



*WARNING*

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For continuous protection against radiation, shock and flame, replace only with same type and rating components specified in the approved sheets.

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**B. SCHEMATICS AND PCB LAYOUT DIAGRAM**

## Audience

This service manual is primarily for system / service engineers, distributors and dealers. It carries the assumption that the reader understands the basic operating concepts.

## Purpose

This manual contains reference data for **Speco Technologies** monitor. It gives information regarding the operating principles of monitors, as well as technical service and maintenance information.

## 1. Introduction

The **VM-1201**, high performance monochrome monitor, display over 1,000 TV lines resolution on a bright 12-inch picture tube. This combination provides excellent multi-screen displays commonly produced by picture-in picture and quad units.

All user controls are conveniently located behind a protective front panel door. This monitor can be placed on a desk or mounted in a standard 12-inch rack (with an optional rack mount kit)

This series are housed in an enameled steel cabinet for ruggedness and durability, and with the exception of the picture tube, the circuitry is all solid-state. It also feature video loop through connectors with switchable high-z/75ohm termination.

The **VM-1201** is an excellent choice when you require a rugged, compact B/W monitor. The exquisite and reliable design of this monitor will provide years of trouble-free operation.

### 1.1 Operational Specification

#### 1.1.1 Operating Environment

- Temperature

Operating : -10 to + 50°C

Storage : -20 to +70 °C

- Humidity (Relative)

Operating : 10 to 85% non-condensing

Storage : 10 to 95% non-condensing

### 1.1.2 Signal Input Requirements

- Connector

For CVBS : BNC terminal

Type : composite video input      Level : 1.0Vp-p

Synchronous : 0.3 V

Luminance : 0.7V

Polarity : Positive bright

Impedance : 75 ohms

### 1.1.3 Power Input Requirements

- Operating Voltage Range : 90 ~ 264 V<sub>AC</sub> at 50 / 60 ±3Hz

- Input Current at 90 V<sub>AC</sub>

Operating : 0.5 Amps rms. maximum

- Input Current at 264 V

Operating : 0.3 Amps rms. maximum

- Power consumption

Normal operation : 30 Watts maximum

## 1.2 Functional Specification

The standard conditions for verifying the following specification are as below :

- Temperature : 25 ±5°C
- Magnetic field : No additional magnetic field in near side
- AC line Input : 100 ~ 240 V<sub>AC</sub> ±10%, 50/60 ±3Hz
- Warm-up Time : 30 minutes min. after power on and signal applied
- Ambient light : 400 to 600 lux.

### 1.2.1 Display Quality

- Display area (monoscope pattern) : full scan
- Video Amplifier Performance
  - Video Bandwidth : 8 MHz
- Light output (brightness and contrast at maximum)
  - At block pattern : 100 FL minimum
  - At full white pattern : 50 FL minimum
- Contrast adjustment range : Over 12 dB
- Linearity (cross pattern)
  - Horizontal : 10% maximum
  - Vertical : 10% maximum

- Picture geometry :  $\leq 2.5\%$
- Picture centering :  $\leq 6\text{mm}$
- Size stability : Picture luminance from 5 FL to max., the size shall be less than 2.5%  
(with full white pattern)
- Swing and jitters : Swing and jitters are not allowed (viewed at 50cm from eyes to screen).
- Focus : (viewed at 50cm from eye to screen, contrast adjusted to set luminance at 20 FL with full white pattern, brightness set at raster just disappeared) Inspect full character pattern, all characters should be distinguished.

### **1.3 Controls and adjustments**

- External user's controls :
  - Brightness adjustment
  - Contrast adjustment
  - Horizontal hold
  - Vertical hold
  - Volume adjustment (optional).

### **1.4 Physical Specifications**

- Dimension : 313mm(H) ×310mm(W) x300mm(D)
- Net Weight : 9 Kg

## **2. Theory of Operation**

This section describes each functional block of the monitor.

## 2.1 Main Power Supply Block

- AC power input : AC socket
- Line input noise / EMI filtering : Line filter T902 ;  
X-Cap C901, C902.  
Y-Cap C903, C904, C905.
- Over current protection : Fuse
- Power on/off control : Power switch
- AC to DC conversion and filtering : Diode D901, Capacitor C906
- Start-up circuit : R914, C914.
- Main switching power controller, free run oscillation, voltage feed back, switching duty control, cycle by cycle over current protection, power MOSFET driving : U901-UC3842
- Free run oscillation : R909, C910.
- Voltage feed back and control : output voltage control R910, R911 & VR901; gain compensation C911& R903.
- Current sensing and cycle by cycle over current protection : Current sensing R904; Noise filtering R906, C909.
- Energy storing and transferring : Power transformer T901.
- Power driving : Power MOS transistor Q901.



- Snubber circuit : Snubber C907, D902, R902.
- Primary side self-powering circuit : D903,C914.
- Output 13.5 volts for vertical & horizontal drive circuits : D904, C915.
- Output 27.5volts for horizontal deflection circuit : D906 ,C916.

## 2.2 Video input block

- **Signal input buffering and switch**
  - CVBS Input buffer : Q201 & R201,R202.
- **Video filter & output stage.**
  - Video input : Through C202 to W202 (Contrast VR ) and differential amplifier Q202, Q203.
  - Video amplifier: Cascade amplifier R219, Q204, Q205, R222, C206.
  - Brightness control:VR201, R214, R225, R226, Q204.

## 2.3 Vertical & horizontal processor

### 2.3.1 Vertical guard:

This vertical feedback signal on pin2 when the level on pin 2 is below 0.35v or high than 1.85v the guide circuit inserts a continuous level of 2.5V in the sandcastle output signal of pin 17.The results in the blanking of the picture displayed, thus preventing a burnt-in horizontal line.

### 2.3.2 Vertical drive output:

The drive o/p pin1 of U401 delivers a drive current of 1.5mA at 5V output through R302 to U402 pin1.

### 2.3.3 Sync separator:

The video input through C401, R401 and filter C402 to pin 5 of U401.The Sync separator is designed such that the slicing level is independent of the amplitude of the Sync pulse. The

black level is stored at pin7 by C404. The slicing level is stored at pin6 by C403 and decided by R403.

#### **2.3.4 Phase detector:**

The phase detector circuit is connected to pin8. The circuits are activated depending on the voltage of pin18 and the state of the Sync pulse noise detection circuit, C405, C406, R405.

#### **2.3.5 Supply (pin9, 10 and 16):**

U401 can start operating by application of a very low supply current into pin16. When the starting circuit is taken from pin10 via internal diode, and the voltage on pin16 will stabilize to a typical value of 9.4V

#### **2.3.6 Horizontal oscillator, horizontal output transistor, and second phase detector (pin11, 12, 14 and15):**

The oscillator is connected to pin15. An external RC; C409, R412, VR401; sets the frequency combination between pin15 and ground. The open collect horizontal output is connected to pin11. The duty factor is set by an internal npn emitter follower stage connected to pin14. When no flyback pulse is detected at pin12 the duty factor of the horizontal output stage is set to 50%.

#### **2.3.7 Mute output and 50/60HZ identification (pin13):**

Pin13 has the possibility for 50/60HZ identification. A pull-high resistor R408 achieves the function.

#### **2.3.8 Sandcastle output (pin17):**

The sandcastle output pulse generated at pin17.

### **2.4 Vertical Deflection Block**

- Power amplifier :
  - The DC level across C308 and the current is detected by R306 and feedback to U401 through R311.
  - The driver output comes from pin5 and it drives the yoke by a negatives slope current ramp R419 is used to stabilize the power amplifier.
  - Boost power D301, C305 is connected to pin3.

- Flyback generator :
  - U301 pin6 is the output of the flyback generator that when driven, jumps from low to high condition C305 transfers the jump to pin3
- Vertical size control : VR301, R312, R308.

## 2.5 Horizontal Deflection Block

- Horizontal drive buffering : Driving source-U401 pin11. Driving transistor-Q40, to pull high the driving waveform to drive the Q401(MOS FET).
- Horizontal deflection : Horizontal Output transistor-Q401; Load-Yoke inductance and C414 ; D401, High Voltage generation-flyback transformer .

## 3 Troubleshooting Instructions

- This chapter describes possible failures of the monitor with corresponding check/correction actions, and guidelines for safe operation and service of the monitor.

### 3.1 No Display, No Power

- 3.1.1 First of all, turn power off, use multimeter to check Q901, and R904, replace if bad. Turn power on after that.
- 3.1.2 Check DC voltage across C906. If no voltage or voltage too low, check and fix the following components : AC receptacle poor contact, fuse F601 broken, power switch malfunction, or bridge diode D901 bad
- 3.1.3 Check voltage on U901 pin 7 for start up condition : If voltage on U901 pin 7 reaches the start up voltage(around 15 to 17.5V), U901 UC3842 will start to work and output 5V at pin 8. If voltage on U601 pin 7 is too low, check and fix following circuits : start up circuit R914, and C914.
- 3.1.4 If no output pulses at U901 pin 6, check and replace U901.

3.1.5 If driving pulses at U901 pin6 and drain of Q901 are correct but voltage at U901 pin 7 low than threshold voltage --causing U901 to stop and restart periodically, check and repair following circuits. Power transformer T901 bad; D903 short-circuit/opened.

### **3.2 No Display, power output normal.**

3.2.1 Check and fix FBT B+ : If no B+ ( 27.5V ) on pin2 of FBT replace D906, C916.

3.2.2 Check driving output voltage : 0 or very low check and replace Q402, Q401.

3.2.3 Power off monitor. Check yoke connection. Use multimeter to check D501, D502, D401, Fix if any is bad.

3.2.4 Power on, check voltage at pin10 of U401 if no voltage, check and fix Vertical circuit B+, D904.

### **3.3 No Display (No Raster).**

3.3.1 Check yoke connection.

3.3.2 Check CRT board and verify CRT heater is on.

3.3.3 Check G2 voltage if fail, check and fix FBT or D502.

3.3.4 Check K (cathode) voltage at negative of D501 about 150V, If no voltage output Check and replace D501 and C501.

### **3.4 Vertical Deflection Failure**

3.4.1 Vertical display can't be held--check and fix : U401.

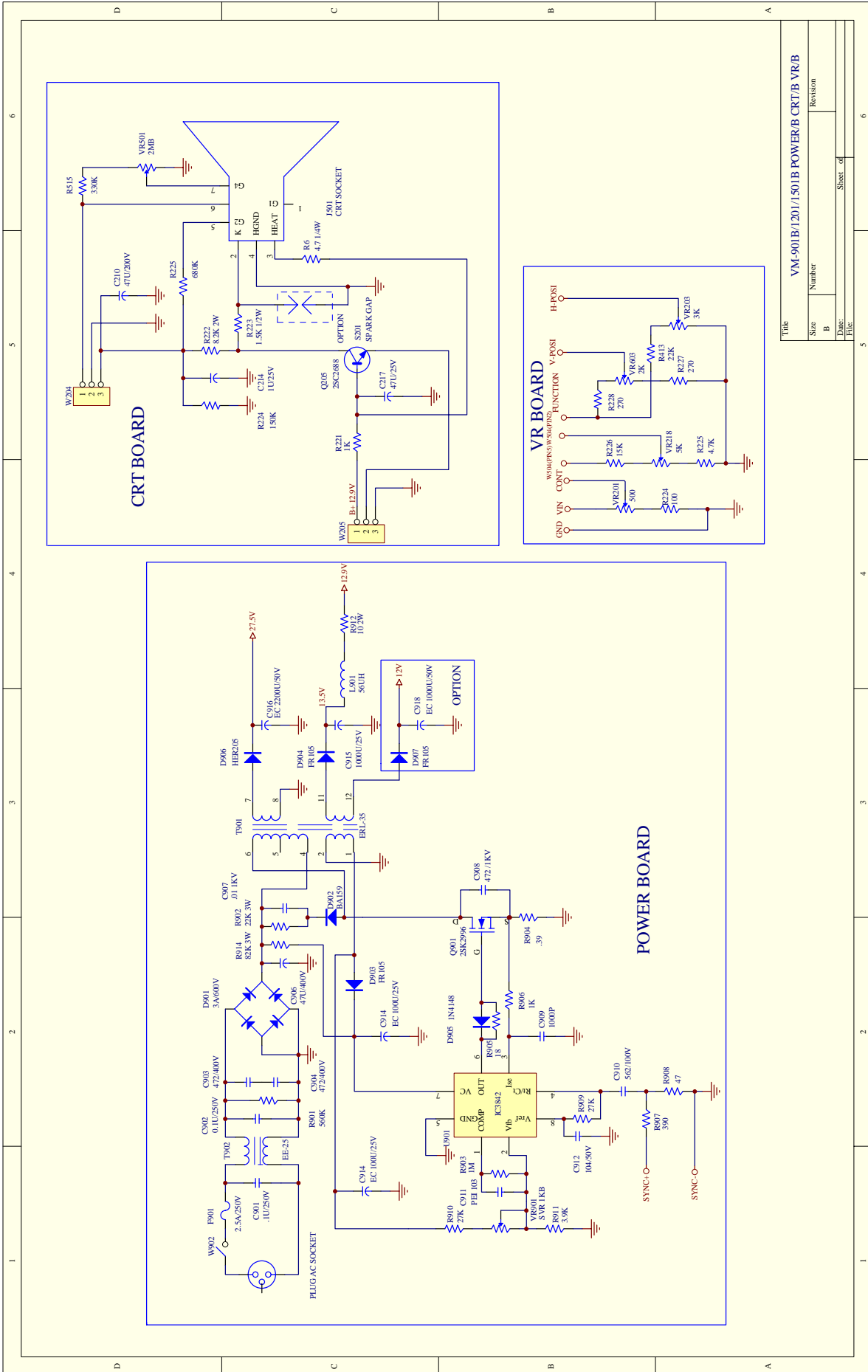
3.4.2 Vertical raster abnormal (one horizontal line, size too small or fold back on top / bottom) -- check and fix : 14V supply at U402 pin2, if has voltage check and fix U301.

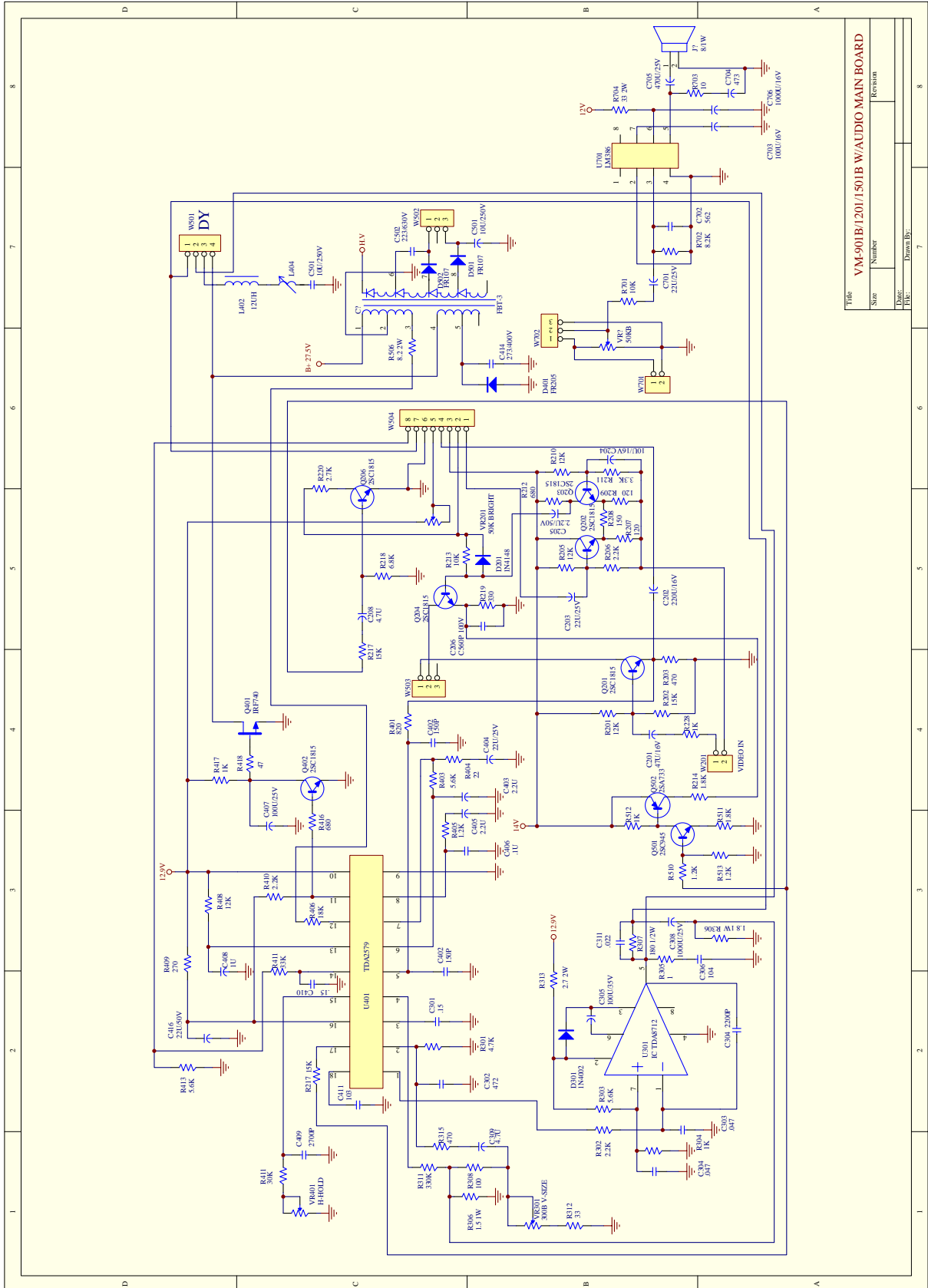
## Appendix A. Spare Parts List

Location	Parts Number	Description
F901	28-1100-0006	Fuse, 2A/250V, slow blow
D901	06-3100-0005	Diode 3A, 600V, RS407
D902	06-1100-0001	Diode, 1.5A, 800V, BA159
D501, D502	06-1100-0023	Diode, 3A, 800V, FR107
D903, D904, D301	06-1100-0014	Diode, FR1005
D906, D401	06-1100-0058	Diode, 2A, 600V, FR205
Q901	08-3100-0011	Power MOS 2SK2996
Q201, Q202, Q206, Q402, Q501	08-1100-0003	Transistor NPN 2SC1815
Q205	08-1100-0001	Transistor NPN 2SC2688
Q502	08-1100-0002	Transistor PNP 2SA1015
Q203, Q204	08-1100-0081	Transistor NPN 2SD667
U401	09-4100-0007	IC TDA2579B
U301	09-4100-0119	IC TEA8172
U901	09-4100-0087	IC UC3842
FBT	11-0100-0054	Flyback Transformer
T401	41-2100-4009	Driver Transformer
T901	11-2100-0095	Driver Transformer
R902	01-3203-223J	CR 22K 3W
R904	01-01 2-*39J	CF 0.39 1W
R614	01-2003-823J	MOF 82K 3W

## **Appendix B. Schematics and PCB Layout Diagram**

- 1. Schematics Page 1 -- Main Board, Video Board.**
- 2. Schematics Page 2 -- Power Supply, Video Amplifier**
- 3. PCB Layout -- Video Board, Circuit Trace**
- 4. PCB Layout -- Main Board, Silk Screen**





Title: VM-901B/1201/1501B W/AUDIO MAIN BOARD

Size: Number

Date: Drawn By:

Revision



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