



# SERVICE AND OPERATION MANUAL

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## MTG-XX01 SERIES (13", 19") CGA OPEN FRAME COLOR MONITORS

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19" : 49 - 1329 - VP2

13" : 49 - 1345 - VP2

***VISION PRO***  
HAPP CONTROLS

This monitor has been designed and manufactured to deliver high performance video. For continued peak performance use and safe operation, it is recommended to use only high quality Happ Controls replacement parts or their exact specified equivalent when servicing.

## **SAFETY PRECAUTIONS AND WARNINGS**

### **Service Warning**

The display contains HIGH VOLTAGE capable of delivering LETHAL levels of energy. Service should only be attempted by trained personnel familiar with the potential dangers inherent with high voltage equipment.

### **Safety Related Component Warning**

Certain components used in Happ Controls color monitors are critical for safe operation of the display. These part numbers are marked by (  $\Delta$  ) on the schematic diagram. It is essential that these safety critical components be replaced only with exact manufacturer specified components to prevent the possibility of excessive X-radiation emission, electrical shock, fire or premature component failure. Modifying the original design without written approval from Happ Controls is expressly forbidden, will void the original parts and labor warranty, and may result in creating a hazardous situation.

### **X-Radiation Warning**

COMPONENTS WHICH MAY AFFECT POTENTIAL EXCESS EMISSION OF X-RADIATION IN THE HORIZONTAL DEFLECTION AND HIGH VOLTAGE CIRCUITS(INCLUDING THE PICTURE TUBE) ARE INDICATED ON THE SCHEMATIC DIAGRAM BY A(★). USE ONLY TYPE AND RATING OF REPLACEMENT COMPONENT AS SHOWN IN THE PARTS LIST.

1. The only potential source of X-radiation emission is the picture tube. When the high voltage and horizontal deflection circuits are operating correctly there is no possibility of excess X- radiation emission. NEVER attempt to modify these circuits.
2. Periodically check the high voltage with a reliably calibrated meter for values not in excess of manufacture recommendations. See High Voltage Shut-down Circuit, page 4 for further details.

### **CRT Warning**

All picture tubes used in Happ Controls monitors are quipped with an integral implosion protection system. The picture tube is, however, a highly evacuated component which outside surfaces are subject to strong external forces. Care must be exercised so as not to bump or scratch the tube during installation or servicing as this may cause the tube to implode, resulting in possible personal injury and property damage. Shatter-proof goggles must be worn by individuals while handling the CRT or installing the display in the cabinet. Do not handle the CRT by neck.

1. Always ensure the high voltage at the anode cap is fully discharged prior to handling or service.
2. Replace picture tube only with same type and number.

### **Product Safety and Service Guidelines**

1. Service should be performed only after reading all of the warnings and precautions in the manual and as labeled on the CRT and chassis.
2. Where a short circuit has occurred, replace all components that indicate evidence of overheating. Also check for evidence of overheating or poor connection on all plastic connectors.
3. Inspect wiring for frayed leads and damaged insulation. When service is required, observe original lead dress, assume lead dress is followed as from the factory, especially in the high voltage circuitry area.
4. Do not expose this display to rain or place in areas where the potential for exposure to moisture is high. Additionally, do not mount the removed VR PCB if so equipped outside the cabinet or in areas where there is a possibility of exposure to moisture.
5. All protective devices must be reinstalled per original design.

## PERFORMANCE AND OPERATING DATA

### **1. Power Supply**

This color monitor shall maintain the specified performance in the range described below.

Frequency : 47Hz ~ 63Hz

Voltage : 90VAC-264VAC

Consumption : Less than 70Watts

### **2. Input Signal**

The referenced video controller used for adjustment and test will guarantee the performance described below.

Video signals

Red, Green, Blue analog input

150  $\Omega$  termination to ground

Level : 0 to 2.4Vp-p

Polarity : Positive

Sync signals

Separate H/V sync input

10k termination to ground

Level : TTL level

Polarity : Positive or Negative

### **3. Horizontal Deflection**

Scanning Frequency : Nominal (15-17.5kHz)

Retrace period : < 11.5us

### **4. Vertical Deflection**

Scanning Frequency : Nominal (50-65Hz)

Retrace period : < 900us

### **5. Linearity**

$\pm 5\%$

### **6. Picture Size Regulation**

Static Regulation 2%

Dynamic Regulation 1.5%

### **7. Geometric Distortion**

It is acceptable that pincushion, trapezoid, parallelogram, barrel distortion, out of orthogonality and various waves can appear all together. If the data area parameter remains within the limits of 2%.

### **8. Degaussing**

This color monitor shall employ an automatic degaussing circuit, The degaussing sequence shall be self activated at the time of switch-on.

After a degaussing cycle, the demagnetizing circuit shall recover.

### **9. High Voltage**

This color monitor shall employ an X-radiation shut-down protection with internal circuitry.

13" : 26KV

19" : 27KV

### **10. Environmental Conditions**

Temperature : 10 ~ 55°C (Operating)

Humidity : 10 ~ 90%, no condensation

## OPERATING INSTRUCTIONS

1. Apply line AC,90V-264V, in your locality to the monitor through W801.
2. Apply signal source to the monitor through W301.
3. Set up user adjustable controls.

All controls are preset at the factory for optimum performance. If adjustment is necessary to suit program material, most adjustments can be made using only the controls on the remove VR PCB. Other controls in the monitor should be adjusted only if those controls have been tampered with or if major repairs were necessary on the monitor.

## CONTROLS

### 1. Remote VR PCB

Contrast, VR720  
Brightness, VR721  
H-Position, VR722  
H-Size, VR723  
V-Size, VR724  
V-Position, VR725

### 2. Main PCB

Horizontal OSC, VR301  
V-HOLD, VR303  
V-LIN, VR302

### 3. Flyback Transformer

Focus Adjustment  
Screen Adjustment

### 4. Neck PCB

Red Cut-off, VR552  
Red Gain, VR551  
Green Cut-off, VR555  
Green Gain, VR553  
Blue Cut-off, VR554  
Blue Gain, VR556

These controls in main, neck PCB and flyback transformer have been preset and sealed at the factory and should not require further attention.

## HIGH VOLTAGE SHUT-DOWN CIRCUIT

The chassis of this color monitor has been designed to emit a minimum of soft X-radiation, in accordance with US DHHS rules 21 CFR, subchapter J, applicable at date of manufacture. A high voltage shut-down circuit, as shown below, guarantees horizontal oscillation shut-down.

A flyback pulse is generated at pin 10 of flyback transformer. This pulse is fed through a resistive divider network to pin 13 of I301.

The voltage appearing on pin 13 is compared with a precise internal voltage in the IC should the EHT exceed 28KV the change in voltage on pin 13 actuates a circuit which inhibits the oscillator and consequently the EHT circuit.

The circuit continues to inhibit the oscillator until the fault condition is corrected, and even then the monitor has to be switched off and on oscillator cable is re-activated.



## PARTS LIST

LOC.	PARTS NAME	SPECIFICATIONS	LOC.	PARTS NAME	SPECIFICATIONS
	<b>MAIN PCB</b>				
C301	C ELECTRO	16V 10uF RSS	C348	C ELECTRO	16V 100uF RSS
C302	C CERAMIC	CH 50V 22pF J	C349	C CERAMIC	B 50V 680pF K
C303	C ELECTRO	50V 10uF RSS	C350	C CERAMIC	B 50V 680pF K
C304	C ELECTRO	16V 10uF RSS	C351	C CERAMIC	B 50V 680pF K
C305	C CERAMIC	CH 50V 22pF J	C352	C CERAMIC	B 50V 680pF K
C306	C ELECTRO	50V 10uF RSS	C353	C CERAMIC	B 50V 680pF K
C307	C ELECTRO	16V 10uF RSS	C354	C CERAMIC	B 50V 680pF K
C308	C CERAMIC	CH 50V 22pF J	C357	C CERAMIC	B 50V 680pF K
C309	C ELECTRO	50V 10uF RSS	C360	C ELECTRO	25V 1000uF RSS
C310	C CERAMIC	F 50V 0.1uF Z	C362	C ELECTRO	35V 470uF RSS
C311	C CERAMIC	F 50V 0.1uF Z	C363	C CERAMIC	B 50V 1000pF K
C312	C CERAMIC	F 50V 0.1uF Z	C364	C CERAMIC	CH 50V 27pF J
C313	C CERAMIC	F 50V 0.1uF Z	C366	C CERAMIC	B 50V 820pF K
C314	C CERAMIC	F 50V 0.1uF Z	C367	C MYLAR	100V 0.033uF J
C315	C CERAMIC	F 50V 0.1uF Z	C368	C MYLAR	100V 0.033uF J
C317	C CERAMIC	F 50V 0.1uF Z	C369	C ELECTRO	50V 4.7uF RSS
C318	C CERAMIC	F 50V 0.1uF Z	C371	C TANTAL	TB 35V 1uF K
C319	C CERAMIC	F 50V 0.1uF Z	C372	C ELECTRO	50V 10uF RSS
C320	C ELECTRO	50V 1uF RSS	C373	C MYLAR	100V 0.1uF J
C321	C CERAMIC	F 50V 0.1uF Z	C374	C MYLAR	100V 0.01uF J
C322	C ELECTRO	16V 100uF RSS	C378	C MYLAR	100V 0.1uF J
C323	C CERAMIC	F 50V 0.1uF Z	C379	C ELECTRO	50V 22uF RSS
C324	C CERAMIC	F 50V 0.1uF Z	C380	C MYLAR	100V 8200pF J
C325	C CERAMIC	F 50V 0.1uF Z	C381	C MYLAR	100V 0.01uF J
C326	C CERAMIC	F 50V 0.1uF Z	C382	C ELECTRO	50V 1uF RSS
C327	C CERAMIC	B 50V 680pF K	C383	C ELECTRO	50V 1uF RSS
C328	C CERAMIC	F 50V 0.1uF Z	C384	C MYLAR	100V 6800pF J
C330	C CERAMIC	B 50V 150pF K	C385	C MYLAR	100V 5600pF J
C331	C ELECTRO	16V 10uF RSS	C386	C MYLAR	100V 1000pF J
C332	C MYLAR	100V 0.1uF J	C389	C ELECTRO	35V 1000uF RSS
C333	C CERAMIC	B 50V 100pF K	C390	C MYLAR	MPE 63V 1uF J
C334	C CERAMIC	B 50V 680pF K	C401	C MYLAR	NPPS 1.6KV 2200pF J
C335	C CERAMIC	B 50V 680pF K	C403	C CERAMIC	B 500V 1000pF K
C336	C CERAMIC	B 50V 1000pF K	C404	C CERAMIC	B 500V 2200pF K
C339	C ELECTRO	16V 470uF RSS	C405	C MYLAR	100V 0.1uF J
C340	C ELECTRO	25V 100uF RSS	C408	C MYLAR	NPPS 1.6KV 8200pF J
C341	C ELECTRO	35V 1000uF RSS	C409	C MYLAR	NPP 400V 0.01uF G
C342	C CERAMIC	B 500V 1000pF K	C410	C CERAMIC	B 500V 100pF K
C343	C ELECTRO	50V 4.7uF RSS	C411	C MYLAR	100V 0.1uF J
C344	C ELECTRO	16V 220uF RSS	C412	C ELECTRO	250V 10uF RSS
C345	C MYLAR	100V 0.1uF J	C420	C MYLAR	MPP 200V 0.47uF J
C346	C MYLAR	100V 0.1uF J	C422	C MYLAR	250V MF 3.3uF (K)
			C423	C MYLAR	MPP 400V 0.39uF J

## PARTS LIST

LOC.	PARTS NAME	SPECIFICATIONS	LOC.	PARTS NAME	SPECIFICATIONS
C801	C MYLAR	AC 275V 0.1uF J	D808	DIODE	1N4937
C802	C MYLAR	AC 275V 0.47uF	D809	DIODE	1N4937
C803	C ELECTRO	400V 220uF FHS	D810	DIODE	RU3AM
C804	C MYLAR	NPPS 1.6KV 2200pF J	D813	DIODE	1N4937
C805	C ELECTRO	25V 470uF RSS	D814	DIODE	1N4937
C806	C MYLAR	100V 2200pF J	F801	FUSE	218 250V 3.15A
C807	C ELECTRO	16V 100uF RF	I201	IC	LM1205N
C808	C ELECTRO	160V 10uF RSS	I301	IC	LA7851
C809	C ELECTRO	160V 220uF RUS	I302	IC	LA7833
C810	C ELECTRO	35V 470uF RSS	I302A	HEAT SINK	MH9212-B1
C811	C ELECTRO	35V 470uF RSS	I801	IC	PC123Y11
C812	C ELECTRO	25V 220uF RSS	I802	IC	STRS6707
C813	C ELECTRO	25V 100uF RSS	I802A	HEAT SINK	WJ-HTSB03
C814	C MYLAR	200V 0.1uF K	I803	IC	KA7812
C815	C CERAMIC	B 500V 1000pF K	L301	COIL	101K
C817	C CERAMICDS	AC250V E 2200pF M	L360	COIL	5.6uH K
C818	C ELECTRO	160V 220uF RUS	L401	COIL	TRL-64
C820	C CERAMICDS	C250V E 4700pF M	L402	COIL	CP-002
C822	C CERAMICDS	AC250V E 4700pF M	L801	LINE FILTER	LF-2828B
C823	C CERAMICDS	AC250V E 2200pF M	L802	COIL	101K
C824	C CERAMICDS	AC250V E 2200pF M	L803	COIL	101K
D301	DIODE	1N4148	Q301	TR	KSC945C-Y
D302	DIODE	1N4148	Q302	TR	KSC945C-Y
D303	DIODE	1N4148	Q303	TR	KSC945C-Y
D304	DIODE	1N4937	Q304	TR	2N3906
D307	DIODE	1N4148	Q305	TR	2N3906
D311	DIODE	UZ-5.1B	Q310	TR	KSC945C-Y
D312	DIODE	UZ-5.1B	Q360	TR	2N4401
D313	DIODE	UZ-12B	Q401	TR	KSC2330-YTA
D314	DIODE	UZ-12B	Q402	TR	2SC4769-2/3
D315	DIODE	UZ-12B	Q402A	HEAT SINK	MH9212-C
D360	DIODE	1N4937	Q403	TR	KSA733C-Y
D361	DIODE	UZ-22BSC	Q404	TR	2N3904
D401	DIODE	PS156R	Q405	TR	KTD2058
D402	DIODE	RH4F	Q405A	HEAT SINK	MH9212-B6
D403	DIODE	RU4AM	Q801	TR	KSC2073
D405	DIODE	1N4937	Q802	IC	SE120N
D407	WIRE COPPER	AWG22 1/0.65	R301	R CARBON FILM	1/6W 33K J
D801	DIODE	D3SBA60-4100	R302	R CARBON FILM	1/6W 5.6K J
D802	DIODE	1N4937	R303	R CARBON FILM	1/6W 4.7K J
D804	DIODE	1N4937	R304	R CARBON FILM	1/6W 390 J
D805	DIODE	UZ-7.5B	R305	R CARBON FILM	1/6W 220 J
D807	DIODE	1N4937	R306	R CARBON FILM	1/6W 33K J

## PARTS LIST

LOC.	PARTS NAME	SPECIFICATIONS	LOC.	PARTS NAME	SPECIFICATIONS
R307	R CARBON FILM	1/6W 5.6K J	R368	R METAL FILM	1/6W 18K F
R308	R CARBON FILM	1/6W 4.7K J	R369	R CARBON FILM	1/6W 180K J
R309	R CARBON FILM	1/6W 390 J	R370	R CARBON FILM	1/6W 120K J
R310	R CARBON FILM	1/6W 220 J	R371	R CARBON FILM	1/6W 330 J
R311	R CARBON FILM	1/6W 33K J	R372	R CARBON FILM	1/6W 68K J
R312	R CARBON FILM	1/6W 5.6K J	R376	R CARBON FILM	1/6W 4.7K J
R313	R CARBON FILM	1/6W 4.7K J	R378	R METAL FILM	1/6W 10K F
R314	R CARBON FILM	1/6W 390 J	R379	R METAL FILM	1/6W 3.3K F
R315	R CARBON FILM	1/6W 220 J	R380	R CARBON FILM	1/4W 430 J
R316	R CARBON FILM	1/6W 51K J	R381	R CARBON FILM	1/6W 15K J
R317	R CARBON FILM	1/6W 30 J	R382	R CARBON FILM	1/6W 560 J
R320	R CARBON FILM	1/6W 1.1K J	R383	R CARBON FILM	1/6W 33K J
R323	R CARBON FILM	1/4W 10 J	R384	R CARBON FILM	1/6W 510 J
R324	R CARBON FILM	1/6W 390 J	R385	R METAL FILM	1/6W 9.35K F
R328	R CARBON FILM	1/6W 390 J	R386	R CARBON FILM	1/6W 15K J
R329	R CARBON FILM	1/6W 47 J	R389	R CARBON FILM	1/6W 47 J
R330	R CARBON FILM	1/6W 47 J	R391	R CARBON FILM	1/6W 2.7K J
R331	R CARBON FILM	1/6W 510 J	R392	R CARBON FILM	1/6W 6.2K J
R333	R CARBON FILM	1/6W 390 J	R401	R METAL OXIDE	1W 10K J
R334	R CARBON FILM	1/6W 100 J	R403	R CARBON FILM	1/4W 1K J
R335	R CARBON FILM	1/6W 100 J	R404	R CARBON FILM	1/2W 15K J
R336	R CARBON FILM	1/6W 2.7K J	R405	R CARBON FILM	1/4W 100 J
R337	R CARBON FILM	1/6W 10K J	R406	R METAL OXIDE	1W 100 J
R338	R CARBON FILM	1/6W 10K J	R407	R CARBON FILM	1/4W 1.8K J
R339	R CARBON FILM	1/6W 100 J	R408	R CARBON FILM	1/6W 33 J
R340	R CARBON FILM	1/6W 2.7K J	R409	R CARBON FILM	1/4W 200 J
R341	R CARBON FILM	1/6W 8.2K J	R410	R CARBON FILM	1/2W 560 J
R342	R CARBON FILM	1/6W 510 J	R411	R METAL OXIDE	1W 22K J
R343	R CARBON FILM	1/6W 2.2K J	R412	R METAL OXIDE	1W 1K J
R344	R CARBON FILM	1/6W 18K J	R413	R CARBON FILM	1/6W 2.7K J
R345	R CARBON FILM	1/6W 22K J	R414	R METAL OXIDE	1W 0.33 J
R346	R CARBON FILM	1/6W 12K J	R419	R CARBON FILM	1/4W 3.3K J
R347	R CARBON FILM	1/6W 12K J	R420	R CARBON FILM	1/6W 1K J
R348	R CARBON FILM	1/6W 22K J	R421	R CARBON FILM	1/4W 4.7K J
R349	R CARBON FILM	1/6W 18K J	R423	R CARBON FILM	1/6W 8.2K J
R350	R CARBON FILM	1/6W 1K J	R424	R CARBON FILM	1/6W 1K J
R351	R CARBON FILM	1/6W 150 J	R425	R CARBON FILM	1/6W 10K J
R352	R CARBON FILM	1/6W 150 J	R426	R CARBON FILM	1/2W 7.5K J
R362	R CARBON FILM	1/6W 22K J	R427	R METAL OXIDE	1W 100 J
R363	R CARBON FILM	1/6W 10K J	R428	R CARBON FILM	1/2W 100 J
R364	R CARBON FILM	1/6W 2K J	R429	R METAL OXIDE	1W 560 J
R366	R CARBON FILM	1/6W 22K J	R430	R CARBON FILM	1/6W 18K J
R367	R CARBON FILM	1/6W 470 J	R431	R CARBON FILM	1/6W 10K J

## PARTS LIST

LOC.	PARTS NAME	SPECIFICATIONS	LOC.	PARTS NAME	SPECIFICATIONS
R436	R CARBON FILM	1/2W 3.3 J		<b>NECK PCB</b>	
R438	WIRE COPPER	AWG22 1/0.65	C514	C CERAMIC	B 2KV 1000pF K
R801	POSISTOR	ECPC180M290	C551	C CERAMIC	B 50V 150pF K
R802	R CEMENT	10W 2.2 J (R TYPE)	C552	C CERAMIC	B 50V 150pF K
R803	R METAL OXIDE	2W 47K J	C553	C CERAMIC	B 50V 150pF K
R804	R METAL OXIDE	2W 47K J	C560	C ELECTRO	16V 100uF RSS
R805	R CARBON FILM	1/4W 1K J	L551	COIL	82uH J
R807	R CARBON FILM	1/4W 1.5K J	L552	COIL	82uH J
R809	R CEMENT	2W 0.47 J (MPR TYPE)	L553	COIL	82uH J
R810	R CARBON FILM	1/4W 2.2K J	Q551	TR	KTC3229
R812	R CARBON FILM	1/2W 68 J	Q552	TR	KTC3229
R813	R CARBON FILM	1/2W 20K J	Q553	TR	KTC3229
R814	R CARBON FILM	1/2W 20K J	R535	R CARBON FILM	1/2W 100K J
R816	R METAL OXIDE	1W 1.5K J	R551	R CARBON FILM	1/2W 1K J
R818	R METAL OXIDE	1W 1 J	R552	R METAL OXIDE	3W 4.7K J
R819	R METAL OXIDE	2W 15K J	R553	R CARBON FILM	1/6W 390 J
R821	R METAL OXIDE	1W 27 J	R554	R CARBON FILM	1/6W 2.7K J
R830	R CARBON FILM	1/6W 2.2K J	R555	R CARBON FILM	1/6W 390 J
SW301	SW-PUSH	IT-2203	R556	R CARBON FILM	1/2W 1K J
T401	TRANS-DRIVE	HD-1035G	R557	R CARBON FILM	1/2W 1K J
T402	FBT	MCK-20A036	R558	R CARBON FILM	1/6W 2.7K J
T802	TRANS-S/W	TM-1901	R560	R CARBON FILM	1/2W 33 J
TP1	WAFER	CENTER PIN	R561	R METAL OXIDE	3W 4.7K J
TP2	WAFER	CENTER PIN	R562	R METAL OXIDE	2W 1 J
TP3	WAFER	CENTER PIN	R563	R CARBON FILM	1/6W 2.7K J
TP4	WAFER	CENTER PIN	R564	R METAL OXIDE	3W 4.7K J
VR301	VR-SEMI	NVZ 6TLT 2K	R569	R CARBON FILM	1/6W 390 J
VR302	VR-SEMI	NVZ 6TLT 50K	SC01	SOCKET CRT	ISHS04S
VR303	VR-SEMI	NVZ 6TLT 200K	SG501	SPARK GAP	MTA-301M
VR401	VR-SEMI	NVZ 6TLT 20K	SG502	SPARK GAP	MTA-301M
W301	WAFER	LW1143-10(PIN7 NC)	SG503	SPARK GAP	MTA-301M
W302	WIRE LEAD	UL 1015 #18 BK 150	VR551	VR-SEMI	V09 200 (CCT-117A)
W401A	WAFER	SMW250-12	VR552	VR-SEMI	V09 2K (CCT-117A)
W402	WAFER	YFW800-04	VR553	VR-SEMI	V09 200 (CCT-117A)
W501A	WAFER	5267-05A	VR554	VR-SEMI	V09 2K (CCT-117A)
W510A	WAFER	5267-04A	VR555	VR-SEMI	V09 2K (CCT-117A)
W801	WAFER	YFW800-02	VR556	VR-SEMI	V09 200 (CCT-117A)
W802	WIRE LEAD	UL 1015 #18 BK 150	W501	WAFER	YFW800-01
W803	WAFER	YFW600-02			
W804	WIRE LEAD	UL 1015 #18 BK 150			



## PARTS LIST

LOC.	PARTS NAME	SPECIFICATIONS
<b>CONTROL PCB</b>		
C701 .....	C ELECTRO .....	16V 10uF RSS
D701 .....	DIODE .....	UZ-5.1B
R701 .....	R CARBON FILM .....	1/4W 20K J
R702 .....	R CARBON FILM .....	1/4W 68K J
R703 .....	R CARBON FILM .....	1/4W 4.7K J
R704 .....	R CARBON FILM .....	1/4W 4.7K J
R705 .....	R CARBON FILM .....	1/4W 4.7K J
R706 .....	R CARBON FILM .....	1/4W 330 J
R707 .....	R CARBON FILM .....	1/4W 5.6K J
R708 .....	R CARBON FILM .....	1/4W 470 J
R709 .....	WIRE COPPER .....	AWG22 1/0.65
VR720 .....	VR-SEMI .....	H09 200K (CCT-092A)
VR721 .....	VR-SEMI .....	H09 10K (CCT-092A)
VR722 .....	VR-SEMI .....	H09 10K (CCT-092A)
VR723 .....	VR-SEMI .....	H09 10K (CCT-092A)
VR724 .....	VR-SEMI .....	H09 500 (CCT-092A)
VR725 .....	VR-SEMI .....	H09 10K (CCT-092A)
W401B .....	WAFER .....	SMAW250-12

***VISION PRO***  
**HAPP CONTROLS**

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**RESTRICTED CONFIDENTIAL DOCUMENT**  
 THIS DRAWING AND ALL INFORMATION SHOWN HEREON ARE THE EXCLUSIVE PROPERTY OF TOVIS CORPORATION AND ARE SUBMITTED ONLY ON A CONFIDENTIAL BASIS. THE RECIPIENT AGREES NOT TO REPRODUCE THE DRAWING TO RETURN IT UPON REQUEST, AND THAT NO DISCLOSURE OF THE DRAWING UPON RETURN IT UPON REQUEST, AND THAT NO DISCLOSURE OF THE DRAWING OR THE INFORMATION SHOWN HEREON WILL BE MADE TO A THIRD PARTY WITHOUT PRIOR WRITTEN CONSENT FROM MANUFACTURER

- \*\* WARNING \*\***  
 BEFORE SERVICING THIS CHASSIS READ THE " X-RAY RADIATION PRECAUTION ", " SAFETY PRECAUTION " AND " PRODUCT SAFETY NOTICE " IN THE SERVICE MANUAL.
- \*\* NOTE \*\***
1. RESISTANCE IS SHOWN IN OHM K-1,000 M-1,000,000
  2. UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITOR VALUES LESS THAN 1 ARE EXPRESSED IN uF AND THE VALUES MORE THAN 1 IN pF.
  3. VOLTAGES READ WITH "V.T.V.M" FORM POINT INDICATED TO CHASSIS GROUND USING A COLOR BAR SIGNAL WITH ALL CONTROLS NORMAL MAIN VOLTAGE 120 VOLTS AC VOLTAGE READINGS SHOWN ARE NOMINAL VALUES AND MAY VARY + 20% EXCEPT H.V.
  4. IN CASE OF 13" RECEIVER THE COMPONENT WITHIN THE MAKE # A SHOULD BE USED ONLY.
  5. THIS CIRCUIT DIAGRAM IS A STANDARD ONE CIRCUITS PRINTED MAY BE SUBJECT TO CHANGE FOR PRODUCT IMPROVEMENT WITHOUT PRIOR NOTICE.
- CAUTION SAFETY CRITICAL COMPONENT.**  
 \* X-RAY PROTECTION RELATED COMPONENT REPLACE ONLY WITH SAME TYPE PARTS AS SHOWN IN PARTS LIST.

