MAINTENANCE MANUAL
FRONT CAP ASSEMBLY 19D901913G1
FOR MVS

TABLE OF CONTENTS

DESCRIPTION

The Front Cap Assembly consists of a LCD Assembly, a Control Panel, a Control Board, and an internal speaker. Each module will be discussed individually in the following paragraphs.

The Front Cap Assembly is interconnected to the radio by a nine pin plug and a flat ribbon cable. The microphone connector is at the bottom of the Front Cap Assembly located on the Control Board.

LCD ASSEMBLY

The LCD Assembly provides all of the display indicators and the POWER on/off switch. The assembly is mounted on the front of the Front Cap Assembly under the Control Panel. The LCD is viewed through the window on the Control Panel. The LCD receives data from the Control Board to turn on the indicators. LEDs behind the LCD backlight the display for night viewing.

CONTROL PANEL

The Control Panel plugs into the Front Cap Assembly and provides all controls except the power switch. The panel determines the number of channels and provides the Type 99 decode option or the Public Address option.

There are 7 different optional interchangeable Control Panels available:

- 2 Channel 19D801450P1
- 2 Channel with Type 99 decode 19D801450P2

- 16 Channel with scan 19D801450P3
- 16 Channel with scan and Public Address 19D801450P4
- 128 Channel with scan 19D801450P5
- 2 Channel with Public Address 19D801450P6
- 16 Channel with scan and Type 99 decode 19D801450P7

CONTROL BOARD

The LCD Assembly and the Control Panel are connected to the Control Board. The microprocessor on the Control Board interfaces the LCD and the Control Panel to two serial data lines for communication with the main radio microprocessor on the Logic Board (A1). The Control Board also contains a digital volume control and a 3 watt audio amplifier.

CIRCUIT ANALYSIS

The microprocessor (U725) on the Control Board uses two serial data lines to send and receive data with the main radio processor on the Logic Board (A1). Schmitt triggered hex inverters (U726) buffer the lines to reduce noise and data error problems. Both serial lines normally rest at +5 volts, with data causing the lines to go low.

LCD ASSEMBLY

The LCD connects to the microprocessor output port pins through J727. Serial commands from the Logic Board (A1) are sent to the microprocessor on the DISPLAY SERIAL line through P701. The microprocessor converts the serial data to the data format needed to drive the LCD Assembly. LEDs behind the LCD for backlighting receive power from SW A+. The POWER switch momentarily grounds the POWER SW line which feeds the A+ switching circuitry on the System Board (A5).

CONTROL PANEL

The Control Panel connects to the microprocessor input port pins through J726. The microprocessor port pins are normally pulled high to +5 volts through 50K ohm resistors in the microprocessor. A switch closure on the Control Panel grounds an input port line. The diodes on these lines protect the microprocessor from static discharges. The microprocessor converts each switch closure to serial data which is sent on the KEYPAD SERIAL line through P701 to the Logic Board (A1).

CONTROL BOARD

Receiver Audio

RX AUDIO from the Audio Board (A3) passes through the Control Board to the System Board (A5) on connectors P701 and J901. The audio is attenuated on the System Board and sent back to the Control Board. ATTENUATED RX AUDIO feeds the digital volume control U802.

Digital volume control U802 is equivalent to a 10K potentiometer with the wiper stepped by data from microprocessor U725. When the VOLUME UP/DOWN buttons are pushed on the Control Panel, the microprocessor sets the UP/DOWN control input on U802 to the desired direction and then toggles the INC (increment) line to step the pot. The microprocessor provides data to the pot for 14 levels of volume. The volume setting is sent back serially to the Logic Board to be stored in the personality EEPROM. When the radio is turned on, the Logic Board sends this data to the Control Board to return to the same volume setting.

R811 prevents turning the volume down to zero. If no audio output is desired at the bottom step of the volume control, a short may be placed across R811.

The 3 watt audio power amplifier U801 is fed by the wiper of the digital volume control. U801 has a gain of 22 (27dB). The feedback loop consisting of R805, R806, and C803 determines the amplifier's gain. R803, C804, C806, and C810 prevent high frequency oscillations.

The 3 watt audio PA is muted (switched off) when $\overline{\text{AUDIO MUTE}}$ is low. When no messages are being received, Q801 is turned on, applying 1.25 volts to U801 pin 2. This voltage turns off U801 causing the output pin 4 to switch to ground. The $\overline{\text{AUDIO MUTE}}$ line is pulled high to +5 volts by an internal 50K ohm resistor in the Logic Board (A1) microprocessor. This line may be grounded through the mic connector J725 or the System Board (A5) option connector to mute the receiver audio.

The 3 watt audio output is routed to the System Board (A5) on SPKR HI through J901. SPKR HI is also available on the mic connector J725. The internal speaker normally connects to the System Board to provide easy access to the speaker when servicing the radio. An alternate speaker connector J801 on the Control Board is used for the internal speaker in the remote mount option.

CG Disable Input

The Channel Guard disable input is grounded when the microphone is placed off-hook. Grounding $\overline{\text{CG DISABLE}}$

will place the radio into squelch operation only and stop all scanning. When the microphone is on-hook, this line is at 5 volts provided by the 50K ohm pullup resistor in microprocessor U725.

GE STAR Input

The $\overline{\text{GE STAR}}$ input to the microprocessor is used with the $\overline{\text{GE STAR}}$ Encoder option when transmitting the emergency data message. The GE STAR input prevents illuminating the TX indicator on the LCD when the transmitter is keyed. The input must be grounded before or simultaneously with the $\overline{\text{PTT}}$. Once the $\overline{\text{PTT}}$ is keyed, the TX indicator will remain off if the $\overline{\text{GE STAR}}$ input is ungrounded. This line normally rests at 5 volts provided by the 50K ohm pullup resistor in the microprocessor.

PUB ADD MUTE Output

The public address mute line output from the microprocessor normally rests at a logical low to keep the public address microphone audio muted on the System Board A5. If a Control Panel with the public address option is used, this line will switch to +5 volts when the PA button is pushed and the microphone $\overline{\text{PTT}}$ is keyed.

POWER DISTRIBUTION

Switched A+ from the System Board (A5) feeds the Control Board through J901. SW A+ supplies 13 volts to 5 volt regulator U727, 3 watt audio PA U801, and the LED backlighting on the LCD Assembly.

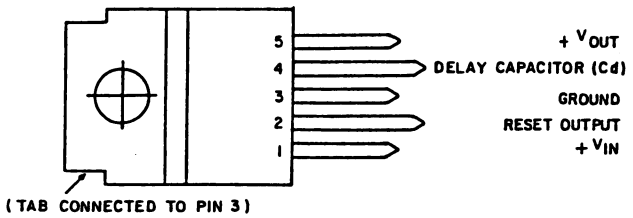
Voltage regulator U727 supplies +5 volts to the microprocessor U725, digital volume U802, serial line buffers U726, and the LED lighting on the Control Panel. A reset circuit in U727 provides the microprocessor with a 20 ms logical low pulse at power-up.

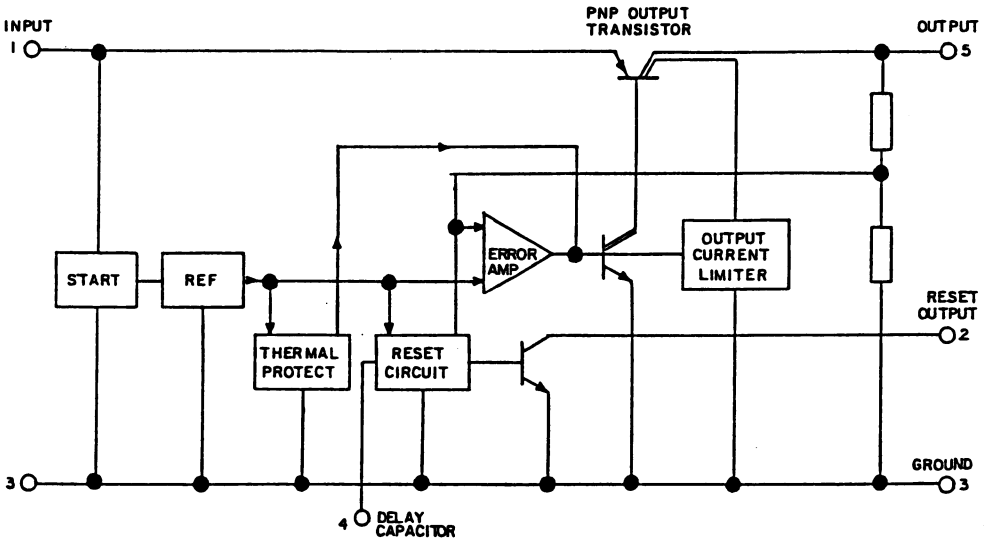
An overall Distribution Block Diagram is provided in the Service Section of this manual.

FRONT CAP

VOLTAGE REGULATOR

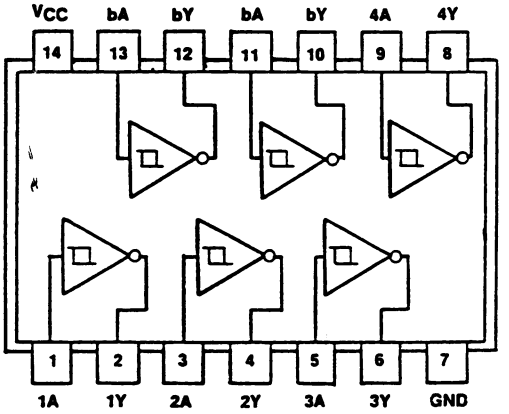
19A704970P1





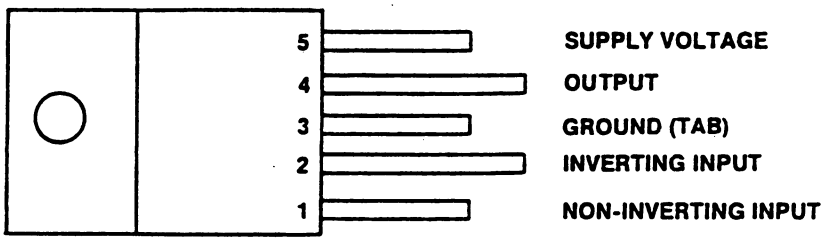
RC-5851A

HEX SCHEMITT TRIGGER INVERTER
(U726)
19A700037P313



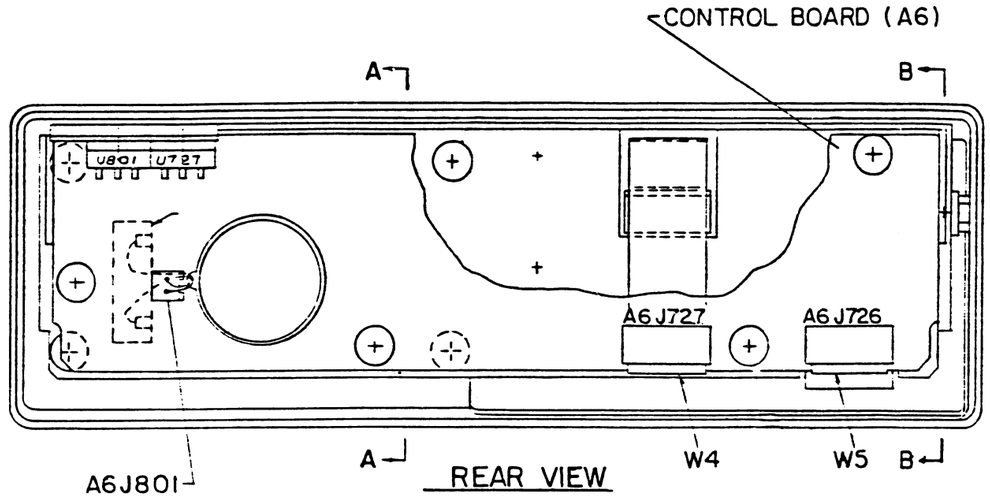
RC-5852

AUDIO AMPLIFIER
(U801)
19A701830P1

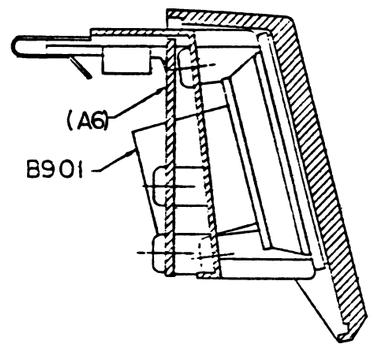


PIN INDENTIFICATION

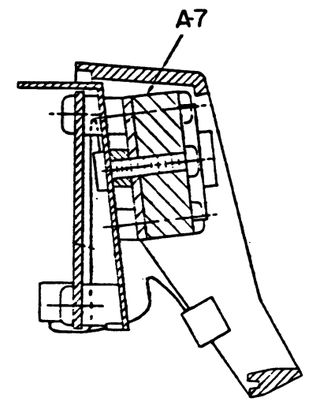
RC-5848



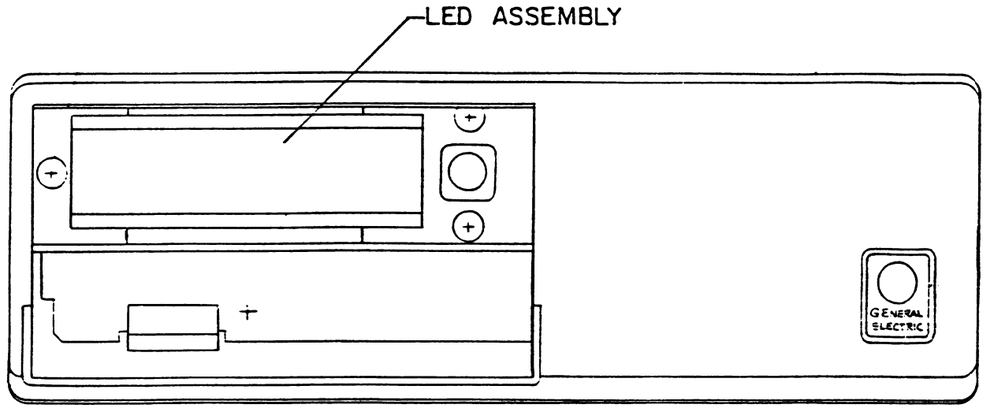
REAR VIEW



SECTION A-A



SECTION B-B

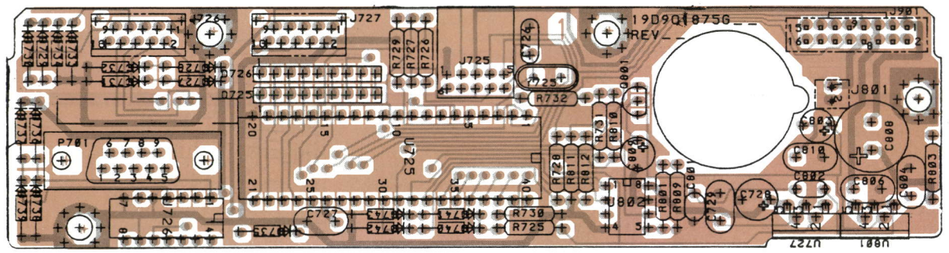


FRONT VIEW

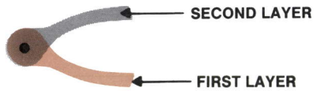
NOTE: REFER TO THE MECHANICAL PARTS BREAKDOWN IN THE COMBINATION SECTION FOR A DETAILED PARTS BREAKDOWN.

RC-5911
(MADE FROM 19D901913 REV. 1)

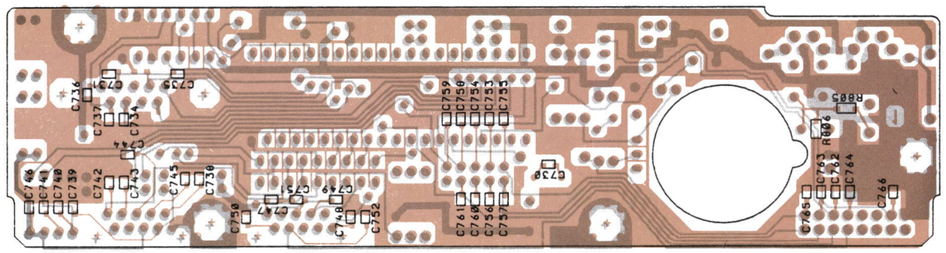
COMPONENT SIDE



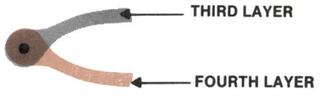
(19D901875, Sh. 2, Rev. 1)
(19D902162, First Layer, Rev. 1)
(19D902162, Second Layer, Rev. 0)



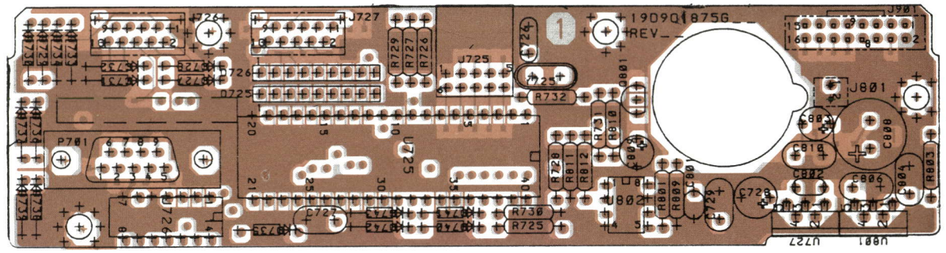
SOLDER SIDE



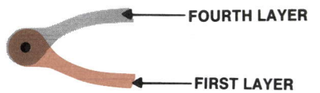
(19D901875, Sh. 2, Rev. 1)
(19D902162, Fourth Layer, Rev. 1)
(19D902162, Third Layer, Rev. 0)



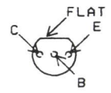
Control Board
19D901875G2



(19D901875, Sh. 2, Rev. 1)
(19D902162, First Layer, Rev. 1)
(19D902162, Fourth Layer, Rev. 1)

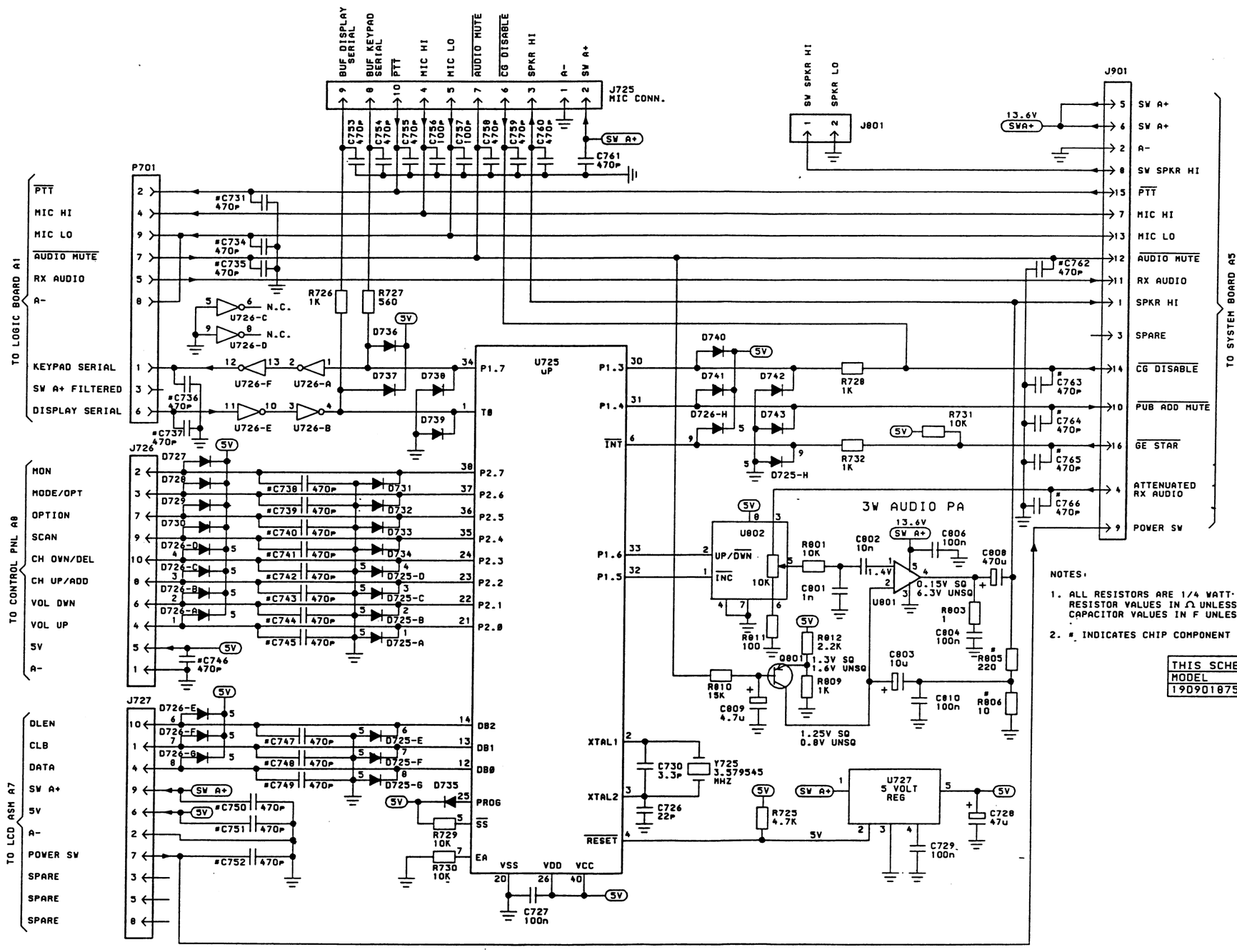


LEAD IDENTIFICATION
FOR Q801



IN-LINE
TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



NOTES:

1. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED. RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M. CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER u,n OR p.
2. # INDICATES CHIP COMPONENT LOCATED ON SOLDER SIDE OF PWB.

THIS SCHEMATIC DIAGRAM APPLIES TO	
MODEL	REVISION
19D901875G2	

POWER AND GROUND CONNECTIONS

DEVICE	5V	GND
U725	26,40	20
U726	14	7

(19D902218, Rev. 0)

Control Board
19D901875G2

PARTS LIST

MVS FRONT CAP ASSEMBLY
19D901913G1

ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
A6		MVS Control Board 19D901875G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C726	19A700235P17	Ceramic: 22 pF ±5%, 50 VDCW.
C727	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C728	19A701534P9	Tantalum: 47 uF ±20%, 6.3 VDCW.
C729	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C730	19A702061P7	Ceramic: 3.3 pF ±0.5 pF, 50 VDCW, temp coef 0 ±120 PPM/°C.
C731	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C734 thru C755	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C756 and C757	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C758 thru C766	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
C801	T644ACP210K	Polyester: .0010 uF ±10%, 50 VDCW.
C802	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.
C803	19A701534P7	Tantalum: 10 uF ±20%, 16 VDCW.
C804	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C806	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
C808	19A701225P11	Electrolytic: 470 uF -10% to +75%, 16 VDCW.
C809	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C810	T644ACP410K	Polyester: 0.1 uF ±10%, 50 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
D725	19A705313P2	Integrated: Common anode, sim to DAP 801.
D726	19A705313P1	Integrated: Common cathode, sim to DAN 801.
D727 thru D743	19A700028P1	Silicon, Fast Recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		- - - - - - - - - - JACKS - - - - - - - - - -
J725	19A702333P52	Printed wire: sim to Dupont 78207-110.
J726 and J727	19A705236P1	Connector, 10 contacts: sim to MICS-10-.8.
J801	19A703248P17	Contact, electrical.
J901	19A703248P17	Contact, electrical.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P701	19B209727P31	Connector.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q801	19A700022P2	Silicon, PNP: sim to 2N3906.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R725	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.
R726	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R727	H212CRP156C	Deposited carbon: 560 ohms ±5%, 1/4 w.
R728	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R729 thru R731	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R732	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R801	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R803	H212CRP910C	Deposited carbon: 1 ohm ±5%, 1/4 w.
R805	19B800607P221	Metal film: 220 ohms ±5%, 200 VDCW, 1/8 w.
R806	19B800607P100	Metal film: 10 ohms ±5%, 200 VDCW, 1/8 w.
R809	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R810	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R811	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R812	H212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U725	19A703244P50	Digital: 8 Bit HMOS Microcomputer.
U726	19A700037P313	Digital: Hex Schmitt-Trigger Inverter.
U727	19A704970P1	Linear: 5 Volt Regulator; sim to SGS L387.
U801	19A701830P1	Linear: Audio Amplifier; sim to TDA 2003.
U802	19A705180P2	Digital/Linear: Digitally controlled potentiometer; sim to CAT X9103P.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
Y725	19A702511G28	Quartz: 3.5795 MHz.
A7		LCD ASSEMBLY 19B801459P1
B901	19A705165P1	Loudspeaker, permanent magnet.
		- - - - - - - - - - CABLES - - - - - - - - - -
W4 and W5	19A705234P1	Cable assembly.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19D901890P1	Front Cap.
	19D901889G1	Can, Shield.
	19A705209P1	Name Plate
	19A705381P13008	Screw, thread forming.
	19A702381P508	Screw, thd. form: No. 3.5-0.6 x 8.
	19A702364P316	Machine Screw: Pan Head, Steel.
	19A705244P2	Clip, spring tension.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES