MAINTENANCE MANUAL
ORION™
136-174 MHz CONTROL LOGIC/IF BOARD
CMC-682/CMF-135

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DESCRIPTION

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

SYSTEM CONTROL LOGIC (CMC-682)

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- 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-135)

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

Ericsson GE Mobile Communications Inc.
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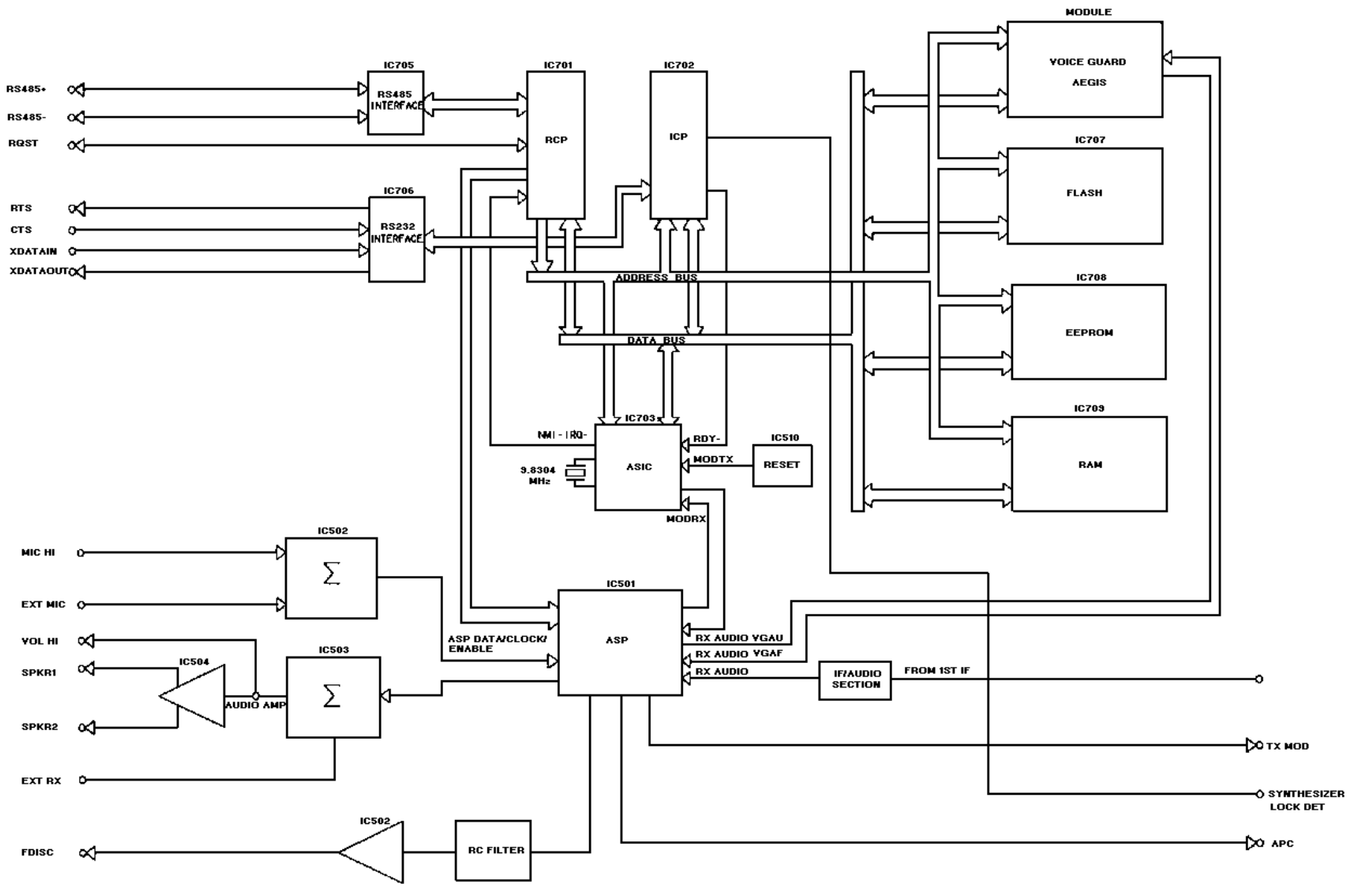


Figure 1 - Logic Section Block Diagram

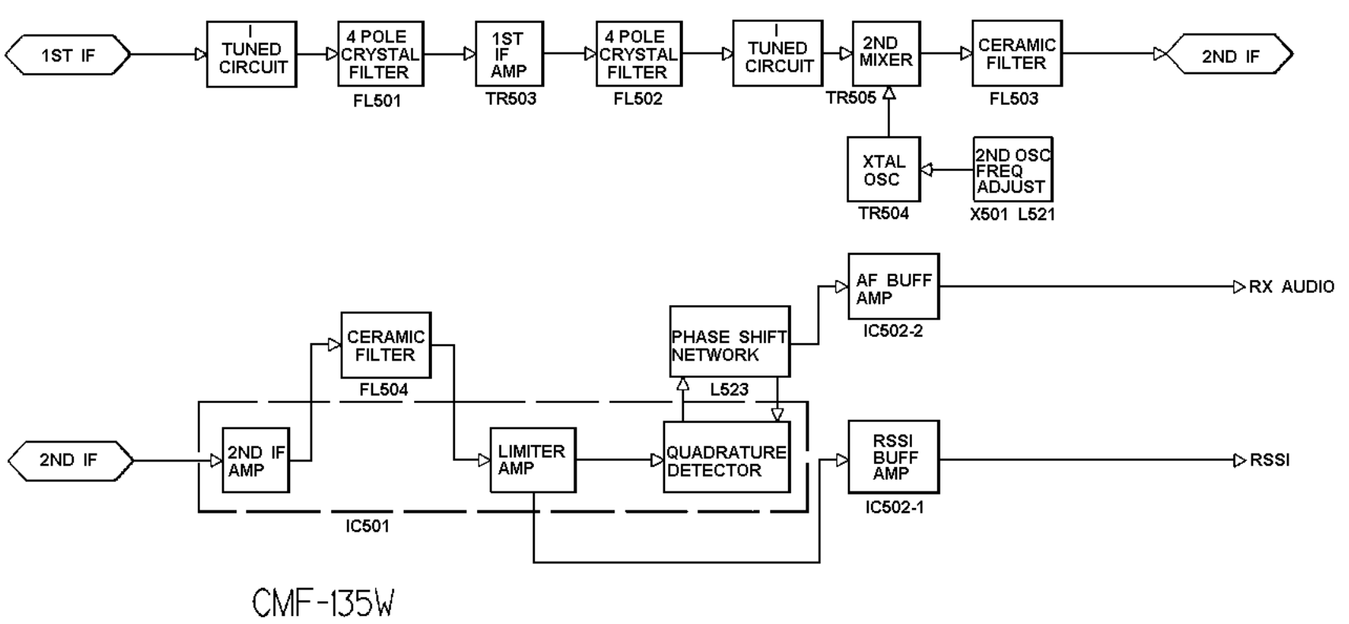


Figure 2 - IF Section Block Diagram

CIRCUIT ANALYSIS

LOGIC (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 microprocessor. 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.

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 at 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 may 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 process 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 process 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 process 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 alert tone

All of these functions are made up of switched capacitor filters, amplifiers and timing logic. The timing for this logic is derive 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 (CMF-135)

1st IF

The 45.1 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 tran-

sistor 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 45.1 MHz IF input is applied to transistor TR505 and mixed with a 44.645 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.

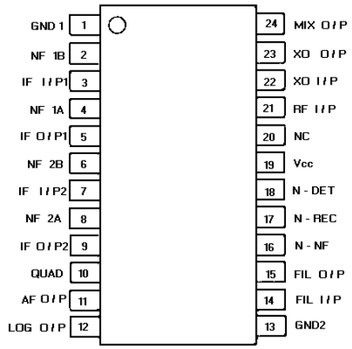
2nd IF And Detector

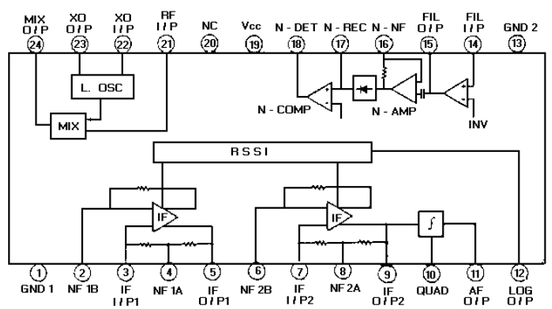
The output of the 2nd mixer is coupled to the input of 4-pole ceramic filter FL503 which provides 455 kHz 2nd IF selectivity. The 455 kHz IF output of ceramic filter FL503 is coupled to Pin 3 of Limiter/FM Detector IC501. The IF signal is amplified internal to IC501 then applied to a 4-pole ceramic filter 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 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

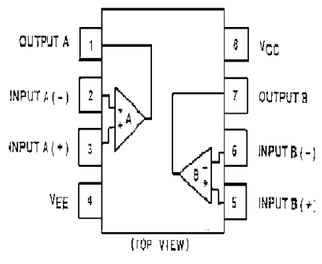
The 9-volt regulator circuit powers the IF circuits of CMF-135 and consists of regulator IC503 and filter capacitors C570, C571 C572 and C573. An input voltage of +13.8 Vdc is applied to the input of IC503. This input is monitored at test point TP2.

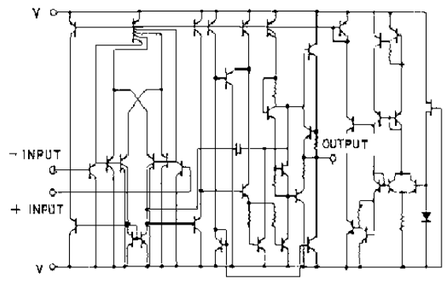
Linear, IF Amplifier/Detector IC501
B19/5DDAE02286 (TA31132F)



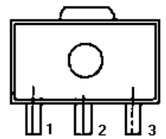


Linear, Dual Operational Amplifier IC502
B19/5DAAN00368 (NJM3404)

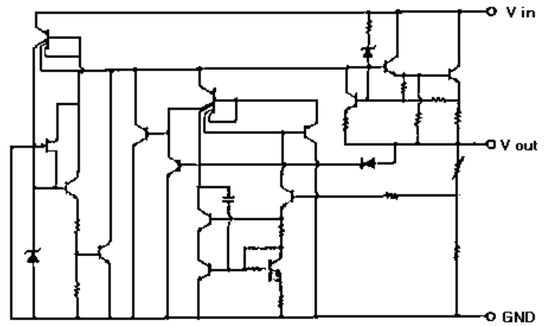




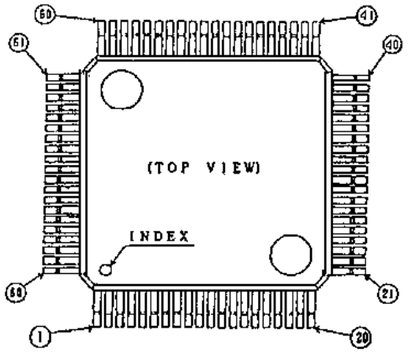
Linear, Positive Voltage Regulator IC503
B19/5DAAN00483 (NJM78L09UA)

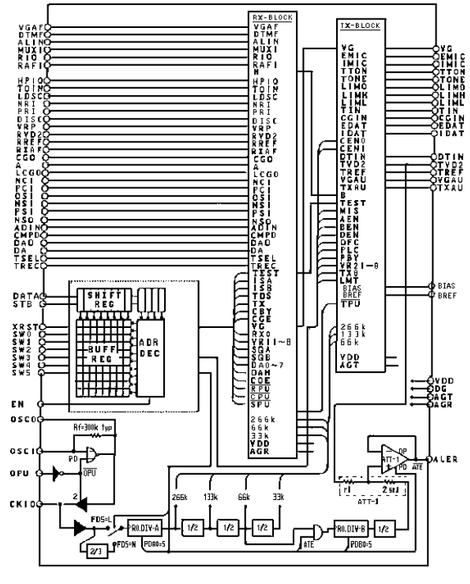


1. OUT
2. GND
3. IN

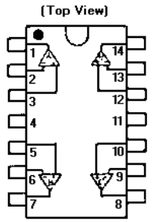


Audio Signal Processor IC601
B19/5DDJK00001 (SFPM-64V)

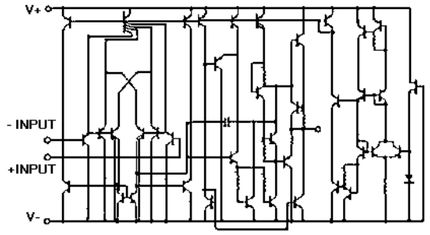




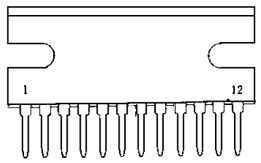
Linear Audio Amplifier IC602, IC603
B19/5DAAN00650 (NJRC 3403, PC123D)



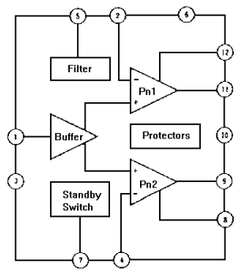
1. A OUTPUT
2. A - INPUT
3. A + INPUT
4. V+
5. B+ INPUT
6. B- INPUT
7. B OUTPUT
8. C OUTPUT
9. C- INPUT
10. C+INPUT
11. V-
12. D+ INPUT
13. D- INPUT
14. D OUTPUT



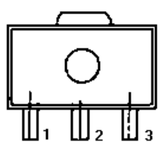
Audio Frequency Power Amplifier IC604
B195DAAA00350 (UPC2500H)



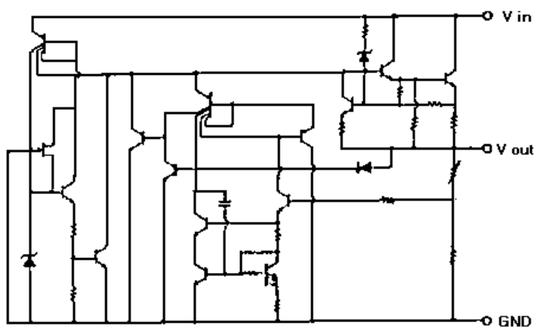
1. INPUT
2. NFB 1
3. GND(INPUT)
4. NFB 2
5. FILTER
6. VCC
7. STAND-BY SW
8. BOOTSTRAP 2
9. OUTPUT 2
10. GND(OUTPUT)
11. OUTPUT 1
12. BOOTSTRAP 1



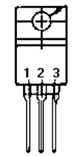
Linear: Positive Voltage Regulator IC605, IC609
B19/5DAAN00483 (NJM78L09UA)



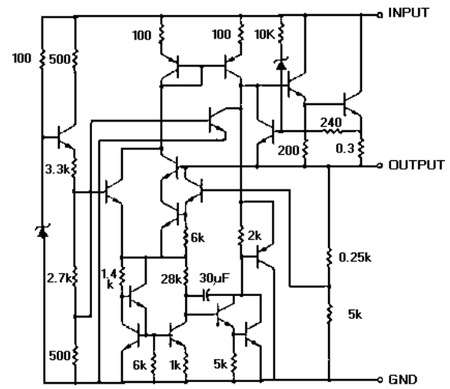
1. OUT
2. GND
3. IN



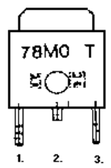
Linear: Positive Voltage Regulator IC606
B19/5DAAJ00305 (MC7805CT)



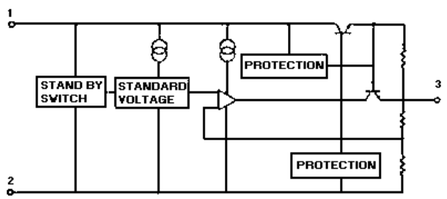
PIN 1. INPUT
2. GROUND
3. OUTPUT



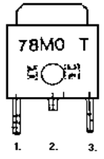
Linear: Positive Voltage Regulator IC607
B19/5DDCC00043 (L78M05T)



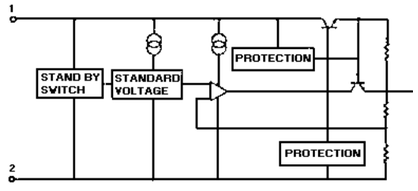
1. INPUT
2. GND
3. OUTPUT



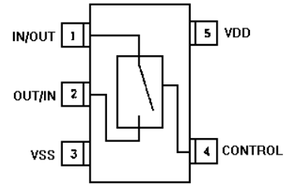
Linear: Positive Voltage Regulator IC608
B19/5DDCC00042 (L78M09T)

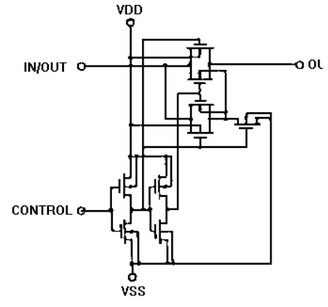


1. INPUT
2. GND
3. OUTPUT

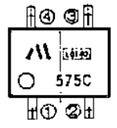


Bilateral Switch IC611, IC612
B19/5DDAE01621 (TC4S66F)

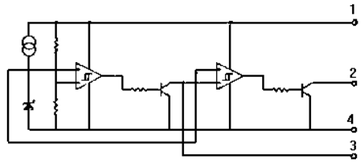




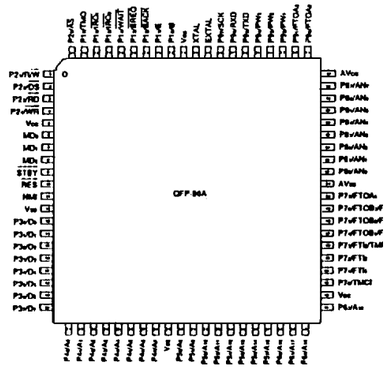
Reset Circuit IC610
19/5DADX00002 (PST575)

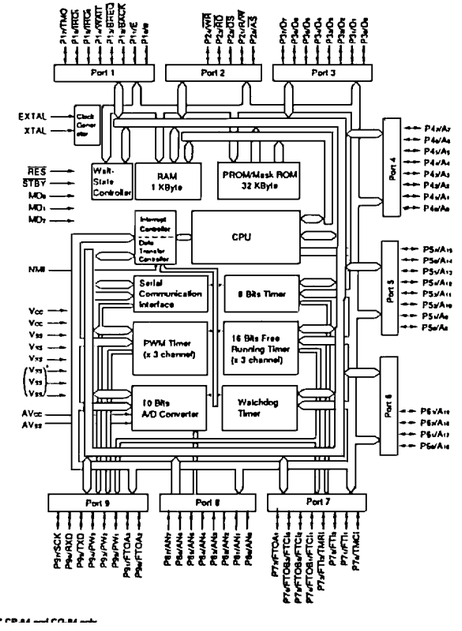


1. VCC
2. OUT
3. CO
4. GND

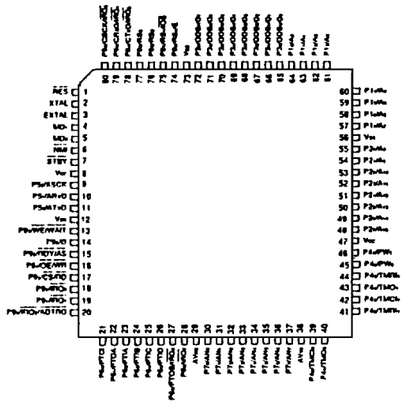


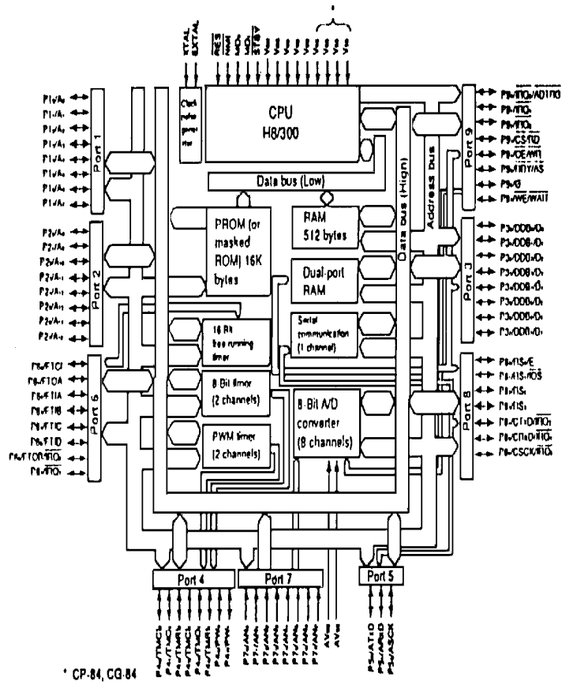
Central Processing Unit IC701
B19/5DDAF01903 (HD6475328F)



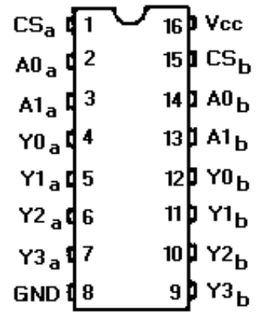


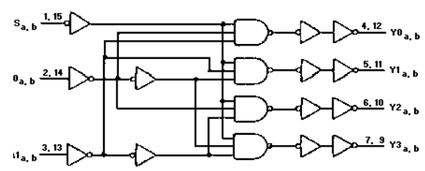
Central Processing Unit IC702
B19/5DDAF02006 (HD6473308RF)





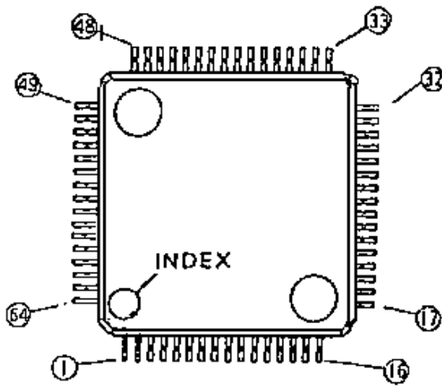
Decoder IC704
B19/5DAAJ00387 (MC74HC139)

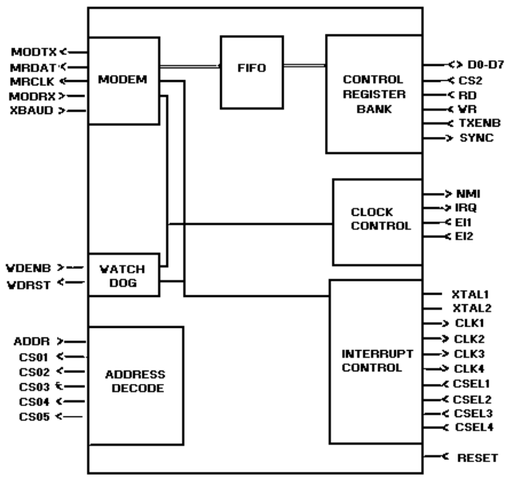


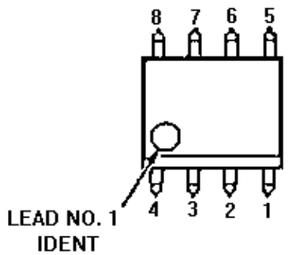


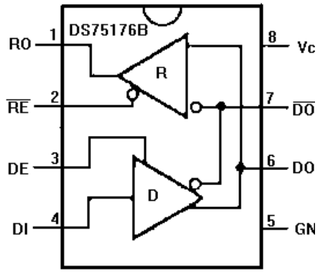
RS-485 Driver/Receiver IC705
B19/5DDAW00387 (NS AS75176)

ASIC IC703
B19/5DAAD00684 (TC245C090AF)

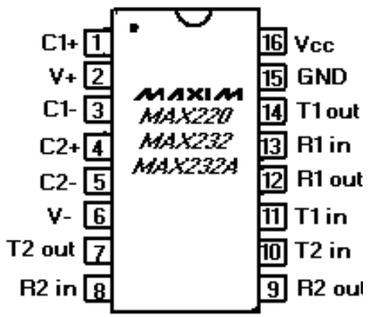


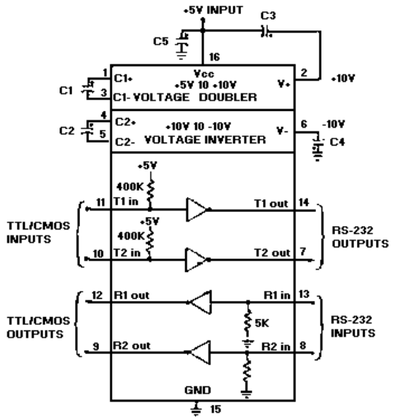




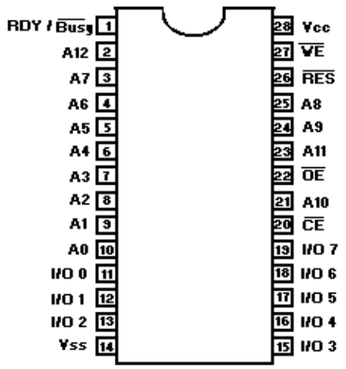


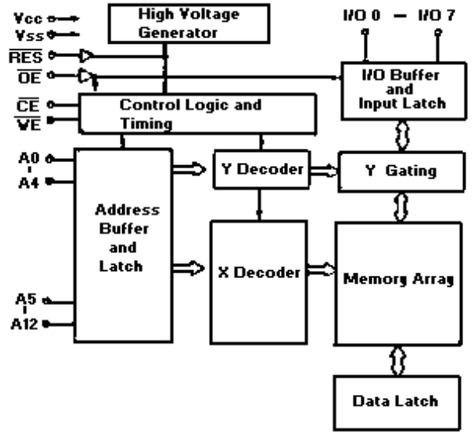
RS-232 Driver/Receiver IC706
B19/5DDED00117 (MA232EWE)



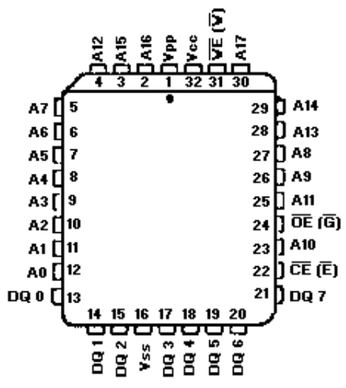


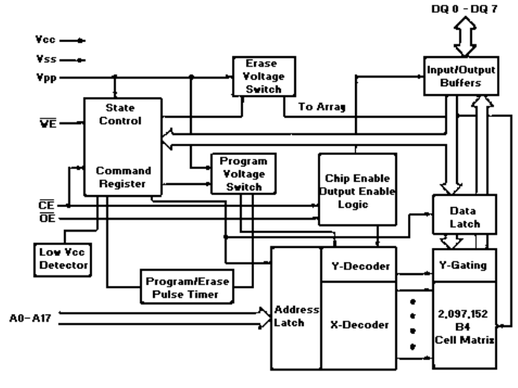
EEPROM IC708
B19/5DAAG00515 (HN58C66FP)



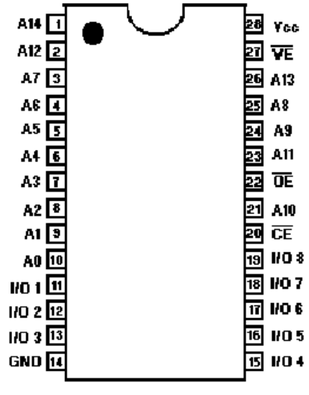


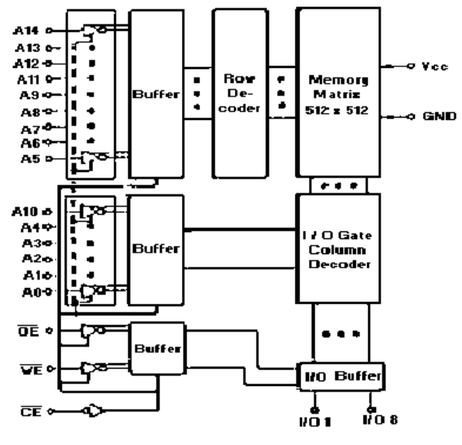
Flash Memory IC707
B19/5DDAK00467 (N28F020)



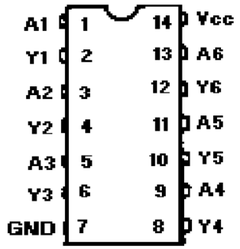


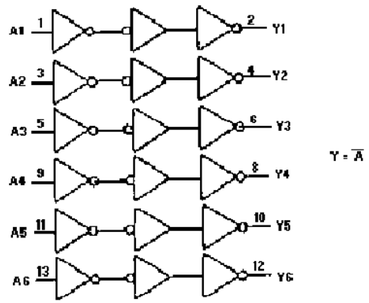
RAM IC709
B19/5DZCJ00065 (CXK58257AM)





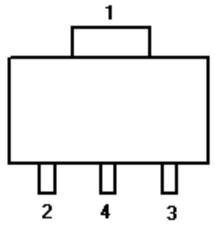
Inverter IC711
B19/5DRRJ00954 (19C74HC04)



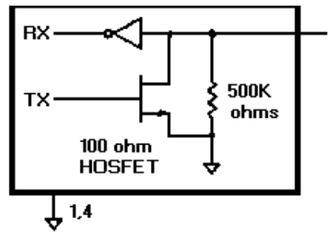


$Y = \overline{A}$

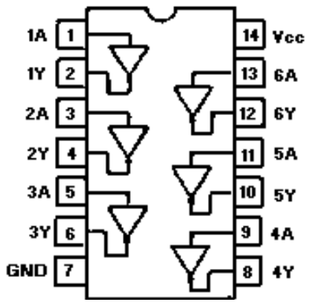
Silicon Serial Number IC712
B19/5DDKA00002 (DS2400)

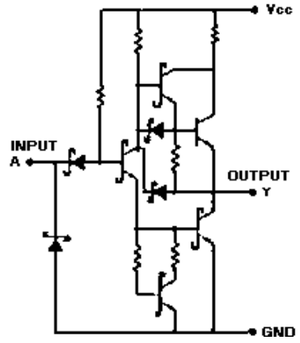


1. GND
2. DATA (DG)
3. NC
4. GND



Inverter IC713
B19/5DDAF02069 (HD74LS04FP)





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

SYMBOL	PART NO.	DESCRIPTION
		---------- CAPACITORS ----------
C601	B19/5CAAD00959	Ceramic: 0.01 µF ±10% 50 VDCW, temp coef ±15%.
C602	B19/5CAAD02226	Ceramic: 1 µF +80%/-20% 16 VDCW, temp coef +22%/-82%.
C603	B19/5CAAD00954	Ceramic: 220 pF ±5% 50 VDCW, temp coef 0±30 PPM/°C.
C604	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW.
C605	B19/5CAAD00959	Ceramic: 0.01 µF ±10% 50 VDC, temp coef ±15%.
C606	B19/5CSAD00316	Tantalum: 1 µF ±20% 16 VDCW.
C607 thru C609	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C610	B19/5CSAD00316	Tantalum: 1 µF ±20% 16 VDCW.
C611	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C612	B19/5CSAD00404	Tantalum: 3.3 µF ±20% 16 VDCW.
C613	B19/5CSAD00316	Tantalum: 1 µF ±20% 16 VDCW.
C614	B19/5CSAD00396	Tantalum: 0.33 µF ±20% 35 VDCW.
C615	B19/5CAAD00839	Ceramic: 100 pF ±5% 50 VDCW, temp coef 0±30 PPM/°C.
C616	B19/5CAAD02226	Ceramic: 1 µF +80%/-20% 16 VDCW, temp coef +22%/-82%.
C617	B19/5CSAD00396	Tantalum: 0.33 µF ±20% 35 VDCW.
C618	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C621 and C622	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C623	B19/5CSAD00403	Tantalum: 22 µF ±20% 16 VDCW.
C624	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C625	B19/5CSAD00316	Tantalum: 1 µF ±20% 16 VDCW.
C626	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C627	B19/5CSAD00403	Tantalum: 22 µF ±20% 16 VDCW.
C628 and C629	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C630	B19/5CSAD00403	Tantalum: 22 µF ±20% 16 VDCW.
C631 and C632	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C633	B19/5CSAD00403	Tantalum: 22 µF ±20% 16 VDCW.
C634 thru C637	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C638	B19/5CAAD00954	Ceramic: 220 pF ±5% 50 VDCW, temp coef 0±30 PPM/°C.
C639	B19/5CEAA01820	Electrolytic: 47 µF ±20% 25 VDCW.
C640	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C641 and C642	B19/5CEAA02690	Electrolytic: 22 µF ±20% 16 VDCW.
C643	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C644	B19/5CEAA02877	Electrolytic: 10 µF ±20% 25 VDCW.
C645	B19/5CAAD02226	Ceramic: 1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C646	B19/5CAAD02263	Ceramic: 1000pF +80%/-20% 50 VDCW, temp coef +22%/-82%.
C647	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C649 and C650	B19/5CEAA02690	Electrolytic: 22 µF ±20% 16 VDCW.
C651 and C652	B19/5CAAD03928	Ceramic: 0.47 µF +80%/-20% 25 VDCW, temp coef +30%/-80%.
C653 and C654	B19/5CAAG00014	Tantalum: 2.2 µF ±20% 16 VDCW.
C655 and C656	B19/5CEAA02877	Electrolytic: 10 µF ±20% 25 VDCW.
C657 and C658	B19/5CAAD02442	Ceramic: 0.047 µF +80%/-20% 50 VDCW, temp coef +22%/-82%.
C659 and C660	B19/5CSAD00316	Tantalum: 1 µF ±20% 16 VDCW.
C661 thru C664	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C665 and C666	B19/5CAAD01237	Ceramic: 0.1 µF ±10% 25 VDCW, temp coef ±15%.
C667	B19/5CSAD00316	Tantalum: 1 µF ±20% 16 VDCW.
C670	B19/5CAAD01426	Ceramic: 3300 pF ±10% 50 VDCW, temp coef ±15%.
C701 thru C706	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C707	B19/5CAAD02207	Ceramic: 47 pF ±5% 50 VDCW, temp coef 0±30 PPM/°C.
C708 and C709	B19/5CAAD02477	Ceramic: 12 pF ±20.25 pF 50 VDCW, temp coef 0±30 PPM/°C.
C710	B19/5CAAD02207	Ceramic: 47 pF ±5% 50 VDCW, temp coef 030 PPM/°C.
C711	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C712 and C713	B19/5CAAD02182	Ceramic: 100 pF ±5% 50 VDCW, temp coef 0±30 PPM/°C.
C714	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C715 thru C719	B19/5CSAD00316	Tantalum: 1 µF ±20% 16 VDCW.
C720 thru C722	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C726 and C727	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C728 thru C743	B19/5CAAD02182	Ceramic: 100 pF ±5% 50 VDCW, temp coef 0±30 PPM/°C.
C744 and C745	B19/5CAAD01586	Ceramic: 0.1 µF +80%/-20% 25 VDCW, temp coef +22%/-82%.
C746	B19/5CAAD02402	Ceramic: 1000 pF ±10% 50 VDCW, temp coef ±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.

*COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

Continued

SYMBOL	PART NO.	DESCRIPTION
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.
CD712	B19/5TXAE00930	Zener 900mW 22 V: sim to Hitachi HZF12.
CD713 and CD714	B19/5TXAD00648	Silicon fast recovery (2 diodes in series): sim to TOSHIBA ISS302.
CX701 and CX702	B19/5NXAA00081	EMI Filter.
F601	B19/5ZFAP00008	Fuse, 5A.
		---------- INTEGRATED CIRCUITS --------
IC601	B19/5DDJK00001	Audio Signal PROCESSOR.
IC602 and IC603	B19/5DAAN00650	Linear Audio Amplifier: sim to NJRC 3403. PC1230H2.
IC604	B19/5DAAA00350	AF Power Amplifier: sim to NEC UPC2500H.
IC605	B19/5DAAN00483	Linear Positive Voltage Regulator: sim to NJRC NJM78L09UA.
IC606	B19/5DAAJ00305	Linear: Positive Voltage Regulator; sim to MOTOROLA MC7805CT.
IC607	B19/5DDCC00043	Linear: Positive Voltage Regulator; sim to SANYO L78M05T.
IC608	B19/5DDCC00042	Linear: Positive Voltage Regulator; sim to SANYO L78M09T.
IC609	B19/5DAAN00483	Linear Positive Voltage Regulator: sim to NJRC NJM78L09UA.
IC610	B19/5DADX00002	Reset Circuit: sim to MITSUMI PST575.
IC611 and IC612	B19/5DDAE01621	Bilateral Switch: sim to TOSHIBA TC4S66F.
IC701	B19/5DDAF01903	CPU: sim to HITACHI HD6475328F.
IC702	B19/5DDAF02006	CPU: sim to HITACHI HD6473308RF.
IC703	B19/5DAAD00684	ASIC: sim to TOSHIBA TC24SC090AF.
IC704	B19/5DAAJ00964	DECODER: Sim to MOTOROLA MC74HC139.
IC705	B19/5DDAW00387	RS485 Driver/Receiver: sim to NS AS75176.
IC706	B19/5DDED00117	RS232 Driver/Receiver: sim to MAXIM MA232EWE.
IC707	B19/5DDAK00467	FLASH MEMORY: sim to INTEL N28F020.
IC708	B19/5DAAG00515	EEPROM: sim to HITACHI HN58C66FP.
IC709	B19/5DZCJ00065	RAM: sim to SONY CXK58257AM.
IC711	B19/5DAAJ00954	Inverter: sim to MOTOROLA MC74HC04.
IC712	B19/5DDKA00001	Silicon Serial Number: sim to DALLAS DS2400.
IC713	B19/5DDAF02069	Inverter: sim to HITACHI HD74LS04FP.
		---------- JACKS ----------
J701	B19/5JDAG00315	Connector: 18 pins.
J702 and J703	B19/5JBAX00013	Connector: 24 pins.
J704	B19/5JTCAOO410	Connector: 4 pins.
J706	B19/5JWBE00231	Connector: 10 pins.
J707	B19/5JWBE00232	Connector: 13 pins.
J708	B19/5JWBE00233	Connector: 5 pins.
K601	B19/5KLAC00112	Relay: sim to TAKAMIZAWA JY9H-K.
		---------- RESISTORS ----------
R601	B19/5REAGO3425	Metal film: 15k ohms ±5% 100 VDCW, 1/16W.
R602	B19/5REAG03598	Metal film: 33K ohms ±5% 100 VDCW, 1/16W.
R603	B19/5REAG03590	Metal film: 68k ohms ±5% 100 VDCW, 1/16W.
R604	B19/5RDAA03599	Metal film: 120K ohms ±5% 100 VDCW, 1/16W.
R605	B19/5REAG03851	Metal film: 270K ohms ±5% 100 VDCW, 1/16W.
R606	B19/5REAG03567	Metal film: 56K ohms ±5% 100 VDCW, 1/16W.
R607	B19/5REAG03600	Metal film: 150K ohms ±5% 100 VDCW, 1/16W.
R608 and R609	B19/5REAG03336	Metal film: 22k ohms ±5% 100 VDCW, 1/16W.
R610 and R611	B19/5REAG03228	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
R612 and R613	B19/5REAG03232	Metal film: 39k ohms ±5% 100 VDCW, 1/16W.
R614	B19/5REAG03377	Metal film: 4.7K ohms ±5% 100 VDCW, 1/16W.
R615	B19/5REAG03446	Metal film: 100k ohms ±5% 100 VDCW, 1/16W.
R616	B19/5REAG03235	Metal film: 470K ohms ±5% 100 VDCW, 1/16W.
R617	B19/5REAG03777	Metal film: 3.3 M ±10% 200 VDCW, 1/10W.
R618 and R619	B19/5REAG03446	Metal film: 100k ohms ±5% 100 VDCW, 1/16W.
R620	B19/5REAG03233	Metal film: 47K ohms ±5% 100 VDCW, 1/16W.
R621	B19/5REAG03230	Metal film: 22k ohms ±5% 100 VDCW, 1/16W.
R622 thru R624	B19/5REAG03567	Metal film: 56K ohms ±5% 100 VDCW, 1/16W.
R625	B19/5REAG03228	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
R626	B19/5REAG03567	Metal film: 56k ohms ±5% 100 VDCW, 1/16W.
R627	B19/5REAG03600	Metal film: 150k ohms ±5% 100 VDCW, 1/16W.
R628 and R629	B19/5REAG03446	Metal film: 100K ohms ±5% 100 VDCW, 1/16W.
R630	B19/5REAG03777	Metal film: 3.3M ohms ±10% 200 VDCW, 1/10W.
R631	B19/5REAG03233	Metal film: 47k ohms ±5% 100 VDCW, 1/16W.
R632	B19/5REAG03446	Metal film: 100K ohms ±5% 100 VDCW, 1/16W.
R633	B19/5REAG03230	Metal film: 22k ohms ±5% 100 VDCW, 1/16W.
R634	B19/5REAG03238	Metal film: 1M ohms ±5% 100 VDCW, 1/16W.
R635	B19/5REAG03354	Metal film: 6.8k ohms ±5% 100 VDCW, 1/16W.
R636 thru R639	B19/5REAG03228	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
R640	B19/5REAG03339	Metal film: 3.3k ohms ±5% 100 VDCW, 1/16W.
R641	B19/5REAG03228	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
R642	B19/5REAG03230	Metal film: 22k ohms ±5% 100 VDCW, 1/16W.
R643 and R644	B19/5REAG03381	Metal film: 22 ohms ±5% 100 VDCW, 1/16W.
R645 and R646	B19/5REAG03227	Metal film: 1.0k ohms ±5% 100 VDCW, 1/16W.
R647	B19/5REAG03335	Metal film: 8.2k ohms ±5% 100 VDCW, 1/16W.
R648	B19/5REAG03228	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
R649	B19/5REAG03238	Metal film: 1M ohms ±5% 100 VDCW, 1/16W.
R650 and R651	B19/5REAG03336	Metal film: 680 ohms ±5% 100 VDCW, 1/16W.
R652	B19/5REAG03425	Metal film: 15K ohms ±5% 100 VDCW, 1/16W.
R653	B19/5REAG03425	Metal film: 15K ohms ±5% 100 VDCW, 1/16W.
R654	B19/5REAG03425	Metal film: 15K ohms ±5% 100 VDCW, 1/16W.
R655	B19/5REAG03567	Metal film: 56k ohms ±5% 100 VDCW, 1/16W.
R656	B19/5REAG03227	Metal film: 1.0k ohms ±5% 100 VDCW, 1/16W.
R657	B19/5RDAA01240	Carbon film: 560 ohms ±5% 200 VDCW, 1/4W.
R701 thru R703	B19/5REAG03424	Metal film: 100 ohms ±5% 100 VDCW, 1/16W.
R704	B19/5REAG03590	Metal film: 68k ohms ±5% 100 VDCW, 1/16W.
R705	B19/5REAG03424	Metal film: 100 ohms ±5% 100 VDCW, 1/16W.
R706 and R707	B19/5REAG03227	Metal film: 1.0k ohms ±5% 100 VDCW, 1/16W.
R709 and R710	B19/5REAG03424	Metal film: 100 ohms ±5% 100 VDCW, 1/16W.
R718	B19/5REAG03377	Metal film: 4.7k ohms ±5% 100 VDCW, 1/16W.
R719	B19/5REAG03446	Metal film: 100k ohms ±5% 100 VDCW, 1/16W.
R720	B19/5REAG03228	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
R721	B19/5REAG03233	Metal film: 47k ohms ±5% 100 VDCW, 1/16W.
R724 and R725	B19/5REAG03340	Metal film: 2.7K ohms ±5% 100 VDCW, 1/16W.
R726	B19/5REAG03238	Metal film: 1M ohms ±5% 100 VDCW, 1/16W.
R729 and R730	B19/5REAG03378	Metal film: 0 ohms.
R732	B19/5REAG03378	Metal film: 0 ohms.
R733	B19/5REAG03377	Metal film: 4.7K ohms ±5% 100 VDCW, 1/16W.
R734	B19/5REAG03227	Metal film: 1.0k ohms ±5% 100 VDCW, 1/16W.
R735	B19/5REAG03377	Metal film: 4.7K ohms ±5% 100 VDCW, 1/16W.
R736	B19/5REAG03354	Metal film: 6.8K ohms ±5% 100 VDCW, 1/16W.
R737 thru R740	B19/5REAG03228	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
R741	B19/5REAG03231	Metal film: 27k ohms ±5% 100 VDCW, 1/16W.
R742 and R743	B19/5REAG03377	Metal film: 4.7K ohms ±5% 100 VDCW, 1/16W.
R744 and R745	B19/5REAG01827	Metal film: 470 ohms ±5% 100 VDCW, 1/10W.
R747	B19/5REAG03378	Metal film: 0 ohms.
R748	B19/5REAG03228	Metal film: 10K ohms ±5% 100 VDCW, 1/16W.
R749	B19/5REAG03346	Metal film: 100K ohms ±5% 100 VDCW, 1/16W.
R750 and R751	B19/5REAG03230	Metal film: 22k ohms ±5% 100 VDCW, 1/16W.
R752 and R753	B19/5REAG03378	Metal film: 10k ohms ±5% 100 VDCW, 1/16W.
SW601	B19/5SAFB00002	Slide Switch.
SW701	B19/5SAFB00002	Slide Switch.
		---------- TRANSISTORS ----------
TR602	B19/5TCAZ00011	Transistor NPN: sim to SANYO 2SC3398.
TR603	B19/5TDAB00098	Transistor NPN: sim to NEC 2SD596 .
TR701	B19/5TZAD00608	Transistor NPN: sim to TOSHIBA RN2301.
TR702 thru TR712	B19/5TKAD00169	FET: sim to NEC 2SK1582.
TR713 and TR713	B19/5TCAF00459	Transistor NPN: sim to TOSHIBA 2SC2859.
TR715 and TR716	B19/5TCAB01457	Transistor NPN: sim to NEC 2SC3736.
X701	B19/5XHAA01299	Crystal: 9.8304 MHz CP12A.

*COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

Continued

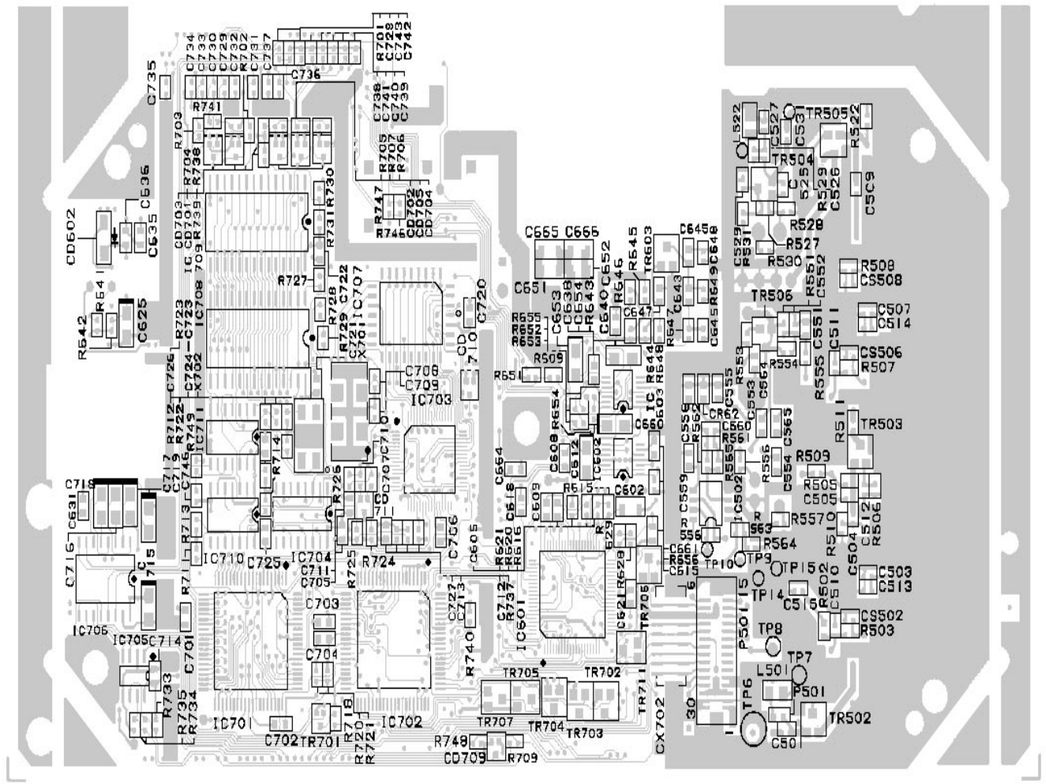
SYMBOL	PART NO.	DESCRIPTION
		LOGIC/IF BOARD IF SECTION CMF-135 (Used in P1, P2)
		----------CAPACITORS----------
C501	B19/5CAAA03470	Ceramic: 0.01 µF ±10% 50 VDCW, temp coef ±15%.
C502	B19/5CAAA03285	Ceramic: 10pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C503	B19/5CAAA03447	Ceramic: 7pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C504	B19/5CAAA03285	Ceramic: 10pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C505	B19/5CAAA03409	Ceramic: 15pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C505	B19/5CAAA03409	Ceramic: 15pF ±5% 50 VDCW, temp coef 0±60 PPM.
C506	B19/5CAAA03448	Ceramic: 8pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C507	B19/5CAAA03447	Ceramic: 7pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C508	B19/5CAAA03448	Ceramic: 8pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C509 thru C512	B19/5CAAA03470	Ceramic: 0.01 µF ±10% 50 VDCW, temp coef ±15%.
C515 and C516	B19/5CAAA03470	Ceramic: 0.01 µF ±10% 50 VDCW, temp coef ±15%.
C521	B19/5CAAA03470	Ceramic: 0.01µF ±10% 50 VDCW, temp coef ±15%.
C522 and C523	B19/5CAAA03921	Ceramic: 0.1 µF ±10% 25 VDCW, temp coef ±15%.
C524	B19/5CAAA03470	Ceramic: 0.01 µF ±10% 50 VDCW, temp coef ±15%.
C525	B19/5CBAB02716	Ceramic: 33pF ±5% 50 VDCW, temp coef 0±60 PPM.
C526	B19/5CAAA03470	Ceramic: 0.01 µF ±10% 50 VDCW, temp coef ±15%.
C527	B19/5CBAB02858	Ceramic: 120pF ±5% 50 VDCW, temp coef 0±60 PPM.
C528	B19/5CAAA03448	Ceramic: 8pF ±0.5 pF 50 VDCW, temp coef 0±60 PPM.
C529 and C530	B19/5CAAA03470	Ceramic: 0.01 µF ±10% 50 VDCW, temp coef ±15%.
C531	B19/5CAAA03004	Ceramic: 1pF ±0.25pF 50 VDCW, temp coef 0±250 PPM.
C553	B19/5CAAA03470	Ceramic: 0.01µF 10% 50 VDCW, temp coef ±15%.
C554 thru C556	B19/5CAAA03921	Ceramic: 0.1F ±10% 25 VDCW, temp coef ±15%.
C557	B19/5CAAA03409	Ceramic: 15pF ±5% 50 VDCW, temp coef 0±60 PPM.
C558 and C559	B19/5CAAA03921	Ceramic: 0.1mF ±10% 25 VDCW, temp coef ±15%.
C560	B19/5CAAA03471	Ceramic: 1000pF ±10% 50 VDCW, temp coef ±15%.
C561 thru C565	B19/5CAAA03921	Ceramic: 0.1 µF ±10% 25 VDCW, temp coef ±15%.
C567	B19/5CEAA02696	Electrolytic: 10µF ±20% 16 VDCW.
C570	B19/5CAAA03471	Ceramic: 1000pF ±10% 50 VDCW, temp coef ±15%.
C571 and C572	B19/5CAAA03921	Ceramic: 0.1µF ±10% 25 VDCW, temp coef ±15%.
C573	B19/5CEAA02696	Electrolytic: 10µF ±20% 16 VDCW.

*COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

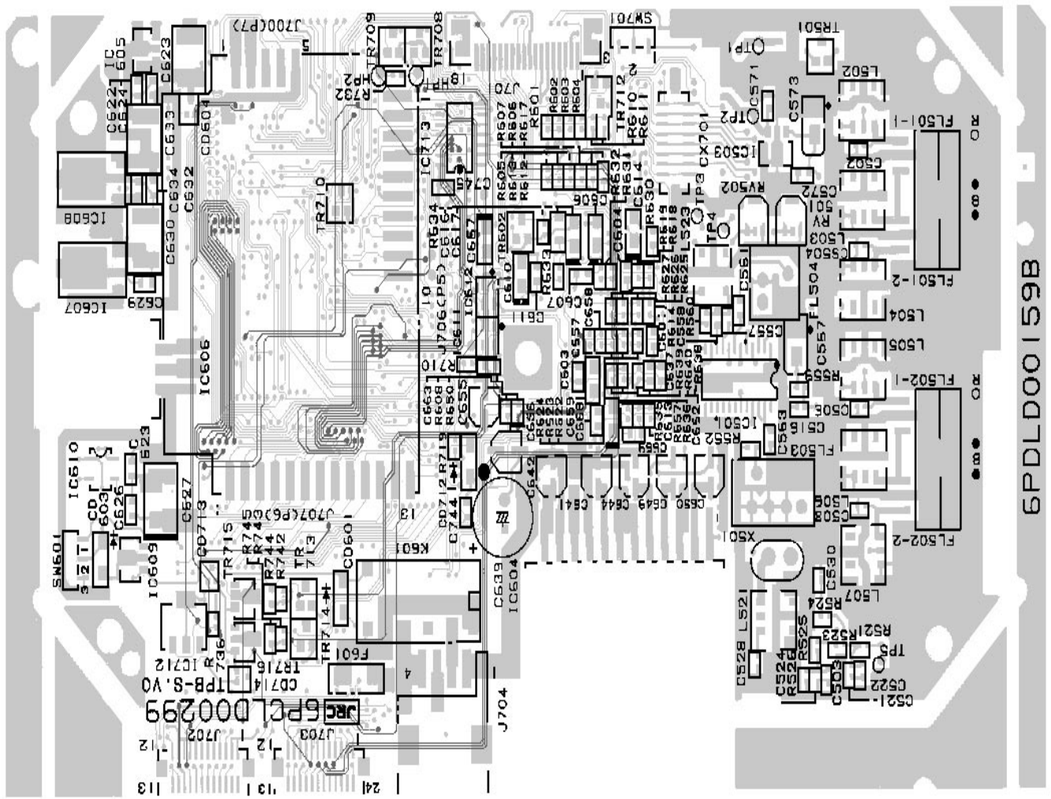
SYMBOL	PART NO.	DESCRIPTION
		----------FILTERS ----------
FL501 and FL502	B19/6XMLD00017	Crystal Filter: 45.1 MHz.
FL503	B19/5NRAA00094	Ceramic: Filter: 455 KHz.
FL504	B19/5NRAA00041	Ceramic: Filter: 455 KHz.
		-------- INTEGRATED CIRCUITS --------
IC501	B19/5DDAE02286	Linear, IF Amplifier/Detector; 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.
		----------CONNECTORS ----------
P501	B19/5JBAX00007	Connector: 30 Pins.
		---------- COILS ----------
L501	B19/5LCAP00211	Coil: RF 1 µH ±20%.
L502	B19/6LALD00168	Coil: RF.
L503	B19/5LZAL00057	Coil: RF.
L504 and L505	B19/6LALD00168	Coil: RF.
L506	B19/5LZAL00057	Coil: RF.
L507	B19/6LALD00168	Coil: RF.
L521	B19/5LZAL00057	Coil: RF.
L522	B19/5LCAP00234	Coil: RF 0.22 µH ±10%.
L523	B19/6LALD00123	Coil: RF.
		----------RESISTORS ----------
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	B19/5RDAC02838	Metal film: 4.7K 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	B19/5RDAC02804	Metal film: 8.2K ohms ±5% 100 VDCW.1/16W.
R508	B19/5RDAC02839	Metal film: 6.8K ohms ±5% 100 VDCW.1/16W.
R509	B19/5RDAC02832	Metal film: 220 ohms ±5% 100 VDCW.1/16W.
R510	B19/5RDAC02816	Metal film: 3.3K ohms ±5% 100 VDCW.1/16W.
R511	B19/5RDAC02827	Metal film: 330 ohms ±5% 100 VDCW.1/16W.
R521		Metal film: 15K ohms ±5% 100 VDCW.1/16W.

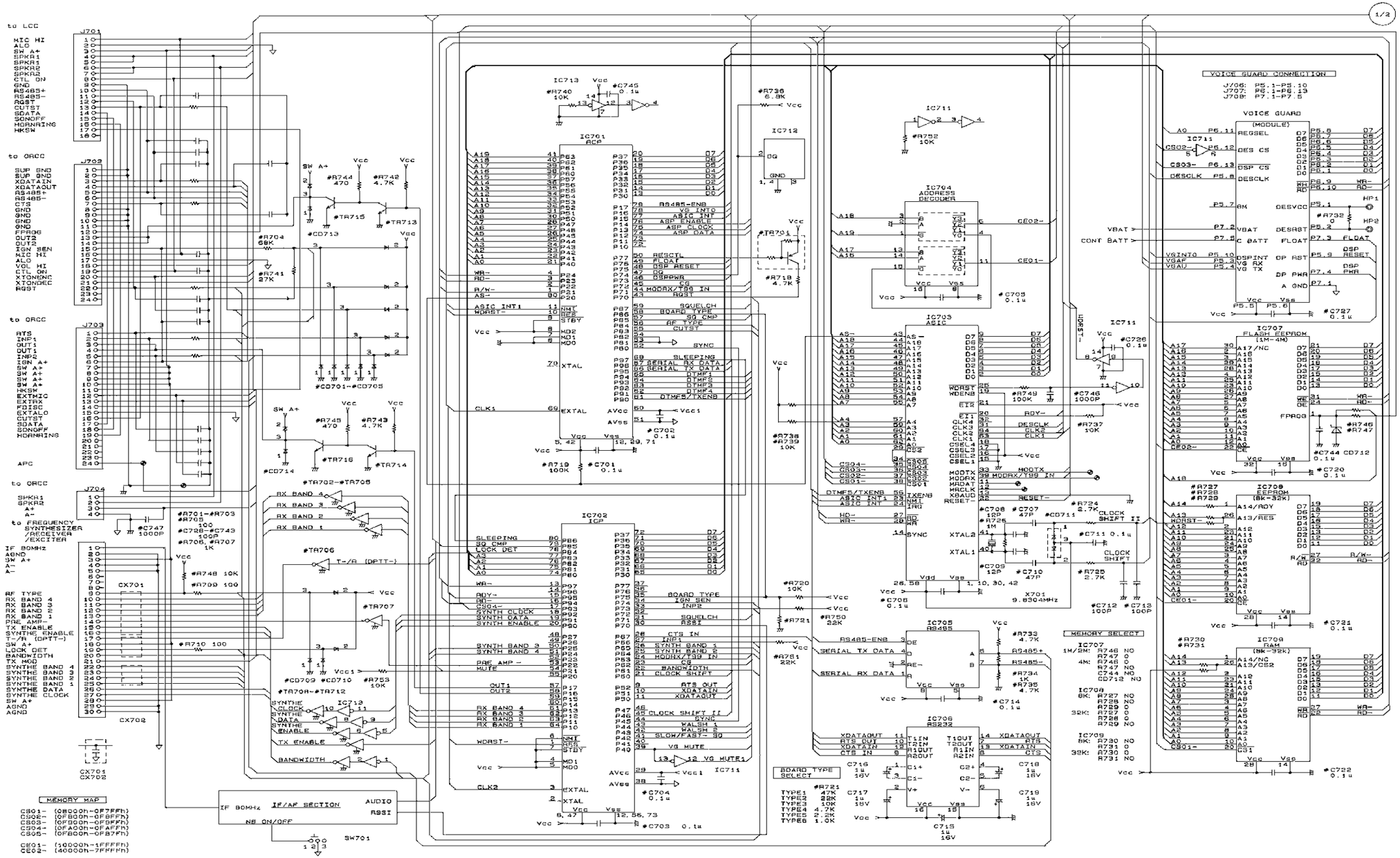
SYMBOL	PART NO.	DESCRIPTION
R522	B19/5RDAC02838	Metal film: 4.7K ohms ±5% 100 VDCW, 1/16W.
R523	B19/5RDAC02822	Metal film: 1.5K ohms ±5% 100 VDCW, 1/16W.
R524	B19/5RDAC02828	Metal film: 100 ohms ±5% 100 VDCW, 1/16W.
R525	B19/5RDAC02899	Metal film: 33 ohms ±5% 100 VDCW, 1/16W.
R526	B19/5RDAC02819	Metal 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.
		---------TRANSISTORS ----------
TR501 and TR502	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.
		---------- CRYSTALS ----------
X501	B19/6XHLD00030	Quartz crystal: 44.645 MHz.
XS501A and XS501B	B19/5ZJDF00001	Crystal Socket.

COMPONENT SIDE



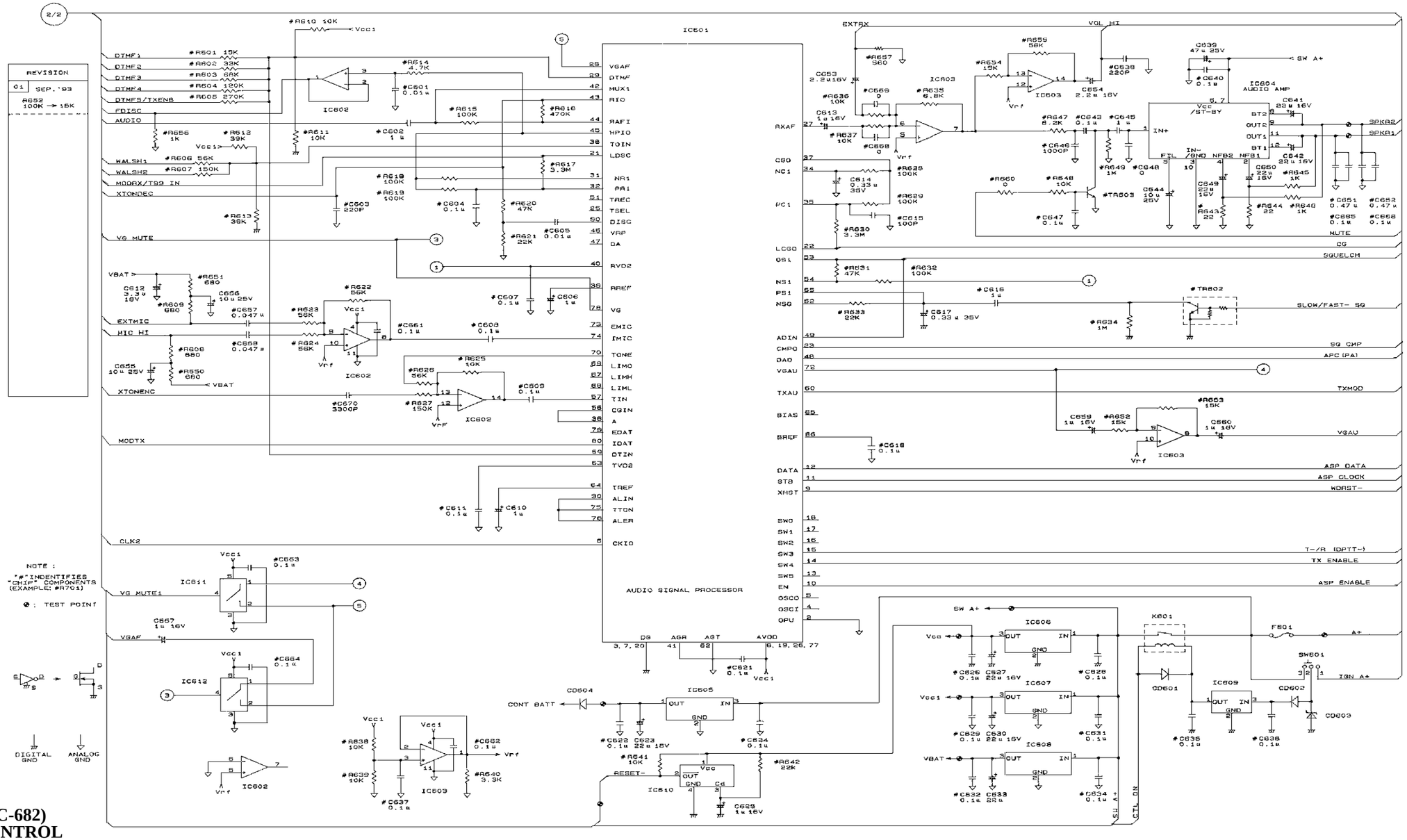
SOLDER SIDE





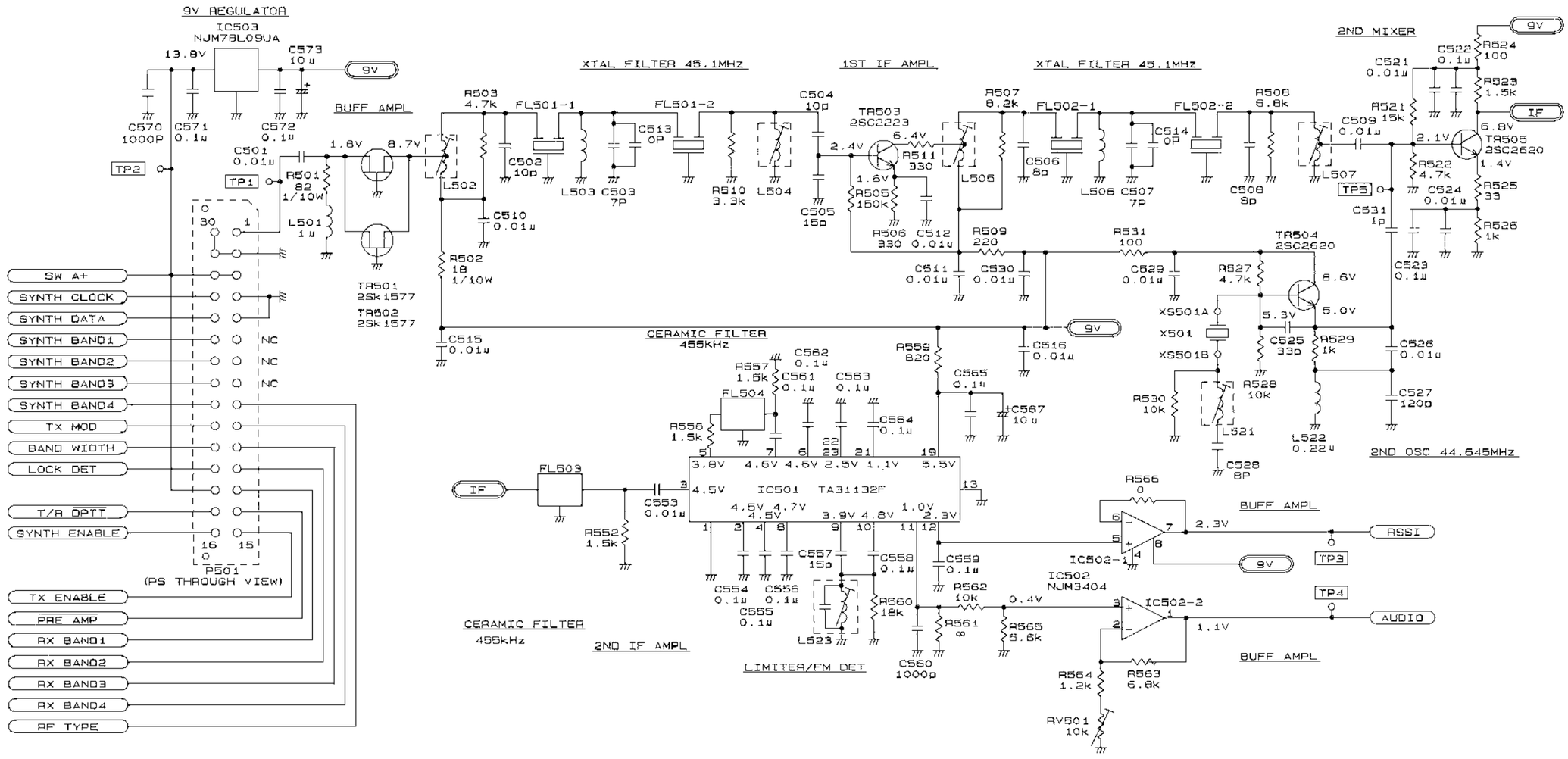
LOGIC (CMC-682)
SYSTEM CONTROL

(DD00-CMC-682 1/2)



LOGIC (CMC-682)
SYSTEM CONTROL

(DD00-CMC-682 2/2)



NOTE

ALL RESISTER ARE 1/16 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER u, n OR p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m, u OR n.

IF(CMF-135)

(DD0-CMF-135)