DM40 Direct Drive Monitor

OPERATOR CONTROLS AND SET UP ADJUSTMENTS

All adjustments are located on the Printed Circuit Assembly with the exception of the Raster Centering Rings and Beam Alignment Rings. Only qualified service personnel should be making these adjustments.

Brightness - R474 - Adjusts DC Voltage level between Cathode and Control Grid. Set so that the background raster is just extinguished.

Vertical Size - R303 - Adjusts the height of the display. With a full video pattern applied adjust for desired height.

Vertical Hold - R302 - Adjusts the free running frequency of the Vertical Oscillator. May need to be adjusted when switching from 60 to 50 Hz.

Vertical Linearity - R307 - Adjusts the size relationship between characters at the top and bottom of the display.

Video Centering - R410 - Adjusts the timing relationship between the horizontal drive and video. With a full video pattern applied adjust so that the video is centered horizontally within the raster.

Width Coil L403 - Adjusts the current to the horizontal winding of the yoke. With a full video pattern applied adjust for desired width. A .104" Hex non-magnetic tuning tool must be used.

Raster Centering Rings Part of Yoke L404 - The 2 magnetic rings at the back of the yoke are used to center the raster and display vertically and horizontally.

Focus - R477 - Adjust to obtain best overall focus quality.

Power Supply - R502 - Adjust Power Supply for +55VDC output.

8-12-81

DM40 Direct Drive Monitor

THEORY OF OPERATION

This DM40 Series Video Monitor is primarily intended as an alpha numeric data display. It is completely solid state, except for the cathode ray tube. The following is a functional description of the operation by section.

VIDEO AMPLIFIER - The Video Amplifier consists of one section, the single stage voltage amplifier Q104.

Q104, operating as a class C amplifier, remains cut off until a positive going signal arrives at its base and turns on the transistor. R118 adds series feedback which stabilizes voltage gain from one transistor to another as well as variations in temperature.

The negative going signal at the collector of Q104 drives the CRT cathode to increase electron beam current and excite the screen.

The overall brightness of the CRT screen is determined by the setting of the brightness control R474.

HORIZONTAL DELAY (Video Centering) - Horizontal Sync/Drive is fed to the base of Q400 where it is inverted. C406, R403, R404 form an edge trigger network to couple the Horizontal Sync/Drive to U400. U400 provides a ficed delay from the beginning of Horizontal Drive until U400 times out. The falling edge of U400's output is coupled to U401. U401 provides a variable delay which is controlled by R410 (Video Cent). The combined delays of U400 and U401 allow the Horizontal Drive to be delayed from 0 to 1 full line time. This allows the video to be centered with respect to the raster. U402 provides a constant width drive pulse to the Horizontal Driver Q413.

HORIZONTAL DEFLECTION - The circuitry associated with Q413 and Q414 has been designed to optimize the efficiency and reliability of the horizontal deflection circuits.

A positive going pulse is coupled through R413 to the base of Q413.

The driver stage Q413 is either cut off or driven into saturation by the base signal. The output signal appears as a rectangular wave form and is transformer-coupled to the base of the horizontal output state Q414. The polarity of the voltage at the secondary of the driver transformer is chosen such that Q414 is cut off when Q413 conducts and vice versa.

During conduction of the driver transistor, energy is stored in the coupling transformer. The voltage at the secondary is then negative and keeps Q414 cut off. As soon as the primary current of T403 is interrupted due to the base signal driving Q413 into cut off, the secondary voltage changes polarity. Q414 starts conducting, and its base current flows. This gradually decreases at a rate determined by the transformer inductance and circuit resistance.

The horizontal output stage has 3 main funcitons: to supply the yoke with the correct horizontal scanning currents; develop an accelerator grid voltage for use with the CRT; develop a negative supply voltage for CRT bias.

Q414 acts as a switch which is turned on or off by the rectangular waveform on the base. When Q414 is turned on, the supply voltage plus the charge on C441 causes yoke current to increase in a linear manner and moves the beam from near the center of the screen to the right side. At this time, the transistor is turned off by negative voltage on its base which causes the output circuit to oscillate. A high reactive voltage in the form of a half cycle negative voltage pulse is developed by the yoke's inductance and the primary of T402. The peak magnetic energy which was stored in the yoke during scan time is then transferred to C438 and the yoke's distributed capacity. During this cycle, the beam is returned to the center of the screen.

The distributed capacity now discharges into the yoke and induces a current in a direction opposite to the current of the previous part of the cycle. The magnetic field thus created around the yoke moves the scanning beam to the left of the screen.

After slightly more than half a cycle, the voltage across C438 biases the damper diode into conduction which prevents the flyback pulse from oscillating. The magnetic energy that was stored in the yoke from the discharge of the distributed capacity is released to provide sweep for the first half of scan and to charge C441 through the rectifying action of the damper diode. The beam is then at the center of the screen. The cycle will repeat as soon as the base voltage of Q414 becomes negative.

C441, in series with the yoke, also serves to block DC currents through the yoke and to provide "S" shaping of the current waveform. "S" shaping compensates for stretching at the left and right sides of the picture tube because the curvature of the CRT face and the deflected beam do not describe the same arc.

L403 is an adjustable width control placed in series with the horizontal deflection coils. The variable inductive reactance allows a greater or lesser amount of the deflection current to flow through the horizontal yoke and, therefore, varies the width of the horizontal scan. L402 is a saturable reactor, magnetically biased to effect a changing impedance in series with the horizontal yoke winding depending on current direction to improve horizontal scan linearity.

The same pulse is transformer-coupled to the secondary of transformer T402 where it is rectified by CR407 to produce rectified voltages of approximately 17kv for the CRT.

VERTICAL DEFLECTION - Vertical sync/drive pulses are coupled to the base of Q298, the vertical sync inverter, where they are inverted and coupled to pin 8 of the vertical deflection system IC. C300 provides high frequency bypassing.

U300, TDA1170, is a monolithic IC which incorporates all of the functions of a vertical deflection system, including output stages, in one package.

R302, the vertical hold control, and C304 form the basic timing for the vertical oscillator. R301 sets the range of R302. R303, the vertical size control, is used to adjust the size of the display on the vertical axis. R304 sets the range of R303.

R307, the vertical linearity control, provides a feedback path to allow pre-distortion of the ramp produced at pin 12 of U300. R306 sets the range of R307.

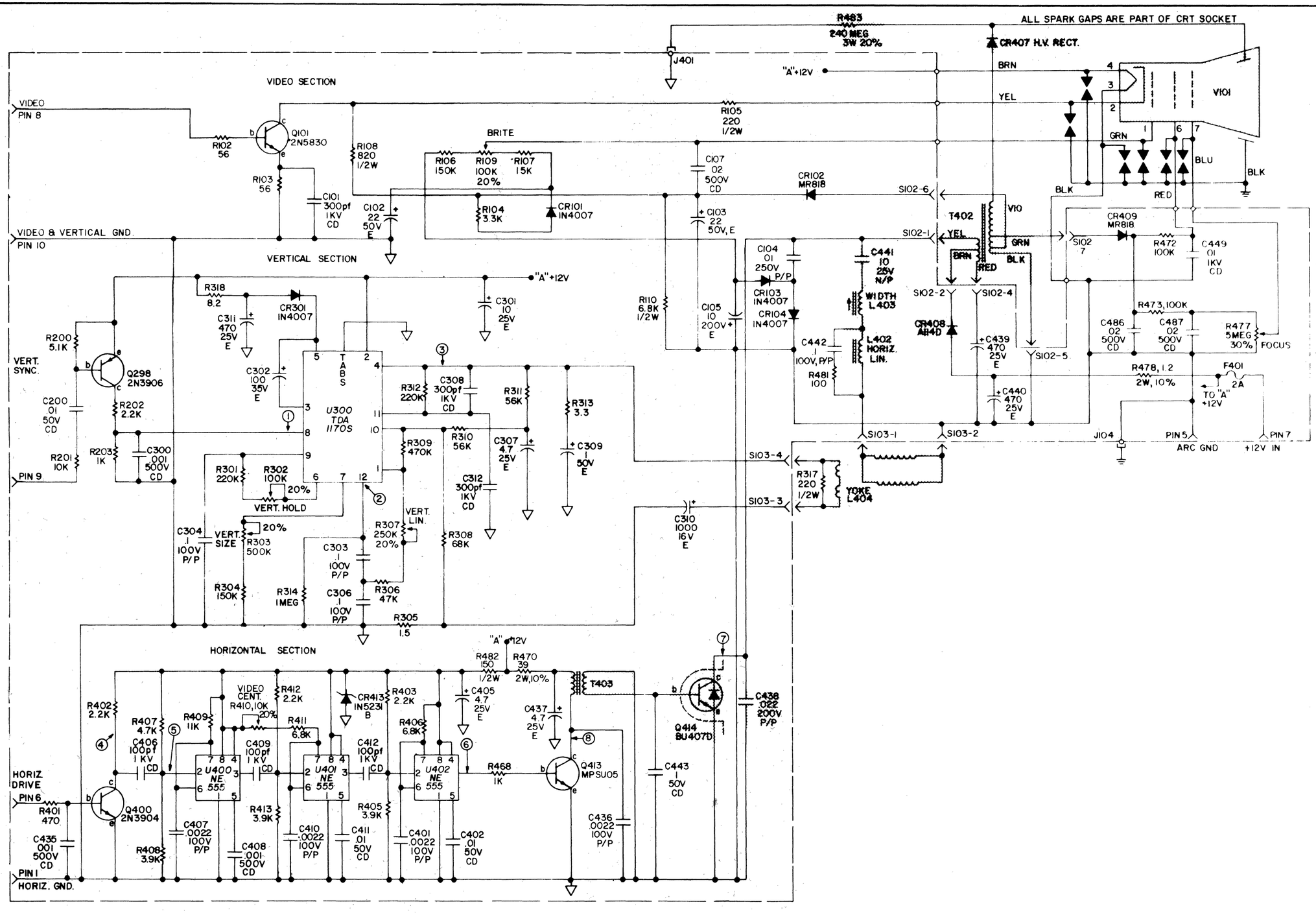
R314 is used as an "S" shaping resistor to allow correction for the curvature of some CRTs.

Due to the internal structure of U300, the vertical adjustments do not interact with each other.

C301, C307 and C308 provide high frequency bypassing and stabilization for U300 and minimizes any tendancy toward high frequency oscillations in the vertical circuit.

C302 is used by U300 to generate a high voltage retrace pulse which is approximately 2 times the supply voltage.

R316 or R317 when present supplies a raster shift by introducing a DC current in the vertical deflection windings. The minimum value of R316 or R317 is 100 ohms.



NOTE:
1). ALL RESISTORS ARE 1/4W 5% UNLESS OTHERWISE SPECIFIED.
2). ALL CAPACITORS ARE IN MFD UNLESS OTHERWISE SPECIFIED.
3). CIRCUIT FOR P.C. BOARD 02-93625-99
4). COMPONENTS IN SHADED AREAS ARE CRITICAL COMPONENTS FOR RADIATION SAFETY OR DESIGN RELIABILTY. REPLACE ONLY WITH ELSTON ELECTRONICS PARTS.

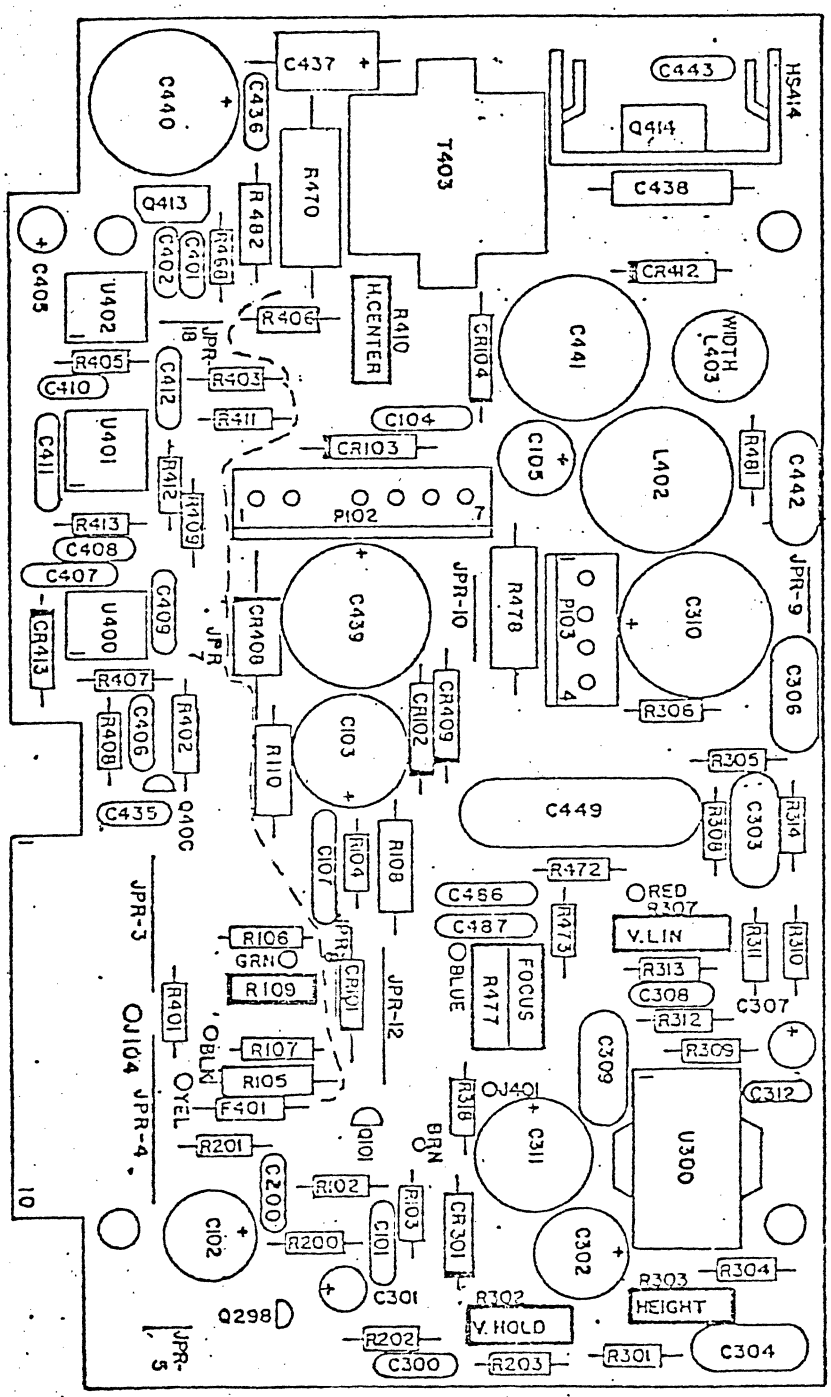
CAPACITOR TYPES

E- ELTROLYTIC
T- TANTALUM
CD- CERAMIC DISC
N/P- NON POLARIZED
P/P- PLASTIC PACKAGE

NO.	REVISION	BY	DATE	ECN	APPVD
9	C406, C409, C412 WERE 500V C411 402 WAS .001 500V	TJS	12/28/82		
8	REDRAW	TJS	10/9/82		

TITLE	DM30-12B0-99-XXX		
FOR	RESEARCH INC.		
DRAWN	T. SMITH	DATE 10/9/82	APP'D
ELSTON ELECTRONICS CORP.			

RUNING 44 231 54123



TITLE	DM30-12B0-99-A31		
	RESEARCH INC.		
DRAWN DLW	DATE 3-31-81	APPVD.	DATE
ELSTON ELECTRONICS CORP.			

NO	REVISION	BY	DATE

AF 12826C

BRIGHTNESS
R474 100K 20%
+24V
C446 100 35V
R475 33K NOTE3
TO XV101-2
C443 .02 1KV
R473 82K
CR 408
C442 .1,100V
IN4007
ALL SPARK GAPS ARE PART OF CRT SOCKET
R112 820,1/2 W
TO P503-1
YEL
BRN
BLK
WHT
V101/XV101
VIDEO SECTION
+55V
R115 820 1/2W
TO P503-4
L406
CR407 HV RECT.
RED
BLU
GRN
R484 4.7 K 1/2 W
R485 47,1/2W
R486,47K,1/2W
R102 56
Q104 2N5830 VIDEO DRIVER
VIDEO PIN 8
R101 1K CONTRAST
NOTE 3
PIN 10
R118 56
C107 300PF 1KV
TO P401-5
OPTIONAL CRT HEATER SUPPLY
C441 A .1 250V
C441 B 47 100 V
CR406
TO CR477
T402
HV TRANS
TO C443
P401-4
YEL
VIO
RED
BLK
P401-2
P401-5
TO CR408
R479 47K 1/2W
R480 47K 1/2W
R481 470 1/2 W
L402
C438 .0082,1.5K P/P
VJ
HORIZ. LINEARITY
Q414 MJ3030
L 403 WIDTH
+12 V
R200 5.1K
Q298 SYNC. INV.
PIN9
C200 .01
R201 10 K
2N3906
50V VERTICAL SECTION
R202 2.2 K
CR301 IN4007
C301 100 35V
HEAT SINK
P506-3
30 V UNREG.
U502 LM317 T
P506-2
24V REG.
P506-1
R508 270
C302 100 35V
U 300 TDA 1170
C308 680 PF 50V
R312 220 K
R313 3.3
R311 15 K
R310 1.5K
R308 5.6K
R305 A 1.5
R305 B 1.5
R507 4.7 K
C307 33 35V
C309 .1 100V
C312 .001, 50V CD
R309 47K
R303 500 K HEIGHT
R304 150K
R314 270K
C303 .1,100 V
R306 27K
C306 .1,100V
R307 250 K 20%
V LIN
V. HOLD
R302 100 K 20%
R301 220K
C304 .1 100V
R203 1K
C300 .001 CD 50 V
C310 1000 25V
P 402-1
P 301-2
P 301-3
YOKE L404 A
R317 120 1/2W
L 404 B
P402-2
L405
C440 47 100V
P401-1
TO P401-4
CR476
CR477
C487 .22 630V
FOCUS R477 5 MEG 30%
R478 5,5 W
R514 15 W
C505 220 50V
55V
100
30V UNREG.
F502 2A
CR506, IN4007
R501 470
R502 5K
R503 3.9K
R504, 39K
C502 .001 50V
OUT
P502-5
P502-1
P502-3
LM317K U501 ADJ REG
ADJ.
P502-2
IN
C307 .001 50V
C504 .001 50V
C503 .001 50V
C501 1000 100V
R507 20, 11
P502-4
P502-8
P502-7
HORIZONTAL SECTION
HORIZ. SYNC / DRIVE
R401 470
PIN 6
PIN 1
HORIZ. GND
R402 2.2K
C406 100PF 500V
Q400 2N3904
C435 .001 50V
R403 4.7 K 500V
R404 3.9K
R405, 11K
NE555 U400
C407 .0022 100V
C408 .001 50V
C413 .05,50V
R406 2.2K
C409 100PF 500V
VIDEO CENTER
R410 10K
R408 7.5K
R407 3.9K
C410 .0022 100V
NE555 U401
C411 .001 50V
C414 .05 50V
R409 2.2K
C412 500 V 100PF
C401 .0022 100V
R412 7.5K
R411 3.9K
NE555 U402
C405 .05 50V
C402 .001 50V
R413 1K
C432 .1 100V
C433 470 25V
CR405 IN4742
R471 220 2W
R430 2W 120
C437 .1,100V
Q413 MPSU05 HORIZ. DRIVER
T403
C436 .0022 100V
TO CRT HEATER
P503-4
P503-1
GRN/RED
RED
BLK
BLK/YEL
BLK/RED
BLK/GRN
P501-4
P501-8
P501-7
P501-6
P501-3
115V 230V
SW501A
SW501B
R506 1MEG,1W
F501 3/4A SB
P501-1
J504
J505
J107
NOTES
1). ALL CAPACITANCE IN MFD UNLESS OTHERWISE INDICATED
2). ALL RESISTORS ARE 1/4 WATT 5% UNLESS OTHERWISE NOTED
55V POWER SUPPLY
115/230V A.C. INPUT

DRAFTRACE 250

NO	REVISION	BY	DATE

TITLE	DM40-15A0-18-A31		
	RESEARCH INC.		
DRAWN D.CAREY	DATE 7/22/81	APPVD MGB	DATE 8-12-81
ELSTON ELECTRONICS CORP			

DS12NF51 18.6

VERTICAL

HORIZONTAL

VIDEO

VERT SYNC (9) R301 5.6K C301 1500PF 10% W30 C302 150PF 10% R302 22K R303 200K R304 47 1/4W 10% R306 12K R307 6.8K C304 33/16V R308 27K C303 .1 100V 5% Q301 VERT OSC.I Q302 VERT OSC.II CRX301 14V 12 VDC

DIFF AMP Q303 R309 2.2 MEG 1/4W 5% R311 1.5MEG 1/4W,5% R312 250K VERT SIZE R313 1001/4W 10% R314 12K R316 27K R317 2.2K C307 10/25V ±10% C308 1/35V 20% C309 1/35V 20% R318 100 1/4W,10% R319 47K Q304 VERT DRIVER

R322 2.2K R321 2.2K C311 47/25V CR302 CR303 Q307 VERT OUT I Q306 VERT OUT II RX323 3.3 FAILSAFE C314 .022 100V 10% R328 390 R329 680 C316 470/16V R331 2.7

VERT. RETRACE Q308 CR304 C312 47/25V R326 75 R324 220,1/2W 5% R327 3.3K C313 10/25V C317 220/25V W11 RX333 22 FAILSAFE W3 18.5 VDC

RED TX202A VERT. YOKE BLUE

12 VDC R403 1K C402 10/25V R404 1K R406 47,1/4W 10% Q401 VIDEO OUTPUT

VIDEO INPUT (8) R409 47,1/4W 10% Q402 VIDEO DRIVER +12 VDC R415 15K C403 220PF 10% R412 47 1/4W 10% R413 22 1/4W 10%

50 VDC CR401 L401 C401 3.3/100V R402 820 5% 2W W13 W20 R201 VX201 R203 330 1/2W 5% R204 2.2K 10% R206 10K 10% R207 47K 10%

BRIGHTNESS CONTROL R128 100K W18 C122 .01 100V 10% C123 .001 1KV 10% R132 1 MEG 1/4W 10% R134 680K 1/4W 10% R136 2 MEG FOCUS

R126 82K 1/4W 10% W14 R127 82K 1/4W 10% C121 .01 10% 100V

W9, W12, W22, W26 12 VDC W27 C119 220/25V W4

HORIZ SYNC INPUT (6) W23, W5 C101 150PF 10% R101 W8 1K R103 1K SYNC AMP Q104 C106 .01 100V 10% R107 22 K R106 680 C104 0068 100V C107 6800PF 100V 5% R109 2.4K R111 2.5K PHASE R112 7.5K 2% CR102 IC 101 HORIZ OSC. 1 2 3 4 5 6 7 8

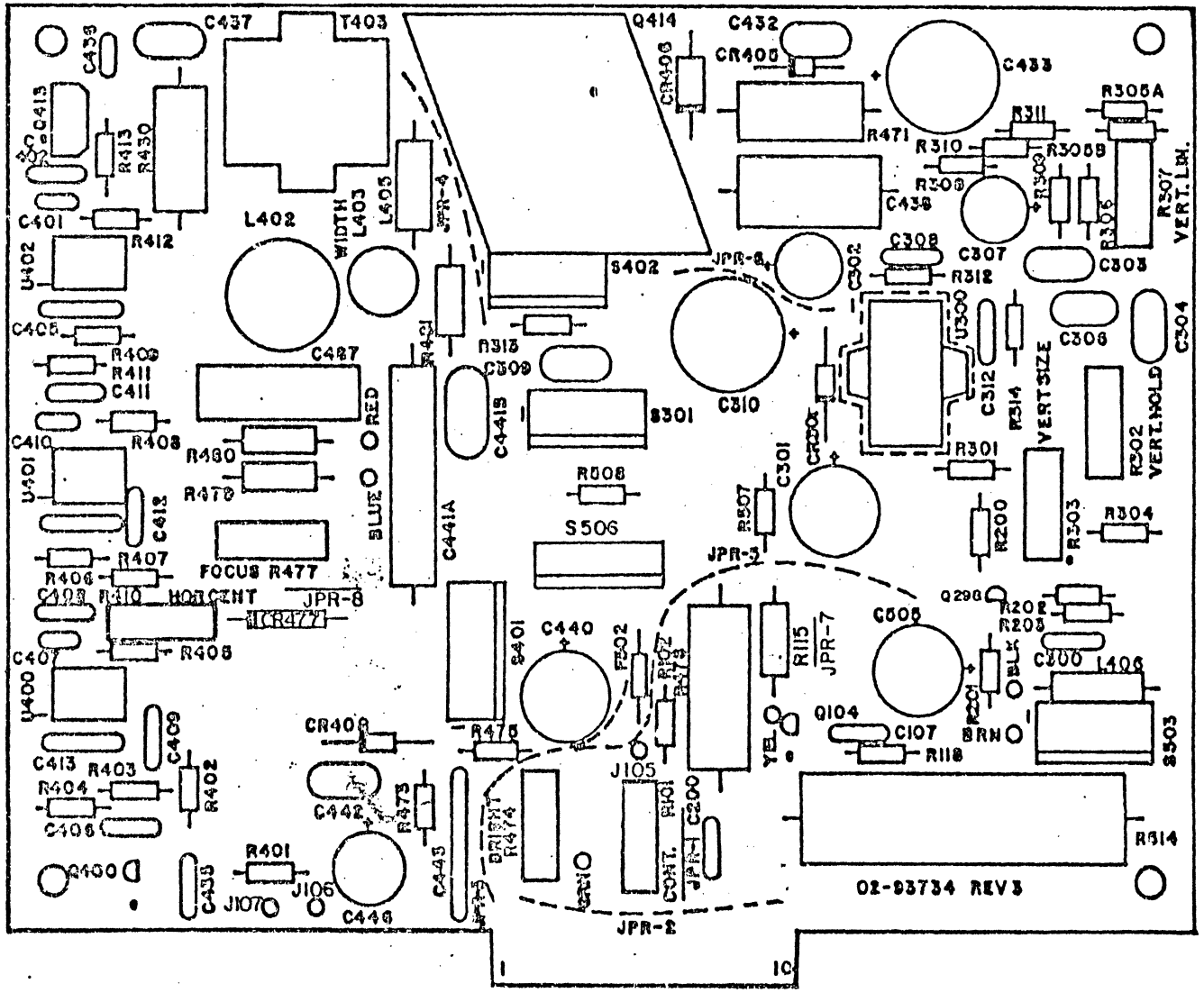
C103 33/16 V W6 W7 R104 680 C108 .018,5% Q101 R117 4.7K 2% R116 10K R114 2.2K R105 22K CR112 R113 1K W5 RX118 2.2 FAILSAFE

RX119 3.3 FAILSAFE Q102 HORIZ DRIVER R139 180 1/4W 10% C109 .022 100V 10% HORIZ DRIVER TX 101 R121 82 Q103 HORIZ OUTPUT

CR108 W10 18.5 VDC C118 220/25V CR109 C116 .001 10% 1KV W2 CR106 C117 .001 10% 1KV CR107 CR103 CX111 .015 400V SPECIAL LX101 WIDTH C112 .10MFD SPECIAL LX102 LIN W1

TX102 SWEEP XFMR 1 (F) YEL 4 (E) BLU 5 (C) ORA 3 (D) RED (A) BLK (B) VIO

TX202B HORIZ YOKE YEL BLK RX122 100 FAILSAFE CR110 R123 680 C113 .022 10% 100V CR104 R138 15K C114 33/63V 50V DC



TITLE	DM40-15A0-18-A31		
RESEARCH INC.			
DRAWN D. CAREY	DATE 7/22/81	APPVD. RGB	DATE 8-12-81