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.


8-12-81

ELSTON ELECTRONICS CORPORATION. 35 LEHIGH STREET. P.O. BOX 553 GENEVA NEW YORK 14456
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 fixed 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 functions: 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. T402 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 tendency 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 1/2W 5% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MFD UNLESS OTHERWISE SPECIFIED.
3. CIRCUIT FOR P.C. BOARD 02-93305-99
4. COMPONENTS IN SHADED AREAS ARE CRITICAL COMPONENTS
   FOR RADIATION SAFETY OR DESIGN RELIABILITY. REPLACE
   ONLY WITH ELMTON ELECTRONICS PARTS

CAPACITOR TYPES
E-ELSTOLYTIC
T-TANTALUM
CD-CERAMIC DISC
N/P-NZ0 POLARIZED
WP-PLASTIC PACKAGE

DM30-10BO-99-XXX

RESEARCH INC.

T SMITH / 10/8/99

P  STONE ELECTRONICS CORP.