Maintenance Manual

System Control/Synthesizer Board
CMC-552
Two-Way Mobile Radio Combinations
MLSH041

ComNet Ericsson
CRITICAL RADIO SYSTEMS

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1 DESCRIPTION

The System Control/Synthesizer Board (A801) for the MLSH041 two-way mobile FM radio, controls the radio by providing all necessary digital processing, tones and control functions. The logic circuitry of this board controls channel acquisition, RF frequency selection, tone generation and detection, timing functions and operator interface functions. Interface functions include control panel displays and switch panel controls, microphone hookswitch and programming functions. The frequency synthesizer generates the transmitter output frequency and the receiver first mixer injection frequency. The System Control/Synthesizer Board contains the following:

- Microprocessor
- External memory EPROM for the microprocessor
- The programmable personality EEPROM
- Transmit and receive audio processing circuitry

The System Control/Synthesizer Board CMC-552 mounts in the top section of the frame assembly as shown in Figure 1 – System Control/Synthesizer Board Location.

System Control/Synthesizer Board CMC-552 provides the microprocessor, control logic and audio processing for both the transmitter and the receiver circuits. This board also provides the synthesizer circuit for generating operating frequencies.

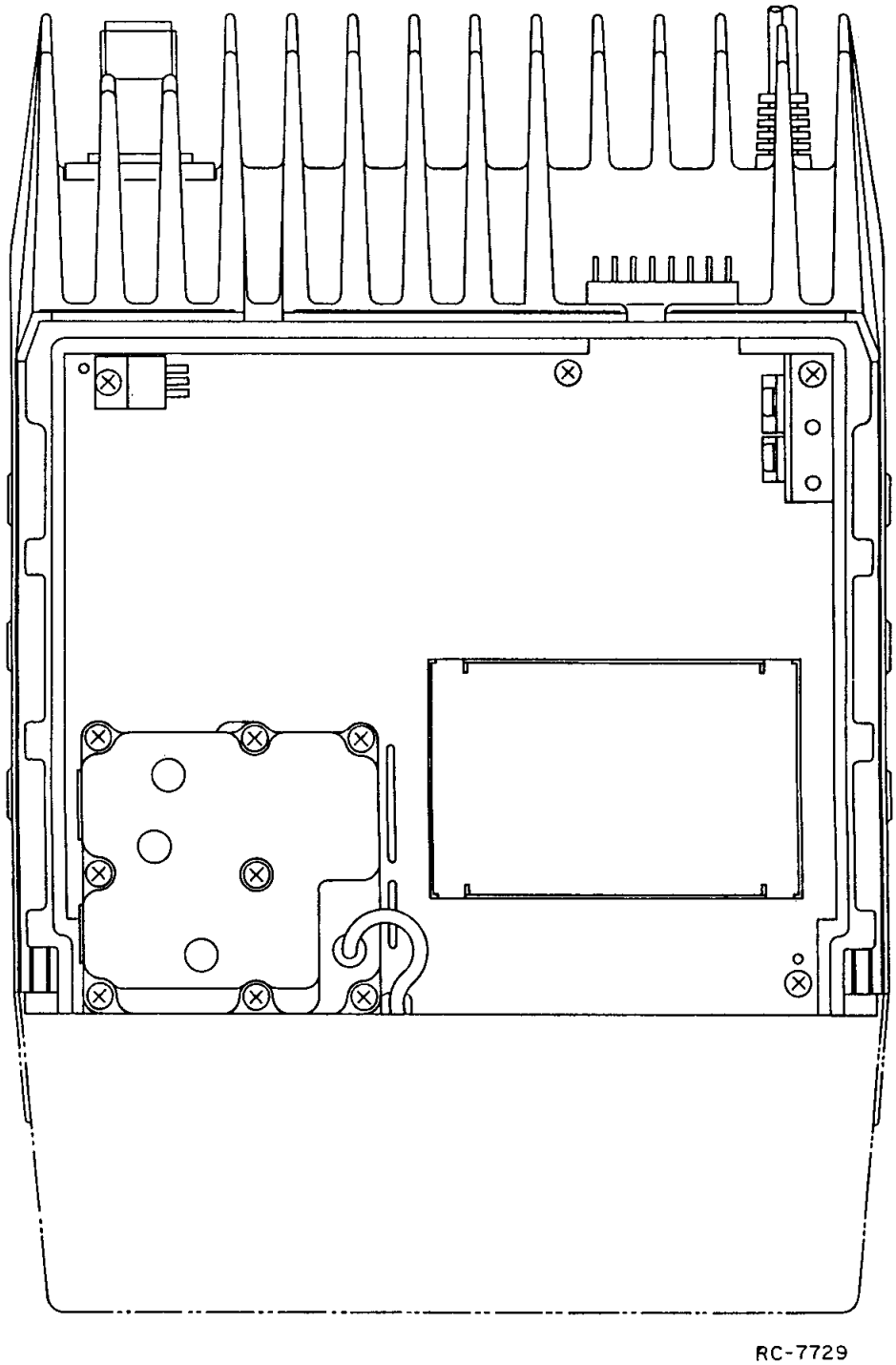


Figure 1 – System Control/Synthesizer Location (Top View)

2 CIRCUIT ANALYSIS

2.1 POWER DISTRIBUTION

A continuous 13.8 Volts supply is applied to the Power Control circuit IC606.

Pressing the power-on switch energizes power relay K501. Energizing this relay applies a switched 13.8 volts to 5-volt and 9-volt regulators IC101, IC207, IC501, IC607, IC608, and IC610. Switched 13.8 volts is also applied to Audio PA module IC551.

2.2 DIGITAL PROCESSING

The digital processing circuitry consists of microprocessor IC701, octal latch IC702, EPROM IC703, EEPROM IC704, PIO IC705, and Flip-Flop IC707. IC703 is an 8K X 8-Bit EPROM and is used by the microcomputer to control all radio and system functions. Crystal X701 provides the time base to sequence the microcomputer through an internal software program, allowing it to execute the program stored in the program memory (refer to Figure 2 – System Control Block Diagram).

EEPROM IC704 contains all data unique to the radio and is referred to as the "Personality" PROM. Information stored in the Personality PROM includes data for RF channels and Channel Guard as well as all radio options (e.g. carrier control timer, etc.).

2.3 OPERATION

2.3.1 OCTAL LATCH IC702

Octal Latch IC702 is used to exchange data passing between the microprocessor IC701 and the memory and control circuits respectively.

Octal Latch IC702 has the "G" input connected to the Address Latch Enable (ALE) output of the microprocessor to provide a latched address interface between the microprocessor and program memory IC703.

2.3.2 RESET

A reset circuit is provided to reset the microprocessor (IC701), PIO (IC705) and Flip-Flop (IC707). The reset is provided by IC609. When SW A+ falls below approximately 9 volts, IC609-3 goes high.

2.3.3 MICROPROCESSOR

IC701 directly interfaces with and controls the operation of all the digital processing circuitry. It also interfaces with the radio and control panel functions through PIO IC705. Microprocessor IC701 responds to manually initiated functions of Push-To-Talk (PTT), frequency selection (ADD, DELETE), MONITOR, VOLUME and SCAN (ADD, DELETE) through PIO IC705. Other functions are performed automatically by the microprocessor.

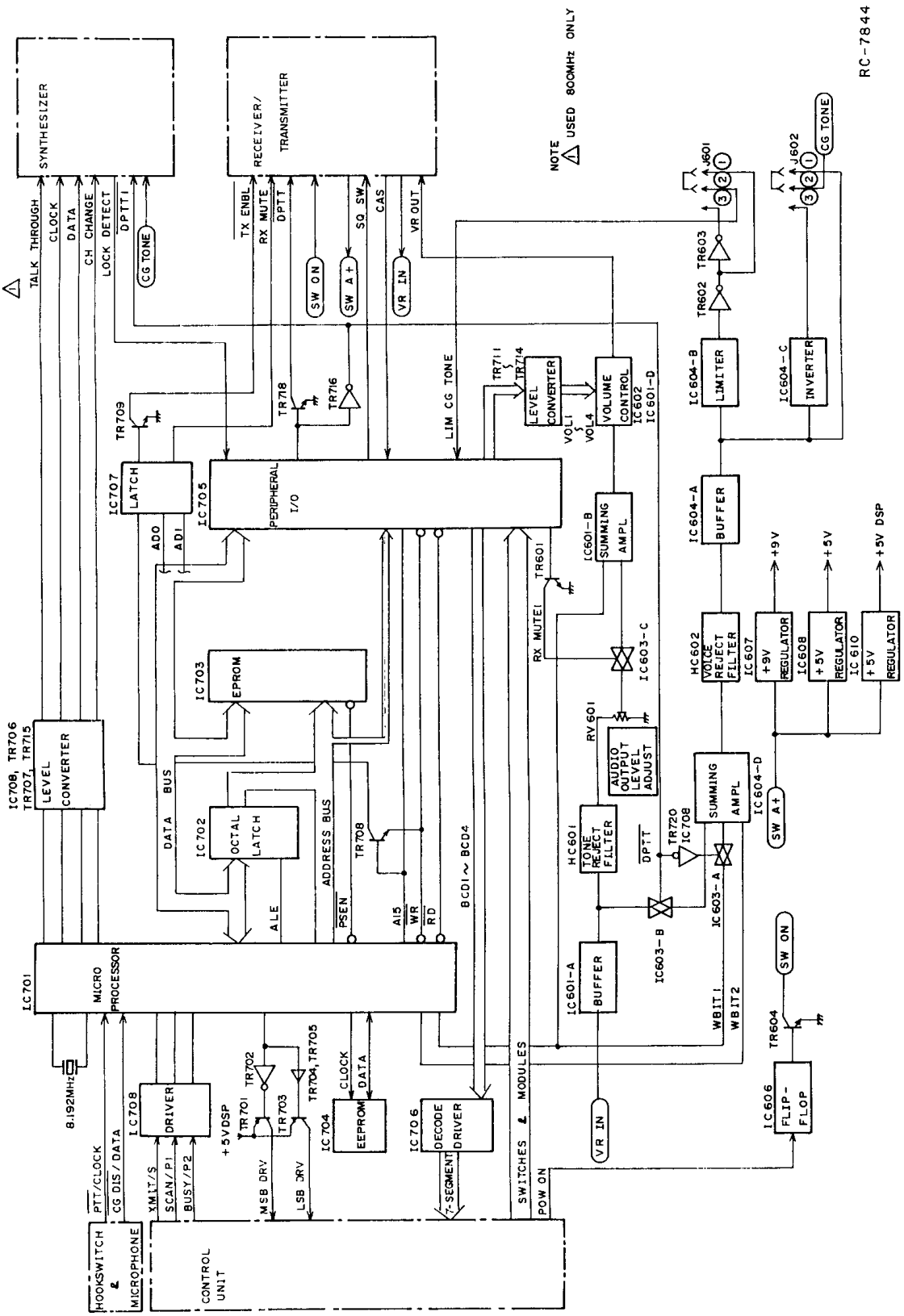


Figure 2 – System Control Block Diagram

The Microprocessor controls the operation of the radio by performing the following major functions:

- System Timing
- Frequency Selection
- Receiver Scan (16 channels)
- Two-Channel Priority
- Channel Guard Generation and Detection
- Transmit/Receive Control
- Front Panel Controls and Displays
- Audio Routing and Mute Control

Microprocessor IC701 is sequenced through its program by an internal 8.192 MHz oscillator controlled by crystal X701. The microprocessor accesses its program from EPROM IC703. Reading of the stored program at IC703 occurs when the $\overline{\text{PSEN}}$ line of IC701 is low. The upper eight address lines of IC701 (A8 through A15) are stationary during this access time. The lower eight address lines of IC701 (AD0 through AD7) are captured by octal latch IC702 and held stationary. ALE (IC701-27) is used to latch the lower eight address lines. The output of IC703 is then read into the data bus (AD0 through AD7) of IC701.

The microprocessor interfaces with the microphone through MIC PTT and LOGIC HKSW. It also interfaces with the PC Programmer through HKSW, MIC PTT, and Personality EEPROM IC704. The microprocessor control signals include the following:

$\overline{\text{EA}}$	-	When this enable line is low, allows the microcomputer to retrieve all instructions from external memory.
RST	-	Resets the microcomputer to beginning of the software program when switched A+ is turned on, immediately following power interruptions or with low battery voltage.
SYN DATA	-	Data transferred to synthesizer representing RF frequencies.
SYN CLOCK	-	Timing output to synthesizer.
SYN LOCK	-	A status input signal from the synthesizer to indicate frequency lock status of VCO.
RX MUTE	-	Receiver Mute turns receiver audio off while operating in the trunked mode during channel acquisition (idle and wait mode) and when transmitting.

$\overline{\text{DPTT}}$ - Delayed PTT energizes the antenna relay. $\overline{\text{DPTT}}$ low switches off the bilateral audio gates on the System Control/Synthesizer Board in the transmit mode.

$\overline{\text{TX ENBL}}$ - $\overline{\text{TX ENBL}}$ low tuns transistor TR103 on and applies 9 volts to the exciter.

$\overline{\text{MIC PTT}}$ - The microprocessor monitors the status of the switched PTT lead from the microphone. It also receives data on this line while the radio is being programmed.

$\overline{\text{RD}}$, $\overline{\text{WR}}$ - Read, Write allows the microprocessor to read/write data to/from PIO IC705 and write to FF IC707.

$\overline{\text{PSEN}}$ - Program Send Enable allows the processor to read instructions from program memory IC703.

ALE - Address Latch Enable allows the microcomputer to hold the eight least significant lines (AD0 through AD7) stable by using octal latch IC702. This is necessary when reading from program memory IC703 or reading/writing from/to PIO IC705.

A8 – A15 - Eight most significant address lines. These lines are used to address and access program memory IC703 and PIO IC705.

2.3.4 PUSH-TO-TALK

Pressing the PTT switch on the microphone applies a ground through J701-2 on the System Control/Synthesizer Board to microprocessor IC701. The ground on IC701-5 causes the $\overline{\text{TX ENBL}}$ output at TR709 to go low and the RX MUTE output at IC707-9 to go high.

The high output of IC705-36 is applied to the input of inverter transistors TR716, TR718, and TR720. The low output at TR720 becomes the high outputs through inverter. The low outputs $\overline{\text{DPTT1}}$ and $\overline{\text{DPTT}}$ through inverter transistors TR716 and TR718 respectively are applied to the synthesizer, Transmitter/Receiver board and the audio circuitry. The low output at TR718 is applied to the Transmitter/Receiver board from J703-13 and operates antenna relay K1. The $\overline{\text{DPTT1}}$ output is supplied to the synthesizer circuit to turn the RX VCO off and TX VCO on. Also the low $\overline{\text{DPTT1}}$ output at TR716 is added to the bilateral switch IC603 in the audio circuit to change the operating mode from receive to transmit. $\overline{\text{TX ENBL}}$ is low and through J703-12 is connected to the Receiver/Transmitter board to apply 9 volts to the exciter and key the transmit circuit.

2.3.5 CHANNEL SELECT

When a channel is selected and the bit stream is loaded into the synthesizer, a strobe pulse is applied to the Phase-Lock-Loop (PLL) module to allow the synthesizer to generate the correct RF frequency. The microprocessor immediately begins monitoring the LOCK DET LINED to verify that the synthesizer is "on" frequency. If the synthesizer is not locked on the correct frequency, a high on the LOCK DET line (IC705-11) will cause the microprocessor to reload the synthesizer in an attempt to lock it on frequency. If the synthesizer is locked on the correct frequency and MIC PTT is low, the microprocessor applies the high to the input of inverter transistor TR709. The low output of TR709 ($\overline{\text{TX ENBL}}$) is connected to the Transmitter/Receiver board through J703-12 to key the transmit circuit.

2.3.6 MONITOR

Pressing the MONITOR pushbutton applies a low to the microprocessor through PIO IC705-19. This low causes the microprocessor to open the receiver so the channel can be monitored.

2.3.7 CHANNEL GUARD

In the encode mode, the microprocessor selects the assigned Channel Guard tone/code information from the EEPROM memory for each transmit and receive channel and generates the Channel Guard signal. This signal is applied as Walsh Bits "1" and "2" to summing amplifier IC604-D. These two bits are summed together and filtered to provide a smooth sine wave for Tone Channel Guard.

The output of IC604-D is applied to low-pass filter (Voice Reject) HC602. This filter shunts all frequencies above 300 Hz to ground, preventing those frequencies from interfering with the encoded signal.

In the decode mode, the $\overline{\text{DPTT1}}$ input to bilateral switches IC603-B is high, changing the switches to the receive mode. Audio and tone from RX Audio at J703-11 is applied to low-pass filter (Voice Reject) HC602 through buffer amplifier IC604A. This signal is filtered and only the Channel Guard (if present) is applied to hard limiter IC604B.

The square-wave output of IC604-B is connected to transistor switch TR602 and the Channel Guard tone is applied to the microprocessor for comparison to determine if the Channel Guard tone is correct. If the tone is correct, the microprocessor causes the RX MUTE line to go low at IC707-9, turning the receiver audio on so that the message can be heard in the speaker.

2.3.8 CARRIER CONTROL TIMER

The Carrier Control Timer (CTT) is contained in and controlled by the microcomputer. Each time the PTT switch is activated an internal counter begins to count down. If the counter times out, a 500 Hz tone is heard in the speaker for five (5) seconds or until the microphone PTT is released. The timing cycle is programmable from 30 seconds to 7.5 minutes in 30-second increments.

2.3.9 AUDIO CIRCUITRY

Transmit and receive audio signals are routed through the three-stage bilateral switch IC603-C. The switches are controlled by the RX MUTE 1 output of microprocessor IC701. In the transmit mode, the RX MUTE 1 from IC705-38 is high, TR601 turns on, bilateral switch IC603 control lead is low, switching the stages to the transmit mode as shown on the System Control/Synthesizer Board schematic diagram. When the PTT switch is released, the switches revert back to the normal receive mode ($\overline{\text{DPTT1}}$ high).

The +9 volts from regulator IC607 is applied to voltage divider resistors R651 and R652. The +4.5 volt output from the voltage dividers establishes the reference voltage for the operational amplifiers. Capacitor C617 provides an AC ground at the summing input of operational amplifier IC601.

2.3.10 TRANSMIT AUDIO

Audio from the microphone at J701-3, 4 (MIC HI, LO) is coupled through capacitor C258 and Audio Processor IC208-B and applied to a high-pass filter. The filter output is coupled through capacitor C230 and Modulation Adjust potentiometer RV201 to the next stage.

The Channel Guard tone/code (if present) from Voice Reject Filter HC602 is coupled through bilateral switch IC603-A and applied to the CG input of Channel Guard Deviation Adjust potentiometer RV202. The Channel Guard tones and audio are combined and applied to summing amplifier IC208-A.

2.3.11 RECEIVE AUDIO

In the receive mode, the PTT input to the System Control/Synthesizer Board goes high, switching antenna relay to the receive mode. The RX MUTE lead remains low, keeping the audio amplifier turned on.

If the channel being received has been programmed for Channel Guard, the received CG tone is coupled through bilateral switch IC603-B and buffer amplifier IC604-D to low-pass filter (Voice Reject) HC602. The filtered tone output is coupled through IC604-A, limiter IC604-B and transistor TR602 to the microprocessor.

Received audio from the receiver is applied to the input of buffer amplifier IC601-A. The audio out from IC601-A is applied to the volume control circuit (IC602 and IC601-D) through tone reject filter HC601, audio gate IC603-C and audio pre-amplifier IC601-B. The audio output from the volume control circuit is applied through the de-emphasis network, consisting of resistors R551 and R552 and capacitors C552 and C553, to audio amplifier IC551 which provides up to 4 watts of audio output power to 4 ohm speaker SP801, located in the front panel.

When the radio is squelched, the Carrier Activity Sensor (CAS) to the microprocessor through J703-10 goes low. The Flip-Flop (IC707) and PIO (IC705) output the RX MUTE and RX MUTE 1 signals. The RX MUTE 1 signal turns bilateral switch IC603-C off and mutes the audio signal. The RX MUTE signal turns transistor TR551 off and mutes the audio signal from IC601-D.

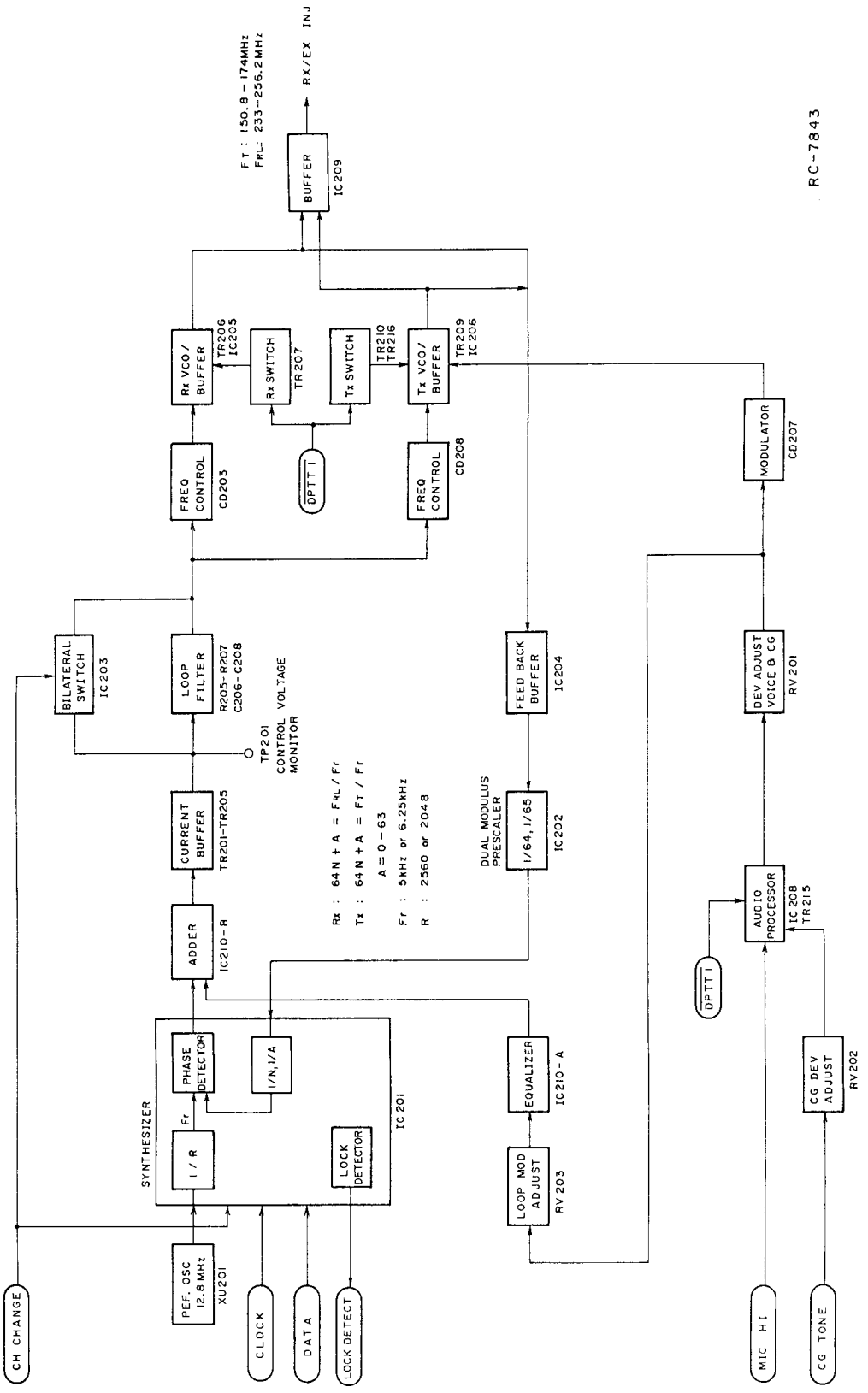


Figure 3 – Frequency Synthesizer Block Diagram

2.3.12 FREQUENCY SYNTHESIZER

The frequency synthesizer circuit consists of reference oscillator XU201, synthesizer chip IC201, dual modulus prescaler IC202, TX and RX Voltage-Controlled Oscillators (VCOs), transistors TR206 and TR209, a loop filter and associated circuitry (refer to Figure 3 – Synthesizer Block Diagram).

2.3.12.1 Reference Oscillator

Reference oscillator XU201 operates at a frequency of 12.8 MHz and is temperature compensated to provide a frequency stability of ±5 PPM. Voltage for the oscillator is supplied by 9-volt regulator IC207 and 4-volt zener diode CD201. The oscillator output is applied to synthesizer chip IC201-2 (refer to Figure 4 – Synthesizer IC201).

2.3.12.2 Synthesizer

Synthesizer IC201 consists of a programmable reference oscillator divider (÷R), phase detector and programmable VCO dividers (÷N, A).

When the PTT switch is pressed (transmit) or released (receive) new frequency data is received on the clock, data and enable lines and the synthesizer immediately begins generating the new RF frequency. This serial data determines the VCO frequency by setting the internal dividers. The reference oscillator frequency applied to the programmable reference oscillator divider is divided down to some lower frequency as indicated by the input data and applied to the internal phase detector. The phase detector compares this signal with the output of the internal programmable VCO dividers. The output of the programmable VCO dividers is a function of the RF frequency which is divided down by the dual modulus prescaler and the programmable VCO dividers. When operating on the correct frequency, the inputs to the phase detector are identical and the output voltage of the phase detector is constant. Under these conditions, the VCO is stabilized or locked on frequency.

If the compare frequencies (phases) differ, an error voltage is generated and applied to the VCO through the frequency acquisition circuit, causing the Phase-Lock-Loop (PLL) to acquire the new frequency.

The LOCK DETECT (LD) line provides the PLL lock status information to the microcomputer. When the PLL is out of lock, negative going pulses are on the Lock Detect lead. When locked on frequency the lead is high.

2.3.12.3 Equalizer

The equalizer; consisting of IC210-A, R277, R278 and C284; receives transmit audio from Loop Mod adjuster RV203. The output of the equalizer is summed with the output signal from the phase-detector by adder IC210-B.

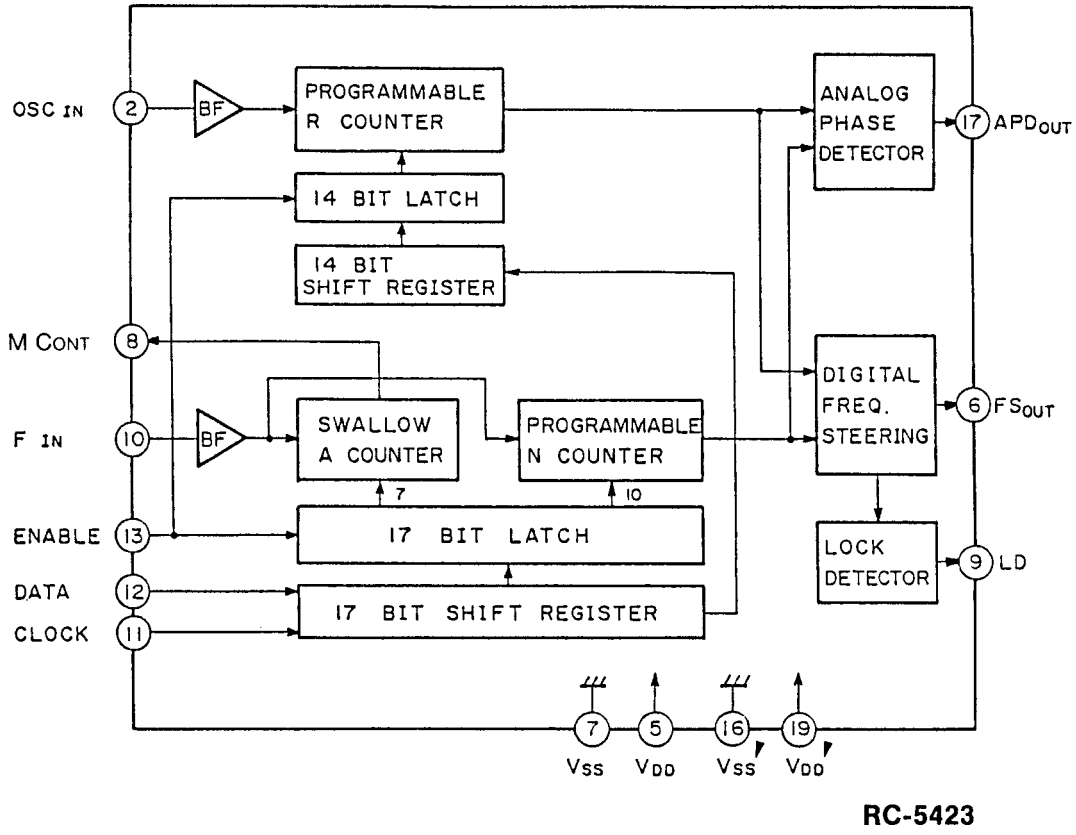


Figure 4 – Synthesizer IC201

2.3.12.4 DC Offset and High Current Buffers

DC offset buffers TR202 , TR205 and diode CD204 receive the error voltage from the synthesizer and increases this level by 1.8 VDC to extend the operating range of the high current buffers. When the PLL is off frequency due to a channel change or frequency drift, the error voltage from the synthesizer (APD) rises or falls, turning TR202 either on or off. TR202 controls the DC offset buffer TR205. TR205 completes a high current rapid charge or discharge path for C206-C208.

As the error voltage decreases, TR202, TR205 and CD204 turn on, completing a discharge path for C206-C208 through bilateral switch IC203. When the error voltage goes positive, TR202, TR205 and CD204 are turned off, allowing C206-C208 to charge through R204. IC203 is turned on for 15 milliseconds each time a channel is changed in receive or when changing from transmit to receive. The time is 15 milliseconds when in transmit.

2.3.12.5 Loop Filter

The loop filter consists of R205-R207, and C206-C208. This filter controls the bandwidth and stability of the synthesizer loop. Bilateral switch IC203 is controlled by the 15 milliseconds, 9-volt channel change pulse. When the channel change pulse is present, the bilateral switch shorts out the low pass filter, greatly increasing the loop bandwidth to achieve the 35 milliseconds channel acquisition time required for PSLM. The low pass filter removes noise and other extraneous signals internal to the synthesizer chip.

The output of the filter is applied to the varicaps in the transmit and receive VCO's to adjust or correct the VCO frequency.

2.3.12.6 Receiver VCO

The Receiver VCO consists of a low noise JFET oscillator, TR206, followed by high gain buffer IC205. This buffer prevents external loading and improves power gain. The VCO is a Colpitts oscillator with the varicap capacitors and inductor forming the tank circuit. Capacitor CV201 allows manual adjustment of the VCO across the frequency split. The varicap provides voltage controlled frequency adjustment of about 3 MHz. The VCO is switched on and off under control of the $\overline{\text{DPTT1}}$ line. When the $\overline{\text{DPTT1}}$ line is high, the Receiver VCO is turned on (TR207 is on). The RX injection output is typically +5 dBm. RX VCO lock time is 15 milliseconds maximum.

2.3.12.7 Transmitter VCO

The transmitter VCO is basically the same as the Receiver VCO. The Varicap provides a voltage controlled adjustment range of approximately 6 MHz. The EX injection provides a typical output of +5 dBm. Transmit audio is applied to modulation adjustment control RV201. Deviation is set for ±4.5 kHz. TX VCO lock time is 15 milliseconds maximum.

The transmitter VCO is turned on when $\overline{\text{DPTT1}}$ line is low (TR210 is on, TR216 is off).

The use of two VCO's allows rapid independent selection of transmit and receive frequencies across the frequency split.

2.3.12.8 VCO Characteristics

The synthesizer has two VCO's, the frequency of which is directly related to a control voltage generated by the synthesizer circuitry and must remain within specified limits for the synthesizer to function properly. The RX VCO typically will increase in frequency about 3 MHz when the control voltage moves from its lower limit to its upper limit. The TX VCO moves about 6 MHz for the same situation. By tuning the variable capacitor in the VCO, the same control voltage frequency spread can be moved up or down through the full range of frequencies that the radio operates on.

In order to maintain the selectivity, hum and noise performance of the radio, the frequency range that the VCOs can be voltage tuned must be kept to a minimum. This requires that all the available voltage range be fully utilized. The alignment procedure, therefore, instructs the user to accurately set the control voltage to the upper or lower limit of the voltage range at the highest or lowest frequency channel.

NOTE

Going too high with the voltage setting at the highest frequency channel may cause problems over temperature extremes as the VCOs will drift slightly. Set the voltage too low and you may not remain within the required lower voltage limit as you cover the radio's maximum two-frequency spread.

If the required frequency spread is less than the maximum two frequency spread, then there are no restrictions on setting the lowest and highest frequencies within the required voltage limits.

The minimum tuning requirement of the VCOs is to cover the proper frequency range. For instance, to cover 160 to 166 MHz, the VCO must be tunable such that at 166 MHz, the control voltage is equal to the upper voltage limit, and at 160 MHz, the voltage must be greater than the lower limit. If the control voltage can be tuned higher than the lower limit at 160 MHz, this simply means that you can program channels below 160 MHz until you finally run into the lower voltage limit. When tuning the VCO's to a channel close to 166 MHz, the control voltage may not reach the upper control voltage limit. This is normal for some radios and is due to the tolerances on the many capacitors in the VCO. Even though it takes very little change in capacitance to shift the VCO frequency range a few megahertz, this variation has been carefully compensated for by increased tuning range for the VCO. Therefore, if you tune to 174 MHz, you may not achieve the maximum control voltage for all radios, but you will always be greater than the lower voltage limit.

2.3.12.9 Feedback Buffer

The buffered output of the RX VCO and TX VCO are supplied to the receiver mixer and the exciter respectively and to the feedback buffer. Buffering is provided by IC204 and the output applied to dual modulus prescaler IC202.

2.3.12.10 Dual Modulus Prescaler

The dual modulus prescaler completes the PLL feedback path from the synthesizer to loop filter, to the VCO's and feedback buffer and then back to the synthesizer through the prescaler. The prescaler divides the VCO frequency by 64 or 65 under control of M Cont from the synthesizer. The output of the prescaler is applied to the synthesizer where it is divided down to 5 or 6.25 kHz by an internal ÷N, ÷A counter and compared in frequency and phase with the divided down frequency from the reference oscillator. The result of this comparison is the error voltage used to maintain frequency lock. The N, A counter is controlled by data received from the microcomputer. Depending on the operating frequency, the DC voltage at TP201 should be within the range 3.5 and 7.5 VDC when the PLL is locked.

2.3.12.11 Audio Processor

The audio processor provides audio pre-emphasis with amplitude limiting and post limiter filtering and a total gain of approximately 27 dB. Approximately 30 dB gain is provided by IC208B and 4 dB by IC208A and –7 dB by R248, R249.

The 9-volt regulator IC207 powers the audio processor and applies regulated 9 volts to a voltage divider consisting of R245 and R246. The +4.7 volts output from the voltage divider establishes the operating reference point for operational amplifiers IC208B and IC208A. C261 provides an AC ground at the summing input of both operational amplifiers.

When the input signal to IC208B-6 is of a magnitude such that the amplifier output at IC208B-7 does not exceed 5 volts pp, the amplifier provides a nominal 30 dB gain. When the audio signal level at IC208B-7 exceeds 5 volts pp, the amplifier gain is reduced to 1. This limits the audio amplitude at IC208B-7 to 6 volts pp.

Resistors R242, R243 and Capacitor C258 comprise the audio pre-emphasis network that enhances the signal-to-noise ratio. R243 and C258 control the pre-emphasis curve below limiting. R242 and C258 control the cut-off point for high frequency pre-emphasis.

Audio from the microphone is coupled to the audio processor through R242 and C258.

The amplified output of IC208B is coupled through R248, R250, R252, and R253 to a second operational amplifier IC208A. TR215 is controlled by the $\overline{\text{DPTT1}}$ line so that TX audio is transmitted only when the PTT switch is pressed.

The Channel Guard tone input is applied to IC208A-2 through CG Mod Adjust RV202, C263 and R254. The CG tone is then combined with the microphone audio at IC208A. IC208A provides a signal gain of approximately 4 dB.

A post limiter filter consisting of IC208A, R205-R253, C264 and C265 provide 12 dB per octave roll-off. R248 and C260 provide an additional 6 dB per octave roll-off for a total of 18 dB. The output of the post limiter filter is coupled through Mod Adjust RV201 to the transmitter VCO.

Tx enable switch TR215 shorts out operational amplifier IC208-A when the radio is in the receive mode. The $\overline{\text{DPTT1}}$ signal is generated by the microcomputer when the PTT switch is released and is 9 VDC in the receive mode.

2.3.12.11.1 SCAN Operation

The scan operation is controlled by the microprocessor, and provides for scanning any or all of up to 16 channels. The scanned channels may be located anywhere within the frequency band of the radio, and can include two priority channels (P1 and P2).

If desired, all 16 channels can be scanned with or without priority level. When SCAN is enabled, scanning of the selected channels starts immediately. Scan time is approximately 50 to 450 milliseconds per channel, depending upon whether Channel Guard has been programmed for a particular scan channel. If a carrier is not detected, the scan time is 50 milliseconds. If a carrier is deleted and Channel Guard is programmed for the channel, the time is 200-450 milliseconds, depending upon how close the Channel Guard tone is to the desired tone. Typical value is 250 milliseconds.

Priority 1 (P1) and Priority 2 (P2) channels, if present, are not part of the non-priority channel scan list (S1, S2, S3…) and are treated separately. If there is no activity on any of the scanned channels, then the scan sequence is as shown in the following examples.

Example 1: (More than four non-priority channels, (e.g., six channels))
P1-P2-**S1-S2-S3-S4**-P1-P2-**S5-S6-S1-S2**-P1-P2-**S3-S4-S5-S6**-P1-P2-…

Example 2: (Four or less non-priority channels, (e.g., three channels))
P1-P2-**S1-S2-S3**-P1-P2-**S1-S2-S3**-P1-P2-**S1-S2-S3**-P1-P2-**S1-S2-S3**-…

Therefore, the scan sequence is: Scan P1 and P2 if programmed, then scan up to four non-priority channels before scanning P1 and P2 again. If more than 4 non-priority channels exist, then scan will wrap around, continuously scanning four of the non-priority list between each P1, P2 sequence. If the number of non-priority channels is less than or equal to four, then all non-priority channels will be scanned between each P1, P2 scan.

As an added example, consider channels 1-8 to be the scanned channels, with P1 being Channel 1 and P2 being Channel 8. The scanning order then would be:

S1-S2-S3-S4-P1-P2-S5-S6-S1-S2-P1-P2-S3-S4-…
7 6 5 4 1 8 3 2 7 6 1 8 5 4

Since it takes approximately 50 to 450 milliseconds to scan each channel, then each Priority channel is sampled every 0.3 to 2.7 seconds and the Non-Priority channels are sampled at least once every 0.4 to 3.6 seconds. If Channel Guard is programmed for a channel but no carrier is detected, the scan time for that channel is 50 milliseconds.

2.3.12.11.2 SCANNING (Stopped On A Valid SCAN Channel)

Once a carrier is detected, the Receive Channel display will light up, indicating that channel. If the channel is a Non-Priority channel, and there are no Priority channels, then scanning is halted. If only a Priority 2 (P2) channel is present, then it is scanned every 5 seconds if it has Channel Guard programmed and carrier is detected, and every second otherwise. If there is only a Priority 1 (P1) channel, then it is sampled every 2.5 seconds if it has Channel Guard programmed and carrier is detected, and every 500 milliseconds otherwise. If there are both P1 and P2 Priority channels, the sample rate will vary.

In order to show the various scan conditions, the following conditions are used:

NOTE

The following conditions are shown while listening to a non-priority channel.

CONDITION 1: P1 and P2 have Channel Guard programmed.

a. <u>No carriers detected</u>

P1-P1-P2-P1-P1-P2-P1-P1-P2-…

tb (time between samples) = 500 msec
ts (time of sample) = 100 msec

Note: ts is the whole time placed in the signal being heard.

b. Carrier on P1 detected/wrong Channel Guard

P1-P2-P2-P2-P2-P2-P1-P2-P2-P2-P2-P2-P1-P2-…

tb = 1 second
ts = 100 msec for P2
250-500 msec for P1

c. Carrier on P2 detected/wrong Channel Guard

P1-P2-P1-P1-P1-P1-P1-P1-P1-P1-P1-P2-P1-…

tb = 500 msec
ts = 100 msec for P1
250-500 msec for P2

d. Carrier on P1 and P2 detected/both wrong Channel Guard

P1-P1-P2-P1-P1-P2-P1-P1-P2-…

tb = 2.5 sec
ts = 250-500 msec

e. Carrier on P1 and right Channel Guard

Stop scan, display P1

f. Carrier on P2 and right Channel Guard

Display P2, scan P1

P1-P1-P1-P1-P1-P1-…

tb = 500 msec
ts = 100 msec

g. Carrier on P2 with right Channel Guard, carrier/wrong Channel Guard P1

P1-P1-P1-P1-P1-P1-…

tb = 2.5 second
ts = 250-500 msec

CONDITION 2: Priority 1 has Channel Guard programmed, PRI2 does not

a. No carriers detected

P1-P1-P2-P1-P1-P2-P1-P1-P2-…

tb (time between samples) = 500 msec
ts (time of sample) = 100 msec

b. Carrier on P1 detected/wrong Channel Guard

P1-P2-P2-P2-P2-P2-P1-P2-P2-P2-P2-P2-P1-P2-…

tb = 1 second
ts = 100 msec for P2
250-500 msec for P1

c. Carrier on P1 detected/right Channel Guard

Stop on P1, stop scan

d. Carrier on P2

Stop on P2, scan P1

P1-P1-P1-P1-P1-P1-…

tb = 500 msec
ts = 100 msec

e. Carrier on P2 and P1 with wrong Channel Guard on P1

Stop on P2, scan P1

P1-P1-P1-P1-P1-P1-…

tb = 2.5 seconds
ts = 250-500 msec

CONDITION 3: P2 has Channel Guard, P1 does not

a. No carriers detected

P1-P1-P2-P1-P1-P2-P1-P1-P2-…

tb (time between samples) = 500 msec
ts (time of sample) = 100 msec

b. Carrier on P2 detected/wrong Channel Guard

P1-P2-P1-P1-P1-P1-P1-P1-P1-P1-P1-P2-P1-…

tb = 500 msec
ts = 100 msec for P1
250-500 msec for P2

c. Carrier on P2 detected/right Channel Guard

Stop on P2, scan P1

P1-P1-P1-P1-P1-P1-…

tb = 500 msec
ts = 100 msec

d. Carrier on P1 detected

Stop on P1, stop scan

CONDITION 4: P1 and P2 with no Channel Guard

a. No carriers detected

P1-P1-P2-P1-P1-P2-P1-P1-P2-…

tb (time between samples) = 500 msec
ts (time of sample) = 100 msec

b. Carrier on P2

Display P2, scan P1

P1-P1-P1-P1-P1-P1-…

tb = 500 msec
ts = 100 msec

c. Carrier on P1

Stop on P1, stop scan

2.3.12.11.3 Hang Time

If the carrier on a Non-Priority channel disappears before a carrier is detected on a Priority channel, then a 5-second hang time is applied before Non-Priority scanning is resumed. However, during this time the Priority channels are still being sampled. The hang time is provided to prevent fades from causing big gaps in the audio signals. The transmitter may be keyed at any time during the hang time. The hang time is restarted when the transmitter is unkeyed.

If a carrier (or Channel Guard tone if programmed) is detected on a Priority channel during the sample period, then the channel is immediately switched to the Priority channel, and either the PRI-1 or PRI-2 indicator will turn on. If the carrier is on Priority 1 channel, scanning is stopped until the carrier goes away (plus the five second hang time). If the carrier is on the P2 channel, then P1 is still sampled every 500 milliseconds if no Channel Guard is programmed. If there is no P1 channel, then scanning is stopped until the carrier disappears (+5 seconds). Once a carrier is detected on the P1 channel, the channel is switched to Priority 1 regardless of what is being received on another channel (Non-Priority or P2).

2.3.12.11.4 Other Characteristics

When the microphone is removed from the hookswitch, scanning will stop and revert to the Pre-Scan selected channel if the scan has not stopped on any channel. The scan light will blink. Transmit (if a valid TX frequency is programmed) is possible on the pre-scan channel while off-hook. The channels can be changed during this mode, but when the microphone is returned to the hookswitch, hang time occurs on the pre-scan selected channel.

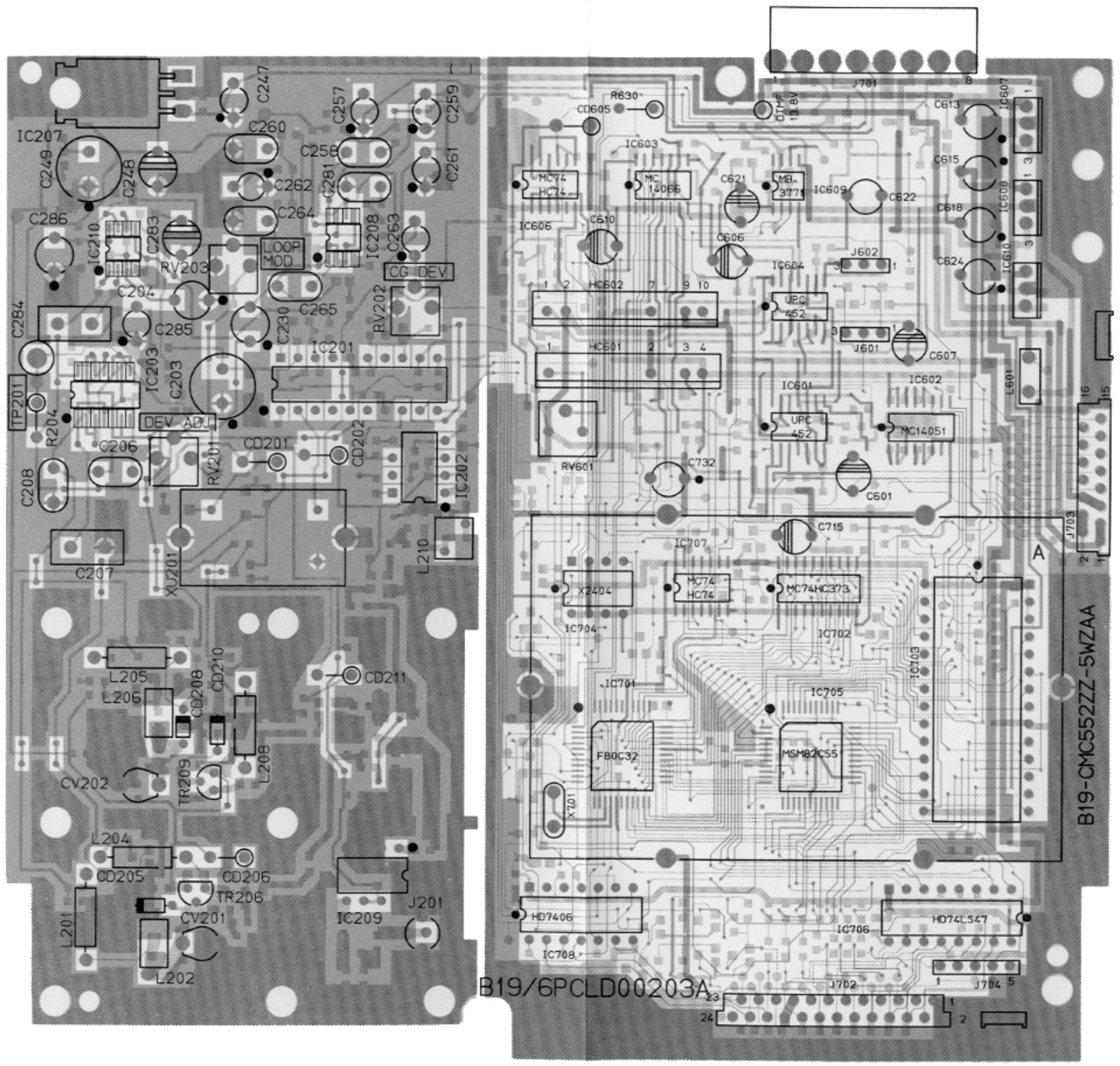
If a channel has been detected and the radio is hanging on this channel, then scanning stops and the radio will sit on the Received scan channel until the microphone is placed on the hook-switch or scan is disabled by pressing the SCAN button. If the microphone is replaced on the hookswitch, scanning will resume five seconds later. Channel changes are allowed until the microphone is replaced in the hookswitch. When scan is disabled, the radio automatically reverts to the Pre-Scan selected channel.

When the PTT is pressed, the channel that the scan was hanging on when the microphone was removed from the hookswitch will be the transmit channel. This is the displayed channel. If the PTT is pressed while on-hook and in SCAN, the transmitter is disabled until scan stops on a valid channel or scan is disabled.

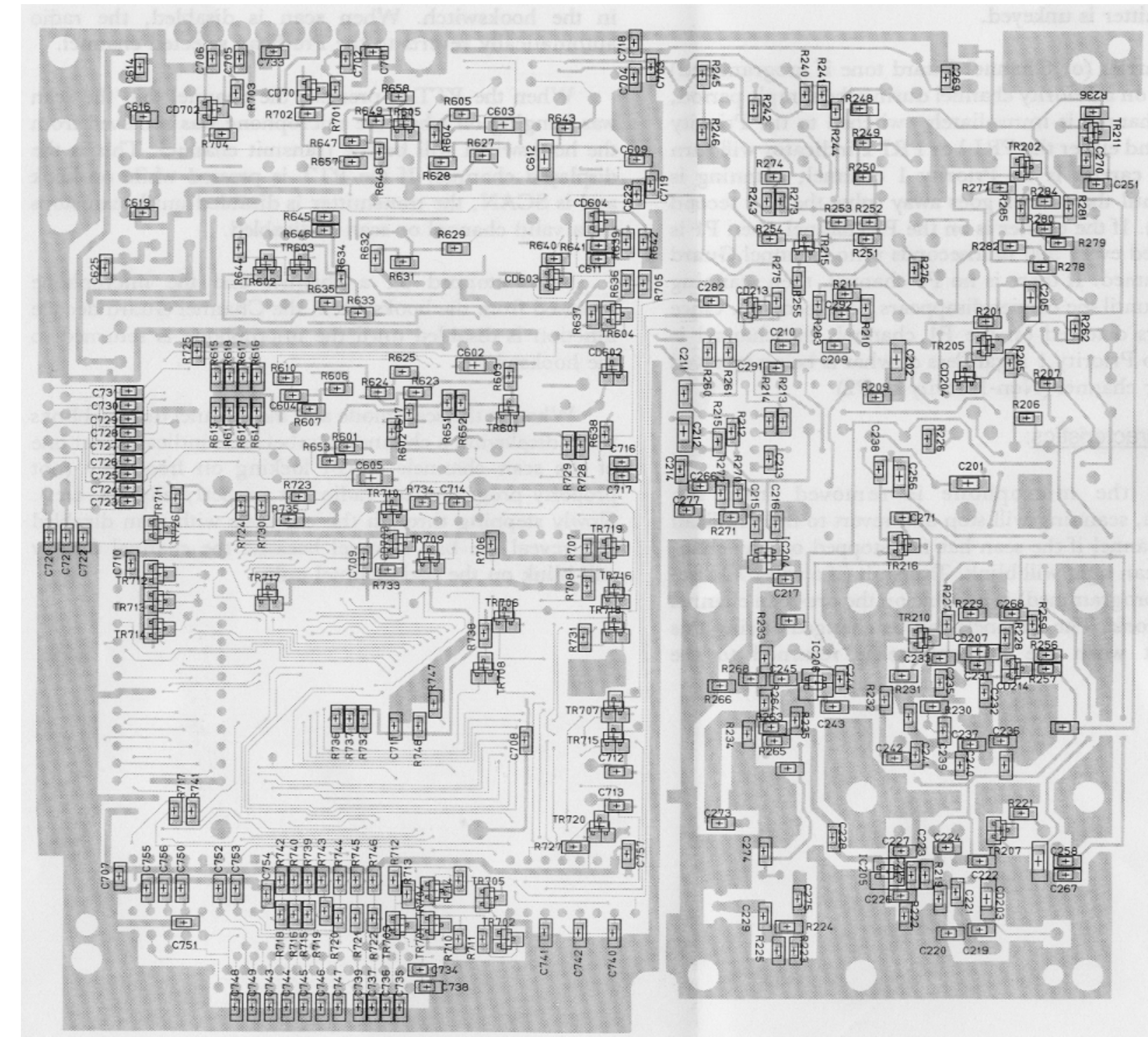
Once stopped on a channel and the microphone removed from the hookswitch, the Channel Guard decode function is disabled until the microphone is returned to the hookswitch.

When in the scan mode and the channel display blinks while displaying a channel number, this indicates that one of the scan channels is not locking on frequency (not properly programmed, radio not properly aligned, etc.). Slowly stepping through the channels with scan disabled will reveal the bad channel because the channel display will blink on the bad channel only.

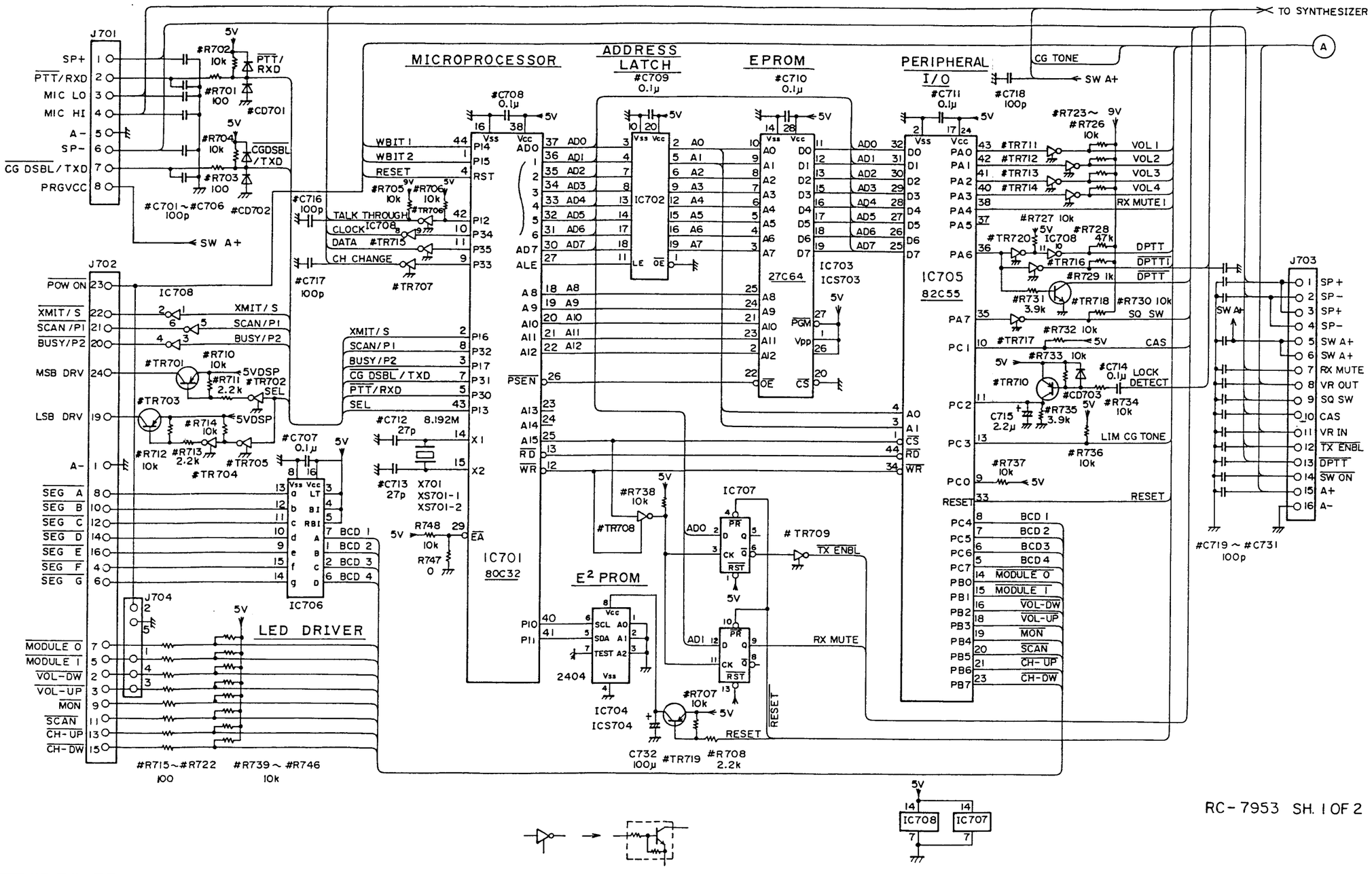
COMPONENT SIDE



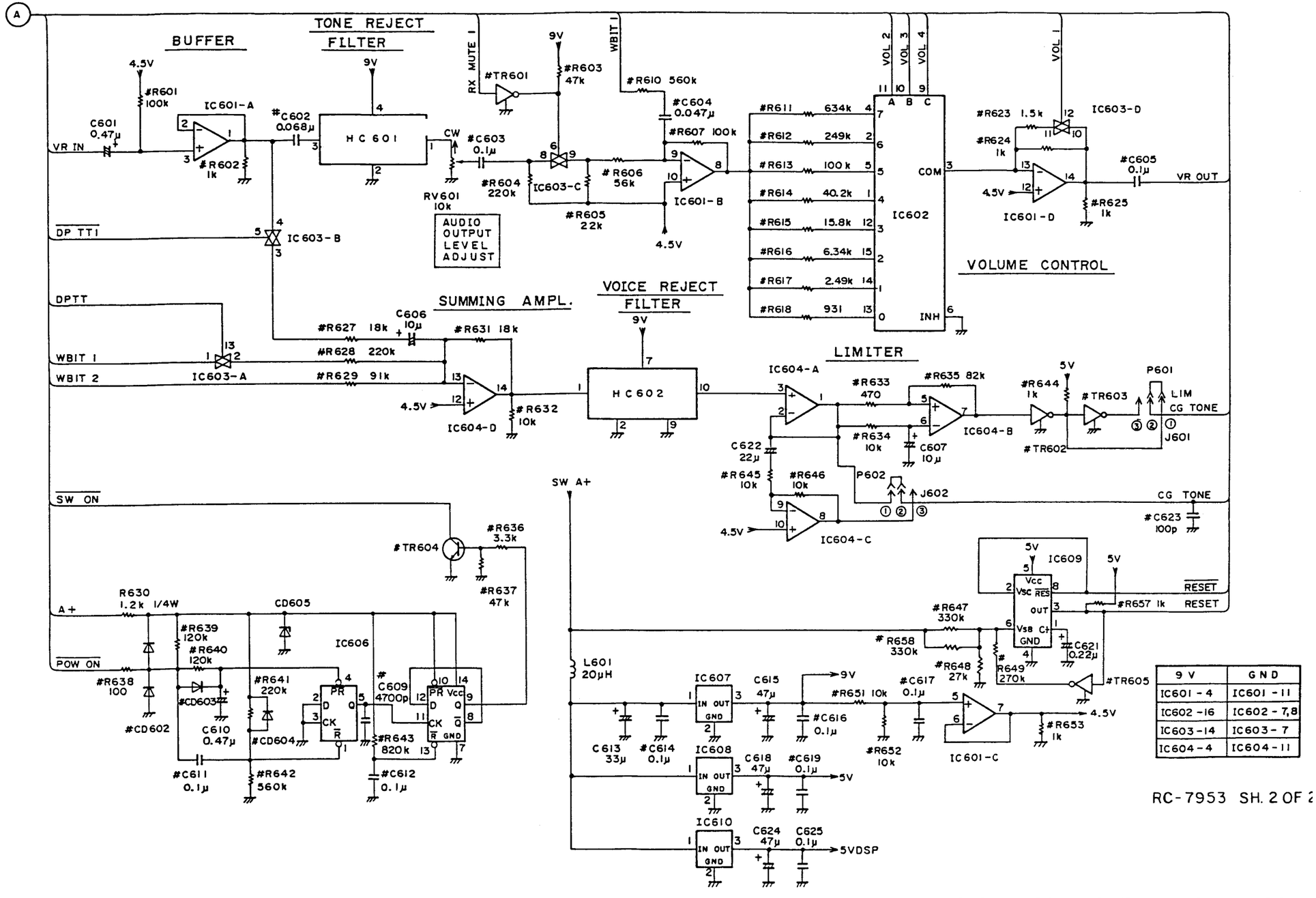
SOLDER SIDE



SYSTEM CONTROL/SYNTHESIZER BOARD
6PCLD00203



SYSTEM COPNTROL BOARD
SHEET 1 OF 2



9 V	GND
IC601 - 4	IC601 - 11
IC602 - 16	IC602 - 7,8
IC603 - 14	IC603 - 7
IC604 - 4	IC604 - 11

RC-7953 SH. 2 OF 2

SYSTEM CONTROL/SYNTHESIZER BOARD

PARTS LIST

SYSTEM CONTROL SECTION
MLS (HIGH BAND)
CMC-552-1
ISSUE 1

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C601	B19/5CSAC01065	Tantalum: 0.47 uF, ±10%, 35 VDCW.
C602	B19/5CAAD01201	Ceramic: 0.068 uF, ±10%, 25 VDCW, Temp coef ±15%.
C603	B19/5CAAD01237	Ceramic: 0.1 uF, ±10%, 25 VDCW, Temp coef ±15%.
C604	B19/5CAAD01724	Ceramic: 0.047 uF, +80%, -20%, 50 VDCW, Temp coef +30%, -80%.
C605	B19/5CAAD01237	Ceramic: 0.1 uF, ±10%, 25 VDCW, Temp coef ±15%.
C606 and C607	B19/5CSAC00932	Tantalum: 10 uF, ±10%, 16 VDCW.
C609	B19/5CAAD00957	Ceramic: 4700 pF, ±10%, 50 VDCW, Temp coef ±15%.
C610	B19/5CSAC01065	Tantalum: 0.47 uF, ±10%, 35 VDCW.
C611	B19/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C612	B19/5CAAD01237	Ceramic: 0.1 uF, ±10%, 25 VDCW, Temp coef ±15%.
C613	B19/5CEAA02283	Electrolytic: 33 uF, ±20%, 25 VDCW.
C614	B19/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C615	B19/5CEAD00756	Electrolytic: 47 uF, ±20%, 16 VDCW.
C616 and C617	B19/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C618	B19/5CEAC00756	Electrolytic: 47 uF, ±20%, 16 VDCW.
C619	B19/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C621	B19/5CSAC00988	Tantalum: 0.22 uF, ±10%, 35 VDCW.
C622	B19/5CEAA02733	Electrolytic: 22 uF, ±20%, 16 VDCW.
C623	B19/5CAAD00839	Ceramic: 100 pF, ±10%, 50 VDCW, Temp coef ±15%.
C624	B19/5CEAC00756	Electrolytic: 47 uF, ±20%, 16 VDCW.
C625	B19/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C701 thru C706	B19/5CAAD00839	Ceramic: 100 pF, ±10%, 50 VDCW, Temp coef ±15%.
C707 thru C711	B19/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C712 and C713	B19/5CAAD00952	Ceramic: 27 pF, ±5%, 50 VDCW, Temp coef ±15%.
C714	B19/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C715	B19/5CSAC01069	Tantalum: 2.2 uF, ±10%, 35 VDCW, Temp coef ±15%.
C716 thru C731	B19/5CAAD00839	Ceramic: 100 pF, ±10%, 50 VDCW, Temp coef ±15%.
C732	B19/5CEAA01827	Electrolytic: 100 uF, ±20%, 16 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
CD602	B19/5TXAD00320	Silicon, fast recovery (2 diodes in series): sim to 1S8226.
CD603 and CD604	B19/5TXAD00290	Silicon, fast recovery (2 diodes in series common): sim to TOSHIBA 1SS184.
CD605	B19/5TXAE00568	Zener: 5 V; sim to HITACHI HZ5C1RE.
CD701 and CD702	B19/5TXAD00320	Silicon, fast recovery (2 diodes in series): sim to TOSHIBA 1SS226.
CD703	B19/5TXAD00290	Silicon, fast recovery (2 diodes in series common): sim to TOSHIBA 1SS184.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - HYBRID CIRCUIT - - - - - - - - -
HC601	B19/6DHFD00168	Filter: sim to MURATA DHFD168.
HC602	B19/6DHFD00169	Filter: sim to MURATA DHFD169.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
IC601	B19/5DAAA00328	Linear, Quad OP Amp: sim to NEC UPC452G2.
IC602	B19/5DAAJ00689	Digital, 8-Channel Analog Multiplexer; sim to MOTOROLA MC14051BF.
IC603	B19/5DAAJ00629	Digital, Bilateral Switch; sim to MC14066BF.
IC604	B19/5DAAA00328	Linear, Quad OP Amp: sim to NEC UPC452G2.
IC606	B19/5DAAJ00688	Digital, Dual D-type Flip-Flip: sim to MOTOROLA MC74HC74F.
IC607	B19/5DAAR00021	Linear, Positive Voltage Regulator: sim to MATSUSHITA AN6541.
IC608	B19/5DAAJ00305	Linear, Positive Voltage Regulator: sim to MOTOROLA MC7805CT.
IC609	B19/5DDAT00763	Linear, Voltage Detector; sim to FUJITSU MB3771PF.
IC610	B19/5DAAJ00305	Linear, Positive Voltage Regulator: sim to MOTOROLA MC7805CT.
IC701	B19/5DDFX00004	Digital, Microcontroller; sim to MATRA HARRIS F-80C32.
IC702	B19/5DAAJ00766	Digital, Octal Transparent Latch: sim to MOTOROLA MC74HC373F.
IC703	B19/5DDAY00366	Digital, EPROM; sim to AMD AM27C64-250DC.
IC704	B19/5DDBY00048	Digital, EEPROM; sim to XICOR X2404.
IC705	B19/5DDAG00274	Digital, P10; sim to OKI MSM82C55A-2GS.
IC706	B19/5DDAF00390	Digital, BCD to n-Segment Decoder/Driver; sim to HITACHI HD74LS47P.
IC707	B19/5DAAJ00688	Digital, Dual d-type Flip-Flop: sim to MOTOROLA MC74HC74F.
IC708	B19/5DDAF00113	Digital, Hex Inverter; sim to HITACHI HD7406P.
ICS703	B19/5ZJAB00028	IC Socket: 28 pins.
ICS704	B19/5ZJAB00033	IC Socket: 8 pins.
		- - - - - - - - - - JACKS - - - - - - - - - -
J601 and J602	B19/5JTCA00137	Connector: 3 pins.
J701	B19/5JJAL00078	Connector: 8 pins.
J702	B19/5JWBS00182	Connector: 24 pins.
J703	B19/5JWBS00240	Connector: 16 pins.
J704	B19/5JTCA00288	Connector: 5 pins.
		- - - - - - - - - - COILS - - - - - - - - - -
L601	B19/5LCAA00599	Croke Coil 20 uH.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P601 and P602	B19/5JDAN00012	Short plug: 2 pins.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R601	B19/5RDAC02449	Metal film: 100K ohms ±5%, 100 VDCW, 1/10 w.
R602	B19/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R603	B19/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w.
R604	B19/5RDAC02453	Metal film: 220K ohms ±5%, 100 VDCW, 1/10 w.
R605	B19/5RDAC02454	Metal film: 22K ohms ±5%, 100 VDCW, 1/10 w.
R606	B19/5RDAC02444	Metal film: 56K ohms ±5%, 100 VDCW, 1/10 w.
R607	B19/5RDAC02449	Metal film: 100K ohms ±5%, 100 VDCW, 1/10 w.
R610	B19/5RDAC02463	Metal film: 560K ohms ±5%, 100 VDCW, 1/10 w.
R611	B19/5REAG03000	Metal film: 634K ohms ±1%, 100 VDCW, 1/10 w.
R612	B19/5REAG03001	Metal film: 249K ohms ±1%, 100 VDCW, 1/10 w.
R613	B19/5REAG03002	Metal film: 100K ohms ±1%, 100 VDCW, 1/10 w.
R614	B19/5REAG03003	Metal film: 40.2K ohms ±1%, 100 VDCW, 1/10 w.

SYMBOL	PART NO.	DESCRIPTION
R615	B19/5REAG03004	Metal film: 15.8K ohms ±1%, 100 VDCW, 1/10 w.
R616	B19/5REAG03005	Metal film: 6.34K ohms ±1%, 100 VDCW, 1/10 w.
R617	B19/5REAG03006	Metal film: 2.49K ohms ±1%, 100 VDCW, 1/10 w.
R618	B19/5REAG03022	Metal film: 931 ohms ±1%, 100 VDCW, 1/10 w.
R623	B19/5REAG03023	Metal film: 1.5K ohms ±1%, 100 VDCW, 1/10 w.
R624	B19/5REAG03007	Metal film: 1K ohms ±1%, 100 VDCW, 1/10 w.
R625	B19/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R627	B19/5RDAC02482	Metal film: 18K ohms ±5%, 100 VDCW, 1/10 w.
R628	B19/5RDAC02453	Metal film: 220K ohms ±5%, 100 VDCW, 1/10 w.
R629	B19/5RZAB01254	Metal film: 91K ohms ±5%, 100 VDCW, 1/10 w.
R630	B19/5RDAA01539	Carbon film: 1.2K ohms ±5%, 300 VDCW, 1/4W.
R631	B19/5RDAC02482	Metal film: 18K ohms ±5%, 100 VDCW, 1/10 w.
R632	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R633	B19/5RDAC02471	Metal film: 470 ohms ±5%, 100 VDCW, 1/10 w.
R634	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R635	B19/5RDAC02486	Metal film: 82K ohms ±5%, 100 VDCW 1/10 w.
R636	B19/5RDAC02462	Metal film: 3.3K ohms ±5%, 100 VDCW, 1/10 w.
R637	B19/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w.
R638	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R639 and R640	B19/5RDAC02487	Metal film: 120K ohms ±5%, 100 VDCW, 1/10 w.
R641	B19/5RDAC02453	Metal film: 220K ohms ±5%, 100 VDCW, 1/10 w.
R642	B19/5RDAC02463	Metal film: 560K ohms ±5%, 100 VDCW, 1/10 w.
R643	B19/5RDAC02587	Metal film: 820K ohms ±5%, 100 VDCW, 1/10 w.
R644	B19/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R645 and R646	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R647	B19/5RDAC02459	Metal film: 180K ohms ±5%, 100 VDCW, 1/10 w.
R648	B19/5RDAC02457	Metal film: 27K ohms ±5%, 100 VDCW, 1/10 w.
R649	B19/5RDAC02488	Metal film: 270K ohms ±5%, 100 VDCW, 1/10 w.
R651 and R652	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R653	B19/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R657	B19/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R701	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R702	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R703	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R704 thru R707	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R708	B19/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w.
R710	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R711	B19/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w.
R712	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R713	B19/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w.
R714	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R715 thru R722	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R723 thru R727	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R728	B19/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w.
R729	B19/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R730	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R731	B19/5RDAC02477	Metal film: 3.9K ohms ±5%, 100 VDCW, 1/10 w.
R732 thru R734	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R735	B19/5RDAC02477	Metal film: 3.9K ohms ±5%, 100 VDCW, 1/10 w.

SYMBOL	PART NO.	DESCRIPTION
R736 thru R746	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R747	B19/5RDAC02581	Metal film: 0 ohms ±5%, 100 VDCW, 1/10 w.
R748	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
RV601	B19/5RVAB00399	Variable: 10K ohms ±30%, 1/10 w.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
TR601 thru TR603	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
TR604	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596.
TR605	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
TR701	B19/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR702	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
TR703	B19/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR704 thru TR709	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
TR710	B19/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR711 thru TR717	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
TR718	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596.
TR719	B19/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR720	B19/5TCAZ00007	Silicon, NPN: sim to SANYO 2SC3396.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
X701	B19/5XHAA00817	Quartz crystal: F=8.192 MHz.
X701-1 and X701-2	B19/5ZJDP00001	Crystal Socket.

PARTS LIST

SYNTHESIZER SECTION
MLS (HIGH BAND)
CMC-552-2
ISSUE 1

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C201 and C202	B19/5CAAD01131	Ceramic: 0.047 uF +10%, 25 VDCW.
C203	B19/5CEAA01829	Electrolytic: 470 uF +20%, 16 VDCW.
C204	B19/5CEAA01982	Electrolytic: 47 uF ±20%, 16 VDCW.
C205	B19/5CAAD01131	Ceramic: 0.047 uF +10%, 25 VDCW.
C206	B19/5CRAA00628	Metallized plastic: 0.047 uF ±5%, 50 VDCW.
C207	B19/5CRAA00773	Metallized plastic: 1 uF ±5%, 50 VDCW.
C208	B19/5CRAA00617	Metallized plastic: 0.1 uF ±5%, 50 VDCW.
C209	B19/5CAAD00958	Ceramic: 150 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C210 and C211	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef +15%.
C212	B19/5CAAD01131	Ceramic: 0.047 uF ±10%, 25 VDCW.
C213 thru C217	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C219	B19/5CAAD00952	Ceramic: 27 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C221	B19/5CZAJ00013	Ceramic: 18 pF ±5%, 50 VDCW, temp coef -750 ±120 PPM.
C222	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C223	B19/5CAAD00950	Ceramic: 15 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C224	B19/5CAAD00840	Ceramic: 22 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C225	B19/5CAAD00949	Ceramic: 2 pF ±0.25 pF, 50 VDCW, temp coef 0±30 PPM.
C226 thru C229	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C230	B19/5CEAA01827	Electrolytic: 100 uF ±20%, 16 VDCW.
C232	B19/5CAAD00962	Ceramic: 6 pF ±0.5 pF, 50 VDCW, temp coef 0±30 PPM.
C233	B19/5CAAD00946	Ceramic: 2200 pF ±10%, 50 VDCW, temp coef ±15%.
C235	B19/5CAAD00955	Ceramic: 39 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C236	B19/5CAAD00949	Ceramic: 2 pF ±0.25 pF, 50 VDCW, temp coef 0±30 PPM.
C237	B19/5CZAJ00013	Ceramic: 18 pF ±5%, 50 VDCW, temp coef -750 ±120 PPM.
C238 and C239	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C240	B19/5CAAD00963	Ceramic: 18 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C241	B19/5CAAD00840	Ceramic: 22 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C242	B19/5CAAD00949	Ceramic: 2 pF ±0.25 pF, 50 VDCW, temp coef 0±30 PPM.
C243 thru C245	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C247	B19/5CEAA01831	Electrolytic: 1 uF +20%, 50 VDCW.
C248	B19/5CSAC00939	Tantalum: 22 uF ±10%, 16 VDCW.
C249	B19/5CEAA01829	Electrolytic: 470 uF +20%, 16 VDCW.
C251	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C256	B19/5CAAD01131	Ceramic: 0.047 uF +10%, 25 VDCW.
C257	B19/5CEAA01982	Electrolytic: 47 uF +20%, 16 VDCW.
C258	B19/5CRAA00587	Polyester: 0.01 uF +5%, 50 VDCW.
C259	B19/5CEAA01982	Electrolytic: 47 uF +20%, 16 VDCW.
C260	B19/5CRAA00617	Metallized plastic: 0.1 uF +5%, 50 VDCW.
C261	B19/5CEAA01982	Electrolytic: 47 uF +20%, 16 VDCW.
C262 and C263	B19/5CEAA01864	Electrolytic: 10 uF +20%, 25 VDCW.
C264	B19/5CRAA00587	Polyester: 0.01 uF +5%, 50 VDCW.
C265	B19/5CRAA00585	Polyester: 1000 uF +5%, 50 VDCW.
C266	B19/5CAAD00962	Ceramic: 6 pF +.5 pF, 50 VDCW, temp coef 0±30 PPM.
C267 and C268	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C273 thru C275	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
C282	B19/5CAAD00974	Ceramic: 390 pF +5%, 50 VDCW, temp coef 0±30 PPM.
C283	B19/5CSAC01444	Tantalum: 3.3 uF ±10%, 20 VDCW.
C284	B19/5CRAA00838	Metalized plastic: 0.47 uF ±5%, 50 VDCW.
C285 and C286	B19/5CEAA01827	Electrolytic: 100 uF ±20%, 16 VDCW.
C291 and C292	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, temp coef ±15%.
CV201	B19/5CVAB00080	Variable: 10 pF max.
CV201	B19/5CVAB00089	Variable: 15 pF max.
		- - - - - - - - - - DIODES - - - - - - - - - -
CD201	B19/5TXAE00587	Zener: 4.0 V; sim to Hitachi HZ4B3.
CD202	B19/5TXAE00566	Zener: 3.0 V; sim to Hitachi HZ3B-2.
CD203	B19/5TXAE00704	Silicon: variable capacitance diode; sim to Hitachi 1SV202.
CD204	B19/5TXAD00320	Silicon: fast recovery (2 diodes in series); sim to Toshiba 1SS226.
CD205	B19/5TXAA00326	Silicon: Schottky Barrier; sim to NEC 1S897.
CD206	B19/5TXAE00566	Zener: 3.0 V; sim to Hitachi HZ3B-2.
CD207	B19/5TXAE00690	Silicon: variable capacitance diode; sim to Hitachi 1SV202.
CD208	B19/5TXAE00691	Silicon: variable capacitance diode; sim to Hitachi 1SV202.
CD210	B19/5TXAA00326	Silicon: Schottky Barrier; sim to NEC 1S897.
CD211	B19/5TXAE00566	Zener: 3.0 V; sim to Hitachi HZ3B-2.
CD213 and CD214	B19/5TXAD00320	Silicon: fast recovery (2 diodes in series); sim to Toshiba 1SS226.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
IC201	B19/5DAAJ00328	Synthesizer: CMOS serial input, sim to Motorola MC145159P.
IC202	B19/5DDAT00206	Prescaler: sim to FUJITSU MB501P.
IC203	B19/5DAAJ00629	Digital, bilateral switch: sim to Motorola MC14066BFR.
IC204 thru IC206	B19/5DAAA00284	RF wide-band amplifier; sim to NEC UPC1676G.
IC207	B19/5DAAR00021	Linear, positive voltage regulator; sim to Matsushita AN6541.
IC208	B19/5DAAN00365	Linear, dual OP Amp: sim to 4558 type.
IC209	B19/5DAAA00183	RF wide-band amplifier; sim to NEC UPC1656C.
IC210	B19/5DDAB00367	Linear, dual OP Amp: sim to Mitsubishi M5223FP.
		- - - - - - - - - - CONNECTORS - - - - - - - - - -
J201	B19/5JWCL00058	Connector.
		- - - - - - - - - - COILS - - - - - - - - - -
L201	B19/5LCAC00887	Choke coil: 0.47 uH +10%.
L202	B19/5LZAC00042	Coil, RF.
L204	B19/5LCAC00887	Choke coil: 0.47 uH +10%.
L205	B19/5LCAA00314	Choke coil: 1.5 uH +20%.
L206	B19/5LZAV00043	Coil, RF.
L208	B19/5LCAA00315	Choke coil: 0.22 uH +20%.
L210	B19/6ZAFD01288	Coil, RF.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R201	B19/5RDAC02465	Metal film: 22 ohms +5%, 1/10 w.
R204	B19/5RDAA01480	Carbon film: 330 ohms +5%, 1/4 w.
R205	B19/5RDAC02449	Metal film: 100K ohms +5%, 1/10 w.
R206	B19/5RDAC02458	Metal film: 6.8K ohms +5%, 1/10 w.
R207	B19/5RDAC02462	Metal film: 3.3K ohms +5%, 1/10 w.
R209	B19/5RDAC02453	Metal film: 220K ohms +5%, 1/10 w.
R210	B19/5RDAC02439	Metal film: 47K ohms +5%, 1/10 w.
R211	B19/5RDAC02481	Metal film: 15K ohms +5%, 1/10 w.
R212	B19/5RDAC02451	Metal film: 2.2K ohms +5%, 1/10 w.
R213 and R214	B19/5RDAC02445	Metal film: 10K ohms +5%, 1/10 w.
R219	B19/5RDAC02439	Metal film: 47K ohms +5%, 1/10 w.
R221	B19/5RDAC02467	Metal film: 68 ohms +5%, 1/10 w.
R222	B19/5RDAC02460	Metal film: 47 ohms +5%, 1/10 w.
R223	B19/5RDAC02468	Metal film: 150 ohms +5%, 1/10 w.
R224	B19/5RDAC02466	Metal film: 33 ohms +5%, 1/10 w.
R225	B19/5RDAC02468	Metal film: 150 ohms +5%, 1/10 w.
R226	B19/5RDAC02581	Metal film: 0 ohms.
R227	B19/5RDAC02490	Metal film: 470K ohms +5%, 1/10 w.
R228	B19/5RDAC02454	Metal film: 22K ohms +5%, 1/10 w.
R229	B19/5RDAC02458	Metal film: 6.8K ohms +5%, 1/10 w.
R230	B19/5RDAC02439	Metal film: 47K ohms +5%, 1/10 w.
R231	B19/5RDAC02467	Metal film: 68 ohms +5%, 1/10 w.
R232	B19/5RDAC02460	Metal film: 47 ohms +5%, 1/10 w.
R233	B19/5RDAC02554	Metal film: 120 ohms +5%, 1/10 w.
R234	B19/5RDAC02570	Metal film: 330 ohms +5%, 1/10 w.
R235	B19/5RDAC02554	Metal film: 120 ohms +5%, 1/10 w.
R236	B19/5RDAC02470	Metal film: 330 ohms +5%, 1/10 w.
R240 and R241	B19/5RDAC02472	Metal film: 680 ohms +5%, 1/10 w.
R242	B19/5RDAC02474	Metal film: 1.5K ohms +5%, 1/10 w.
R243	B19/5RDAC02488	Metal film: 270K ohms +5%, 1/10 w.
R244	B19/5RDAC02447	Metal film: 100 ohms +5%, 1/10 w.
R245	B19/5RDAC02478	Metal film: 4.7K ohms +5%, 1/10 w.
R246	B19/5RDAC02452	Metal film: 5.6K ohms +5%, 1/10 w.
R248	B19/5RDAC02473	Metal film: 1.2K ohms +5%, 1/10 w.
R249	B19/5RDAC02446	Metal film: 1K ohms +5%, 1/10 w.
R250	B19/5RDAC02482	Metal film: 18K ohms +5%, 1/10 w.
R251	B19/5RDAC02457	Metal film: 27K ohms +5%, 1/10 w.
R252	B19/5RDAC02445	Metal film: 10K ohms +5%, 1/10 w.
R253	B19/5RDAC02473	Metal film: 1.2K ohms +5%, 1/10 w.
R254	B19/5RDAC02444	Metal film: 56K ohms +5%, 1/10 w.
R255	B19/5RDAC02445	Metal film: 10K ohms +5%, 1/10 w.
R256	B19/5RDAC02483	Metal film: 33K ohms +5%, 1/10 w.
R257	B19/5RDAC02449	Metal film: 100K ohms +5%, 1/10 w.
R258 and R259	B19/5RDAC02466	Metal film: 33 ohms +5%, 1/10 w.
R260 and R261	B19/5RDAC02445	Metal film: 10K ohms +5%, 1/10 w.
R262	B19/5RDAC02451	Metal film: 2.2K ohms +5%, 1/10 w.
R263	B19/5RDAC02467	Metal film: 68 ohms +5%, 1/10 w.
R264	B19/5RDAC02582	Metal film: 82 ohms +5%, 1/10 w.
R265	B19/5RDAC02471	Metal film: 470 ohms +5%, 1/10 w.
R266	B19/5RDAC02467	Metal film: 68 ohms +5%, 1/10 w.
R268	B19/5RDAC02471	Metal film: 470 ohms +5%, 1/10 w.
R270	B19/5RDAC02470	Metal film: 330 ohms +5%, 1/10 w.
R271	B19/5RDAC02464	Metal film: 15 ohms +5%, 1/10 w.
R272	B19/5RDAC02470	Metal film: 330 ohms +5%, 1/10 w.
R275	B19/5RDAC02445	Metal film: 10K ohms +5%, 1/10 w.
R277	B19/5RDAC02455	Metal film: 150K ohms +5%, 1/10 w.
R278	B19/5RDAC02461	Metal film: 1M ohms +5%, 1/10 w.
R279 and R280	B19/5RDAC02451	Metal film: 2.2K ohms +5%, 1/10 w.
R281	B19/5RDAC02447	Metal film: 100 ohms +5%, 1/10 w.
R282 thru R285	B19/5RDAC02449	Metal film: 100K ohms +5%, 1/10 w.
R287	B19/5RDAC02445	Metal film: 10K ohms +5%, 1/10 w.
RV201 thru RV203	B19/5RVAB00411	Variable: 10K ohms ±30%, 1/10 w.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
TR202	B19/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR205	B19/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR206	B19/5TKAH00006	N-Channel, field effect. (Junction single gate); sim to Sony 2SK125.
TR207	B19/5TCAZ00011	Silicon, NPN: sim to Sanyo 2SC3398.
TR209	B19/5TKAH00006	N-Channel, field effect. (Junction single gate); sim to Sony 2SK125.
TR210 and TR211	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596.
TR215	B19/5TDAB00054	Silicon, NPN: sim to NEC 2SD596.
TR216	B19/5TCAZ00011	Silicon, NPN: sim to Sanyo 2SC3398.
		- - - - - - - - - - CRYSTAL - - - - - - - - - -
XU201	B19/6XNFD00017	Reference oscillator unit.

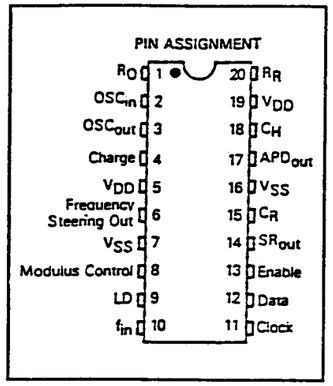
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

CAUTION

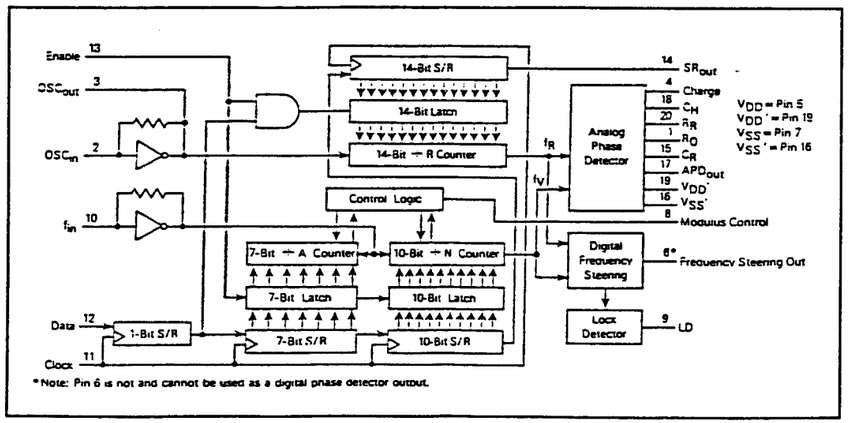
OBSERVE PRECAUTIONS FOR HANDLING

ELECTROSTATIC SENSITIVE DEVICES

MC145159-1

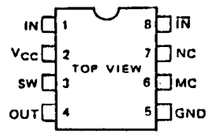


This device contains circuitry to protect the inputs aganist damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

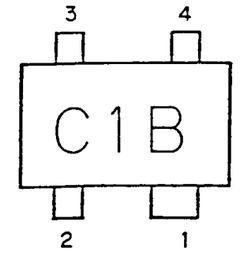


RC-5448

PIN ASSIGNMENT



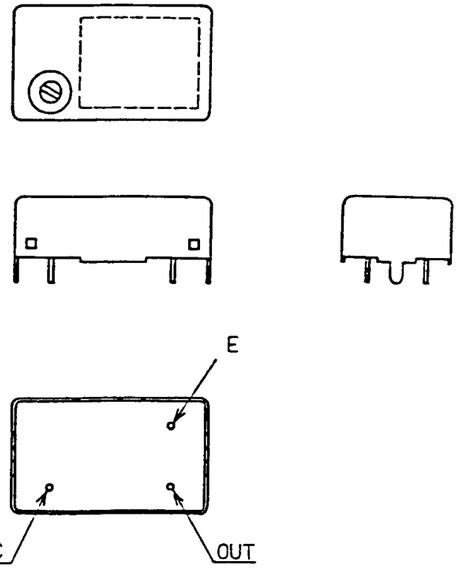
RC-5471



NEC UPC1676G

1. GND
2. OUTPUT
3. Vcc
4. INPUT

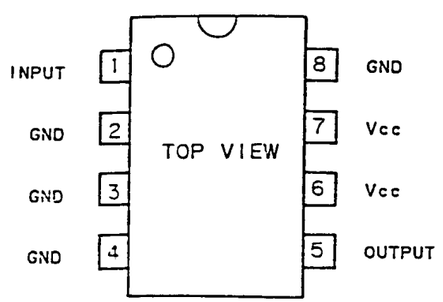
RC-7849



RC-7852

PIN ASSIGNMENT

NEC UPC1656C

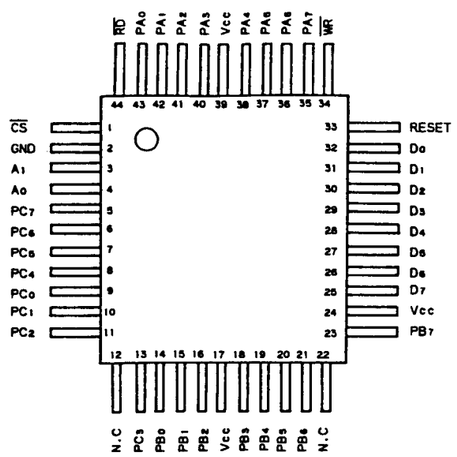


RC-7850

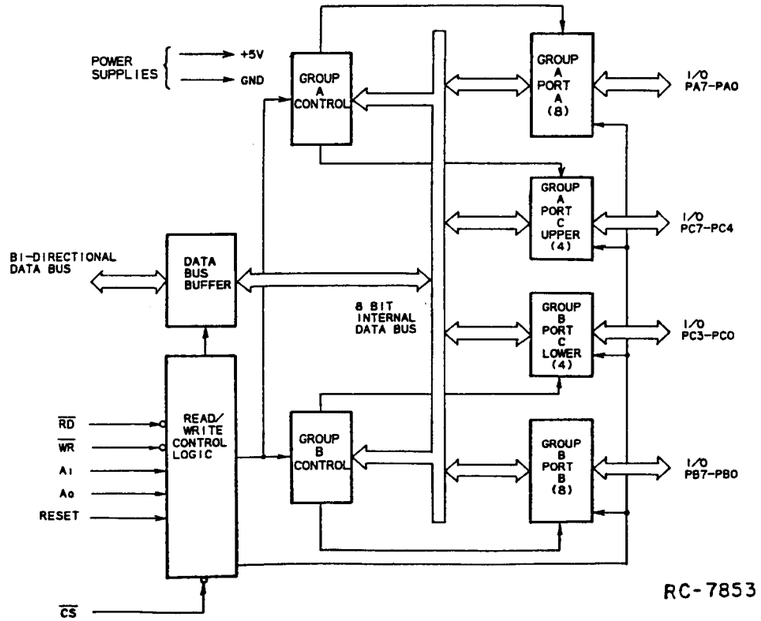
PROGRAMMABLE PERIPHERAL INTERFACES

(IC705) MSM82C55A

PIN CONFIGURATION



BLOCK DIAGRAM

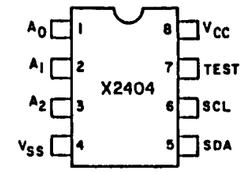


RC-7853

DIGITAL 512X8 EEPROM

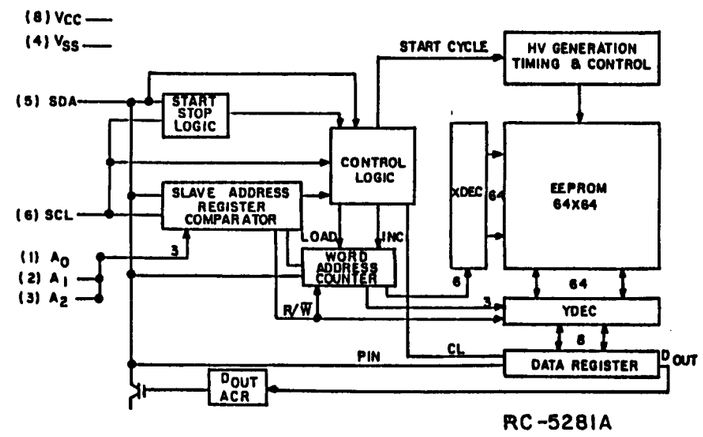
(IC704)

PIN CONFIGURATION



1 A_0 → TO V_{SS}
2 AND 3 A AND A ADDRESS INPUTS
4 V_{SS}
5 SDA SERIAL DATA — I^2C BUS
6 SCL SERIAL CLOCK —
7 TEST INPUT — TO V_{SS}
8 V_{CC}

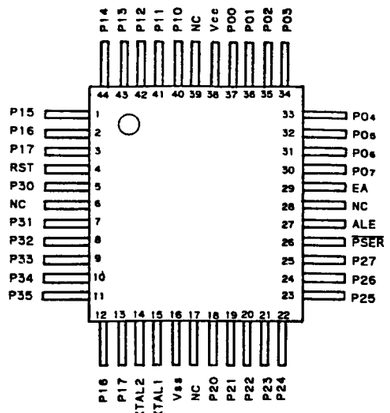
FUNCTION DIAGRAM



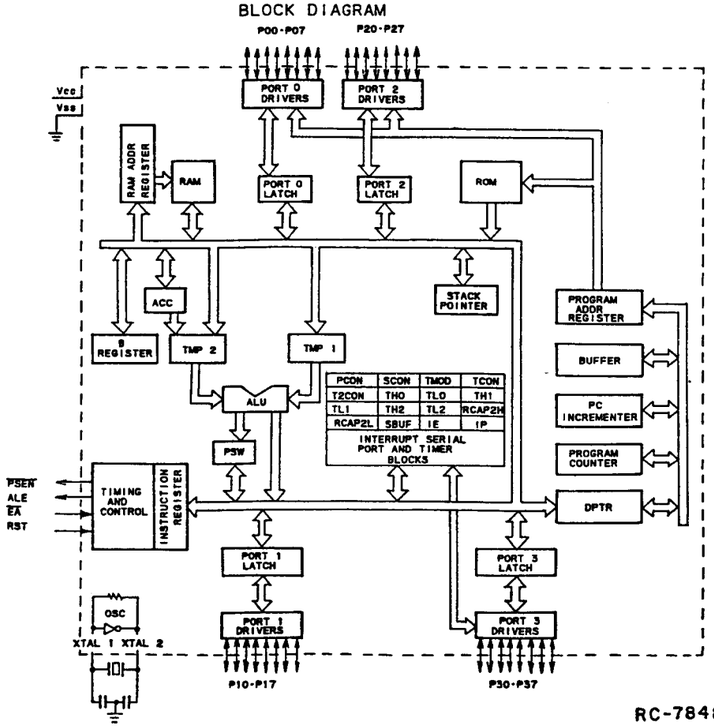
RC-5281A

PIN CONFIGURATION

(IC701)



BLOCK DIAGRAM



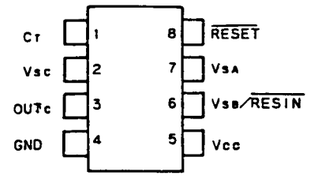
RC-7848

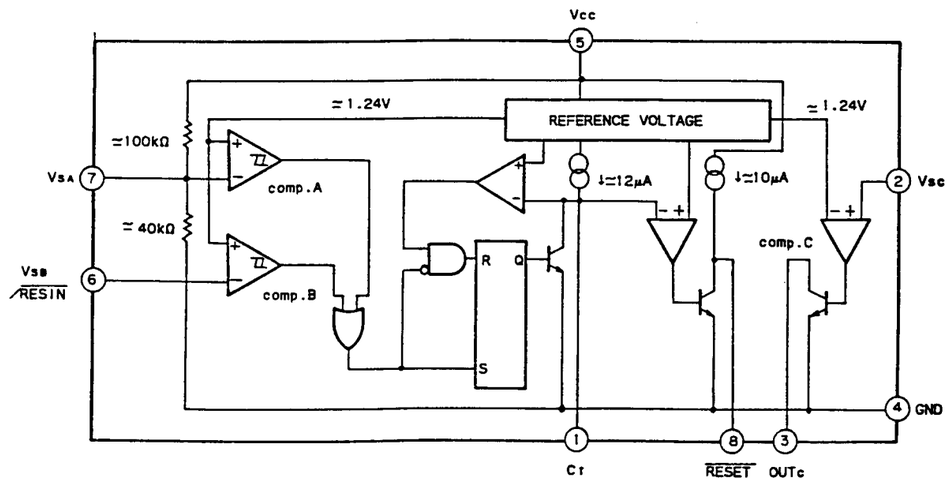
RESET CIRCUIT

(IC609) MB3771

BI9/5DDAT00763

PIN CONFIGURATION





RC-7851

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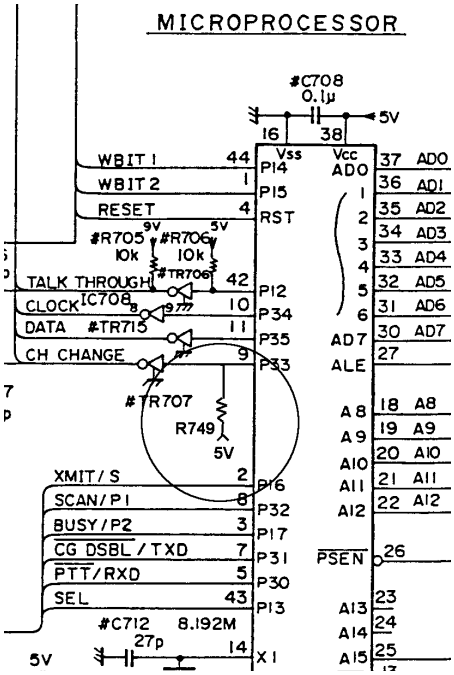
ADDENDUM #1 TO LBI-38423A
(PCML)

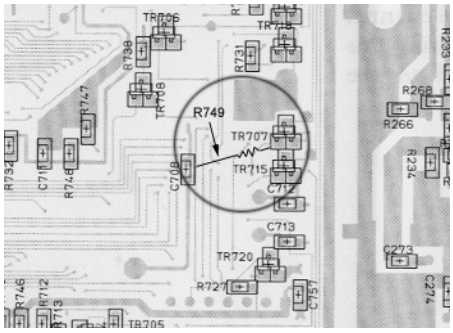
This addendum provides revision letter changes which have not yet been published in LBI-38423A. The revision is made to improve power-up performance of the microprocessor. This was done by adding a 10K ohm pullup resistor (R749). The resistor is installed between IC701 Pin 9 and the 5 VDC power supply (see diagrams below).

REV B

Parts List: CMC-552-1 Issue 1 is changed to add the following:

R749 – B19/5RDAA01146, Carbon Film: 10K ohm

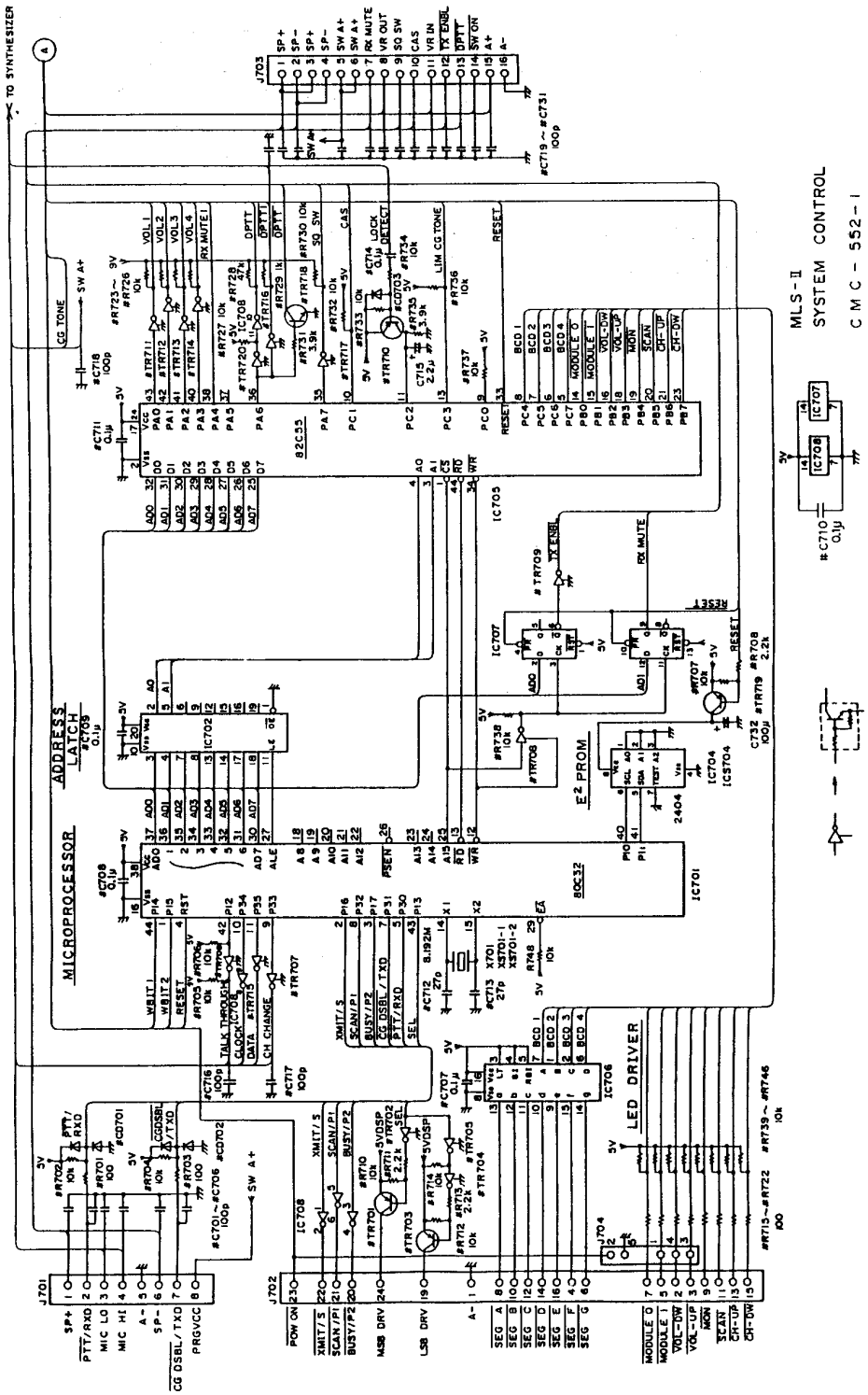




ADDENDUM # 2 TO LBI-38423A
(PCML)

This addendum updates the Schematic Diagram and parts list to reflect new changes in the system control section of the system board. Changes included changing the microprocessor from an unmasked part to a masked part. Deleted IC703, ICS703 and R747. The new part number for the microprocessor is listed below. The schematic diagram is attached:

IC701 – B19/5DDFX00005: Digital Microcontroller; sim to MATRA HARRIS F-80C52-586.



SCHEMATIC DIAGRAM
SYSTEM CONTROL
CMC-552-1