MAINTENANCE MANUAL

SYSTEM CONTROL/SYNTHESIZER BOARD CMC-553 FOR MLSU141 & MLSU241 TWO-WAY MOBILE RADIO COMBINATIONS

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DESCRIPTION

The System Control/Synthesizer Board (A801) for the MLSU141/241 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-553) mounts in the top section of the frame assembly as shown in Figure 1 - System Control/Synthesizer Board Location.

System Control/Synthesizer Board CMC-553 provides the microprocessor, control logic and the audio processing for both the Transmitter circuit and the Receiver circuit. This board also provides the synthesizer circuit for generating operating frequencies.

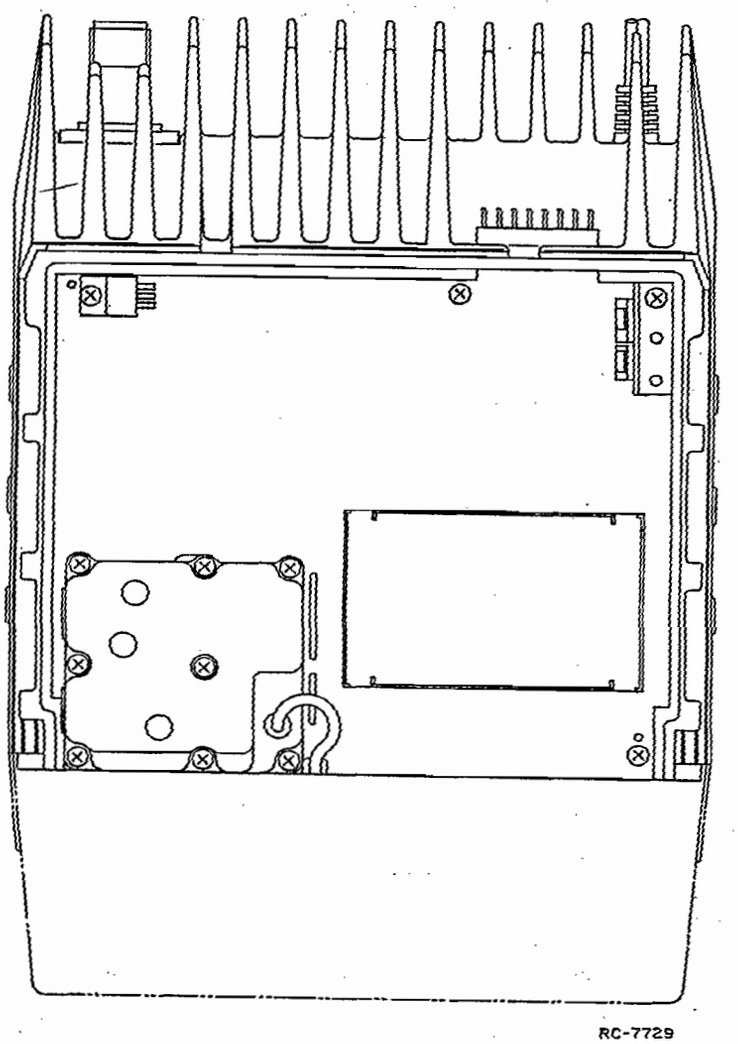


Figure 1 - System Control/Synthesizer Location (Top View)

CIRCUIT ANALYSIS

POWER DISTRIBUTION

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

Pressing in 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.

Digital Processing

The digital processing circuitry consists of microprocessor IC701, Octal Latch IC702, EPROM IC703, EEPROM IC704, PIO IC705 and FlipFlop 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.).

OPERATION:

Octal Latch IC702

Octal latch IC702, is used to exchange data passing between 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.

Reset

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

Microprocessor

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 manual initiated functions of Push-To-Talk (PTT), frequency selection (ADD, DELETE), MONITOR, VOLUME and SCAN ADD and DELETE through PIO IC705. Other functions are performed automatically by the microprocessor.

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 $\overline{PSEN}$ 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 PC Programmer through HKSW, MIC PTT, and with Personality EEPROM IC704. The microprocessor control signals include the following:

$\overline{EA}$	-	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.

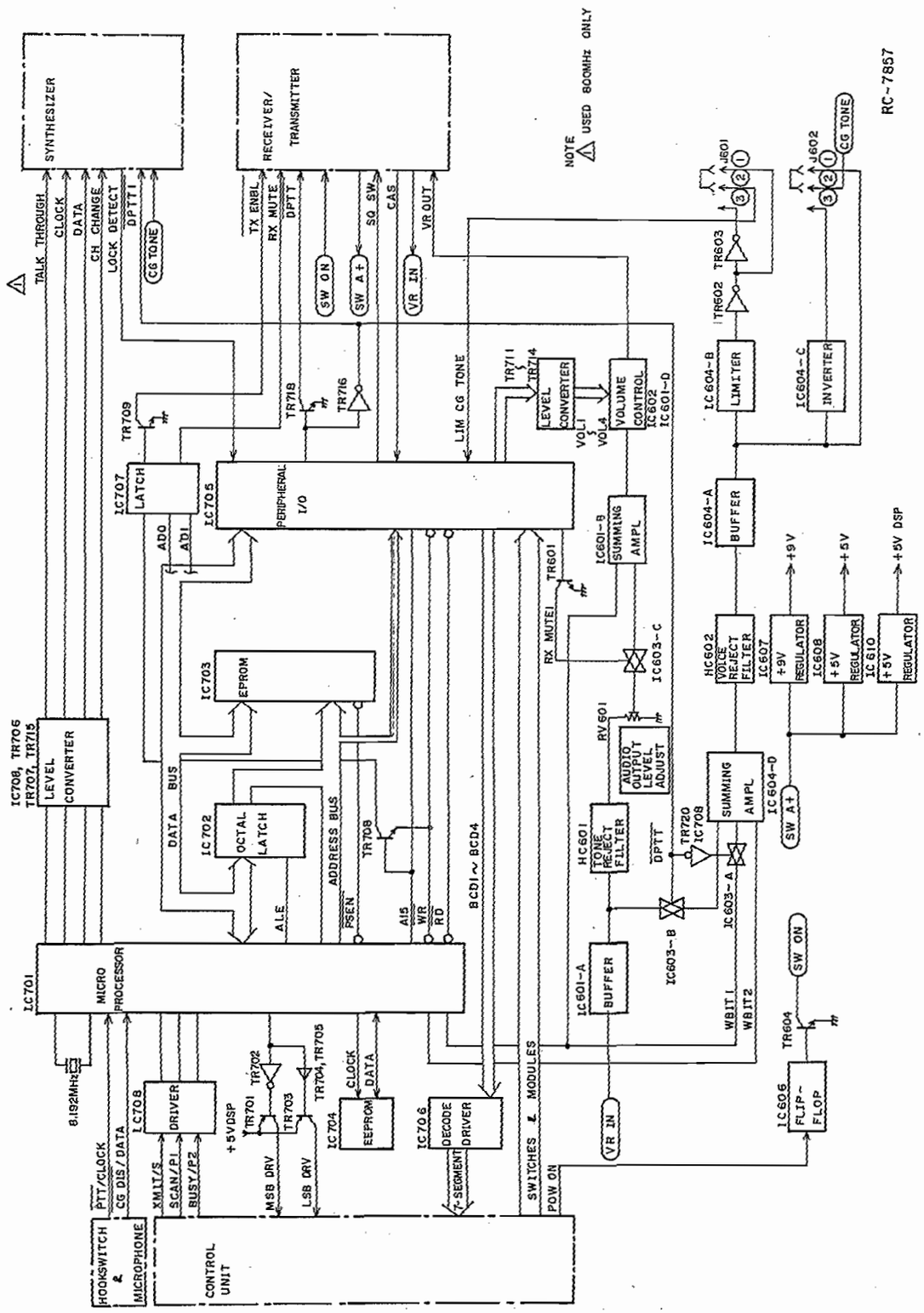


Figure 2 - System Control Block Diagram

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 turns 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.

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

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 output $\overline{\text{DPTT}}$ through inverter IC708. $\overline{\text{DPTT1}}$, $\overline{\text{DPTT}}$ and $\overline{\text{DPTT}}$ 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 Transmitter/Receiver board to apply 9 volts to the exciter and key the transmit circuit.

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 DETECT line to verify that the synthesizer is "on" frequency. If the synthesizer is not locked on the correct frequency, a high on the LOCK DETECT 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 transmit circuit.

Monitor

Pressing the MONITOR push-button 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.

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 generate the Channel Guard Signal. This signal is applied as Walsh Bits "1" and "2" to summing amplifier IC604-D. These tow 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 VR IN at J703-11 is applied to low-pass filter (Voice Reject) HC602 through buffer amplifier IC604-A. This signal is filtered and only the Channel Guard (if present) is applied to hard limiter IC604-B.

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.

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.

Audio Circuitry

Transmit and receiver audio signals are routed through three-stage bilateral switches 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).

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 TONE input of Channel Guard Deviation Adjust potentiometer RV202. The Channel Guard tones and audio are combined and applied to summing amplifier IC208-A.

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 summing amplifier IC604-D to low-pass filter (Voice Rejection) 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 FLIPFLOP and PIO outputs 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.

Frequency Synthesizer

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

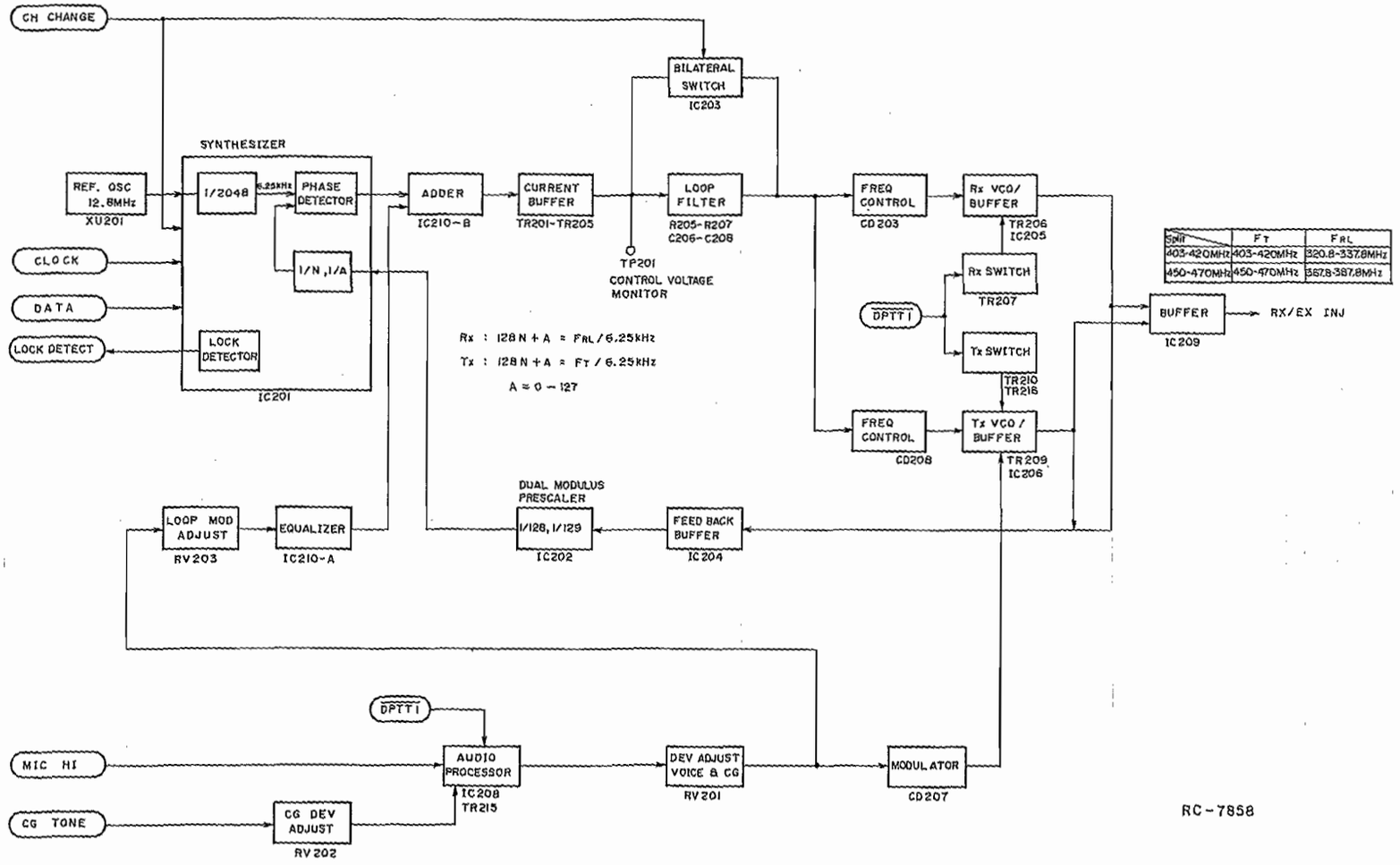


Figure 3 - Synthesizer Block Diagram

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/±2.5PPM. 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).

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 pre-scaler 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 compared 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. The LOCK DETECT lead is negative going pulses when the PLL is out of lock. When locked on frequency the lead is high.

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.

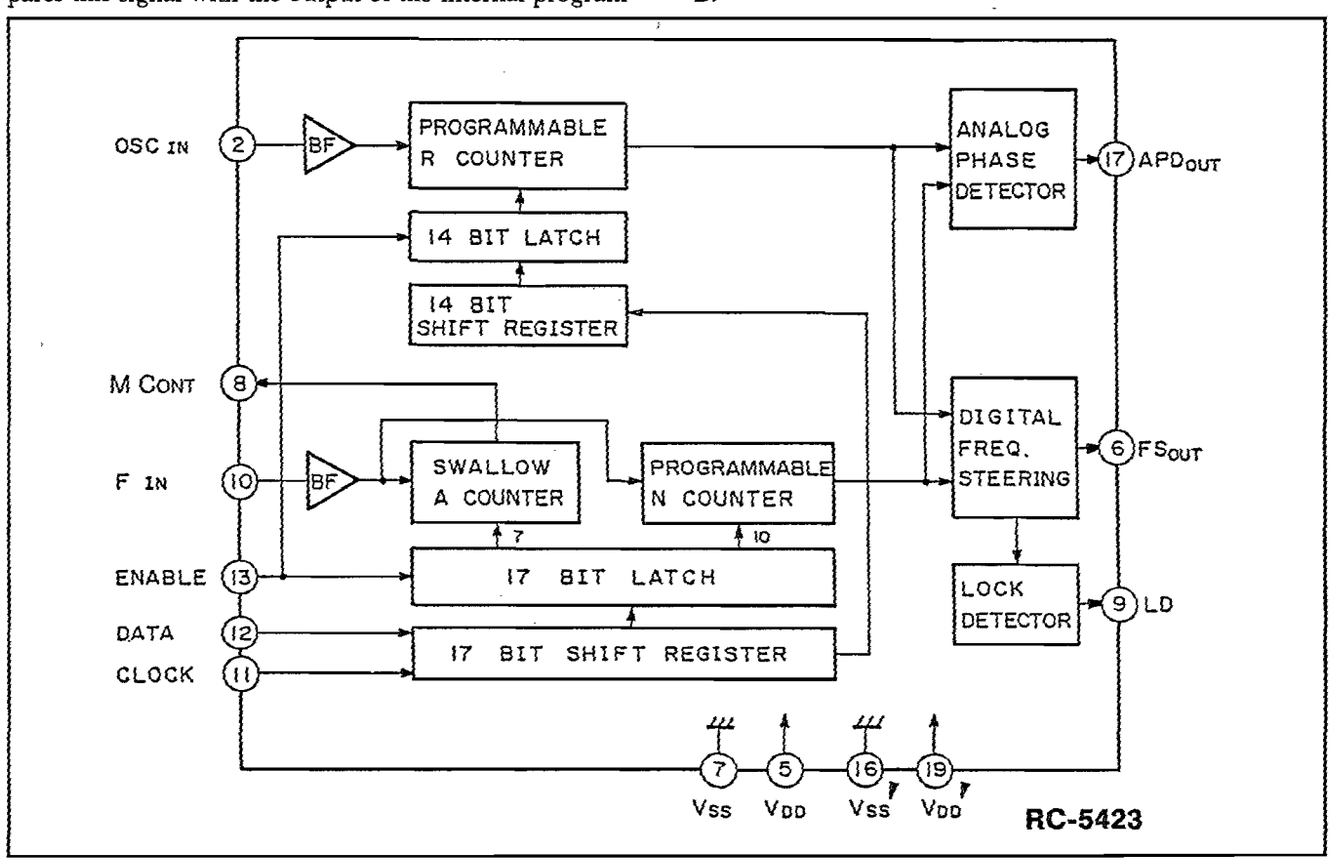


Figure 4 - Synthesizer IC201

DC Offset and High Current Buffers:

DC offset buffers TR205, TR204 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. R204, CD204 and TR205 complete 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 switches 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.

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 millisecond, 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.

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 5 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 +4 dBm. RX VCO lock time is 15 milliseconds maximum.

Transmitter VCO:

The transmitter VCO is basically the same as the Receiver VCO. The varicap provides a voltage controlled adjustment range of approximately 10 MHz. The EX injection provides a typical output of +4 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 transmit 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.

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 5 MHz when the control voltage moves from its lower limit to its upper limit. The TX VCO moves about 10 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 VCO's 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 limit of the voltage range at the highest frequency channel.

NOTE

Going too high with the voltage setting at the highest frequency channel may cause problems over temperature extremes as the VCO's 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 VCO's is to cover the proper frequency range. For instance, to cover 450 to 460 MHz the VCO must be tunable such that at 460 MHz the control voltage is equal to the upper voltage limit, and at 450 MHz the voltage must be greater than the lower limit. If the control voltage can be tuned higher than the lower limit at 450 MHz, this simply means that you can program channels below 450 MHz until you finally run into the lower voltage limit. When tuning the VCO's to a channel close to 460 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 470 MHz, you may not achieve the maximum control voltage for all radios, but you will always be greater than the lower voltage limit.

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.

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 128 or 129 under control of M Cont from the synthesizer. The output of the prescaler is applied to the synthesizer where it is divided down to 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.

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, R250-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.

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 detected 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, i.e., 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, i.e., 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 channels of the non-priority list between each P1, P2 scan 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.

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 channel, then it is sampled every 2.5 seconds if it has Channel Guard 1 (P1) and carrier is detected, and every 500 milliseconds otherwise. If there are 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. No carriers detected

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 milliseconds
ts = 100 milliseconds for P1
250-500 milliseconds 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 seconds
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, and 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-...

tb = 2.5 seconds
ts = 250-500 msec

CONDITION 2: Priority 1 Has Channel Guard Programmed, PRI 2 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-...

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 milliseconds
ts = 100 milliseconds for P1
250-500 milliseconds 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

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, and every 2.5 seconds if 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).

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 hookswitch 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.

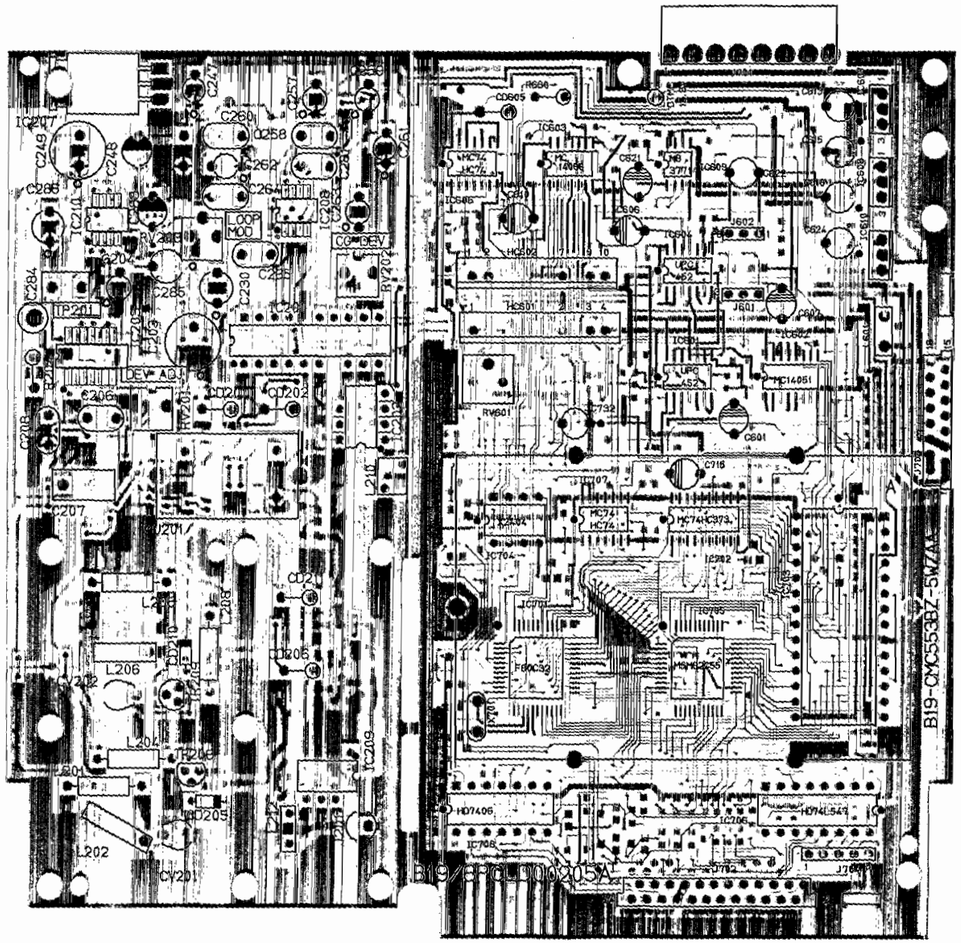
When in the scan mode and the channel display blinks while displaying a channel number, this indicates that one of the scan channels is not locking on frequency (not properly programmed, radio not properly aligned, etc.). Slowly stepping through the channels with scan disabled will reveal the bad channel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

ERICSSON

Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg, Virginia 24502

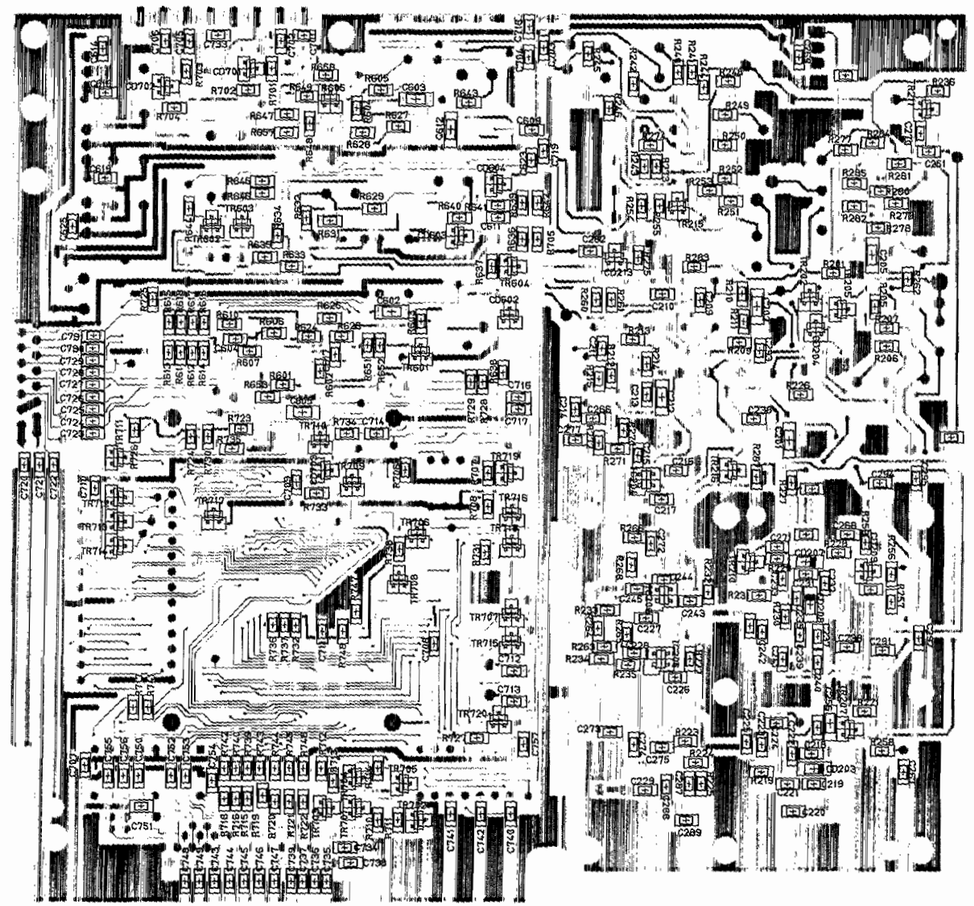
Printed in U.S.A.

COMPONENT SIDE



(RC-7859-1)
(RC-7860-1)
(RC-7860-2)

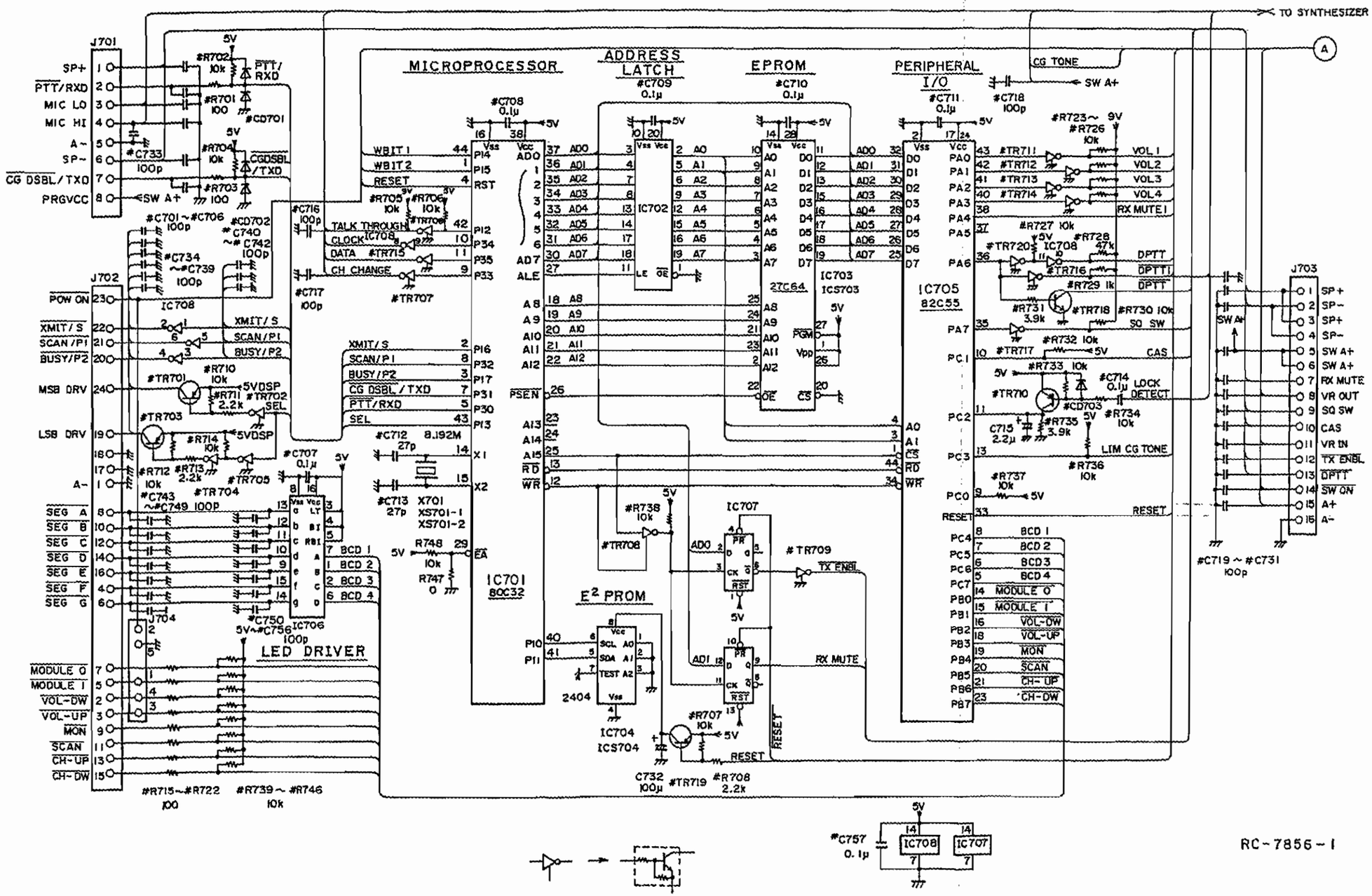
SOLDER SIDE



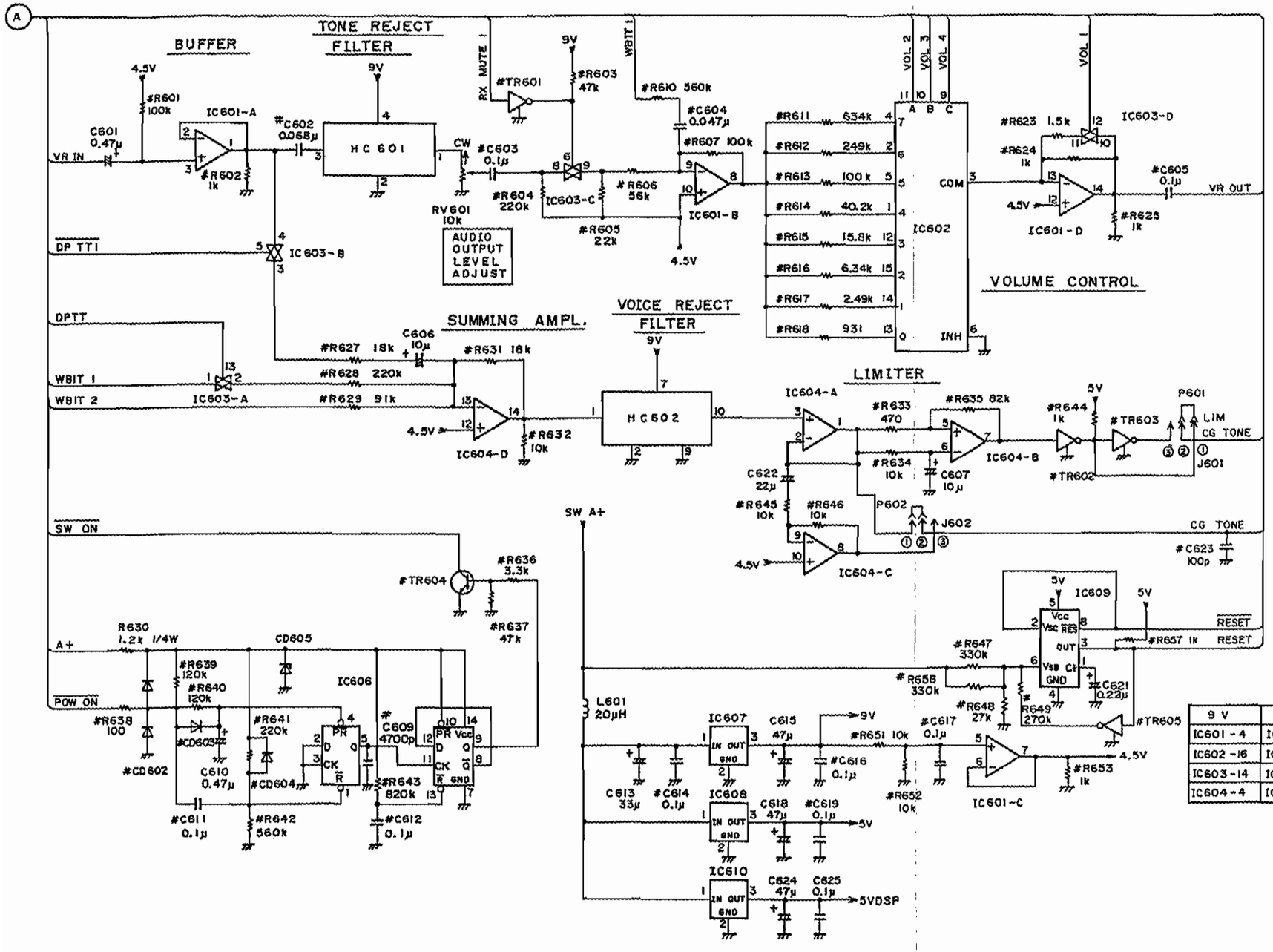
(RC-7860-2)
(RC-7859-2)
(RC-7861-1)

System Control/Synthesizer Board

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE



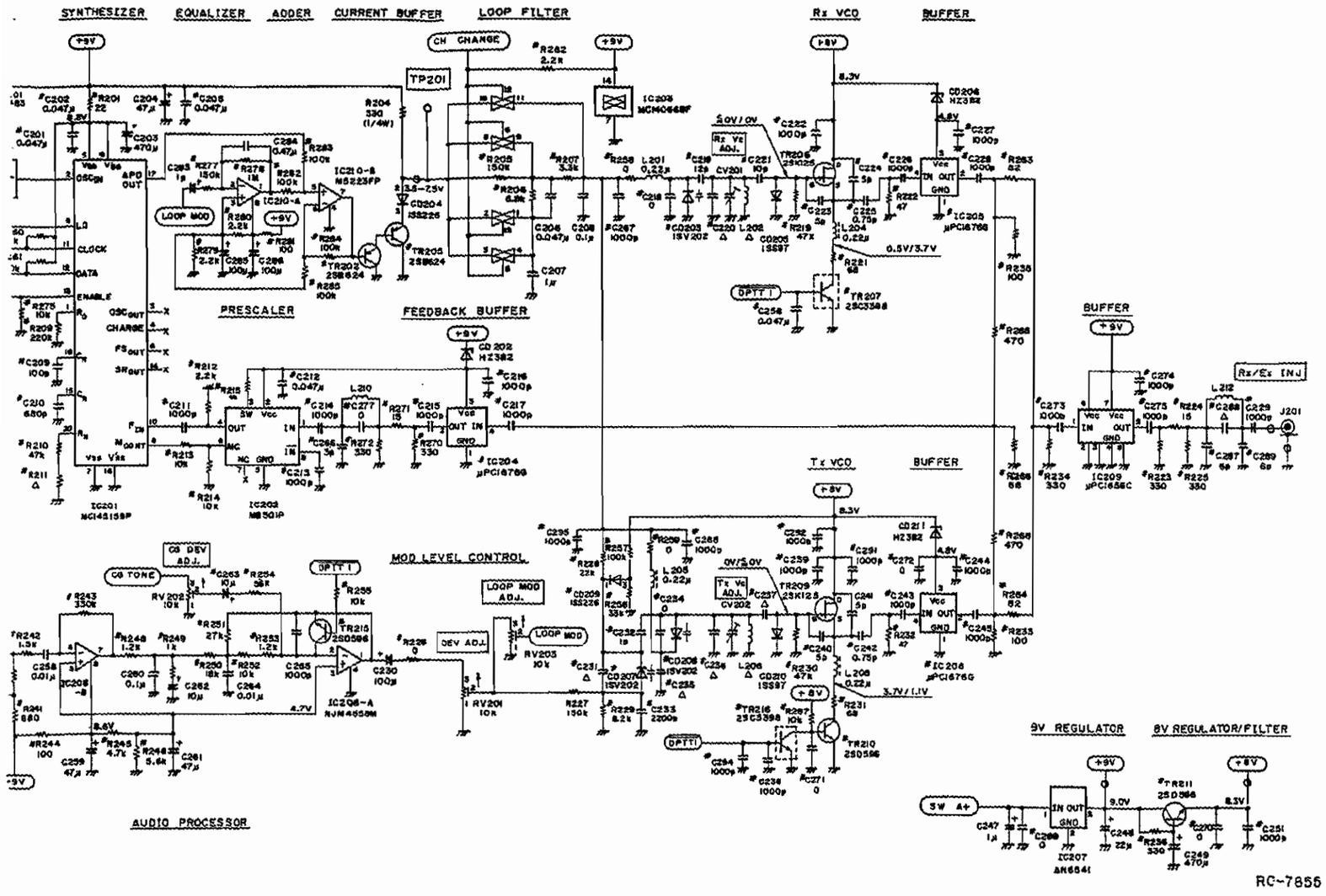
System Control 1/2



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

RC-7856-2

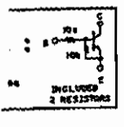
System Control 2/2



△ COMPONENT IDENTIFICATION CHART

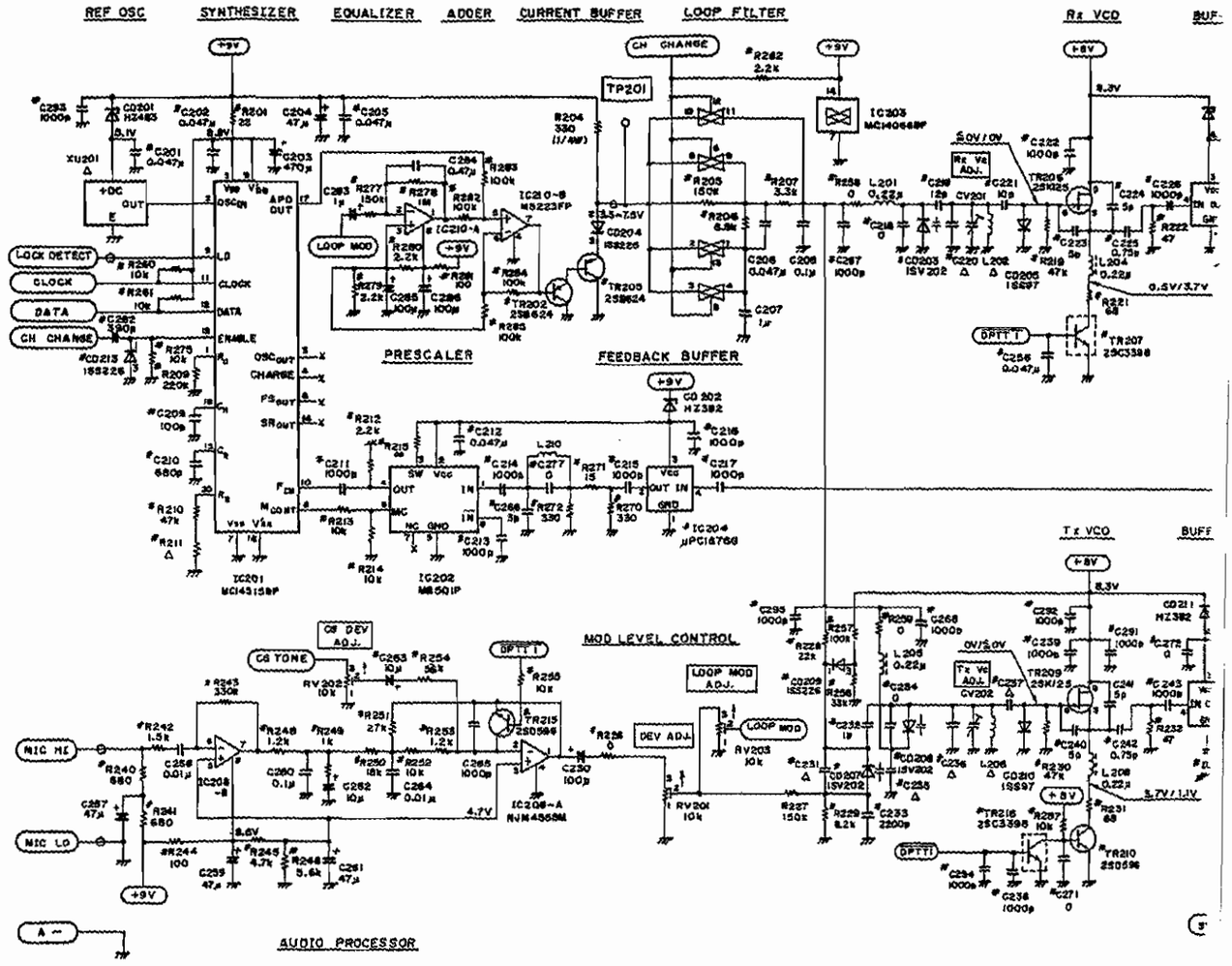
SPLIT / TEMP STAB. / SYMBOL	CMC - 553A - 2 403 - 420 MHz		CMC - 553B - 2 440 - 470 MHz	
	2.5 PPM	5 PPM	2.5 PPM	5 PPM
C 220	4 pF		2 pF	
C 231	1 pF		0	
C 235	12 pF		10 pF	
C 236	1 pF		0	
C 237	15 pF		10 pF	
C 287	6 pF		6 pF	
C 288	3 pF		2 pF	
C 289	6 pF		6 pF	
L 202	6LALD120		6LALD87	
L 206	6LALD119		6LALD80	
R 211	330Ω		220Ω	
XU 201	XPJ12-1	XPJ13-1	XPJ12-1	XPJ13-1

RC-7854



IDENTIFIES "CHIP" COMPONENTS (EXAMPLE # R234) WHICH ARE LOCATED ON SOLDER SIDE OF PWB.

RESISTORS ARE 1/10 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER K OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER μ OR p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER μ.


REF OSC
SYNTHESIZER
EQUALIZER
ADDER
CURRENT BUFFER
LOOP FILTER
Rx VCO
BUF
+9V
CH CHANGE
TP201
IC203 MC14066BF
8.3V
5.0V/0V
Rx Vc ADJ.
0.5V/3.7V
LOCK DETECT
CLOCK
DATA
CH CHANGE
XU201
+DC OUT
IC201 MC145158P
PRESCALER
IC202 MB501P
FEEDBACK BUFFER
IC204 μPC1676G
LOOP MOD
IC210-A
IC210-B M5223FP
DRIFT
TR207 2SC3358
Tx VCO
BUFF
0V/5.0V
Tx Vc ADJ.
TR209 2SK125
TR210 2SD596
TR216 2SC3396
CG DEV ADJ.
CG TONE
DPTT
MOD LEVEL CONTROL
LOOP MOD ADJ.
DEV ADJ.
RV201 10k
RV202 10k
RV203 10k
MIC HI
MIC LO
A −
IC206-A NJM4558M
4.7V
8.6V
AUDIO PROCESSOR
2SC3396
INCLUDES 2 RESISTORS
IDENTIFIES "CHIP" COMPONENTS (EXAMPLE # R234) WHICH ARE LOCATED ON SOLDER SIDE OF PWB.
RESISTORS ARE 1/10 WATT UNLESS OTHERWISE SPECIFIED. RESISTOR VALUES IN Δ UNLESS FOLLOWED BY MULTIPLIER k OR M.
CAPACITOR VALUES IN P UNLESS FOLLOWED BY MULTIPLIER μ OR n.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER μ.

PARTS LIST

SYSTEM CONTROL SECTION
MLS (CNF)
CMC-553-1
18SEP 1

SYMBOL	GE PART NO.	DESCRIPTION
		819/CMC-553A5 (403-420 MHz SPPH; 819/CMC-553B5 (450-470 MHz SPPH; 819/CMC-553A2 (450-470 MHz 2.5PPM;
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ CAPACITORS ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
C601	819/5CSAC01065	Tantalum: 0.47 uF, ±10%, 35 VDCW.
C602	819/5CAAD01201	Ceramic: 0.068 uF, ±10%, 25 VDCW, Temp coef ±15%.
C603	819/5CAAD01237	Ceramic: 0.1 uF, ±10%, 25 VDCW, Temp coef ±15%.
C604	819/5CAAD01724	Ceramic: 0.047 uF, +80%, -20%, 50 VDCW, Temp coef +30%, -80%.
C605	819/5CAAD01237	Ceramic: 0.1 uF, ±10%, 25 VDCW, Temp coef ±15%.
C606 and C607	819/5CSAC00532	Tantalum: 10 uF, ±10%, 16 VDCW.
C608	819/5CAAD00957	Ceramic: 4700 pF, ±10%, 50 VDCW, Temp coef ±15%.
C610	819/5CSAC01065	Tantalum: 0.47 uF, ±10%, 35 VDCW.
C611	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C612	819/5CAAD01237	Ceramic: 0.1 uF, ±10%, 25 VDCW, Temp coef ±15%.
C613	819/5CEAA02283	Electrolytic: 33 uF, ±20%, 25 VDCW.
C614	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C615	819/5CEAC00756	Electrolytic: 47 uF, ±20%, 16 VDCW.
C616	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
and C617		
C618	819/5CEAC00756	Electrolytic: 47 uF, ±20%, 16 VDCW.
C619	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C621	819/5CSAC00988	Tantalum: 0.22 uF, ±10%, 35 VDCW.
C622	819/5CEAA02735	Electrolytic: 22 uF, ±20%, 16 VDCW.
C623	819/5CAAD00839	Ceramic: 100 pF, ±10%, 50 VDCW, Temp coef ±15%.
C624	819/5CEAD00756	Electrolytic: 47 uF, ±20%, 16 VDCW.
C625	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C701 thru C706	819/5CAAD00839	Ceramic: 100 pF, ±10%, 50 VDCW, Temp coef ±15%.
C707 thru C711	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C712 and C713	819/5CAAD00952	Ceramic: 27 pF, ±5%, 50 VDCW, Temp coef ±15%.
C714	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
C715	819/5CEAC01049	Tantalum: 2.2 uF, ±10%, 35 VDCW, Temp coef ±15%.
C716 thru C731	819/5CAAD00839	Ceramic: 100 pF, ±10%, 50 VDCW, Temp coef ±15%.
C732	819/5CEAA01827	Electrolytic: 100 uF, ±20%, 16 VDCW.
C733 thru C756	819/5CAAD00839	Ceramic: 100 pF, ±10%, 50 VDCW, Temp coef ±15%.
C757	819/5CAAD01078	Ceramic: 0.1 uF, +80%, -20%, 25 VDCW, Temp coef +30%, -80%.
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ DIODES ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
CD602	819/57XAD00320	Silicon, fast recovery (2 diodes in series): sim to TOSHIBA 1SS226.

SYMBOL	GE PART NO.	DESCRIPTION
CD603 and CD604	819/57XAD00290	Silicon, fast recovery (2 diodes in series common): sim to TOSHIBA 1SS184.
CD605	819/57XAE00568	Zener: 5 V; sim to HITACHI HZS6LKE.
CD701 and CD702	819/57XAD00320	Silicon, fast recovery (2 diodes in series): sim to TOSHIBA 1SS226.
CD703	819/57XAD00290	Silicon, fast recovery (2 diodes in series common): sim to TOSHIBA 1SS184.
		~ ~ ~ ~ ~ ~ ~ ~ ~ HYBRID CIRCUIT ~ ~ ~ ~ ~ ~ ~ ~ ~
HC601	819/6DRFD00168	Filter: sim to MURATA DRFD168.
HC602	819/6DRFD00169	Filter: sim to MURATA DRFD169.
		~ ~ ~ ~ ~ ~ ~ ~ INTEGRATED CIRCUITS ~ ~ ~ ~ ~ ~ ~ ~
IC601	819/5DAAA00328	Linear, Quad OP Amp: sim to NEC UPC452G2.
IC602	819/5DAAJ00689	Digital, 8-Channel Analog Multiplexer; sim to MOTOROLA MC14051BF.
IC603	819/5DAAJ00629	Digital, Bilateral Switch; sim to MC14066BF.
IC604	819/5DAAA00328	Linear, Quad OP Amp: sim to NEC UPC452G2.
IC606	819/5DAAJ00648	Digital, Dual D-type Flip-Flop: sim to MOTOROLA MC74HC74F.
IC607	819/5DAAK00021	Linear, positive voltage regulator: sim to MAB8S8S12A AN6541.
IC608	819/5DAAJ00305	Linear, positive voltage regulator: sim to MOTOROLA MC7805CT.
IC609	819/5DDAF00763	Linear, Voltage Detector; sim to FUJITSU MB3771PF.
IC610	819/5DAAJ00305	Linear, positive voltage regulator: sim to MOTOROLA MC7805CT.
IC701	819/5DDFX00004	Digital, Microcontroller; sim to MATRA HARRIS F-80C32.
IC702	819/5DAAJ00766	Digital, Octal Transparent Latch: sim to MOTOROLA MC74HC373F.
IC703	819/5DDAY00346	Digital, EPROM; sim to AMD AM27C64-250DC.
IC704	819/5DDBY00648	Digital, EEPROM; sim to XICOR X2404.
IC705	819/5DDAG00274	Digital, PIO: sim to OKI M5M82C55A-2G4.
IC706	819/5DDAF00390	Digital, BCD to z-Segment Decoder/Driver; sim to HITACHI HD74LS47F.
IC707	819/5DAAJ00648	Digital, Dual d-type Flip-Flop: sim to MOTOROLA MC74HC74F.
IC708	819/5DDAF00113	Digital, Hex Inverter; sim to HITACHI HD7406P.
ICS701	819/5SJAJ00028	IC Socket: 28 pins.
ICS704	819/5SJAB00033	IC Socket: 8 pins.
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ JACKS ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
J601 and J602	819/53PCA00137	Connector: 3 pins.
J701	819/5JJAL00078	Connector: 8 pins.
J702	819/5JWBB00182	Connector: 24 pins.
J703	819/5JWBA00240	Connector: 16 pins.
J704	819/52PCA00288	Connector: 5 pins.
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ COILS ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
L601	819/5LCAA00599	Choke Coil 20 uH.
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ PLUGS ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
P601 and P602	819/53DAN00012	Short plug: 2 pins.
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ RESISTORS ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
R601	819/5RDAC02449	Metal film: 100K ohms ±5%, 100 VDCW, 1/10 w..
R602	819/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w..
R603	819/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w..
R604	819/5RDAC02453	Metal film: 220K ohms ±5%, 100 VDCW, 1/10 w..
R605	819/5RDAC02454	Metal film: 22K ohms ±5%, 100 VDCW, 1/10 w..

SYMBOL	GE PART NO.	DESCRIPTION
R606	819/5RDAC02444	Metal film: 56K ohms ±5%, 100 VDCW, 1/10 w..
R607	819/5RDAC02449	Metal film: 100K ohms ±5%, 100 VDCW, 1/10 w..
R610	819/5RDAC02463	Metal film: 560K ohms ±5%, 100 VDCW, 1/10 w..
R611	819/5REAG03000	Metal film: 634K ohms ±1%, 100 VDCW, 1/10 w..
R612	819/5REAG03001	Metal film: 249K ohms ±1%, 100 VDCW, 1/10 w..
R613	819/5REAG03002	Metal film: 100K ohms ±1%, 100 VDCW, 1/10 w..
R614	819/5REAG03003	Metal film: 40.2K ohms ±1%, 100 VDCW, 1/10 w..
R615	819/5REAG03004	Metal film: 15.8K ohms ±1%, 100 VDCW, 1/10 w..
R616	819/5REAG03005	Metal film: 6.34K ohms ±1%, 100 VDCW, 1/10 w..
R617	819/5REAG03006	Metal film: 2.49K ohms ±1%, 100 VDCW, 1/10 w..
R618	819/5REAG03022	Metal film: 931 ohms ±1%, 100 VDCW, 1/10 w..
R623	819/5REAG03023	Metal film: 1.5K ohms ±1%, 100 VDCW, 1/10 w..
R624	819/5REAG03007	Metal film: 1K ohms ±1%, 100 VDCW, 1/10 w..
R625	819/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w..
R627	819/5RDAC02482	Metal film: 18K ohms ±5%, 100 VDCW, 1/10 w..
R628	819/5RDAC02453	Metal film: 220K ohms ±5%, 100 VDCW, 1/10 w..
R629	819/5REAB01254	Metal film: 91K ohms ±5%, 100 VDCW, 1/10 w..
R630	819/5RDAA01539	Carbon film: 1.2K ohms ±5%, 300 VDCW, 1/4 w.
R631	819/5RDAC02482	Metal film: 18K ohms ±5%, 100 VDCW, 1/10 w..
R632	819/5RDAC02468	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R633	819/5RDAC02471	Metal film: 470 ohms ±5%, 100 VDCW, 1/10 w..
R634	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R635	819/5RDAC02486	Metal film: 82K ohms ±5%, 100 VDCW 1/10 w..
R636	819/5RDAC02462	Metal film: 3.3K ohms ±5%, 100 VDCW, 1/10 w..
R637	819/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w..
R638	819/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w..
R639 and R640	819/5RDAC02487	Metal film: 120K ohms ±5%, 100 VDCW, 1/10 w..
R641	819/5RDAC02453	Metal film: 220K ohms ±5%, 100 VDCW, 1/10 w..
R642	819/5RDAC02463	Metal film: 560K ohms ±5%, 100 VDCW, 1/10 w..
R643	819/5RDAC02587	Metal film: 820K ohms ±5%, 100 VDCW, 1/10 w..
R644	819/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w..
R645 and R646	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R647	819/5RDAC02459	Metal film: 180K ohms ±5%, 100 VDCW, 1/10 w..
R648	819/5RDAC02457	Metal film: 27K ohms ±5%, 100 VDCW, 1/10 w..
R649	819/5RDAC02488	Metal film: 270K ohms ±5%, 100 VDCW, 1/10 w..
R651 and R652	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R653	819/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w..
R657	819/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w..
R701	819/5RDAC02449	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w..
R702	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R703	819/5RDAC02449	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w..
R704 thru R707	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R708	819/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w..
R710	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R711	819/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w..
R712	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R713	819/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w..
R714	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R715 thru R722	819/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w..
R723 thru R727	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..

SYMBOL	GE PART NO.	DESCRIPTION
R728	819/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w..
R729	819/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w..
R730	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R731	819/5RDAC02477	Metal film: 3.9K ohms ±5%, 100 VDCW, 1/10 w..
R732 thru R734	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R735	819/5RDAC02477	Metal film: 3.9K ohms ±5%, 100 VDCW, 1/10 w..
R736 thru R746	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
R747	819/5RDAC02581	Metal film: 0 ohms ±5%, 100 VDCW, 1/10 w..
R748	819/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w..
RV601	819/5RVAA00399	Variable: 10K ohms +30%, 1/10 w.
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ TRANSISTORS ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
TR601 thru TR603	819/5TCAX00007	Silicon, NPN: sim to SANYO 2SC3396.
TR604	819/5TDAB00054	Silicon, NPN: sim to NEC 2SD596.
TR605	819/5TCAX00007	Silicon, NPN: sim to SANYO 2SC3396.
TR701	819/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR702	819/5TCAX00007	Silicon, NPN: sim to SANYO 2SC3396.
TR703	819/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR704 thru TR709	819/5TCAX00007	Silicon, NPN: sim to SANYO 2SC3396.
TR710	819/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR711 thru TR717	819/5TCAX00007	Silicon, NPN: sim to SANYO 2SC3396.
TR718	819/5TDAB00054	Silicon, NPN: sim to NEC 2SD596.
TR719	819/5TBAB00055	Silicon, PNP: sim to NEC 2SB624.
TR720	819/5TCAX00007	Silicon, NPN: sim to SANYO 2SC3396.
		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ CRYSTALS ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
X701	819/5XMAA00817	Quartz crystal: Fo=8.192 MHz.
X701-1 and X701-2	819/5XJDF00051	Crystal Socket.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

SYNTHESIZER SECTION
MLS (UHF)
CMC-553-2
ISSUE I

SYMBOL	GE PART NO.	DESCRIPTION
		B19/CMC-553A5 (403-420 MHz 5PPM) B19/CMC-553B5 (450-470 MHz 5PPM) B19/CMC-553B2 (450-470 MHz 2.5PPM)
		- - - - - - - - - - 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	B19/5CAAD00839	Ceramic: 100 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C210	B19/5CAAD01063	Ceramic: 680 pF ±5%, 50 VDCW, Temp coef +350 to -1000 PPM.
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	B19/5CAAD00968	Ceramic: 12 pF ±5%, 50 VDCW, Temp coef 0±30 PPM.
C220	B19/5CAAD00961	Ceramic: 4 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM. (Used in A5).
C220	B19/5CAAD00949	Ceramic: 2 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM. (Used in B5,B2).
C221	B19/5CAAD00953	Ceramic: 10 pF ±0.5 pF, 50 VDCW, Temp coef 0±30 PPM.
C222	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, Temp coef ±15%.
C223 and C224	B19/5CAAD00956	Ceramic: 5 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM.
C225	B19/5CAAD00996	Ceramic: 0.75 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.
C231	B19/5CAAD00852	Ceramic: 1 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM. (Used in A5).
C232	B19/5CAAD00852	Ceramic: 1 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM.
C233	B19/5CAAD00946	Ceramic: 2200 pF ±10%, 50 VDCW, Temp coef ±15%.
C235	B19/5CAAD00968	Ceramic: 12 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A5).
C235	B19/5CAAD00953	Ceramic: 10 pF ±0.5 pF, 50 VDCW, Temp coef 0±30 PPM. (Used in B5,B2).
C236	B19/5CAAD00852	Ceramic: 1 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM. (Used in A5).
C237	B19/5CAAD00950	Ceramic: 15 pF ±5%, 50 VDCW, Temp coef 0±30 PPM. (Used in A5).
C237	B19/5CAAD00953	Ceramic: 10 pF ±0.5 pF, 50 VDCW. Temp coef 0±30 PPM. (Used in B5,B2).
C238 and C239	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, Temp coef ±15%.
C240 and C241	B19/5CAAD00956	Ceramic: 5 pF ±0.25 pF, 50 VDCW. Temp coef 0±30 PPM.
C242	B19/5CAAD00996	Ceramic: 0.75 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	B19/5CEAC00939	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 pF ±5%, 50 VDCW.
C266	B19/5CAAD00853	Ceramic: 3 pF ±0.25 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	B19/5CEAC00982	Tantalum: 1 uF ±10%, 35 VDCW.
C284	B19/5CRAA00838	Metallized plastic: 0.47 uF ±5%, 50 VDCW.
C285 and C286	B19/5CEAA01827	Electrolytic: 100 uF ±20%, 16 VDCW.
C287	B19/5CAAD00962	Ceramic: 6 pF ±0.5 pF, 50 VDCW, Temp Coef 0±30 PPM.
C288	B19/5CAAD00853	Ceramic: 3 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM. (Used in A5).
C288	B19/5CAAD00949	Ceramic: 2 pF ±0.25 pF, 50 VDCW, Temp coef 0±30 PPM. (Used in B5,B2).
C289	B19/5CAAD00962	Ceramic: 6 pF ±0.5 pF, 50 VDCW, Temp coef ±30 PPM.
C291 thru C295	B19/5CAAD00838	Ceramic: 1000 pF ±10%, 50 VDCW, Temp coef ±15%.
CV201 and CV202	B19/5CVAB00093	Variable: 5 pF max.
		- - - - - - - - - - DIODES - - - - - - - - - -
CD201	B19/5TRAE00567	Zener: 4.0 V; sim to HITACHI HZ4B3.
CD202	B19/5TRAE00566	Zener: 3.0 V; sim to HITACHI HZ3B-2.
CD203	B19/5TRAE00690	Silicon; variable capacitance Diode; sim to HITACHI 1SV202.
CD204	B19/5TRAD00320	Silicon: fast recovery (2 diodes in series); sim to TOSHIBA 1S8226.
CD205	B19/5TRAA00326	Silicon: Schottky Barrier; sim to NEC 1S897.
CD206	B19/5TRAE00566	Zener: 3.0 V; sim to HITACHI HZ3B-2.
CD207 and CD208	B19/5TRAE00690	Silicon; variable capacitance Diode; sim to HITACHI 1SV202.
CD209	B19/5TRAD00320	Silicon: fast recovery (2 diodes in series); sim to TOSHIBA 1S8226.
CD210	B19/5TRAA00326	Silicon: Schottky Barrier; sim to NEC 1S897.
CD211	B19/5TRAE00566	Zener: 3.0 V; sim to HITACHI HZ3B-2.
CD213	B19/5TRAD00320	Silicon: fast recovery (2 diodes in series); sim to TOSHIBA 1S8226.
		- - - - - - - - - - INTEGRATED CIRCUIT - - - - - - - - - -
IC201	B19/5DAAJ00318	Synthesizer: C MOS 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 New JRC NJM4558M.
IC209	B19/5DAAA00183	RF wide-band amplifier; sim to NEC UPC1655C.
IC210	B19/5DDAB00367	Linear, Dual OP Amp; sim to MITSUBISHI M5223FP.
		- - - - - - - - - - CONNECTORS - - - - - - - - - -
J201	B19/5JWCL00058	Connector, RF.
		- - - - - - - - - - COILS - - - - - - - - - -
L201	B19/5LCAC00929	Choke Coil: 0.22 uH ±10%.
L202	B19/6LALB00120	Coil, RF. (Used in A5).
L202	B19/6LALB00087	Coil, RF. (Used in B5, B2).
L204 and L205	B19/5LCAC00929	Choke Coil: 0.22 uH ±10%.
L206	B19/6LALB00119	Coil, RF. (Used in A5).
L206	B19/6LALB00080	Coil, RF. (Used in B5, B2).
L208	B19/5LCAC00929	Choke Coil: 0.22 uH ±10%.
L210	B19/6LAFD01241	Coil, RF.
L212	B19/6LALB00038	Coil, RF.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R201	B19/5RDAC02465	Metal film: 22 ohms ±5%, 100 VDCW, 1/10 w.
R204	B19/5RBAA01480	Carbon film: 330 ohms ±5%, 300 VDCW, 1/4W.
R205	B19/5RDAC02455	Metal film: 150K ohms ±5%, 100 VDCW, 1/10 w.
R206	B19/5RDAC02458	Metal film: 6.8K ohms ±5%, 100 VDCW, 1/10 w.
R207	B19/5RDAC02462	Metal film: 3.3K ohms ±5%, 100 VDCW, 1/10 w.
R209	B19/5RDAC02453	Metal film: 220K ohms ±5%, 100 VDCW, 1/10 w.
R210	B19/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w.
R211	B19/5RDAC02470	Metal film: 330 ohms ±5%, 100 VDCW, 1/10 w. (Used in A5).
R211	B19/5RDAC02469	Metal film: 220 ohms ±5%, 100 VDCW, 1/10 w. (Used in B5, B2).
R212	B19/5RDAC02451	Metal film: 2.2A ohms ±5%, 100 VDCW, 1/10 w.
R213 and R214	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R219	B19/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w.
R221	B19/5RDAC02467	Metal film: 68 ohms ±5%, 100 VDCW, 1/10 w.
R222	B19/5RDAC02460	Metal film: 47 ohms ±5%, 100 VDCW, 1/10 w.
R223	B19/5RDAC02470	Metal film: 330 ohms ±5%, 100 VDCW, 1/10 w.
R224	B19/5RDAC02464	Metal film: 15 ohms ±5%, 100 VDCW, 1/10 w.
R225	B19/5RDAC02470	Metal film: 330 ohms ±5%, 100 VDCW, 1/10 w.
R227	B19/5RDAC02455	Metal film: 150K ohms ±5%, 100 VDCW, 1/10 w.
R228	B19/5RDAC02454	Metal film: 22K ohms ±5%, 100 VDCW, 1/10 w.
R229	B19/5RDAC02479	Metal film: 8.2K ohms ±5%, 100 VDCW, 1/10 w.
R230	B19/5RDAC02439	Metal film: 47K ohms ±5%, 100 VDCW, 1/10 w.
R231	B19/5RDAC02467	Metal film: 68 ohms ±5%, 100 VDCW, 1/10 w.
R232	B19/5RDAC02460	Metal film: 47 ohms ±5%, 100 VDCW, 1/10 w.
R233	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R234	B19/5RDAC02470	Metal film: 330 ohms ±5%, 100 VDCW, 1/10 w.
R235	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R236	B19/5RDAC02470	Metal film: 330 ohms ±5%, 100 VDCW, 1/10 w.
R240 and R241	B19/5RDAC02472	Metal film: 680 ohms ±5%, 100 VDCW, 1/10 w.
R242	B19/5RDAC02474	Metal film: 1.5K ohms ±5%, 100 VDCW, 1/10 w.
R243	B19/5RDAC02456	Metal film: 330K ohms ±5%, 100 VDCW, 1/10 w.
R244	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R245	B19/5RDAC02478	Metal film: 4.7K ohms ±5%, 100 VDCW, 1/10 w.
R246	B19/5RDAC02452	Metal film: 6.8K ohms ±5%, 100 VDCW, 1/10 w.
R248	B19/5RDAC02473	Metal film: 1.2K ohms ±5%, 100 VDCW, 1/10 w.
R249	B19/5RDAC02446	Metal film: 1K ohms ±5%, 100 VDCW, 1/10 w.
R250	B19/5RDAC02482	Metal film: 18K ohms ±5%, 100 VDCW, 1/10 w.
R251	B19/5RDAC02457	Metal film: 27K ohms ±5%, 100 VDCW, 1/10 w.
R252	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R253	B19/5RDAC02473	Metal film: 1.2K ohms ±5%, 100 VDCW, 1/10 w.
R254	B19/5RDAC02444	Metal film: 56K ohms ±5%, 100 VDCW, 1/10 w.
R255	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R256	B19/5RDAC02483	Metal film: 33K ohms ±5%, 100 VDCW, 1/10 w.
R257	B19/5RDAC02449	Metal film: 100K ohms ±5%, 100 VDCW, 1/10 w.
R260 and R261	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R262	B19/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w.
R263 and R264	B19/5RDAC02582	Metal film: 82 ohms ±5%, 100 VDCW, 1/10 w.
R265	B19/5RDAC02471	Metal film: 470 ohms ±5%, 100 VDCW, 1/10 w.
R266	B19/5RDAC02457	Metal film: 68 ohms ±5%, 100 VDCW, 1/10 w.
R268	B19/5RDAC02471	Metal film: 470 ohms ±5%, 100 VDCW, 1/10 w.
R270	B19/5RDAC02470	Metal film: 330 ohms ±5%, 100 VDCW, 1/10 w.
R271	B19/5RDAC02464	Metal film: 15 ohms ±5%, 100 VDCW, 1/10 w.
R272	B19/5RDAC02470	Metal film: 330 ohms ±5%, 100 VDCW, 1/10 w.
R275	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
R277	B19/5RDAC02455	Metal film: 150K ohms ±5%, 100 VDCW, 1/10 w.
R278	B19/5RDAC02461	Metal film: 1M ohms ±5%, 100 VDCW, 1/10 w.
R279 and R280	B19/5RDAC02451	Metal film: 2.2K ohms ±5%, 100 VDCW, 1/10 w.
R281	B19/5RDAC02447	Metal film: 100 ohms ±5%, 100 VDCW, 1/10 w.
R282 thru R285	B19/5RDAC02449	Metal film: 100K ohms ±5%, 100 VDCW, 1/10 w.
R287	B19/5RDAC02445	Metal film: 10K ohms ±5%, 100 VDCW, 1/10 w.
RV201 thru RV203	B19/6RVAB00411	Variable: 10K ohms ±30%, 1/10 w.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
TR202	B19/5TRAB00035	Silicon, PNP: sim to NEC 2SB624.
TR205	B19/5TRAB00035	Silicon, PNP: sim to NEC 2SB624.
TR206	B19/5TRAN00006	N-Channel, field effect. (Junction Single Gate): sim to SONY 2SK125.
TR207	B19/5TCAE00011	Silicon, NPN: sim to SANYO 2SC3338.
TR209	B19/5TRAN00006	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	B19/6TCAE00011	Silicon, NPN: sim to SANYO 2SC3338.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
XU201	B19/6XNFD00017	Reference Oscillator Unit (Used in A5, B5).
XU201	B19/6XNFD00016	Reference Oscillator Unit (Used in B2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

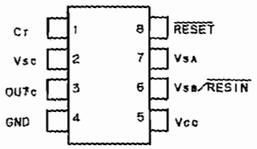
CAUTION

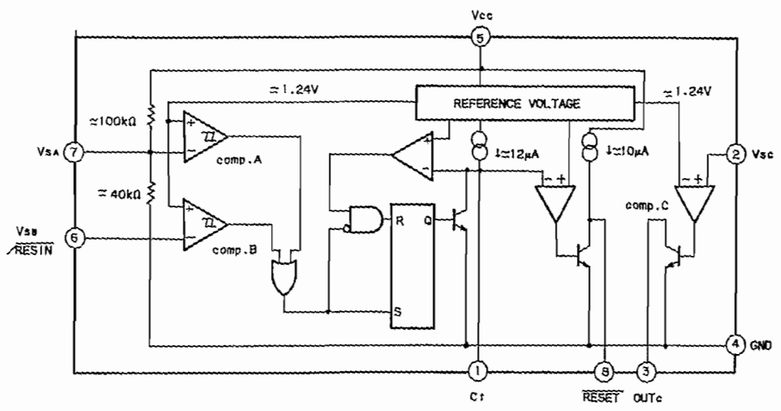
OBSERVE PRECAUTIONS FOR HANDLING

ELECTROSTATIC SENSITIVE DEVICES

IC609

PIN CONFIGURATION

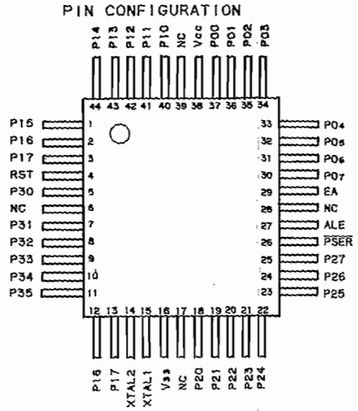




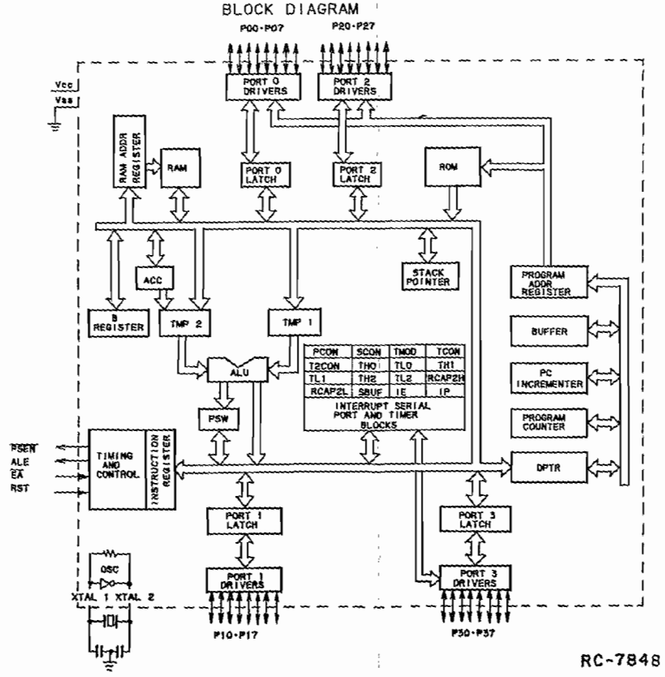
RC-7851

IC701

PIN CONFIGURATION



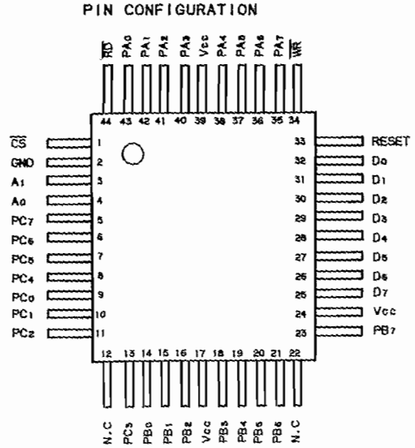
BLOCK DIAGRAM



RC-7848

IC705

PIN CONFIGURATION



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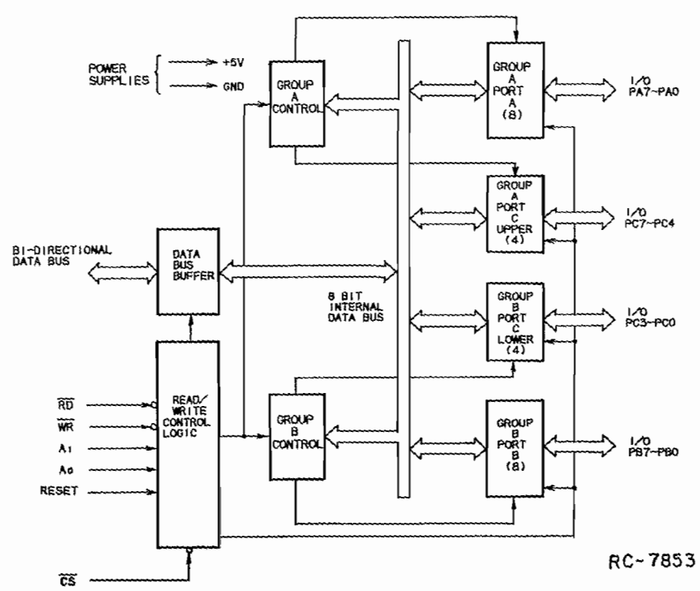


RC-7853

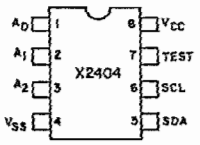
CAUTION

OBSERVE PRECAUTIONS FOR HANDLING

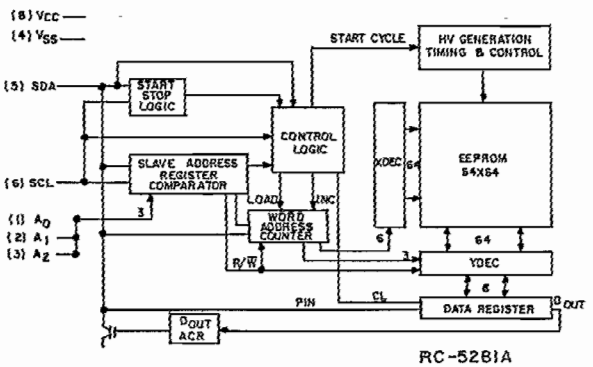
ELECTROSTATIC SENSITIVE DEVICES

IC707

PIN CONFIGURATION

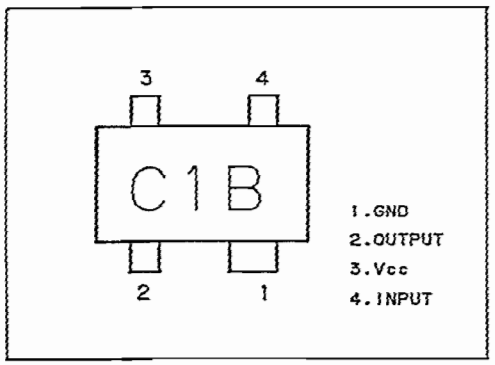


FUNCTION DIAGRAM



RC-5281A

OPERATIONAL AMPLIFIER (IC204 THROUGH IC206)

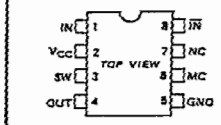


RC-7849

IC202

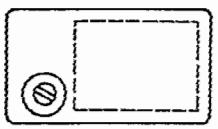
This device contains circuitry to protect the inputs aganist damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

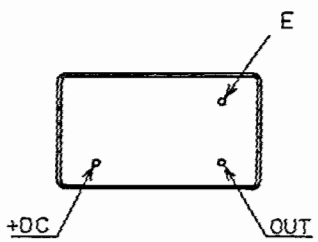
PIN ASSIGNMENT



RC-5471

REFERENCE OSCILLATOR UNIT XU201

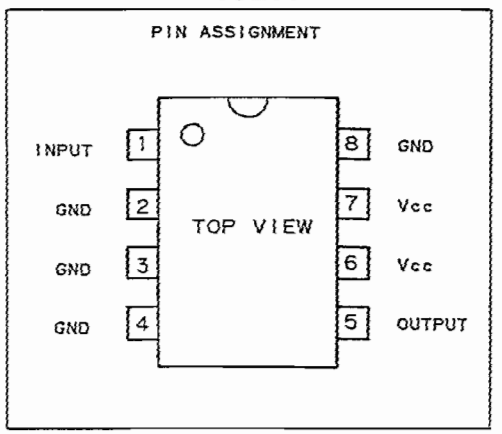




RC-7852

OPERATIONAL AMPLIFIER IC209

PIN ASSIGNMENT



RC-7850

ADDENDUM NO. 1A TO LBI-38428 (PCML)

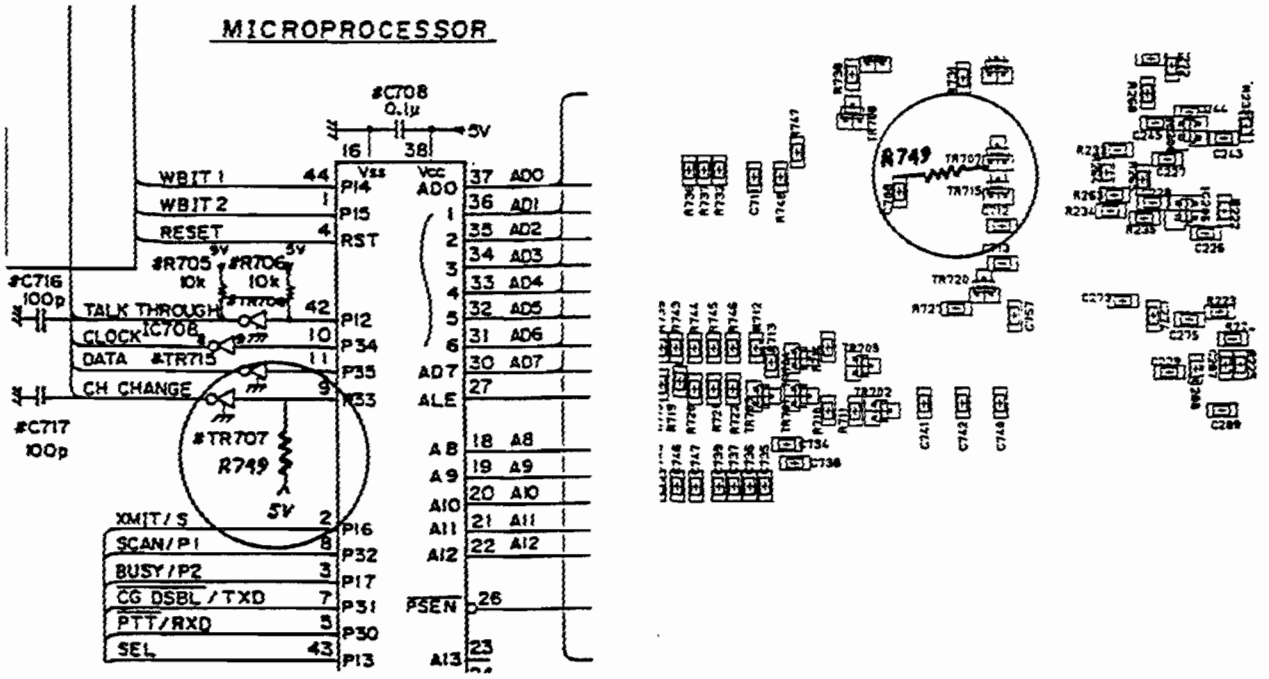
This addendum provides revision letter changes which have not yet been published in LBI-38428.

REV. B SYSTEM CONTROL BOARD

To improve power-up performance of the microprocessor a 10K ohm pull-up resistor R749 was installed between IC701-9 and the 5 VDC power source and C203 was changed from 470 µF to 10 µF.

R749 - B19/5RDAA01146, Carbon film: 10K.

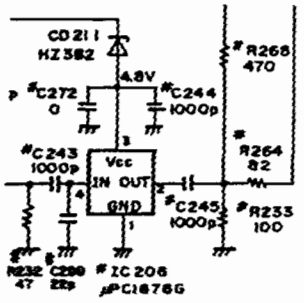
C203 - B19/5CEAA01864, Electrolytic: 10 µf, ±20%, 25 VDCW.



REV. C FREQUENCY SYNTHESIZER

To prevent oscillation in TX VCO buffer during receive, a 22 pF capacitor C299 was added between IC206-4 and ground.

C299 - B19/5CAAD00840, Ceramic: 22 pF.



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