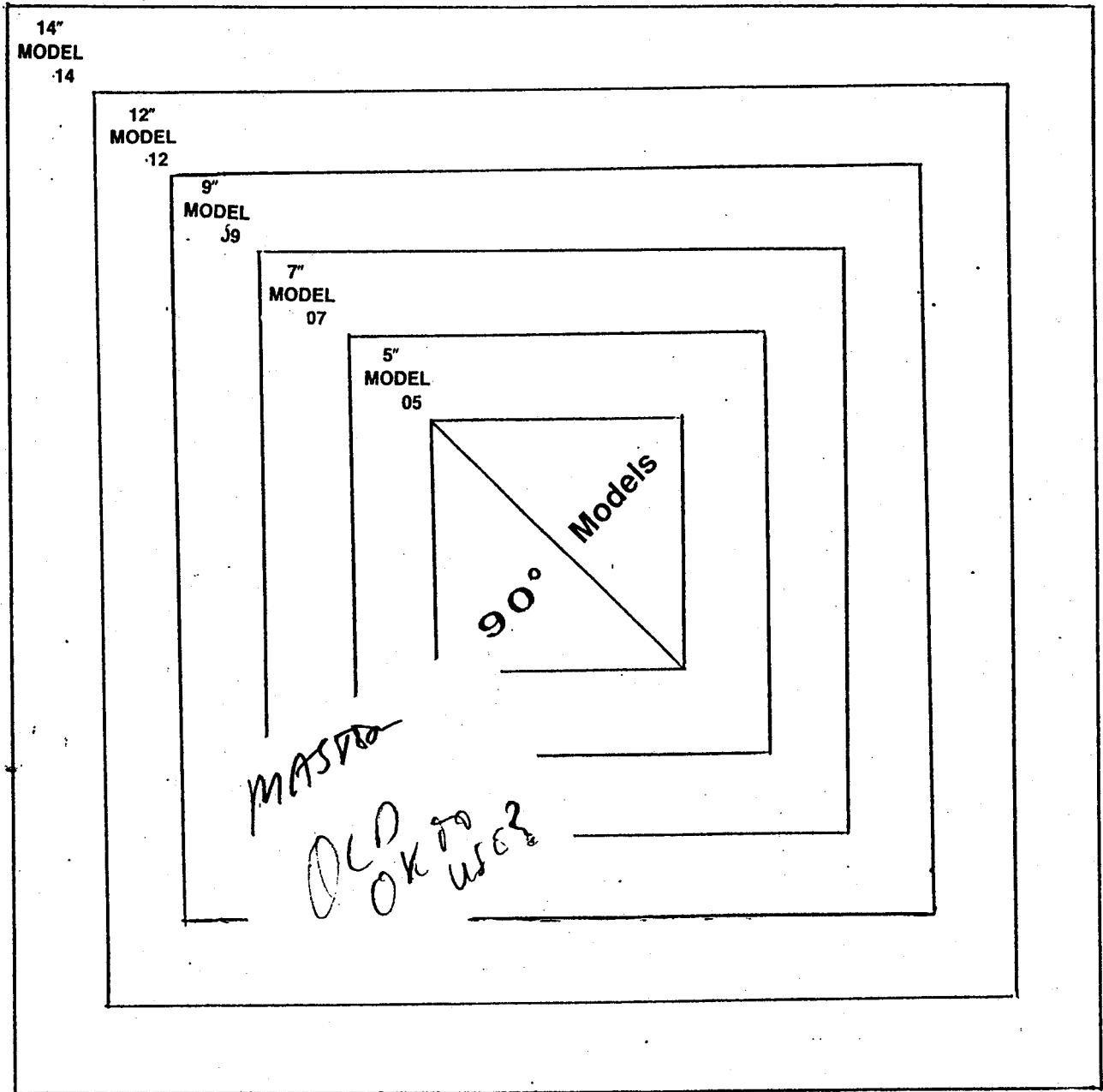


# CRT Display Monitors



## SERVICE MANUAL



**Kristel**® corporation

833 INDUSTRIAL DRIVE  
WEST CHICAGO, IL 60185

AREA CODE (312) 293-0850

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## CRT Display Monitors

### SPECIFICATIONS:

Kristel Corporation offers mechanical and electrical retrofit for all major manufacturers.

Standard Deflection.....90°

#### CRT

- P4 phosphor standard, all others available
- PPG or direct etch

#### Synchronization

- Horizontal.....15 to 21.0 KHz
- Vertical.....47-63 HZ (80Hz optional)
- Horiz blanking.....10 sec at 15.7 KHz to 21.6 KHz
- Vertical blanking.....800 u sec

#### Power Input

- 12VDC, 18W Max.
- 15VDC optional

#### 10 Pin Edge Connector Standard

- 10 or 20 pin ribbon header available

#### Video Performance

- 900 line center resolution
- 25 MHz within 3 db bandwidth
- Displays 2000 to over 3000 characters
- Linearity to meet 1½% EIA standards

#### Environment

- Operating Temp.....10°C to 55°C
- Storage Temp.....50°C to 65°C

#### Warranty

- One (1) Full Year

#### Quality

- AQL Standards Compliance

NOTE: 90 series designed to comply with DHHS Radiation Standards and U.L., BPO, CSA, & FCC Conducted and Radiated and Interference Standards

## KRISTEL CORPORATION

### GENERAL INFORMATION

The Kristel 90° Monitors are solid state raster scan displays for data terminal application. The Monitors are designed for high quality display of alphanumeric characters and graphics.

The Data Monitor requires composite video or three separate TTL compatible input signals for operation, they are 1) vertical drive, 2) horizontal drive and 3) video. These three separate TTL input signals eliminate redundancy associated with the mixing and stripping operation required in composite signals.

The unit is available with the following factory installed options. The horizontal frequency can be altered from 15.0 KHz to 21.0 KHz. The product is available with a brightness control, with or without contrast control and the video termination is fixed to match TTL level inputs, or 75 ohm coax in the case of composite video.

### ELECTRICAL

The Kristel product must be operated from an independent 12 VDC source. Input of the 12 VDC is through the edge connector or a separate connector on the P.C. Board.

### MECHANICAL

Refer to mechanical specification as follows on the next six pages.

### SAFETY NOTE

All CRT's maintain a voltage charge at the anode, even when inoperative. Therefore, when a CRT is to be replaced or a monitor is to be used in a kit form, always discharge the picture tube anode to ground using an insulated wire or screwdriver. Safety goggles and gloves usage is recommended by CRT manufacturers.

## GENERAL DISPLAY SPECIFICATIONS AND CHARACTERISTICS

### HORIZONTAL

Frequency 15 to 21.0 KHz maximum  
TTL Drive Amplitude 2.5 VPP. 4 to 30 usec.

### VERTICAL

Frequency 46 Hz to 64 Hz standard  
46 Hz to 80 Hz available  
TTL Drive Amplitude 2.5 VPP to 5 VPP. 60 to 1200 usec.

### SIGNAL POLARITY

Both drive signals are positive going on standard production units,  
however, negative is also available on either.

### VIDEO

Amplitude 2.5 VPP to 5 VPP. 40 nsec minimum width.  
Polarity - The whites are high (positive)  
Termination Impedance: 500 ohm  
TTL Versions: 75 ohm composite versions

### FREQUENCY RESPONSE

CRT resolution without PPG (P4 phosphor)  
Resolution: 900 TV lines, center  
Bandwidth: DC to 25 MHz at - 3db.

### LINEARITY

Characters to be within +10% of adjacent characters and within +10%  
of character height.

### GEOMETRY

Geometric distortion to be within 1½ of EIA.

### ENVIRONMENTAL

Operational: 5 C to 55 C at 5% to 80% humidity  
-30 C to 65 C at 5% to 90% humidity

### REGULATORY AGENCIES

Designed to comply with UL, CSA, FCC, & DHHS Specifications

### RELIABILITY

The demonstrated MTBF for CRT display monitors has been in excess of  
25,000 hours. Long term reliability tests were the basis for the  
data at elevated temperatures of 55 C at 90% humidity.

KRISTEL CORPORATION

ALIGNMENT PROCEDURE

90° PRODUCT

I. Check unit physically

- A. Check leads for secure connections
- B. Check for physical damage

II. Electrical Checkout

A. Check size-Horizontal and Vertical

- 1. If the horizontal size requires readjustment use width coil (L102) to set size to  $\pm \frac{1}{4}$  inch of spec.
- 2. If vertical size requires readjustment use height control (R109) to set size to  $\pm \frac{1}{4}$  inch of spec. Readjustment of linearity control (R117) may be necessary.

B. Check brightness adjustment-increase remote brightness control to maximum. Raster lines should be just barely visible.

- 1. Increase master brightness control (R234) until raster lines are visible.
- 2. Reset remote brightness to normal viewing level.

C. Check Horizontal Centering-increase remote brightness control until raster lines are just visible. No more than one (1) character width difference should be measured when comparing the right side spacing, between the raster edge and the video, to the left side spacing.

- 1. If necessary adjust the Horizontal Delay Control (R219) only for minor correction.
- 2. If considerable adjustment is required, the following steps should be taken.
  - a. Disable horizontal sync input.
  - b. Adjust horizontal hold control (R217) to achieve a single vertical band of the horizontal blanking interval floating thru the video presented.
  - c. Reenable the horizontal sync input.
  - d. Adjust horizontal delay control (R219) to center video in raster.

- 3. Reset the Remote Brightness Control for normal viewing level.

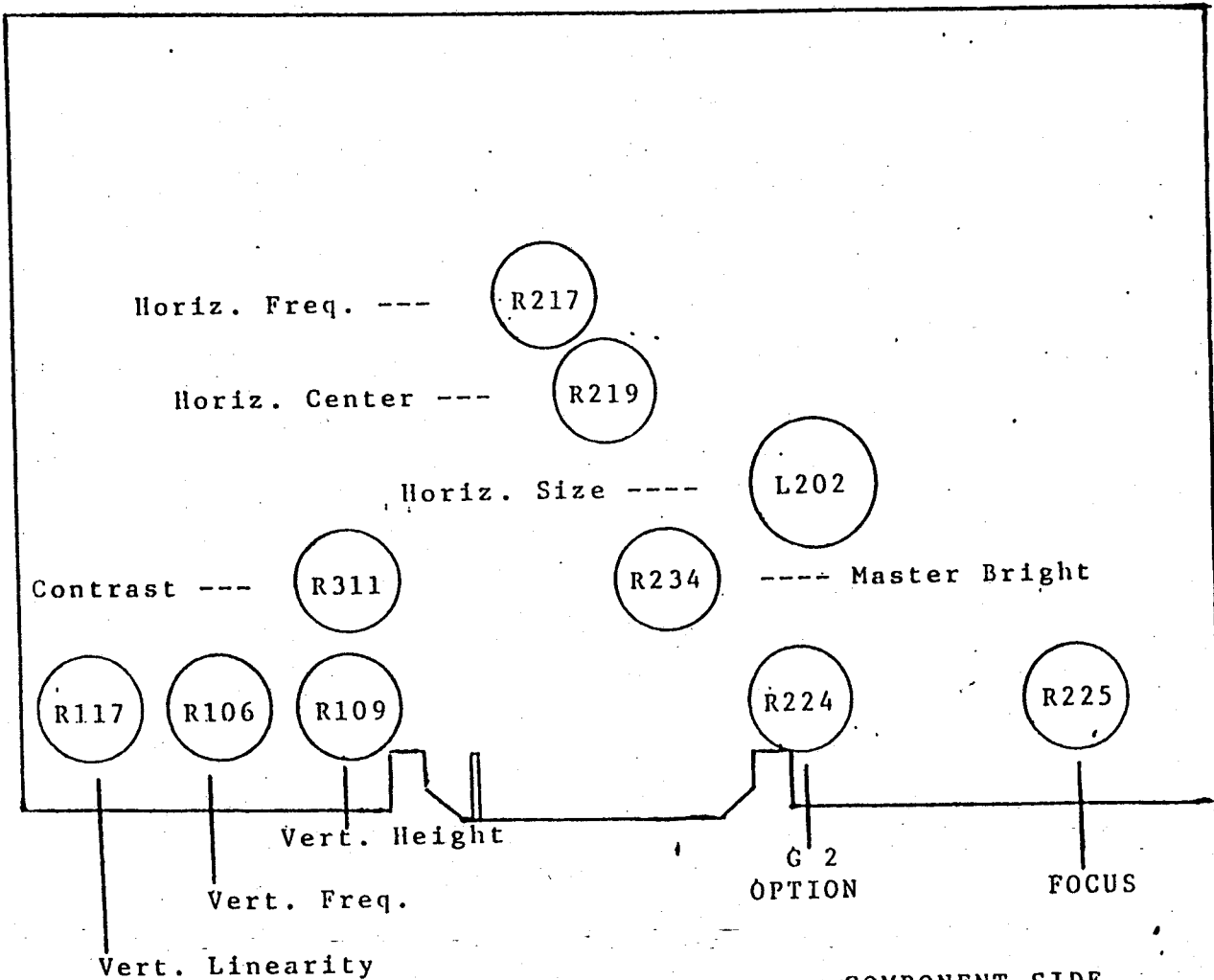
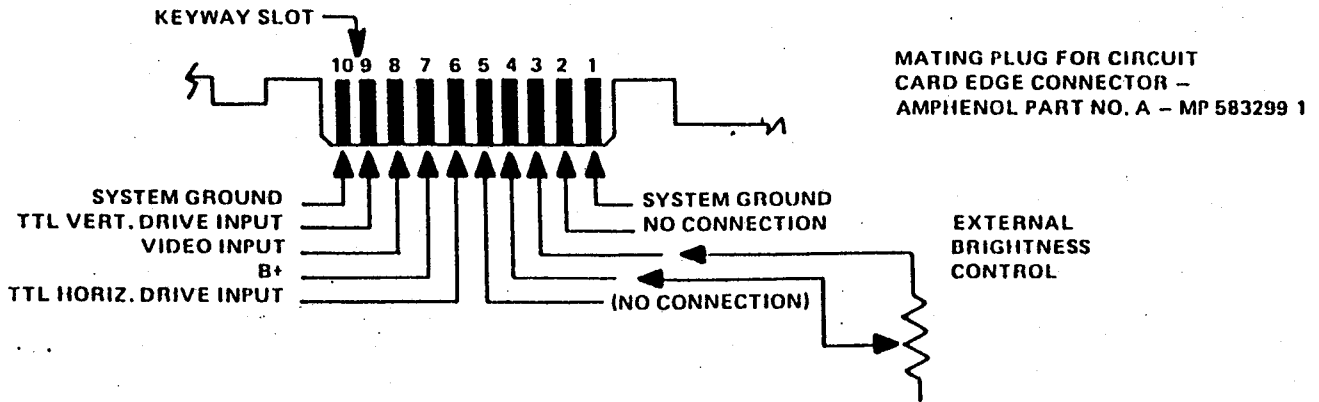
D. Check Focus

1. If necessary, adjust focus control (R224) to obtain best overall focus. Center focus will be compromised in order to gain better corner focus.

E. Check Geometry-Rectangular presentation of video display

1. If correction is required, adjust magnets on yoke ring as required.

**MONITOR CIRCUIT CARD EDGE CONNECTOR  
COMPONENT SIDE VIEW**



COMPONENT SIDE

## GEOMETRY

The Kristel display monitors are supplied with yokes on which a special retainer has been designed to accommodate adjustable magnets. The tabs on this retainer hold the magnets which retain their position and do not vibrate loose in transit.

The magnets can be rotated in either direction until satisfactory geometry has been achieved.

**NOTE!** The geometry has been adjusted at the factory prior to shipment. If however, adjustments are to be made on the yoke, the directions on this page should be of assistance.

### GEOMETRY ADJUSTMENTS

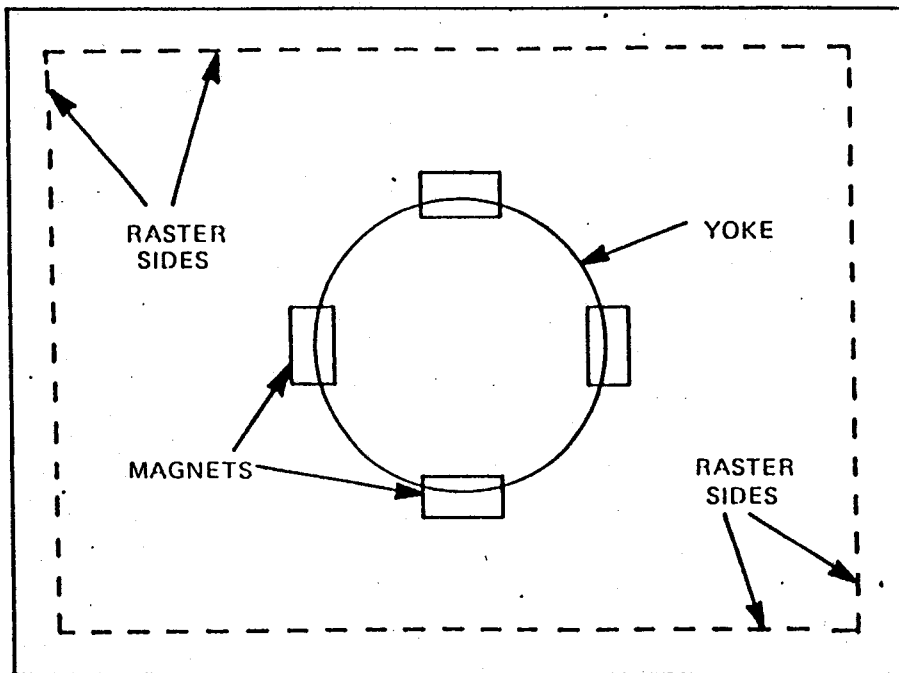
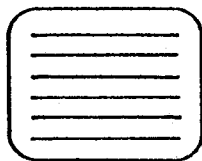
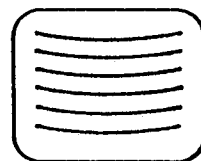


FIG. 4 GEOMETRY

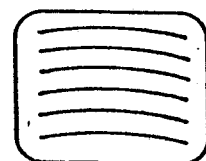
TOP-BOTTOM  
ADJUSTMENTS



NORMAL

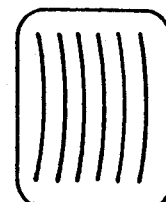
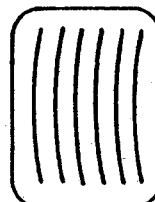
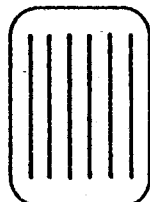


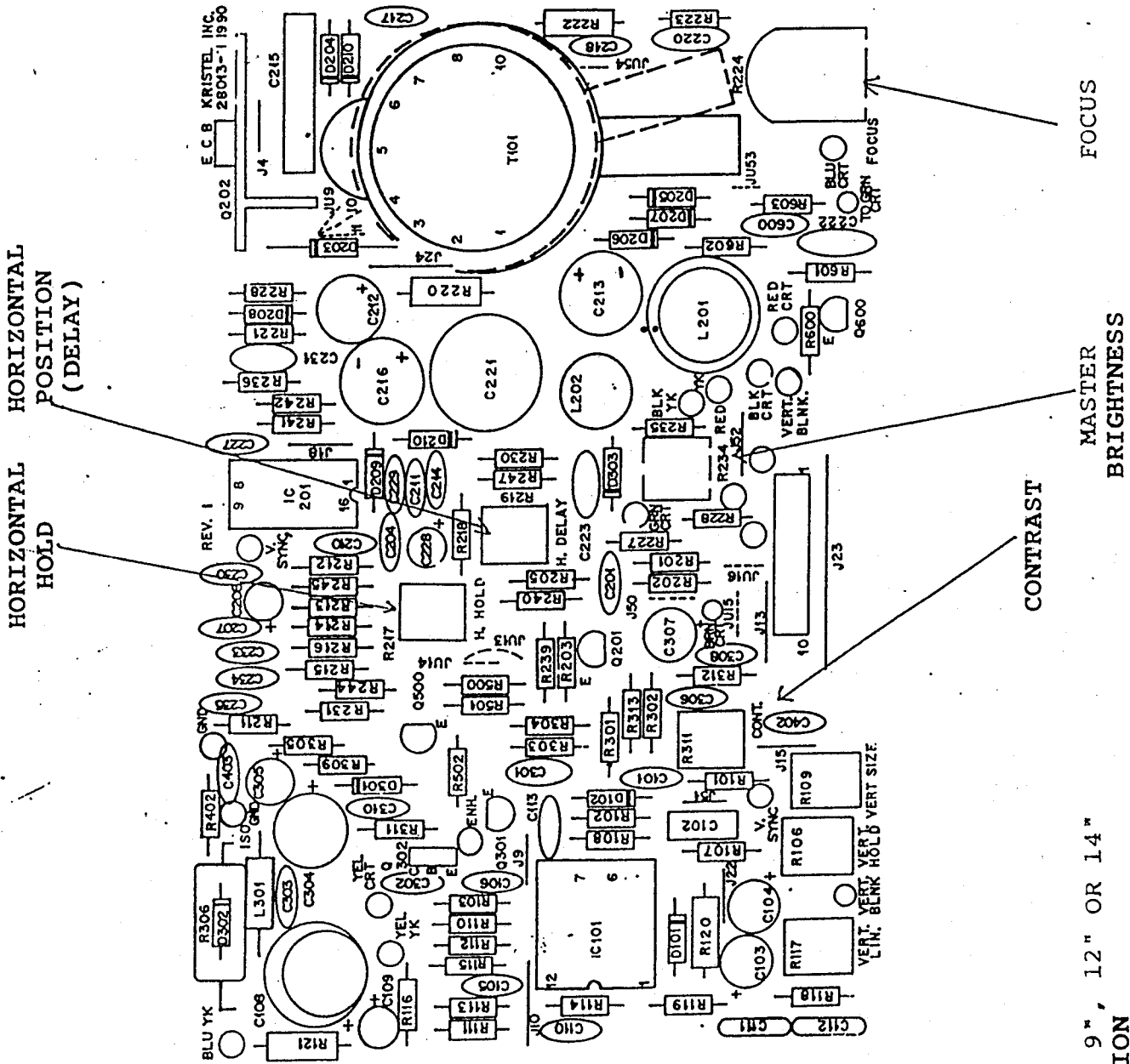
OVERCORRECTED  
BARREL



OVERCORRECTED  
PINCUSHION

SIDES -  
LEFT AND RIGHT





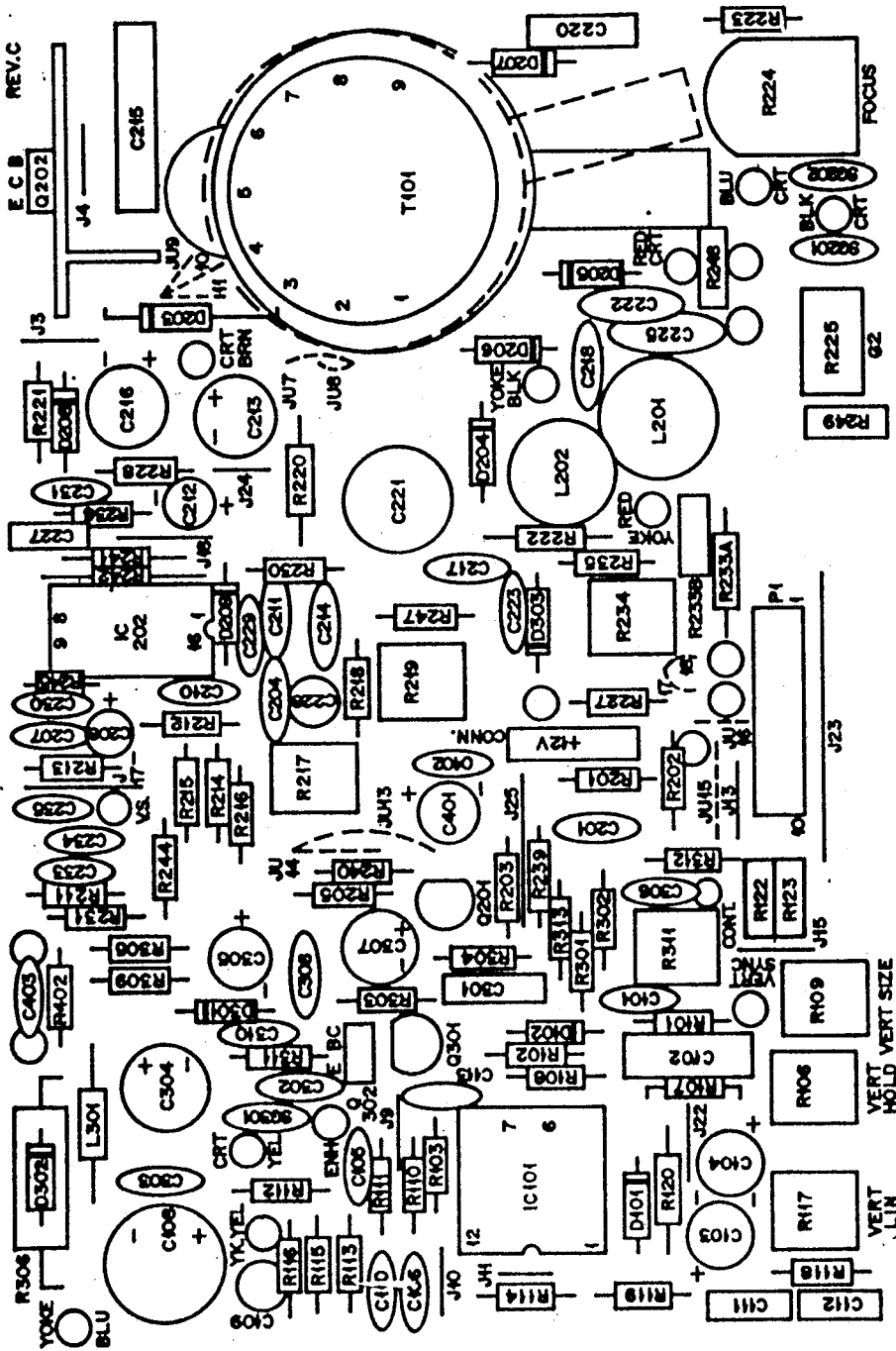
FOCUS

MASTER BRIGHTNESS

CONTRAST

STANDARD 90° 7", 9", 12" OR 14"  
KRISTEL CORPORATION

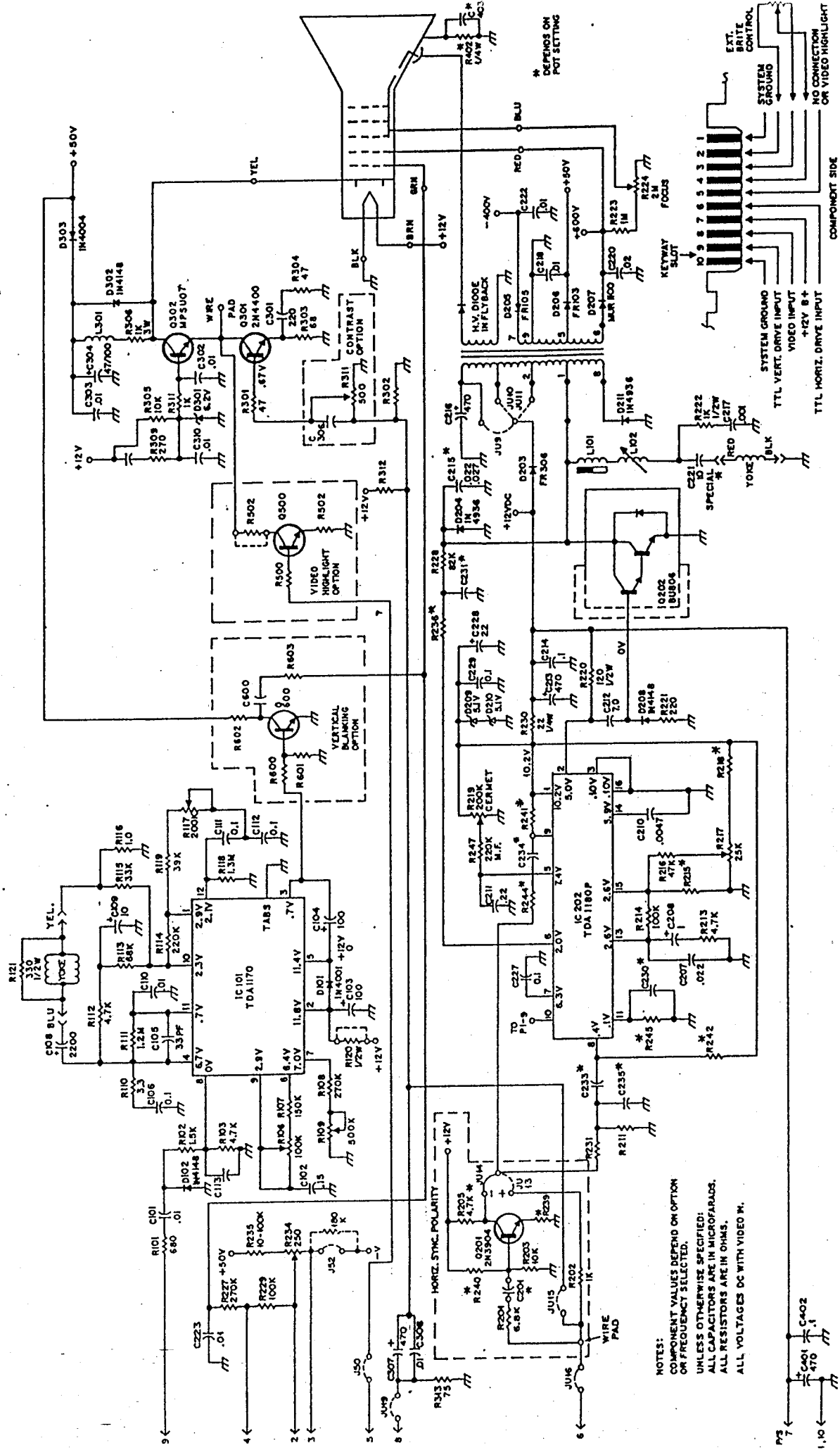
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555 SOUTH KIRK RD.  
SAINT CHARLES, IL 60174



COMPONENT SIDE

ISSUE C  
28013





NOTES:  
 COMPONENT VALUES DEPEND ON OPTION OR FREQUENCY SELECTED.  
 UNLESS OTHERWISE SPECIFIED:  
 ALL CAPACITORS ARE IN MICROFARADS.  
 ALL RESISTORS ARE IN OHMS.  
 ALL VOLTAGES DC WITH VIDEO M.

STANDARD 90° 7", 9", 12" OR 14"

KRISTEL CORPORATION  
 595 SOUTH KIRK RD.  
 SAINT CHARLES, IL 60174

REPLACEMENT PARTS LIST

| <u>PART NUMBER</u> | <u>SCHEMATIC DESIGNATOR</u> | <u>DESCRIPTION</u>                  |
|--------------------|-----------------------------|-------------------------------------|
| 22000-1            | C223, C218                  | Capacitor, Cer. Disc. 0.01-500-Z5U  |
| 22008-3            | C217, C110                  | " " " 0.001-1KV-Z5U                 |
| 22008-1            | C222                        | " " " 0.01-1KV-Z5U                  |
| 22007-1            | C106, C227, C214, C229      | " " " 0.1-100-Z5U                   |
| 24000-1            | C211                        | Capacitor Mylar Film 0.22-75        |
| 22007-2            | C101, C302, C303            | Capacitor Cer. Disc. 0.01-100-Z5U   |
| 22002-1            | C105, C306                  | " " " 33pf-500-NPO                  |
| 22017-11           | C210                        | " " " 0.0047-100-NPO                |
| 22005-11           | C301                        | " " " 560pf-100V-NPO                |
| 22021-1            | C231                        | " " " 68pf-100V-NPO                 |
| 22005-1            | C301                        | " " " 220pf-100V-NPO                |
| 24000-4            | C207                        | Capacitor Mylar Film 0.022-50-10%   |
| 24001-3            | C111, C112                  | " " " 0.1-100-10%                   |
| 24001-1            | C102                        | " " " 0.15-100-10%                  |
| 24004-3            | C220                        | " " " .1-630-10%                    |
| 24008-1            | C215                        | " " " 0.023-400V-5%                 |
| 23004-2            | C208, C209                  | Capacitor Alum. Lytic, Rad. 1uf-50V |
| 23002-1            | C212                        | " " " Rad. 4.7uf-35V                |
| 23001-10           | C213                        | " " " Rad. 1500uf-16V               |

REPLACEMENT PARTS LIST

| <u>Part Number</u> | <u>Schematic Designator</u> | <u>Description</u>                      |
|--------------------|-----------------------------|---|
| 23001-6            | C401                        | Capacitor, Alum. Lytic, Axial, 1uf-50V  |
| 23005-3            | C109                        | Capacitor, Alum. Lytic, Rad. 10uf-25V   |
| 23001-3            | C305                        | Capacitor, Alum. Lytic, Rad. 220uf-16V  |
| 23003-1            | C103, C104                  | Capacitor, Alum. Lytic, Rad. 100uf-25V  |
| 23003-2            | C108                        | Capacitor, Alum. Lytic, Rad. 2200uf-25V |
| 23012-1            | C216                        | Capacitor, Alum. Lytic, Rad. 220uf-35V  |
| 23008-3            | C304                        | Capacitor, Alum. Lytic, Rad. 33uf-63V   |
| 23002-2            | C228                        | Capacitor, Alum. Lytic, Rad. 22uf-35V   |
| 23009-1            | C221                        | Capacitor, Bi Polar, 10uf-25V           |
| 22019-1            | SG301, SG201, SG202         | Spark Gap 0.001-1 to 2KV                |
| 20005C             | D208, D302, D102, D201      | Diode 1N4148                            |
| 20011C             | D301                        | Diode Zener (6.2V) 1N4627               |
| 20013C             | D204                        | Diode 1N4936                            |
| 20017C             | D203                        | Diode FR304                             |
| 20014C             | D101                        | Diode 1N4001                            |
| 20025              | D205                        | Diode FR105                             |
| 20024              | D206                        | Diode FR102                             |
| 20026              | D207                        | Diode FR107                             |
| 26001              | Q303                        | Transistor PNP, MPSA55                  |

REPLACEMENT PARTS LIST

| <u>Part Number</u> | <u>Schematic Designator</u> | <u>Description</u>              |
|--------------------|-----------------------------|---------------------------------|
| 26002              | Q302                        | Transistor NPN, D40P5           |
| 26003              | Q301                        | Transistor NPN, 2N4400          |
| 26008              | Q201                        | Transistor NPN, 2N3904          |
| 36002              | IC101                       | IC TDA 1170S                    |
| 36005              | IC202                       | IC TDA 1180P                    |
| 19000-48           | R306                        | Resistor, Wire Wound 1.5K-5-10% |
| 19002-46           | R306                        | Resistor, Wire Wound 1K-3-10%   |
| 37001-8            | R217                        | Pot, 30K Cermet                 |
| 37000-1            | R311                        | Pot, 500 ohm-Piher Carbon       |
| 37000-4            | R106                        | Pot, 100K-Piher Carbon          |
| 37000-5            | R117                        | Pot, 200K-Piher Carbon          |
| 37000-11           | R109                        | Pot, 500K-Piher Carbon          |
| 37008-1            | R224                        | Pot, 2Meg, CTS 5X-201-RS        |
| 37006-1            | R234                        | Pot, 250K-Cermet                |
| 37003-2            | R219                        | Pot, 200K-Piher Cermet          |
| 25007              | L301                        | Coil Peaking 4.7uh              |
| 25010              | L301                        | Coil Peaking 12uh               |
| 25005              | L202                        | Coil Width                      |
| 25013              | L201                        | Coil Linearity 12" 14"          |

REPLACEMENT PARTS LIST

| <u>Part Number</u> | <u>Schematic Designator</u> | <u>Description</u>         |
|--------------------|-----------------------------|----------------------------|
| 25014              | L201                        | Coil Linearity 7" & 9"     |
| 38006              | ----                        | Yoke 7" & 9"               |
| 38007              | ----                        | Yoke 12" & 14"             |
| 39006              | T101                        | Transformer Flyback (7-9") |
| 39011              | T101                        | " " (12-14")               |
| 72035              | HS-1                        | Heatsink Assy (7-9")       |
| 72035-1            | HS-1                        | " " (12-14")               |
| 33011-1            | ----                        | Socket, CRT Assy           |
| 72036-4            | ----                        | Spring, Dag Assy           |
| 72042-2            | ----                        | Connector, Spring Assy     |