

INTEGRATED CIRCUITS FOR TV AND RADIO RECEIVERS

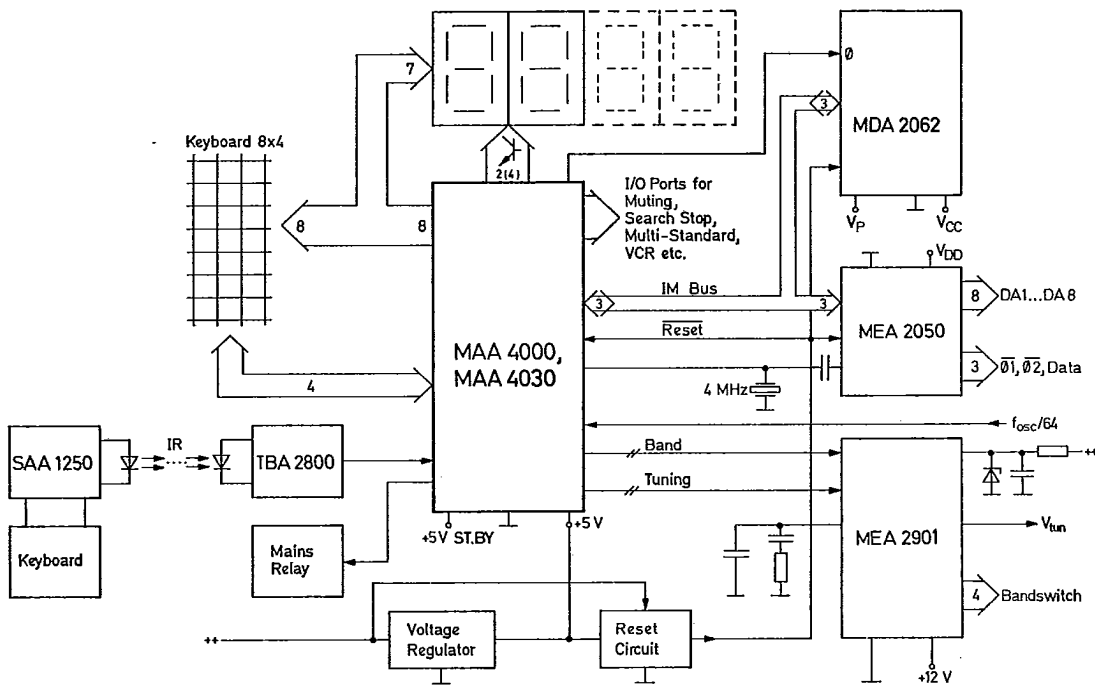
MAA4000/MAA4030, MEA2050, MDA2061, MEA2901 Microcomputer-Controlled Operating and Tuning System for Color TV Receivers

The CCU2000 Central Control Unit originally developed for the DIGIT 2000 digital TV system can also be separately used for remote control and channel selection in conventional TV receivers with advantage. The version of the CCU2000 provided for this application has, as un-programmed basic device, the type designation MAA4000 or MAA 4030. It permits the several TV set makers to equip their products with individual properties by software. The differently programmed versions, according to the set makers' wishes, have the type designations MAA4001, MAA4002, MAA4031, MAA4032 and so on.

The MAA4000/MAA4030 is based on the 8049 eight-bit microcomputer. Acting together with the integrated circuits mentioned hereafter, the MAA4000/MAA4030 is the heart of a most modern remote-control and channel selection system for TV receivers. This system comprises the following circuits:

- the SAA1250 Infrared Remote-Control Transmitter IC
- the TBA2800 Infrared Pre-amplifier IC
- the MDA2062 1024-Bit EEPROM
- the MEA2050 D/A and Bus Converter IC
- the MEA2901 Tuner Interface IC

The special properties of the infrared remote control and of the PLL frequency synthesis tuning including storage of the tuning information are software-defined. The block diagram of a modern user front-end of a TV receiver is shown below. The circuit contains infrared remote control, direct operation keys at the TV receiver, PLL tuning (frequency synthesis) including station search and program memory, display of channel and program number on a seven-segment LED display (two or four digits), actuation of the mains relay, control of max. eight analog functions (volume, brightness etc), and storage of preferred user's settings for volume, brightness, contrast etc. By adding the programmable adapter IC SAA1272, Teletext and Viewdata can also be handled. Further, video recorder operation is also provided.



Block Diagram of a Modern TV Receiver's Control Section

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MAA4000/MAA4030 Microcomputer for Remote Control and PLL Tuning in TV Receivers (40-Pin Plastic Package)

The MAA4000/MAA4030 is an 8-bit one-chip microcomputer in N-channel MOS technology with peripheral hardware for:

- infrared remote control
- front-panel control with up to 32 commands
- tuning by frequency synthesis (PLL) and band switching
- LED display for channel indication, max. 4 digits, directly driven
- generation and recognition of various signals
- control of the external circuits via a serial bus (IM bus)

The MAA4000/MAA4030 contains on one chip the following functions:

- 8049 8-bit microcomputer
- remote-control decoder
- Ports P2 and P3 for connecting a maximum of 32 keys and 4-digit seven-segment LED channel indication
- PLL tuner circuit for VHF and UHF
- IM bus interface for inputting and outputting control signals
- crystal-controlled clock oscillator
- mains flip-flop and reset circuit

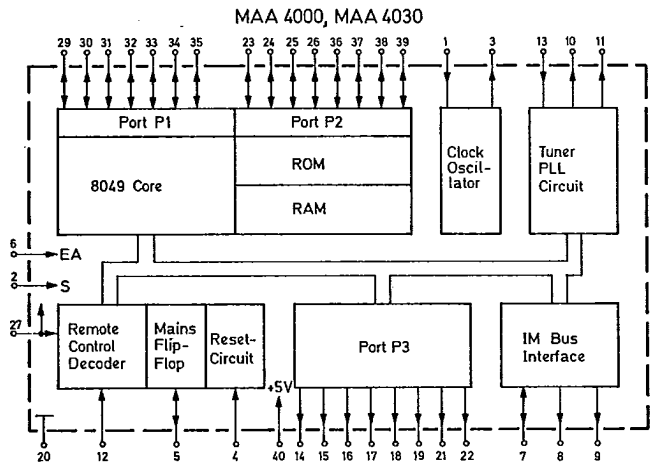
The types MAA4000 and MAA4030 are different in their ROM and RAM capacity:

MAA4000 - 3.875 K Byte ROM and 96 Byte RAM

MAA4030 - 6.5 K Byte ROM and 120 Byte RAM

Functional Description

The MAA4000/MAA4030 provides an efficient interface between user and TV set. Its programmability enables different set makers to design receivers according to their own specs. All user settings such as channel selection, station search, adjustment of volume, brightness, color saturation, etc. are fed to the MAA4000/MAA4030 either by infrared remote control or by means of the local keyboard (direct input, up to 32 keys).



MAA4000 Block Diagram

The tuning system is designed as a frequency synthesizer using a PLL with a resolution of 62.5 kHz. It requires a predivider with a fixed ratio of 64:1. Station keys can be programmed for selected channels, the tuning information being stored in the MDA2062 EEPROM with 128 8-bit words. This capacity is sufficient to store 30 TV channels and preferred user's settings for volume, brightness, contrast, etc.

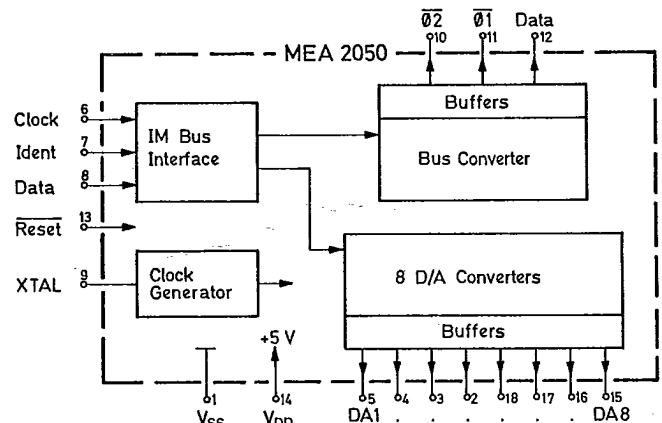
Channel information is put out via ports P2 and P3 in seven-segment code and is indicated directly on a 2-digit (optionally 4-digit) LED display without the need of an interface. A number of programmable I/O ports provides additional inputs and/or outputs which can be used to realize various features such as automatic station search, indicators other than seven-segment displays, or AFC.

MEA2050 D/A and Bus Converter IC for IM Bus (18-Pin Plastic Package)

The MEA2050 D/A and bus converter is an N-channel MOS circuit which converts the digital informations on, for example, volume, brightness, contrast and color saturation supplied by the MAA4000 or similar circuits, into analog signals for controlling analog stages. Further, the MEA2050 provides a data output DA compatible with that of the infrared remote-control receiver SAA1251, so that additional integrated circuits for controlling the TV receiver can be connected, for example for Teletext or video recorder operation. Clock outputs $\Phi 1$ and $\Phi 2$ are associated with DA.

The MEA2050 receives its input information via the IM bus from the MAA4000 in the form of 16-bit words containing the infrared address in the upper byte and the infrared command in the lower byte.

The supply voltage is 5 V and the current consumption 25 mA max. All outputs have open-drain configuration, the voltage rating being 12 V. At a 4 MHz clock frequency, the analog outputs DA1 to DA8 supply a rectangular 63.5 kHz output signal. This signal contains the information in the pulse/interval ratio which is variable in 64 steps between zero and infinite.



MEA2050 Block Diagram

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