

MEADOWS LANES

Model ML-1

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#### INTRODUCTION

MEADOWS LANES, a game of skill, is a video bowling game. The player must locate the "Bowler" inside the gutters and then bowl the ball either fast or slow. If the ball is not going exactly where the player wants it to he can hook the ball either to the right or to the left, but he can only hook the ball one time. The instructions are printed on the video screen and will provide the proper instructions for whatever options that the operator has selected.

#### WARRANTY

PRINTED CIRCUIT BOARDS: Contact the distributor from whom the game was purchased for warranty repair and/or replacement information.

NOTE: Any PCB repair attempted by anyone other than factory authorized service people, or any damage due to improper handling or use shall void any existing warranty. Proper procedures for removal and replacement, as outlined in manual, must be adhered to.

DISPLAY MONITOR: Contact the distributor from whom the game was purchased for warranty repair and/or replacement information.

NOTE: Any monitor repair attempted by anyone other than factory authorized people, or any damage due to improper handling or use, shall void any existing warranty.

ALL EQUIPMENT RETURNED TO THE FACTORY MUST HAVE RETURN AUTHORIZATION NUMBER AND TRAVEL FREIGHT PREPAID. PLEASE LIST SYMPTOMS OR PROBLEMS TO EXPEDITE REPAIRS.

#### MEADOWS LANES SETUP AND CHECKOUT

When the game is received and unpacked, save all packing materials in the event that it was damaged and must be returned. After reading "CABINET ENTRY" section, proceed to inspect the interior of the cabinet for loose or damaged connectors, wires, hardware, etc. If everything seems in satisfactory condition, plug the game in and play it as described in the section "GAME SEQUENCE". For questions about length of play time, coins per game, sound level, or anything relating to picture image, see the section "ADJUSTMENTS/MAINTENANCE".

#### GAME SEQUENCE

#### CONTROL AND SWITCH FUNCTIONS

COIN: Operator selectable:

1 coin, 25¢, per player

2 coins, 50¢, per player

TIME: Operator selectable

unlimited time to bowl ball

3 seconds to bowl ball

5 seconds to bowl ball

START GAME: Clears the instructions and starts the game

of the monitor and the second player score is displayed on the left side of the monitor and the second player score is displayed on the right side. When a two player game is finished the word "WINNER" is written under the player with the highest score. In case of a tie the word "TIE" is written across the bowling alley. The score displayed on the monitor is scored exactly the same way that real bowling is scored.

#### CABINET ENTRY

Entry into the MEADOWS LANES cabinet is at three points: the coin door, the back door, and the control panel.

#### COIN DOOR

The coin door is hinged to open from right to left giving access to the following:

Coin Box Coin Mechanism Control Panel Wing Nuts

#### BACK DOOR

The back door tilts out from the top and lifts up for removal. This allows access to the following:

Display Monitor Harness Logic PCB Sound PCB

#### CONTROL PANEL

To open the control panel open the coin door first. Remove the two wing nuts located up towards the control panel to the left and right. Finally, swing the control panel away from the cabinet. This will give access to the following:

Cleaning Monitor/Inner Plexiglass Plexiglass Removal Speaker Start Switch Player Controls

#### COIN ACCEPTOR OPERATION, ADJUSTMENT AND MAINTENANCE

#### SEE FIGURE 1

The detection and rejection of undesired or counterfeit coins are determined by size (both thickness and diameter), weight and metallic composition.

The transfer cradle (#9) is used to test both the size and weight of the coin. The coin must first pivot an "undersize" lever (10) to unlock the transfer cradle and can be returned by actuating the wiper operating lever (17). Oversize diameter coins will fail to pass between the transfer cradle and the wiper and can be returned by operating the wiper lever. Coins that are oversize in thickness will fail to pass between the magnet gate (11) and the main channel (5) and will have to be dislodged by actuating the wiper operating lever. Underweight coins will fail to overcome the transfer cradle counterweight and can be returned by operating the wiper lever.

A magnet is used to test the metallic composition of the coin. Highly magnetic coins, such as steel or iron, will be retained by the magnet and can be returned by actuating the wiper operating lever. Coins having comparatively high magnetic properties will be slowed down by the magnet and will drop off the rail short of the accept entrance and will be returned. Coins having little or no magnetic properties, such as brass or zinc, will pass through the magnetic field so fast they will overshoot the accept entrance and will be returned.

#### ADJUSTMENT

All coin acceptors leave the factory adjusted for maximum performance. If, however, more critical adjustment is desired, or if the unit has been disassembled for cleaning, the following adjustment procedure is suggested.

#### KICKER AND SEPARATOR

- a. Set the acceptor on a level surface with the back of the unit facing you (the kicker and separator are on the back).
- b. Loosen the screws holding the kicker (1) and the separator (3) and move both the kicker (2) and the separator (4) as far to the right as they will go. Tighten the screws lightly.
- c. Insert several test coins (both old and new) and note that some are returned by striking the separator.

- d. Loosen the separator screw and move the separator a slight amount to the left. Retighten the screw.
- e. Insert the test coins again, and if some are still returned, repeat Step d until all coins are accepted.
- f. Loosen the kicker screw and move the kicker a slight amount to the right.
- g. Insert the test coins again and, if some of them are returned, repeat Step f until all coins are accepted.
- h. Be sure that both screws are tight after the adjustments have been made.

#### THE MAGNETIC GATE

- a. Set the acceptor with the front of the unit facing you in the test position.
- b. Turn the magnet gate adjustor (12) out (counter-clockwise) until none of the coins will fit through.
- c. With a coin resting in the transfer cradle, turn the adjustor in (clockwise) until the coin barely passes through the magnet gate.
- d. Test this adjustment using several coins, and if any fail to pass through the magnet gate, repeat Step c until all coins are accepted.
- e. Fix the gate adjustor in this position with a drop of glue or Loctite, if necessary.

#### ACCEPTOR MAINTENANCE

Depending on the environment in which the acceptor is used, periodic preventative maintenance should be performed.

The mainplate (5) may be cleaned with any liquid household cleaner. Thorough rinsing and drying are necessary to remove deposits and/or film. Remove all metal particles from the magnet by guiding a screw-driver along the edges of the magnet. Remove the transfer cradle and undersize lever and clean the bushings and pivot pins and re-assemble. Spray the entire unit lightly with WD-40, a silicone lubricant.

#### COINS PER GAME, ADJUSTMENT

The number of plays per coin is switch adjustable to either 1 coin per game or 2 coins per game. See the illustration of the Logic PCB for switch details.

#### GAME TIME, ADJUSTMENT

Length of time for player to bowl the ball can be set for unlimited time, 3 seconds or 5 seconds. See Logic PCB illustration for switch details.

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#### DISPLAY MONITOR, ADJUSTMENT AND MAINTENANCE

The display monitor contains the following adjustments from left to right:

Contrast: Adjustments for clear picture

Brightness: Adjustment to suit location

Vertical Hold: Adjustment if picture flips

Horizontal Hold: Adjustment if picture has diagonal lines

or is distorted

For any maintenance see your "DISPLAY MONITOR MANUAL".

For access to display monitor see "Back Door" section under "CABINET ENTRY".

#### PCB REMOVAL

Before removing PCB's, power cord should be disconnected. Note the position of PCB to the connector to ensure proper connection upon replacement.

#### TROUBLE SHOOTING HINTS

#### TESTING COMPONENTS OF GAME

BUTTONS & COIN SWITCH are normally closed. When pushed they are open. The buttons can be by-passed by pulling off one of the terminals.

HARNESS can be tested by an ohm-meter or continuity checker.

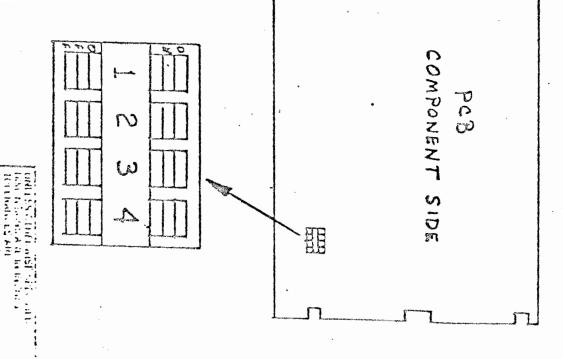
FUSES are checked by visual inspection or continuity checker.

LOGIC PCB, SOUND PCB & TV MONITOR can be checked by substitution of a good replacement. Repair of logic PCB, sound PCB & monitor should only be serviced by experienced technicians.

NO PICTURE: Check if back of picture tube is lit, if not, inspect fuses, power cord, and power outlet. If these are good and tube is not lit, repair of monitor is necessary.

If the tube is lit, check adjustments of brightness and contrast. Test continuity of logic board pins #1 and #3 (5 volt dc power supply), and pin #5 (video output). If all check out, the problem is either the logic PCB or the monitor.

NO SOUND: Check the adjustment of the volume control on the Sound PCB. Check the speaker, logic PCB, and TV monitor.



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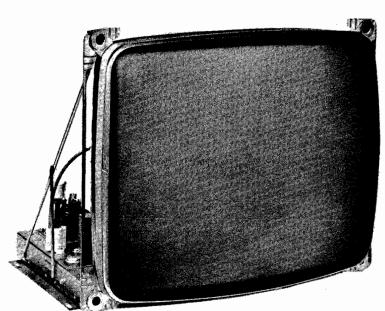
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FIGURE 4

# *motorola* service manual

#### FILE VP12

#### **DISPLAY PRODUCTS**



**CHASSIS** 

19VP111 23VP111

**MODELS** 

XM501-10 XM701-10

# GENERAL INFORMATION

These models are transistorized monitors designed for the video game market. They are identical except for the CRT size. See V1 in Replacement Parts List.

Circuitry includes four stages of video amplification, a two stage audio amplifier, sync and deflection circuits and a regulated power supply. An additional 5 volt 3 amp supply is included to power external logic systems. The picture tube is a 114 degree deflection CRT with implosion protection. Composite video is fed to the monitor through a connector mounted on the rear of the chassis.

Rear panel controls include Horizontal Hold, Vertical Hold, Contrast, Brightness, Volume and width controls. Additional service controls are mounted on the plated circuit panel, and are accessible from the rear of the chassis.

The chassis utilizes plug-in etched panel construction with components mounted on the top side and plated wiring on the bottom. Component reference numbers and circuit legend are printed on the board to aid in servicing. Horizontal, vertical output and regulator transistors are mounted on the chassis base which also serves as a heat sink and CRT support.

#### **CAUTION**

NO WORK SHOULD BE ATTEMPTED ON ANY EXPOSED MONITOR CHASSIS BY ANYONE NOT FAMILIAR WITH SERVICING PROCEDURES AND PRECAUTIONS.

#### **ELECTRICAL SPECIFICATIONS**

Power Rating: 110 watts nominal.

50 watts without 5 volt

supply.

Source: 120/240V AC at 50/60Hz

Switch selected.

Video Input: 0.5 to 2.5 volts composite

PP (sync negative).

Audio Output: 5 watts peak

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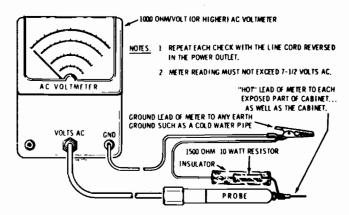
#### SAFETY WARNING

CAUTION: NO WORK SHOULD BE ATTEMPTED ON AN EXPOSED MONITOR CHASSIS BY ANYONE NOT FAMILIAR WITH SERVICING PROCEDURES AND PRECAUTIONS.

- 1. SAFETY PROCEDURES should be developed by habit so that when the technician is rushed with repair work, he automatically takes precautions.
- 2. A GOOD PRACTICE, when working on any unit, is to first ground the chassis and to use only one hand when testing circuitry. This will avoid the possibility of carelessly putting one hand on chassis or ground and the other on an electrical connection which could cause a severe electrical shock.
- 3. Extreme care should be used in HANDLING THE PICTURE TUBE as rough handling may cause it to implode due to atmospheric pressure (14.7 lbs. per sq. in). Do not nick or scratch glass or subject it to any undue pressure in removal or installation. When handling, safety goggles and heavy gloves should be worn for protection. Discharge picture tube by shorting the anode connection to chassis ground (not cabinet or other mounting parts). When discharging, go from ground to anode or use a well insulated piece of wire. When servicing or repairing the monitor, if the cathode ray tube is replaced by a type of tube other than that specified under the Motorola Part Number as original equipment in this Service Manual, then avoid prolonged exposure at close range to unshielded areas of the cathode ray tube. Possible danger of personal injury from unnecessary exposure to X-ray radiation may result.
- 4. An ISOLATION TRANSFORMER should always be used during the servicing of a unit whose chassis is connected to one side of the power line. Use a transformer of adequate power rating as this protects the serviceman from accidents resulting in personal injury from electrical shocks. It will also protect the chassis and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.
- 5. Always REPLACE PROTECTIVE DEVICES, such as fishpaper, isolation resistors and capacitors and shields after working on the unit.
- 6. If the HIGH VOLTAGE is adjustable, it should always be ADJUSTED to the level recommended by the manufacturer. If the voltage is increased above the normal setting, exposure to unnecessary X-ray radiation could result. High voltage can accurately be measured with a high voltage meter connected from the anode lead to chassis.

7. BEFORE RETURNING A SERVICED UNIT, the service technician must thoroughly test the unit to be certain that it is completely safe to operate without danger of electrical shock. DO NOT USE A LINE ISOLATION TRANSFORMER WHEN MAKING THIS TEST.

In addition to practicing the basic and fundamental electrical safety rules, the following test, which is related to the minimum safety requirements of the Underwriters Laboratories should be performed by the service technician before any unit which has been serviced is returned.



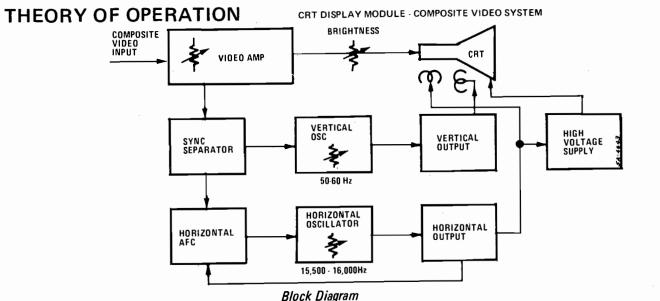
Voltmeter Hook-up for Safety Check-

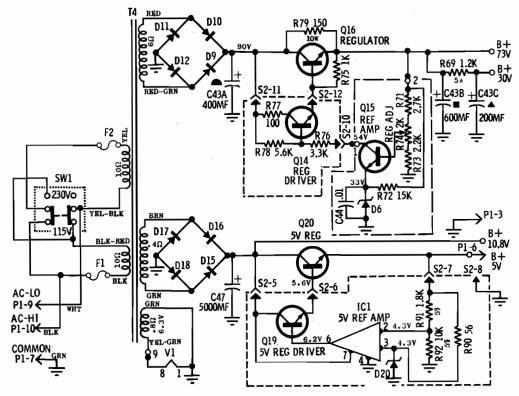
A 1000 ohm per volt AC voltmeter is prepared by shunting it with a 1500 ohm, 10 watt resistor. The safety test is made by contacting one meter probe to any portion of the unit exposed to the operator such as the cabinet trim, hardware, controls, knobs, etc., while the other probe is held in contact with a good "earth" ground such as a cold water pipe.

The AC voltage indicated by the meter may not exceed 7½ volts. A reading exceeding 7½ volts indicates that a potentially dangerous leakage path exists between the exposed portion of the unit and "earth" ground. Such a unit represents a potentially serious shock hazard to the operator.

The above test should be repeated with the power plug reversed, when applicable.

NEVER RETURN A MONITOR which does not pass the safety test until the fault has been located and corrected.





#### **POWER SUPPLY**

The power supply is a transformer operated, full wave, regulated supply which maintains constant output voltage with input variations of ±15%. A switch (SW1) is provided to allow operation from 115/230 volts, 50/60Hz. The regulator is a series pass circuit. Q16 is the series pass transistor, Q15 the reference amplifier and Q14 the output driver.

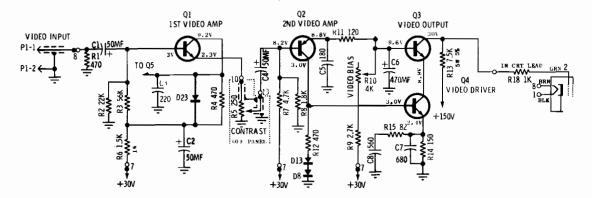
The output voltage of the regulator appears at the emitter of Q16. This voltage is divided between R71, R74 and R73. The voltage appearing on the arm of potentiometer R74 is a reference input to the base of Q15.

A temperature conpensated zener diode (D6) is used to establish a fixed reference voltage at the emitter of Q15. R72 provides a bias current for D6, establishing its operating point.

An increase in output voltage will result in an increase of voltage at the base of Q15. Since the emitter of Q15 is held at a fixed reference voltage, the change in base voltage will turn Q15 on harder, reducing its collector voltage. This reduces forward bias for Q14 resulting in less emitter current and less base current for Q16. Q16 will conduct less, lowering the output voltage.

R79 provides a shunt current path for Q16 allowing it to run cooler, improving reliability. C44 is an RF noise filter.

A fixed, regulated 5V DC supply is used to power circuits external from the monitor. Its operation is similar to the 73V regulator except for the reference amplifier which is contained in the IC package.



#### **VIDEO AMPLIFIER**

The video amplifier has four stages incorporating devices Q1, Q2, Q3 and Q4. The first stage, Q1, functions as an emitter follower. The low output impedance of the first stage permits use of a low resistance contrast control which furnishes flat video response over its entire range without the need for compensation. The collector output of Q1 is used to drive the sync separator. C3 provides high frequency roll off to limit the collector output to the bandwidth required to pass synchronization signals. Q2 is a common emitter stage and is directly coupled to Q4. Q3 and Q4 are connected in a cascode configuration. This common emitter-common base connection greatly reduces the effect of Miller capacity compared with a conventional single transistor video output stage. C6 provides a ground for video at the base of Q3, the grounded base transistor of the video output cascode pair. Diodes D13 and D8 provide temperature compensation for the video output stages, and diode D23 protects Q1 from transients.

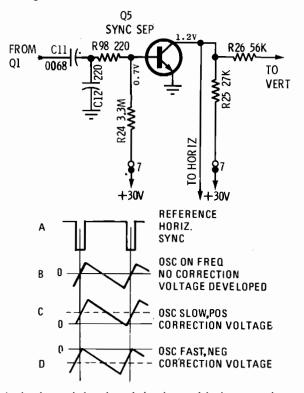
The video bias control R10, is used to set the quiescent collector voltage of Q3. C5, C7, C8 and R15 are used for high frequency compensation. The video amplifier output is direct coupled to the control grid of the CRT through R18 which is used to isolate Q3 from transients that may occur as a result of CRT arcing.

#### SYNC SEPARATOR

The sync separator employs a single stage, Q5, to recover sync from the composite video signal. A single stage sync separator is adequate due to the high impedance of the following stages. The video input to the sync separator is black positive. C11 is charged by the peak base current that flows when the positive peak of the input takes Q5 to saturation. This charge depends on the peak to peak input to Q5 and thus makes the bias for Q5 track the amplitude of the input signal. As a result Q5 amplifies only the positive peaks of the input signal. The initial bias current through R24 sets the clipping level. R98 is used for transient protection.

#### PHASE DETECTOR

The Phase Detector consists of two diodes in a keyed clamp circuit. Two inputs are required to generate the required output, one from the sync separator and one from the horizontal deflection system. The required output must be of the correct polarity and amplitude to correct phase differences between the input sync and the horizontal time base. The horizontal collector pulse is integrated into a sawtooth by R45 and C15. During sync time both diodes in D7 conduct, shorting C15 to ground.

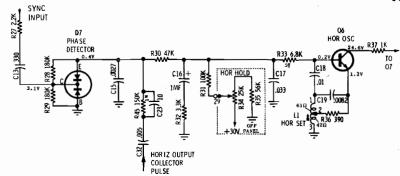


The sawtooth on C15 is thus clamped to ground at sync time. If the horizontal time base is in phase with the sync, the sync pulse will occur when the sawtooth is passing through its AC axis and the net charge on C15 will be zero. (Figure B). If the horizontal time base is lagging the sync, the sawtooth on C15 will be clamped to ground at a point negative from the AC axis. This will result in a positive DC charge on C15. (Figure C). This is the correct polarity to cause the horizontal oscillator to speed up to correct the phase lag.

Likewise, if the horizontal time base is leading the sync, the sawtooth on C15 will be clamped at a point positive from its AC axis, resulting in a net negative charge on C15 which is the required polarity to slow the horizontal oscillator (Figure D). R30, C17, C16 and R32 comprise the phase detector filter. The bandpass of this filter is chosen to provide correction of horizontal oscillator phase without ringing or hunting. Capacitor C23 times the phase detector for correct centering of the picture on the raster.

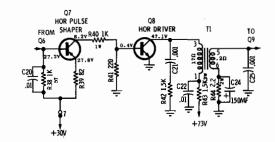
#### HORIZONTAL OSCILLATOR

Q6 is employed in a modified type of Hartley oscillator. The operating frequency of this oscillator is sensitive to its base input voltage. This permits control by the output of the phase detector and also by the setting of the horizontal hold control, R34. The horizontal hold range is set by adjustment of the core of L1.



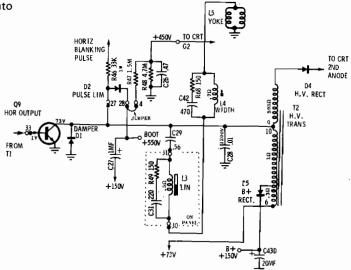
#### **PULSE SHAPER & HORIZONTAL DRIVER**

Q7 is used as a buffer stage between the horizontal oscillator and horizontal driver. It provides isolation for the horizontal oscillator as well as a low impedance drive for the horizontal driver. R38 and C20 form a time constant which shapes the oscillator output to the required duty cycle (approximately 50%), to drive the horizontal output circuitry. The horizontal driver stage, Q8 operates as a switch to drive the horizontal output transistor through T1. Because of the low impedance drive and fast switching times furnished by Q7, very little power is dissipated in Q8. C21 and R42 provide damping to suppress ringing of the primary of T2 when Q8 goes into cutoff.

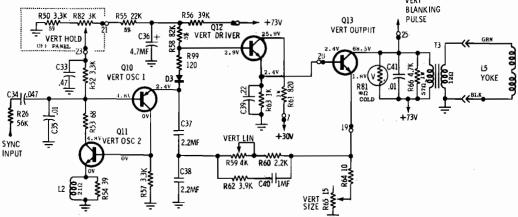


#### HORIZONTAL OUTPUT

The secondary of T1 provides the required low drive impedance for Q9. R44 and C24 form a time constant for fast turn-off of the base of Q9. Q9 operates as a switch which, once each horizontal period, connects the supply voltage across the parallel combination of the horizontal deflection yoke and the primary of T2. The required sawtooth of deflection current through the horizontal yoke is formed by the L-R time constant of the yoke and output transformer primary. The horizontal retrace pulse charges C27 through D2 to provide operating voltage for G2 of the CRT. Momentary transients at the collector of Q9, should they occur, are limited to the voltage on C27 since D2 will conduct if the collector voltage exceeds this value.



The damper diode, D1, conducts during the period between retrace and turn on of Q9. C28 is the retrace tuning capacitor. C29 blocks DC from the deflection yoke. L3 is a magnetically biased linearity coil which shapes deflection current for optimum trace linearity. L4 is a series width control. C31 and R49, C42 and R68 are damping network components for the linearity and width controls. C43D is charged through D5 developing the video supply voltage.



#### VERTICAL OSCILLATOR DRIVER AND OUTPUT

Sync from the collector of Q5 is integrated by R26 and C35. Q10 and Q11 are connected as a regenerative switch. The series combination of C37 and C38 charges through R58, R56 and D3 until Q10 turns on. This occurs when the emitter of Q10 exceeds its base voltage and causes current to flow into the base of Q11, turning that device on. When Q10 and Q11 conduct,

C37 and C38 are discharged to nearly zero. Q10 and Q11 then shut off and the cycle repeats. The setting of R82 determines the repetition rate of the charge and discharge of C37 and C38. The waveform generated is a positive going ramp or sawtooth with a fast retrace to zero. D3 provides a small incremental voltage above ground to overcome the forward sawtooth to a low impedance drive for Q13.

T3 matches the collector of Q13 to the vertical yoke. When Q13 is cut off during vertical retrace, a high voltage pulse is developed across the primary of T3. To limit this pulse to a safe value a varistor, R81, is connected across the primary. R66 and C41 provide damping to shape the collector pulse so it may be used for retrace blanking. Since the primary impedance of T3 decreases with current, the degree to which the primary shunts the reflected load impedance varies with collector current. This would result in severe vertical non-linearity unless some compensation is employed.

Resistors R59 and R60 couple the emitter voltage of Q13 to the junction of C37 and C38. Since this path is resistive, the waveform coupled back will be integrated into a parabola by C38. This results in a pre-distortion of the drive sawtooth as shown in Figure C. This is done to compensate for the non linear charging of C37 and C38 and the changing impedance of the primary of T3. An additional feedback path through R62 and C40 serves to optimize the drive waveshape for best linearity.

#### RETRACE BLANKING

Both vertical and horizontal retrace blanking are provided by positive pulses applied to the CRT cathode. The collector pulse from the horizontal output transistor is placed across R23 through R46. The vertical collector voltage is differentiated by C30 to remove the sawtooth portion of the waveform. The remaining pulse appears across R23. The mixed vertical and horizontal pulses on R23 are coupled to the CRT cathode by C10.

#### **AUDIO AMPLIFIER**

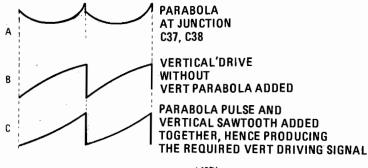
Q17 and Q18 form a DC coupled "switching tone burst amplifier". An input signal biases Q17 on, in turn driving Q18 into conduction. When the signal is removed both stages return to a quiescent mode. Coupling capacitor C50, diode D19 and resistor R88 establish a bias voltage which is signal dependent. Volume control R85 sets the peak to peak level for the output stage.

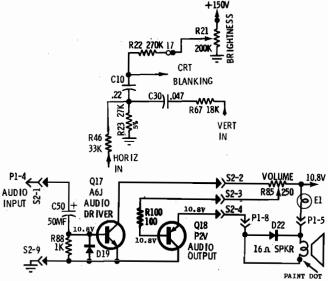
Lamp E1 serves to protect the speaker if the audio output transistor fails, it also protects the transistor should the speaker leads be shorted.

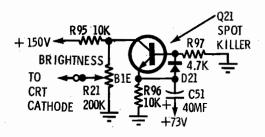
Diode D22 (on early models) polarizes the speaker insuring proper installation. If it is installed wrong, little or no audio will be developed.

#### SPOT KILLER

Normally Q21 is not conducting and capacitor C51 is charged to the supply voltage. When the monitor is turned off, C51 discharges through R96 turning the transistor on. It in turn removes the positive potential from the brightness control connecting the CRT cathode to ground, causing the tube to conduct hard, discharging the high voltage.



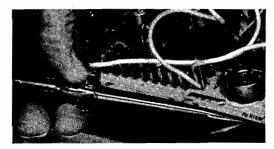




#### PANEL REMOVAL/INSTALLATION



#### SERVICE NOTES



To prevent damage to the board or foil when removing the circuit panel it may be necessary to pry up slowly, IN STAGES around the edges as shown. Start at one corner and move all around the board keeping the screw driver tip against the chassis. When installing, apply pressure at the edges near the pins. Do not force down on the components.

#### CIRCUIT TRACING

Component reference numbers are printed on top and bottom of the plug-in circuit board to facilitate circuit tracing. In addition, control names and board terminal numbers are also shown and are referenced on the chassis schematic diagram in this manual.

Transistor elements are identified as follows:

E — emitter, B — base, and C — collector.

#### COMPONENT REMOVAL

Removing components from the etched board is facilitated by the fact that the circuitry (plating) appears on one side of the board only and the component leads are inserted straight through the holes and are not bent or crimped.

It is recommended that a solder extracting gun be used to aid in component removal. An iron with a temperature controlled heating element would be desirable since it would reduce the possibility of damaging the board due to over-heating.

The nozzle of the soldering gun is inserted directly over the component lead and when sufficiently heated, the solder is drawn away leaving the lead free from the copper plating. This method is particularly suitable in removing multi-terminal components.

#### REGULATOR ADJUSTMENT

NOTE: Misadjustment of the low voltage regulator, or the horizontal oscillator may result in damage to the Horizontal Output Transistor or pulse limiter diode. The following procedures are recommended to insure reliable operation.

- 1. Connect monitor to AC line supply. Adjust supply to 120 volts (240 on some models).
- 2. Apply test signal to proper input. Signal should be of same amplitude and sync rate as when monitor is in service.
- 3. Adjust vertical and horizontal oscillator controls until display is synced.
- 4. Connect a DC digital voltmeter or other precision accuracy voltmeter to the emitter of the regulator output transistor, (or any 73 volt test point).
- 5. Adjust the regulator control R74, on circuit board for an output of 73 volts. Do not "run" the regulator control through its range or damage to the monitor may result.
- 6. When adjustment is complete, the AC line supply can be varied between 105 and 130 volts to check for proper regulator operation. With regulator operating properly, changes in display size should be negligible.

# HORIZONTAL OSCILLATOR ADJUSTMENT

- 1. Set the horizontal hold potentiometer to mid-range (R34).
- 2. Adjust core of horizontal hold coil L1 until the horizontal blanking lines are vertical.
- 3. Rotate potentiometer R34 through its full range. Display should go out of sync in each direction and hold in sync at the center of its range. Retouch L1 as necessary to center the hold range.

### VIDEO AMPLIFIER BIAS ADJUSTMENT

Adjust video bias control R10 for 30 volts DC on collector of video output transistor Q3 with no signal input.

Disconnect cable from video input jack if necessary to eliminate noise.

## POWER TRANSISTOR REPLACEMENT

When replacing any "plug-in" transistor, i.e., the horizontal or vertical output, please observe the following precautions:

- 1. The transistor sockets are not "Captive", that is, the transistor mounting screws also secure the socket. When installing the transistor, the socket must be held in its proper location. This location is indicated by flanges on the socket which fit into the heat sink.
- 2. When replacing the output transistors, silicone grease (Motorola Part No. 11M490487) should be

applied evenly to both sides of the mica insulator.

3. All transistor mounting screws must be tight before applying power to the receiver. This insures proper cooling and electrical connections.

NON-COMPLIANCE WITH THESE INSTRUCTIONS CAN RESULT IN FAILURE OF THE TRANSISTOR AND/OR ITS RELATED COMPONENTS.

NOTE: Use caution when tightening transistor mounting screws. If the screw threads are stripped by excessive pressure, a poor electrical and mechanical connection will result.

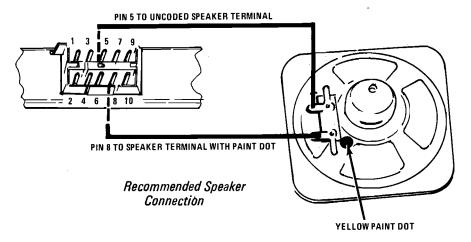
#### CRT REPLACEMENT

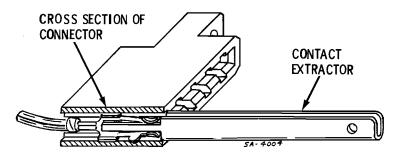
Use extreme care in handling the CRT as rough handling may cause it to implode due to atmospheric pressure. Do not nick or scratch glass or subject it to any undue pressure in removal or installation. Use goggles and heavy gloves for protection.

- 1. Discharge CRT by shorting 2nd anode to ground. Remove CRT socket, yoke and 2nd anode lead.
- 2. Remove CRT from chassis by removing four screws at corners.

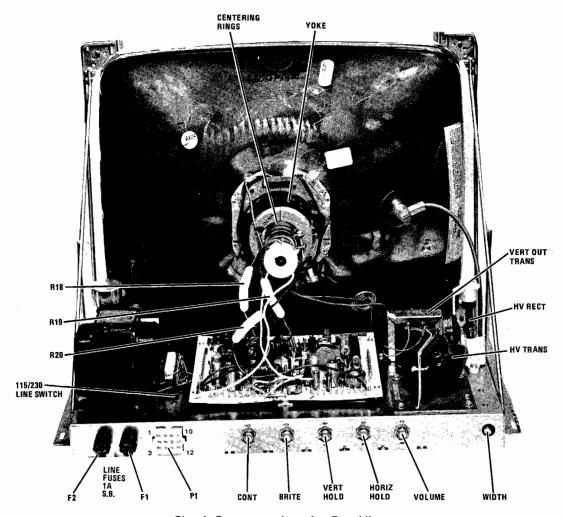
#### PANEL CONNECTOR CONTACT REMOVAL

Contacts can be removed from the mulitpin panel connector by using extractor tool, Part No. 66P65173A47. Insert the tool over contact and seat fully. Tool will release contact. Pull contact out from wired side.

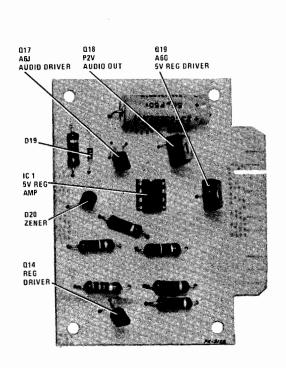




Edge Connector Contact Removal

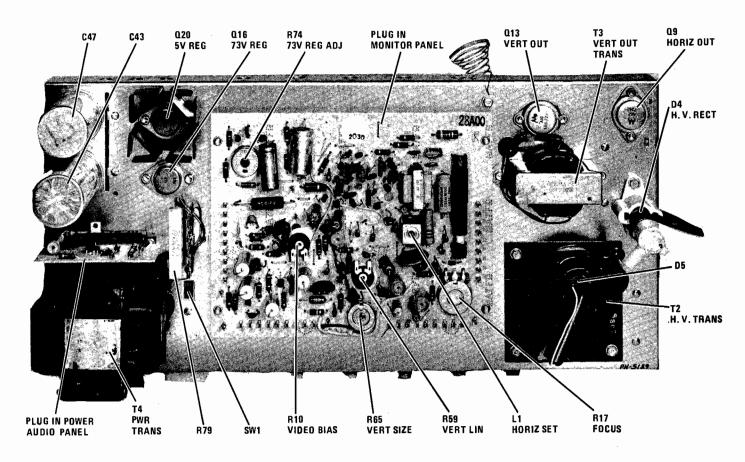


Chassis Component Location Rear View

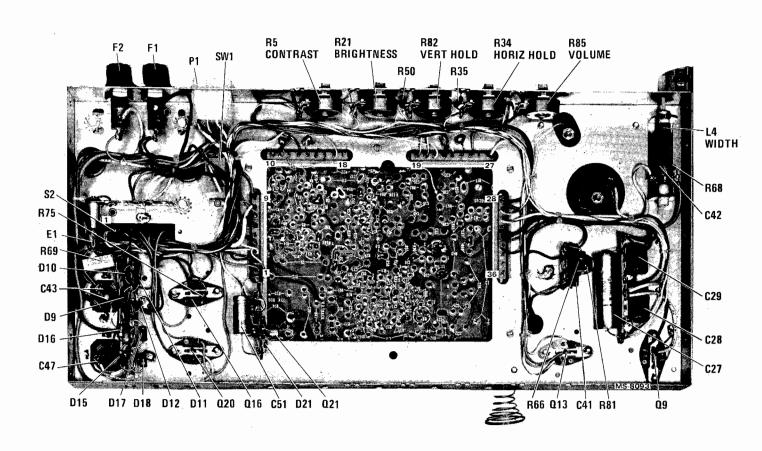


Top View

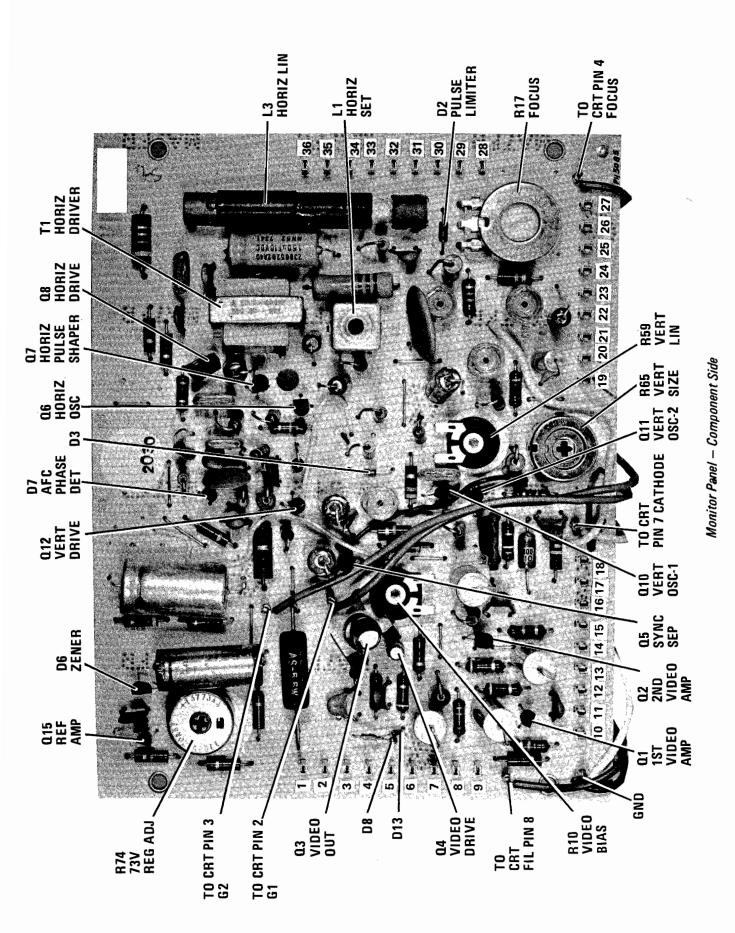
Circuit Side



Chassis Component Location Top View

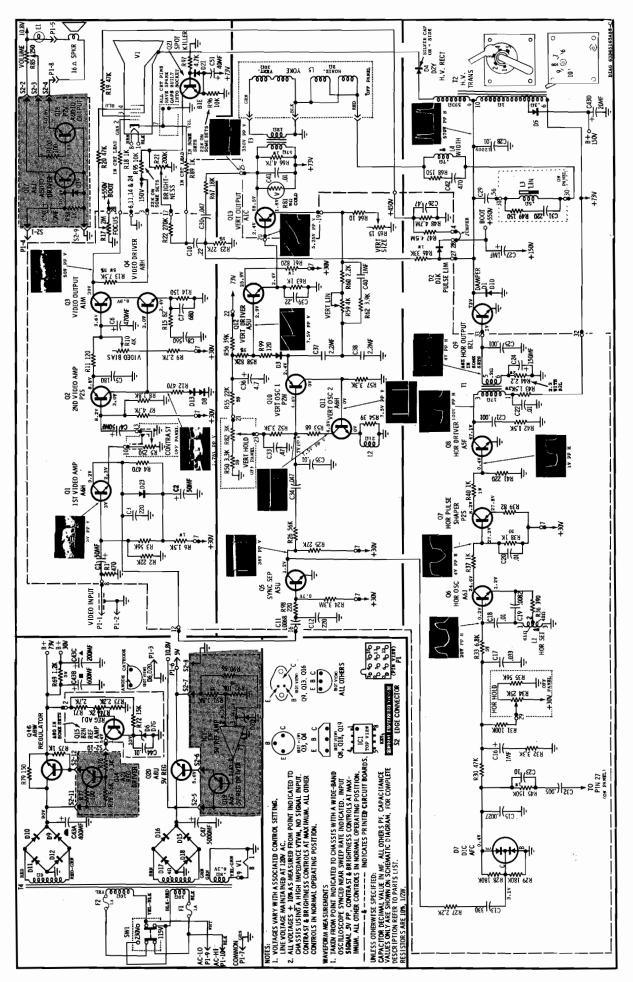


Chassis Component Location Bottom View



Monitor Panel — Circuit Side

11



REF. NO.	PART NUMBER	DESCRIPTION	REF. NO.	PART NUMBER	DESCRIPTION
ı			COILS &	CHOKES	
ELECT	RICAL PART	·s	L-1 L-2	24D68822A08 24D68801A67	HORIZ SET COMPENSATING: 2000 uh
	1705017.01	MONITOR RANGE	L-3 L-4	24D69163A18 24V25000A74	HORIZ LINEARITY HORIZ WIDTH: incls C42 & R68
	1Y25017A01 1Y25017A02	MONITOR PANEL: complete; KT364LM POWER, Audio Panel: complete:	L-5 TRANSI	24D68523A15 STORS	DEFLECTION YOKE
	1123017202	KT365LM	Q-1 Q-2	48S137171 48S137127	1st VIDEO: A6H 2nd VIDEO: P2S
			Q-3 Q-4	48S134919 48S137317	VIDEO OUTPUT: A1M VIDEO DRIVER: A8H
CAPACIT			Q-5 Q-6	48S137115 48S137172	SYNC SEPERATOR: A5U HORIZ OSCILLATOR: A6J
C-1 C-2	23C65282A41 23C65282A41	50 mf 50V Lytic 50 mf 50V Lytic	Q-7 Q-8 Q-9	48S137127 48S137093 48S137570	HORIZ PULSE SHAPER: P2S HORIZ DRIVER: A5F HORIZ OUTPUT: B2L
C-3 C-4 C-5	21S180D10 23C65282A41 21S180B98	220 pf 20% 100V X5F (Use 21R132503) 50 mf 50V Lytic 180 pf 10% 500V X5F	Q-10 Q-11	48\$137173 48\$137171	VERT OSCILLATOR (1): P2W VERT OSCILLATOR (2): A6H
C-6 C-7	23S10255A78 21S180C01	470 mf 16V Lytic 680 pf 10% 500V X5F	Q-12 Q-13	48S137115 48S134900	VERT DRIVER: A5U VERT OUTPUT: A1C
C-8 C-10	21S180B85 8S10191B67	560 pf 10% 500V X5F .22 mf 10% 250V Polyester	Q-14 Q-15 Q-16	48S134952 48S137574 48S137368	REGULATOR DRIVER; A2J REFERENCE AMP: B2N REGULATOR: A8W
C-11 C-12 C-13	8S10191A54 21S180D10 21S131625	.0068 mf 10% 160V Polyester 220 pf 20% 100V X5F (Use 21R132503) 330 pf 10% X5F	Q-17 Q-18	48S137172 48S137168	AUDIO DRIVER: A6J AUDIO OUTPUT: P2V
C-15	21S180C41	.0027 mf 10% 500V Z5F (Use 21K 121699)	Q-19 Q-20	48S137169 48S137344	5V REGULATOR, Driver: A6G 5V REGULATOR: A8U
C-16	23S10229A07	1.0 mf +40-20% 15V Lytic (Use 23C43280A17)	Q-21 CONTRO	48S137476	SPOT KILLER: B1E
C-17 C-18 C-19	8S10191B90 8S10299A73 8S10299A74	.033 mf 10% 160V Polyester .01 mf 10% 100V Poly carb .0082 mf 10% 160V Poly carb	R-5	18D68222A34	CONTRAST: 250 Ohm
C-20 C-21	8S10191B98 21S180B51	.01 mf 10% 250V Polyester .001 mf 10% 500V X5F	R-10 R-17	18D66401A44 18D67858A12	VIDEO BIAS: 4K FOCUS: 2 meg
C-22 C-23	8S10191B98 21S180C02	.01 mf 10% 160V Polyester 10 pf 10% N150	R-21 R-34 R-59	18D68222A35 18D68222A37 18D66401A44	BRIGHTNESS: 200K HORIZ HOLD: 25K VERT LINEARITY: 4K
C-24 C-25 C-26	23D65282A40 21S180B51 8S10212B53	150 mf 10V Lytic .001 mf 10% 500V X5F .47 mf 10% 630V Mtlz Poly	R-65 R-74	18D67671A18 17D65820A37	VERT SIZE: 15 Ohm REGULATOR ADJUST: 2K
C-27 C-28	8S10212A11 8S10571A06	1.0 mf 10% 630V Mtlz Poly .01 mf 5% 1200V Poly Prop Foil	R-82 R-85	18D68222A36 18D68222A34	VERT HOLD: 3K VOLUME: 250 Ohm
C-29 C-30	8S10571A23 8S10191A32	.56 mf 10% 250V Prop Foil .047 mf 10% 250V Polyester	RESIST		470 40% 470%
C-31 C32	21S180B87 21S180D34	220 pf 10% 500V X5F .005 mf 20% 1KV Z5F (Use 21S180D31)	R-1 R-2 R-3	6S127633 6S125568 6S127541	470 10% 1/2W 22K 10% 1/2W 56K 10% 1/2W
C-33 C-34 C-35	8S10212A69 8S10191A32 8S10191B98	.47 mf 10% 100V Mtlz Poly .047 10% 250V Polyester .01 mf 10% 250V Polyester	R-4 R-6	6S127633 6S128955	470 10% 1/2W 1500 10% 1W
C-36 C-37	23S10255A69 8S10212A20	4.7 mf 100V Lytic 2.2 mf 10% 100V Mtzl Poly	R-7 R-8	6S121847 6S122445	4700 10% 1/2W 1800 10% 1/2W
C-38 C-39	8S10212A20 8S10191B67	2.2 mf 10% 100V Mtlz Poly .22 mf 10% 250V Polyester	R-9 R-11 R-12	6S119926 6S128226 6S127633	2700 10% 1/2W 120 10% 1/2W 470 10% 1/2W
C-40 C-41	8S10212A10 8S10064A06	1.0 mf 10% 100V Mtlz Poly (Use 8S10191A46 .01 mf 10% 600V Mylar	R-13 R-14	17S10731A02 6S124797	7500 5% 5W WW 150 10% 1/2W
C-42 C43	21S180A71 23C65B07A47	470 pf 10% 500V X5F 400 mf/125V; 600 mf/50V;	R-15 R-18	6S127516 	82 10% 1/2W Part of CRT socket assembly
C-44	21S180E60	20 mf/200V Lytic .01 mf +80—20% 50V Z5V	R-19 R-20 R-22	6S129296	Part of CRT socket assembly Part of CRT socket assembly 270K 10% 1/2W
C-47 C-50 C-51	*23C65807A52 23D65282A41 23S10255B43	5000 mf 20V Lytic 50 mf 50V Lytic 40 mf 100V Lytic	R-23 R-24	6S10053C67 6S127538	27K 5% 1/2W 3.3 meg 10% 1/2W
1	& RECTIFIERS	2011. 1000 2700	R-25 R-26	6S121300 6S127541	27K 10% 1/2W 56K 10% 1/2W
D-1	48S134921	DIODE, Silicon: D1D; Damper	R-27 R-28 R-29	6S129875 6S125531 6S125531	2200 10% 1/2W 180K 10% 1/2W 180K 10% 1/2W
D-2 D-3 D-4	48S134978 48D67120A11 48S137114	DIODE, Silicon: D1K; Pulse Limiter DIODE, Low Power RECTIFIER, H. V.: Silicon; D2Y	R-30 R-31	6S125892 6S125534	47K 10% 1/2W 100K 10% 1/2W
D-5	48S191A05	RECTIFIER, Silicon: 91A05 (Use 48S191A07)	R-32 R-33	6S124506 6S10053C53	3300 10% 1/2W 6800 5% 1/2W
D-6 D-7	48S137469 48S134917	DIODE, Silicon: zener; D7G DIODE, Dual: D1C; Detector	R-35 R-36 R-37	6S127541 6S125545 6S121301	56K 10% 1/2W 390 10% 1/2W 1000 10% 1/2W
D-8 D-9 D-10	48S67120A11 *48S191A07 48S191A07	DIODE, Low Power RECTIFIER, Silicon: 91A07 RECTIFIER, Silicon: 91A07	R-38 R-39	6S10053C33 6S127516	1000 5% 1/2W 82 10% 1/2W
D-11 D-12	48S191A07 48S191A07	RECTIFIER, Silicon: 91A07 RECTIFIER, Silicon: 91A07	R-40 R-41 R-42	6S127547 6S127099	1000 10% 1W 220 10% 1/2W 1500 10% 1/2W
D-13 D-15	48D67120A11 48S191A10	DIODE, Low Power RECTIFIER, Silicon: 91A10	R-43 R-44	6S127513 17S10130B07 17S744356	1500 10% 1/2W 1500 10% 3W fxd mtl film 2.2 10% 2W WW
D-16 D-17 D-18	48S191A10 48S191A10 48S191A10	RECTIFIER, Silicon: 91A10 RECTIFIER, Silicon: 91A10 RECTIFIER, Silicon: 91A10	R-45 R-46	6S120141 6S127634	150K 10% 1W 33K 10% 1W
D-18 D-19 D-20	48D67120A11 *48S10641D43	RECTIFIER, Silicon: 91A10 DIODE, Low Power DIODE, Silicon, D4.3	R-47 R-48	6S129417 6S10053D21 6S124797	1.5 MEG 10% 1/2W 4.7 meg 10% 1/2W 150 10% 1/2W
D-21 D-23	48D67120A11 48S191A05	DIODE, Low Power RECTIFIER, Silicon:	R-49 R-50 R-52	6S124797 6S10053C45 6S124506	150 10% 1/2W 3300 5% 1/2W 3300 10% 1/2W
FUSES		(Use 48S191A07)	R-53 R-54	6S129874 6S131972	68 10% 1/2W 39 10% 1/2W
F-1	65S139424	FUSE: 1A-250V	R-55 R-56	6S10053C65 6S125535	22K 5% 1/2W 39K 10% 1/2W
F-2	65S139424	FUSE: 1A-250V	R-57 R-58 R-60	6S124506 6S129793 6S129875	3300 10% 1/2W 82K 5% 1/2W 2200 10% 1/2W
IC-1	*51S10732A01	INTEGRATED CIRCUIT: T3F	R-61 R-62	6S10053F29 6S127515	820 10% 1W 3900 10% 1/2W
1		<u></u>			

REF. NO.	PART NUMBER	DESCRIPTION	REF. NO.	PART NUMBER	DESCRIPTION
2.00					
R-63	6S121301	1000 10% 1/2W		50D68164A27	SPEAKER: 4" PM
R-64	17S10130C91	10 10% 1/2W (special)	E-1	65S139451	LAMP: No. 1436
R-66	6S129064	4700 10% 1W	ľ		
R-67 R-68	6S122848	18K 10% 1/2W			
R-69	6\$124797 17\$647132	150 10% 1/2W	MECH	IANICAL PAR	TS
n-09	1/504/132	1200 10% 5W WW (Use 17S136197)	I	IANIOALIAN	10
R-71	6S119926	2700 10% 1/2W	ı		
R-72	6S124551	15K 10% 1/2W	1	9D66133A28	CAP, SS Rect (HV Transformer -
R-73	6S129875	2200 10% 1/2W		55 55 155A25	PRI/SEC lead)
R-75	6S121301	1000 10% 1/2W	ŀ	42B25158A01	CLAMP, Metal: Defl Yoke Mtg
R-76	6S124506	3300 10% 1/2W		31D70080B04	CONNECTOR, PC panel: 9 contact;
R-77	6S129221	100 10% 1/2W	1		on chassis
R-78	6S127005	5600 10% 1/2W	S-2	*15S10390A06	CONNECTOR, PC panel: 12 contact;
R-79	17\$135589	150 10% 10W WW			less key and contacts (power-audio panel)
R-81	6C66263A08	VARISTOR (Use 6S66263A16)	P-1	*15S10183A69	CONNECTOR', Plug: 12 contact; less
R-88	6S121301	1000 10% 1/2W			contacts (power)
R-89		Part of CRT Socket	ı		
R-90	6S131412	56 10% 1/2W		*39S10184A63	CONTACT, Plug: for power connector
R-91	6S10053C39	1800 5% 1/2W			15S10183A69
R-92	6S10053C57	10K 5% 1/2W		39S10184A22	CONTACT: for S2 connector
R-95	6S119932	10K 10% 1/2W		15S10630A01	COVER, nylon: slide switch; SW1
R-96	6S119932	10K 10% 1/2W		*7S10609A03	GROMMET, Plastic: PC panel mtg
R-97	6S121847	4700 10% 1/2W		26C66745A05	HEAT SINK: Q3
R-98	6S127099	220 10% 1/2W		*26C25198A01	HEAT SINK: Q20
R-99	6S128226	120 10% 1/2W		9C66238A02	HOLDER, Fuse: F1 & F2
R-100	6S129221	100 10% 1/4W		14A562353	INSULATOR, Mica: Transistor socket;
			I		Q9, Q13, Q16 & Q20 (Use 14A543810)
SWITCHE	S			28S10733A01	KEY, Plug: for S2 connector
	10010001101	OWITCH OF DEDT (115)/ 000//		287051	NUT, hex: 3/8-32; control mtg
SW-1	40S10624A01	SWITCH, Slide: DPDT (115V-230V)		5S10281A03	RIVET, drive pin: nylon; HV transf mtg
TRANSF	ODMEDO			47C66082A03	ROD, Adjustment: width coil; L4 SCREW, tpg: 6-20 x 1/2 clu pen hd;
	OHMEHS		ľ	3S136050	
T-1	25D67440A03	HORIZ DRIVER		0040447441	Q9, Q13, Q16 & Q20 SOCKET, lamp: Ε1
T-2	24D25240A04	H.V. TRANSFORMER: complete		9S10143A41	
T-3	25D25221A07	VERT OUTPUT		9D67555V27	SOCKET, CRT: incls leads & resistors
T-4	*25D68164A31	POWER		*9D25201A01	SOCKET, HV Rectifier (4): complete; incls 2nd anode lead & cup
MISCELL	ANEOUS ELECTR	ICAL DARTS		9C63825A01	SOCKET, transistor: Q9, Q13, Q16
MISCELL	MINEOUS ELECTH	ICAL FANTS		9C63825A01 9C63825A02	SOCKET, transistor: Q9, Q13, Q16
V-1	20WP4	CRT (XM501-10 19VP111)	ŀ	41D65987A01	SPRING, special: CRT aquadag grnd
l <sup>v-</sup> '	20VP4 23JEP4	CRT (XM501-10 19VP111)		66P65173A47	TOOL, contact removel (S2 connector)
l	23JEF4	Chi (AMI/UI-IU 23VFIII)		001 00 173A47	TOOL, COMMENTER (32 COMMENT)

<sup>\*</sup> DENOTES NEW ITEM APPEARING ON ANY LIST FOR FIRST TIME.

# service manual

FILE VP12-S1

SUPPLEMENT TO PART NO. 68P65130A70
DISPLAY PRODUCTS

**CHASSIS** 

19VP111 23VP111

**MODELS** 

XM501-10 XM701-10

# AUDIO INPUT TO R82. VOLUME (HI SIDE) TO R82. VOLUME ARM SPEAKER TO Q20 COLLECTOR TO Q20 EMITTER 5V SENSING TO Q15 COLLECTOR TO Q16 BASE 12 R83 R87 R92 R77 Q14

Power Supply/Audio Circuit Card (Circuit Foil Side)

#### GENERAL INFORMATION

This supplement updates service information for chassis 19 & 23VP111 (Models XM501-10/XM701-10). Changes are applicable to the 84C25078<u>B06</u> circuit card, which are reflected in the revised diagrams and parts list. The "A" suffix models include a 6A fuse (F3).

For all other service information on these models, refer to the original VP12 manual, part number 68P65130A70.

REF.NO.	PART NUMBER	DESCRIPTION	REF. NO.	PART NUMBER	DESCRIPTION
I ELECTR	RICAL PARTS		C-20 C-21	8S10191B98 21S180B51	.01 mf 10% 250V Polyester .001 mf 10% 500V X5F
			C-22	8S10191B98	.01 mf 10% 160V Polyester
	ONITOR CIRCUIT CARE		C-23	21S180C02	10 pf 10% N150
	RDER BY MODEL NUMB		C-24	23S10255B50	150 mf 10V Lytic
		CIRCUIT CARD complete:	C-25	21S180B51	.001 mf 10% 500V X5F
.01	RDER BY MODEL NUM	BER	C-26	8S10212B53	.47 mf 10% 630V Mtlz Poly
			C-27 C-28	8S10212A11	1.0 mf 10% 630V Mtlz Poly
	rope.			8S10571A06	.01 mf 5% 1200V Poly Prop Foil
CAPACIT	ORS		C-29 C-30	8S10571A23 8S10191A32	.56 mf 10% 400V Poly Prop Foil
		FO4 FOV 1	C-30		.047 mf 10% 250V Polyester 220 pf 10% 500V X5F
C-1	23S10255B51	50 mf 50V Lytic 50 mf 50V Lytic	C-31	21S180B87 21S180D34	.005 mf 20% 1KV Z5F (Use 21S180D31
C-2	23S10255B51	220 pf 20% 100V X5F (Use 21R132503)	C-32	8S10212A69	.47 mf 10% 100V Mtlz Poly
C-3	21S180D10	50 mf 50V Lytic	C-34	8S10191A32	.047 10% 100V Mitt2 Poly
C-4 C-5	23S10255B51 21S180B89	180pf 10% 500V X5F	C-35	8S10191B98	.01 mf 10% 250V Polyester
C-5 C-6	23S10255A78	470 mf 16V Lytic	C-36	23S10255A69	4.7 mf 100V Lytic
C-6 C-7	23510255A78 21S1B0C01	680 pf 10% 500V X5F	C-37	8S10212A20	2.2 mf 10% 100V Mtzi Polv
C-7 C-8	21S180B85	560 pf 10% 500V X5F	C-38	8S10212A20	2.2 mf 10% 100V Mtlz Poly
C-10	8S10191B67	.22 mf 10% 25OV Polyester	C-39	8S10191B67	.22 mf 10% 250V Polyester
C-10	8S10191A54	.0068 mf 10% 160V Polvester	C-40	8S10212A10	1.0 mf 10% 100V Mtlz Poly (Use
C-12	21S180D10	220 pf 20% 100V X5F (Use 21R132503)	0 .0	33.32.12.113	8S10191A46)
C-13	21S131625	330 pf 10% X5F	C-41	8S10064A06	.01 mf 10% 600V Mylar
C-15	21S180C41	.0027 mf 10% 500V Z5F (Use	C-42	21S180A71	470 pf 10% 500V X5F
,5 15	210100011	21K 121699)	C-43	23C65807A47	400 mf/125V; 600 mf/50V;
C-16	23S10229A07	1.0 mf +4020% 15V Lytic			20 mf/200V Lytic
		(Use 23C43280A17)	C-44	21S180E60	.01 mf +80-20% 50V 25V
C-17	8S10191B90	.033 mf 10% 160V Polyester	C-47	23S10255B46	5000 mf 20V Lytic
C-18	8S10299A73	.01 mf 10% 100V Poly carb	C-50	23S10255B51	50 mf 50V Lytic
C-19	8S10299A74	.0082 mf 10% 160V Poly carb	C-51	23S10255B43	40 mf 100V Lytic

Monitor Circuit Card (Circuit Foil Side)

VIDEO INPUT

Q1 1ST VIDEO AMP AGH

VIDEO OUTPUT AIM SOV

Schematic Diagram

0

REF. NO.	PART NUMBER	DESCRIPTION	REF. NO.	PART NUMBER	DESCRIPTION
DIODES 8	& RECTIFIERS 48S134921 48S134978	DIODE, Silicon: D1D; Damper DIODE, Silicon: D1K; Pulse Limiter		nly power or specia	resisters are listed. Use
D-3 D-4 D-5	485134976 48D67120A11 48S137114 48S191A05	DIODE, Silicon: DTR; Pulse Limiter DIODE, Low Power RECTIFIER, H.V.: Silicon; D2Y RECTIFIER, Silicon: 91A05		e description when fixed carbon resiste	ordering standard values ers up to 2 watts.
D-6 D-7	48S137469 48S134917	DIODE, Silicon: zener; D7G DIODE, Dual: D1C; Detector	R-18 R-19		Part of CRT socket assembly Part of CRT socket assembly
D-8 D-9	48S67120A11 48S191A10	DIODE, Low Power RECTIFIER, Silicon: 91A10	R-20		Part of CRT socket assembly
D-10	48S191A10	RECTIFIER, Silicon: 91A10	R-43 R-44	17S10130B07 17S744356	1500 10% 3W fxd mtl film 2.2 10% 2W WW
D-11 D-12	48S191A10 48S191A10	RECTIFIER, Silicon: 91A10 RECTIFIER, Silicon: 91A10	R-64 R-69	17S10130C91 17S647132	10 10% 1/2W (special) 1200 10% 5W WW
D-13 D-15	48D67120A11 48S191A05	DIODE, Low Power RECTIFIER, Silicon: 91A05			(Use 17S136197)
D-16	48S191A05	RECTIFIER, Silicon: 91A05	R-79 R-81	17S135589 6S10201A04	150 10% 10W WW VARISTOR
D-17 D-18	48S191A05 48S191A05	RECTIFIER, Silicon: 91A05 RECTIFIER, Silicon: 91A05	R-89		Part of CRT Socket
D-19 D-20	48D67120A11 48S10641D43	DIODE, Low Power DIODE, Silicon Zener, D4,3			
D-21	48S191A05	RECTIFIER, Silicon: 91A05			
D-23	48S191A05	RECTIFIER, Silicon: 91A05	SWITCH	FS	
			SW-1	40S10624A07	SWITCH, Slide: DPDT (115V - 230V)
FUSES					2
F-1 F-2	65S139424 65S139424	FUSE: 1A-250V FUSE: 1A-250V			
F-3	65S139551	FUSE: 6A-250V	TRANSF	ORMERS	
			T-1	25D25221A05	HORIZ DRIVER
INTEGRA	ATED CIRCUITS		T-2 T-3	24D25240A07	H.V. TRANSFORMER: complete
IC-1	51S10732A01	INTEGRATED CIRCUIT: T3F	T-4	25D25221A07 25D25239A07	VERT OUTPUT POWER
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COILS &			MISCEL	LANEOUS ELECTR	ICAL PARTS
L-1 L-2	24D68822A08 24D68801A67	HORIZ SET COMPENSATING: 2000 uh	V-1	19VARP4	CRT (XM501-10 19VP111)
L-3 L-4	24D69163A18 24V25000A74	HORIZ LINEARITY HORIZ WIDTH: incls C42 & R68	1	22VATP4 50D68384A02	CRT (XM701-10 23VP111) SPEAKER: 4" PM
L-5	24D25261A03	<b>DEFLECTION YOKE XM701-10</b>	E-1	65S139451	LAMP: No. 1436
	24D25261A04	DEFLECTION YOKE XM501-10			
TRANSIS	TORS		MECHA	NICAL PARTS	
Q-1 Q-2	48S137171 48S137127	1st VIDEO: A6H	ł	9D66133A28	CAP, SS Rect (HV Transformer PRI/SEC lead)
Q-3	48S134919	2nd VIDEO: P2S VIDEO OUTPUT: A1M		42825158801	CLAMP, Metal: Defl Yoke Mtg
Q-4 Q-5	48\$137317 48\$137115	VIDEO DRIVER: A8H SYNC SEPARATOR: A5U		31D70080804	CONNECTOR, PC panel: 9 contact; on chassis
Q-6 Q-7	48S137172 48S137127	HORIZ OSCILLATOR: A6J HORIZ PULSE SHAPER: P2S	S-2	15S10390A06	CONNECTOR, PC panel: 12 contact; less key and contacts (power-audio panel)
Q-8	48\$137093	HORIZ DRIVER: A5F	P-1	15S10183A69	CONNECTOR, Plug: 12 contact; less
Q-9 Q-10	48S137570 48S137173	HORIZ OUTPUT: B2L VERT OSCILLATOR (1): P2W		39S10184A63	contacts (power) CONTACT, Plug: for power connector
Q-11 Q-12	48\$137171 48\$137115	VERT OSCILLATOR (2): A6H VERT DRIVER: A5U		39S10184A22	15S10183A69 CONTACT: for S2 connector
Q-13	48\$137596	VERT OUTPUT: B2V		15S10630A02	COVER, nylon: slide switch; SW1 GROMMET, Plastic: PC panel mtg
Q-14 Q-15	48S134952 48S137574	REGULATOR DRIVER; A2J REFERENCE AMP: B2N	1	7S10609A03 26C66745A05	HEAT SINK: Q3
Q-16 Q-17	48\$137368 48\$137172	REGULATOR: A8W AUDIO DRIVER: A6J		26C25198A01 9S10783A01	HEAT SINK: Q20 HOLDER, Fuse: F1 & F2
Q-18	48S137168	AUDIO OUTPUT: P2V		14A562353	INSULATOR, Mica: Transistor socket;
Q-19 Q-20	48S137169 48S137344	5V REGULATOR, Driver: A6G 5V REGULATOR: A8U		28S10733A01	Q9, Q13, Q16 & Q20 (Use 14A543810) KEY, Plug: For S2 connector
Q-21	48\$137476	SPOT KILLER: B1E		2S7051 5S10281A03	NUT, hex: 3/8-32; control mtg RIVET, drive pin: nylon; HV transf mtg
,				47C66082A03	ROD, Adjustment: width coil; L4
CONTRO	u s		,	3\$136050	SCREW, tpg: 6-20 x 1/2 clu pen hd; Q9, Q13, Q16 & Q20
				9S10143A41 9D25282A08	SOCKET, lamp: E1 SOCKET, CRT: incls leads & resistors
R-5 R-10	18D25212A09 18D25245A04	CONTRAST: 250 Ohm VIDEO BIAS: 4K		9D25201A01	SOCKET, HV Rectifier: complete;
R-17 R-21	18C25218A10 18D25212A10	FOCUS: 2 meg	1	9C63825A03	incls 2nd anode lead & cup SOCKET, transistor: Q9, Q13, Q16
R-34	18D25212A12	BRIGHTNESS: 200K HORIZ HOLD: 25K		9C63825A02 41D65987A01	SOCKET, transistor: Q20 SPRING, special: CRT aquadag grnd
	18D25245A04	VERT LINEARITY: 4K	1	66P65173A47	TOOL, contact removal (S2 connector)
R-59 R-65	18D25245A19	VERT SIZE: 100K Ohm			
	18D25245A19 18C25218A13 18D25212A11	VERT SIZE: 100K Ohm REGULATOR ADJUST: 2K VERT HOLD: 3K			

