



MAINTENANCE MANUAL
ORION™
UHF CONTROL LOGIC/IF BOARD
CMC-682/CMF-138

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DESCRIPTION

The System Control Logic/IF circuit board combines functions of receive circuit 1st IF, 2nd IF, audio detection, audio signal processing and system control on one circuit board. As an option, an additional circuit board can be plugged into this board to provide **AEGIS™** (digital encryption system). Programming and personality information is stored in **FLASH** and **EEPROM** memory on the logic/IF board. The audio speaker amplifier is also part of the same board.

Electrical interfaces are achieved between this board and the Control Unit (LCC), synthesizer, RF PA (APC) and the **Option and Remote Control Connector (ORCC)** on the rear of the assembled radio.

All radio control signals originate or terminate on the control logic/IF board. Two microcomputers share the processing load. Control signals are connected through a high speed digital link with the control unit, either through the LCC or ORCC connectors, making possible either front or remote control for the radio. The same link also makes possible dual radio or dual control head configuration. An RS-232 compatible digital link is available at the ORCC interface, to facilitate programming or Radio Data Interface to Mobile Digital terminals.

This circuit board also generates Type 99, Channel Guard, GE-Star and DTMF signals if so programmed.

The System Control Logic/IF board consists of the following control logic, IF and audio circuits (see figures 1 & 2).

SYSTEM CONTROL LOGIC (CMC-682)

- CMOS Microprocessor (IC701, IC702)
- Custom CMOS ASIC Chip (IC703)
- Address Decoder (IC704)
- RS-485 (IC705)
- RS-232 (IC706)
- Flash EEPROM (IC707)
- EEPROM (IC708)
- CMOS SRAM (IC709)
- CMOS Inverters (IC711)
- Silicon Serial Number (IC712)
- TTL Inverters (IC713)

IF (CMF-138)

- Custom CMOS ASP Chip (IC601)
- Operational Amplifier (IC602, IC603)
- Audio Amplifier (IC604)
- 5 Volt Regulator (IC606, IC607)
- 9 Volt Regulator (IC605, IC608, IC609)
- Reset Circuit (IC610)
- Bilateral Switch (IC611, IC612)

CIRCUIT ANALYSIS

LOGIC SECTION (CMC-682)

Microcomputer

The main microcomputer circuit in the **ORION** radio consist of microprocessor IC701, EEPROM IC708, Flash EEPROM IC707, RAM IC709 and custom ASIC IC703. This circuitry runs at a 9.8304 MHz rate determined by crystal X701 and controls the radio through a second microprocessor IC702. This second microprocessor runs at a 4.9152 MHz rate. The 4.9152 MHz rate is determined by ASIC IC703.

- Controlling the **ASIC, FLASH EEPROM and RAM**
- Loading data to the frequency synthesizer
- Fetching and processing the PTT, monitor, channel, selection and volume control
- Controlling the audio circuit (processor)
- Decoding the squelch
- Encoding/Decoding the Channel Guard and Digital Channel Guard
- Controlling the loading interface for the radio data (channel number and signaling)

FLASH EEPROM (IC707)

This memory contains the software to control the micro-processor. This Flash EEPROM has a storage capacity of 256k x 8 bits.

CMOS SRAM (IC709)

This SCRATCH RAM has a storage capacity of 32k x 8 bits. The memory is available for variables, buffers, etc.

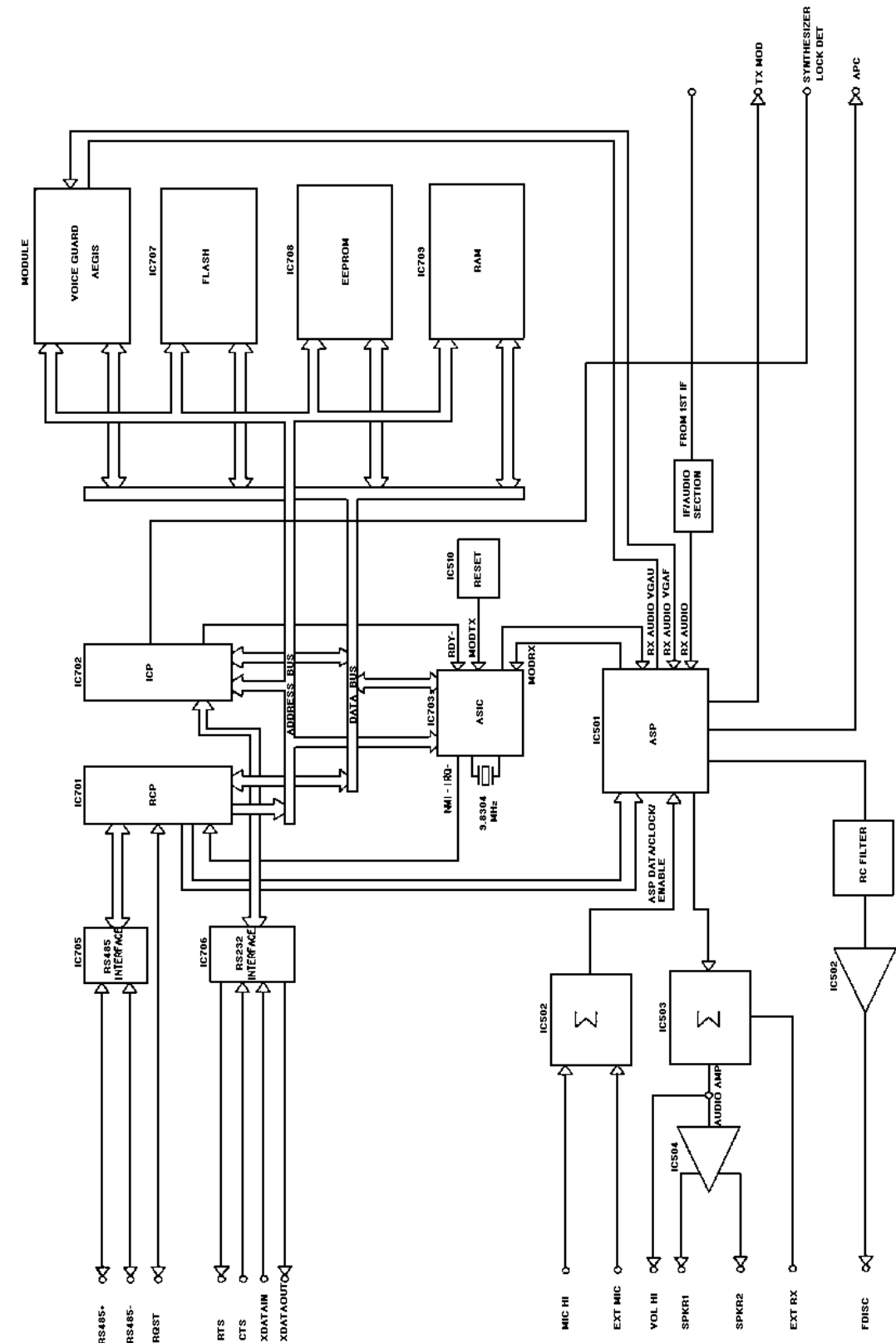


Figure 1 - Logic Section Block Diagram

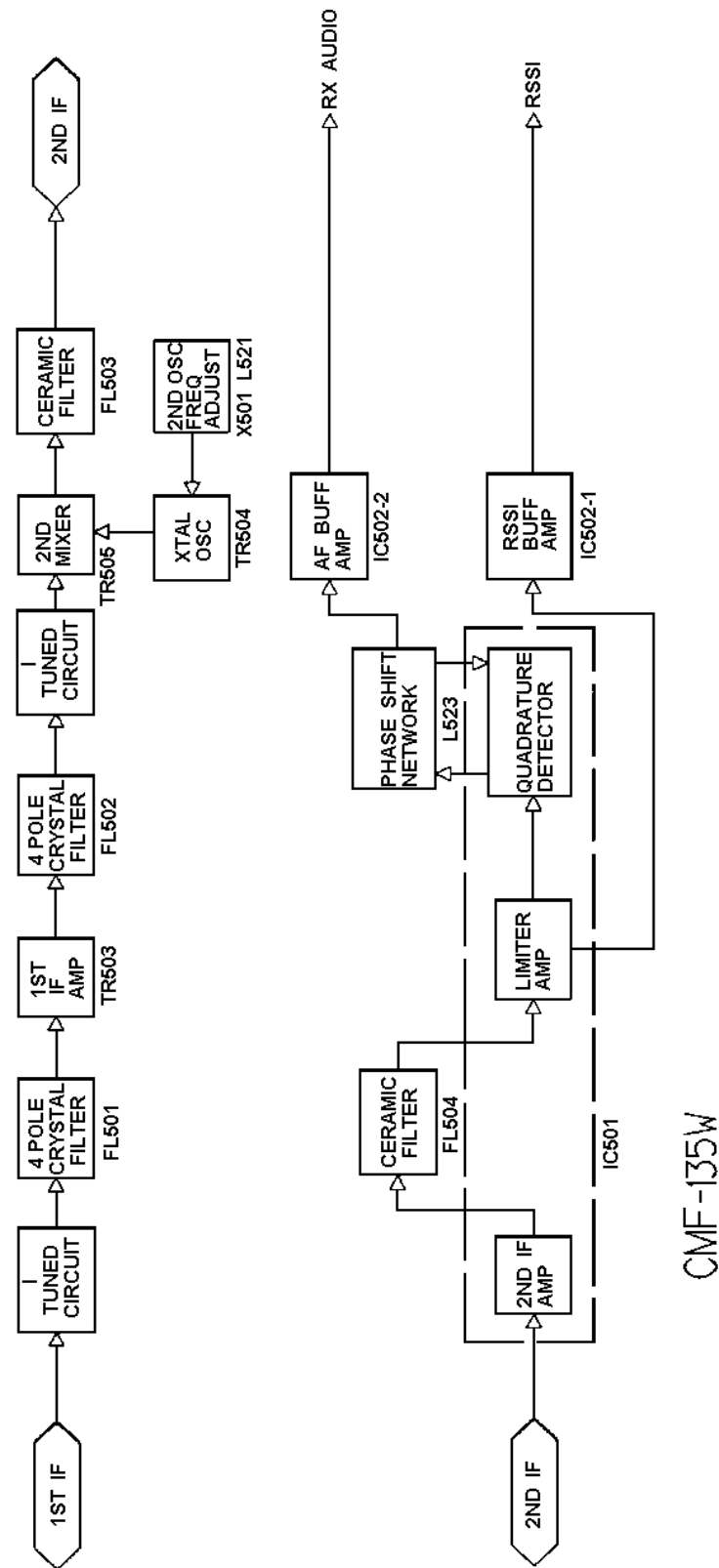


Figure 2 - IF Section Block Diagram

EEPROM (IC708)

This EEPROM has a storage capacity of 8k x 8 bits. The memory contains the user configurable parameters that must be maintained through a power cycle. This personality controls various functions of the radio. The personality data is entered from outside the radio through the ORCC connector to the microprocessor and then to the EEPROM.

The data mainly consists of the following:

- Channel Frequency Data
- CG/DCG Data
- Tx Power, Tx Modulation Data
- Squelch Data
- Display Data, etc.

APPLICATION OF SPECIFIC INTEGRATED CIRCUITS

ASIC (IC703)

The ASIC is basically a chip that integrates many miscellaneous functions. The chip provides functions as follows:

- MODEM
- Watch Dog Timer
- Clock Control
- Interrupt Control
- Address Decode etc.

Voltage Regulators (IC606, IC607) (IC605, IC608, IC609)

Voltage regulators IC606 and IC607 each generate a 5 Vdc for the Control Board. Voltage regulators IC605, IC608 and IC609 each generate a 9 Vdc for the Control Board and Voice Guard Adapter Module.

Audio Amplifier (IC604)

The audio amplifier is located between the audio processor and the speaker. Amplifier IC604 amplifies the output signal of the ASP (IC601) to the level adequate for driving the speaker.

Audio Signal Processor (ASP) (IC601)

The audio processor consists of a one-chip IC accommodating almost all of the audio functions. The audio functions are

under control of the microcomputer in compliance with the function of the radio unit.

The functions of the audio processor are as follows:

- Rx Audio processor with Tone Reject Filter, De-emphasis and Programmable Attenuator.
- Data Limiting
- CG/DCG filtering and limiting
- Noise Squelch filtering and detecting
- 8 bits D/A Converter with sample and hold
- Tx audio processor with microphone amplifier, pre-emphasis, deviation limiter, summing amplifier, post limiter filter and programmable attenuator
- Data signal filtering
- Two 6 bits programmable divider for clock and alt tone

All of these functions are made up of switched capacitor filters, amplifiers and timing logic. The timing for this logic is derived from the 4.9152 MHz clock generator (ASIC).

RS-485 (IC705)

This is a high speed differential TRI-STATE bus/line transceiver designed to meet the requirements of EIA standard RS-485 specification. The IC705 is located between the Radio Unit and the Control Unit.

RS-232 (IC706)

This IC consists of line drivers/receivers designed to meet the requirements of EIA standard RS-232 specifications. The IC706 is located between the radio unit and the ORCC.

Reset Circuit (IC610)

This is an active low reset IC which includes a delay time generating circuit. Delay time can be set up by externally using a capacitor and a resistor. The function of this IC is to accurately reset the system after detecting voltage at the time of switching power on and instantaneous power off.

Option and Remote Control Connector (ORCC)

The ORCC is located on the rear of the radio and is used for options and accessories when Control Unit and Radio Unit are directly attached and for remote control in all other configurations. The ORCC allows various kinds of external equipment connections to be made. External equipment connecting signals are as follows:

PIN	SIGNAL	PIN	SIGNAL
1	SUP GND	20	RTS
2	XDATA IN	21	INP1
3	XDATA OUT	22	OUT1
4	RS485+	23	INP2
5	RS485-	24	IGN A+
6	CTS	25	SW +
7	GND	26	HKSW
8	FPROG	27	EXTMIC
9	OUT2	28	EXTRX
10	IGN SEN	29	FDISC
11	MIC HI	30	EXTALO
12	ALO	31	CUTST
13	VOL HI	32	SPARE
14	CTL ON	33	SPARE
15	XTONENC	34	SPARE
16	XTONEDEC	35	SDATA
17	RQST	36	SONOFF
18	SPKR1	37	HORNRING
19	SPKR2		

IF SECTION (CMF-138)

1st IF

The 82.2 MHz 1st IF output signal is coupled from the output of the first mixer circuit, located on the Synthesizer/Receiver/IF board, through 30-pin connector P501-1 and capacitor C501 to the source input of buffer amplifier Junction Field Effect Transistors (JFET) TR501 and TR502. This input can be monitored at test point TP1. The output of TR501 and TR502 is coupled through inductor L502 to 4-pole crystal band-pass filter FL501. The highly-selective crystal filters FL501-1 and FL502-2 provide the first part of receiver IF selectivity. The output of the filters is coupled through the impedance matching network consisting of inductor L502 and capacitors C504 and C505 to the base of 1st IF amplifier transistor TR503.

The crystal filter output of FL501 is applied to the base of 1st IF amplifier transistor TR503. This amplified signal is taken from the collector of TR503 through an impedance matching network consisting inductor L505, capacitor C506 and resistor R507 that matches the amplifier output to the input of 4-pole crystal filters FL502-1 and FL502-2 which provides the second part of receiver IF selectivity. The output of the crystal filters is coupled through an impedance-matching network consisting of inductor L507, capacitor C508, resistor R508 and coupling capacitor C509 to the base of 2nd IF amplifier transistor TR505.

2nd Mixer

The 82.2 MHz IF input is applied to transistor TR505 and mixed with a 82.655 MHz frequency supplied by a crystal oscillator circuit consisting of X501 and oscillator transistor TR504. Variable inductor L521 sets the frequency of the oscillator circuit. This signal can be monitored at test point TP5.

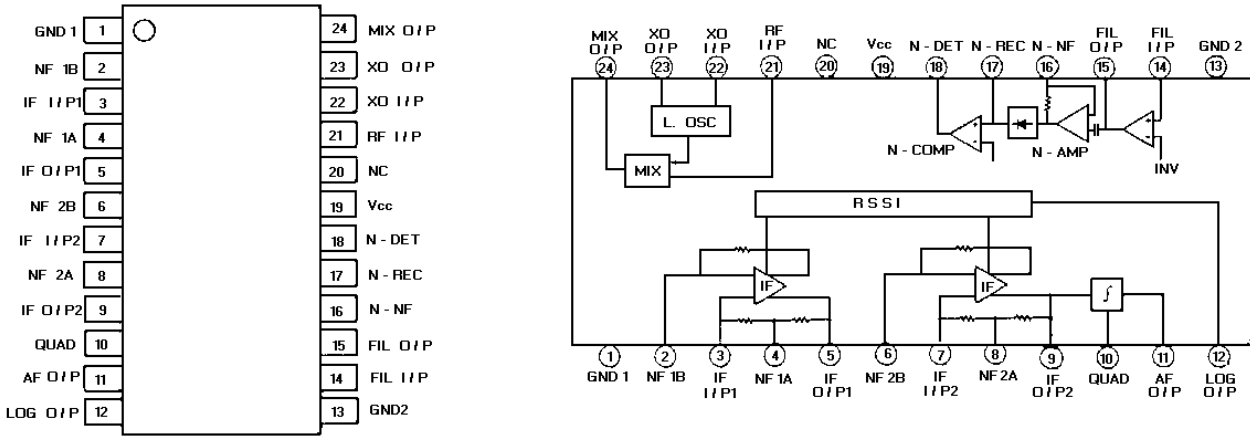
2nd IF And Detector

The output of the 2nd mixer is coupled to the input of 4-pole ceramic filter FL503 which provides 455 kHz 2nd IF selectivity. The 455 kHz IF output of ceramic filter FL503 is coupled to Pin 3 of Limiter/FM Detector IC501. The IF signal is amplified internal to IC501 then applied to 4-pole ceramic filter FL504 which provides additional 455 kHz IF selectivity (Refer to IC DATA for IC501). The output of the 455 kHz filter is applied to IC501, Pin 7. The 2nd IF signal is amplified and limited internal to IC501. Inductor L523 shifts the IF signal by 90° and applies it to the internal FM detector. The FM detector compares the shifted IF signal to the internal IF signal to recover the audio modulation. The audio output of the operational amplifier internal to IC501 is applied the input of buffer amplifier IC502-2. The AUDIO output of IC502-2 is applied to the System Control Logic circuit. This signal can be monitored at test point TP4. The output on Pin 12 of IC501 is applied to the input of amplifier buffer IC502-1. The output of IC502-1 provides a Receiver Signal Strength Indicator (RSSI) signal also sent to the System Control Logic circuit. This signal can be monitored at test point TP3.

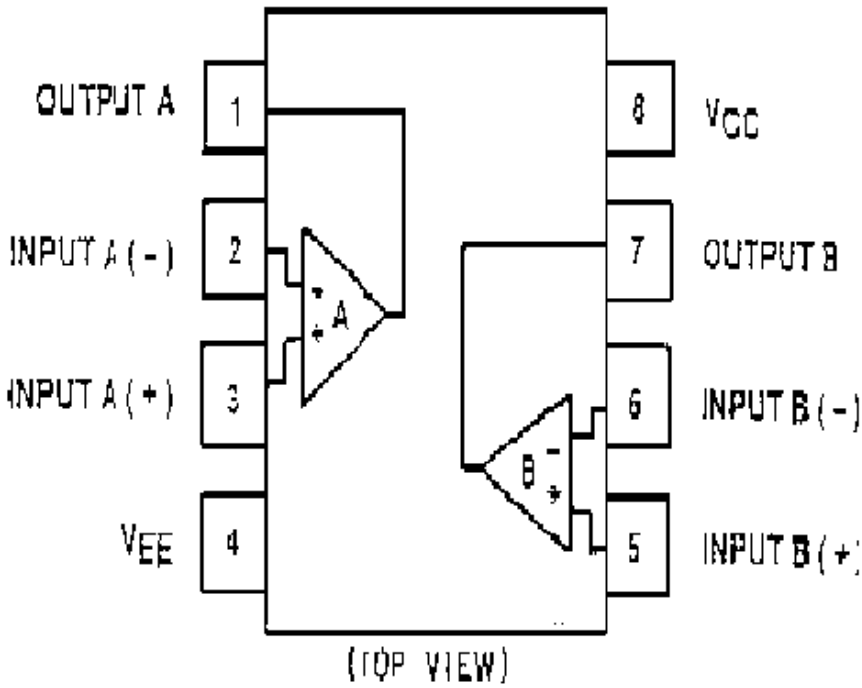
9 Volt Regulator

The 9-volt regulator circuit powers the IF circuits of CMF-138 and consists of regulator IC503 and filter capacitors C570, C571 C572 and C573. An input voltage of +13.8 Vdc is applied to the input of IC503. This input is monitored at test point TP2.

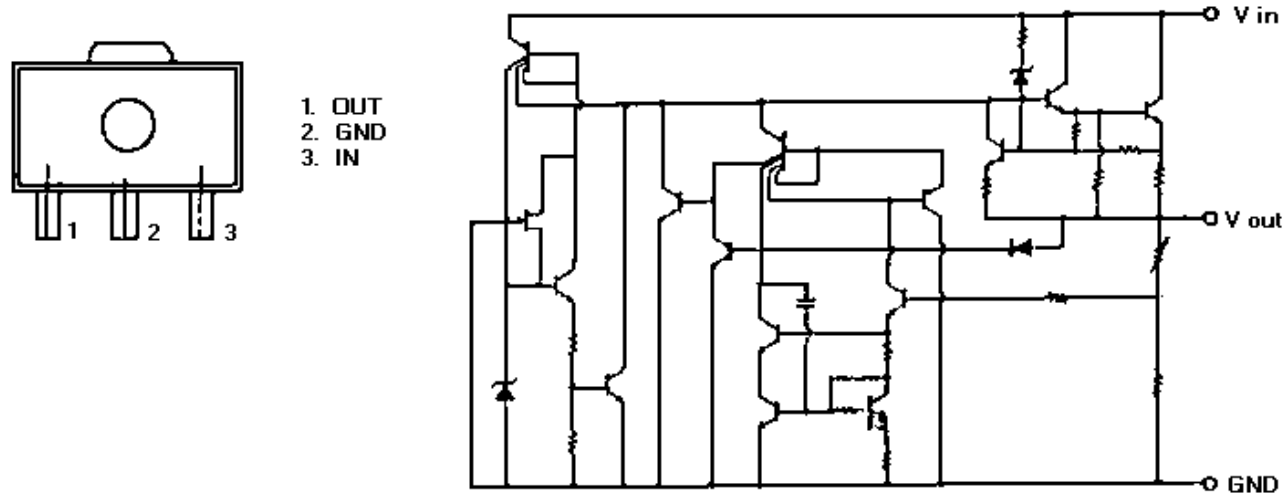
Linear, IF Amplifier/Detector IC501
B19/5DDAE02286 (TA31132F)



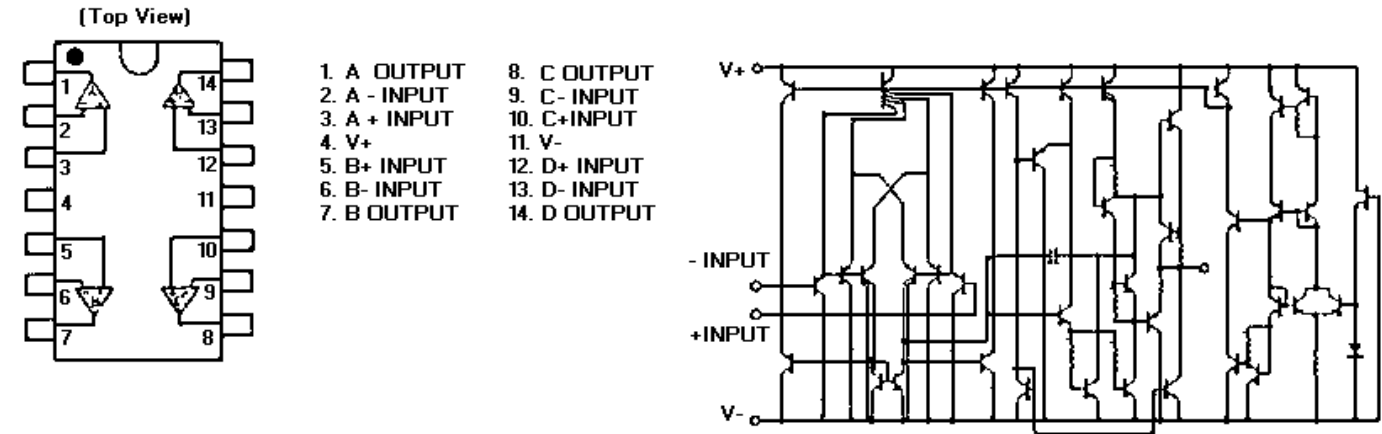
Linear, Dual Operational Amplifier IC502
B19/5DAAN00368 (NJM3404)



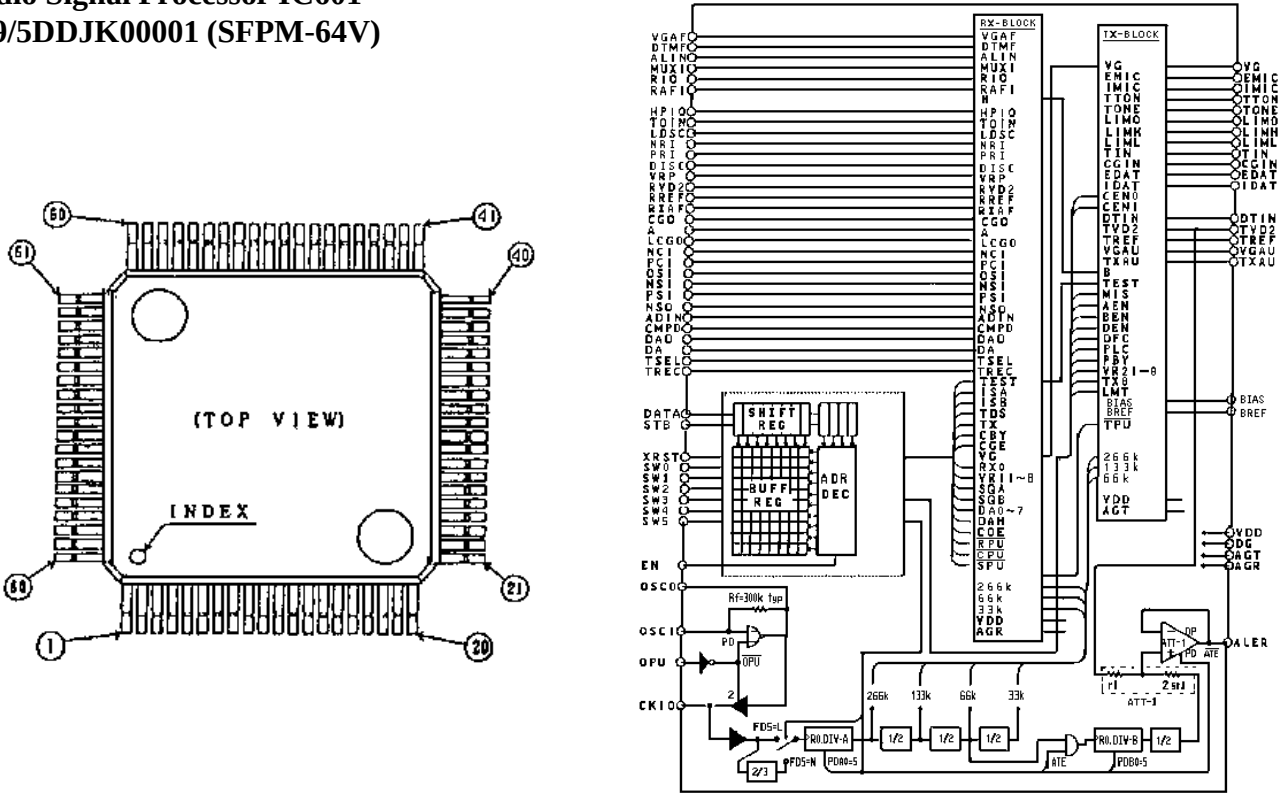
Linear, Positive Voltage Regulator IC503
B19/5DAAN00483 (NJM78L09UA)



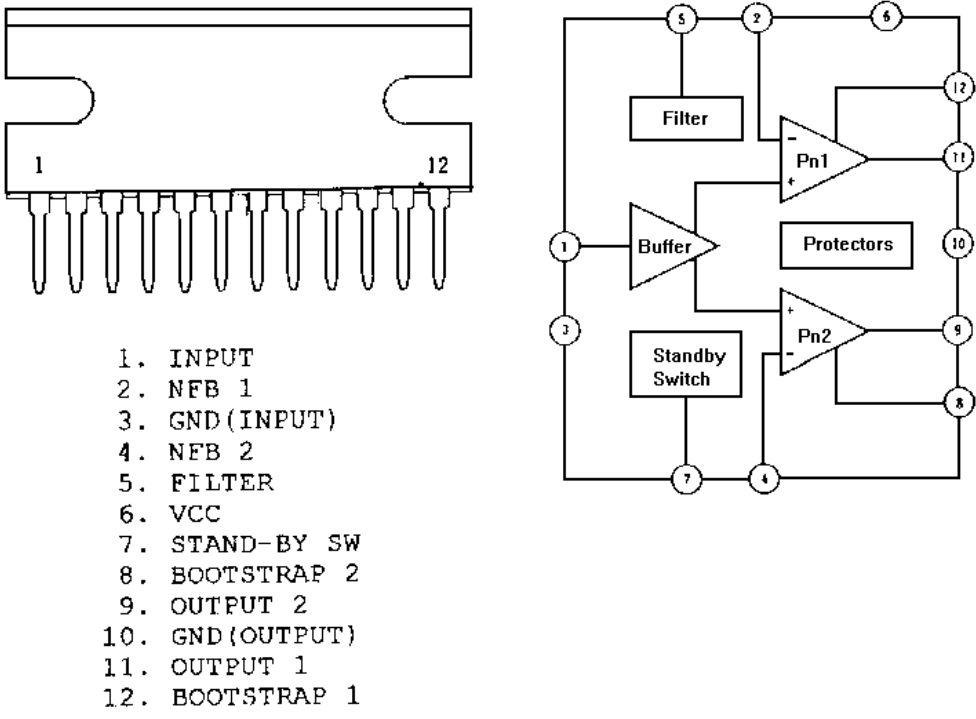
Linear Audio Amplifier IC602, IC603
B19/5DAAN00650 (NJRC 3403, PC123D)



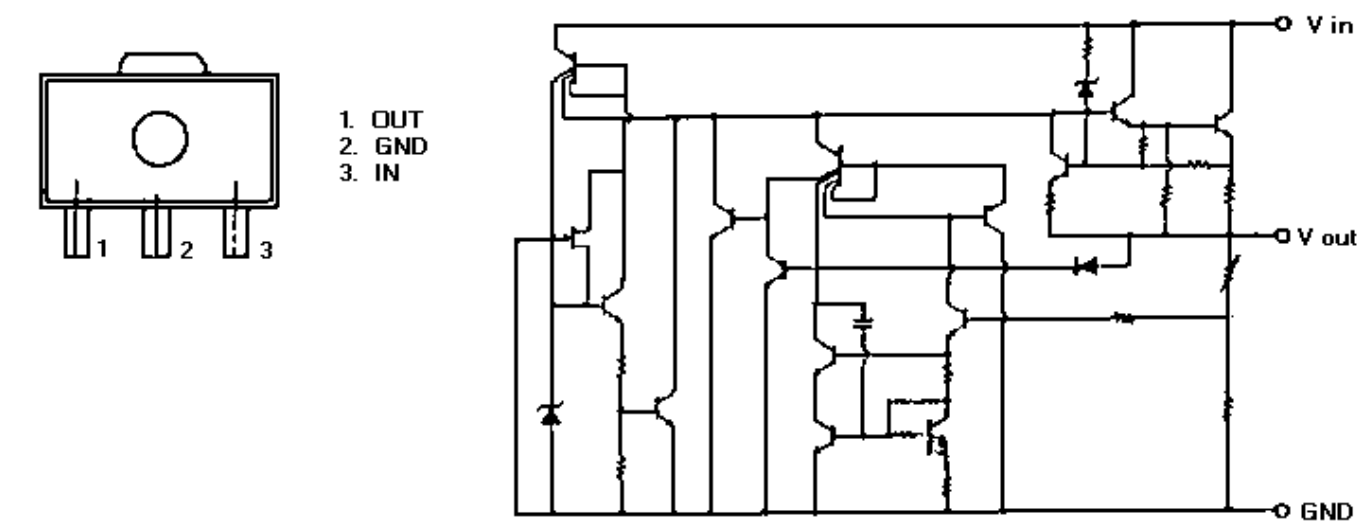
Audio Signal Processor IC601
B19/5DDJK00001 (SFPM-64V)



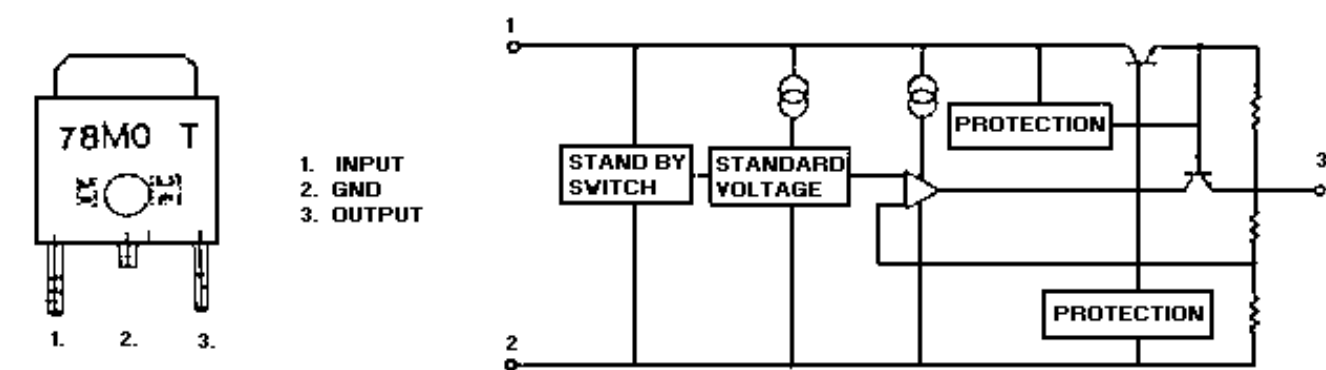
Audio Frequency Power Amplifier IC604
B195DAAA00350 (UPC2500H)



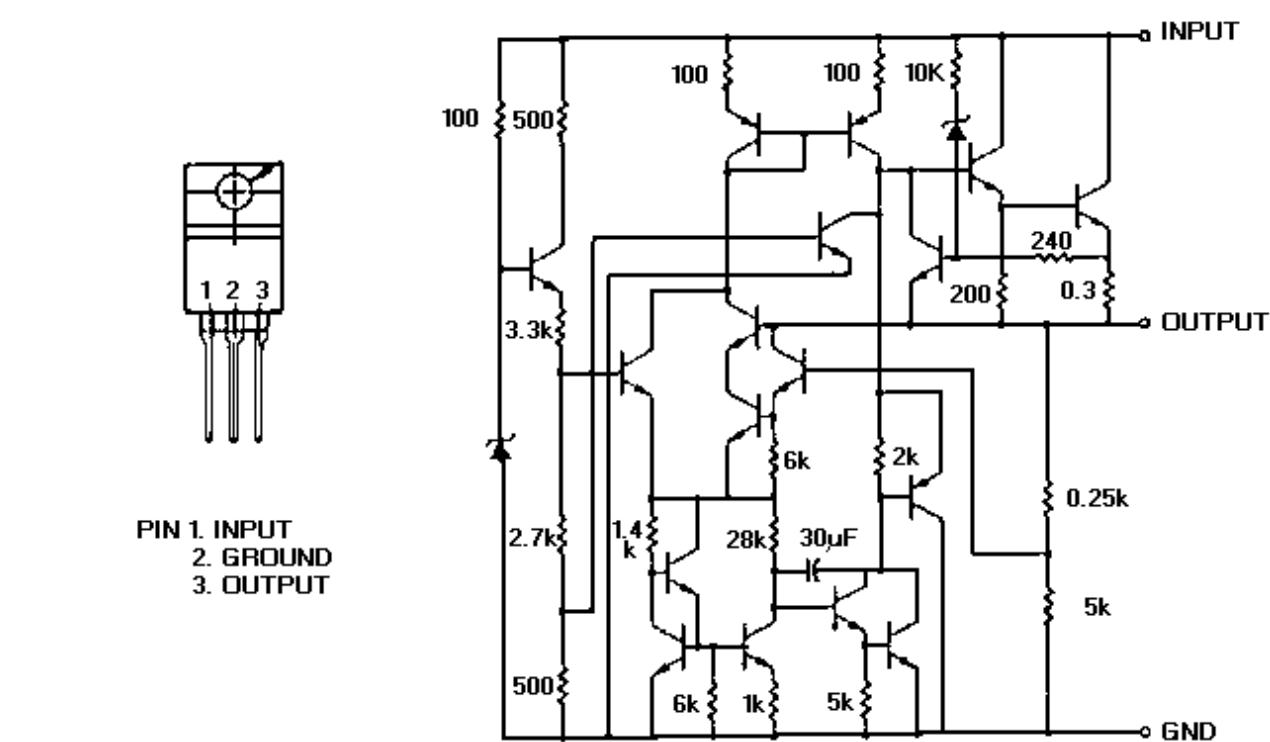
Linear: Positive Voltage Regulator IC605, IC609
B19/5DAAN00483 (NJM78L09UA)



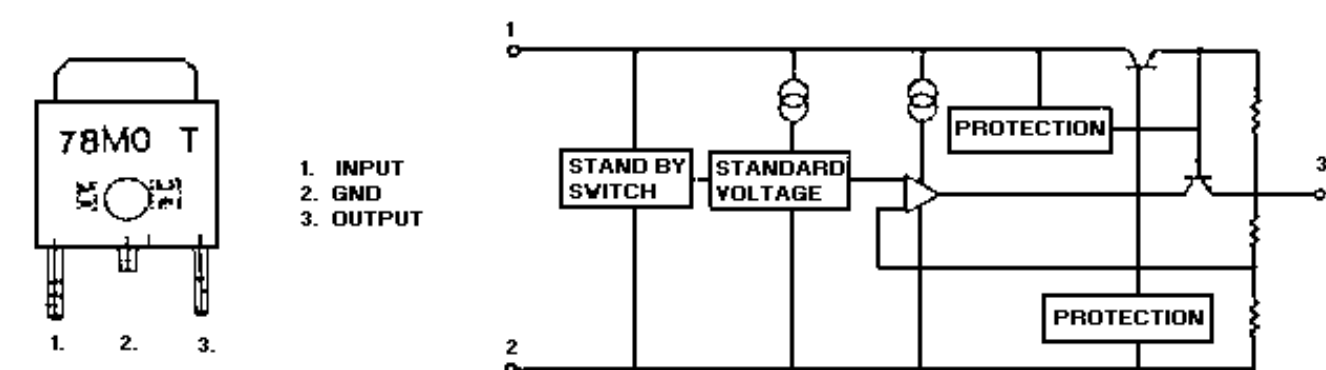
Linear: Positive Voltage Regulator IC607
B19/5DDCC00043 (L78M05T)



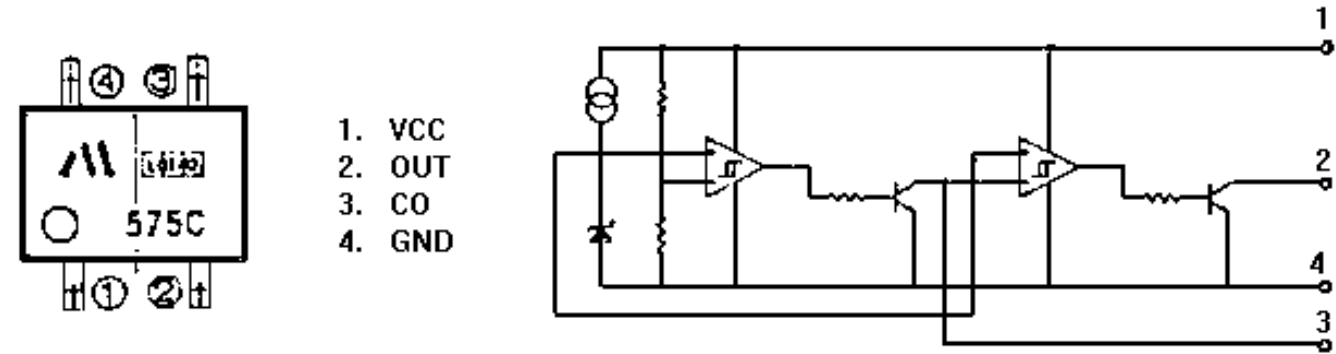
Linear: Positive Voltage Regulator IC606
B19/5DAAJ00305 (MC7805CT)



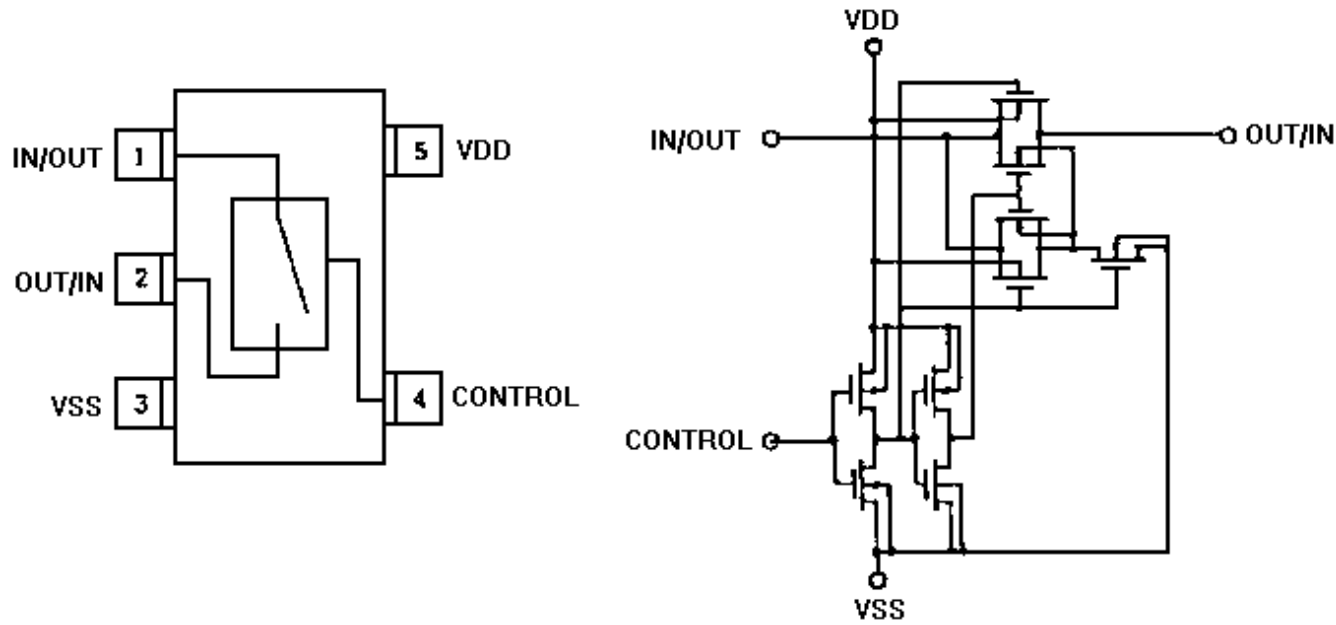
Linear: Positive Voltage Regulator IC608
B19/5DDCC00042 (L78M09T)



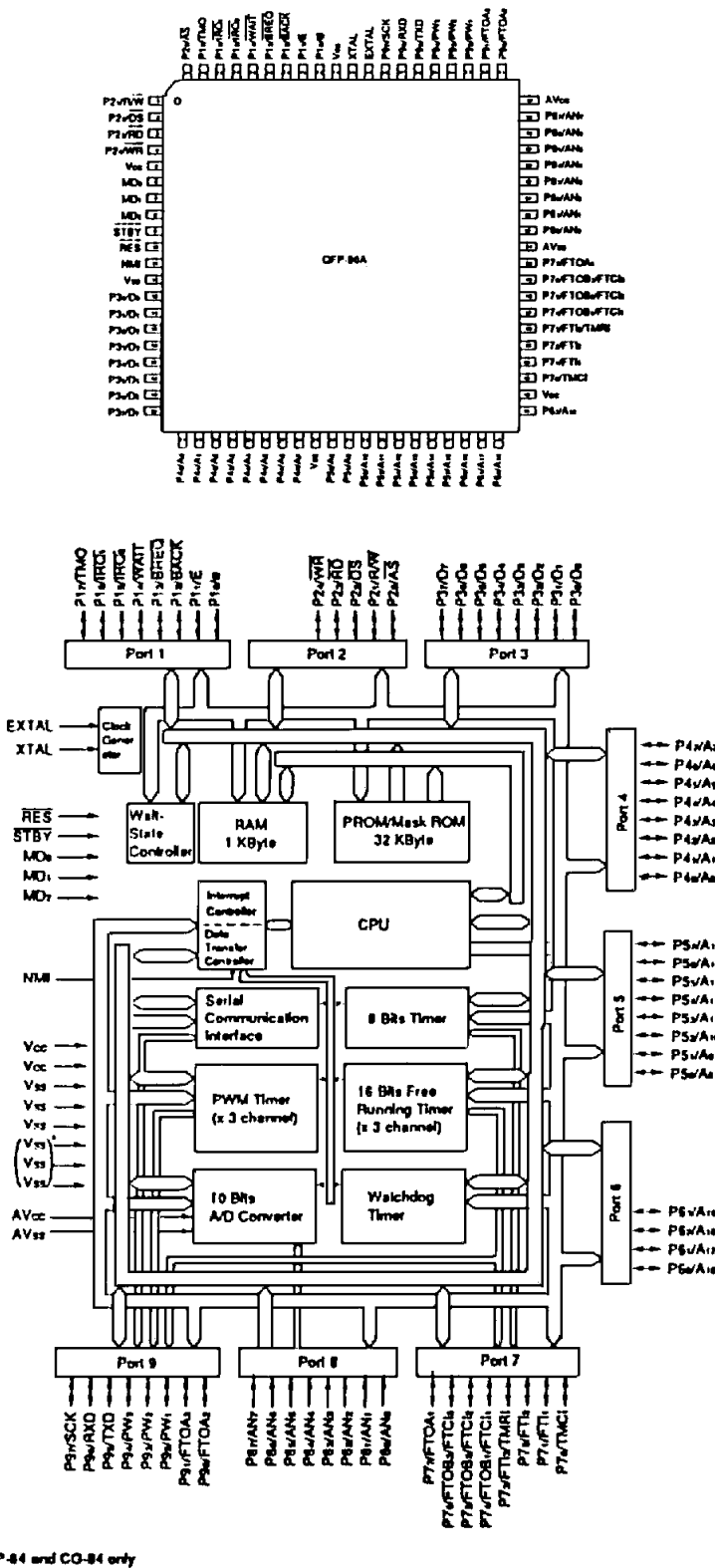
Reset Circuit IC610
19/5DADX00002 (PST575)



Bilateral Switch IC611, IC612
B19/5DDAE01621 (TC4S66F)



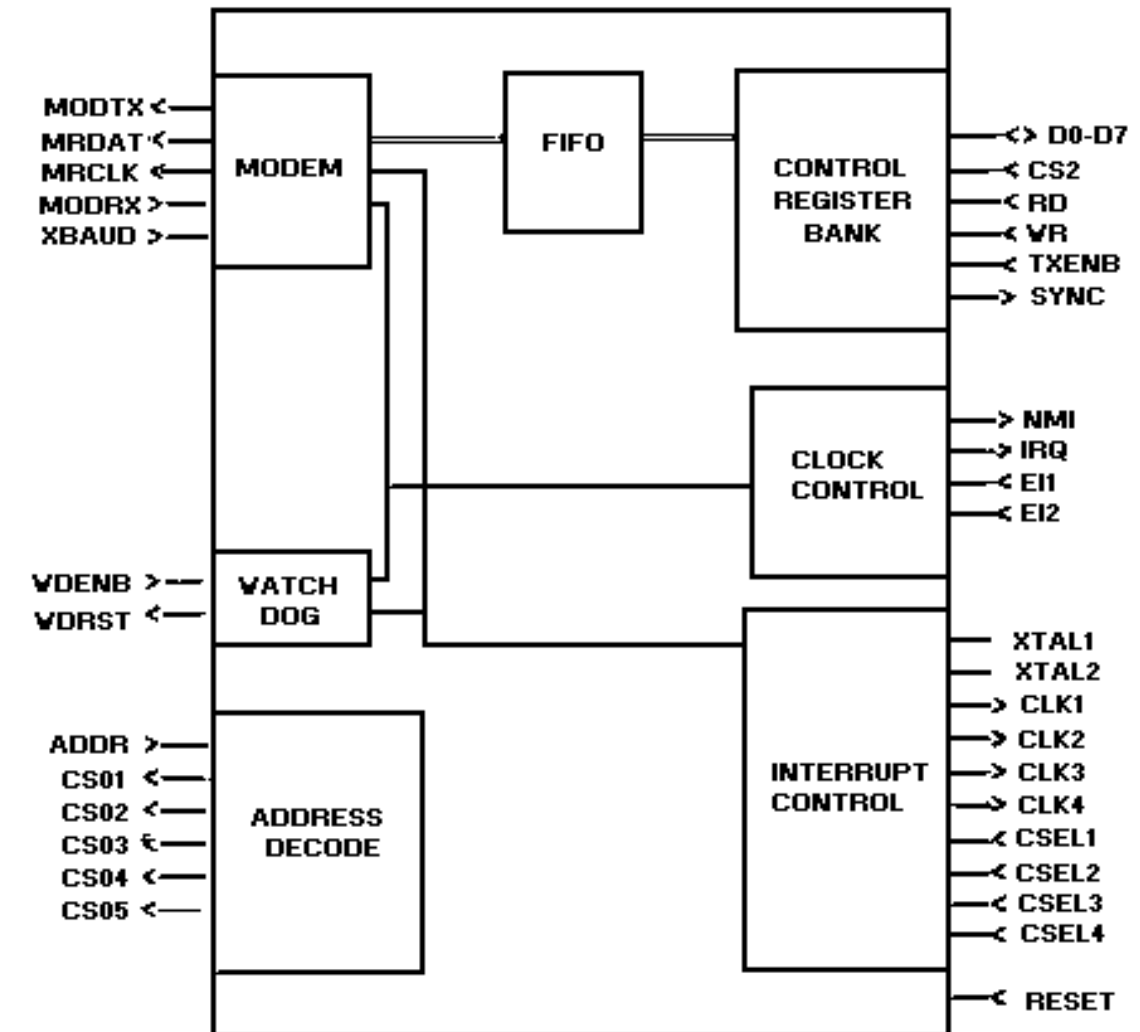
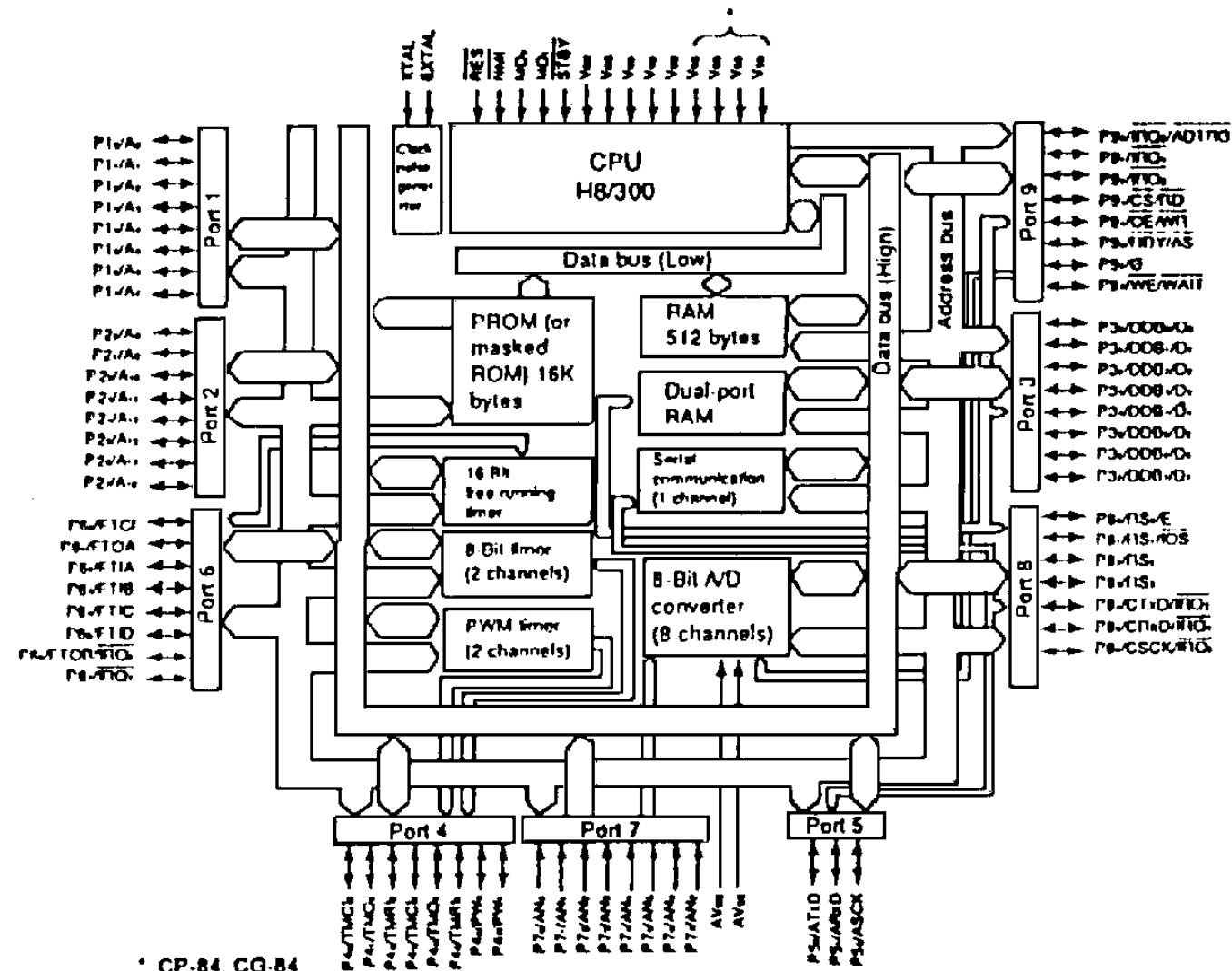
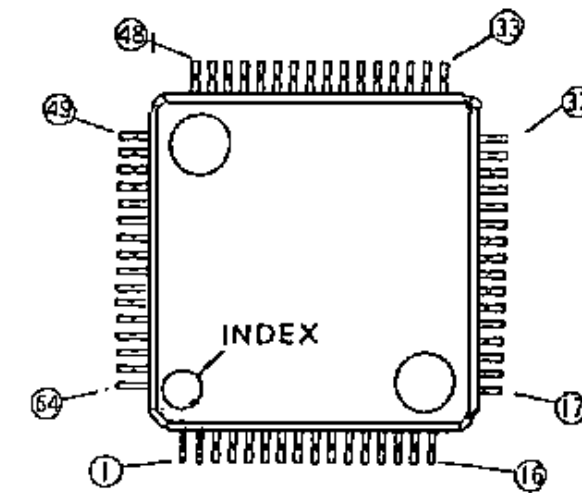
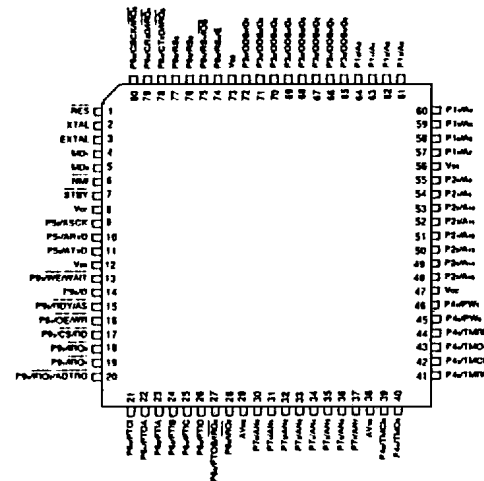
Central Processing Unit IC701
B19/5DDAF01903 (HD6475328F)



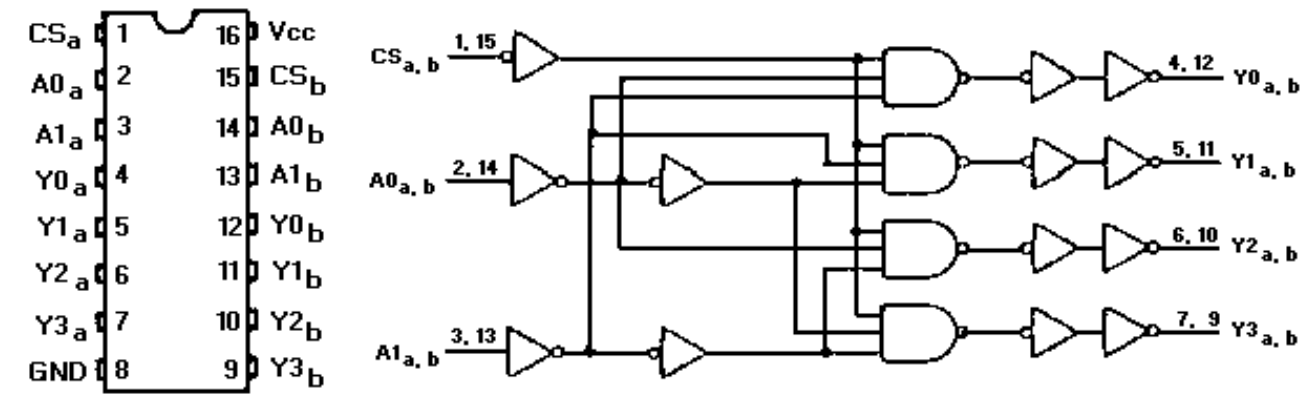
* CP-84 and CO-84 only

Central Processing Unit U702
B19/5DDAF02006 (HD6473308RF)

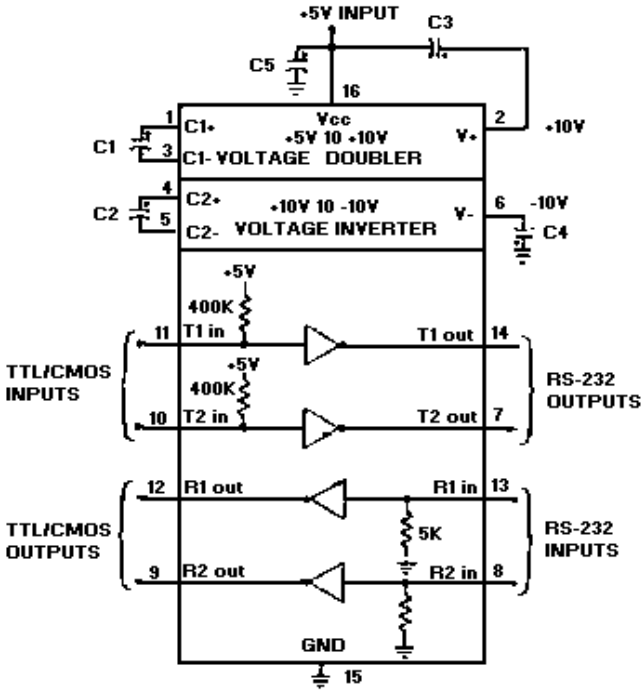
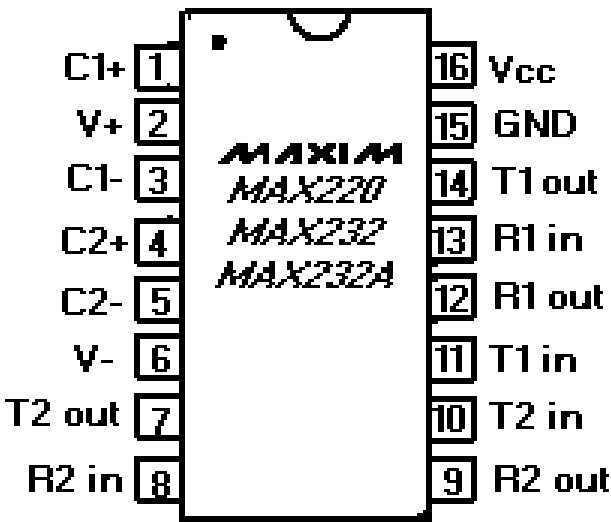
ASIC IC703
B19/5DAAD00684 (MC74HC139)



Decoder IC704
B19/5DAAJ00387 (NS AS75176)

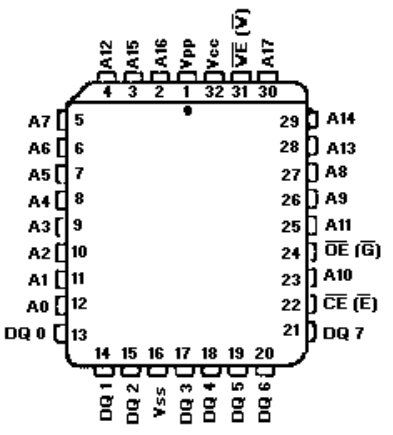
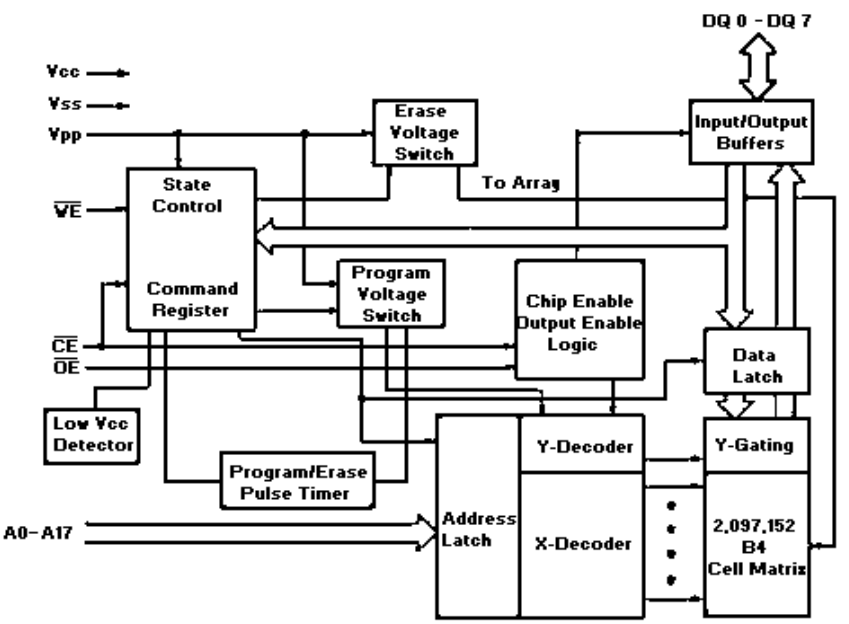
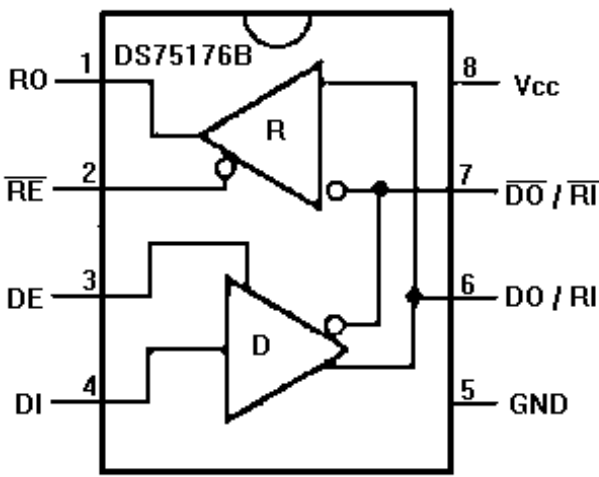
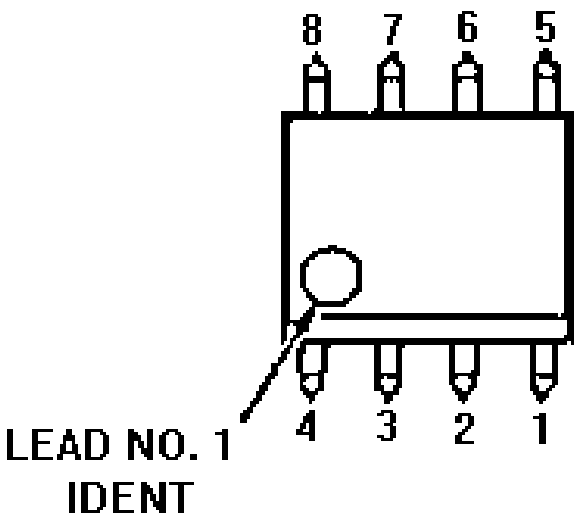


RS-232 Driver/Receiver IC706
B19/5DDED00117 (MA232EWE)

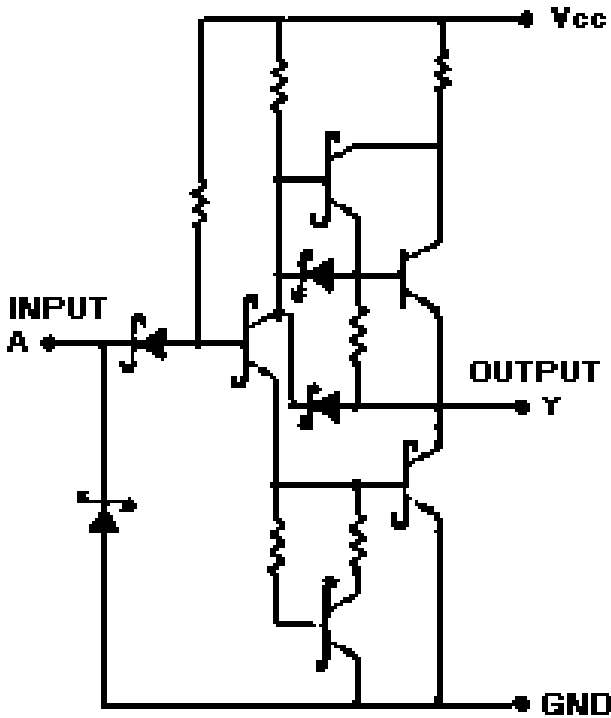
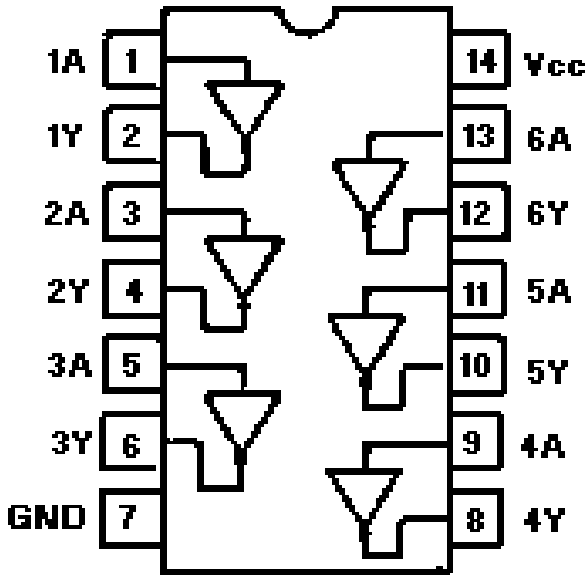


RS-485 Driver/Receiver IC705
B19/5DDAW00387 (NS AS75176)

Flash Memory IC707
B19/5DDAK00467 (N28F020)



Inverter IC713
B19/5DDAF02069 (HD74LS04FP)



PARTS LIST
LOGIC/IF BOARD
LOGIC SECTION
CMC-682
(Used in P1, P2, P3)

SYMBOL	PART NO.	DESCRIPTION
----- CAPACITORS -----		
C601	B19/5CAAD00959	Ceramic: 0.01 μ F $\pm$ 10% 50 VDC, temp coef $\pm$ 15%.
C602	B19/5CAAD02226	Ceramic: 1 μ F +80%/-20% 16 VDCW, temp coef +22%/-82%.
C603	B19/5CAAD00954	Ceramic: 220 pF $\pm$ 5% 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C604	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW.
C605	B19/5CAAD00959	Ceramic: 0.01 μ F $\pm$ 10% 50 VDC, temp coef $\pm$ 15%.
C606	B19/5CSAD00316	Tantalum: 1 μ F $\pm$ 20% 16 VDCW.
C607 Thru C609	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C610	B19/5CSAD00316	Tantalum: 1 μ F $\pm$ 20% 16 VDCW.
C611	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C612	B19/5CSAD00404	Tantalum: 3.3 μ F $\pm$ 20% 16 VDCW.
C613	B19/5CSAD00316	Tantalum: 1 μ F $\pm$ 20% 16 VDCW.
C614	B19/5CSAD00396	Tantalum: 0.33 μ F $\pm$ 20% 35 VDCW.
C615	B19/5CAAD00839	Ceramic: 100 pF $\pm$ 5% 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C616	B19/5CAAD02226	Ceramic: 1 μ F +80%/-20% 16 VDCW, temp coef +22%/-82%.
C617	B19/5CSAD00396	Tantalum: 0.33 μ F $\pm$ 20% 35 VDCW.
C618	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C621 And C622	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C623	B19/5CSAD00403	Tantalum: 22 μ F $\pm$ 20% 16 VDCW.
C624	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C625	B19/5CSAD00316	Tantalum: 1 μ F $\pm$ 20% 16 VDCW.
C626	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C627	B19/5CSAD00403	Tantalum: 22 μ F $\pm$ 20% 16 VDCW.
C628 And C629	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C630	B19/5CSAD00403	Tantalum: 22 μ F $\pm$ 20% 16 VDCW.
C631 And C632	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C633	B19/5CSAD00403	Tantalum: 22 μ F $\pm$ 20% 16 VDCW.
C634 Thru C637	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C638	B19/5CAAD00954	Ceramic: 220 pF $\pm$ 5% 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C639	B19/5CEAA01820	Electrolytic: 47 μ F $\pm$ 20% 25 VDCW.
C640	B19/5CAAD01586	Ceramic: 0.1 F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C641 And C642	B19/5CEAA02690	Electrolytic: 22 μ F $\pm$ 20% 16 VDCW.
C643	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C644	B19/5CEAA02877	Electrolytic: 10 μ F $\pm$ 20% 25 VDCW.
C645	B19/5CAAD02226	Ceramic: 1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C646	B19/5CAAD02263	Ceramic: 1000 pF +80%/-20% 50 VDCW temp coef +22%/-82%.
C647	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.

SYMBOL	PART NO.	DESCRIPTION
C649 And C650	B19/5CEAA02690	Electrolytic: 22 μ F $\pm$ 20% 16 VDCW.
C651 And C652	B19/5CAAD03928	Ceramic: 0.47 μ F +80%/-20% 25 VDCW temp coef +30%/-80%.
C653 And C654	B19/5CAAG00014	Tantalum: 2.2 μ F $\pm$ 20% 16 VDCW.
C655 And C656	B19/5CEAA02877	Electrolytic: 10 μ F $\pm$ 20% 25 VDCW.
C657 And C658	B19/5CAAD02442	Ceramic: 0.047 μ F +80%/-20% 50 VDCW temp coef +22%/-82%.
C659 And C660	B19/5CSAD00316	Tantalum: 1 μ F $\pm$ 20% 16 VDCW.
C661 Thru C664	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C665 And C666	B19/5CAAD01237	Ceramic: 0.1 μ F $\pm$ 10% 25 VDCW, temp coef $\pm$ 15%.
C667	B19/5CSAD00316	Tantalum: 1 μ F $\pm$ 20% 16 VDCW.
C670	B19/5CAAD01426	Ceramic: 3300 pF $\pm$ 10% 50 VDCW, temp coef $\pm$ 15%.
C701 Thru C706	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C707	B19/5CAAD02207	Ceramic: 47 pF $\pm$ 5% 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C708 And C709	B19/5CAAD02477	Ceramic: 12 pF 20.25 pF 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C710	B19/5CAAD02207	Ceramic: 47 pF $\pm$ 5% 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C711	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C712 And C713	B19/5CAAD02182	Ceramic: 100 pF $\pm$ 5% 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C714	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C715 Thru C719	B19/5CSAD00316	Tantalum: 1 μ F $\pm$ 20% 16 VDCW.
C720 Thru C722	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C726 And C727	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C728 Thru C743	B19/5CAAD02182	Ceramic: 100 pF $\pm$ 5% 50 VDCW, temp coef 0 $\pm$ 30 PPM/ $^{\circ}$ C.
C744 And C745	B19/5CAAD01586	Ceramic: 0.1 μ F +80%/-20% 25 VDCW, temp coef +22%/-82%.
C746	B19/5CAAD02402	Ceramic: 1000 pF $\pm$ 10% 50 VDCW, temp coef $\pm$ 15%.
----- DIODES -----		
CD601 And CD602	B19/5TXAN00230	POWER Supply rectification diode: sim to SANKEN SFPM-64V.
CD603	B19/5TXAE00939	Zener 900mW 22 V: sim to Hitachi HZF22.
CD604	B19/5TXAD00637	Silicon fast recovery (2 diodes in series):sim to TOSHIBA ISS300.
CD701 Thru CD705	B19/5TXAD00648	Silicon fast recovery (2 diodes in series):sim to TOSHIBA ISS302.
CD709 And CD710	B19/5TXAD00648	Silicon fast recovery (2 diodes in series):sim to TOSHIBA ISS302.
CD711	B19/5TXAD00637	Silicon fast recovery (2 diodes in series):sim to TOSHIBA ISS300.

SYMBOL	PART NO.	DESCRIPTION
CD712 CD713 And CD714 CX701 And CX702 F601	B19/5TXAE00930 B19/5TXAD00648 B19/5NXAA00081 B19/5ZFAP00008	Zener 900mW 22 V: sim to Hitachi HZF12. Silicon fast recovery (2 diodes in series):sim to TOSHIBA ISS302. EMI Filter. Fuse , 5A. ----- INTEGRATED CIRCUITS -----
IC601 IC602 And IC603 IC604 IC605 IC606 IC607 IC608 IC609 IC610 IC611 And IC612 IC701 IC702 IC703 IC704 IC705 IC706 IC707 IC708 IC709 IC711 IC712 IC713	B19/5DDJK00001 B19/5DAAN00650 B19/5DAAA00350 B19/5DAAN00483 B19/5DAAJ00305 B19/5DDCC00043 B19/5DDCC00042 B19/5DAAN00483 B19/5DADX00002 B19/5DDAE01621 B19/5DDAF01903 B19/5DDAF02006 B19/5DAAD00684 B19/5DAAJ00964 B19/5DDAW00387 B19/5DDED00117 B19/5DDAK00467 B19/5DAAG00515 B19/5DZCJ00065 B19/5DAAJ00954 B19/5DDKA00001 B19/5DDAF02069	Audio Signal PROCESSOR. Linear Audio Amplifier: sim to NJRC 3403. PC1230H2. AF Power Amplifier: sim to NEC UPC2500H. Linear Positive Voltage Regulator: sim to NJRC NJM78L09UA. Linear: Positive Voltage Regulator; sim to MOTOROLA MC7805CT. Linear: Positive Voltage Regulator; sim to SANYO L78M05T. Linear: Positive Voltage Regulator; sim to SANYO L78M09T. Linear Positive Voltage Regulator: sim to NJRC NJM78L09UA. Reset Circuit: sim to MITSUMI PST575. Bilateral Switch: sim to TOSHIBA TC4S66F. CPU: sim to HITACHI HD6475328F. CPU: sim to HITACHI HD6473308RF. ASIC: sim to TOSHIBA TC24SC090AF. DECODER: Sim to MOTOROLA MC74HC139. RS485 Driver/Receiver: sim to NS AS75176. RS232 Driver/Receiver: sim to MAXIM MA232EWE. FLASH MEMORY: sim to INTEL N28F020. EEPROM: sim to HITACHI HN58C66FP. RAM: sim to SONY CXK58257AM. Inverter: sim to MOTOROLA MC74HC04. Silicon Seral Number: sim to DALLAS DS2400. Inverter: sim to HITACHI HD74LS04FP.
		----- JACKS -----
J701 J702 And J703 J704 J706 J707 J708 K601	B19/5JDAG00315 B19/5JBAX00013 B19/5JTCAO0410 B19/5JWBE00231 B19/5JWBE00232 B19/5JWBE00233 B19/5KLAC00112	Connector: 18 pins. Connector: 24 pins. Connector: 4 pins. Connector: 10 pins. Connector: 13 pins. Connector: 5 pins. Relay: sim to TAKAMIZAWA JY9H-K.
		----- RESISTORS -----
R601 R602 R603 R604 R605 R606 R607 R608 And R609 R610 And R611	B19/5REAGO3231 B19/5REAG03567 B19/5REAG03599 B19/5RDAA02260 B19/5REAG03235 B19/5REAG03567 B19/5REAG03600 B19/5REAG03336 B19/5REAG03228	Metal film: 27k ohms ±5% 100 VDCW 1/16W. Metal film: 56K ohms ±5% 100 VDCW 1/16W. Metal film: 120k ohms ±5% 100 VDCW 1/16W. Metal film: 220K ohms ±5% 100 VDCW 1/16W. Metal film: 470K ohms ±5% 100 VDCW 1/16W. Metal film: 56K ohms ±5% 100 VDCW 1/16W. Metal film: 150K ohms ±5% 100 VDCW 1/16W. Metal film: 22k ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W.

SYMBOL	PART NO.	DESCRIPTION
R612 And R613 R614 R615 R616 R617 R618 And R619 R620 R621 R622 Thru R624 R625 R626 R627 R628 And R629 R630 R631 R632 R633 R634 R635 R636 Thru R639 R640 R641 R642 R643 And R644 R645 And R646 R647 R648 R649 R650 And R651 R652 R653 R654 R655 R656 R657 R701 Thru R703 R704 R705 R706 And R707 R709 And R710 R718 R719 R720 R721 R724 And R725	B19/5REAG03232 B19/5REAG03377 B19/5REAG03446 B19/5REAG03235 B19/5REAG03777 B19/5REAG03446 B19/5REAG03233 B19/5REAG03230 B19/5REAG03567 B19/5REAG03228 B19/5REAG03567 B19/5REAG03600 B19/5REAG03446 B19/5REAG03777 B19/5REAG03233 B19/5REAG03446 B19/5REAG03230 B19/5REAG03238 B19/5REAG03354 B19/5REAG03228 B19/5REAG03339 B19/5REAG03228 B19/5REAG03230 B19/5REAG03381 B19/5REAG03227 B19/5REAG03335 B19/5REAG03228 B19/5REAG03238 B19/5REAG03336 B19/5REAG03446 B19/5REAG03425 B19/5REAG03425 B19/5REAG03567 B19/5REAG03227 B19/5RDAA01240 B19/5REAG03424 B19/5REAG03590 B19/5REAG03424 B19/5REAG03227 B19/5REAG03424 B19/5REAG03377 B19/5REAG03446 B19/5REAG03228 B19/5REAG03233 B19/5REAG03340	Metal film: 39k ohms ±5% 100 VDCW 1/16W. Metal film: 4.7K ohms ±5% 100 VDCW 1/16W. Metal film: 100k ohms ±5% 100 VDCW 1/16W. Metal film: 470K ohms ±5% 100 VDCW 1/16W. Metal film: 3.3 M ±10% 200 VDCW 1/10W. Metal film: 100k ohms ±5% 100 VDCW 1/16W. Metal film: 47K ohms ±5% 100 VDCW 1/16W. Metal film: 22k ohms ±5% 100 VDCW 1/16W. Metal film: 56K ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W. Metal film: 56k ohms ±5% 100 VDCW 1/16W. Metal film: 150k ohms ±5% 100 VDCW 1/16W. Metal film: 100K ohms ±5% 100 VDCW 1/16W. Metal film: 3.3M ohms ±10% 200 VDCW 1/10W. Metal film: 47k ohms ±5% 100 VDCW 1/16W. Metal film: 100K ohms ±5% 100 VDCW 1/16W Metal film: 22k ohms ±5% 100 VDCW 1/16W. Metal film: 1M ohms ±5% 100 VDCW 1/16W. Metal film: 6.8k ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W. Metal film: 3.3k ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W. Metal film: 22k ohms ±5% 100 VDCW 1/16W. Metal film: 22 ohms ±5% 100 VDCW 1/16W. Metal film: 1.0k ohms ±5% 100 VDCW 1/16W. Metal film: 8.2k ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W. Metal film: 1M ohms ±5% 100 VDCW 1/16W. Metal film: 680 ohms ±5% 100 VDCW 1/16W. Metal film: 100K ohms ±5% 100 VDCW 1/16W. Metal film: 15K ohms ±5% 100 VDCW 1/16W. Metal film: 15K ohms ±5% 100 VDCW 1/16W. Metal film: 56k ohms ±5% 100 VDCW 1/16W. Metal film: 1.0k ohms ±5% 100 VDCW 1/16W. Carbon film: 560 ohms ±5% 200 VDCW 1/4W. Metal film: 100 ohms ±5% 100 VDCW 1/16W. Metal film: 68k ohms ±5% 100 VDCW 1/16W. Metal film: 100 ohms ±5% 100 VDCW 1/16W. Metal film: 1.0k ohms ±5% 100 VDCW 1/16W. Metal film: 100 ohms ±5% 100 VDCW 1/16W. Metal film: 4.7k ohms ±5% 100 VDCW 1/16W. Metal film: 100k ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W. Metal film: 47k ohms ±5% 100 VDCW 1/16W. Metal film: 2.7K ohms ±5% 100 VDCW 1/16W.

SYMBOL	PART NO.	DESCRIPTION
R726 R729 And R730 R732 R733 R734 R735 R736 R737 Thru R740 R741 R742 And R743 R744 And R745 R747 R748 R749 R750 And R751 R752 And R753 SW601 SW701	B19/5REAG03238 B19/5REAG03378 B19/5REAG03378 B19/5REAG03377 B19/5REAG03227 B19/5REAG03377 B19/5REAG03354 B19/5REAG03228 B19/5REAG03231 B19/5REAG03377 B19/5REAG01827 B19/5REAG03378 B19/5REAG03228 B19/5REAG03346 B19/5REAG03230 B19/5REAG03378 B19/5SAFB00002 B19/5SAFB00002	Metal film: 1M ohms ±5% 100 VDCW 1/16W. Metal film: 0 ohms. Metal film: 0 ohms. Metal film: 4.7K ohms ±5% 100 VDCW 1/16W. Metal film: 1.0k ohms ±5% 100 VDCW 1/16W. Metal film: 4.7K ohms ±5% 100 VDCW 1/16W. Metal film: 6.8K ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W. Metal film: 27k ohms ±5% 100 VDCW 1/16W. Metal film: 4.7K ohms ±5% 100 VDCW 1/16W. Metal film: 470 ohms ±5% 100 VDCW 1/10W. Metal film: 0 ohms. Metal film: 10K ohms ±5% 100 VDCW 1/16W. Metal film: 100K ohms ±5% 100 VDCW 1/16W. Metal film: 22k ohms ±5% 100 VDCW 1/16W. Metal film: 10k ohms ±5% 100 VDCW 1/16W. Slide Switch. Slide Switch.
		----- TRANSISTORS -----
TR602 TR603 TR701 TR702 Thru TR712 TR713 And TR713 TR715 And TR716 X701	B19/5TCAZ00011 B19/5TDAB00098 B19/5TZAD00608 B19/5TKAD00169 B19/5TCAF00459 B19/5TCAB01457 B19/5XHAA01299	Transistor NPN: sim to SANYO 2SC3398. Transistor NPN: sim to NEC 2SD596. Transistor NPN: sim to TOSHIBA RN2301. FET: sim to NEC 2SK1582. Transistor NPN: sim to TOSHIBA 2SC2859. Transistor NPN: sim to NEC 2SC3736. Crystal: 9.8304 MHz CP12A.

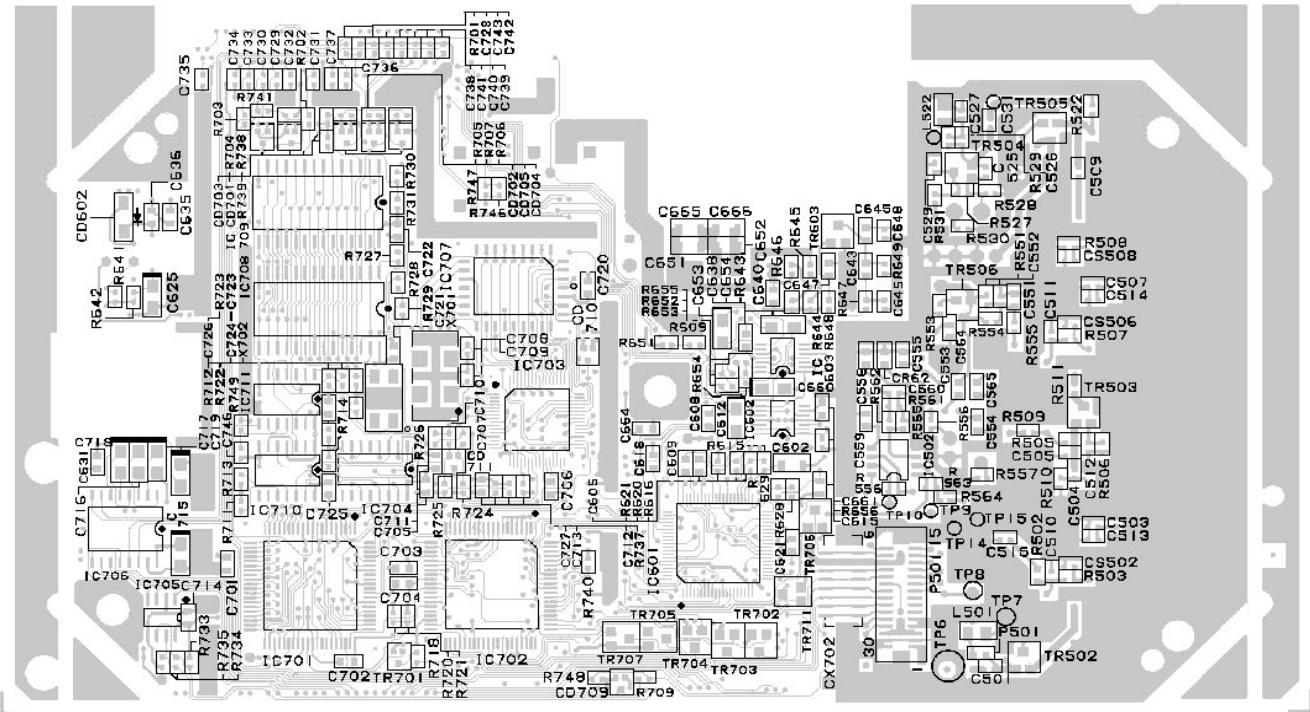
PARTS LIST
UHF LOGIC/IF BOARD
LOGIC SECTION
CMF-138W
(Used in P1, P2, P3)

SYMBOL	PART NO.	DESCRIPTION
		-----CAPACITORS-----
C501 C502 C503 C504 C505 C506 C507 C508 C509 Thru C512 C513 And C514 C515 And C516 C521 C522 And C523 C524 C525 C526 C527 C528 C529 C530 C531 C553 C554 Thru C556 C557 C558 And C559 C560 C561 Thru C565 C567 C571 And C572 C573	B19/5CAAA03471 B19/5CAAA03229 B19/5CAAA03061 B19/5CAAA03447 B19/5CAAA03285 B19/5CAAA03229 B19/5CAAA03061 B19/5CAAA03229 B19/5CAAA03471 B19/5CAAA03445 B19/5CAAA03471 B19/5CAAA03471 B19/5CBAB02716 B19/5CAAA03409 B19/5CAAA03471 B19/5CAAA03470 B19/5CAAA03004 B19/5CAAA03470 B19/5CAAA03921 B19/5CAAA03409 B19/5CAAA03921 B19/5CAAA03471 B19/5CAAA03921 B19/5CEAA02696 B19/5CAAA03921 B19/5CEAA02696	Ceramic: 1000pF ±10% 50 VDCW temp coef ±15%. Ceramic: 5pF 0.25 pF 50 VDCW temp coef 0±60 PPM. Ceramic: 1.5pF 0.25 pF 50 VDCW temp coef 0±250 PPM. Ceramic: 7pF 0.5 pF 50 VDCW temp coef 0±60 PPM. Ceramic: 10pF 0.5 pF 50 VDCW temp coef 0±60 PPM. Ceramic: 5pF 0.25 pF 50 VDCW temp coef 0±60 PPM. Ceramic: 1.5pF 0.25 pF 50 VDCW temp coef 0±250 PPM. Ceramic: 5pF 0.25 pF 50 VDCW temp coef 0±60 PPM. Ceramic: 1000pF ±10% 50 VDCW temp coef ±15%. Ceramic: 0.75pF 0.25pF 50 VDCW temp coef 0±250 PPM. Ceramic: 1000pF ±10% 50 VDCW temp coef ±15%. Ceramic: 0.1F ±10% 25 VDCW temp coef ±15%. Ceramic: 1000pF ±10% 50 VDCW temp coef ±15%. Ceramic: 15pF ±5% 50 VDCW temp coef 0±60 PPM. Ceramic: 1000pF ±10% 50 VDCW temp coef ±15%. Ceramic: 33pF ±5% 50 VDCW temp coef 0±60 PPM. Ceramic: 15pF ±5% 50 VDCW temp coef 0±60 PPM. Ceramic: 1000pF ±10% 50 VDCW temp coef ±15%. Ceramic: 0.01F ±10% 50 VDCW temp coef ±15%. Ceramic: 1pF 0.25pF 50 VDCW temp coef 0±250 PPM. Ceramic: 0.01F ±10% 50 VDCW temp coef ±15%. Ceramic: 0.1F ±10% 25 VDCW temp coef ±15%. Ceramic: 15pF ±5% 50 VDCW temp coef 0±60 PPM. Ceramic: 0.1F ±10% 25 VDCW temp coef ±15%. Electrolytic: 10F ±20% 16 VDCW. Ceramic: 0.1F ±10% 25 VDCW temp coef ±15%. Electrolytic: 10F ±20% 16 VDCW. -----FILTERS----- Crystal Filter: 82.2 MHz. Ceramic: Filter: 455 KHz.

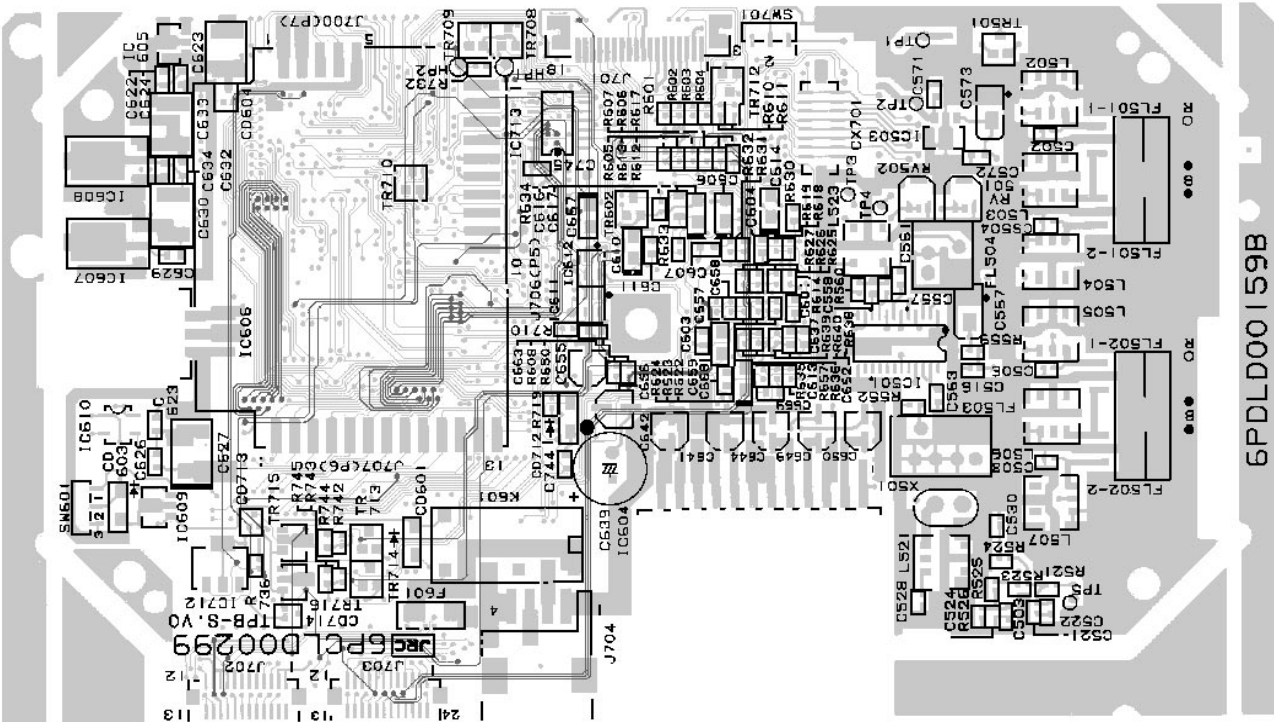
SYMBOL	PART NO.	DESCRIPTION
FL504	B19/5NRAA00041	Ceramic: Filter: 455 KHz.
IC501	B19/5DDAE02286	Linear, IF Amplifier/Audio Detector; sim to TOSHIBA TA31132F.
IC502	B19/5DAAN00368	Linear, Dual OP AMP; sim to NJRC NJM3404.
IC503	B19/5DAAN00483	Linear, Positive Voltage Regulator; sim to NJRC NJM78L09UA.
P501	B19/5JBAX00007	Connector: 30 Pins.
L501	B19/5LCAP00211	Coil: RF 1 H ±20%.
L502	B19/6LALD00166	Coil: RF .
L503	B19/6LALD00168	Coil: RF .
L504 And L505	B19/6LALD00166	Coil: RF .
L506	B19/6LALD00168	Coil: RF .
L507	B19/6LALD00166	Coil: RF .
L521	B19/6LALD00166	Coil: RF .
L522	B19/5LCAP00234	Coil: RF 0.22 H ±10%.
L523	B19/6LALD00123	Coil: RF .
R501	B19/5RDAC02582	Metal film: 82 ohms ±5% 100 VDCW.1/10W.
R502	B19/5RDAC02545	Metal film: 18 ohms ±5% 100 VDCW.1/10W.
R503	B19/5RDAC02821	Metal film: 3.9K ohms ±5% 100 VDCW.1/16W.
R505	B19/5RDAC02814	Metal film: 150K ohms ±5% 100 VDCW.1/16W.
R506	B19/5RDAC02827	Metal film: 330 ohms ±5% 100 VDCW.1/16W.
R507 And R508	B19/5RDAC02807	Metal film: 10K ohms ±5% 100 VDCW.1/16W.
R509	B19/5RDAC02832	Metal film: 220 ohms ±5% 100 VDCW.1/16W.
R510	B19/5RDAC02816	Metal film: 5.6K ohms ±5% 100 VDCW.1/16W.
R511	B19/5RDAC02827	Metal film: 330 ohms ±5% 100 VDCW.1/16W.
R521	B19/5RDAC02824	Metal film: 15K ohms ±5% 100 VDCW.1/16W.
R522	B19/5RDAC02838	Metal film: 4.7K ohms ±5% 100 VDCW.1/16W.
R523	B19/5RDAC02822	Metal film: 1.5K ohms ±5% 100 VDCW.1/16W.
R524	B19/5RDAC02828	Metal film: 100 ohms ±5% 100 VDCW.1/16W.
R525	B19/5RDAC02899	Metal film: 33 ohms ±5% 100 VDCW.1/16W.
R526	B19/5RDAC02819	Metal film: 1K ohms ±5% 100 VDCW.1/16W.
R527	B19/5RDAC02838	Metal film: 4.7K ohms ±5% 100 VDCW.1/16W.
R528	B19/5RDAC02807	Metal film: 10K ohms ±5% 100 VDCW.1/16W.
R529	B19/5RDAC02819	Metal film: 1K ohms ±5% 100 VDCW.1/16W.
R530	B19/5RDAC02807	Metal film: 10K ohms ±5% 100 VDCW.1/16W.
R531	B19/5RDAC02828	Metal film: 100 ohms ±5% 100 VDCW.1/16W.
R552	B19/5RDAC02822	Metal film: 1.5K ohms ±5% 100 VDCW.1/16W.
R556 And R557	B19/5RDAC02822	Metal film: 1.5K ohms ±5% 100 VDCW.1/16W.
R559	B19/5RDAC02906	Metal film: 820 ohms ±5% 100 VDCW.1/16W.
R560	B19/5RDAC02840	Metal film: 18K ohms ±5% 100 VDCW.1/16W.
R562	B19/5RDAC02807	Metal film: 10K ohms ±5% 100 VDCW.1/16W.
R563	B19/5RDAC02839	Metal film: 6.8K ohms ±5% 100 VDCW.1/16W.
R564	B19/5RDAC02835	Metal film: 1.2K ohms ±5% 100 VDCW.1/16W.
R565	B19/5RDAC02816	Metal film: 5.6K ohms ±5% 100 VDCW.1/16W.
R566	B19/5RZAB01429	Metal film: 0 ohms, 1/16W.
RV501	B19/5RVAF00176	Variable: 10K ohms.

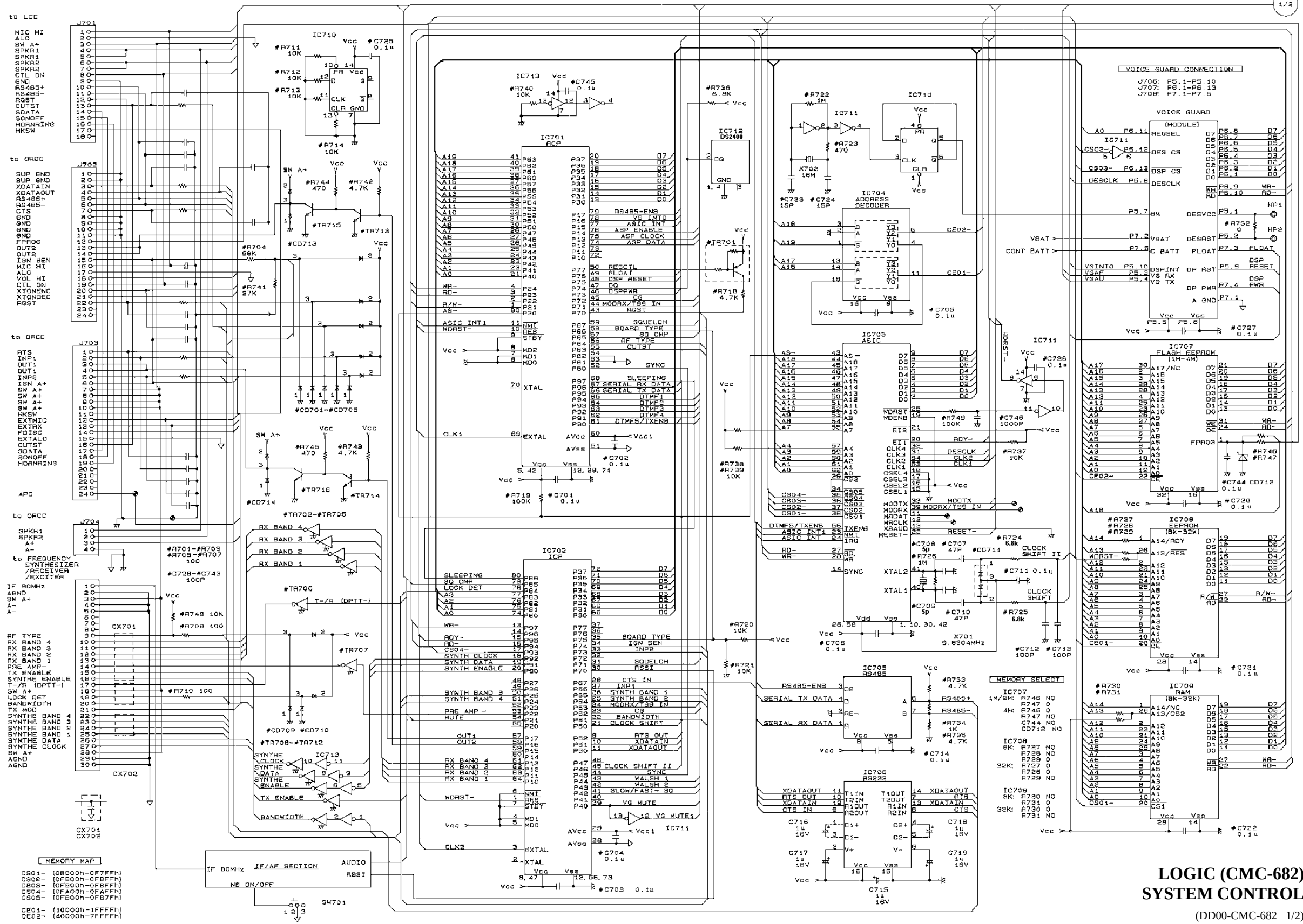
SYMBOL	PART NO.	DESCRIPTION
TR501 And TR502A	B19/5TCAE00044	N-Channel, field effect 2SK1577.
TR503	B19/5TCAB00238	Silicon, NPN; sim to NEC 2SC2223.
TR504 And TR505	B19/5TCAA00274	Silicon, NPN; sim to HITACHI 2SC2620.
X501	B19/6XHLD00024	Quartz crystal: 82.655 MHz.
XS501A And XS501B	B19/5ZJDF00001	Crystal Socket.

COMPONENT SIDE



SOLDER SIDE





LOGIC (CMC-682)
SYSTEM CONTROL
(DD00-CMC-682 2/2)

