch the projector on the connected source with the highest Vertical frequency. See chart on page **.

Short-circuit the anode of the diode D7 to ground.

Adjust P1 for a slowly rolling up of the picture (ceiling mounted projector).

Remove the short-circuit.

Schematic Reference:
Page: 6-9
Sect: D-9

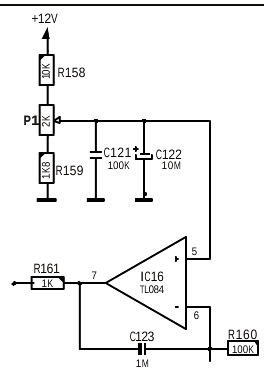


Fig. M

b. Main Vertical SHIFT adjustment for RED and BLUE image

Note:These are factory set coarse alignments of vertical shift, to compensate for the shift caused by the stigmators on the CRT necks. These potentiometers also are used to minimize the range of the digital potentiometers for the vertical shift, allowing for a more accurate center convergence.

Preparation

Adjust the vertical raster centering controls for Red and Blue in their mid position. The numeric indicator under the respective bar scale indicates 50.

(Refer to the Owner's manual of the projector - Guided or Random Access Adjustment Mode). Raster is found under geometry adjustment in Random Access Adjustment Mode.

Use the vertical shift controls P621 for RED and P620 for BLUE to shift vertically the Red and Blue image until the horizontal center line coincides with this of the Green image.

Schematic Reference:
Page: 6-10
Sect: C-3

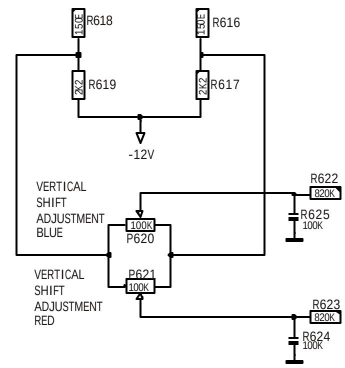


Fig. N

c. Vert amplitude correction for RED and BLUE image

Adjust potentiometer P626 for the Red image and P627 for the Blue image to obtain the same vertical amplitude as the Green image.

Schematic Reference:
Page: 6-10
Sect: B-5

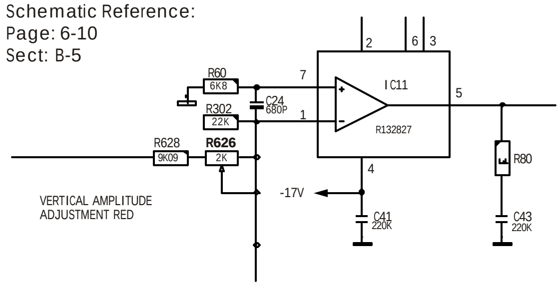


Fig. O

Schematic Reference:
Page: 6-10
Sect: D-5

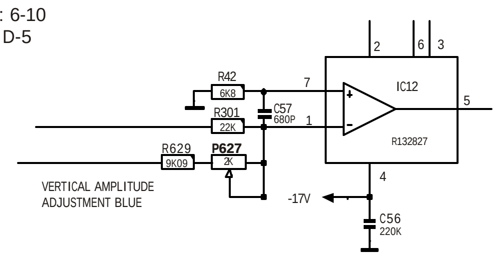


Fig. P

d. Sub Module - Vert Parabol Symetery & Vert Amplitude

Vertical Symetery Adjsutment

1. Connect the oscilloscope to pin 10 of connector J4 on the sub module.

2. Adjust P1 for a **symmetrical** curve of the parabola signal.

Vertical Amplitude Adjustment

1. Connect the oscilloscope to pin 10 of connector J4 on the sub module.

2. Adjust P2 for an **amplitude** of the parabola signal of 4.5 Vpp

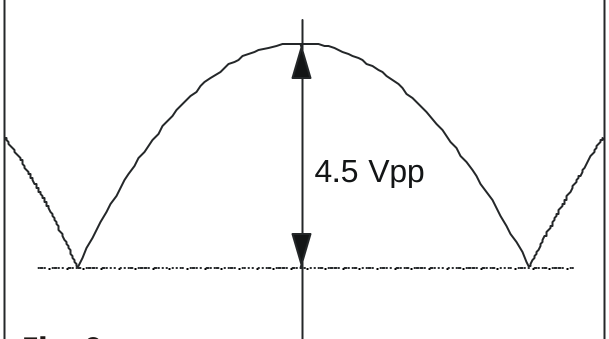


Fig. Q

MAGNETIC FOCUS+HOR SHIFT

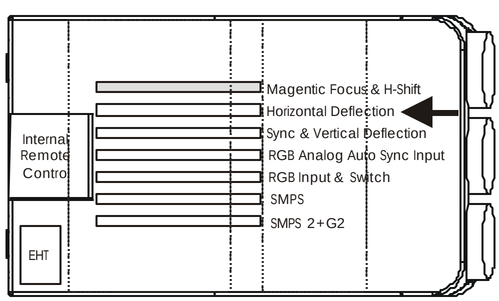


Fig. R

Note: the mentioned adjustments are Horizontal shift 'course' adjustments for the Red and Blue picture tube.

Preparation

Remove A/C and Install PCB Extension

Adjust the Horizontal raster centering controls for Red and Blue in their mid position by means of the Remote Control Unit. The numeric indicator under the respective bar scale indicates 50.

(Refer to the Owner's manual of the projector - Guided or Random adjustment mode).

Alignment

Use the Horizontal shift controls **P2** for **RED** and **P1** for **BLUE** to shift horizontally the Red and Blue image until the center coincides with the center of the Green image.

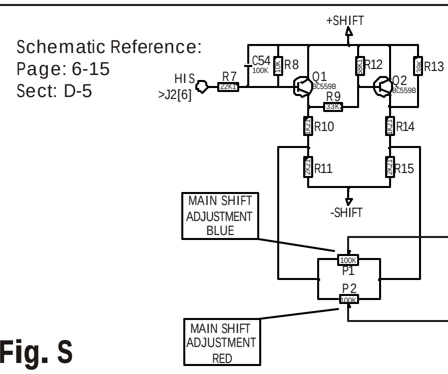


Fig. S

SMPS-2 + G2

1. Adjust for 1020v with P1 at M2 as test Point.
2. Remove A/C and Install PCB Extension

HORIZONTAL AMPLITUDE /SWITCHING

Horizontal Amplitude

1. Decrease the contrast and increase the brightness to reveal the (background) raster.

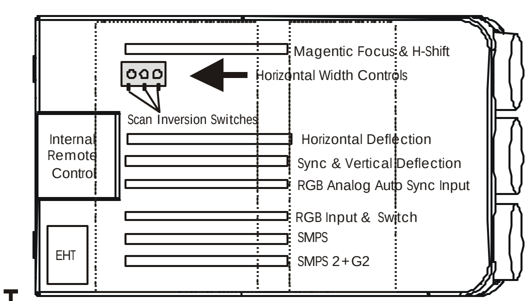


Fig. T

2. Provide either an internally or externally generated source with the highest line frequency to the projector. See Page 13-2 for Frequency Chart.

3. Disable the convergence by entering the Geometry mode and select the Raster Shift adjustment. Raster shift is fond in Randon Access menu under Geometry settings.

4. Gently turn the cores of **L1 (R)**, **L2 (G)** and **L3 (B)** in a clockwise direction until there is no more adjustment, i.e. core is fully turned in.

5. Identify which raster (R,G or B) has the smallest raster width and adjust the remaining raster via **L1**, **L2** or **L3** in a counter clockwise manner to match the raster with the smallest width. In order to facilitate these adjustments, you may wish to use the horizontal shift control for the raster (R,G or B) that you are adjusting. Disregard any horizontal static convergence errors at this time, they will be corrected later.

Schematic Reference:
Page: 6-8
Sect: D-4, 5, 6

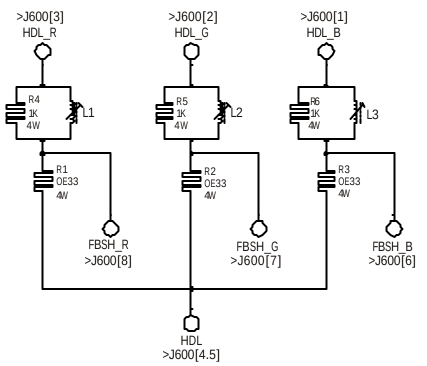


Fig. U

FLOOR & CEILING SWITCHING

For switch location refer to page 1-4 & 5 (*interconnect*.)

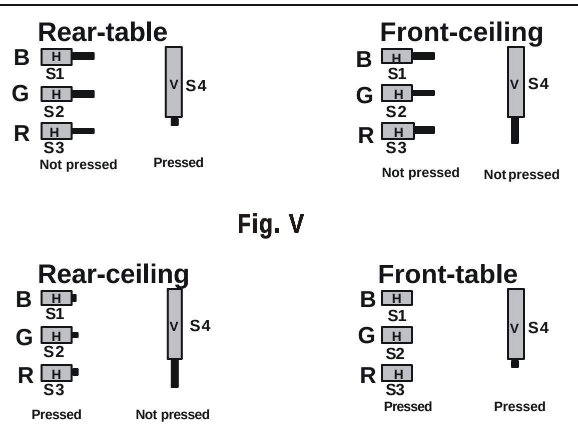


Fig. V

Do not adjust scan switches with A/C Connected.

Horizontal Scan Switches

Three switches are used, one for each CRT. When changing the horizontal scan, insure that all three switches are set in the same position. See positions of the switches (Fig. V) for the corresponding projector configuration.

Vertical Scan Switch

One vertical switch is used for the three CRT's. See position of the switch (diagrams) for the corresponding projector configuration.

Positions of the scan switches are for the different mounting configurations are illustrated in figure S.1

After setting the scan switches, close the metal protection plate and secure it with the retaining screws.

Close the top cover and reconnect the power cord to the wall outlet.

Note : Switching over from Floor to Ceiling or vice versa requires a complete readjustment of picture geometry and convergence. See INSTALLATION SETUP

CONVERGENCE DRIVER MODULE

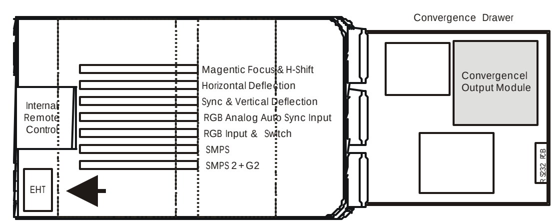


Fig. W

Adjustment of the pulse width PULSE 1 and PULSE 2

1. Connect an oscilloscope to the pin 3 of the IC39.
2. Adjust the potentiometer P1 for a pulse 1 duration of 1.0us.
3. Adjust the potentiometer P2 for a pulse 2 duration of 2.5us.

Schematic Reference:
Page: 6-30
Sect: A&B-1

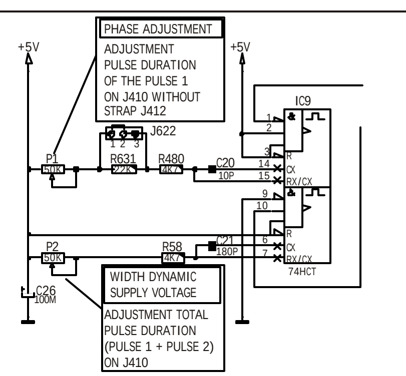
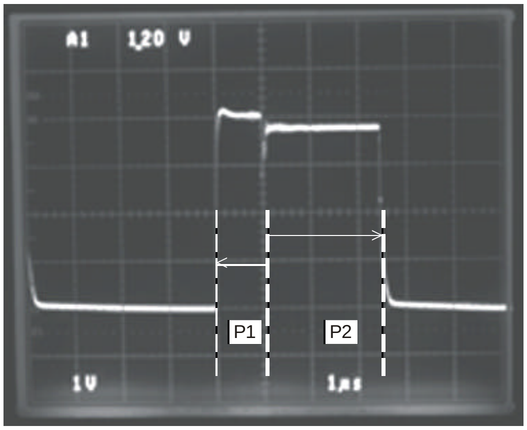


Fig. X



4. Adjustment of the potentiometers P3: DC Offset switching level. See wave form below figure Y.

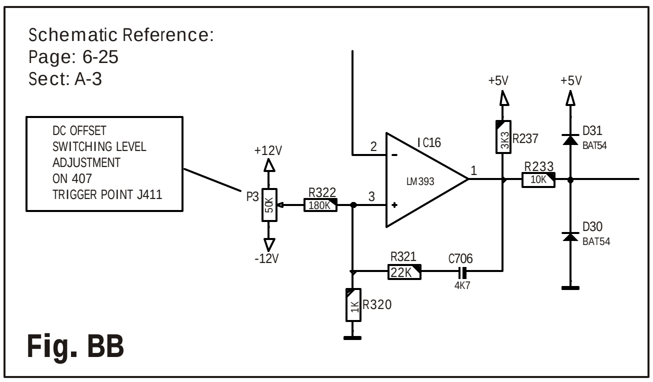
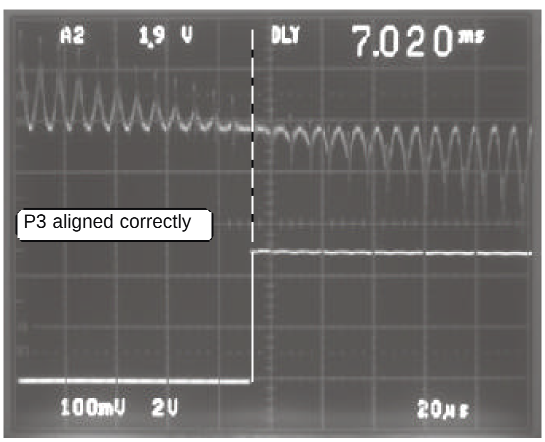


Fig. BB



P4: Hor-Par/Vert-Sawt DC Offset

5. Connect an oscilloscope to the pin 10 of the IC30.
6. Adjust the potentiometer P4 until the DC Offset is at GROUND-level. See wave form below figure Z.

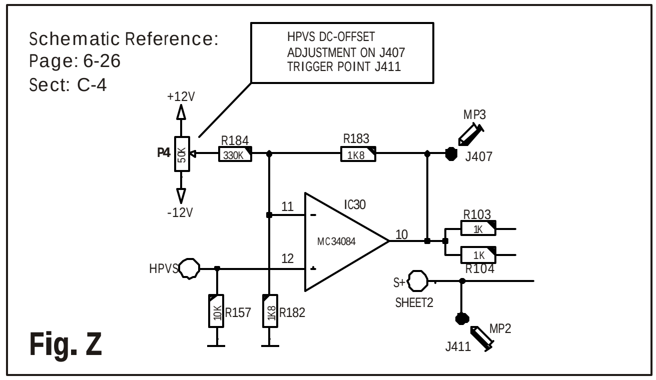
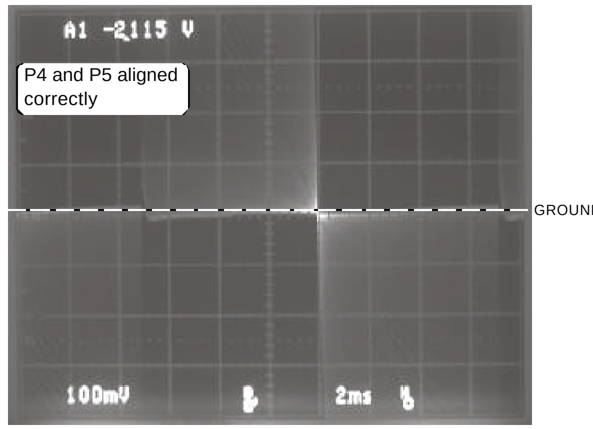


Fig. Z



P5: Clamping level Hor Parabola

Adjust the potentiometer P5 until the clamping level of the Horizontal parabolas are at GROUND-level. See wave form below figure Z.

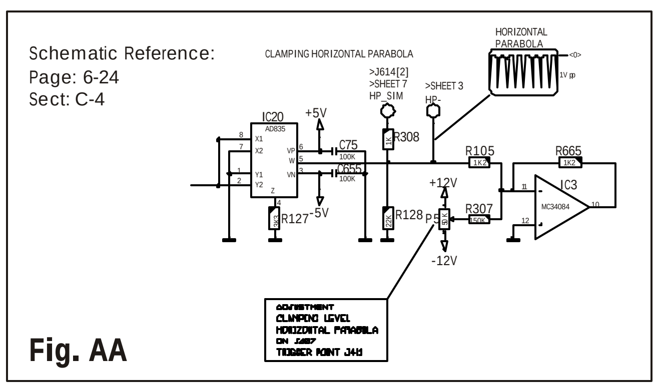


Fig. AA

Note: After Adjustmen of P4 and P5, readjustment of P3 is necessary.

8. Connect the second probe of the oscilloscope to the pin 1 of the IC39.
9. Adjust the potentiometer P3 until the switching transient matches horizontal parabola inversion point.

Schematic Reference:
Page: 6-25
Sect: A-3

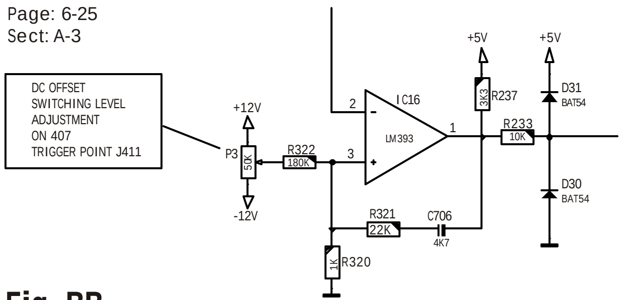
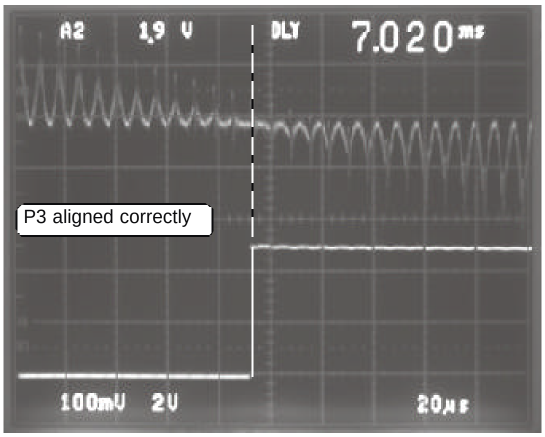


Fig. BB



10. Connect the probe of the oscilloscope to the pin 1 of the IC30.
11. Adjust the potentiometer P6 for a correct clamping level of the Vertical parabola (see fig below).

Schematic Reference:
Page: 6-25
Sect: E-4

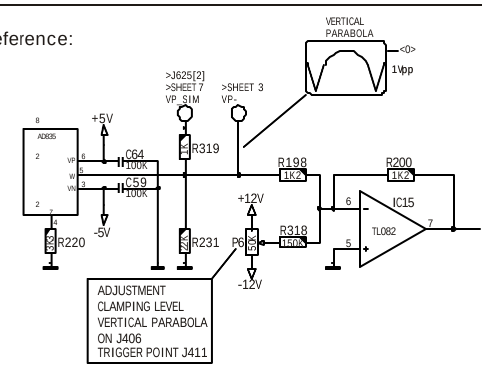
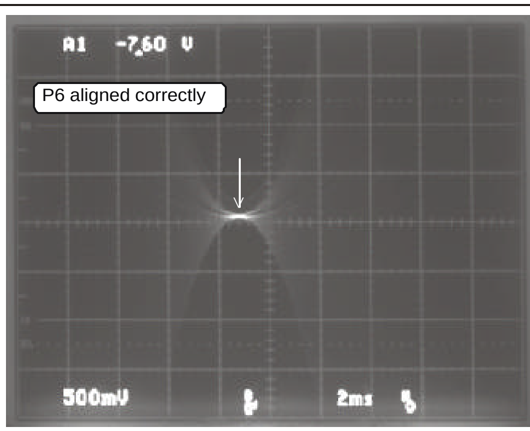


Fig. CC



RGB Input+Switching Module
Signal input: Oscillator Period Adjustment

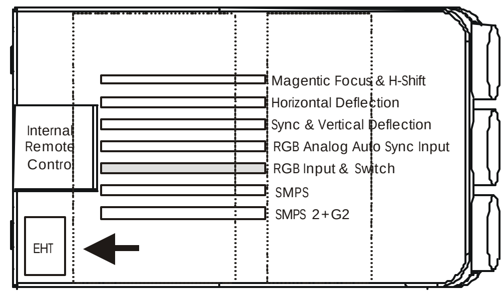
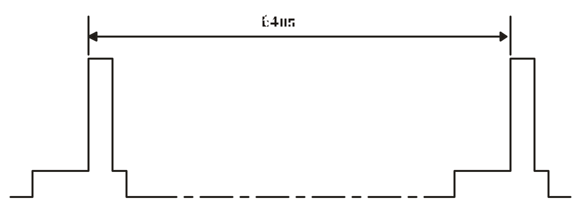


Fig. DD

Adjustment of the Oscillator period in the IC 801 Requires **no signal**.

1. Connect an oscilloscope to pin 2 of the connector J400. Adjust the potentiometer P800 for a period of the Sandcastle pulse of 64us.



Schematic Reference:
Page: 6-42
Sect: F-4

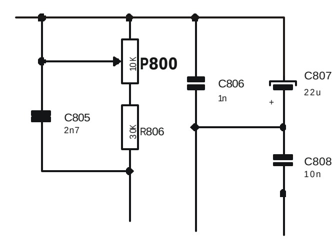


Fig. EE

2. Input GAIN adjustment Red (P200) channel.
Connect a RGB/S signal to the RGB-HS/CS inputs and select RGB/S.

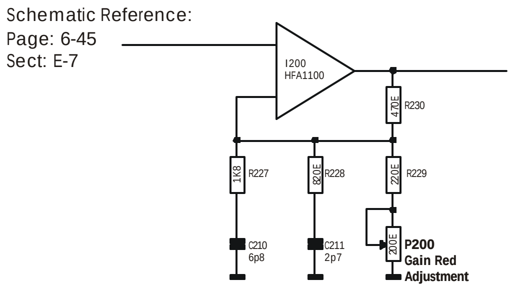


Fig. FF

3. Connect one probe of the double beam oscilloscope to the RED_IN signal and the other to RED_OUT, pin 1 of the board connector J250.
4. Adjust the potentiometer P200 for a signal aspect ratio In/Out of 1.

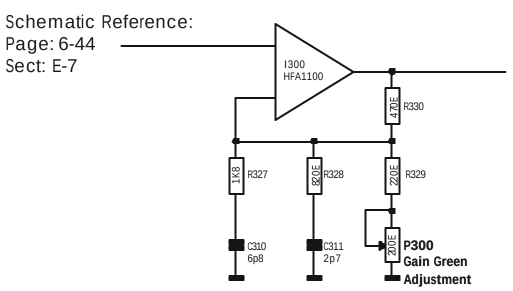


Fig. GG

5. Connect one probe of the double beam oscilloscope to the GREEN_IN signal and the other to GREEN_OUT, pin 1 of the board connector J350.
6. Adjust the potentiometer P300 for a signal aspect ratio In/Out of 1.

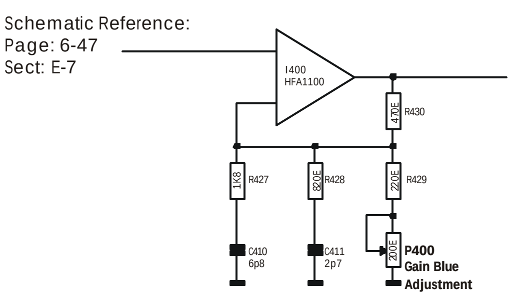


Fig. HH

7. Connect one probe of the double beam oscilloscope to the BLUE_IN signal and the other to BLUE_OUT, pin 1 of the board connector J450.
8. Adjust the potentiometer P400 for a signal aspect ratio In/Out of 1.

RGB OUTPUT

Adjustment procedure

1. Supply an external signal to the projector (e.g. a color bar signal)

2. Connect the first measuring probe to the video input signal, testpoint TP1 'VIDEO_IN'.

3. Adjust the customers brightness control until the DC blacklevel of the video input signal reaches 2V.

4. Adjust the customer contrast control until the video input signal information reaches an amplitude of 2.35V.

Adjustments

Adjustment of the +200V (Regulated Power Supply)

1. Connect a voltmeter to the Emitter of Q14.

2. Adjust the potentiometer P3 for +200V on MP8.

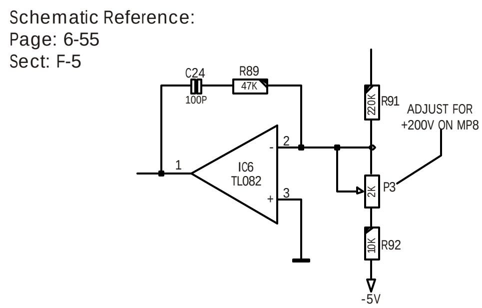


Fig. II

Adjustment of the signal GAIN for each output Amplifier

3. Connect the oscilloscope probe to the base of Q4 'VIDEO OUT'

4. Adjust the potentiometer P1 for an amplitude of the output signal of 100Vpp

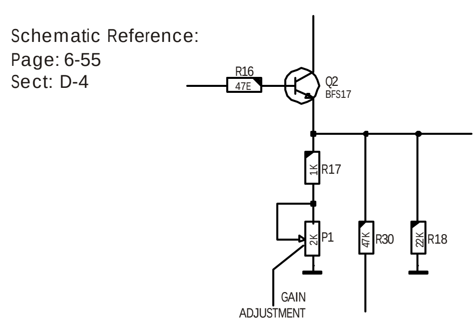
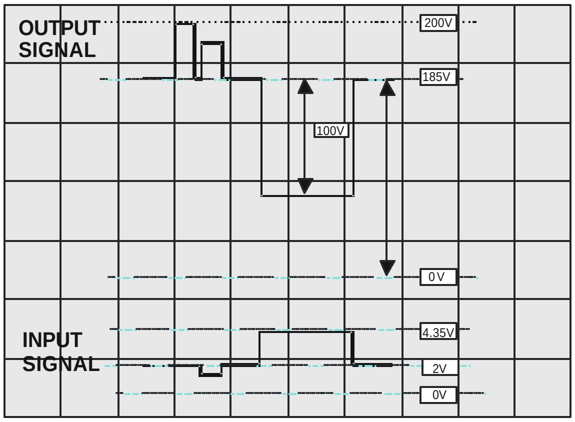


Fig. JJ



Adjustment of the ABL_LED

IMPORTANT: No oscilloscope probe connected to respective CRT board.

1. Adjust the potentiometer P30 until the LED D30 'ABL_LED' just stops lighting up.

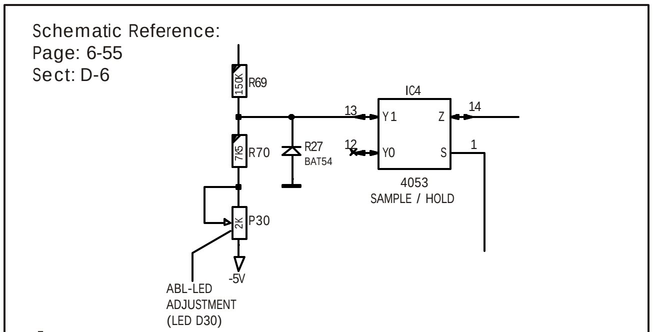


Fig. KK

762745 QUAD DECODER+COMB FILTER

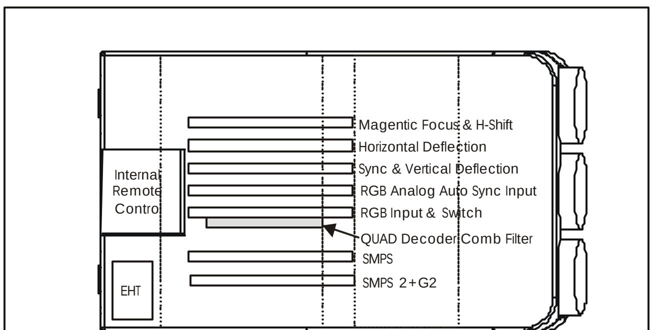


Fig. LL

A. Adjustment Comb Filter

Quick adjustment for Color display

1. Connect to the VIDEO input e.g. an electronic **NTSC3.58** test video signal, if there is no colour, adjust trimming capacitor C13 for color display.

Note: Final adjustment of the trimming capacitor C13 is explained in the 'adjustment of the decoder' (see further).

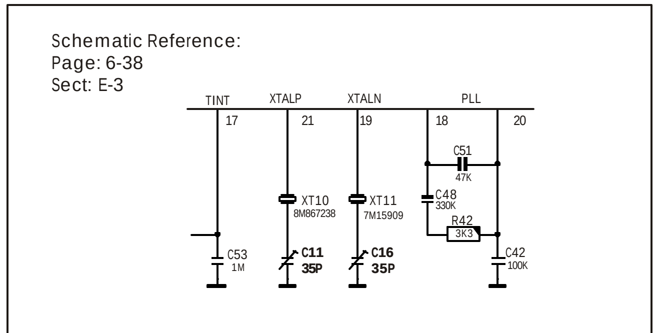


Fig. MM

Oscillator adjustments

No input signal connected to the VID/LUMA and CHROMA inputs.

1. Connect pin 26 of IC11 to L13 (forcing decoder into NTSC mode).
2. Connect a Frequency meter (Range 20MHz-accuracy of 10Hz) to the 4Fsc line (pin 17 IC15).
3. Adjust the trimming capacitor C16 for a frequency read out of 14.318180 MHz with an accuracy of 80Hz.

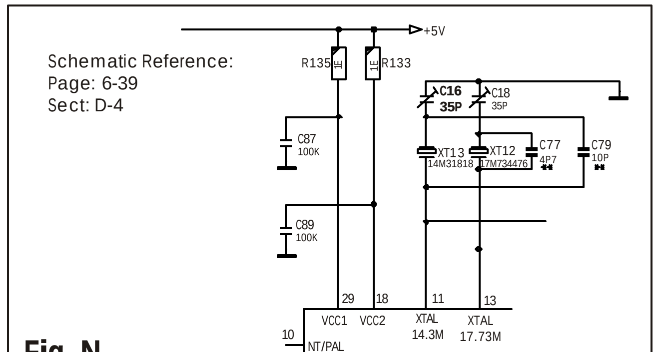


Fig. N

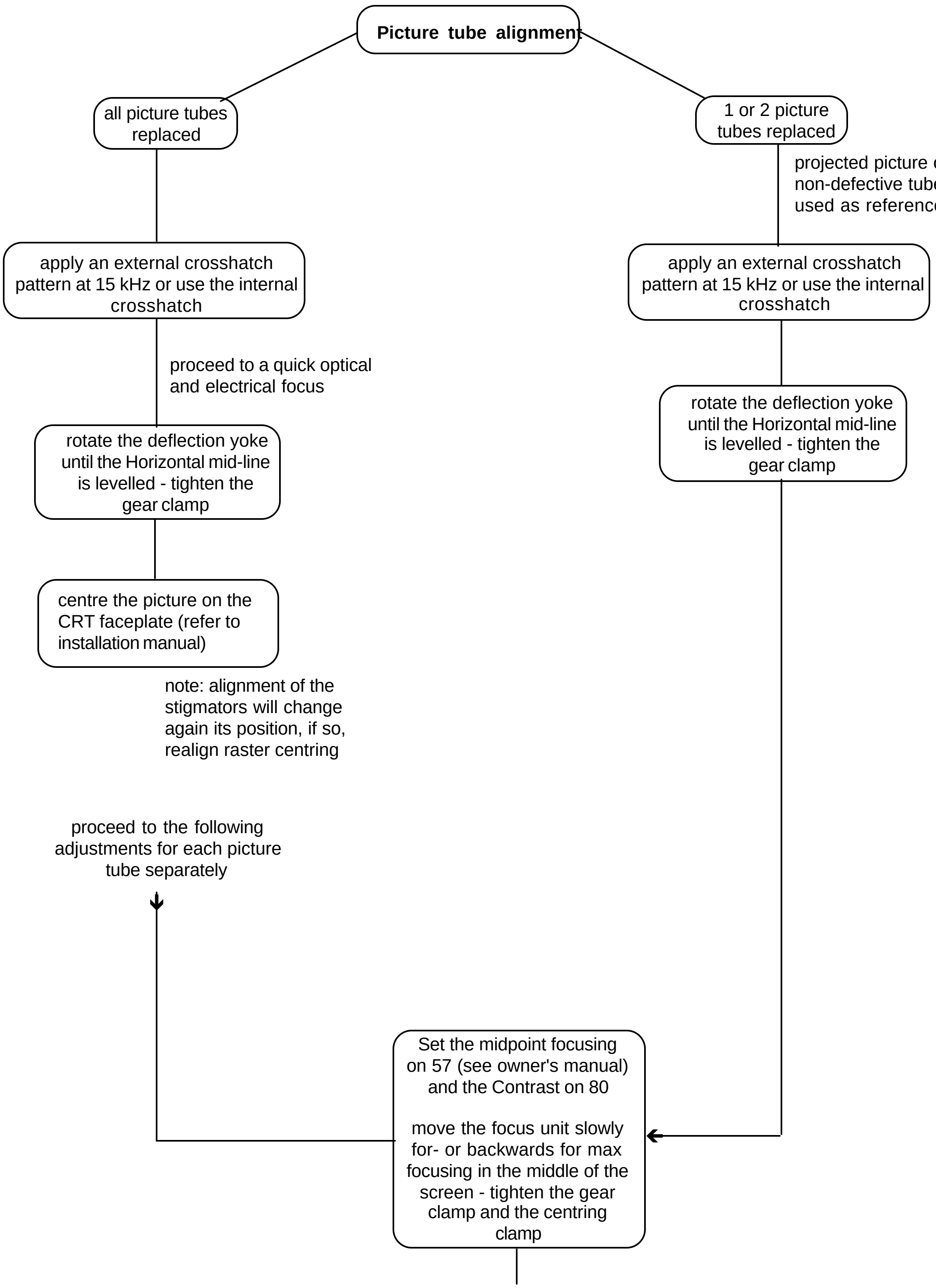
B. Adjustment Decoder

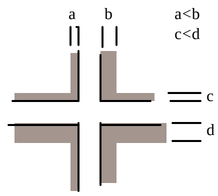
Reference Oscillator NTSC3.58

1. Connect to the VIDEO input e.g. an electronic **NTSC3.58** test video signal.
2. Short circuit pin 17 of IC11 to ground.
3. Adjust trimming capacitor C13 for a colour zero beat. Remove the short-circuit.

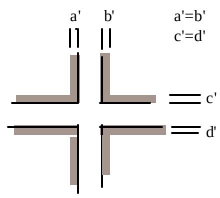
III. Picture tube alignment

Before starting the alignment of the new picture tube, the projector must warm up for at least 15 minutes at a medium brightness and contrast.





lower the Brightness and put the Contrast on its max with the RCU
Set the midpoint focusing on 0



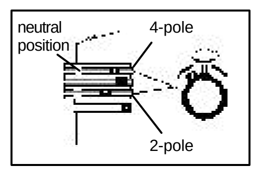
adjust the 2-pole magnets rings by rotating one or both up to a point where 'shading' of both sides of the vertical and horizontal lines is equal.

realign the electrical and optical focus

select a source that generate a field of small dots and crosshairs

Set the midpoint focusing on 100

adjust the 4-pole rings until the defocued dots are circular.

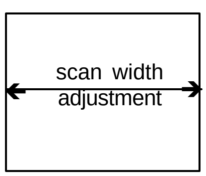


realign the electrical and optical focus

re-position the raster as described earlier

due to mutual influence between the stigmators, focus and centring, it is advised to repeat above a couple of times

decrease the Contrast and Increae the Brightness to reveal the background raster



see service sheet 'Deflection switching/Hor Amplitude' in this manual for the alignment of the image width coils

Note: when only one tube has been replaced, the image width of one of the other tubes as a reference, and obviously limit the adjustment to the core of the corresponding replaced tube

PROVERGE SETUP AND ADJUSTMENT

INTRODUCTION

The **PROVERGE** is a fully automatic convergence and geometry system for the PRO1200 CRT-based projection systems. Using the **PROVERGE's** user friendly on-screen displays, the unit effortlessly aligns the projected image on the screen with extreme accuracy in the shortest possible time. This makes the unit perfectly useful for a wide range of applications.

Easy-to-use, high precision automatic convergence system.
Various options on the menu offer you the optimal solution for your own individual needs :

Align : convergence starts from the current image situation
Align from midposition : convergence starts from midposition.
Touch-up : convergence starts when the source switches or after a user-defined time : alignment of static convergence is almost invisible for the audience.

Easy-to-use, high precision automatic geometry system
Various options on the menu offer a comprehensive solution to your geometry requirements :

Quick auto-picture : aligns geometry within 45 seconds.
Full auto-picture : aligns geometry very accurately followed by auto convergence. This option offers a very powerful adjustment tool.

Compact, built-in system
A very compact, monochrome CCD camera

Use of Sub-Pixel Resolution Techniques, a state-of-the-art proprietary Digital Signal Processing System.

Preparing your PROVERGE
When the lens of the **PROVERGE** is covered with the lens protection cap, ensure to remove this cap first before starting the adjustment procedure for the Lense.

ACCESS TO PROVERGE ON-SCREEN MENUS
Press the <ADJUST> button on the RCU (Remote Control Unit) or the local keypad of the projector to enter the 'Adjustment mode' (please refer to the projector Owner's Manual). The PROVERGE path will be displayed in the menu:

1. Highlight **PROVERGE** by pushing the ↑ or ↓ keys of the control disc (on RCU).
2. Press the <ENTER>. button to enter the **PROVERGE** menu.
   PROVERGE menu

The **PROVERGE** menu will be displayed after the path **PROVERGE** is selected. Six items are available :

TOUCH UP.

Autoconvergence.

Quick AutoPICTURE.

FULL AutoPICTURE.

PROVERGE SETUP.

PROVERGE DIAGNOSTICS.

Choose **PROVERGE** SETUP first to carry out the SETUP procedures.

Use **PROVERGE** DIAGNOSTICS to check whether the **PROVERGE** is functioning normally.

PROVERGE SETUP
The **PROVERGE** SETUP procedure needs to be done only once after the projector is correctly installed or whenever the projector is reinstalled in another position.

TO ENTER THE PROVERGE SETUP MENU :

1. Highlight **PROVERGE** SETUP by pushing the ↑ or ↓ keys of the control disc.
2. Press the <ENTER>. button to display the **PROVERGE** SETUP menu.

SETTING THE CONFIGURATION

The option is available for all PRO1200 projectors. When using a retro-projector, this option must be set to rear. Follow the steps described below to set the right configuration

3. Highlight FRONT (OR REAR) by pushing the ↑ or ↓ keys of the control disc.
4. Press the <ENTER>. button to set the correct projector configuration.

The **PROVERGE** SETUP menu provides you with easy to use methods to focus the camera lens and to center the camera.

Please pay attention while doing it, as a properly focused camera lens and correctly centered camera are prerequisites for a perfect automatic convergence.

Focusing the camera lens

The lens of the camera must be focused properly on the projection screen. Follow the steps described below :

1. In the **PROVERGE** SETUP menu, highlight FOCUS THE LENS by pushing the ↑ or ↓ keys of the control disc.
2. Press the <ENTER>. button to start up the process.
3. A pattern of horizontal alternating green/black bars will be projected onto the screen, together with a text box. Inside the box, the text “CAMERA FOCUS” indicates the item subject to adjustment and under the text, a numeric bar scale (from 0 to 99) will visualize the correction.
4. To obtain a correctly focused camera, turn the lens until maximum readout. The value of the stabilised maximum readout will be in the range between 60 and 90, depending on ambient light. In rear projection, the maximum value can be less than 60 dependant on ambient light.

After finishing the correction, press the <EXIT> button to return to the **PROVERGE** SETUP menu.

CENTERING THE CAMERA

The camera must be centered in the middle of the projection screen. Follow the steps described below :

1. Highlight CENTER CAMERA by pushing the ↑ or ↓ keys of the control disc;
2. Press the <ENTER>. button to start up the process.

Note: It is critical that the green raster of the presently selected source is centered on the CRT faceplate. Otherwise, the camera will not be centered properly.

CENTERING THE CAMERA HORIZONTALLY

One vertically centered green bar will be projected onto the screen, together with a text box. Inside the box, the text of “CAMERA ALIGNMENT HORIZONTAL” indicates the item subject to adjustment and a symmetrical bar scale (from -50 to +50) under the text.

If the indicated value below the bar scale is not equal to zero (i.e. the black highlight is not in the middle of the bar scale), the camera is not centered horizontally. Follow the steps below to center the camera horizontally:

3. Turn the screw situated on the upper-right corner of the camera clockwise or counter clockwise until the highlight is in the middle of the bar scale (i.e. the indicated value becomes zero);
4. Press the <ENTER>. button to continue with the camera vertical centering.

Note: When centering a retro projector this option is not required as the camera is fixed inside the retro using the camera support plate (part 12 on page 2-1.)

Centering the camera vertically

One horizontally centered green bar will be projected onto the screen, together with a text box. Inside the box, the text of “CAMERA ALIGNMENT VERTICAL” indicates the item subject to adjustment and a symmetrical bar scale (from -50 to +50) under the text.

If the indicated value below the bar scale is not equal to zero (i.e. the black highlight is not in the middle of the bar scale), the camera is not centered vertically. Follow the steps below to center the camera vertically :

5. Turn the screw situated on the lower-left corner of the camera clockwise or counter clockwise until the highlight is in the middle of the bar scale (i.e. the indicated value becomes zero).

After finishing the vertical centering, press the <ENTER>. button to return to the **PROVERGE** SETUP menu.

When installed in a retro projector, the centering procedure is not necessary and not possible as the camera mounting is fixed.

Set Touch-up options

For convergence purpose, the screen is divided into 25 areas. Every area has its unique number from 1 to 25. Touch-up adjusts the Area No. 1. This adjustment is also called the “static convergence”.

The Touch-up can be set on Source or on Timer.
Touch-up on Source means when switching from one source to another, the static convergence will be carried out automatically.
Touch-up on Timer means whenever the user-defined period of time has elapsed the static convergence will be adjusted automatically.

TOUCH-UP ON SOURCE ON/OFF

Follow the steps below to set the option ON or OFF :

1. Push ↑ or ↓ keys of the control disc to highlight ON SOURCE SWITCH: off
2. Press the <ENTER>. button to toggle between ‘ON /’OFF’.
3. Press the <EXIT> button to return to the **PROVERGE** menu.

Note:Touch-up on Timer
This option allows the static convergence to be carried out automatically after a user-defined time, which can be programmed in hours and/or minutes.

To program the touch-up on Timer :

1. Push ↑ or ↓ keys of the control disc to highlight ON TIMER :off
2. Press the <ENTER>. button to switch it to ON and the preset time will be displayed

3. Press the <TEXT> button to enter the TOUCH-UP TIMER menu
4. Push left or right keys of the control disc to highlight the digit to be changed;
5. Use the numeric keys to enter a desired value;
6. Press the <ENTER>. button to confirm and the **PROVERGE** SETUP menu will return on the screen; or press the <EXIT> button to leave the preset value untouched and return to the **PROVERGE** SETUP menu.

Press the <EXIT> button to return to the **PROVERGE** menu.

TOUCH UP AND AUTOCONVERGENCE

ADJUSTING SCREEN SIZE

In case the projection screen is not greater than the desired size or the screen has a frame around it (i.e. projection impossible outside the frame), the following blanking adjustments have to be done before starting the automatic convergence :

When using a video source : adjust the top, bottom, left and right blanking until the whole projected image of video is just still visible;

When using a screen with a frame : adjust the top, bottom, left and right blanking until the whole projected image is just still visible.

So that the selected screen area after blanking adjustments corresponds with the projected image size. In this way, the screen size is set correctly to ensure the successful convergence.

Note: For blanking adjustments, please refer to the projector owner's manual.

To enter the AUTOCONVERGENCE menu :

1. Highlight AUTOCONVERGENCE by pushing 🡅 or 🡇 keys of the control disc;
2. Press the <ENTER>. button.

The AUTOCONVERGENCE menu allows the automatic convergence either on the currently selected source or on all sources (all filled memory blocks of the projector.)

On current source

The on current source includes three options, the first of which is selectable in the iris menu:

Touch Up (in iris menu)

Align

Align from midposition

Touch-up

When TOUCH-UP is selected, only the static convergence of the currently selected source will be carried out automatically. Follow the steps below to select :

1. Highlight TOUCH-UP by pushing 🡅 or 🡇 keys of the control disc;
2. Press the <ENTER> button to start up the static convergence.

If the process is successfully completed, the projector will return to image display of the current source.

Align on current source

When ALIGN is selected, the automatic convergence on the current source will be carried out automatically, starting from the existing settings.

By projecting alternately red and blue lines, 25 convergence areas are aligned to the green pattern.

Follow the steps below to select :

1. Highlight ALIGN below ON CURRENT SOURCE by pushing 🡅 or 🡇 keys of the control disc;
2. Press the <ENTER>. button to start up the automatic convergence of the entire screen.

If the process is successfully completed, the projector will return to image display of the current source.

Use this option when the convergence is close to proper alignment.

Align from midposition on current source

When ALIGN FROM MIDPOSITION is selected, the automatic convergence on the current source will be carried out automatically, but starting from the midposition settings.

By projecting alternately red and blue lines, 25 convergence areas are aligned to the green pattern.

Follow the steps below to select :

1. Highlight ALIGN FROM MIDPOSITION by pushing 🡅 or 🡇 keys of the control disc;
2. Press the <ENTER>. button to start up the automatic convergence of the entire screen.

If the process is successfully completed, the projector will return to image display of the current source.

Use this option when the convergence is far from proper alignment.

On all sources

The "On all sources" functions as the "On current source".

It includes also three options :
Touch-up

Align

Align from midposition

The difference is that the convergences will be carried out on all sources of the projector, i.e. all available memory blocks of the projector. The total number of sources is displayed between the brackets.

TOUCH-UP ON ALL SOURCES
When TOUCH-UP is selected, only the static convergence of all sources will be carried out automatically.

Follow the steps below to select :

1. Highlight TOUCH-UP below ON ALL SOURCES by pushing ↑ or ↓ keys of the control disc;
2. Press the <ENTER>. button to start up the static convergence.

The process will repeat for as many times as the total number of the sources until all sources are perfectly aligned.

If the process is successfully completed, the projector will return to image display of the current source.

ALIGN ON ALL SOURCES

When ALIGN is selected, the automatic convergence on all sources will be carried out automatically, starting from the existing settings.

By projecting alternately red and blue lines, 25 convergence areas are aligned to the green pattern. The process will repeat for as many times as the total number of the sources until all sources are perfectly aligned.

Follow the steps below to select :

1. Highlight ALIGN below ON ALL SOURCES by pushing ↑ or ↓ keys of the control disc;
2. Press the <ENTER>. button to start up the automatic convergence of the entire screen.

If the process is successfully completed, the projector will return to image display of the current source.

Use this option when the convergence is close to proper alignment.

ALIGN FROM MIDPOSITION ON ALL SOURCES
When ALIGN FROM MIDPOSITION is selected, the automatic convergence on all sources will be carried out automatically, but starting from the midposition settings.

By projecting alternately red and blue lines, 25 convergence areas are aligned to the green pattern. The process will repeat for as many times as the total number of the sources until all sources are perfectly aligned.

Follow the steps below to select :

1. Highlight ALIGN FROM MIDPOSITION below ON ALL SOURCES by pushing ↑ or ↓ keys of the control disc
2. Press the <ENTER> button to start up the automatic convergence of the entire screen.

If the process is successfully completed, the projector will return to image display of the current source.

Use this option when the convergence is far from proper alignment.

INTERRUPTING THE AUTOMATIC CONVERGENCE PROCESS
The process of the above-mentioned automatic convergence can be interrupted at any moment by pressing the <EXIT> button.

After the <EXIT> button is pressed, the projector will leave the automatic convergence process and a message will be displayed informing of the action :

Status : Forced <EXIT>

ERROR MESSAGES
The status line in the AUTOCONVERGENCE menu gives three possible messages :

Ready : before automatic convergence starts

Forced <EXIT> : when interrupting the process

Forced break : error message.

Error messages are displayed when the automatic convergence is not successfully completed.

NO PATTERN ERROR
After starting up the automatic convergence, the projector will start to calculate and locate 5 horizontal and 5 vertical lines which are used to divide the screen into 25 areas.

If the projector does not succeed in finding the pattern, it will try two times. If the two attempts fail, the projector will quit the process and display the Error menu.

The AUTOCONVERGENCE selection will be followed by the error window displaying the following possibilities.

Error occurred, please check :

- ✓ the lens cap is removed
- ✓ the lens of the camera is correctly focused;
- ✓ the camera is correctly centered;
- ✓ if hardware problems exist, do diagnostics;
- ✓ the ambient light is too high;
- ✓ the blanking adjustments are correct;

Press the <ENTER> button to start **PROVERGE** diagnostics

Status reporting Forced break
After starting up the automatic convergence, if unexpected trouble such as the interruption of source input occurs, the projector will quit the process and display the AUTOCONVERGENCE menu on the screen.

The status line in the AUTOCONVERGENCE menu will display the following message :

Status : **Forced break**

The possible causes of such an error :

- ✔ The source is disconnected during the convergence: On the screen a message “Source not available” will be displayed and the projector waits until the source is reconnected or selected;
- ✔ Switching sources during the convergence: After the source is available again, the AUTOCONVERGENCE menu will be displayed with the status line reporting “Forced break”.

ADJUSTMENT OF GEOMETRY
INTRODUCTION
When one adjusts geometry by hand, a reference screen and a reference pattern are required. There are a lot of possibilities for a reference screen. The reference pattern is mostly a pattern with a border and centre lines for adjustment of horizontal and vertical linearity.
Once a selection of a reference screen and a reference pattern is made, adjusting geometry is only a matter of converging these two elements.

PROVERGE requires a reference for adjusting geometry. The simplest way to have a reference screen is to adjust one source by hand, which then serves as reference for all other sources. After adjusting a source, the reference is learnt by **PROVERGE** and stored in non-volatile memory. Having this Reference Source in memory **PROVERGE** can adjust all other sources to have the same geometry as the Reference Source.

REFERENCE SOURCE
Before any geometric adjustment can be done, the user **must** learn a Reference Source. This process is **only done once** since the Reference will be stored in non-volatile memory. If however the projector is moved from its position, then the Learn Reference procedure must be repeated. After learning a Reference do not touch the camera (for focusing and centering.)

ADJUSTING OTHER SOURCES
Once a Reference Source is in memory, other sources are aligned with the same geometry as the Reference Source. If no Reference Source is learnt, the resulting geometry will be unpredictable. Learning a Reference Source

Adjust one Reference Source with perfect geometry. This source can have either horizontal or vertical frequency. Remember that other sources will have the same geometry as this Reference Source. This means that if a source has a 4:3 aspect ratio, all sources will be adjusted with a 4:3 aspect ratio and the same horizontal and vertical amplitudes.

Follow the steps below to select :

1. Enter into the Adjustment Mode and select **PROVERGE**, by pushing ↑ or ↓ keys of the control disc. Now select SETUP using the ↑ or ↓ keys, finally select LEARN REFERENCE.

PROVERGE will now project the Reference Source with a horizontal green line inserted at the top region and a horizontal green line inserted at the bottom region of the image.

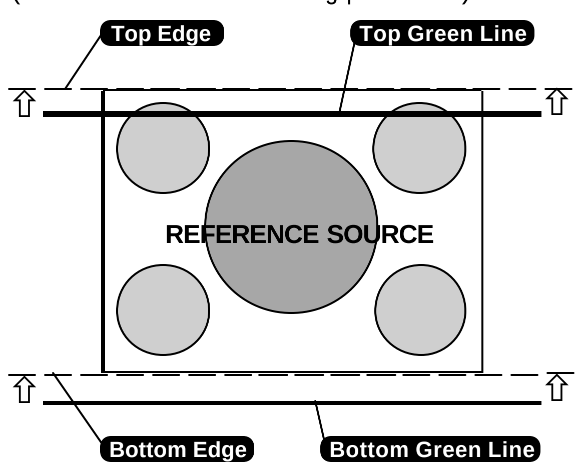
2. Pushing the ↑ or ↓ keys of the control disc adjust the horizontal green line at the top until it matches the top edge of the Reference Source perfectly, then press <ENTER>.

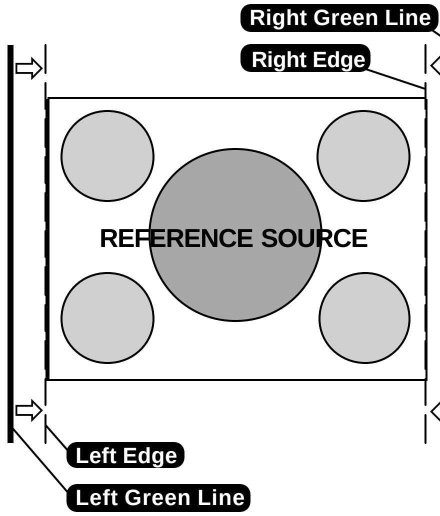
3. Using the ↑ or ↓ keys of the control disc adjust the horizontal green line at the bottom until it matches the bottom edge of the Reference Source perfectly, then press <ENTER>.

Now **PROVERGE** projects the Reference Source with a vertical green line inserted at the left and a vertical green line inserted at the right.

4. Pushing the ↑ or ↓ keys of the control disc changes the position of the vertical green lines simultaneously; they are being shifted symmetrically inwards and outwards with respect to the scan of the projector.

5. Use ← or → keys of the control disc to change the phase of the Reference Source. Use both ↑ or ↓ or ← or → so that the green vertical lines perfectly match the right-left edges of the reference image, then press <ENTER> (this will initiate the learning procedure.)





NOTE: if you had to use the arrow keys ← or → to adjust the phase, this means that the phase of the Reference Source was originally not adjusted correctly. Hence the Reference Source may now fall short of the physical screen. To avoid this, re-adjust the Horizontal Raster Shift (in the Random Access Adjustment mode, refer to Owner Manual) so that the Reference Source falls on the physical screen and repeat the Learn Reference selection.

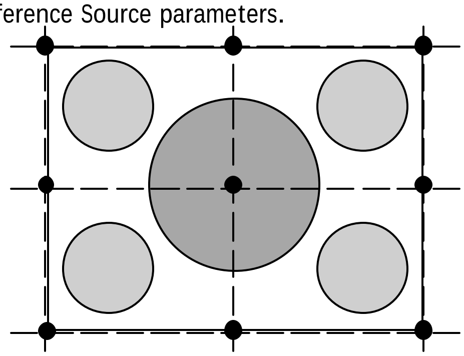
Do not adjust the phase when repeating the Learn Reference procedure.

Pressing <EXIT> will interrupt the Learn Reference procedure if required.

WHAT IS BEING MEASURED BY PROVERGE

Using the borderlines defined above, **PROVERGE** knows exactly when the image starts and stops with respect to time scale. **PROVERGE** is now able to project lines at the edges. Using the border lines left and right, **PROVERGE** projects three vertical thick green lines at positions 5, 50 and 95 %. Using the border lines top and bottom, **PROVERGE** projects three horizontal thick lines at positions 5, 50 and 95 %. **PROVERGE** then calculates the intercepts of the three vertical and three horizontal lines resulting in nine points. These nine points are the reference points for other geometry sources and are stored into memory.

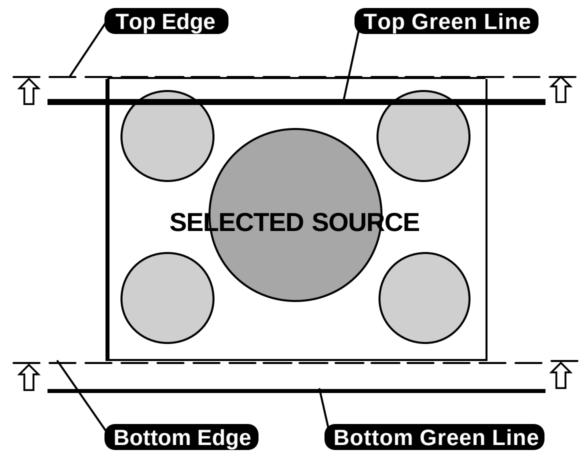
note: "delete all blocks" in the Service menu does not delete the Reference Source parameters.



ADJUSTMENT OF GEOMETRY OF OTHER SOURCES

Follow the steps below to select :

1. Enter into the Adjustment Mode and select **PROVERGE**, by pushing ↑ or ↓ keys of the control disc. Now select FULL AUTOPICTURE.
2. A 'Define Image' screen will be shown stating,"define the top and bottom border by adjusting the projected line with ↑ or ↓ in order to frame the projected image horizontally, adjust the projected lines with ↑ or ↓ and correct the phase of the image with ← or →." Press <ENTER> to continue the process, or press <EXIT> to quit.

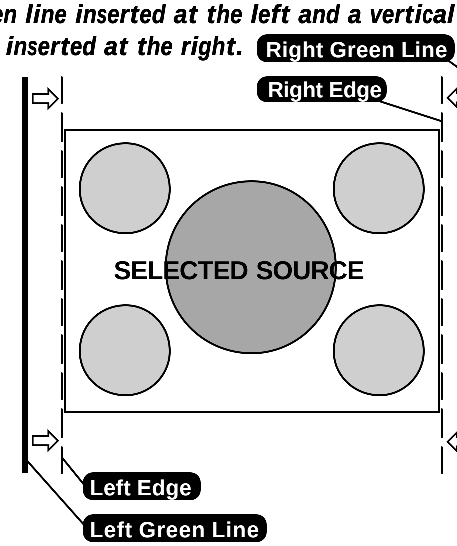


If continuing **PROVERGE** will project the source with a horizontal green line inserted at the top and a horizontal green line inserted at the bottom of the image.

3. Pushing the ↑ or ↓ keys of the control disc adjust the horizontal green line at the top until it matches the top edge of the image perfectly, then press <ENTER>.

4. Using the ↑ or ↓ keys of the control disc adjust the horizontal green line at the bottom until it matches the bottom edge of the image perfectly, then press <ENTER>.

Note: Now PROVERGE projects the source with a vertical green line inserted at the left and a vertical green line inserted at the right.



5. Pushing the ↑ or ↓ keys of the control disc changes the position of the vertical green lines simultaneously; they are being shifted symmetrically inwards and outwards with respect to the scan of the projector.

6. Use ← or → keys of the control disc to change the phase of the Source. Use both (↑ or ↓) or (← or →) so that the green vertical lines perfectly match the right-left edges of the image, then press <ENTER>.

GEOMETRY

Note: After pressing <ENTER> in the previous step, the geometry begins alignment. The alignment consists of the following three adjustment steps :

1. Coarse adjustment of geometry.
Adjustments performed are :
A. Simultaneous adjustment of vertical amplitude, shift and linearity.
B. Simultaneous adjustment of horizontal amplitude and shift.
C. Simultaneous adjustment of East-West side bow,East-West side skew, East-West midline bow and East-West midline skew.

2. Fine adjustment of geometry
Note: Once the coarse geometry has been adjusted, **PROVERGE** ***starts to adjust the geometry using a higher precision.***
Further adjustments performed are :
A. Simultaneous adjustment of vertical amplitude, shift and linearity.
B. Simultaneous adjustment of horizontal midline bow and skew.
C. Simultaneous adjustment of horizontal top bow and skew.
D. Simultaneous adjustment of horizontal bottom bow and skew.
E. Simultaneous adjustment of horizontal amplitude, shift, East-West side bow, East-West side skew, East-West midline bow and East-West midline skew.
F. Simultaneous adjustment of left skew and bow.
G. Adjustment of W/M.
H. Adjustment of W/M.

3. Once the coarse and fine adjustments are completed the geometry is almost perfect. Each geometry setting is now swept around its location to fine tune the alignment.

CONVERGENCE

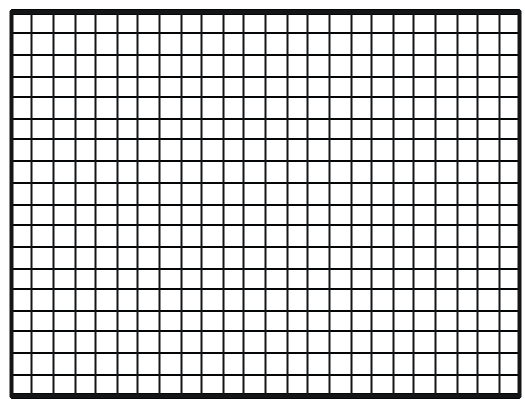
When the geometry is finished, **convergence is automatically started**. Using the border lines defined in the geometry **PROVERGE** is immediately able to project five vertical and horizontal lines which are perfectly spread all over the image. No blanking adjustments are required (see page 2-7.)

QUICK AUTOPICTURE

The quick autopicture option adjusts geometry without using the border lines. Pressing quick autopicture **immediately** starts geometry adjustment. This means that the resulting image will be orthogonal, but a slight adjustment to the phase shift, and vertical and horizontal amplitude corrections can be needed. The quick option performs only the coarse geometry adjustments. The procedure only takes 45 seconds, and results in a quick usable projector.

After these 45 seconds, an internal RGB pattern is projected to be able to check it for convergence adjustment is needed or not.

Pressing <ENTER> will initiate convergence correction.



Pressing <EXIT> quits alignment.

PROVERGE Diagnostics

This option allows a check-up of the **PROVERGE**.

To start up the **PROVERGE** Diagnostics :

1. Highlight **PROVERGE** DIAGNOSTICS by pushing ↑ or ↓ keys of the control disc;
2. Press the <ENTER>. button.

After the <ENTER>. button is pressed, the **PROVERGE** Diagnostics menu will be displayed and the Tests start instantly.

It includes check-ups on four items :

– Interface Test;
– Generic Test;
– Sync Test;
– Ram Test.

After completing each test, the status report will give the test result :

– Pass; or
– Failed plus the error number.

During the Interface Test, the following messages will be displayed one after another on the screen:

– Ready and Config Test;
– Ready and Config OK;
– Config Ackn. Test;
– Config Ackn. OK;
– Full Config Test;
– Full Config OK;
– Interface Test OK.

In case of failures, the error message will be shown :

– FAILED... Error 01; or
– FAILED... Error 02; or
– FAILED... Error 03.

During the Generic Test, the following messages will be displayed one after another on the screen:

– Config for Generic;
– Config for Generic OK;
– Chipselects Test;
– Chipselects OK;
– Addressability Test;
– Addressability OK;
– Crystal and Reset Test;
– Crystal and Reset OK;
– Generic Test OK.

In case of failures, the error message will be shown :

– FAILED... Error 11; or
– FAILED... Error 12; or
– FAILED... Error 13; or
– FAILED... Error 14; or
– FAILED... Error 15.

During the Sync Test, the following messages will be displayed one after another on the screen:

– Config for Sync;
– Config for Sync OK;
– Horizontal Sync Test;
– Horizontal Sync OK;
– Vertical Sync Test;
– Vertical Sync OK;
– Frame and Field Test;
– Frame and Field OK;
– Sync Test OK.

In case of failures, the error message will be shown :

– FAILED... Error 21; or
– FAILED... Error 22; or
– FAILED... Error 23; or
– FAILED... Error 24; or
– FAILED... Error 25; or
– FAILED... Error 26; or
– Sync Test Error 27
  No Syncs found
  Check Camera & Cabling.

During the Ram Test, the following messages will be displayed one after another on the screen:

– Config for Ram;
– Config for Ram OK;
– Ram Data Lines Test;
– Ram Data Lines OK;
– Ram Address Lines Test;
– Ram Address Lines OK;
– Ram Full Content Test;
– Ram Full Content OK;
– Ram Test OK.

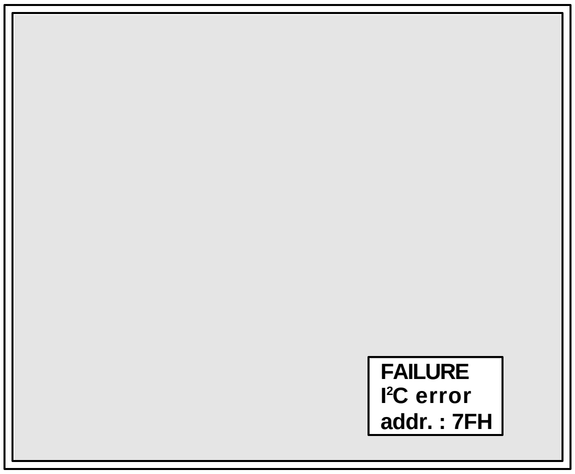
In case of failures, the error message will be shown :

– FAILED... Error 31; or
– FAILED... Error 32; or
– FAILED... Error 33; or
– FAILED... Error 34.

If all the tests are successful, the **PROVERGE Diagnostics** menu will be as follows :
Press the <EXIT> button to return to the **PROVERGE** menu.

Refer to the Installation Adjustment Mode section for On Screen Convergence Alignment.

I²C error is displayed on the screen together with the respective address, as illustrated on screen picture:

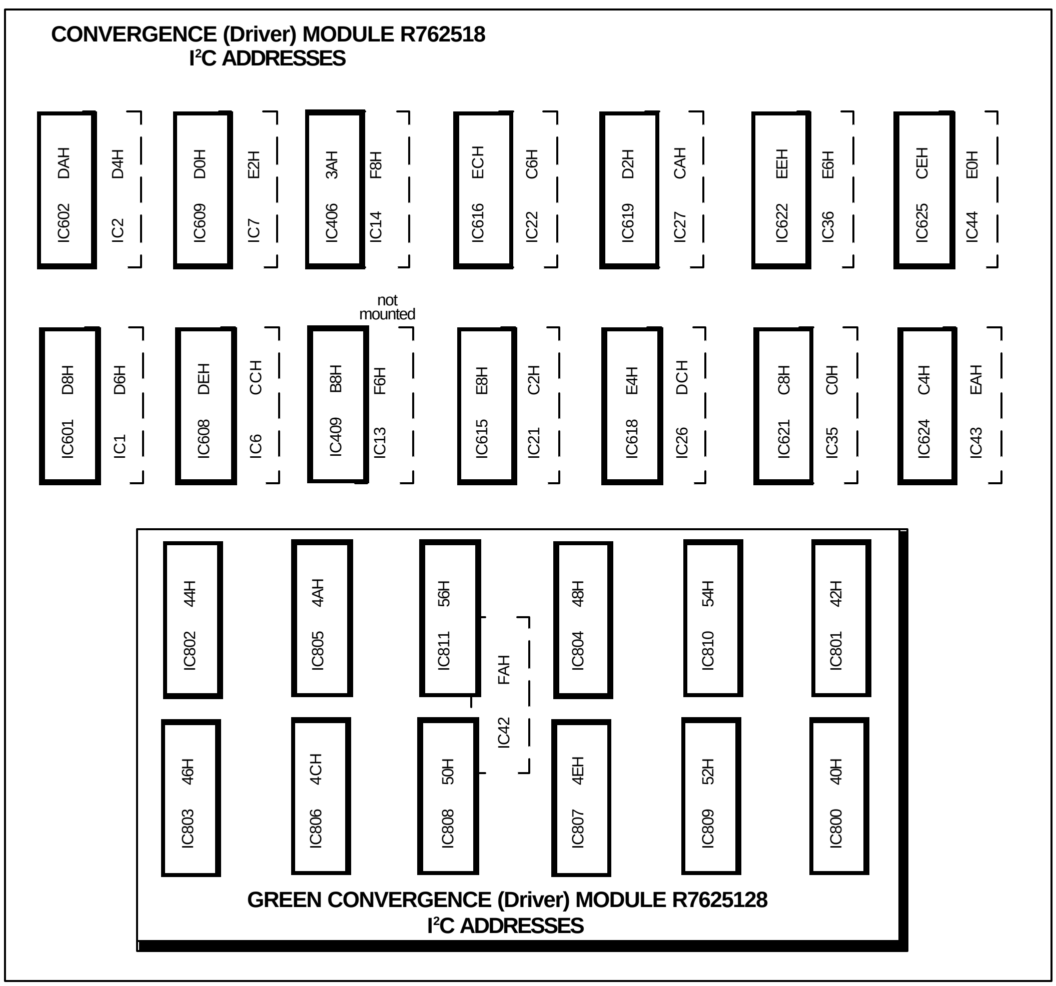


The table below indicates which IC corresponds to the displayed address . Replacement of the indicated IC solves the I²C error.

Convergence zones

1	2	3	4	5
6	7	8	9	10
11	12		13	14
15	16	17	18	19
20	21	22	23	24

Convergence module (Driver) - Green convergence sub module



Green convergencemain module

HEX address	IC	CORRECTION	ZONE
D6H	IC1	R Horizontal/Vertical	12
		B Horizontal/Vertical	12
D8H	IC601	R Horizontal/Vertical	13
		B Horizontal/Vertical	13
D4H	IC2	R Horizontal/Vertical	11
		B Horizontal/Vertical	11
DAH	IC602	R Horizontal/Vertical	14
		B Horizontal/Vertical	14
C4H	IC624	R Horizontal/Vertical	3
		B Horizontal/Vertical	3
EAH	IC43	R Horizontal/Vertical	22
		B Horizontal/Vertical	22
CEH	IC625	R Horizontal/Vertical	8
		B Horizontal/Vertical	8
E0H	IC44	R Horizontal/Vertical	17
		B Horizontal/Vertical	17
D0H	IC609	R Horizontal/Vertical	9
		B Horizontal/Vertical	9
E2H	IC7	R Horizontal/Vertical	18
		B Horizontal/Vertical	18
CCH	IC6	R Horizontal/Vertical	7
		B Horizontal/Vertical	7
DEH	IC608	R Horizontal/Vertical	1
		B Horizontal/Vertical	1
C0H	IC35	R Horizontal/Vertical	1
		B Horizontal/Vertical	1
E6H	IC36	R Horizontal/Vertical	20
		B Horizontal/Vertical	20
C8H	IC621	R Horizontal/Vertical	5
		B Horizontal/Vertical	5
EEH	IC622	R Horizontal/Vertical	24
		B Horizontal/Vertical	24
C6H	IC22	R Horizontal/Vertical	4
		B Horizontal/Vertical	4

HEX address	IC	CORRECTION	ZONE
ECH	IC616	R Horizontal/Vertical	23
		B Horizontal/Vertical	23
C2H	IC21	R Horizontal/Vertical	2
		B Horizontal/Vertical	2
E8H	IC615	R Horizontal/Vertical	21
		B Horizontal/Vertical	21
DCH	IC26	R Horizontal/Vertical	15
		B Horizontal/Vertical	15
E4H	IC618	R Horizontal/Vertical	19
		B Horizontal/Vertical	19
CAH	IC27	R Horizontal/Vertical	6
		B Horizontal/Vertical	6
D2H	IC619	R Horizontal/Vertical	10
		B Horizontal/Vertical	10
F6H	IC13	R/G/B Left BOW (Hor)	Left side
		R/G/B Left SKEW (Hor)	Left side
F8H	IC14	R/G/B Bottom BOW (Vert)	N/S corr.
		R/G/B Top BOW (Vert)	N/S corr.
		R/G/B Bottom Keystone (Vert)	N/S corr.
		R/G/B Top Keystone (Vert)	N/S corr.
FAH	IC42	G Vertical Midline SKEW (H)	Midlines
		R/G/B Vertical Midline BOW (H)	Midlines
		R/G/B Vertical Midline SKEW (V)	Midlines
		R/G/B Vertical Midline BOW (V)	Midlines
3AH	IC406	R/G/B E/W Seagull	E/W
		R/G/B N/S Seagull	N/S
B8H	IC409	R/B Precorrections	Sides
		R/B Precorrections	Head Corner

CONVERGENCE / ERROR CODES

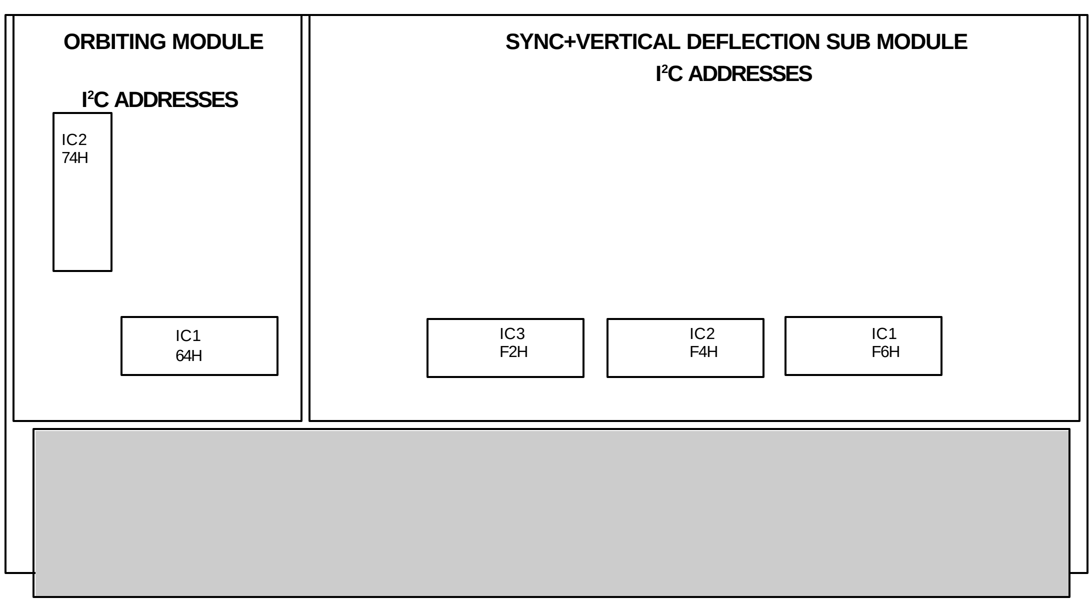
HEX address	IC	CORRECTION	ZONE	HEX address	IC	CORRECTION	ZONE
50H	IC808	G Horizontal/Vertical	23	54H	IC810	G Horizontal/Vertical	1
		G Horizontal/Vertical	4			G Horizontal/Vertical	20
52H	IC809	G Horizontal/Vertical	24	56H	IC811	G Horizontal/Vertical	21
		G Horizontal/Vertical	5			G Horizontal/Vertical	2

SYNC+VERTICAL DEFLECTION MODULE

HEX address	IC	CORRECTION	HEX address	IC	CORRECTION
F2H	IC3	bottom blanking	F6H	IC1	side keystone
		vertical shift red			side bow
		vertical shift green			left blanking
		vertical shift blue			right blanking
F4H	IC2	vertical amplitude			
		vertical linearity			
		horizontal phase			
		top blanking			

ORBITING

HEX address	IC	CORRECTION	HEX address	IC	CORRECTION
74H	IC2	max deviation	64H	IC1	shift orbit
		zero deviation			phase orbit
		slow orbiting			
		fast orbiting			



MAGNETICAL FOCUS+HOR SHIFT

HEX address	IC	CORRECTION
F0H	IC52	horizontall shift red horizontal shift green horizontal shift blue
FCH	IC303	focus Red center focus Green center focus Blue center H Amp (not used)

HEX address	IC	CORRECTION
FEH	IC311	focus bottom R focus top R focus left R focus right R
66H	IC312	focus bottom G focus top G focus left G focus right G
68H	IC313	focus bottom B focus top B focus left B focus right B

QUAD DECODER

HEX address	IC	CORRECTION
40H	IC17	sharpness sharpness On

CONVERGENCE / ERROR CODES

INPUT RGB+SWITCHING

HEX address	IC	CORRECTION	HEX address	IC	CORRECTION
42H	IC601	Clamp Width 1 Clamp Width 2 Clamp Mode 1 Clamp Mode 2 (not 1200 mode) Enable CHROMA filters Scan Doubler On Width ident.	70H	IC602	Red on/off Green on/off Blue on/off Sync fast/slow IC601 SDA On/Off (P5-P7) Input Switch
3EH	IC604	RGB Matrix Saturation Hue (V03) not used			

RGB Driver

HEX address	IC	CORRECTION	HEX address	IC	CORRECTION
5AH	IC1	Bright. Red Bright.Green Bright. Blue Brightness	58H	IC3	Red gain Blue gain Red cut off Blue cut off
5CH	IC2	Cut off Red Cut off Green Cut off Blue IBCL Value	42H	IC100	Midlights Red 1 Midlights Red 2 Midlights Red 3 Midlights Red 4 Midlights Blue 1 Midlights Blue 2 Midlights Blue 3 Midlights Blue 4
3C	IC109	Right Blanking Left Blanking Blue Breakpoint (4) not used	44H	IC101	Peaking 1 Peaking 2 Peaking 3 (P3) not used Blue correction 1 Blue correction 2 Blue correction 3 IC100 SDA On/Off

I²C error messages in ascending order of address number

HEXaddress	IC	MODULE
40H	IC800	Convergence G
42H	IC801	Convergence G
44H	IC802	Convergence G
46H	IC803	Convergence G
48H	IC804	Convergence G
4AH	IC805	Convergence G
4CH	IC806	Convergence G
4EH	IC807	Convergence G
50H	IC808	Convergence G
52H	IC809	Convergence G
54H	IC810	Convergence G
56H	IC811	Convergence G
40H	IC17	QUAD Decoder
66H	IC312	Mag. Foc+Hor Shift
68H	IC313	Mag. Foc+Hor Shift
F0H	IC52	Mag. Foc+Hor Shift
FCH	IC303	Mag. Foc+Hor Shift
FEH	IC311	Mag. Foc+Hor Shift
42H	IC601	IN RGB+Switching
70H	IC602	IN RGB+Switching
3EH	IC604	IN RGB+Switching
64H	IC1	Orbiting
74H	IC2	Orbiting
C0H	IC35	Convergence
C2H	IC21	Convergence
C4H	IC624	Convergence
C6H	IC22	Convergence
C8H	IC621	Convergence
CAH	IC27	Convergence
CCH	IC6	Convergence
CEH	IC625	Convergence

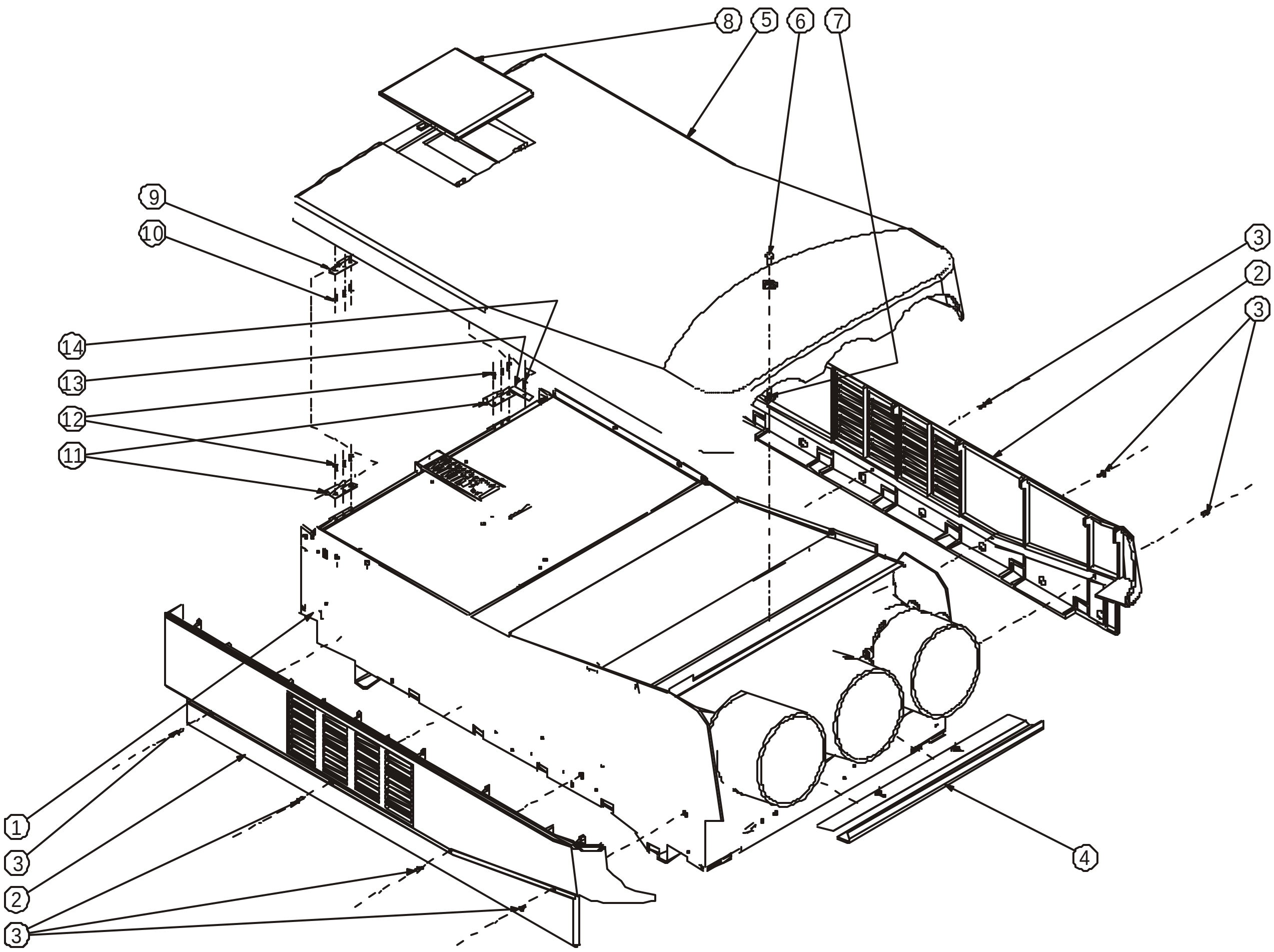
HEXaddress	IC	MODULE
D0H	IC609	Convergence
D2H	IC619	Convergence
D4H	IC2	Convergence
D6H	IC1	Convergence
D8H	IC601	Convergence
DAH	IC602	Convergence
DCH	IC26	Convergence
DEH	IC608	Convergence
E0H	IC44	Convergence
E2H	IC7	Convergence
E4H	IC618	Convergence
E6H	IC36	Convergence
E8H	IC615	Convergence
EAH	IC43	Convergence
ECH	IC616	Convergence
EEH	IC622	Convergence
F6H	IC13	Convergence
F8H	IC14	Convergence
FAH	IC42	Convergence
3AH	IC406	Convergence
B8H	IC409	Convergence
F2H	IC3	Sync+Vert defl
F4H	IC2	Sync+Vert defl
F6H	IC1	Sync+Vert defl
42H	IC100	RGB DrIVE R
44H	IC101	RGB DrIVE R
58H	IC3	RGB DrIVE R
3CH	IC109	RGB DrIVE R
5AH	IC1	RGB DrIVE R
5CH	IC2	RGB DrIVE R

MODEL PARTS

PRO 1200

809-10447	Module, Smps
809-10448	Module, Horizontal Deflection
809-10449	Module, Magnetic Focus
809-10450	Module, RGB Output / CRT Pcb
809-10451	Module, Convergence Driver
809-10452	Module, Convergence Output
809-10453	Module, Cpu Controller
809-10454	Module, RGB Driver
809-10455	Module, Quad Decoder + Comb
809-10456	Module, Sync + Vertical Deflection
809-10457	Module, G2 + Diagnostics
809-10458	Module, Eht Generator
809-10459	Module, Eht Quadrupler
809-10460	Module, Rs232 Interface
809-10461	Module, RGB Input + Switching
809-10462	Module, Eht Splitter
809-10463	Module, Dynamic Astigmatism
809-10464	Module, Horizontal Amp Coils
809-10465	Module, 2Nd RGB
809-10466	Module, Main A/C Input
809-10468	Module, Proverge Control
809-10469	Module, Proverge Camera
812-10111	Side Plate, Lower Rails
812-10112	Bracket, Hv.Splitter Mount
812-10114	Bracket, CRT
812-10115	Access Asy, Top Rear
812-10116	Plate, Lower Cover
812-10117	Bracket, Left Frame Support
812-10118	Bracket, Rt. Frame Support
812-10119	Bracket, CRT. Access Door
812-10120	Bracket, Front Bracket, Bottom
812-10121	Rear Bracket, Bottom
812-10122	Bracket, CRT. Gnd. Plate
812-10123	Bracket, CRT. Upper Plate
812-10124	Bracket, CRT. Separator Plate
812-10125	Bracket, CRT. Support Plate
812-10126	Bracket, Controller Cover
812-10127	Bracket, Controller Screen
812-10128	Bracket, Front Plate
812-10129	Bracket, Convergence
814-10131	Cabinet, Upper
814-10132	Cabinet, Side R & L
814-10133	Cabinet, Name Plate
814-10134	Cabinet, Front
814-10135	Cabinet, Back
819-10004	Convergence Lock, Rt.
819-10005	Convergence Lock, Left
831-10004	Fan, DC Cooling
831-10005	Fan, Convergence
840-323	Hinge, Top
840-324	Cover Hinge, Lock
873-10002	Fast Lock Screw, Top
880-10042	CRT. Support Plate Spring
882-10013	Dag Spring Contact, Outer
882-10014	Dag Spring Contact, Inner
900-10040	CRT 8" Red
900-10041	CRT 8" Green
900-10042	CRT 8" Blue
924-10073	Remote Control, Customer
924-10074	Remote Control, Inside
925-10002	Grommet, CRT
925-10003	Grommet, Controller Cover
947-10007	Spacer Rod
947-10008	Spacer, CRT Block
956-10007	Fast Lock Screw, Retainer
994-10015	Foam, Convergence Fan

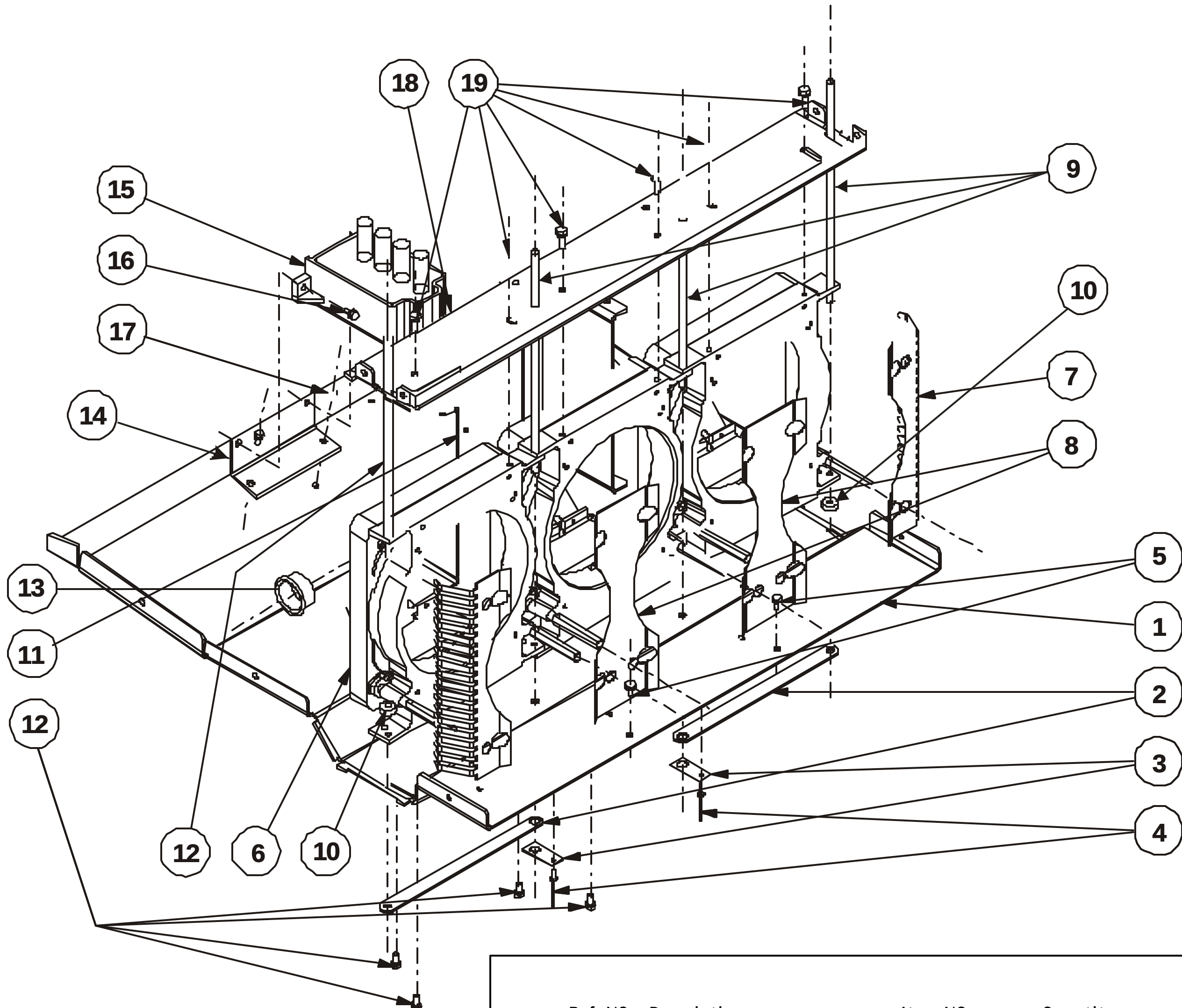
FRAME ASSEMBLY



1 Frame projector

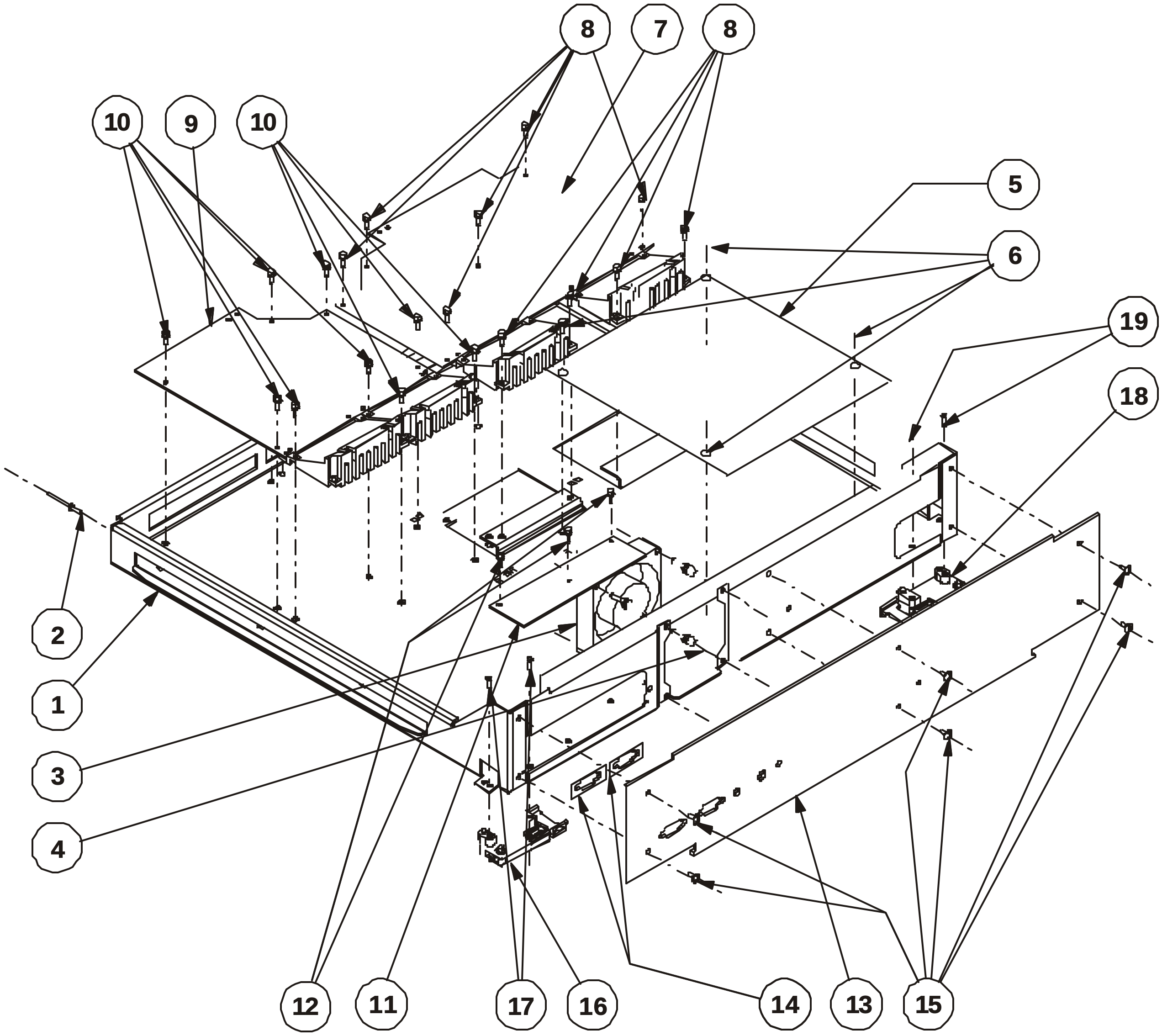
Ref. NO	Description	Item NO	Quantity
2	side parts (Beige)	814-10132	2
3	DIN 965 M4X10	NSP	8
4	front part (Beige)	814-10134	1
5	Upper housing (Beige)	814-10131	1
6	fast lock screw	873-10002	1
7	fast lock retainer	956-10007	1
8	name plate	814-10133	1
9	hinge (upper part)	840-00323	2
10	winglin 3X15	NSP	6
11	hinge (lower part)	840-00323	2
12	DIN 965 M3X10	NSP	6
13	hinge lock	840-00324	1
14	blind-rivet	NSP	1

FRAME ASSEMBLY



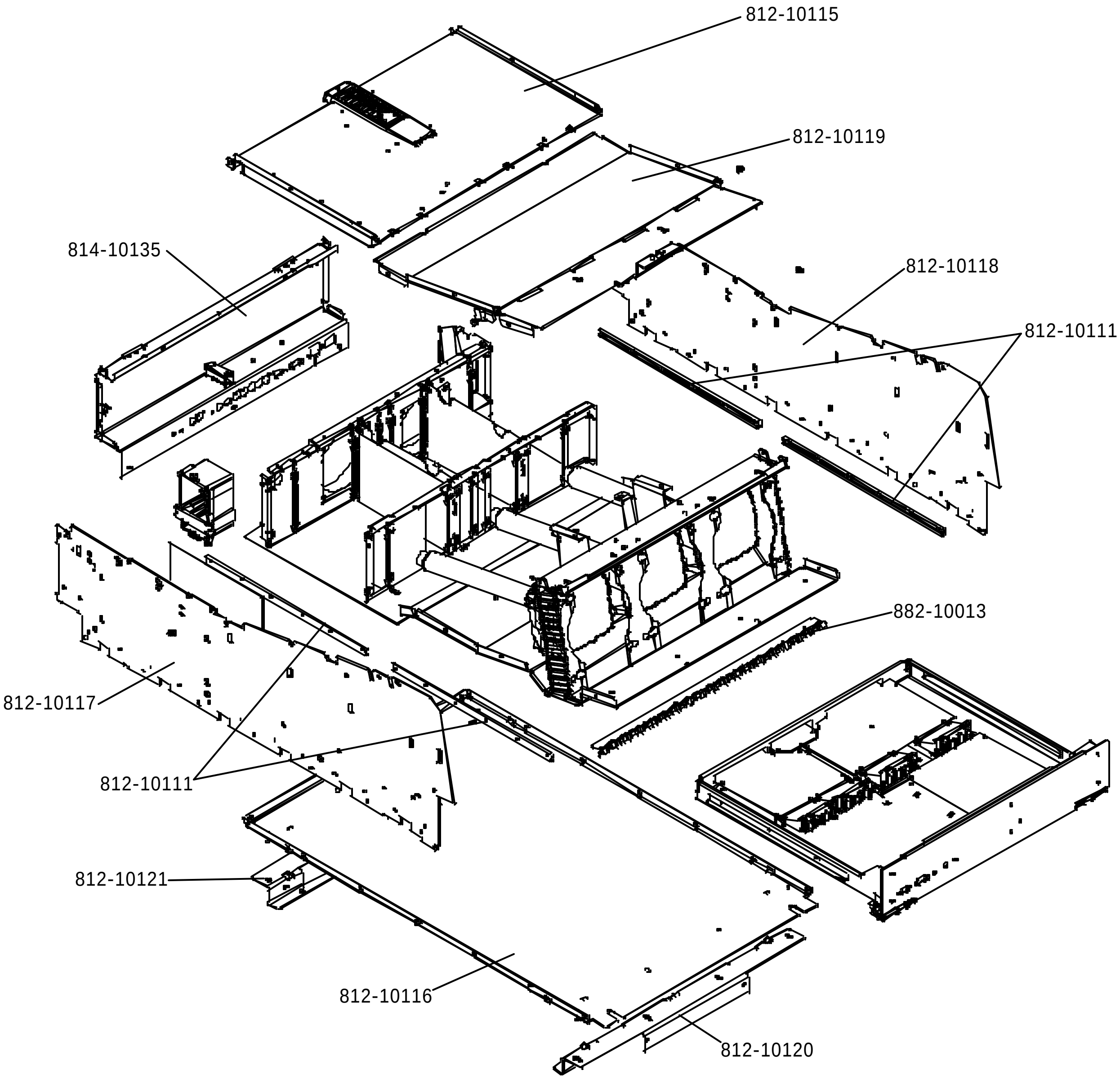
Ref. NO	Description	Item NO	Quantity
1	ground plate CRT block	812-10122	1
2	floating nut plate	812-10125	2
3	spring floating nut plate	880-10042	2
4	blind-rivet	NSP	2
5	DIN 933 M4X10	NSP	2
6	CRT block R G B	812-10114	1
7	pressure spring (side)	882-10013	2
8	pressure spring (middle)	882-10014	2
9	distance screw CRT block	947-10007	4
10	spacer	947-10008	2
11	partition frame CRT block	812-10124	1
12	DIN 933 M4X10	NSP	4
13	grommet	NSP	2
14	fixation Splitter	812-10112	1
15	Splitter	809-10492	1
16	DIN 933 M4X10	NSP	2
17	DIN 933 M4X10	NSP	2
18	upper plate CRT block	812-10123	1
19	DIN 933 M5X16	NSP	6

FRAME ASSEMBLY

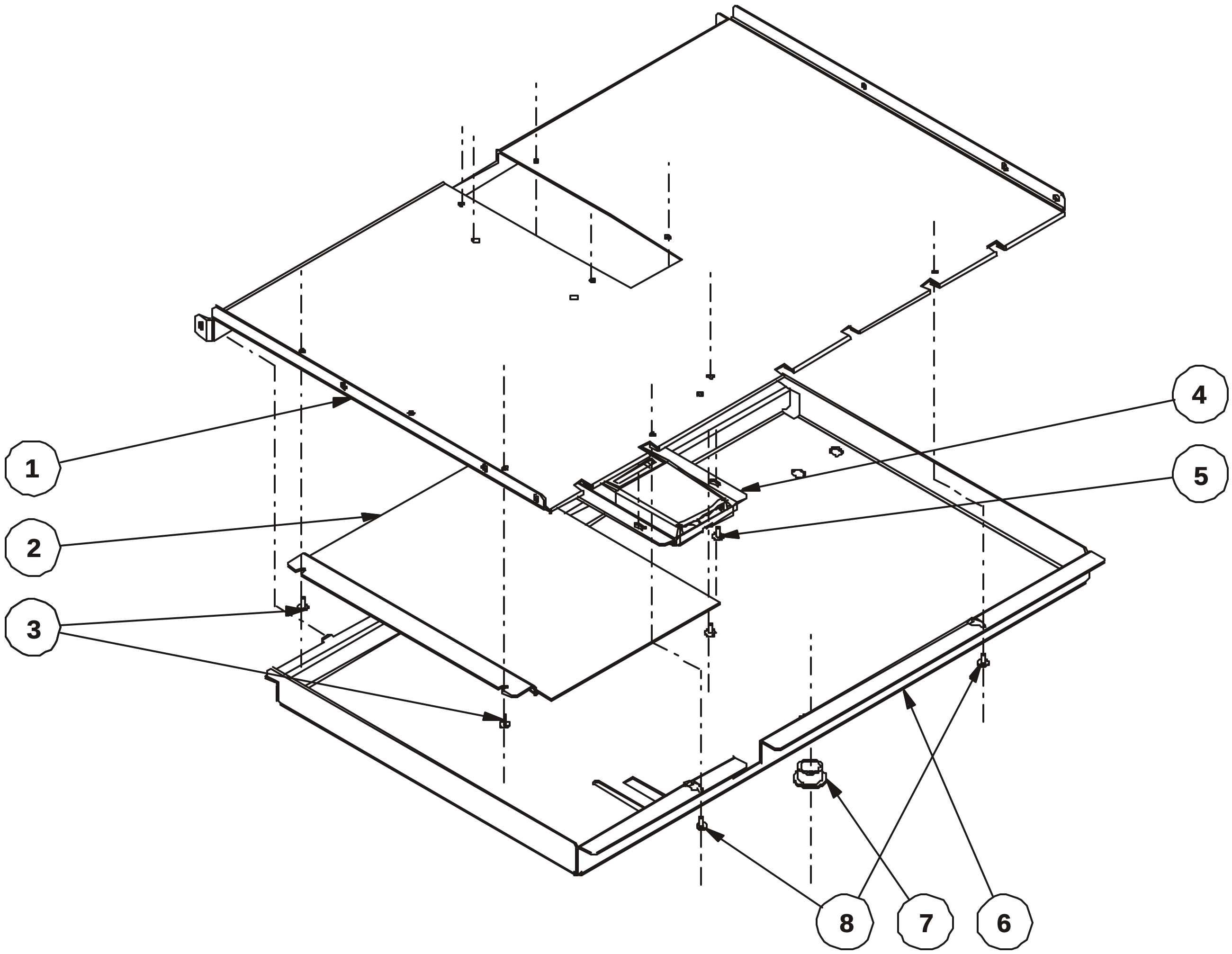


Ref. NO	Description	Item NO	Quantity
1	convergence drawer	812-10129	1
2	blind-rivet	NSP	2
3	Fan	831-10005	1
4	fixation foam Fan	994-10015	4
5	convergence (driver)	809-10451	1
6	DIN 933 M3X10	NSP	4
7	convergence (output)	809-10452	1
8	DIN 933 M3X10	NSP	10
9	dynamic stygmator	809-10463	1
10	DIN 933 M3X10	NSP	9
11	RS232	809-10460	1
12	DIN 933 M3X10	NSP	3
13	front plate	812-10128	1
14	pressure spring connectors	NSP	2
15	DIN 933 M3X8	NSP	6
16	convergence lock (right)	819-10004	1
17	DIN 7981 4.2X16	NSP	1
18	convergence lock (left)	819-10005	1
19	DIN 7981 4.2X16	NSP	1

FRAME ASSEMBLY



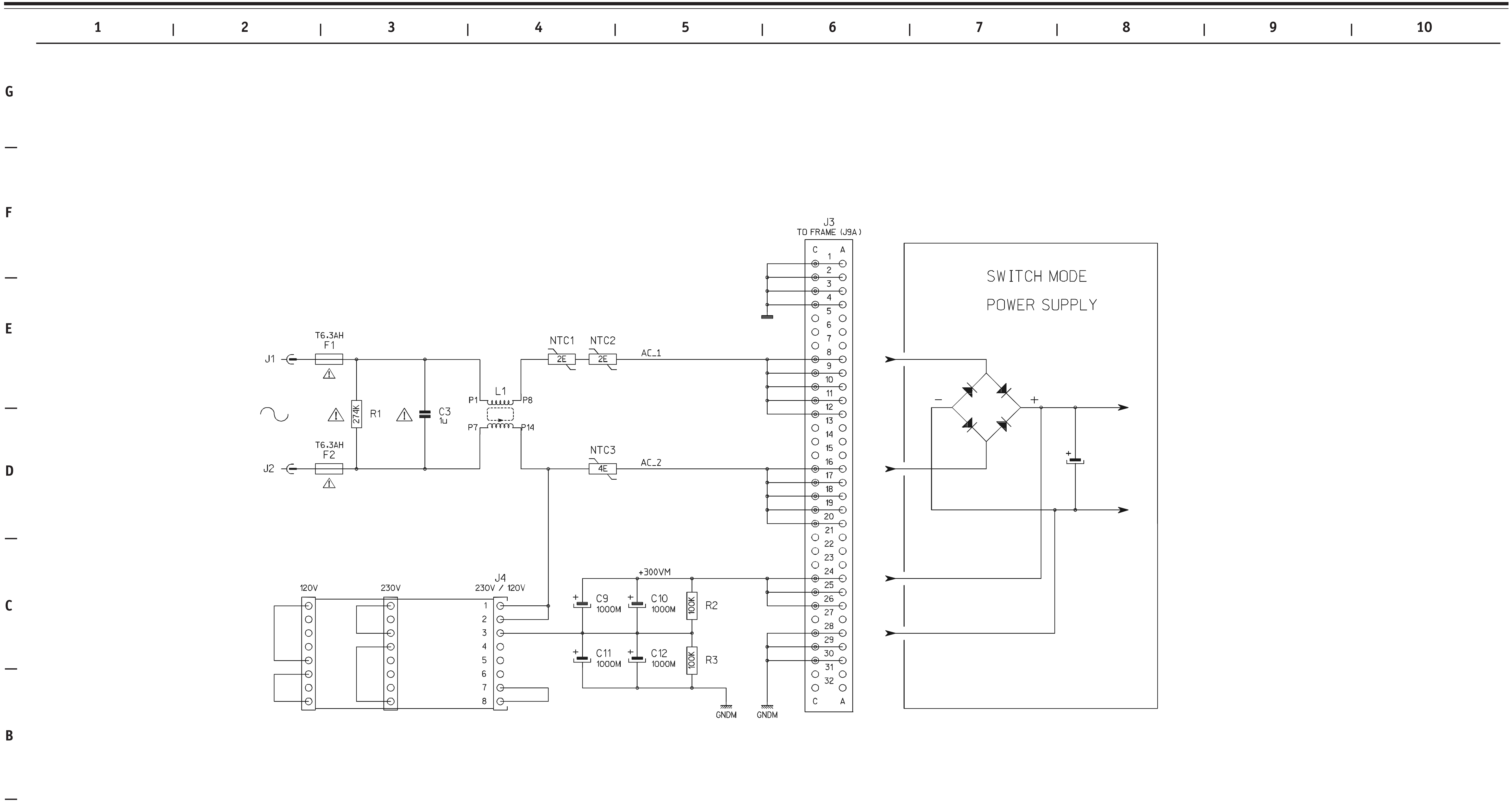
FRAME ASSEMBLY



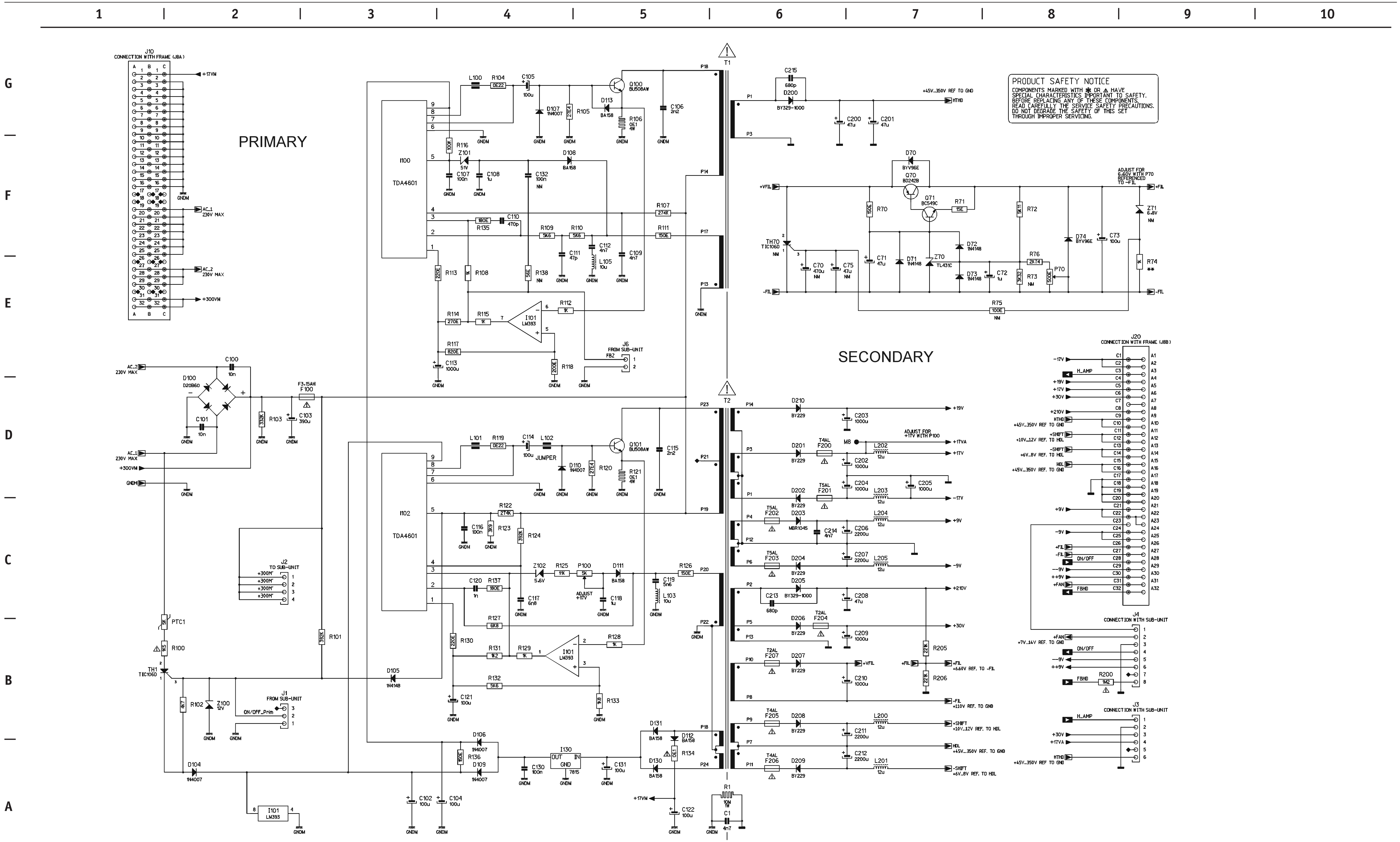
Ref. NO	Description	Item NO	Quantity
1	module cover	812-10126	1
2	controller module	809-10453	1
3	DIN 921 M3X8	NSP	4
4	internal control unit	924-10074	1
5	DIN 921 M3X8	NSP	5
6	screening controller	812-10127	1
7	grommet	NSP	1
8	DIN 921 M3X8	NSP	2

zenith

MAIN INPUT

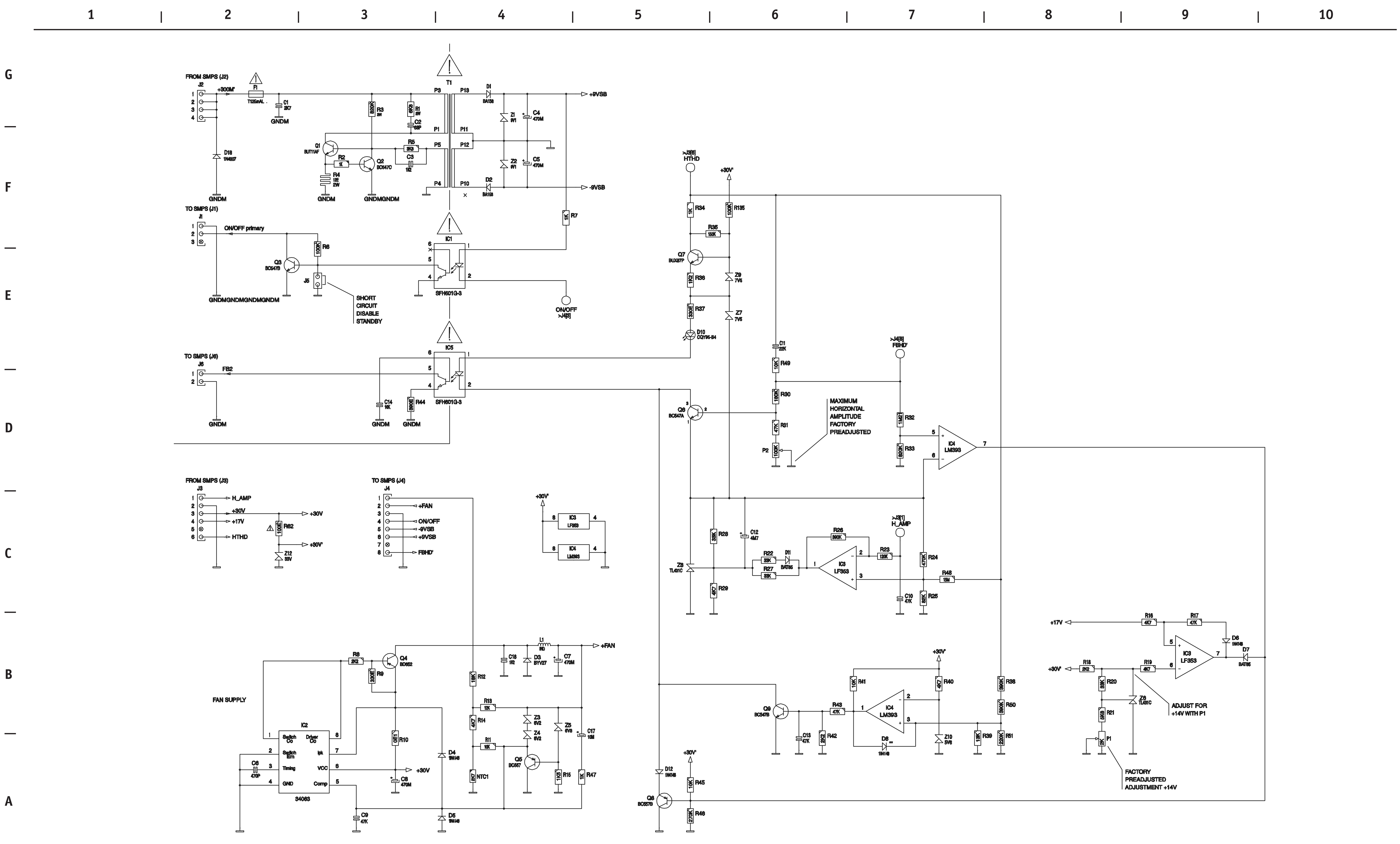

J1
J2
T6.3AH
F1
T6.3AH
F2
274K
R1
C3
1u
L1
P1
P8
P7
P14
NTC1
NTC2
2E
2E
NTC3
4E
AC_1
AC_2
J3
TO FRAME (J9A)
C
A
SWITCH MODE
POWER SUPPLY
120V
230V
J4
230V / 120V
+300VM
C9
1000M
C10
1000M
100K
R2
C11
1000M
C12
1000M
100K
R3
GNDM
GNDM

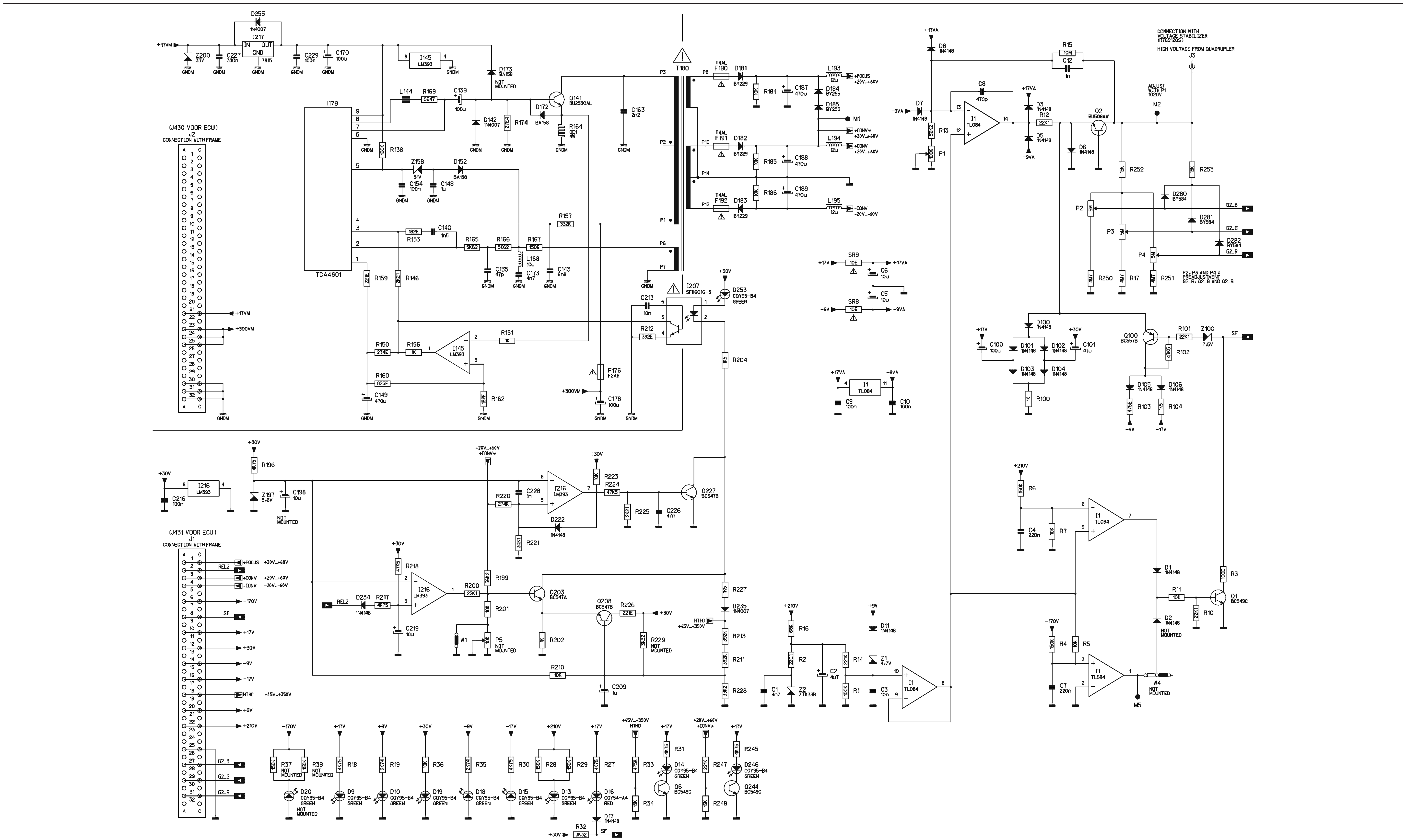
SWITCH MODE POWER SUPPLY



CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

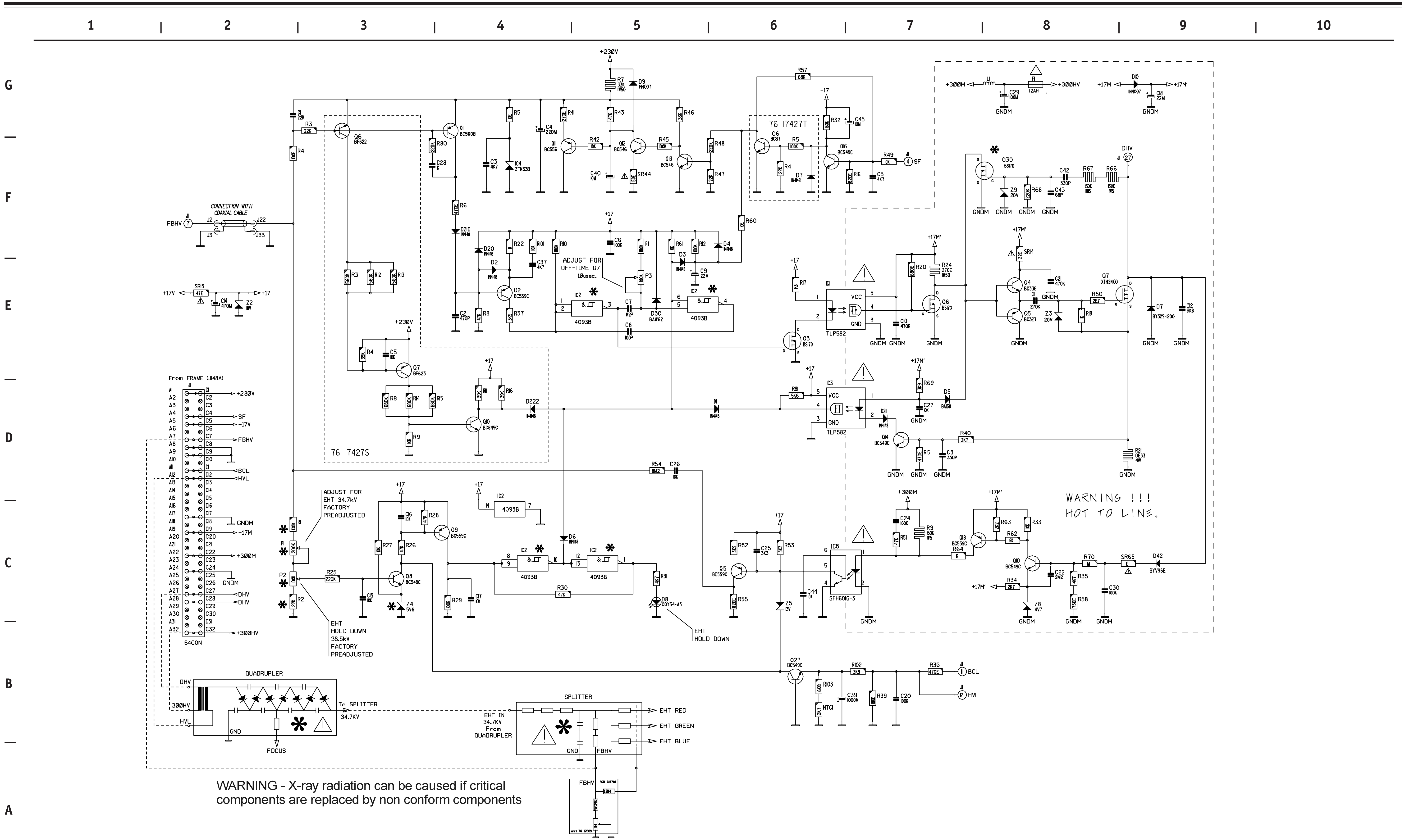
SMPS SUB UNIT





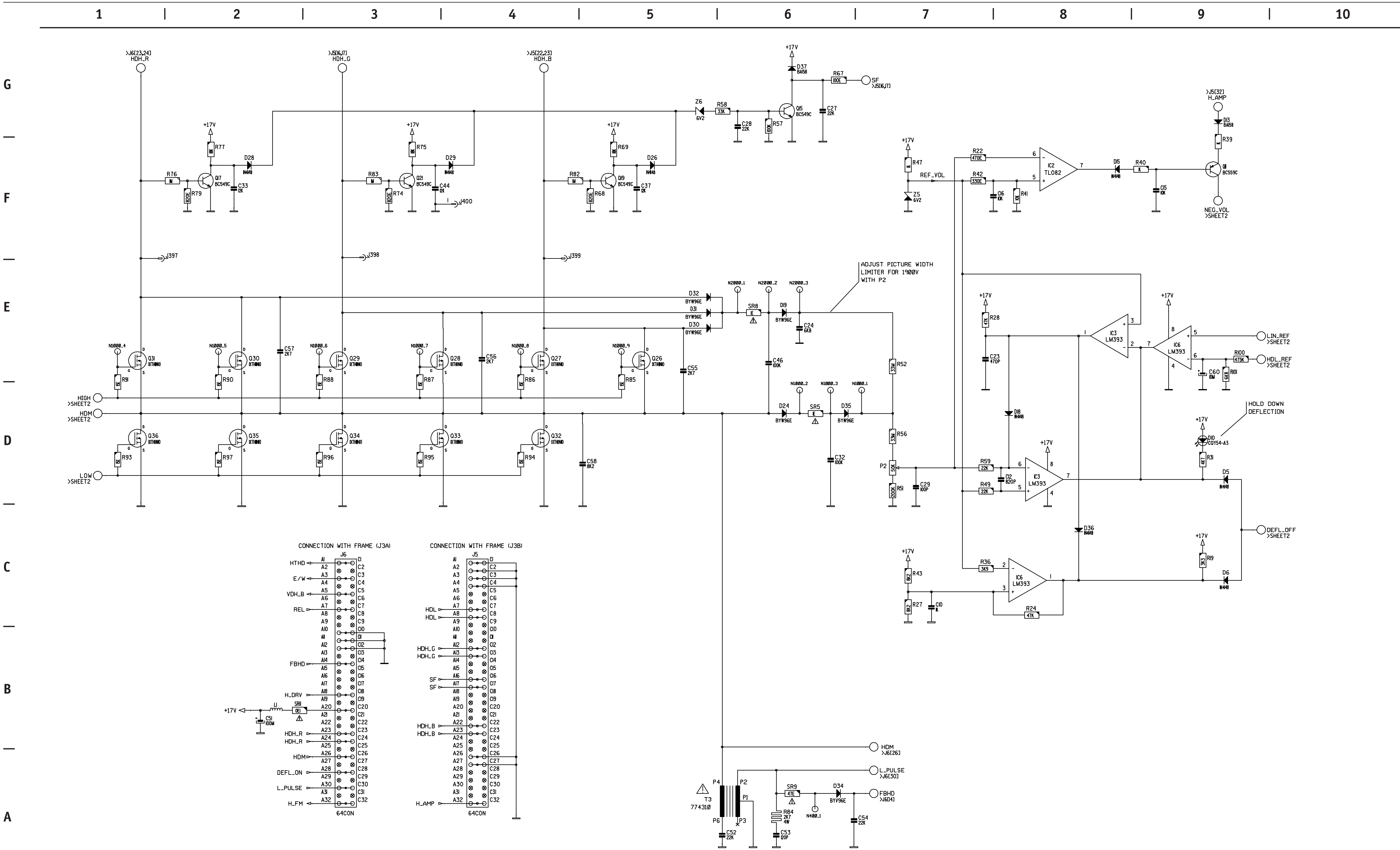
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✻ . READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

EHT MODULE

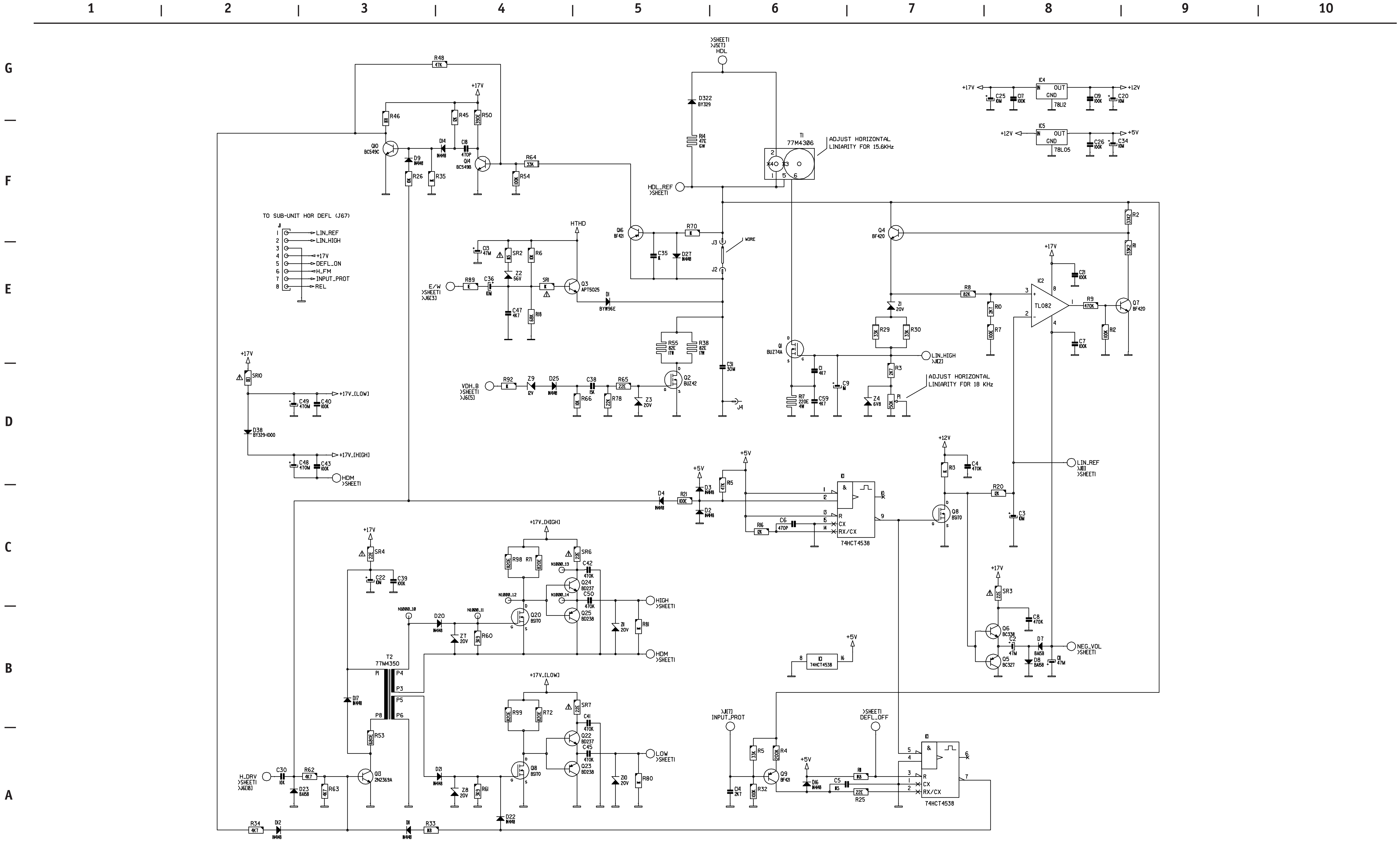


WARNING - X-ray radiation can be caused if critical components are replaced by non conform components

HORIZONTAL DEFLECTION 1/2

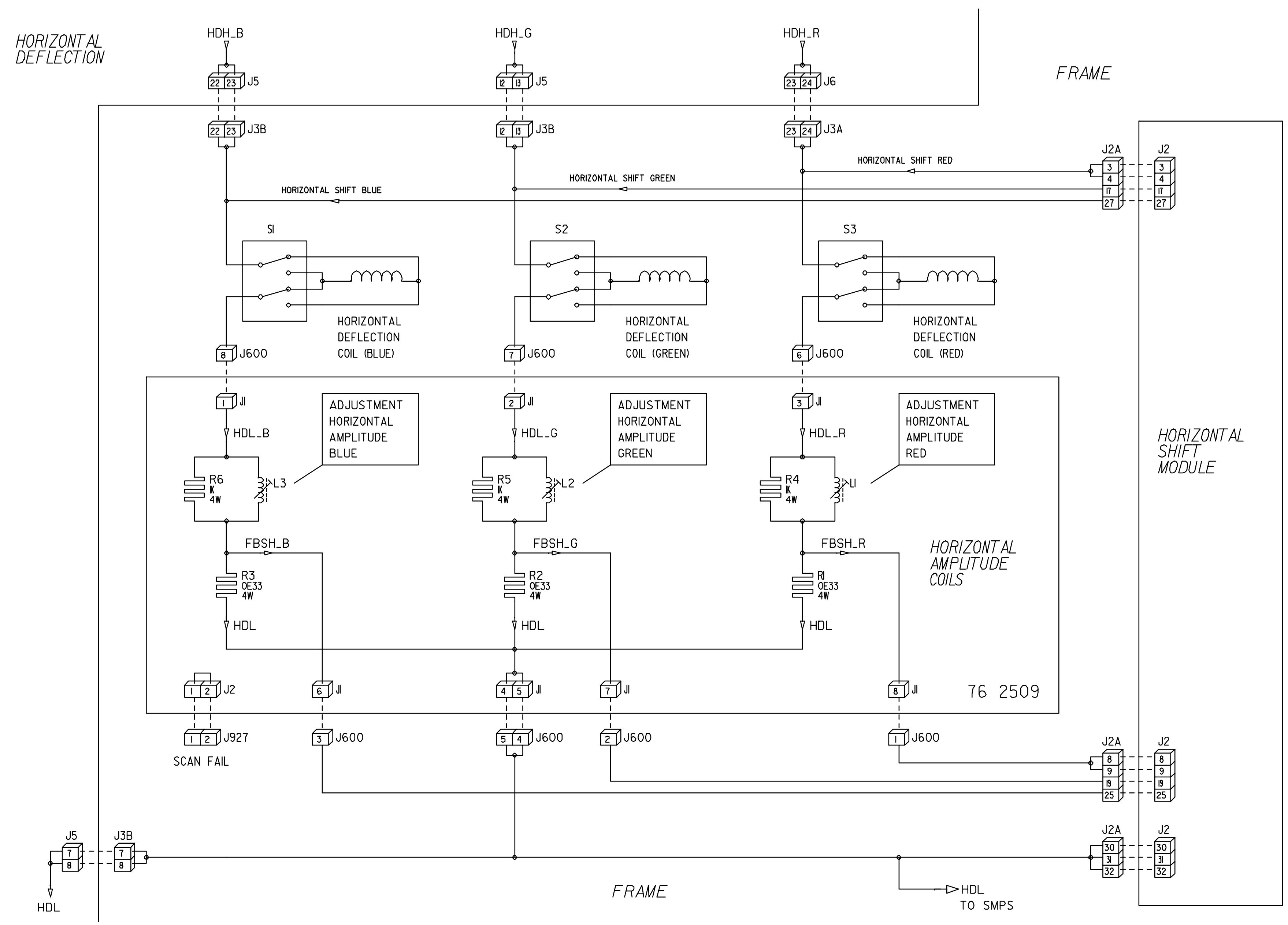


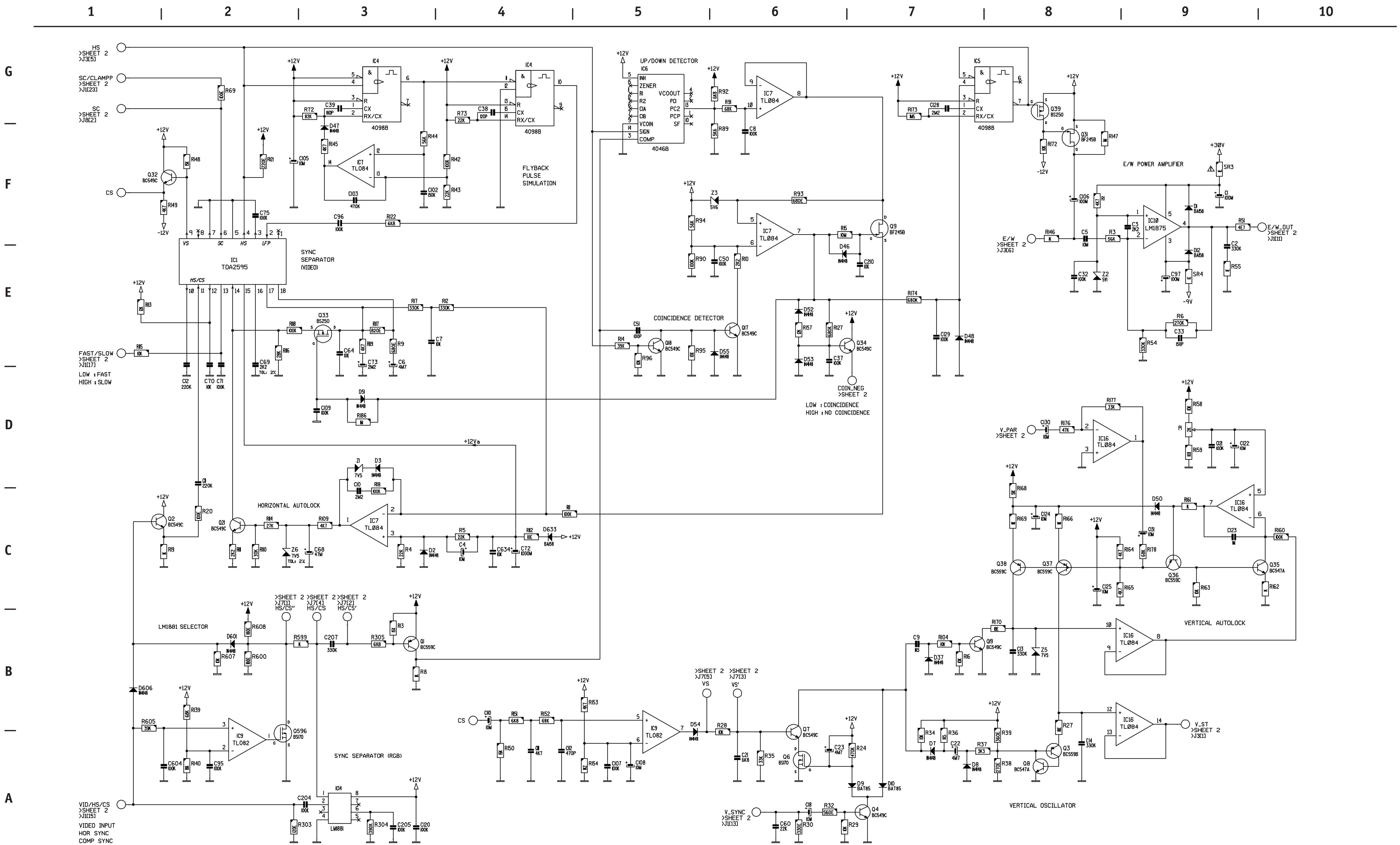
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.


1 2 3 4 5 6 7 8 9 10
G F E D C B A
TO SUB-UNIT HOR DEFL (J67)
LIN_REF
LIN_HIGH
+17V
DEFL_ON
H_FM
INPUT_PROT
REL
ADJUST HORIZONTAL LINIARITY FOR 15.6KHz
ADJUST HORIZONTAL LINIARITY FOR 18 KHz
77M4306
77M4350
TL082
74HCT4538
78L12
78L05
HDL
HDL_REF
HTHD
E/W
VDH_B
+17V_[LOW]
+17V_[HIGH]
HDM
HIGH
LOW
H_DRV
LIN_REF
LIN_HIGH
NEG_VOL
INPUT_PROT
DEFL_OFF

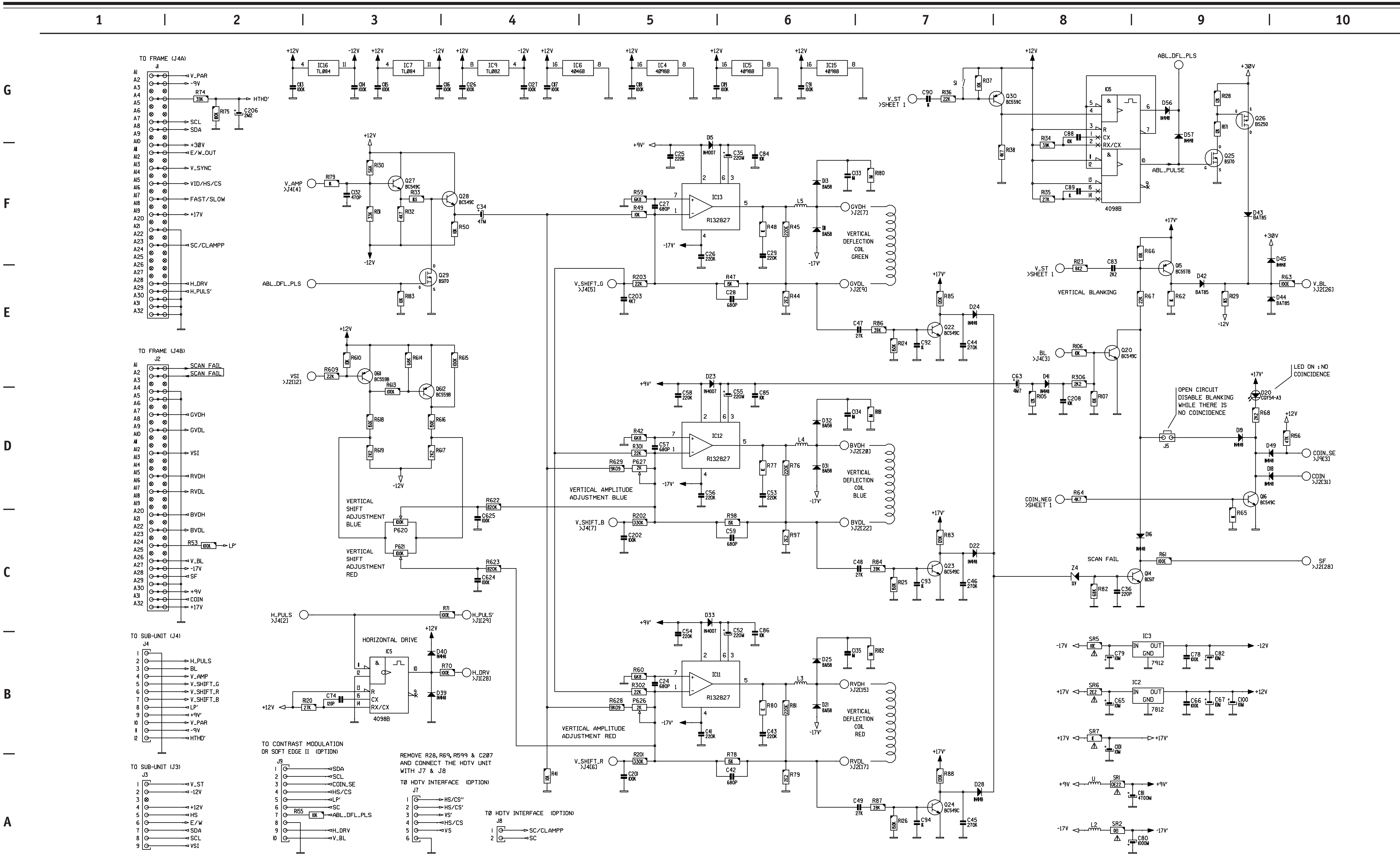
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

G F E D C B A



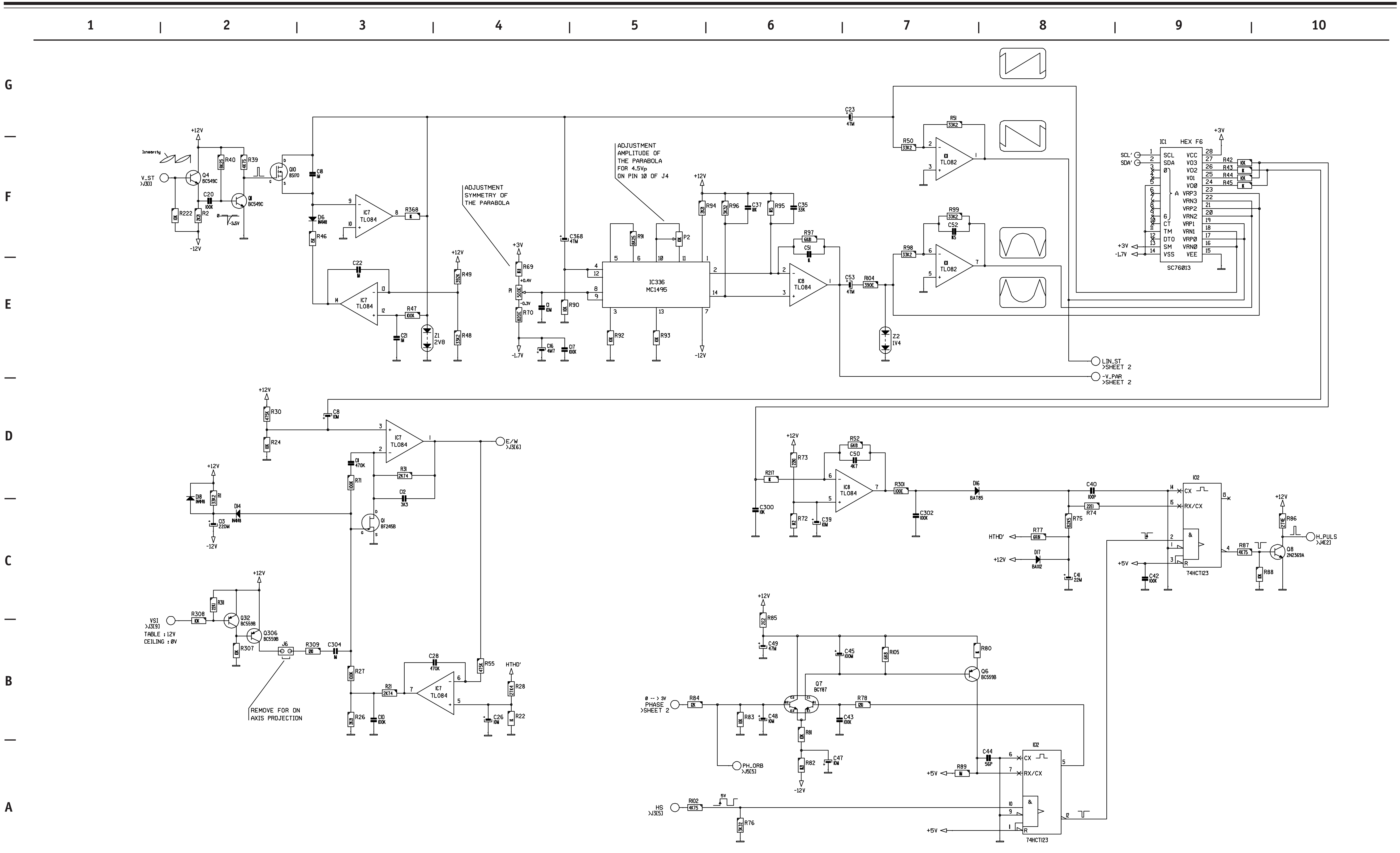


VERTICAL DEFLECTION 2/2



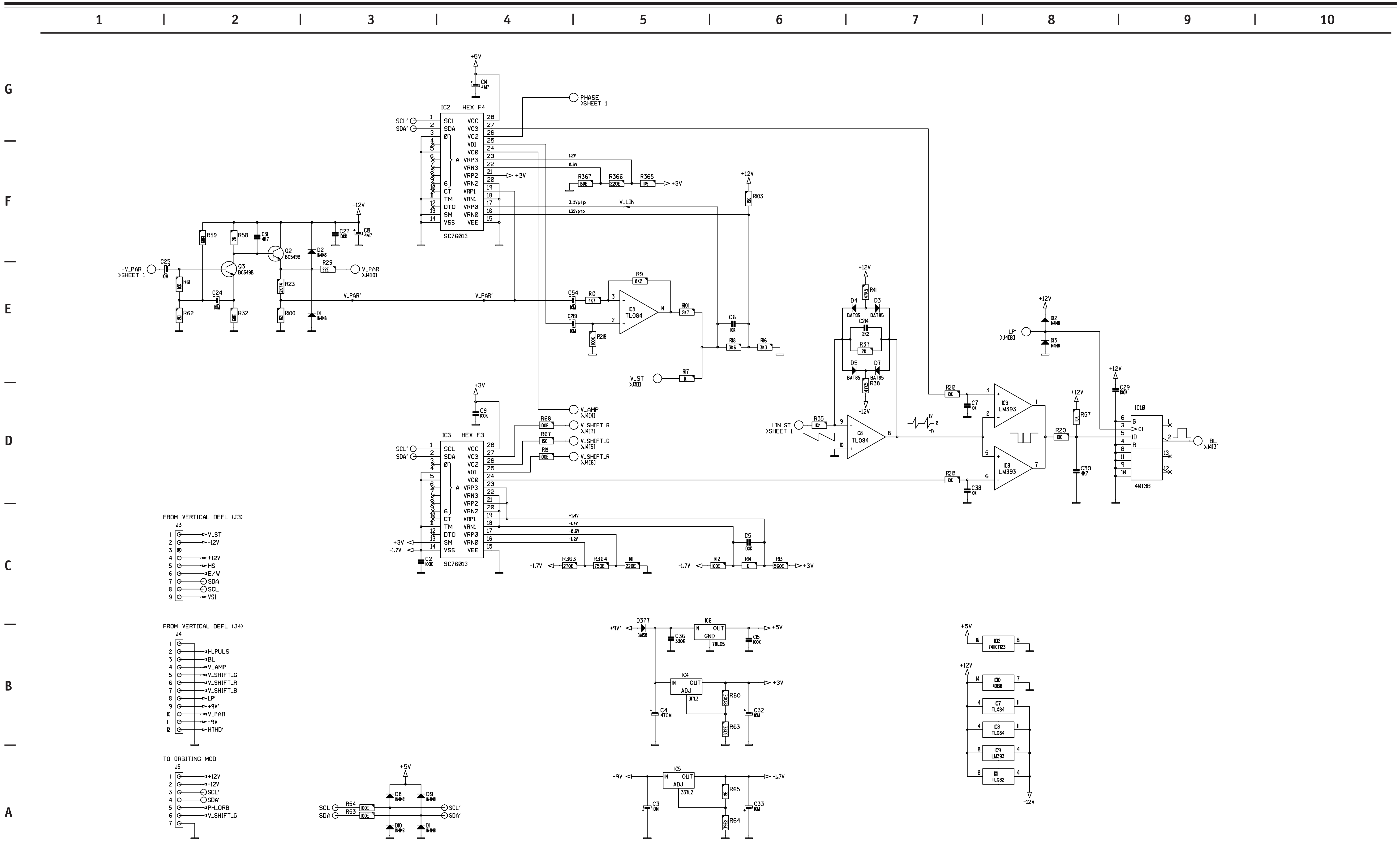
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

VERTICAL + SYNC SUB-UNIT 1/2

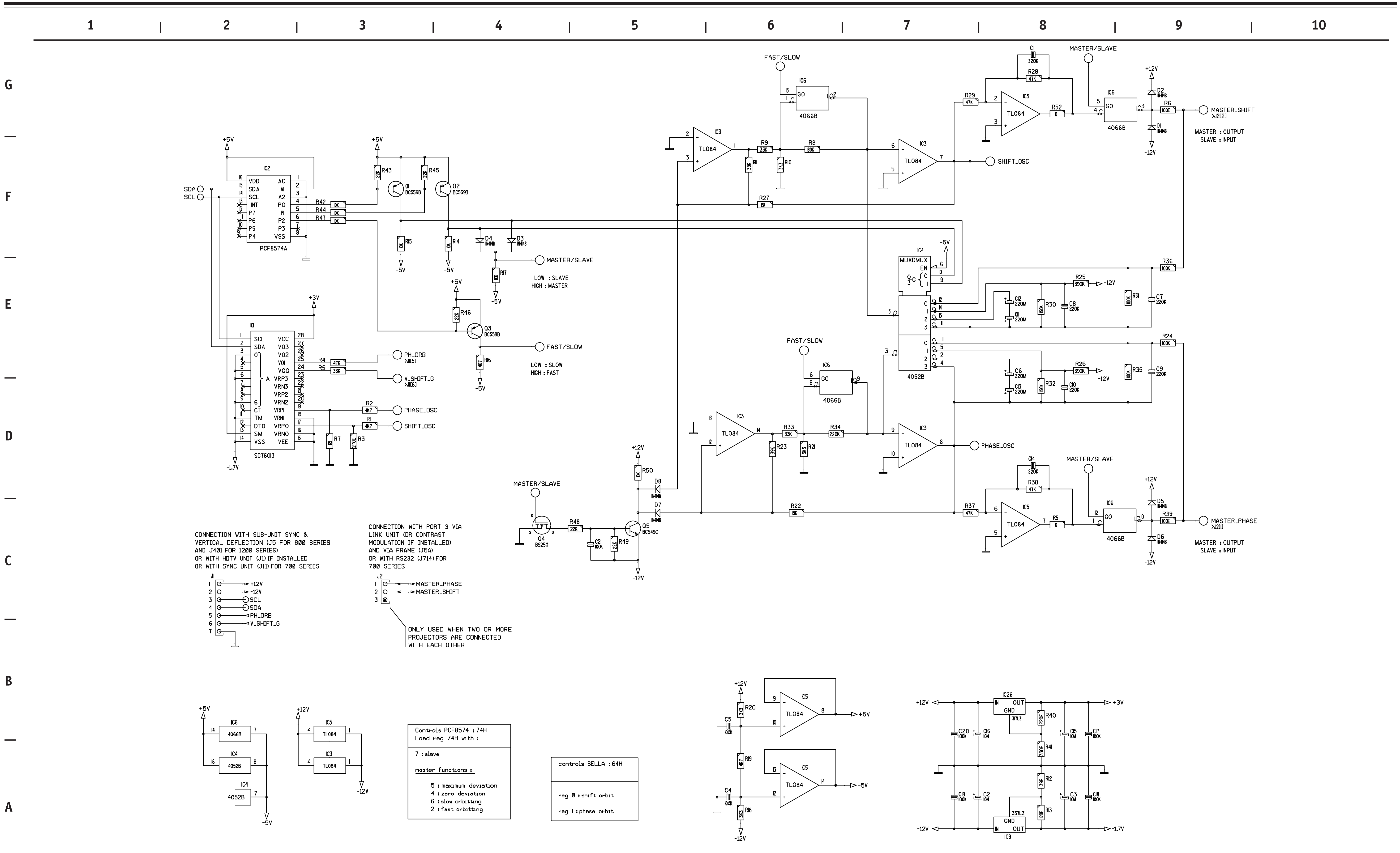


CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

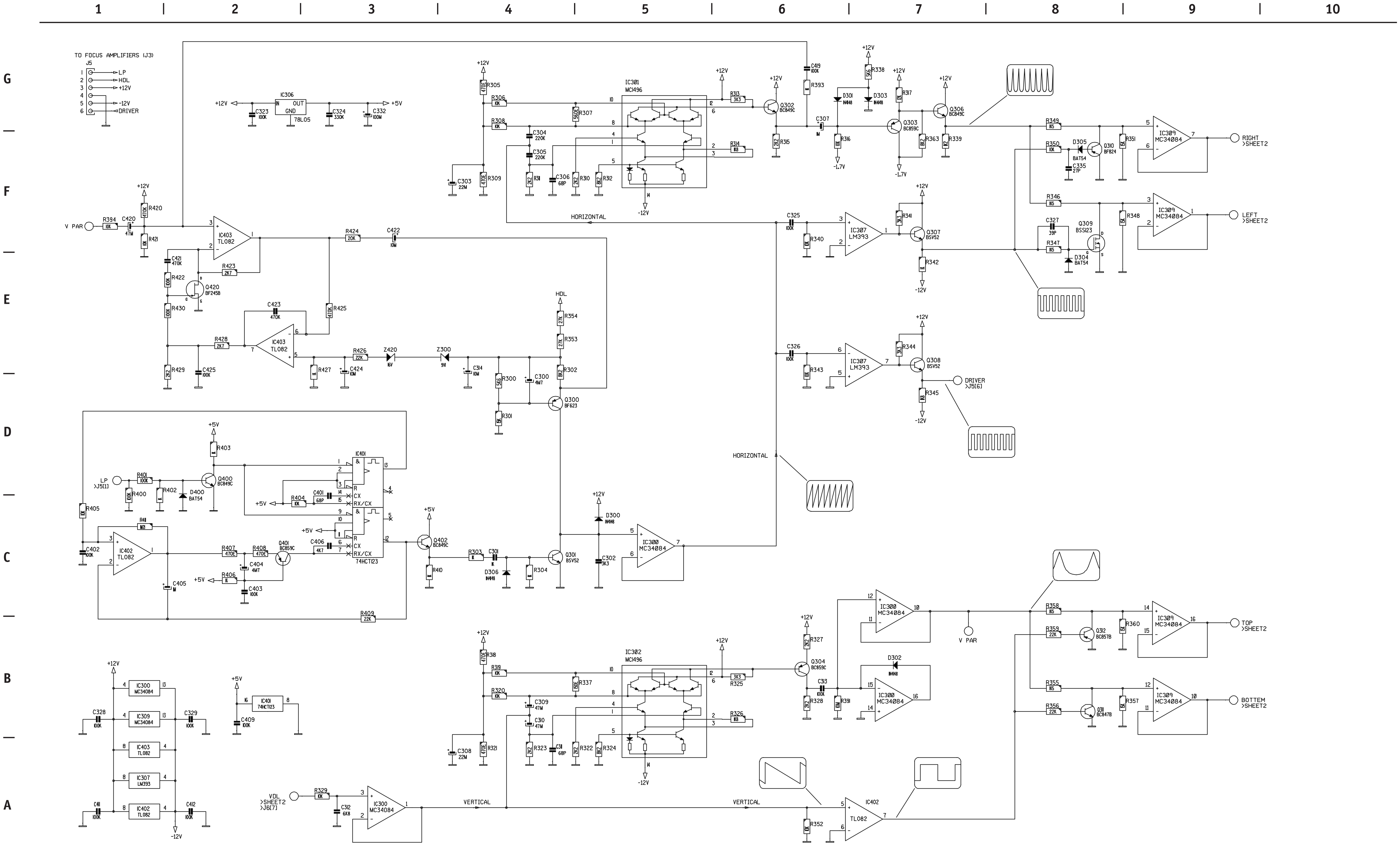
VERTICAL + SYNC SUB-UNIT 2/2



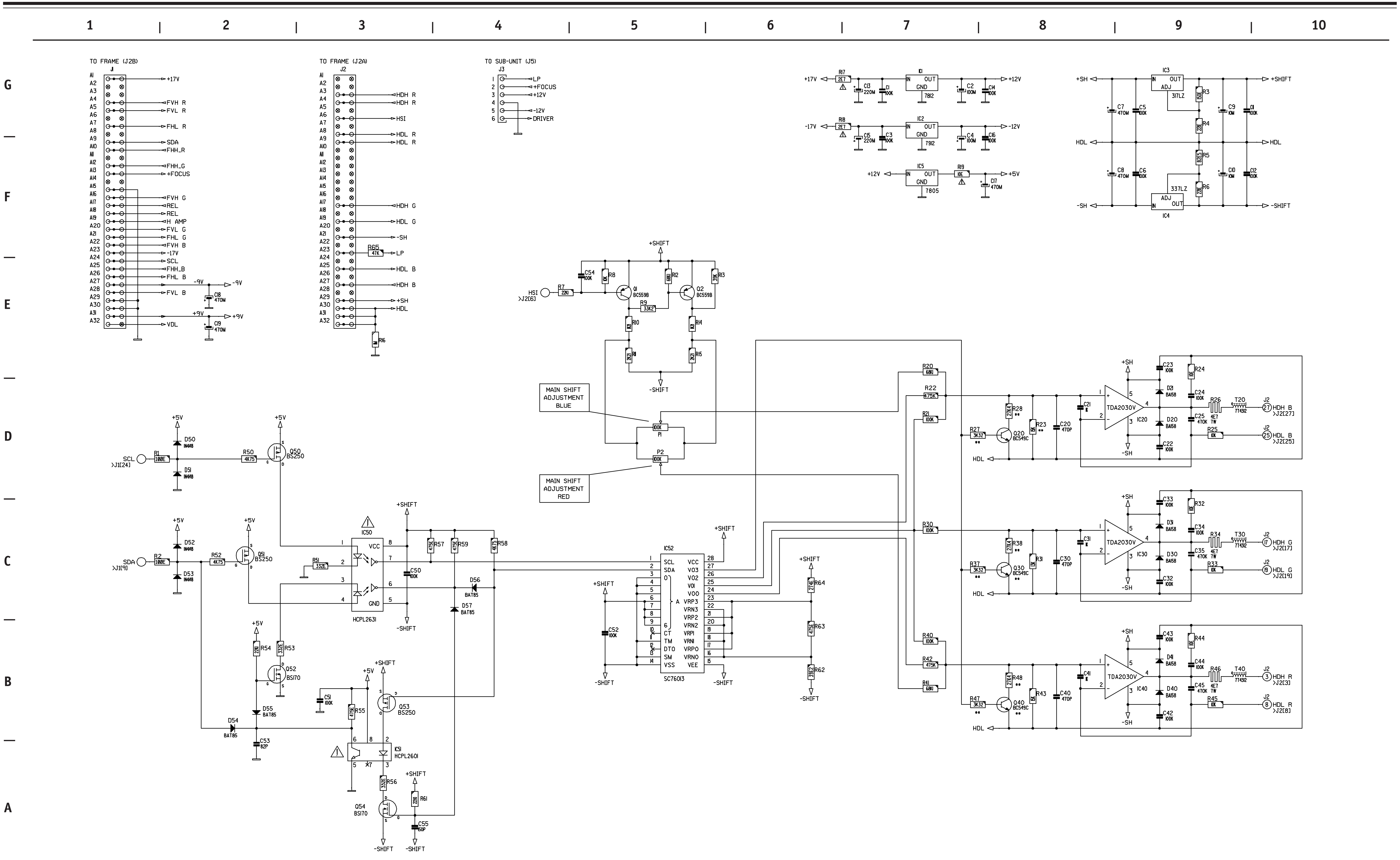
ORBITING UNIT



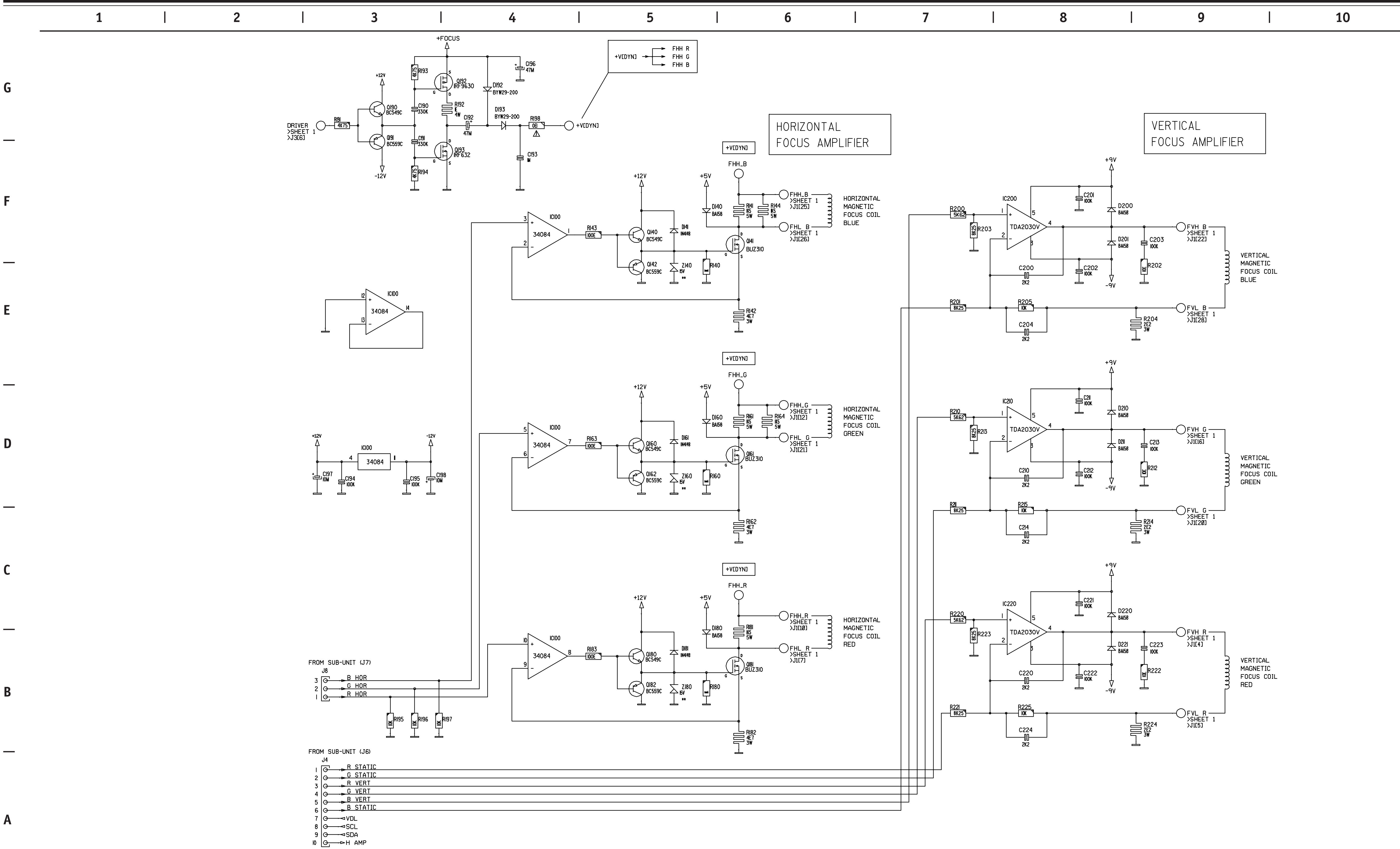
FOCUS & SHIFT 1/6



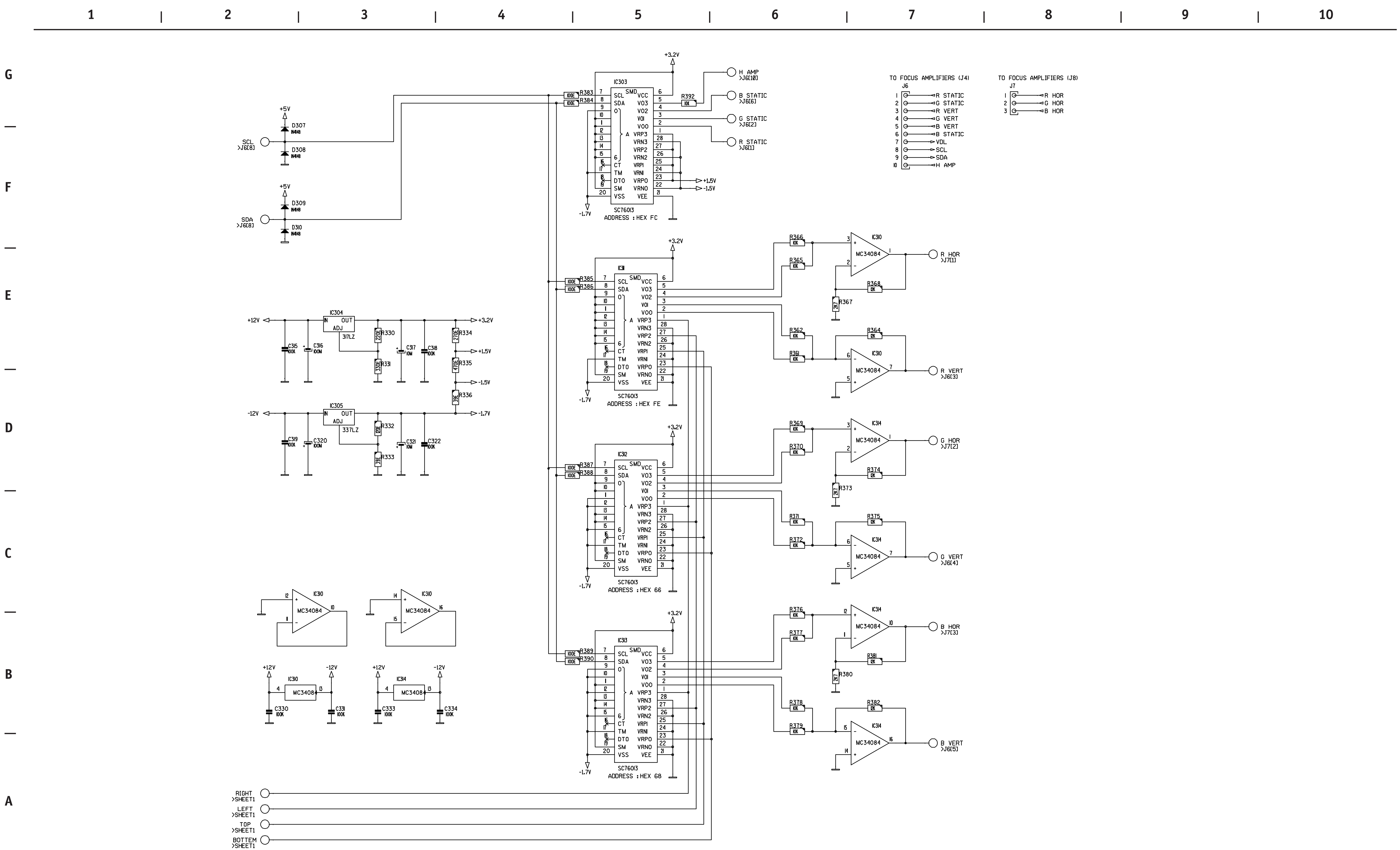
FOCUS & SHIFT 2/6



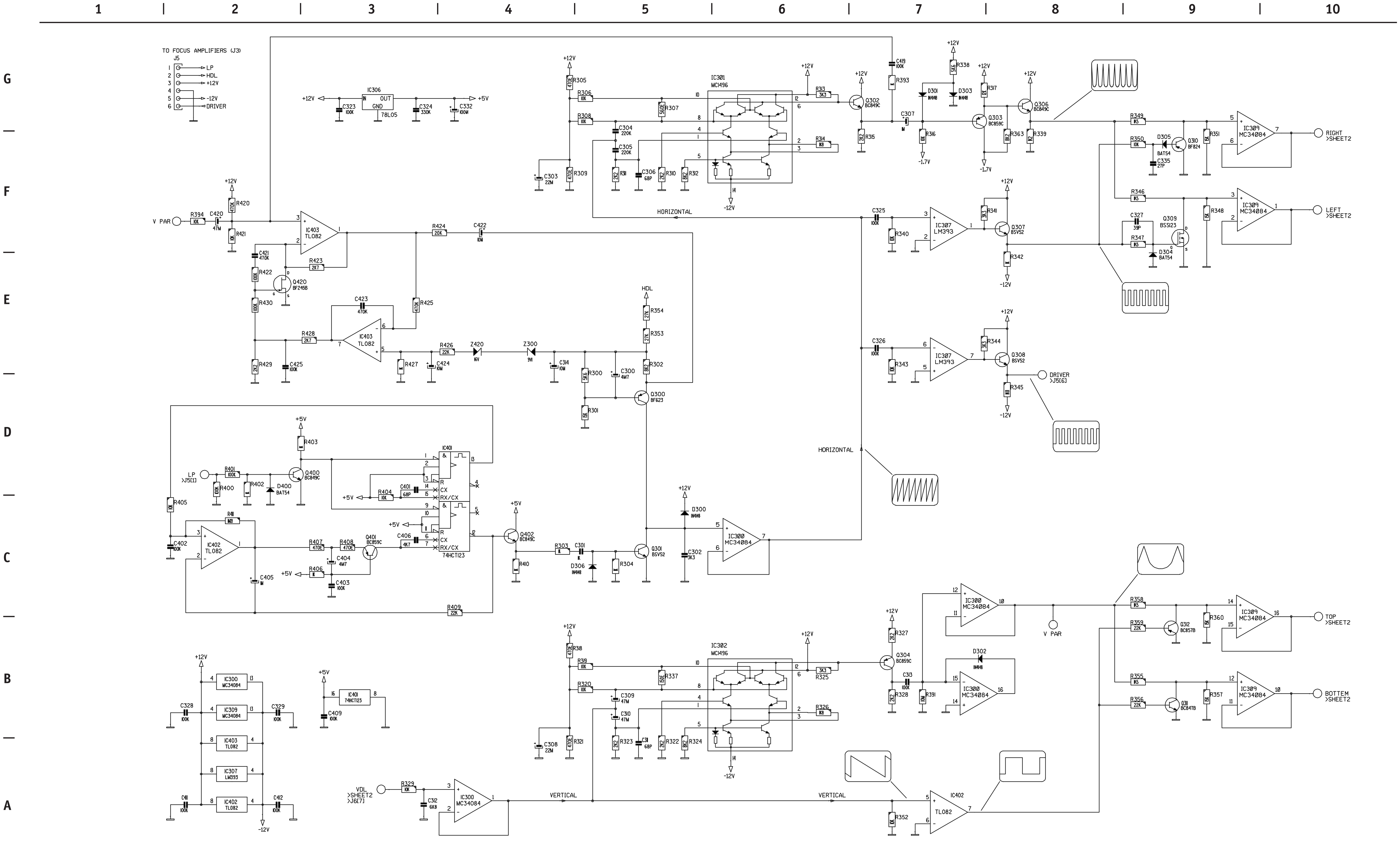
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✻. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.



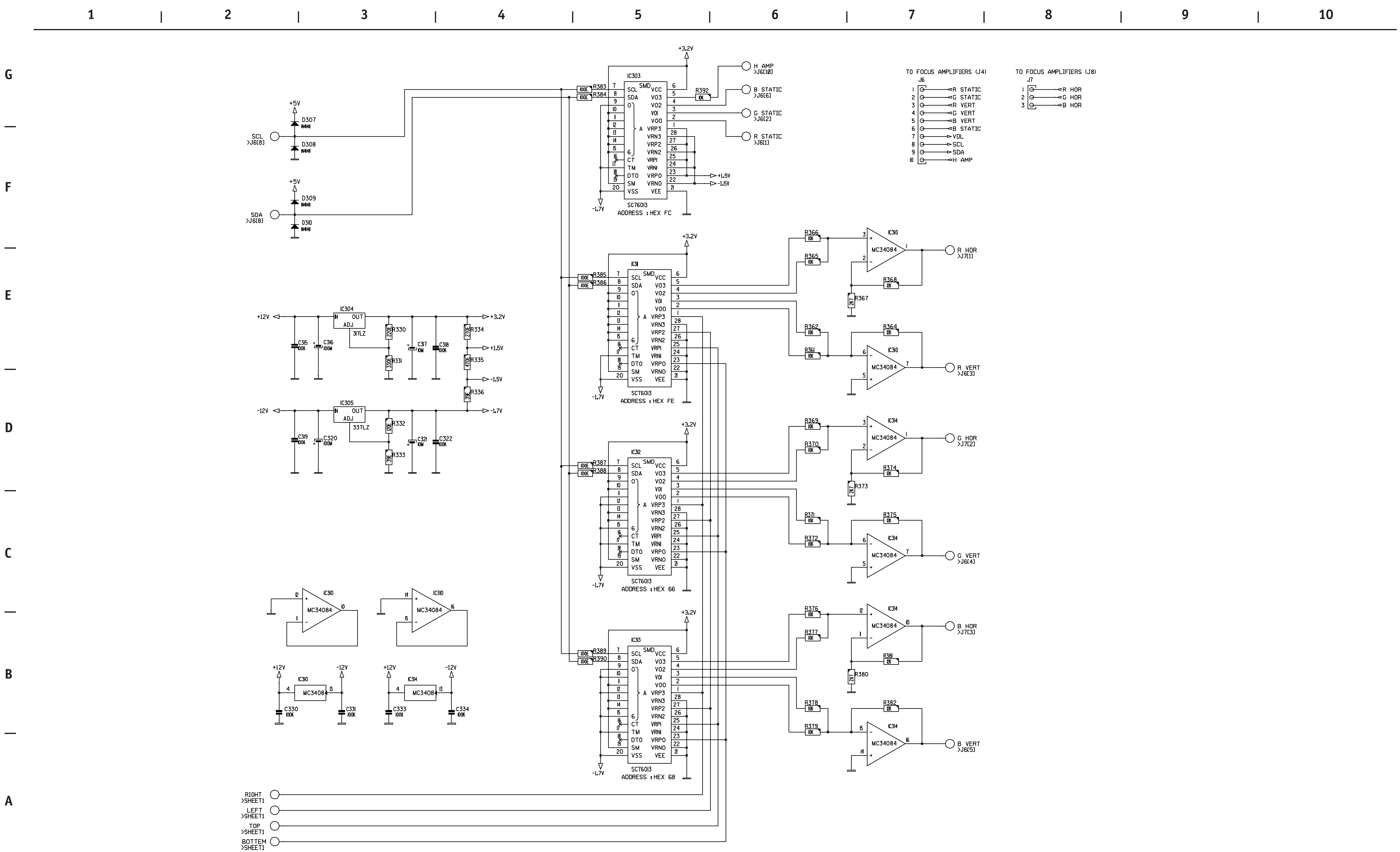
HORIZONTAL FOCUS AMPLIFIER
VERTICAL FOCUS AMPLIFIER
HORIZONTAL MAGNETIC FOCUS COIL BLUE
HORIZONTAL MAGNETIC FOCUS COIL GREEN
HORIZONTAL MAGNETIC FOCUS COIL RED
VERTICAL MAGNETIC FOCUS COIL BLUE
VERTICAL MAGNETIC FOCUS COIL GREEN
VERTICAL MAGNETIC FOCUS COIL RED
FROM SUB-UNIT (J7)
FROM SUB-UNIT (J6)
B HOR
G HOR
R HOR
R STATIC
G STATIC
R VERT
G VERT
B VERT
B STATIC
VDL
SCL
SDA
H AMP
+FOCUS
DRIVER >SHEET 1 >J3[6]
+V(DYN)
FHH R
FHH G
FHH B
34084
TDA2030V



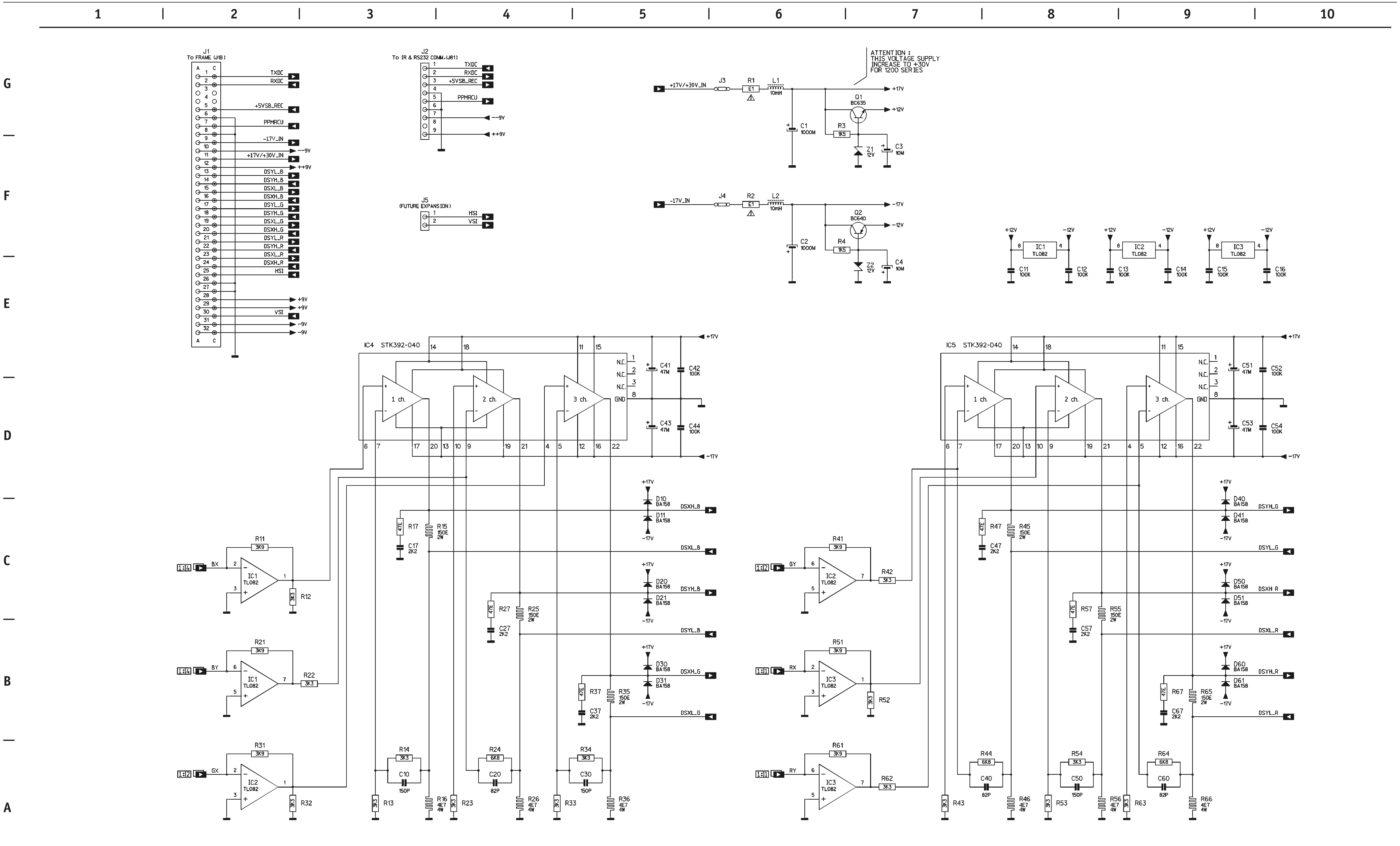
FOCUS & SHIFT 5/6



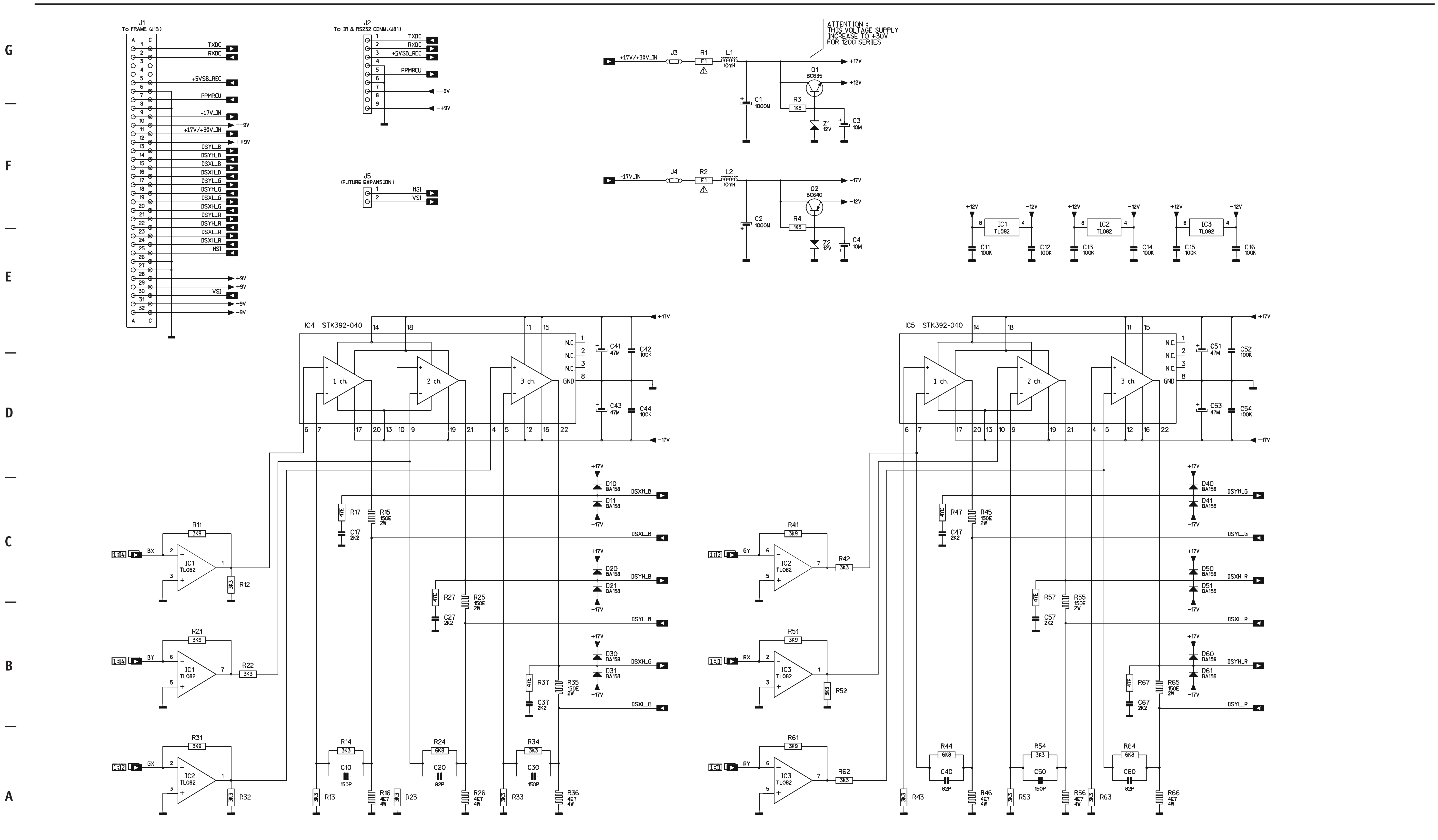
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.



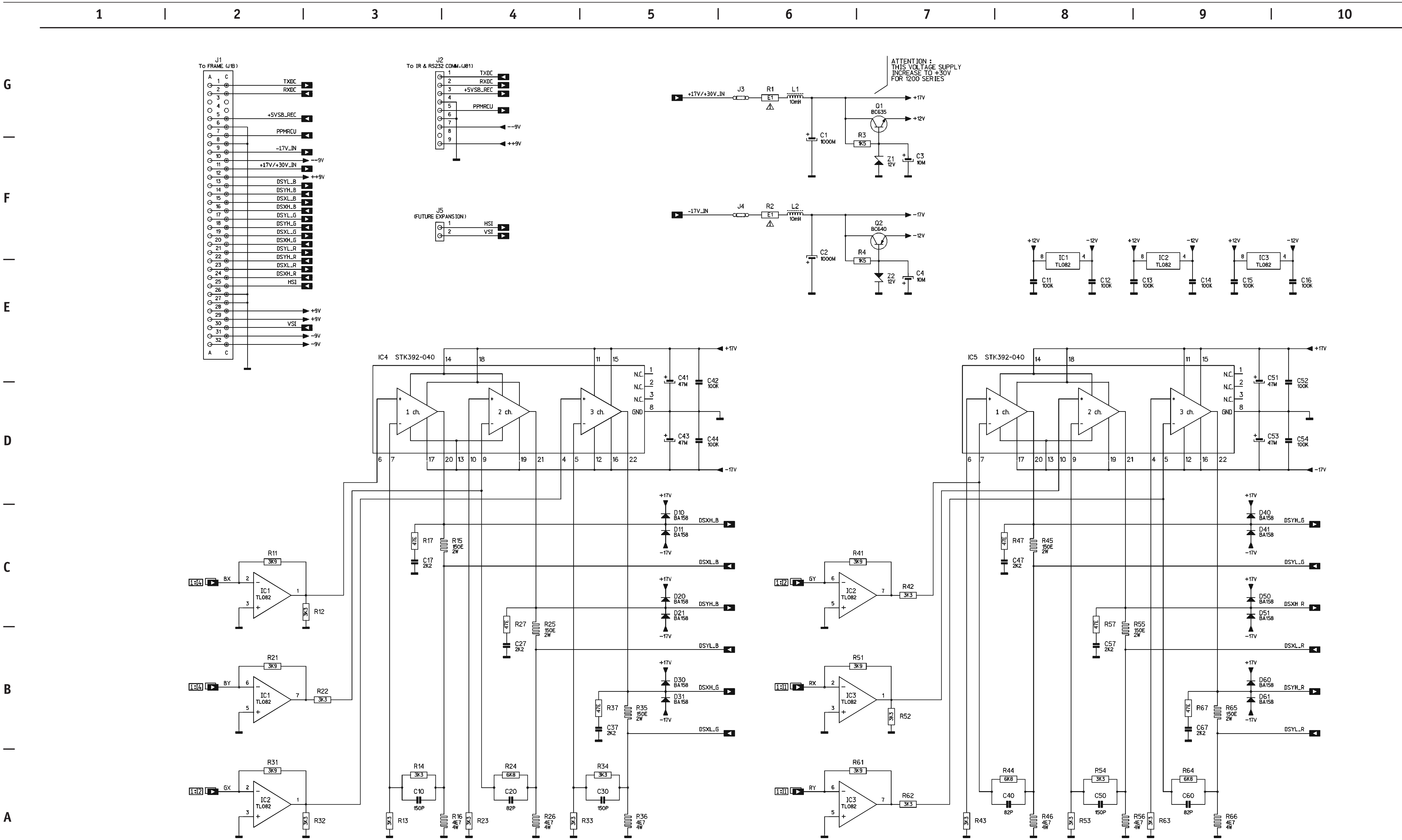
DYNAMIC ASTIGMATISM 1/4



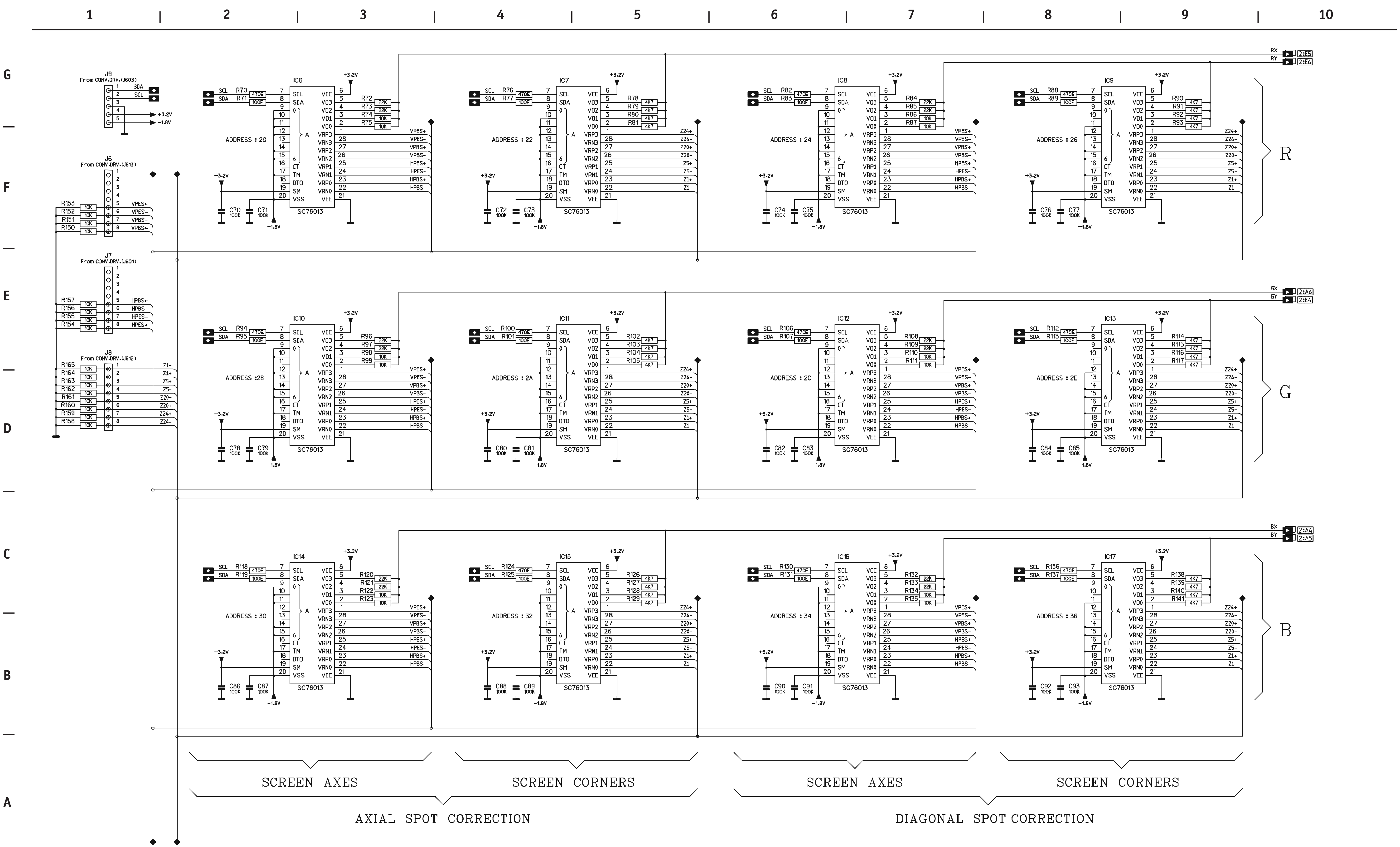
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.



1 2 3 4 5 6 7 8 9 10
G F E D C B A
J1
To FRAME (J18)
TXDC
RXDC
+5VSB_REC
PPMRCU
-17V_IN
+17V/+30V_IN
DSYL_B
DSYH_B
DSXL_B
DSXH_B
DSYL_G
DSYH_G
DSXL_G
DSXH_G
DSYL_R
DSYH_R
DSXL_R
DSXH_R
HSI
VSI
+9V
-9V
++9V
J2
To IR & RS232 COMM.(J81)
J5
(FUTURE EXPANSION)
ATTENTION :
THIS VOLTAGE SUPPLY
INCREASE TO +30V
FOR 1200 SERIES
+17V/+30V_IN
J3
R1
E1
L1
10mH
C1
1000M
Q1
BC635
R3
1K5
Z1
12V
C3
10M
+17V
+12V
-17V_IN
J4
R2
L2
C2
Q2
BC640
R4
Z2
C4
-17V
-12V
IC1 TL082
IC2 TL082
IC3 TL082
C11 100K
C12 100K
C13 100K
C14 100K
C15 100K
C16 100K
IC4 STK392-040
IC5 STK392-040
1 ch.
2 ch.
3 ch.
N.C.
GND
C41 47M
C42 100K
C43 47M
C44 100K
C51 47M
C52 100K
C53 47M
C54 100K
BX
BY
GX
GY
RX
RY
R11 3K9
R12 3K3
R21 3K9
R22 3K3
R31 3K9
R32 3K3
R41 3K9
R42 3K3
R51 3K9
R52 3K3
R61 3K9
R62 3K3
R17 47E
C17 2K2
R15 150E 2W
R27
C27 2K2
R25 150E 2W
R37
C37 2K2
R35 150E 2W
R47
C47 2K2
R45 150E 2W
R57
C57 2K2
R55 150E 2W
R67
C67 2K2
R65 150E 2W
D10 BA158
D11 BA158
D20 BA158
D21 BA158
D30 BA158
D31 BA158
D40 BA158
D41 BA158
D50 BA158
D51 BA158
D60 BA158
D61 BA158
R14 3K3
C10 150P
R24 6K8
C20 82P
R34 3K3
C30 150P
R44 6K8
C40 82P
R54 3K3
C50 150P
R64 6K8
C60 82P
R13
R16 4E7 4W
R23
R26 4E7 4W
R33
R36 4E7 4W
R43
R46 4E7 4W
R53
R56 4E7 4W
R63
R66 4E7 4W

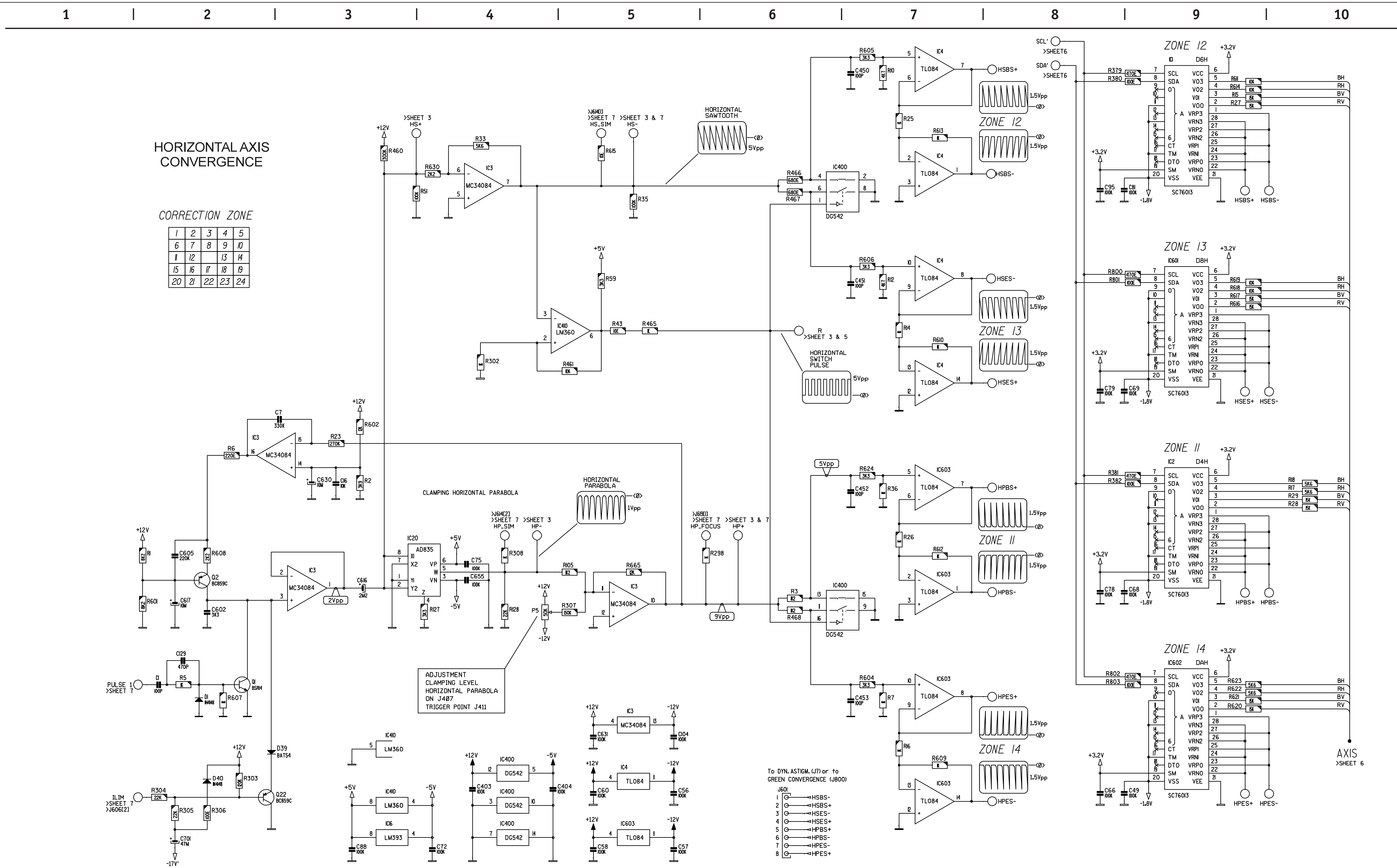


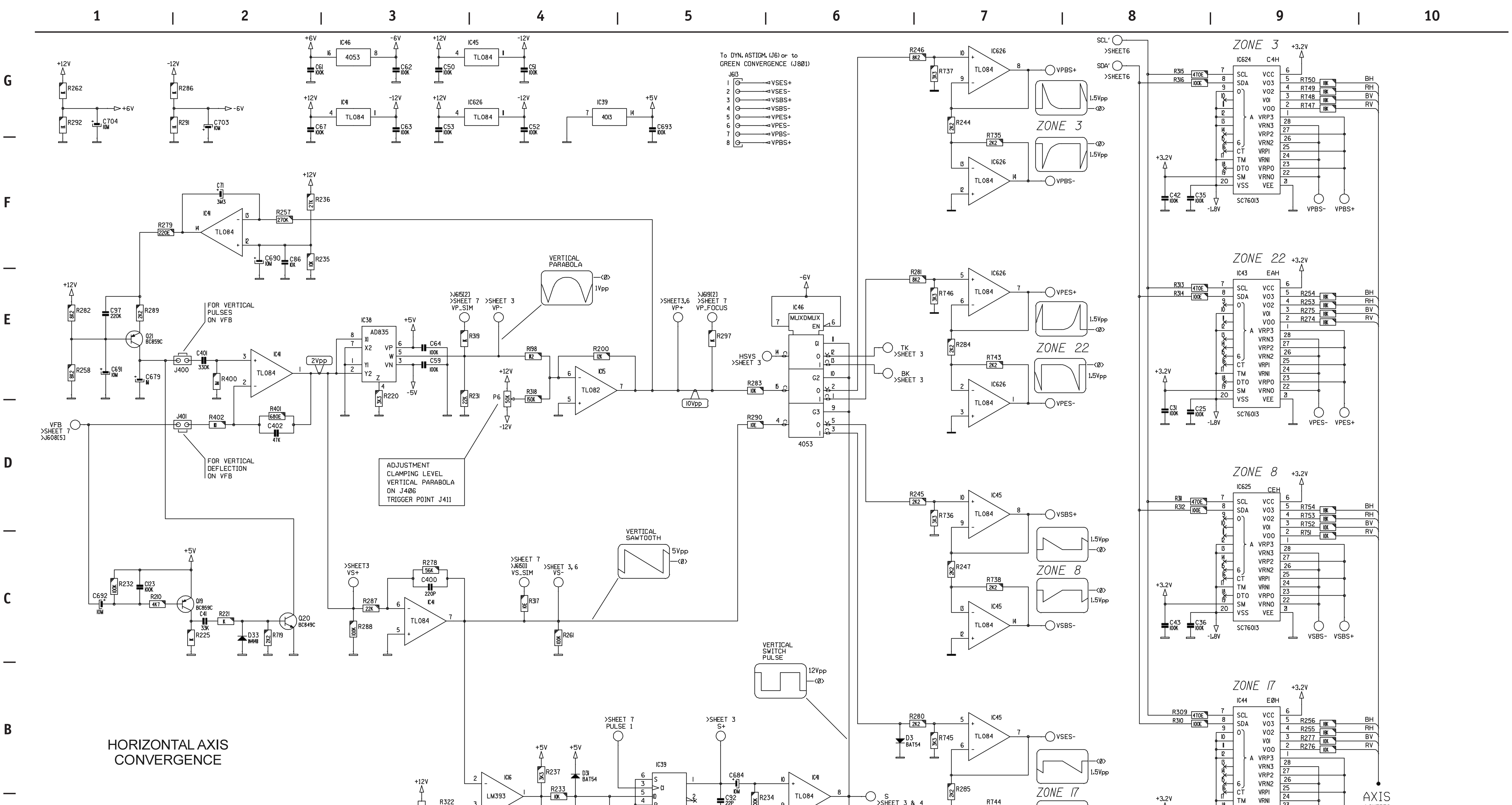
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.



1
2
3
4
5
6
7
8
9
10
G
F
E
D
C
B
A
J9 From CONV.DRV.(J603)
J6 From CONV.DRV.(J613)
J7 From CONV.DRV.(J601)
J8 From CONV.DRV.(J612)
IC6
IC7
IC8
IC9
IC10
IC11
IC12
IC13
IC14
IC15
IC16
IC17
SC76013
ADDRESS : 20
ADDRESS : 22
ADDRESS : 24
ADDRESS : 26
ADDRESS :28
ADDRESS : 2A
ADDRESS : 2C
ADDRESS : 2E
ADDRESS : 30
ADDRESS : 32
ADDRESS : 34
ADDRESS : 36
R
G
B
SCREEN AXES
SCREEN CORNERS
SCREEN AXES
SCREEN CORNERS
AXIAL SPOT CORRECTION
DIAGONAL SPOT CORRECTION

CONVERGENCE DRIVER 1/7

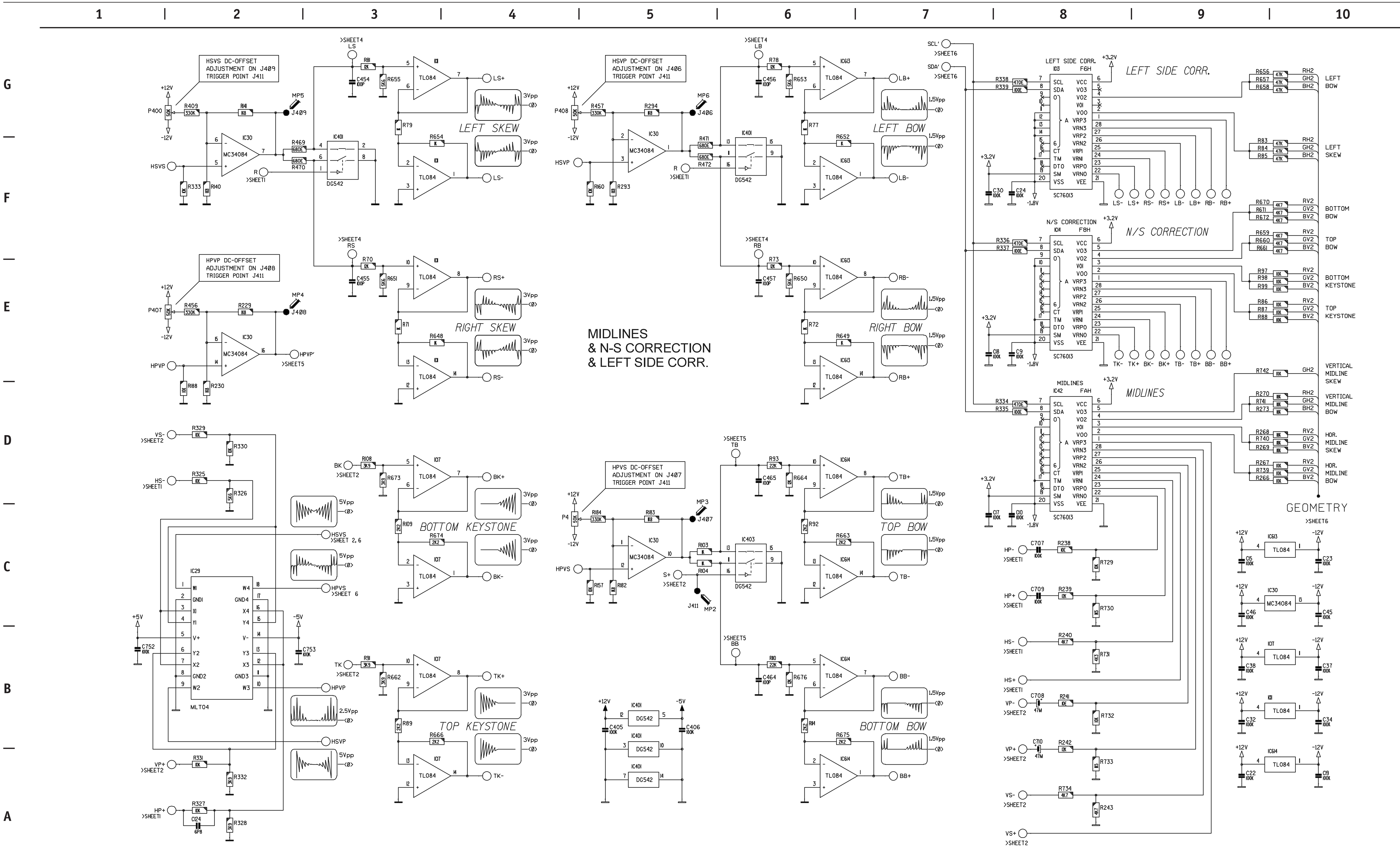




CORRECTION ZONE

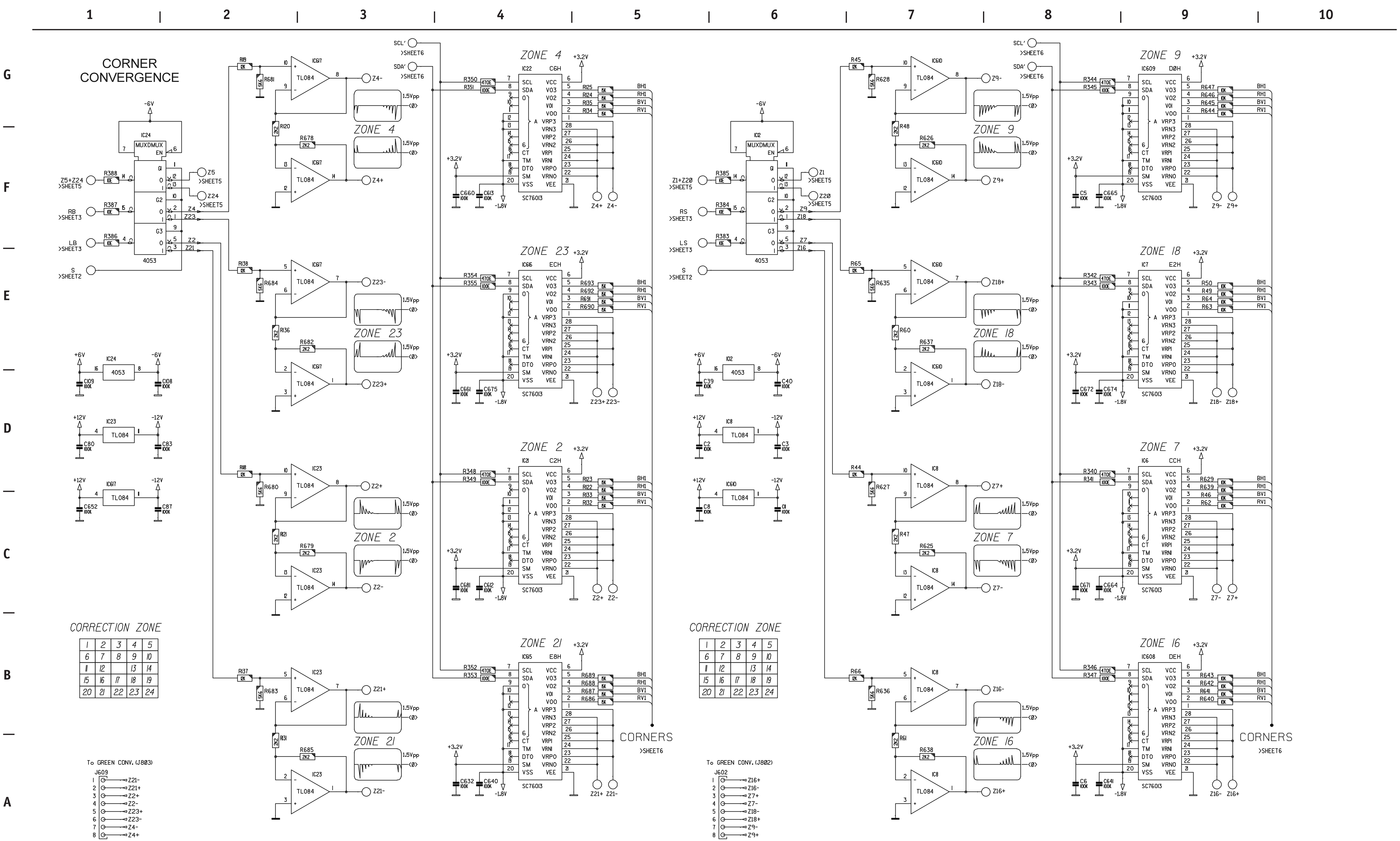
1	2	3	4	5
6	7	8	9	10
11	12		13	14
15	16	17	18	19
20	21	22	23	24

CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

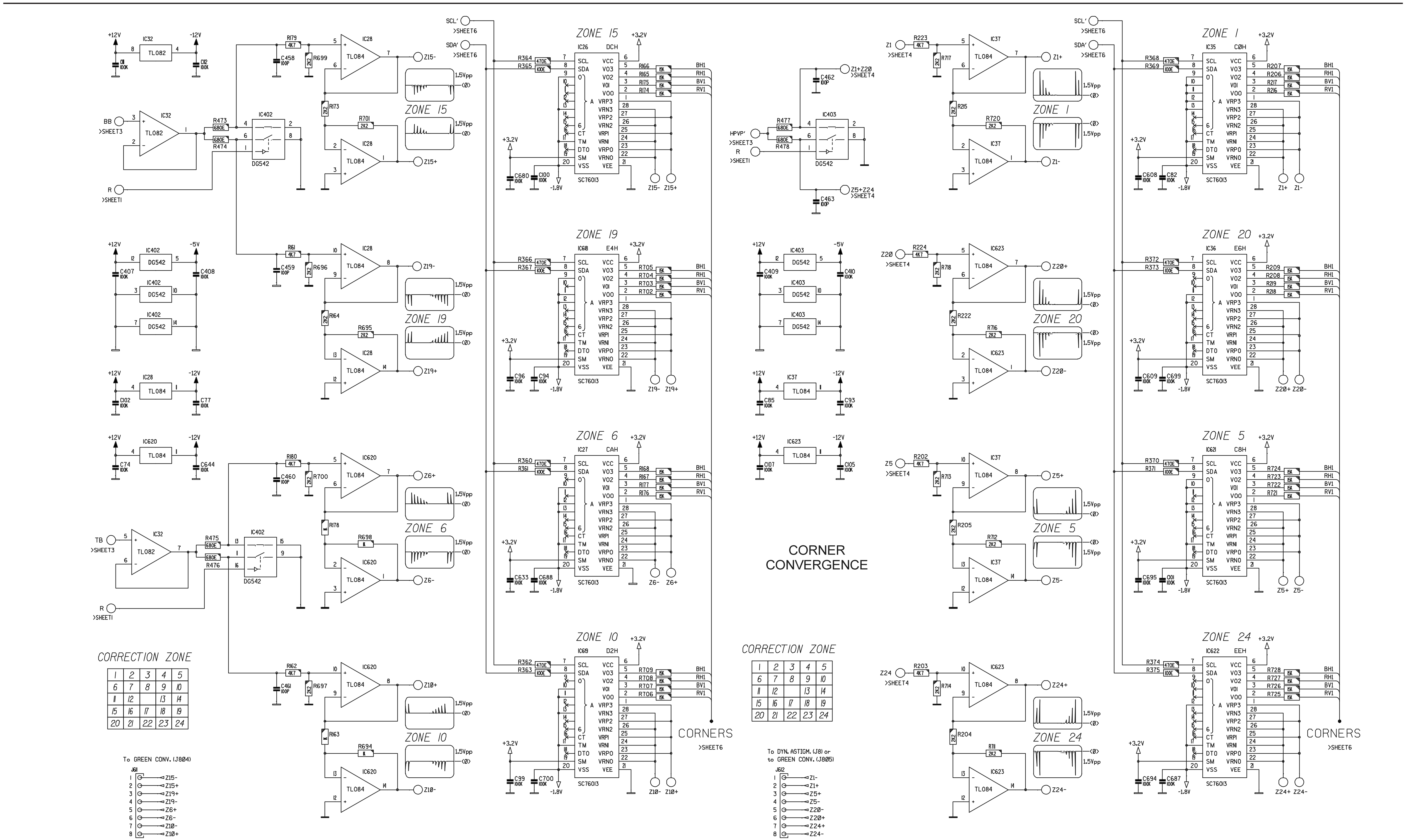


HSVS DC-OFFSET ADJUSTMENT ON J409 TRIGGER POINT J411
HPVP DC-OFFSET ADJUSTMENT ON J408 TRIGGER POINT J411
HSVP DC-OFFSET ADJUSTMENT ON J406 TRIGGER POINT J411
HPVS DC-OFFSET ADJUSTMENT ON J407 TRIGGER POINT J411
LEFT SKEW
RIGHT SKEW
BOTTOM KEYSTONE
TOP KEYSTONE
LEFT BOW
RIGHT BOW
TOP BOW
BOTTOM BOW
MIDLINES
& N-S CORRECTION
& LEFT SIDE CORR.
LEFT SIDE CORR.
N/S CORRECTION
MIDLINES
LEFT BOW
LEFT SKEW
BOTTOM BOW
TOP BOW
BOTTOM KEYSTONE
TOP KEYSTONE
VERTICAL MIDLINE SKEW
VERTICAL MIDLINE BOW
HOR. MIDLINE SKEW
HOR. MIDLINE BOW
GEOMETRY
>SHEET6

CONVERGENCE DRIVER 4/7



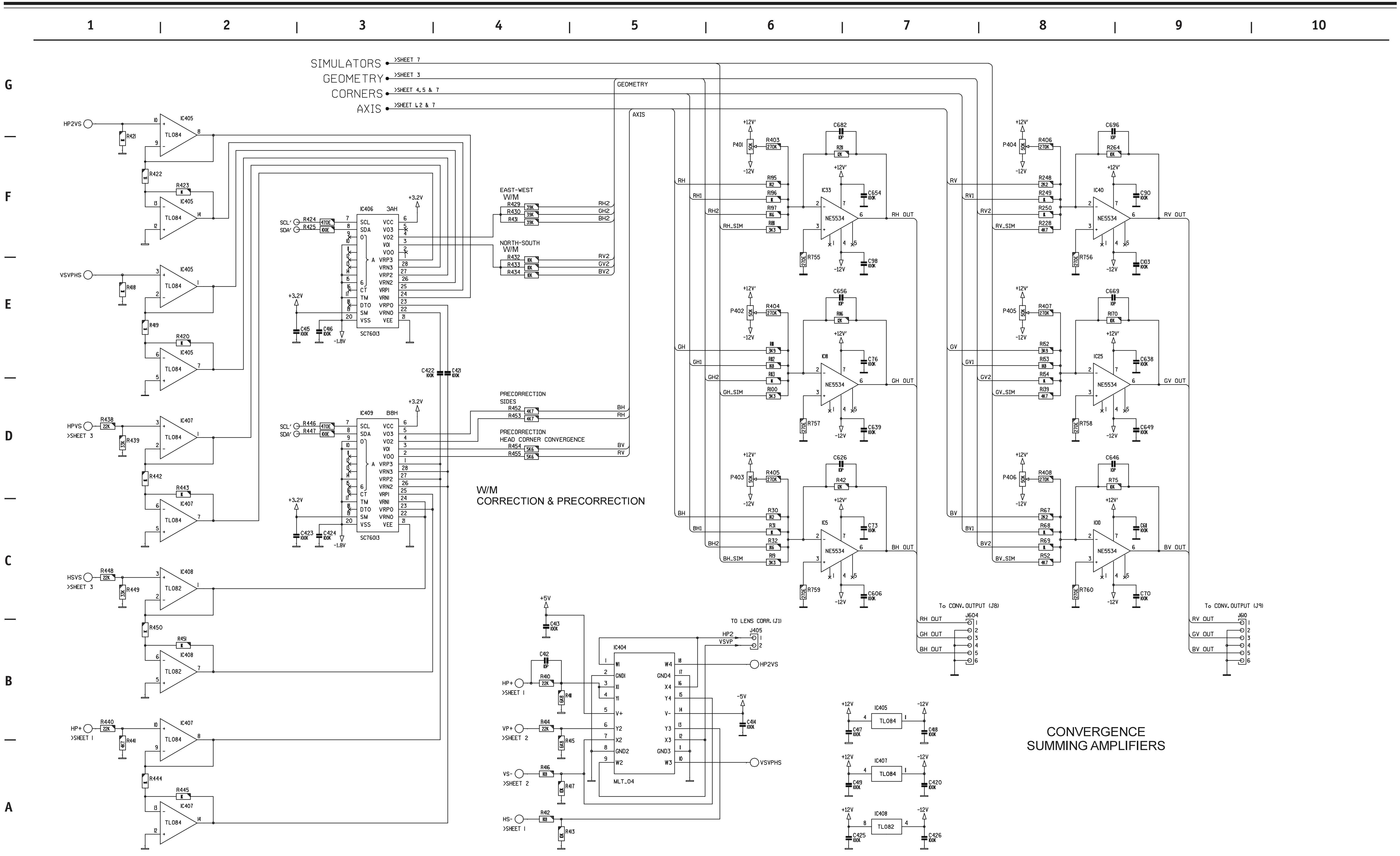
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

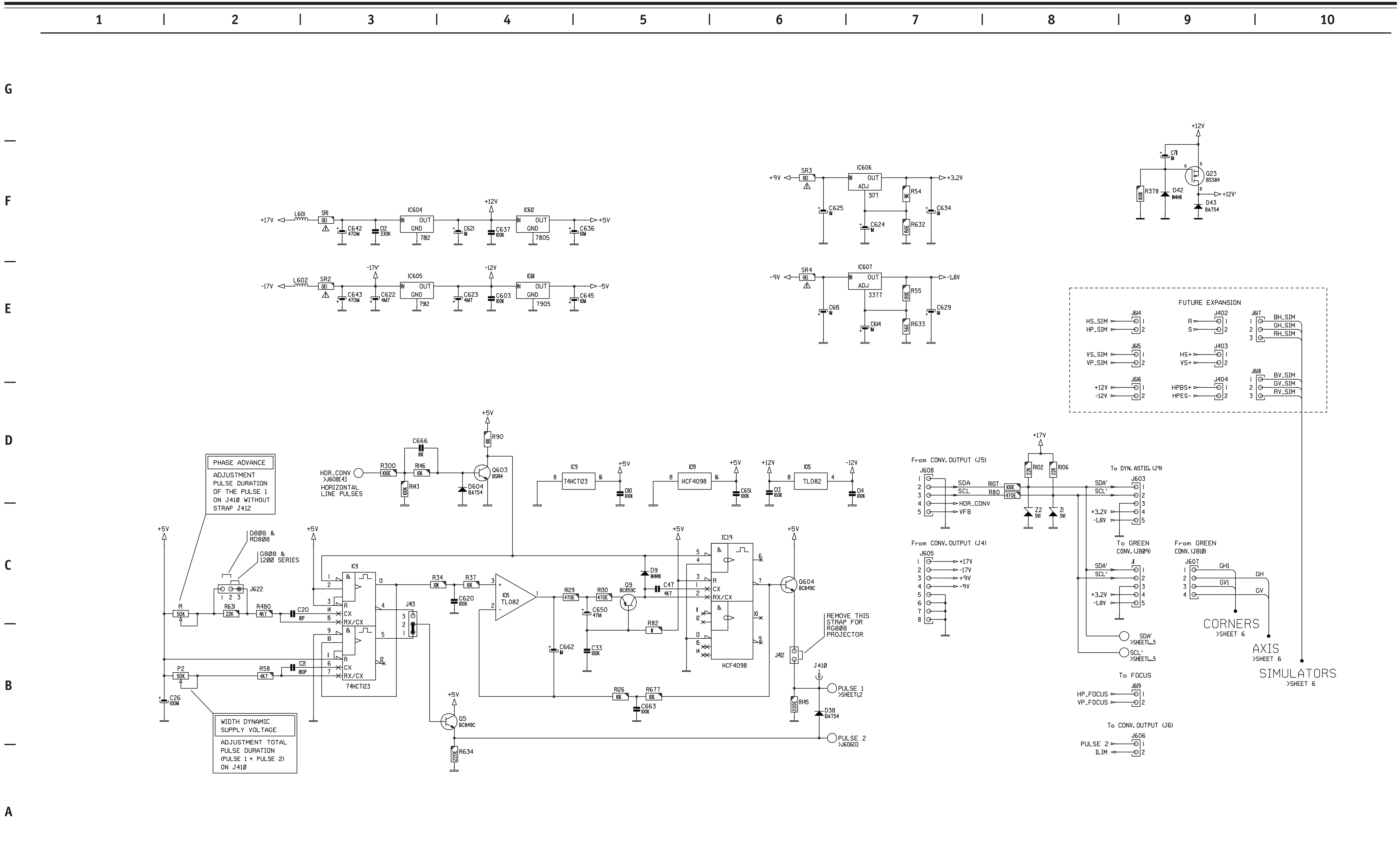


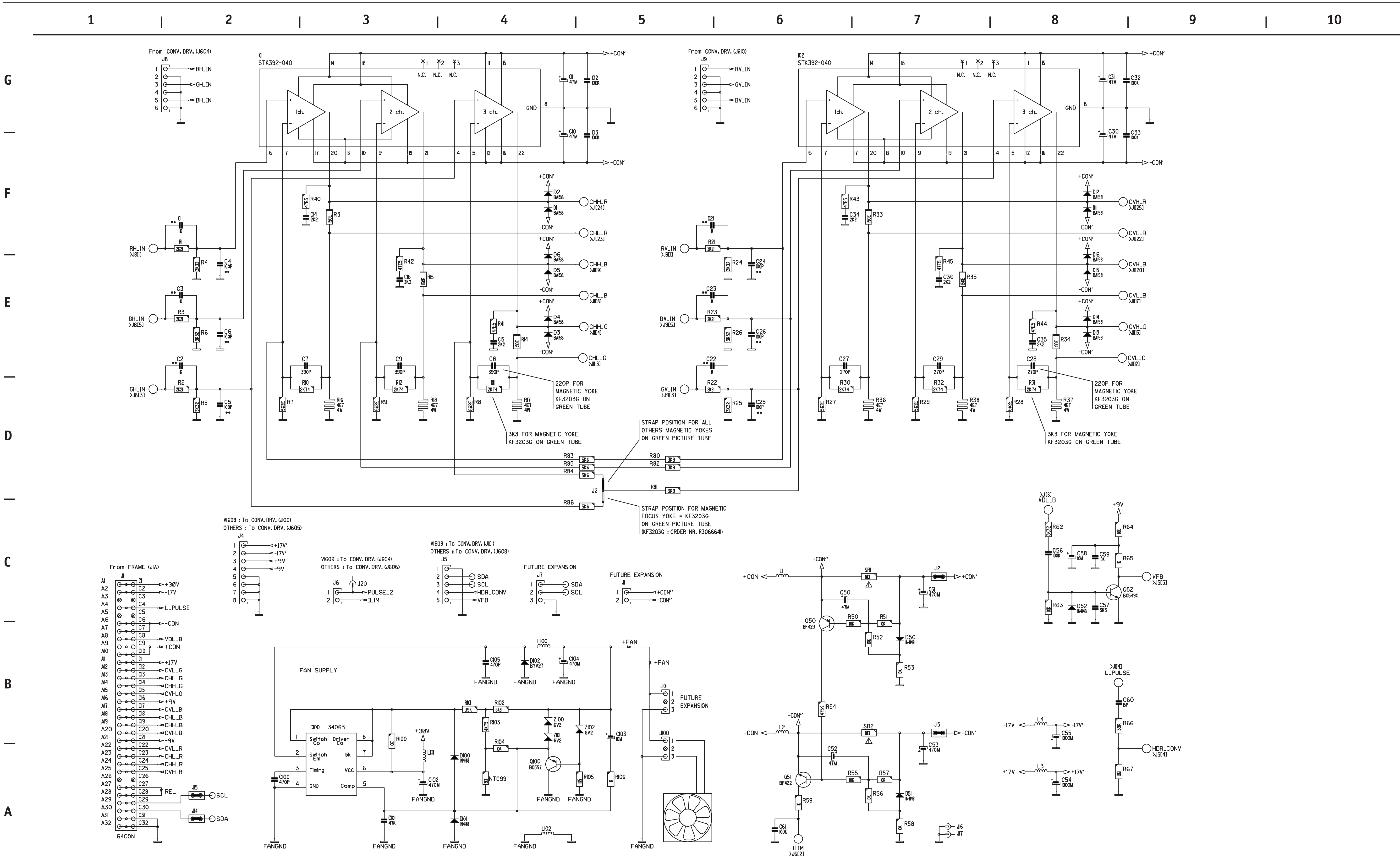
CORRECTION ZONE

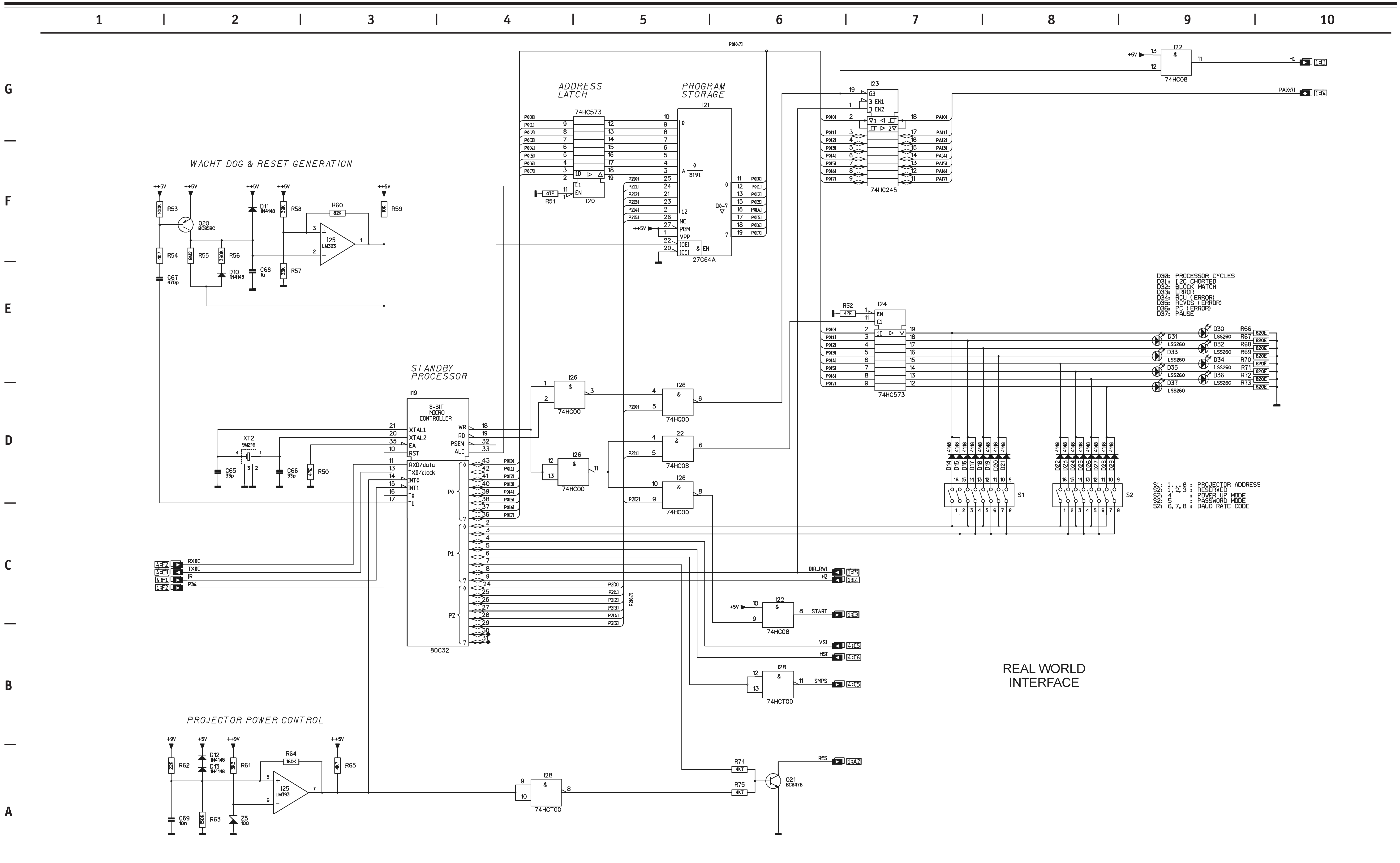
1	2	3	4	5
6	7	8	9	10
11	12		13	14
15	16	17	18	19
20	21	22	23	24

CONVERGENCE DRIVER 6/7

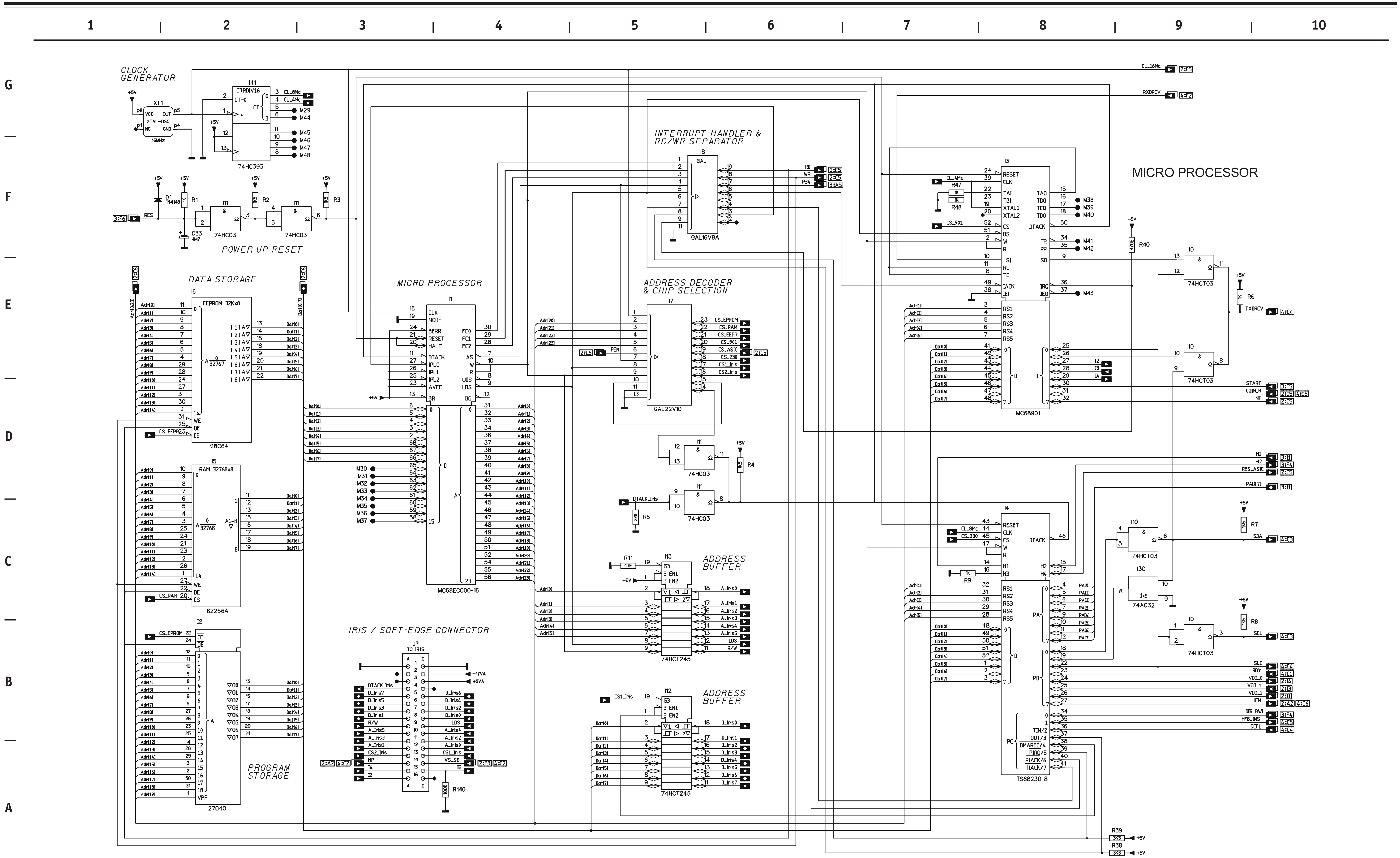



PHASE ADVANCE
ADJUSTMENT PULSE DURATION OF THE PULSE 1 ON J410 WITHOUT STRAP J412
WIDTH DYNAMIC SUPPLY VOLTAGE
ADJUSTMENT TOTAL PULSE DURATION (PULSE 1 + PULSE 2) ON J410
REMOVE THIS STRAP FOR RG808 PROJECTOR
HDR_CONV
HORIZONTAL LINE PULSES
FUTURE EXPANSION
From CONV. OUTPUT (J5)
From CONV. OUTPUT (J4)
To DYN. ASTIG. (J9)
To GREEN CONV. (J809)
From GREEN CONV. (J810)
To FOCUS
To CONV. OUTPUT (J6)
CORNERS
AXIS
SIMULATORS
PULSE 1
PULSE 2

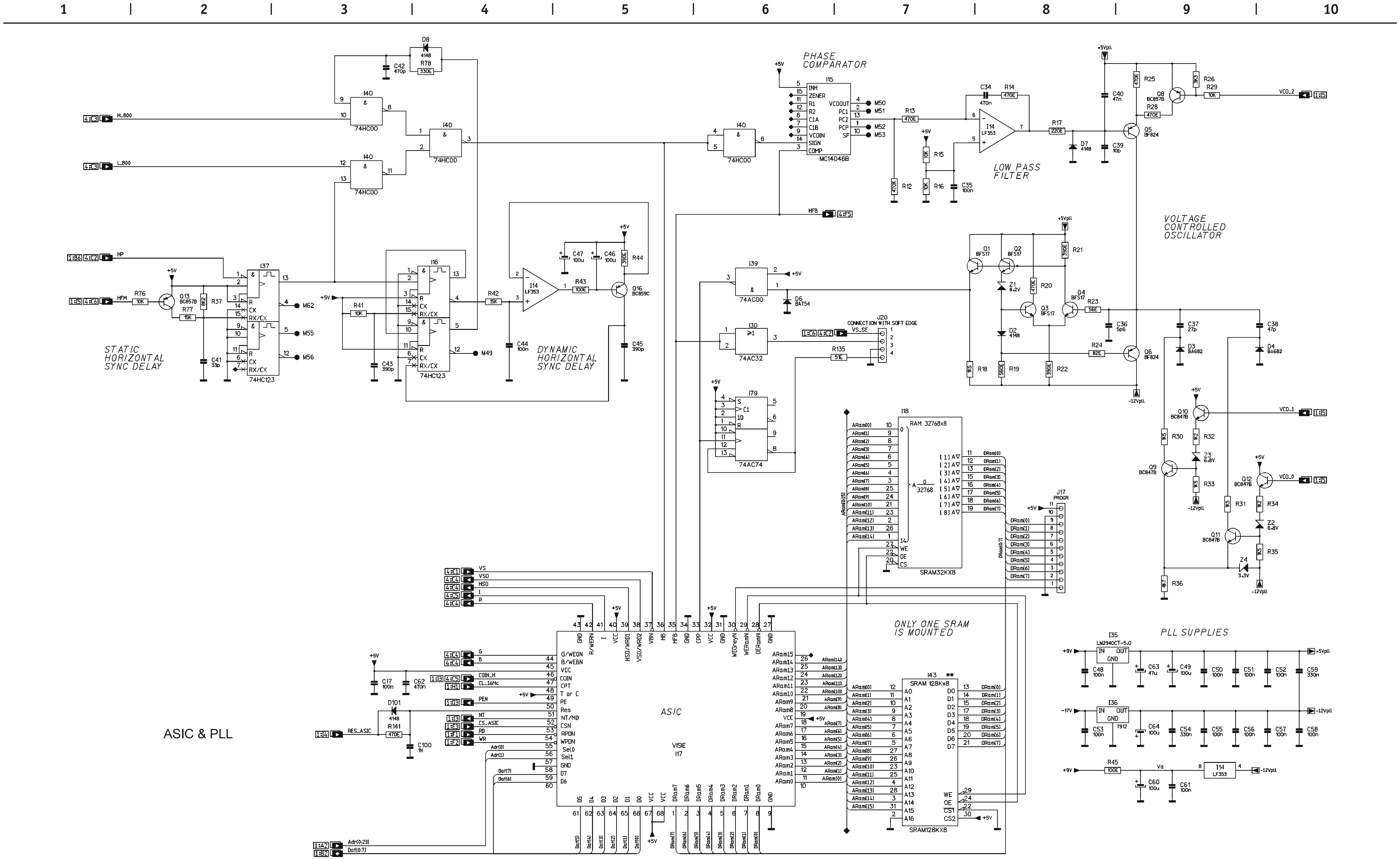

From CONV. DRV. (J604)
J8
RH_IN
GH_IN
BH_IN
IC1
STK392-040
N.C.
1ch.
2 ch.
3 ch.
GND
+CON'
-CON'
CHH_R
CHL_R
CHH_B
CHL_B
CHH_G
CHL_G
220P FOR MAGNETIC YOKE KF3203G ON GREEN TUBE
3K3 FOR MAGNETIC YOKE KF3203G ON GREEN TUBE
STRAP POSITION FOR ALL OTHERS MAGNETIC YOKES ON GREEN PICTURE TUBE
STRAP POSITION FOR MAGNETIC FOCUS YOKE = KF3203G ON GREEN PICTURE TUBE (KF3203G : ORDER NR. R3066641)
From CONV. DRV. (J610)
J9
RV_IN
GV_IN
BV_IN
IC2
STK392-040
CVH_R
CVL_R
CVH_B
CVL_B
CVH_G
CVL_G
220P FOR MAGNETIC YOKE KF3203G ON GREEN TUBE
3K3 FOR MAGNETIC YOKE KF3203G ON GREEN TUBE
From FRAME (J1A)
64CON
V1609 : To CONV. DRV. (J100)
OTHERS : To CONV. DRV. (J605)
V1609 : To CONV. DRV. (J604)
OTHERS : To CONV. DRV. (J606)
V1609 : To CONV. DRV. (J101)
OTHERS : To CONV. DRV. (J608)
FUTURE EXPANSION
PULSE_2
ILIM
SDA
SCL
HDR_CONV
VFB
FAN SUPPLY
IC100 34063
FANGND
NTC99
+FAN
FUTURE EXPANSION
VDL_B
L_PULSE



WACHT DOG & RESET GENERATION
ADDRESS LATCH
PROGRAM STORAGE
STANDBY PROCESSOR
PROJECTOR POWER CONTROL
REAL WORLD INTERFACE
D30: PROCESSOR CYCLES
D31: I2C CHORTED
D32: BLOCK MATCH
D33: ERROR
D34: RCU (ERROR)
D35: RCVDS (ERROR)
D36: PC (ERROR)
D37: PAUSE
S1: 1..8 : PROJECTOR ADDRESS
S2: 1,2,3 : RESERVED
S2: 4 : POWER UP MODE
S2: 5 : PASSWORD MODE
S2: 6,7,8 : BAUD RATE CODE
80C32
74HC573
27C64A
74HC245

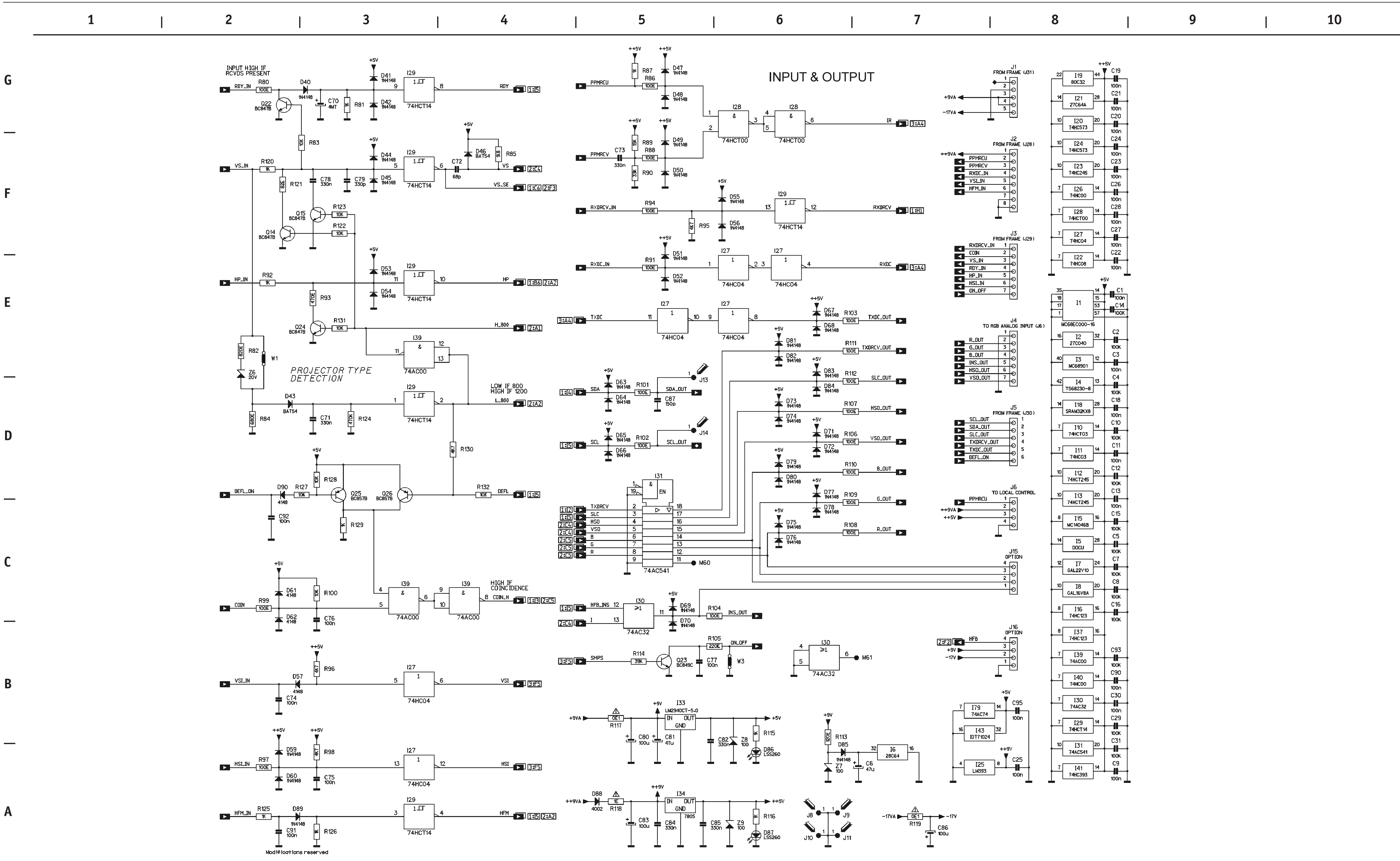


CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

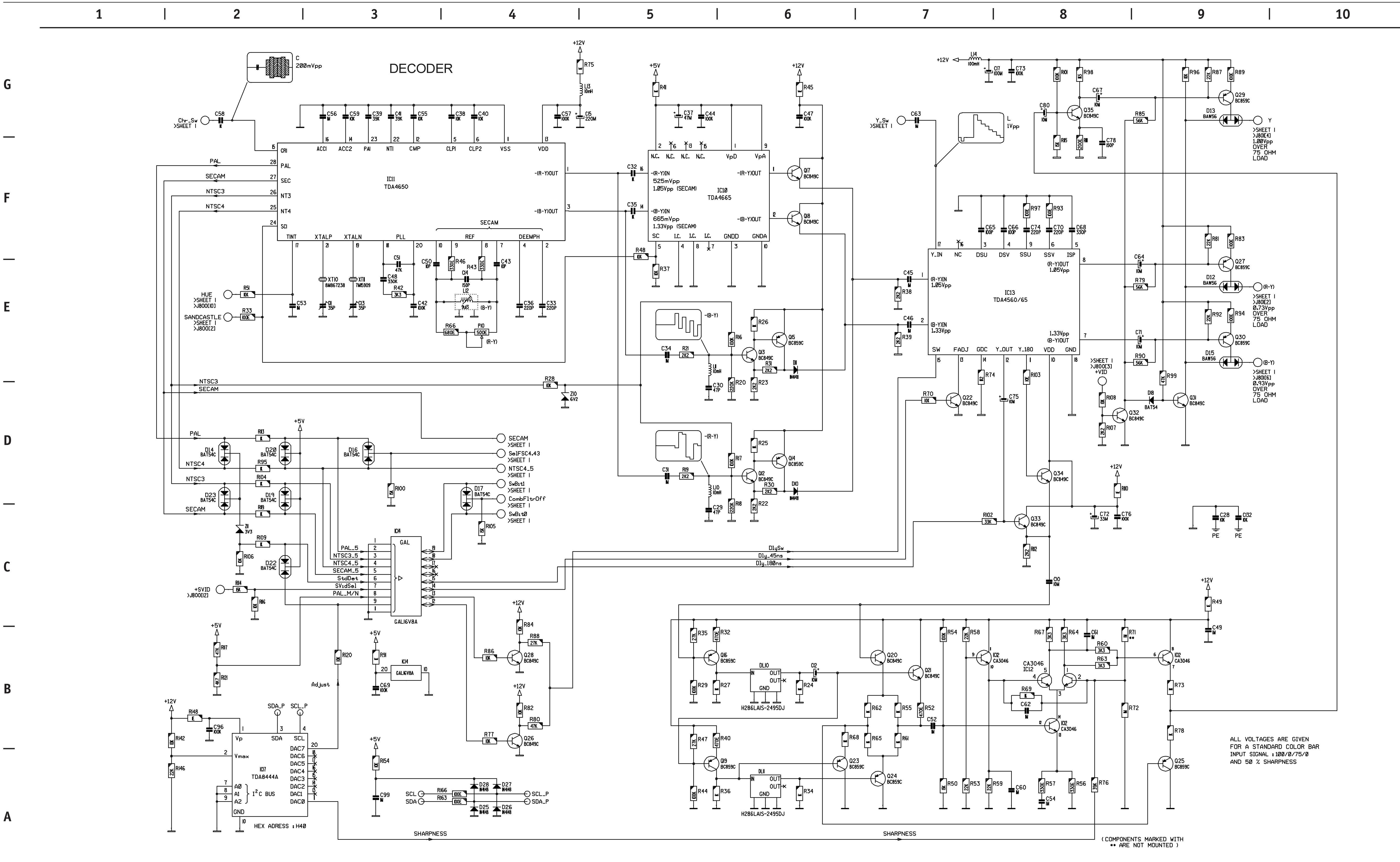


CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

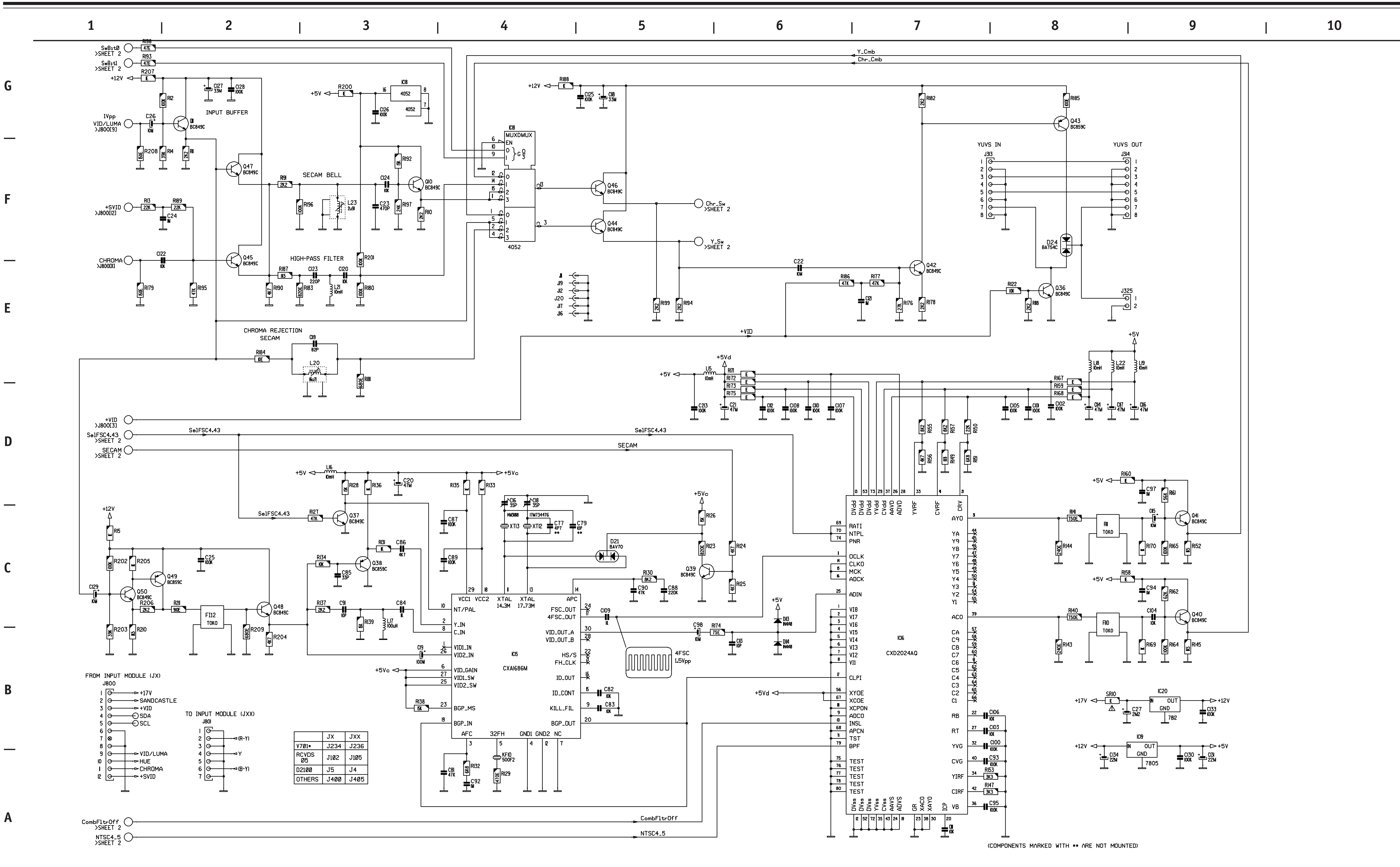
CONTROLLER 4/4



CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

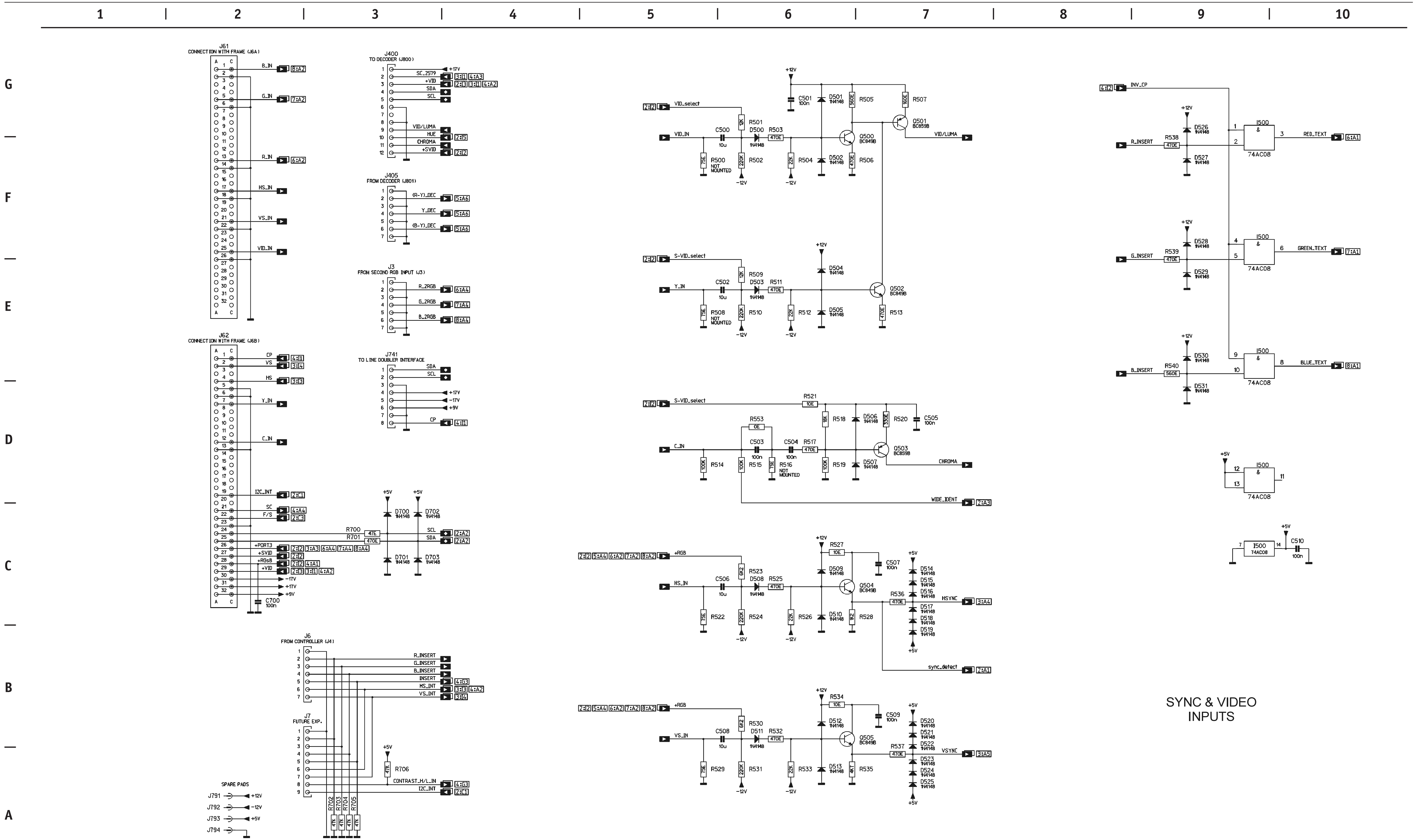

DECODER
IC11 TDA4650
IC10 TDA4665
IC13 TDA4560/65
IC14 GAL16V8A
IC7 TDA8444A
HEX ADRESS : H40
I²C BUS
DL10 H286LAIS-2495DJ
DL11 H286LAIS-2495DJ
CA3046 IC12
SHARPNESS
ALL VOLTAGES ARE GIVEN
FOR A STANDARD COLOR BAR
INPUT SIGNAL :100/0/75/0
AND 50 % SHARPNESS
(COMPONENTS MARKED WITH
** ARE NOT MOUNTED)

DECODER & COMB FILTER 2/2

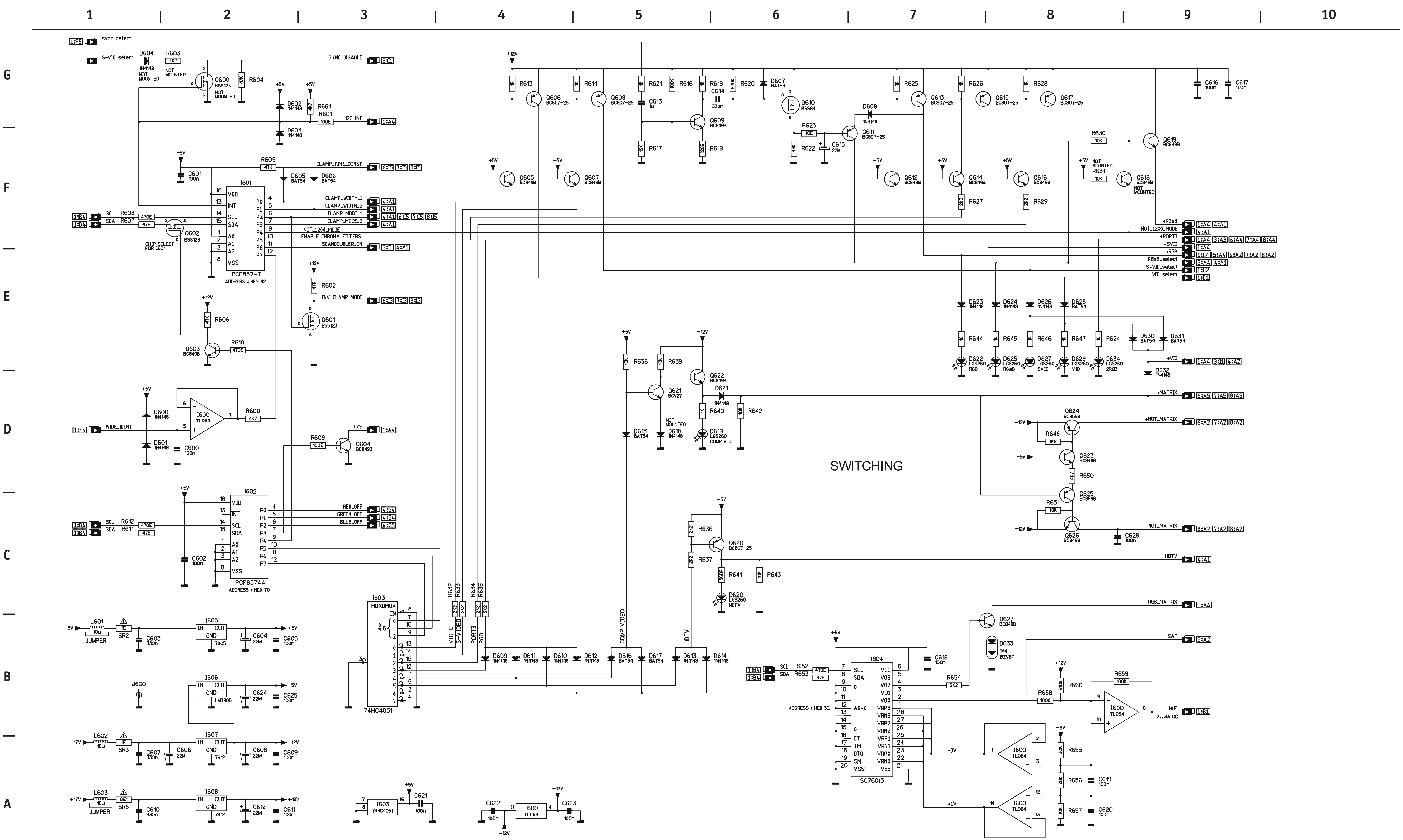


	JX	JXX
V701*	J234	J236
RCVDS 05	J102	J105
D2100	J5	J4
OTHERS	J400	J405

RGB INPUT & SWITCHING 1/8

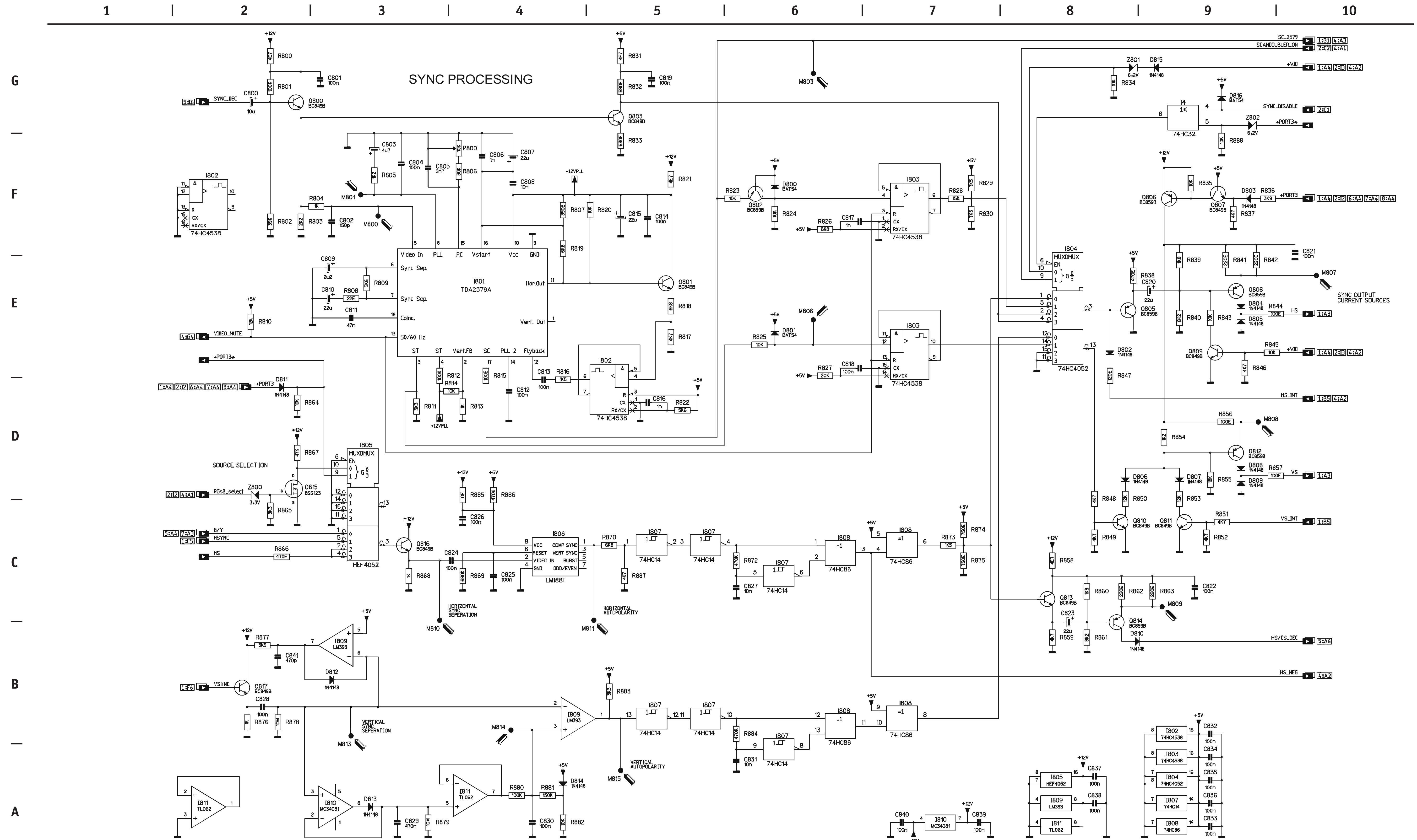


RGB INPUT & SWITCHING 2/8

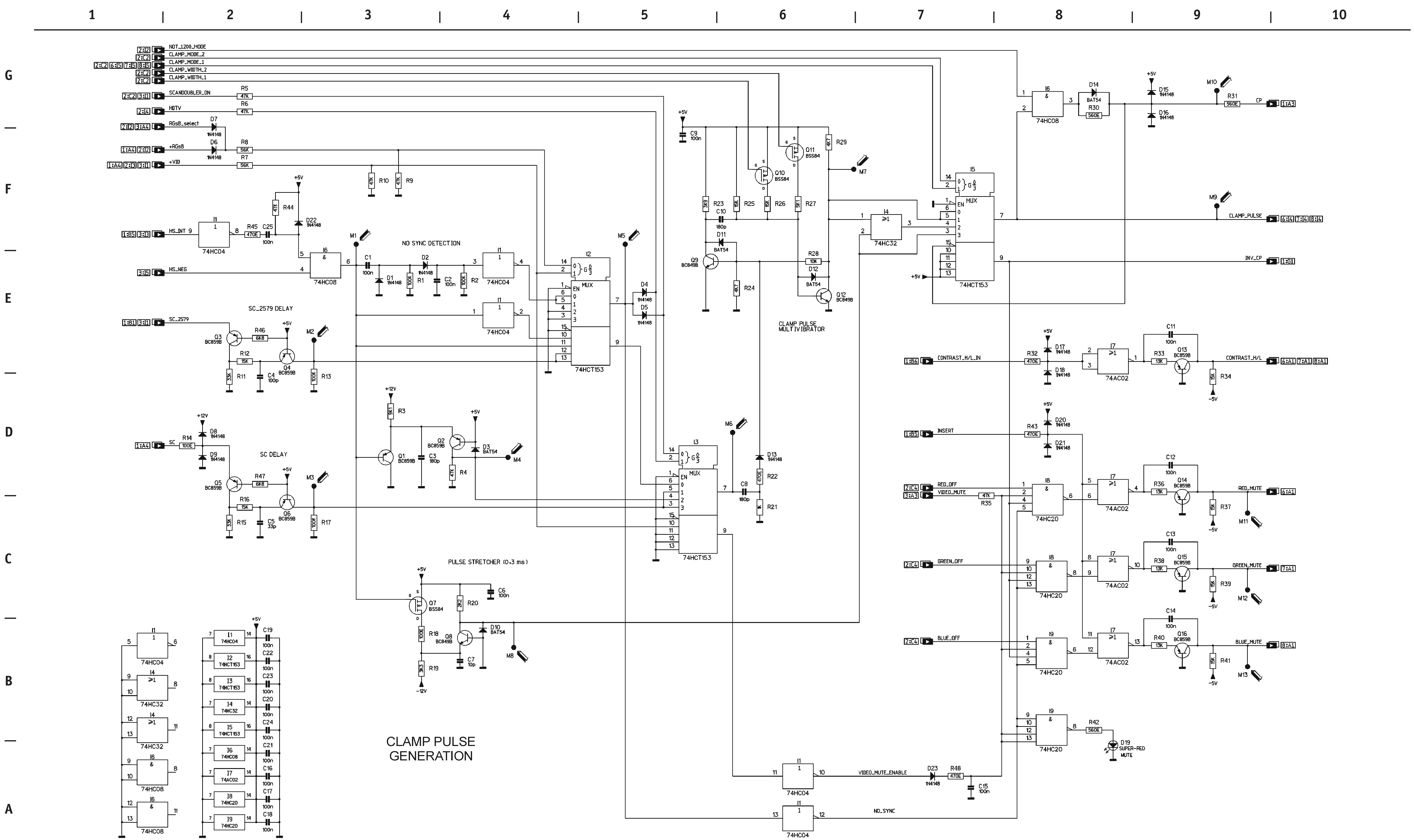


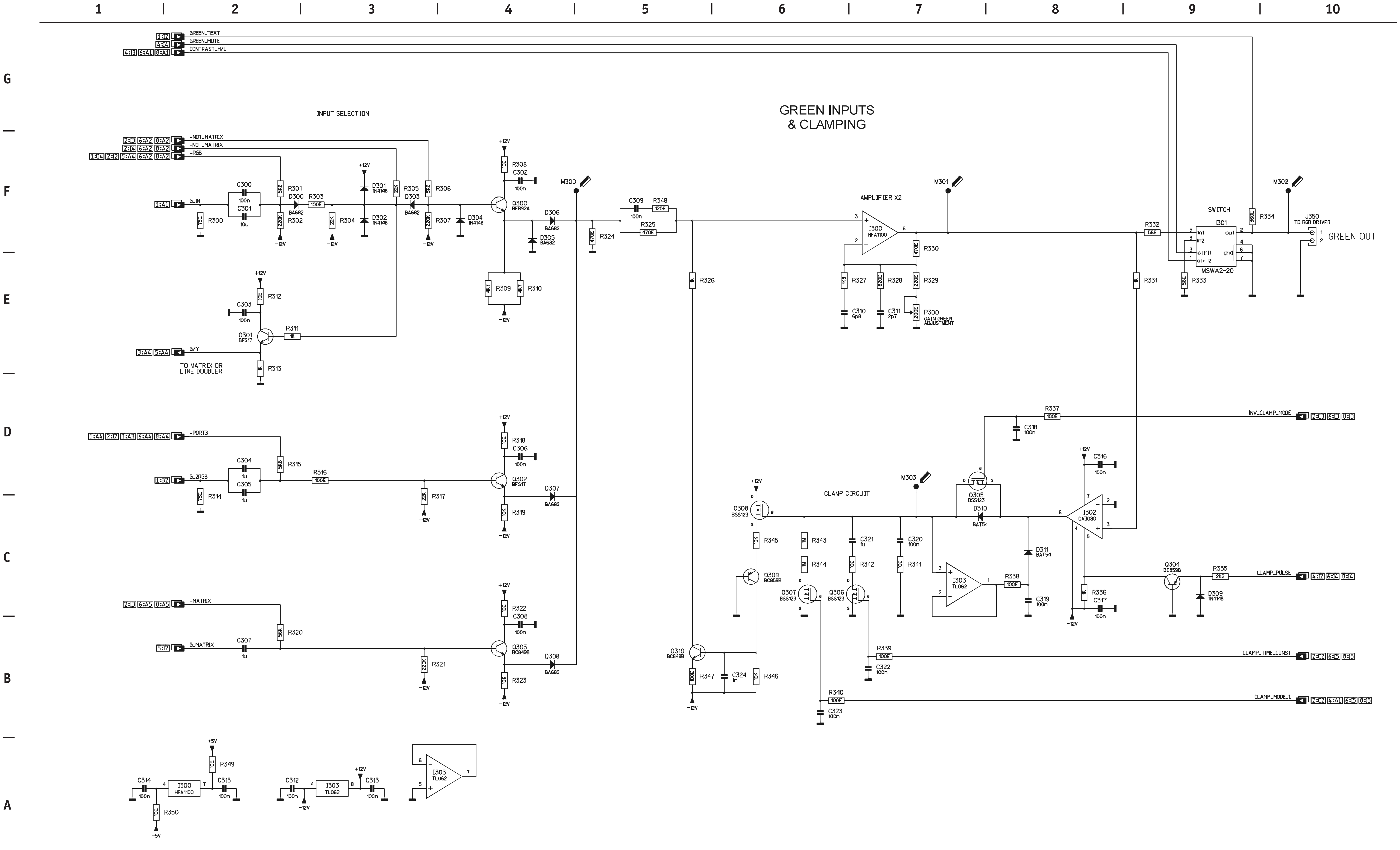
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

RGB INPUT & SWITCHING 3/8



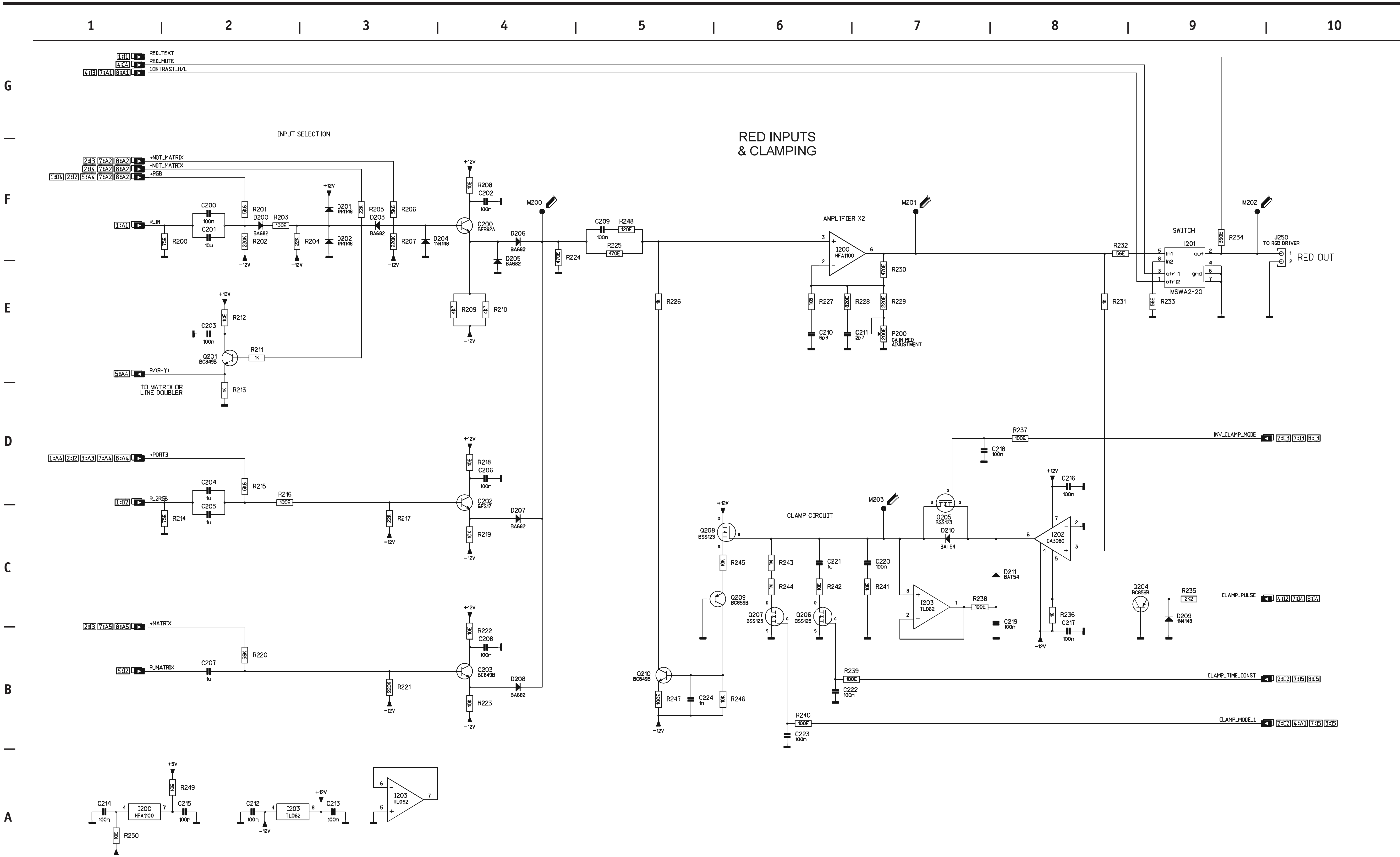
RGB INPUT & SWITCHING 4/8



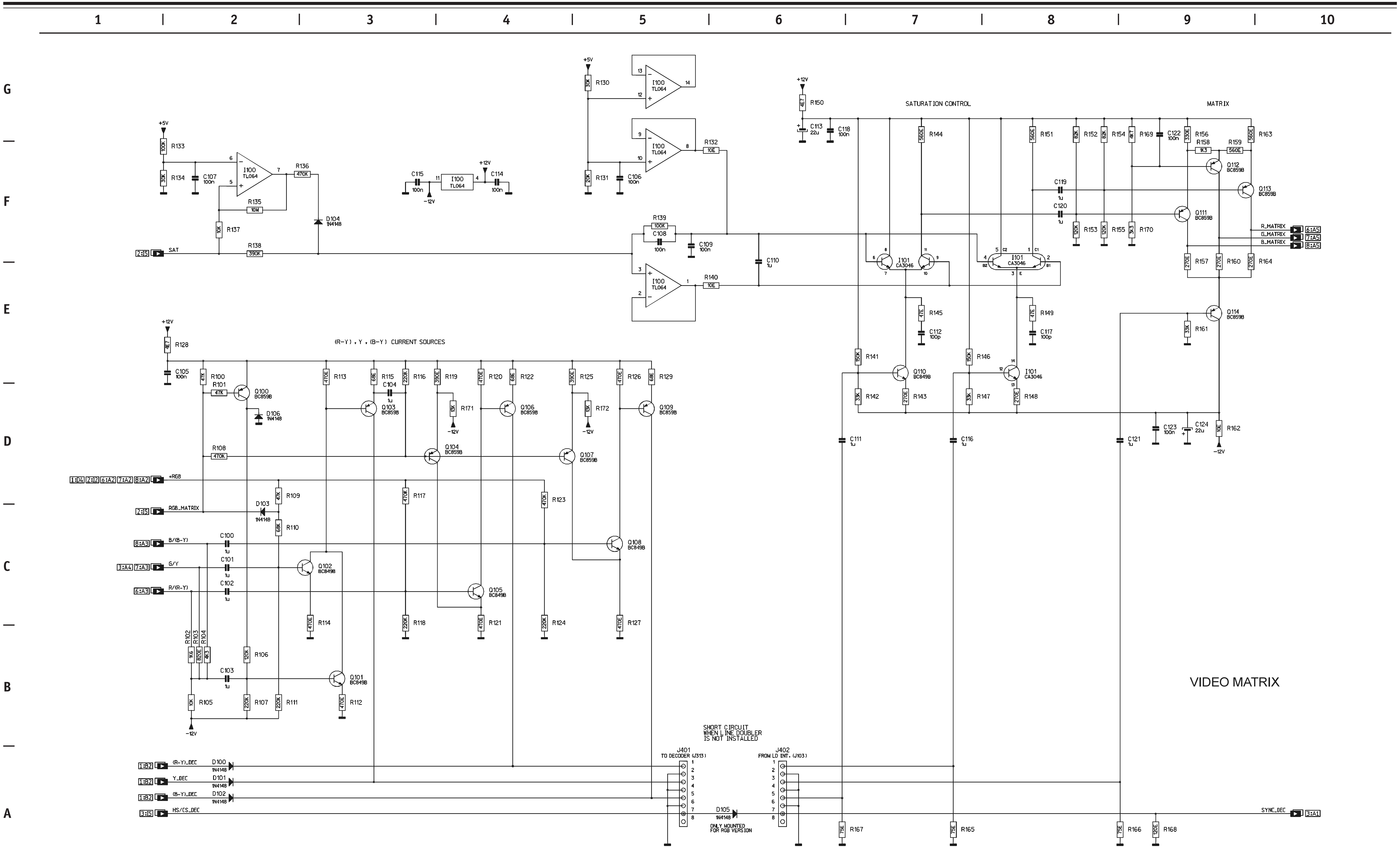


CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

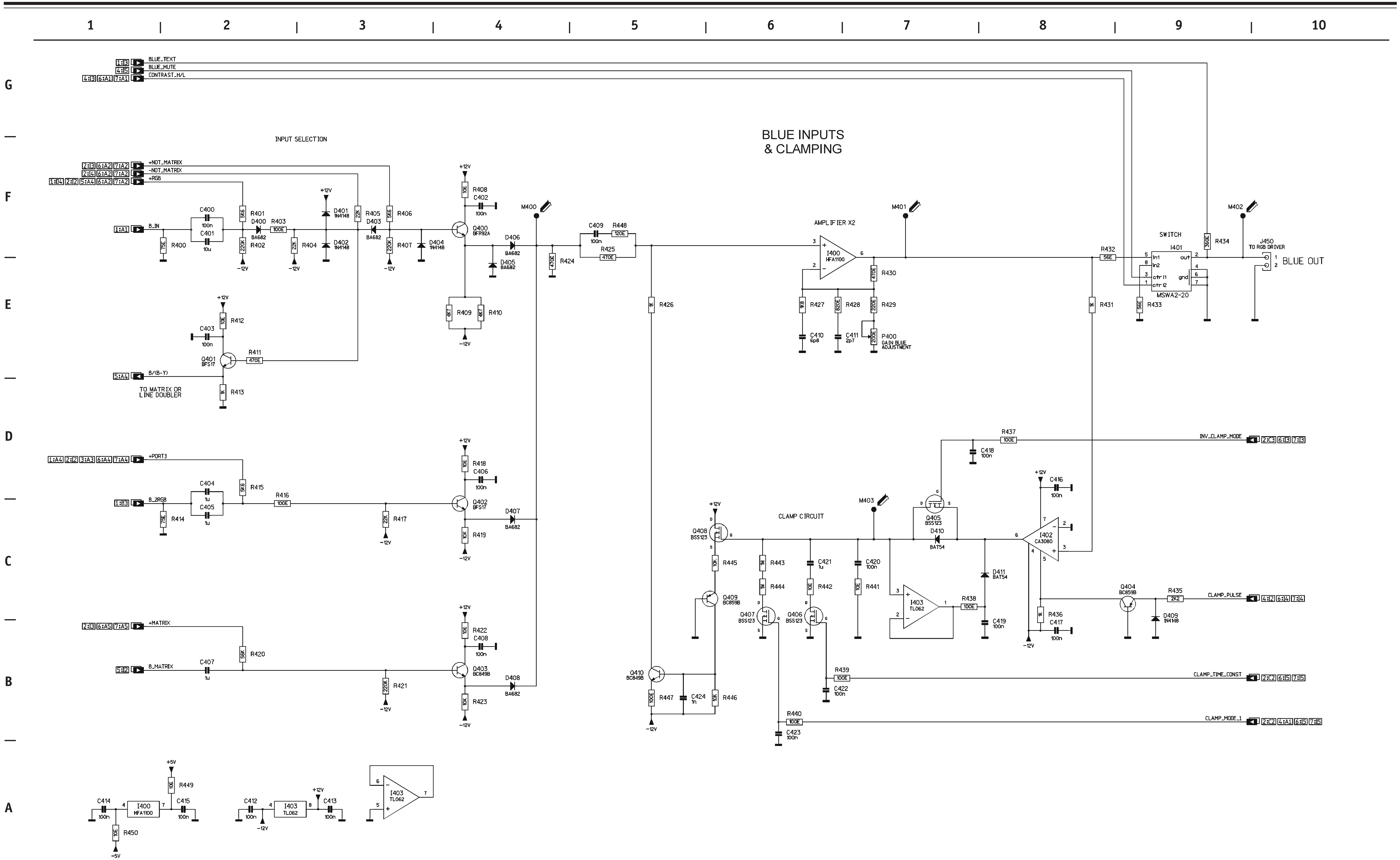
RGB INPUT & SWITCHING 6/8



CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

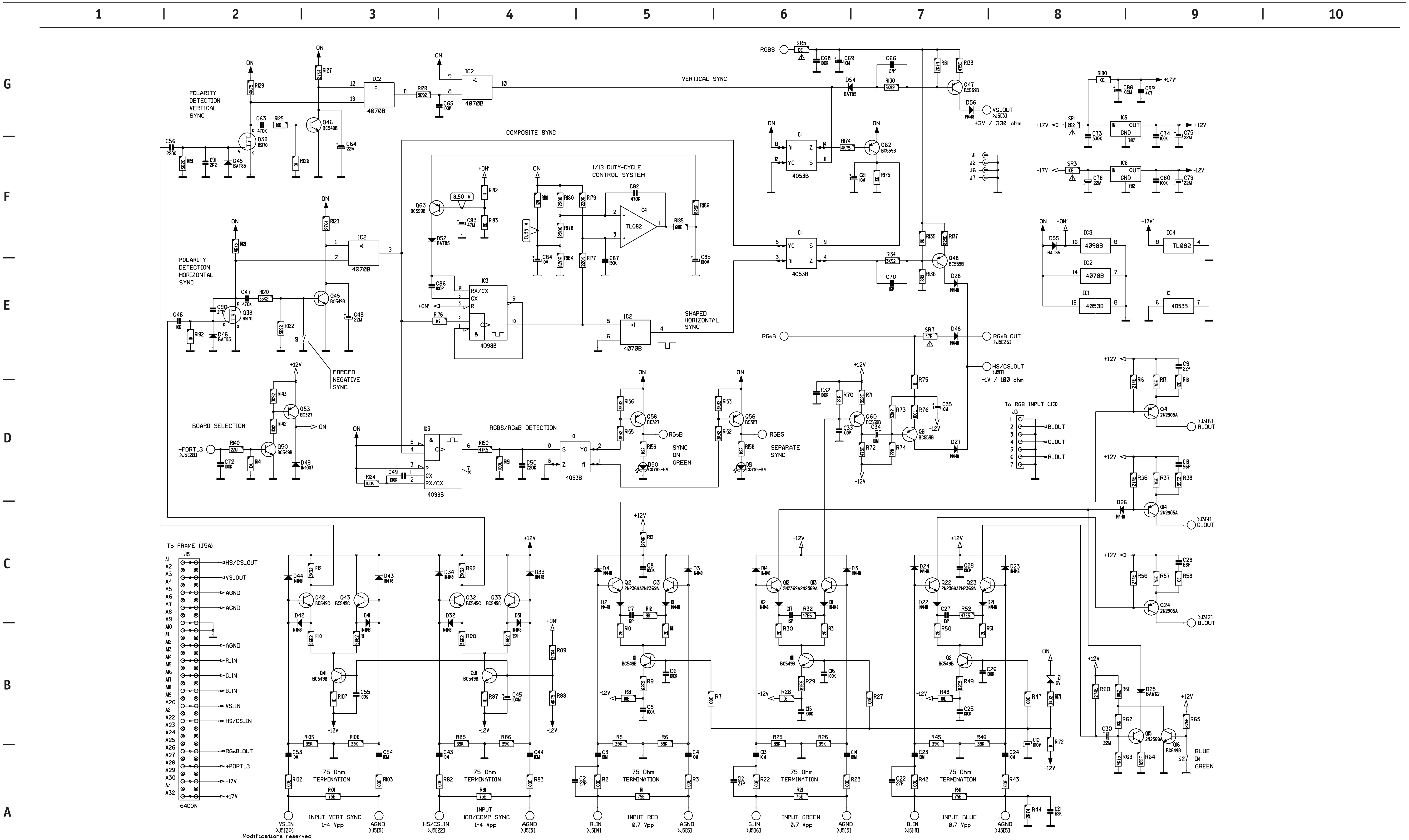

SATURATION CONTROL
MATRIX
(R-Y) , Y , (B-Y) CURRENT SOURCES
SHORT CIRCUIT WHEN LINE DOUBLER IS NOT INSTALLED
J401 TO DECODER (J313)
J402 FROM LD INT. (J103)
ONLY MOUNTED FOR RGB VERSION
VIDEO MATRIX

RGB INPUT & SWITCHING 8/8

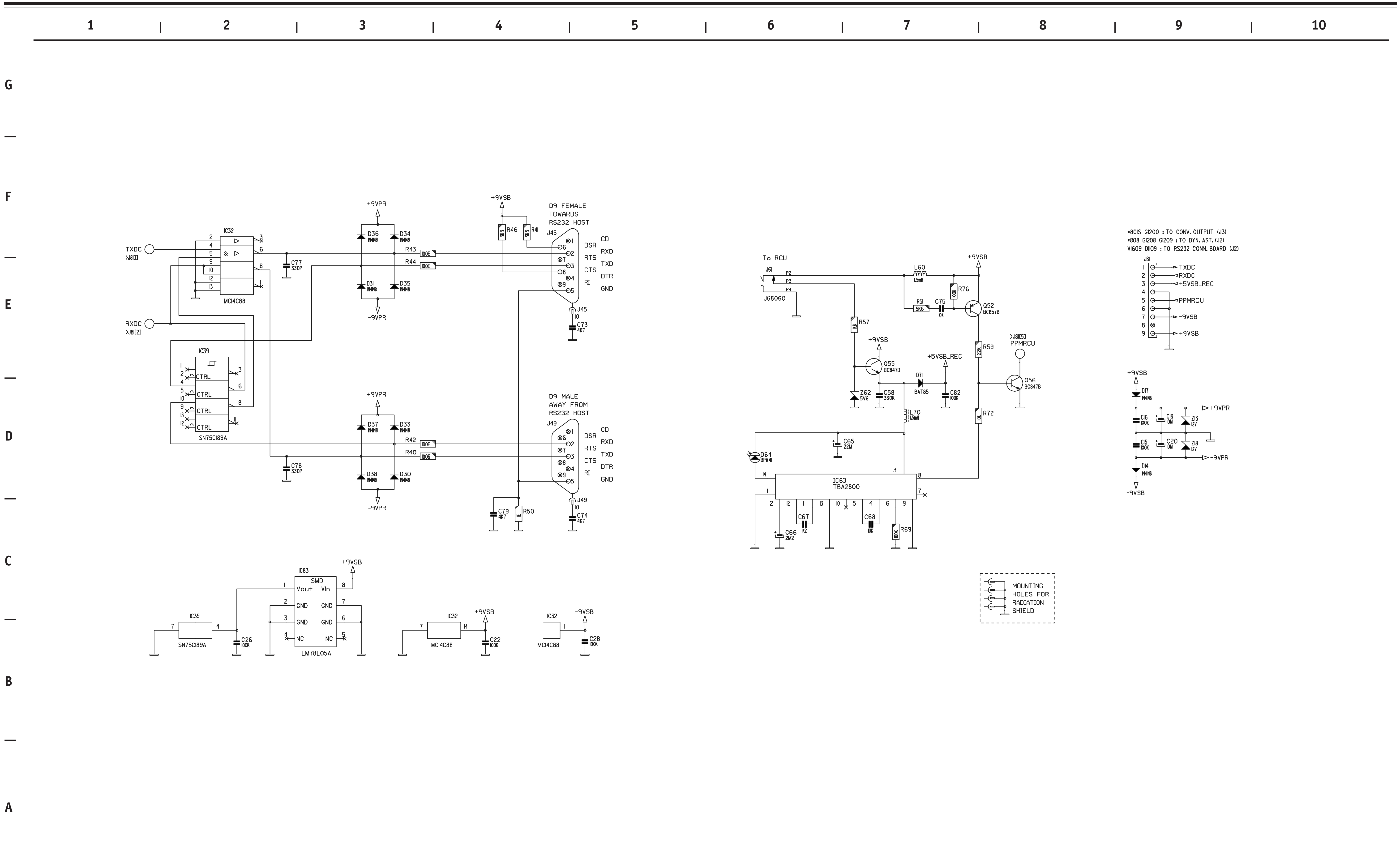


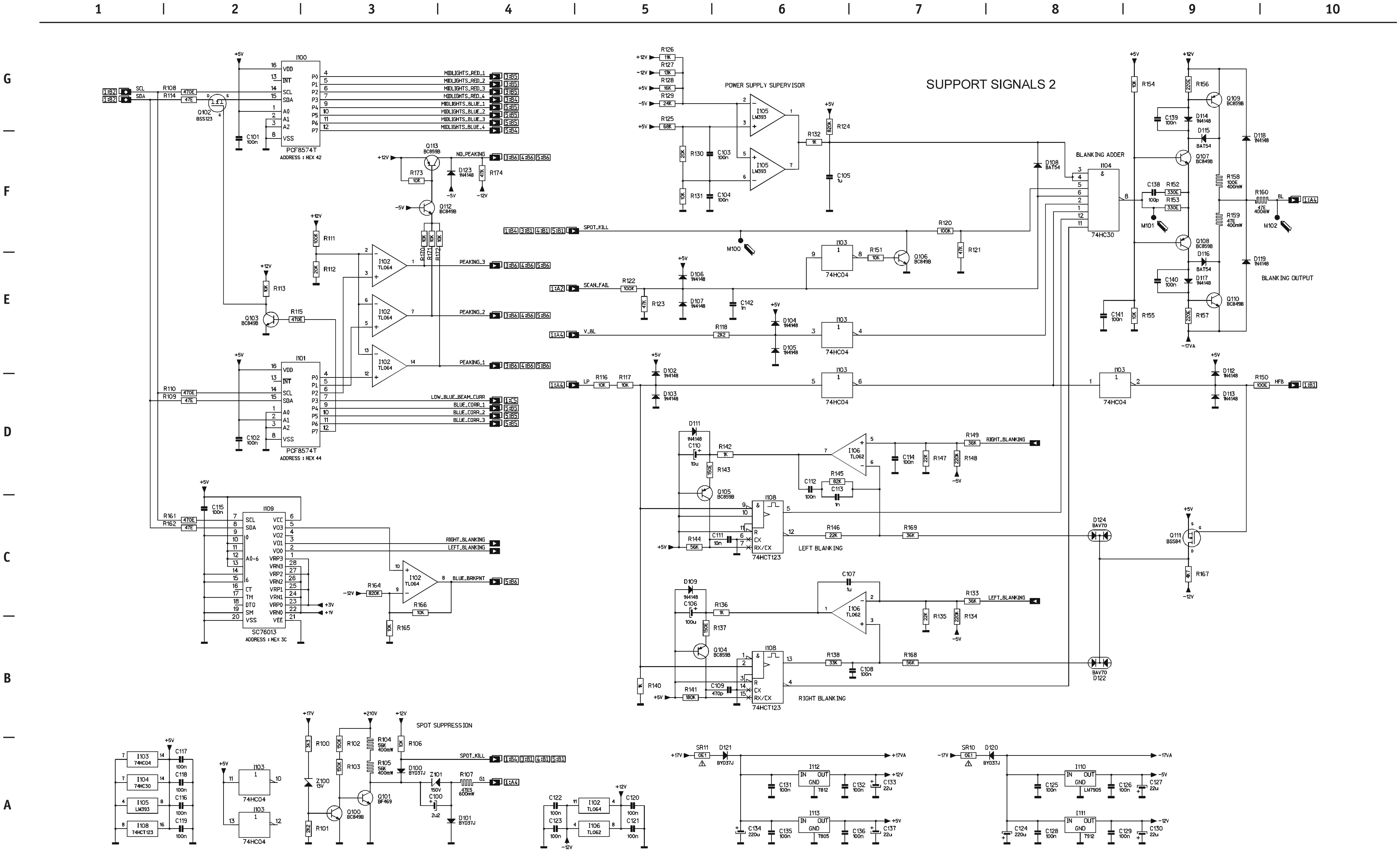
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

SECOND RGB INPUT

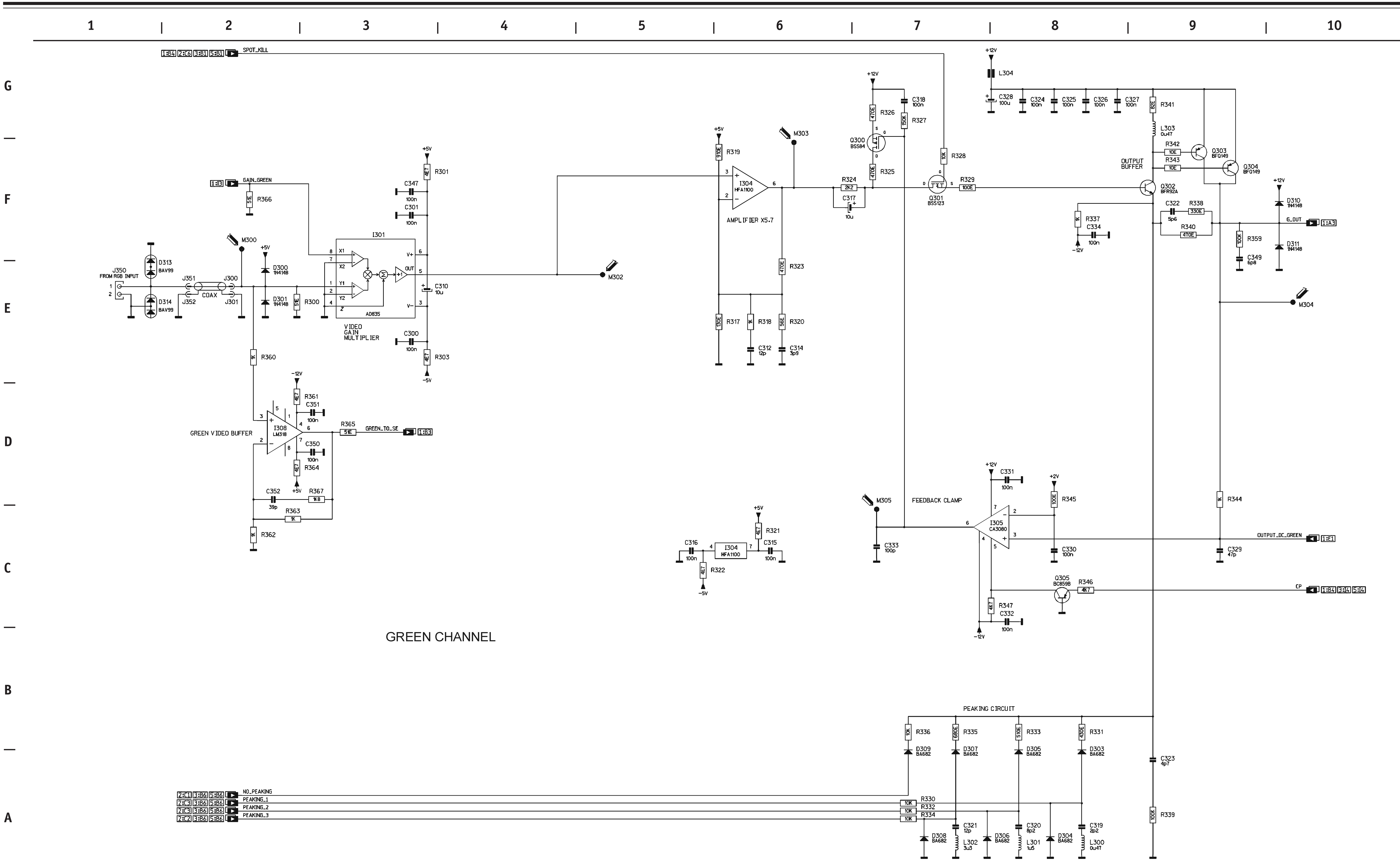


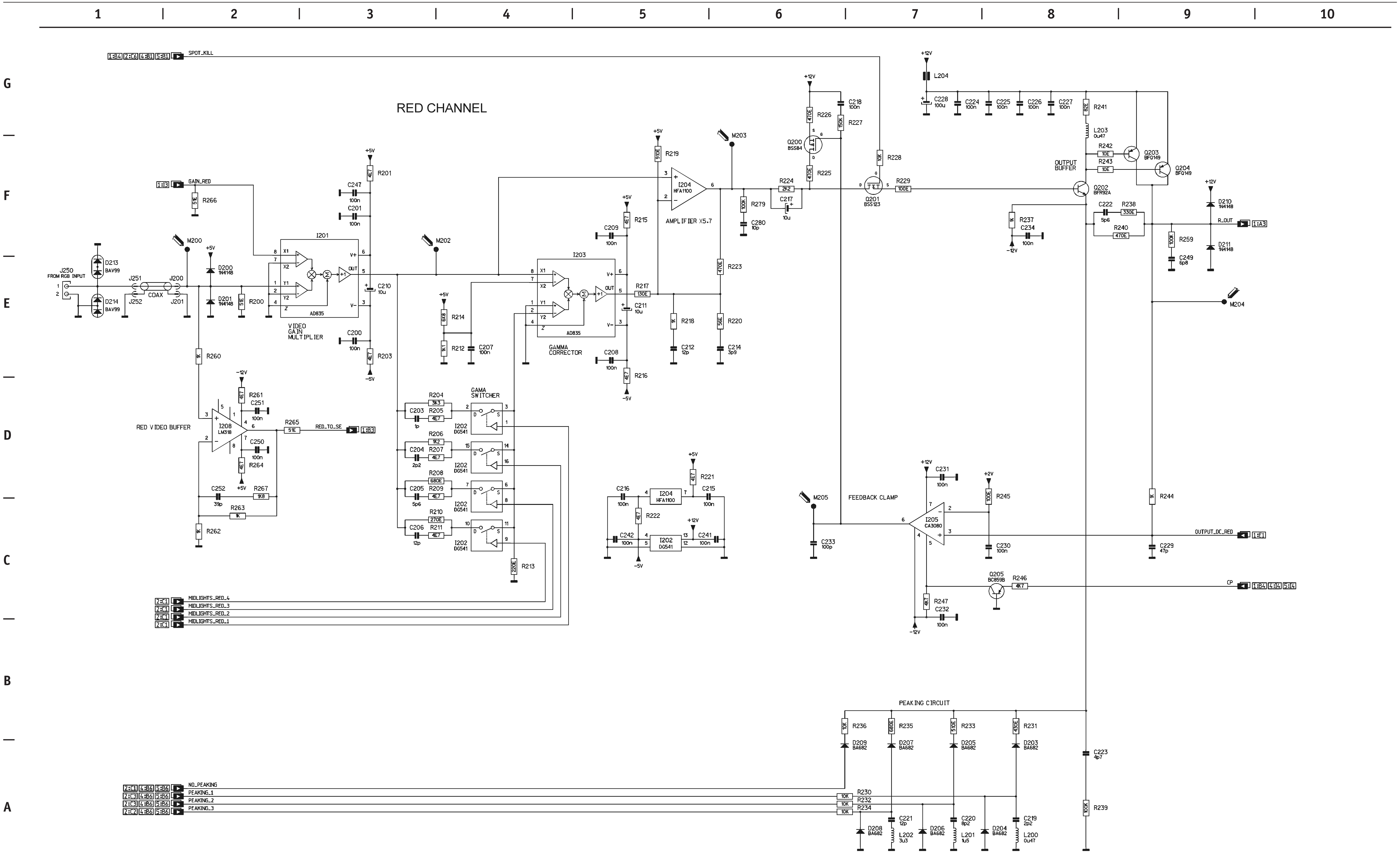
RS232 COMMUNICATIONS INTERFACE

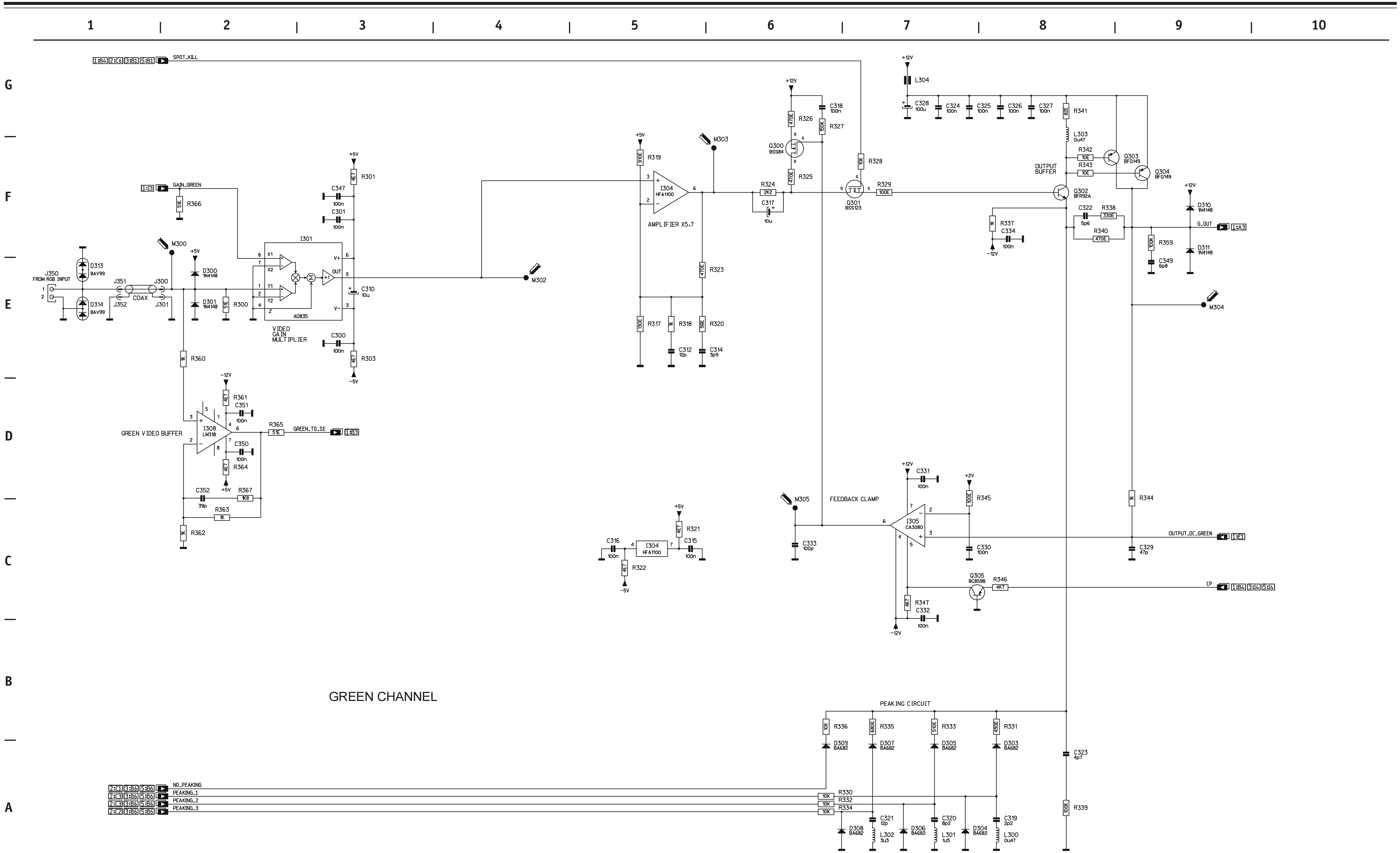




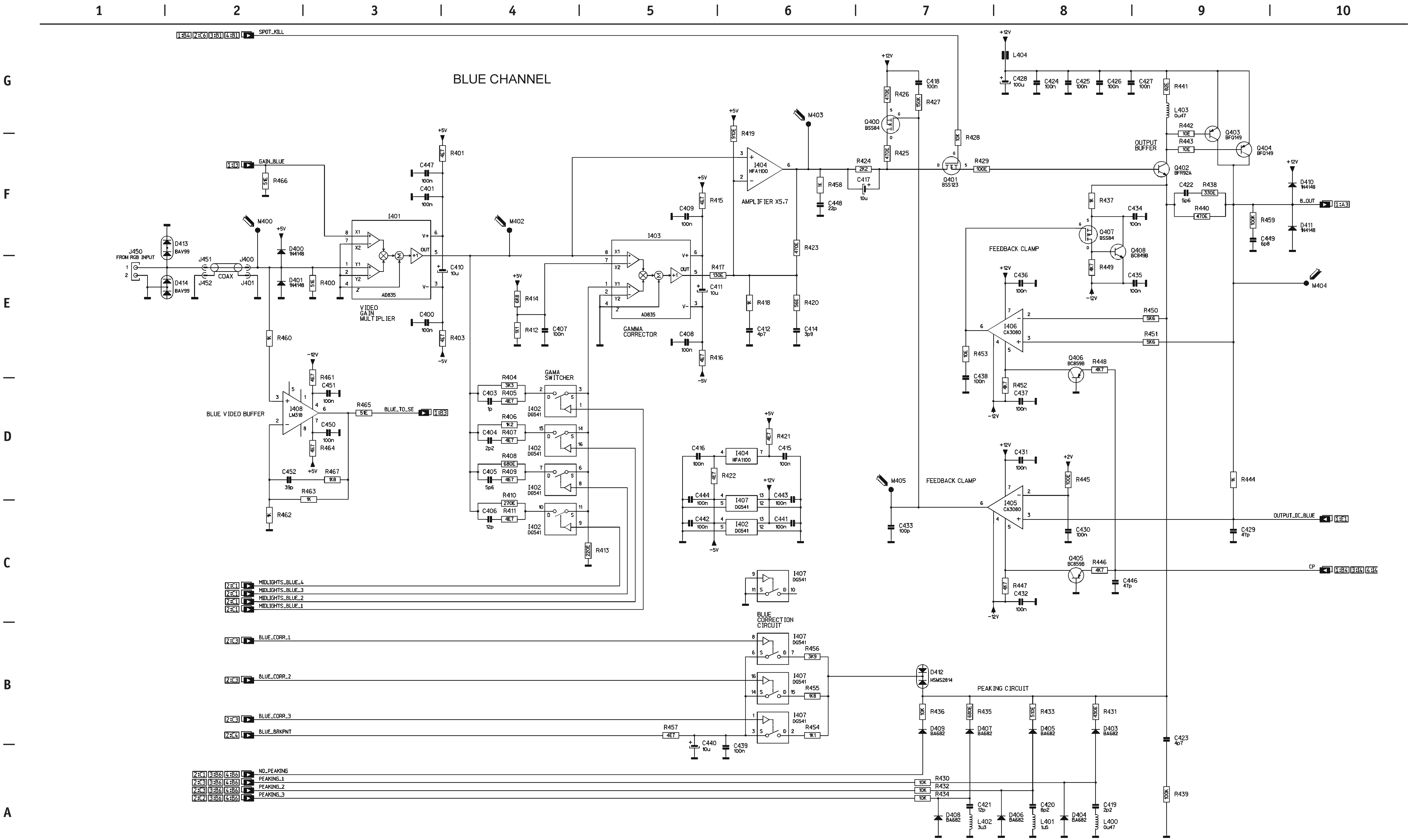
CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.


GREEN CHANNEL
VIDEO GAIN MULTIPLIER
GREEN VIDEO BUFFER
AMPLIFIER X5.7
OUTPUT BUFFER
FEEDBACK CLAMP
PEAKING CIRCUIT
SPOT_KILL
GAIN_GREEN
GREEN_TO_SE
G_OUT
OUTPUT_DC_GREEN
CP
NO_PEAKING
PEAKING_1
PEAKING_2
PEAKING_3
FROM RGB INPUT
COAX


RED CHANNEL
SPOT_KILL
GAIN_RED
J250
FROM RGB INPUT
COAX
VIDEO
GAIN
MULTIPLIER
AD835
GAMMA
CORRECTOR
AMPLIFIER X5.7
RED VIDEO BUFFER
RED_TO_SE
GAMA
SWITCHER
OUTPUT
BUFFER
R_OUT
FEEDBACK CLAMP
OUTPUT_DC_RED
CP
MIDLIGHTS_RED_4
MIDLIGHTS_RED_3
MIDLIGHTS_RED_2
MIDLIGHTS_RED_1
PEAKING CIRCUIT
NO_PEAKING
PEAKING_1
PEAKING_2
PEAKING_3

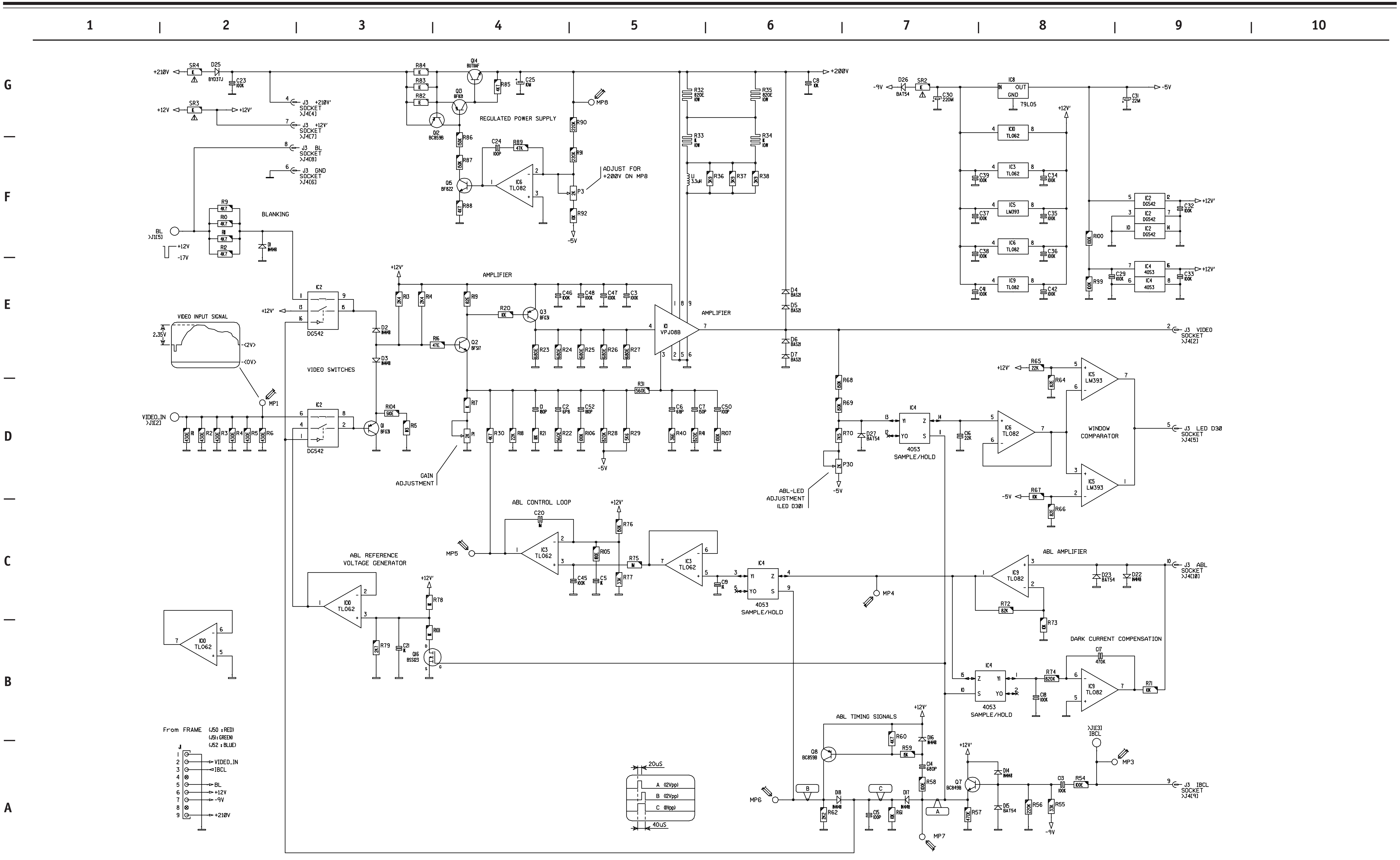


CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

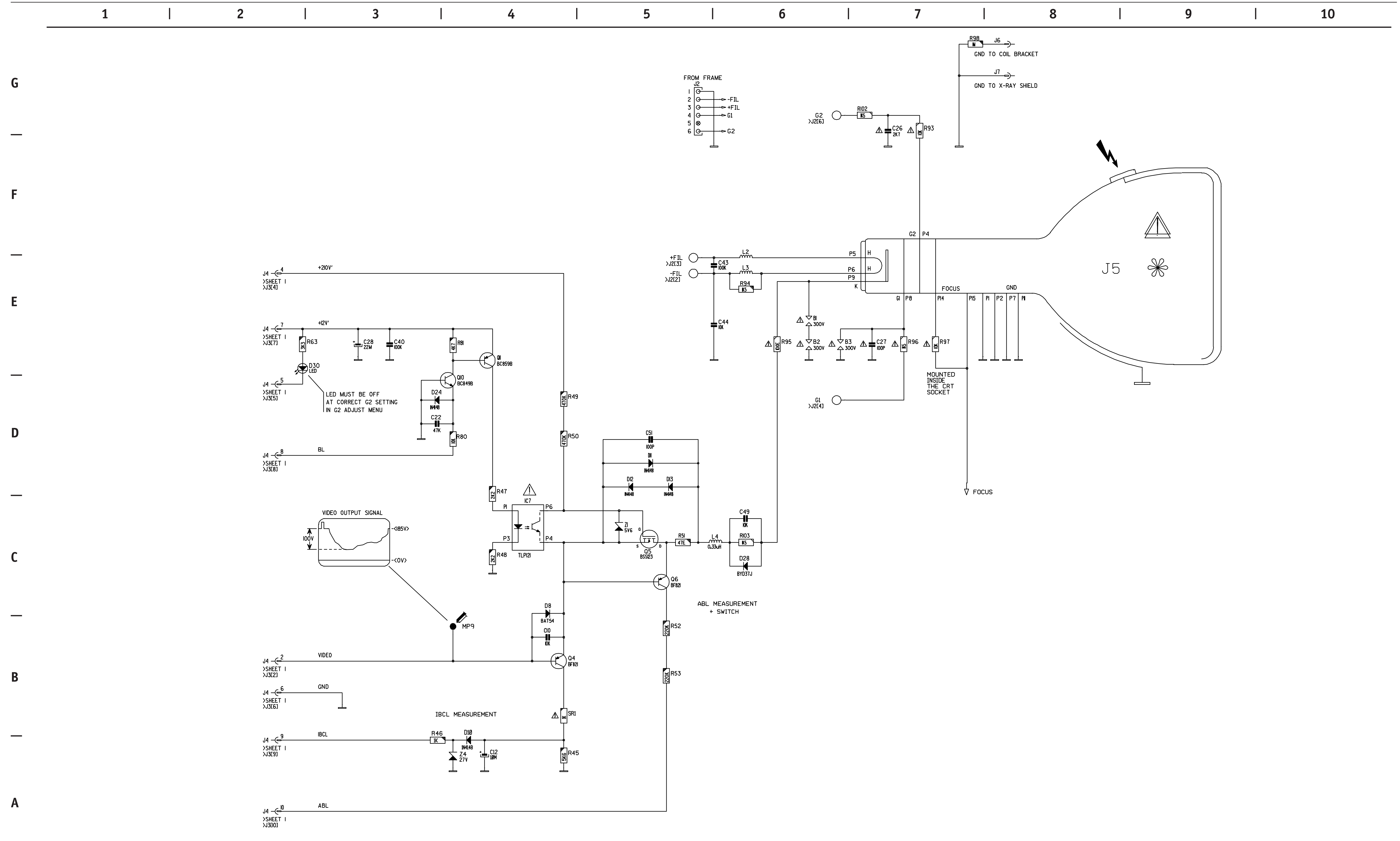


CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

OUTPUT AMPLIFIER

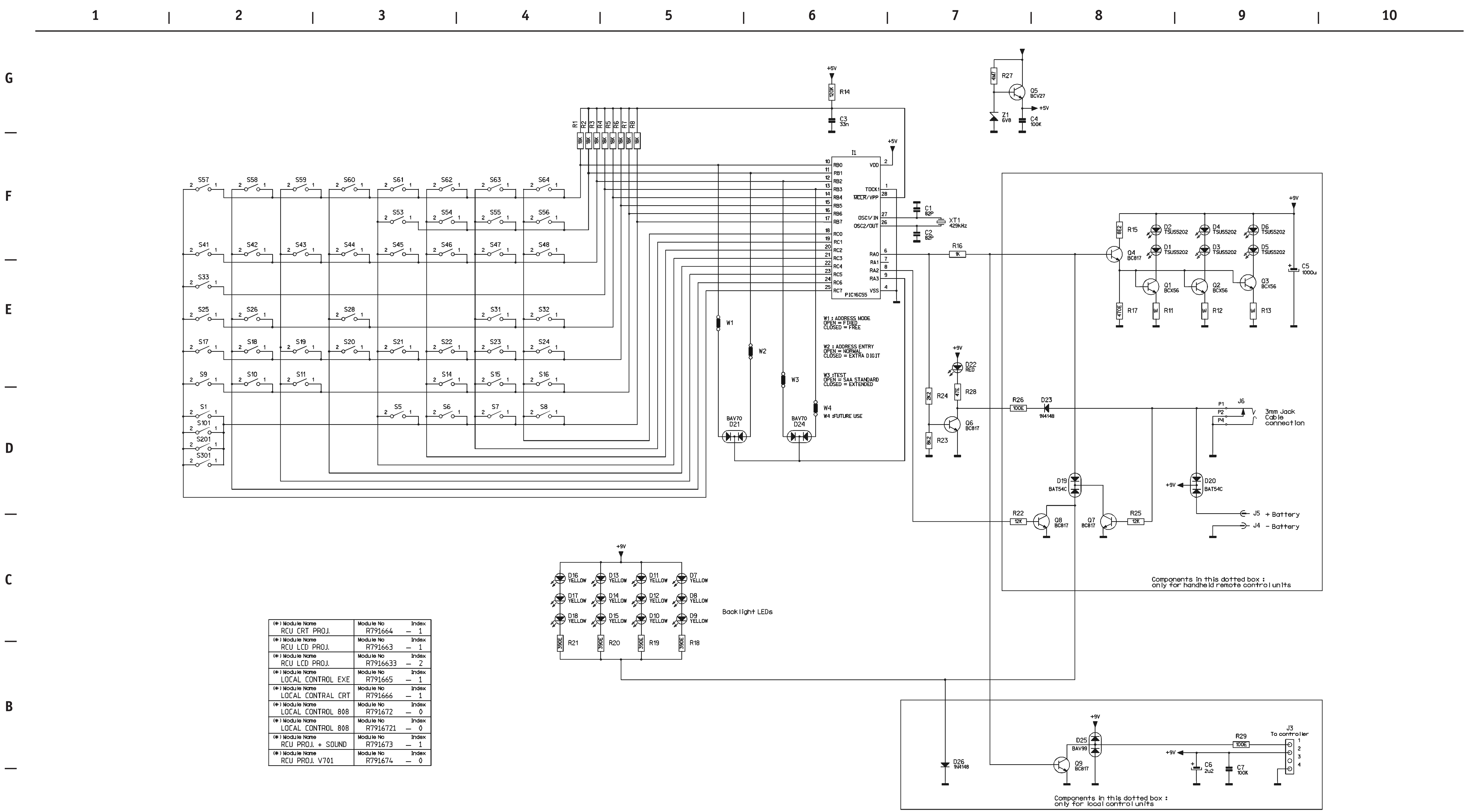


RGB OUTPUT & SOCKET



CRITICAL SAFETY COMPONENTS ARE IDENTIFIED BY ⚠ OR ✱. READ THE SAFETY PRECAUTIONS BEFORE REPLACING. REPLACE ONLY WITH PART NUMBERS SPECIFIED. X-RAY RADIATION CAN BE CAUSED BY NOT FOLLOWING THE SAFETY PRECAUTIONS.

IR TRANSMITTER



(*) Module Name	Module No	Index
RCU CRT PROJ.	R791664	— 1
RCU LCD PROJ.	R791663	— 1
RCU LCD PROJ.	R7916633	— 2
LOCAL CONTROL EXE	R791665	— 1
LOCAL CONTRAL CRT	R791666	— 1
LOCAL CONTROL 808	R791672	— 0
LOCAL CONTROL 808	R7916721	— 0
RCU PROJ. + SOUND	R791673	— 1
RCU PROJ. V701	R791674	— 0