MAINTENANCE MANUAL
FOR
I/O BOARD
19D902231G1

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ERICSSON

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SPECIFICATIONS*

Input Power	
A+(J1-1)	13.8 VDC ±20%
A+IGN (J1-2)	13.8 VDC ±20%
Output Power	
A+SW	13.6 VDC ±20%
+5V	5.0VDC ±5%
TX-SW-IGN	13.6 VDC ±20%
Maximum Input Current Drain	
A+	
With Radio	3.5 amperes
Without Radio	350 milliamperes
A+ IGN	20 milliamperes
Maximum Output Current Drain	
A+SW	3.15 amperes
+5 VOLTS	350 milliamperes
TX-SW-IGN	20 milliamperes
Temperature Range	-30° C TO +60°C
	(-22 F TO +140° F)
Logic Levels	TTL, or 0 - 13.8 Volts ±3.0
Rise and Fall Times	100 nanoseconds
Clock Pulses	1 microsecond
Reset Pulse Duration	30 milliseconds ±10 ms
Horn Ring Input	
Power	13.8 VDC ±20%
Current	220 milliamperes
Horn Ring Output	
Power	13.6 VDC ±20%
Current	200 milliamperes
Siren Light Driver Current	200 milliamperes
Audio Amplifier	
Filtering	De-emphasis per EIA RS-220
Minimum Power Supply Rejection	30 dB

*These specifications are intended primarily for use by service personnel. Refer to the appropriate Specification Sheet for complete specifications.

DESCRIPTION

I/O Board 19D902231G1 provides the Control Unit interface to all external equipment used with the System or Scan radio system.

The I/O board interfaces to the control units and the following equipment, if present:

- RANGR or Delta S/SX mobile radio
- Vehicular Repeater
- Mobile Siren/Light/PA unit
- Dual control unit
- Voice Guard unit
- Motorcycle Headset unit

The processor board writes to the registers of the I/O board to perform the interface functions to the radio system.

One register performs the audio routing and control of the VOL/SQ-HI (or VOL-HI) and MIC-HI signals to the radio transmitter, external siren/PA, or internal/external speaker. Also the routing of alert tones, GESTAR signalling, T90/T99 signalling, and DTMF generation is also performed by this same register. This register also sets up the audio and squelch EEPOTs with the appropriate level. Three radio controls are generated by this register. They are the radio transmit control, receiver mute control, and receiver PA key control.

A second register controls the horn enable/disable circuitry which routes the horn signal back to the horn relay, the channel guard disable signal to the radio, the squelch disable signal to the radio, the siren PA push to talk, optional TAPII and WAIL controls (not used in S-825 SERIES/control units), and the remote Voice Guard controls.

Table 1 - Jumper Configuration

JUMPER	POSITION OF PLUG	FUNCTION OR OPTION
J21	1&2 2&3	DEFAULT CHANNEL DOWN REMOTE
J22	1&2 2&3	DEFAULT HANDSET/HOOKSWITCH
J23	1&2 2&3	DEFAULT VOICE GUARD

A third register controls the radio frequency selection and downloading. This includes four of the five frequency bits, the radio reset function, and the radio store function.

The fourth register performs the mobile siren/light controls. Darlington drivers are used to interface to the siren/light relay controls. Also included as part of this register is the dual control unit select control The internal/external speaker relay control line is also generated.

The fifth register performs the DTMF and repeater enable controls.

Sampling of the input lines is performed through an analog multiplexer. Up to ten separate radio system inputs are multiplexed onto a single line to the processor board.

Squelch level setting is performed by an electrically erasable potentiometer. Volume setting for VOL ARM, ALERT TONE, PA-AUDIO, DTMF generation, T90/T99 signalling, and GESTAR signalling is performed by an electrically erasable potentiometer. An analog switch is used to route the different audio signals to the radio transmitter and the external siren/PA.

An audio amplifier is used to provide the audio drive to the siren/PA and the optional headset interface.

The horn relay control enable or disable the routing of the horn power to the horn relay.

A relay controls the power of the control unit by switching the continuous A+ power to the A+ switched power. This also provides power to the logic devices on the I/O board and the rest of the CONTROL UNIT through a 5 volt regulator.

JUMPER CONFIGURATION AND SETUP

Jumpers on the I/O board configure the control unit for the various options used. Table 1 contains the jumper configuration for the various options.

PROCESSOR BOARD MEMORY-MAPPED OUTPUT

The control unit processor board addressed the five registers on the I/O board through memory-mapped output accesses.

Six data lines are captured by the I/O board on a rising edge of the appropriate clock line to the registers. In addition, the I/O-RESET line is used to reset or initialize all of the five registers to an initialized state upon a power up or watchdog timer reset (from the processor board). The output of the initialized register is a logic low on all output lines.

The six data lines are I/O-DATA-0 through I/O-DATA-5. The individual clock lines to the registers are IO1C through IO5C.

Tables 2 through 5 depict the memory-mapped loading and control of the individual registers/control lines on the I/O board.

Table 2 - Register U2 I/O Definition

REGISTER	CLOCK LINE	INPUT LINES I/O DATA 210	OUTPUT LINES	INVERT
U2	IO1C_/	000	VOL CS	N
		001	AUDIOUD	N
		010	VOM	N
	DATA ISI/O DATA 3	011	GEV	N
		100	PAM	N
		101	PA KEY	Y
		110	RAD PTT	Y
		111	RX MUTE	Y

Table 3 - Register U3 I/O Definition

REGISTER	CLOCK LINE	INPUT LINES I/O DATA 210	OUTPUT LINES	INVERT
U3	IO2C_/	000	SQ DIS	Y
		001	CG DIS OUT	Y
		010	HORN DIS	N
	DATA ISI/O DATA 3	011	SIR PA PTT	Y
		100	TAP II	Y
		101	WAIL	Y
		110	GUARD SEL	Y
		111	CLEAR SEL	Y

Table 4 - Regitser U4 I/O Definition

REGISTER	CLOCK LINE	INPUT LINES I/O DATA 210	OUTPUT LINES	INVERT
U4	IO3C_/	000	DUAL CTR	Y
		001	SPKR RELAY	Y
		010	SIR LT 1	Y
	DATA ISI/O DATA 3	011	SIR LT 2	Y
		100	SIR LT 3	Y
		101	SIR LT 4	Y
		110	SIR LT 5	Y
		111	SIR LT 6	Y

Table 5 - Register U5 I/O Definition

REGISTER	CLOCK LINE	INPUT LINES	OUTPUT LINES	INVERT
U5	IO4C_/	I/O-DATA-0	DTMF0	N
		I/O-DATA-1	DTMF1	N
		I/O-DATA-2	DTMF2	N
		I/O-DATA-3	DTMF3	N
		I/O-DATA-4	DTMF4	N
		I/O-DATA-5	RPTR ENBL	N

Table 6 - Register U6 I/O Definition

REGISTER	CLOCK LINE	INPUT LINES	OUTPUT LINES	INVERT
U6	IO5C_/	I/O-DATA-0	FB-1	Y
		I/O-DATA-1	FB-2	Y
		I/O-DATA-2	FB-3	Y
		I/O-DATA-3	FB-4	Y
		I/O-DATA-4	RAD RESET	Y
		I/O-DATA-5	RAD STORE	Y

The control lines generated by registers U2 through U6 are described below. Note that all references are referred to the actual signal as it appears on the schematic and not necessarily that which is generated directly by the registers. A description of each control line and its active state are as follows:

VOLCS is used to select audio EEPOT U11 for possible audio level changes. This is the chip select line to the audio EEPOT. This line is active low.

SQCS is used to select squelch EEPOT U10 for possible squelch changes. This is the chip select line to the squelch EEPOT. This line is active low.

AUDIOUD is the audio and squelch up/down control line. The EEPOT level is incremented when this line is high and is decremented when this line is low.

GEV, **PAM**, and **VOM** controls the various audio paths. This includes audio to the radio speaker (internal or external), siren/PA speaker, motorcycle headset, radio alert tone, DTMF generator, T90/T99 signalling, and GESTAR signalling.

PAKEY control the routing of the alert tone to the radio speaker. This line is active low.

RADPTT controls the radio push to talk function. This line is active low.

RX MUTE control the muting of audio at the radio speaker. This line is active low.

SQ DIS disables the radio squelch function inside the radio. That is, the radio is opened. This line is active low.

CG DIS OUT disables the decoding of channel guard information by the radio. This line is active low.

HORN DIS disables the routing of the horn ring input to the horn ring return circuit. This line is active high.

SIR PA PTT activates the siren push to talk function and routes the PA AUDIO signal to the siren amplifier and speaker. This line is active low.

SEND is siren control to the serial Siren/Light/PA unit.

GUARD SEL and **CLEAR SEL** are the remote Voice Guard control lines which enable the guarded mode of radio communication or the clear modes of radio communication. These lines are active low.

DUAL CTR is a pulsed output from the control unit to the dual control unit assembly. This line is pulsed to enable all radio control to be generated from the desired control unit. This line is pulsed active low.

SPKR RELAY select the internal or the external speaker as the destination of the radio speaker audio. When this line is high, the internal speaker is selected. When low, the external speaker is selected.

SIREN 1 through **SIREN 6** and ON/OFF are the interface lines to the parallel siren/light/PA unit.

DTMF TONE is the scaled and summed output of 5 TTL digital lines. These 5 lines generate a 32 step DTMF tone or an alert tone to be routed to the radio speaker and/or the radio's microphone input for transmission.
RPTR ENBL is an option used to remotely enable or disable the vehicular repeater. This line is active high to enable the VRS unit.

FB1 through **FB4** are four of the five frequency bits used to lock the radio onto a designated channel.

RAD STORE is the radio store function used in the downloading of information from the control unit to the mobile radio. This line is active low to store radio information.

RAD RESET is the radio reset line used to reset the radio for an upcoming download of frequency and personality information. This line is active low to reset the radio.

SPARE is an unused output line.

Table 7 contains the selection of the radio system inputs to be muxed onto the single data line, AUD MUX.

Table 7 - Sampling Of Digital Inputs

REGISTER	AUD MUX	I/O DATA 3210	INVERT
U9	CG DIS IN	0000	N
	IGN A+	0001	Y
	PTT IN	0010	N
	GESTAR	0011	N
	CAS	0100	N
	RAD PTT	0101	Y
	RX MUTE	0110	N
	CTRL A-	0111	N
	CPTT	1110	Y
	CHDN	1101	Y

The control input lines received by the I/O board through analog mux U9 and associated circuitry are described below. Note that all references are referred to the actual input muxed on the AUX MUX line and not necessarily that which appears at the connectors. The description and state of the control input lines is as follows:

CG DIS IN is the hookswitch or monitor function generated the microphone hanger function. The microphone has the CG DIS IN function built as part of the assembly. The channel guard decode function is disabled when the mic is taken off hook, that is, when this line is a low.

IGN A+ is the ignition power sense. The ignition switch is off when this line is a low.

PTT IN is the microphone push to talk input. The mic PTT is held depressed when this line is a low.

GESTAR IN is the emergency GESTAR switch input. The emergency GESTAR footswitch is depressed when this line is a low.

RAD PTT BUF is the monitored version of the radio PTT line. This line is monitored to determine if the vehicular repeater is attempting to transmit through the radio. The VRS is attempting transmission when this line is a high. Also when the control unit is controlling radio transmission, this line will be read as a high.

RX MUTE BUF is the monitored receiver mute line to the radio. This line is monitored to determine if the Voice Guard unit is attempting to open the speaker audio path. The Voice Guard is attempting to enable radio audio when this line is a high. Also, when the control unit is controlling the radio audio opening, this line will be read as a high.

CTRL A - is the dual control unit select input. The specified control unit is enabled for radio control when this line is a low.

CPTT is the alternate push to talk input to the control unit. The alternate PTT input is active high.

CH DN is the remote select of the channel down function. This line is active high.

SQUELCH AND AUDIO LEVEL SETTING

The squelch and audio levels are adjusted electronically through two electrically erasable potentiometers (EEPOT's), U10 and U11, respectively. Each EEPOT provides a three line control to its internal resistance level setting. The three lines are AUDIO-U/D, AUDIO-INC, and SQ-CS (for the squelch level control EEPOT) or VOL-CS (for the audio level control EEPOT).

Each EEPOT is composed of a resistor array of 99 resistive elements. Between each element and at either end are tap points accessible to the wiper element.

The AUDIO-U/D input controls the direction of the wiper movement. The AUDIO-INC input is negative edge-triggered. Toggling AUDIO-INC moves the wiper and subsequently increments (if AUDIO-U/D is high) or decrements (if AUDIO-U/D is low) the wiper along the resistive element array. The appropriate device is selected when its select input (SQ-CS or VOL-CS) is low.

Although the EEPOT is capable of retaining the last value upon a power up, this nonvolatile feature of the EEPOT is not used in the control unit. The level setting of the EEPOT for squelch and all audio levels are retained in the EEPROM on the processor board.

SQUELCH EEPOT LEVEL SETTING

The squelch EEPOT wiper input is derived from the received radio audio (VOL/SQ-HI or SQ-HI if the Voice Guard option is used). VOL/SQ-HI is used if the Voice Guard option is not used and SQ-HI is used if the Voice Guard option is used.

Capacitor C24 provides a DC block from the received radio audio and the operating DC bias to the squelch EEPOT (U10). The negative analog input of the squelch EEPOT (U10-6) is the return ground lead for the incoming received radio audio (VOL/SQ-LO). The wiper arm output (SQ-ARM) of the squelch EEPOT (U10-5) is sent to the mobile radio (J2-1) where squelch circuitry provides the CAS generated signal to the rest of the radio and the control unit.

The squelch EEPOT's wiper arm is varied linearly from VOL/SQ-LO to VOL/SQ-HI (or SQ-HI) in 99 steps.

AUDIO EEPOT LEVEL SETTING

The audio EEPOT wiper input is derived from the analog multiplexer (U12A-14). The analog multiplexer switches the positive analog input to the audio EEPOT (U11) from the decoupled (DC blocked) received radio audio (VOL/SQ-HI) or from the generated signalling (DTMF-TONE).

One source of analog input to the audio EEPOT is DTMP-TONE which is switched through the analog mux U2A. DTMF-TONE is used to generate a feedback volume setting tone to the radio speaker or the actual generation of a DTMF digit. DTMF-TONE is sent to the audio EEPOT through the analog mux U12A to adjust the level of the beep tone heard in the radio speaker used to adjust the received radio volume for a comfortable listening level.

AC-TONE is used to couple the MIC-HI audio to the external siren/PA unit for the siren PA (public address) mode of operation. In this mode of operation, MIC-HI is AC coupled through capacitor C38 to the analog mux (U2B-15). Resistor R52 sets up a DC bias point to the analog mux input. The analog mux switches the A coupled MIC-HI signal over to AC-TONE.

DTMF-TONE is also used by the processor board to generate GESTAR signalling and T90/T99 signalling which also passes through the audio EEPOT for the purpose of adjusting modulation level.

Another source of analog input to the audio EEPOT is the received radio audio (VOL/SQ-HI) which is switched through the analog mux U12A. Capacitor C91 provides a DC block from the received radio audio and the operating DC bias to the audio EEPOT (U11) through the analog mux, J12A. The negative analog input of the audio EEPOT (U11-6) is the return ground lead for the incoming received radio audio (VOL/SQ-LO).

The wiper arm output is AC coupled (via capacitor C29) to the op-amp, U13B, which provides a unity gain buffer stage prior to going to the radio on VOL ARM. This same VOl ARM signal is sent to the analog mux U2C where it can pass to the external siren/PA for the external siren radio and external siren PA mode of operation. VOL ARM is also sent to transistor Q27 which is switched to ALERT TONE which forms the sidetone beeps and DTMF digits heard in the radio speaker.

The audio EEPOT's wiper arm is varied linearly from VOLSQ-LO to VOL/SQ-HI or AC-TONE (which is generated from DTMF-TONE or the mic audio) in 99 steps.

FAST SQUELCH ADJUSTMENT

Fast squelch adjustment pot R71 is used to provide an attenuated received radio audio to the processor board of the control unit for fast noise squelch detection.

Received radio audio that is sent to the positive analog input of the squelch EEPOT is AC coupled (via capacitor C25) and sent to the processor board through the variable pot R71.

The FAST-SQUELCH signal is an attenuated version of VOL/SQ-HI that is used by the processor to detect the presence of an RF carrier in PSLM applications.

The processor board uses a modified mobile radio CAS detector to provide a quick indication of noise squelch in the 6000 to 8000 Hz range.

Adjustment of variable potentiometer R71 producing FAST-SQUELCH is performed in conjunction with the processor board of the control unit.

AUDIO PATH SELECTION

The audio paths on the I/O board are selected and routed through the analog multiplexer U12 (sections A, B, and C). The previous description on the radio EEPOT level setting is applicable to the operation of the audio path selection through the analog mux U12.

Section U12A routes either the incoming radio received audio (VOL/SQ-HI) or the AC-TONE signal over to the input of the audio EEPOT U3.

VOL/SQ-HI is the radio received (demodulated incoming RF carrier) audio on the receiver frequency or channel.

The AC-TONE input can consist of either the processor board generated feedback tone or DTMF digits used in audible volume setting beeps or it can consist of the AC coupled MIC-HI audio used in the PA mode of operation (to the external speaker or to the siren PA) or it can consist of GESTAR or T90/T99 signalling to the radio transmitter.

The control line for the analog mux U12A is GEV which is generated from register U2. If GEV is a logic low then the AC-TONE signal is fed to the input of the audio EEPOT. If GEV is logic high then the AC coupled radio received signal is fed to the input of the audio EEPOT.

Section U12B enables the routing of the AC coupled MIC-HI audio onto the AC-TONE signal for PA operation (both external speaker and siren PA) or for generating the GESTAR or T90/T99 signalling to the transmitter of the radio.

The control line for the analog mux U12B is PAM which is generated from register U2. If PAM is a logic low then the AC coupled MIC-HI audio is sent onto the AC-TONE signal which is used for PA operation. If PAM is a logic high then the MIC-HI signal or GESTAR or T90/T99 signalling is routed to the radio transmitter.

Section U12C enables the received radio audio or the microphone audio to be sent to the external siren PA unit or the headset or GESTAR or T90/T99 signalling to be sent to the radio transmitter.

The control line for the analog mux U12C is VOM which is generated from register U2. If VOM is a logic low then the external siren PA and headset audio is derived from the received radio or the microphone. If VOM is a logic high then the external siren PA and headset audio is quiet and GESTAR routed to the radio transmitter.

The allowable audio paths, controls and descriptions are summarized in Table 8.

Table 8 - Audio Path Selection And Control

U2A CONTROL GESTAR/ VOL	U2B CONTROL PA/MIC	U2C CONTROL VOL/MIC	FUNCTION
1	1	0	MIC HI AUDIO TO RADIO TRANSMITTER
0	1	0	VOLUME BEEPS TO RADIO SPEAKER
0	1	1	GESTAR SIGNALLING TO RADIO TRANSMITTER
1	0	0	VOL/SQ HI AUDIO TO RADIO SPEAKER
0	0	0	EXTERNAL PA OR MIC HI AUDIO TO PA
1	1	0	EXTERNAL RADIO OR VOL/SQ HI AUDIO TO PA
1	0	1	STANDBY MODE NO SIGNAL RX NO SIGNAL TX

RADIO CONTROL AND INTERFACE

The I/O board provides the control and interface to the mobile radio. The mobile radio system control functions are derived from registers U2, U3, U4, and U6. The mobile radio system outputs are sampled through the analog multiplexer U9. The mobile radio audio interface is accomplished through the received radio audio and the microphone audio. In addition, several signals are inputted/outputted directly from the processor board with the I/O board serving as a buffer.

All of the radio control and interface functions are classified according to radio receive output control, radio receive input control, radio transmit output control, and radio frequency selection and downloading.

The microphone, although not part of the mobile radio, provides inputs to the control unit to perform the radio control and interface.

RADIO RECEIVE INPUT CONTROL

Radio receive input controls consist of those input lines to the control unit that initiate the receiver functions of the mobile radio to operate.

The radio receive inputs include CG-DIS-IN, CAS, VOL/SQ-HI (VOL-HI and SQ-HI). A description of the inputs and their active state are as follows:

CG-DIS-IN is derived from the microphone (J4-6). This signal is also referred to as the hookswitch or monitor switch. When active low, this signal will disable the decoding of channel guard that is used to enable reception of incoming message transmissions. When inactive, the incoming transmissions are sent to the radio speaker if the decoded channel guard is valid.

CAS is a radio generated signal that indicates the presence of an RF carrier on the mobile receive frequency. When active low, this signal will disable the incoming transmissions to be sent to the radio speaker. When inactive, the incoming radio transmissions are enabled to be sent to the radio speaker. The processor board uses this signal as an input to determine whether to open the radio speaker for incoming audio. The processor board also contains a fast squelch detector, similar to the CAS detector used in the mobile radio, to provide a quick indication of RF carrier in PSLM applications.

VOL/SQ-HI (VOL-HI and SQ-HI) is the radio received audio. This is the unfiltered (no de-emphasis filtering applied) demodulated RF received signal containing only voice or channel noise. VOL/SQ-HI (or SQ-HI) is input to the squelch EEPOT U10 for a variable squelch setting to the radio and to the analog mux U12A (via VOL-HI) used in the audio path selection of the I/O board. VOL/SQ-HI is also attenuated by pot R71 and sent to the processor board (via SQ-HI) for input to the fast squelch detector used in PSLM (scan) applications.

RADIO RECEIVE OUTPUT CONTROL

Radio receive output controls consist of those output lines from the control unit that initiate the receiver functions of the mobile radio to operate.

The radio receive outputs include VOL-ARM, SQ-ARM, CG-DIS-OUT, SQ-DIS, and RX-MUTE

VOL-ARM is the audio to be sent to the radio speaker. This signal is generated from the audio path selection on the I/O board. For radio functions, this audio consists of either the demodulated VOL/SQ-HI radio received audio or DTMF-TONE (feedback volume beeps), both of which are attenuated through the EEPOT U11.

SQ-ARM is the an attenuated version of VOL/SQ-HI (or SQ-HI) that is sent to the mobile radio to be used as the input to the noise squelch detector that generates the radio's CAS signal. SQ-ARM provides a variable radio squelch setting from the control unit.

CG-DIS-OUT is an open collector output from the I/O board to the mobile radio. This active low output is used by the mobile radio to disable the decoding of channel guard during incoming radio reception.

SQ-DIS is an open collector output from the I/O board to the mobile radio. This active low output is used by the mobile radio to disable the noise squelch function.

RX-MUTE is an open collector output from the I/O board to the mobile radio. This active low output is used by the mobile radio to mute the audio on VOL-ARM or on ALERT-TONE.

RADIO TRANSMIT INPUT CONTROL

Radio transmit input controls consist of those input lines to the control unit that initiate the transmitter functions of the mobile radio to operate.

The radio transmit inputs include C-PTT, S-PTT, MIC-HI, and GESTAR.

C-PTT is an active low push to talk input to the I/O board from the microphone to initiate transmission on an optional frequency. This is not a standard function on the control unit.

S-PTT is an active low push to talk input to the I/O board from the microphone to initiate transmission on the programmed channel frequency.

MIC-HI is the analog audio from the microphone. This audio line is normally terminated via a 600 pull up to 9 volts inside the radio. MIC-HI is also used in the audio path selection of the I/O board to inject GESTAR signalling prior to voice transmission as well as routed to the external siren/PA unit for the external PA mode of operation.

GESTAR is an active low input to the I/O board from an external switch. This input provides an emergency GESTAR signalling to be transmitted from the mobile radio.

RADIO TRANSMIT OUTPUT CONTROL

Radio transmit output controls consist of those output lines from the control unit that initiate the transmitter functions of the mobile radio to operate.

The radio transmit outputs include MIC-HI and RAD-PTT (input and output).

MIC-HI is the analog audio from the microphone. This audio line is terminated via a 600 pull up to 9 volts inside the radio. MIC-HI is also used in the audio path selection of the I/O board to inject GESTAR signalling prior to voice transmission as well as routed to the external siren/PA unit for the external PA mode of operation.

RAD-PTT is an open collector output from the I/O board to the mobile radio. This active low output is used by the mobile radio to initiate an RF transmission on the given radio frequency channel. The RAD-PTT line is also an input to enable detection of radio transmission from a vehicular repeater.

RADIO FREQUENCY SELECTION AND DOWNLOAD

The mobile radio frequency selection and download controls consist of those lines that select the radio channel frequency and perform the download of radio information to the mobile radio.

Signals that perform the radio channel frequency selection include FB-1, FB-2, FB-3, FB-4, FB-5, and ADV-CHANGE.

The frequency channel is selected by the TTL compatible data lines consisting of FB-1, FB-2, FB-3, FB-4, FB-5, and ADV-CHANGE. Four of the five frequency select lines (FB-1 through FB-4) are generated from register U6 on the I/O board. FB5 is generated by the processor board and is buffered by the I/O board to be sent to the mobile radio. ADV-CHANGE is generated by the processor board and is buffered by the I/O board to be sent to the mobile radio.

FB-1 through FB-5 are active low outputs that select the radio channel frequency. ADV-CHANGE is an active high output that interrupts the mobile radio controller for a quick radio frequency change.

The signals that perform the radio frequency download include FB-5, ADV-CHANGE, CG-DIS-OUT, RESET, and STORE.

CG-DIS-OUT provides the latch control function of the serial download. FB-5 provides the bidirectional serial data. ADV-CHANGE provides the serial clock. STORE provides the radio EEPROM store signal. RESET provides the initialization of the radio prior to and after each download.

REPEATER CONTROL AND INTERFACE

The I/O board provides the optional control and interface to the vehicular repeater system (VRS). Inputs from the vehicular repeater to the I/O board includes RAD-PTT and MIC-HI. Outputs to the vehicular repeater from the I/O board include RPTR-ENBL and VOL-SQ-HI.

RPTR-ENBL is an optional active low output to the VRS unit to enable the vehicular repeater unit to function as part of the mobile radio system.

VOL/SQ-HI is the radio received audio that is also routed to the VRS unit for transmission.

MIC-HI is the microphone audio that is also routed from the VRs unit to the receiver.

SIREN/LIGHT CONTROL AND INTERFACE

The S-825 Series control unit provides up to 9 siren/light control signals. Each of the siren/light functions are turned on and off via the serial link. There is a separate on/off control, audio path, ignition control, and horn ring input. There are also five parallel outputs that are PC programmable.

SEND (J5-17): The RS-232C (ASCII like) signal is an open collector Darlington. The data rate is 1200 BAUD.

SIREN/LIGHT ON/OFF CONTROL (J5-15): The ON/OFF command from the control unit to the SIREN/LIGHT unit is an open collector output. To turn the SIREN/LIGHT unit on, this signal will go low. When the SIREN/LIGHT unit is off, this signal will float.

A- (J5-20): Digital ground (shield) provides the return path for all the control signals listed above.

PA AUDIO HI (J5-21): Audio Hi is the active Public Address or External Radio audio path.

PA AUDIO LO (J5-22): Audio Lo is the ground return (shield) for PA Audio Hi.

IGN A+ (J1-16): If the PC Programmer option IGN A+ REQUIRED is NO, then the siren will operate whenever the control unit is turned on. If the option is YES, then the IGN A+ must be present (car ignition turned on) before the unit will operate.

NOTE

When the S-825 unit is turned off or power is removed, all active SIREN/LIGHT functions are reset to OFF.

HORN RING (J5-25): The Horn ring provides an (A+ or A- active) input to the control unit for sensing when the horn ring is active.

LT1 - LT5: There are five parallel darlington output drivers that will operate in conjunction with the serial messages to the siren/light option. These are mirror functions of the vendor light programming of lights 5 through 9. For example, if the S-825 key SL1 is programmed to active the light relay 5, then the S-825 parallel output LT1 will activate also.

VENDOR LIGHT OUTPUT	S-825 PARALLEL OUTPUT
5	LT1 (J5-10)
6	LT2 (J5-11)
7	LT3 (J5-12)
8	LT4 (J5-13)
9	LT5 (J5-14)

OPTIONAL HEADSET AUDIO AMPLIFIER

The PA and headset audio amplifier consists of U14 and associated circuitry.

Audio amplifier U14 drives the audio derived from the audio path selection to the siren/PA unit and to the headset. The audio selected to be routed to the siren/PA unit is the received radio audio (in external radio mode of operation) or the microphone (in the external PA mode of operation).

The audio amplifier U14 is capable of driving the 16-ohm impedance of the optional headset interface as well as providing power (voltage) gain to both the headset and siren/PA unit.

Resistor R49 and Capacitor C33 provide a 6 dB-per-octave de-emphasis filter for the radio received audio on VOL/SQ-HI.

Capacitor C35 provides the power supply ripple filtering for the audio amplifier. The audio amplifier U13 is powered from A+SW. Capacitor C35 serves to eliminate the alternator whine and ignition noise on the battery leads of the vehicle or motorcycle. R51 and C37 provide high frequency stability.

5 VOLT REGULATOR AND RESET

The 5 volt regulator circuit on the I/O board consists of U1, C21, and C22.

U1 is a +5 volt regulator with an external reset output. The reset output is an open collector active low signal that is used to initialize four of the five registers on the I/O board as well as the processor board at a power up and power down condition. Capacitor C21 provides the delay time for the rest pulse generated by U1.

On a power down condition, the reset output pulse from U1 is generated when the output voltage (5 volts nominal) drops to about 4.75 volts.

At a power up condition, the reset output I/O-RESET is held low until the output voltage reaches a nominal 5 volts. At that point, the reset output is held low until a specified delay time has expired.

The regulator reset pulse I/O-RESET is or-tied with the watchdog timer reset pulse generated from the processor board and also to CU-RESET used in the serial download programming of the control unit personality information contained in the EEPROM on the processor board.

POWER RELAY

Relay K1 is used to switch the continuous A+ battery power to the switched power supply A+SW.

Switched power, A+SW, supplies input power to devices on all three boards of the control unit either directly or through the +5 volt regulator U1.

When the control unit is powered down, the A+ power supply drain in the control unit is on the processor board through its relay control flip flop.

The processor board relay control flip flop generates RELAY-CTRL which is a low (approximately 0 volts) or a high (approximately 10 volts) level.

RELAY-CTRL is the input to a darlington driver. The output of the darlington driver (RLY), is sent to the relay coil K1-16.

When RELAY-CTRL is high, RLY is low and pulls current through the relay coil. The relay contacts close and routes A+ power to the A+SW line.

When RELAY-CTRL is low, RLY is high and floats the relay coil high to A+. The relay contacts open and disconnects the A+ continuous power from the switched power A+SW.

INTERNAL/EXTERNAL SPEAKER CONTROL

The routing of audio to the internal or external speaker is performed by relay K2. The control line for the internal or external speaker is SDPKR-RELAY.

When the control line is low, the radio speaker 1 line is routed to the earpiece speaker 1 and the internal speaker 1 (via jumper J22).

When the control line is high, the radio speaker 1 line is routed to the external speaker 1 line.

POWER DISTRIBUTION

The power supply used by the I/O board of the control unit includes A+. The power supply, IGN-A+, is sensed by the control unit to enable units to be powered on or activated.

The power supplies generated by the I/O board include A+SW and +5v.

The A+ power is the continuous battery power. Sometimes, this power input is passed through the ignition switch of the vehicle or motorcycle. This power supply normally goes to the relay K1.A+ is used as the voltage to the darlington drivers U7 and U8 for their internal diode protection. A+ power is input to the relay control flip flop on the processor used to turn energize the coil of the relay K1 through the darlington driver.

A+SW power is the switched A+ power which enables the control unit to be turned on and off. The A+SW power is generated from the A+ power through the relay K1. The A+SW power us used to power the audio amplifier U14 on the I/O board, generate the +5 volt power through regulator U1, power the LEd's on the keypad board, and power the EL driver on the processor board.

The +5V power is generated from the A+SW power through the 5 volt regulator U1. This power supply is the 5 volt logic power to devices on the I/O board, the processor board, and the keypad board of the control unit and provides a stable reference voltage for the LCD temperature compensation circuit and the photodetector circuit on the keypad board as well as the fast squelch operational amplifier on the processor board.

The ground used on the I/O board are GND (logic ground), VOL/SQ-LO (radio received audio ground), and MIC-LO (microphone audio ground). Figure 1 shows the power distribution on the I/O board.

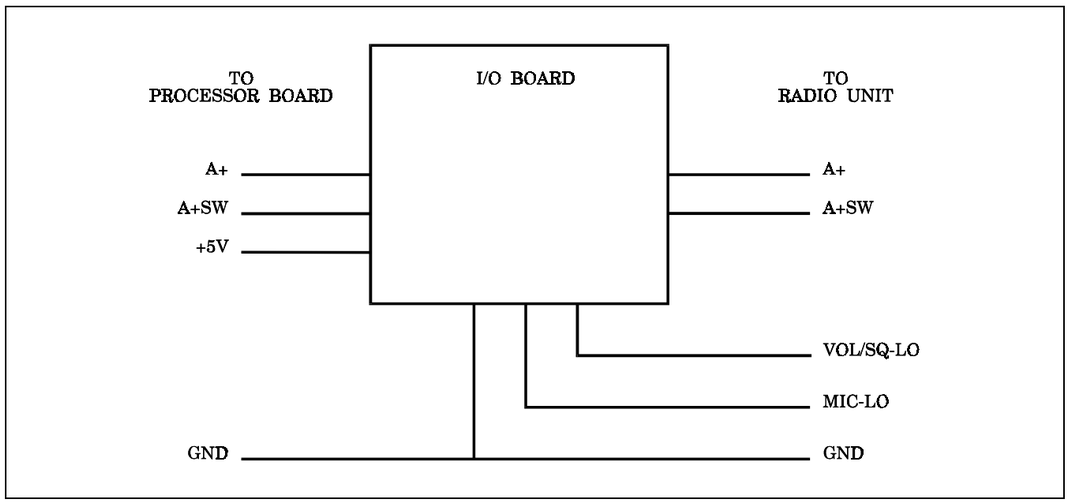


Figure 1 - I/O Board Power Distribution

RF BYPASS CAPACITORS

The I/O board is interfaced to the processor board of the control unit, to the mobile radio, to the power system of the vehicle or motorcycle, to the vehicular repeater system, to the microphone, and to the siren/PA unit. Therefore, RF bypass capacitors are provided to filter the fast switching digital signals and to prevent radio frequency noise bursts from corrupting the digital signals.

The sensitive signals that are bypassed include those on the connectors that the I/O board interfaces with.

I/O SIGNAL LINE PROTECTION

The I/O board employs diode protection on input and output lines in order to prevent excessive noise voltage spikes from causing damage to the control unit components from the environment.

The sensitive signals that are diode protected are those on the J1, J2, J3, J4, and J5 connectors interface the I/O board with the radio system units outside of the control unit.

TROUBLESHOOTING

A functional test procedure for the I/O board consists of exercising the board using a "dumb" terminal and the MONITOR test software. The MONITOR software is part of the operational code.

Instructions for the MONITOR tests and power continuity checks are contained in Combination Manual LBI-38244. Complete instructions for the MONITOR checks and test commands are contained in the Maintenance Manual for the S-800 Automatic Tester.

INPUT/OUTPUT BOARD
19D902231G1
ISSUE 5

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - -
C2 thru C4	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C6	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C10 and C11	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C13	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C21	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW.
C22	19A705205P3	Tantalum: 2.2 µF ±20%, 10 VDCW; sim to Sprague 293D.
C23	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW.
C24	19A705205P3	Tantalum: 2.2 µF ±20%, 10 VDCW; sim to Sprague 293D.
C25	19A702052P6	Ceramic: 1500 pF ±10%, 50 VDCW.
C27 thru C30	19A705205P3	Tantalum: 2.2 µF ±20%, 10 VDCW; sim to Sprague 293D.
C31	19A702052P22	Ceramic: 0.047 µF ±10%, 50 VDCW.
C32	19A705205P3	Tantalum: 2.2 µF± 20%, 10 VDCW; sim to Sprague 293D
C33	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW.
C34	19A705205P3	Tantalum: 2.2 µF± 20%, 10 VDCW; sim to Sprague 293D.
C35 and C36	19A704879P2	Electrolytic: 47 µF± 20%, 16 VDCW.
C37	19A702052P22	Ceramic: 0.047 µF ±10%, 50 VDCW.
C38 thru C40	19A705205P3	Tantalum: 2.2 µF± 20%, 10 VDCW; sim to Sprague 293D
C41	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C42	19A704879P2	Electrolytic: 47 µF ±20%, 16 VDCW.
C66	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C68	19A702052P3	Ceramic: 470 pF±10%, 50 VDCW.
C71	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C72	19A702061P65	Ceramic: 150 pF 10%, 50 VDCW.
C73	19A700121P2	Ceramic, High Dielectric: 0.01 µF ±20%, 50 VDCW.
C74 and C75	19A702052P14	Ceramic: 0.01 µF ±10%, 50 VDCW.
C91	19A705205P3	Tantalum: 2.2 µF ±20%, 10 VDCW; sim to Sprague 293D
C92	19A702052P26	Ceramic: 0.1 µF ±10%, 50 VDCW.
C102	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C105	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C107 and C108	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C110 thru C113	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C115 and C116	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C119	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C201	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C203 thru C206	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C208 thru C214	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C216 thru C218	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C301 and C302	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C304	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C309 and C310	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C312 thru C319	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C401 thru C407	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C501 thru C504	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C506	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C508	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C511 and C512	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C514 thru C519	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C521	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C524 thru C526	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
		- - - - - - - - - DIODES - - - - - - - - -
D101	19A703588P3	Zener, transient suppressor: sim to 1N6268A.
D102 and D103	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
D108	19A700053P2	Silicon: 2 diodes in series; sim to BAV99.
D110	19A700053P2	Silicon: 2 diodes in series; sim to BAV99.
D210	19A700053P2	Silicon: 2 diodes in series; sim to BAV99.
D312	19A700053P2	Silicon: 2 diodes in series; sim to BAV99.
D402	19A700053P2	Silicon: 2 diodes in series; sim to BAV99.
		- - - - - - - - - - JACKS - - - - - - - - - -
J1 thru J3	19A701785P2	Contact, electrical; sim to Molex -08-50-0404.
J4	19B209727P35	Connector, plug: 9 pin receptacle; sim to AMP 205734-1 w/contact AMP 5-66504-9.
J5	19A703248P11	Post: Gold Plated, 10 mm length.
J6	19A702333P55	Connector header; sim to Dupont 79257-126.
J21 thru J23	19A703248P11	Post: Gold Plated, 10 mm length.
		- - - - - - - - - - RELAYS - - - - - - - - -
K1 and K2	19B235003P1	Relay: sim to AROMAT DS2E-N-12V.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P21 thru P23	19A702104P3	Connector: two position shorting; sim to Dupont 68786-202.
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1 thru Q26	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q27	19A700059P2	Silicon, NPN: sim to MMBT3906.
Q28 and Q29	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q30	19A700059P2	Silicon, NPN: sim to MMBT3906.
Q31	19A702504P2	Silicon, NPN: sim to 2N4403.
Q32	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 thru R12	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R13	19B800607P102	Metal film: 1K ohms ±5%, 1/8 w.
R14	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R15 and R16	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R17	19B800607P102	Metal film: 1K ohms ±5%, 1/8 w.
R18 and R19	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R20	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R21	19B800607P102	Metal film: 1K ohms ±5%, 1/8 w.
R22	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R23	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R24	19B800607P472	Metal film: 4 7K ohms ±5%, 1/8 w.
R25 thru R32	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R33	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R34 and R35	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R36 thru R39	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R40	19B800607P152	Metal film: 1.5K ohms ±5%, 1/8 w.
R42	19B800607P224	Metal film: 220K ohms ±5%, 1/8 w.
R43 and R44	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R45	19B800607P272	Metal film: 2.7K ohms ±5%, 1/8 w.
R46	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R47 thru R48	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R49	19B800607P393	Metal film: 39K ohms ±5%, 1/8 w.
R50	19B800607P472	Metal film: 4.7K ohms ±5%, 1/8 w.
R51	19B800607P100	Metal film: 10 ohms ±5%, 1/8 w.
R52	19B800607P224	Metal film: 220K ohms ±5%, 1/8 w.
R53	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R54	19B800607P224	Metal film: 220K ohms ±5%, 1/8 w.
R55	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R56 and R57	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R58	19B800607P224	Metal film: 220K ohms ±5%, 1/8 w.
R59	19B800607P223	Metal film: 22K ohms ±5%, 1/8 w.
R60	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R61	19B800607P102	Metal film: 1K ohms ±5%, 1/8 w.
R62 thru R67	19B800607P104	Metal film: 100K ohms ±5%, 1/8 w.
R68	19B800607P100	Metal film: 10 ohms ±5%, 1/8 w.
R71	19A700016P4	Variable, cermet: 10K ohms ±10%, 1/2 w; sim to Bourns 3329H-1-103.
R81	19A702931P458	Metal film: 382K ohms ±1%, 200 VDCW, 1/8 w.
R82	19A702931P430	Metal film: 200K ohms ±1%, 200 VDCW, 1/8 w.
R83	19A702931P401	Metal film: 100K ohms ±1%, 200 VDCW, 1/8 w.
R84	19A702931P368	Metal film: 49 9K ohms ±1%, 200 VDCW, 1/8 w.
R85	19A702931P339	Metal film: 24 9K ohms ±1%, 200 VDCW, 1/8 w.
R86	3R151P224J	Composition: 220K ohms ±5%, 1/8 w.
R95	H212CRP322D	Carbon film: 22K ohms ±5%, 1/4 w.
R97	19B800607P393	Metal film: 39K ohms ±5%, 1/8 w.
R98	19B800607P224	Composition: 220K ohms ±5%, 1/8 w.
R99	19B800607P562	Composition: 5.6K ohms ±5%, 1/8 w.
		- - - - - - - INTEGRATED CIRCUITS - - - - - -
U1	19A704970P1	Linear: 5 volt Regulator with Reset Output; sim to SGS L387.
U2 thru U4	19A703471P9	Digital: CMOS 8 Bit Latch / 1 of 8 Decoder; sim to 74HC259.
U5 and U6	19A704380P9	Digital: CMOS Hex Data Flip-Flop; sim to 74HC174.
U7 and U8	19A134693P1	Interface: 7 Darlington Transistor Arrays; sim to ULN-2003A.
U9	19A700029P36	Digital: CMOS Single 8-Channel Multiplexer; sim to 4051B.
U10 and U11	19A705180P2	CMOS Digitally Controlled Potentiometer: 40 - 10K ohms; sim to X9103P.
U12	RYTUA30101/1	Digital: CMOS Triple 2-Channel Multiplexer.
U13	19A701789P2	Linear: Dual Op Amp; sim to LM358.
U14	19A705647P1	Linear: Low Voltage Audio Power Amplifier; sim to National LM386N-4.
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	N404P11B6	Lockwasher: Internal: No. 4.
	N80P9006B6	Screw, Machine: Pan Head: 4-40 x 3/8.
	7141225P2	Nut, Hex: 4-40.
	19B234894P1	Plate.
	19A143578P67	Spacer, threaded, metallic.
	19B801644P1	Cap, Protector.

*COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter" which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for the descriptions of parts attached by these revisions.

REV. A - INPUT/OUTPUT BOARD 19D902231G1
To correct the Siren/Light interface current drain and to add a negative horn ring input, diodes D102 and D103 were added. Modified integrated circuits U7 and U8 by removing the IC leg at pin 9, disconnecting the IC from A+.

REV. B - INPUT/OUTPUT BOARD 19D902231G1
To eliminate low level receiver noise and to enable any tone encode (DTMF, GESTAR, CG or T90/T99) to begin transmitting with full deviation, resistor R86 and capacitor C71 were added.

REV. C - INPUT/OUTPUT BOARD 19D902231G1
To prevent a false receive CG decode, the TX audio VOL/HI noise was reduced by adding resistor R99 between U12-13 and C24.

REV. D - INPUT/OUTPUT BOARD 19D902231G1
This revision includes the following changes:

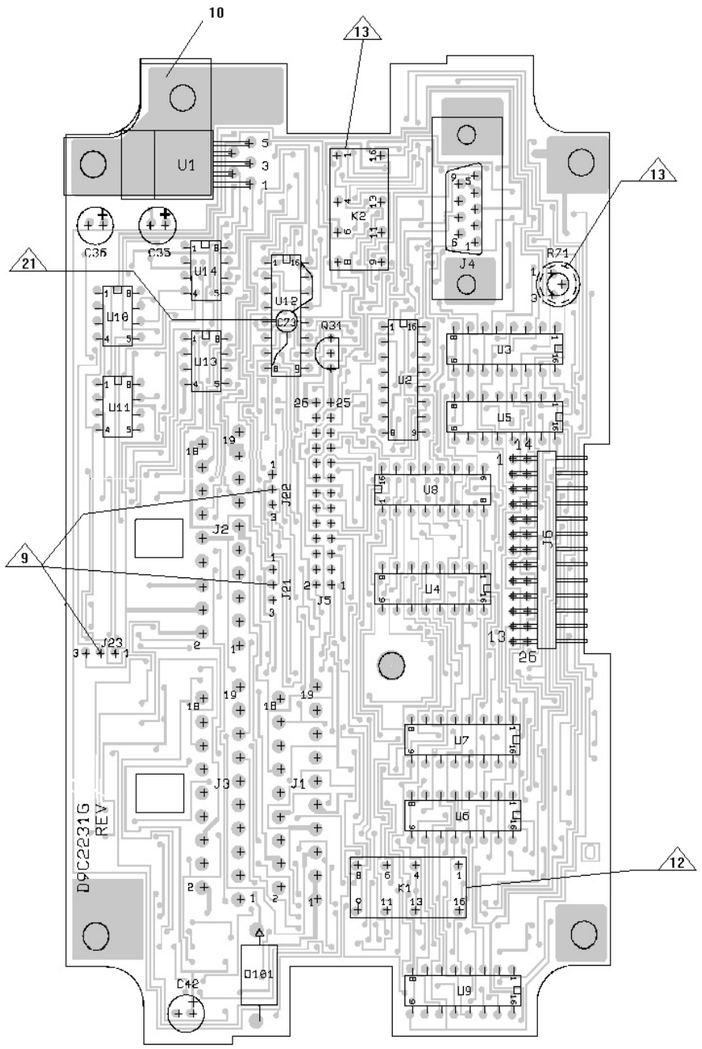
1. To prevent falsing of Squelch and volume EEPOTS U10 and U11, capacitor C74 was added between U10-6 and U10-7 and C75 between U11-6 and U11-7.
2. To correct External Speaker audio distortion, capacitor C31 and resistor R49 were changed.

   C31 was 19A702052P26 - Ceramic: 0.1 µF.
   R49 was 19B800607P103 - Metal film: 10K ohms.
3. To enhance Dual Control applications, capacitor C72 was added between U13-6 and U13-7 (on solder side) and C73 was added between U12-8 and U12-16 (on component side). Resistor R98 was added between Q27 collector and emitter (on solder side). PW run between C92 and J2-3 was cut and resistor R97 was added between C92 and J2-3 (on solder side).
4. To improve operation with Microcomputer Board 19D902865, resistor R68 was changed.

   R68 was - 19B800607P101: Metal film. 100 ohms.

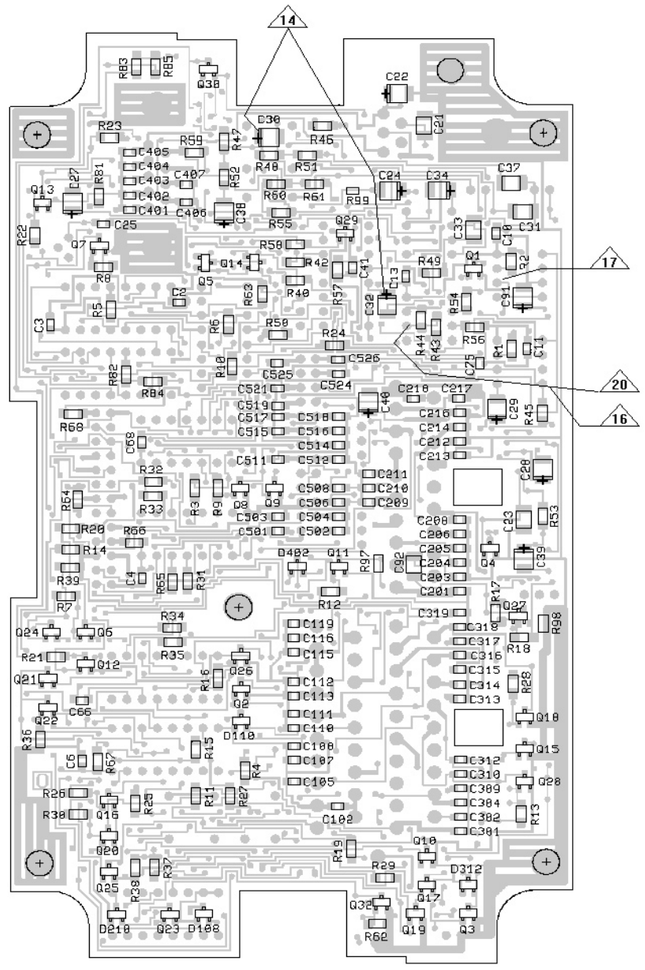
REV. D - INPUT/OUTPUT BOARD 19D902231G1
To correct sensing of the hookswitch, a pull-up resistor R95 added, 22k ohms (H212CRP322D).

COMPONENT SIDE



(19D902231, Sh. 1, Rev. 6)

SOLDER SIDE



VIEW FROM BACKSIDE

(19D902231, Sh. 1, Rev. 6)

NOTES:

5. THE FOLLOWING DEVICES ARE MOS DEVICES REQUIRING SPECIAL CARE PER 19A701294: U2, U3, U4, U5, U6, U9, U10, U11, & U12.

9

JUMPER CHART		
JUMPER	POSITION	DESCRIPTION
J21	1 & 2	DEFAULT
	2 & 3	REMOVE OPTION
J22	1 & 2	DEFAULT
	2 & 3	HANDSET/HOOKSWITCH OPTION
J23	1 & 2	DEFAULT
	2 & 3	VOICE GUARD OPTION

10 INSTALL PROTECTOR CAP OVER R71 WITH BEVEL FACE UP. PRESS FLUSH.

11 ADD R95 ON THE SOLDER SIDE OF PWB FROM U9-13 TO U9-16.

12 ADD D102 ON SOLDER SIDE OF PWB FROM K1-1 (CATHODE) TO K1-16 (ANODE).

13 ADD D103 ON SOLDER SIDE OF PWB FROM K2-1 (CATHODE) TO K2-16 (ANODE).

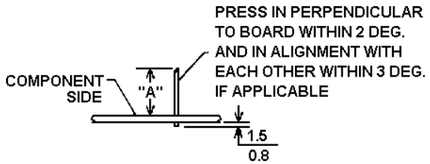
14 ADD R86 (SLEEVED) ON SOLDER SIDE OF PWB FROM + SIDE OF C30 TO + SIDE OF C32.

16 ADD C71 ON SOLDER SIDE OF PWB FROM U13-5 TO U13-6.

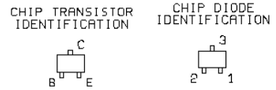
17 ADD C74 ON SOLDER SIDE OF PWB FROM U10-6 TO U10-7.

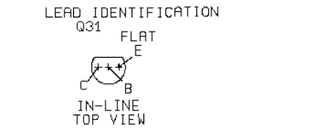
20 ADD C72 ON SOLDER SIDE OF PWB FROM U13-6 TO U13-7.

21 ADD C73 ON SOLDER SIDE OF PWB FROM U12-8 TO U12-16 (AS SHOWN).



MOUNTING FOR
J1, J2, J3, J5, J21, J22 & J23
A = 12.7 FOR J1, J2 & J3
A = 6.7 FOR J5, J21, J22, & J23

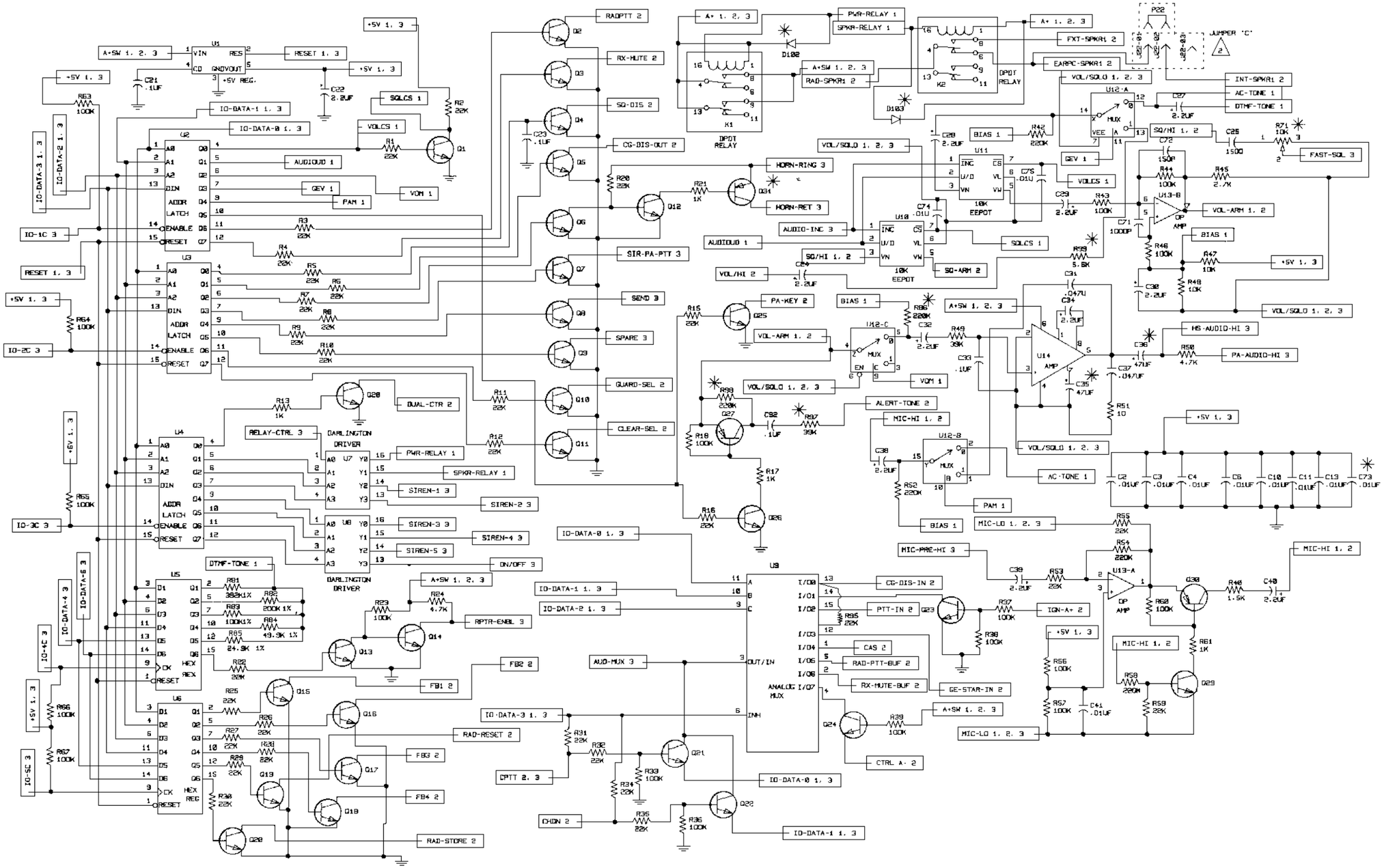




NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION

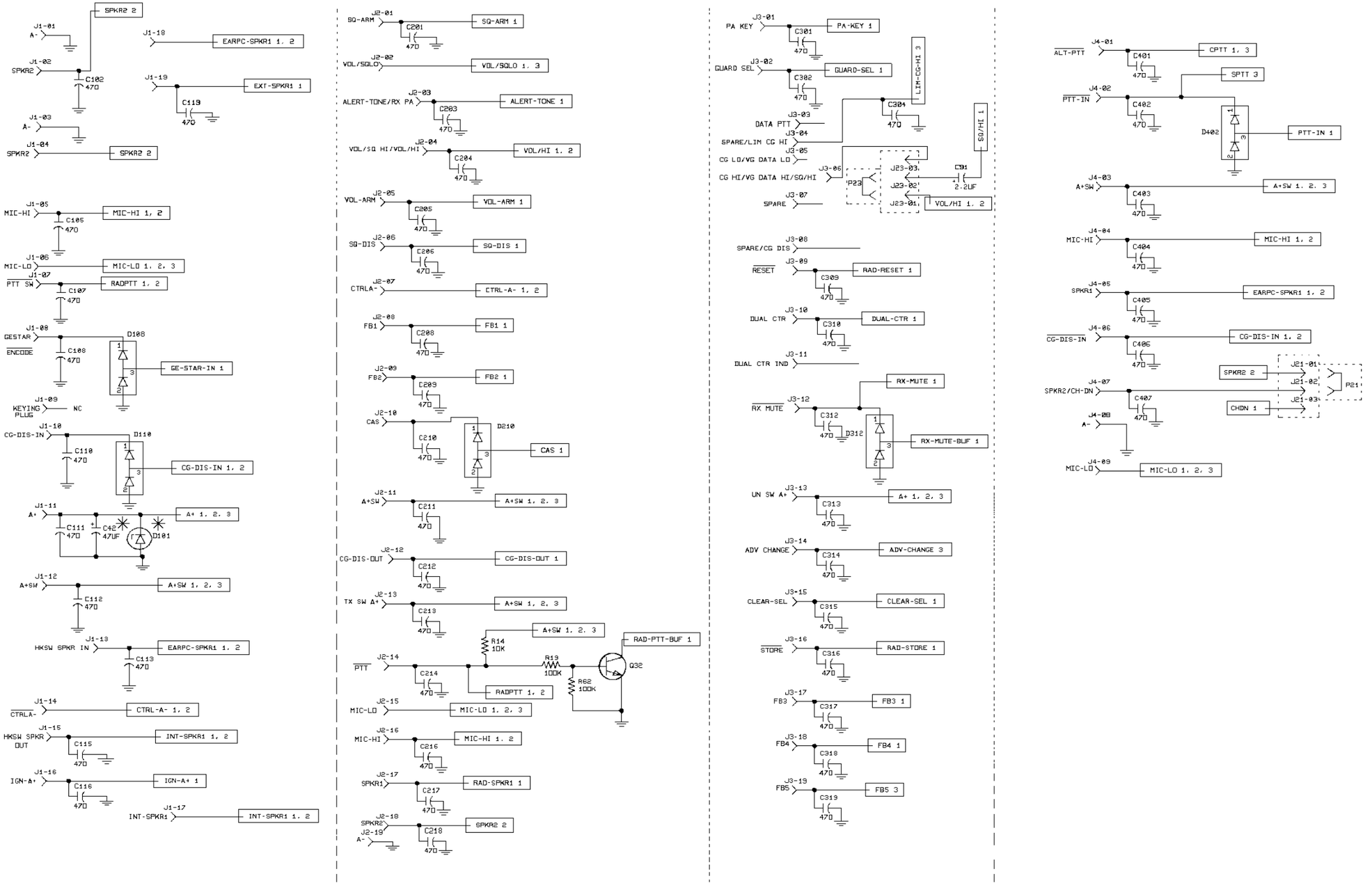
CAUTION
OBSERVE PRECAUTIONS FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES

I/O BOARD
19D902231G1



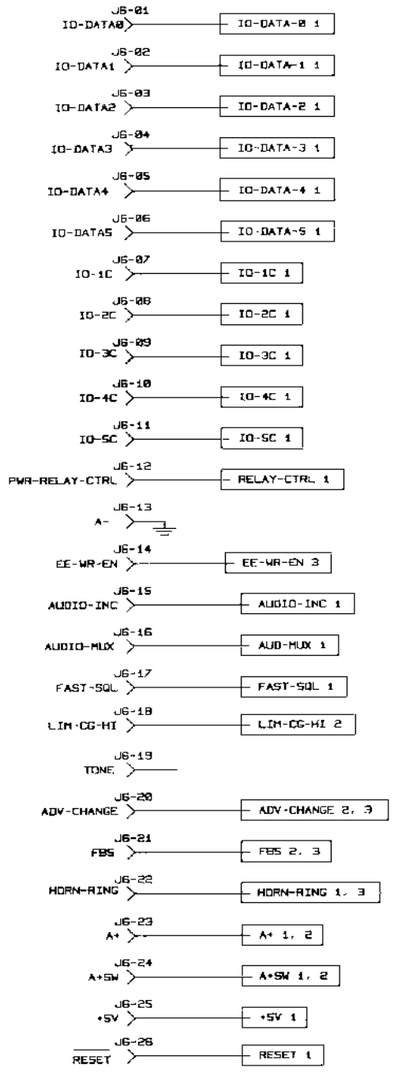
I/O BOARD
19D902231G1

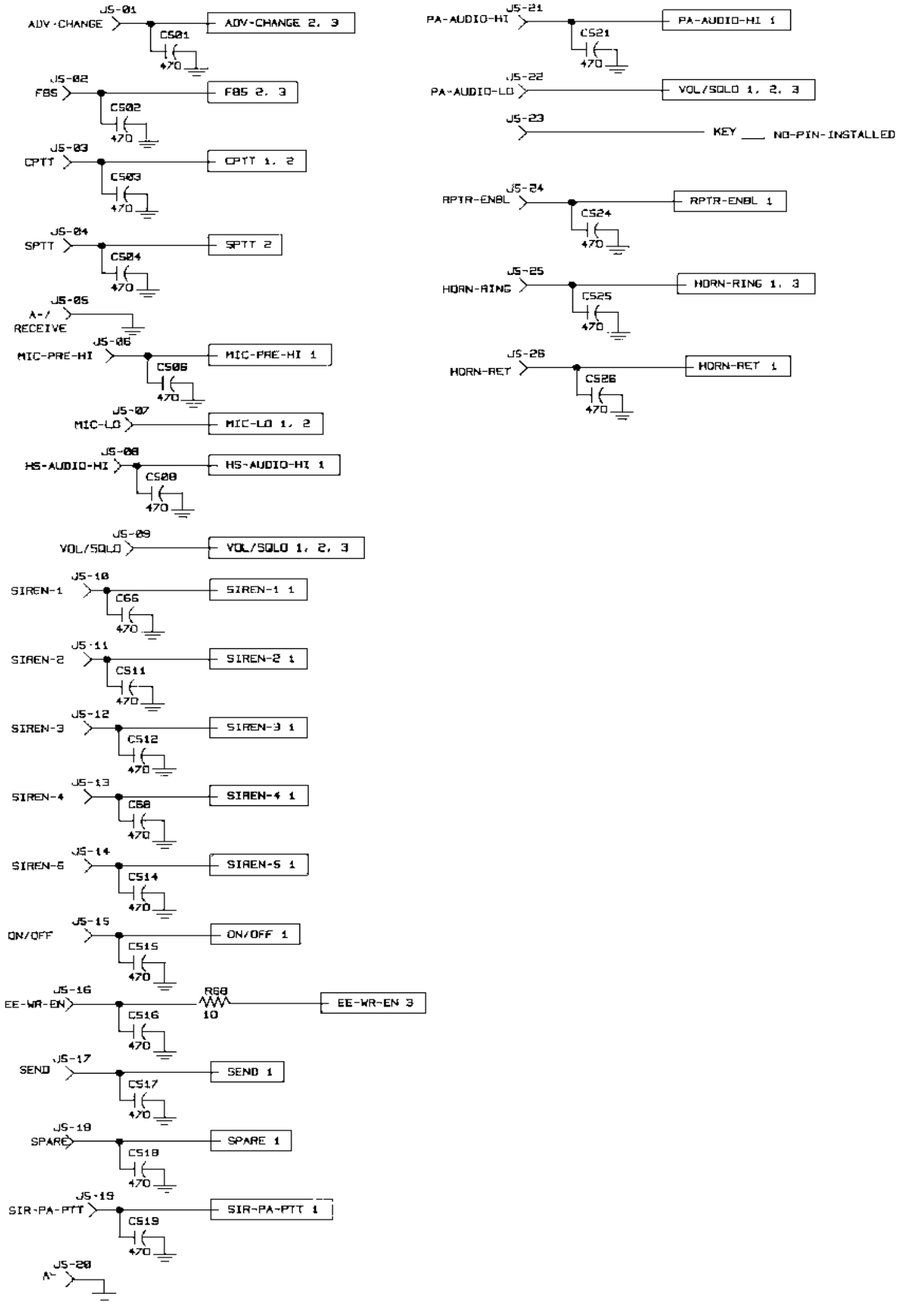
(19D438581, Sh. 1, Rev. 5)



I/O BOARD
19D902231G1

(19D438581, Sh. 2, Rev. 2)





POWER AND GROUND CONNECTIONS CHART					
DEVICE	+5V PIN	GND	A+ SW PIN	A+ PIN	VOL/SQLO PIN
U2	16	8			
U3	16	8			
U4	16	8			
U5	16	8			
U6	16	8			
U7		8			
U8		8			
U9	16	7,8			
U10	8				4
U11	8				4
U12	16				7, 8
U13	8				4

NOTE: C2,C3,C4,C5,C6,C10,C11,C13 ACROSS POWER&GROUND OF U2,U3,U4,U5,U6,U10,U11&U13 RESPECTIVELY

C101-C111 NEAR J1
C201-C219 NFAR J2
C301-C319 NEAR J3
C401-C407 NEAR J4
C501-C518 NEAR J5
C701-C712 NEAR J7
C801-C804 NEAR J8

ALL RESISTORS ARE 1/8 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY MULTIPLIER K OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER U, N OR P
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER M OR U

ALL RESISTORS, CAPACITORS, TRANSISTORS, DIODES ARE CHIPS UNLESS FOLLOWED BY ✳

1. MHOVE P21 T0J21 PINS 2&3 FOR REMOTE CHANNEL SELECT OPTION.

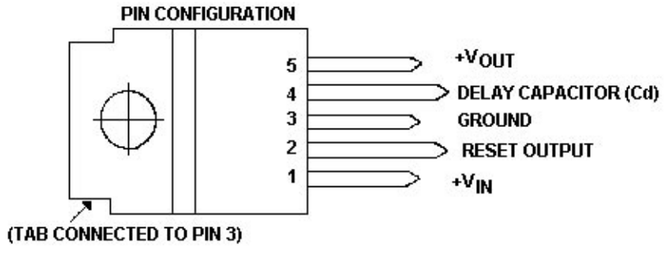
2. MOVE P22 TO J22 PINS 2&3 FOR HANDSET/HOOKSWITCH OPTION.

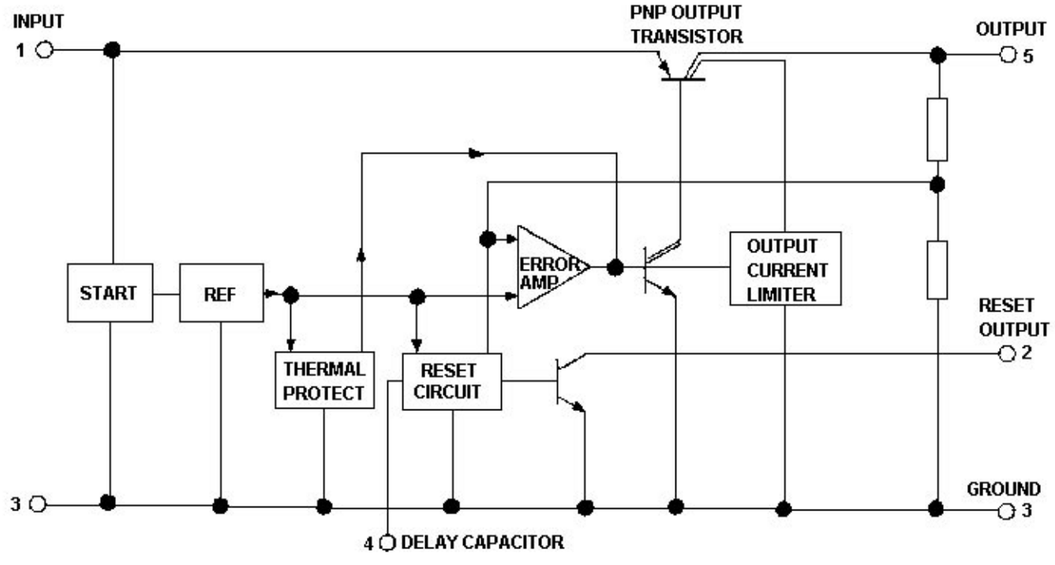
THIS SCHEMATIC DIAG APPLIES TO	
MODEL NO.	REV LETTER
PL19D902231G1	E

I/O BOARD
19D902231G1

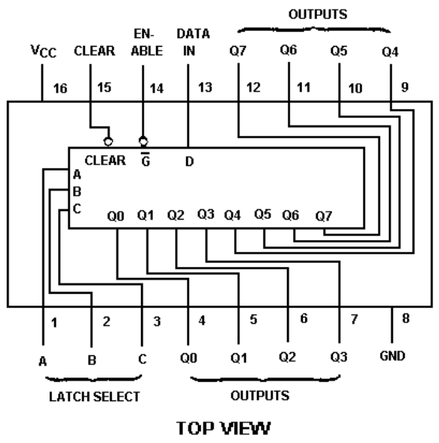
(19D438581, Sh. 3, Rev. 5)

VOLTAGE REGULATOR U1
19A704970P1





LATCH/DECODER U2, U3, U4
19A703471P9

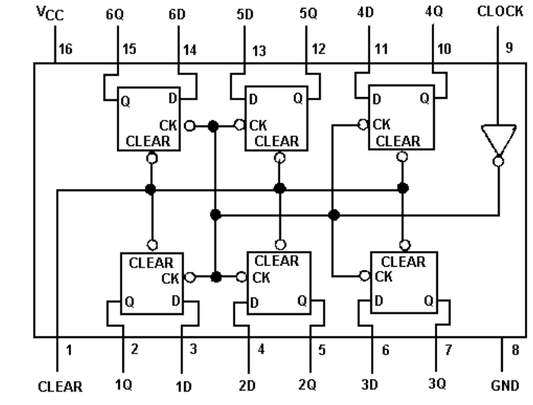


TRUTH TABLE

Inputs		Outputs of Addressed Latch	Each Other Output	Function
Clear	$\overline{G}$			
H	L	D	Q_{io}	Addressable Latch
H	H	Q_{io}	Q_{io}	Memory
L	L	D	L	8-Line Decoder
L	H	L	L	Clear

HEX DATA FLIP-FLOP U5, U6
19A704380P9

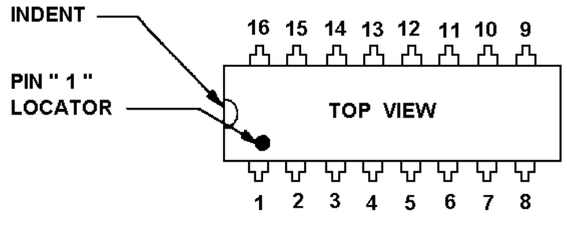
CONNECTION DIAGRAM

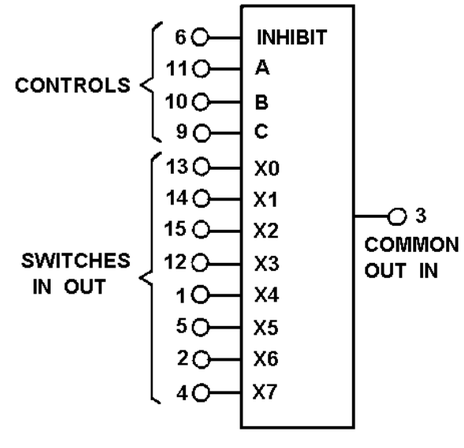


TRUTH TABLE

INPUTS			OUTPUTS
CLEAR	CLOCK	O	Q
L	X	X	L
H	I	H	H
H	I	L	L
H	L	X	Q

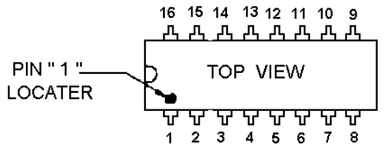
MULTIPLEXER U9
19A700029P36

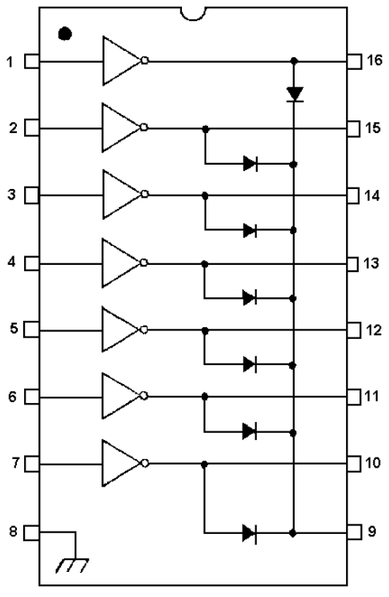




V_{DD} = PIN 16
V_{SS} = PIN 8
V_{EE} = PIN 7

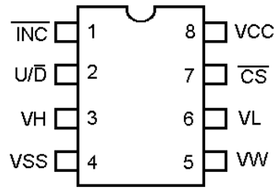
DARLINGTON INTERFACE U7, U8
19A134693P1





DIGITAL POTENTIOMETER U10, U11
19A705180P2

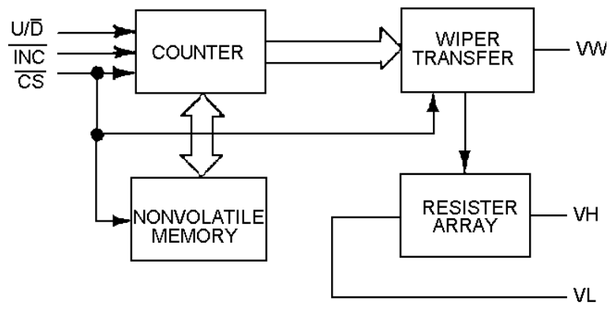
PIN CONFIGURATION



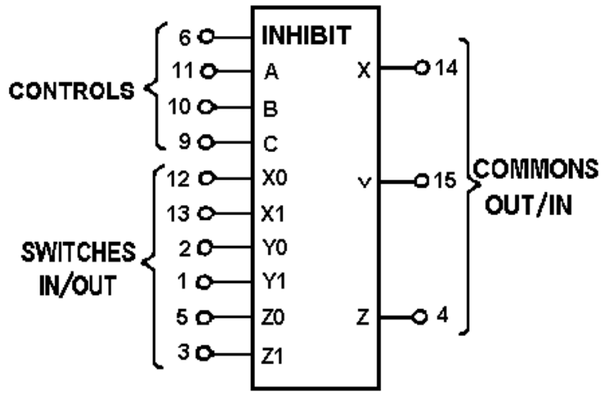
PIN NAME

VH	HIGH TERMINAL OF POT
VW	WIPER TERMINAL OF POT
VL	LOW TERMINAL OF POT
VSS	GROUND
VCC	SYSTEM POWER
U/D	UP / DOWN CONTROL
INC	WIPER MOVEMENT CONTROL
CS	CHIP SELECT

FUNCTIONAL DIAGRAM

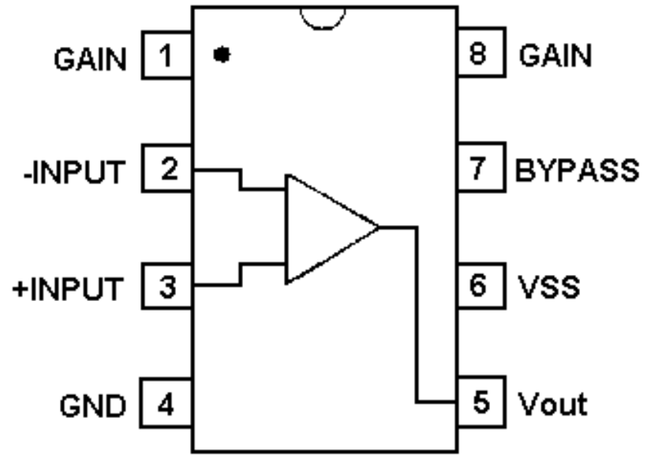


MULTIPLEXER U12
RYTUA30101/1



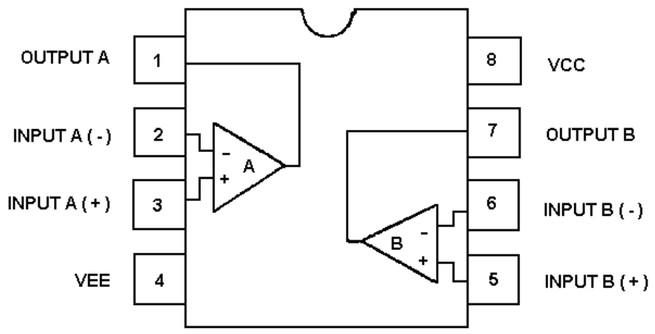
V_{DD} = PIN 16
V_{SS} = PIN 8
V_{EE} = PIN 7

AUDIO POWER AMPLIFIER U1
419A705647P1



TOP VIEW

OPERATIONAL AMPLIFIER U13
19A701789P2



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